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Message from Associate Editor In Chief



Let me first of all take this opportunity to wish all our readers a very happy, peaceful and prosperous year ahead.

This is the Second Issue of the Third Volume of International Journal of Engineering Research and General Science. A total of 326 research articles are published and I sincerely hope that each one of these provides some significant stimulation to a reasonable segment of our community of readers.

In this issue, we have focused mainly on the Innovation. We also welcome more research oriented ideas in our upcoming Issues.

Author's response for this issue was really inspiring for us. We received many papers from many countries in this issue than previous one but our technical team and editor members accepted very less number of research papers for the publication. We have provided editors feedback for every rejected as well as accepted paper so that authors can work out in the weakness more and we shall accept the paper in near future. We apologize for the inconvenient caused for rejected Authors but I hope our editor's feedback helps you discover more horizons for your research work.

I would like to take this opportunity to thank each and every writer for their contribution and would like to thank entire International Journal of Engineering Research and General Science (IJERGS) technical team and editor member for their hard work for the development of research in the world through IJERGS.

Last, but not the least my special thanks and gratitude needs to go to all our fellow friends and supporters. Your help is greatly appreciated. I hope our reader will find our papers educational and entertaining as well. Our team have done good job however, this issue may possibly have some drawbacks, and therefore, constructive suggestions for further improvement shall be warmly welcomed.

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Poly m-Aminophenol/ Montmorillonite Nanocomposite for Adsorption of Lead from Authentic Water Samples and Spiked River Nile Water

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Abstract— A polymer/clay nanocomposite (PCN) adsorbent was prepared from locally obtained natural raw montmorillonite clay and poly (m-aminophenol) and was used to remove lead ions from aqueous solutions. Raw clay (RC) and its sulfuric acid activated form (AAC) were also used to study the removal efficiency of lead ions. TGA, XRD, FTIR and SEM analyses were used to characterize the mineralogical compositions of (RC), (AAC) and (PCN). Batch adsorption method was applied and optimum conditions for adsorption were evaluated by changing various parameters; adsorbent dosage, contact time, temperature, pH and initial metal ion concentration. Analysis of the filtrated solutions for residual Pb^{2+} ions were conducted using ICP-MS. Langmuir, Freundlich, Tempkin, Dubinin-Radushkevich and Florry–Huggins isotherm equations have been applied to analyze the obtained experimental data. All adsorbents are best fitted with Langmuir isotherm model with affinity order $PCN > RC > AAC$ and corresponding correlation coefficients (R^2) 0.9996, 0.9938 and 0.9904, respectively. The other isotherms affinity order were found to be for both Freundlich and Florry–Huggins $AAC > PCN > RC$; Tempkin $PCN > AAC > RC$, and for Dubinin-Radushkevich the order was $PCN > RC > AAC$. The maximum adsorption capacity for RC, AAC and PCN with respect to Langmuir was found to be 21.73, 24.52 and 61.81 mg/g, respectively. Adsorption kinetic models were studied and the data for PCN and AAC were fitted well by the pseudo-second-order kinetics model with $R^2 = 0.9999$, while RC was fitted well by pseudo-first-order and liquid film diffusion kinetics model. The spontaneity of the adsorption process for each type of clay was proven by the negative value of ΔG° , the other thermodynamic parameters ΔH° and ΔS° were also studied for further interpretation. The method was applied on real surface water samples obtained directly from the River Nile and spiked with lead ions. The three adsorbents proved efficient in adsorbing lead ions.

Keywords— Polymer/clay nanocomposite, XRD, TGA, FTIR, montmorillonite, lead, adsorption, removal, acid activated, water treatment, isotherms, kinetics.

INTRODUCTION

Enhanced industrial activity during recent decades has led to the discharge of unprecedented volumes of wastewater, which is a serious cause of environmental degradation. If these volumes of wastewaters were discharged directly into natural waters, it will constitute a great risk for the aquatic ecosystem. The removal of toxic heavy metals or decreasing their concentrations to the permitted levels before discharge in the ecosystem has becoming more important with the increase in industrial activities. The discharge of untreated industrial wastewater in streams, rivers and lakes, has been responsible for several types of health problems in all living systems [1-6]. Within the European community, the 13 elements of highest concern are As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sn, and Ti, the emissions of which are regulated in waste systems. Some of these elements are actually necessary for humans in minute amounts (Co, Cu, Cr, Ni) while others are carcinogenic or toxic, affecting, among others, the central nervous system (Hg, Pb, As), the kidneys or liver (Hg, Pb, Cd, Cu) or skin, bones, or teeth (Ni, Cd, Cu, Cr) [7-9].

They have non-biodegradable nature and the risk of entry into the food chain or into the water supply [10] that leads to bioaccumulation in living organisms causing health problems in animals, plants, and human beings. One of such heavy metals of concern is lead. Lead is a highly toxic heavy metal even at a trace level, it was known to be harmful to human health if ingested or inhaled (WHO). Complaint about exposure to lead in the womb and during childhood that reduces intelligence quotient (IQ) [11]. Lead in the body can damage the brain, kidneys, nervous system, and red blood cells. Children, infants, pregnant women, and their unborn children are especially vulnerable to lead [11-13]. In children, lead has been associated with the impaired mental and physical development as well as hearing problems. The harmful effects of lead in the body can be subtle and may occur without any obvious signs of lead poisoning. Lead also cause mental retardations, reduces haemoglobin production necessary for oxygen transport and it interferes with normal cellular metabolism [14-16]. The Environmental Protection Agency (EPA) has set a cumulative blood lead level to remain below 10 $\mu\text{g/dL}$. EPA and WHO limit in drinking water is 15 $\mu\text{g/l}$.

Lead is a common metal found throughout the environment in the air, lead-based paint, soil, household dust, canned food, porcelain, production of petroleum products, batteries, accumulators, paints, printed circuit boards, pewter, certain types of pottery and mining activities. Lead is also present in plumbing fixtures [11-13, 17-19]. Plumbing for several hours or more, lead may dissolve into the water. Also, the dismantling of waste electrical and electronic equipment (WEEE) industry yields high Pb margins. The numerous sources of lead in the environment make it one of the commonly found metal ions in water and wastewater solutions.

Various methods for heavy metals removal have been used include chemical precipitation, membrane filtration, ion exchange, reverse osmosis, electrochemical treatment, and evaporative recovery [20]. The application of such processes is often limited because of technical or economic constraints. Besides these techniques, adsorption is the most attractive option. The prevalence of adsorption separation [21-33] in the environmental chemistry remains an aesthetic attention owing to its low initial cost, effectiveness, local availability, sustainability, simplicity of design, ease of operation, sensitivity to toxic substances and complete removal of pollutants even from dilute solutions. In addition, owing to the reversible nature of most adsorption processes, the adsorbents can be regenerated by suitable desorption processes for multiple use [34, 35], and many desorption processes are of low maintenance cost, high efficiency, and ease of operation.

The high cost of activated carbon has motivated scientists towards the search for new low cost adsorption means. Clays are natural environment friendly materials with high specific surface area showed a large participation in waste water treatment. A large number of clays have been utilized as adsorbents: siderite [36], clinoptilolite [37], natural and conditioned clinoptilolites [38], Tunisian smectitic [39], bentonite [40], zeolite [41], clay minerals [42], synthetic Goethite [43] and bio-inspired polydopamine coated natural zeolites [44]. Recently, nanoparticles have been extensively used for the ease of modifying their surface functionality and their high surface area to volume ratio for increased adsorption capacity and efficiency [2, 22, 45].

Numerous biosorption materials have been used for the removal of lead ions such as: ground nut shells [1], palm fiber [14], husk and modified rice husk [15], waste tire rubber ash [18], biomass adsorbents [20, 26], chitosan [46], chitosan-enhanced membrane filtration [47]. Also some fungi like *Asperigillus niger* [27] have the ability to accumulate heavy metals from the toxic environment.

In the last few years, polymer/clay nanocomposites have received a great deal of attention as sorbents for the toxic heavy metals in the wastewater streams. Nanocomposites often exhibit physical and chemical properties that are dramatically different from conventional microcomposites. The increasing attention devoted to polymer/clay nanocomposites arises from the fact that presence of relatively low amount of clay mineral in the polymerization procedure gives the possibility to modify drastically some of its chemical and physical properties for the resultant polymer/clay nanocomposite.

In the present study, natural raw clay RC having low or even no cost, obtained from Gebel Qarara Beni-Suef city, Egypt, was used in the design of PCN. The RC and its acid activation form by sulfuric acid were also performed in order to compare its removal efficiency in adsorbing lead ions. Batch experiments were conducted to investigate the adsorption affinity, kinetics and equilibrium isotherms of the prepared composite towards Pb^{2+} ions in aqueous solution. After each experiment, aliquots of the treated samples were separated by filtration, followed by analysis of the filtrate for residual Pb^{2+} ions using ICP-MS.

Materials and Method

Adsorbent Materials

RC: Natural raw clay mineral was obtained from Gebel Qarara, Beni-suef, Egypt. The clay was dried at room conditions for two weeks then crushed by Jaw crusher, grinded in a ball mill and sieved to pass completely from 125 μm sieve. The grinded clay was purified by washing several times with distilled water ($>18 M\Omega$) until the supernatant became clear from any deterioration, filtered and dried at 80 °C over night. Finally the RC was grinded in a ball mill to nano-size and stored in a desiccator for further study.

AAC: Fifty grams of the purified RC mineral were activated by refluxing with 1000 mL 1M H_2SO_4 at 80 °C for 2 h with vigorous and continuous stirring. The precipitate was washed twice with deionized water by decantation. The activated clay was filtrated and washed with deionized water more than five times until the washings were free from SO_4^{2-} tested by lead acetate solution 0.01 M. The precipitate was dried under vacuum at 90 °C for three hours. Finally the product was grinded and stored in the desiccator.

PCN: Poly m-aminophenol/clay nanocomposite has been synthesized using a pseudo dispersion oxidative polymerization of m-aminophenol (mAP) in aqueous HCl medium using ammonium persulfate (APS) as oxidant. At first, 50 g of the purified RC mineral was added to 350 mL deionized water under vigorous stirring to form a suspension. The clay suspension was ultrasonicated for 30 min to improve dispersion. A solution of 22.917 g mAP (0.21 mol.) in 350 mL 1 M HCl was poured into the suspension; and sonication was continued to one hour. Then, 95.844 g APS (0.42 mol.) dissolved in a minimum volume of water was poured once which the drop-wise addition was avoided as it gave low yield. A thermostat was inserted to measure the temperature change during polymerization and the reaction mixture was sonicated continuously in an ice-bath for 10 h at 10–20 °C. A dark brown precipitate of PmAP/clay nanocomposites was filtered and washed 4–5 times with 4 M HCl in order to remove unreacted monomers or oligomers. The precipitate was further washed with deionized water for several times till the pH of the washings becomes neutral. The resulting product was finally dried at 60–70 °C in a vacuum oven for about 12 h.

Batch adsorption experiments for lead were studied at room temperature. After each Batch experiment, aliquots of the treated samples were separated by filtration, followed by analysis for residual Pb^{2+} ions using ICP-MS.

Determination of the optimum adsorbent amount:

Initial metal concentrations of 120, 57.14 and 400 mg Pb^{2+} /L at pH 5.25 were used to optimize the adsorbent dosage for RC, AAC and PCN, respectively. The amounts of adsorbent used for RC and AAC were (0.05, 0.1, 0.15, 0.2, 0.3, 0.4 and 0.5 g), these dosages were added to 35 mL of the heavy metal solution in a 40 mL vial. But for PCN use (0.06, 0.08, 0.1, 0.12, 0.14, 0.16 and 0.18 g), these dosages were added to 10 mL of the heavy metal solution in a 20 mL vial. Vigorous stirring was applied for one hour contact time at room temperature 25 °C.

Determination of the optimum agitation contact time:

The agitation contact time was investigated for 15, 30, 45, 60, 90, 120, 150 and 180 min. The reaction was done at room temperature 25 °C with optimized adsorbent dosage 0.2, 0.15 and 0.1 g for RC, AAC and PCN, respectively.

Determination of the effect of temperature:

Water bath equipped with a temperature controller was used to examine the effect of temperature on the adsorption process. Different temperatures 25, 30, 40, 50, 60 and 70 °C were investigated for each type of clay.

2.3.4. Determination of the optimum pH value:

At room temperature 25 °C, the initial pH values of solution were adjusted by adding nitric acid or sodium hydroxide at 2, 3, 3.5, 4, 4.5, 5, 6, and 7. Buffering wasn't used in the experiments due to unknown effects on the adsorption process.

Determination of the optimum metal concentrations

Different Initial metal concentrations ranged from 100 to 700 mg Pb^{2+} /L were prepared. The reaction solutions had pH 5.25 and were allowed to proceed at room temperature 25 °C.

Real sample treatment

Surface water samples were obtained from the River Nile and their pH was adjusted to 5.5. The samples were spiked with lead ions to prepare 200 mg Pb^{2+} /L. A 0.5 g of each adsorbent was added to 100 mL of the 200 mg Pb^{2+} /L solution in order to study the removal efficiency. The reaction mixture was allowed to proceed at room temperature for 3 hours agitation time followed by analysis of the filtrate for residual Pb^{2+} ions using ICP-MS.

Results and Discussions

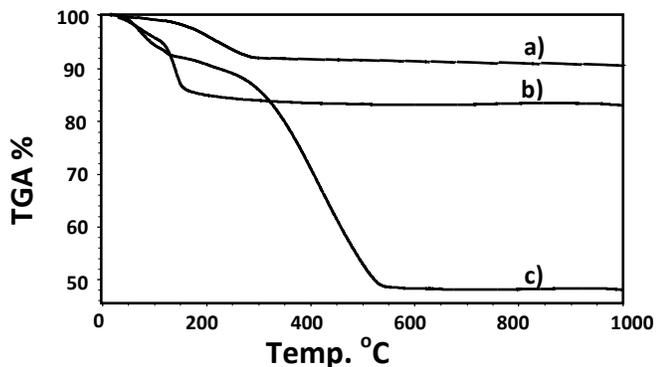


Fig.1. Thermal gravimetric analysis for: a) RC, b) AAC and c) PCN.

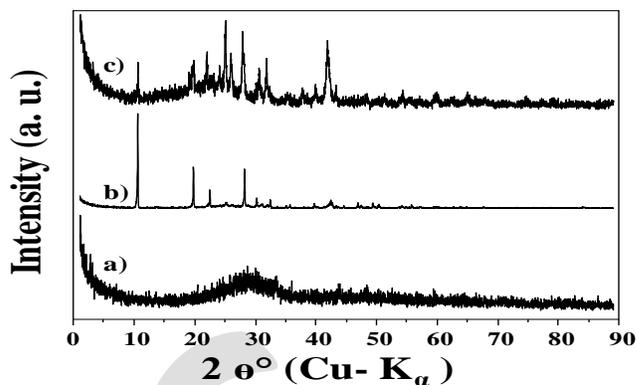


Fig.2. X-ray diffractograms of: a) RC, b) AAC and c) PCN.

The changes in weight of the investigated clay samples were studied by thermal gravimetric analysis as shown in figure (1). It is clear that RC and its activated form reveal three weight loss steps. The first one is slow at the temperature range 30 to 150 °C corresponding to the liberation of the mechanically held water, with a weight loss of about 2 %. The second stage lies between 150 and 300 °C which is very fast and characterizes the dehydration of iron bearing minerals, the weight loss amounts to about 5.5 %. The last weight loss occurs at the temperature range 300 to 1000 °C which confirms the evolution of the lattice hydroxyl groups of the clays as well as the dissociation of dolomite, with a weight loss of about 1.5 %. Four weight losses were recorded for PCN. The first is slow with weight loss of 8% at temperature range 30 to 150 °C, is attributed to the liberation of the mechanically held water in the clay minerals and the release of bound water molecules present in the polymer sample. The second weight loss of 6% at temperature range 150 to 300 °C is attributed to the dehydration of iron bearing minerals and trace decomposition at 300 °C, this is due to the release of some decomposition products, which might be O₂ and H₂O molecules [48, 49]. The third weight loss of 36.2% at temperature range 300 to 545 °C which is attributed to the total decomposition of poly (m-aminophenol) in the form of CO₂, NO_x and H₂O gases. The last weight loss of 1.8% from 545 to 1000 °C which confirms the evolution of the lattice hydroxyl groups of the clays.

Identification of clay minerals by (XRD) is based on the determination of the lattice spacing d (Å) which is the distance between the two successive lattice planes. Bragg's equation is used to calculate the lattice spacing as follows [50]:

$$n\lambda = 2d(hkl) \sin \theta$$

where hkl is the index of the reflecting plane, λ is the wave length of radiation, n is an integer number usually used equals one, d is lattice spacing and θ is the angle of incidence. The XRD patterns of the studied clay samples are shown in figure (2). ASTM cards for clay and non-clay minerals were used in the identification of the mineral composition of the studied samples. The results revealed that the investigated RC and PCN contain some quartz, montmorillonite, illite, kaolinite, and dolomite. For AAC, the kaolinite is converted to gypsum which is the main cause for decreasing its removal efficiency which is less than that of RC. On the other hand, montmorillonite represents the major clay mineral content of the studied samples.

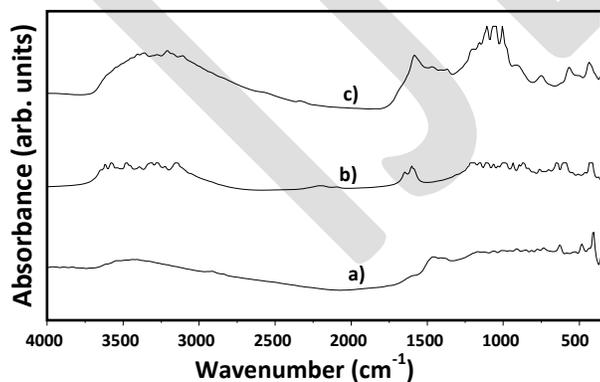


Fig.3. FT-IR spectra of: a) RC, b) AAC and c) PCN.

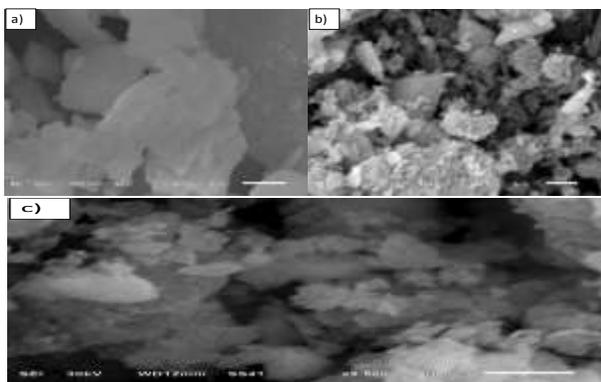


Fig.4. SEM images of: a) RC, b) AAC and c) PCN.

The characteristic vibrational bands obtained from FTIR spectra of PCN figure (3) proved the successful preparation of the poly meta-aminophenol [48, 49, 51]. A broad band appears in the region 3690–1833 cm⁻¹ which is due to the stretching of aromatic C–H, hydrogen bonded –OH, and –NH– groups. The –OH group is hydrogen bonded with the nearest nitrogen of –NH group

present in the polymer chain. So $-OH$ absorption band appears at about 3425 cm^{-1} as a broad peak. There is a band at 1050 cm^{-1} due to bending vibration of aromatic $C-O-H$ group present in the polymer. The band at 1236 cm^{-1} is close to $C-O$ stretching band at 1265 cm^{-1} as an overlapping broad band. Due to the band at 1050 cm^{-1} and a very weak band at 1236 cm^{-1} , it is expected that very little $C-O-C$ linkage was formed in the polymer. That means most of the $-OH$ groups remain free after polymerization.

As shown in figure (4), the morphological structure of RC figure (4a) appears in micrometer scale with uniform arrangement of the clay silicate layers stacked together in form of agglomerates. This formation was disappeared in PCN SEM micrograph figure (4c); this was attributed to the single nano polymer chains that are intercalated between unaltered silicate layers. The single clay layer with nanometer width spreads on the polymer matrix. The SEM image of AAC figure (4b) show different particle morphology than RC. The large flat layers of RC change to smaller layers and fragmented pieces caused by acid treatment effect [52, 53].

Effect of adsorbent dosage and contact time on the adsorption process

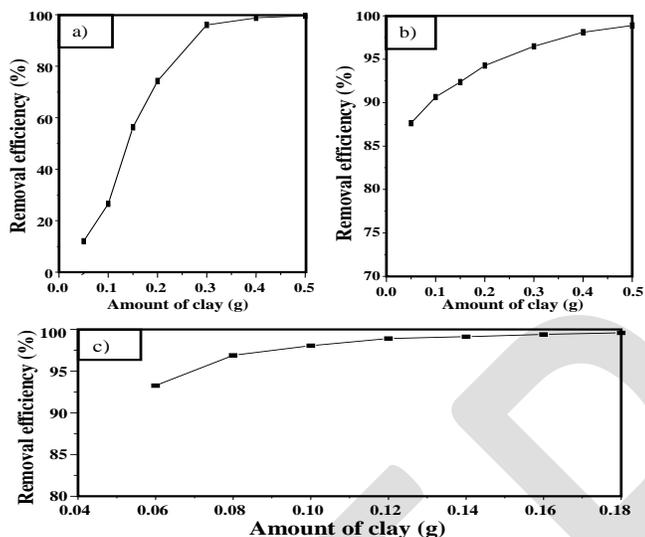


Fig.5. Effect of the adsorbent dosage on the adsorption

of Pb^{2+} ions: a) RC, b) AAC and c) PCN.

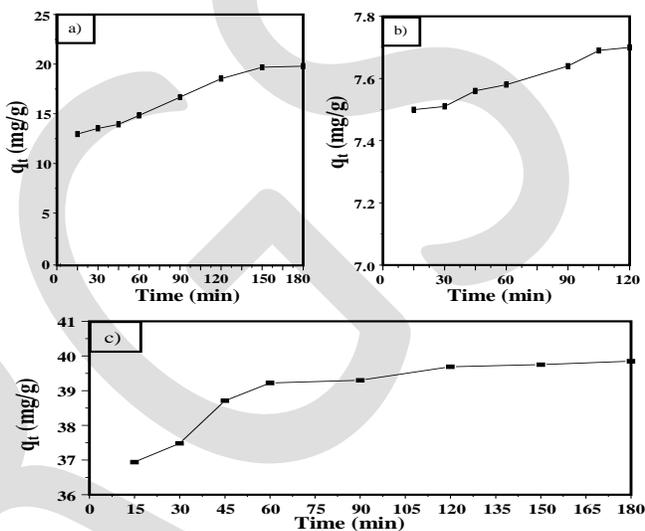


Fig.6. Effect of the contact time on the adsorption of Pb^{2+}

ions: a) RC, b) AAC and c) PCN.

As expected, the removal efficiency is increased with increasing the adsorbent dose for a given initial metal concentration. This is due to the increase of adsorbent dose that is proportional to the increase of number of adsorption sites and surface area which is attributed to the binding of metal ions onto the surface functional groups present on the adsorbent surface. The effect of RC, AAC and PCN dose on the percentage removal of Pb^{2+} ions was shown in figure (5). From the figure it can be observed that the percentage removal of lead ions was increased from 12.02% to 99.56% when the adsorbent dose was increased from 0.05 g to 0.5 g in case of RC. For AAC, the percentage of lead removal was increased from 87.63% to 98.88% when the adsorbent dose was increased from 0.05 g to 0.5 g. The percentage of lead removal began very high 93.26% for PCN compared with RC and AAC till reached 99.58% when the adsorbent dose was increased from 0.06 g to 0.18 g. By the end of adsorbent dosage study we consider the optimum dosage was 0.2, 0.15 and 0.1 g that achieved removal efficiency 71.44%, 92.36% and 98.06% for RC, AAC and PCN, respectively.

The effect of contact time on adsorption of Pb^{2+} ions is shown in figure (6). The adsorption of lead ions was increased by increasing the contact time. The adsorption process was faster in the first 60 min for both RC and PCN; and then became more slowly until they reached equilibrium at 150 and 120 min.; and achieving adsorption capacity of 18.54 and 39.7 mg/g, respectively. The adsorption rate in case of AAC began slowly until it reached equilibrium at 120 min. achieving adsorption capacity of 7.7 mg/g. It was found that; the adsorption of Pb^{2+} ions using PCN reached equilibrium within 120 min with removal capacity 39.7 mg/g indicating the strong ability of this adsorbent to abstract Pb^{2+} ions from aqueous solutions. The higher amount of adsorption by PCN could be rationalized in terms of increasing both the active sites and the surface area according to the presence of the polymer chains.

Adsorption kinetics

The relationship between adsorption capacity and adsorption time represented in figure (6) is used to describe the adsorption kinetics. The adsorption kinetics is one of the important characteristics defining the efficiency of an adsorbent. It describes the solute uptake rate which evidently controls the diffusion process and the residence time of adsorbate uptake at the solid–solution interface. In order to analyze the adsorption mechanism of Pb^{2+} ions onto the different types of clay; Lagergren pseudo-first-order and pseudo-second-order [54-57] adsorption kinetics models were applied to fit the obtained experimental data and to investigate the adsorption properties of each adsorbent.

The pseudo-first-order kinetic model of the Lagergren is one of the most widely used for the adsorption of a solute from liquid solutions and can be expressed by:

$$\frac{dq_t}{dt} = k_1(q_e - q_t) \quad \text{which can be expressed in linear form as } \ln(q_e - q_t) = \ln q_e - k_1 t$$

The chemisorption pseudo-second-order kinetic model is represented by:

$$\frac{dq_t}{dt} = k_2(q_e - q_t)^2 \quad \text{which can be expressed in linear form as } \frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e}$$

where k_1 and k_2 are the adsorption rate constants of first-order and second-order kinetic models (1/min and g/mg min), respectively; q_t and q_e (mg/g), are the respective adsorption capacity of the metal ion at a time t and at equilibrium, respectively. The slopes and the intercepts of each linear plot in figure (7) are used to calculate the adsorption rate constants (k_1 and k_2) and the amount of adsorption at equilibrium (q_e). The calculated kinetics parameters for adsorption of Pb^{2+} ions onto the different types of clay are listed in Table 1.

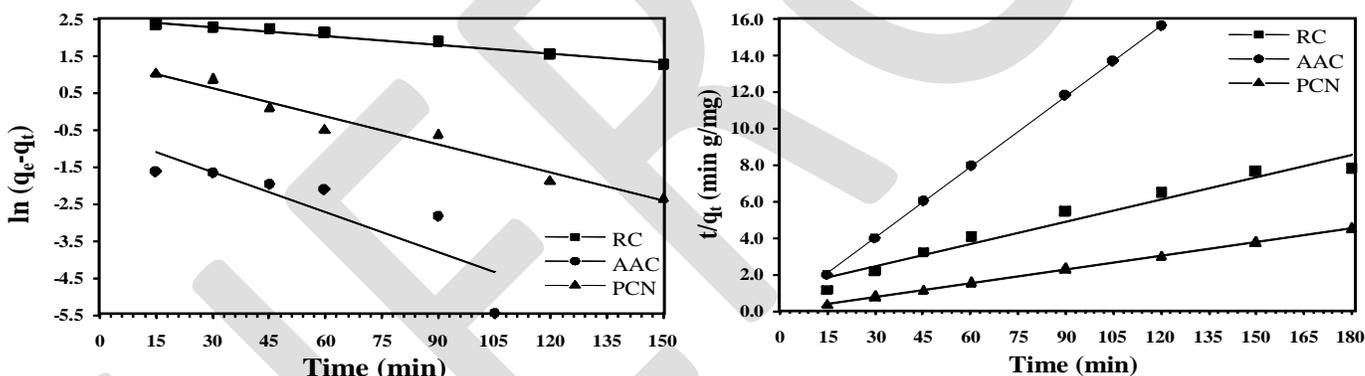


Fig.7. The first and second-order kinetic model for the adsorption process.

Table 1. Kinetic model parameters for the adsorption of Pb^{2+} ions onto RC, AAC and the PCN:

Kinetic models	Parameters	RC	AAC	PCN
Pseudo first-order	K_1 (min^{-1})	0.0082	0.0360	0.0255
	q_e cal. (mg/g)	12.724	0.5696	4.1055
	S.D.	0.0714	0.8452	0.2521
	R^2	0.9746	0.7326	0.9677
Pseudo second-order	K_2 (g/mg min)	0.0014	0.1466	0.0141
	q_e cal. (mg/g)	24.504	7.7393	40.225
	S.D.	0.5463	0.0429	0.0073
	R^2	0.9582	0.9999	0.9999
Experimental	q_e Exp. (mg/g)	23.2	7.7	39.851

Referring to Table 1, the correlation coefficients (square of regression (R^2) values close or equal to 1) is an expression for the conformity between the experimental data and the model. A relatively high R^2 value for a model indicates that this model is successfully describing the kinetics of Pb^{2+} ions adsorption. The favorability of RC to follow Lagergren kinetic model is found to

be high as confirmed by the highest value of the square regression (R^2) 0.9746. The adsorption of Pb^{2+} ions by each of AAC and PCN didn't fit well the first-order Lagergren kinetic model. The second-order kinetic model is fitted well in case of the adsorption of Pb^{2+} ions on AAC and PCN (square of regression 0.9999 for both) indicating that the adsorption process might be a chemical adsorption (chemisorption) involving valence forces through sharing or exchange electrons between the sorbent and adsorbate. In chemical adsorption, it is assumed that the adsorption capacity is proportional to the number of active sites occupied on the adsorbent surface. Fitted equilibrium capacities (q_e , cal) are in close agreement with those observed (q_e , exp) experimentally as clearly shown in Table 1. The experimental data so far revealed that PCN is an efficient adsorbent for the removal of lead ions from aqueous solutions where the adsorption capacity reaches 39.85 mg/g within 120 min.

The adsorption data may also, be described by some adsorption diffusion models which are always constructed on the basis of three consecutive steps: (1) film diffusion (i.e., diffusion across the liquid film surrounding the adsorbent particles); (2) intraparticle diffusion (i.e., diffusion in the liquid contained in the pores and/or along the pore walls); and (3) mass action (i.e., physical adsorption and desorption between the adsorbate and active sites). Since the adsorption step is very rapid, it is assumed that it doesn't influence the overall kinetics. The overall rate of adsorption process will be controlled by either surface diffusion or intraparticle diffusion. The intraparticle diffusion model[58, 59] assumes that the metal ions are transported from the solution through an interface between the solution and the adsorbent which called film diffusion, followed by a rate-limiting intraparticle diffusion step which bring them into the pores of the particles in the adsorbent.

Isotherm Analysis

For analyzing the experimental data, adsorption isotherm models were used to determine the homogeneous and heterogeneous characteristics. To evaluate the adsorption isotherm, two equilibrium isotherms were studied: A) Langmuir & B) Freundlich. Analysis of isotherms was used to describe the experimental adsorption data, and then best results can be obtained when correlation coefficients (R^2) come close to 1, Table 2. High values of R^2 (close or equal to 1) indicate the conformity among experimental data with the isotherm model.

Equilibrium models	Parameters	RC	AAC	PCN
Langmuir	Q_m (mg/g)	21.734	24.581	61.805
	K_L (L/mg)	-4.5064	0.5913	0.2816
	S.D.	0.2566	0.0427	0.0124
	R^2	0.9938	0.9904	0.9996
Freundlich	K_F (mg/g)(L/mg) ^{1/n}	18.219	13.007	16.947
	n_F	25.667	5.8323	3.0467
	S.D.	0.0548	0.0631	0.2486
	R^2	0.8167	0.9661	0.8769

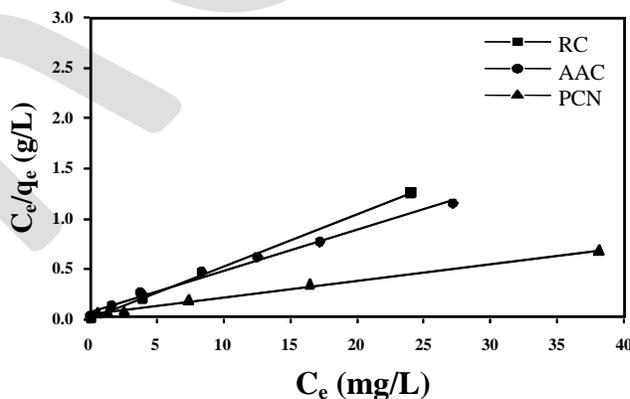


Table 2. Equilibrium isotherm model parameters for the adsorption of Pb^{2+} ions onto RC, AAC and PCN

Fig.8. The Langmuir isotherm model for the adsorption process

Langmuir adsorption isotherm [60] describes quantitatively the formation of a monolayer adsorbate on the outer surface of the adsorbent [61] and after that no further adsorption takes place [62]. The Langmuir isotherm is valid for monolayer adsorption onto a surface containing a finite number of identical sites. Langmuir model assumes that adsorption forces are similar to the forces in chemical interactions, uniform energies of adsorption onto the surface and no transmigration of adsorbate in the plane of the surface. Based upon these assumptions, Langmuir represented the following equation:

$$q_e = \frac{Q_m K_L C_e}{1 + K_L C_e} \quad \text{which can be expressed in linear form as} \quad \frac{C_e}{q_e} = \frac{C_e}{Q_m} + \frac{1}{Q_m K_L}$$

where C_e is the concentration of Pb^{2+} ions at equilibrium (mg/L), q_e is the adsorption capacity at equilibrium (mg/g), Q_m is the maximum adsorption capacity at monolayer coverage (mg/g) and K_L is the intensity of adsorption (L/mg). Figure (8), illustrates a plot of C_e/q_e versus C_e , enabling the calculation of Langmuir constants from the intercept and slope of the linear plot.

Langmuir isotherm model assumes the mechanism of the adsorption process as a monolayer adsorption on completely homogeneous surfaces where interactions between adsorbed molecules are negligible [63]. This empirical model assumes that the adsorbed layer is one molecule in thickness, with adsorption can only occur at a fixed number of definite identical and equivalent localized sites. Once a molecule occupies a site, no further adsorption can take place. This is described as homogeneous adsorption with uniform energies of ion exchange as all sites possess equal affinity for the adsorbate.

An essential characteristic of Langmuir isotherm can be expressed by a dimensionless constant called equilibrium parameter or separation factor (R_L) [64] which is used to describe the favorability of the adsorption process on the surface of the different types of the clay. The Langmuir separation factor can be represented by the following equation:

$$R_L = \frac{1}{1 + K_L C_o}$$

where K_L is the Langmuir equilibrium constant and C_o is the initial Pb^{2+} ions concentration (mg/L). The value of R_L indicates the type of the isotherm to be either unfavorable ($R_L > 1$), linear ($R_L = 1$), favorable ($0 < R_L < 1$) or irreversible ($R_L = 0$) [65-67]. The more favorable adsorption is reflected by lower R_L values. The R_L values for the adsorption of the Pb^{2+} ions are given in Table 4, which reveals that the values fall in the preferred region (i.e., $0 < R_L < 1$).

The lower values of R_L for RC adsorption (approaching 0) point toward irreversible nature of the adsorption. It can be noted in Table 3 that the R_L values decrease with the increase in the initial Pb^{2+} concentration indicating that the ion exchange is more favorable at higher initial concentration. The favorability of PCN to follow Langmuir model is found to be higher as confirmed by the high square regression (R^2) value (0.9996) than in the case of RC and AAC (0.9938 and 0.9903) respectively, Table 3.

RC		AAC		PCN	
C_o (mg/L)	R_L Value	C_o (mg/L)	R_L Value	C_o (mg/L)	R_L Value
100	-0.0022	42.86	0.038	100	0.0343
120	-0.0018	57.14	0.0287	200	0.0175
140	-0.0016	71.43	0.0231	300	0.0117
180	-0.0012	85.71	0.0193	400	0.0088
220	-0.001	100	0.0166	500	0.007
260	-0.0008	114.29	0.0146	600	0.0059
300	-0.0007	128.57	0.013	700	0.005

Table 3. The R_L values based on the Langmuir isotherm

model for the adsorption of Pb^{2+} ions at different initial concentrations

The Freundlich isotherm [68] is a semi-empirical equation based on the adsorption occurred on heterogeneous surfaces having unequally available sites with different energy of adsorption as well as multilayer sorption. It can be represented by the following form:

$$q_e = k_F C_e^{1/n_F} \text{ which can be expressed in a linear form as } \ln q_e = \ln k_F + \frac{1}{n_F} \ln C_e$$

where q_e is the adsorption capacity at equilibrium (mg/g), C_e is the equilibrium concentration of Pb^{2+} ions (mg/L), k_F and n_F are Freundlich isotherm constants related to adsorption capacity and adsorption intensity ((mg/g) (L/mg)^{1/n} and g/L), respectively. This isotherm gives an expression encompassing the surface heterogeneity and the exponential distribution of active sites and their energies. Values of n_F between 2 and 10 show good adsorption [69, 70]. Also from Table 3, the values of n_F were determined to be 5.83 and 3.05 for AAC and PCN, respectively; lying in the range of 1–10, thus is classified as favorable adsorption. The slope ($1/n_F$) range of 0–1 is known to be a measure of adsorption intensity or surface heterogeneity, becoming more heterogeneous as its value gets closer to zero. Whereas, a value below unity implies chemisorption processes where $1/n_F$ above one is an indicative of cooperative adsorption [71].

As assumption of Freundlich isotherm model, the adsorption process on RC was mostly heterogeneous and chemisorption mechanism with $1/n_F$ 0.039. A $1/n_F$ value below unity (0.172 and 0.328 for AAC and PCN, respectively) is indicative of

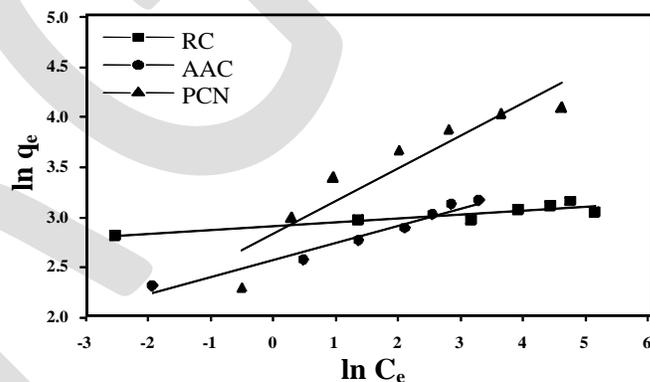


Fig.9. Freundlich isotherm model for the adsorption process

chemisorption process. For PCN, the higher value of the constant k_F 16.947 indicates the higher affinity for Pb^{2+} ions in comparison to AAC 13.007. As shown in figure (9), a plot of $\ln q_e$ versus $\ln C_e$, the best fitting to Freundlich isotherm model is AAC with square regression value (R^2) 0.9661.

Based on energy of activation, we can predict whether an adsorption is physisorption or chemisorption. If the energy of activation is < 8 KJ/mol, the adsorption is physisorption and if the energy of activation is 8-16 KJ/mol, the adsorption is chemisorptions in nature. From Table 3, the adsorption process is physisorption for AAC and PCN where the energy of activation is 4.469 and 1.337 KJ/mol, respectively.

Temperature study

Effect of temperature on the adsorption process

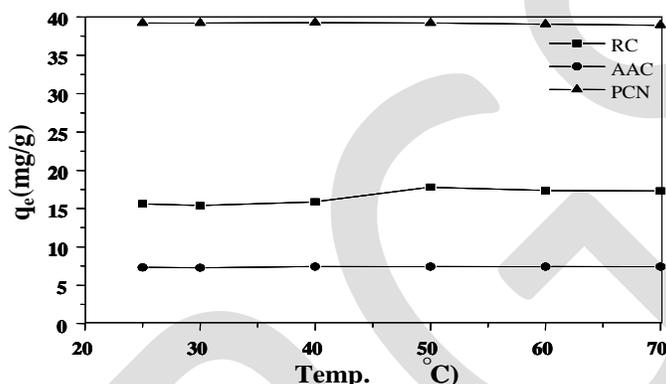


Fig.10. Effect of the temperature on the adsorption of Pb^{2+} ions.

As shown in figure (10), the change in adsorption capacity has the same behavior for RC and its activated form. The graph begins with slight increase in the removal efficiency till reaches its maximum at 50 and 60 °C, respectively; after which a decrease in the removal process takes place. Using RC, the adsorption capacity begins from 15.39 mg/g till reaches its maximum of 17.79 mg/g at 50 °C. Beyond 50 °C slight decrease in the adsorption process occurs. As for AAC, the adsorption capacity begins from 7.3 mg/g till reaches its maximum of 7.44 mg/g at 60 °C. After 60 °C slight decrease in the adsorption process takes place. As listed in Table 4, the enthalpy of the adsorption process for RC and its activated form was positive value that means the reaction occurs endothermic. However, when the adsorption occurs as an endothermic process, the increasing temperature favors the adsorption of the adsorbate. Therefore, such an outcome confirms that the best adsorption is obtained with the temperature increase. The previous behavior can be attributed to the fact that, when the temperature increases, the Pb^{2+} ions move more vigorously. As a result, the ions interact more easily with the active sites of the adsorbent surface and result in greater retention. Furthermore, some of the adsorption stages that are originally slow are accelerated by the increase of the activation energy of the system. The slight decrease at the end of each graph can be attributed to the breaking down of the physical adsorption bonds due to the large increase in temperature. The adsorption capacity for PCN begins from 39.22 mg/g with no more increase by increasing the temperature till reaches 50 °C. After 50 °C sharp decrease in the adsorption process takes place till it reaches 38.92 mg/g. This behavior may be attributed to the leakage of the physical adsorption bonds due to the increase in the temperature. Also, as listed in Table 4, the enthalpy was negative that means the reaction occurs exothermic. In such process, the adsorption decreases with the increase of the temperature, favoring the adsorbate desorption.

Thermodynamics parameters

The thermodynamic parameters change in Gibb's free energy (ΔG°), change in enthalpy ΔH° , and change in entropy ΔS° for the adsorption of Pb^{2+} ions on each type of clay has been determined by using the following equations:

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ \quad \text{and} \quad \Delta G^\circ = -RT \ln K_D \quad \text{where} \quad K_D = q_e / C_e$$

The relationship between the distribution coefficient and temperature under the assumption that ΔH° is constant [72] can be expressed by:

$$\ln K_D = -\Delta H^\circ / RT + \Delta S^\circ / R$$

where K_D is the distribution coefficient of the adsorbate, C_e and q_e are the concentrations of Pb^{2+} ions at equilibrium (mg/L) and the adsorption capacity at equilibrium (mg/g), respectively; R is the universal gas constant (8.314 J/mol K) and T is the temperature (K).

ΔH° and ΔS° parameters can be calculated from the slope and intercept of the plot of $\ln K_D$ vs. $1/T$ figure (11). ΔG° was calculated using the upper equations and all results are listed in Table 5. The spontaneity of the adsorption reactions on the surface of each type of clay was confirmed by the negative value of ΔG° . The positive value of enthalpy indicated that the adsorption process was endothermic for RC and AAC 8.8439 and 7.1522 kJ/mole, respectively. For PCN, the adsorption process seems to be exothermic in nature that explains the decreasing in the adsorption capacity by increasing the temperature. Moreover, the positive value of ΔS° indicates that the degrees of freedom increased at the solid-liquid interface during the adsorption.

Thermodynamic parameters	RC	AAC	PCN
ΔH° (kJ/mol)	8.8439	7.1522	-5.9058
ΔS° (J/mol K)	77.832	90.523	51.574
ΔG° (kJ/mol)	-14.350	-19.823	-21.275

Table 4. Thermodynamic parameters for the adsorption of Pb^{2+} ions onto RC, AAC and PCN

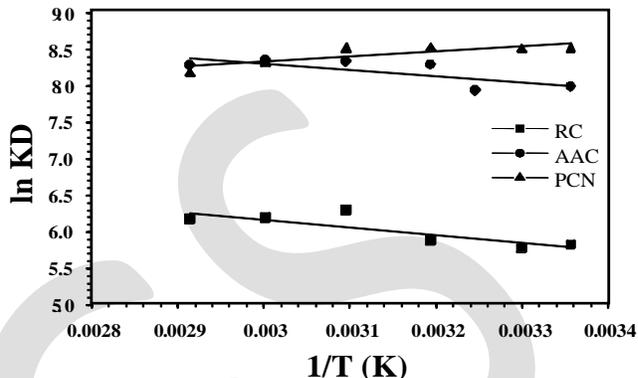


Fig.11. Plot of $\ln K_D$ Vs. $1/T$ for the thermodynamics parameters

Effect of the pH on the adsorption process

As shown in figure (12), a gradual increase in the adsorption process in the case of RC from 10.14 mg/g at pH 2 to reach the maximum removal of 22.96 mg/g at pH 5.3, takes place. The adsorption capacity was dropped to 20.37 mg/g at pH 6 and finally total removal of the metal ion at pH 7 is achieved, this is owing to the complete precipitation of the metal ion in the form of hydroxide. In the case of AAC the removal capacity was very low. It begins from 7.39 mg/g at pH 2 with no sharp increase by increasing the pH where it reaches its maximum removal of 7.42 mg/g at pH 6. Finally total removal of the metal ion at pH 7 takes place similarly. For PCN, the removal efficiency was very high. It begins with adsorption capacity of 38.87 mg/g at pH 2 without sharp increase on increasing the pH until maximum removal of 39.28 mg/g at pH 4, then no more increase in the removal of the metal ion till pH 7 where complete precipitation of the metal ion occurred in the form of hydroxide. The low adsorption at low pH was attributed to electrostatic repulsion of both positively charged adsorbent and adsorbate. On the other hand, the H^+ ions present at higher concentration in the aqueous medium compete with the positively charged Pb^{2+} ions for the surface adsorbing sites resulting in a decrease in the removal of Pb^{2+} ions [37, 69].

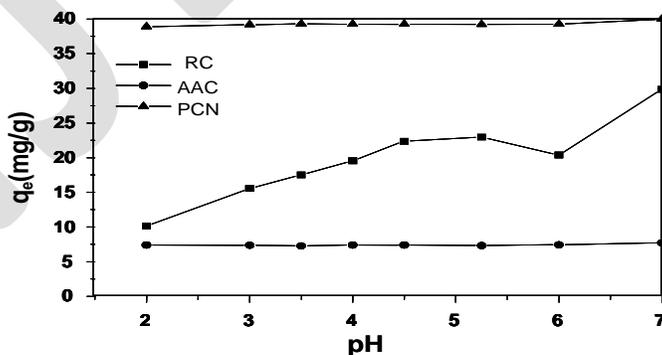


Fig.12. Effect of the pH on the adsorption of Pb^{2+} ions.

Real sample treatment

Real surface water samples taken directly from the River Nile are collected from different places in Beni-Suef governorate in order to study the matrix effect on the adsorption process. The samples are spiked with lead ions and the batch adsorption method was applied. The removal efficiency was found to be 57.58%, 81.88% and 98.25% for RC, AAC and PCN, respectively; proving that PCN, as expected, has the best removal efficiency. The equilibrium adsorption capacity for PCN is nearly twice that for RC. The equilibrium adsorption capacity values for the three adsorbents are illustrated in table 5

Table 5. Analysis of real samples:

Surface water analysis	$C_o = 100$ (mg/L)				$C_o = 200$ (mg/L)			
	C_e (mg/L)	Removal amount (mg/L)	Removal percent (%)	q_e (mg/g)	C_e (mg/L)	Removal amount (mg/L)	Removal percent (%)	q_e (mg/g)
RC	3.55	96.45	96.45	19.29	84.84	115.16	57.58	23.03
AAC	12.68	87.32	87.32	17.46	36.25	163.75	81.88	32.75
PCN	0.28	99.72	99.72	19.95	3.5	196.5	98.25	39.3

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CONCLUSION

Natural raw montmorillonite clay mineral RC, its sulfuric acid activated form AAC and its polymer/clay nanocomposite PCN were applied for the removal of Pb^{2+} from authentic samples and spiked real surface water samples collected directly from the River Nile. TGA, XRD, IR and SEM analyses were used to characterize the mineralogical compositions of RC, AAC and functionalized PCN. Batch adsorption method was applied and optimum conditions for adsorption (adsorbent dosage, contact time, effect of temperature, effect of pH and initial lead concentration) were evaluated. Langmuir (L), Freundlich (F), isotherm equations have been applied to analyze the obtained experimental data. The maximum adsorption capacity for RC, AAC and PCN was found to be 21.73, 24.52 and 61.82 mg/g with respect to Langmuir.

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An optimized cellular network design using various technologies within a service area

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Abstract— this paper deals with Optimized Cellular Network with different access technologies with in the Staffordshire country. The main aim is to provide good coverage to the customers in the prescribed area as per the customers' utilization. For the cause of poor coverage probability and higher call blocking rates the network has been redefined. So the cellular network was designed with the target coverage probability of 0.98 and blocking probability of 1% which covers entire Staffordshire country. For designing practically we use a tool called "MENTUM PLANET" software providing capacity, coverage and frequency planning and analysis of Staffordshire County according to the customers' utilization.

Keywords— Global Systems for Mobile Communications, Universal Mobile Telecommunications Systems, Long Term Evolution, Core Network, UMTS Terrestrial Radio Access Network, Radio Network Controller, Frequency Division duplex..

1. INTRODUCTION

In present day technology, mobile world plays a high flying role in every individual day to day life. There has been drastic change in the field of cellular technology since few decades. Even today the network technologies are developing with new requirements depending upon the usage of traffic, but in early days it was utilized for minimum and limited requirements. Here we are designing optimized cellular network and obtaining network constraints and parameters.

While talking about the mobile communications, there has been tremendous improvement on different generations over the past few years. In the first generation, in early 80's Analogue systems came into existence and are called as NMT ("Nordic Mobile Telephone"). In the second generation GSM was developed and used EDGE ("Enhanced Data GSM Environment") technology which offers data rate up to 384Kbps. In the third generation, UMTS came into existence which uses WCDMA (Wideband Code-Division Multiple Access) and providing high data rates. In fourth generation, LTE ("Long-Term Evolution") has been developed which is the latest technology leading the entire mobile communications in today's competitive world.

2. BACKGROUND RESEARCH

As the document aim is to design Optimized network with different mobile technologies in particular area and provide less blocking rates, best handover and Quality of service. In order to meet the above conditions, background research should be done regarding Staffordshire County.

In terms of area and population the Staffordshire seems to be the largest county where the others do not meet with those requirements. It is located in the west midlands of UK.

- The total area of Staffordshire county is 2,716.19km²
- Total population is 1,096,700

The total 9 regions of this county is given below

- Tamworth
- Litchfield
- Cannock chase

- South Staffordshire
- Stafford
- Newcastle Under Lyme
- Staffordshire moorlands
- East Staffordshire
- Stoke on Trent



Fig. 2.1. Staffordshire County and its Districts

Here in our network design we are mainly concentrating on improvement of limitations of network especially on coverage probability. For designing a cellular network which is using UMTS technology providing the same coverage probability with a link budget of 144Kbps data rate, we considered the evaluation from GSM to UMTS later to LTE. The coverage planning was done by dividing the regions into different types followed by updating the link budget for UMTS to 144Kbps data rate. The required theoretical calculations are shown below.

2.1 GSM (2G) - Global Systems for Mobile Communications

GSM stands for Global System for Mobile Communication which is used for digital communication. GSM provides improved quality and flexibility over first generation mobile services and can able to allow mobile phones to make and receive calls when travelling. These offer advanced technical features that supports wide range of services including international roaming. It also includes short message texting, web browsing and picture messaging.

The wireless telegraphy act licenses for 2G cellular services were allocated through public consultation processes in the 1980s and 1990s.

The MS and BSS communicate across the UM interface, also known as the air interface or radio link. The BSS communicates with the network service switching center across the interface.

In GSM network the following areas are defined.

- **Cell:** Cell is the basic service area for which one BTS cover one cell. Each cell is given a Cell Global Identity (CGI) that uniquely identifies the cell
- **Location Area:** This is the area covers when the subscriber gets an incoming call. Each location area is assigned a Location Area Identity (LAI). Each location area is served by one or more BSCs
- **MSC/VLR Service Area:** It is defined as the area covered by one MSC is called MSC/VLR service area.
- **PLMN:** The area covered by one network operator is called PLMN. It contain one or more MSCs.

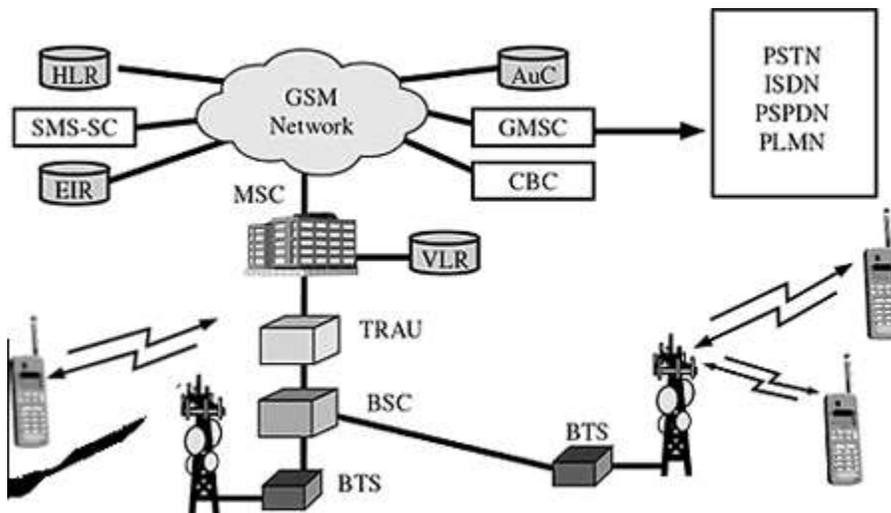


Fig. 2.1.1.GSM Network

2.2 UMTS (3G)-Universal Mobile Telecommunications Systems

UMTS means "Universal Mobile Tele Communication System" which is the third generation digital mobile technology. The UMTS network consist of three interfacing domains called Core Network(CN), UMTS Terrestrial Radio Access Network (UTRAN) and User Equipment (UE). The main function of the network is to provide switching, routing and transit for user traffic. Core network also contains the databases and network management functions.

The basic Core Network architecture for UMTS is based on GSM network with GPRS. It modified for UMTS operation and services. The UTRAN provides air interface access method for User Equipment Base Station referred as Node-B and control equipment for Node-B's is called Radio Network Controller (RNC). It is necessary for a network to know the approximate location in order to be able to page user equipment. The list of system areas is shown.

- UMTS systems
- Public Land Mobile Network(PLMN)
- MSC/VLR or SGSN
- Location Area
- Routing Area
- UTRAN Registration Area
- Cell
- Sub cell

UMTS also have Virtual Home Environment (VHE). Both connections oriented and connectionless services exist for point to point and point to multipoint communication. Offered data rate targets are

- 144 Kbits/s satellite and rural outdoor
- 384kbits/s urban outdoor
- 2048kbits/s indoor and low range outdoor

Bearer services have different QOS parameters for maximum transfer delay, delay variation and bit error rate. UMTS also has improved network security and location services.

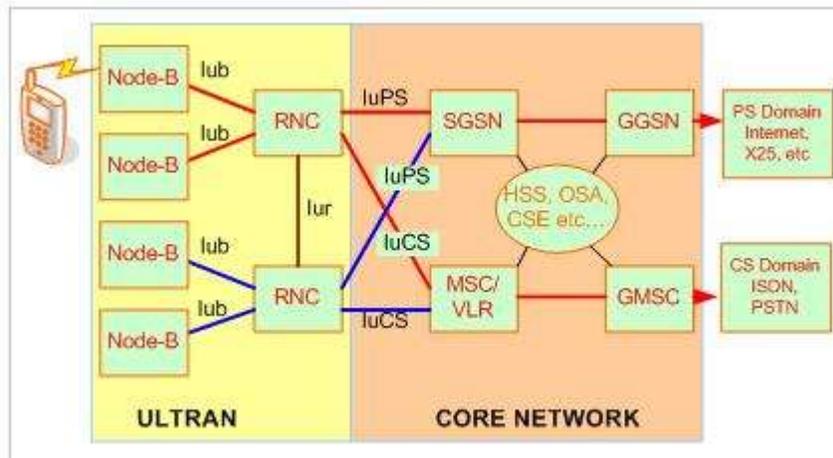


Fig.2.2.1. UMTS Network

2.3 LTE (4G) - Long Term Evolution

LTE means "Long Term Evolution" which is 4G technology came into existence and ruling the present day mobile communications but not yet become popular. This 4G LTE is being driven by combination of emerging wireless services. Few people in mobile industry dispute the inevitability of 4G Long Term Evolution but the timing and nature of deploying LTE network technology is less. In LTE uplink and downlink transmission paths are separated by using Frequency Division duplex (FDD). The operating of the system and its architecture is completely differ to that of UMTS.

In general the architecture of LTE is similar to GSM and UMTS. The entire architecture is divided into two parts.

- Radio network
- Core network

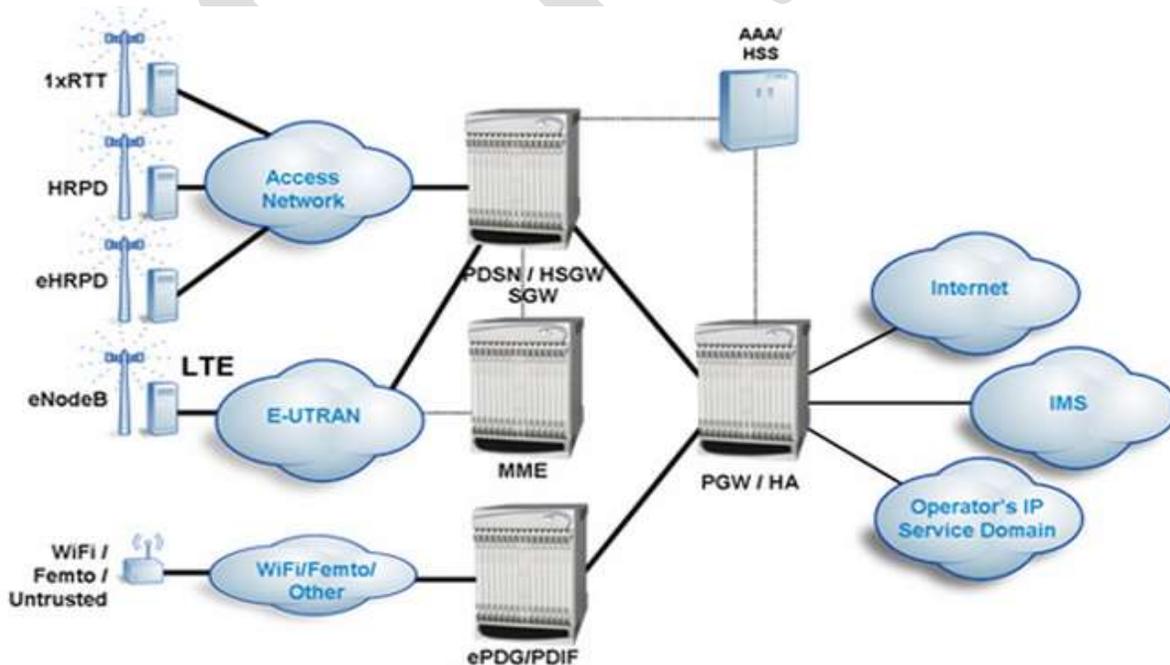


Fig.2.31. LTE Network Overview

These are employed in different frequency bands depending on the geographical location.

3. DESIGNING OF THE NETWORK

To design a network we need some basic components. In the process of mobile communication, every part has its own recognition. The base station serves as cell and diameter ranges up to few kilometers. CLUSTER can be defined as group of cells. Single cluster which consists of number of base stations is connected to MSC (Mobile Switching Centre) with the help of landlines. MSC can originate calls between the customers in that particular cluster when the calls demanded.

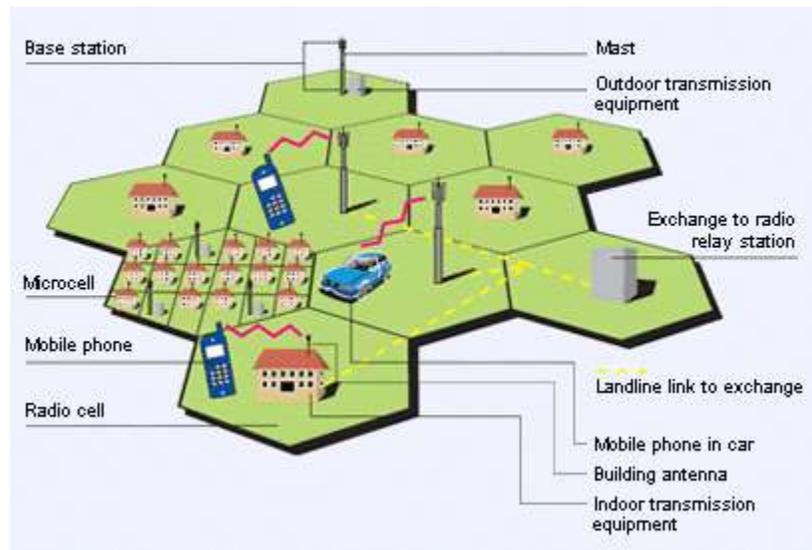


Fig.3.1. Basic cellular network

While utilizing the network it depends on the type of terrain in which the country has been located. It varies from rural and urban areas because in rural areas there is less number of subscribers in which urban areas has more number of subscribers. So while designing the network for Staffordshire county, it is required to develop some factors called capacity, coverage and less blocking rate. We have founded all the parameters for Staffordshire county initially and later for individual regions.

4. THEORETICAL CALCULATIONS

Here we have to consider the Staffordshire County for 9 different regions and their specifications are as follows:

I. Stoke-on-Trent:

- Area: 92.74 Km²
- Population: 2,39,700
- Latitude and Longitude: 53⁰ 00'' N / 2⁰ 11'' W

II. Tamworth:

- Area: 30.85 Km²
- Population: 76,000
- Latitude and Longitude: 52.633⁰ N / 1.695⁰ W

III Litchfield:

- Area: 330.3 Km²
- Population: 30,583
- Latitude and Longitude: 52.6835⁰ N / 1.865⁰ W

IV Cannock Chase:

- Area: 78.9 Km²
- Population: 94,700
- Latitude and Longitude: 52⁰ 43'' 50'' N / 1⁰ 58' 13'' W

V South Staffordshire:

- Area: 407.3 Km²
- Population: 1,06,600
- Latitude and Longitude: 52.6285⁰ N / 1⁰ W

VI Stafford:

- Area: 598.2 Km²
- Population: 126, 000
- Latitude and Longitude: 52⁰ 48'' 18.05'' N / 2⁰ 6' 59.99'' W

VII New Castle Underlyme:

- Area: 211.0 Km²
- Population: 124,500
- Latitude and Longitude: 53.011⁰ N / 2.229⁰ W

VIII Staffordshire Moorlands:

- Area: 575.9 Km²
- Population: 95,400
- Latitude and Longitude: 53⁰ 6' 23.75'' 50'' N / 2⁰ 1' 36.06'' W

IX East Staffordshire:

- Area: 390.0 Km²
- Population: 109,400
- Latitude and Longitude: 52.8080⁰ N / 1.6457⁰ W

Depending upon the density of population and existing demand of the customers the areas are divided in four different types. They are

- Type 1: Large city
- Type 2: Medium sized cities
- Type 3: Suburban
- Type 4: Open areas

5. MENTUM PLANET SOFTWARE

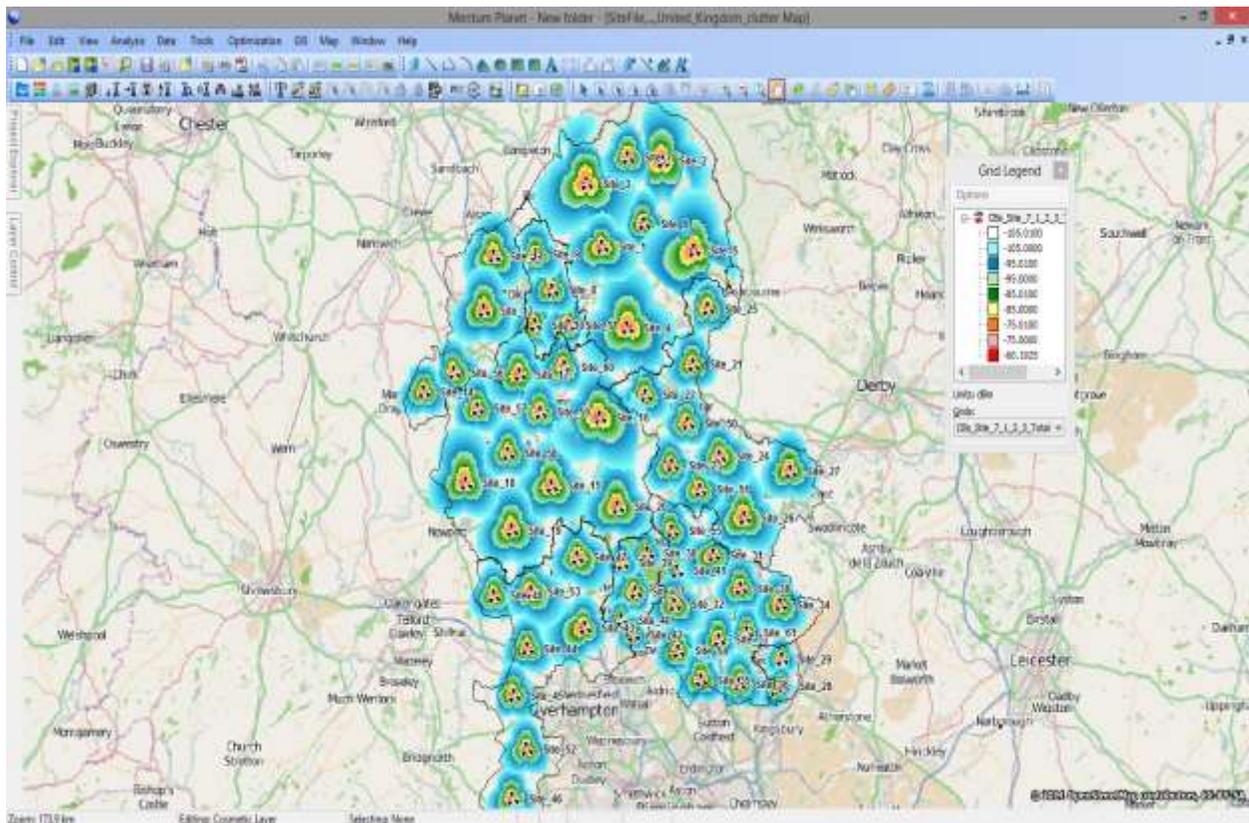
Mentum planet is software which is focused on wireless network planning and wireless design. It helps to design and optimize wireless access and transmission networks. It has advanced software including wireless technology educational services which enable operators to manage and optimize existing networks, coverage expansions. Wireless networks are continuously modified as the operator must adapt to the customer demand while modernizing, expanding and optimizing the network. In order to manage these changes the network planner needs a platform to deal with those scenarios. It is very cost effective, while we designing any network in real time scenario and if the network fail there is a lot of investment loss. So it is best preferable in such cases. It helps more than 250 customers in 90 countries by defining wireless networks. Mentum is a privately held company headquarters at Paris, with other offices in Dallas, Ottawa, Hong Kong and Tokyo.

6. SIMULATION USING MENTUM PLANET

In the simulation part, we can do by using the Mentum Planet software by which the background research was done theoretically or practically. Here the base station is to be located to meet the customer needs. The area and population can be calculated in theoretical way and the latitudes and longitudes for every region are known separately for obtaining

- Best Server Signal Strength
- Coverage Probability
- Required Mobile Power
- Total C/I ratio

7. Output Results: For entire Staffordshire County



CONCLUSION

Finally we have designed GSM network for Staffordshire County and provided 0.98% coverage probability and 1% blocking probability. Both theoretical and practical progress of designed network is shown. Now the designed network supports better data capabilities which well suits for coming generations having better services like uninterrupted call service and video streaming. The network which is designed is moved from GSM to UMTS and then extended to LTE. Thus the total practical approach is done by using Mentum software.

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Qualitative Approach For Estimating the Influence Of Refactoring And Scrum In Software Development

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Abstract— Software development is intellectually a complex chore. The swift progress of software currently requires the high rate software product release by development teams. Different software development techniques and quality assurance methods are used in order to achieve high worth, unfailling, and error free software. In order to deliver the product earlier, the development teams make an alteration to their conservative software development lifecycle to agile development method which can allow them towards prompt release of software management with the requirements-change experience. Refactoring has been rising in magnitude with modern software engineering advances, predominantly agile methodologies, which endorse uninterrupted progress of an application's code and blueprint. Refactoring is the practice of analyzing and facilitating the plan of offered code, without altering its performance. Another trendy techniques in Agile development is the Scrum methodology. It involves regular release and the client receives an absolutely prepared application that includes more and more features every time In this paper Qualitative Approach For Estimating the Influence Of Refactoring And Scrum In Software Development is utilized. In this model scrum methodology is utilized in enhanced form to overcome scrum issues along with refactoring project at both design and implementation level.

Keywords— AOSD, CBO,KPI, SDMs, MDA,XP,agile,refactor

INTRODUCTION

The development of the Internet and the electronic frugality has tainted the policy of software engineering. Conventional software development methodologies (SDMs) are being recouped by agile SDMs. Agile SDMs are outlined by incremental development, incessant code assimilation, and the capability to switch altering production requirements. Agile technology is used to generate advanced quality software in a briefer epoch .Agile procedures were refined to rationalize the growth practices and remove boundaries to accommodating production requirement changes through the growth process. Agile methodologies do not need that business requirements and plan particulars be protected in for the period of expansion [1]. Agile SDMs contribute to numerous features including prototyping, incremental development, and negligible citations [1]. Extreme Programming (XP) is an agile (lightweight) soft-ware development methodology and it becomes more and more well-liked. Extreme programming (XP) is one of the mainly and extensively used agile practices for software development. It tries to look up software quality and receptiveness to varying client requirements. Software refactoring is an XP procedure to augment the maintainability of software, improve reusability and understandability of the software. Refactoring is basically the object-oriented variant of restructuring:"the process of changing an object-oriented software system in such a mode that it does not change the peripheral performance of the code, however enhances its inner organization" [3]. In the refactoring process, modifications were done to the scheme parting its performance unaffected, but upgrade some non-functional quality like integrity, flexibility, understandability, etc., [4].Un-refactored code contribute to decompose. Rot takes several forms: insanitary interdependence between classes or packages, poor distribution of class errands, too many responsibilities per method or class, replica code, and many other variations of uncertainty and litter. This is because each time code is modified without refactoring, rot aggravates. Code rot disappoints users, overheads time, and excessively reduces the lifetime of practical systems. In an agile perspective, it can signify the difference between fulfilling or not fulfilling an iteration target. Refactoring code callously prevents rot, keeping the code trouble-free to sustain and expand. This extensibility is the reason to refactor and the degree of its success. The Scrum procedure was also considered to switch speedily altering business requirements. The practice's name is a consequent of an approach used in the game of Rugby. In a Rugby scrum, the ball is passed reverse and forward between players to move the ball onward. The Scrum method promotes a project by enhancing connection between group members and splitting the task into a series of "sprints" that last thirty days or less [Schatz]. Scrum focuses additional on organization of the

growth process than coding phenomenon [5]. Scrum is a practica that can be utilized on little and huge projects. Individual teams can use the Scrum methodology on their projects while huge projects can be splitted into modules and a Scrum team ascribed to each subproject. The connection and main concern administration between the subproject teams can be regulated with Scrum techniques. The key purpose of the investigation is to enhance software development model using Refactoring and Scrum practices. The software development model is planned in such a way that refactoring activity accompanies all design and implementation phases of software development. Similarly scrum methodology is proposed considering certain issues like usability, understanding, security etc. This effort also shows the estimation of influence of projected strategy.

LITERATURE REVIEW

Quality cannot be attained rapidly in any software development. Perfection comes over the epoch. Adjustment in the software development form is required in managing quality product deployment.[11] Agile software development procedures are used to yield high aspect software in briefer duration of time.[14] “Refreshing requirements yet belatedly in development” is fundamental of agile development methodology.[6] A few prominent agile development techniques are Extreme Programming (XP), Scrum, Crystal Methods, Feature Driven Development (FDD) and Test Driven Development. These procedures behave in a different way from conventional Software Development Methods and facilitate systems meet up the demands of the digital cost-cutting measure .[15] Refactoring is a foremost technique used to handle changes. Freezing the external performance it facilitates to restructure code .[6] Similarly Scrum is a nimble way to run a development, typically software development. Scrum software development team deals with project development in the agile development based on scrum methodology. It doesn’t need detailed imagery of implementation, because the team knows best optimization of project to solve the problem.[16] Karim M. Zaki, Ramadan Moawad in [9] “A Hybrid Disciplined Agile Software Process Model” provides integration between customary techniques, configuration, constancy and swift understanding of populace, capability, ease. The proposed model will provide a platform that regulates aims and objectives of both management and implementation team. The past vacancies and issues could be easily resolved and a follow up will be provided to track system status. Manjunath K N, Jagadeesh J, Yogeesh M in [11] “Achieving quality product in a long term software product development in healthcare application using Lean and Agile principles” have proposed V-model.By comparison of the outcome obtained through implementation of Agile principles with previous results, it is observed that this model is an excellent approach for lengthy projects in healthcare departments. Completion of V-model will be possible through agile and lean approaches in every iteration of requirements change. A. Ahmed, et al in [10] “Agile Software Development: Impact on Productivity and Quality” recommended a model that accentuate on code refactoring .There should be a chapter of high rank blueprint of the project after the early requirements gathering and reasoning of the project. The suggested model recommends that the design must be stretchy as much as necessary to put up changes afterward in the execution part. Code refactoring guarantee simple development and expandability of the project making it more comprehensible and advances the quality of the code. K.Ush, N.Poonguzhali ,E.Kavitha in [7] “A Quantitative Approach for Evaluating the Effectiveness of Refactoring in Software Development Process” conducted various experiments based on refactoring in the developed model .Research in this proposed method extend refactoring in three phases, Identification, Proposal and Application. The Evaluation criteria’s are Reusability, Understandability, Maintainability. In evaluation phase, the effect of refactoring based on evaluation parameters is quantified using software metrics. From the execution results, it is concluded that, refactoring phase in the software development increases reusability and understandability of the code, thus boosting maintainability of the code. M. Kleyman, S.Tyszberowicz, A.Yehudai in [6] “Refactoring Aspects into Java Code” declared transformation through refactoring. This opposite transformation is done by ACME i-e generation of a object oriented structure through refactoring. It can be when a structural change that makes aspect inappropriate is required. In several cases, aspects are not utilized just as some organizations avoid in production code. But now ACME allows use of aspect is possible and object oriented code can be obtained according to requirement. Without changes in already existing classes ACME allows implementation modifications. Automatic refactorings can be done. However, it will be an addition to the core functionality of ACME. It depends on programmer, if he wants to apply conversions on aspects. The case study presents that without intentions of using ACME, it is possible to convert aspects. S.A.M.Rizvi, Zeba Khanam in [8] “A Methodology for Refactoring Legacy Code” organized methodology which is embraced based on refactoring. First of all, the purpose to make the intact process is defined. Selection of refactoring patterns from the existing and new catalog is done after creating the goal. Next step is to determine the application of refactorings. The development team can then explore refactoring opportunities and assess the effects and results of refactoring. Systematically, refactoring can be applied to move in the correct path instead of applying on different inventories. Bart Du Bois, et al in [12] “A Discussion of Refactoring in Research and Practice” in their research paper demonstrates that software refactoring is revolving efficiently, different business tools for refactoring are increasing swiftly, but there are a large number of issues that still require consideration and solution. In refactoring research, they deal with action-preservation, assembling responses and feedback on refactoring implementation and assimilation with MDA and AOSD for future research work. There is requirement for procedures, techniques and tools that tackle refactoring in a more constant, aimed, flexible manner. Raimund Moser, et al in [13] “Does Refactoring Improve Reusability?” examines reusability of adhoc in refactoring is either supported or not. In software development and implementation, reusability should be supported at maximum. Refactoring have improved object oriented classes by promoting internal metrics like reusability

especially in adhoc. The first choice for development code could be refactoring as it enhances many factors like reusability and maintainability.

PROPOSED FRAMEWORK

In this model scrum methodology is utilized in enhanced form to overcome scrum issues along with refactoring project at both design and implementation level. The start of development is a simple design and any flexibility problem if discovered later through the process, the design is refactored. Refactoring can be applied to all phases of software development and artifacts (design, test cases, use cases, sequence diagrams etc).

1. Refactoring at design and implementation level:

In web development ,refactoring can be applied at both design and implementation phase. Implementation phase refactoring is similar to code-level refactoring both by convention and structure but in code refactoring we work with object oriented programming but in this type all other codetypes like HTML, javascript ,XML etc are also refactored.

1.1. Design level

In this phase we will focus on navigational refactoring model where navigational class diagram are transformed that preserve operational semantics and navigability. It means that existing nodes may not become unreachable though the set may be augmented (e.g. by splitting a node).Following steps must be considered while doing navigation model refactoring:

1. Add operations, content and links to the node, already present.
2. Add a new node
3. Remove a node with no link i-e unreachable.
4. If the node does not become unreachable by removing a link, remove it.

Analysis of application's usage have shown that users repeatedly use forward and backward links when navigating a web application. This is because the target link is not the user expected.Too much false link activations will lead to frustration and confusion.User will ultimately leave the site.This model provides a solution to this problem .

1.1.1. Anticipate target:

By adding a script to the link anchor, a mouse can hover over link which will give a small version of the target page. This may be also called interface refactoring and is utilized in advance scripting languages like AJAX.



Figure 1:small version of target information[23]

1.1.2. Introduce link destination announcement:

By adding a script to particular widget or index, mouse can hover over link which will open a pop-up menu consisting of all possible operations and functionalities related to that link. The drawback of applying this solution is that pop-ups may be blocked or may be annoying for some users.

1.1.3. Introduce scrolling:

Use vertical and horizontal scroll bars.



Figure 2:scroll bars[24]

1.1.4. Split list:

Divide entries of index in several pages. This will make it user friendly. There are plenty of examples of this, like Google search results. Example: B-commerce applications usually provide recommendations for their products as an effective way of advertising. It has become a trend that emerging website has a starting page with list of products and titles etc. All operations related to it must be shifted to next linked pages.

1.1.5. Add operation:

To remove repetitive operations, add operations in main class from where it can be accessed when required. For example, if a user want to buy a product then if he is already a customer of that site, all user information will be retrieved. User will not have to write details on next product purchase.

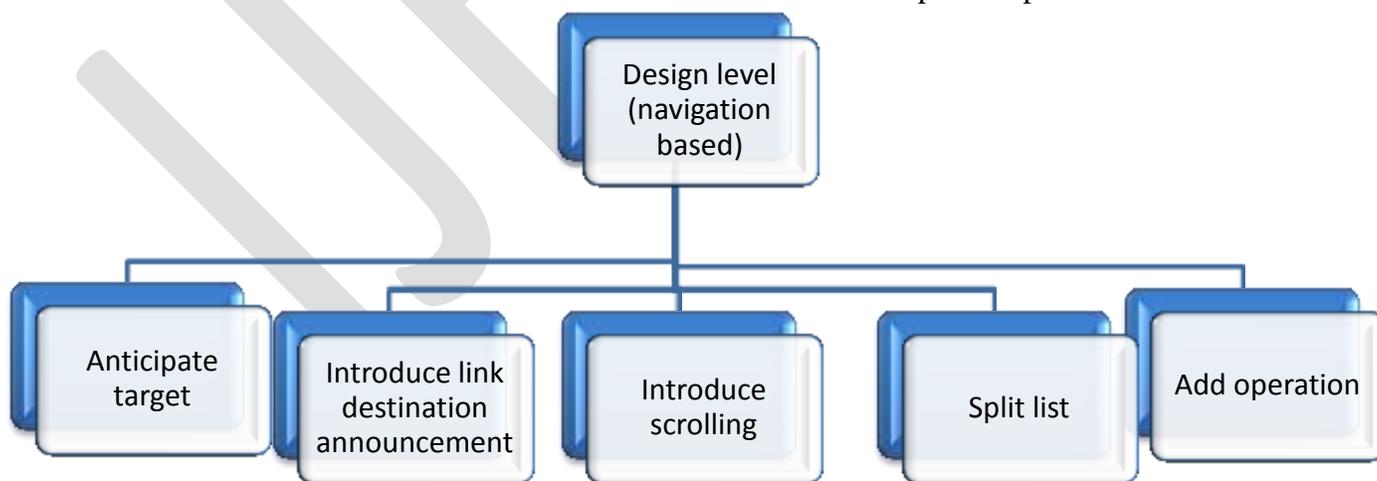


Figure 3: phases of design level refactoring for web based application

1.2. Implementation level:

Improvement of code clarity and enhancing maintainability and usability are the main objectives of refactoring. Therefore it is reasonable to evaluate the refactoring effect in terms of:

1. Maintainability
2. Reusability
3. Understandability

1.2.1. Refactoring through code smell:

This is identification phase where source code area to be refactored is identified. This is done by means of code smell detection. Normally there are two types of bad smell:

1. Duplicated code : By unifying these parts code is enhanced
2. Lazy class (class that does not play significant role): They may be excluded by adjusting their functionality somewhere else in the source code.

1.2.2. Selection of metrics:

Refactoring can be implemented in two modules:

1. Selection of appropriate quantification metrics for maintainability, reusability and understandability.
2. Measuring and comparing metrics before and after refactoring.

Popular metrics suites are Halstead's Complexity Measures [17], McCabe's. Cyclomatic Complexity [9] and Maintainability Index[18].

1.2.3. Effect of Refactoring based on Complexity Measure:

NOA: Number of attribute metrics is used to count the average number of class and instance variable. A class with large number of variables indicates cohesion. Class requires further decomposition to manage complexity. Number of attributes > 10 indicates poor design.

NOM: number of methods in a class. A class must not have excessive number of methods in it.

TLOC: Total lines of code in class metric will count the non-blank and non-comment lines in a class. Size of the system can be easily measured through it.

NOC: Number of classes in package. The overall size of the system can be estimated by finding the number of classes it contains. system with more classes become complex because object interaction is higher.

CC (m): Cyclomatic Complexity in a method . It measures the number of linearly independent paths through a system program module. The amount of decision logic in each software module is measured.

1.2.4. Effect of Refactoring based on Modularity Measure:

Coupling between Objects (CBO): Coupling measurement is done . when one class uses functions or variables of another class then coupling is said to occur. Understandability and maintainability become difficult. C&K suggest CBO as an indicator for evaluation of effort required for maintenance. CBO was found to be helpful in detecting highly coupled classes [19]. In [20], presents that maximum value for CBO is 30 and min value to be 0.

Coupling Factor (CF): computes the ratio of number of pairs of classes that are coupled with each other to total number of possible couplings in a given system of classes [20].

Lack of cohesion among Methods (LCOM): The metric counts the number of methods 'pairs in the class using no attributes in common, minus the number of pairs of methods that do.

1.2.5. Applying and comparing results:

- Average Number of Attributes will make the code simple and less
- Decrease in Average Number of Methods makes the code simple. Class is not overloaded with more functionality.
- System with few classes will be understandable and easier.
- Decrease in the average Cyclomatic complexity reduces The system complexity
- Decrease in the value of CBO improves reusability which decreases the dependencies exits between classes.
- Maintains Moderate values for CF enhances maintainability and reusability without any side effects
- Decrease value of LCOM increases cohesion values, thereby improving reusability and Understandability of the code

Scrum artifacts that is proposed to change to work better in Network Organizations.

1. Task-feasibility instead of time-estimation:

Instead of using formal time estimates ,it is focused to commit only those user stories which are realistic to implement before next session.Through this change, commitment is limited, which is unable to obtain.

2. Report Meeting instead of Sprint Review Meeting:

We propose to limit participants only to representatives of the customer and the team because sprint review meetings require lot of resources (i-e participants) .This type of meeting should be held more frequently in order to improve performance and requirements gathering between customer.

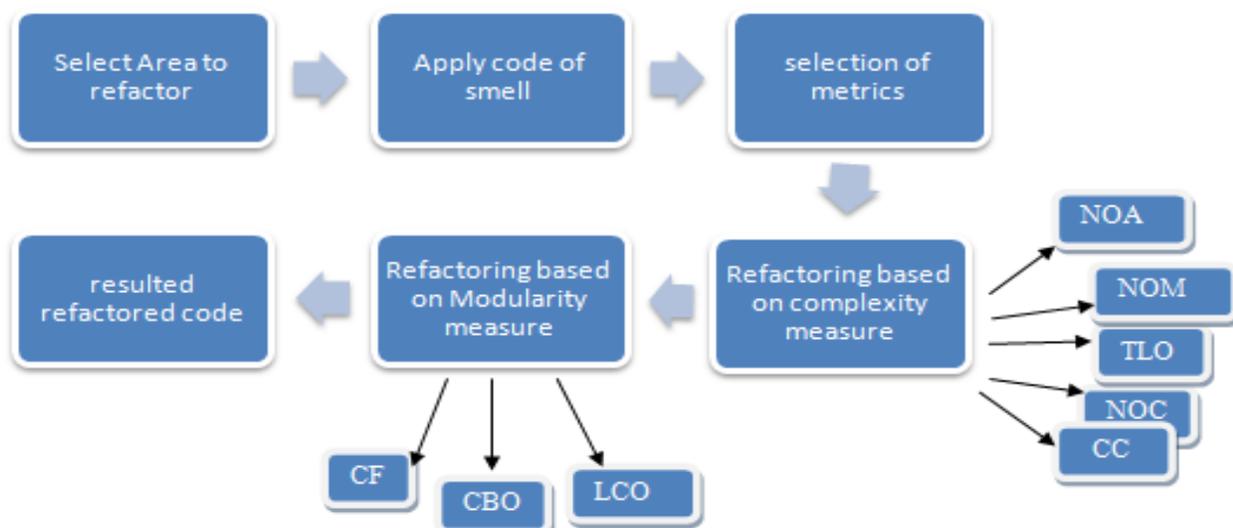


Figure 4: phases of implementation level refactoring

3. Key Performance Indicators:

An item of information collected to track the performance of a system is known as performance in indicator [22].In scrum, indicators are used as time-estimate of the remaining work amount that needs to be done versus amount of User stories that are considered done in Sprint Backlog [21].It is pro-posed to use the following KPI's (i.e. Key Performance Indicators) that help better control software development in Net-work Organization:

• **Reliability:** to measure if the team is successful in achieving the desired. The difference between the amount of committed Story Points (ci) and delivered Story Points is represented as percentage of reliability calculated per Sprint (Ri) can be calculated as.

$$R_i = c_i / d_i * 100\% \quad (1)$$

• **Productivity:** to measure project velocity. The amount of fixed bugs (bi) and newly implemented re-quirements (si) are represented as the value of produc-tivity (Pi) after delivery of each sprint should be calculated as :

$$P_i = b_i + S_i \quad (2)$$

• **Effectiveness:** to evaluate effectiveness of testing service by measuring the amount of defects delivered to the customer. The ratio between all found defects (ai) and those found by external S (ei) providing complementary testing are measured to calculate the effectiveness of internal testing service Based on this KPI. This shows effectiveness (Ei) of soft-ware development team and testing services:

$$E_i = a_i - e_i / a_i * 100\% \quad (3)$$

2. Scrum Enhancement:

2.1. Security Backlog:

By analyzing the phases in scrum it is analyzed that in first phase i-e planning the approved product is used .User/client approve this product and the users/clients do not know much about security risks. An extra backlog can be managed to overcome security risks well without affecting the agility of this method. For this, an additional role, called "Security Master" is introduced . The Security Backlog follows existing security principle so that security issues can be reduced. the features in Product Backlog are made security-pruned by the addition of security backlog. No feature should miss its security concern. The features in Product Backlog will go through Security Backlog. Only the certain features in the product backlog are figured out by the security master that require the security attention. The security requirements for the selected features in security backlog are marked. The testing part will be conducted and the marked security concerns will be carried forward to sprint backlog for developers' attention. The features selected by the Scrum Master are processed as usual like other processes. It is also helpful to highlight the development team and client wish to discuss about the security requirement or anything related to security to the features. The Security Backlog is related to technical skill to identify and overcome the security risks, so it is also recommend to make a security education first through training to developer and stakeholder to make sure their security awareness are satisfied.

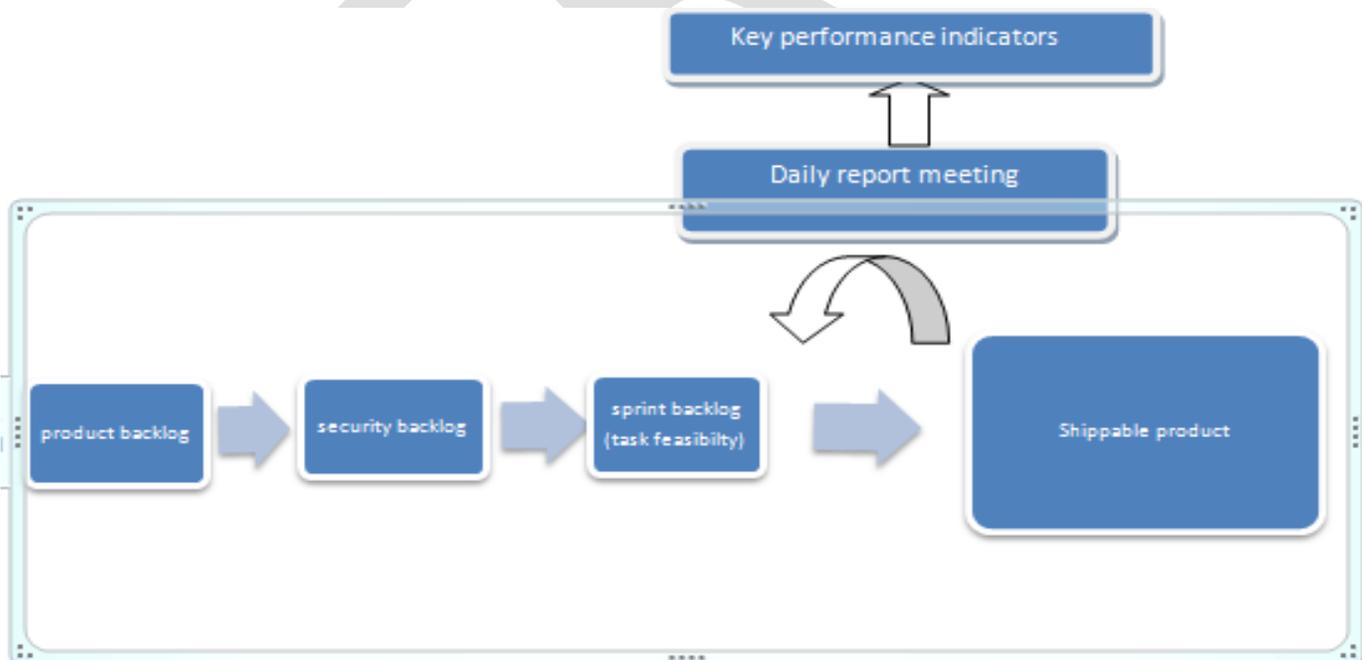


Figure 5: phases of implementation level refactoring

CONCLUSION

In this research work initially a refactoring methodology at design and implementation level is proposed. An approach for design refactoring in Web applications is presented specifically. It is based on the view of modern Web engineering methods and it considers

refactorings to the navigation and presentation design models. It is demonstrated how refactorings can help Web applications evolve by applying well-known Web patterns into their design, in order to improve quality in use properties, such as usability. At implementation level, metrics are selected and their effects are described. The Evaluation parameters are taken as Maintainability, Reusability and Understandability. It is concluded that, refactoring activity in the software development process leads to improvement in reusability and Understandability of the code, thereby enhancing maintainability of the code. Further, scrum method is enhanced by introducing security backlog and monitoring of indicators in report meetings. This will be cost-effective and secure. Usability level and user understanding is also improved.

FUTURE WORK

Methodology based on design refactorings for all applications in addition to web applications. The proposed methodology can be practically implemented in software development processes.

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An Optimized Technique for Image Archive and Image Search Using Heterogeneous APKET Technique

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ABSTRACT- Increasing popularity of storing and managing personal multimedia data using online services. Preserving confidentiality of online personal data for offering efficient functionalities becomes important pressing research issue. In system study the problem of content based search of image data archived online while preserving content confidentiality. The problem has different settings from those typically considered in the secure computation literature, as it deals with data in rank-ordered search, and has a different security-efficiency requirement. Secure computation techniques, such as homomorphic encryption, can potentially be used in this application, at a cost of high computational and communication complexity. Efficient techniques based on randomizing visual feature and search indexes have been proposed recently to enable similarity comparison between encrypted images. This focuses on comparing these two major paradigms of techniques, namely, homomorphism encryption-based techniques and feature/index randomization-based techniques, for confidentiality preserving image search. It develops novel and systematic metrics to quantitatively evaluate security strength in this unique type of data and applications with the comparison of these two paradigms of techniques in terms of their search performance, security strength, and computational efficiency. The insights obtained through this project and comparison will help design practical algorithms appropriate for privacy-aware cloud multimedia systems.

Keywords: Content based image retrieval, secure search, secure cloud computing, homomorphic encryption

1. INTRODUCTION

Nowadays the need grows to securely outsource data to an untrusted system. Think, for instance, of a remote database server administered by somebody else. If you want your data to be secret, you have to encrypt it. The problem then arises how to query the database. The most obvious solution is to download the whole database locally and then perform the query. This of course is terribly inefficient. A single-server solution for remote querying of encrypted relational databases on untrusted servers is presented. The approach is based on the use of B+ tree indexing information attached to the relations. The designed indexing mechanism can balance the trade-off between efficiency requirements in query execution and protection requirements due to possible inference attacks exploiting indexing information.

It is desirable to store data on data storage servers such as mail servers and file servers in encrypted form to reduce security and privacy risks. But this usually implies that one has to sacrifice functionality for security. For example, if a client wishes to retrieve only documents containing certain words, it was not previously known how to let the data storage server perform the search and answer the query without loss of data confidentiality

Our techniques have a number of crucial advantages. They are provably secure: they provide provable secrecy for encryption, in the sense that the untrusted server cannot learn anything about the plaintext when only given the ciphertext; they provide query isolation for searches, meaning that the untrusted server cannot learn anything more about the plaintext than the search result; they provide controlled searching, so that the untrusted server cannot search for an arbitrary word without the user's authorization; they also support hidden queries, so that the user may ask the untrusted server to search for a secret word without revealing the word to the server. The algorithms system present are simple, fast (for a document of length the encryption and search algorithms only need stream cipher and block cipher operations), and introduce almost no space and communication overhead, and hence are practical to use today.

The processing and encryption of multimedia content are generally considered sequential and independent operations. In certain multimedia content processing scenarios, it is, however, desirable to carry out processing directly on encrypted signals. The field of secure signal processing poses significant challenges for both signal processing and cryptography research; only few ready-to-go fully integrated solutions are available. This study first concisely summarizes cryptographic primitives used in existing solutions to processing of encrypted signals, and discusses implications of the security requirements on these solutions. The study then continues to describe two domains in which secure signal processing has been taken up as a challenge, namely, analysis and retrieval of multimedia content, as well as multimedia content protection. In each domain, state-of-the-art algorithms are described. Finally, the study discusses the challenges and open issues in the field of secure signal processing.

In several application scenarios, however, it is desirable to carry out signal processing operations directly on encrypted signals. Such an approach is called *secure signal processing*, *encrypted signal processing*, or *signal processing in the encrypted domain*. For instance, given an encrypted image, can system calculate the mean value of the encrypted image pixels? On the one hand, the relevance of carrying out such signal manipulations, that is, the algorithm, directly on encrypted signals is entirely dependent on the security requirements of the application scenario under consideration. On the other hand, the particular implementation of the signal processing algorithm will be determined strongly by the possibilities and impossibilities of the cryptosystem employed. Finally, it is very likely that new requirements for cryptosystems will emerge from secure signal processing operations and applications. Hence, secure signal processing poses a joint challenge for both the signal processing and the cryptographic community.

2. RELATED WORK

Most of the existing systems for rank-ordered search over encrypted text documents, so that documents can be returned in the order of their relevance to the query term. In that work, several protocols are studied to address different operational constraints such as different communication cost allowed performing the secure search. Secure text retrieval techniques can also be applied to keyword based search of image data.

However, keyword search relies on having accurate text description of the content already available, and its search scope is confined to the existing keyword set. In contrast, content-based search over an encrypted image database provides more flexibility, where by sample images are presented as queries and documents with similar visual content in the database are identified. An emerging area of work related to confidentiality preserving image retrieval is secure signal processing, which aims at performing signal processing tasks while keeping the signals being processed secret.

Erkin et al.[1][2] provided a review of related cryptographic primitives and some applications of secure signal processing in data analysis and content protection. However, applying cryptographic primitives to the task of content-based image retrieval is not straightforward.

Effective image retrieval typically relies on evaluating the similarity of two documents using the distance between their visual features, such as color histograms, shape descriptors, or salient points. By design, traditional cryptographic primitives do not preserve the distance between feature vectors after encryption. Given the much larger data volume for image data than that of text and other generic data, efficiency and scalability are critical for image retrieval but can be difficult to achieve using cryptographic primitives alone. Another work by Shashank et al.[3] addresses the problem of protecting the privacy of the query image when searching over a public database, where the images in the database are not encrypted.

2.1 Classification-based methods in optimal image interpolation Encryption

In this work introduce two new approaches to optimal image interpolation which are based on the idea that image data falls into different categories or classes, such as edges of different orientation and smoother gradients. Both these methods work by classifying the image data in a window around the pixel being interpolated, and then using an interpolation alter designed for the selected class. The first method, which system calls Resolution Synthesis (RS),[4][5] performs the classification by computing probabilities of class membership in a Gaussian mixture model. The second method, which system calls Tree-based Resolution Synthesis (TRS),[6][7] uses a regression tree. Both of these methods are based on stochastic models for image data whose parameters must have been estimated beforehand, by training on sample images. System demonstrates that under some assumptions, both of these methods are actually optimal in the sense that they yield minimum mean-squared error (MMSE) estimates of the target-resolution

image, given the source image. System also introduces Enhanced Tree-based RS, which consists of TRS interpolation followed by an enhancement stage.

During the enhancement stage, system recursively add adjustments to the pixels in the interpolated image. This has the dual effect of reducing interpolation artifacts while imparting additional sharpening. System present results of the above methods for interpolating images which are free of artifacts. In addition, system present results which demonstrate that RS can be trained for high-quality interpolation of images which exhibit certain characteristic artifacts, such as JPEG images and digital camera images. System also present results of a new interpolative image coding method which uses RS along with the well-known JPEG compression scheme. These results demonstrate that for relatively low bit rates, the RS-based compression scheme can improve upon JPEG compression used alone, in terms of subjective image quality (for an approximately fixed bit-rate), and in terms of better rate-distortion tradeoff.

2.2 Limits on super-resolution and how to break them

Nearly all super-resolution algorithms are based on the fundamental constraints that the super-resolution image should generate the low resolution input images when appropriately warped and down-sampled to model the image formation process. (These reconstruction constraints are normally combined with some form of smoothness prior to regularize their solution.) In the first part of this paper, systems derive a sequence of analytical results which show that the reconstruction constraints provide less and less useful information as the magnification factor increases. System also validate these results empirically and show that for large enough magnification factors any smoothness prior leads to overly smooth results with very little high-frequency content (however many low resolution input images are used.) In the second part of this paper, system proposes a super-resolution algorithm that uses a different kind of constraint, in addition to the reconstruction constraints. The algorithm attempts to recognize local features in the low resolution images and then enhances their resolution in an appropriate manner. System calls such a super-resolution algorithm a *hallucination* or *reconstruction* algorithm. System tried our hallucination algorithm on two different datasets, frontal images of faces and printed Roman text. System obtained significantly better results than existing reconstruction-based algorithms, both qualitatively and in terms of RMS pixel error.

2.3 Sparse Bayesian learning and the relevance vector data security

This proposed introduces a general Bayesian framework for obtaining sparse solutions to regression and classification tasks utilizing models linear in the parameters. Although this framework is fully general, system illustrate our approach with a particular specialisation that system denote the 'relevance vector machine' (RVM)[8], a model of identical functional form to the popular and state-of-the-art 'support vector machine' (SVM)[9]. System demonstrate that by exploiting a probabilistic Bayesian learning framework, system can derive accurate prediction models which typically utilise dramatically fewer basis functions than a comparable SVM while offering a number of additional advantages. These include the benefits of probabilistic predictions, automatic estimation of 'nuisance' parameters, and the facility to utilise arbitrary basis functions (e.g. non-'Mercer' kernels).

System details the Bayesian framework and associated learning algorithm for the RVM, and give some illustrative examples of its application along with some comparative benchmarks. System offers some explanation for the exceptional degree of sparsity obtained, and discusses and demonstrates some of the advantageous features, and potential extensions, of Bayesian relevance learning.

2.4 Empirical filter estimation for sub pixel interpolation and matching

System studies the low-level problem of predicting pixel intensities after sub pixel image translations. This is a basic subroutine for image warping and super-resolution, and it has a critical influence on the accuracy of subpixel matching by image correlation. Rather than using traditional frequency-space filtering theory or ad hoc interpolators such as splines, system take an empirical approach, finding optimal subpixel interpolation filters by direct numerical optimization over a large set of training examples. The training set is generated by subsampling larger images at different translations, using subsamplers that mimic the spatial response functions of real pixels. System argues that this gives realistic results, and design filters of various different parametric forms under traditional and robust prediction error metrics. System systematically study the performance of the resulting filters, paying particular attention to the influence of the underlying image sampling regime and the effects of aliasing ("jaggies"). System summarizes the results and gives practical advice for obtaining subpixel accuracy.

3. PROPOSED DESIGN

Secure image retrieval through feature encryption and index encryption are closely related. Image features themselves can be considered as a special form of search index, where each image is represented by its feature vectors and during retrieval, the query image's feature is compared to all features in the database. On the other hand, modern indexing schemes are built upon image features and allow efficient retrieval by reducing the number of images that need to be compared. Since the encrypted features preserve the capability of similarity comparison, they can be used to build efficient indexing schemes.

The content owner has the flexibility either to provide the server with encrypted features and let the server perform the time consuming index generation, or to generate the secure index on his/her side to reduce the amount of information that needs to be sent to the server. Therefore, the two kinds of approaches represent different trade-offs between user-side computational complexity and communication overhead.

So this proposed technique for image search and secure storage options will be well handled by the **APKET (Asynchronous Private Key based Encryption Technique)** that shows the complete solution to the problem of image retrieval from the cluster of random images. This system feature protection schemes that enable similarity comparison between features in the encrypted domain. The encrypted features along with encrypted images can protect image content privacy against untrustworthy service providers and malicious intruders. The ability to generate encrypted indexes on the user side provides an alternative for secure retrieval with reduced communication overhead. In the second part of this section, system discusses the protection of search indexes by exploiting the visual words representation of images. Visual words method hierarchically clusters features into a vocabulary tree, following which each image is indexed based on this vocabulary tree and represented as a bag of visual words.

Unlike dedicated servers, cloud servers can be run on a hypervisor. The role of a hypervisor is to control the capacity of operating systems so it is allocated where needed. With cloud hosting there are multiple cloud servers which are available to each particular client. This allows computing resource to be dedicated to a particular client if and when it is necessary. Where there is a spike in traffic, additional capacity will be temporarily accessed by a website, for example, until it is no longer required. Cloud servers also offer more redundancy. If one server fails, others will take its place.

3.1 CLIENT REQUEST METRIC

Clients are used to create requests, create transactions, send requests through an HTTP handler, and return a response. This exchange of messages is an example of inter-process communication. To communicate, the computers must have a common language, and they must follow rules so that both the client and the server know what to expect. The language and rules of communication are defined in a communications protocol. All client-server protocols operate in the application layer. The application-layer protocol defines the basic patterns of the dialogue. To formalize the data exchange even further, the server may implement an API such as a web service. The API is an abstraction layer for such resources as databases and custom software. By restricting communication to a specific content format, it facilitates parsing. By abstracting access, it facilitates cross-platform data exchange.

3.2 64-BIT OCTET ENCRYPTION PROCESS

In many applications of public-key cryptography, user security is ultimately dependent on one or more secret values. Since an image is not directly applicable as a key to any conventional cryptosystem, however, some processing of the image is required to perform cryptographic operations with it. Moreover, as images are often chosen from a relatively small space, special care is required in that processing to defend against search attacks. It is difficult for an opponent to recompute all the keys corresponding to a dictionary of images, or even the most likely keys. If the salt is 64 bits long, for instance, there will be as many as 2^{64} keys for each image. An opponent is thus limited to searching for images after an image-based operation has been performed and the salt is known.

3.3 OTC ALLOCATION

Passwords are used by almost all business applications for authentication. However static passwords have lots of limitations and can get hacked; careless employee may write down passwords somewhere; system with saved passwords may be used by various users or a malicious user may reset all passwords just to create havoc. Hence it is advisable to move to a more dynamic password

scheme like one time passwords or OTC. OTC is way more secure than static passwords as there are no chances to forget or reuse passwords. Each time a new password is generated for each login session. Authentication by one time passwords are more reliable and user friendly as well. OTC generation can be done by OTC generation algorithms for generating strings of passwords.

3.4 IMAGE RETRIVAL USING APKET

In order to overcome these difficulties APKET (Asynchronous Private Key based Encryption Technique) was introduced. APKET (Asynchronous Private Key based Encryption Technique) is the application of computer vision to the image retrieval problem. In this approach instead of being manually annotated by textual keywords, images would be indexed using their own information contents. The information contents may be color, texture and shape. This approach is said to be a general framework of image retrieval. There are three fundamental bases for Content Based Image Retrieval which are information feature extraction, multidimensional indexing and retrieval system design. The color aspect can be achieved by the techniques like averaging and histograms. The texture aspect can be achieved by using transforms or vector quantization shown in the figure 1.

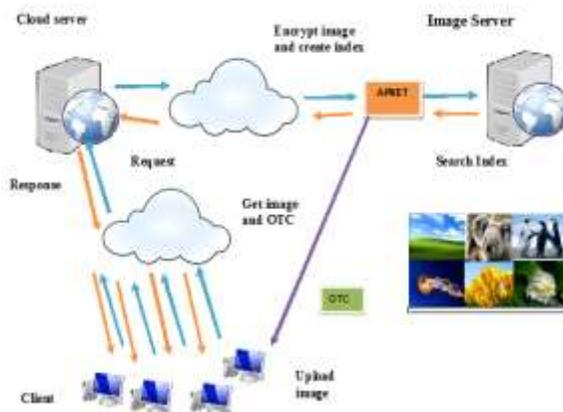


Figure 1 shows the architecture of proposed model

4. RESULTS AND DISCUSSIONS

Security-related aspects are one of the main factors hampering further cloud adoption. The inherent multi-tenancy of the environment, and the existence of three different actors in a normal scenario the end user, the application provider, and the cloud provider, raise a significant number of security issues. A cloud environment presents additional security challenges. Instead of operating in a single data center, controlled by one company, cloud applications can operate over a multi-tenant infrastructure from different providers. There is a need for extending security best practices to a federated environment. Federated identity and trust have been some of the key elements of research and industry since the early days of service-oriented architecture applications. These advances can be applied to both the applications accessing the infrastructure, and also to inter-cloud communications. Cross cloud solutions also need to potentially consider the networking aspect of the federated infrastructure. Data must not only be stored securely, but communications need to be protected with the adequate means.

For geo-distributed applications, a fully centralized management plane presents some difficulties. Decisions must consider all the relevant runtime information collected at the distributed instances. Therefore, decision algorithms can either be run on the distributed environment, potentially incurring on significant penalty from the network component, or run on a centralized location, after having moved all the information to a single points. In any of these cases, the decision will require the use of parallel computing techniques for large-scale services. The cited papers report total computation time in the order of hours and days, making it not well suited for a highly dynamic environment. A decentralized management scheme can process most of the monitoring information locally, and only exchange a subset of that information with its peers. Some research studies show how decentralized decision making can be taken to geo-distributed application, combining the ability to enforce user-defined policies with an added level of resiliency over a central solution.

CONCLUSION

The main differentiating aspect of cross-cloud applications is the nature of their physical distribution as an overlay across networks and data centers. This characteristic makes the network element critical for an effective deployment and management. In the

project system have highlighted how. **APKET (Asynchronous Private Key based Encryption Technique)** enabled networks can become a key element for fully realizing the vision behind these applications, with the ability to provide virtual links with certain guarantees, support to seamlessly integrate network-wide services and support for the low-level activities related to WAN-scale virtual machine migration. System believe a networked cloud marketplace might provide incentives for the different infrastructure stakeholders to collaborate, including the potential for better infrastructure management based on using information about the real needs of the applications that use the infrastructure. On the application side, the location dimension greatly impacts application architecture and management. Decisions become substantially more complex; a cross-cloud infrastructure provides the required means for applications to achieve satisfactory performance for a changing workload of users around the world. The architecture of these applications can resemble a dynamic, distributed overlay that raises several challenges regarding how to manage the internal application state, provide service reliability, and ensure security requirements.

FUTURE WORK

As there are other algorithms that may well be candidates for software implementation in the kernel. It should be quite interesting to implement all of these algorithms and to test them on equal footing, using the same hardware, rule-bases, and traffic load. Furthermore, it would be interesting to do this comparison with real rule-bases, in addition to synthetic Perimeter-model rules. The system leaves such a "bake-off" for future work. As for GEM itself, the system would like to explore the algorithm's behavior when using more than 4 fields, e.g., matching on the TCP flags, Meta data, interfaces, etc. The main questions are: How best to encode the non-range fields? Will the space complexity still stay close to linear? What will be the best order of fields to achieve the best space complexity? Another direction to pursue is how GEM would perform with of IPv6, in which IP addresses have 128 bits.

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Benchmarking Performance Assessment of Irrigation Water Management in Initial Reach of Left Bank Canal Network of Rani Avanti Bai Sagar Irrigation Project

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Abstract— Irrigation water management is facing organizational changes worldwide. Beginning in the 1980's, there have been a large scale programs to turn over irrigation management from Government Agencies to organized Water User Associations in a number of countries such as Philippines, Indonesia, Senegal, Madagascar, Columbia and Mexico. This trend has been seen as the convergence of a number of policy trends including decentralization, privatization, participation and democratization. This study aims to benchmarking performance assessment of water user's association (WUAs) taken over irrigation water management in the Initial Reach of Left Bank Canal Network of *Rani Avanti Bai Sagar* Irrigation Project (RABSP), Jabalpur, India. For this purpose, the indicators of Water Deliveries, Maintenance, Financial and Sustainability were used. The study was carried out in *rabi* season of year 2008 on four minors from initial reach of Left Bank Canal Network of Rani Avanti Bai Sagar Irrigation Project to evaluate irrigation performance by different performance indicators. In this study, the tail-end supply ratio is varied between 0.20 to 0.58 which is less than the reference range of 0.50-0.70 which indicate the poor scheduling of irrigation water and poor maintenance of canal strictures which result in water logging in head reach of minor. The delivery timeliness ratio was found to be 1 which is ideal condition. Carrying capacity ratio under maintenance indicator varied between 0.81 to 0.99 which indicate siltation of the minor. Poor structure ratio is varied in between 0.53 to 0.65 which is much more than the reference range of 0.01 to 0.20 indicates poor maintenance of the strictures both by government and WUA. Water fee collection rates were generally good on the all organizations in the command area. The collection rate was found to be average 87%. This ratio shows that the cost of irrigation water was generally paid by farmers with reference to satisfaction with the irrigation water service delivery. In general, *Pipariya* WUA was of the most successful farmers' organization among all four WUA in the study area. This water user association can be used as benchmarks against which the other WUA can be assess their performance. The study results showed that the benchmarking indicators provided the WUA in the basin to see where they were placed in comparison with others. As a result, performance assessment and benchmarking can help to improve performance of irrigation water management in a canal command area.

Keywords— Benchmarking, Performance indicator, Canal irrigation performance, Water management, Water user association. introduction

Introduction—Poor water management is certainly one of the most important factor for poor performance of irrigation system. Irrigation, the single largest user of the water resources accounts for about 84% of all withdrawals in India [1]. Further, with increasing municipal and industrial needs; agriculture's share of water is likely to go down. Therefore, water management in the canal command area is very essential to improve the performance of irrigation project and thus calls for a through diagnostic analysis and evaluation of the system as a whole [2]. The performance evaluation studies are envisaged as an auditing exercise not only to assess the actual performance as compared to what envisaged at the formulation stage, but also to draw lessons for devising appropriate steps for future projects.

Recent decades have seen increasing emphasis on change as a critical driver of organizational success [3] [4]. Irrigated agriculture is facing organizational changes worldwide. There is a growing recognition worldwide that irrigation water management is a service provided to customers with better results when operated by decentralized organizations: this leads to irrigation management transfer [5].

Beginning in the 1980's, there have been a large scale programs to turn over irrigation management from Government Agencies to organized Water User Associations in a number of countries such as Philippines, Indonesia, Senegal, Madagascar, Columbia and Mexico [6]. This trend has been seen as the convergence of a number of policy trends including decentralization, privatization, participation and democratization. A result of this has been 'rolling back of the boundaries of the state' within the irrigation sector. Participatory irrigation management refers to the programs that seek to increase farmers direct involvement in system management, either as a compliment or as a substitute for the state role.

The acceptance of Participatory Irrigation Management (PIM) was powered by the dismal state of irrigation systems itself. Non-irrigated fields because of undependable water flows, indiscriminate use of water by head-enders depriving the same to the tail enders, inequitable distribution and resulting conflicts created a situation where the WU A ensures greater water control by

farmers and fairness in water distributions [7]. Greater water control by farmers permits less water to be used per unit of production, which translates into reduced energy consumption, water logging and salinity [8].

Irrigation performance assessment is an important management tool to aid in providing sound water service delivery. Performance assessment in irrigation and drainage can be defined as the systematic observation, documentation and interpretation of activities related to irrigated agriculture with the objective of continuous improvement [9]. There is a clear relationship between performance assessment and organizational excellence. The latter can be defined as “Organizational excellence an outstanding practice in managing organizations and delivering value for all stakeholders” [10]. Recently, academicians, practitioners and researchers have debated on development of new approaches, looking for better ways to measure and determine organizational performance more rapidly and reliably.

Performance indicators are a powerful tool for identifying deficiencies in irrigation district management [11]. A set of performance indicators was developed by the International Water Management Institute (IWMI) and likewise a new set of performance indicators called “benchmarking indicators” was developed by International Program Technology and Research in Irrigation and Drainage (IPTRID) to assess the performance of irrigation organizations [12] [13].

Benchmarking can be defined as a systematic process for securing continual improvement through comparison, using indicators, with relevant and achievable internal and/external norms and standards. It can compare past and present performance, as well as the performance of (otherwise similar) entities, and/or compare a performance against a relevant set of 'best practices'. Benchmarking is a very powerful management tool widely accepted all over the world for analyzing and improving the performance of water resources projects [14] [15]. The benchmarking indicators cover a range of process service delivery, financial and environmental management. Also, the productive efficiency are essentially for comparison of scheme outputs against key inputs (land, water) and allow organizations to see where they are placed in comparison with others. The process indicators can then be used to investigate which processes are contributing well or poorly to this output relative to similar process on other schemes [16].

Performance assessment through key indicators has become a standard practice in the irrigation water management sector in many countries. Dozens of irrigation performance indicators have been proposed over the years. But they still receive relatively little use, and that use is mostly by researchers and agencies rather than managers. David E. Nelson describes performance indicators which can be applied within the limited time, money, and information resources available to the typical manager or water users association [17]. Indicators are oriented toward items that directly or indirectly affect water deliveries, rather than indicators like crop yields that are also affected by other factors. These indicators are also oriented toward the existing system, aspects which do not require major modification of the infrastructure.

Materials and Methods—The area selected for the present study is a part of Left Bank Canal of RABSP. Command of *Dhulakheda, Pipariya, Jhansi* and *Jamuniya* Minor of Left Bank Canal (LBC) was considered for this study. Command area lies between latitude 23° 02' 21" to 23° 04' 53"N and longitude 79° 41' 14" to 79° 43' 19"E in the Jabalpur district of Madhya Pradesh.

The Dhulakheda, Pipariya, Jhansi and Jamuniya minor starts at 47.62km, 45.50km, 51km, 52km on LBC respectively and commanded about 1058 ha. The climate of the study area is subtropical monsonic characterized by an oppressive hot summer, high humidity and chilly winter. The temperature beings to rise rapidly from about March till May, which is generally the hottest month. The average annual temperature of the study area is 25.7° C. The mean maximum temperature ranges between 42.2° C and 25.8° C and mean minimum temperature ranges between 26.7° C and 9.2° C. As the project area lies in hot zone, the variation in humidity is quite large. Most of the land in the study area comes under class-II of land capability classification and as per land irrigability classification the area falls under class-B. The water holding capacity in the study area is 16.0 cm, which is favorable for plant growth. The major crops grown in the area during *rabi* season are Wheat, Gram, Lentil, Pea, Arhar and some Vegetables crops and in *kharif* season the main crops are paddy. Information of sowing and harvesting of different crops, their duration and the cropping pattern of the study area were collected from the different sources including contacts with the local farmers and revenue records of the village. The soil of the study area is clay-loam. The details of soil characteristics were collected from Soil Testing Department of M.P. govt. In the testing of 763 soil samples they observed that soil of the study area have low phosphorous, medium Nitrogen and medium potassium.

In this study Data comprising Water Deliveries, Maintenance, Financial and Sustainability of irrigation command area were collected through the methods of measurements, survey and estimation. Some of the recommended performance indicators were not considered due to irregular and unavailability of reliable data. The indicator were calculate as follows:

Water Deliveries

1. Tail-end Supply Ratio: The simplest indicator of water delivery performance is whether adequate water is reaching the farmers at the end of the canal system. The Tail-end Supply Ratio is the number of days that sufficient water reached the end of the canal system, divided by the total number of days. Ideally, this ratio would be close to one. TSR is simple and inexpensive, but is only a qualitative indicator. It is based on the common situation that irrigators at the end of the canal are usually the ones shorted.

$$TSR = N_s / N_t$$

Where,

N_s is the number of days that sufficient water reached the end of the canal system
 N_t is the total number of days the canal system was delivering water.

2. Delivery Timeliness Ratio: If water is delivered on request, an analysis of timeliness may be possible from the individual water order records. The Delivery Timeliness Ratio is the number of orders where water was delivered within the target time of the requested date, divided by the total number of orders. Ideally, this ratio would equal one. If there is a difference in DTR between the upper part of the canal system and the lower end or DTR is low, or lower than normal, this may be occur due to reasons like, if demand exceed the canal capacities, if demand exceed the available water supply, or the water supply itself miss-managed or it could also be caused by poor maintenance or management of the diversion dam, pump stations, or canals.

$$DTR = N_t/NT$$

Where,

N_t is the number of orders where water was delivered within the target time.

NT is the total number of orders (from the individual water order records).

Maintenance

1. Carrying Capacity Ratio: Canal capacity can indicate problems related to sediment deposits, erosion, vegetation, or possibly inadequate capacity of some structures. The Carrying Capacity Ratio is the actual capacity for the selected canal, divided by its designed capacity [18]. The ideal ratio would be one. In applying this indicator, flow should be measured at the designed water level or head. It is possible to operate a canal at a higher flow than its actual capacity, by operating the canal too full and reducing canal freeboard to an unsafe margin.

$$CCR = C_a/C_d$$

Where,

C_a is actual canal capacity for the selected canal (measured at designed head)

C_d is the designed canal capacity for the selected canal.

2. Poor Structure Ratio: The Poor Structure Ratio is the number of structures in poor condition, divided by the total number of structures. Poor can be defined as a structure not functioning adequately, or at risk of failing during the coming year. Ideally, this ratio should be zero [19].

$$PSR = NP/NT$$

Where,

NP is the number of structures in poor condition (not functioning adequately or at risk of failure)

NT is the total number of structures on the system.

Financial:

1. Fee Collection Performance: Fee Collection Performance is the annual irrigation fees collected, divided by the total annual fees assessed. This indicates the effectiveness of the collection program, but it can also be affected by the economic condition of the irrigators and the degree to which the irrigators feel the system is worth supporting. Values greater than 1 are possible if some delinquent assessments from previous years are collected.

$$FCP = F_c / F_a$$

Where,

F_c is the annual amount of water charges collected.

F_a is the annual amount of water charges assessed.

2. Manpower Numbers Ratio: The Manpower Numbers Ratio, which is the number of staff (full-time equivalent) divided by the total irrigated area. The optimum value for this indicator may vary widely among different regions of the world, because of differences in labor productivity and irrigation intensity [20].

$$MNR = N_s/At$$

Where,

N_s is number of staff (full-time equivalent)

At is total irrigated area

Sustainability:

1. Sustainability of Irrigated Area: Sustainability of Irrigated Area is the current irrigated area, divided by the initial irrigated area when the system was first fully developed. A trend toward reduced area generally indicates that the system is not sustainable (for

water supply, environmental, or economic reasons). If area has increased significantly from the designed area, it may indicate that the water supply is now distributed over too much land, or delivery capacities are being exceeded.

$$SIA = A_c/A_i$$

Where,

A_c is current total irrigated area.

A_i is total irrigated area when system development was completed.

2. Relative Groundwater Depth: Relative Groundwater Depth is the actual groundwater depth, divided by the Critical minimum depth needed for good crop production. This ratio should be greater than one, preferably at all locations and for the whole season. If the ratio is getting closer to one over time, it may indicate a need for improved drainage. Minimum depth should be based on the most sensitive crop grown in the area; one meter is a value frequently used. Where wells are used as a source of water, increasing depth to groundwater over time usually indicates groundwater over drafting.

$$RGD = D_a/D_m$$

Where,

D_a is actual depth to the water table.

D_m is the minimum intended depth to the water table, based on most sensitive crop

3. Area/Infrastructure Ratio: A key variable affecting the economic sustainability of a system is the Area/Infrastructure Ratio, which can be roughly defined as the irrigated area divided by the total length of canals and laterals. The critical value for this variable is determined by the economics of the region.

$$AIR = A_t/L_c$$

Where,

A_t is the total irrigated area.

L_c is the total length of canals and laterals on the system.

Results and Discussions—These performance indicators were evaluated through field visits, analyzing survey and collecting information from water resources department, (M.P.). Table 1 shows the results obtain for the Jamuniya, Jhasi, Pipariya and Dhulakheda minors.

Table 1 Performance Indicator for Jamuniya, Jhasi, Pipariya and Dhulakheda Minors.

Parameters	Performance Indicator	Name of Command Area				Reference range
		Jamuniya	Jhasi	Pipariya	Dhulakheda	
Water Deliveries	Tail-end Supply Ratio	0.208	0.25	0.58	0.416	0.50-0.70
	Delivery Timeliness Ratio	1	1	1	1	0.72-0.90
Maintenance	Carrying Capacity Ratio	0.918	0.94	0.993	0.811	0.60-1.26
	Poor Structure Ratio	0.5357	0.647	0.622	0.645	0.01-0.20
Financial	Fee Collection Performance	0.95	0.9	0.8	0.82	0.62-1.0
	Manpower Numbers Ratio	0.0142	0.0196	0.0066	0.0083	0.0004-0.001
Sustainability	Sustainability of Irrigated Area	0.325	0.246	0.416	0.436	0.50-1.0
	Relative Ground Water Depth	1.5	1.5	1.5	1.5	>1
	Area/Infrastructure Ratio	21.53	22.66	40	27.58	35

A common practice in irrigation supply is to apply water to the root at the required time, amount and quality. In this study, the tail-end supply ratio is varied between 0.20 to 0.58 which is less than the reference range of 0.50-0.70 which indicate the poor scheduling of irrigation water and poor maintenance of canal strictures which result in water logging in head reach of minor. The delivery timeliness ratio was found to be 1 which is ideal condition.

Carrying capacity ratio under maintenance indicator varied between 0.81 to 0.99 which indicate siltation of the minor. Poor structure ratio is varied in between 0.53 to 0.65 which is much more than the reference range of 0.01 to 0.20 indicates poor maintenance of the strictures both by government and WUA.

Water fee collection rates were generally good on the all organizations in the command area. The collection rate was found to be average 87%. This ratio shows that the cost of irrigation water was generally paid by farmers with reference to satisfaction with the irrigation water service delivery. In general, Pipariya WUA was of the most successful farmers' organization among all four WUA in the study area. This water user association can be used as benchmarks against which the other WUA can be assess their performance.

Conclusion—This study provides support for literature claiming that performance of irrigation water management should be assessed in the light of integrated approach. Analyses in this study show the bench-marking performance of WUAs in canal command area and may be lead to searching for best practices, regenerative ideas and highly effective operating procedures considering the experience of others. As a result, performance assessment and benchmarking can help to improve the water delivery, financial and production performance in a canal command area.

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Diabetic Retinopathy Stages Detection Using Fundus Images

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Abstract— The International Diabetes Federation (IDF)'s Diabetes Atlas reports that India has the highest number of people with diabetes in the world, and hence considered to be the “Diabetes Capital of the World”. Currently, 40.9 million Indians are estimated to be suffering from diabetes. By 2025, this number will rocket to 69.9 million, and potentially 85 million by 2030. It is considered that nearly 14-22% of the population across India fall in the pre-diabetic condition. These people could get diabetes within a decade. Diabetes affects the eye in various ways and one of the ways is Diabetic Retinopathy. Diabetic retinopathy (DR) refers to damage to the retina caused by abnormal blood flow related to diabetes mellitus, which can potentially lead to severe loss of vision. Annual retinal examination and early detection of DR can considerably reduce the risk of visual loss in diabetic individuals. The analysis therefore indicates the need of detecting Diabetic Retinopathy at its early stage and preventing the loss of vision in diabetic patients. In this paper, one of the automatic methods of detection of DR levels in humans is adopted and implemented using MATLAB. The method involves the processing of fundus images in MATLAB and detecting the level of Diabetic Retinopathy in patients.

Keywords - Diabetic Retinopathy, SVM classifier, Feature Extraction, Hemorrhages, Macula Edema, Exudates, Neural Network.

INTRODUCTION

The Diabetic Retinopathy is a disease affecting the human eye. The humans suffering from diabetes have high level of glucose in the blood[22] Due to this, the blood vessels of retina may get damaged, thus affecting the vision. The retina is the light-sensitive tissue at the back of the eye. A healthy retina is necessary for good vision.

The method implemented in this paper involves automatic detection of DR levels by processing the fundus images taken from a fundus camera.

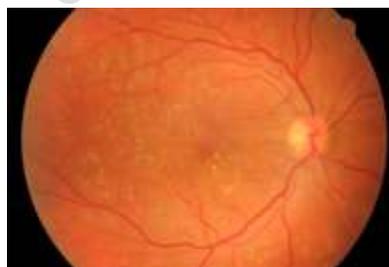


Figure.1: Fundus image

The Diabetic Retinopathy is divided into three levels depending upon the features present in the DR affected fundus images. [20][1]. The fundus images are pre-processed involving Grey Scale Conversion of RGB fundus images followed by removing of noise using Median Filtering Technique and finally improving the contrast of images using Histogram Equalization technique. The pre-processed fundus images are then fed for Segmentation using Histogram Segmentation Technique. The segmented output is further fed to

feature extraction level wherein various feature of segmented output is calculated. The feature vector is then designed based on the features extracted which are then fed to an SVM classifier. The SVM classifier is designed in such a way that it measures the level of DR in patients based on the type (Haemorrhages, Macula Edema and Exudates) of structures present in the fundus image[9].

Haemorrhages result due to leakage of retinal blood vessels. They have a similar red colour to the vessels. It indicates Mild Diabetic Retinopathy. Macula Edema is retinal thickening within 2 disc diameters of the centre of the macula, results from retinal microvascular changes that compromise the blood-retinal barrier, causing leakage of plasma constituents into the surrounding retina. It indicates Moderate Diabetic Retinopathy. Exudates are bright yellow-white deposits on the retina due to the leakage of blood from abnormal vessels. It indicates Severe Diabetic Retinopathy.

FUNDUS IMAGE PRE-PROCESSING

Pre-processing of fundus images is required in order to obtain an image which is noise free and contrast enhanced. The pre-processing of Fundus images includes the following steps:

- Conversion of RGB to grey scale image
- Noise removal using Median Filtering
- Histogram Equalization for contrast enhancement

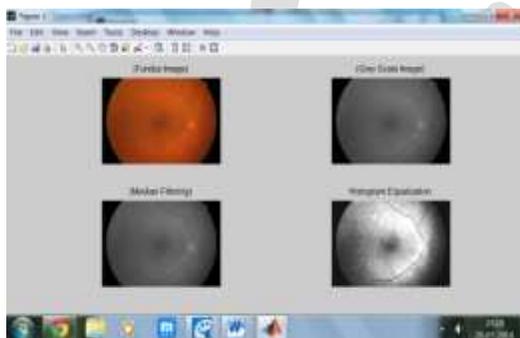


Figure 2: Output of Pre-processed Fundus images

SEGMENTATION USING HISTOGRAM THRESHOLDING

In Histogram Thresholding, based on the histogram obtained for a particular pre-processed image, a threshold point is selected. This threshold value will segment the image in order to obtain the required contour (region of interest).

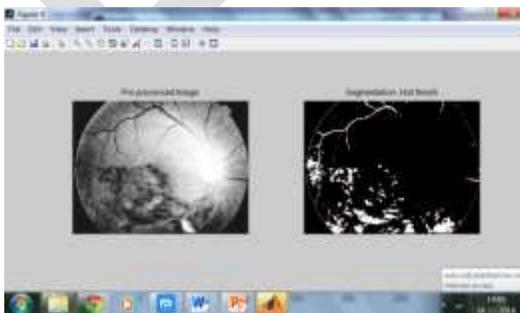


Figure3a: Output of Segmentation of Fundus Images- presence of Haemorrhages

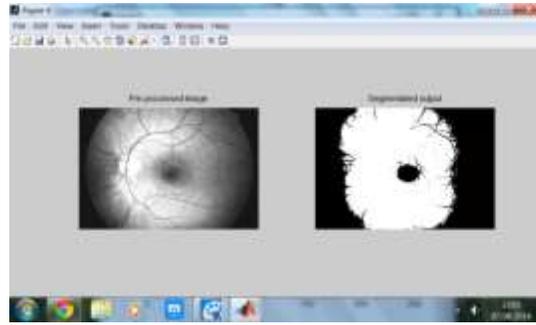


Figure3b: Output of Segmentation of Fundus Images- presence of Macula Edema



Figure3c: Output of Segmentation of Fundus Images- presence of Exudates

FEAUTRE EXTRACTION

The feature extraction includes evaluating the various features of a segmented image in order to form a feature vector required to input the SVM classifier. The feature extraction is a process wherein various features of the segmented image are extracted. In order to capture the spatial dependence of grey-level values, a two-dimensional dependence matrix known as a grey-level co-occurrence matrix (GLCM) is extensively used. The grey-level co-occurrence matrix $P [i, j]$ is defined by first specifying a displacement vector $d = (dx, dy)$ and counting all pairs of pixels separated by 'd' having grey levels 'i' and 'j' [23].

The following are the features which are extracted from segmented images:

1. **ENERGY:** Energy corresponds to the mean squared value of the image typically measured with respect to the global mean value. Energy of an image returns the sum of squared elements in the GLCM.

$$Energy = \sum_{i,j} [p(i, j)]^2 \quad (1)$$

2. **CONTRAST:** The **CONTRAST** function enhances the contrast of an **image**. Contrast of an image returns a measure of the intensity contrast between a pixel and its neighbour over the whole image.

$$Contrast = \sum_{i,j} |i - j|^2 * p(i, j) \quad (2)$$

3. **CORRELATION:** The operation called *correlation* is closely related to convolution. In correlation, the value of an output pixel is also computed as a weighted sum of neighbouring pixels. The difference is that the matrix of weights, in this case called the *correlation kernel*, is not rotated during the computation. The correlation operation therefore returns a measure of how correlated a pixel is to its neighbour over the whole image.

$$Correlation = \sum_{i,j} \frac{[(i - \mu_i) * (j - \mu_j) * p(i, j)]}{[\sigma_i \sigma_j]} \quad (3)$$

4. **HOMOGENEITY:** Homogeneity reflects the uniformity of several pixels in an image and expresses how similar all of them are. Homogeneity of image returns a value that measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal.

$$Homogeneity = \sum_{i,j} \frac{[p(i, j)]}{[1+ |i - j|]} \quad (4)$$

5. **ENTROPY:** Entropy is a feature which measures the randomness of grey-level distribution.

$$Entropy = -\sum_{i,j} p(i, j) * \log_2(p(i, j)) \quad (5)$$

The features extracted are fed to SVM classifier to classify the mages for levels of DR in patients.

CLASSIFICATION USING SVM CLASSIFIER

In machine learning, support vector machines (SVMs, also support vector networks are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification.

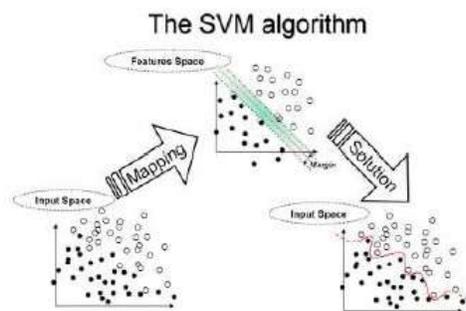


Figure 4: SVM Technique

The SVM classifier is a technique in which, the classifier undergoes two phases: Learning/Training phase and Testing Phase. The Learning Phase is wherein the classifier is made to learn the known set of images. Here the feature vector of each known image is fed to the classifier and the output is labeled accordingly. The Testing Phase is wherein the unknown images' feature vector is fed to the classifier and based on its mapping with the Learning Phase, the image is classified appropriately. The table 1.1 shows the training data images along with its features extracted in order to train SVM for detection of macula Edema. The presence of Macula Edema indicates Moderate Level of Diabetic Retinopathy. The table 1.2 shows the training data images along with its features extracted in order to train SVM for detection of Exudates. The presence of Exudates indicates Severe Level of Diabetic Retinopathy. The table 1.3 shows the training data images along with its features extracted in order to train SVM for detection of Hemorrhages. The presence of Hemorrhages indicates Mild Level of Diabetic Retinopathy.

Table 1a: Training image-sets to SVM for detection of Macula Edema

	Feature Extraction				
Training data Images	Energy	Correlation	Contrast	Homogeneity	Entropy
Tr_image1	2.3437e-007	0.0224	1.4515e+006	0.0043	0.9987

Tr_image2	2.3785e-007	0.0081	1.5259e+006	0.0043	0.9995
Tr_image3	2.3437e-007	0.0224	1.4515e+006	0.0043	0.9987
Tr_image4	2.3650e-007	0.0266	1.4063e+006	0.0044	0.9992
Tr_image5	2.3353e-007	0.0099	1.4135e+006	0.0042	0.9985
Tr_image6	2.3489e-007	0.0182	1.4112e+006	0.0044	0.9988
Tr_image7	2.3785e-007	0.0081	1.5259e+006	0.0043	0.9995
Tr_image8	2.3444e-007	0.0272	1.4721e+006	0.0042	0.9987
Tr_image9	2.3890e-007	0.0107	1.6075e+006	0.0043	0.9996
Tr_image10	2.3870e-007	0.0171	1.3228e+006	0.0045	0.9996
Tr_image11	2.3599e-007	0.0178	1.3786e+006	0.0045	0.9991
Tr_image12	4.3353e-006	-0.0070	8.6766e+004	0.0152	0.9987
Tr_image13	4.4948e-006	-0.0042	7.6070e+004	0.0153	1.0000
Tr_image14	4.4581e-006	-0.0058	8.2679e+004	0.0149	0.9999
Tr_image15	4.3973e-006	-0.0042	8.2831e+004	0.0155	0.9994
Tr_image16	4.3317e-006	-0.0070	8.1668e+004	0.0152	0.9986
Tr_image17	4.3261e-006	-0.0124	9.2363e+004	0.0149	0.9985
Tr_image18	4.3803e-006	-0.0106	7.8395e+004	0.0149	0.9993
Tr_image19	4.3527e-006	-0.0053	7.6950e+004	0.0146	0.9989
Tr_image20	4.4061e-006	-0.0110	7.8107e+004	0.0148	0.9995

Table 1b: Training image-sets to SVM for detection of Exudates

	Feature Extraction				
Training data Images	Energy	Correlation	Contrast	Homogeneity	Entropy
Tr_image1	4.5775e-005	0.0581	1.1252e+006	0.0015	0.0267
Tr_image2	1.0624e-004	-0.0056	1.2374e+005	0.0217	0.1486
Tr_image3	2.4432e-004	-0.0176	9.8072e+004	0.0227	0.0758
Tr_image4	1.0036e-004	0.0900	1.0062e+005	0.0202	0.1554

Tr_image5	1.7352e-004	0.1678	8.5385e+004	0.0072	0.1003
Tr_image6	3.7736e-004	-0.0799	1.3047e+005	0.0093	0.0528
Tr_image7	4.1590e-005	0.0186	9.2517e+004	0.0166	0.3046
Tr_image8	3.7649e-005	-0.0297	8.4959e+004	0.0159	0.3276
Tr_image9	1.4096e-004	-0.0204	1.0413e+005	0.0167	0.1186
Tr_image10	1.9732e-004	0.0152	8.5114e+004	0.0073	0.0903
Tr_image11	5.1073e-004	-0.0292	1.2065e+006	0.0013	0.0032
Tr_image12	5.1073e-004	-0.0292	1.2065e+006	0.0013	0.0032
Tr_image13	0	0	0	0	0
Tr_image14	0	0	0	0	0
Tr_image15	4.3706e-004	-0.0267	1.2646e+006	0.0013	0.0037
Tr_image16	0	0	0	0	0
Tr_image17	0	0	0	0	0
Tr_image18	7.1332e-005	0.0394	2.2738e+006	0.0012	0.0182
Tr_image19	0.0051	-0.1225	2.5595e+005	0.0054	0.0016
Tr_image20	0	0	0	0	0

Table 1c: Training image-sets to SVM for detection of Haemorrhages

	Feature Extraction				
Training data Images	Energy	Correlation	Contrast	Homogeneity	Entropy
Tr_image1	2.9869e-005	-0.0136	1.0753e+005	0.0122	0.3868
Tr_image2	2.8842e-005	0.0472	1.0139e+005	0.0150	0.3964
Tr_image3	2.8106e-005	0.0501	6.7139e+004	0.0144	0.4037
Tr_image4	2.9389e-005	0.0507	1.0292e+005	0.0169	0.4093
Tr_image5	7.1332e-005	0.0394	2.2738e+006	0.0012	0.0182
Tr_image6	7.1332e-005	0.0394	2.2738e+006	0.0012	0.0182
Tr_image7	0.0051	-0.1225	2.5595e+005	0.0054	0.0016
Tr_image8	4.1590e-005	0.0186	9.2517e+004	0.0166	0.3046

Tr_image9	3.7649e-005	-0.0297	8.4959e+004	0.0159	0.3276
Tr_image10	1.4096e-004	-0.0204	1.0413e+005	0.0167	0.1186
Tr_image11	1.0624e-004	-0.0056	1.2374e+005	0.0217	0.1486
Tr_image12	2.4432e-004	-0.0176	9.8072e+004	0.0227	0.0758
Tr_image13	1.0036e-004	0.0900	1.0062e+005	0.0202	0.1554
Tr_image14	2.3353e-007	0.0099	1.4135e+006	0.0042	0.9985
Tr_image15	2.3489e-007	0.0182	1.4112e+006	0.0044	0.9988
Tr_image16	2.3785e-007	0.0081	1.5259e+006	0.0043	0.9995
Tr_image17	2.3444e-007	0.0272	1.4721e+006	0.0042	0.9987
Tr_image18	4.3317e-006	-0.0070	8.1668e+004	0.0152	0.9986
Tr_image19	4.3261e-006	-0.0124	9.2363e+004	0.0149	0.9985
Tr_image20	4.3803e-006	-0.0106	7.8395e+004	0.0149	0.9993

RESULTS

The Diabetic Retinopathy (DR) level in humans can be detected by scanning the human fundus image for the presence of Macula Edema, Haemorrhages and Exudates. Macula Edema indicates Moderate level of DR, Haemorrhages indicates Mild Level of DR and Exudates indicate Severe level of DR in humans. The SVM classifier is trained with 100 fundus images which show different levels of DR. The input test image fed to the classifier appropriately classifies the level of DR based on the training of SVM Classifier.

The segmented output as shown in figure (3a) shows presence of Haemorrhages. The features are extracted of this segmented image and then the features are subjected to SVM classifier. The output of the classifier is as shown in figure (5a). The segmented output as shown in figure (3b) shows presence of Macula Edema. The features are extracted of this segmented image and then the features are subjected to SVM classifier. The output of the classifier is as shown in figure (5b). The segmented output as shown in figure (3c) shows presence of Exudates. The features are extracted of this segmented image and then the features are subjected to SVM classifier. The output of the classifier is as shown in figure (5c).



Figure 5a: SVM classifier output showing patient suffering from Mild DR



Figure 5b: SVM classifier output showing patient suffering from Moderate DR



Figure 5c: SVM classifier output showing patient suffering from Severe DR

CONCLUSION

The method adopted in this paper for early detection of DR disease in humans is reliable and shows accurate results. The method implemented can be used for screening of patients eyeballs for detecting level of DR in a cost effective manner. This technique helps in determining levels of DR in its early stage and thus preventing vision loss.

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Time Truncated Chain Sampling Plan for Weibull Distributions

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Abstract: Chain sampling plan is developed for a truncated life test when the life time of an item follows Weibull distribution are provided in this manuscript. The design parameters such as the minimum sample size and the acceptance number are obtained by satisfying the consumer's risks at the specified quality levels, under the assumption that the termination time and the number of items are pre-fixed, the results are discussed with the help of tables and examples

Keywords - Truncated life test, Weibull distribution, Chain sampling plan, Operating characteristics, Consumer's risk, Producer's risk .

1. INTRODUCTION:

Sampling plans often used to determine the acceptability of lots of items. Although in recent years more emphasis is placed on process control and off-line quality control methods, acceptance sampling remains as a major tool of many practical quality control system. In acceptance sampling, if the quality variable is the lifetime of an item, the problem of acceptance sampling is known as the reliability sampling, and the test is called the lifetest. Acceptance sampling has been one of practical tools for quality assurance applications, which provide a general rule to the producer and the consumer for product acceptance determination. It has been shown that variables sampling plans requires less sampling compared with attributes sampling plans. Thus, variables sampling plans become more attractive and desirable especially when the required quality level is very high or the allowable fraction non-conforming is very small.

One can use the truncated life test, where the test can be performed without waiting until all test items fail, that reduces the test time and money significantly. In most acceptance sampling plans for a truncated life test, major issue is to determine the sample size from the lot under consideration. The problem considered here is that of finding the minimum sample size, when the life test is terminated at a preassigned T , where the number of failures is recorded until the pre specified time. If the number of failures observed is not greater than the specified acceptance number, then the lot will be accepted. Using life tests one may find the probability of acceptance, minimum sample size put on test and the minimum ratio of true average life to the specified average life or quality level subject to the consumer's risk. These life tests are studied by many authors using the different statistical distributions, More recently, Aslam and Jun [1] proposed the group acceptance sampling plan based on the truncated life test when the lifetime of an item follows the inverse Rayleigh and Log-logistic distribution, Kantam R.R. L., Rosaiah K. and Srinivasa Rao G. [12] discussed acceptance sampling based on life tests with Log-logistic models. Rosaiah K. and Kantam R.R.L. [13] discussed acceptance sampling based on the Inverse Rayleigh distribution. Gupta and Groll(1961), Baklizi and EI Masri(2004), and Tsai, Tzong and Shou(2006), Balakrishnan, Victor Leiva & Lopez (2007),[5]. All these authors developed the sampling plans for life tests using single acceptance sampling.

In this paper a new approach of designing Chain sampling plan for truncated life test is proposed assuming that the experiment is truncated at preassigned time, when the lifetime of the items follows, Weibull distribution. The test termination time and the mean ratio's are specified. The design parameter is obtained such that it satisfies the consumer's risk. The probability of acceptance are also determined when the life time of the items follows the above distribution. The tables of the design parameter are provided for easy selection of the plan parameter. The results are analysed with the help of tables and examples.

2. GLOSSARY OF SYMBOLS:

n - Sample size

λ - Shape parameter

- σ - Scale parameter
- α - Producer's risk
- T - Prefixed time
- β - Consumer's risk
- d - Number of defectives
- p_0 - Failure probability
- L(p) - Probability of acceptance
- i - Acceptance criteria

3. WEIBULL DISTRIBUTION : The cumulative distribution function of the Weibull distribution is given by

$$F(t / \sigma) = 1 - e^{-\left(\frac{t}{\sigma}\right)^\lambda} \quad \text{-----} \quad (1)$$

Where shape parameter $\lambda = 2$, σ is the scale parameter. If some other parameters are involved, then they are assumed to be known, for example, if shape parameter of a distribution is unknown it is very difficult to design the acceptance sampling plan. In quality control analysis, the scale parameter is often called the quality parameter or characteristics parameter. Therefore it is assumed that the distribution function depends on time only through the ratio of t/σ .

4. CHAIN SAMPLING PLAN :

Chain Sampling Plan

(ChSP-1) proposed by Dodge (1955) making use of cumulative results of several samples help to overcome the shortcomings of the Single Sampling Plan. The distinguishing feature is that the current lot under inspection can also be accepted if one defective unit is observed in the sample provided that no other defective units were found in the samples from the immediately preceding i lots, i.e. the chain. It avoids rejection of a lot on the basis of a single nonconforming unit and improves the poor discrimination between good and bad quality. When large samples are not practicable, and the use of $c = 0$ plan is warranted, for example, when an extremely high quality is essential the use of chain sampling plan is often recommended. The conditions for application and operating procedure of chsp-1 are as follows

4.1 CONDITIONS FOR APPLICATION OF ChSP -1:

The cost of destructiveness of testing is such that a relatively small sample size is necessary, although other factors make a large sample desirable.

- 1) The product to be inspected comprises a series of successive lots produced by a continuing process.
- 2) Normally lots are expected to be of essentially the same quality.
- 3) The consumer has faith in the integrity of the producer..

4.2 OPERATING PROCEDURE OF CHAIN SAMPLING PLAN The plan is implemented in the following way:

- 1) For each lot, select a sample of n units and test each unit for conformance to the specified requirements.
- 2) Accept the lot if d (the observed number of defectives) is zero in the sample of n units, and reject if $d > 1$.
- 3) Accept the lot if d is equal to 1 and if no defectives are found in the immediately preceding i samples of size n .

4.3 OPERATING PROCEDURE OF CHAIN SAMPLING PLAN FOR THE LIFE TESTS

- 1) For each lot, select a sample of n units and test each unit for conformance to the specified requirements during the time t_0 .
- 2) Accept the lot if d (the observed number of defectives during the time t_0) is zero in the sample of n units, and reject if $d > 1$.
- 3) Accept the lot if d is equal to 1 and if no defectives are found in the immediately preceding i samples of size n during the time t_0 .

The Chain sampling Plan is characterized by the parameters n and i . We are interested in determining the sample size required for in the case of Weibull distribution and various values of test termination ratios. The probability (α) of rejecting a good lot is called the producer's risk, whereas the probability(β) of accepting a bad lot is known as the consumer's risk. Often the consumer risk is expressed by the consumer's confidence level. If the confidence level is p^* then the consumer's risk will be $\beta = 1 - p^*$. We will determine the sample size so that the consumer's risk does not exceed a given value β .

The probability of acceptance can be regarded as a function of the deviation of specified average from the true average. This function is called operating characteristic (oc) function. Once the minimum sample size is obtained one may be interested to find the probability of acceptance of a lot when the quality of the product is good enough. The probability of acceptance in the case of chain sampling plan is calculated using the following equation is given by

$$P_a(p) = (1-p)^n + np(1-p)^{n-1} (1-p)^{ni} \text{-----} (2)$$

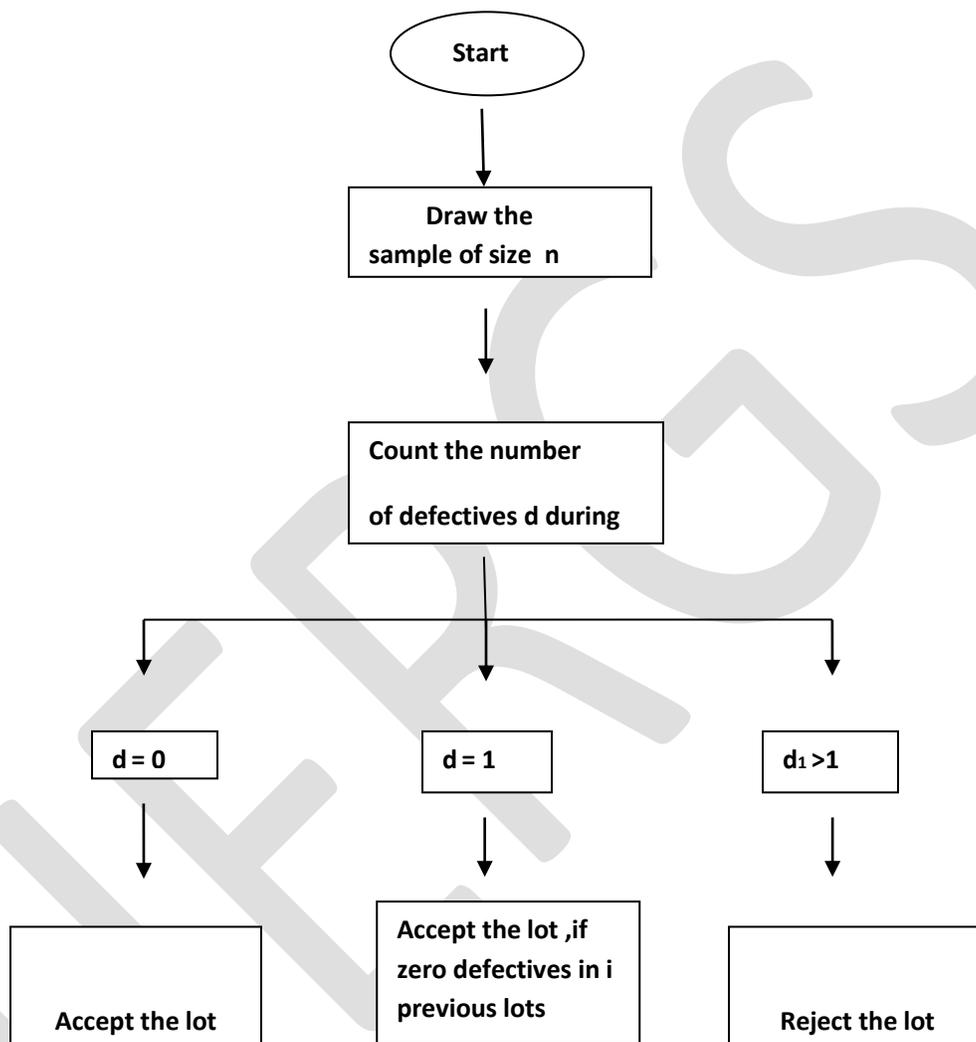
The time termination ratio t/σ_0 are fixed as 0.628, 0.942, 1.257, 1.571, 2.356, 3.141, 4.712, the consumer's risk β as 0.25, 0.10, 0.05, 0.01 and the mean ratios σ/σ_0 are fixed as 2, 4, 6, 8, 10 and 12. These choices are consistent with Gupta and Groll (1961), Gupta (1962), Kantam et al (2001), Baklizi and EI Masri (2004), Balakrishnan et Al (2007). For various time termination ratios the design parameter values n are obtained by substituting the failure probability at the worst case in the equation (2) using the inequality

$$L(p_0) \leq \beta$$

where p_0 is the failure probability at $\sigma = \sigma_0$ and are presented in Table 1. The probability of acceptance for Chain sampling plan are also calculated for various time termination ratios and mean ratios and are presented in Table 2 when the life time of an item follows Weibull distribution.

5.FLOWCHART:

The following is the operating procedure of Chain sampling plan for the life tests in the form of a flow chart



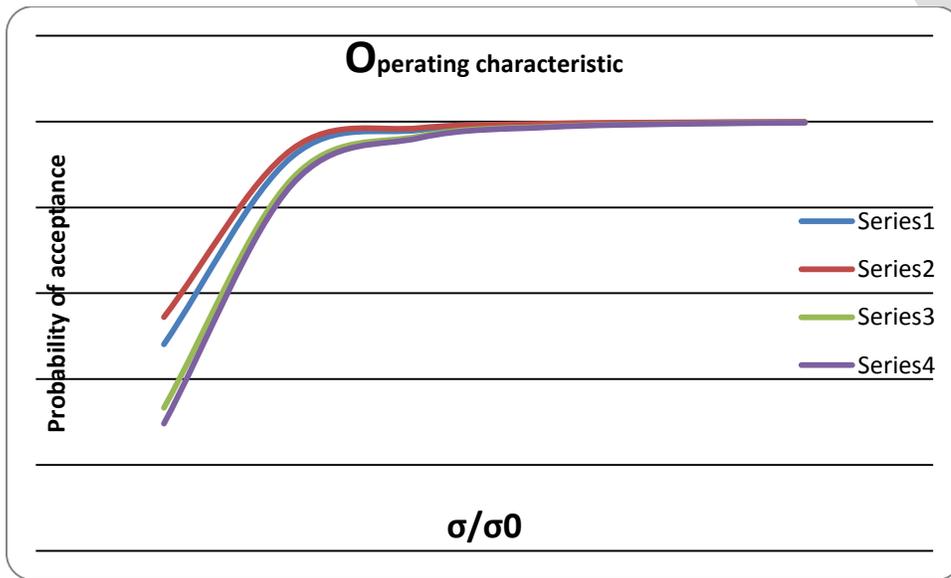
6.DESCRPTION OF TABLES AND AN EXAMPLE:

Assume that the life time distribution is an Weibull distribution when the acceptance criteria (previous lots number) is predefined as $i = 2$, and that the experimenter is interested in knowing that the true mean life is atleast 1000 hours with confidence 0.75. Based on consumer’s risk values and the time termination ratio, the minimum sample size is determined using the chain sampling plan for truncated life test. It is desired to stop the experiment at 628 hours with $\beta = 0.25$, then the required n from Table 1 is 4. If during 628 hours no failures out of 4 are observed then the experimenter can assert, with a confidence level of 0.75 that the average life is at least 1000 hours, and, accept the lot, if one non conforming unit is observed, provided that no failure occurs in the i preceeding samples, and otherwise reject the lot. From the Table 2, one can observe that the probability of acceptance for this sampling is 0.801056, when $\sigma/\sigma_0 = 2$. For the same measurements and plan parameters, the probability of acceptance is 0.999720,

when the ratio of the unknown average life is 12. For this sampling plan with $(n = 4, i = 2, t/\sigma_0 = 0.628)$ and $\beta = 0.25$ under Weibull distribution, the values of the operating characteristic function from Table 2 as follows

σ/σ_0	2	4	6	8	10	12
L(p)	0.801056	0.980370	0.995759	0.998615	0.999424	0.999720

FIGURE 4:



OC curve for Probability of acceptance against σ/σ_0 for the Chain Sampling Plan when the life time of the item follows Weibull distribution.

Table 1: Minimum sample size (n) for Chain sampling plan when the life time of the item follows Weibull distribution

β	i	t/σ_0							
		0.628	0.942	1.257	1.571	2.356	3.141	3.927	4.712
0.25	1	5	5	2	2	1	1	1	1
	2	4	2	1	1	1	1	1	1
	3	4	2	1	1	1	1	1	1
	4	4	2	1	1	1	1	1	1
	5	4	2	1	1	1	1	1	1
	6	4	2	1	1	1	1	1	1
0.10	1	7	6	3	2	1	1	1	1
	2	6	3	2	1	1	1	1	1
	3	6	3	2	1	1	1	1	1
	4	6	3	2	1	1	1	1	1
	5	6	3	2	1	1	1	1	1
	6	6	3	2	1	1	1	1	1
0.05	1	8	6	3	2	1	1	1	1
	2	8	4	2	2	1	1	1	1
	3	8	4	2	2	1	1	1	1
	4	8	4	2	2	1	1	1	1
	5	8	4	2	2	1	1	1	1
	6	8	4	2	2	1	1	1	1
0.01	1	12	6	3	2	1	1	1	1
	2	12	6	3	2	1	1	1	1
	3	12	6	3	2	1	1	1	1
	4	12	6	3	2	1	1	1	1
	5	12	6	3	2	1	1	1	1
	6	12	6	3	2	1	1	1	1

Table 2: Probability of acceptance for Chain sampling plan with $i = 2$, when the life time of the item follows Weibull distribution

β	n	t/σ_0	σ/σ_0					
			2	4	6	8	10	12
0.25	4	0.628	0.801056	0.980370	0.995759	0.998615	0.999424	0.999720
	2	0.942	0.772910	0.976780	0.994946	0.998345	0.99931125	0.999665
	1	1.257	0.821771	0.983147	0.996391	0.998825	0.999512	0.999763
	1	1.571	0.673600	0.962055	0.991510	0.997192	0.998826	0.999427
	1	2.356	0.296419	0.853329	0.962083	0.986770	0.994327	0.997194
	1	3.141	0.091478	0.673855	0.898854	0.962098	0.983177	0.991521
	1	3.927	0.021605	0.471422	0.799494	0.918118	0.962072	0.980420
	1	4.712	0.003900	0.296419	0.673770	0.853329	0.928605	0.962083
0.10	6	0.628	0.658855	0.958601	0.990647	0.996895	0.998700	0.999365
	3	0.942	0.615192	0.950579	0.988692	0.996229	0.998417	0.999226
	2	1.257	0.544392	0.935557	0.984922	0.994931	0.997864	0.998954
	1	1.571	0.673600	0.962055	0.991510	0.997192	0.998826	0.999427
	1	2.356	0.296419	0.853329	0.962083	0.986770	0.994327	0.997194
	1	3.141	0.091478	0.673855	0.898854	0.962098	0.983177	0.991521
	1	3.927	0.021605	0.471422	0.799494	0.918118	0.962072	0.980420
	1	4.712	0.003900	0.296419	0.673770	0.853329	0.928605	0.962083
0.05	8	0.628	0.532183	0.931526	0.983839	0.994549	0.997700	0.998873
	4	0.942	0.481087	0.918291	0.980370	0.993336	0.997179	0.998615
	2	1.257	0.544392	0.935557	0.984922	0.994931	0.997864	0.998954
	2	1.571	0.333230	0.866747	0.965932	0.988163	0.994934	0.997498
	1	2.356	0.296419	0.853329	0.962083	0.986770	0.994327	0.997194
	1	3.141	0.091478	0.673855	0.898854	0.962098	0.983177	0.991521
	1	3.927	0.021605	0.471422	0.799494	0.918118	0.962072	0.980420
	1	4.712	0.003900	0.296419	0.673770	0.853329	0.928605	0.962083

0.01	12	0.628	0.342049	0.867246	0.965918	0.988139	0.994919	0.997489
	6	0.942	0.291683	0.843032	0.958601	0.985444	0.993735	0.996895
	3	1.257	0.347265	0.871622	0.967308	0.988658	0.995149	0.997605
	2	1.571	0.333230	0.866747	0.965932	0.988163	0.994934	0.997498
	1	2.356	0.296419	0.853329	0.962083	0.986770	0.994327	0.997194
	1	3.141	0.091478	0.673855	0.898854	0.962098	0.983177	0.991521
	1	3.927	0.021605	0.471422	0.799494	0.918118	0.962072	0.98042
	1	4.712	0.003900	0.296419	0.673770	0.853329	0.928605	0.962083

7.CONCLUSIONS: In this paper, designing a Chain sampling plan for the truncated life test is presented. The minimum sample size and the probability of acceptance are calculated, for various values of the test termination time, assuming that the lifetime of an item follows Weibull distribution. From the figure1 and the tables provided, it is observed that the operating characteristic values of Weibull distribution increases disproportionately and reaches the maximum value 1 with the increase in the mean ratios. It is concluded that the sampling plan can be used conveniently in practical situations to reduce the cost and time of the life test experiments.

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A Review on Contribution of Data mining in e-Governance Framework

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Abstract- Information and communication technology has the aptitude to enhance the method by that governments involve individual in formulating public policy and public policies. Even if a lot of government rules could currently be in digital type (and typically obtainable online), thanks to their complexness and variety, distinguishing those relevant to a selected context may be a non-trivial task. Similarly, with the appearance of variety of electronic on-line forums, social networking sites and blogs, the chance of gathering citizens' petitions and stakeholders' views on government policy and proposals has increased greatly, however the amount and therefore the complexness of analyzing unstructured knowledge makes this tough. On the opposite hand, text mining has come back a protracted manner from straightforward keyword search, and matured into a discipline capable of addressing way more advanced tasks. during this paper we tend to discuss however text-mining techniques will facilitate in retrieval of information knowledge and relationships from matter data sources, thereby helping policy manufacturers in discovering associations between policies and citizens' opinions expressed in electronic public forums and blogs etc. we tend to additionally gift here, an integrated text mining based mostly design for e-governance call support alongside a discussion on the Indian situation.

Keywords: E-Governance, Data mining, Knowledge discovery, Grievance redressal, DSS, ICT, Text mining.

INTRODUCTION

The emergence of Information and Communications Technology (ICT) has provided means for faster and better communication, efficient storage, retrieval and processing of data and exchange and utilization of information to its users, be they individuals, groups, businesses, organizations or governments [1]. What had begun as a faster, more accurate and simpler means of word-processing quickly lent itself to being used as a tool for processing and tabulating data as an aid in decision making. With growing computerization and increasing internet connectivity, this process has presently reached a stage where more and more users are motivated to modifying their ways of doing things in order to leverage the advantages provided by ICT. In other words, this has led to 'business process re-engineering'. So far as governments are concerned, the coming together of computerization and internet connectivity/web-enablement in association with process re-engineering, promises faster and better processing of information leading to speedier and qualitatively better decision making, greater reach and accountability, better utilization of resources and overall good governance. In the case of citizens, it holds the promise of enhanced access to information and government agencies, efficient service delivery and transparency in dealings and interactions with government. With the increasing awareness among citizens about their rights and the resultant increase in expectations from the government to perform and deliver, the whole paradigm of governance has changed. Government, today, is expected to be transparent in its dealings, accountable for its activities and faster in its responses. This has made the use of ICT imperative in any agenda drawn towards achieving good governance. It has also led to the realization that such technologies could be used to achieve a wide range of objectives and lead to faster and more equitable development with a wider reach. In its Fourth Report entitled 'Ethics in Governance' [2], the Commission had clearly stated that the tools of modern technology such as Information and Communications Technology (ICT) should be used to transform the relationship of the government with its constituents, citizens and businesses, and also between its own agencies. While recognizing the potential of ICT in transforming and redefining processes and systems of governance, the Commission had suggested that e-Governance is the logical next step in the use of ICT in systems of governance in order to ensure wider participation and deeper involvement of citizens, institutions, civil society groups and the private sector in the decision making process of governance. Although the term 'e-Governance' has gained currency in recent years, there is no standard definition of this term. Different governments and organizations define this term to suit their own aims and objectives. Sometimes, the term 'e-government' is also used instead of 'e-Governance'. According to the World Bank [3], "E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with

business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions.” UNESCO defines e-Governance as [3] “Governance refers to the exercise of political, economic and administrative authority in the management of a country’s affairs, including citizens’. The articulation of their interests and exercise of their legal rights and obligations. E-Governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating information to the public, and other agencies, and for performing government administration activities.” This definition visualizes the use of the electronic medium in the exercise of authority in the management of a country’s affairs along with articulation of citizens’ interests leading to greater transparency and efficiency. The benefits of e-Governance are as follows [4]:

- Better access to information and quality services for citizens: ICT would make available timely and reliable information on various aspects of governance. In the initial phase, information would be made available with respect to simple aspects of governance such as forms, laws, rules, procedures etc later extending to detailed information including reports (including performance reports), public database, decision making processes etc. As regards services, there would be an immediate impact in terms of savings in time, effort and money, resulting from online and one-point accessibility of public services backed up by automation of back end processes. The ultimate objective of e-Governance is to reach out to citizens by adopting a life-cycle approach i.e. providing public services to citizens which would be required right from birth to death.
- Simplicity, efficiency and accountability in the government: Application of ICT to governance combined with detailed business process reengineering would lead to simplification of complicated processes, weeding out of redundant processes, simplification in structures and changes in statutes and regulations. The end result would be simplification of the functioning of government, enhanced decision making abilities and increased efficiency across government – all contributing to an overall environment of a more accountable government machinery. This, in turn, would result in enhanced productivity and efficiency in all sectors.
- Expanded reach of governance: Rapid growth of communications technology and its adoption in governance would help in bringing government machinery to the doorsteps of the citizens. Expansion of telephone network, rapid strides in mobile telephony, spread of internet and strengthening of other communications infrastructure would facilitate delivery of a large number of services provided by the government. This enhancement of the reach of government – both spatial and demographic – would also enable better participation of citizens in the process of governance.

DATA MINING IN E-GOVERNANCE

The transformation from conventional government services to E-government services heralds a new era in public services. E-government services can replace the government’s traditional services with services of better quantity, quality and reach, and increase citizen satisfaction, using Information and Communication Technology (ICT). E-governance aims to make the interactions between government and citizens (G2C), government and business enterprise (G2B) and intergovernmental department dealing (G2G) friendly, convenient transparent and less expensive [5]. A growing amount of informative text regarding government decisions, directives, rules and regulations are now distributed on the web using a variety of portals, so that citizens can browse and peruse them. This assumes, however, that the information seekers are capable of entangling the massive volume and complexity of the legally worded documents [6]. Government regulations are voluminous, heavily cross-referenced and often ambiguous. Government information is in unstructured / semi-structured form, the sources are multiple (government regulations comes from national, state and local governments) and the formats are different – creating serious impediment to their searching, understanding and use by common citizens. In the G2G arena, the government departments are in an even greater need of a system that is able to provide information retrieval, data exchange, metadata homogeneity, and proper information dissemination across the administrative channels of national, regional / state, and local governments [7]. The increasing demand for and complexity of government regulations on various aspects of economic social and political life, calls for advanced knowledge-based framework for information gathering, flow and distribution. Also, regulations are frequently updated by government apartments to reflect environmental changes and changes in policies. Tools that can detect ambiguity, inconsistency and contradiction are needed because the regulations, amended provisions, legal precedence and interpretive guidelines together create a massive volume of semi-structured documents with potentially similar content but possible differences in format, terminology and context. Information infrastructures that can consolidate, compare and contrast different regulatory documents will greatly enhance and aid the understanding of existing regulations and promulgation of new ones. Government regulations should ideally be retrievable and understandable with ease by legal practitioners, policy makers as well as general public /citizens. Despite many attempts, it is recognized that e-government services are yet to render the desired pro-citizen services and are mostly targeted towards internal efficiency [8]. Kwon et al [9], have proposed a system that helps rule makers understand and respond to the public comments, before finalizing proposed regulations. These public comments are opinion-oriented arguments about the regulations. The facility of identification and classification of main subject of the claims / opinions provided by the tool helps rule-writers preview and summarize the comments [9]. The proposed solution identifies conclusive sentences showing

the author's attitude towards the main topic and classifies them to polar classes [9]. The researchers have applied a supervised machine learning method to identify claims using sophisticated lexical and structural features and to classify them by the attitude to the topic: in support of, opposed to, and proposing a new idea.

It is widely acknowledged that democracy requires well-informed citizens. Information creates trust and is the mechanism for ensuring that politicians serve the electorate. Democracy is effective when there is smooth flow of information between citizens and government [10]. E-Governance in its present form has furthered this concept to a certain extent. However, the character of e-governance is mainly one-way flow of information – from the government to the citizens, and authentic citizen participation is absent. With the integration of citizens' participation in the entire process of governance with the help of Information and Communication Technology e-governance evolves into E-democracy and Citizen Participation in policy making can secure democracy, as it generates a continuous flow of information between citizens and the government, helping them in the decision-making process and the citizens can assume a more active role in society, exercising their opinion power with ease and agility [11]. In the usual form of democracy, the general election is the most important citizen participation process. It is significant because it formulates the country's transfer of power from one civilian government to another. Since, elections are intermittent, it is important to have a system in place that has the capability to track public opinion on a more or less continuous basis, and encourage involvement and participation from the electorate on matters of public importance. It is quite possible for citizens' to have different opinions on government proposals. Government can use the online discussion forums and encourage citizens' to discuss on public projects. Once the discussions phase is opened and finished its output are needs to be analyzed so that the underlying trends and preferences of citizens can be incorporated into the decision-making process of the pertinent administrative department [12]. Capturing citizens' opinions through electronic participation / discussion media can be more reliable than traditional methods based on opinions polls and help avoid false opinion declaration. This also drastically changes the methods of surveying citizens' opinion trends as well as the accuracy of the evaluation of their opinions. It reduces the cost, increases reach, and provides almost real time information. Potentially, arguments that led to significant opinion shifts can be detected. However, the volume and the complexity of analyzing unstructured data make this far from straight forward. Text mining can process unstructured data leading to greater understanding of the text in the context of others on the same topic. This is especially important when dealing with expressed public opinion, where the arguments for and against particular positions are important to identify and gauge, but is immensely difficult to extract due their storage in natural language format. These systems though somewhat futuristic and still in the process of being researched, demonstrate that the concept of participation of citizens' in democratic processes through electronic media is an achievable one. It is also evident from the way these systems work, that text mining capability is the cornerstone of the move towards democracy systems. Figure-1 depicts a 'Participation System' for gathering, analysis and addressing citizens' concerns regarding existing / proposed government policies / laws. In the figure, the central repository of documents (mostly in unstructured form) has been labeled 'Proposed Govt policies/Govt policies. The citizens are encouraged to record their reactions through the 'public forums / feedback'. Government can also collect data corpus from Social networks. Print/Digital Media contains data in the form of 'Public dialogue and stakeholders opinions. Each of these three corpuses contains huge amount of unstructured/semi structured Data. Knowledge/ insights extracted from these databases can be used in forming new regulation/policies, understanding citizens' opinions and answering their concerns. The main users of the system are Public Administrative officers (PA Officers), Moderators and Decision makers. It helps in the formulation of new policies, budget analysis, understanding the stakeholders' opinion on national level projects and regulations with the help of text mining tools. Government agencies can better understand social behaviour and demands, through analyzing citizens' behaviour patterns, information extracted from this can be used to provide citizen centric solution and maintain a closer relationship between government and citizens and enhance the citizens' satisfaction on govt services.

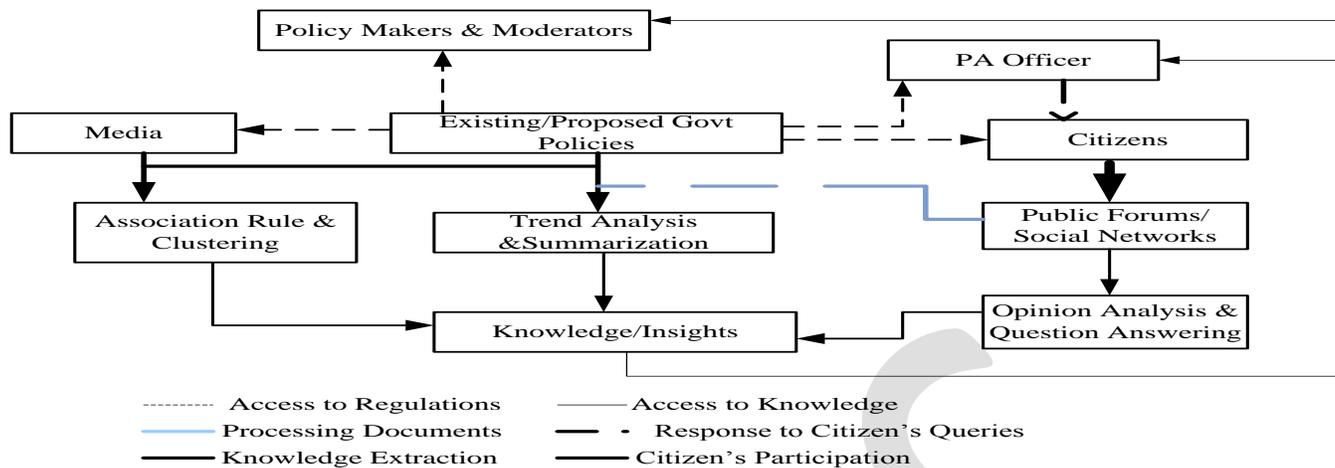


Figure. 1: Citizens' and Stakeholders' participation system

E-GOVERNANCE IN INDIA

India is a land of diversity. This diversity spans across culture, language, geography and the economic condition of the people. There are significant numbers of people who are below the minimal socio-economic benchmarks. This section of the Indian society is not only deprived of basic necessities but also lack skills and elementary education. Their social development is far worse i.e. health, education, sanitation and availability of drinking water. The quality of life of these people is far below satisfactory levels thereby making the task of improving their standard of living and sustain the same is daunting. Government of India recognizes that e-governance, in the context of developing countries, provides an excellent opportunity for improving the quality of life of these sections of society and moreover it could actually provide them more equitable access to economic opportunities. India's experience in e-governance initiatives has demonstrated significant success in improving accessibility, cutting down costs, reducing corruption and increased access to un-served groups [13]. The study points out that the development of infrastructure is very important in countries such as India, which have a high proportion of global population and could benefit from E-Government if literacy can be improved. E-governance is reforming the way government manages and shares information with external and internal clients. Specifically, it harnesses information and communications technologies (such as Wide Area Networks, the Internet, and mobile computing) to transform relations with citizens, businesses and amongst various arms of government. Chakravarthy [14] has discussed the need of Citizen Centric e-Governance in India and discussed about the need to create a culture of maintaining, processing and retrieving the information through an electronic system and use that information for decision making. The Government of India, in various forums, has indicated its commitment to provide efficient and transparent government to all strata of society. E-Governance is now mainly seen as a key element of the country's governance and administrative reform agenda. The Government of India aspires to provide governance that is easily understood by and accountable to the citizens, open to democratic involvement and scrutiny (an open and transparent government) and Citizen-centric governance that will cover all of its services and respect everyone as individuals by providing personalized services.

ROAD MAP FOR DATA MINING

E-Government can advance the agenda on Governance and fiscal reform, transparency, anticorruption, empowerment and poverty reduction .E-Governance in India has steadily evolved from computerization of Government Departments to initiatives that encapsulate the finer points of Governance, such as citizen centricity, service orientation and transparency. Paramjeet Walia [13] has discussed about the initiative applications of Information and Communication Technologies (ICTs) in support of e-government initiatives in India, National portal of India is initiated as a Mission Mode Project under the National e-governance Plan (NeGP) [15] and other planning initiatives undertaken by the Government of India (GOI) have discussed about the importance of feedback pertaining to utility of the projects, which are part of NeGP and need of a systems to assess the usefulness and impact of e-governance initiatives in India. The plan envisages creation of right environments to implement Government to Government (G2G), Government to Business (G2B), Government to Employee (G2E), and Government to Citizen. Among national portals in the Southern Asia region, India has the highest ranking portal with the highest online services score. It has the most e-services and tools for citizen engagement in the region but not included one among the top 20 countries in e-participation (United Nations E-Government Survey 2010) [16], there is not much literature available on this. Indian government should take the initiative to encourage citizens to send their feedback, complaints, and suggestions through e-portal and discuss various issues on government services in virtual discussion forums. Gupta,

has discussed about the problems with existing systems and implemented an Indian Police Information System and that can be used to extract useful information from the vast crime database maintained by National Crime Record Bureau (NCRB) and find crime hot spots using crime data mining techniques such as clustering etc. Gupta [17] has noted many E-Government projects which are running in India (Rural and urban level projects, National level, state level, district level projects and so on) all these projects are taking about G2C and few of them are G2G and we can find very few efforts towards C2G (e-democracy). Yadav [18] has discussed about the need of making policy based on computerization to overcome environmental changes and need of series of efforts to achieve this. Need of establishing complete connectivity between various ministries and departments so that transfer of files and papers could be done through Internet thereby choosing efficacious speed as an alternative to manual labour. Authors in [19] and [20] have discussed the major challenges and bottlenecks for successful E-Governance Implementation in India. It has been shown that lack of local language interface is a major detrimental effect for wider proliferation of E-Governance applications in India. For successful deployment of E-Governance applications in multilingual domain, various standardization aspects related to input mechanisms, storage and retrieval, and output and display mechanism need to be addressed in a national perspective. It is also necessary that open-standards to be in place and adopted for seamless access and interchange information and Moreover, various research aspects for futuristic tools such as Cross-Lingual Information Retrieval between Indian Languages and W3C compliant Indian Language Web-Browsers need to be initiated in an urgent basis.

- Multilingual Text Mining (MLTM):- Various authors [19][20] has discussed about the need for highly multilingual text mining applications (10, 20 or more languages), but the available systems cover only few number of languages and also noted that machine learning solutions are particularly promising to achieve high multilingualism. Multilingual text processing is useful because the information content found in different languages is complementary, both regarding facts and opinions. Authors in [21] have proposed a text mining method to extract associations between multilingual texts and use them in multilingual information retrieval. Documents written in different languages were first clustered and organized into hierarchies using the growing hierarchical self-organizing map model. They have also noted that in the domain of multilingual text mining, little attention has to be paid for building multilingual document hierarchies and deriving associations from such hierarchies. Rowena Chau et al [22] have discussed about the multilingual text mining approach to cross-lingual text retrieval (CLTR), and their multilingual text mining approach for automatically discovering the multilingual linguistic knowledge contributes to cross-lingual text retrieval by providing a more affordable alternative to the costly manually constructed linguistic resources. By exploiting a parallel corpus covering multiple languages, the automatic construction of language-independent concept space capturing all conceptual relationships among multilingual terms is accomplished.
- Multilingual and Cross Lingual Projects in India:-India is a multi-lingual with 22 official languages and multi-script country. The Indian languages belong to four language families namely Indo-European, Dravidian, Austro- Asiatic (Austic) and Sino-Tibetan. Majority of India's population are using Indo-European and Dravidian languages. The former are spoken mainly in northern and central regions and the latter in southern India. Some ethnic groups in Assam and other parts of eastern India speak Austic languages. People in the northern Himalayan region and near the Burmese border speak Sino-Tibetan languages. As the amount of textual data on the Internet increases, there are also an increasing number of people who want to retrieve information in their native language. Many citizens also have multilingual capabilities that allow them to understand more than one language. This is one of the main reasons behind developing cross-language information retrieval systems. It is therefore essential that tools for information processing in local languages are developed in India. Development of technologies in multilingual computing areas involves intensive indigenous R&D efforts due to variety of Indian languages. The focused areas of the Technology Development for Indian Languages Programme in India may be divided into following domains [23]:
 - Translation Systems
 - Cross Lingual Information Access and Retrieval
 - Linguistic Resources
 - Human Machine Interface systems
 - Language processing and Web tools
 - Localization and content creation

The Data Mining techniques are extensively used by private organizations and research communities to uncover hidden trends and knowledge from historical data. The survey suggest that data warehouse and data mining concepts are adopted in many government sectors like healthcare, agriculture, education, social security fund, pollution control, electronic voting, rainfall prediction, customer complain, road traffic violation, crime control, crime forecasting, tax department et. The Table 1 provides summary of the literature review

Table 1. Summary of literature review on data mining implementation on e-governance data

Authors	Research Area	Country	Practical Implementation?	Remarks
Matjaž Gams et al. [24]	demography, fertility	Multinational	YES	Analysis performed using Decision Trees
Neera Singh et al. [25]	Healthcare	India	Yes	Knowledge discovered using Association rules, Clustering, Decision Trees
Kishori Lal Bansal et al. [26]	E-governance	India	No	Conceptual discussion about use of data warehouse and data mining in e-governance
G. Koteswara Rao et al. [27]	DSS	India	No	Conceptual discussion about Text Mining
Bidgoli [28]	Customer complain System	Iran	Yes	Knowledge discovery using Association Rules
Sushil Kumar et al. [29]	E-voting	India	No	Conceptual discussion
Adeyemo [30]	Air Pollution	Nigeria	Yes	Knowledge discovery using Clustering and decision trees
Hana. [31]	Road Traffic	China	Yes	Knowledge discovery using Association Rules
Malathi. A et al. [32]	Crime Detection	India	Yes	Enhance Data Mining algorithm for Crime Detection
R Sujatha et al. [33]	Crime Detection	India	Yes	Crime Detection using Classification
Anjum Mujawar [34]	Tax	India	Yes	Better decision making in Tax department using Fuzzy Data Mining
Hanmant N. Renushe et al. [35]	Crime Forcasting	India	Yes	Crime forecasting and prevention using data mining

CONCLUSION

In this paper we have discussed need of text mining based DSS for government agencies, various text mining applications developed in e-government, architecture for system development process and proposed an integrated framework that can be used by government

organizations' to develop text mining based DSS. We have also studied e-government objectives and the need for citizen centric systems for India and provided a road map for an Indian TMBDSS project. India can start with bilingual text mining project at national level and extend the same as multi lingual text mining initiative and then replicate the system to states at a later stage

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Significance of Selection of Material Handling System Design in Industry – A Review

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Abstract— In this paper an attempt is made to review the considerations for material flow design problems (i.e. material handling equipment selection, flow path design, facility layout design, routing, etc.) for related product design in the Industry. A concise study on developing material Handling technology has been explained in the literature.

Keywords— transit, facility design, automaton, manufacturing, material Handling equipment selection, analysis, simulation model.

INTRODUCTION

A material-handling system can be defined as movement, handling, storage and controlling of materials throughout the manufacturing process. The main purpose of using a material handling system is to ensure that the material in the right amount is carefully delivered to the desired destination at the right time at minimum cost. Material handling as such is not a production process and hence does not add to the value of the product but it costs 30-75% of the total product cost. An efficiently designed material handling system ensures the reduction in operation cost, manufacturing cycle time, MH cost, delay and damage. It promotes productivity, flexibility, better utilization of manpower, increases material flow and automation in handling. This paper discusses the research carried out on material handling system design, MH equipment Selection, Analysis and simulation from last decades to get the best solution for implementing the design of MH system in the existing facilities. The constraints and challenges in designing material handling system, solutions are identified and discussed.

1.1 Significance of Material handling system in Industry

Material handling is an essential and significant component of any productive activity. It is something that goes on in every plant all the time. It is simply picking up, moving, and lying down of materials through manufacture. It applies to the movement of raw materials, parts in process, finished goods, packing materials, and disposal of scraps. In general, hundreds and thousands tons of materials are handled daily requiring the use of large amount of manpower while the movement of materials takes place from one processing area to another or from one department to another department of the plant. The cost of material handling contributes significantly to the total cost of manufacturing.

In the recent period of competition, this has acquired greater magnitude due to growing need for reducing the manufacturing cost. The significance of material handling function is greater in those industries where the ratio of handling cost to the processing cost is large. Today material handling is rightly considered as one of the most potentially lucrative areas for reduction of costs.

1.2 Factors and considerations for Design of MHS

It is usually difficult to identify and quantify the benefits associated with MH; it is much easier to identify and quantify the costs of MH (e.g., the cost of MH equipment, the cost of indirect MH labor, etc.). MHS cost as the sole criterion to select a MHS design depends on the degree to which the other aspects of the production process are able to be changed. If a completely new facility and production process is being designed, then the total cost of production is the most appropriate criterion to use in selecting a MHS—the lowest cost MHS may not result in the lowest total cost of production. In actual practice, it is difficult to consider all of the components of total production cost simultaneously. If it is too costly to even consider changing the basic layout of a facility and the production process, then MHS cost is the only criterion that need be considered.

The movement of material from the place where it is to the place where it is needed can be time consuming, expensive, and troublesome. The material can be damaged or lost in transit. It is important, therefore, that it be done smoothly, directly, with the proper equipment and so that it is under control at all times. The several factors that must be known when a material handling system is designed include:

1. Form of material at point of origin, e.g., liquid, granular, sheets, etc.
2. Flow demands, e.g., amount needed, continuous or intermittent, timing, etc.
3. Handling equipment available, e.g., devices, prices, reliability, maintenance needs, etc.

1.3 Other factors to be considered include:

1. Labor skills available
2. Degree of mechanization desired
3. Capital available
4. Return on investment
5. Expected life of installation

Since material handling adds expense so it should be reduced as much as possible with respect to time, distance, frequency, and overall cost. A straight steady flow of material is usually most efficient. The use of mechanical equipment rather than humans is usually, but not always, desirable—depending upon the duration of the job, frequency of trips, load factors, and characteristics of the material. When equipment is used, maximizing its utilization, using the correct equipment, proper maintenance, and safety are important considerations. The proper material handling equipment can be selected by analyzing the material, the route it must take from point of origin to destination, and knowing what equipment is available.

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2. Literature Review

J. S. Noble and C. M. Klein, A. Mid ha [1] have examined several aspects of the integrated material flow system design problem. ; However, as problem complexity has increased the ability to obtain solutions to the more integrated problem formulations has become more difficult. They present a model which integrates material handling equipment selection and specification (including interface equipment between different types of equipment), and path/load dependent unit load size and variable unit load size. The formulation is solved using the meta-heuristic procedure of tabu search to find a "good" solution to a more integrated formulation

Ramazan YAMAN [2] develop a knowledge-based system for material handling equipment selection and pre-design of these equipments in the facility layout is discussed. The study comprises two sections. In first section author explained the selection of material handling equipment for related product requirements and in second section decision making for equipment between departments. However, it is defined more comprehensively as using the right method to provide the right amount of material, at the right place, at the right time, in the right sequence, in the right position, in the right condition, and at the right cost (White and Apple, 1985). Author compared the selection of equipment and design of MHS by means of traditional selection and using analytical method with knowledge based approaches. In traditional selection, the designer relies principally on handbooks and experience and also may not be cost-effective because of the limitation of personnel experience. Only consulting agencies and large companies are likely to have a specialized planner with full-time facility planning responsibilities. In medium and small size companies, facility layout forms a part of the responsibilities of an industrial or plant engineer's activities. He also explained the Analytical models have not often been applied in industry, because they generally consider only quantifiable factors such as cost and utilization and are often difficult to implement (Matson et al., 1992). Thus he prefers a knowledge-based approach which involves the use of expert guidelines and 'rules of thumb' and allows extensive matching of equipment characteristics to application requirements. Practically, this expertise needs to be established over a period of time, based on operational experience.

A Suratkar, V. Shukla [5] represents a design optimization method for the over head crane using computer modeling procedure. The researches that use for the majority of the test cases different strain measurement stern out to be quite hard and expensive for the real experimental studies to take into consideration the influence of the connections between the main beams and the rest parts of the construction, the influence of the longitudinal and transverse ribbings as well as the influence of the supports on the overall stressed state of the construction. All these problems could be solved successfully by the use of computer modeling procedures. They present a 3D model that could satisfy all the requirements for examining the general stressed state of the carrying metal construction while 2D computer studies give idea of the planar behavior of the construction and lack the opportunity of showing the influence of supports. For research they created of 3-D models crane design and analyzed its behavior. They have also done calculations of Conventional design proposed by Indian Standard Rules were performed. They applied the load, assign material and define boundary conditions to and Finite Element meshes to the solid model. A four-node tetrahedral element was used for finite element analysis, using the girder solid model generated by means of Inventor software 2012. After a comparison of the finite element analyses, and the conventional calculations, the analysis was found to give the most realistic results.

J. D. Tew, S. Manivannan, D. A. Sadowski, and A. F. Seila [4] were illustrate the simulation methodologies used in the design of Automated Material Handling Systems (AMHS) at Intel wafer fabs for semiconductor manufacturing. The models used in AMHS design has categorized as AMHS models and production models. The AMHS models support the design of Interbay and Intrabay systems. The Inter bay systems handle the material flow between different bays (production centers). The Intrabay systems handle the material flow within the bays. The production models compliment the AMHS models. In modeling framework, they approaches AMHS and the production process models use a consistent set of assumptions. This de-coupling approach typifies the general philosophy to using simulation in design. Authors review the general model structures and simulation examples under these categories used in actual system implementations. In this paper the main purpose of using simulation is to ensure that the material handling system design meets material storage and transport requirements.

Prasad Karande and Shankar Chakraborty[5] have carried out the selection method for suitable MH equipment . They had proceed with multicriteria decision-making (MCDM) problem. As wide range of MH equipment is available today, for this complicated task they applied a multicriteria decision-making (MCDM) tool to select the most suitable MH equipment. They implement weighted utility additive (WUTA) method to solve an MH equipment selection problem. They have also observed a comparison of ranking obtained with the past researchers and found its potentiality, applicability, and accuracy to solve complex decision-making problems. They have explained that the WUTA method has a strong mathematical base and proficient of deriving more precise ranking of the considered alternatives. They have also concluded that it can also be useful for any decision-making problem with any number of selection criteria and feasible alternatives.

3. Conclusion:

From the above study it is observed that the material handling is important activity in manufacturing industry. The selection of the most appropriate MH equipment for any particular application can be influence the profit of any manufacturing company. The literature review has shown that researchers have consider the design problems in material flow system and overcome with adequate knowledge base approach, properly design, 3d modeling ,analyzing and using simulation model to validate the system performance for acquiring the MH equipment selection. Thus it concludes that MH system plays a major role in productivity. Distribution, manufacturing, and warehousing and helps to give the best optimization to increase the productivity, reduced cost and idle time, proper utilization of labour, product quality and safety.

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Modeling and implementation of vector control for Induction motor Drive

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ABSTRACT: This paper explains the performance of the induction motor drive by using vector control to overcome the coupling effect and inferior dynamic response of scalar control. The basic idea of the vector control is to decompose a stator current into a magnetic field-generating component (i_{ds}) and a torque generating component (i_{qs}) and both components can be separately controlled to make the performance of the AC machine similar to that of DC machine. This paper also gives the mathematical modeling explained with d-q reference frame. The control used in this paper controls the speed in four quadrants without any additional control elements. The effectiveness of the proposed control method is verified by using MATLAB/SIMULINK Software and results are presented to validate the effectiveness of topology.

KEY WORDS:

Mathematical model , induction motor(IM) drives, PWM inverter ,direct vector control, scalar control, MATLAB.

1. INTRODUCTION

Induction motor (IM) can be considered as the workhorse of the industry because of its special features such as low cost, high reliability, low inertia, simplicity and ruggedness. Even today IMs especially the squirrel cage type, are widely used for single speed applications rather than variable speed applications due to the complexity of controlling algorithm of IM variable speed drives. However, there is a great interest on variable speed operation of IM within the research community mainly because IMs can be considered as a major industrial load of a power system. It is well known fact that electric energy consumption of the appliances can be reduced by controlling the speed of the motor[1-2].

The methods which enjoyed wide acceptability in controlling in the speed and torque of the induction motor drive are termed as voltage control, frequency control, rotor resistance control, V/f control, flux control, slip control, slip power recovery control, etc. All these controls are termed as scalar control techniques of an IM in exhibits coupling effect and inferior dynamic response[3-7].

This paper explains the vector control to overcome the coupling effect and inferior dynamic response of scalar control techniques. Aim of vector control is decompose a stator current into magnetic field-generating component (i_{ds}) and a torque generating component (i_{qs}) and both components can be separately controlled to make the performance of IM similar to that of DC machine. This paper also explains the speed control of IM drive in four quadrants without using of any additional elements[8-16].

Vector control usually realized with PWM controller[17-20] in rotating(d-q) reference. In vector control stator current is controlled instantaneously which reduces the torque ripples and improves overall performance of machine[8-9]. In this paper vector control of IM is implemented and verified in MATLAB SIMULINK environment. It appears that eventually, vector control will oust scalar control, and will be accepted as the industry standard control for ac drives.

The paper is organized as follows: section 2 presents the modeling of IM. Section 3 develops the implementation of vector control. Section 4 provides the simulation results and analysis of vector control IM drive. Section 5 concludes the paper.

2. MATHEMATICAL MODELING

Mathematical modeling is required for simulation and analysis of drive system. IM equations are presented in d-q reference frame[8].

2.1 Axes Transformation

Consider a symmetrical three-phase induction machine with stationary as-bs-cs axis at $2\pi/3$ angle apart. Our goal is transform the three-phase stationary reference frame (as-bs-cs) variables into two-phase stationary reference frame ($d^s - q^s$) variables[8-9]. Assume that $d^s - q^s$ are oriented at θ angle as shown in Fig. 1.

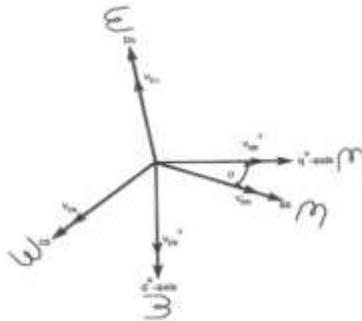


Fig. 1. 3- Φ to 2- Φ Transformation

The voltages v_{ds}^s and v_{qs}^s can be resolved into as-bs-cs components and can be represented in the matrix form as:

$$\begin{bmatrix} v_{as} \\ v_{bs} \\ v_{cs} \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta & 1 \\ \cos(\theta - 120^\circ) & \sin(\theta - 120^\circ) & 1 \\ \cos(\theta + 120^\circ) & \sin(\theta + 120^\circ) & 1 \end{bmatrix} \begin{bmatrix} v_{qs}^s \\ v_{ds}^s \\ v_{0s}^s \end{bmatrix} \quad (1)$$

The corresponding inverse relation is:

$$\begin{bmatrix} v_{qs}^s \\ v_{ds}^s \\ v_{0s}^s \end{bmatrix} = \frac{2}{3} \begin{bmatrix} \cos\theta & \cos(\theta - 120^\circ) & \cos(\theta + 120^\circ) \\ \sin\theta & \sin(\theta - 120^\circ) & \sin(\theta + 120^\circ) \\ 0.5 & 0.5 & 0.5 \end{bmatrix} \begin{bmatrix} v_{as} \\ v_{bs} \\ v_{cs} \end{bmatrix} \quad (2)$$

Here v_{0s}^s is zero- sequence component, convenient to set $\theta = 0$, so that q^s - axis is aligned with as- axis. Therefore ignoring zero – sequence component[9], it can be simplified as

$$v_{qs}^s = \frac{2}{3}v_{as} - \frac{1}{3}v_{bs} - \frac{1}{3}v_{cs} \quad (3)$$

$$v_{da}^s = \frac{-1}{\sqrt{3}}v_{bs} + \frac{1}{\sqrt{3}}v_{cs} \quad (4)$$

Equation (3) and (4) consecutively called as clark transformation.

Fig .2 shows the synchronously rotating $d^e - q^e$ axes, which rotate at synchronous speed w_e with respect to the $d^s - q^s$ axes and the angle $\theta = w_e t$. The two-phase $d^s - q^s$ windings are transformed into the hypothetical windings mounted on the $d^e - q^e$ axes. The voltages on the $d^s - q^s$ axes can be transformed into the $d^e - q^e$ frame as follows:

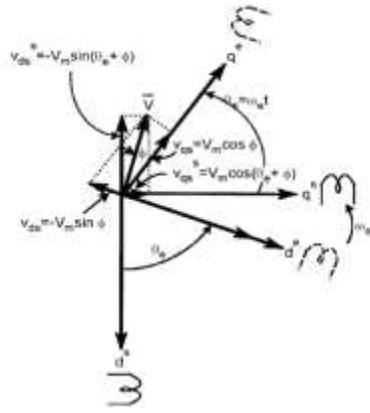


Fig .2. stationary frame $d^s - q^s$ to synchronously rotating frame $d^e - q^e$ transformation

$$v_{qs}^e = v_{qs}^s \cos \theta_e - v_{ds}^s \sin \theta_e \quad (5)$$

$$v_{ds}^e = v_{qs}^s \sin \theta_e + v_{ds}^s \cos \theta_e \quad (6)$$

Equation (5) and (6) consecutively called as park transformation.

Again, resolving the rotating frame parameters into a stationary frame, the relation are

$$v_{qs}^s = v_{qs}^e \cos \theta_e + v_{ds}^e \sin \theta_e \quad (7)$$

$$v_{ds}^s = -v_{qs}^e \sin \theta_e + v_{ds}^e \cos \theta_e \quad (8)$$

Equation (7) and (8) are known as inverse park transformation.

2.2 Induction motor Dynamic model

The following assumptions are made to derive the dynamic model

1. Uniform air gap.
2. Balanced rotor and stator windings, with sinusoidally distributed mmf.
3. Inductance vs. rotor position is sinusoidal.
4. Saturation and parameter changes are neglected.

Fig. 3 shows the d-q equivalent circuits for a three phase symmetrical squirrel cage motor in synchronously rotating frame with zero sequence component neglected[8-9]. From the dynamic equivalent circuit, the induction motor parameters can be expressed in matrix equation (9), assuming that the rotor bars in squirrel cage induction motor are shorted out and the rotor voltages equal zero[8-9].

$$\begin{bmatrix} v_{qs}^e \\ v_{ds}^e \\ v_{qr}^e \\ v_{dr}^e \end{bmatrix} = \begin{bmatrix} R_s + PL_s & w_e L_s & L_m P & w_e L_m \\ -w_e L_s & R_s + L_s P & -w_e L_s & L_m P \\ L_m P & (w_e - w_r) L_m & R_r + PL_r & (w_e - w_r) \\ -(w_e - w_r) L_m & PL_m & -(w_e - w_r) L_r & R_r + PL_r \end{bmatrix} \begin{bmatrix} i_{qs} \\ i_{ds} \\ i_{qr} \\ i_{dr} \end{bmatrix} \quad (9)$$

Where R_s , R_r are the stator and rotor resistance per phase respectively, L_s , L_r are the stator, and the rotor inductance per phase, respectively, $p = \frac{d}{dt}$ operator, ω_e , ω_r are synchronous and rotor speeds respectively.

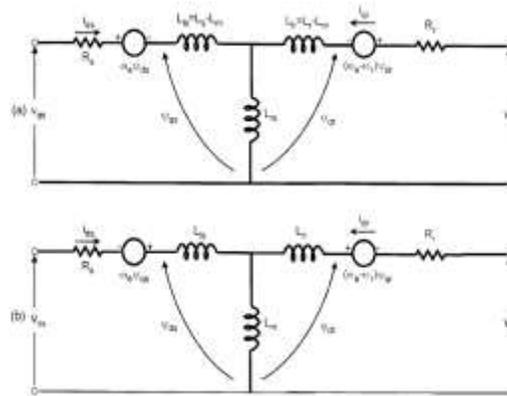


Fig. 3. Dynamic d^e - q^e equivalent circuits of machine (a) q^e -axis circuit, (b) d^e -axis circuit

3. VECTOR CONTROL

3.1 principal of Vector control

The fundamentals of vector control implementation can be explained with the help of Fig.4. Where the machine model is represented in synchronously rotating reference frame. The inverter has unity gain, that is, it generates the currents i_a , i_b , and i_c as dictated by corresponding command currents i_a^* , i_b^* , i_c^* from the controller. The machine terminal phase currents i_a , i_b and i_c are converted to i_{ds}^s and i_{qs}^s components by a 3-phase to 2-phase transformation. These are then converted to synchronously rotating frame by the unit vector control components $\cos\theta_e$ and $\sin\theta_e$ before applying them to the $d^e - q^e$ machine model as shown. The controller makes two stages of inverse transformation, as shown, so that the control currents i_{ds}^* and i_{qs}^* correspond to the machine currents i_{ds} and i_{qs} , respectively. In addition the unit vector assures correct alignment of i_{ds} currents with flux vector $\hat{\Psi}_r$ and i_{qs} perpendicular to it as shown in Fig. 4[9].

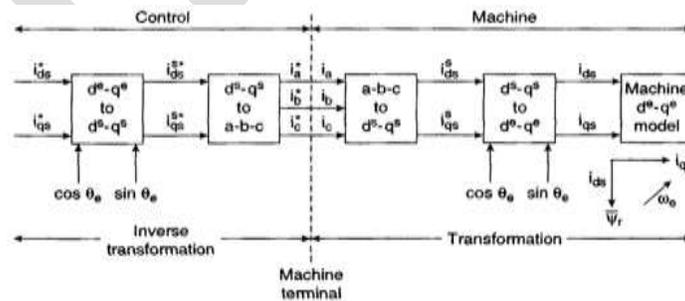


Fig4. vector control implementation principal with machine $d^e - q^e$ model.

3.2 Direct or Feedback Vector control

The basic block diagram of the direct vector control method for a PWM voltage-fed inverter is shown in Fig. 5. We developed a strategy for rotor flux oriented direct vector control by manipulating equations derived from d^e - q^e equivalent circuit.

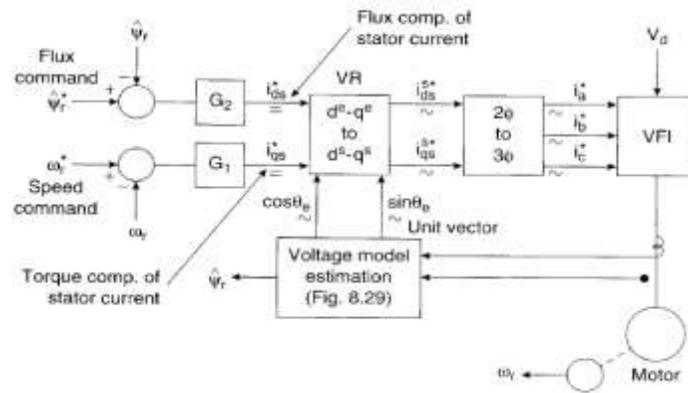


Fig. 5. Direct vector control block diagram.

The key estimation equation can be summarized as follows:

$$\Psi_{dr}^s = \hat{\Psi}_r \cos \theta_e \quad (10)$$

$$\Psi_{qr}^s = \hat{\Psi}_r \sin \theta_e \quad (11)$$

$$\cos \theta_e = \frac{\Psi_{dr}^s}{\hat{\Psi}_r} \quad (12)$$

$$\sin \theta_e = \frac{\Psi_{qr}^s}{\hat{\Psi}_r} \quad (13)$$

$$\hat{\Psi}_r = \sqrt{\Psi_{dr}^s{}^2 + \Psi_{qr}^s{}^2} \quad (14)$$

Where vector $\bar{\Psi}_r$ is represented by magnitude $\hat{\Psi}_r$. Signals $\cos \theta_e$ and $\sin \theta_e$ have been plotted in correct phase position in Fig.6(b). These unit vector signals, when used for vector rotation in Fig. 5, give a ride of current i_{ds} on the d^e -axis (direction of $\bar{\Psi}_r$) and i_{qs} on the q^e -axis as shown. At this condition, $\Psi_{qr} = 0$ and $\Psi_{dr} = \bar{\Psi}_r$, as indicated in the figure. When the i_{qs} polarity is reversed by the speed loop, the i_{qs} position in Fig. 6(a) also reverse, giving negative torque. The generation of a unit vector signals from feedback flux vectors gives the name “direct vector control” [8-16]

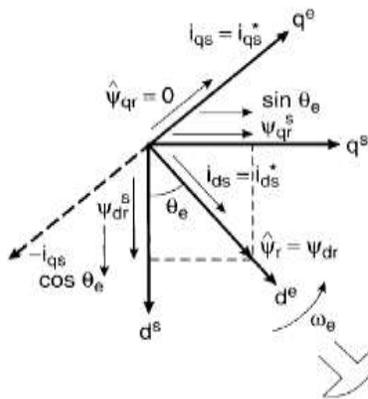


Fig 6(a)

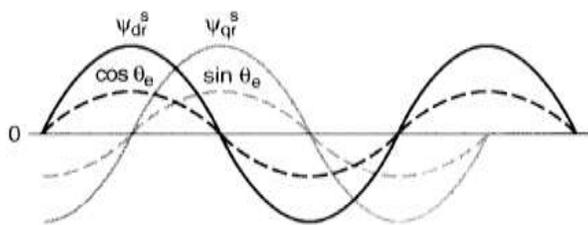


Fig 6(b)

Fig. 6: (a) $d^s - q^s$ and $d^e - q^e$ phasors showing correct rotor flux orientation, (b) plot of unit vector signals in correct phase position .

4. SIMULATION RESULTS AND ANALYSIS

Simulation is performed in MATLAB-SIMULINK to investigate the performance of vector controlled induction motor drive. In this section electromagnetic torque, speed, and stator currents of proposed motor drive has been studied and compared with scalar control.

Fig.7 shows the electromagnetic torque response of both vector controlled and scalar controlled IM drive. We can say that the torque response of the vector controlled IM drive has less transient ripples or less overshoot and it is smoothly following the load torque and it reaches the desired torque. The torque response of scalar controlled IM drive has spikes or transient ripples when the motor is in starting and suddenly loaded condition.

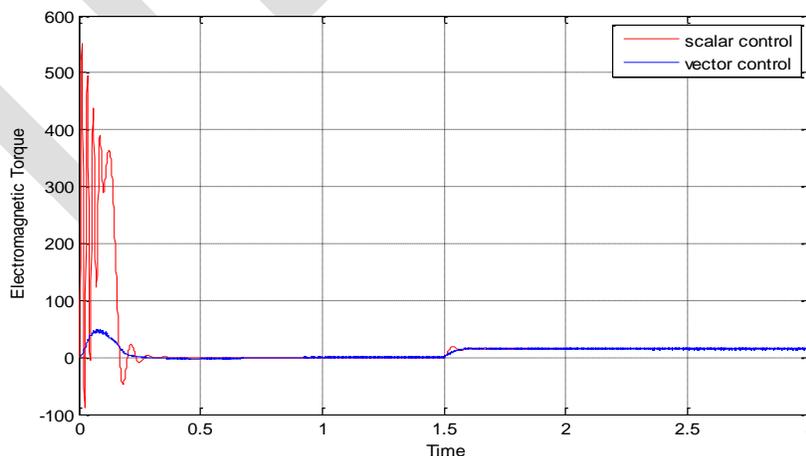


Fig.7. Torque response of both vector and scalar controlled IM drive.

The bad effect of that spiky transient torque is that the motor is forced to draw a higher current especially, when we have load torque which has to be applied for certain time and then switched off and so on and if the motor is over load even for short time the drive will effect dangerously.

Fig.8. shows the no-load speed response of both vector controlled and scalar controlled IM drive. We noticed that while using the vector control the overshoots obtained in speed response are very less as compared to the case when the scalar control is used. We can also noticed that the vector controlled IM drive reaches the desired speed in 0.5 seconds whereas scalar controlled IM drive takes 1 second to reach the desired speed.

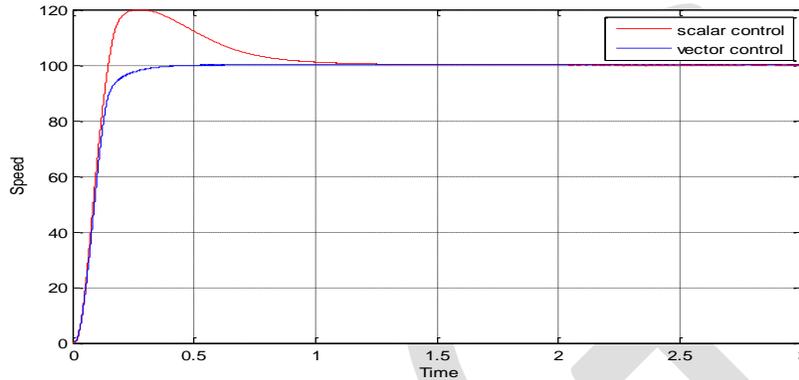


Fig.8. Speed response of both vector and scalar controlled IM drive on no-load.

Fig .9 shows the response of the IM drive at loaded condition. The IM drive speed set as 100 rad/sec and the load of 15 Nm is applied at 1.5 seconds. The scalar control drive response shows decrease in speed of the induction motor during loaded condition. The vector controlled drive has a very low speed drop in speed response compared to the scalar controlled drive. And also we noticed that the vector controlled drive gives slight decrease in steady state speed response.

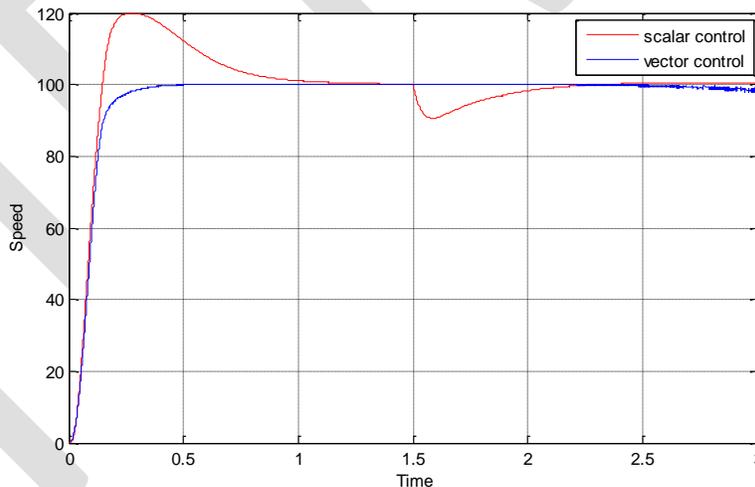


Fig.9. Speed response of both vector and scalar controlled IM drive on load.

Fig .10 shows the speed reponse of vector controlled IM drive which is accurately trace the reference speed command value irrespective of load, machine parameter and any external environment change. Fig.11 shows the speed response of scalar controlled IM drive which is not accurately trace the reference speed command value.

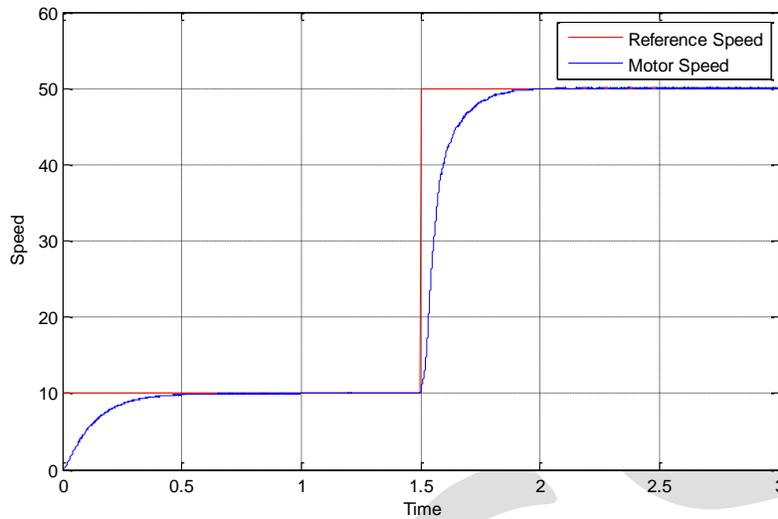


Fig.10. Speed response of vector controlled IM drive.

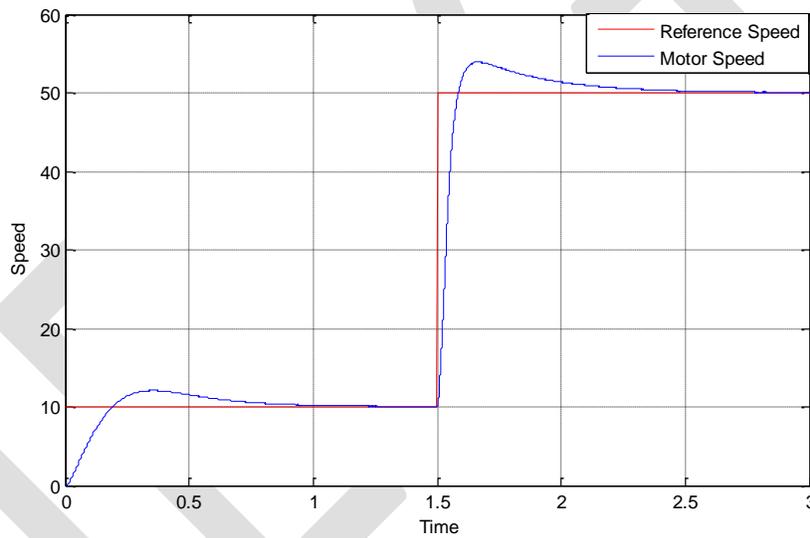


Fig.11. Speed response of scalar controlled IM drive.

Fig .12 shows the stator currents of both vector controlled and scalar controlled IM drive. We can notice that scalar controlled drive maintain high stator current, due to the effect of spiky torque at starting position of the drive. This higher magnitude of current will give dangerous effect to drive. This bad effect is overcome by vector control.

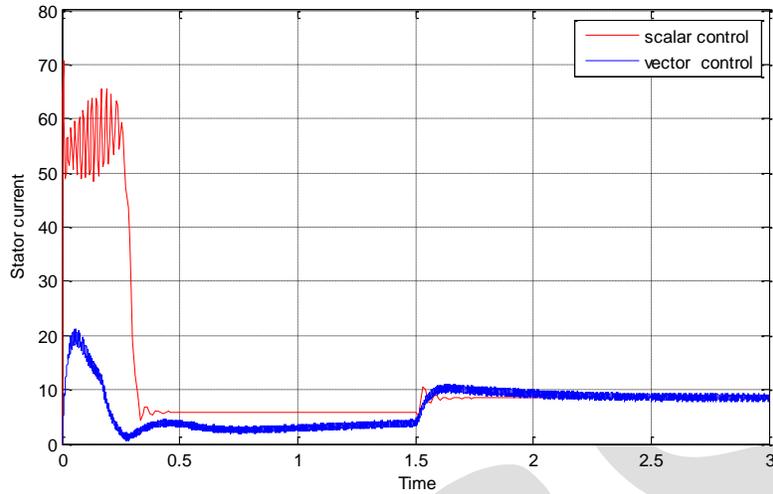


Fig.12. Stator current response of both vector and scalar controlled IM drive.

Fig .13 Three phase currents of vector controlled IM drive fed three phase space vector pulse width modulated inverter at step change in 0-15Nm.

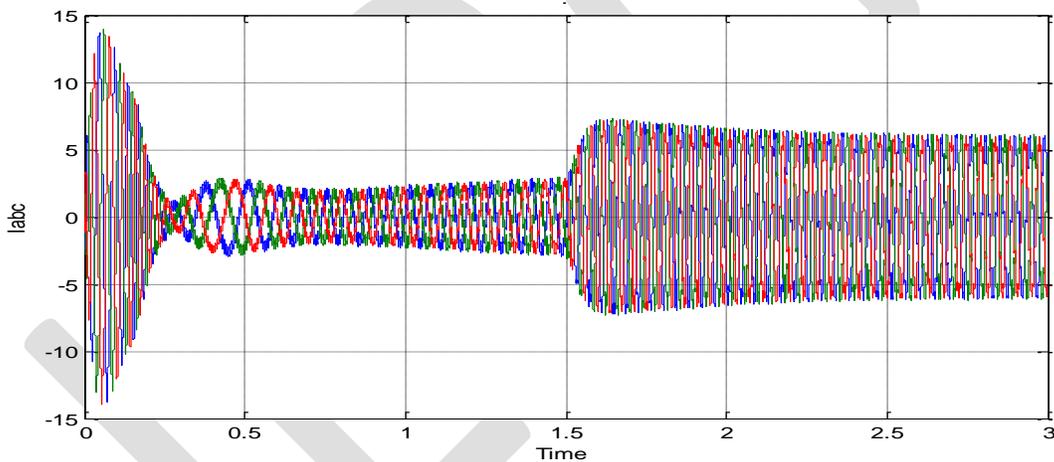


Fig .13 Three-phase currents of vector controlled IM drive at step change in 0-15Nm.

Fig.14(a) shows the simulation results for the vector controlled IM drive speed 100 rad/sec and 0 rad/sec under constant load torque 15 N.m like dc machine, speed control is possible in four quadrants without any additional control element. In motor braking condition, the torque T_e is negative, the drive initially goes into regenerative braking mode as shown in Fig.14(b) .

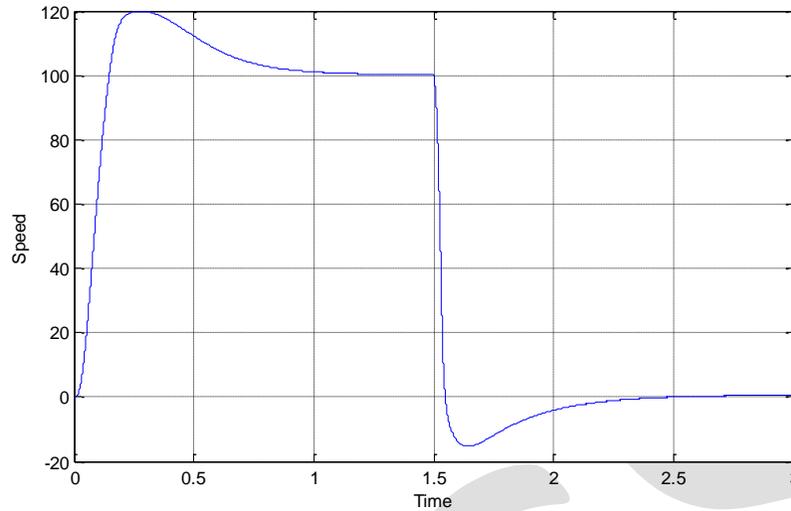


Fig.14(a) Speed response of vector controlled IM drive.

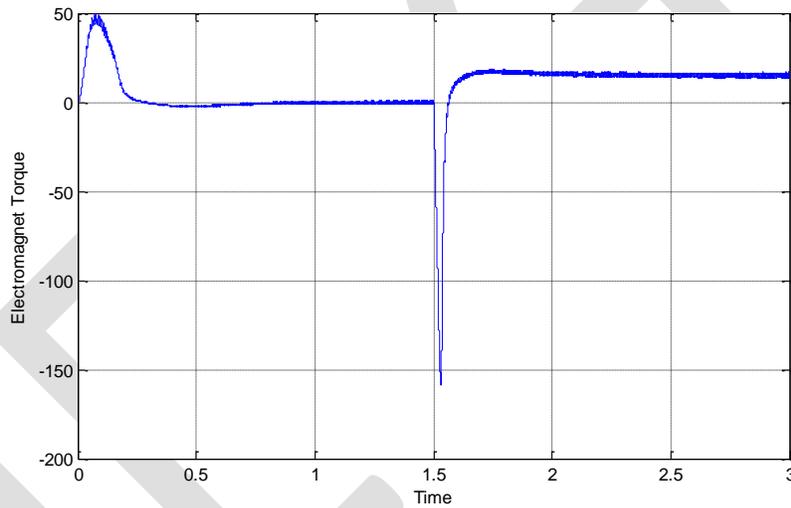


Fig.14(b) Torque response of vector controlled IM drive when speed is zero.

As mentioned before and based on the simulation results the vector controlled IM drive having good dynamic response. Speed and torque of a vector controlled IM drive are controlled separately like the dc machine which is not possible with scalar control.

5. CONCLUSION

This paper demonstrates a direct vector control in an induction motor drive system. The proposed control method assures:

- Torque generating component and magnetic field – generating component have been controlled independently and gives good dynamic response
- The transient response will be fast and dc machine like because torque control by i_{qs} does not affect the flux.
- Like a dc machine, speed control is possible in four quadrants without any additional control elements.

- Good stabilization of load torque for wide range speed control.

The effectiveness of the proposed control method is verified by simulation in MATLAB SIMULINK environment.

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IJERGS

Game Based Intelligent Tutoring System

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Abstract- A lot of research and development is happening in the past few years on the use of computers as teaching tools. Importance of change in teaching and evaluation methods is required these days because of significant growth of Internet. Because of the Internet many students spend their most of the time on playing online games, we decided to develop these games which can be used to motivate and increase involvement of students in learning activities. Game-based learning is teaching-learning strategy composed of software applications or products that use games for learning or educational purposes. Because it is an Intelligent Tutoring System, it contains an Artificial Intelligence component which makes inferences about the learners' strength and weakness based on his performance and knowledge level.

Keywords: Problem with current e-learning technique, Intelligent tutoring system, ITS modules, Personalized Tutoring, Meeting students and instructor goals, strategies of ITS, Game based learning, Characteristics of Games

1. Introduction

Educational Technology (ET) is the efficient organisation of any learning system adapting or adopting methods, processes, and products to serve identified educational goals. Modern ET has its potential in schools, in the teaching of subjects, in examinations, in research, in systemic reforms, and, above all, in teacher education, overcoming the conventional problems of scale and reach through online, anytime, anywhere.

Alternative models of education such as distance and open-learning, on-demand education and other such flexible models of learning. Flexible systems, futuristic curricula, and a twenty-first-century career orientation have become a necessity for today's young people. There is an urgent need to convince the educational system, which should play an important role in engineering the teaching-learning situation and to make it a more meaningful experience for both teachers and their pupils.

Computers have become an integral part and personality of the present generation and they like to embrace all the things in the scope of this modern technology. This modern generation is much more advanced and smarter than their teachers in terms of usage of modern technical gadgets. They want the computers to be there for all their tasks including academic related activities. Keeping in mind the psychology and interest of the modern learner, many universities and educational institutions have focused on integrating the modern technology with education. In fact, a lot of research is happening on the use of computers as teaching tools. The goal of this project is to build an Intelligent Tutoring System (ITS) framework which can guide students and help them to learn quickly and intelligently. The ITS framework built monitors the behaviour of each learner and then adapts itself to the learner level. More importance is given to the user experience to make it highly interactive.

2. Problem with current E-learning Technique

- Most instructional technologies consist of a repository for lecture notes with a possible feature of a message board discussion forum

- Prensky (2001) described this method of online training as “enormous step backward” while Klaila (2001) described it as “the worst of all possible alternatives”.

3. Intelligent Tutoring System

Why ITS?

-There is a practical need for one to one teaching environment.

-Studies show that students can learn up to 3 times faster in a one to one setting than in the traditional classroom

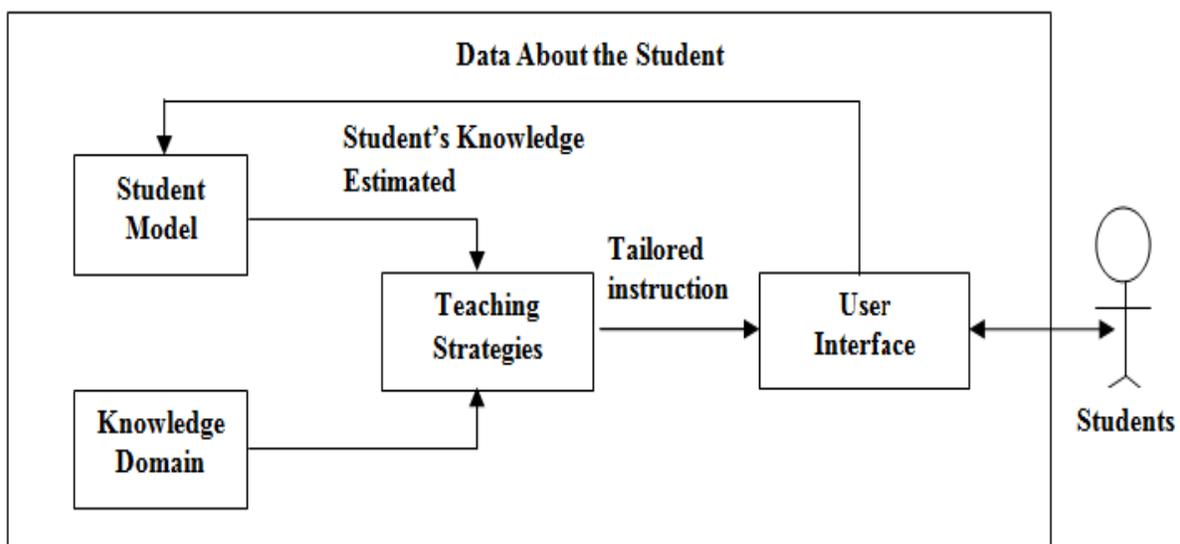
-Also, tutoring systems are interactive and hence more “interesting” than traditional text books.

An Intelligent Tutoring System (ITS) is any computer system that provides direct customized instruction or feedback to learners, i.e. without the intervention of human beings, while performing a task. Thus, ITS implements the theory of learning by doing.

ITSs are used in many domains such as in traditional education, distance learning and training. It is a multidisciplinary area.

One reason that ITS is such a large and varied field is that “intelligent tutoring system” is a broad term, encompassing any computer program that contains some intelligence and can be used in learning. ITS is an outgrowth of the earlier computer-aided instruction or CAI model, which usually refers to a frame-based system with hard-coded links, i.e. hypertext with an instructional purpose.

The traditional ITS model contains four components: the domain model, the student model, the teaching model, and a learning environment or user interface. ITS projects can vary tremendously according to the relative level of intelligence of the components. For example, a project focusing on intelligence in the domain model may generate solutions to complex and novel problems so that students can always have new problems to practice on, but it might only have simple methods for teaching those problems, while a system that concentrates on multiple or novel ways to teach a particular topic might find a less sophisticated representation of that content sufficient.



When multiple components contain intelligence, homogeneous or heterogeneous representations can be used. ITS can also be classified by their underlying algorithm. One well-known category is the *model tracing tutor*, which tracks students' progress and keeps them within a specified tolerance of an acceptable solution path.

3.1 ITS Modules

- **Domain Module**

The domain module is the knowledge management system and represents the content knowledge that the student is acquiring. All the concepts that the system pretends to transmit to the student are stored in this module. This module is at the heart of an intelligent tutoring system and provides the basis for interpreting student actions.

- **Student Module**

The student module is a record of the student's knowledge state. It stores information that is specific to each individual learner. All the student behaviour is recorded in the system and used for "reasoning" and adapt the domain module to the learner's needs.

- **Teaching Module**

The teaching module provides a model of the teaching process. It acts as a virtual instructor, presenting the contents in an appropriate sequence, based on the student's knowledge and his learning style. This is an interactive process and this module has the mission to explain the concepts to the student given several points of view and supporting all the learning process. For example, information about when to review, when to present a new topic, and which topic to present is controlled by the teaching module. As mentioned earlier, the student module is used as input to this component, so the pedagogical decisions reflect the differing needs of each student.

- **Interface Module**

The interface module communicates and interacts with the student. It control the dialogue and the screen layouts of the system. To develop a good interface module it is necessary to consider the usability issues of a user computer interface, because this module interacts with the user and the other components of the system. If the interface fails all the other modules fail too.

3.2 Personalized Tutoring

Research has shown that better learning outcomes result from one-on-one tutoring. It presents different content for different students depending on their individual needs and preferences. But one-on-one interaction is not possible due to very large student-to-teacher

ratio. Also, the cost and time investments required for one-on-one tutoring in any learning environment makes it very difficult to implement in today's realities. This is the reason why we need to use computers as teaching tools.

There are numerous benefits of using electronic tutors in education. These tools

are called as Computer-Aided Instruction (CAI) systems. A student can learn at his own pace at anytime of the day. They provide hands-on learning on an individual basis to each student. They can be more effective than traditional text books because they can provide a higher level of interactivity through the use of visual and audio simulation. The main drawback with these systems is they are static systems and do not adapt itself according to the intelligence of the learners. This is why the need for Intelligent Tutoring Systems arises. ITS has the ability to adapt itself depending on the domain and the cognitive profile of a student. Intelligent tutoring systems can personalize learning for a diverse generation of students with changing needs. It provides a more convenient, less expensive solution by keeping the costs down and more effectively using instructor's time.

3.3 Meeting Student and Instructor Goals

An Intelligent Tutoring System can also benefit instructors to manage learning objectives. For example, Web Study or Angel Learning has an integrated course management system which allows an instructor to view the progress of students learning objectives for the entire course through a dashboard reporting feature. These type of electronic tutoring systems can help instructors determine what material is presented to each student and create rules to release additional materials to students based on their assessment results. Ideally, a student and an instructor can see immediately what progress the student is making towards a learning objective. It is exciting to think that presentation of course content can adapt in response to student performance and be driven by the combined goals of student and instructor.

4. Intelligent Tutoring System Strategies

One of the advantages provided by our Intelligent Tutoring Systems(ITS) is it allows a flexible pedagogical approach according to the cognitive ability of a learner. This flexibility is enhanced using multiple learning strategies that can be successively triggered depending on the progression of learning. The following four teaching strategies are used to build our ITS.

The ITS framework built includes the following four teaching strategies:

1. Socratic Questioning
2. Scaffolding
3. Guided Discovery and
4. Game-based Learning

4.1 Socratic Questioning

Socratic Questioning is an approach in which teaching-learning is performed in the form of question and answer. It is a kind of series of questioning in which an original question is splitted into more than one low level questions. It is just like bottom up approach. In this strategy we start from the question which student or learner knows and goes to our target questions which we want to teach him.

Socratic Questioning is basically a dialogue conversion between the teacher and student. First, instructor starts the question and student responses. In return, instructor reformulates a new question according to the response given by student. Questioning and answering is structured systematically to reach an ultimate goal.

4.2 Scaffolding

Scaffolding also known as Instructional scaffolding is a learning process designed to promote a deeper learning. Scaffolding is the support given during the learning process which is tailored to the needs of the student with the intention of helping the student achieve his/her learning goals. The best and most effective use of instructional scaffolding helps the learner figure out the task at hand on their own. Once students build knowledge and develop skills on their own, elements of the support are removed.

According to McKenzie (1999), the defining features of successful scaffolding include clear direction, purpose, and expectation. Results include on-task activity; better student direction; reduced uncertainty, surprise, and disappointment; increased efficiency; and palpable momentum.

4.3 Guided discovery

Guided discovery, also known as an inductive approach, is a technique where a teacher provides examples of a language item and helps the learners to and the rules themselves. Guided Discovery is characterized by convergent thinking. The instructor devises a series of statements or questions that guide the learner, step by step, making a series of discoveries that leads to a single predetermined goal. In other words the instructor initiates a stimulus and the learner reacts by engaging in active inquiry thereby discovering the appropriate response.

Guided discovery is regarded by many teachers as an important tool. It encourages independence, makes learning more memorable, and if analysis is done in groups is a meaningful communicative task.

4.4 Game based learning

Game based learning (GBL) is a branch of serious games that deals with applications that have defined learning outcomes. Generally they are designed in order to balance the subject matter with the gameplay and the ability of the player to retain and apply said subject matter to the real world.

GBL uses competitive exercises, either pitting the students against each other or getting them to challenge themselves in order to motivate them to learn better.

Games often have a fantasy element that engages players in a learning activity through a storyline.

4.4.1 Definition of GBL

Game-based learning (GBL) refers to different kinds of software applications or products that use games for learning or educational purposes. These game applications are also termed as serious games. They can be anything from simpler games to games which use 3D graphics to provide opportunity for learners to take on virtual presence in virtual world.

"The underlying idea is that students learn better when they are having fun and are engaged in the learning process".

The main characteristic of an educational game is the fact that instructional content is blurred with game characteristics. The game should be motivating, so the learner repeats cycles within a game context. While repeating the act of playing the game, the learner acquires the knowledge through thought, experience, and the senses which result from interaction with and feedback from the game play.

Garris et al. suggested that the learning outcomes occur outside of the game during reflection and debriefing. The following figure describes the debriefing process between the game cycle and the achievement of the learning outcomes.

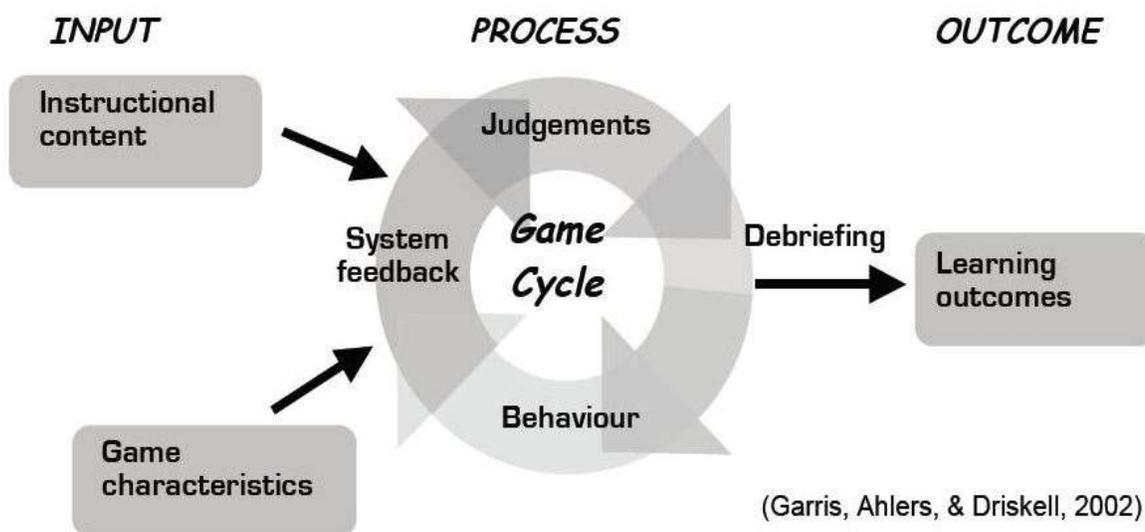


Figure 4.1: Learning Process in GBL

The debriefing process provides a link between simulation and the real world. It connects game experience and learning by drawing a relationship between the game events and the real-world events. This process of study in a game is described by Kolb et al., as "doing, reflecting, understanding, and applying".

4.4.2 Characteristics of Games

Malone (1981) summarized four essential characteristics or elements for computer games to answer the question of what makes a computer application enjoyable to operate: fantasy, curiosity, challenge and control.

Fantasy stands for the virtual world or the scenario in which the activity is embedded. Games involve imaginary worlds and nothing outside the game is relevant. The activity inside the game has no impact on the real world. The fantasy in the context of the game leads to greater interest on the part of the student as well as increased efficiency of learning.

Curiosity is embedded into the game by the continual introduction of new information and non-deterministic outcomes. The different types of rules help the players to reach the goal of the game. This includes the use of randomizing to add variety to the game. Malone emphasizes that environments should be neither too complicated nor too simple with respect to the end-user's existing knowledge.

Challenge is provided within each appropriate level of difficulty. If the activity level of difficulty is too low, students lose interest and the same occurs if the activity level is too high relative to the student's abilities. The challenge should be incorporated by introducing multiple levels or goals with progressively increasing the difficulty levels.

The students **control** the game environment by making the decisions and choices. This opportunity to make choices has direct consequences and helps to solve the confronted tasks and problems.

5. Conclusion

The ultimate goal of the project is to have a system with minimal human intervention in which students can learn and get instant feedback and hints. This project is only a rest step towards achieving that goal. The modular architecture ensures that each module can be extended and developed independently. This opens up a lot of avenues for future research and development.

Given our society's increasing need for high quality teaching and training, computer-supported education is becoming critical to complementing human tutoring in a large variety of fields and settings. Research in Intelligent Tutoring Systems leverages advances in Artificial Intelligent, Cognitive Science and Education to increase the ability of computer supported education to autonomously provide learners with effective educational experiences tailored to their specific needs, as good human tutors do.

The system must be evaluated from both a design perspective and from an Educational Technology perspective. Evaluation must be done for each module and also for the whole integrated system. The interfaces must be evaluated for the user experience. As mentioned earlier, a flawless user experience is crucial for the success of the system as an effective learning tool because a bad interface could lead to cognitive overloading of the student's working memory.

Over all, the effectiveness of the system as a learning tool should also be evaluated either in a laboratory setting with a control group or by subject experts.

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A Novel Low Power Approach for Radix-4 commutator FFT Based on CSD Algorithm

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Abstract -- This paper proposes a low power pipelined FFT for wireless LAN applications based on canonic signed digit (CSD) algorithm. New techniques and approaches are required at all levels of design abstractions as future technologies are expected to provide unprecedented levels of computations performance in small hands-held units. Since the evolution in battery technology has not yet caught up with the demands in computational requirements, this provides us with a motivation to consider new approaches to reduce computation without compromising the constraints on system performance. This paper proposes several low power approaches for radix-4 single path delay commutator FFT processors which utilize the minimum number of shifters and adders to replace the complex multiplier and low power butterfly architecture. Both power consumption and area is reduced, due to operation substitution compared to a conventional FFT architecture.

Keywords: CSD, FFT, Hand-held units.

I. INTRODUCTION

The Fast Fourier Transform (FFT) is an important tool used in the Digital Signal Processing (DSP) applications. In recent years, because of the popularity of the signal processing there been a lot of development to increase its performance both at the algorithmic level and the hardware implementation level. On the other hand, developers of the VLSI systems are including features in their design that improves the system performance for applications requiring FFTs. For the portability requirement, the need of low power FFT architecture for telecommunication systems in portable form is attached more and more importance.

Due to the nature of non-stopping processing on the same clock frequency of sampling data, pipelined FFT is preferred especially for a high throughput demand or low power solution [6]. In the pipelined architectures, the commutator and the complex multiplier at each stage contribute a dominating part of the whole power consumption. A number of researchers have explored the scope of low power implementation for FFT processors. In [2], the authors combined voltage over scaling and algorithmic noise-tolerance techniques to reduce power consumption in butterfly blocks. The author of [4] Presented low power cache-memory architecture by using an algorithm offering good data locality to increase speed and energy efficiency. In [5], the authors proposed a new radix algorithms, which can effectively minimize the number of complex multiplications in pipelined FFTs. A novel ordering based low power pipelined radix-4 FFT was presented in [1]. Coefficient ordering reduces the switching activity between successive coefficients fed to the complex multiplier and hence leads to low power consumption [1]. However, as far as we know, until now, there are no explorations on FFTs. In the past, some researchers used shifters and adders to replace the complex multiplication by some special constant coefficients. In [5], the authors used 12 additions to realize the complex multiplication by $\sqrt{2}/2(1\pm i)$. The authors in [7] employed seven shift-and-add units to carry out seven multipliers in parallel, each by a constant coefficient.

This paper explores the application of common subexpression sharing across coefficients to the first stage of 16-point FFTs based on a popular pipelined FFT, R4SDC [8]. Complex multiplications are replaced by the minimum number of shift and addition operations. Hence, both area and power consumption for the multiplier unit are reduced. This new FFT processor architecture also employs a new commutator architecture based on dual port RAMs [9] and improved low power butterfly elements [10].

II. CANONIC SIGNED DIGIT (CSD) ALGORITHM

The number of add operations required in a constant coefficient multiplication equal to one less than the number of nonzero bits in the constant coefficient. In order to further reduce the area and power consumption, the constant coefficient can be encoded such that it contains the fewest number of nonzero bits, which can be accomplished using canonic signed digit (CSD)

In [8], the authors presented the R4SDC pipelined FFT algorithm for word-sequential data. For radix r_1 , equation 1 can be written as follows:

$$x(k) = \sum_{q_1=0}^{N_1-1} W_N^{q_1 k} \sum_{p=0}^{r_1-1} x(N_1 p + q_1) W_{r_1}^{pk} \dots \dots \dots (2)$$

The N-point DFT in (2) can be decomposed into v stages where $N = r_1 r_2 \dots r_v$. The final stage is defined by

$$X(r_1 r_2 \dots r_{v-1} m_v + r_1 r_2 \dots r_{v-2} m_{v-1} + \dots + r_1 m_2 + m_1) = \sum_{q_{v-1}=0}^{r_v-1} x_{v-1}(q_{v-1}, m_{v-1}) W_{r_v}^{q_{v-1} m_v} \dots \dots \dots (3)$$

While intermediate stages are given by the recursive equation 4 below [8]:

$$x_t(q_t, m_t) = W_{N_t}^{q_t m_t} \sum_{p=0}^{r_t-1} x_{t-1}(N_t p + q_t, m_{t-1}) W_{r_t}^{p m_t} \dots \dots \dots (4)$$

Where, for both (3) and (4)

$$0 \leq q_i \leq N_i - 1, 2 \leq i \leq v, N_i = N / (r_1 r_2 \dots r_i), 2 \leq t \leq v - 1 \text{ and } 0 \leq m_i \leq r_i - 1$$

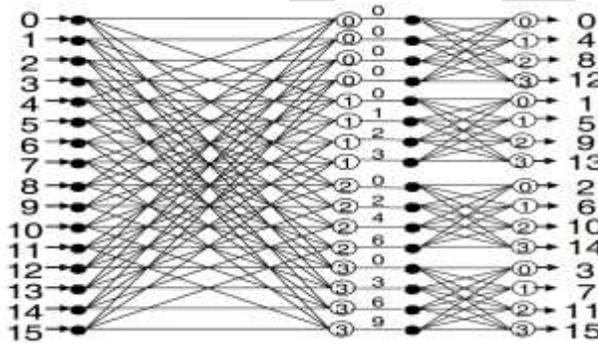


Fig.1. Signal flow graph of a radix-4 16-point FFT

When $r_1=4$, we use 16-point FFT whose flow graph based on the above equations can be seen in Figure 1. As can be seen, each open circle denotes a summation while the dots define the stage borders.

The number inside the open circle is the value of m_1 (for the first stage) or m_2 (for the second stage). The number outside the open circle is the twiddle factor used. N-point pipelined FFT processor based on this architecture shown in Figure 2. It achieves 75% utilization of the complex multiplier and 100% utilization of the butterfly element respectively.

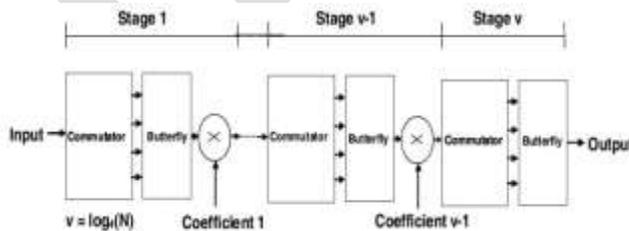


Fig.2. N-point R4SDC pipelined FFT processor architecture [10]

IV. COMMON SUB EXPRESSION SHARING

Common sub-sharing or common sub-expression elimination pre-computes the subexpression among several multiplication-accumulation operations in order to reduce the total number of shift and addition operations [11] which are utilized to carry out multiplications. The approach is very effective for reducing the hardware cost of multiple constants multiplications, especially for the filter-like operation. For example, for a 3-tap FIR filter, the output Y (2) is given as follow.

$$Y(2) = \sum_{i=0}^2 A_i + x_{n-i} \dots \dots \dots (5)$$

The weights A_i are the filter coefficients. Suppose the coefficients are given as $A_0=00111011$, $A_1=00101011$, and $A_2=10110011$. The coefficients are represented in two's complement format. According to (5),

$$Y(2) = A_0X_2 + A_1X_1 + A_2X_0 .$$

Using shifts and additions to replace the multiplications, gives:

$$Y(2) = X_2 + X_2 \ll 1 + X_2 \ll 3 + X_2 \ll 4 + X_2 \ll 5 + X_1 + X_1 \ll 1 + X_1 \ll 3 + X_3 \ll 5 + X_0 + X_0 \ll 1 + X_0 \ll 4 + X_0 \ll 5 - X_0 \ll 7.$$

The computation requires 12 additions, 1 subtraction and 11 shifts. However, if pre-computing $X_{02} = X_0 + X_2$; $X_{12} = X_1 + X_2$; $X_{012} = X_{12} + X_0$, the output can be shown as:

$Y(2) = X_{012} + X_{02} \ll 4 + X_{012} \ll 1 + X_{012} \ll 5 + X_{12} \ll 3 - X_0 \ll 7$. This computation only needs 7 additions, 1 subtraction and 5 shifts. X_{02} , X_{12} , X_{012} are the available common sub expressions for this case. From the above examples, it can be shown that common subexpression sharing can reduce the number of additions and subtractions from 13 to 8 (38% reduction).

V. DESIGN AND IMPLEMENTATION

A. Multiplier-less Units of 16-point R4SDC FFT

In multiplier-less 16-point R4SDC pipelined architecture FFT, the conventional complex multiplier consists of one subtracter, one adder and four real multipliers. The coefficient for the stages can be previously calculated which means from the previous stages.

However, since the complex coefficients for all stages can be pre-computed, we can apply shift and addition operations with common subexpression sharing to those stages where the number of coefficients is limited.

For example, the number of coefficients for the first stage of 16-point FFTs is 16. These coefficients are shown in Table 2. A close observation of these coefficients reveals that seven of these are (7fff, 0000), one is (0000, 8000) which are the quantized representation for (1, 0) and (0, -1) in 16-bit two's complement format respectively. In each set, the first entry corresponds to the cosine function (the real part, W_r) and the second one corresponds to the sine function (the imaginary part, W_i). For the trivial coefficients (7fff, 0000) and (0000, 8000), the complex multiplication is not necessary. Data can directly pass through the multiplier unit without any multiplication, when data is multiplied with (7fff, 0000). Only an additional unit, which swaps the real and imaginary parts of input data, and inverts the imaginary part, is needed for those data by (0000, 8000).

TABLE II
 The coefficients for 16-point R4SDC FFT

Coefficient sequence m1 =0,1	Original Quantized coefficient	Coefficient sequence m1 =2,3	Original Quantized coefficient
W0	7fff,0000	W0	7fff,0000
W0	7fff,0000	W2	5a82,a57d
W0	7fff,0000	W4	0000,8000
W0	7fff,0000	W6	a57d,a57d
W0	7fff,0000	W0	7fff,0000
W1	7641,cf04	W3	30fb,89be
W2	5a82,a57d	W6	a57d,a57d
W3	30fb,89be	W9	89be,30fb

The rest of the coefficients are composed of only 6 constants (7641, 5a82, 30fb, a57d, 89be, cf04). However, one can see that only 3 of these constants (7641, 5a82 and 30fb) would be enough to implement all of the coefficients. For example, a multiplication with the constant a57d could be realized by first multiplying the data with 5a83, and then two's complementing the result. Note that a multiplication by the constant 5a82 already exists. Therefore, the multiplication with the constant 5a83 can simply be obtained by adding the data to the already existing multiplication with 5a82. The other two constants (89be and cf04) can be realized in a similar manner, using constants 7641 and 30fb respectively. 5a82 is

represented by two's complement format, 7641 and 30fb are represented by CSD format as follow,

5a82 0101101010000010
 7641 1000-10-1001000001
 30fb 010-1000100000-10-1

The mixed use of CSD and two's complement is for minimizing the number of addition/shift operations. We can use shifters and adders based on the three constants to carry out those nontrivial complex multiplications as shown below:

$$5a82X = 5X \ll 12 + 5X \ll 9 + 65X \ll 1$$

$$7641X = X \ll 15 + 65X - 5X \ll 9$$

$$30fbX = 65X \ll 8 - X \ll 12 - 5X$$

In the above 'X' is input data. The common subexpression for the three constants are 101 (5) and 1000001 (65). Figure 3 shows the shift-and-addition module for the three constants in 16-point FFT. The module carries out the multiplications in which the real part (X_r) or imaginary part (X_i) of input data will be multiplied with W_r and W_i respectively.

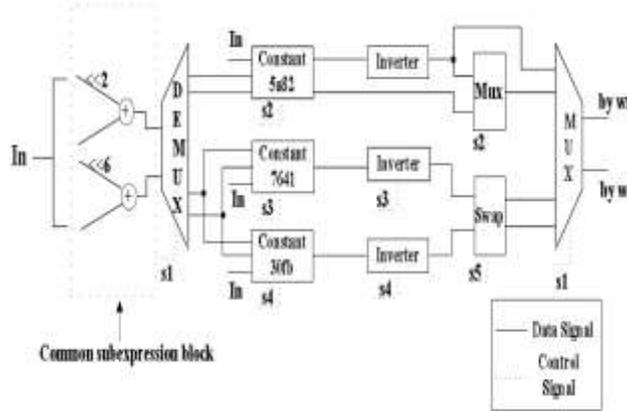


Fig.3. Block diagram of the shift-and-addition module in multiplier-less unit of 16-point R4SDC FFT

The shift-and-addition module is equipped with 5 single-bit control signals $s_1 - s_5$. Firstly the input data are fed into the common subexpression block. The signal s_1 indicates which constant channels will be chosen for processing the input data. Each channel carries out shift, negation and addition for the constant. The control signal s_3 indicates that the constant 7641 block outputs the product either by 7641 or 7642. Similarly, the signals s_2 and s_4 control the outputs of constant 5a82 and 30fb blocks respectively. The invert units following the constant units either invert the outputs of the constant units or pass them without any change. The swap unit provides the appropriate swapping for input data, depending on whether the coefficient is (30fb, 7641) or (7641, 30fb). The demultiplexer unit judges which couple of products are final outputs. Totally, 11 adders are used to compose the shift-and-addition module.

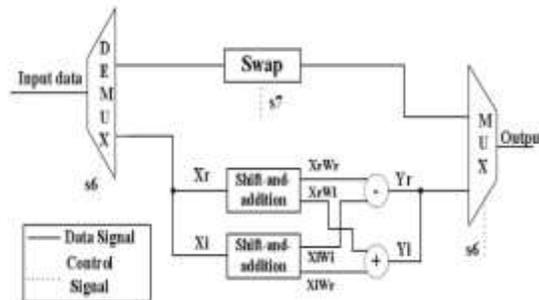


Fig.4. Block diagram of the multiplier-less unit in 16-point R4SDC FFT

Based on the above discussion, the complex multiplication unit in 16-point radix-4 pipelined FFT can be substituted by a multiplier-less unit. The block diagram of the unit is depicted in Figure 4. Only those data, which multiply nontrivial complex coefficients, are fed into the shift-and-addition units. Two shift-and-addition units are needed for the real part (X_r) and imaginary part (X_i) respectively. There are two single-bit control signals s_6 and s_7 in the multiplier-less unit. The signal s_6 indicates that whether the input data is corresponding to a nontrivial complex coefficient or not. When the signal s_7 is asserted to logic 1 state, the real and imaginary parts of the input data are swapped, and the imaginary part is inverted. Here, in the

multiplier-less unit, 22 adders are used to substitute the four real multipliers in the complex multiplier unit. Due to the use of multiplier-less unit, the Rom unit storing the coefficient will be replaced by a FSM unit generating control signals (s1 - s7).

B. Commutator Based On Dual Port RAMs For R4SDC

The commutator unit is one of the main power-consuming components in R4SDC FFT. Previous approaches to implement commutators include shift register architecture (SR) [8], conventional dual port RAM architecture (DR) [13], and triple port RAM architecture (TR) [13]. These architectures are based on the same interconnection topology among different FIFO elements [13]. In [9], a new architecture based on dual port RAMs, termed as IDR. IDR exploits a new interconnection topology among dual port RAM blocks [3]. IDR efficiently reduces the switching activity through maintaining the unused outputs of RAMs at their previous values [9]. IDR also reduces the number of write operations to memory blocks [3]. With IDR architecture each RAM block is enabled 5/3 times on average, during the four periods. Whereas, for DR and TR, each RAM block is enabled 4 and 10/3 times respectively [13]. Hence, IDR is significantly more power efficient than both DR and TR.

C. Improved Butterfly Architecture

In [10], low power butterfly architecture was presented. Two 4-input summation blocks were employed to replace six adder/subtractors. However, since inversions were implemented based on one's complementing (and not two's complementing), this architecture introduced a small error in the butterfly operations. In R4SDC FFT, the butterfly element performs the summations of Equations 4 and 5. The conventional butterfly architecture consists of 6 adders/ subtracts. We improve this architecture by eliminating this error. Figure 5 shows the improved low power butterfly architecture. Six inverters (CI1 to CI6) are used to generate the normal or the one's complement form under the control of C5, C6 and C7. The signal C4 controls the four multiplexers (M1 to M4) for directing appropriate data to the inputs of the summation blocks. Two 5-input summation blocks (SUM0 and SUM1) are employed to generate the real and imaginary parts of the output respectively. An additional decoder unit is used to generate compensation for eliminating the error due to the one's complement based inversion.

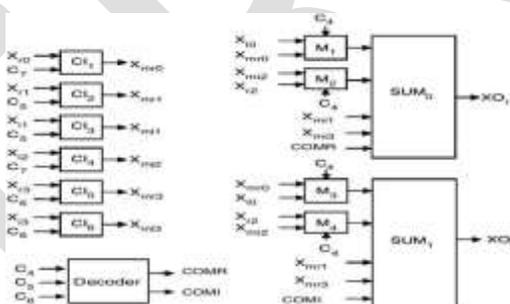


Fig.5. Block diagram of the improved butterfly architecture

VI. RESULTS AND DISCUSSIONS

The proposed architectures have been implemented in Verilog HDL for 16-point multiplier-less R4SDC pipelined FFT and simulated in Xilinx 9.2i (ISE Simulator). Input data used are 32 bits complex data. The 16-point R4SDC FFT was synthesized at 10ns clock cycle, using Synopsys Design Compiler targeting the UMC 0.18μ CMOS library. Power evaluations were carried out, using Synopsys Design Power, at 8ns clock cycles for 16-point FFT respectively. Less multiplier FFT architecture employs CSD multiplier unit to carry out the complex multiplication operations shown in fig.5. The input to FFT module is sequential input data will be separated into 4 parallel output data streams by the commutator, these parallel data summed into the butterfly element and then CSD multiplier performs the multiplications of complex input data with all the synchronized constant coefficients and generates real and imaginary outputs. The clock and reset are global signals.

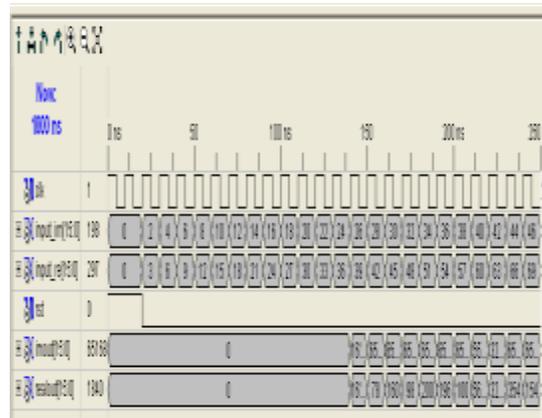


Fig.6.Simulation waveform for multiplier less FFT

The comparative power and area results are shown in following table.

TABLE III
 Comparative results of Power and Area

Instance	Cells	Dynamic Power (mW)	Total Power (mW)	Cell Area
Conventional FFT	4692	29.083	29.084	181209
CSD FFT	3528	20.588	20.589	141069

Clearly, for 16-point FFT the best power saving of 50.2% is achieved. The multiplier-fewer units in 16-point FFT power reduction, as compared to the complex multiplier based on non-Booth coded Wallace tree. All designs have the commensurate area with each other. The application of the new techniques brings a slight reduction in the cost of area and power consumption.

VII. CONCLUSION

This paper presents a low power pipelined R4SDC FFT processor architecture based on canonic signed digit multiplier suitable for shorter FFTs. This design approach can also be applied for the last stages of longer FFTs. The multiplier-less architecture employs the minimum number of shift and addition operations to realize the complex multiplications. This reduces the power consumption of the multiplier by using the architectures such as low power butterfly and commutator scheme as compared to conventional non-Booth coded Wallace tree multiplier based R4SDC FFT architecture.

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Reconfigurable N-Point FFT Processor Design For OFDM System

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Abstract— Under many research works, it has been observed that the multiple input multiple output (MIMO) system can be considered an efficient solution for the high-speed wireless communication. However, the delay spreads in non-flat fading channels abrupt the functioning of MIMO system. In orthogonal frequency division multiplexing (OFDM), the channel impulse response is flat in each sub carrier. Hence, MIMO with OFDM can be used effectively in non flat fading channels. MIMO OFDM system requires many independent baseband processors thereby increasing hardware complexity of the system. So there is a need to reduce the hardware complexity of FFT/IFFT processor. The proposed model uses multipath delay commutator (MDC) architecture to design a reconfigurable N-point FFT processor.

Keywords— Multiple Input Multiple Output, Orthogonal Frequency Division Multiplexing, Multipath Delay Commutator, Fast Fourier Transform processor, Inverse Fast Fourier Transform, Wireless, Communication

INTRODUCTION

OFDM is a special type of multi-carrier transmission where a single data stream is transmitted over a number of lower rate sub-carriers. In high speed digital communication, the OFDM technique is widely used against frequency selective fading and intersymbol interference. It is also used for wideband data communication over mobile radio channels, DAB and DVB.

MIMO system, the wireless communication system with multiple antennas at the transmitter and receiver, has received remarkable attention because of its ability to increase system capacity without expanding the bandwidth.

The use of multiple-input multiple-output (MIMO) signal processing with orthogonal frequency division multiplexing (OFDM) can provide enhanced data rates for the next generation wireless communication systems. But as MIMO-OFDM system transmits multiple data streams, it requires various independent baseband processors. This increases its hardware complexity tremendously when compared with single-input single-output OFDM (SISO OFDM) systems.

A very high data throughput rate is provided by the IEEE 802.11n standard based on the MIMO OFDM system. Since FFT processor is one of the most computationally intensive modules of the OFDM processors, it becomes very important to design a low complexity FFT processor. However, MIMO OFDM system with k transmitting and receiving antennas consists of k OFDM baseband processors. This requires k FFT processors thus increasing the hardware complexity by k times.

In WLAN system, the hardware complexity is a very important component as it is used in non-fixed environment. So it is essential to design an efficient system module to reduce the increasing complexity of the MIMO OFDM system. Therefore the focus should be on FFT processor as it is one of the largest block in MIMO OFDM processor.

In the proposed system, a reconfigurable N-point FFT processor for MIMO OFDM system is designed. The proposed FFT processor is based on MDC architecture and can support variable lengths of FFT operations. Section II presents the work done related to reducing the complexity of the FFT/IFFT processor. Section III presents the methodology for the FFT/IFFT processor. Section IV presents the simulation results of the proposed FFT processor and section V concludes the paper.

RELATED WORK

There are various methods which have been used for designing FFT/IFFT processor for MIMO OFDM system.

An area efficient FFT processor for SDR systems based on MIMO OFDM is proposed [1]. The variable lengths of 64, 128, 512, 1024 and 2048 are supported by the proposed FFT processor. The complexity of the proposed FFT processor is decreased by reducing the number of non trivial multipliers. This is achieved by employing mixed radix and multipath delay commutator architecture. In the process, the system throughput is not sacrificed. The design of the proposed FFT processor is made in hardware description language and it is implemented on Xilinx Virtex 4 FPGA.

The FFT processor proposed in [1] reduces the logic slices by 41.9%, dedicated multipliers by 62.5% and memory size by 39% when compared with the conventional 4 channel R2SDF FFT processor. When compared with 4 channel R2MDC FFT processor, the proposed FFT processor [1] reduces the logic slices by 26.2%, dedicated multipliers by 25% and memory size by 26.8%. Thus the complexity of the FFT processor is reduced tremendously.

The scalable FFT processor architecture for OFDM based communication systems is described [2]. In recent times, different mobile devices can support multiple wireless standards [8] and requires efficient transceiver. Hence, in a communication transceiver, the baseband hardware needs to be scalable and efficient across multiple standards.

Design of FFT hardware is a challenging task while balancing design parameters such as speed, power, area, flexibility and scalability. The research work in [2] proposes a scalable radix-2 N-point novel FFT processor architecture. The architecture design is based on an approach to balance various specified design parameters to meet the requirements of SDR platforms supporting multiple wireless standards. The processor operates at a maximum frequency of 200MHz, uses less than 1% of FPGA device resources [9] and meets the performance requirements of multiple wireless standards.

A 128/64 point fast Fourier transform (FFT)/ inverse FFT processor which is applied in wireless LAN processor based on MIMO OFDM multiplexing is proposed in [3]. The sequences of multiple data is properly dealt with by the mixed radix MDF fast fourier transform architecture. The 64 and 128 point FFT operation is supported by the processor. For simultaneous sequences of data, multiple data rates is also provided [10]. Furthermore, less hardware complexity is needed in the design compared with the traditional four-parallel approach. At the operation clock rate of 40 MHz, the processor can calculate 128-point FFT with four independent data sequences within 3.2 us.

A FFT/IFFT processor which can be applied in WLAN processor based on MIMO OFDM system is proposed [4]. Higher mixed radix FFT algorithm is used to achieve better throughput, low power and less complex multipliers. To design FFT/IFFT processor, the mixed radix architecture of FFT is proposed with reversal of bits. The consumption of power is reduced and the hardware is made less complex by the proposed FFT processor [4].

An area-efficient FFT processor for mobile WiMAX systems is proposed [5]. The variable lengths of 1024, 512, 2048 and 4096 can be supported by the FFT processor due to its scalability. The complexity of the processor is decreased considerably by lowering the non trivial multipliers used along with MDC architecture [11]. HDL was used to design the FFT processor. The size of memory is reduced compared with those of the 4-channel radix-2 MDC (R2MDC) FFT processor by the FFT architecture used.

An energy and area efficient structure and hardware architecture of FFT processor for 4x4 MIMO-OFDM WLAN systems with four transmit and four receive antennas is proposed [6]. Since the basic scheme of MIMO-OFDM system is multiple data transmission, conventional FFT processor for SISO-OFDM system is not suitable for MIMO-OFDM systems. The proposed FFT processor has multi-channel structure to support multiple data paths. Multi-channel structure enables the processing of several FFT operations with a single processor [12]. Also, by the mixed radix algorithm, the number of non-trivial multiplications of the FFT processor is decreased. The proposed FFT processor reduces the logic gates over a 4-channel R4MDC FFT processor. Thus, the proposed FFT processor contributes to the low power and low complexity design of MIMO-OFDM systems.

The FFT processor for applications in MIMO OFDM systems which uses low power and has variable length is presented [7]. The variable length of FFT computation is achieved by mixed radix algorithm [13]. To reduce main memory accesses, cache memory architecture is used. Higher SQNR which is required for QAM signals is also achieved by the proposed FFT /IFFT processor. The computation time and the power dissipation of the processor are decreased.

From the related work, it is observed that reducing the complexity of FFT processor is a high priority task. This can be achieved by using a multipath delay commutator (MDC) architecture.

METHODOLOGY

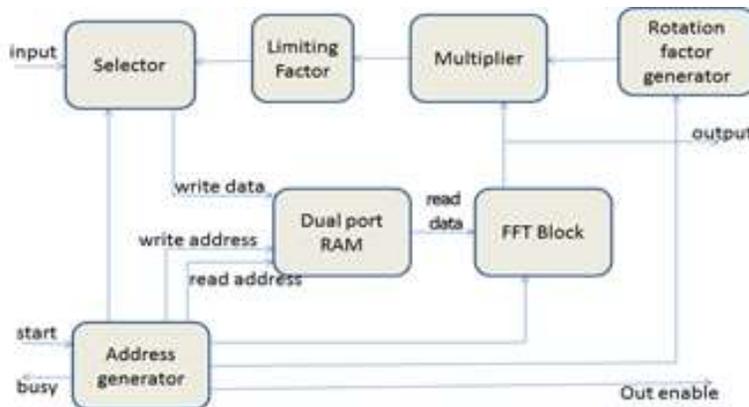


Fig.1 Block diagram of generic N-point FFT

Fast Fourier transformation (FFT) processor is one of the largest modules in the OFDM baseband processor. It is very important to design the low-complexity FFT/IFFT processor for MIMO-OFDM based communication systems. To make FFT processors more area efficient, it is necessary to reduce the parameters of FFT processors like the area, the number of multipliers and the memory size. The proposed model works towards reducing these critical parameters of the FFT processor.

In the proposed system, a generic N- point FFT processor is designed. Radix 4 FFT is used in the design. The various blocks involved in the design of generic N-point FFT is shown in fig.1. FFT points upto 1024 can be calculated using the proposed model. The address generator block generates addresses of the clock. One stage is triggered at a time. Dual port RAM is used as RAM is instantiated two times one for real part and another for imaginary part of the complex number. Radix 4 FFT is used to calculate higher point FFTs upto 1024 point. Inbuilt multipliers (trivial multipliers) are used in the design. The commutator block provides a delay of 1 clock cycle. All the blocks are interconnected to form a generic N-point FFT. The design is simulated on Xilinx ISE 13.2 using VHDL.

RESULTS

The simulation results of generic N-point FFT using radix 4 is shown in fig.2. Iin & Qin are the real and imaginary parts of the complex numbers fed as input to FFT whereas Iout & Qout are the real and imaginary parts of the output of the FFT. The device utilization summary of fig.3 shows the logic utilization of the target device used during the simulation of the FFT processor.

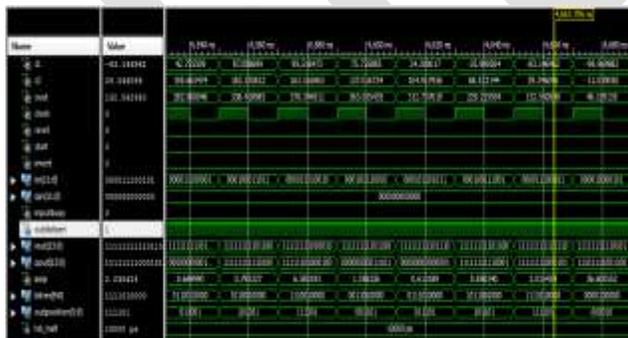


Fig.2 Simulation results of FFT

Device Utilization Summary (estimated values)			
Logic Utilization	Used	Available	Utilization
Number of Slices	506	1920	26%
Number of Slice Flip Flops	799	3840	20%
Number of 4 input LUTs	973	3840	25%
Number of bonded IOBs	64	141	45%
Number of BRAMs	2	12	16%
Number of GCLKs	1	8	12%

Fig.3 Device utilization summary

CONCLUSION

The paper describes the generic model used for the designing of N-point FFT processor for MIMO OFDM system. From the research done and the results observed, it can be concluded that the use of the hardware devices used in the FFT design is optimized.

The simulation results of the design match the calculated results thus verifying the correctness of the design. The FFT processor is reconfigurable and various points of FFT can be calculated using the proposed design.

The future work includes the design of non-trivial multipliers and their use in the design of the FFT/IFFT processor for MIMO OFDM system. The multipliers used in the FFT processor are to be reduced thus reducing the area consumption of the processor.

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New robust LSB steganographic technique for increased security

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Abstract: Steganography is fetching attraction because of rapid growth & use of internet as a communication medium. A steganography is a technique of invisible or secret communication. In steganography the secret message can be hidden into a cover media so that no one can realize its subsistence except the sender & receiver. This paper discussed a technique based cryptography applied on numerical values of secret data & cover the encrypted data into other media, here it is image. So after steganalysis there is less chance of an attacker being able to recover data as the encryption applied on numerical values of data and not the text values itself. This method provides high security.

Keywords: Steganography, Cryptography, Steganalysis, LSB, Spatial domain, PVD, encryption.

1. INTRODUCTION:

With exponential growth and use of internet as a way of communication for exchanging information the information security has become a major issue. To thwart the exploitation, devastation, or malicious modification of the secret information the information hiding technique is used. There are three techniques to hide data are Cryptography, Steganography, Watermarking.

Digital watermarking

It is hiding information in a carrier like image. A Watermark may contain the copyright information to retain the authenticity & integrity of information. Digital watermark remains constant even through recording, manipulation, compression & de compression, etc.; without affecting the quality of content. The applications of watermark, is to read barcodes on products etc.

Cryptography:

The term cryptography came from [Greek](#) word *kryptós* means "hidden, secret"; and *graphein*, means "writing". It is techniques for [secure communication](#) in the presence of third parties. In cryptography the original text (plain text) is encrypted and converted into cipher text. The method used to recover original text from the cipher text is Cryptanalysis or decryption.

The types of cryptographic algorithms are:

- Secret key cryptography: It uses a single key for encryption and decryption.
- Public key cryptography: It uses one key for encryption and other key for decryption.
- Hash function:

Steganography:

The term steganography came from Greek words "Steganos" & "graphein" which together means "Concealed writing". Steganography is a science of masking a secret data within another message, image, audio, video or protocol, etc., which results in stego_media so that presence of hidden message is indiscernible and one cannot notice the subsistence of private information. The method used to recover the original message from the stego_media is called Steganalysis.

Terms used in steganography are:

Secret message: The message is to be hidden into other media.

Cover_media: It is the digital media which will cover the secret message. In this paper we are using binary image.

Stego_media: It is the combination of secret message and the cover_media.

In encryption the structure or sequence of data is altered and looks suspicious which attracts the attention of invaders. This leads to certain actions in order to decrypt it and get secret data. In steganography it hides the existence of any data. So it provides better security.

The niche of steganography is not to replace cryptography but to provide supplement to it. Rather together both can provide two level of security. The proposed algorithm in this paper is also the combination of cryptography & steganography.

2. LITERATURE SURVEY:

- Ankita Agarwal [1] has proposed a method with combination of cryptography & steganography. Before hiding a data it encrypted first using simplified data encryption standard (S-DES). After encryption that scrambled secret message is covered in an image by using alteration component technique. This technique provides two tier security.
- Anil Kumar *et al.* [2] have proposed an algorithm based on RSA algorithm & Hash-LSB algorithm. Author used RSA algorithm for encryption & Hash LSB method for hiding the encrypted data which is better than RSA-LSB technique. This algorithm gives better image quality gives high PSNR & MSE values because of less variation in image pixels and more security as encryption cannot be break without key as it is probably known to sender & receiver.
- R. Ibrahim *et al.* [3] have proposed a new algorithm to hide the data Bitmap image. In this algorithm first the secret message is to be transferred into the text file, then zip that text file, Converting the zip file & secret key into binary codes. Encode binary codes using LSB replacement mechanism. It will generate good quality of stego_image as the image distortion cannot be seen by naked eyes. Also the secret message cannot be detected easily by steganalysis. As BMP image is a bigger in size, So it can store large amount of data. Zip technique diminishes the total size of file and improves the security of file.
- Vikas Tyagi [4] has proposed a combination of cryptography and steganography technique to secure the secret data. First the secret information to be scrambled & then that data can be embedded into a cover image. This algorithm gives double layer of security as the original information cannot be extracted even after getting the data from stego-image which is actually an encrypted data. So it is secure & easy to implement practically
- S.K. Bandyopadhyay *et al.* [5] The authors have proposed alternative method for steganography using reference image for 4 bit images. The binary numbers of the data is stored in an 4 bit gray scale image and the occurrence and x, y coordinates are stored in the different data file. So for steganalysis both stego-image and data file must be available. With one of them one cannot determine the secret message. As a result this approach is more secure and time complexity of algorithm is simple and proportional to $O(n)$.
- Amanpreet Kaur, *et al.* [6] has proposed 'First component alteration technique'. Each image have an array of pixels & each pixel is a combination of Red, Green, Blue values. In 'First component alteration technique' the bits of first component (i.e. blue) of pixels of image can be substituted with bits of each character in secret data. As the visual perception of blue in R, G, B is low, and on changing it slightly will not disturb the color intensity of image. So it diminishes the picture distortion and it is unnoticeable by human eyes. Also gives increased PSNR than Pixel-Value Differencing (PVD) scheme, LSB3 etc. This scheme can integrate more secret data with improved image quality.
- V. K. Sharma *et al.* [7] have proposed improved LSB substitution mechanism to hide image in image which minimizes the revealing possibility. This approach is hiding the secret image into cover image using logic gates, which improves/increase PSNR of stego-image than First component alteration technique'. This method can be used for 24 bit color & 8 bit gray scale image by adding conversion algorithm of color image into gray scale image. Also the number of steps are less which reduces the complexity of algorithm. The limitation of this algorithm is; As the number bits increases the PSNR values will be decreased i.e. the quality of stego-image will be reduced.
- Al-Shatnawi [8], The author has proposed a new method to hide secret message by finding the same or identical bits between cover image & secret message. Also set the locations of hidden data bits to a binary file which can be helpful at the time of retrieval of secret message. By this technique the maximum bits in image remain unchanged so the quality of image will never be degraded.
- Dr. T. Ch. M. Rao *et al.* in [9] This algorithm proposed an improved data hiding technique continuing the research in [8]. This algorithm does the searching of identical bits from cover image & the secret text. The 8 bit of secret character is divided into 3 segments such as (3bits; 3bit; 2 bits) so that the first 3bits can be matched & stored in 8 bits of Red, another 3 bits in green & remaining 2 bits in blue in a RGB pixel of cover image. & all non-identical bits can be stored in least significant bits of pixel. This algorithm is highly efficient and gives better resolution than existing models.

3. PROPOSED METHOD:

In the proposed method the encryption of ASCII values of secret data before embedding is introduced. Encryption can be done by manipulating these values and that will result new data set of ASCII's. This data set is converted into binary format after that traditional least significant bit technique is applied to hide those data bits into cover_image. It gives us combination of encrypted

data and cover_image into a stego_image or stego_gramme. In this paper the cover image used is binary image. While steganalysis the data extracted by someone will be encrypted data. The data looks suspicious but it is very hard get original data by applying cryptanalysis as the numbers are manipulated not the characters, which improves the security of data. The following Figure1 & algorithm shows procedure of embedding the secret data

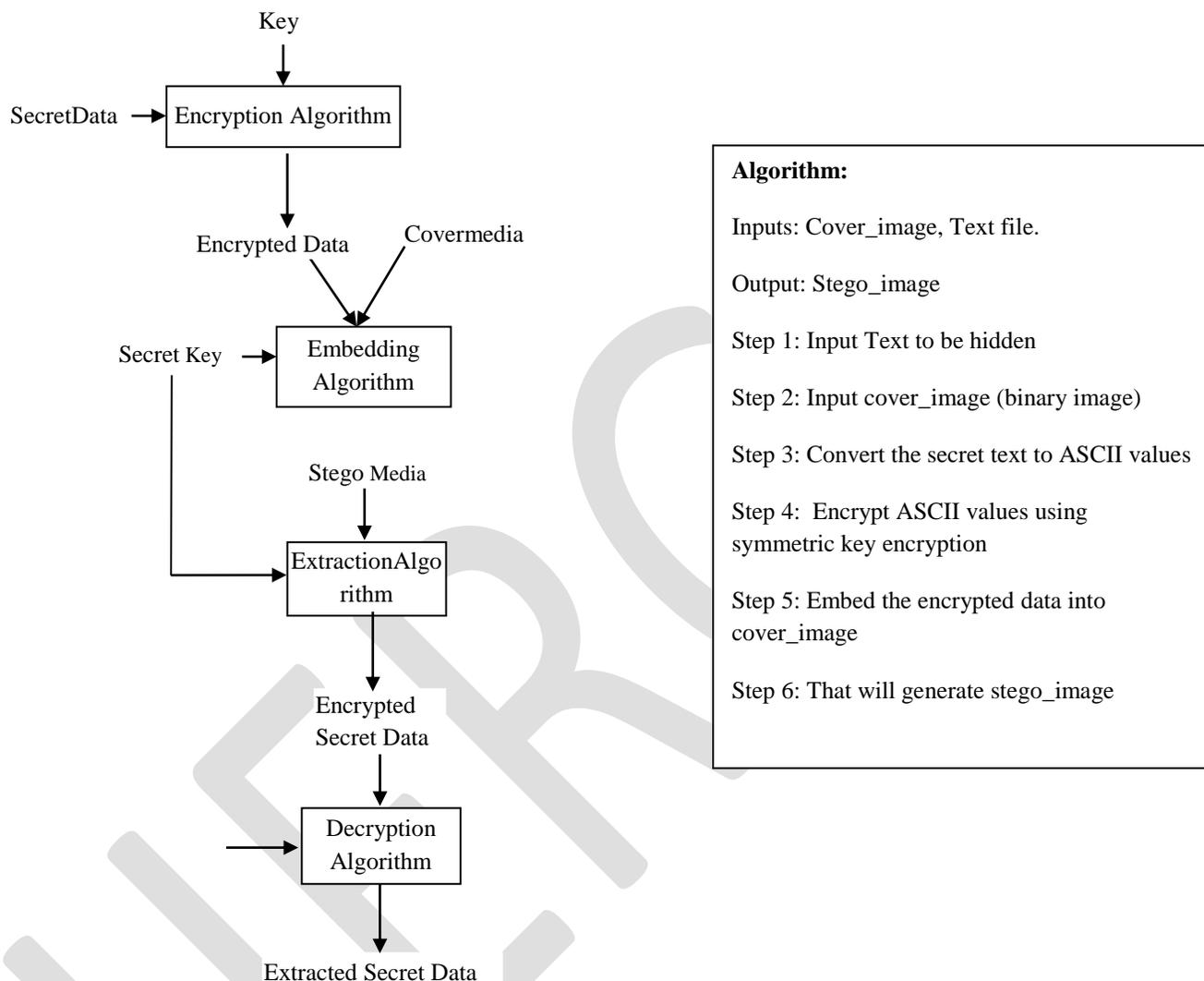


Figure 1: Procedure of proposed method

4. EXPERIMENTAL RESULTS:

The traditional LSB methods are easy to crack by the attackers by using Steganalysis. So in the proposed algorithm, encryption technique is used before LSB embedding which provides greater security because the encryption is done on ascii values of data. This proposed method is applied on binary images. This method also gives good image quality. The proposed method gives higher security for the secret data to be hidden in the cover_image. The results of algorithm are as shown in the Figure 2 & Figure 3

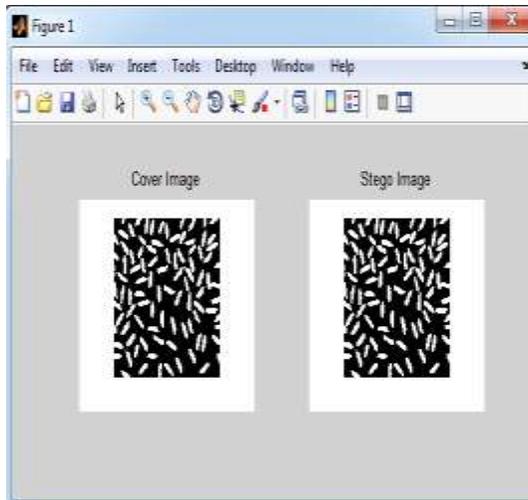


Figure 2:
Image Name: ipexrice_05.png
PSNR: 52.8957
MSE: 0.3338

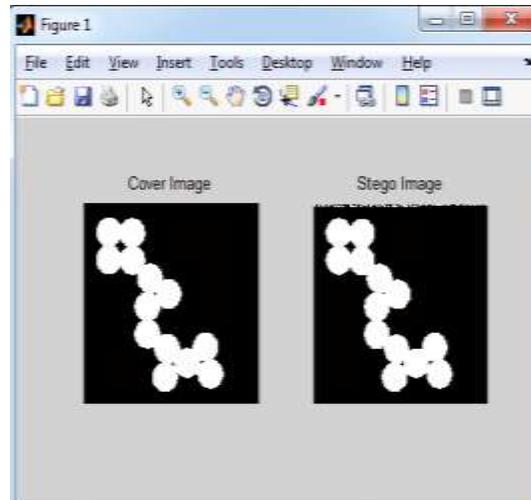


Figure 3:
Image Name: circles.png
PSNR: 49.2268
MSE: 0.7770

5. Conclusions:

Cryptography & Steganography are two major and ancient data security techniques. But only cryptographic or only steganographic techniques may lack in security sometimes. So in this proposed scheme cryptographic & steganographic LSB technique are combined to get greater data security. As the encryption is done on the numerical values that is ASCII values of data which is ultimately the binary encryption which is hardly attracted and revealed by eavesdropper. That scrambled data is then concealed by the other image by using LSB technique which is easy to implement. As a result it provides two-tier higher security. Also it provides good PSNR & better quality stego_image. In this paper the algorithm is applied on binary images only. Finally we conclude that the proposed approach gives higher security with good image quality.

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IJERGS

Light Fidelity (LI-FI) - The Future of Visible Light Communication

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Abstract-- In the present world, Wireless communication has become a utility like electricity, food and water. We use it every day and everywhere, in our business life, private life, social life and so on. Whether we are using internet at our home or office or simply in a coffee shop, we usually get irritated at the slow speeds and pray to almighty for a faster internet speed. To tackle this issue, a German Physicist- Harald Haas has introduced a solution which he calls “data through illumination”-transmission of data through LED lights which vary in intensities faster than the human eye can follow. According to him, the heart of this technology lies in the intensity and potential of the light emitting diode. This paper focuses on construction and working of Li-Fi based system and compares its performance with the existing technologies.

Keywords-- Li-Fi, Wi-Fi, visible light communications (VLC), RF (Radio Frequency), LED (Light Emitting Diode), electromagnetic spectrum, lamp driver.

INTRODUCTION

Li-Fi, is a bidirectional, high speed and fully networked wireless communications, using visible light and can be a very good complement to RF communication (Wi-Fi or Cellular network), or can even serve as a replacement in contexts of data broadcasting.

Li-Fi basically known as “light fidelity” is an outcome of twenty first century research. It is a [5G visible light communication](#) system that uses light from [light-emitting diodes](#) (LEDs) as a medium to deliver networked, mobile, high-speed communication in a similar manner as [Wi-Fi](#).

Li-Fi could lead to the [Internet of Things](#), which is everything electronic being connected to the internet, with the LED lights on the electronics being used as Li-Fi internet access points. Visible light communications (VLC) works by switching bulbs on and off within [nanoseconds](#), which is too quickly to be noticed by the human eye. This can be obtained by fitting a Li-Fi chip, to turn the light bulb into a high speed broadband communication device. Although Li-Fi bulbs would have to be kept ON to transmit data, the bulbs could be dimmed to the point that they were not visible to humans and yet still functional. Li-Fi has an amazing feature to think about i.e. - one light bulb of 1 watt can produce internet streaming of media in nearly 5 laptops.



Fig. 1. Example of Li-Fi application

The wireless technology’s huge success has led to an imminent shortage of radio frequency (RF) spectrum. The amount of data sent through wireless networks is expected to increase 10 fold during the next 4 years. However, there isn’t enough new RF spectrums to

allocate. In addition, the spectral efficiency (the number of bits successfully transmitted per hertz bandwidth) of wireless networks has become saturated. The U.S. Federal Communications Commission has therefore warned of a potential spectrum crisis.

The solution to this problem is the Li-Fi technology. It has been designed in such a way that it overcomes the disadvantages that occurs during the usage of Wi-Fi. The demonstration took place using two Casio smart phones. The data was made to exchange between the phones using light. Even though the distance was nominal, it is sure that there would be a rapid increase in the distance of transmission. The German Physicist believes that a speed of 10 Gbps can be achieved in no time. If this would be possible then a high clarity image would take about 30 seconds to download!!

If we consider this technology 10 years from now, it certainly will be very useful to us. Consider malls, roads, shops-we have light everywhere we go, so we can think of internet almost everywhere.

WHY ONLY VLC

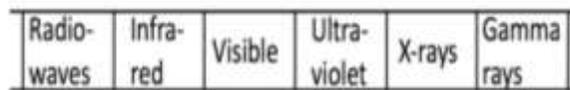


Fig. 2. Electromagnetic Spectrum

- Gamma rays cannot be used as they can be dangerous.
- X-Rays have similar health issues.
- Ultra-violet rays are good for places without people, otherwise dangerous for human beings.
- Infrared due to eye safety regulation should be used with low power.
- Visible light on the other hand is everywhere, and also has a wide spectrum.

HOW Li-Fi WORKS

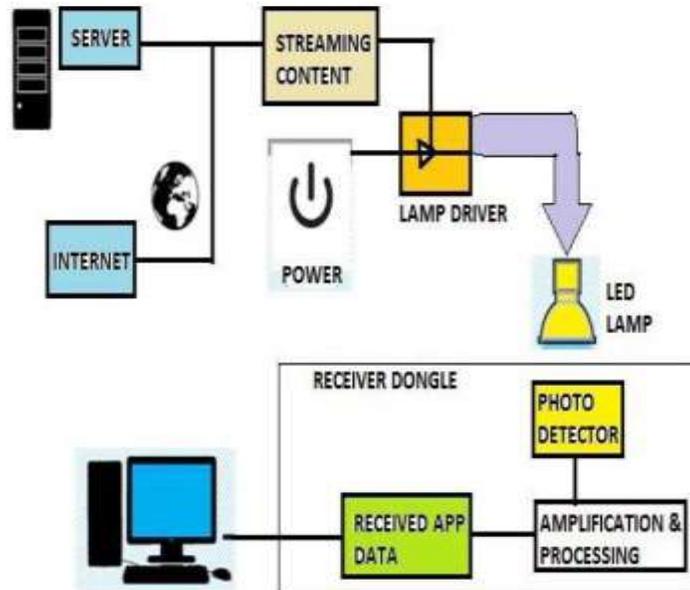


Fig. 3. Block Representation of Li-Fi

This figure describes the major functionality of Li-Fi where all light sources will have small LED lamps with lamp driver circuitry fitted inside the arrangement to make the LEDs turn ON and OFF according to the digital data being transmitted. On the receiver side a photo-detector will decode the received light signals, which is further amplified, processed and sent to the device you are using. Li-Fi can give you speed up to 1 Gbps in your home network. Also this speed is variable and can be adjusted by varying the properties of light source.

A. Stage 1 - Server

A server is a system ([software](#) and suitable [computer hardware](#)) that responds to requests across a [computer network](#) to provide, or help to provide, a [network service](#).

Internet and server run parallelly. When we type a site for example-google.com, it sends request to various servers and finally sending request to the server of google in USA. Finally after analysing the request google server sends us the required information in various packets. All this happens in a few seconds.

B. Stage 2 - Lamp Driver

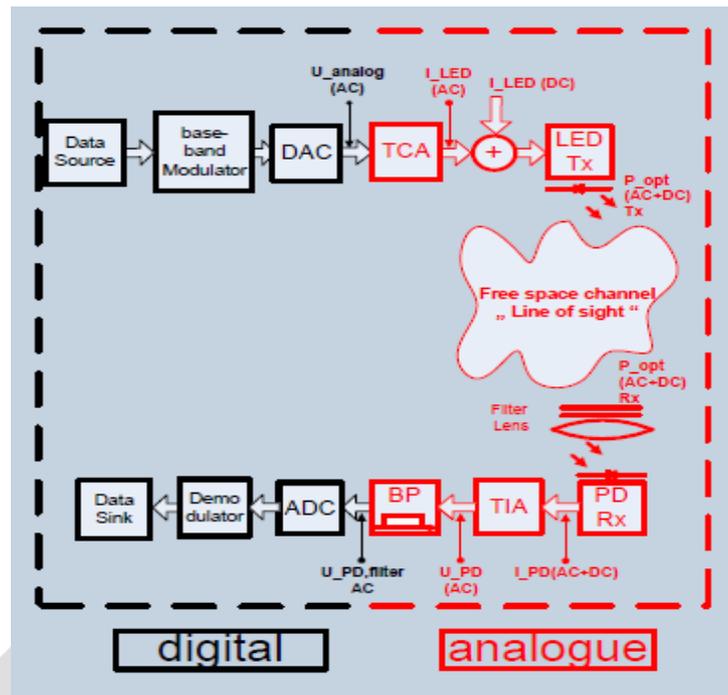


Fig. 4. Block Diagram of Lamp Driver ^[3]

Components of Light driver -

1. **Baseband modulator:** Baseband modulation and demodulation techniques are fundamental to communication systems. Baseband is actual frequency band of signal (e.g voice, video). If we consider the voice signal then voice signal band is approximately 4 kHz. That means voice signal contains frequencies ranging from 0-4kHz. Modulation is basically increasing signal frequency. This means voice base band of 4 kHz can be uplifted to let's say, 1900 kHz

2. **DAC:** In [electronics](#), a digital-to-analog converter (DAC, D/A, D2A or D-to-A) is a function that converts digital data (usually binary) into [analog signal](#) ([current](#), [voltage](#), or [electric charge](#)) ^[12].

3. **TCA:** A trans-conductance amplifier (gm amplifier) puts out a current proportional to its input voltage. In [network analysis](#), the trans-conductance amplifier is defined as a voltage controlled current source (VCCS). It is common to see these amplifiers installed in a [cascade](#) configuration, which improves the frequency response.

4. **ADDER:** It simply adds a dc current to the TCA output.

C. Stage 3

An overhead lamp fitted with an LED with signal processing technology streams data embedded in its beam at ultra-high speeds to the photo-detector.

D. Stage 4

A receiver dongle then converts the tiny changes in amplitude into an electrical signal, which is then converted back into a data stream and transmitted to a computer or mobile device.

ADVANTAGES OF Li-Fi

- *Capacity:* Visible light spectrum is 10000 times bigger than RF spectrum. It is predicted that we will run out of the RF spectrum by 2020.
- *Security:* Light cannot penetrate walls, but radio waves can, thus security is higher in using Li-Fi.
- *Efficiency:* The 1 million radio masts base stations consume a lot of energy, which indeed is used to cool the base stations and not to transmit radio waves. These base stations have poor efficiency upto only 5%. Whereas Li-Fi uses the 2.4 billion led lamps which offers a much higher efficiency.
- *Transmission of data:* Wi-Fi transmits data serially and Li-Fi transmits thousands of data streams parallelly thus offering higher speed ^[6].
- *Infrastructure:* It is already existing. Inexpensive devices, mostly powered by LED, so it is cost effective, compared to base stations.

APPLICATIONS OF Li-Fi

1. *Intelligent Transport System:* LED equipped headlight and backlights, where the cars can talk to each other and react faster when they are Li-Fi enabled. Traffic lights and street lights can talk to each other and also to the cars which can indeed reduce the number of accidents ^[9].
2. *Underwater Awesomeness:* The RF cannot penetrate in the water while the visible light can. Divers can use their torches enabled with Li-Fi technology to communicate with each other ^[8]. Also, the submarines can transmit and receive information from the ships that are above it, through transmission and reception of light.
3. *Indoor Navigation:* Li-Fi can be used to navigate through any hospital or office building that has Li-Fi enabled LED lighting, through the user's smart phones.
4. *Oil and gas wells:* Testing and maintaining of gas wells can be performed with greater ease and efficiency. This can be obtained by placing the Li-Fi transmitter at the bottom of the well and the receiver at the surface, for real-time continuous monitoring.
5. *Intrinsically safe environments:* This can be used in petroleum and chemical industries and other environments where the usage of radio waves or other transmission frequencies can be hazardous.
6. *Boon for Hospitals:* Operating rooms in hospitals do not allow Wi-Fi over radiation concerns, and also there is lack of dedicated spectrum. Wi-Fi is in place in many hospitals, but interference from cell phones and computers can block signals from the monitoring equipment. Li-Fi solves both problems: lights are not only allowed in operating rooms, but tend to be the most glaring fixtures in the room. It can also be used for advanced medical instruments.
7. *Enjoy your Flight:* 'Kindly switch off your Mobile Phones', is the primary instruction of flights globally, during takeoff and landing. The reason being the electromagnetic interference caused to the aircraft systems by the radio waves emitted from mobile phones, thus hindering our online operations. Li-Fi provides a solution to this as it can use the light present in the aircraft lobby for data transmission.

CONCLUSION

Li-Fi technology thus holds the solution to various shortcomings of radio based wireless communication systems. It has a wide range of applications. It also supports green environment, as it uses Visible Light Communication for transmission of data, which is harmless and available everywhere. Thus if the idea and technology of Harald Hass are put to practical use, every LED bulb can be used as a Li-Fi hotspot for transmitting and receiving wireless data.

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WIND ENERGY CONSERVATION WITH GRID LEVELING FOR TRANSIENT LOADS

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Abstract: The paper discusses the maximum power point tracking in a grid connected PMSG based WECS. To the variable-speed wind turbine, if the rotor speed can always be adjusted to make the turbine operate under optimum tip speed ratio then it means that the turbine realises the MPPT operation. For this purpose the P & O tracking algorithm is adopted. In addition to fully recognise the wind energy it is necessary to integrate it to the grid and hence grid parameters are regulated as well using PI controller. The proposed system is developed in Matlab environment.

Keywords: Wind Energy Systems, HAWT, PMSG, MPPT, PI Controller, Voltage, Current regulation, Grid Integration.

INTRODUCTION: The potential of renewable energy sources is enormous as they can in principle meet many times the world's energy demand. The depletion of fossil fuels and concomitant global climate change has compelled nations to seek new non-polluting ways to produce energy. Among various kinds of renewable energy, wind energy is treated as the most challenging one because of its free availability, policies fostering, and the maturity of turbine techniques. Renewable energy especially wind energy conversion systems have drawn an increasing interest in the past years since they could be considered as confirmed alternatives for sustaining the continuous growing energy needs. The growth of Renewable Energy in India is enormous and Wind Energy proves to be the most effective solution to the problem of depleting fossil fuels, importing of coal, greenhouse gas emission, environmental pollution etc. Thus, wind energy conversion technology has become the research focus of researchers all over the world.

In modern wind energy conversion system two turbine structures are preferred: DFIG and PMSG. Although both of these structures feature improved efficiency, reduced aerodynamic loads, and ease of active and reactive power regulation, latter is much more reliable than the former, considering the possibility of cancellation of gearbox. Therefore, a direct-drive-PMSG based WECS is considered in this paper. To harvest more energy from the variation winds, MPPT control should be included in the power control system. The different methods of MPPT system are defined in [9]. However till date, there is no conclusive evidence is available as to which MPPT system is likely to provide a more efficient and less expensive in literatures.

WIND ENERGY CONVERSION SYSTEM TECHNOLOGY

A WECS is a structure that transforms the kinetic energy of the incoming air stream into electrical energy. Modern Wind Energy Conversion System (WECS) is shown in Figure 1

The energy conversion chain is organised into four subsystems:

- **Aerodynamic subsystem**, consisting mainly of the turbine rotor, which is composed of blades, and turbine hub, which is the support for blades;
- **Drive train**, generally composed of: low-speed shaft – coupled with the turbine, hub, speed multiplier and high-speed shaft – driving the electrical generator;
- **Electro Magnetic subsystem**, consisting mainly of the electric generator.
- **Electric subsystem**, including the elements for grid connection and local grid.

The circuit diagram of the proposed system as in figure 3.1 includes Variable speed wind turbine, Permanent Magnet Synchronous Generator, power electronic components which includes rectifier, inverter, boost converter and the control system which is a PI controller. The de description of the circuit diagram parameters are described in the following sections.

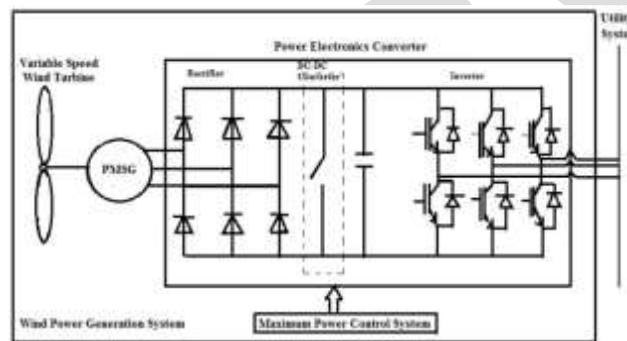


Figure 1: Circuit Diagram of the proposed system

The tip speed ratio of a wind turbine is a variable expressing the ratio between the peripheral blade speed and the wind speed. It is denoted by λ and computed as below,

$$\text{TSR} = \frac{(\text{Blade length} * \text{rotor speed})}{\text{wind speed}} \quad (1)$$

Where, the blade length is denoted as R , the rotor speed as ω , the wind speed is v and the power extracted by a wind turbine whose blade length is R is expressed as,

$$P_T = \frac{1}{2} \rho \pi R^2 C_p(\lambda) v^3 \quad (2)$$

$$\text{Therefore, } C_p = 4a(1 - a)^2 \quad (3)$$

The maximum value of C_p occurs for $a = 1/3$ and hence $C_{pmax} = 0.59$ known as the Betz limit and represents the maximum power extraction efficiency of a wind turbine.

Working:

- (a) When wind speed is below cut-in speed the machine does not produce power. If the rotor has a sufficient torque to start, it may start rotating below this wind speed. However, no power is extracted and the rotor rotates freely. In many modern designs the aerodynamic torque produced at the standstill condition is quite low and the rotor has to be started (by working the generator in the motor mode) at the cut-in wind speed.
- (b) At normal wind speeds, maximum power is extracted from wind. The maximum power point is achieved at a specific (constant) value of the TSR. Therefore, to track the maximum power limit point, the rotational speed has to be changed continuously in proportion to the wind speed.
- (c) At high winds, the rotor speed is limited to maximum value depending on the design limit of the mechanical components that are the turbine blades and hub. In this region, the power co-efficient is lower than the maximum and the power output is not proportional to the cube of the wind speed.
- (d) At even higher wind speeds, the power output is kept constant at the maximum value allowed by the electrical components.
- (e) At a certain cut-out wind speed or otherwise known as furling wind speed, the rotation of turbine blades are stalled and hence no power generation is done in order to protect the system components.

The output power evolves according to Equation (2), proportionally with the wind speed cubed, until it reaches the wind turbine rated power. This output power from turbine is fed into the PMSG. PMSG is favoured more and more in developing new designs because of its higher efficiency, high power density, availability of high-energy permanent magnet material at reasonable price, and the possibility of providing smaller turbine diameter in direct drive applications.

Then power conversion for wind energy systems occurs in two stages. The first stage is rectification, where the alternating current (AC) is transformed into direct current (DC). The boost converter steps up the input DC voltage. The second stage is inversion where the direct current is transformed back into alternating current. PI controller is adopted in this system as this will optimize the conversion coefficient to maintain maximum power output. The inputs to the controller are the wind speed and voltage, current that are to be fed into the grid. The PI controller regulates the inputs and feeds the error signal to PWM. The PWM scheme is most commonly used because of the possibility of voltage regulation, but it will also cancel out multiples of the third harmonic to help improve output power quality. The inverter receives the switching signals from the PWM which in turn regulates the incoming DC link voltage and current and feeds it into the grid. The wind speed tracking is also shown.

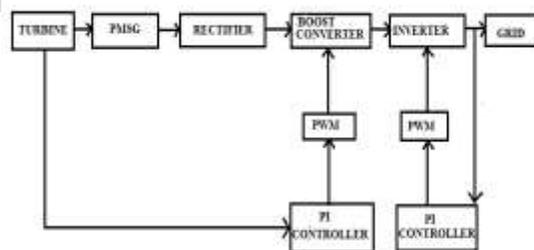


Figure 2: Block Diagram of the Proposed Grid-Connected WECS

The basic device in the wind energy conversion system is the wind turbine which transfers the kinetic energy into a mechanical energy. The wind turbine is connected to the electrical generator through a coupling device gear train or a direct drive system. The output of the generator is given to the electrical grid by employing a proper controller to avoid the disturbances and to protect the system or network. The detailed description of various blocks are already discussed in the above sections

SIMULATION RESULTS

This chapter presents the results of the proposed wind energy conservation system with grid levelling for transient loads. Simulation results are shown below in the following sections.

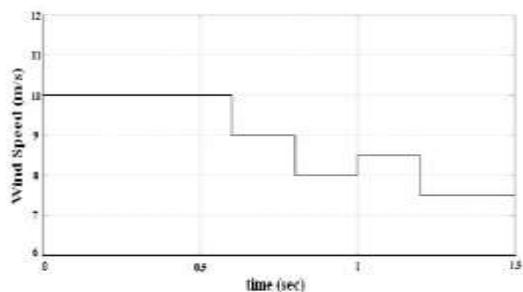


Figure 3: Tracking of wind speeds with varying time

The intended contribution of this paper is to find out a relation between the MPPT speed and the transient loads (torque ripples). Hence a graph showing the waveform of the tracking of wind speed with time is shown in figure 3 generated torques is shown in figure 4

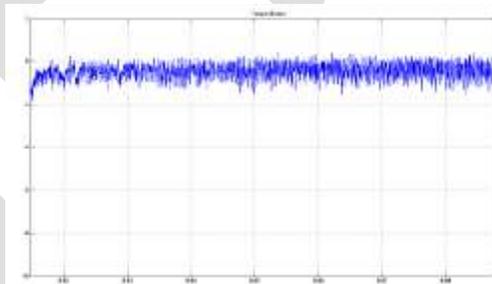


Figure 4:Generated Torque

The WTS controller outputs a torque command which contains the turbine dynamic information to the inverter, which is working in torque control mode. Because the PMSG is driven by this inverter, it will generate a torque that is equal to that of a real wind turbine. The validity of the wind turbine emulator has already been verified in the previous work. As mentioned earlier the output from the wind energy system is integrated with the grid in order to fully utilise its potential.

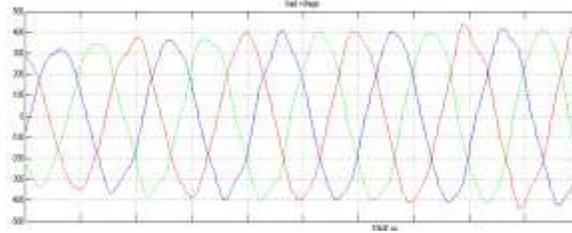


Figure 5: Input Voltage to Grid

The voltage fed into the grid from the inverter. The current waveforms that are free from ripples which are obtained as outputs from the inverter are also given to the grid are shown in figure 6.

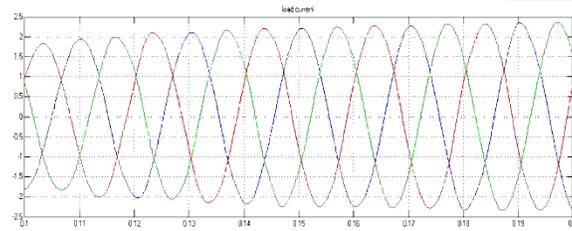


Figure 6 : Input current to grid

The first plot is the output voltage, as can be seen, without the harmonic filters; the output is essentially a square wave due to the switching nature of the inverter. The second plot is of the output current, it is not in phase with the output voltage. Both the unclean output voltage and current lead to an unstable output active power (P), and a large, also unstable, reactive power (Q) output

CONCLUSION

The main focus of this paper is on proposing a systematic study on the MPPT system to get a good compromise between the MPPT speed and the transient load. Furthermore, to confirm that the WECS can operate at the designed system bandwidth, P and O control method is proposed. The MPPT controller helps in tracking wind speeds varying with time. In addition, the system includes a PI controller to control the turbine speed and the grid voltage on the generator side and the grid side respectively. The controller further inputs pulses to the PWM inverter, the output of which are fed to grid

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Negative Role of Atmosphere On Free Space Light Communication

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Abstract— When every a communication system is to be designed whether wireless or wired, the first and the most important issue which is to be considered is about the features possess by the medium through which communication will take place and whether those features will induce a negative role on it or not. In free space light communication technique, it is clear by the name that the atmosphere is being used as a medium for carrying or transferring data using infrared carrier. Various atmospheric phenomena do play a negative role on light communication and what we term them as attenuation phenomenal. This paper deals with such various phenomena and its negative role on free space light communication technique. Also why IR wave is preferred for free space light communication is also explained.

Keywords— Free space light communication (FSLC), Infrared wave (IR), penetration depth (Dp), signal to noise ratio (SNR), bit error rate (BER).

INTRODUCTION

At one time, connecting all of the people at all time around the world was a nice idea but completely impractical. Even communication using light was never imagined that some day it would take a real face. Today's commercially available FSLC systems operate in the near IR spectral windows located around 850 nm and 1550 nm. Even a clean, clear atmosphere is composed of oxygen and nitrogen molecules. The weather can contribute large amounts of water vapor. Other constituents can exist, as well, especially in polluted regions. These particles can scatter or absorb infrared photons propagating in the atmosphere.

ADVANTAGES OF USING LIGHT OVER RADIO WAVE

Free space light communication versus radio communication

Advantage of FSLC over radio communication is its no interference with external fields (magnetic and electric) as well as they do not cause EMI themselves. No problem jamming. Another advantage is that it can carry data over a very long distance than radio waves without using repeaters frequently. Below Fig.1 and Fig.2 shows the difference between them.

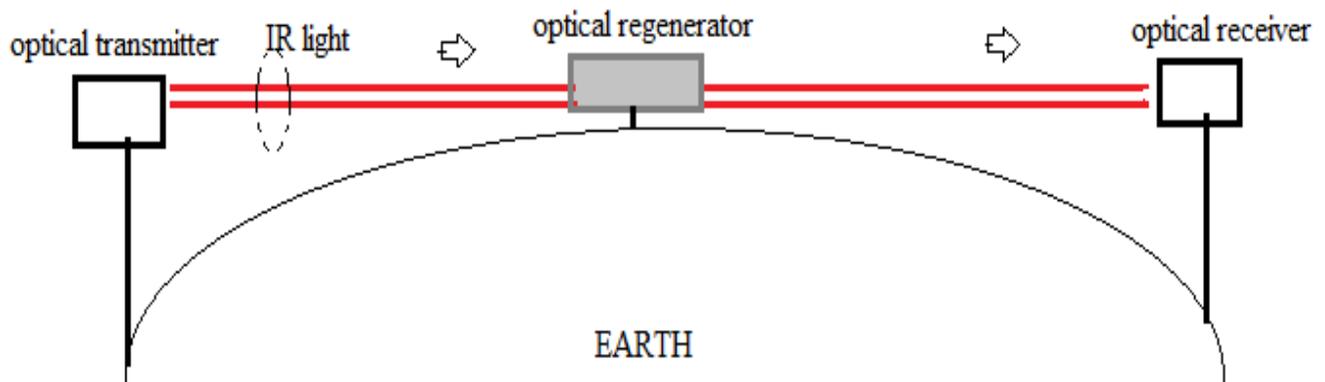


Fig.1: FSLC using IR wave

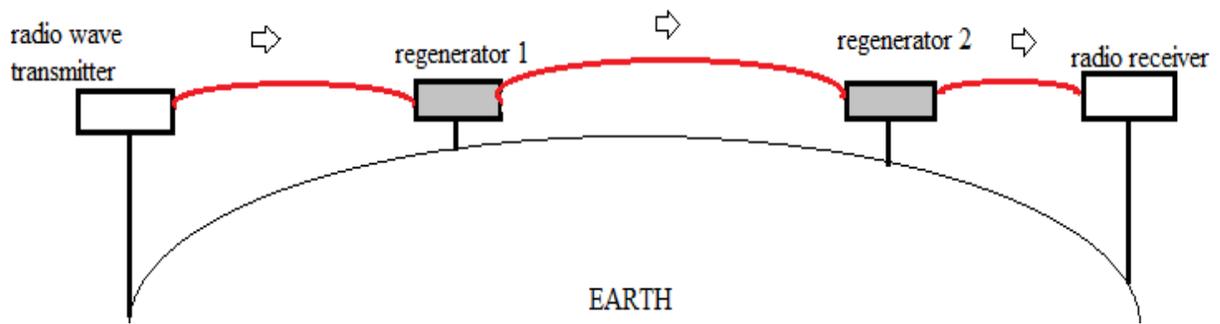


Fig.2: Radio Communication

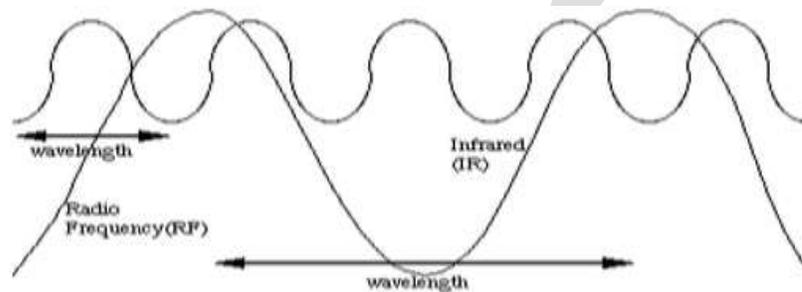


Fig.3. depicts an infrared energy wave and a radio energy wave

PENETRATION POWER OF IR WAVE AND DEPENDENCY OF RECEIVER'S POWER

Penetration power of IR and receiver unit's light capturing strength plays a major role in overcoming various atmospheric attenuation.

Penetration power of IR wave used in FSLC technique

Knowledge about IR penetration depth (D_p) is very important while designing FSLC and separation distance between transmitter and receiver. IR wave has high penetration power than visible light. Hence communication using IR wave is highly preferred. IR can easily penetrate and can pass well when atmospheric condition is not heavily bad. IR suffers from high scattering, distortion, absorption and blocking when atmospheric condition is very bad. We may think that increasing the strength/intensity of transmitted IR will help overcome such penetration loss. This is true up to some level. This means that if the power of IR which is being transmitted is increased by 2 times, do not indicate that the penetration depth is also increased by 2 times. Penetration will only increase by approximately 5%. For example, if 100mW laser penetrates a thickness of 10mm and if same laser is driven at 200mW, then penetration dept will be 10.5mm to 10.9mm approximately. This experiment can be tried using your finger and a laser pointer of power 5mW (legally approved value by FDA and will cause no harm to human finger and tissue). Numerically (D_p) has been illustrated below with figure 4.

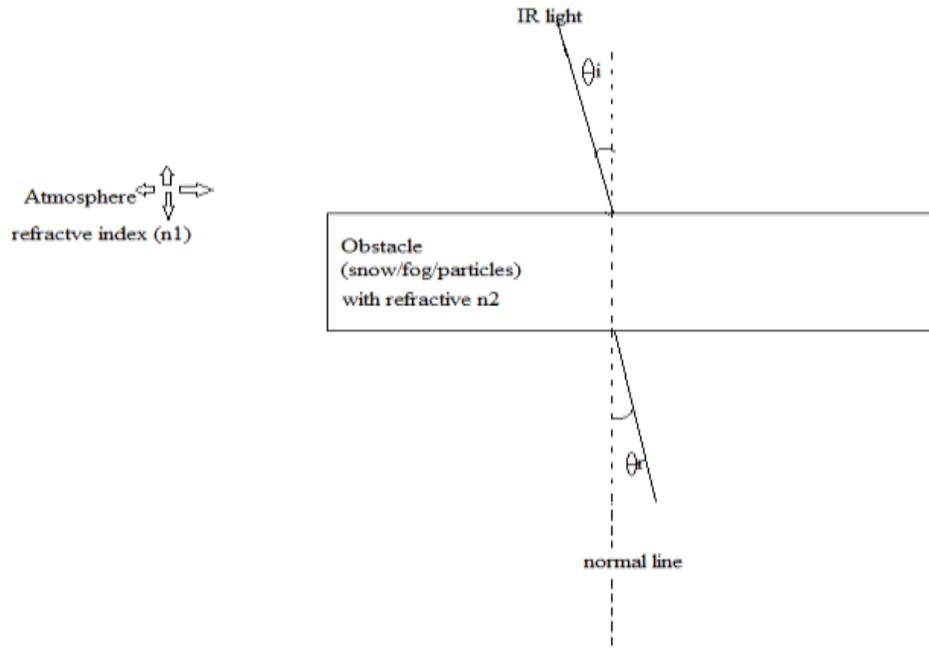


Fig.4: Diagrammatic illustration of penetration depth of IR

$$D_p = \frac{\lambda}{2\pi\sqrt{(n_1^2 \sin^2 \theta_i - n_2^2)}} \quad (1)$$

Where

λ is wavelength of IR, θ_i is angle of incidence of IR perpendicular to the surface of obstacle, n_1 refractive index of incidence medium, n_2 refractive index of refractive medium.

Effective penetration ($D_{p_{eff}}$) made by IR is given below where (d_{\perp}) is depth of perpendicular penetration and (d_{\parallel}) depth of parallel penetration.

$$D_{p_{eff}} = (d_{\perp} + d_{\parallel}) / 2 \quad (2)$$

$$d_{\perp} = \frac{n_1^2 \cdot n_2 \cdot \cos \theta_i}{(n_1^2 - n_2^2)} \times \frac{\lambda}{\pi\sqrt{(n_1^2 \sin^2 \theta_i - n_2^2)}} \quad (3)$$

$$d_{\parallel} = \frac{n_1^2 \cdot n_2 \cdot \cos \theta_i}{(n_1^2 - n_2^2)} \times \frac{\lambda}{\pi\sqrt{(n_1^2 \sin^2 \theta_i - n_2^2)}} \times \frac{2n_1^2 \cdot \sin^2 \theta_i - n_2^2}{(n_1^2 - n_2^2) \cdot \sin^2 \theta_i - n_2^2} \quad (4)$$

Dependency of receiver's power

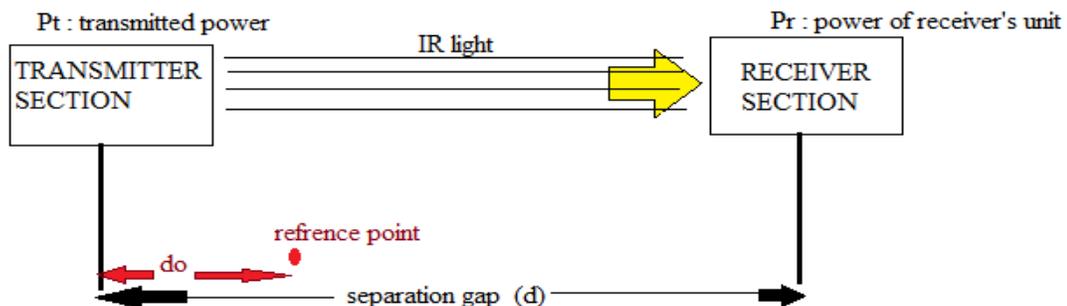


Fig.5: illustration of various factors on which receiver's power depends

In above fig.4, (d_o) represent the distance from the transmitter unit up to the reference point. The reason for measuring (d_o) from transmitter's side is due to the fact that when a signal is transmitted, the strength of the transmitted signal (P_t) is high at this region. Afterward it decreases as it passes through the atmosphere. Dependency of receiver's power ($P_r(d)$) is given as :

$$P_r(d) \propto P_t \cdot \left(\frac{d_0}{d}\right)^2 \tag{5}$$

Typically

$d_0 = 1$ meter ; for indoor communication using IR light.

$d_0 = >100$ meters to 10km ; for outdoor.

ATTENUATION AND SCATTERING

Attenuation and scattering are 2 main causes of light power distortion or weakening.

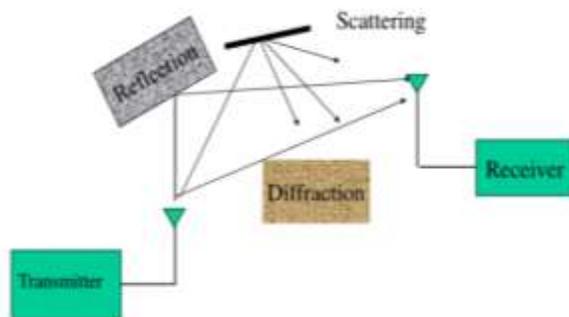


Fig.6: Attenuation and scattering

Attenuation

Attenuation is a phenomenon which contributes in loss of signal strength. It is caused in indoor as well as in outdoor light (IR) communication applications. Attenuation in outdoor application is based on straight forward calculations. But in contrast, indoor attenuations are very complex as indoor light signals suffers from multiple bounces and penetration through variety of materials causing different levels of attenuations. Below is the table which describes basic objects which causes attenuation and level of attenuation in (dB).

TABLE 1: basic objects causing attenuation and corresponding attenuation level

<i>Objects</i>	<i>Attenuation level (dB)</i>
Glass	2
Wall	2
Human body	3
Wood	3
Marble	5
Metal	6
Concrete	10-15
Low fog	25
Heavy fog	120
Rain	24-40

Scattering

Scattering is a phenomenon in which the light's direction is changed or shifted after striking any dust particle of any size. Based on the size of particle, scattering is divided into 3 sub categories (Rayleigh, Mie and Non-selective).

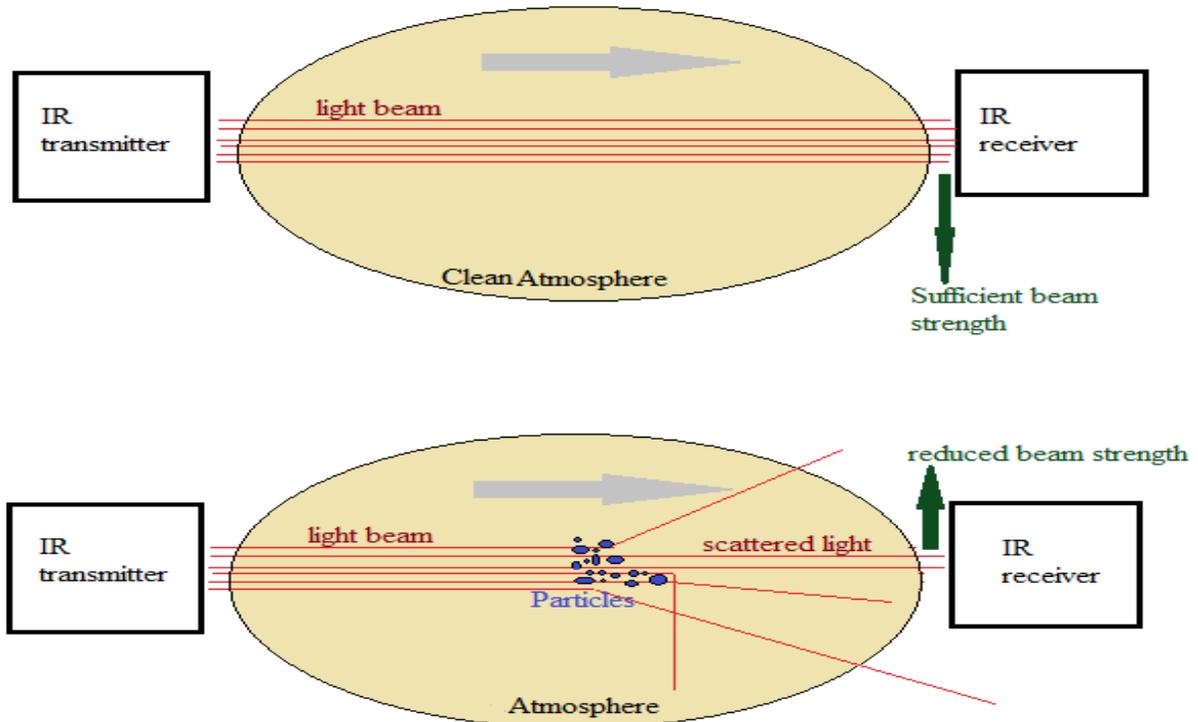


Fig.7: Scattering and its negative effect on receiver

Rayleigh scattering: Caused by those particles whose size is less than wavelength of the scattered light. Example of such particles is air molecule. It occurs at higher atmospheric level. Near IR are scattered more than far IR light.

Mie scattering: Caused by those particles whose size is same as wavelength of the scattered light. Example of such particles is aerosol. It occurs at lower atmospheric level. It influences the complete light spectrum from UV to IR.

Non-selective scattering: Caused by those particles whose size is larger than wavelength of the scattered light. Example of such particles is fog and clouds. It occurs at lowest atmospheric level. Has least effect on IR.

IMPACT OF VARIOUS ATMOSPHERIC ATTENUATIONS ON FSLC COMMUNICATION

Impact of sound on IR light

Sound does affect IR light. Depending on the nature of the medium ie: whether foggy atmosphere or pure atmosphere, sound has less or more significant role on IR light. We know that refractive index of light varies with pressure and a sound wave is nothing more than a pressure wave travelling through the air. Perhaps a picture might explain why the refractive index will change with pressure.

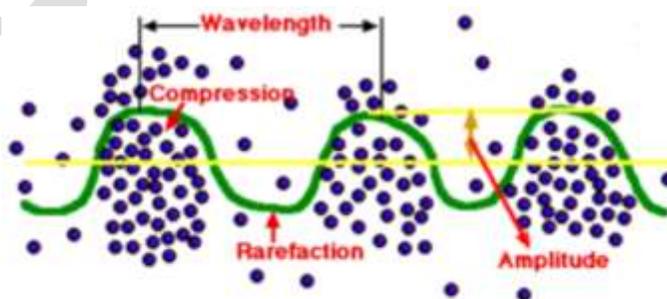


Fig.8: impact of sound on IR light

Impact of fog on IR light

Fog is a visible aggregate of minute water droplets suspended in the atmosphere at or near the surface of the earth. When air is almost saturated with water vapour, this means that the relative humidity is close to 100%, and that fog can form in the presence of a sufficient number of condensation nuclei, which can be smoke or dust particles. There are different types of fog. Advection fog is formed through the mixing of two air masses with different temperatures and/or humidity. Another form is radiative fog. This is formed in a process of radiative cooling of the air at temperatures close to the dew point. Some fogbanks are denser than others because the water droplets have grown bigger through accretion.

In fog conditions droplets can absorb more water and grow considerably in size. There are different ways to classify fog as done in below table 2.

TABLE 2: classification of fog

<i>CATEGORY</i>	<i>RANGE</i>
Category I:	visual range 1220 meters
Category II:	visual range 610 meters
Category IIIa:	visual range 305 meters
Category IIIc:	visual range 92 meters

Fog attenuation model:

Attenuation due to fog is a complex function of density, extension, refractive index and wavelength. Normalized fog attenuation (A) concept only deals with the signal wavelength (λ) and temperature of the foggy region (t).

$$A = [- 1.347 + 0.0372 \lambda + (18/\lambda) - 0.022t] \tag{6}$$

This is valid only for (3mm < λ < 30cm) and (-8⁰C < t < 25⁰C)

Total fog attenuation (α_{fog}) concept includes the concept of fog density (D) (in g/m³) and for range (in Km).

$$\alpha_{fog} = [A] X [\text{fog density (in g/m}^3)] X [\text{fog range (in Km)}] \tag{7}$$

As liquid content decrease, fog density decreases and visibility increases. Thus the IR light receiver can capture or collect much amount of IR light. Visibility is the defined as the distance from an observer at which a minimum contrast ration (c) between black target and bright background is equal to 0.2 (ie: target distinction drops by 2%).

$$\text{Visibility (v)} = \frac{4.343}{\alpha} \ln \frac{1}{c} = \frac{16.99}{\alpha} \tag{8}$$

$$V = 0.02D^{-0.6} \tag{9}$$

Relating equations (7) and (8),

$$\alpha_{fog} = KM \tag{10}$$

Where K is attenuation coefficient

Impact of atmospheric gases on IR light

Effect of atmospheric gases on long wave IR waves depends on amount of gas by volume, signal's wavelengths. Different gas molecules absorb different wavelength. Composition of atmosphere includes (N₂, O₂, H₂O, CO₂, CH₄, N₂O, O₃) and chlorofluorocarbon CFCs. Absorption of UV is very high by O₂ and O₃ gases. Atmosphere is highly transparent to visible light because its corresponding photon energies are too low for electrons transition. A gas molecule will absorb radiation of specific wavelength only if it can supply energy that can be used to increase internal energy level of the molecule. At this higher state, 3 phenomenal are associated: vibration, rotational and electronic. After absorption of IR light by a molecule if it starts vibrating then its termed as vibration transition and if absorption of IR leads to the generation of free electrons then such transition is termed as electronic.

TABLE 3: transition phenomenon associated with gas molecules after absorption of IR

Electronic transition	Vibration transition	Rotational transition
<ul style="list-style-type: none"> Transition of electrons to higher electronic state or free state after absorption of IR. 	<ul style="list-style-type: none"> Atoms/molecules vibrate after absorption of IR. 	<ul style="list-style-type: none"> Atoms/molecules start rotating or spinning after absorption of IR.
<ul style="list-style-type: none"> Generally caused by UV rays 	<ul style="list-style-type: none"> Caused by near IR rays. 	<ul style="list-style-type: none"> Caused by far IR

N_2 and O_2 are transparent to IR because they have uniform distribution of charges and as a result they do not undergo any of the 3 transition very easily. CO_2 is good absorber of IR because of its easy bending and stretching mechanisms.

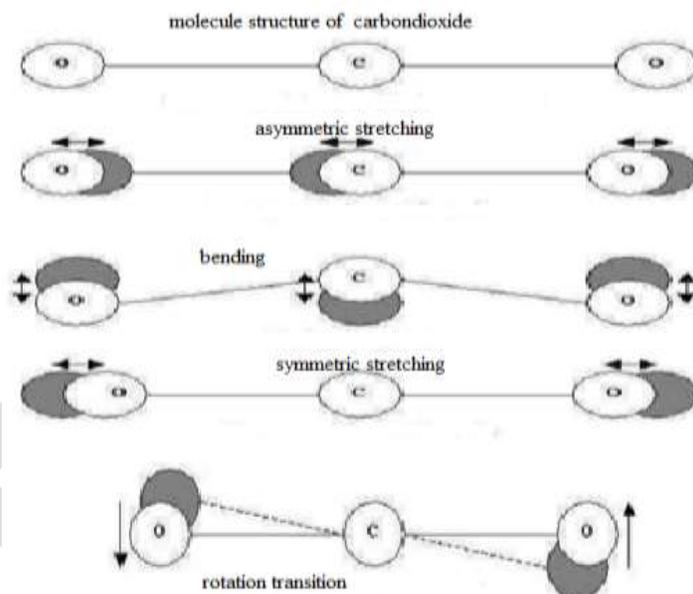


Fig.9: Vibration, rotation, stretching transition associated with carbon dioxide molecule

Water (H_2O) is the main absorber of IR. Water content varies about 100 fold between cold and dry desert. Transition happens in various ways in H_2O molecule after absorption of IR. Gaseous phase is associated with vibration and stretching transition. Liquid phase is associated with rotation transition.

Crosstalk between two IR paths

If there is 1 system (ie: transmitter and receiver) and communicating with IR signal then there is no problem of interference. But if 2 systems communicate using IR light then there can arise crosstalk phenomena. Cross talk means cross connection between 2 systems belonging to the same category (in this case both of them are using IR light as data carrier).

single FSLC system using IR light :: no cross talk

2 FSLC communicating :: Arise a problem of cross talk

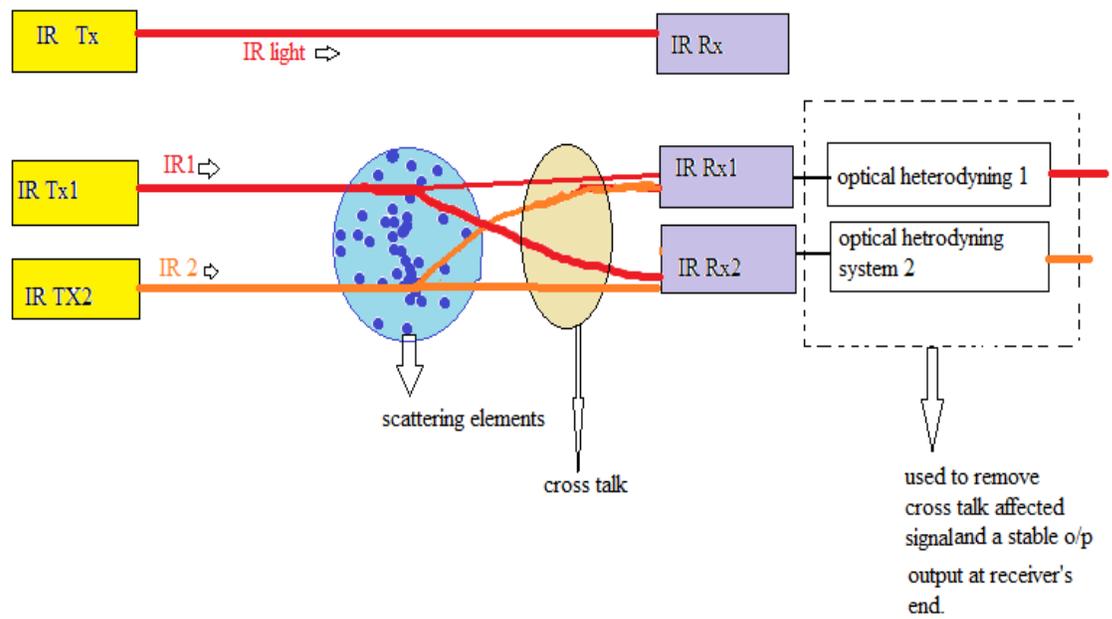


Fig.10: illustration of cross talk

Impact of rain on IR light

Rain reduces visibility. It causes a shift in velocities of light wavelengths. Rain effects signals which are above 10GHz. Higher the frequency of a signal, more power will be absorbed by water droplets. Polarization plays a vital role. Horizontal polarized light gets highly attenuated than vertical polarized light. This is due to the shape of the rain drops.

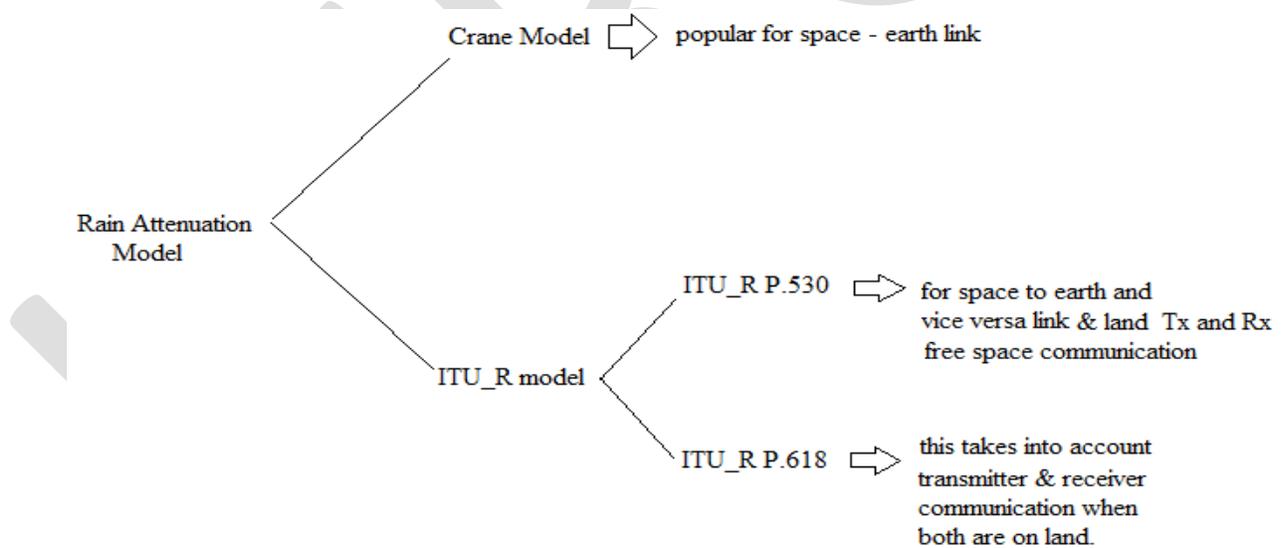


Fig.11: Popular rain attenuation models

Calculation of rain attenuation ($A_{0.01}$) using ITU_R P.530 Model:

Step 1:

The first step is to measure rain rate. This model is used if the rain rate exceeds 0.01% of time. Thus rain rate which is measured in mm/hr is represented as $R_{0.01}$. Rain rate of a particular can be obtained by consulting rain measuring authorities (who monitors weather changes each day and keeps a track of it) of that area.

Step 2:

Compute specific attenuation (γR) in dB/Km. Specific attenuation is the amount of attenuation occurred due to rain per unit length of the signal path.

$$\gamma R = K \cdot R_{0.01} \tag{11}$$

where K is frequency attenuation coefficient.

Step 3:

Calculate the effective distance D_{eff} which is defined as the distance over which rain cell(s) is/are located.

$$D_{\text{eff}} = d \cdot r \tag{12}$$

Where

D = separation distance between receiver and transmitter.

$$r \text{ (path reduction factor)} = 1 / \left(1 + \frac{d}{35 \cdot e^{-0.01(R_{0.01})}} \right) \tag{13}$$

Consider $R_{0.01} = 100$ if $R_{0.01} \geq 100$ mm/hr. If not, then take values of $R_{0.01}$ provided in the rain rate table.

Step4:

$$\text{Rain attenuation} = A_{0.01} = \gamma R \cdot D_{\text{eff}} \quad (\text{dB/Km}) \tag{14}$$

GRAPHICAL REPRESENTATION OF FSLC PERFORMANCE BASED ON ATTENUATION FACTORS

In India, monsoon strikes during June month and continues till the month of September. And we all know rain puts FSLC performance completely down. Thus FSLC face a drastic rise and fall in its performance throughout the complete year.

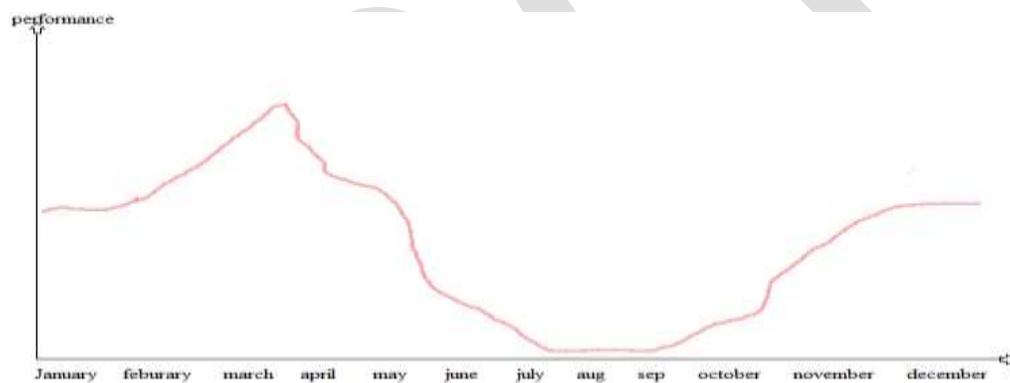


Fig.12: Performance versus months

During the day time especially during the afternoon time (in India), FSLC communication suffers from stray/ unwanted lights received at the receiver unit. Thus during day time, performance of FSLC goes down.

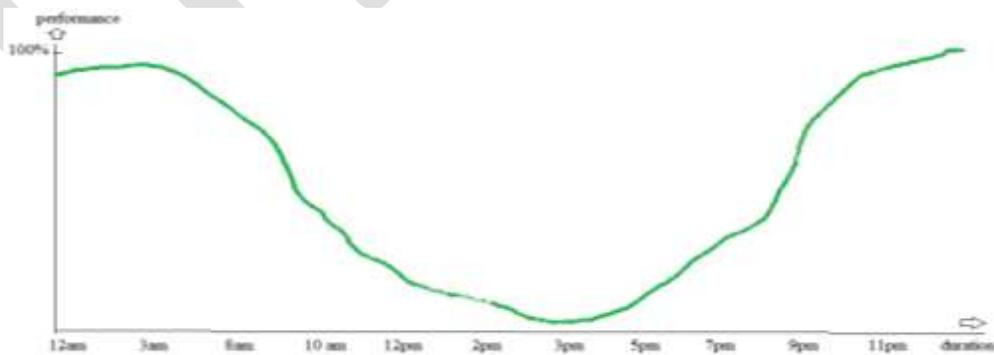


Fig.13: Performance versus day durations

As rain increases, water droplets in the atmosphere increases and thus visibility decreases. Less rain more is the visibility and higher will be the performance of FSLC.

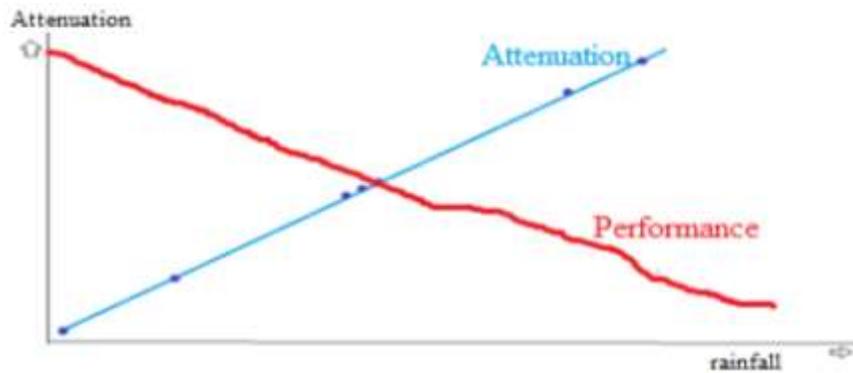


Fig.14: Attenuation versus rainfall

CONCLUSION

Through this paper I have tried to put a clear explanation that why only IR carrier is used in FSLC and its comparison with radio wave. Also various atmospheric attenuations which highly damage the performance of FSLC technology is clearly illustrated.

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Raspberry Pi based home door security through 3g dongle

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Abstract-The system is being developed to connect any door with the internet, and USB camera will be fixed in front of the door. Here we using PIR sensor for human detection. In a case that one is sitting inside the home and a visitor is at his door steps, if the visitor pressing the alarm switch (pushbutton) PIR sensor will be enable and sense the human entry at nearby the door, at that time USB camera will be turn on for 10sec and records the human's face at nearby the door. Then the captured video will be transmitting to the authorized person's system by using 3G dongle. that 3G dongle has a unique IP address, by using that IP address the authorized person will access that 3G dongle from anywhere/any system for receiving the captured video. So after that person seen the visitors face via web and if he willing to allow the visitor inside the home he can press the pushbutton for open the door.

Keywords: Raspberry Pi, USB Camera, 3G Dongle, PIR Sensor, Human Detection

1. Introduction

Now a day's mobile devices are integrated with our everyday life. The security and remote surveillance system is increasingly prominent feature on the mobile phone. The modern home is integrated with many automation technologies. The user can control door lock, light, air conditioner and other devices using remote control In this modern world crime has become ultra modern tool. In this current time a lot of incident occurs like robbery, stealing unwanted entrance happens abruptly. So the security does matters in this daily life. People always remain busy in their day to day work also wants to ensure their safety of their beloved things. Sometimes they forget to look after their necessary things like keys, wallet, credit cards etc. Without these, they are unable to access their home or any place they want. To prevent such incidents many scholars came into action and tried to prohibit them.

According to Kaur[1], The access control system used to allow only authorized members while the user away from their house. When the system gets wrong password in three times than it signals to the door alarm. But this technology is very effective when using internet capable mobile devices. Developments in cloud computing and mobile technology allow internet communication in automation and security systems to improve flexible and fast communication. According to YanboZhao ; ZhaohuiYe [3]GSM/GPRS based wireless home security system but the system is not cost effective as the GSM/GPRS charges a fixed amount from each sms /call or data transfer. Then Hassan,H. ; Bakar,R.A.; Mokhtar,A.T.F[4] proposed face recognition based on auto-switching magnetic door lock system using microcontroller but face recognition means complex algorithms and sometimes the system may be unable to detect the visitors identification correctly and keeps a computer chip busy for longer time.

Lots of paper work has been done so far. In this paper, a new system is designed which would control the door through the internet without any complexity. It's very convenient and serves as a plug and play system. The user can see from anywhere in this world that who is at his door steps. The system keeps a picture of the visitor as evidence that would be needed if any unwanted situation occurs like stealing, robbery etc.

2. Overall Project Outline

In this project with a minicomputer raspberry pi different input and output is interfaced. In input section there is calling bell, PIR sensor & wireless camera. In processing section a minicomputer raspberry pi is used. Raspberry pi is equipped with 3G dongle.

Nowadays to manage the security concerned issues in a cost effective way. The system is being developed to connect any door with the internet, and USB camera will be fixed in front of the door. Here we using PIR sensor for human detection. In a case that one is sitting inside the home and a visitor is at his door steps, if the visitor pressing the alarm switch (pushbutton) PIR sensor will be enable and sense the human entry at nearby the door, at that time USB camera will be turn on for 10sec and records the human's face at nearby the door.

Then the captured video will be transmitting to the authorized person's system by using 3G dongle. that 3G dongle has a unique IP address, by using that IP address the authorized person will access that 3G dongle from anywhere/any system for receiving the

captured video. So after that person seen the visitors face via web and if he willing to allow the visitor inside the home he can press the pushbutton for open the door. In this project we using DC gun for open the door/close operations.

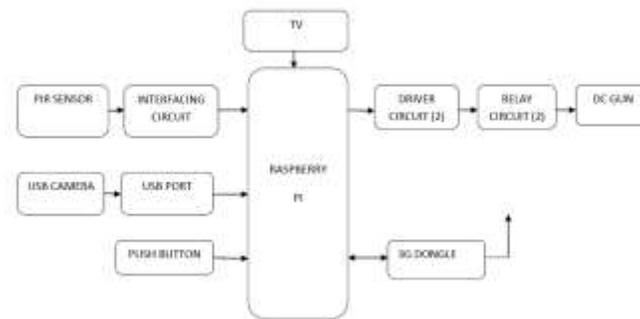


Figure 1. Block diagram of Project

3. Hardware Prototype

3.1. Raspberry Pi

The Raspberry-pi is the system on chip which is a small computer, which runs using embedded C program. The controller gets the pulses from the sensor through the controllers Input, output ports known as I/O ports. The received data are used to calculate the distance.



Figure 2. Raspberry-pi.

Heart of this project is raspberry pi minicomputer. 3G dongle is connected through USB port. The 3G module scans for the available network and connects to the network with pass-word. Calling bell is connected with GPIO of raspberry pi. Whenever someone come to home and press button the calling bell starts to transmit music's. A resistor is connected to calling bell and whenever music plays it generates 5v signal. This causes an interrupt to raspberry pi. PIR sensor is also connected to GPIO. The pin is pulled down and pir sensor also generates a high voltage whenever it detects presence of any human. Raspberry pi is always scanning for pir sensor input or calling bell input. Here is also an indication which gene-rates an special alert.

In the algorithm it is defined that if any visitor comes in and press the bell means both the interrupt happened it is a common situation and indicating that a visitor has arrived But if only one interruption happens like human motion then it's indicates that a thief or robber might have come. An individual interrupt of calling bell indicates pir sensor has gone out of order. When the system received both the interrupts raspberry pi take a snap shot /video of the person through camera. Here the camera is connected with raspberry pi through wifi network. Raspberry pi stores the snapshot/ video itself.. And also we can see whenever it possible..

But if only PIR sensor generates the interrupt then it generates an instant alarm that might have someone is trying to have unauthorized access or break into the house. It takes several video ,it helps user in any emergency situations occur.

3.2. 3G dongle

A 3G dongle uses the 3G mobile/cellular phone network connection to connect the internet. It is useful when travelling on a train .In some remote areas of the uk no internet connection is available but cellular network are which it makes mobile dongles useful . A USB

camera will be connect in front of the door it will be directly communicate with a controller. and transmitting the captured picture or video will be bidirectional communicate with a 3G dongle.

3.3. Passive Infra Red Sensor

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves.

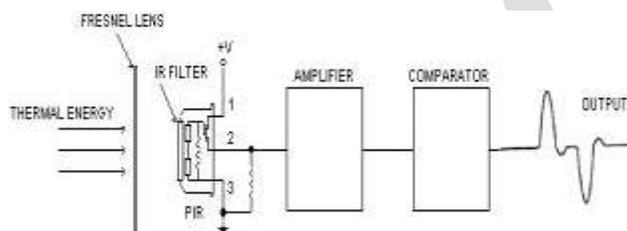


Figure 3. Typical Configuration of PIR.

The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

Along with the pyroelectric sensor is a bunch of supporting circuitry, resistors and capacitors. It seems that most small hobbyist sensors use the This chip takes the output of the sensor and does some minor processing on it to emit a digital output pulse from the analog sensor.

3.3.1. Working Principle of PIR

The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors.

When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a *positive differential* change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a *negative differential* change. These change pulses are what is detected.

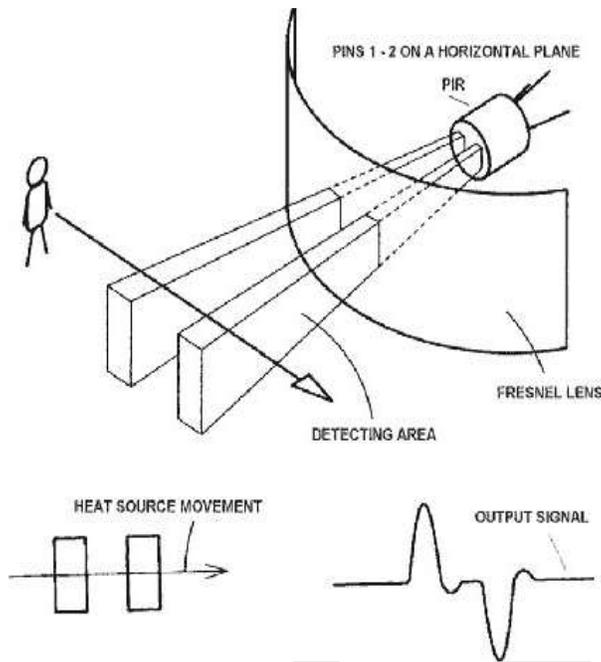


Figure 4. Working principle of PIR.

4. Hardware Implementation

Here the figure of the implemented hardware is given. All the components are connected according to the main circuit diagram. When the PIR sensor is interrupted then the USB camera takes a snapshot/Video and E-mail that attachment to the respective E-mail account. The user can then see the visitor either from web from anywhere in the world by USB camera.

Raspberry pi is equipped with 3G dongle. In a case that one is sitting inside the home and a visitor is at his door steps, if the visitor pressing the alarm switch (pushbutton) PIR sensor will be enable and sense the human entry at nearby the door, at that time USB camera will be turn on for 10sec and records the human's face at nearby the door. Then the captured video will be transmitting to the authorized person's system by using 3G dongle. that 3G dongle has a unique IP address, by using that IP address the authorized person will access that 3G dongle from anywhere/any system for receiving the captured video. So after that person seen the visitors face via web and if he willing to allow the visitor inside the home he can press the pushbutton for open the door. In this project we using DC gun for open the door/close operations.

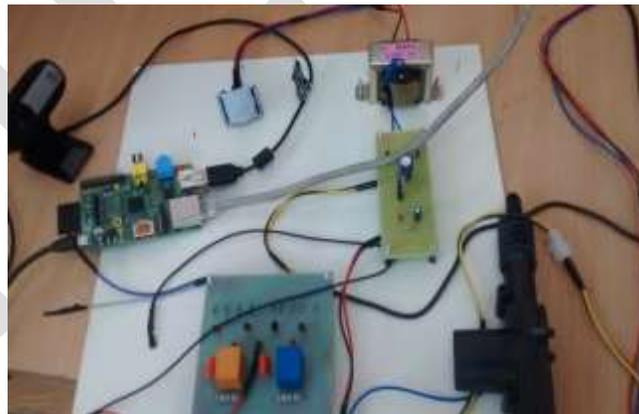


Figure 5. Image of the Project.

5. Output of the System

When the PIR sensor faces obstacles or detects human or the visitor rings the bell the camera takes a snapshot and send it via

Email to the users account.

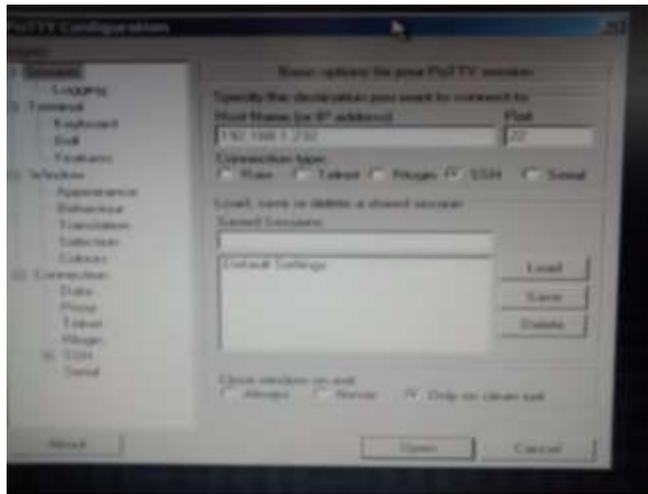


Figure 6 putty configuration software

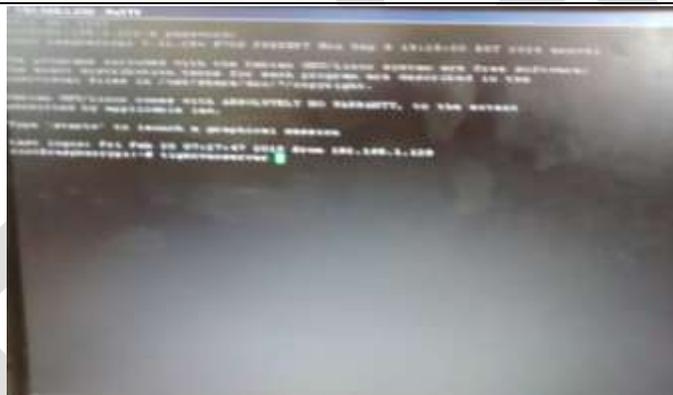


Figure 7 Raspbian wheezy software

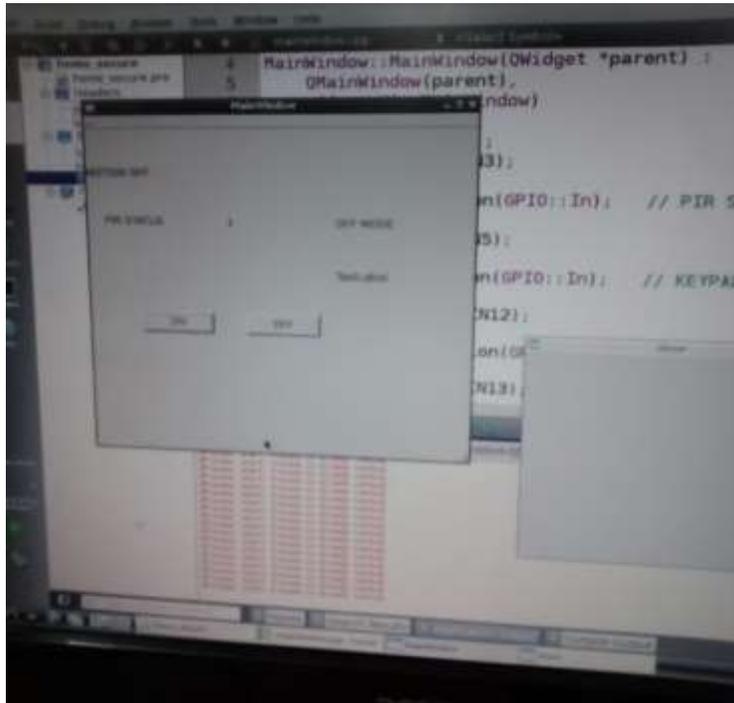


Figure 8 PIR status

Figure 9 Output of the system

Advantages

- Dramatically reduce the hazard of unauthorized entry .
- Evidence can be given to the security department if any robbery issue occurs.

6. Further Applications

- Internet of households where we can attach other devices of house with internet.
- Industrial automation and control through internet.
- Automated fire exit systems can be build
- Improvement in the security issues in highly re-restricted areas

7. Conclusion

The system can be used in several places like banks, hospitals, labs and other sophisticated automated systems, which dramatically reduce the hazard of unauthorized entry. Evidence can be given to the security department if any robbery issue occurs. But the system needs to be monitor always that the internet bills are paid in due time to keep connected with own home. Future work would include the design and building of a battery backup system. This project could also be expanded to multiple doors and windows. It can be coupled with existing home automation devices to add thoroughness and completeness to the system.

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VOICE COMMANDS CONTROL RECOGNITION ANDROID APPS

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ABSTRACT- Smart mobile phones have become modern-day Swiss Army knives like for an example an Android smart phone is a handheld smart phone, a music player, a notepad, a GPS navigation unit and more functionalities, all rolled into one sleek device that fits in your pocket. Today's smart phones do so many things for us that sometimes we don't even think about how we do them. Even though Smart phones do all these new things, the most natural way of interacting with a phone remains the same as what it always has been traditionally. The mobile phone users are increase day by day and everyone wants to develop new things which are improved version of existing one. Voice Actions are a series of spoken commands that let you control your phone using your voice. Voice Recognition is a fascinating field spanning several areas of computer science and mathematics. Speech recognition technology, which is able to recognize human speech and change to text, or to perform a command, has emerged as the 'Next Big Thing' of the IT industry. Speech recognition is technology that uses desired equipment and a service which can be controlled through voice without touching the screen of the android smart phone. Reliable speech recognition is a hard problem, requiring a combination of many techniques; however modern methods have been able to achieve an impressive degree of accuracy. At the end, we're pleased to introduce some new set of features for Voice Actions for Android platform smart mobile phones. The device proposed here is an interactive android smart phone, which is capable of recognizing spoken words. We propose to develop interactive application which can run on the tablet or any android based phone. The application helps the user to open any application as well as call any contact through voice. Users can command a mobile device to do something via speech. These commands are then immediately executed.

Keywords: Smart Phone, Android, Speech Recognition, Voice, Mobile Phones, Application, Call.

INTRODUCTION

People love their mobile phones because they can actually stay in touch wherever they are. That means not just for talking, but e-mailing, texting, and so on. We are constructing with the growth of mobile phone technology. As per the users are increase day by day, facilities are also increasing. Let's start with simple regular handsets which were used just for making calls, Smart Phone have affected our lives and have become a part of it. Now a day's smart phones are not use for making calls but they have innumerable uses and can be used as a Camera, Music player, Tablet PC, T.V., Web browser etc. New application and operating systems are required with the new technologies. In recent years, smart phones have placed an increasing emphasis on bringing speech technologies into limelight usage. This focus has led to products such as Speech server. Now let's limit our focus towards voice message system it is a service component of phone, using standardized communications protocols.

As we all know cell phones are very important part of modern life. Many of us need to make a urgent call or message at anytime from anywhere. Many of them needs their cell phones when they can't do so example at the time of driving, cooking accidents may occur because of this activity, a voice recognition application for mobile device is being develop to avoid harmful incidents. Android is the one of the best suitable operating system for this kind of system. It is the open source operating system that is use to develop application for mobile users.

Speech recognition also appeared as part of ongoing research in progress in 1950s, but was not popularized until the mid-2000s, with low voice recognition. Presently, related speech recognition technologies, which have been previously used limitedly for special-purposes, have been rapidly evolving because of the proliferation of portable computing terminals such as smart phones interconnected with the expansion of the cloud infrastructure. Siri is one of the most prominent examples of a mobile voice interface, latest iPhone have built in voice activated personal assistant. Also Android, the Windows Phone platform, and most other mobile systems have voice functionality as well as many other applications. While these interfaces still have considerable constraint, we are inching closer to machine interfaces we can actually talk to.

LITERATURE REVIEW

Hae-Duck J. Jeong, Sang-Kug Ye, Jiyoung Lim, Ilsun You and Woo Seok Hyun^[1] had proposed a computer remote control system using voice recognition technologies of mobile devices and wireless communication technologies for the blind and physically

disabled population as assistive technology. These people experience difficulty and inconvenience using computers through a keyboard and/or mouse. The purpose of this system is to provide a way that the blind and physically disabled population can easily control many functions of a computer via voice. The configuration of the system consists of a mobile device such as a smartphone, a PC server, and a Google server that are connected to each other. Users can command a mobile device to do something via voice; such as writing emails, checking the weather forecast, or managing a schedule. These commands are then immediately executed. The proposed system also provided blind people with a function via TTS(Text To Voice) of the Google server if they want to receive contents of a document stored in a computer. [Halimah, B.Z. Azlina, A. ; Behrang, P. ; Choo, W.O.](#) [2] had proposed the Mg Sys Visi system that has the capability of access to World Wide Web by browsing in the Internet, checking, sending and receiving email, searching in the Internet, and listening to the content of the search only by giving a voice command to the system. In addition, the system was built with a translator that has the functionality to convert html codes to voice; voice to Braille and then to text again. The system comprised of five modules namely: Automatic Speech Recognition (ASR), Text-to-Speech (TTS), Search engine, Print (Text-Braille) and Translator (Text-to-Braille and Braille-to -Text) module, was originally designed and developed for the visually impaired learners, can be used for other users of specially needs like the elderly, and the physically impaired learners. Initial testing of the system indicates very positive results. Md. Sipon Miah, and Tapan Kumar Godder [3] had proposed a voice Control Keyboard Systems, fully controlled by a computer, and display output on the display device with predefined time. So the project will work as a helping system for those person who has small knowledge about computer system even those person who are illiterate they can operate computer system. They implemented the system in other system for example voice control car system.

DESIGN

Our Android App which we are going to design will have these functionality: Selection of any App and Calling a Specific Contact from Phone book. We may use incremental model to implement our android app with above functionalities. Because if we would like to make any changes in the android app in future, it would be easily accommodated. Incremental model is an enhancement of waterfall model. The product is designed, implemented, integrated and tested as a series of incremental builds. Many commercial software companies and system vendor uses popular model software evolution. Incremental software development model may be applicable to projects where:

- ✓ Software Requirements are well defined, but realization may be delayed.
- ✓ The basic software functionality are required early

Initially software requirements are broken down into multiple standalone modules under incremental model. Under the software project these modules are drafted according to the level of priority they have. According to the implementation and progression of the project every module as a standalone function has to be developed. Although they can be inter related but they sure are able to exists without having the need of other modules and functionality. Incremental Model is one of the most followed model by large number of project which requires implementing individual functions and adding standalone models in the long run. There are three phases in each increment: design, implementation and analysis. During the phase of design of the first increment, the functionality with topmost priority is selected and the design is prepared. In the phase of implementation, the design and testing is implemented. In the phase of analysis, the functional capability of the partially developed product is analyzed. The development process is repeated until all the functions of the project are implemented.

METHODOLOGY

There are several well defined steps for the process of voice recognition. Different systems vary on the nature of these steps, as well as how each step is implemented, but similar methodology is followed by most successful systems.

1. Firstly the sound wave is divided into evenly spaced blocks.
2. Each block is processed for important characteristics, for example strength across various frequency ranges, total energy and number of zero crossings.
3. Attempt to associate each block with a phone using this characteristic vector, this is the most basic unit of speech, producing a string of phones.
4. Search the word whose model is the most likely similar to the string of phones which was produced.

A spectrum analysis of the block is typically being performed in step2. This can be done with a bank of frequency filters or with Fast Fourier Transform (FFT), but Linear Precidive Coding is one of the most successful technique to date. Analyzing the total energy, the number of zero crossings, and the change in the features over time are the additional important features. Step 3 is often done through a decision tree. The field of consideration is narrowed by phone which often has very prominent characteristics. Similar sounding phones are separated using additional characteristics. The final decisions are often mistaken, and these mistakes must be accounted for later. With a high degree of success using Hidden Markov Models (HMM's) step 4 has been implemented. To determine which model is the most likely match a Hidden Markov Model is constructed for each word in the vocabulary, and then the string of phones is compared against each HMM.

IMPLEMENTATION

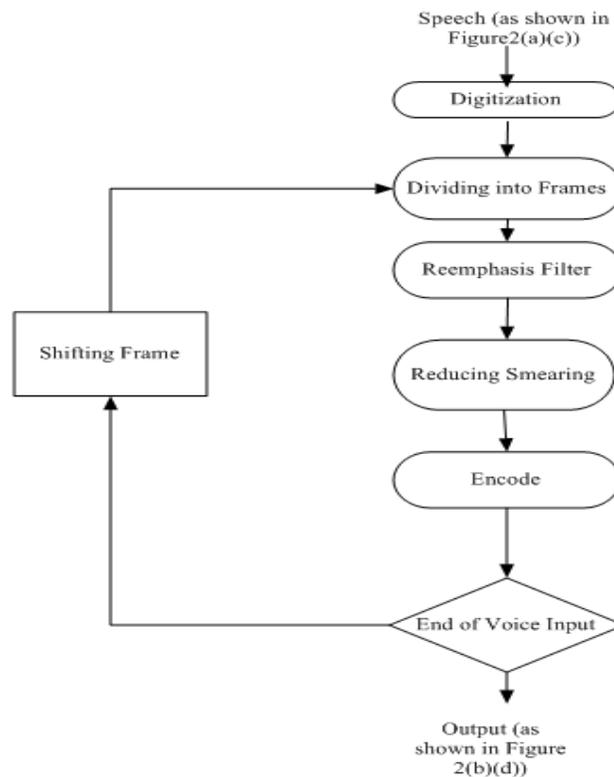


Figure 1: Flowchart - Converting Speech signal into a set parameters suitable for ASR

Figure 1 shows the steps involve in converting speech signal into a set of parameters are: The main purpose of the digitization process is to produce a sampled data representation of the speech signal with as high a Signal to Noise ratio (SNR) as possible. The process of grouping digitalized speech into a set of samples, called frame. A one coefficient digital filter, known as a Reemphasis filter. This stage spectrally flattens the frame using a first order filter. Windows are functions defined across the time record which are periodic in the time record. They start and stop at zero and are smooth functions in between. When the time record is windowed, its points are multiplied by the window function, time bin by time bin, and the resulting time record is by definition periodic. It may not be identical from record to record, but it will be periodic (zero at each end). In the frequency domain, a window acts like a filter. The net result of windowing is to reduce the amount of smearing in the spectrum from signals not exactly periodic with the time record. To encode the speech signal into a suitable set of parameters three basic classes of techniques are being used:

- Fourier transformations
- Filtering through digital filter-banks
- Linear prediction

Figure 2 shows the results obtained after giving voice commands as input in part (a)The voice input is given to open an app and the corresponding app is opened in part (b).In part (c) the voice is input for calling a contact and in part (d) the corresponding contact is called.

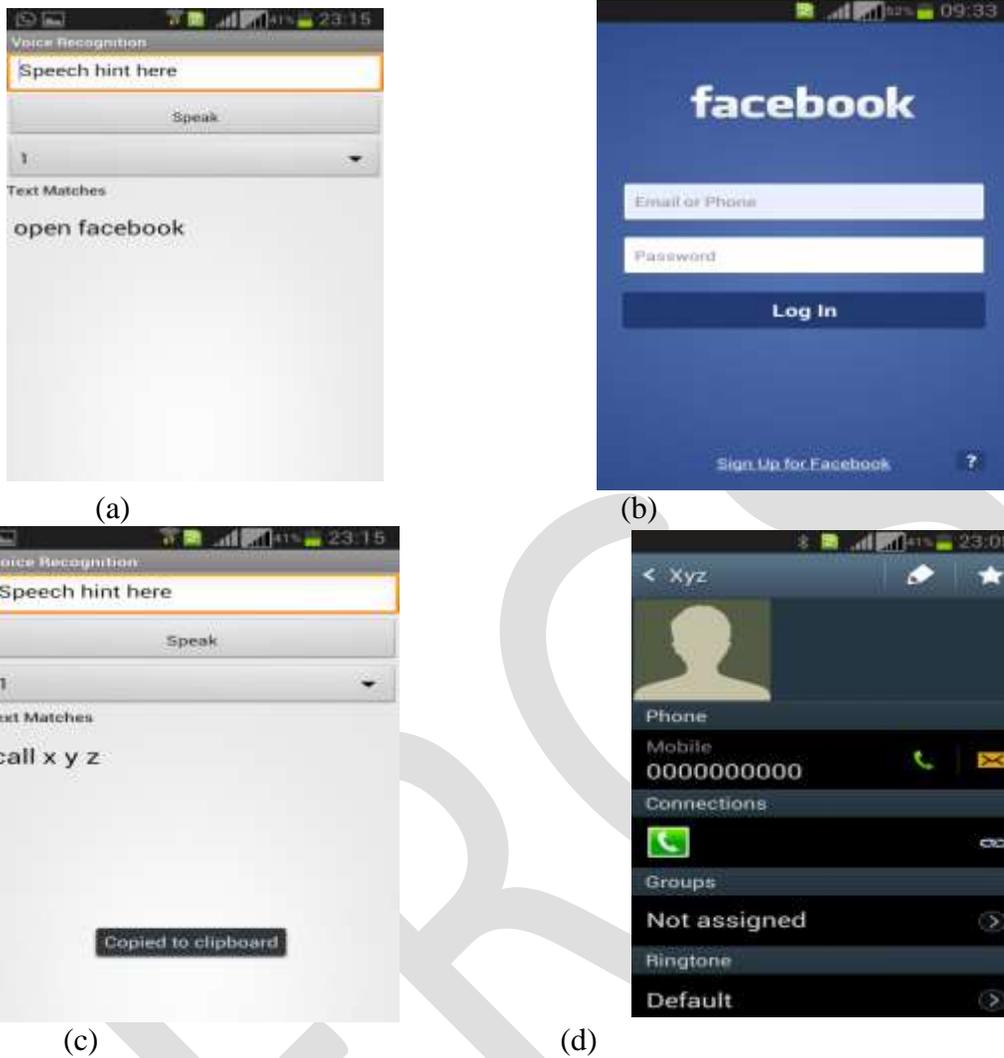


Figure 2: Results Obtained after giving voice commands as input.

Table 1: shows the Comparative Study of our voice recognition system on different Android Version..The performance of good, fair, best and excellent is being developed on the basis of number of seconds our voice recognition system takes for recognising a voice input. it is found that on Jellybeans the performance of our voice recognition system proved to be best, and on Kitkat version it proves to be excellent and in the older version éclair and froyo the performance appear to be good but in the honeycomb and ice cream sandwich version it appears to be fair.

TABLE 1: Comparative Study of our voice recognition system on different Android Version

Android Version	Number of seconds - recognizing Voice Input	Performance
Eclair (2.0–2.1)	8sec	Good
Froyo (2.2–2.2.3)	8sec	Good
Gingerbread (2.3–2.3.7)	8sec	Good
Honeycomb (3.0–3.2.6)	7sec	Fair
<u>IceCream Sandwich</u> (4.0–4.0.4)	7sec	Fair
<u>Jelly Bean</u> (4.1–4.3.1)	6sec	Best
KitKat (4.4–4.4.4)	5sec	Excellent

Note: The voice recognition system will not work on android versions below eclair.

TARGET AUDIENCE & APPLICATIONS

The goal is to provide a system that can easily help the blind, physically disabled personalities to operate and control a smart mobile phone through their voice commands as input. The scope of this system is not just limited to such personalities but even more it will acquiesce excellent outcome for others too.

TABLE 2: Application of Voice Recognition System

Applicable Areas	Details
Education Sector	Speech to text processing, to correct pronunciation of vocabulary on foreign languages. Use keyboard to enter text verbally for handicapped students.
Medical Sector	Precision surgery, Automatic wheel chair, Medical transcription (digital speech to text).
Military Sector	Automatic aircraft control, helicopter, Training air traffic controller, Automatic ammunition control
Communication Sector	Voice dialling, Telephone directory inquiry without operator assistance.
Domestic Sector	Ovens, refrigerators, washing machine, home appliances control etc.
General	Use for security purposes at highly secure places, Dictation system on market. To translate data from one language to another, video gaming and ATM (data entry).

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CONCLUSION

A smart phone based voice recognition system can be developed to operate an app with simple voice commands. This technology can be implemented into a user friendly and compact device. By creating online voice-controlled applications, people are free to choose which device better suits them. This paper proposed the capability of modern voice recognition software to increase independence for persons with disabilities. Major purpose of this system was to provide a system so that the blind and physically disabled population can easily control many functions of a smart phone via voice. The system is very useful for the general population as well. Users command a mobile device to do something via voice such as directly controlling smart phones. These commands are then immediately executed.

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Enhancement of Natural convection heat transfer coefficient by using V-fin array

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Abstract— Extended surfaces known as fins are, used to enhance convective heat transfer in a wide range of engineering applications, and offer an economical and trouble free solution in many situations demanding natural convection heat transfer. Fin arrays on horizontal, inclined and vertical surfaces are used in variety of engineering applications to dissipate heat to the surroundings. Studies of heat transfer and fluid flow associated with such arrays are therefore of considerable engineering significance. The main controlling variables generally available to the designer are the orientation and the geometry of the fin arrays. An experimental work on natural convection adjacent to a vertical heated plate with a multiple V- type partition plates (fins) in ambient air surrounding is already done. Boundary layer development makes vertical fins inefficient in the heat transfer enhancement. As compared to conventional vertical fins, this V-type partition plate works not only as extended surface but also as flow turbulator. This V-type partition plate is compact and hence highly economical. The numerical analysis of this technique is done using Computational Fluid Dynamics (CFD) software, Ansys CFX, for natural convection adjacent to a vertical heated plate in ambient air surrounding. In numerical analysis angle of V-fin is further optimized for maximum average heat transfer coefficient. Attempts are made to validate the results obtained by using CFD analysis by experimentation.

Keywords— h - Convective heat transfer coefficient (W/m²K), A_s - Exposed surface area (m²), A - Cross section area (m²), Q - Heat transfer rate (W), I - Current (A), V - Voltage (V), T_i - Temperature of the respective thermocouple (°C), T_s - Temperature of surface (°C), T_∞ & T_a - Temperature of atmosphere (°C), T_f - Film temperature (°C), ΔT - Temperature difference (°C or K)

INTRODUCTION

Convection

Convection is heat transfer by means of motion of the molecules in the fluid. Heat energy transfers between a solid and a fluid when there is a temperature difference between the fluid and the solid. Convection heat transfer cannot be neglected when there is a significant fluid motion around the solid. There are mainly two types of the convection heat transfer viz. Natural or Free Convection and Forced Convection.

Natural Convection

The temperature of the solid due to an external field such as fluid buoyancy can induce a fluid motion. This is known as "natural convection" and it is a strong function of the temperature difference between the solid and the fluid. This type of convective heat transfer takes place due to only fluid buoyancy caused due to temperature difference between fluid layers. Natural convection in gases is usually accompanied by radiation of comparable magnitudes except for low emissivity surfaces. Thus natural convection cooling does not require external power.

Forced Convection

Forcing air to blow over the solid by using external devices such as fans and pumps can also generate a fluid motion. This is known as "forced convection". Some external means for fluid motion is necessary in this type of convective heat transfer. Fluid mechanics plays a major role in determining convection heat transfer. For each kind of convection heat transfer, the fluid flow can be either laminar or turbulent. For laminar flow of fluid over solid surface, steady boundary layer formations takes place through which conductive heat transfer occur. This reduces convective heat transfer rate. Turbulent flow forms when the boundary layer is shedding or breaking due to higher velocities or rough geometries. This enhances the heat transfer. Heat transfer due to convection is described by Newton's Law of Cooling,

$$Q_{conv} = h \times A_s \times (T_s - T_\infty)$$

where,

Q_{conv} = Rate of heat transferred to the surrounding fluid (W)

h = Convection heat transfer coefficient (W/m^2K)

AS = Area of solid in contact with the fluid (m^2)

$T_s - T_\infty$ = Temperature difference between solid and surrounding fluid (K or $^\circ C$)

FINS

The fins are generally extended surfaces or projections of materials on the system. The fins are used to increase the heat transfer rate from the system to the surroundings by increasing the heat transfer area. Different fin geometries and heat sink used for natural convection are shown in figers.



Figure: Heat Sink

Necessity of Fins

The heat that is generated in the system that conducts through the walls or boundaries are needed to be continuously dissipated to the surroundings or environment to keep the system in steady state condition. Large quantities of heat have to be dissipated from small area as heat transfer by convection between a surface and the fluid surroundings. It can be increased by attaching thin strips of metals called fins to the surface of the system. The fin is generally an extended surface on the system. Whenever the available surface is found to be inadequate to transfer the required quantity of heat with the available temperature drop and convective heat transfer coefficient, the surface area exposed to the surroundings is frequently increased by attachment to protrusions to the surfaces. These protrusions are called fins or spines. Thus, the fins increase the effective area of surface there by increasing the heat transfer by convection. Natural convection heat transfer between a surface (T_s) and the fluid surrounding (T_∞) is given by,

$$Q_{conv} = h \times AS \times (T_s - T_\infty)$$

where,

h = Heat transfer coefficient

A_s = Surface area of heat transfer

T_s = Surface temperature

T_∞ = Surrounding fluid temperature

V-FIN ANALYSIS USING ANSYS CFX

The required models for computational analysis are first made in PRO-E software and then imported in the CFX-Pre Processor. The aim of the project is to find the optimum included angle for V-fins. Therefore various models are created with included angles 0° , 30° , 60° , 90° , 120° , 180° . These models are then analyzed in CFX. The computational analysis in this project is carried out with the help of the software ANSYS 14.5. The vertical pitches for these models are first determined and then are used in PRO-E software.

CALCULATIONS FOR V FIN PARAMETERS

While selecting a heat sink a question that often arises is whether to select closely packed fins or widely spaced fins for a given base area. A heat sink with closely packed fins will have greater surface area for heat transfer but a smaller heat transfer coefficient because of the extra resistance the additional fins introduce to fluid flow through the inter-fin passages. A heat sink with widely spaced fins, on the other hand, will have a higher heat transfer coefficient but a smaller surface area. Therefore, there must be an optimum spacing

that maximizes the natural convection heat transfer from the heat sink for a given base area WL, where W and L are the width and height of the base of the heat sink, respectively, as shown in Figure. S is the optimum fin spacing and t is the thickness of the fins.

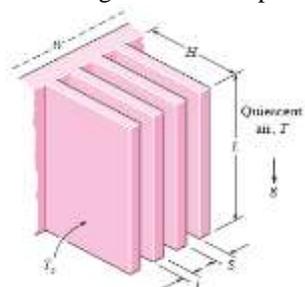


Figure: Finned Surface Oriented Vertically

To calculate the optimum fin spacing, let us consider the model taken by sable et al. for vertical fins as in Figure 4.2. The model considered is of base plate 250mm x 250mm with vertical fins having fin height 20mm and fin thickness 3mm. The heater input is 100W. The surface temperature is $T_s = 115^\circ$ and Temperature of air, $T_a = 27^\circ$. Therefore the properties of air are calculated at the film temperature of,

$$T_f = (T_s + T_a) / 2 = ((115 + 27) / 2) = 71^\circ\text{C}$$

From the standard tables, properties of air at mean film temperature of 71°C and 1atm pressure are,

Thermal conductivity = 0.02888 W/m-K

Prandtl number = 0.71747

Kinematic Viscosity = $2.0868 \times 10^{-5} \text{ m}^2/\text{s}$

Table: Calculation for Vertical Pitch for Various Included Angles in V-Fins

Total Included Angle θ_i°	Half Angle θ_h°	No. of fins (n) $n = \frac{250 \times 13}{\frac{125}{\sin \theta_h} \times 2}$	Vertical Pitch $p = \frac{250}{n} (\text{mm})$
0	0	13.0000	19.2308
30	15	3.3646	74.3020
60	30	6.5000	38.4615
90	45	9.1924	27.1964
120	60	11.2583	22.2058
180	90	13.0000	19.2308

V-FIN MODEL CREATIONS IN PRO/E

The various types of fins with proper orientation and spacing can be modeled on different CAD software available in the market. These softwares are compatible with the softwares for computational fluid dynamics. For the current modeling, Pro|ENGINEER WILDFIRE 5.0 has been used. The models so formed are along with the fluid domain where in the effects of the heat flow has to be analyzed. Pro|ENGINEER is a feature-based, parametric solid modeling system with many extended design and manufacturing applications. As a comprehensive CAD/CAE/CAM system, covering many aspects of mechanical design, analysis and manufacturing, Pro|ENGINEER represents the leading edge of CAD/CAE/CAM technology.

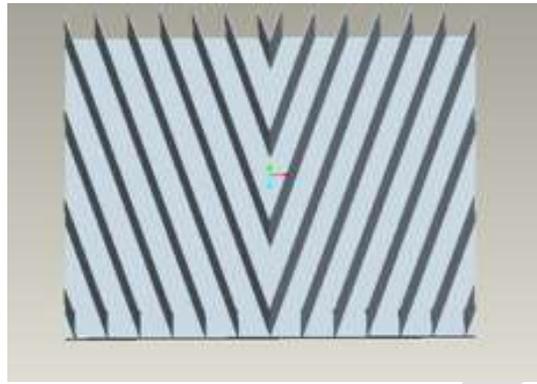


Figure: V-Fins Model of 30o

CFD ANALYSIS FOR V-FIN

Ansys software is capable of performing stress analysis, thermal analysis, modal analysis, frequency response analysis, transient simulation. My requirement here is thermal analysis of the model. Finite element method of discretization is used. CFX is a commercial Computational Fluid Dynamics (CFD) program, used to simulate fluid flow in a variety of applications. The ANSYS CFX product allows testing systems in a virtual environment. The scalable program has been applied to the simulation of water flowing past ship hulls, fins, gas turbine engines, aircraft aerodynamics, pumps, and fans. For 60model analysis procedure and the computer requirement is mentioned below:

Meshing In ICEM CFD

Initially solid body and meshing for the geometrical modeling is done in ICEM which is explained below. At the start in ICEM new working directory is created. Then geometry is imported from pro-e software which was in the form of Step/iges file shown in Figure.

The file that opens, as above, is a surface model which does not have two surfaces in the front and back, as seen. Due to this, the fluid domain is still to be completely formed. The front and back faces are created by using create/modify surface as options. The next step is to create parts on the model as per convenience. The various parts are created for the fluid domain and aluminum domain.

In blocking, initially it is required to give the premesh parameters to define the mesh size and for this by selecting different edges of the model, number of nodes are given. For the outer domain 60 numbers of nodes are assigned. Once we define the mesh size, premesh is generated as shown in Figures.

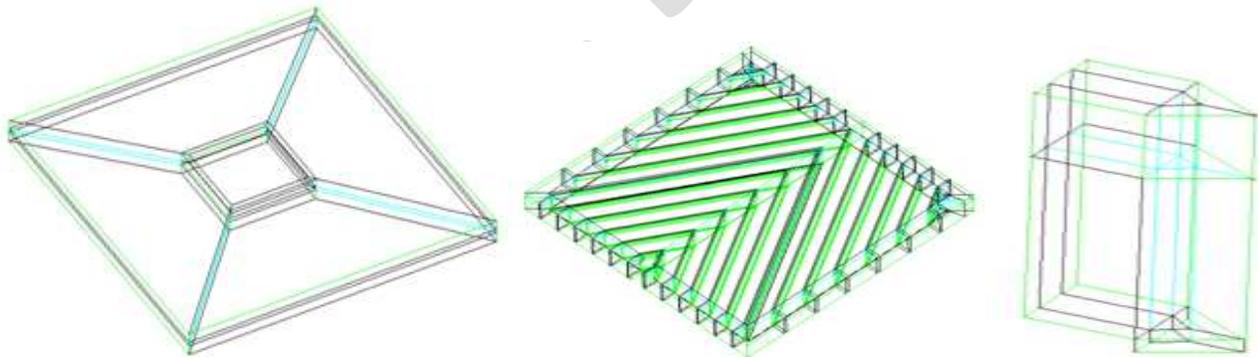


Figure: Final Blocking for outer domain, Figure: Final Blocking for half aluminum domain, Figure: Final Blocking for single V fin

The quality of the mesh can be checked by selecting mesh quality and keep the default parameters and select ok. A range of quality values appear on the screen, the minimum and lowest quality value being zero and the best, highest quality value being one. For this model minimum of quality is 0.66 and maximum is 1. The number of mesh element in each of the quality classes also appear in the dashboard below. The mesh quality is also verified by checking angle, aspect ratio etc. The value of angle should be more than 18° and less than 90° . The angle for outer domain is around 40° . The volume above zero is acceptable.

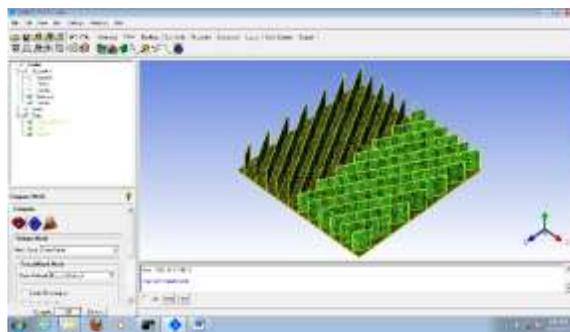


Figure: Meshed Solid Domains

To improve the mesh quality it is required to obtain the above mentioned values within the range. If the quality is still not good then, we have to improve the split, projections. This ICEM model is now complete and ready for pre-processing in CFX. Select the 'output' option in the tool chest and write input finally the save file.

Pre-Processing

Both the mesh solid and mesh fluid domains are now ready for pre-processing in CFX. Each of the models is individually called in the CFX pre file. Since the axes of both the models match, they do not have to be separately aligned in the CFX file.

The page has a tree flow on the right hand side which helps to follow a definite sequence of preprocessing. The main objective of pre-processing is to set up the necessary boundary conditions. These conditions are actually the constraints under which the solver has to determine the flow conditions. The actual ambience and experimentation can be carried out under a whole variety of different conditions and combinations. Therefore, defining boundary conditions is extremely critical in pre-processing. Even one minor change can lead to a set of totally different results than expected.

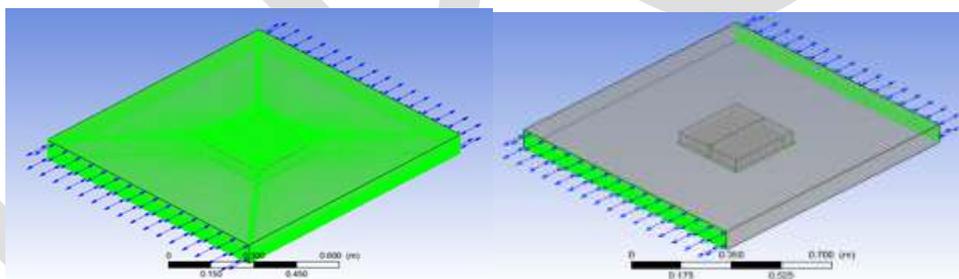


Figure: Fluid domain setting,

Figure: opening Boundary Condition

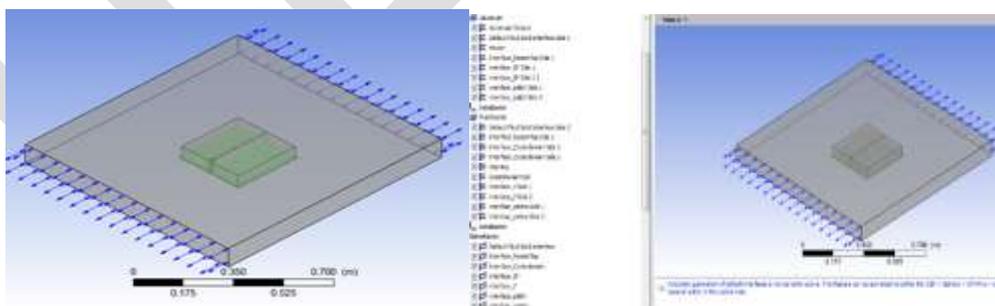


Figure: Solid Domain setting,

Figure: Model with all Boundaries Defined

Right click solver control the number of iterations are changed according to requirement the number of iterations given are 1000. But the required iteration for this model is around 120. Under the convergence criteria residual target is kept 100. This is the number of digits after decimal, up to which the accuracy of convergence is required. If the order is increased to either -5 more, the accuracy of convergence improves, although the number of iterations increases by a significant value. For the current model it is seen that order of -5 provides the required accuracy. The last option in the solver is output control. This is not required to be handled in pre processing as

these will be taken care of during the actual processing of the model .All these settings are shown in Figure. Finally save case and define run.

Processing In Solver Manager

After the pre-processing is complete and the run is defined, and the solver starts processing in the CFX solver manager. The number of iterations that are carried out depends on the convergence criteria. If the solution is converged before the total number of iterations, as specified, is complete, the solver stops and saves the processed data. If the solution does not get converged within the given number of iterations, we can give additional iterations to the solver till convergence is reached. When the iterations begin, the screen shows the variations in velocity, momentum etc as the iterations proceed. These graphs give a general idea of how the system is stabilized and convergence is approached.

EXPERIMENTATION

CFD analysis indicates that, V-fin with included angle 60° gives the minimum ΔT and hence the maximum average heat transfer coefficient amongst all the considered models. Therefore it is decided to fabricate the V-fin model for 60° . The experiments are to be carried out under natural convection conditions. For the experimental evaluation of results temperature measurements at various locations of the model and also of the surrounding are required. The heater input values when measured will give total heat flow rate from the model under study.

The base plate is made from Aluminum over which fins are to be joined. Initially the fins of desired length (as per the dimensions in Pro-E) are cut by shearing. Then fins are joined on the base plate by using gas welding process. Another side of base plate, asbestos and wooden insulator are attached. In between the base plate and insulator, square plate type heater is sandwiched. Due to square plate type heater there is a uniform temperature distribution over the base plate. The dimensions of base plate, insulator, and heater are 250mm x 250mm x 3mm. The rated power output of heater is 1000 W.

The fins are manufactured as per the dimensions of model of V-fin with 60° included angle. The fins are manufactured by cold working operation. As per the model created in PRO-E, markings are made on the base plate, and the fins are joined on it by gas welding. The entre-line length of fin over the base plate is 3250mm.



Figure: Experimental Set-up

RESULTS AND DISCUSSION

From the results of post processing the temperature variations on base plate due to various fin angles were found. The angle at which the temperature difference was minimum i.e. convective heat transfer coefficient was maximum, is the angle of interest for actual experimentation. Thus the angle of V-fin can be optimized. The optimized V-fin with base plate was tested for different heat input and different orientations. The results that are obtained after the processing can be viewed in the CFX post processor. In this, various parameters can be graphically seen. The streamlines, velocity vectors, pressures gradients, temperature contours are some of the major parameters that can be viewed. The temperature difference in the 60° V-fin model was observed to be 20-30 within the surface and fins. The graphical values of variations of temperature on V-fin base plate V-fin model is as follows,

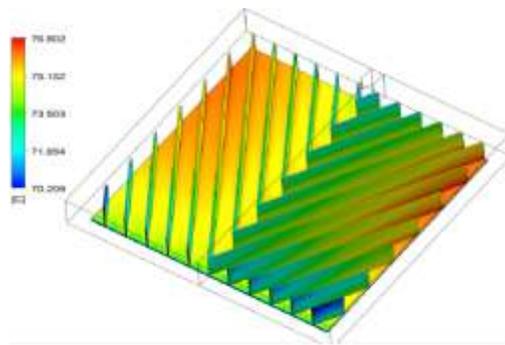


Figure: Temperature Variations on 60° V-Fin Base Plate

The above temperatures contours show the color variations correspond to different temperatures and their locations on the base plate. The dark red color is the maximum temperature, which goes on decreasing as the shades get lighter. The blue colour indicates lower temperature. Figure shows that the temperature is high at the top sides and low in the bottom portion of the plate. Figure shows that the temperature is high at the top sides and low in the bottom portion of the plate. Figure shows that the temperature is high at the middle sides of base plate and low in the top and bottom portion of the plate. Figure shows that the temperature is high at the top sides and low in the bottom portion of the plate. Figure shows that the temperature is high at the middle and centre side of the plate and low at outer periphery of the base plate. Figure shows that the temperature difference on the 60° V-fin base plate is minimum means average heat transfer coefficient is maximum. The temperature difference all other base plate is maximum it means average heat transfer coefficient is minimum. These temperature variations are seen due to buoyancy effect on different orientations of plate. The velocity contour and stream line of flow further clarifies the flow direction of fluid on 60° V-fin model.

CONCLUSIONS

Based on the present work for V-shaped fin with various included angle, it is concluded that The maximum convective average heat transfer coefficient is obtained for 60° V-fin array. CFD and experimental results for base plate with V-fin showed the similar trend. As the included angle of the V-fins increases, the convective heat transfer coefficient increases. It reaches maximum at 60° included angle and thereafter, the heat transfer coefficient decreases. It was also observed that low pressure suction region is created in the nose region of each V-fin which eventually admits the low temperature ambient fluid easily from surrounding areas. It increases the heat transfer rate. conformity of style throughout a conference proceedings. Margins, column widths, line spacing, and type styles are built-in; examples of the type styles are provided throughout this document and are identified in italic type, within parentheses, following the example. Some components, such as multi-leveled equations, graphics, and tables are not prescribed, although the various table text styles are provided. The formatter will need to create these components, incorporating the applicable criteria that follow.

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Modern Multipurpose Security Management System

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Abstract — Recent statistics show that premature babies are stolen to a great extent and also death increases due to improper and unnoticed security issues. To avoid these issues a method has to be implemented that monitors the position of the baby and inform by message or alarm when it is removed out of the allotted range. The proposed system is that the tag attached to the baby, if it is cut or removed then the system will be informed to the user by alarm, and also message is send to the nearest police station . In order to remove the baby proper password must be used to disable the alert system.

INTRODUCTION

Identification of persons is always important in places like Airports, railway stations, theatres, etc. Identification can be made automatic using Auto-identification. There are various methods for auto-identification; some of them are bar-code systems, optical character recognition, biometrics, smart cards and RFIDs, of which RFID technology is a revolution. Various applications of RFID include: Transportation and logistics, manufacturing and processing, security, animal tagging, waste management, time and attendance, postal tracking, airline baggage reconciliation, road toll management, etc. To keep unauthorized personnel out of their building, companies have implemented access control systems. Employees are given an access badge with radio frequency identification (RFID) chip in it. This technique uses electromagnetic fields to exchange data from a tag (like a smartcard) to an object (a reader) for the purpose of authentication, identification or tracking.

The application and standardization of RFID are widely increasing but its adoption is still relatively new and hence many features of the technology are not well understood. Developments in RFID technology continue to yield larger memory capacities, wider reading ranges, and faster processing. Though the RFID technology is advantageous compared to bar code, it's highly unlikely that the technology will ultimately replace bar code, even with the inevitable reduction in raw materials coupled with economies of scale, since the integrated circuit in an RF tag will never be as cost effective as a bar code label. If some standards commonality is achieved, whereby RFID equipment from different manufacturers can be used interchangeably, the market will very likely grow exponentially

Extending the benefits of wireless communications to communication of data, to and from portable low cost data carriers, we can appreciate the nature and potential of radio frequency identification (RFID). RFID is an area of automatic identification that is now being seen as a radical means of enhancing data handling processes, complimentary in many ways to other data capture technologies such bar coding. The range that can be achieved in an RFID system is essentially determined by:

1. The power available at the reader/interrogator to communicate with the tag(s)
2. The power available within the tag to respond
3. The environmental conditions and structures, the former being more significant at higher frequencies including signal to noise ratio.

RFID tag is contactless card, referred to as a Proximity Integrated Circuit Card (PICC). Tags may either be actively or passively powered. Active tags contain an on-board power source, such as a battery, while passive tags must be inductively powered via an RF signal from the reader. The distance a reader may interrogate tags from is limited by the tag's power. Consequently, active tags may be read from a greater distance than passive tags. Active tags may also record

sensor readings or perform calculations in the absence of a reader. Passive tags can only operate in the presence of a reader and are inactive otherwise. An active tag's memory size varies according to application requirements and some systems operate with up to 1MB of memory. Passive RFID tags operate without a separate external power source and obtain operating power generated from the reader. Tags contain microchips that store the unique identification (ID) of each object. The ID is a serial number stored in the RFID memory. The chip is made up of integrated circuit and embedded in a silicon chip. RFID memory chip can be permanent or changeable depending on the read/write characteristics. RFID tags can be different sizes and shapes depending on the application and the environment at which it will be used. A variety of materials are integrated on these tags. For example, in the case of the credit cards, small plastic pieces are stuck on various objects, and the labels. Labels are also embedded in a variety of objects such as documents, cloths, manufacturing materials etc. The range of the RFID tags depends on their frequency.

EXISTING SECURITY SYSTEMS

The following security systems are available in hospitals in order to avoid baby theft they are

Security warden

In hospitals for baby ward the special warden is appointed to avoid baby theft. Even though security warden present in the hospital baby theft is a serious issue

Tag system

In both government and private hospitals the tag system is used to identify the baby and mother. This tag may be either paper or card and it can be tear. Hence it is not an efficient system for baby theft.

CCD Camera

In private hospitals CCD camera placed in the baby ward for the security purpose. It is used to continuously monitoring the entire ward. It is also an inefficient security system because only after baby theft we can identify the person. This system not available in most of the government hospitals.

PROPOSED ARCHITECTURE

By analyzing the functionality of three basic security system available in hospitals namely security warden, tag system and CCD camera. All the above three system leads to an inefficient security system we propose modern multipurpose security management system.

Block diagram

The block representation of the modern multipurpose security management system comprises of two blocks namely

- Control block
- Baby block

Control block → Control block is placed either doctor control room or security warden room.

Baby block → Baby block is attached with the baby it's look like a bangle or wearable tag

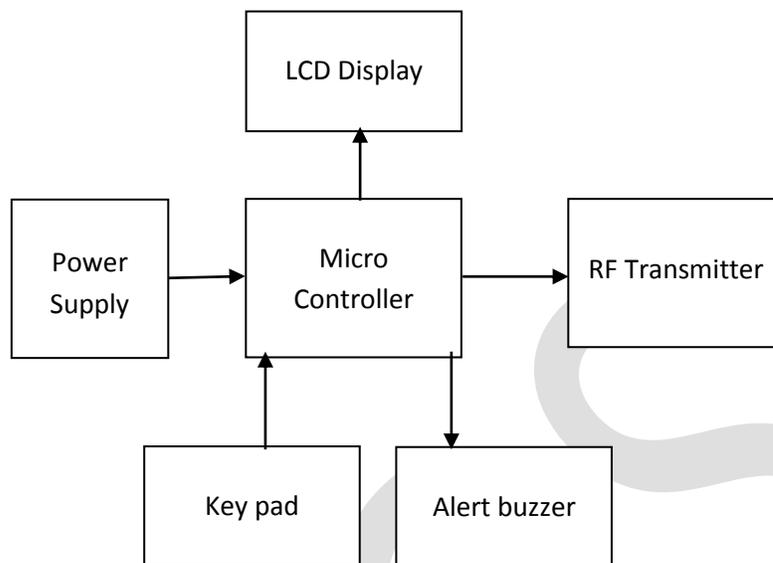


Fig 1 Control Block

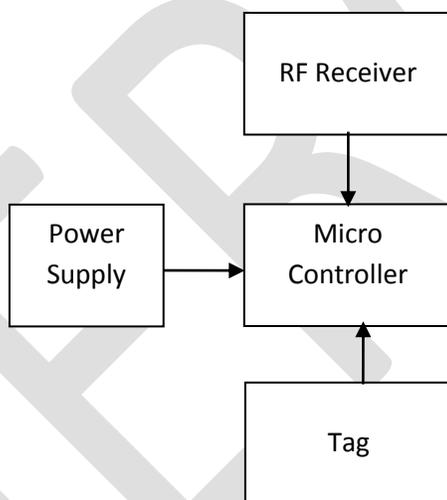


Fig 2 Baby Block

Working Principle

The proposed architecture is subdivided in to two blocks namely control block and baby block in which control block is placed either in the doctor control room or security warden room and baby block is attached with the baby. There are two situation arises in the baby theft they are

- Baby moving out of frequency range
- Tag is removed

(i) When the proposed system is ON the RF transmitter in the control block send signal continuously to the RF Receiver in the baby block. RF transmitter and receiver having property of covering certain frequency range for example if covering frequency rage is one meter means if baby is moving out of one meter will leads to interruption in the signal transmission and reception and hence baby is out of control and buzzer will on.

(ii) The second situation is trying to remove tag or cut the tag. In both the case the interruption in the signal transmission and reception takes place and hence baby is out of control and buzzer will on. From above two conditions satisfied the proposed system is efficient baby theft security system.

SIMULATION RESULTS

In this section, we illustrate the simulation results obtained for proposed system.

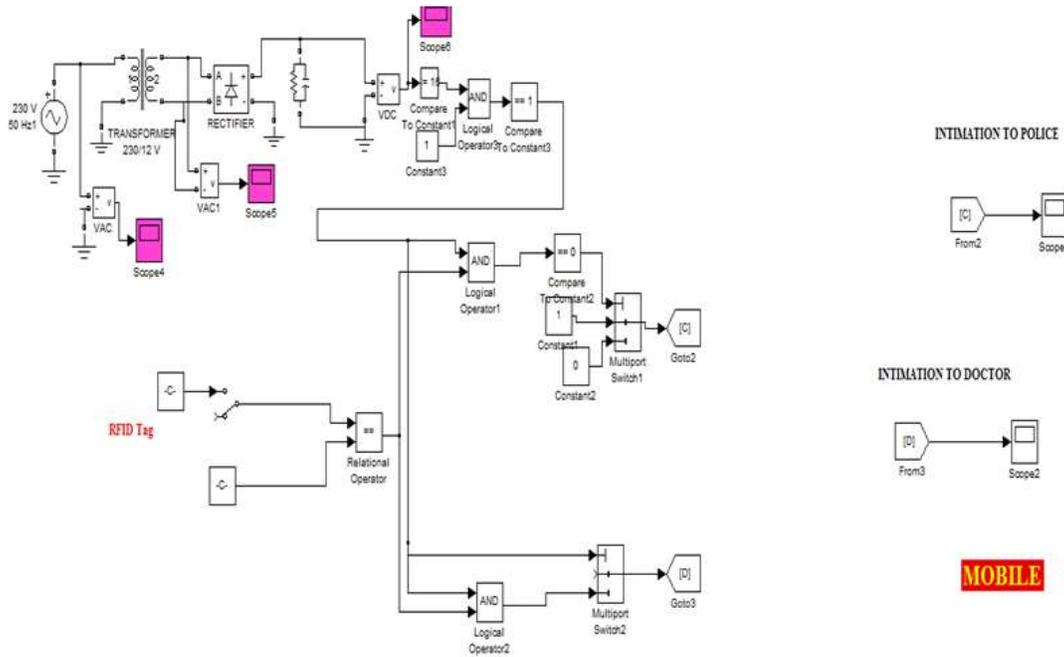


Fig 3 Overall System

The following procedure will followed to create model

- Open MATLAB then click file→model
- Pick and place the required component from library browser save the model and then run.
- Click on the scope block to view the obtained result.

We are creating the model in such a way that if the tag is not removed or cut the signal ‘1’ will send to the authority. Similarly if the tag is removed or cut it will checked by the comparator block and signal ‘0’ will send to the authority and siren will on.

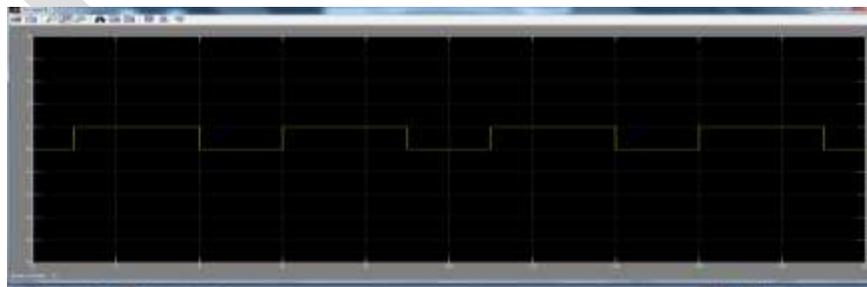


Fig 4 Baby in Safe Condition

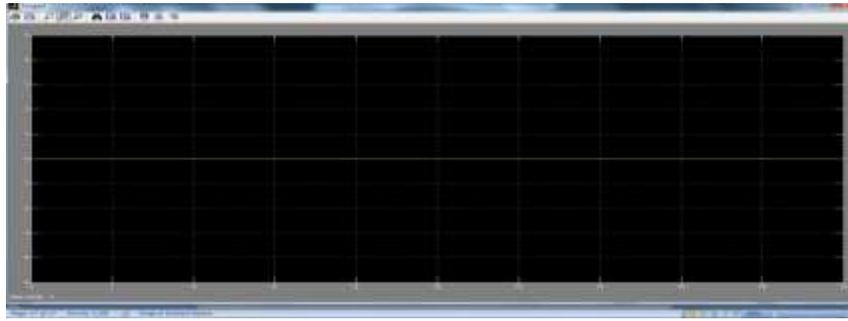


Fig 5 Baby in not Safe Condition

CONCLUSION

From the survey we observe that the available security systems for baby theft protection are security warden, security tag system and CCD camera. All the above security system will leads to an inefficient security hence we propose modern multi-purpose security management system which is a highly efficient security system for baby theft in hospitals. The proposed system is fully automatic monitoring system. The same system can be used in jewelry shop protection and also in prisons to avoid escaping of prisoner hence we named the proposed system as modern multipurpose security management system.

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Smart Face Recognition System

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Abstract: Due to increase in the day to day criminal activities and also slow action of our security forces especially police to nab the culprit leading to a less secure society. In India we have seen many 'CCTV' cameras around us which are less in number and these cameras just record the day to day activity in database. It does not provide any alert system for the people from an unknown person. For an instance the police get an eyewitness who saw a murder or any other crime & he/she knows the face structure of the culprit then the police call a sketch artist to retrieve the image of that person which takes lot more time. Above drawbacks can be overcome by several techniques which are including 'Real Time Face Detection' in which it recognize the face of suspect or criminal in real time and inform to its nearby police headquarters, secondly 'Sketch for Match - 'CBIR' using sketches' contains retrieving of face of the suspect or criminal with the help of an eyewitness in less amount of time and lastly the 'pattern Matching' in which it considers every available evidence and match it with the pattern stored in the database, retrieve the list of suspected people and show it for that crime. It is only done in case of robbery, theft and burglary.

Index Terms- face detection, sketch match, CBIR, ICCTV.

I. INTRODUCTION

In this fast growing world information plays an important role in our life. As this is the world of imagination, every person imagines that they get instant information of object which they see or which is in their hand at that moment. Also in some countries like India and Sri Lanka there is a requirement of efficient criminal identification software which helps them to identify and nab the culprit in mean time. So it will help the security system to work faster and which helps to secure the society. As we know the rate at which criminal activities are growing and reaction of our police towards sensitive situations. So there is need of a system which satisfies all the security requirements.

In the proposed system which is based on concept of "Smart Face Recognition System" satisfies maximum requirements. The proposed project of "Smart Face Recognition System" uses webcam to detect and recognize the face of person coming in front of it. Then all the information regarding the image or detected face will be displayed. The "Smart Face Recognition System" is a system to be used by our security departments to identify the criminal by observing it by a camera or making its sketch from another person. Many of the image processing measures will be utilized during implementation of the project like image capturing, pre-processing, storing in database, comparison from database etc. on a successful match; a message is send to its nearby police station of captured information. The main objective of this project is to detect and recognize the face of suspected person coming in front of the camera, retrieve the sketches of suspected person and present its information to the user. As there are many images stored in database, so it will take a minute scale of time to find the correct image, so there is need of correct implementation of algorithm for image processing and data handling. After finding correct object image, a sms containing the information about the detected image or person is send to its nearby police station. If image is not present in the database then it will store it for future use.

II. CURRENT APPROACHES FOR CRIME INVESTIGATION

Before going through from the project while surveying we have considered many things around our society and also the operations done by the security forces attempting various crime cases. In that we have seen that they are still using old techniques to handle tedious tasks in crime investigation. This increases insecurity in society which is not acceptable. While reviewing various things regarding our project either the difficulties or challenges we have noted two main points:

A. PREVIOUS SYSTEM

As we have seen that in today's technical world some Asian countries used to investigate in an old manner. The old word used here because their way of investigation is far behind than that of other countries. For example the CCTV cameras provided in many areas in the city but it does not repay a good result to us. They still used the old techniques to retrieve sketches of suspected person. They did not save the evidences of previous crime scenes due to which it takes more than enough time to nab the criminals.

B. PROPOSED SYSTEM

We are proposing this software in which we enhance the technology of CCTV cameras in which it provides an alert system for the security forces (police departments) in real time through which they can spontaneously take action for that.

We are proposing efficient sketch base software through which we can easily retrieve the picture of suspected person from the eyewitness. As saving data regarding the evidences available at the crime spot in the database and use it for the future conditions.

III. METHODS AND PROCEDURES

The Smart Face Recognition System provides real time information about the images or video placed in front of camera. The product functions are more or less the same as describe in product perspective. The functions of the system include the system providing different type of services based on type of module. This system mainly uses Eigen-face detection algorithm.

In this algorithm we manage 3 different things to extract the pixels of the face so as to calculate and store it in database. First it identifies the pixels in a particular face region, plot it apparently using graphics and manage the neighbouring pixels so as to configure the pixels accurately.

To extract from a particular region two algorithms are used precisely i.e. Harr-cascade classification and edge detection algorithm. In edge detection case we increase the brightness and contrast of the image due to which lines going to generate which are mainly the edges of various face features. In case of Harr-cascade classification a particular image is place it eh coordinate axis with plot (x, y) and it is rotated to about 45 degree so that regions of face can be detect easily. This classification is done until the whole face is covered.

- The user should be provided with updated information of the suspected images or culprits.
- The admin is given a provision to check his account information and change the account information any time.
- The user can get the information about the images or videos which are placed in front of camera.
- The admin is provided with interfaces to add/delete the characteristics of the information available in the database.

The system uses internet to interconnect with the surrounding systems for efficient matchup.

IV. USER INTERFACES

- System login interface that use for validate the user
- Main view (an interface for searching for details) using the interface user can,
Upload a digital image
Validated updated image
Search for details
- Searched criminal details interface
Interface that requires showing all the detail that user has searched.
- Add criminal details interface user for add new details of the criminal
Add information of criminals
Validate information
- Criminal detail modification interface
- Administrator interface
Add users, Edit users, Delete users, View users, User accounting.

V. DESIGN OF SFRS

A. STEPS FOR FACE RECOGNITION

The section below shows the main steps in using facial recognition to identify an individual in controlled environment. Identification steps are:

Take photo of individual and encode it. Match the encoding against database and display possible matches. Select any matching image and display the full record. While different developers have used different approaches to developing facial recognition technology, the principle is the same as for other biometrics, i.e. the patterns within the object are identified and transformed mathematically into a code. In the case of face, features such as the eyes and tip of the nose are used as anchor points, and the relative location of numerous other facial characteristics to them is determined. The information is then transformed into a digital string. The string can be matched against recorded images in a database to determine if there is a match. As the shot can be taken with a standard camera from a reasonable distance, facial recognition is only biometric that does not require the cooperation or even knowledge of the individual for the process to work. However the implication of this is that the image is subject to external factors, particularly lighting and facial angles.

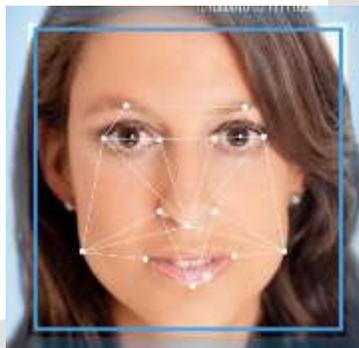


Fig: face analysis

B. FLOW WORK OF FACE RECOGNITION

The user who wants to search for information on a particular criminal will obtain a digital image of the person and upload it to the system using the web based interface. If the input image is in colour, the system will convert it to gray-scale to match the standard image format in the database. Then the image is normalized to match the standard image format and size. Here, the lighting conditions, the angle of the face when taking the photo, facial hair, etc. will be considered. Then the image is converted to a binary image. It is easy to process image. Once the image is converted to the binary image, the face regions are detected. The unique facial features are extracted and analyzed. The value of each facial feature is calculated and assigned to the image. The values will be sending to the database. After these values are put to database, the values that are already stored in the database are matched and compared. If matches are found, the output is displayed to the user through the interface.

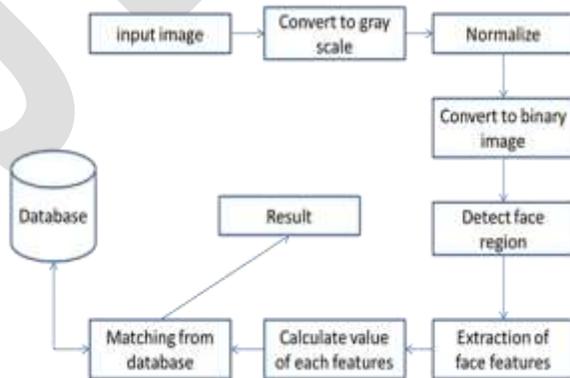
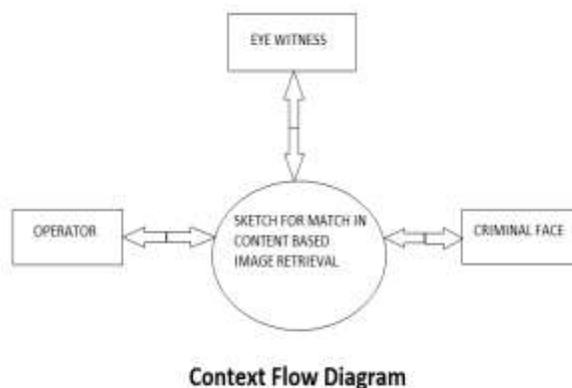


FIG: FLOW DIAGRAM OF FACE DETECTION

C. STEPS FOR SKETCH MATCH

While implementing this technology we have to consider various aspects regarding an image processing. In that we have to retrieve a desired image from the sketch made by the operator with the help of an eyewitness. This includes following steps to be carried out in a proper manner:

Ask the witness whether the person is male or female. According to its response show the different image constraints to be taken for sketching. The constraints are hair, nose, eyes, head, ears, chicks, wrinkles, lips etc. After selecting some of its constraints and the sketch is made according to the witness, it will then match with the available images in the database and shows the result to the user and the witness. If it is the desired image for them then it will get printed out for surveillance and if not then it will converted to colour image through image segmentation. Mostly it is 90% accurate image for the identification but can be differing from person to person. For comparing we have to keep our database up to date so it will help the user to construct the sketch image.



D. FLOW WORK SKETCH MATCH

The flow of sketch identification is same as that of face recognition for input image but instead of calculating the feature vector of the image through pixel analysis it converts the image into corresponding sketch view and choose the feature vector to be match.

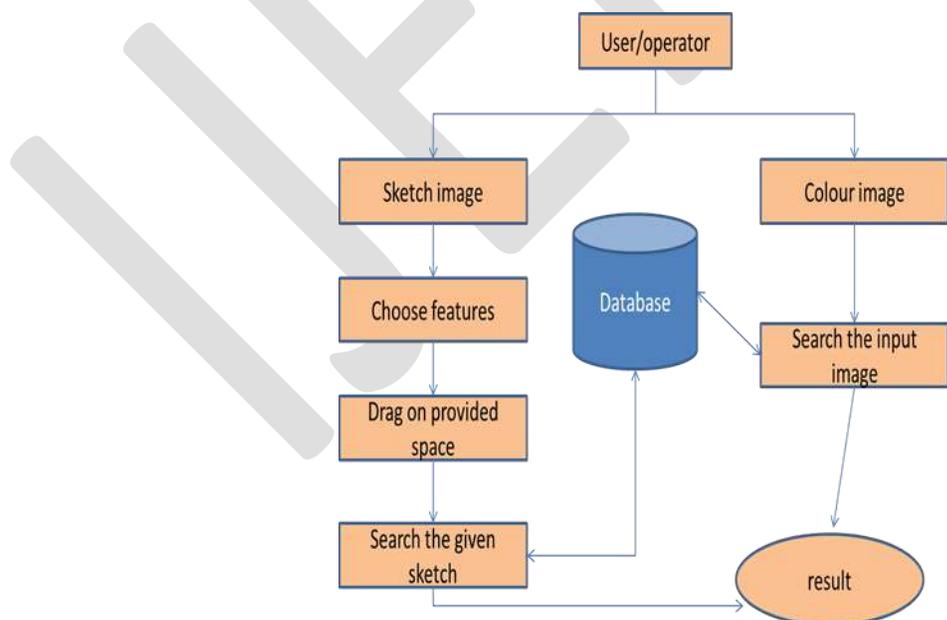


FIG: FLOW DIAGRAM FOR SKETCH MATCH

E. SYSTEM ARCHITECTURE

1] Login: The user login to the system by entering valid username & password. If username and password is incorrect, then user will not get access to the system.

2] Capture image/video: The user uses the camera to capture the images of the suspected person so as to detect it for comparison with the database.

3] Sketch matching: A technique in which we are using the templates of images to make sketches and retrieve it from the database if available.

4] Interact: Detection and recognition of object which is placed in front of camera is done. All image processing algorithms are applied to identify the image.

5] Perform operation: If image is already present in system, then information related to object is retrieved through database and it will be displayed and message will be send. Otherwise image have to be added into the system.

6] Add images: If the image is new to the system then it must have to be added in a system. Next time when we placed that image in provided space then system will identify the image.

7] Detect and recognize: Another technique which we are using for facial recognition is to recognize the faces in the images and display the result.

VI. IMPLEMENTATION OF SFRS

There are some hardware and software requirements needs to be fulfilled in accordance with its implementation.

These requirements are:

Camera: 1 webcam with better resolution (if necessary), **RAM:** 2GB, **Processor:** Intel dual core processor (1.6 GHz), **Hard disk requirement:** 260 GB, **Operating system:** windows platform (XP/7/8), Microsoft .NET Framework 3.0, **Language:** c#, **Front end:** .NET, **Backend:** SQL server.

VII. RESULT ANALYSIS

If a witness or a forensic report is available on a crime incident identification of criminals is a different case. SFRS is used to suggest possible criminals in situations where a witness or forensic reports are not available in case of face detection. The experimentations are carried out on data obtained from crime records division of Indian police. While recognising the details of criminal will be shown to the user. The end users will be the police officers who require information about criminals when following a certain case. They will need to have the knowledge about using web interface, logging in properly, uploading a digital image and updating new database record. The administrator will need to have advanced knowledge for user account management and usage of web interface as well as about WANs and VPNs. As modules for face recognition and sketch match is different so the end result is divided in two different phase.

A. RESULT FOR FACE RECOGNITION

This section provides you the real time detected face and its location. When the camera detects the face of the person it then sends a message regarding the suspected person including its location within few seconds to its nearby police station. It requires specific hardware to send the message. As soon as the user receives the message he/she can alert other people in probable time.

B. RESULT FOR SKETCH MATCH

This section provides you an efficient and quick sketch image by the system so as to nab the criminals as soon as possible. The end result will show you the possible faces of required match which is ranked using re-ranking algorithm. It will show you the possible images with respect to its probability. We can also use a colour image to match it with available database. The module contains set of image templates through which we have to create the sketch of the person. Crime information is actual but criminal information should be updated with its occurrences.

VIII. CONCLUSION

Thus we have concluded that through this project we can provide our society a secure environment but it needs lot more efforts for that as it is not easy but once it get implemented it will be one of the efficient project to be build for police departments. This project also enhances the efficiency of operations handle by police departments. It can also help us to minimize the terrorist activities and may help to nullify various terrorist attacks happen in the cities. The ability of storing suspect details that were arrested for at least one crime incident but not proved as the responsible criminal by the court, and the efficiency in identifying possible criminals for a crime incident are the characteristics that makes SFRS perfect than other crime investigation tools.

ACKNOWLEDGMENT

With all respect and gratitude, I would like to thank all people who have helped us directly or indirectly for the completion of this Seminar work. I express our heartily gratitude towards **Prof. R. R. Shewale** for guiding us to understand the work conceptually and also for his/her constant encouragement to complete this Seminar work on “**Smart Face Recognition System**”. I also express our thanks to **Prof. B. S. Tarle**, Head, Department of Computer Engineering for providing necessary information and required resources. With deep sense of gratitude I thank to our Principal **Prof. Dr. Jayant T. Pattiwar** and Management of the NDMVP Samaj’s for providing all necessary facilities and their constant encouragement and support. I am ending this acknowledgement with deep indebtedness to our friends who have helped us.

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Advanced Filing Machine

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Abstract- This paper outlines the effective filing process which is done by machine. Filing operation can be used on a wide range of materials as a finishing and burr removing operation. However mostly hand filing is done in industrial fields which is time consuming and not effective as much. Filing is probably very important and most frequent operation in metal work. The filing is done generally by hand with one hand on wood handle and other hand on tip of file. The aim of the present work is reduce human efforts in the filing process by designing the advanced filing machine. There are many problems related to hand filing. So, this paper describes filing process by use of small machine. Prior to the development of modern machining equipment it provided a relatively accurate means for the production of small parts, especially those with flat surfaces. This machine will definitely help in reducing time and human effort in metal as well as wood filing process. Filing machine is in compact size, portable and can be taken anywhere on shop floor. This machine is electrically operated and very easy to handle with one hand. The working model of filing machine is designed in Pro-Engineer software.

Keywords- Metal work, Wood work, Flat surfaces, Conventional filing, Human effort, Portable, Filing machine

1. INTRODUCTION

Filing is a material removing process in manufacturing which can be used on a wide range of materials as a finishing operation. Filing helps to achieve workpiece function by removing some excess material and deburring the surface. Prior to the industrialization of machining and the development of interchangeable parts during the 19th century, filing was much more important in the construction of mechanism [1, 2]. It is a versatile and almost used in every manufacturing process. File come in a wide variety of materials, sizes, shapes, cuts, and tooth configurations. File consists of blade with tang which is fitted in wood handle. These files are of different type and available with different cross section and no. of cut i.e. Single cut and double cut which are sometimes provided with tapers. This conventional filing process is easy but, requires more human effort and much time for different shape of workpiece.



Fig. 1 Hand File

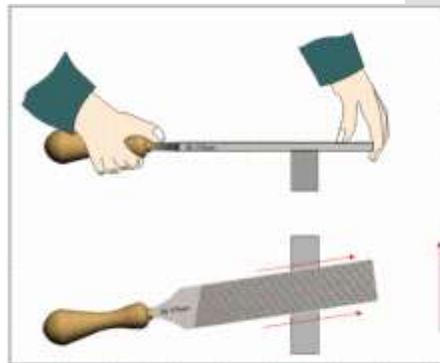


Fig. 2 Conventional filing process

Files come in a wide variety of materials, sizes, shapes, cuts, and tooth configurations. The cross-section of a file can be flat, round, half-round, triangular, square, knife edge or of a more specialized shape.

1.1 TYPES OF FILES

Square files: - These are gradually tapered and cut on all four sides. Used for a wide variety of things.

Three square files: - They are also called triangular files, have a triangular cross-section, which usually are used for many cuts, such as cutting angles less than 90 degrees. They are often employed for sharpening the teeth of wood saws.

Round files: - They are also called rat-tail files, are gradually tapered and are used for many tasks that require a round tool, such as enlarging round holes or cutting a scalloped edge. Round parallel files are similar to round files, except that they do not taper. Shaped like a toothed cylinder.

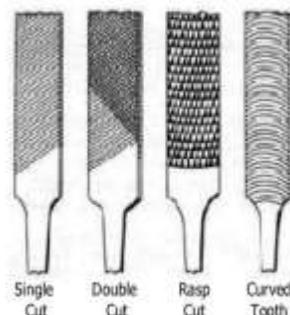


Fig. 3 Types of File

Crossing files: - They are half round on two sides with one side having a larger radius than the other. Tapered in width and thickness. For filing interior curved surfaces. The double radius makes possible filing at the junction of two curved surfaces or a straight and curved surface.

Crochet files: - They are tapered in width and gradually tapered in thickness, with two flats edges, cut all around. Used in filing junctions between flat and curved surface, and slots with rounded edges.

Knife files: - They are tapered in width and thickness, but the knife edge has the same thickness the whole length, with the knife edge having an arc to it. Used for slotting or wedging operations.

Pippin files: - They are tapered in width and thickness, generally of a teardrop cross section and having the edge of a knife file. Used for filing the junction of two curved surfaces and making V-shaped slots.

Equaling files: - They are parallel in width and thickness. Used for filing slots and corners.

Slitting files: - They are parallel in width with a diamond-shaped cross section. Thinner than knife files and use for filing slots.

Nut files: - They are fine, precise files in sets of graduated thickness, used dressing the slots at the end of the neck which support the strings of guitars, violins etc. in the correct position.

Pillar files: - They are parallel in width and tapered in thickness for perfectly flat filing. Double cut top and bottom with both sides safe; these are long, narrow files for precision work.

Warding files: - They are parallel in thickness, tapered in width, and thin. Like a hand or flat file that comes to a point on the end. Used for flat work and slotting.

In today's scenario, to reduce human effort and save time for manufacturing process is of prime importance. Considering the above need, the advanced filing machine is designed which will considerably reduce human effort and time in filing operation. In filing process one hand is kept on handle and another is kept on tip of file. When the surface which to be file is large then it is difficult to file as length of conventional file is limited to 10-15 inch and there is also disturbance due to handle of file [2, 3]. With advanced filing machine surface finishing is to be done with less human efforts and in short span of time. This advanced filing machine is electrically operated and having weight of 2-3.5 kg which can be easily operated by hand. There is an arrangement to replace the traditional hand file, so there is no need to design separate filing tool for this machine.

2. EXPERIMENTAL SETUP AND WORKING

2.1 WORKING PRINCIPLE

This advanced filing machine works on the principle of conversion of rotary motion of spindle into reciprocating motion of piston inside the slider which is shown in following fig.

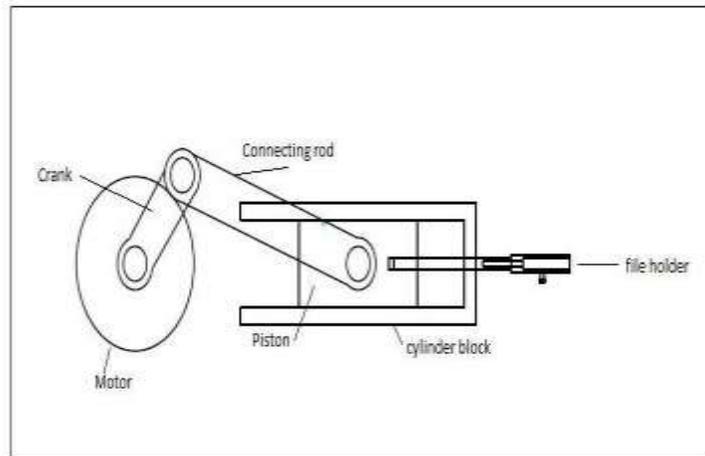


Fig. 4 Working Principle of Advanced Filing Machine

2.2 CONSTRUCTION

This advanced filing machine consists of an electrically operated ac motor and mechanism for conversion of rotary motion of spindle into reciprocating motion of file. The design of machine is simple and compact in size as shown in fig. The mechanism is similar to slider crank mechanism in which rotary motion of mechanism crankshaft converted into the reciprocating motion of piston slider arrangement. The motor is placed at one side of frame and crank is mounted on spindle. Piston and crank is connected by connecting rod with crank pin [4, 5]. The piston is fitted in sliding block by piston pin. The rod is rigidly attached to piston at one side and an arrangement for holding the file is then rigidly attached to this rod at another side. The tapping is also provided with tap screw on the file holding arrangement for fixing file in it. The whole assembly is covered by frame and for easy handling handle is provided as shown in fig.

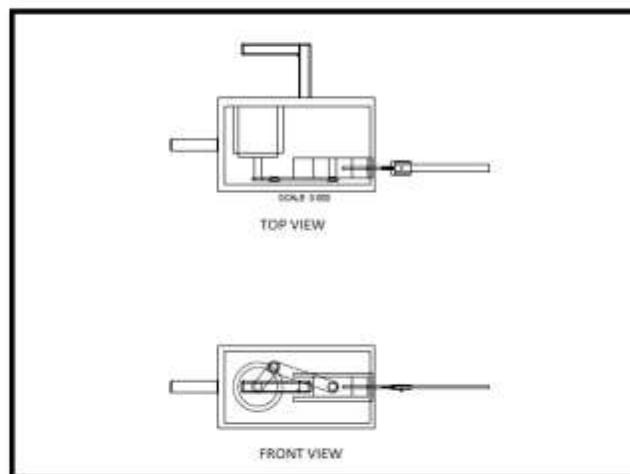


Fig. 5 Front and Top View of Advanced Filing Machine

2.3 WORKING

This advanced filing machine works on the principle of conversion of rotary motion of spindle into reciprocating motion of piston inside the slider. Electrical supply is given to the single phase ac motor and spindle rotates. The crank rotates with spindle and piston

start reciprocating inside the slider [6]. With the movement of piston the rigidly attached arrangement for holding the file also reciprocate horizontally as shown in fig. The file which is fitted inside the arrangement also reciprocates.

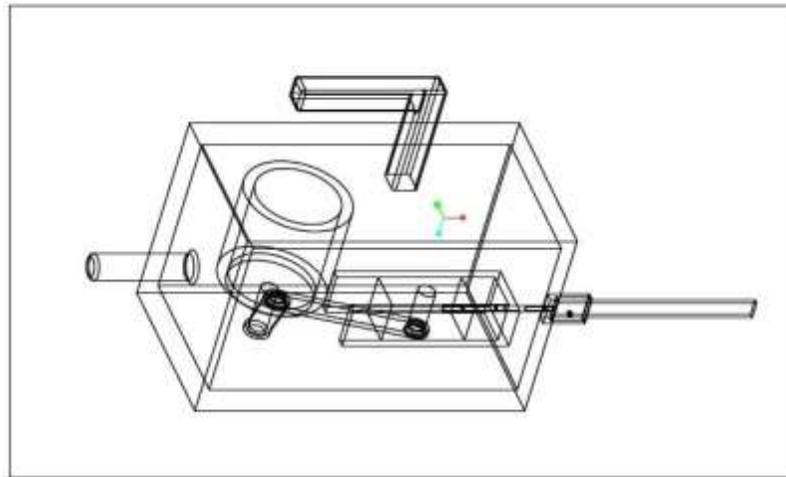


Fig. 6 Advanced Filing Machine (3-D view)

Fit the handle of the file in holder. Ensure that the file is fitted properly. Place the middle of the face of the file on the surface of job. The first stroke should be started with light pressure near the point of the file. Push file across the surface and increase pressure as you go, so that each file tooth will do its share of the job. When the file is reciprocated all the way across the surface of the job, raise file and start all over. Never use pressure on return stroke. Make sure your strokes are slow and steady. Too much speed will cause your file to “rock,” and that will round off the edges of your job. As you file, the teeth of the file will clog up with some of the job shavings and prevent efficient filing. This is known as “pinning”. Rubbing chalk between the teeth of the file can help to prevent this condition. But, better clean the file frequently with a brush, as shown in Figure (a). Brush with a pulling motion parallel to the rows of teeth, diagonally across the file, not up-and-down the length of the file. Clean the file after fifteen strokes and alter your angle of filing at the same time. Now repeat entire process with dowels or broom handle, so that you get practice in filing a rounded surface. Repeat entire practice procedure on metal.



Fig. 7 File Cleaning

3.CONCLUSION

This advanced filing process is much more effective than conventional filing process. Reciprocating action of file decreases the need of human efforts. This filling machine will have more importance when number of workpiece to be machine is more. Filling machine

is of compact size, portable and can be taken anywhere on shop floor. Also the machine is provided with a file holder with which different kind of files can be attached or removed easily and according to need one can use the proper file for smooth operation. However electrical supply is require to run the motor but this filing process require less time as compared to conventional filing process. Hence consumption of electrical energy is less. Files have forward-facing cutting teeth, and cut most effectively when pushed over the job. Pulling a file directly backwards on a job will cause the teeth to bend, permanently damaging the file (especially when an inexperienced user adopts a back-and-forth “sawing” motion). Draw filing involves laying the file sideways instead of head on, and a very fine shaving action is produced. There are also varying strokes that produce a combination of the straight ahead stroke and the draw filing stroke, and very fine work can be attained in this fashion. Using a combination of strokes, and progressively finer files, a skilled operator can attain a surface that is perfectly flat and near mirror finish. Pinning refers to the clogging of the file teeth with pins, which are material shaving. These pins cause the file to lose its cutting ability and can scratch the job. A file card, which is a brush with metal bristles, is used to clean the file.

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Infrastructures for Secure Data Aggregation, use of Wireless Sensor Networks for Industrial Monitoring and its application in Networks Monitor Transportation

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Abstract:-With the help of this paper we come to know that need for accurate time synchronization in the order of $0.6 - 9 \mu s$ every few minutes is necessary for data collection and analysis. Two-stage energy-efficient time synchronization is proposed in this paper. Firstly, the network is divided into clusters and a head node is elected using Low-Energy Adaptive Clustering Hierarchy based algorithm. Later, multiple packets of different lengths are used to estimate the delay between the elected head and the entire network hierarchically at different levels. Wireless sensor networks (WSNs) have not only become an attractive solution for low power implementations and embedded systems but also for the Power transmission and distribution. Research is ongoing to develop an innovative power source to facilitate the running of advanced sensing and communications technology in hazardous areas using WIFI to Power Sensors, Energy Harvesting using novel MEMS Electromagnetic Transducers, Powering sensors with Pipeline heat

Keywords- Electromagnetic Transducers, Adaptive Clustering Hierarchy, Energy Harvesting

I. SECURE DATA AGGREGATION IN WSN

A Wireless Sensor Network (WSN) typically consists of a sink node sometimes referred to as a Base Station and a number of small wireless sensor nodes. The base station is assumed to be secure with unlimited available energy while the sensor nodes are assumed to be unsecured with limited available energy as shown in figure 1. The sensor nodes monitor a geographical area and collect sensory information. Sensory information is communicated to the Base Station.

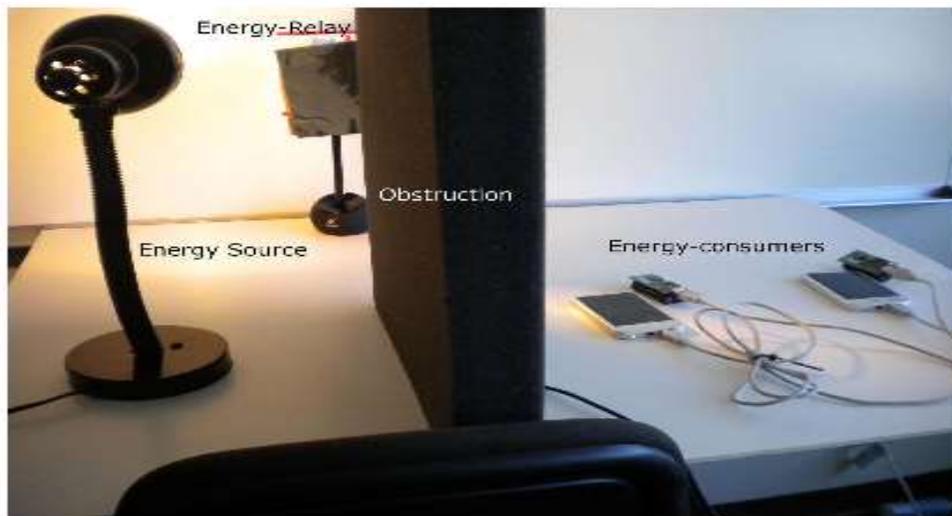
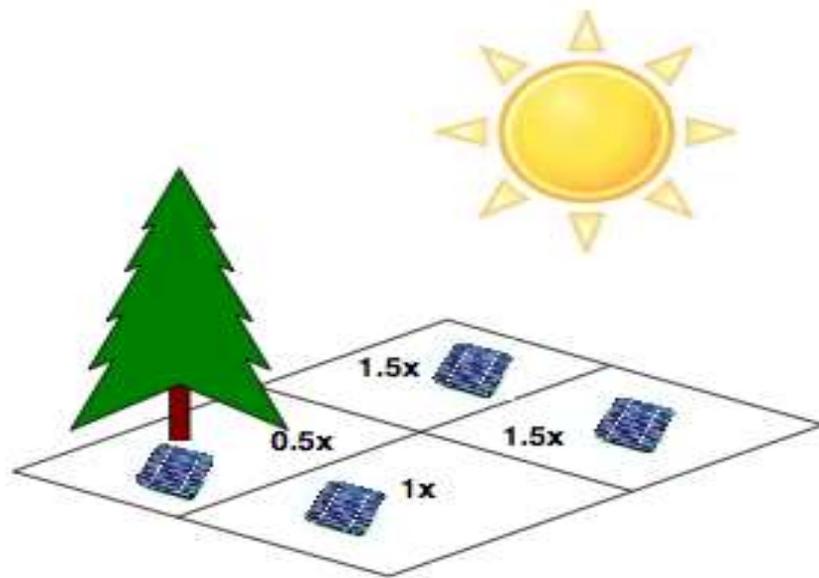


Figure1. Relationship between energy relay, obstruction and energy consumption

To conserve energy this information is aggregated at intermediate sensor nodes by applying a suitable aggregation function on the received data. Aggregation reduces the amount of network traffic which helps to reduce energy consumption on sensor nodes [1]. It however complicates the already existing security challenges for wireless sensor networks and requires new security techniques tailored specifically for this scenario. Providing security to aggregate data in Wireless Sensor Networks is known as Secure Data Aggregation in WSN. Were the first few works discussing techniques for secure data aggregation in Wireless Sensor Networks?

Two main security challenges in secure data aggregation are confidentiality and integrity of data. While traditionally encryption is used to provide end to end confidentiality in Wireless Sensor Network (WSN), the aggregators in a secure data aggregation scenario need to decrypt the encrypted data to perform aggregation [2]. This exposes the plaintext at the aggregators, making the data vulnerable to attacks from an adversary. Similarly an aggregator can inject false data into the aggregate and make the base station accept false data. Thus, while data aggregation improves energy efficiency of a network, it complicates the existing security challenges.

II. WIRELESS SENSOR NETWORKS FOR INDUSTRIAL MONITORING AND CONTROL



Figure2. Smart Mesh Wireless Sensor Network infrastructure.

Greater access to monitoring and control information gives engineers better visibility and ultimately better decision-making power when it comes to industrial environments such as plants, factories, and refineries as shown in figure 2.

Smart Mesh wireless sensor networks (WSN) are used to dramatically reduce the cost and complexity of applications for a wide variety of applications including process monitoring, process control, machine health monitoring, corrosion detection, and to ensure regulatory compliance [3]. Benefits of wireless sensor networks for industrial automation and process control Lower systems and infrastructure costs with reduced maintenance and elimination of cabling Improves efficiency of materials use by monitoring and predicting requirements Improves process safety by automating activities previously unmanageable with a wired solution

Process Monitoring

The rock-solid reliability and simple installation and management of Smart Mesh Wireless HART-enabled solutions lets engineers get the measurements they need, when they need them to improve productivity. And, by leveraging field devices based on the Wireless HART (IEC62591) standard, device commissioning is just as simple as in the wired world—no need for new skills, tools, or consultants. Real-world installations have demonstrated that self-organizing Wireless HART networks provide a 90% reduction in installation cost compared to wired sensors, knocking down the barrier to widespread deployment of sensors in the industrial environment. For example, the GlaxoSmithKline plant in Cork, Ireland, is a strategic operation, manufacturing many of the active ingredients used in the formulation of prescription drugs [4]. To increase productivity, they added two new water storage tanks. Wanting to measure water levels and usage, GlaxoSmithKline selected Emerson Process Management's Rosemount® Smart Wireless flow and pressure transmitters because of the reduced installation costs and because it would be easy to expand the network without disrupting operations or data collection. Using Dust Networks® Smart Mesh® technology, the Rosemount Smart Wireless product family created a resilient, reliable and secure wireless mesh sensor network over which to transmit sensor data without digging trenches and laying cable, reducing installation costs significantly. The Smart Mesh intelligent network also allowed secure, non-disruptive expansion of the network as needed. [Click here for case study.](#)

III TRADITIONAL LAYERED APPROACH

Traditional layered approach cannot share different information among different layers , which leads to each layer not having complete information. The traditional layered approach cannot guarantee the optimization of the entire network. The traditional layered approach does not have the ability to adapt to the environmental change. Because of the interference between the different users, access confliction, fading, and the change of environment in the wireless sensor networks, traditional layered approach for wired networks is not applicable to wireless networks. So the cross-layer can be used to make the optimal modulation to improve the transmission performance, such as data rate, energy efficiency, QoS (Quality of Service), etc. Sensor nodes can be imagined as small

computers which are extremely basic in terms of their interfaces and their components [5]. They usually consist of a processing unit with limited computational power and limited memory, sensors or MEMS (including specific conditioning circuitry), a communication device (usually radio transceivers or alternatively optical), and a power source usually in the form of a battery. Other possible inclusions are energy harvesting modules,^[9] secondary ASICs, and possibly secondary communication interface (e.g. RS-232 or USB). The base stations are one or more components of the WSN with much more computational, energy and communication resources. They act as a gateway between sensor nodes and the end user as they typically forward data from the WSN on to a server. Other special components in routing based networks are routers, designed to compute, calculate and distribute the routing tables.

IV WIRELESS SENSOR NETWORKS MONITOR TRANSPORTATION



Figure3. Transport monitoring in case of Wireless sensor networks.

Wireless sensor networks allow cities, rail systems and logistics operations to cost-effectively gather information and use that field data to develop applications that lead to cost savings and ultimately improved quality of life.

- (a) Benefits of wireless sensor networking for transportation applications.
- (b) Enables new applications by eliminating need for wires.
- (c) Improves safety by automating processes previously managed manually.
- (e) Reduces costs associated with maintenance with greater reliability and extended battery life.
- (f) Minimizes deployment time and costs with easy installation and no cabling.

Reliable, easy to deploy, and built with the priorities of cities and citizens in mind, Street line Networks is leading the way in the development of intelligent infrastructure solutions for urban areas. The Street line solution is a complete information system designed specifically for applications in urban resource management [6]. The platform integrates ultra low power sensing with Web-based solutions that optimize the use of city assets, in this case parking spaces. Here. At the heart of the solution is the Smart Mesh-enabled ultra low power vehicle sensor [7]. These pavement sensors work by detecting a disturbance in the magnetic field from a vehicle parked in a space [8]. Data hops from sensor to sensor until it makes its way to a gateway, a small box sitting on top of a streetlamp or a traffic-signaling box. Leading the revolution in relieving congestion on city streets, solutions like Street line's will have a cascade of positive effects on transportation the economy and the environment.

V CONCLUSION

It is used to detect energy imbalance among static nodes and even them out using rechargeable robots send query to the network to find out the static nodes that needs service, sensors that need service reply back, robots select one and then navigate to the location In present paper we have discussed various kinds energy availability must be decoupled from sensor net operation "Energy relay (with harvesting capabilities) to deliver energy to energy consumers. Enable energy to be treated as a network wide, exchangeable and route-able commodity.

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Satellite-WSN routing Technology, DIFFERENT ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORKS, use of Route DISCOVERY AND Static routing

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Abstract:-With the help of this paper we come to know Residents wear sensors equipped with accelerometers (with fall detection algorithms that detect falls with the combination of speed and orientation changes).In the case of fall detection, the sensor device beeps and an alert message is sent to the ALSP and to a designated healthcare provider. In the case of false alarm, the resident can press a button and disable the message sending from its end.

Keywords- Dynamic Source Routing, Low Energy Adaptive Clustering Hierarchy

I. Routing

Since there is no fixed topology in these networks, one of the greatest challenges is routing data from its source to the destination. Generally these routing protocols draw inspiration from two fields; WSNs and mobile ad hoc networks (MANETs). WSN routing protocols provide the required functionality but cannot handle the high frequency of topology changes. Whereas, MANET routing protocols are can deal with mobility in the network but they are designed for two way communication, which in sensor networks is often not required. Protocols designed specifically for MWSNs are almost always multihop and sometimes adaptations of existing protocols. For example, Angle-based Dynamic Source Routing (ADSR) is an adaptation of the wireless mesh network protocol Dynamic Source Routing (DSR) for MWSNs. ADSR uses location information to work out the angle between the node intending to transmit, potential forwarding nodes and the sink as shown in diagram 1. This is then used to insure that packets are always forwarded towards the sink. Also, Low Energy Adaptive Clustering Hierarchy (LEACH) protocol for WSNs has been adapted to LEACH-M (LEACH-Mobile), for MWSNs. The main issue with hierarchical protocols is that mobile nodes are prone to frequently switching between clusters, which can cause large amounts of overhead from the nodes having to regularly re-associate themselves with different cluster heads.

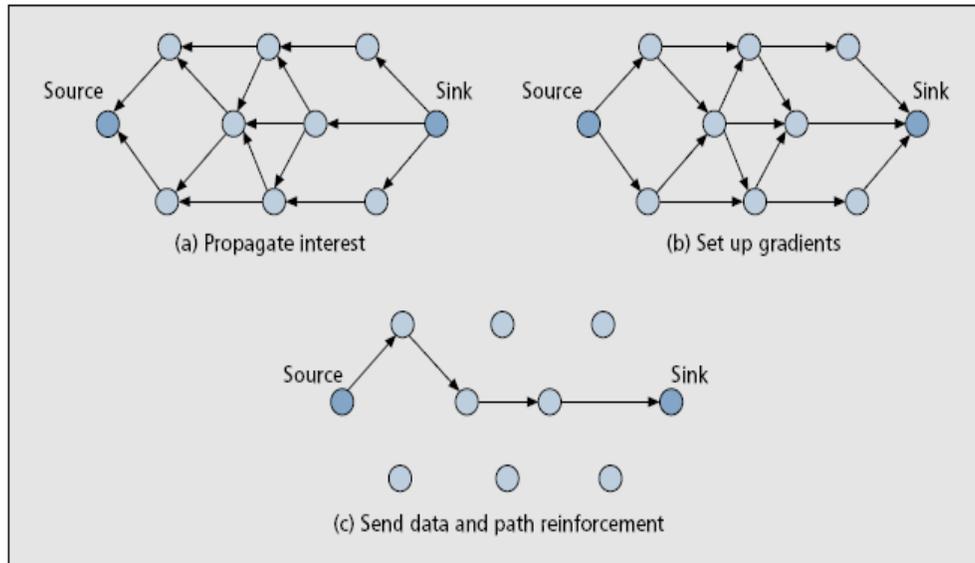


Figure 1. Reinforcement and setup gradient process

Another popular routing technique is to utilize location information from a GPS module attached to the nodes. This can be seen in protocols such as Zone Based Routing (ZBR), which defines clusters geographically and uses the location information to keep nodes updated with the cluster they're in. In comparison, Geographically Opportunistic Routing (GOR) is a flat protocol that divides the network area into grids and then uses the location information to opportunistically forward data as far as possible in each hop. Multipath protocols provide a robust mechanism for routing and therefore seem like a promising direction for MWSN routing protocols. One such protocol is the query based Data Centric Braided Multipath (DCBM).

II. ROUTING PROTOCOLS IN WIRELESS SENSOR NETWORKS

The communication between the nodes of a WSN must be governed by a set of rules (protocols) in order for them to function properly as shown in diagram 2. And the data or information that they share amongst them can be tampered with by an outside intruder (adversary) for its own benefit jeopardizing the operations of the network. Thus the protocol used must provide confidentiality of the data shared among the sensor nodes in order to carry out an intended operation in the selected environment successfully.

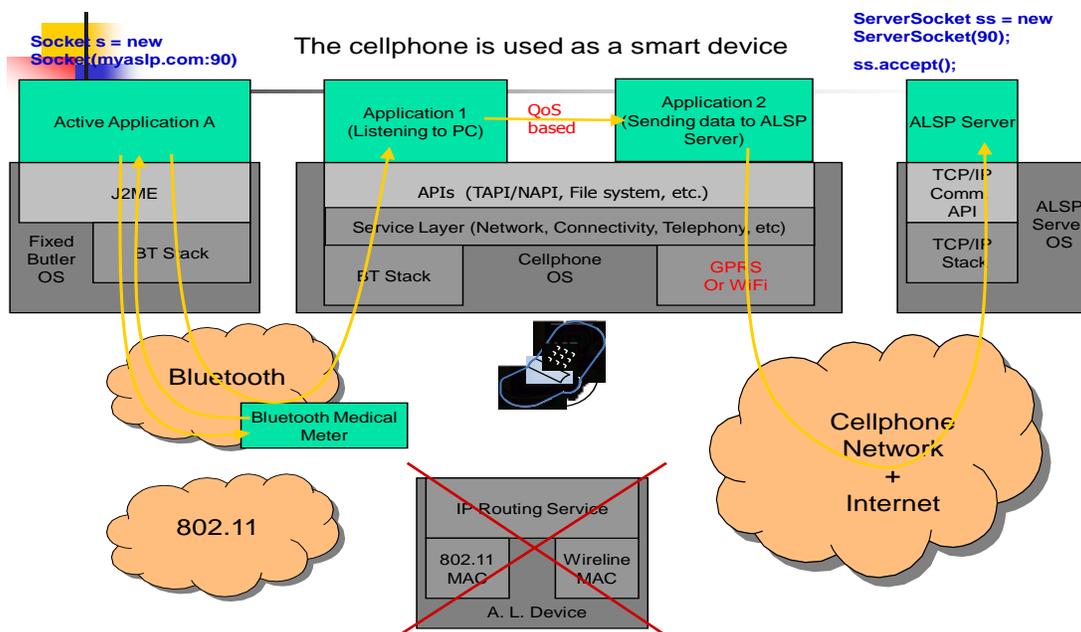


Figure 2. Cell Phone used as Smart Phone.

Due to the difference of wireless sensor networks from other contemporary communication and wireless ad hoc networks routing is a very challenging task in WSNs. For the deployed sheer number of sensor nodes it is impractical to build a global scheme for them. IP-based protocols cannot be applied to these networks. All applications of sensor networks have the requirement of sending the sensed data from multiple points to a common destination called sink. Resource management is required in sensor nodes regarding transmission power, storage, and on-board energy and processing capacity. There are various routing protocols that have been proposed for routing data in wireless sensor networks due to such problems. The proposed mechanisms of routing consider the architecture and application requirements along with the characteristics of sensor nodes. There are few distinct routing protocols that are based on quality of service awareness or network flow whereas all other routing protocols can be classified as hierarchical or location based and data centric.

III. ROUTE DISCOVERY

The base station initiates the first round whenever it needs to construct the forwarding tables of all sensor nodes. This is usually in the beginning when the network is just established, or when the network may have changed substantially due to node mobility. The base station broadcasts a request message that all the sensor nodes receive, each sensor node that receives the request message for the first time in turn broadcasts a request message as shown in diagram 3. This message broadcasted by the sensor node includes a path from the base station to the particular node. When a node receives a request message for the first time, it forwards (broadcasts) this message after appending its identity in the path, it also records the identity of the sender of this message in its neighbor set. If a node receives duplicate request messages, the identity of the sender is added to its neighbor set, but the duplicate request is not rebroadcast. This serves three purposes: (1) it informs all sensor nodes that the base station is collecting topology information to build forwarding tables, (2) it aids in constructing a path from each sensor node to the base station that is used in the second round to forward feedback messages to the base station, and (3) a node receiving a request message learns that the sender of that message is its neighbor. [1]

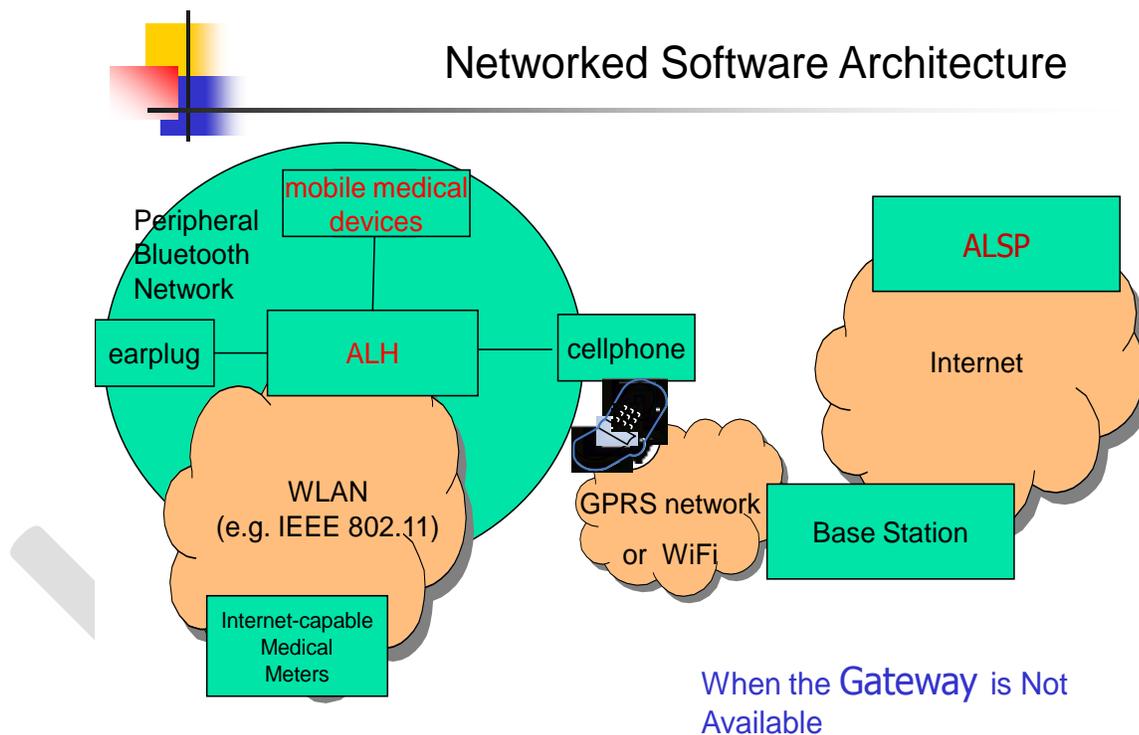


Figure3. Network software architecture

An adversary in the network can attempt to launch several attacks in this round. First, it can attempt to deceive the base station by sending a spurious request message. Second, it can include a fake path in the request message it forwards [2]. Third, it may not forward a request message, or launch a DOS attack by repeatedly sending several request messages. These attacks are counter-acted by two mechanisms: First, we leverage the concept of one-way sequences proposed by the μ TESLA protocol [Perrig01] to identify a request message initiated by the base station and to restrict DOS-style flooding attacks. The base station generates a sequence of numbers $n_1, n_2, n_3, \dots, n_{k-1}, n_k$, such that $n_{i+1} = F(n_i)$, where F is a one-way function, $0 < i < k$, and n_1 is chosen randomly. F is such

that it is computationally impossible to compute n_k in a limited time by knowing n_{k-1} and F. All sensor nodes are pre-configured with function F and value n_k

IV. STATIC ROUTING

Static routing is a form of routing that occurs when a router uses a manually-configured routing entry, rather than information from a dynamic routing protocol to forward traffic. Unlike dynamic routing, static routes are fixed and do not change if the network is changed or reconfigured. Static routing and dynamic routing are not mutually exclusive [3]. Both dynamic routing and static routing are usually used on a router to maximize routing efficiency and to provide backups in the event that dynamic routing information fails to be exchanged. Static routing can also be used in stub networks, or to provide a gateway of last resort. Static routing can have some potential disadvantages like In many cases, static routes are manually configured. This increases the potential for input mistakes [4]. As a result the network is unusable until the failure is repaired or the static route is manually reconfigured by an administrator [5]. Static routes typically take precedence over routes configured with a dynamic routing protocol. This means that static routes may prevent routing protocols from working as intended. A solution is to manually modify the administrative distance. Static routes must be configured on each router in the network(s). This configuration can take a long time if there are many routers [6].

V CONCLUSION

In present paper we have discussed various current tools for simulation. it produces error rate and a limitation in buffering. There is need for extra work to be done to check the heterogeneous capabilities of the network and to verify the multi-path and asymmetrical load balancing. Other future challenges includes ability to transfer data with satellite advantages with the IP stack in WSN nodes, ability to also used the satellite to change the routing mechanism using the generated IP address.

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PLC Based Automatic Fault Detection of Railway Track and Accident Avoidance system

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Abstract— presently in the real time world, commuters are using different types of transport facilities such as flights, trains, buses, cars etc. But majority of the public in our country prefer traveling in trains. The reason may be the comforts available for long journeys and relatively lesser travelling charges. Though the railways has implemented many safety standards for the safe journey, still one can witness some rail accidents and leading to the loss of many precious lives and loss of property.

Some of the major reasons for rail accidents are due to the faults on the rail. At present our railways are using manual methods of fault detection through human inspectors. This work is an attempt to develop an advanced automatic PLC based fault detection technology in railway network to overcome the above problems. The proposed automatic control system makes use of vibration monitoring sensor and ultrasonic sensors to detect the faults occur in the railway track. The hardware components such as PIC16F877A microcontroller, Programmable logic controller (PLC) and GSM are used as advanced controlling and communication elements of automatic fault detection system.

Keywords— Low Cost Automation, PLC, Microcontroller, GSM.

INTRODUCTION

The basic objective of this project is to develop a breakage detection of railway tracks using programmable logic control (PLC) which is used to find the detection of breakage in the railway track. The Indian railway (IR) network today has a track length of 1,15,000 kilometers over a route of 65,000 kilometers and 7,500 stations. It is the fourth largest railway network in the world exceeded only by those of the United States, Russia and China. In 2011, IR carried over 8,900 million passengers' annually or more than 24 million passengers daily and 2.8 million tons of freight daily. Despite boasting of such impressive statistics, the Indian rail network is still on the growth trajectory trying to fuel the economic needs of our nation. Though rail transport in India is growing at a rapid pace, the associated safety infrastructures are not up to international standards. To demonstrate the gravity of the problem, official statistics say that there have been 14 accidents in 2011, 15 accidents in 2012. On further analysis of the factors that cause these rail accidents, recent statistics reveal that approximately 90% are due to cracks on the rails either due to natural causes (like high expansion due to heat). The present work is focused on bringing down the accident rate by automatically detecting the breakage/s on the tracks.

HARDWARE

Ultrasonic sensor

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. As the distance to an object is determined by

measuring the time of flight and not by the intensity of the sound. Ultrasonic sensors are used for material testing (to detect cracks, air bubbles, and other flaws in the products), Object detection, position detection, ultrasonic mouse, etc.

Model Number

UC300-F43-2KIR2-V17

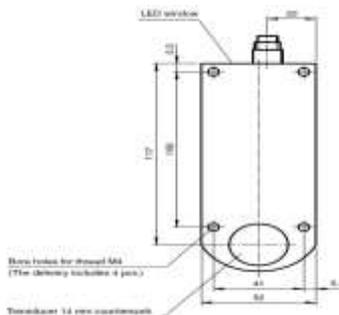


Figure 1: ultrasonic sensor

Features of Ultrasonic sensor

- Current output 4 mA to 20 mA.
- 2 relay outputs.
- Serial Interfaces.
- Temperature compensation.
- Reverse polarity protection.
- Programmable with ULTRA 3000.

Vibration sensor

A vibration sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, strain or force by converting them to an electrical charge. Vibration sensor based on the piezoelectric effect Change in resistance due to the force acting on it and converts it into 4 - 20 mA. They're measuring differences in oscillation and detect the vibration created on the surface.

Model Number Vkv021

Vibration Monitor

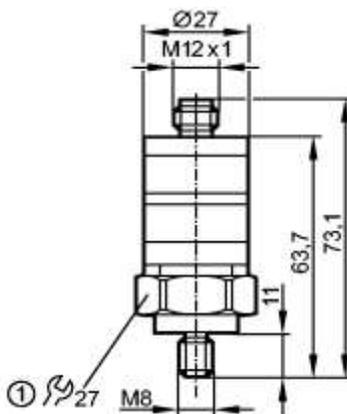


Figure 2: Vibration Sensor

www.ijergs.org

Characteristics of vibration sensor

- Vibration Monitor.
- Measuring Range RMS: 0 to 25mm.
- Switching outputs: Normally Closed and Analogue 4 to 20ma.

IndraControl L20 PLC:



FIG 3: PLC KIT

The IndraControl L20 is a modular and scalable control. It combines the benefits of a compact small control with a standardized I/O system on the basis of terminal technology. It is a hardware platform that can be used for PLC applications. It provides onboard interfaces, e. g. high-speed inputs and outputs (8 each) and communication interfaces, such as Ethernet, PROFIBUS and RS232. The locally available I/O units can be extended by the Rexroth Inline I/O system, just by simply mounting the components side by side. Application programs, including runtime, are completely stored to an easily accessible standardized Compact Flash medium.

Operating elements and interfaces are arranged on the front. The eight-digit display with four operator keys, the Reset button with light-emitting diode, the RS232 interface, and the receptacle for the Compact Flash card are provided to the left of the unit. Further interfaces (Ethernet, PROFIBUS DP) are located in the central section of the unit. The terminals for digital inputs and outputs (eight each) and the voltage supply connectors are arranged to the right of the unit.

Advantages of PLC:

- Programming a PLC is easier than wiring the relay control panel..
- PLC can be reprogrammed. Conventional controls must be rewired and are often scrapped instead.
- PLC takes less floor space than relay control panels.
- A PLC has facility for extensive input/output arrangements.
- Maintenance of the PLC is easier, and reliability is greater.
- PLC can be connected to the plant computer systems more easily than a relay.
- PLC has very few hardware failures compared to electromechanical relay.

III Related work

A literature survey has been carried out in the present investigation to select the problems which are being faced by the railways network. The work has been narrowed down in detecting the breakage in the railway tracks which are causing accidents leading to loss of lives and property. The present work is intended to propose solutions to reduce the occurrence of tragic accidents.

Raghupathy et.al [1] in their work have designed a system based on ultrasonic waves which would prevent the train accidents due to derailment of tracks, unmanned railway crossing and head on collision.

Stefan et al, [2] have used the Eddy current sensors to detect the fault in track. The sensors are mounted 100mm above the rail head of the train bogie. This sensor monitors the railway track and detects the breakage/s in the track.

Ramesh et al, [3] have suggested the detection of cracks and derailments in rails which can be done by ultrasonic waves or sensor.

AnjaliBissa et al, [4] have used vibration sensors and Zigbee technology using microcontroller. To detect the faults in the track or when a running train is detected in front of the standing train, the sensors detects and sound an alarm which is fitted in the operating room in the engine.

From the above literature survey we conclude that PLCs are widely used in breakage detection of railway track.

IV Working Methodology

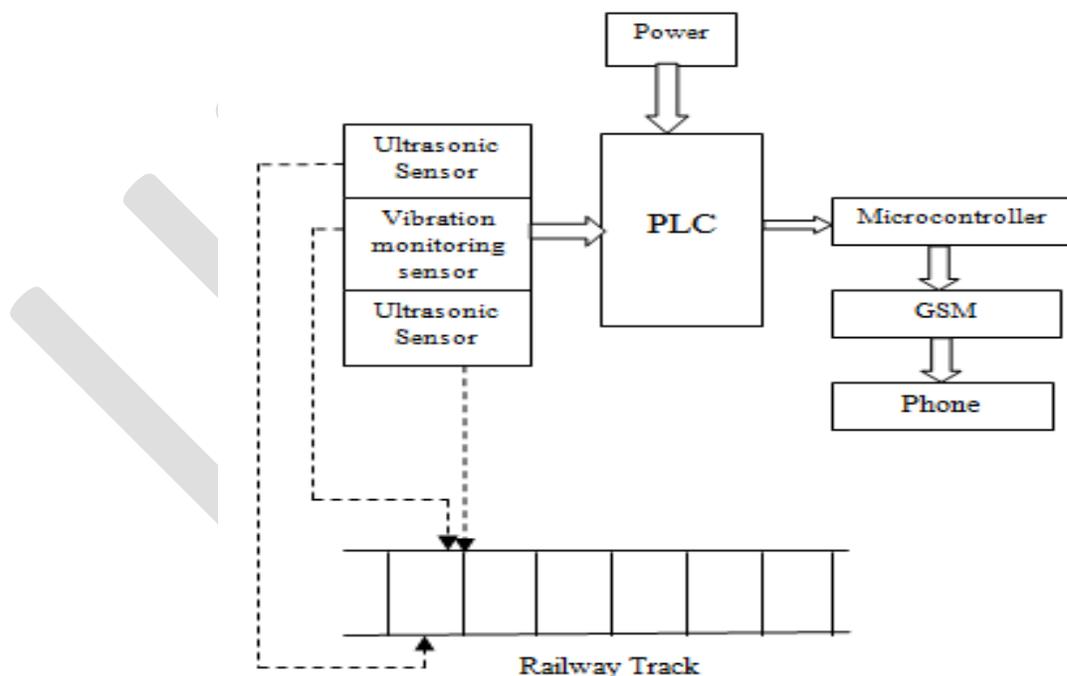


FIG 4: Block Diagram of Automated Fault Detection System

The figure 4 shows block diagram of the automated railway track fault detection system. In the system one vibration monitoring sensor and two ultrasonic sensors, are used to detect the faults in the railway track. The two ultrasonic sensors are located at front and back part of the engine bogie and the vibration monitoring sensors are fixed at the base of the engine bogie. The vibration

monitoring sensor and two ultrasonic sensors are connected as inputs to the PLC and the microcontroller is connected to the output of the PLC, then the GSM is connected to the microcontroller.

When the train moves on the railway track, if any breakage/s, faults in sleepers occurs in the railway track, the vibration monitoring sensor senses the defects in terms of vibrational fluctuation and sends the signal to the PLC and the PLC will prompt the LED. At the same time the PLC sends the predicted defects information to the microcontroller. Then the Microcontroller conveys the received information from the PLC to the GSM Module. GSM module sends the information via SMS to the traffic control room of the nearest railway station.

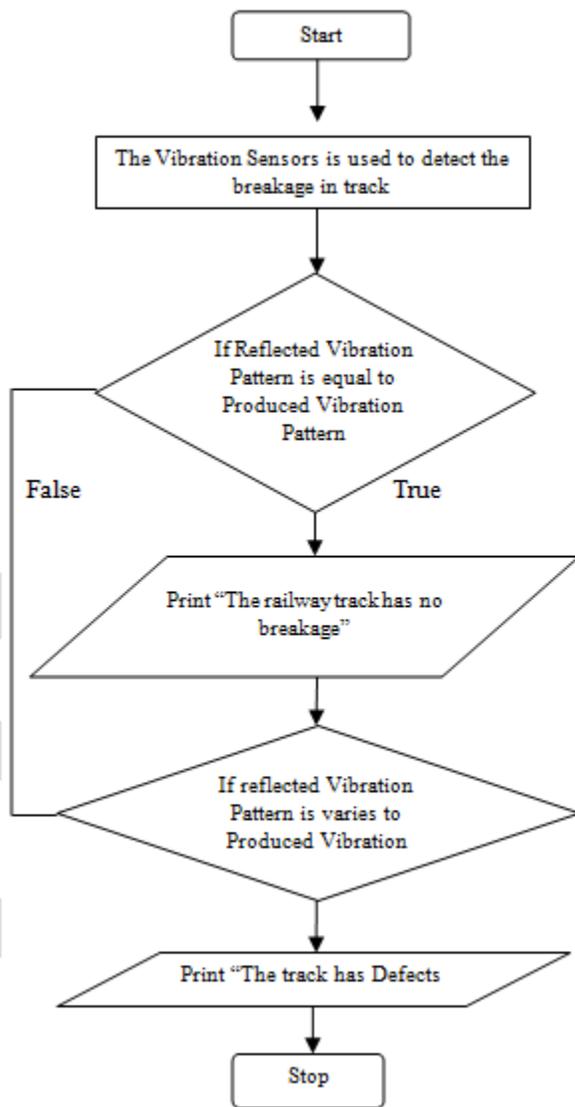


Figure 5: vibration sensor flow chart

The two ultrasonic sensors are used to detect the derailing and faults in fishplates of the railway track. These two ultrasonic sensors are adjusted at a distances of 4mm away from the right and left tracks by assembling them on the sides of the engine bogie. Both the ultrasonic sensors are connected to the input ports of the PLC. When the derailing situations occurs the clearance of sensors probe with a rail track varies the preset 4mm distances, then the ultrasonic sensors sends those predicted error signal to the PLC and PLC will prompt the LED. Simultaneously the PLC sends the predicted defects information to the microcontroller. Then the

Microcontroller conveys the received information from the PLC to the GSM Module. GSM module sends the information via SMS to the traffic control room of the nearest railway station

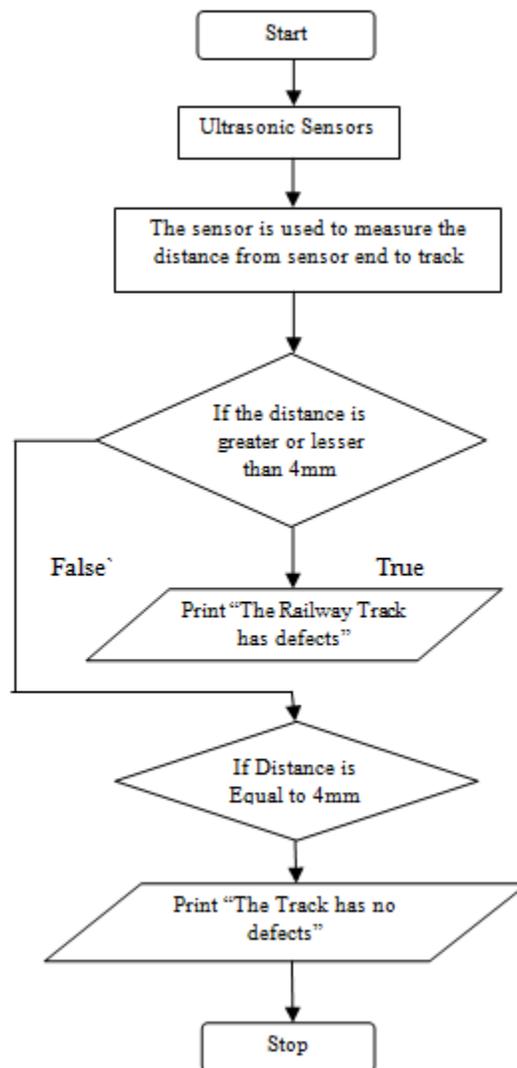


Figure 6: Ultrasonic sensor flow chart

Ladder diagram:

PLC programs are typically written in a special application on a personal computer, and then downloaded by a direct-connection cable or over a network to the PLC. The program is stored in the PLC either in battery-backed-up RAM or some other non-volatile flash memory. Often, a single PLC can be programmed to replace thousands of relays.

Ladder logic is a programming language that represents a program by a graphical diagram based on the circuit diagrams of relay logic hardware. It was primarily used to develop software for programmable logic controllers (PLCs) used in industrial control applications. The name is based on the observation that programs in this language resemble ladders, with two vertical rails and a series of horizontal rungs between them. Figure 5 shows ladder logic.

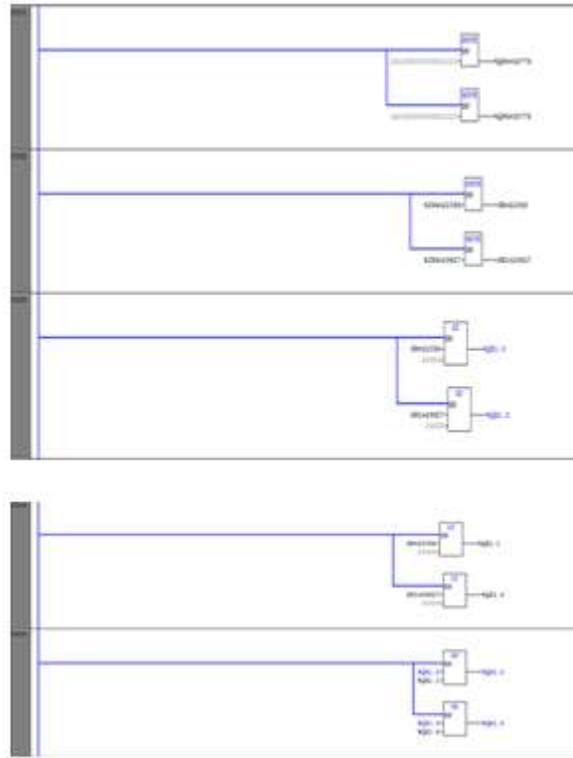


Figure 7: Ladder diagram

The PLC ladder logic diagram is as shown in the figure 7. %QX1.0, %QX1.1, %QX1.2, %QX1.3, %QX1.4, %QX1.5, %QX2.0, %QX2.1, %QX2.2, %QX2.3, %QX2.4 are the digital outputs. %IW4 and %IW6 are refers as analog inputs of the system and %QW4 and %QW6 are refers as analog outputs of the system. To operate the system in analog modes. The analog mode has some standard binary values, that standard binary value has to assign in the program and that binary values has to convert in to word. After conversion the analog mode is ready to operate in the program.

%IW4 and %IW6 are the ultrasonic sensors inputs connected to the PLC. RW and RW1 are the output coming from ultrasonic sensors that RW and RW1 outputs are given as input to the greater functional block (GT) and lesser functional block (LT). The RW and RW1 will compared with the assigned value in the greater functional block. If the RW and RW1 is greater than the assigned value then %QX1.0 and %QX1.3 will glow the LED, then the track is said to be fault. If it is not greater than the assigned value then %QX1.0 and %QX1.3 will not prompt the LED and it will check for the lesser condition. If the RW and RW1 are lesser than the assigned value, then the %QX1.1 and %QX1.4 will prompt the LED then the track is said to be fault. If it is not lesser than the assigned value then the %QX1.1 and %QX1.4 will not prompt the LED. The GT and LT functional block outputs are connected to OR gate then check for the conditions: If any one of the GT and LT functional block output are 1 then the track has fault. If both the GT and LT the functional block output are 0's then the track is in normal conditioned.

V. CONCLUSION

The Proposed work is an advanced alternative solution to replace the manual method of fault detection of railway track with a PLC based automated fault detection system. This system completely eliminates the human intervention for detecting faults. It provides a high speed fault detection system that automatically communicates the predicted railway track defects information immediately to the concerned railway traffic control room by using GSM system, hence this will reduce the accident rates and loss of

precious life. The PLC used as a controller in this system, makes the entire system as a user friendly and highly reliable that carries out control functions of many types and levels of complexity.

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Design of NACA 2412 and its Analysis at Different Angle of Attacks, Reynolds Numbers, and a wind tunnel test

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Abstract—The purpose of this project is to analyze airfoil at different Reynolds numbers using Gambit and Fluent, and wind tunnel experiment. One model is prepared for wind tunnel analysis and 2D and 3D models are created and drawn in solid work and they were meshed in Gambit using geometry data gathered by Airfoil database available on internet. These models were read into Fluent where flow boundary conditions were applied and the discretized Navier-Stokes equations were solved numerically. Tests also run in wind tunnel to find out the general aerodynamic characteristics of the Airfoil (NACA 2412).

Keywords— airfoil, NACA 2412, analysis of airfoil, design of airfoil, 3D analysis of airfoil, four digit airfoil, angle of attacks

INTRODUCTION

In this project, computational Fluid Mechanist analysis of airfoil has been done to understand the aerodynamic airfoil concepts

Airfoil taken is NACA 2412, this is cambered airfoil belongs to the four digit series of the NACA airfoil classification, the general characteristics of this airfoil are:-

NACA FOUR DIGIT SERIES

The NACA four-digit wing sections define the profile by:

1. First digit describing maximum camber as percentage of the chord.
2. Second digit describing the distance of maximum camber from the airfoil leading edge in tens of percents of the chord.
3. Last two digits describing maximum thickness of the airfoil as percent of the chord.

NACA 2412 is the airfoil of NACA 4 digit series. From its designation we get the NACA 2412 airfoil has a maximum camber of 2% located 40% (0.4 chords) from the leading edge with a maximum thickness of 12% of the chord. Four-digit series airfoils by default have maximum thickness at 30% of the chord (0.3 chords) from the leading edge. NACA 2412 is slow speed airfoil; this airfoil is used in single engine Cessna 152, 172 and 182 airplanes

SOME PARAMETERS

Reynolds number

The Reynolds number relates the density, viscosity, speed and size of typical flow in a dimensionless equation which is involve in many fluid dynamics problems. This dimensionless numbers or combination appears in many cases related to the fact that laminar flow can be seen or turbulent. From a mathematical point of view the Reynolds number of a problem or situation is defined by the following equation.[3]

$$Re = (\rho \times V \times L) / \mu$$

Table No.1/ Aerodynamic forces		
For lift coefficient	For Drag Coefficient	For moment coefficient
$C_L = 2 f(Re, M, \alpha)$	$C_D = 2 f(Re, M, \alpha)$	$C_M = 2 f(Re, M, \alpha)$
$L = C_L \frac{1}{2} \rho V^2 c$	$D = C_D \frac{1}{2} \rho V^2 c$	$M = C_M \frac{1}{2} \rho V^2 C^2$

PROCESS OF AIRFOIL DESIGN

Coordinates of NACA 2412 is taken from Javafoil software and its Reynolds no. characteristics are also taken [11]

Table No. 2/ Coordinates of NACA 2412					
Upper surface			lower surface		
1	0	0	0	0	0
0.989259	0.002267	0	0.012606	-0.01662	0
0.957222	0.008773	0	0.04613	-0.02921	0
0.905298	0.018704	0	0.098928	-0.03756	0
0.835653	0.030889	0	0.168624	-0.04171	0
0.751234	0.043993	0	0.25226	-0.0421	0
0.655658	0.056642	0	0.346406	-0.03963	0
0.553071	0.067493	0	0.447493	-0.03544	0
0.447978	0.075277	0	0.551457	-0.02982	0
0.344577	0.078639	0	0.653359	-0.02351	0
0.24774	0.076012	0	0.748766	-0.01728	0
0.162245	0.067489	0	0.833478	-0.01161	0
0.092055	0.054036	0	0.903719	-0.00681	0
0.040324	0.037207	0	0.956323	-0.00313	0
0.009246	0.01873	0	0.988889	-0.0008	0
0	0	0	1	0	0

NACA 2412 airfoil is analyzed on JAVA FOIL. JAVAFOIL is the analysis software which gives analysis data of various airfoils its coordinates, parameters for various Reynolds number, coefficient of lift and drag graphs, coefficient of moment and angle of attack graphs etc.

Modeling of airfoil

The airfoil model is easily designed in solid work. In order to do that airfoil coordinates are plotted and the airfoil 3D model is created.

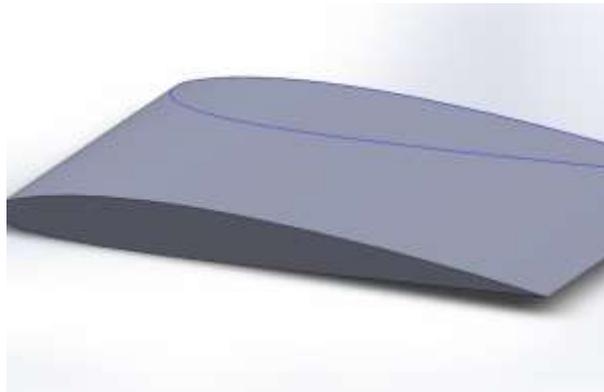


Figure No. 1/ Design of airfoil on solidwork

Gambit is meshing software that is capable of creating meshed geometries that can be read into Fluent and other analysis software. Making a meshed file, it is done in both 2D and 3D these files are imported in fluent.

We have done meshing of Airfoil NACA 2412 and of its domain and then the simulation of flow variables over this control volume is done in case of 2D of Control Line.

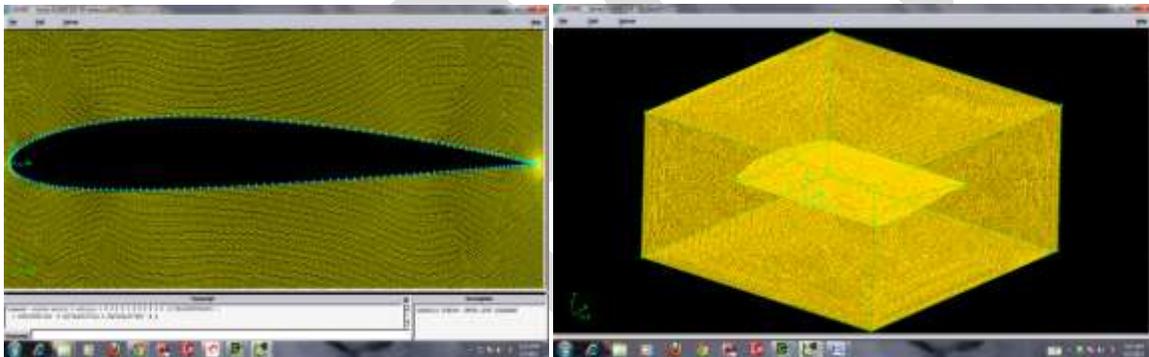


Figure No. 2/ 2D meshing of Airfoil 2412 Figure No. 3/ 3D meshing of Airfoil 2412

The desired mesh can now be read into FLUENT which will then run the geometry through the numerical analysis. Different angles of attack will be analyzed in FLUENT 6.3.26. Airfoil and angle of attacks 4, 8, and 12 degrees are analyzed. Fluent gives results.

2D ANALYSIS DATA

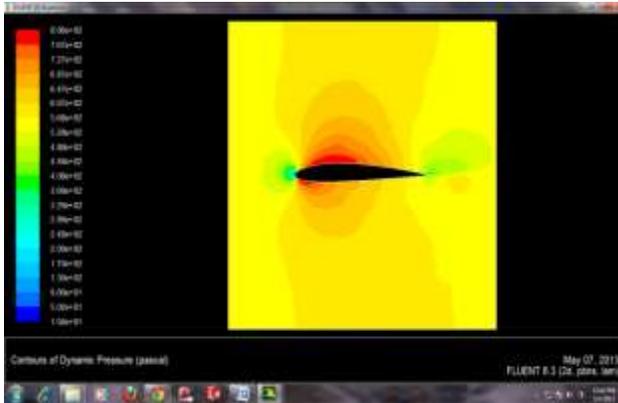


Figure No. 5/Contour of dynamic pressure

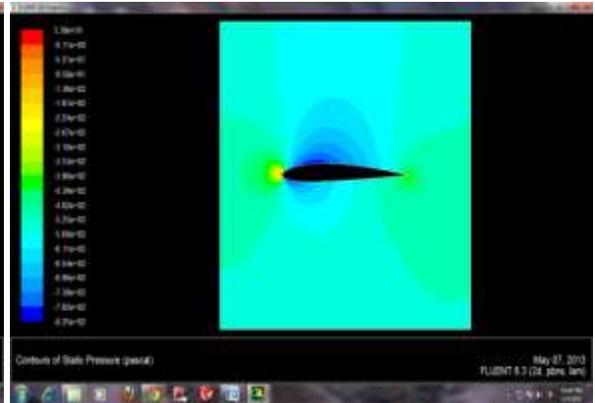


Figure No. 6/ Contour of static pressure



Figure No. 7/ Variation of static pressure

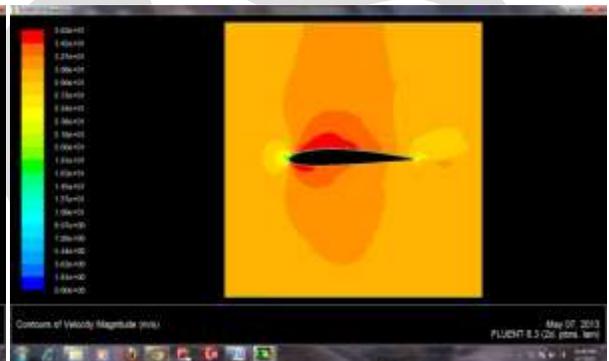


Figure No. 8/ Contours of velocity magnitudes

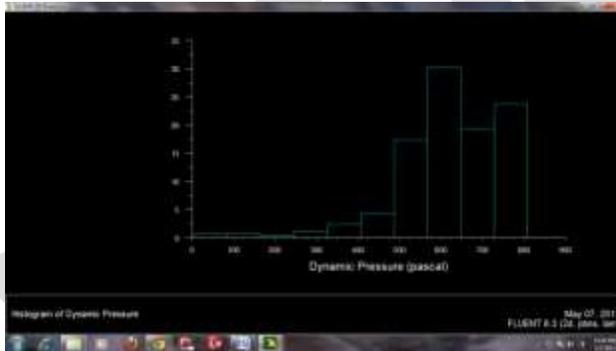


Figure No. 9/ Variation of Dynamic pressure



Figure No. 10/ Variation of Total pressure

3D ANALYSIS RESULTS



Figure No. 11/ Contour of total pressure

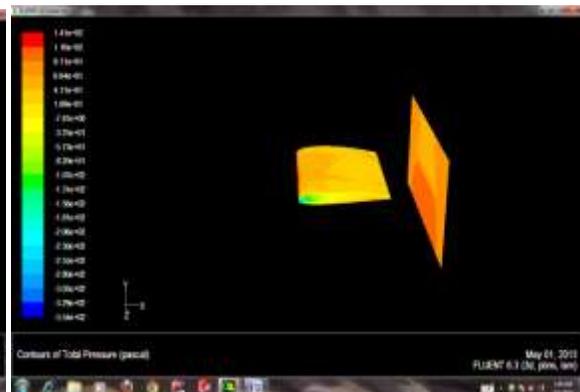


Figure No. 12/ Contour of static pressure

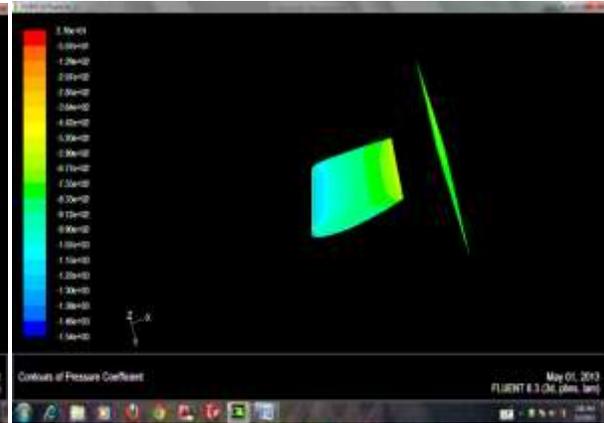
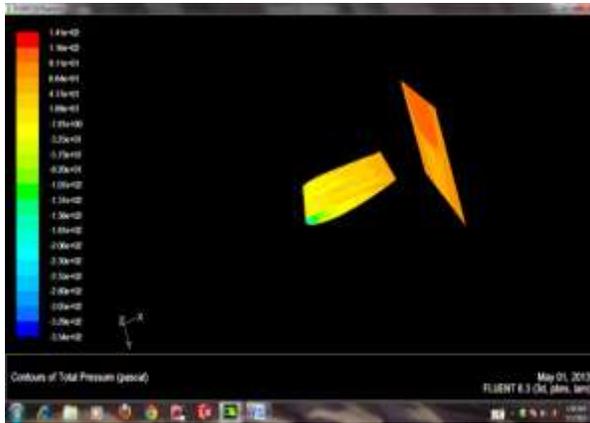


Figure No. 13/ Contour of Total Pressure Figure No. 14/ Contour of Pressure Coefficient

Results at different angle of attacks and at different Reynolds numbers For this three Reynolds numbers are chosen 60000, 100000, and 140000 with four different angle of attacks 0, 4, 8, and 12 degrees. (Table No. 4, 5, & 6)

Table No.3/Velocity characteristics

α	Cl	Cd	Cm 0.25	Cp*	M cr.
[°]	[-]	[-]	[-]	[-]	[-]
0	0.261	0.01197	-0.051	-0.572	0.77
4	0.733	0.01483	-0.055	-1.458	0.603
8	1.139	0.02418	-0.059	-3.935	0.418
12	1.144	0.09473	-0.029	-7.403	0.318

Table No. 4/ Coefficient of lift, drag and moments at different angles of attack, at Reynolds number 60000.

A	Cl	Cd	Cm 0.25
[°]	[-]	[-]	[-]
0	0.261	0.01532	-0.05
4	0.73	0.01841	-0.055
8	1.128	0.02794	-0.059
12	1.142	0.10236	-0.027

Table No. 5/ Coefficient of lift, drag and moment at different angles of attack, at Reynolds number 140000.

A	Cl	Cd	Cm 0.25
[°]	[-]	[-]	[-]
0	0.261	0.01126	-0.051
4	0.734	0.0131	-0.055
8	1.143	0.02226	-0.06
12	1.146	0.0905	-0.031

Table No. 6/ Coefficient of lift, drag, pressure and moments at different angles of attack, at Reynolds number 100000.

α	Cl	Cd	Cm 0.25
[°]	[-]	[-]	[-]
0	0.261	0.01197	-0.051
4	0.733	0.01483	-0.055
8	1.139	0.02418	-0.059
12	1.144	0.09473	-0.029

After a century of theoretical research on the subject of airfoil and wing theory, the final word on the performance of an airfoil must still come from wind tunnel testing. The reason for this state of affairs is that the flow field about a wing is extremely complicated. The simplifying assumptions that are frequently introduced in order to treat the problem theoretically are much too severe to fail to influence the final results. Many of these assumptions ignore the effects of viscosity, nonlinearities in the equations of motion, three-dimensional effects, non steady flow, free stream turbulence, and wing surface roughness. Nevertheless the theoretical prediction of lift produced by a wing has been reasonably successful (not quite so true for drag) and serves as an effective basis with which to study the experimental results.

RESULTS OF THE 3D ANALYSIS DATA

- 1) Static pressure varies from $-4.97e+02$ to $-1.03e+03$ Pascal from trailing to leading edge.
- 2) Dynamic pressure at upper most part and lower most part is of order $8.06e + 02$ Pascal while at leading edge it is of order $1.70e+02$ and at trailing edge it is of order $4.53e+02$.
- 3) Total pressure is maximum at the leading edge $1.41e+02$ Pascal and decreases along the length.
- 4) Coefficient of pressure is maximum at leading edge and trailing edge while lower at thick surfaces.
- 5) Absolute pressure is also higher at leading and trailing edge while it has smaller values at thick surfaces of order $1.01e + 05$ Pascal.
- 6) Velocity magnitude is seems to be constant over the whole airfoil surface $1.81e$ m/s.
- 7) X-Velocity is constant.
- 8) Y-Velocity is nearly constant $-4.84e+01$ m/s.
- 9) Z-Velocity is also nearly constant with magnitude $6.05e+02$ m/s.

- 10) Relative tangential velocity magnitude is lower at upper surface with magnitude $-6.37e+00$ and at lower surface it is changing from tip to end from $9.33e$ to $3.05e$ m/s.
- 11) Vorticity is irregularly changing at the upper surface of the airfoil while at tip and ends it is of magnitude $2.305e+02$ 1/s.
- 12) Molecular viscosity is changing irregularly different at different locations about $1.79e+05$ kg-m/s.
- 13) Wall shear stress is maximum at few locations of the most thicken areas of the airfoil with magnitude $1.7e-01$ Pascal.

RESULTS OF THE 2D ANALYSIS DATA

- Static pressure is constant at the thick surfaces of the airfoil.
- Dynamic pressure is constant at the lower ends of the airfoil.
- Density is seems to be constant with magnitude 1.23 kg-m/s.
- Velocity magnitude is also constant whether it is in x, y, or z direction

WIND TUNNEL DATA

1. Coefficient Lift coefficient is maximum at 15 X/C with magnitude 1.65 . it is increasing from -15 to 15 X/C then sudden drop in C_l and from 17.5 it is constant up to 30 X/C. (Figure No. 16)
2. Drag coefficient is minimum at 0 with value 0.034 and making a irregular parabolic curve. (Figure No. 15)
3. This drag polar is a irregular parabola C_d has its minimum value at 0.034 at $0.75 C_L$, and C_L has its maximum value 1.68 at 0.05 to 0.055 of the C_d . (Figure No. 17)

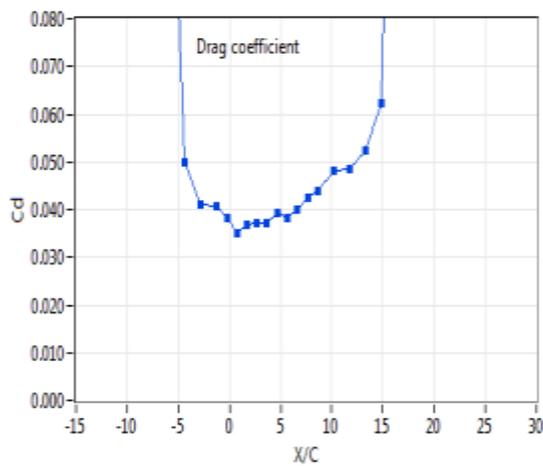


Figure No. 15/ C_d vs X/C

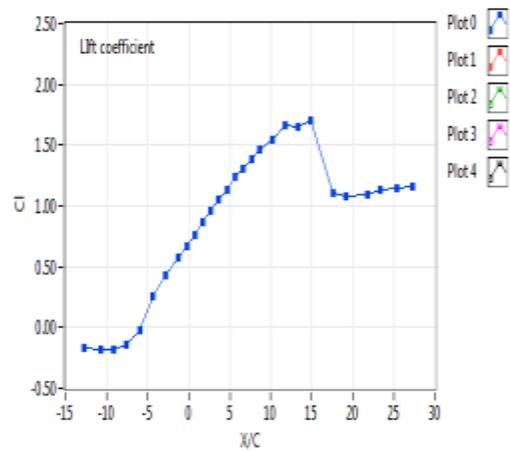


Figure No. 16/ C_L vs X/C

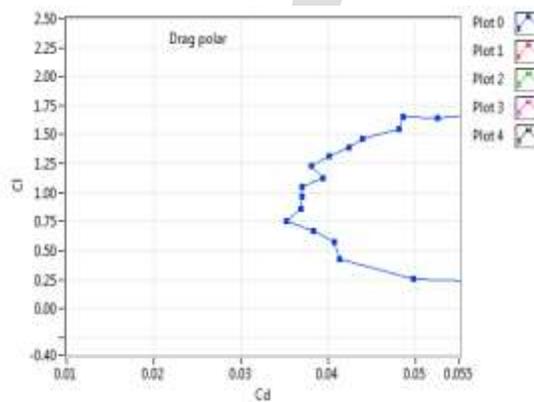


Figure No. 17/ C_L Vs C_D

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Re-Ranking Images by Semantic Signature

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Abstract— Image re-ranking is an effective way to improve the image search result, has been used by many search engines such as MSN, Bing, and Google. Re-ranking is a common methodology used in all variety of fields and the same is applied here for images that are searched from web. Most existing approaches used text based image retrieval which is not so efficient.

Image search engines mostly use keywords and ambiguity of query image is hard to describe accurately. Low level features are sometimes inconsistent with visual perception. The visual and textual features of image are projected into their related semantic space to get semantic signatures. Images are re-ranked by comparing semantic signature and removing of duplicate image.

Keywords— Image Retrieval, Re-ranking, k-means Algorithm, Semantic Signatures

INTRODUCTION

Most of the web search engine are based on keywords as queries. Collection of image on web is growing faster and faster daily millions of images are added on web. It is challenging problem to retrieve image from search large collection. One of main problems is locating the desired image in large collection of images. Due to keyword search ambiguity issue occurs because for a user it is hard to describe the visual content of images.

In recent years, with large scale storing of images the need to have an efficient method of image searching and retrieval has increased. It can simplify many tasks in many application areas such as biomedicine, forensics, artificial intelligence, military, education, web image searching. Most of the image retrieval systems present today are text-based, in which images are manually annotated by text-based keywords and when we query by a keyword, instead of looking into the contents of the image, this system matches the query to the keywords present in the database.

This technique has its some disadvantages:

Firstly, considering the huge collection of images present, it is not feasible to manually annotate them.

Secondly, the rich features present in an image cannot be described by keywords completely.

These disadvantages of text-based image retrieval techniques call for another relatively new technique known as Content-Based Image Retrieval (CBIR). CBIR is a technology that in principle helps organize digital image archives according to their visual content. This system distinguishes the different regions present in an image based on their similarity in color, pattern, texture, shape, etc. and decides the similarity between two images by reckoning the closeness of these different regions. The CBIR approach is much closer to how we humans distinguish images. Thus, we overcome the difficulties present in text-based image retrieval because low-level image features can be automatically extracted from the images by using CBIR and to some extent they describe the image in a more detail compared to the text-based approach

Text re-ranking:

It is the re-ranking of images which we get from database, when we apply text based search. It is about searching the images and re-ranking of them.

Image re-ranking

Given the images retrieved by a text query, using *e.g.* an image web-search engine, the goal of image re-ranking is to sort the retrieved images so that the ones relevant to the query are ranked higher than the ones that are not, using the visual content of the image.

LITERATURE SURVEY

Xiaogang Wang et al.[1] proposed the semantic web based search engine which is also called as Intelligent Semantic Web Search Engines. They use the power of xml meta-tags deployed on the web page to search the queried information. The xml page will be

consisted of built-in and user defined tags. Here propose the intelligent semantic web based search engine. They use the power of xml meta-tags deployed on the web page to search the queried information. The xml page will be consisted of built-in and user defined tags. The metadata information of the pages is extracted from this xml and the practical results showing that proposed approach taking veryless time to answer the queries while providing more accurate information.They used six types of visual features such as attention guided color signature,colorspatialet,wavelet,multi-layer rotation invariant edge orientation histogram,histogram of oriented gradients and GIST.Semantic signature can also be computed from textual features and combined with those from visual features.Use of K-means clustering for clustering of image in offline mode.SVM classifier for classification of images.

Yuxinchen et al.[2] they developed a vertical image search engine that integrates both textual and visual features to improve retrieval performance..iLike system architecture which focused on crawlers/parsers are able to identify patterns and link text descriptions and images with higher confidence.

Xiaou Tang et al.[3] proposed a novel Internet image search approach. It requires the user to give only one click on a query image and images from a pool retrieved by text based search are re-ranked based on their visual and textual similarities to the query image. We believe that users will tolerate one-click interaction which has been used by many popular text-based search engines. For example, Google requires a user to select a suggested textual query expansion by one-click to get additional results. The key problem to be solved in this paper is how to capture user intention from this one-click query image. Image feature like Attention Guided Color Signature, Color Spatialet,Multi-Layer Rotation Invariant EOH,Facial Feature.The key contribution is to capture the users' search intention from this one-click query image in four steps.

(1) The query image is categorized into one of the predefined adaptive weight categories, which reflect users' search intention at a coarse level. Inside each category, a specific weight schema is used to combine visual features adaptive to this kind of images to better re-rank the text-based search result.

(2) Based on the visual content of the query image selected by the user and through image clustering, query keywords are expanded to capture user intention.

(3) Expanded keywords are used to enlarge the image pool to contain more relevant images.

(4) Expanded keywords are also used to expand the query image to multiple positive visual examples from which new query specific visual and textual similarity metrics are learned to further improve content-based image re-ranking. All these steps are automatic without extra effort from the user. This is critically important for any commercial web-based image search engine, where the user interface has to be extremely simple. Besides this key contribution, a set of visual features which are both effective and efficient in Internet image search are designed. Experimental evaluation shows that our approach significantly improves the precision of top ranked images and also the user experience.

Jun Huang et al.[4] Proposed a new algorithm for image re-ranking in web image search application. The proposed method focuses on investigating the following two mechanisms Visual consistency. In most web image search cases, the images that closely related to the search query are visually similar. These visually consistent images which occur most frequently in the first few web pages will be given higher ranks. 2) Visual saliency. From visual aspect, it is obvious that salient images would be easier to catch users' eyes, and it is observed that these visually salient images in the front pages are often relevant to the user's query.By integrating the above two mechanisms, our method can efficiently re-rank the images from search engines and obtain a more satisfactory search result.

Nikhil Rasiwasia et al.[5] mapped visual features to a universal concept dictionary for image retrieval. Proposed query-by-semantic example(QBSE) which is combination of query-by-visual-example (QBVE) and semantic retrieval. SR research turned to the problem f the automatic extraction of semantic descriptors from images,so as to build models of visual appearance of the semantic concepts of interest.

Yushi Jing et al.[6] proposed VisualRank algorithm to find out the visual link structures 1.of images and to find the visual themes for re-ranking. Author present VisualRank, an end-to-end system, to improve Google image search results with emphasis on robust and efficient computation of image similarities applicable to a large number of queries and images. Proposed a novel extension to previously proposed random-walk models that can take advantage of current progress in image-search and text-based Web search. VisualRank employs the Random Walk intuition to rank images based on the visual hyperlinks among the images. Used Global features like color, histograms and shape analysis. Local features include Harris corners, Scale Invariant Feature Transform, Shape Context and Spin Images.

Lixin Duan et.al.[7] proposed a new bag-based re-ranking framework for large scale text-based image retrieval. Clustering of relevant image using both textual and visual feature was done. Bag was treated as a cluster and images in the bag where treated as instances, thus multi-instance problem was formulated. To address the ambiguities issues in bags GMI-SVM new method was invented. Proposed automatic bag annotation method to find our positive and negative bags automatically for training classifier. Automatic bag

annotation method can achieve better performance as compared to traditional image re-ranking method. K-means method of clustering method was used to partition of relevant image in bags/clusters. In the future more effective methods of clustering can be used.

Xinmei Tian et.al[8] proposed a novel active re-ranking framework for web image search. Active sample selection strategy and a dimension reduction algorithm was used to reduce labeling efforts. To learn the visual characteristics, a new local-global discriminative dimension reduction algorithm transfers the local information in the domain of the labeled images domain to the whole image database.

Author	Year	Description	Advantages	Disadvantage/limitation
Xiaogang Wang Shi Qiu, ke Liu Xiaoou Tang [1]	2014	Proposed novel image re-ranking frameworks. Image features used are attention guided color signature, colorspacelet, wavelet, multi-layer rotation invariant edge orientation histogram, histogram of oriented gradients and GIST	1. Improve efficiency. 2. Visual features of thousands of dimensions can be projected to the semantic signatures as short as 25 dimensions	1. Duplicate image where not removed
Yuxin Chen, Hariprasad Sampath kumar, Bo Luo, Xue- wen chen [2]	2013	Proposed vertical image search engine that integrates both textual and visual features to improve retrieval performance. Visual features of image where taken into consideration.	1. Better search performance. 2. iLike architecture is effective and capable of bridging semantic gap.	1. Duplicate image where not removed 2. Only text query was considered.
Xiaoou Tang , Ke Liu, Jingyu Cui, Fang Wen, Xiaogan g Wang [3]	2012	Proposed a novel Internet image search approach. Image feature like Attention Guided Color Signature, Color Spatialet, Multi-Layer Rotation Invariant EOH, Facial Feature.	1. Interaction is user friendly just by one click.	1 1. The ambiguity issue occurs. 2. The result needs filtering 3. Duplicate image where not removed
Jun Huang, Xiaokang Yang, Xiangzhong Fan, Weiyao Lin and Rui Zhang [4]	2011	Proposed a new algorithm for image re-ranking in web image search application. Method focused on visual Saliency and Consistency. Image features like color, edge, texture and visual saliency where used.	1. Efficient re-ranking of images from search engine. 2. More satisfactory result where obtained	1. The ambiguity issue occurred. 2. All image features where not considered.

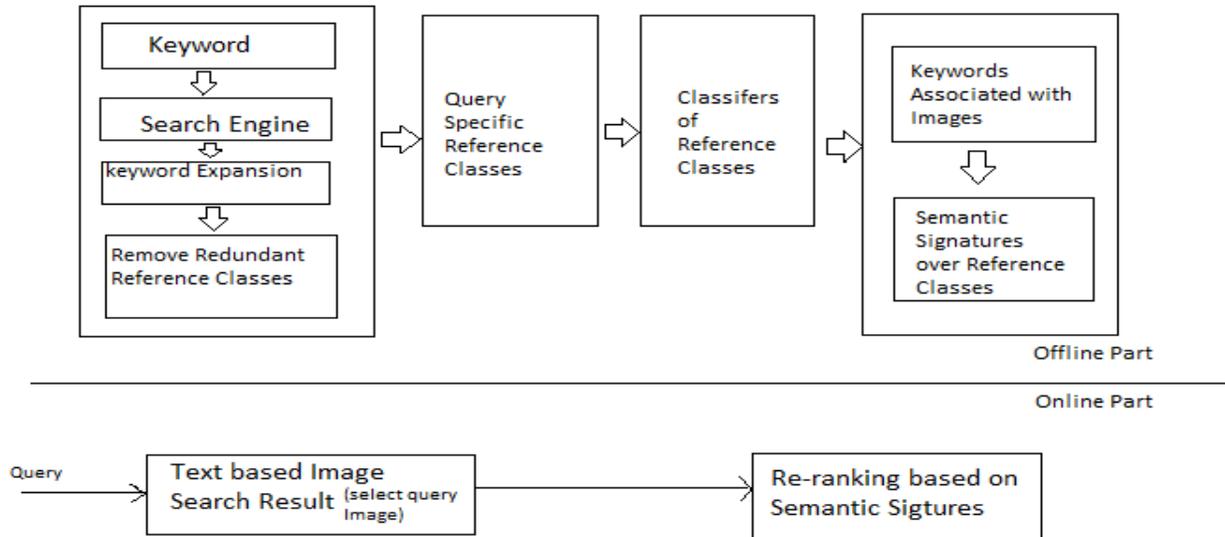
Author	Year	Description	Advantages	Disadvantage
Nikhil Rasiwasia, Pedro J. Moreno, and Nuno Vasconcelos [5]	2007	Proposed QBSE which is a combination of QBVE and SR.	Semantic feature where used which are high level features	1. All features of image are not consider.
Yushi Jing and Shumeet [6]	2008	It used VisualRank algorithm. Use of Global features like color, histograms and shape. Local features like Harris corners, SIFT, shape context and Spin Images	1. Using link and network analysis for Web document search into image search. 2. Reduce the number of irrelevant images efficiently.	1. Since no links explicitly exist in the image search graph. 2. Unnecessary image link where given preferences. Too expensive to construct a graph for all images
Lixin Duan, Wen Li, Ivor Wai-Hung Tsang, and Dong Xu [7]	2011	Bag Based re-ranking- 1. Partition images into clusters using textual and visual features 2. Uses multi instance (GMI) framework 3. Treats each cluster as Bag and images as instances	1. automatic bag annotation method can achieve the best performance.	1. MI learning problem 2. Average precision for images
Xinmei Tian, Dacheng Tao, Xian-Sheng Hua, and Xiuqing Wu [8]	2010	Active re-ranking- 1. Collect labelling information from user to obtain specified semantic space. 2. Localize the visual characteristics of the user intentions in space.	1. Use both ambiguity and representativeness 2. Reduce user labelling efforts	1. Duplicate image where not removed 2. The ambiguity issue occurred.

PROPOSED SYSTEM

To develop a search engine for re-ranking of image with the use of meta-tags and some visual features, and removal of duplicates image.

Removal Duplication

Removed the duplicate image entries. While searching relevant images there are some numbers of images with similar pixel values and features so we are searching with category for exact result. We are also detecting the repeated images by calculating their pixel size and removing repetitive images. Other removal of duplications method are hash code and MD5 algorithm.



SEMANTIC APPROACH OF RE-RANKING OF IMAGES

ALGORITHMS

K-means algorithm for Clustering

- 1) Select K points for initial group centroids.
- 2) Each object is assigned to the group that has the closest distance to the centroid.
- 3) After all objects have been assigned, recalculate the positions of the K centroids.
- 4) Steps 2 and 3 are repeated until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

SIM Rank Algorithm for ranking of image

For textual query expansion we use SimRank algorithm.

- 1) In this system generate a matrix. In matrix rows consists of all tags which are present in image database & columns consists of all the images from database.
- 2) If tag is present in image then matrix value changed to 1 otherwise 0 & so on the matrix is build. When user enters textual query, that query matched with tags. Images from all matching tags are retrieved for resultant set.
- 3) Next system will read the tag files of resultant images & images with these tags are also retrieved for resultant set.
- 4) Now for ranking of the images, system will check that how many tags the image has other than query keywords entered by user.
- 5) An image with few other tags is more relevant & according to this ranking of images is done & resultant set is displayed to the user.

Colour Moment Algorithm for colour extraction.

- 1) System extracts the RGB (Red, Green, Blue) values for each image.
- 2) For every value of RGB, system calculates mean, median & standard deviation. These all value are stored in image database.

These all values are colour features of image. These values are going to be used for comparing colour features with other images. Less difference in value, more the relevant image.

Canny Edge Detection Algorithm

For detecting edge attributes of image canny edge detection algorithm is used

- 1) Blurring of images is done for reducing the noise from image.
- 2) System finds image gradients for every image. The edges are marked where the gradients of the image has large magnitudes.
- 3) Only local maxima marked as edges.
- 4) Potential edges are determined by thresholding.
- 5) Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.
- 6) For every edge pixel value 1 is assigned & non-edge pixel value 0 is assigned & matrix is generated.

Texture Extraction Algorithm

For extracting texture attributes texture extraction algorithm is used.

- 1) The matrix from edge detection algorithm is taken for texture extraction.
- 2) Values for Texture attributes such as energy, brightness etc are calculated & stored. These all values are Texture features of image.

These values are going to be used for comparing Texture features with other images. Less difference in value, more the relevant image.

CONCLUSION

We will combine text based feature with visual image feature to retrieve quality images from internet search. Our system will overcome the drawbacks of existing system by generating quality and exact match result of user intention and the additional function stops retrieving duplicate images and also the repeated images are detected and avoided by system in output. So user will be getting final output as plain, intended images

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Smartphone Battery Optimization by Reducing Energy Consumption in Network Communications

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Abstract- In this paper, a technique for battery optimization of smartphone is being proposed. The technique is based on reduction in energy consumed by communication over network. This will be achieved by utilizing cooperative device-to-device communication. The proposed system will allow users with higher battery level to carry traffic of users with lower battery level, thereby reducing the chances of user running out of battery early. This system can be realized in the form of a proximity service (ProSe) which will utilize device-to-device (D2D) communication architecture underlying Long Term Evolution (LTE) technology in hexagonal cell environment. It is shown through simulations that the proposed system will reduce the probability of outage i.e. the probability of cellular users running out of battery before their target usage time.

Keywords: Cooperative Relaying, Battery Optimization, Valued and Valueless battery, Long Term Evolution, D2D communication,

I. INTRODUCTION

Smartphones have emerged into platforms with powerful computational capabilities that generate large amount of data. Smartphones have become an important part of our daily life and we use smartphones more frequently than we used desktop computers to stay connected on internet, reading news, playing games, browsing, watching video and staying connected with friends through social networking websites. On the other hand the smartphones have a strict energy budget and limited lifetime on a single charge. As the battery technology could not keep pace with smartphone technology, a short battery life has always been a major limiting factor for the utility of smartphones. Many research efforts has been put into designing energy efficient protocols and networks to make best use of the available battery capacity over the past few years. Various factors contributing to power consumption in a smartphone are broken down and studied in detail [1], [2]. It is shown that most of the energy of smartphone is consumed in radio communications, together with the backlit screen. This amount is significantly higher than other components such as processor and memory. Although solutions to this problem of prolonging battery life in wireless networks have already been proposed in all layers, but have either considered a single device, or tried to minimize the total power consumption in cooperative schemes. In the context to the cellular networks (LTE in particular), rather than reduction, an entirely new approach is proposed in this paper. The whole idea is based on *redistributing* the existing energy to increase usage time of smartphone battery.

Firstly, the notions of *valued battery lifetime*, *valueless battery lifetime* and *outage events* are explained. *Valued* battery lifetime is defined as the lifetime of battery of the smartphone when the user is active and does not have access to a power source. Conversely, *valueless* battery lifetime is defined as the remaining battery lifetime of the smartphone after the usage period, when the user gets access to a power source. *Outage events* are instances when the user runs out of (valued) battery before his target usage time. Since the usage patterns of the users varies, the value of their batteries also varies. The proposed system takes advantage of the wide range of battery value created by this diversity of usage. By enabling cooperation, the users are allowed to spend their valueless battery to save someone else's valued battery, reducing the probability of their outage events and increasing the probability of survival of user's battery as a result. Cooperative communications represent a new class of wireless communication techniques in which network nodes help each other in relaying information to realize spatial diversity advantages. This new transmission paradigm promises significant performance gains in terms of link reliability, spectral efficiency, system capacity, and transmission range. Cooperative communication has been extensively studied in the literature, and *fixed terminal relaying* (which involves the deployment of low-power base stations to assist the communication between the source and the destination) has already been included in the 4G Long Term Evolution-Advance (LTE-A) standard. The mechanism being used in proposed system for "distributing" battery, is device-to-device cooperative relay underlying LTE-A networks. This mechanism will help to create direct links between cellular users. A licensed spectrum for D2D operation is proposed in 3GPP release 12 work item [3]. This will benefit in controlling of D2D operation. As a result, the bandwidth and QoS of the communications can be guaranteed. This can also increase system security by making D2D operation transparent to the users. So, as both D2D devices already have a secure connection to the cellular network, a secure D2D connection can be set up automatically (as compared to manual pairing in Wifi and bluetooth). A survey of D2D communications

underlying cellular networks can be found in [4]. One main property of a D2D connection which is of utmost importance for the proposed system is that it consumes significantly less power than a cellular link. This is because on the uplink, the phone needs to cover a much shorter distance to reach a D2D neighbour than to reach a base station. The main component of the signal energy loss over the wireless channel is the distance related path loss. Hence a much lesser signal energy loss is seen with this technology which will in turn minimize the requirement of battery power.

This rest of the paper is organized as follows. In section II, we give a summary of D2D communication underlying cellular networks, outlining its merits, challenges, and progress in standards. The proposed scheme for smartphone battery optimization is discussed in section III. Section IV gives details of obtained simulation results. The paper is finally concluded in section V.

II. DEVICE TO DEVICE COMMUNICATIONS UNDERLAYING CELLULAR NETWORKS

D2D communications underlying a cellular network is a promising future wireless networks technology for improving network capacity and the user experience. It has been agreed in 3GPP Release 12, that D2D technology is of high interest for enhancing the capabilities of wireless networks. Previously, D2D communication has been widely used in consumer Bluetooth and the WiFi unlicensed band for individual pairing and connectivity. The connection is activated only when needed through user manual pairing, and there is little concern about privacy, security, and power. In addition, since the density of these individual D2D applications is relatively low, interference is usually not a major issue in these cases. In this article, we envision a *two-tier cellular network* with so-called macrocell and device tiers. The *macrocell tier* involves base station (BS)-to-device communications as in a conventional cellular system. The *device tier* involves D2D communications. If a device connects the cellular network through a BS, this device is said to be operating in the macrocell tier. If a device connects directly to another device or realizes its transmission through the assistance of other devices, these devices are said to be in the device tier. In such a system, the BSs will continue to serve the devices as usual. However, for implementation of battery optimization technique or for any other specific application, devices will be allowed to communicate with each other, creating an adhoc mesh network. When we develop D2D communications underlying licensed cellular networks, better service guarantee can be provided in a controlled environment. By facilitating the physical proximity of communicating UEs and reuse of spectrum resources, D2D communications has the advantages of high local data rate, offloading the traffic load from the central base station, and increasing cellular capacity. In addition, as D2D communications is short-range transmission, the UE power consumption can be set very low; hence, the battery lifetime of UEs with D2D communications can be extended. In the meantime, these devices for D2D communications need to discover each other constantly and determine service compatibility before communicating with each other. The introduction of D2D communications underlying cellular networks represents a significant step toward future 5G heterogeneous networks. We are still at an early stage in D2D technology development. There are many challenges to be addressed, including device power consumption for D2D user/device/service discovery, interference management and power control among D2D devices and coexistence with overlay networks, radio link design to compensate for the link budget reduction due to no base station, cluster-level vs. global-scale synchronization, device/user identifiers, open vs. Restricted device discovery, security and privacy protection, user mobility and cluster group management, group communication for public safety, multihop D2D and D2D in heterogeneous networks, seamless service or session transfer with overlay network, and network densification in terms of both number of D2D devices and data communication intensity.

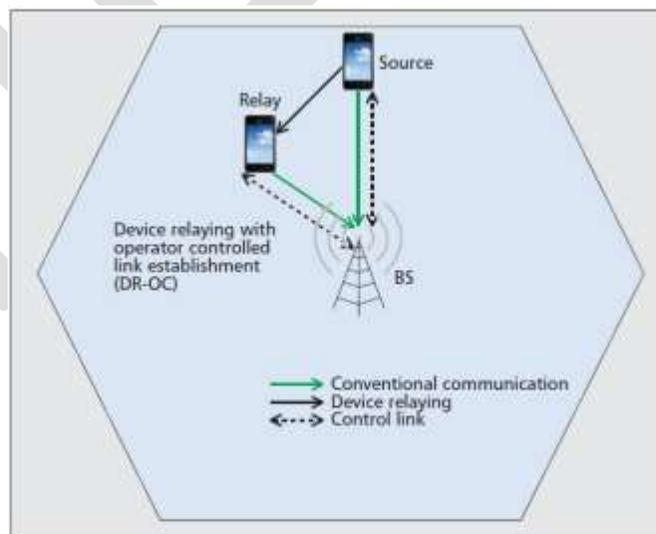


Fig 1. Device relaying with operator controlled link establishment

A simple scenario with Device relaying with operator controlled link establishment (DR-OC) is shown in Fig.1. A device at the edge of a cell or in a poor coverage area can communicate with the BS through relaying its information via other devices. This allows for the device to achieve a higher QoS or more battery life. The operator communicates with the relaying devices for partial or full control link establishment. The advantage of a D2D link compared to a cellular link is that it covers a much shorter distance. The main component of the signal energy loss over the wireless channel is the distance related path loss. Using the nominal values in Table I, we calculate the path loss of the D2D link versus the cellular link according to both UMTS channel model and IST WINNER II channel model [12]. In addition, the eNodeB receiver has better gain (14 dBi) and lower noise figure (5 dB) compared to the UE receiver (0 dBi, 9 dB) [10]. Table II shows that under similar fading conditions and ignoring shadowing, to get the same SNR at the receiver, the cellular UE needs to spend 3 to 4 orders of magnitude more transmission power than the D2D transmitter.

TABLE I
 NOMINAL VALUES FOR PATH-LOSS MODEL

Parameter	Value
UE-macro eNodeB distance	300m
D2D UEs distance	10m
Carrier Frequency	2GHz

TABLE II
 . PATH-LOSS RESULTS (IN dB)

Channel Model	Cellular	D2D	PL Diff.	TX Power Diff.
UMTS	127	67	60	42
WINNER II	122	73	49	31

III. SYSTEM MODEL

In [8], the notions of valueless and valued battery are introduced as the available battery when the user does or does not have access to a power source, respectively. A method of developing a cooperative system is followed where users with high battery level help carry the traffic of users with low battery level. This scheme helps increase the amount of valued battery in the network, henceforth reducing the chance of users running out of battery early. The whole system is realized in the form of a proximity service (ProSe) which utilizes a device-to-device (D2D) communication architecture under laying LTE-A in a circular cell environment. The proximity service here is named as Battery Deposit Service (BDS). The name is derived from the fact that when a user spends his valueless battery to save another user’s valued battery, it can be thought of as “depositing” battery into the network. The user whose valued battery is conserved can be thought of as “withdrawing” battery from the network. The concepts of depositing and withdrawing are used to signify the fact that the benefit of a helper needs not be immediate or reciprocal. In other words, a user receiving help can repay, at a later time, a different user than the one who helps him. This way BDS benefits from the large population of users in the network.

We have proposed to implement the whole system in hexagonal cell environment. It is shown that the path loss incurred while communicating in a circular cell environment is much larger than that in hexagonal cell environment. As previously stated, the main component of the signal energy loss over the wireless channel is the distance related path loss; a much lesser signal energy loss is seen with hexagonal cell implementation of system, thus minimizing the battery usage of cell phones and probability of outage.

A. Spreading of users in hexagonal cell

An algorithm for calculating the position of a random user in hexagonal cell is discussed in [9] by spreading users uniformly over the complete cell area. Consider the hexagon shape of Fig.2. Within this coverage area, for the sake of simplicity and perhaps from an intuitive perspective, we may very well assume that mobiles are equally spread. Because of this hypothesis, the joint PDF becomes:

$$f_{XY}(x,y) = \frac{1}{A_{\text{hexagon}}} = \frac{2}{3\sqrt{3}L^2} \quad (x,y) \in D \tag{1}$$

In fact, if it was not for a generic structure and a priori statistical knowledge of users’ trends and terrain limitations were available, then the information may have been used to ensure a more complete model. Nonetheless, using [16], we can obtain the marginal distribution for the X-component in [17].

$$f_x(x) = \begin{cases} \frac{2}{3L} & |x| \leq \frac{L}{2} \\ \frac{4}{3L^2}(L - |x|) & \frac{L}{2} \leq |x| < L \end{cases} \quad (2)$$

From [17], we then determine the Cumulative Distribution Function (CDF) as plotted in Fig. 3

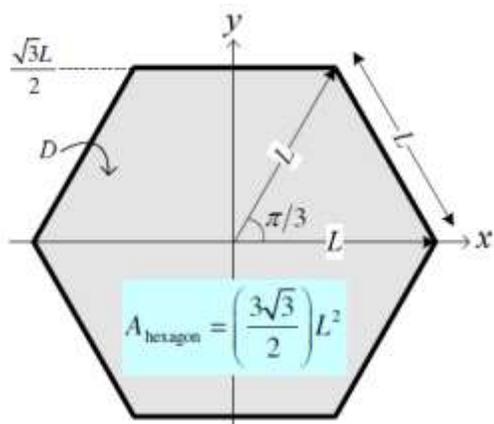


Fig 2. Hexagonal cell

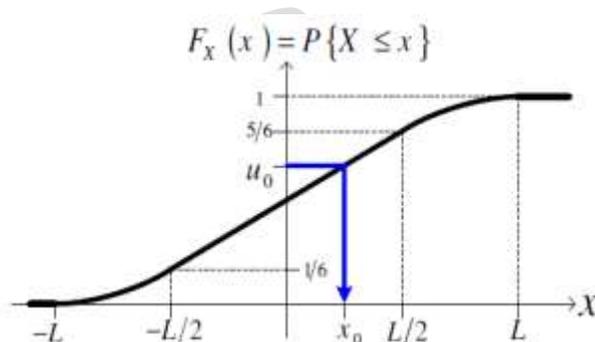


Fig 3. CDF of "x" for a hexagon

Following this further, in regard to random generation, high-level computer languages such as MATLAB®, among others, have the capacity to produce a fairly long pseudorandom sequence of length 2^{1492} from the standard uniform distribution [10]. For any other PDF, provided the corresponding inverse CDF is available in close form, then the *Inverse Transform* method may be used [11]. Hence, we get:

$$x = F_x^{-1}(u) = \begin{cases} L \left\{ \sqrt{\frac{3u}{2}} - 1 \right\} & 0 < u \leq \frac{1}{6} \\ \frac{3L}{4}(2u - 1) & \frac{1}{6} \leq u \leq \frac{5}{6} \\ L \left\{ 1 - \sqrt{\frac{3(1-u)}{2}} \right\} & \frac{5}{6} \leq u < 1 \end{cases} \quad (3)$$

Further, given the obvious correlation between random variables of X and Y , and while assuming first the selection of the X -value, then the conditional density for Y becomes:

$$f_{Y|X=x_0}(y) = \begin{cases} U(-\sqrt{3}(x_0+L) : \sqrt{3}(x_0+L)) & -L < x_0 \leq -\frac{L}{2} \\ U\left(\frac{-\sqrt{3}L}{2} : \frac{\sqrt{3}L}{2}\right) & -\frac{L}{2} \leq x_0 \leq \frac{L}{2} \\ U(-\sqrt{3}(L-x_0) : \sqrt{3}(L-x_0)) & \frac{L}{2} \leq x_0 < L \end{cases} \quad (4)$$

Where $U(a,b) = 1/(b-a)$ is the uniform distribution over $x \in (a,b)$. As a consequence of [18] and [19], proper stochastic node scattering becomes evident as manifested by Fig.4.

B. Simulation Model

In order to enable operator-controlled device and service discovery as well as D2D connection set up, the Evolved Packet Core (EPC) must include additional functionalities to manage D2D services. One method to provide those functionalities is suggested in [10], where two new entities are added: D2D Server and Application Server (AppSer). The D2D Server is responsible for maintaining

D2D-enabled devices' identity, coordinating the establishment of D2D connections, as well as storing usage records for charging purpose. The AppSer performs application/service-specific tasks (because one UE can use multiple D2D services at the same time, with BDS being one of those services). As ProSe is an active working item within 3GPP and there is no standard on how a service should be defined yet, the operational flow of BDS is described instead of the exact signaling formats. This operational flow is illustrated in Fig.5. When a UE's battery level goes below a threshold γ_1 or when it verifies that its channel condition is bad (downlink Reference Signal Received Power is less than a threshold), and receiving help is beneficial, it starts looking for help.

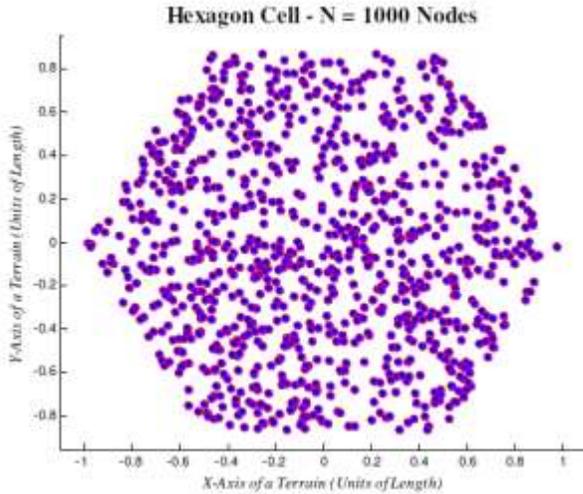


Fig 4. Random nodes within a hexagon

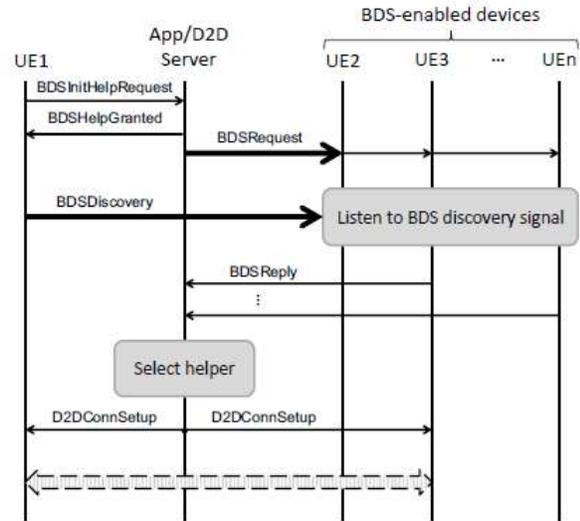


Fig 5. Battery Deposit Service operational flow. Here UE1 is the helpee and UE3 is the selected helper. UE2 is BDS enabled but is not in the proximity of UE1

The process followed next will be as follows:

- 1) The UE sends *BDSInitHelpRequest* to the AppSer. Let us name this UE1.
- 2) The AppSer responds with a *BDSHelpGranted* message where a time-frequency resource is allocated to UE1 for a neighbor discovery signal.
- 3) After receiving the acknowledgment from UE1 (not shown in Fig.5, the AppSer sends a multicast message *BDSRequest* to all BDS-enabled UEs in the cell. This *BDSRequest* message includes the scheduled resource for UE1's discovery signal, *BDSDiscovery*.
- 4) All available helpers, whose battery level is above another threshold γ_2 , listen to this resource unit. Any helper who is able to hear UE1's discovery signal will report to the AppSer through a message *BDSReply*.
- 5) After receiving the list of potential helpers for UE1, the AppSer runs a helper selection algorithm to determine the helper for UE1, together with the duration of this association. In this framework, the helper selection algorithm can be flexibly designed to achieve different goals.
- 6) By the end of this helper selection process, a UE is chosen to help UE1 (UE3 in Fig.5). The AppSer sends this association to the D2D Server which implements the connection establishment procedure. In our terminology, UE1 is called the *helpee*, and UE3 is called the *helper*. Throughout the duration of the association, data from UE1 is relayed to the eNodeB through UE3.

C. Helper Selection Criterion

Various selection algorithms can be included in the application server for helper selection. As discussed in [12], the sum of the transmission power required for *helpee-helper* and *helpee-eNodeB* arms of a relayed transmission can be lower than that of a direct transmission to eNodeB. The factors that determine choosing the helpers are the remaining battery lifetime of the helpee, the elapsed battery lifetime of the helper acting as relay, and transmission powers required for both helpee and helper. The cost of relaying is sum of the cost for helpee to transmit to the helper, and the cost for the helper to transmit to the eNodeB. Since the remaining battery lifetime and the required transmit powers are independent input parameters, the cost of a connection is the product of remaining battery lifetime and transmit power. For a 2-hop relayed connection, the general formula for the cost of a relayed connection is given by:

$$Cost(R) = R_m * T_{mr} + E_r * T_r \tag{5}$$

where,

R_m is normalized remaining battery life of helpee

T_{mr} is required transmission power to a helper relay in watts

E_r is normalized elapsed battery life of a helper relay

T_r is required transmission power to the eNodeB from helper relay in watts
In the simulation, a lower cost value given by (5) is desired.

The cost of transmitting directly to the eNodeB is given by

$$Cost(D) = R_m * T_{md} \quad (6)$$

where, T_{md} is the required transmission power in watts for a direct connection from UE to eNodeB. The costs of both direct and relayed connections are calculated by the eNodeB, which then does an optimization for the entire cell to find out best helpee helper pairs. While finding helpee-helper pairs, the following constraints are made by eNodeB.

$$1) T_{mr} + T_r \leq T_{md} \quad (7)$$

This constraint is necessary since the relays are other UEs. The energy expended by the UE is valuable and this constraint ensures that the relayed connection consumes lower energy than the direct connection.

$$2) R_m > E_r \quad (8)$$

This constraint ensures that helpee is not draining the battery of helpers with a lower battery lifetime than its own.

3) The UE with least remaining battery lifetime gets to choose the helper first, so that the outage probability can be reduced. This constraint is implemented by arranging the UEs in ascending order of their remaining battery lifetime and then selects helpers for them.

The general condition selecting a helper relay is given by

$$Cost(R) < Cost(D) \quad (9)$$

The UE selects a helper with lowest $Cost(R)$ as given in (5). After an UE becomes a helper, it is no longer available for remaining UEs, as we assume that a helper can handle only one helpee at a time. In this paper, we assume that the remaining battery lifetime, R_m , and the Elapsed battery lifetime E_r , are random numbers between 0 and 1, with a uniform distribution. Assuming a linear relationship between remaining/elapsed battery lifetime and maximum allowed transmission power, the value for the latter is given by

$$T = T_m * R_m \quad (10)$$

where, T is the Maximum Transmit power in watts given in Table III. Outage for the UE is calculated by comparing the transmit power T_{mr} required to transmit to its selected helper and the UE's maximum transmit power T_m . If T_{mr} is greater than T_m , an outage occurs.

D. Security Implications

Since BDS is a ProSe service, it has all security guarantees that will be offered by ProSe design. The D2D communication is inherently secure. The reason is that in D2D data are not conveyed via Internet clouds, and thus are not saved anywhere but on the intended devices. In particular, since encryption in LTE is done at UE1 and the eNodeB, UE3 sees only encrypted traffic. As a result, UE1's confidentiality is protected. Encryption also ensures that UE3 cannot insert its own messages into UE1's data stream. Thus data integrity is protected. A temporary ID (C-RNTI) is used instead of the real identity of UE1; therefore UE3 does not learn whose traffic it is carrying. Thus UE1's privacy is protected. The BDS does not incur any more security risk than what can already be obtained by an eavesdropper.

E. Performance Evaluation Framework

To study the energy consumption breakdown on smartphone, researchers have either opened up phones and recorded power consumed by each component [3], or recorded total power consumption and switched on/off different components [11]. The consensus is that network communications and the display are the two biggest contributors, significantly higher than other components such as memory and processor. By reducing the power consumed by communications, our system provides a considerable gain for the overall battery life.

1) Traffic model

The simulation model uses Poisson traffic models in for traffic scenario analysis. Poisson processes are very common in traffic modeling because they capture well the aggregate traffic caused by a large number of sources (in this case application). The uplink data is modeled to arrive in bursts, with inter-arrival time equals 30 seconds. The size of each burst is modeled as a geometric random variable.

2) Power consumption

In LTE, a UE's uplink transmit power is controlled by equation (11). The formula is based on path loss between the UE and either the relay or eNodeB ([13], [14])

$$\text{Transmit Power (Pt, in dB)} = -K - PG + E + L - G - H + C + \text{PathLoss(dB)} \quad (11)$$

where, the various parameters are as enlisted in Table III.

The path loss can be calculated by using channel model. In addition, after every data burst, the eNodeB lets the UE stay in RRC CONNECTED state for a little longer. In this state, the UE consumes notably more energy than RRC IDLE state. The duration that the UE stays in RRC CONNECTED state is configured by the eNodeB. This factor is modeled as well as other circuitry-related energy consumption as a constant component added to all transmissions (both D2D and regular uplink).

3) Channel model

WINNER II urban macro-cell model for regular uplink connections and WINNER II indoor model for D2D connections [15]. Shadowing is modeled by lognormal distributions with parameters given in WINNER II documentation.

4) Mobility

In this work, we use a modification of the Random Waypoint Model to simulate user mobility. The Random Waypoint Model has a weakness that it favors the center of the cell more than the edge. The modified model, which we call the Random Duration Model, generates a uniform distribution of user location. In this model, instead of choosing a new destination (waypoint) as a uniform random variable at each simulation step, a user chooses a random direction and random travel duration, together with a random speed. A random pause time is also implemented after each travel. This simulates the fact that in real life, people are not always moving. All of the mentioned distributions are uniform. This design has been chosen to account for the fact that it is possible for D2D connections to exist between adjacent cells.

IV SIMULATION RESULTS

The paper implemented an event-driven simulation in Matlab. The parameters that we use are summarized in Table III. The constant energy cost factor is derived from the report of power consumption in RRC CONNECTED state of UEs moving at 3 kmph with discontinuous reception period (DRX) set to 160 ms and release timer set to 5 seconds [13]. The other parameters are also chosen to simulate a realistic scenario. The helper selection algorithm is based on proximity (the closest helper is selected). Besides γ_1 and γ_2 , another factor influencing the degree of cooperation in the network is the signal strength of BDSDiscovery. This dictates the size of the neighborhood in which a user seeks help. We simulate the effect of this design parameter by fixing the radius over which a UE can find potential helpers. Our simulation is initialized with a snapshot of the network where the UEs are located at uniformly random locations within a hexagonal cell. Each UE has a random battery level.

TABLE III
 SIMULATION PARAMETERS

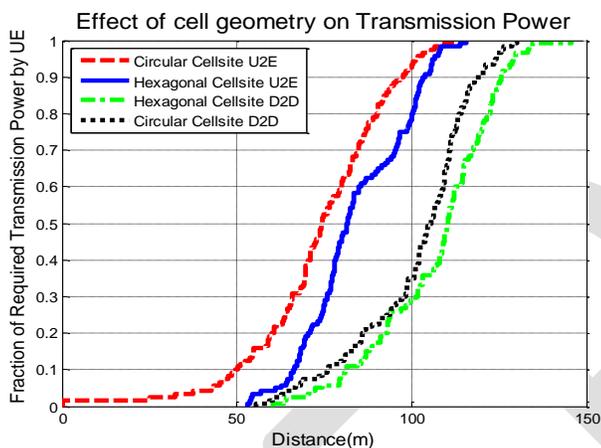
Parameters	Values
Cell Radius	500 m
No. of UEs	500
Mean data inter-arrival time	30 s
Mean burst size	7800 bytes
Speed	0.1 – 3 m/s
Pause duration	0 – 300 s
Walk duration	30 – 300 s
Path loss compensation factor α	0.8
Constant energy cost factor	15 mJ
Communication battery budget	300 J
Base power P_o	-69 dBm
Maximum transmit power T	24 dBm
Modulation order	QAM 16
Code rate	1/3
Carrier frequency	2 GHz
eNode B antenna height	25 m
UE antenna height	1.5 m
No. of walls for indoor NLOS	1
Cooperation threshold γ_1, γ_2	0.3, 0.3
Cooperation path loss threshold	110 dB
Cooperation radius	30 m
SNR (E_b/N_o) E	3.3 dB
Noise Margin K	3 dB
Processing Gain PG	27.95 dB
Handoff gain H	5 dB
Log Normal fade margin L	11.3 dB
Cell Antenna gain G	10 dB
Cable Loss C	2 dB

The results of simulation are shown in Fig.6. Fig.6(a) shows that a much lesser transmission power is required when the system is implemented with hexagonal cell geometry. This certainly affects the battery usage time of smartphone as shown in Fig.6(b). Hexagonal cell implementation provides greater battery usage time than circular cell implementation during cooperative usage. Fig.6(c) shows the increase in probability of survival of UE battery with cooperative usage in case of both hexagonal and circular cell implementation.

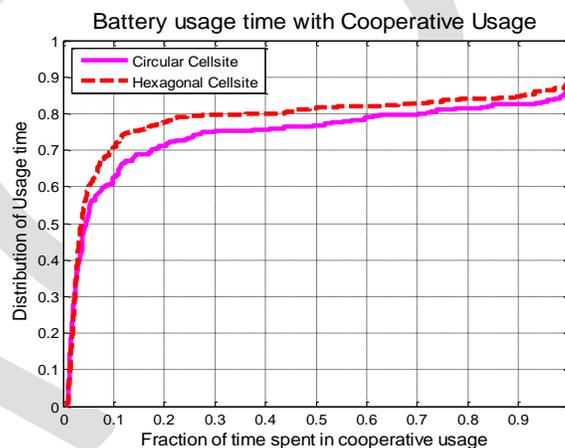
We show the average amount of valued battery for “survived” UEs as a percentage of the total battery capacity for various expected usage durations in Table IV. It can be seen that our system maximizes effectively the useful battery of the users.

TABLE IV
 AVERAGE AMOUNT OF VALUED BATTERY AFTER VARIOUS EXPECTED USAGE DURATIONS

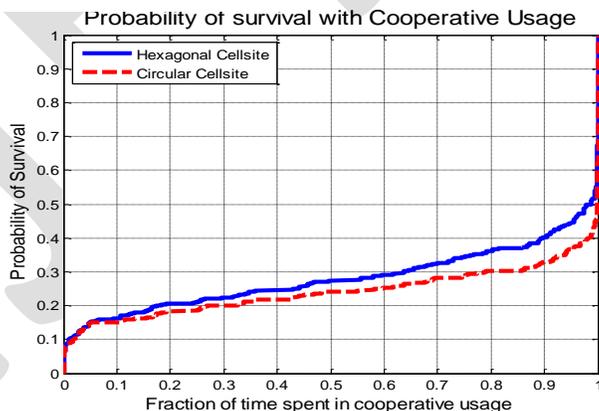
Expected Usage Duration (h)	Valued Battery with Cooperation	
	Hexagonal Cell	Circular Cell
6h	33%	31%
8h	28%	20%
10h	24%	12%



6(a) Plot of required transmission power by UE for communication



6(b) Plot of transmission power required by UE



6(c) Plot of probability of survival of UE's battery

Fig 6. Results of Simulation. Here the usage time of a UE is the period from the start of the simulation until the UE runs out of battery

V CONCLUSIONS

In this paper we have simulated cooperative system, the Battery Deposit Service, as a new solution to prolong smartphone' battery life, in hexagonal cell environment. We have used the notions of *valueless* and *valued battery*, being the available battery on a user's phone when he does or does not have access to a charger, respectively. Our system allows users to expend their valueless battery to

help conserve valued battery for others. Users who receive help (*helpees*) utilize low-cost D2D links to tunnel their traffic to the neighboring helpers. The helpers relay those data over the more expensive cellular links. In effect, the helpers carry the burden of communication energy cost for the helpees. Variation in usage ensures that a user will play both roles of helper and helpee at some different times. We describe how our system can be implemented as a 3GPP proximity service. We confirm that BDS reduces the probability of users not meeting their usage expectation (*probability of outage*) through a realistic simulation in hexagonal cell environment.

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One Click Intent Image Search

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Abstract:

In this paper we are going to enter a keyword for image to search. We will get number of images based on that keyword. Then from certain group number of images .A click or feedback is taken from user as reference image. Then we apply content based image retrieval.

Content-based image retrieval (CBIR) is an image search technique where images are selected from an image database by using a reference image rather than metadata, such as keywords, tags and descriptions associated with that image. Here, input for the search is an image, and the output is similar images from the database. The similarity between two images is measured by calculating the distance between the two images. That distance is calculated from feature vectors, and the feature vectors are constructed from the content of the image. Here, content refers to color, texture and shape of the image.

Keywords: Cbir, Simrank, Haar, Haar coefficient, Transform, mean, skew

Introduction

Existing Systems:

In Existing system, one way is text-based keyword expansion, making the textual description of the query more detailed. Existing linguistically-related methods find either synonyms or other linguistic-related words from thesaurus, or find words frequently co occurring with the query keywords.

Proposed system:

In Proposed system, we propose a novel Internet image search approach. It requires the user to give only one click on a query image and images from a pool retrieved by text based search are re-ranked based on their visual and textual similarities to the query image. We believe that users will tolerate one-click interaction which has been used by many popular text-based search engines. For example, Google requires a user to select a suggested textual query expansion by one-click to get additional results. The key problem to be solved in this paper is how to capture user intention from this one-click query image.

To implement this we are going to use two algorithm

1. Simrank Algorithm

2. Haar Wavelet

1] SimRank Algorithm

Many applications require a measure of "similarity" between objects. One obvious example is the "find-similar-document" query, on traditional text corpora or the World Wide Web. More generally, a similarity measure can be used to cluster objects, such as for collaborative filtering in a recommender system which — similar users and items are grouped based on the users' preferences.

Various aspects of objects can be used to determine similarity, usually depending on the domain and the appropriate definition of similarity for that domain. In a document corpus, matching text may be used, and for collaborative filtering, similar users may be identified by common preferences. SimRank is a general approach that exploits the object-to-object relationships found in many domains of interest.

The intuition behind the SimRank algorithm is that, in many domains, similar objects are referenced by similar objects. More precisely, objects are considered to be similar if they are pointed to by similar objects and are themselves similar. The base case is that objects are maximally similar to themselves.

It is important to note that SimRank is a general algorithm that determines only the similarity of structural context. SimRank applies to any domain where there are enough relevant relationships between objects to base at least some notion of similarity on relationships. Obviously, similarity of other domain-specific aspects are important as well; these can — and should be combined with relational structural-context similarity for an overall similarity measure. For example, for Web pages SimRank can be combined with traditional textual similarity; the same idea applies to scientific papers or other document corpora. For recommendation systems, there may be built-in known similarities between items (e.g., both computers, both clothing, etc.), as well as similarities between users (e.g., same gender, same spending level). Again, these similarities can be combined with the similarity scores that are computed based on preference patterns, in order to produce an overall similarity measure.

2] Haar Wavelet

This sequence was proposed in 1909 by Alfréd Haar. Haar used these functions to give an example of a countable orthonormal system for the space of square-integrable functions on the real line. The study of Wavelets, and even the term "wavelet", did not come until much later. The Haar wavelet is also the simplest possible wavelet. The technical disadvantage of the Haar wavelet is that it is not continuous, and therefore not differentiable. This property can, however, be an advantage for the analysis of signals with sudden transitions, such as monitoring of tool failure in machines.

The Haar wavelet's mother wavelet function $\psi(t)$ can be described as:

$$\psi(t) = \begin{cases} 1, & 0 \leq t < \frac{1}{2} \\ -1, & \frac{1}{2} \leq t < 1 \\ 0, & \text{otherwise} \end{cases}$$

If a data set X_0, X_1, \dots, X_{N-1} contains N elements, there will be $N/2$ averages and $N/2$ wavelet coefficient values. The averages are stored in the first half of the N element array, and the coefficients are stored in the second half of the N element array. The averages become the input for the next step in the wavelet calculation. The Haar equations to calculate an average i and a wavelet coefficient i from an odd and even element in the dataset are

$$A_i = (X_{2i} + X_{2i+1}) / 2$$

$$C_i = X_i - X_{i+1} / 2$$

Steps for a 1D Haar transform of an array of N elements are as follows:

1. Find the average of each pair of elements using Equation 1. (N/2 averages)
2. Find the difference between each pair of elements and divide it by 2. (N/2 coefficients)
3. Fill the first half of the array with averages.
4. Fill the second half of the array with coefficients.
5. Repeat the process on an average part of the array until a single average and a single coefficient are calculated.

Steps for a 2D Haar transform are:

1. Compute 1D Haar wavelet decomposition of each row of the original pixel values.
2. Compute 1D Haar wavelet decomposition of each column of the row-transformed pixels.

Red, green and blue values are extracted from the images. Then we apply the 2D Haar transform to each color matrix.

By Haar wavelet we extract all the three features like color, texture and shape.

Color is one of the most commonly used visual features in content-based image retrieval. Color features have been found to be effective for measuring similarity between images. One of the main aspects of color feature extraction is the choice of a color space. A color space is a multidimensional space in which the different dimensions represent the different components of color. An example of a color space is RGB.

$$E = \sum_{j=1}^N \frac{1}{N} p_{ij}$$

where:

N = number of pixels in the image

p_{ij} = value of the j-th pixel of the image at the i-th color channel p_{ij}

The second color moment is the standard deviation, which is obtained by taking the square root of the variance of the color distribution.

$$\sigma = \sqrt{\left(\frac{1}{N}\right) \sum_{j=1}^N (p_{ij} - E_i)^2}$$

Related Work

Content-based image retrieval has become a prominent research topic, and researchers have proposed different methods to improve the system.

Color features are the most widely used visual features in CBIR systems. The color indexing work of Swain and Ballard, which is based on color histograms, has demonstrated the potential of using color for indexing. Stricker and Orengo have shown that moment-based color distribution features can be matched more robustly than color histograms because histograms do not capture spatial relationships of color regions. Hence, in our proposed method, color moments are used for color feature extraction.

Texture is an important feature for CBIR systems. Various techniques have been developed for measuring texture similarity. Tamura et al. took the approach of devising texture features that correspond to human visual perception. They defined six textural features (coarseness, contrast, directionality, line-likeness, regularity and roughness) and compared them with psychological measurements for human subjects. The first three components of Tamura features have been used in some early well-known image retrieval systems, such as QBIC . Wavelet transform provides a multi-resolution approach to texture analysis and classification. Khan et al. used the Haar wavelet transform for texture feature extraction.

Combination of features is also used in content-based image retrieval. Choras et al. proposed an integrated color, texture and shape feature extraction method in which Gabor filtration is used to determine the number of regions of interest (ROIs). They calculated texture and color features from the ROIs based on threshold Gabor features and histograms, color moments in luminance-bandwidth-chrominance space, and shape features based on Zernike moments.

System Architecture

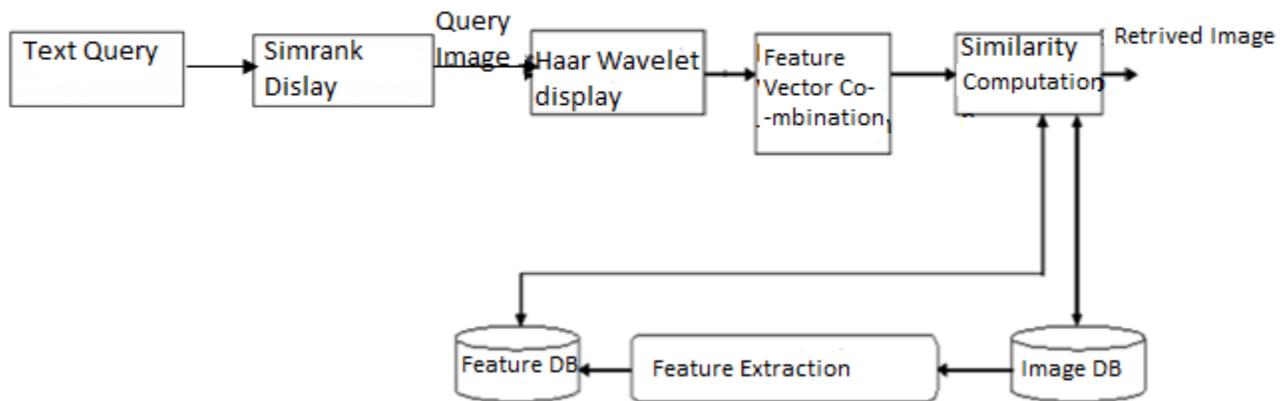


Fig 1. System Architecture

Similarity Measure

The similarity between two images is computed by calculating the distance between feature representation of the query image and feature representation of the image in the dataset. We use Canberra distance for distance calculation of the feature vectors

$$disp(q, d) = \sum_{i=1}^N \frac{q_i - d_i}{q_i + d_i}$$

where :

q=(q1,q2,q3.....) is the feature vector of the query image,
 d=(d1,d2,d3.....) is the feature vector of the image in the database,
 n = number of elements of the feature vector.

If the distance between feature representation of the query image and feature representation of the database image is small, then it is considered similar.

The final distance between the query image and the image in the database is calculated as follows:

$$D=d1*w1+d2*w2$$

where:

d1= calculated distance using Haar wavelet features
w1= weight for Haar wavelet features
d2= calculated distance using color features
w2= weight for color features

Conclusion

In this topic, we propose a novel Internet image search approach which only requires one-click user feedback. Intention specific weight schema is proposed to combine visual features and to compute visual similarity adaptive to query images. Without additional human feedback, textual and visual expansions are integrated to capture user intention. Expanded keywords are used to extend positive example images and also enlarge the image pool to include more relevant images. This framework makes it possible for industrial scale image search by both text and visual content. One shortcoming of the current system is that sometimes duplicate images show up as similar images to the query. This can be improved by including duplicate detection in the future work. Finally, to further improve the quality of re-ranked images, we intent to combine this work with photo quality assessment work in to re-rank images not only by content similarity but also by the visual quality of the images

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Analysis And Selection Of Appropriate Activities Based On Reliability And Security Engineering For Software Development

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Abstract— The most significant phase in software progress process is Requirement engineering .The key subject that affects the accomplishment time and success of projects is defined as RE practices in software engineering. The improvement of client requirement for software reliability, the precision of reliability tools is rising in a new style with the unremitting development of software production technology. Many secure development efforts are carried out in direction of software development lifecycles like security specification languages and processes. This paper simply focuses on software engineering specifications that supports reliability and introduces its development trend.The analysis identifies lack of required properties. In the end, guidelines are provided for the development of secure software and reliability issues are identified.

Keywords— Reliability engineering , secure software development process ,Software Reliability, software testing, software engineering, Software security, software security requirements engineering, Reliability engineering.

INTRODUCTION

The software based systems are more and more dependent on projects in this IT industry. Such systems require specific standards to be followed for less failure and the requirement gathering must be strong enough leading to success of software .Of the most significant standards is reliability. Therefore research on reliability has become important as the problems related to reliability of software are increasing in development industry [1].

In SDLC, security vulnerabilities are at higher risk because software security is not considered as major quality standard in earlier stages of development [2]. The phenomenon of security based software development is to prevent software vulnerabilities by taking security measures throughout the software lifecycle i-e in requirement gathering, designing, development and testing. Secure development methods and procedures are developed for software production.SSD methods comprises of security assessment and assurance techniques, security software specification languages and processes. Security measures in SDLC are different from application security. By application security it means security measures after deployment of application. It normally includes, firewalls, intrusion detection and prevention, antivirus etc [2].The purpose is to develop an SDLC that satisfies security and reliability as development of patch for error removal can be upto 200 times more classy [3] than fixing the defect as soon as it is introduced. This paper highlights the basic contents of software reliability and projected some issues regarding software reliability in software engineering. The target is to introduce a software activities that covers all solutions of present security issues .The identified properties can be useful in conversion of one security language into another. Such a conversion is predominantly functional when a client of a language intends to apply security tools made for further languages.

LITERATURE REVIEW

The typical description of software reliability [5] is the prospect of no failures in precise accepted unit [4]. Reliability-based Software engineering is a practical discipline that decrease the risk of unsatisfied user requirement in software development[4]. Specification of availability ,veracity and privacy is the main objective of security requirements. Normally, security features are identified for software design and production [6].G. McGraw [2] in " Software Security: Building Security In" have briefly described Specification of abuse cases and security requirement in software development lifecycle. Abuse cases can be used to derive test cases. Static code analysis tools are utilized and secure design guidelines are provided. M. Howard and S. Lipner [7] in "The Security Development Lifecycle: SDL: A Process for Developing Demonstrably More Secure Software" analyze identification of interfaces, security objectives and required security features in software development lifecycle. Definition of exit criteria, Identification of critical components, attack surface, design methods, and completion criteria are also mentioned. I. Flechais, C. Mascolo, and M.A. Sasse [8], in "Integrating Security and Usability into the Requirements and Design Process," have done identification of assets in high level security requirements. A. Aprville and M. Pourzandi [9],in "Secure Software Development by Example," proposed use of a secure

programming language in software development, avoiding buffer overflow formatting string vulnerabilities. L. Futcher and R.v. Solms [10], in “SecSDM: A Model for Integrating Security into the Software Development Life Cycle,” explained Modeling using flexible modeling framework (FMF) considering security issues. security code scanning tools are also listed. A security checklist is provided describing potential items to guide development.(CLASP) [11] focused on identification of attackers and attack surface. The research also describes annotation of class diagrams with security information. M. Essafi, L. Labeled, and H.B. Ghezala [12],in “S2D-ProM: A Strategy Oriented Process Model for Secure Software Development,” have briefly described security modeling language and model checking in SDLC.N. Davis [13],in “Secure Software Development Life Cycle Processes: A Technology Scouting Report” have done state machine design and verification for use in software development and production. Renzuo Xu [14], in “Software Reliability Engineering” explained that software reliability plays a vital role as software quality feature. The software is based on the instructive attainment, understanding, mind behavior, cognitive skill, progress environment and specialized principles, so it indicates that failure can’t be avoided. Xizi Huang[15],in Progress Review of Software Reliability have briefly described that SFMEA, SFTA, SSCA, Petri net analysis, Failure-recover, fault-tolerant, fault prevention etc can be analyzed through these issues in software reliability design [15].

METHODOLOGY

If Reliability is very important quality attribute of software development. As the production of software depends on experience, cognitive ability, software production and development environment etc, so chances of failure are more[14]. The problems that need to be solved are how to overcome these failures and what are the preventive measures. Software reliability can be defined as probability of software development without any failure[5]. The contents of software reliability are as follows:

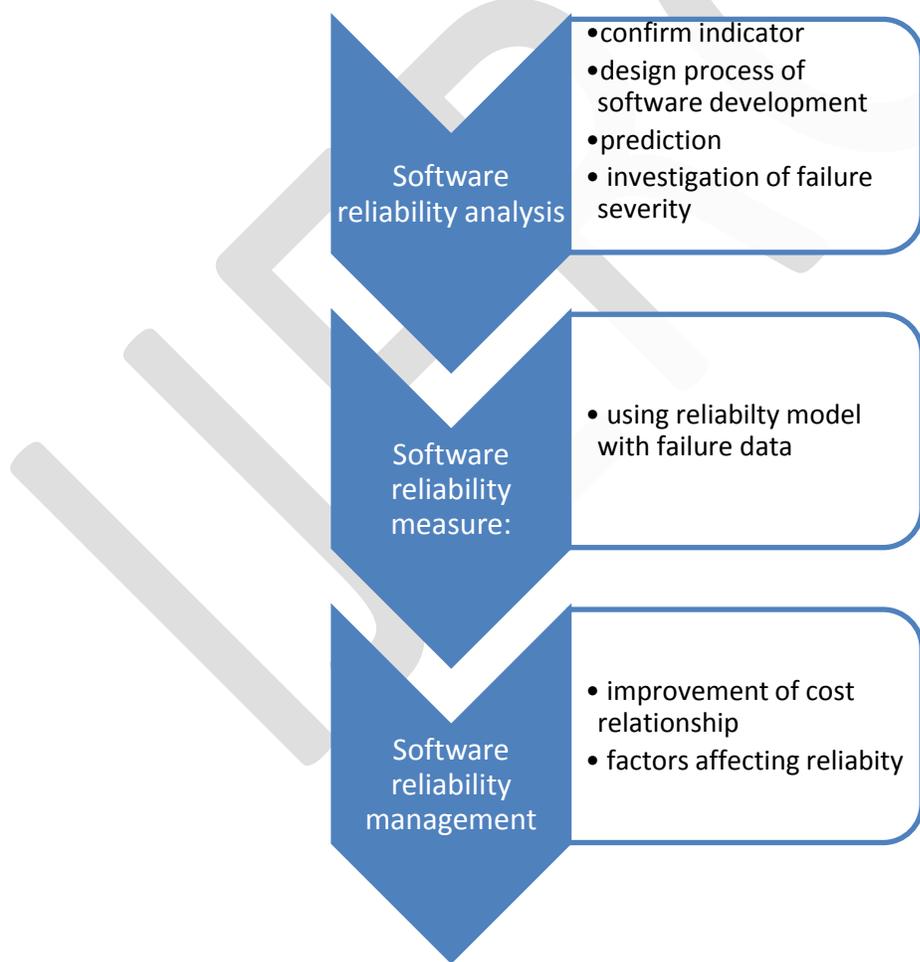


Figure 5: Software Reliability Content

Generally issues with reliability begins at the start of software development. So, software reliability can be divided into five phases:
Hence following problems can be resolved during implementation process of software reliability engineering.

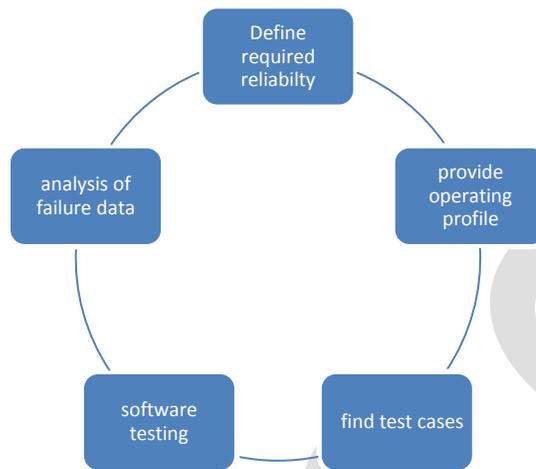


Figure 6: Software Reliability Phases

1) Software Reliability Metrics.

Gray box testing and accelerated test for software reliability assessment method.

2) Analysis and design of software reliability

The confirmation of forecasting and stopping failure comes from information response in structure plan phase which is the essential attribute of reliability engineering.

3) Software Testing and Verifiability.

Automatic generation of test cases, scripts and test data and profile operation .

4) Software Reliability Management.

The management controls development ,purchase and reuse of software, alongwith adapting to changes and confirmation of factors that affects software reliability.

On the other hand, the availability and confidentiality of the software product should be preserved is the key objective of security based specification. Research has reported that security requirement engineering is based on security based requirement engineering specifications and processes. This paper focus on analyzing those security properties that must be a part of software development and production. Security specifications are described by many languages in the literature. Security requirement is a term used to define those requirements which if not implemented causes vulnerability. In other words, specifications that identify attacks on software development and production leading to failure. Similarly, a process is desirable for derivation of these requirements. This process is security requirement engineering process. The most important idea of this process is to make out security requirements activities that can practically make certain security of the software produced. The security processes should have the following activities. The activities are analyzed from requirement engineering processes based on security [11, 6, 16, 17-19].Some activities should be performed iteratively to meet security satisfaction .

R1. High level and low level (e.g., password length) functional specifications and identification of environment for software implementation

R2. Finding out resources and their valuation.

R3. Identification of users, attackers and their interest in the software.

R4. Identification of capabilities and possible threats from attackers.

R5. Specification of misused scenarios and use cases.

R6. Identification of security goals , mechanisms, constraints and policies derived by negotiating with the stakeholders .

R7. Identification of security errors and characterization of exit criteria depending on state of the software(calculation of security state by using security index [7]).

R8. Risk and cost/benefit analysis.

R9. cataloging and prioritization of security requirements of low level.

R10. Inclusion of low level requirements based on security in software.

CONCLUSION

Software products are not competitive because reliability management can't be introduced in production and design. These flaws limit development of software based on reliability engineering. Enforcement of these measures can be helpful in development of reliability engineering. Identification of 10 vital activities are carried out in this research. As a future work, a software model can be generated that could figure out reliability issues mentioned above and implement these activities for security success in software development. .

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FPGA BASED OPTIMAL SECURED COMMUNICATION

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Abstract— In real time systems the FPGA can implement with soft core, hard core and many embedded applications. It is a major platform for reconfigurable, high execution speed and low power consumption. The design resources can also be reached by using this FPGA. This can be implemented by using blow fish algorithm (encryption and decryption) based on security purposes. Earlier we are implementing this process in single FPGA system for multiple process tasks with low operating speed. But now, the multiple FPGA system has been implemented over here for high execution speed. This process can be communicated through the RS232 communication link.

Keywords- Multi-protocol Label Switching (MPLS); Label Distribution Protocol (LDP); Last In First Out (LIFO); Synchronous Optical Networking (SONET).

I. INTRODUCTION

To design a cryptographic protocol to protect the Multi-protocol Label Switching (MPLS) header used in an Internet Service Provider (ISP) network. This protocol should protect the MPLS header primarily against tampering for purposes of hijacking ISP resources. Secondary goals are protection against replay attack and traffic analysis of ISP traffic. The protocol should be fast so as to minimize delay introduced into the high-speed MPLS routers. One goal has been to compile an introduction to the subject of cryptography. There exist a number of studies of various parts of the cryptographic standards, but complete treatments on a technical level are not as common. Material from papers, journals, and conference proceedings are used that best describe the various parts. Another goal has been to search for algorithms that can be used to implement the suitable cryptography for MPLS label switching.

A third goal is to evaluate their performance of various cryptographic protocols and to select a best protocol that can be implemented best for MPLS switching. These properties were chosen because they have the greatest impact on the implementation effort.

A final goal has been to design and simulate an cryptographic protocol. This should be done in C or MATLAB. The source code should be easy to understand so that it can serve as a reference on the standard for designers that need to implement a system

II. MULTIPROTOCOL LABEL SWITCHING (MPLS) HEADER

In computer networking and telecommunications, Multi-protocol Label Switching (MPLS) is a data-carrying mechanism, which emulates some properties of a circuit-switched network over a packet-switched network. MPLS operates at a OSI Model layer that is generally considered to lie between traditional definitions of Layer 2 (data link layer) and Layer 3 (network layer), and thus is often referred to as a "Layer 2.5" protocol. It was designed to provide a unified data-carrying service for both circuit-based clients and packet-switching clients, which provide a datagram service model. It can be used to carry many different kinds of traffic, including IP packets, as well as native ATM, SONET, and Ethernet frames. Fig 1.3 shows the MPLS Header in ISP network model.

A number of different technologies were previously deployed with essentially identical goals, such as frame relay and ATM. MPLS is

now replacing these technologies in the marketplace, mostly because it is better aligned with current and future technology and needs.

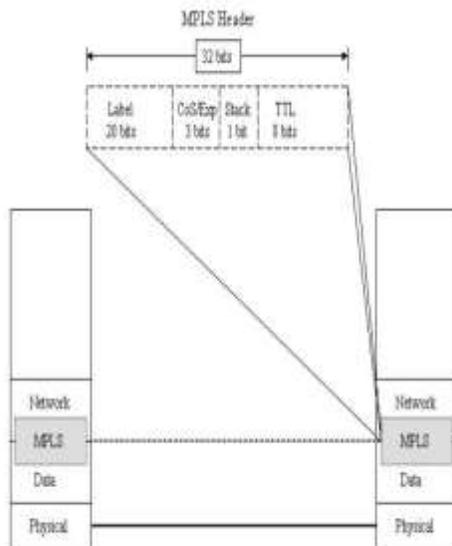


Fig 1 MPLS Header in ISP Network

In particular, MPLS dispenses with the cell-switching and signaling-protocol baggage of ATM. MPLS recognizes that small ATM cells are not needed in the core of modern networks, since modern optical networks (as of 2001) are so fast (at 10 gbit/s and well beyond) that even full-length 1500 byte packets do not incur significant real-time queuing delays (the need to reduce such delays, to support voice traffic, having been the motivation for the cell nature of ATM).

At the same time, it attempts to preserve the traffic engineering and out-of-band control that made frame relay and ATM attractive for deploying large scale networks.

MPLS was originally proposed by a group of engineers from Cisco systems, inc.; it was called "tag switching" when it was a Cisco proprietary proposal, and was renamed "label switching" when it was handed over to the IETF for open standardization.

One original motivation was to allow the creation of simple high-speed switches, since it was at one point thought to be impossible to forward IP packets entirely in hardware. However, advances in VLSI have made such devices possible. The systemic advantages of MPLS, such as the ability to support multiple service models, do traffic management, etc, remain.

III. PROBLEM STATEMENT

In conventional IP forwarding, the router uses a longest-prefix match on the destination IP address to determine where to forward a packet. With MPLS, labels are attached to packets at the ingress point to an MPLS network. Within the network, the labels are used to route the packets, without regard to the original packet header information. These labels can be stacked as a last in first out (LIFO) label stack, enabling MPLS flows to be combined for transport and separated later for distribution.

Current proposed protocols for MPLS security, Behringer [2] and Senevirathne et al. [3] discuss two approaches to securing MPLS. Behringer [2] makes the assumption that the core MPLS network is "trusted and provided in a secure manner." We make no such assumption in our work. We assume that only the MPLS nodes themselves are secure. The physical links connecting the nodes are assumed to not be secure – we protect them using our protocol. Senevirathne et al. [3] proposes an encryption approach using a modified version of IPsec. IPsec is defined by the IETF [4], and is an all-purpose encryption protocol that includes key distribution, authentication for the IP header, and authentication and encryption for the IP payload. Senevirathne et al. [3] translate these capabilities to an MPLS environment. Their proposed system does not meet the requirements specified above for our problem for two reasons:

1. It adds at least 128 bits to each MPLS header. This is four times the size of the MPLS header itself. This level of overhead on every packet would probably prove unacceptable to an ISP. It would almost certainly add significantly more processing delay to each packet when compared to a simple encryption scheme.
2. It does not encrypt the MPLS header (but provides authentication). Therefore the header is vulnerable to traffic analysis. We require fast and inexpensive operation, since MPLS routers are mainly routers without the full capability to do Layer 3 routing operations or are Layer 2 (ATM) switches with some additional capability. For this reason, application layer distribution designs are not applicable in our case. We also require the key exchange algorithm to be aware of the computation burden it imposes on the underlying system and communications performance

Currently, MPLS does not provide header or payload encryption. The only security function employed in MPLS is the use of MD5 [5] to sign and authenticate the control messages sent using TCP. MPLS control messages are transported using IP and do not fall under the scope of this research. They can be secured either by IPsec or any other proprietary method. Integration of the Label Distribution Protocol (LDP) security is an open issue for future study. Nevertheless, MD5 could be used for MPLS header security, since it is already present in the routers' software. MD-5 is particularly suitable in fast re-keying and for the hash or keyed-hash functions that may need to be used

IV.PERFORMANCE ANALYSIS OF ENCRYPTION ALGORITHMS

Our encryption system must be as fast as possible (to minimize processing delay) while meeting the stated security objectives. The protocol should not add bits to the MPLS header or require an additional header to be inserted into each data packet. MPLS routers must be able to recognize a valid, decrypted (received) MPLS header. There will only be a small number of different MPLS headers exchanged between nodes, however there will be potentially hundreds of millions of copies of these same headers exchanged. Therefore, the protocol must not encrypt the same plaintext to the same ciphertext. This, along with the fact that each MPLS header is only 32 bits long implies that some kind of stream protocol is necessary. Packets can be lost or damaged in transmission, so the encryption protocol must be self-synchronizing. This further implies that a cipher feedback mode of operation is required.

Each MPLS router in an MPLS network must be able to read and change the label in the MPLS headers it processes. Therefore, a link encryption scheme is necessary. A disadvantage of link encryption is that the MPLS header message is vulnerable at each router. A link encryption device must be present at each end of the link. Each pair of nodes that share a link could have a unique key with a different key for each link. As an alternative, the same key can be used for all links in an administrative domain and different keys can be used at the edges of the domain. This can expose a large number of nodes (belonging to the same domain) if the key is stolen.

	Key Length (Nk words)	Block Size (Nb words)	Number of Rounds (Nr)
AES-128	4	4	10
AES-192	6	4	12
AES-256	8	4	14

Table 1 Key-Block-Round Combination

V. IMPLEMENTATION OF THE SYSTEM

Blowfish is a variable-length key, 64-bit block cipher. The algorithm consists of two parts: a key-expansion part and a data-encryption part. Key expansion converts a key of at most 448 bits into several sub-key arrays totaling 4168 bytes. Data encryption occurs via a 16-round Feistel network. Each round consists of a key-dependent permutation, and a key- and data-dependent substitution. All operations are XORs and additions on 32-bit words. The only additional operations are four indexed array data lookups per round. Encryption and Decryption Blowfish is a Feistel network consisting of 16 rounds. The input is a 64-bit data element, x .

5.1 Design Considerations

In our design, we consider the types of attacks we intend to protect from, and operational considerations including speed, span of encryption, and key distribution. What kinds of attacks are we protecting from? We are protecting the header in an ISP provider's network so that an attacker cannot collect and analyze traffic data, understand route configuration, and eventually create a covert channel. This protocol will protect the links between MPLS routers by protecting the MPLS headers. All MPLS headers will be encrypted with this protocol.

There are four general categories of attacks described by Stallings [6]: Interruption -- An asset on the system is destroyed or becomes unavailable. This does not have to be a physical asset. This is an attack on availability. We are not protecting from this type of attack with our protocol. Interception -- An unauthorized party gains access to an asset and can capture data. This is an attack on confidentiality. We are not protecting from this type of attack with our protocol. Modification -- An attacker modifies the contents of a message. This is an attack on integrity. We are protecting the MPLS header contents with our protocol. Fabrication -- An attacker inserts counterfeit objects in to the system. This is an attack on authenticity. We are protecting an MPLS network from this type of attack with our protocol.

Our encryption system must be as fast as possible (to minimize processing delay) while meeting the stated security objectives. The protocol should not add bits to the MPLS header or require an additional header to be inserted into each data packet. MPLS routers must be able to recognize a valid, decrypted (received) MPLS header. There will only be a small number of different MPLS headers exchanged between nodes, however there will be potentially hundreds of millions of copies of these same headers exchanged. Therefore, the protocol must not encrypt the same plaintext to the same ciphertext.

5.2 Speeding Processing:

If the Blowfish algorithm was to prove to add too much processing delay to the MPLS routers, we could use a reduced number of

rounds to speed the processing. This would likely reduce the security afforded by 16 rounds; however, the published research to date has not been able to break five rounds or more of Blowfish. There is also a trade-off to be made between the time required to break Blowfish (by brute force) and the time between re-keying. If we are willing to re-key more frequently, we can use fewer rounds in our Blowfish encryption and speed the processing at each MPLS router.

Determining if Decrypted MPLS header is Valid The method of determining if an MPLS header is valid is to check if the label portion of the header is a valid MPLS label in the context of that particular router. Unfortunately, if we are using a large number of labels there is a small but significant chance that an intruder's MPLS header or a valid header with an error will produce a valid label (though a random one). For example, if we are using 1024 labels there is a one in a thousand chance for a random "encrypted" label to produce a valid decrypted label. Our proposed solution to this problem is to "steal" bits from the CoS and TTL fields to increase our chances of detecting a bad MPLS header. Using the three bits from the CoS field (which assumes we create separate paths for each class of service and therefore do not need these bits) and two bits from the TTL field would improve our odds of detecting bad MPLS headers. Redoing the example above using the "stolen" bits, we determined that 15 in 1,000,000 bad MPLS headers would decrypt to a valid label. Changing the expected bit pattern of the unused bits from zero to some other value will not improve the security or ability to detect a valid header, since any value has an equally likely chance of occurring.

5.3 Key Exchange System

A cryptographic key exchange method developed by Whitfield Diffie and Martin Hellman in 1976. Also known as the "Diffie-Hellman-Merkle" method and "exponential key agreement," it enables parties at both ends to derive a shared, secret key without ever sending it to each other.

Using a common number, both sides use a different random number as a power to raise the common number. The results are then sent to each other. The receiving party raises the received number to the same random power they used before, and the results are the same on both sides.

The simplest, and original, implementation of the protocol uses the multiplicative group of integers modulo p , where p is prime and g is primitive mod p . Modulo (or mod) simply means that the integers between 1 and $p - 1$ are used with normal multiplication, exponentiation and division, except that after each operation the result keeps only the remainder after dividing by p .

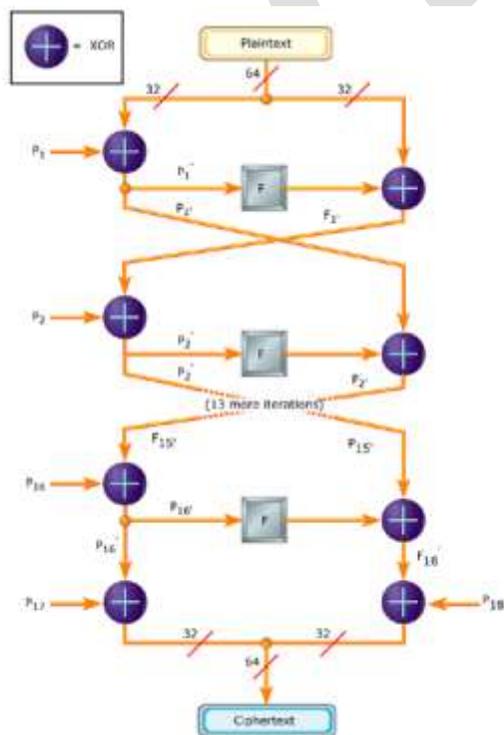


Fig 2 Blowfish Algorithm Fiestel Network.

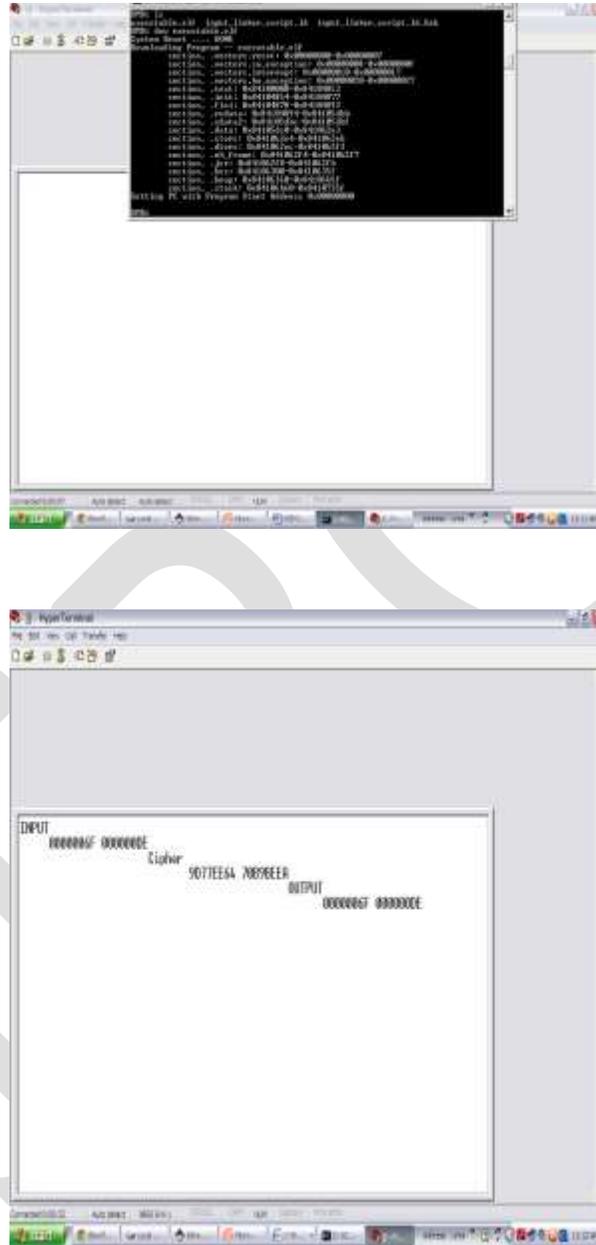
Both Alice and Bob have arrived at the same value, because gab and gba are equal. Note that only a , b , gab and gba are kept secret. All the other values are sent in the clear. Once Alice and Bob compute the shared secret they can use it as an encryption key, known only to them, for sending messages across the same open communications channel. Of course, much larger values of a , b , and p would be needed to make this example secure, since it is easy to try all the possible values of $gab \text{ mod } 23$ (there will be, at most, 22 such values, even if a and b are large). If p was a prime of more than 300 digits, and a and b were at least 100 digits long, then even the best known algorithms for finding a given only g , p , and $ga \text{ mod } p$ (known as the discrete logarithm problem) would take longer than the lifetime of the universe to run. g need not be large at all, and in practice is usually either 2 or 5.

5.4 Authentication Diffie Hellman Key Exchange

In the original description, the Diffie-Hellman exchange by itself does not provide authentication of the parties, and is thus vulnerable to man in the middle attack. The man-in-the-middle may establish two distinct Diffie-Hellman keys, one with Alice and the other with Bob, and then try to masquerade as Alice to Bob and/or vice-versa, perhaps by decrypting and re-encrypting messages passed between

them. Some method to authenticate these parties to each other is generally needed. A variety of cryptographic authentication solutions incorporate a Diffie-Hellman exchange. When Alice and Bob have a public key infrastructure they may digitally sign the agreed key, or g_a and g_b , as in MQV, STS and the IKE component of the IPsec protocol suite for securing Internet Protocol communications. When Alice and Bob share a password, they may use a password-authenticated key agreement form of Diffie-Hellman

RESULTS



CONCLUSIONS

Our proposed cryptographic system for the protection of MPLS headers would likely prove successful at its primary task – preventing theft of services by an intruder with interior access to an ISP's MPLS network. Our encryption system uses the (to date) very strong Blowfish algorithm. Without actually implementing and testing this system, we cannot know for sure what delay our encryption protocol would produce in an MPLS router. This delay would be a critical issue for ISP's supporting Quality of Service protocols, like Differentiated Services. Our key distribution system strives to be as simple as possible to administer, yet provide a high level of security for the keys themselves.

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IJERGS

Design of Photonic Crystal Wavelength Demultiplexer & its Application: Wavelength Filter

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Abstract— In This paper a wavelength division demultiplexer has been proposed based on hexagonal lattice 2D photonic crystal. This structure can be used as a filter for 1.290 μm and 1.468 μm wavelength. The structure has been designed using silicon rods, refractive index 3.4, which are suspended in air. The plane wave expansion method and finite difference time domain method has been utilized for simulating the photonic band gap and results respectively. The localization property of photonic crystal has been demonstrated to guide the wavelength in two different output port with low crosstalk and near about 90% transmission at 1.290 μm and 70% transmission at 1.468 μm .

Keywords— Photonic crystal; photonic band gap(PBG); FDTD method; PWE method; wavelength demultiplexer; wavelength filter; Opti-wave software.

INTRODUCTION

Photonic crystals (PhCs) [1]-[3] are periodic dielectric structures. They are called crystals because of their periodicity and photonic because they act on light. They occur when the period is less than the wavelength of the light [2]. PhCs may inhibit the propagation of certain range of wavelengths in either one direction or in all directions, providing the possibility to confine and trap the light in a cage [1]. Their effect to the propagation of electromagnetic waves is similar to the periodic potential in a semiconductor crystal. but from the communication capacity point of view, the electron-based conventional communication system has shown the physical limitation due to a rapid growth of the internet and multimedia. If the information is processed as an optical signal itself, not an electrical signal, then the information processing speed will be increased and it can provide much more convenience. Therefore the optical communication system will be expected that it will lead the future communication system by using a photonic device [3]-[4].

In this paper, we analyzed a photonic crystal (PhC) demultiplexer structure and proposed 1.290/1.468 μm wavelength filter which plays a very important role in an optical communication system. The PhC filter structure was analyzed by utilizing the plane wave expansion (PWE) method and the proposed wavelength demultiplexer was optimized by utilizing the finite-difference time domain (FDTD) method [5].

PROPOSED STRUCTURE

For this design the PhCs with a wide photonic band gap (PBG) is chosen, because two wavelength signals to be split have a wide wavelength difference.

A. Selection of material

The structure proposed here is a Y- junction with material silicon is chosen because of its high refractive index (RI= 3.4). This high RI provides a high RI contrast with air which helps in getting a large band gap for the photonic crystal.

B. Selection of Lattice Structure

The lattice structure can either be a square lattice or a hexagonal lattice. A hexagonal lattice has advantage that its geometry provides a smaller angle (60 degrees) for bending the light unlike the right angle provided by the square lattice [6]. The smaller angle results in lesser scattering of light and in turn lower losses.

C. Selection of lattice constant and radius of cells

r/a Ratio of lattice play a very important role in determining its band-gap, where, r is the radius of the silicon rod and ' a ' is the lattice constant of the structure. For silicon material r/a is 0.2 chosen for wide band gap [7].

Here $a = 0.50 \mu\text{m}$ is chosen then

$$r/a = 0.2$$

$$r = 0.2 \times 0.50$$

$$r = 0.100 \mu\text{m}$$

D. Adding Defects

Defects are added to allow a particular wavelength to pass through a particular direction while reflecting the rest. The one-line defect waveguide can transmit two wavelength signals, and it is named as Filter-A. Filter-B and Filter-C for transmitting 1.290 and 1.468 μm wavelengths, respectively, are implemented by inserting some point defects into the waveguide.

The r'/a ratio for filter-B and filter-C are 0.2736 μm and 0.3140 μm respectively. Where r' is the changed radius for each defect. Also the transmitted power is Maximum when the number of defect rods in each output waveguide is 3, so in this way a wavelength demultiplexer can perform a work of wavelength filter. So it is confirmed that filter-B and filter-C can work as band pass filter for the wavelength signal of 1.290 μm and 1.468 μm

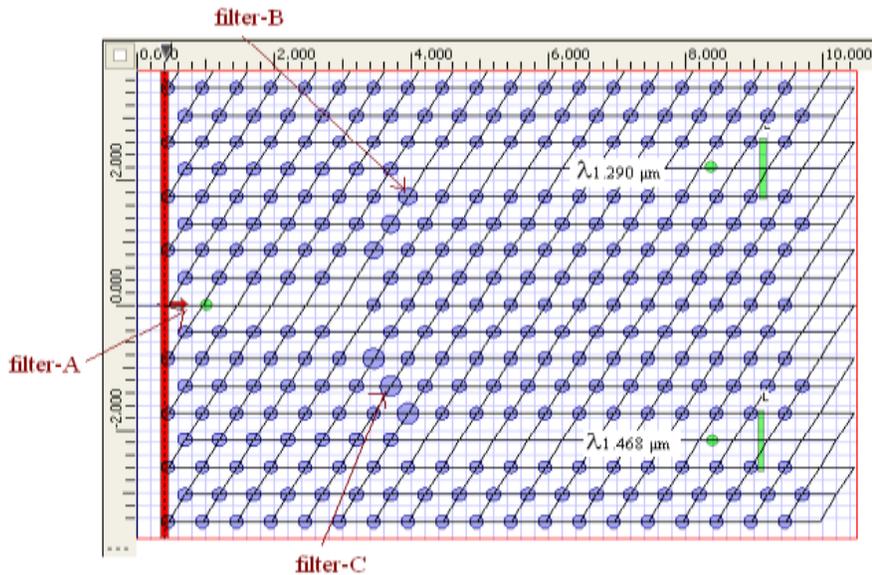
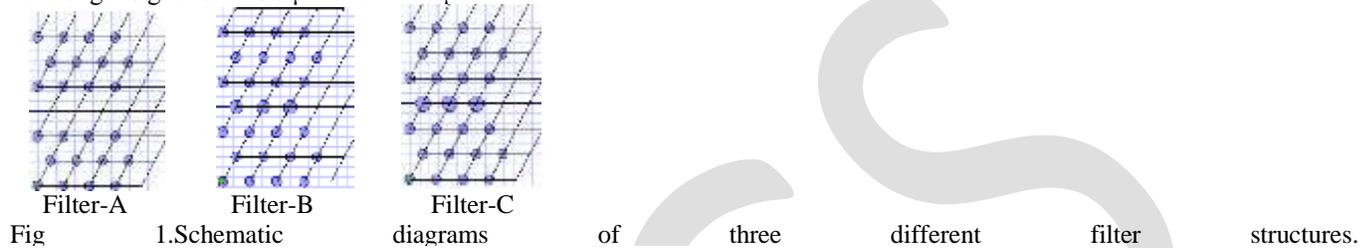


Fig. 2 Layout of the proposed 1.290/1.468 μm wavelength demultiplexer having the three different filter structures

SIMULATION RESULTS

After finalizing the architecture, we simulated it using the Opti-wave. The results are demonstrated in the following figures.

A. Band-gap Calculation

Fig. 3 depicts the photonic band-gap for the proposed structure .

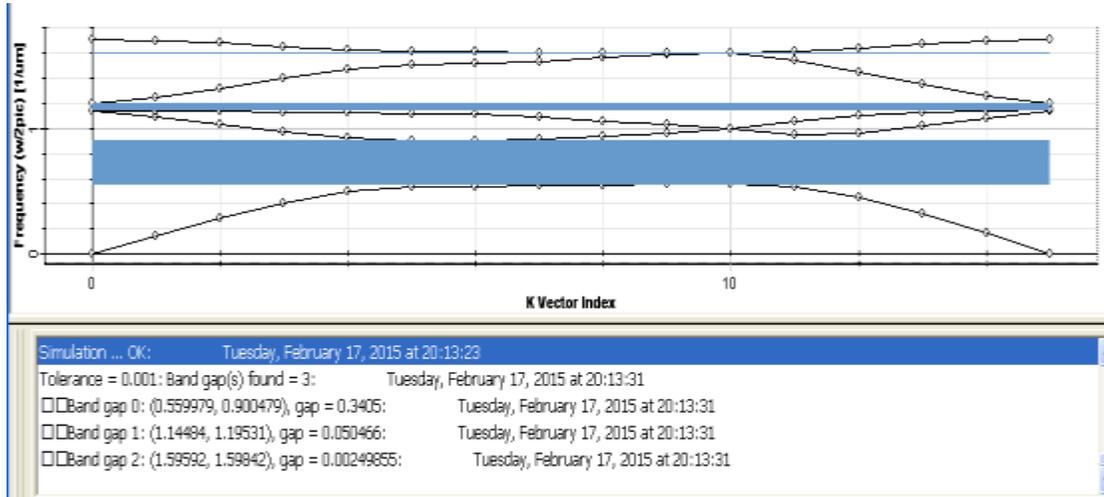


Fig. 3 Photonic band-gap diagram for the proposed PhC structure

B. Electric-field Distribution

Fig. 4 represents the e-field distribution in the proposed device for both the wavelengths.

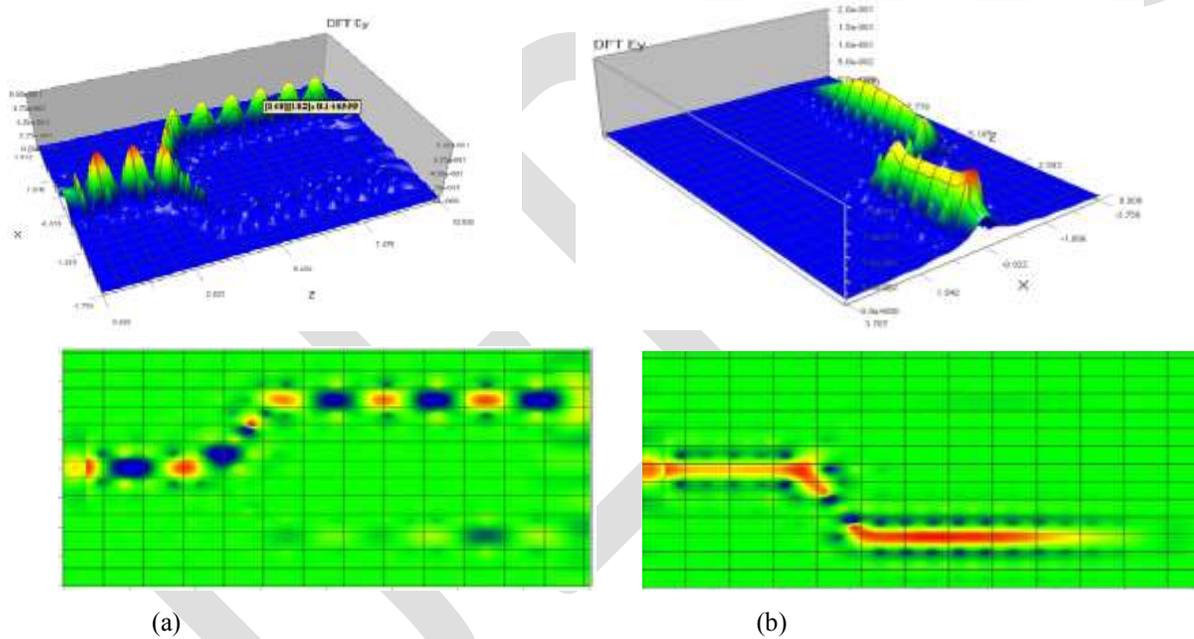
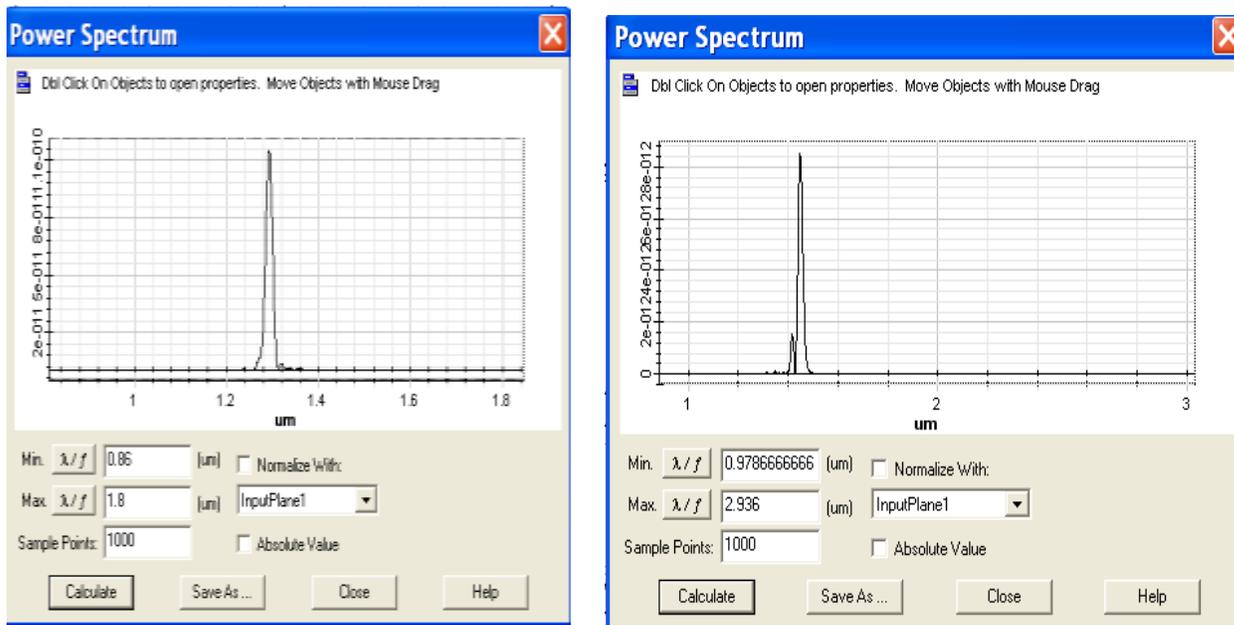


Fig. 4 Simulated electric-field distribution for (a) 1.290 μm , and (b) 1.468 μm

So it is clear from figures 4(a) and 5(b) that, when two signals of wavelengths 1.290 and 1.468 μm will be applied at the input of the device, signal with wavelength 1.290 μm and 1.468 μm are filtered by filter-B and filter-C respectively and follow different path. Thus the Demultiplexing action is realized.

C. Power Spectrum Measurement

Fig. 5(a) and 5(b) illustrate the power spectra for both 1.290 μm and 1.468 μm wavelengths respectively.

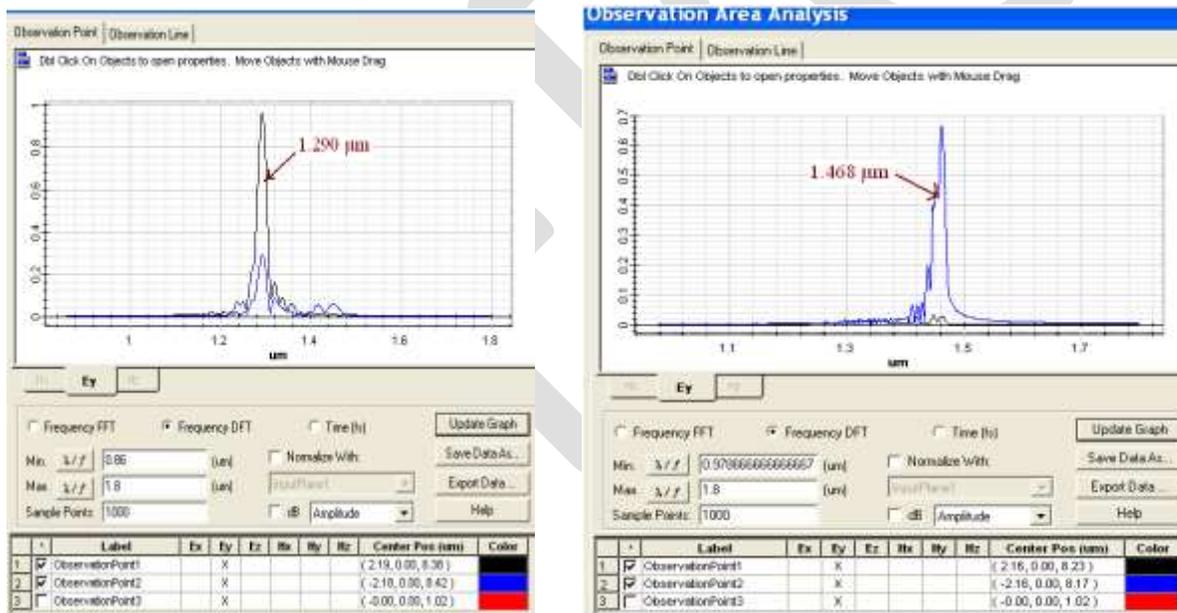


(a) (b)

Fig. 5 Power Spectrum for (a) 1.290 μm, and (b) 1.468 μm.

D. Coupling Measurement

Fig. 6(a) and 6(b) represents the coupling for both 1.290 μm and 1.55 μm wavelengths respectively.



(a) (b)

Fig. 6 Coupling for (a) 1.290 μm, and (b) 1.468 μm

Fig. 6(a) and 6(b) show that 90% transmission is done at 1.290 μm also 1.290 μm is associated with a low cross-talk, whereas 1.468 μm exhibits negligible cross-talk with high transmission with 70% transmission.

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CONCLUSION

In this work, we have proposed a wavelength demultiplexer for splitting 1.290 and 1.468 μm wavelength signals by using the filtering property of the photonic crystal structure with local point defects. The de-multiplexing action is involved with two wavelengths 1.290 μm and it is associated with a low cross-talk, whereas 1.468 μm exhibits negligible cross-talk with high transmission. Also 90% transmission is done at 1.290 μm and 70% transmission at 1.468 μm wavelength. The optimally designed device has the dimension of $10.5 \times 7.5 \mu\text{m}^2$ for $a = 500 \text{ nm}$. So this structure can be used in the future photonic integrated circuits also the mutual interaction between two combined filters will be considered to improve the device performance.

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On-line Image Search Re-ranking based on Interaction

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Abstract- The methods available for image search are based on the text provided in the search. but such kind of image search re-ranking suffer from unreliability because the resulting images contain more irrelevant images. Hence the re-ranking concept arises to re-rank the retrieved images based on the text surrounding the image and metadata and visual feature.

In this paper, we propose an “**On-line image search re-ranking based on Interaction**” Which follows supervised learning. Here the top-ranked images are considered as (noisy) training data & an SVM visual classifier is learned to improve the ranking further. Given the keyword as input to the proposed model the output will contain a set of images which will be more near to user search requirement.

Keywords: reranking ,meta reranker, Prototype Based Reranking, image search, noise ,SVM, supervised learning

I. INTRODUCTION

The search engines search images mostly by using the text associated with the images like title of the images. This is often good to search relevant images but the problem is that precision of search result is less .Methods like Clustering[7], topic modeling[6],[2], Support Vector machine (SVM)[8], graph learning[9],[10] have been investigated for visual reranking All these require prior assumption regarding the relevance of images in initial text based search result . Also Top N search results can also contain irrelevant images which introduce noise. So here we propose solution named as “**On-line image search re-ranking based on Interaction**” a prototype based method to learn reranking function from human labeled samples. Based on images obtained in initial search result, visual prototype will be generated .Each prototype is used to construct a meta reranker to produce a reranking score for any other image from initial set. Finally all scores from all meta rerankers are aggregated. For visual reranking we use SVM algorithm.Support Vector Machine (SVM) adapts widely used SVM classifier to handle a ranking problem . SVM have recently gained prominence in the field of machine learning and pattern classification. Classification is achieved by realizing a linear or non-linear separation surface in the input space.

II. LITERATURE SURVEY

Mario Fritz and Bernt Schiele[2]. presented a novel method for the discovery and detection of visual object categories based on decompositions using topic models. The approach is capable of learning a compact and low dimensional representation for multiple visual categories from multiple view points without labeling of the training instances. The learnt object components range from local structures over line segments to global silhouette-like descriptions. This representation can be used to discover object categories in a totally unsupervised fashion. Furthermore it employ the representation as the basis for building a supervised multi-category detection system making efficient use of training examples and outperforming pure features-based representations.

Winston H. Hsu, Lyndon S. Kennedy, Shih-Fu Chang[3], have their work in video search reranking. Multimedia search over distributed sources often result in recurrent images or videos which are manifested beyond the textual modality. To exploit such contextual patterns and keep the simplicity of the keyword-based search, they proposed novel reranking methods to leverage the recurrent patterns to improve the initial text search results. The approach, context reranking, is formulated as a random walk problem along the context graph, where video stories are nodes and the edges between them are weighted by multimodal contextual similarities.

When evaluated on TRECVID 2005 video benchmark, the proposed approach improve retrieval on the average up to 32% relative to the baseline text search method in terms of story-level Mean Average Precision. In the people-related queries, which usually have recurrent coverage across news sources, we can have up to 40% relative improvement. Most of all, the proposed method does not require any additional input from users (e.g., example images), or complex search models for special queries (e.g., named person search).

Li-Jia Li · Li Fei-Fei [4] proposed automatic online picture collection via incremental model learning. The explosion of the Internet provides us with a tremendous resource of images shared online. It also confront vision researchers the problem of finding effective methods to navigate the vast amount of visual information. Semantic image understanding plays a vital role towards solving this problem. One important task in image understanding is object recognition, in particular, generic object categorization. Critical to this problem are the issues of learning and dataset. Abundant data helps to train a robust recognition system, while a good object classifier can help to collect a large amount of images. This paper presents a novel object recognition algorithm that performs automatic dataset collecting and incremental model learning simultaneously. The goal of this work is to use the tremendous resources of the web to learn robust object category models for detecting and searching for objects in real-world cluttered scenes.

Linjun Yang, Alan Hanjalic[5] proposed supervised reranking for web image search.

Visual search reranking that aims to improve the text-based image search with the help from visual content analysis has rapidly grown into a hot research topic. The interestingness of the topic stems mainly from the fact that the search reranking is an unsupervised process and therefore has the potential to scale better than its main alternative, namely the search based on offline-learned semantic concepts. However, the unsupervised nature of the reranking paradigm also makes it suffer from problems, the main of which can be identified as the difficulty to optimally determine the role of visual modality over different application scenarios.

R. Fergus, L. Fei-Fei, P. Perona, and A. Zisserman [6], have proposed the idea of training using just the objects name by bootstrapping with an image search engine. The training sets are extremely noisy yet, for the most part, the results are competitive (or close to) existing methods requiring hand gathered collections of images.

W. H. Hsu, L. S. Kennedy, and S.-F. Chang[7] have proposed a novel and generic video/image reranking algorithm, IB reranking, which reorders results from text-only searches by discovering the salient visual patterns of relevant and irrelevant shots from the approximate relevance provided by text results. The IB reranking method, based on a rigorous Information Bottleneck (IB) principle, finds the optimal clustering of images that preserves the maximal mutual information between the search relevance and the high-dimensional low-level visual features of the images in the text search results.

R. Yan, A. G. Hauptmann, and R. Jin, [8] present an algorithm for video retrieval that fuses the decisions of multiple retrieval agents in both text and image modalities. While the normalization and combination of evidence is novel, they emphasize the successful use of negative pseudo-relevance feedback to improve image retrieval performance.

Y. Jing and S. Baluja, [9] present the image-ranking problem into the task of identifying “authority” nodes on an inferred visual similarity graph and propose VisualRank to analyze the visual link structures among images. The images found to be “authorities” are chosen as those that answer the image-queries well. To understand the performance of such an approach in a real system, they conducted a series of large-scale experiments based on the task of retrieving images for 2,000 of the most popular products queries. Their experimental results show significant improvement, in terms of user satisfaction and relevancy, in comparison to the most recent Google Image Search results. Maintaining modest computational cost is vital to ensuring that this procedure can be used in practice; they describe the techniques required to make this system practical for large-scale deployment in commercial search engines

X. Tian, L. Yang, J. Wang, Y. Yang, X. Wu, and X.-S. Hua[10] They formulate the image reranking problem in the Bayesian framework, i.e. maximizing the ranking score consistency among visually similar video shots while minimizing the ranking distance, which represents the disagreement between the objective ranking list and the initial text-based. Different from existing point-wise ranking distance measures, which compute the distance in terms of the individual scores, two new methods are proposed by them to measure the ranking distance based on the disagreement in terms of pair-wise orders. Specifically, hinge distance penalizes the pairs with reversed order according to the degree of the reverse, while preference strength distance further considers the preference degree.

By incorporating the pro-posed distances into the optimization objective, two rerank-ing methods are developed which are solved using quadratic programming and matrix computation respectively. Evalu- ation on TRECVID video search benchmark shows that the performance improvement up to 21% on TRECVID 2006 and 61.11% on TRECVID 2007 are achieved relative to text search baseline

III. PROPOSED SYSTEM

FRAMEWORK AND DESIGN

A. Problem Definition :Image Reranking

Firstly, Retrieve a large number of images for a specified object class from browser.Now assuming we have these N images ,retrieved from initial text-based search results (as in fig 1).Then, the reranking process is used to improve the search accuracy by reordering the images based on information extracted from the initial text based search results , the auxiliary knowledge and the example image (prototype). The auxiliary knowledge can be the extracted visual features from each image.

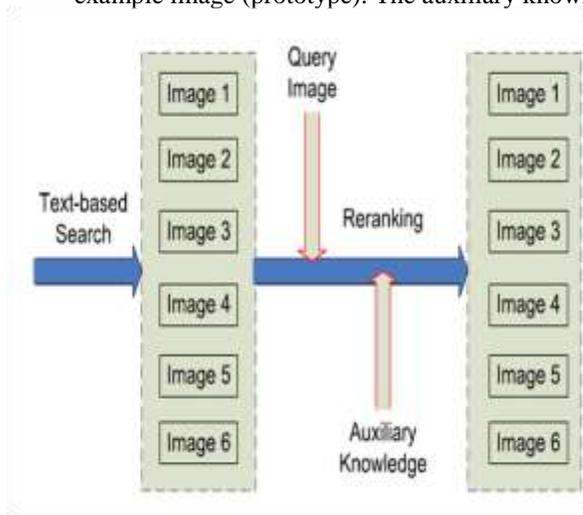


Fig 1 Illustration of reranking problem

In this paper we use a prototype based reranking framework from [1], which constructs meta rerankers corresponding to visual prototypes representing the textual query and learns the weights of a linear reranking model , is used to combine the results of individual meta rerankers and produce the reranking score of a given image taken from initial text based search result.

B. Block Diagram

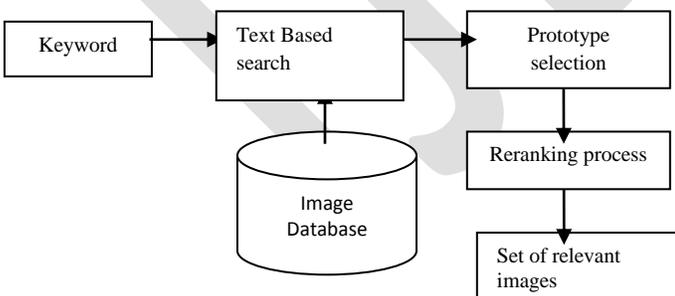


Fig 2 Proposed on-line image reranking system framework

C. Working:

1. Candidate images are obtained by a text based web search querying on object identifier e.g. keyword “cat”.

2. Then noise (irrelevant images) are to be removed and reranked remaining set of images. For ranking surrounding text as well as visual features are used.
3. To the top ranked images, visual classifier is learned and visual prototype is generated, that visually represent a query.
4. Final output is reranked images.

In short the process can be redefines sequentially in following algorithm.

Algorithm:

- 1: start
- 2: User requests an image to Search Engine like Google.
- 3: Search Engine collects images and stores it in the database.
- 4: Then, Filter images by removing symbols and drawings from the collected images.
- 5: Rerank filtered images using metadata such as text, color.
- 6: Rerank images using SVM algorithm.
- 7: Get the SVM reranking result which is more relevant to the image requested by user.
- 8: Render the relevant images to the user.
- 9: Stop

IV. CONCLUSION

Here the proposed a prototype-based reranking framework, which constructs meta rerankers corresponding to visual prototypes representing the textual query and learns the weights of a linear reranking model to combine the results of individual meta rerankers and produce the reranking score of a given image taken from the initial text-based search result. The induced reranking model is learned in a query-independent way requiring only a limited labeling effort and being able to scale up to a broad range of queries. The experimental results on the Web Queries dataset demonstrate that the proposed method outperforms all the existing supervised and unsupervised reranking methods. It improves the performance over the text-based search result by combining prototypes and textual ranking features.

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Adaptable Packet Length for Power Hungry WSN

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Abstract— Wireless Sensor Networks are constrained to a set of resource constraints such as battery power, bandwidth and lifetime. Power is a very serious issue and lot of work is being done in this regard. Reduction of the MAC overhead and adoption of a dynamic packet length with data aggregation leads to power optimization in WSNs. In this paper we implement an algorithm on NS3 wherein clustering of the nodes is formed by K-means clustering algorithm. We then adopt a dynamic packet length technique to minimize the power for transmission of data from nodes to cluster heads by adopting packets with different header lengths, say a smaller MAC for packets from node to cluster head and medium sized MACs for packets from cluster head to base station. The data received from the nodes at the cluster head is aggregated into the cluster node's data. The aggregation scheme consists of doping the node's data into the parity bits of the turbo encoded cluster head's data. The power saving that can be achieved with this scheme is shown using NS3 simulations. [1-3]

Keywords— MAC header, Header Compression, Data Aggregation, BER, Power, NS3, KNN algorithm.

INTRODUCTION

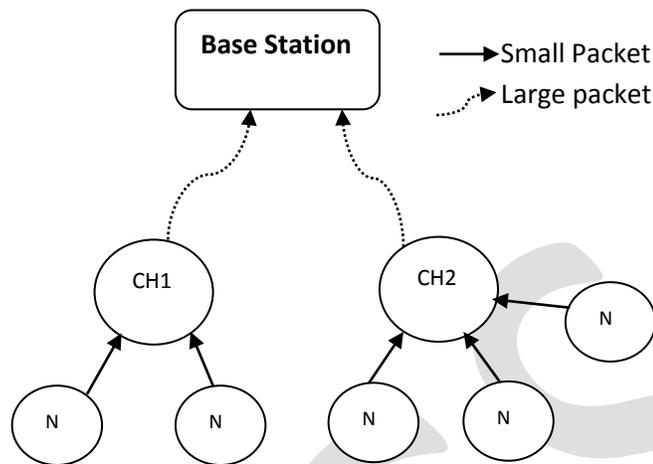
Clustering algorithms like LEACH and its variations have become very predominant in optimizing the battery life time of sensor networks. The power in WSN mote is drained more heavily due to the large MAC overhead, which actually ensures that data is transmitted securely over a wireless channel. The packet overhead (Header or preamble) is large; at times it is much greater than the data to be sent. The nodes in WSN generally have to transmit a small variation in the measured physical parameters (temperature, pressure). [1] So there is lot of research activity going on to reduce the MAC header.[2]

Packet length variation has proved to give better power optimizations for sensor networks. The DPLC, a Dynamic Packet Length Control scheme is more efficient in terms of channel utilization. This algorithm incorporates two types of messaging, small message aggregation and large message fragmentation, to facilitate upper-layer application programming. [3]

In this paper we propose an algorithm wherein we reduce the power by first forming cluster and then aggregation of data at the cluster head. Here we are adopting different packet lengths, smaller packets from individual nodes to cluster head and medium or large packets from cluster head to base station. The cluster head replaces (by aggregation) its encoded parity bits with data of its neighbors in a predefined order and sends the aggregated data to base station. The aggregation technique consumes some amount of energy but here we are concentrating on saving energy required for communication. As the cluster head aggregates data of the nodes in its cluster and sends it to base station we are saving the power of all nodes in cluster by avoiding them to send individual packets to base station owing to the fact that the nodes only send a small change in physical parameter. Also since the aggregation is done in predefined order, decoding at the base station would be much faster.[6]

The rest of the paper is organized as follows: in section III Proposed Algorithm, section IV covers Power Consumption modeling on Network Simulator-3, section V gives Results of simulations using Network Simulator-3. The Section VI describes the conclusion.

Adaptable Packet Length Variation Algorithm



CH1 & CH2 – Cluster Heads.
 N1, N2, N3, N4 & N5 – WSN nodes.

Fig1. Packet Sizes in Clustered WSN

Zigbee [4, 5, 7] the most used protocol in wireless sensor networks, uses the 802.15.4 protocol for the communication layer. In the MAC data frame structure shown in fig 2 & 3 we see that payload is only 122 bytes with 25 bytes of MAC header. MAC bits significantly contribute to the size of the data packet. If the data to be sent by a node is less, then MAC bits overhead will be large.[7]

The source address (or destination address) can be either 2 byte (16bits) or 8 byte (64bits). Two byte address gives 65536 nodes in the network which is also a huge network. In the paper we propose a variable(adaptable) packet size to minimize the power wherein the size of the packet sent from nodes to cluster head station is restricted with an address of only two bytes.

2Bytes	1Byte	4-20Bytes	0-122Bytes	2Bytes
Frame Control	Data Sequence Number	Address Information	Data Payload	Frame Check Sequence

Fig 2 MAC data frame structure

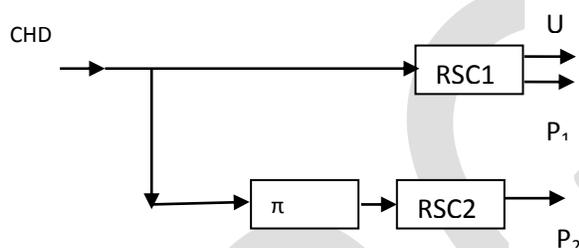
0/2Bytes	0/2/8Bytes	0/2Bytes	0/2/8Bytes
Destination PAN Identifier	Destination Address	Source PAN Identifier	Source Address

Fig 3 Address info field structure

The data encoding technique used in the paper is turbo encoding technique with a code rate of 1/3 as shown in Fig 4. A general Turbo encoder is the parallel concatenation of two or more systematic codes. Here we are using two Recursive Systematic Convolution encoders. As shown in the Fig 4, a data block which is k bits long enters the encoder.

The output of the first encoder block is systematic bit U which is same as the data bit and a parity bit P_1 . The data sequence is then fed in a parallel RSC through an interleaver π . The interleaver scrambles the original data sequence in a pseudo-random fashion and feeds its output into a constituent encoder to produce the second parity P_2 . The information sequence U together with the parity bits P_1 and P_2 are concatenated to form the code word. The pseudo-random interleaver and P_2 parity help to achieve a better BER with increase in overall code rate of the encoder to $1/3$. We replace the P_2 parity bit by the data of the nodes in a cluster which improves the code rate to $1/2$ but reduces the BER which will be compensated by more decoder iterations at the base station. [6,8,9,12]

The cluster head will transmit the data of the nodes in its cluster by using the puncturing technique which is elaborated in fig 4 & 5. The turbo encoder structure is shown in fig 4.



CHD- Cluster Head Data
 RSC1 & 2 Recursive Systematic Convolution encoder
 U- Systematic bit.
 P_1, P_2 – Parity bits.
 Π - Interleaver

Fig 4 Turbo encoder

The turbo encoded data of cluster head has the following structure,

$U_1, U_2, U_3 \dots$ are the Systematic bits,

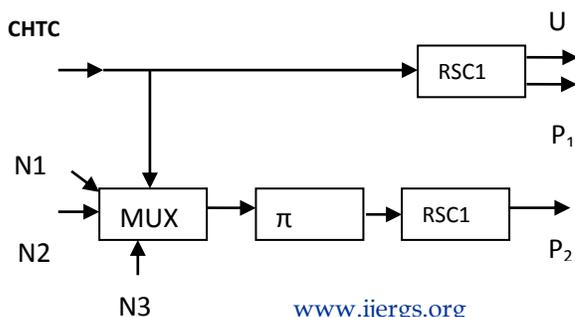
$P_{11}, P_{12} \dots$ are the parity bits of first encoder

$P_{21}, P_{22} \dots$ are the parity bits of second encoder.

The cluster head's encoded output would be

$U_1 P_{11} P_{21} U_2 P_{12} P_{22} U_3 P_{13} P_{23} U_4 P_{14} \dots$

The cluster head will transmit the data of the nodes present in its cluster by using the aggregation technique which is elaborated in fig 5.



CHTC- Cluster Head Turbo Encoded Data
RSC1 & 2 Recursive Systematic Convolution
U- Systematic bit.
 P_1, P_2 – Parity bits.

Π - Interleaver
MUX- Data Aggregator
N1, N2, N3- Nodes data.

Fig 5 Data aggregation model implemented at the CH's transmitter end.

Consider 3 nodes in a particular cluster namely as N1, N2 & N3. Now alternately puncture (replace) the parity bit P_2 with data of neighboring nodes. For three nodes (N1, N2 & N3) the position for the replacement of parity bits of these nodes are fixed ie data of N1 node will be at position 3,12,21... , whereas the data of node N2 will at positions 6,15,24... etc. The final payload of cluster head is as shown below.

$U_1P_{11}N_{11}U_2P_{12}N_{21}U_3P_{13}N_{31}U_4P_{14}N_{12}U_5P_{15}N_{22}...$

Since the positions are fixed the decoding time reduces due to increase in apriori information reducing the power at base station.

Here we are showing that power is saved at two levels

1. Smaller packets with minimum MAC bits are sent from nodes to cluster head. The MAC size is restricted to two bytes, destination address (CH 1Byte) and CRC (1Byte) instead of 25 bytes.
2. Medium sized packets from CH to BS with better data rate (1/2). The MAC header only need to carry the cluster head ID (Identification number) which will be few bits. Since the network is divided into clusters the source address will be few bits so the packet will be medium sized.

KNN Clustering and Adaptive Packet Length Algorithm Simulation in NS3

Clustering techniques have been used in WSN mainly to minimize the power. Here we are implementing K-means algorithm in NS3 to implement cluster and the packets sent from node to cluster heads will be with smaller payload by restricting the address field whereas the packets sent from cluster head to base station will be medium sized packets with data aggregation of all the nodes in its cluster.[10]

a) Set up the WSN in NS3

1. Create a network of N number of nodes.
2. Assign one node as sink (BS) and other nodes as source.
3. Assign the position to the nodes, and IP addresses.
4. Deploy the battery to the nodes and use radio energy model. (CC2500 standard)
5. Randomly select some nodes as cluster heads.
6. Call KNN clustering algorithm.
7. Call an application program that creates the packet (2000 bytes) of user defined data and transmits it.
8. Compute the energy consumed for 10 iterations (1 packet is sent per iteration).
9. Compute the impact on consumed transmission power.

b) KNN CLUSTERING ALGORITHM

KNN (K Nearest Neighbor) algorithm takes the Euclidean distance between neighboring nodes and forms the cluster. [11]

1. Enter n, the number of sensing nodes.
2. Calculate the distances using Euclidean distance formula.

$$d(a, b) = \sqrt{(x_b - x_a)^2 + (y_b - y_a)^2}$$

3. Sort the distance and determine k nearest neighbors based on the k-th minimum distance.
4. Repeat the same procedure for all nodes.

c) Dynamic Length Packet Creation

1. Nodes create the packets with only two bytes of MAC header (Source address and CRC) and broadcast it to the cluster head.
2. CH will not decode but aggregate the data by replacing its turbo encoded parity bits with data of nodes attached to it. Adds only source address (cluster ID) which will be few bits and CRC bits as MAC header.

RESULTS

On simulation of our algorithm on NS3 for a network of 8 nodes we found the following clusters formed according to KNN algorithm.

```
enter the array size:
8 8
enter the euclidian distance matrix:
0 5 8.5 3.3 7.1 7.2 8.1 2.2
0 0 6.1 4.1 5 3.3 3.1 4.2
0 0 0 5 1.1 1.1 7.2 6.4
0 0 0 0 3.3 4.1 7.1 1.1
0 0 0 0 0 1.1 6.7 5
0 0 0 0 0 0 5.9 5.9
0 0 0 0 0 0 0 7.9
0 0 0 0 0 0 0 0

c1 =7 3 0
c2=6 1
c3= 5 4 2
```

Fig 6 Cluster formation using KNN algorithm

We then simulated it in two scenarios firstly direct data transmission from nodes to base station and secondly with our algorithm i.e adaptable data aggregation. We found an average power saving of 92% for the individual nodes. NS3 simulation results showing remaining energy of nodes battery without encoding, with encoding and with Variable MAC size is given by the graph below.

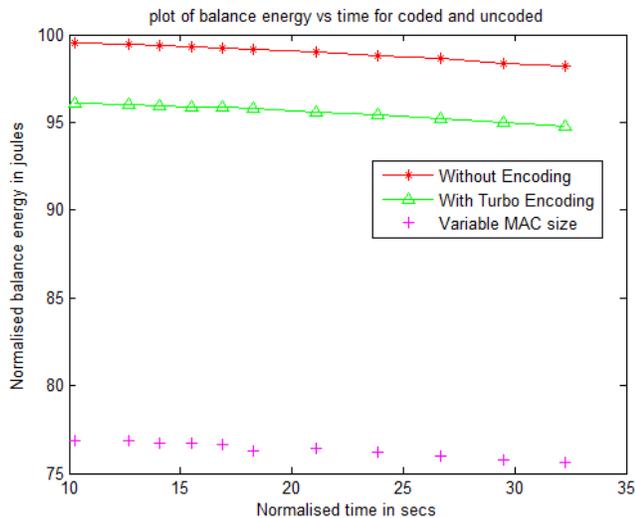


Fig 7 Remaining energy various conditions

As shown in the Fig. 7 there is considerable power saving by reducing the MAC size which in effect increases the life time of the node.

CONCLUSIONS

In this paper we show that by adopting different packet length we can minimize the power required to transmit data from nodes to base station which increases the life time of the node in turn increasing the network life time. We also show that the data aggregation carried out at cluster head has improved the code rate at a slight reduction in BER.

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Wireless Powered Chess: - A Review

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Abstract— When we play an ancient and noble game of Chess, we grapple with ideas about honesty, deceitfulness, bravery, fear, aggression, beauty and creativity which echo the attitude we take up in daily lives. Chess is an activity in which we deploy almost all our available cognitive resources; therefore it makes an ideal laboratory for investigation into the working of human mind.

This study will focus on automatically operated chess board with the help of Bluetooth and Arduino Processor. In this process two chess boards are connected with the help of Bluetooth and by using Arduino processors the interfacing between the two boards is done. The idea to carry on this project is taken up from “Computer Controlled Chinese Chess” in which the program is written in visual basis (VB) language and the commands are given with the help of computer to microcontroller which manages the different RF receiver robots at RF frequency and moves the different major and minor pieces and performs the operation of castling .The Complete operation is done at RF frequency and the moves done on computer is perform on the board as well.

In the proposed wireless powered chess project, since both the chess boards are connected with Arduino Microprocessor, the move performed on manually attended boards is also seen on other board without operating by the player. This study of Wireless powered chess will facilitate playing chess sitting at different location in a limited surrounding.

Keywords — Arduino mux shield, Arduino Uno, Bluetooth, Dc motor, powered Chess, Reed switches, Stepper motor.

INTRODUCTION

Chess is a game which was discovered before 800 years. It has been a favorite game in people of all ages. Though the game is a complex one, it is based on approaching, threatening and capturing pieces until destination is reached. John Artise in **Chess and Education** states: “Visual stimuli tend to improve memory more than any other stimuli; chess is definitely an excellent memory exerciser the effects of which are transferable to other subjects where memory is necessary.” Chess utilizes all abilities of human being. It enhances spatial aptitude, perceptive speed, reasoning, creativity as well as general intelligence of a person. It was claimed that chess playing makes kids smarter and hence in many schools chess is made a compulsory indoor sports. But for playing chess two players need to be in front of each other. What if someday you are alone at home and want to play chess with a friend who is few kilometers away from you. What if there is a competition but a player could not reach at the desired place due to some unavoidable conditions. Wireless powered chess proves to be an excellent solution over these problems. The wireless powered chess is similar to the conventional chess that we play in day-to-day life. It has two players playing with two colored pieces. The way it differs from the conventional chess is that the players need not to be in front of each other for playing. The main elements of the system are Arduino mux shield, DC motors, reed switches and Bluetooth. The range of distant play is about 10-15 km. The key types used to represent chess positions are:

Side - White j Black;

Piece - King j Queen j Rook j Bishop j Knight

Square - N * N

Position - side * (square → (side * piece) option)



Fig.1 Chess board



Fig. 2 Player playing chess

LITERATURE REVIEW

The game of chess with the modern rules came into existence in Italy towards the end of the 15th century. [1] The concept of wireless chess is un-introduced to the world. Many researches have been done on remote chess but the hardware of the concept was not developed yet. A survey paper by Heinz [2] gives an algorithmic construction of end game database and now it exists for every position.

Shi-Jim Yen, Jr-Chang Chen, Tai-Ning Yang, Shun-Chin Hsu in March 2004 proposed a concept of computer Chinese chess.[3] It is very important in the field of artificial intelligence as it is most popular and oldest game. The Chinese chess consists of a board and 32 pieces for two players. The board has eight horizontal and vertical lines in which the squares are arranged up in two alternating colors i.e. Light and Dark. The board is divided into two parts by horizontal central lines. The goal of the game is same as to checkmate the opponent.

Bo-Nian Chen, Bing-Jie Chen and Tsan sheng Hsu in January 2009 proposed an idea of Chinese dark chess [4]. It is different from Chinese chess that it uses only half of the board also called dark chess, blind chess or half chess. Most people playing Chinese chess play Chinese dark chess. A lot more people can play Chinese dark chess while not able to play Chinese chess.

Drawen and Yao proposed an algorithm to solve the problems where the object measure to guide searching process is very difficult [5]. The alpha-beta search algorithm, quiescence algorithm were implemented in Chinese chess [6]. An adaptive genetic algorithm was proposed by Wang [7] for Chinese chess strategies.

Lee and Liu proposed an approach in IEEE international conference in 2006 to develop software framework for rapidly online chess game [8].

PROPOSED CONTENT

Chess is a oldest game started back in 1500 years originated in Northern India in 6th century and got spread worldwide to many countries .In the conventional game of Chess the pieces was abbreviated as King, Adviser ,Elephant, Horse and Foot soldier but now in the modular format the names got changed to King, Queen, Bishop, Knight ,Rook and Pawn. The king and Bishop were weak until the 1500AD and as the rules changes and modern era originates they got power more than other pieces on board.

In Path searching Algorithm of multiple robot system applying in Chinese chess game, the system contains multiple computers, Image system, RF module and thirty two mobile robots. Mobile robots are divided to be in the two sides i.e. black and white. Thus 16 mobile robots are for every opponent. The computer is used as a brain and the computer sends the commands to the robots and accordingly robot move the pieces on board and the present state of each robot is send back to the computer to judge whether the move made by the piece is right or is it at wrong destination. Each robot is having its own Identification code and a unique orientation. The identification code and orientation helps the computer to decide and search the new path for moving the next pieces accordingly to the move performed by user in computer. The player plays its move inside the computer with the help of mouse and accordingly the same move is done on board through the help of computer.

The drawback of this system is that the user need to be computer friendly and user should have the knowledge of computer. Another drawback is that the user should be able to synchronise the board and the computer so that the move played inside should be similar and if the board is synchronized but the moves are different than what is inside the computer then user must be able to troubleshoot the Architecture to enjoy the game without any problem.

In the proposed method of playing chess, the game is played in its true form without using computer. The presented system is having two different boards which is at a suitable distance to play the game, so that the opponent is at his place and enjoying game while being at his bed or watching TV as well.

It is having two wooden 36"× 36" size board which is used to play the game. The architecture contains DC motor, Stepper motor, Reed switches, permanent magnet and X-Y axis setup shown in figure 3.

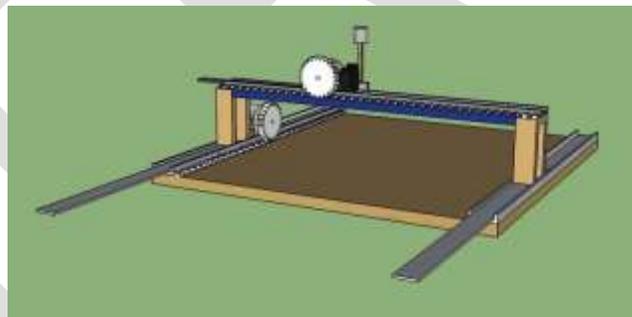


Fig. 3 X-Y Axis Set Up

The X-Y axis set up is used to move the motors to the all 64 blocks and helps the magnet to pick and drag the pieces to the proper position with respect to the move made on next board. The pick and drag is done by the magnet which is attached to the stepper motor and the stepper motor is mounted on the X-Y axis. The movement to the Y and X direction is done by the DC motor which is used to reach the particular position. In between the Permanent magnet and the pieces the reed switches are connected for each block to decide where the connection is terminated and a new connection is established. The Reed switch shown in figure 4 are the magnetic coupling switch in which is the magnet is placed the connection is active and after removal of the magnet the switch turns in its original position. If the particular piece is picked from user on board then the connection is terminated and when the user puts the piece into the new position then the connection is established. All the reed switches are connected to the Arduino Mux shield having 64 input and output ports corresponding to the each block on chess board.



Fig:- 4 Reed Switch



Fig:- 5 Arduino mux Shield

The Arduino board is acting in master and slave configuration. Arduino mux shield and Uno board is shown in figure 5. If the on board shield is sending the information then it is acting in master mode and the shield receiving information is acting in slave mode. The shield is basically used to send or to receive the move played by the user. The boards are connected via wireless link such as Bluetooth or RF module and depending upon the range of technique the distance between the two boards is decided for proper working condition.

The method is effective in terms of enjoying game at distance where the move made on board 1 is reflected on board 2 and the move made on board 2 is reflected on board 1.

ACKNOWLEDGMENT

I would like to express my sincere gratitude to Prof. R. D .Sushir for the necessary support and guidance during various stages of work. I would also like to thank our management for the support because of which we are able to complete our research paper.

CONCLUSION

Proposed system is a very new and introductory project and has wide scope for development. Though if used it can prove to be the most efficient system for playing chess. The proposed method is used for range of few kilo meters. It uses Arduino processor and dc motor as main component. Research is going on for the betterment of device.

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PALM PRINT RECOGNITION AND AUTHENTICATION USING DIGITAL IMAGE PROCESSING TECHNIQUE

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Abstract— In ubiquitous network society, where individuals can easily access their information anytime and anywhere, people are also faced with the risk that others can easily access the same information anytime and anywhere. Now- a-days, passwords, personal identification numbers, etc are used as a means for security. But normally the PIN can be guessed and hence stolen. Passwords can also be hacked by software programs. Sometimes passwords containing special characters, capital letters etc are demanded which are bit complex to remember. Hence authentication using personal identification came to exist which is called Biometric. Biometric is something that we have and something we are. This paper presents biometric technique called palm print authentication which is more secure as compared to other techniques such as finger print, iris detection, face detection, voice detection, etc. As an important member of the biometric characteristics, palm print has merits such as robustness, user-friendliness, high accuracy and cost-effectiveness. Palm print has larger area as compared to finger print, it does not have hairs on it and palm print pattern is unique to every individual. The entire project goes with three basic steps like Pre-processing, feature extraction and feature matching.

Keywords — Binarisation, Biometrics, False acceptance rate (FAR), false rejection rate (FRR), Feature matching, median filtering, structure of human palm.

INTRODUCTION

Biometrics is nothing but identification of person on the basis of his/her physical behaviour or characteristics. As the features of every person are different from each other, it is very difficult to steal it. Hence the chances of forgery are eliminated and the integrity of data is maintained. Biometric authentication gives access to the right person at right time thereby avoiding unauthorized activities. In general, there are three approaches to authentication. They are given in order of least secure and least convenient to most secure and most convenient:

- Something we have - card, token, key.
- Something we know - PIN, password.
- Something we are - a biometric.

These approaches are used for the authentication. The first two approaches are least secure as the token, keys can be stolen and passwords and PIN can be forgotten. The biometric approach has thus proved to be the most efficient one.

The process mainly deals with two steps – authentication and verification. The authentication server contains database of user i.e. passwords, PIN or biometric image. At the verification stage, the input is taken from the user. The system then compares the taken input with the one stored in database and if the match is found then access is given otherwise denied. This is one to one matching process.

Among all the techniques that are available for authentication, palm print has proved to be the most secure and accurate with the FAR of 0.000008% and FRR of 0.0000001%. Hence they can be used in various applications. Use of palm print possesses properties like universality, uniqueness, stability, permanence and strong immunity to the forgery. Any biometric technique is worked on five parts - cost, user acceptance and environment constraints, accuracy, computation speed and security.

Structure of human palm –

Human palm normally consists of three flexion creases, secondary creases and ridges. The flexion creases are called principal creases and secondary creases are called wrinkles. The flexion and major secondary creases are formed in the fifth month of pregnancy and superficial lines are formed after our birth. Even identical twins have different palm patterns and hence these complex patterns are used for identification purpose. Even this palm pattern has been used by fortune tellers from a very long time. High resolution image of palm print is used for forensic applications such as criminal detection and low resolution image is used for civil and commercial application. Ridges and singular points are used extracted from high resolution images (400 dpi) and principle lines, wrinkles and textures are generally extracted from low resolution images (150 dpi).

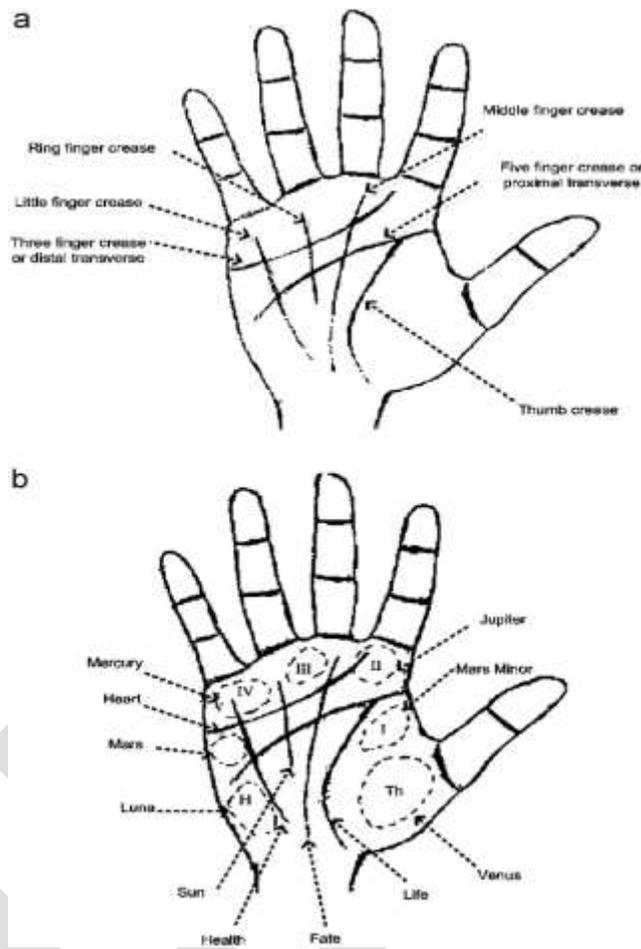


Fig. 1 Basic structure of human palm

LITERATURE REVIEW

In a paper presented by Tee Connie, Andrew Teoh Beng Jin, Michael Goh Kah Ong, David Ngo Chek Ling in March 2004 titled “An Automated Palm Print Recognition System” [5], proposed a technique of verification using palm structure and divided it into three parts pre-processing, feature extraction and registration. They have used several linear subspace projection techniques like principle component analysis (PCA), fisher discriminate analysis (FDA) and independent discriminate analysis. The experiment gave FAR and FRR of 1.356% and 1.492%.

In a paper presented by Zhenhua Guo, David Zhang, Lei Zhang and Wangmeng Zuo titled as “Palm print verification using binary orientation co-occurrence vector”[2], a superior feature extraction method, designated as binary orientation co-occurrence vector (BOCV), to represent multiple orientations for a local region was proposed. They found that using single dominant verification may lose some important information as the palm consists of many cross lines. The BOCV can better describe the local orientation features and it is more robust to image rotation. The method proposed for palm pattern extraction was 2-D Gabor filtering. This method worked well for palm vein feature extraction as the cross section of palm vein was Gaussian in nature.

Jiaa, Huang and Zhang [3] have proposed palm print verification based on robust line orientation code. Modified finite Radon transform was used for feature extraction, which was used to derive orientation feature. For matching of test image with a training image the line matching technique was used based on pixel-to-area algorithm.

X. Wu, K. Wang and D. Zhang [4] proposed a novel algorithm for the automatic classification of low-resolution palm prints. Principle lines were defined and characterized by their position and thickness. A set of directional line detectors was used for extraction of principal lines of the palm. Using these detectors, the potential line initials of the principle lines are extracted and then using these extracted potential line initials, the principal lines were extracted with the help of recursive process. Using this information about the extracted part, the region of interest (ROI) was selected and then a suitable line detector was chosen to extract the next part of the principle line in this ROI. After extracting the principle lines, some rules are presented for palm print classification. The proposed algorithm classified these palm prints with 96.03% accuracy.

Later in a paper presented by Feng Yue, Wangmeng Zuo, David Zhang, Kuanquan Wang titled as "Orientation selection using modified FCM for competitive code-based palm print recognition" [1], fuzzy C-means cluster algorithm to determine the orientation of each Gabor filter was proposed. The statistical distribution was made on set of real palm print images, the method was found to be suitable. The computational accuracy and complexity was considered and competitive code with six orientations was selected.

PROPOSED CONTENT

Now-a-days, biometric is playing a vital role in authentication and palm print has proved the most secure as for every individual, the palm pattern is different. Again palm has no hairs and it is less susceptible to color change as compared to other body parts. Recent research on palm print authentication has proved that orientation of palm lines is one of the most promising features for personal identification.

Figure 2 shows block diagram of proposed system. First block contains an automated approach to extract the region of interest using completely contactless technology. Second block shows feature extraction and it is followed by feature matching i.e. the captured image is compared with the image in database using various matching algorithms.

Pre-processing

Accurate personal identification using palm print patterns will require accurate segmentation of ROI (region of interest) images. In case if the guiding pegs are not provided, then the process of authentication becomes difficult and hence rotation invariant processing technique is designed. Pre-processing is the first step of image processing technique. It is done to extract the required portion of palm from the entire hand image. It is a five step process

Binarization

Boundary tracing

Key point detection

Establishing the co-ordinates

To extract ROI

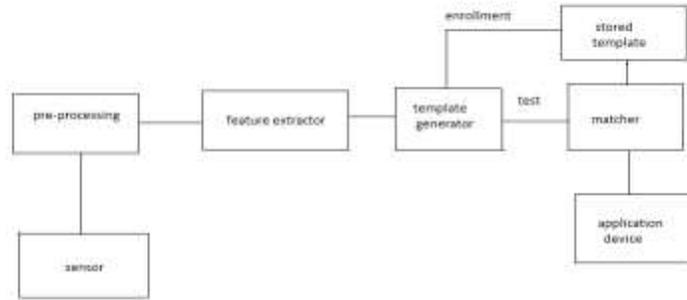


Fig 2. Block diagram of proposed system

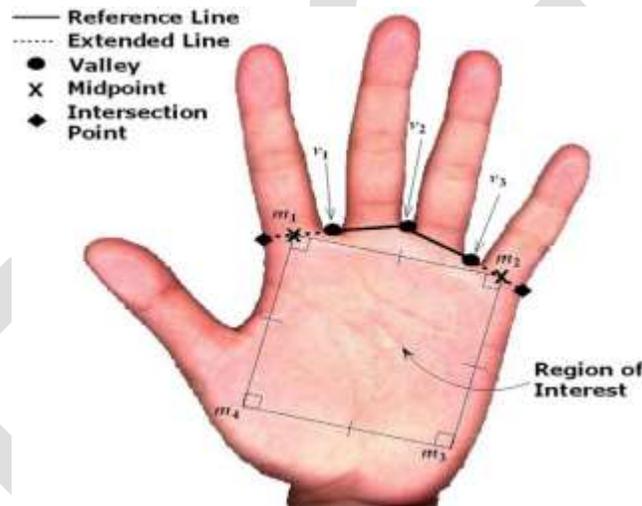


Fig. 3 Extraction of ROI

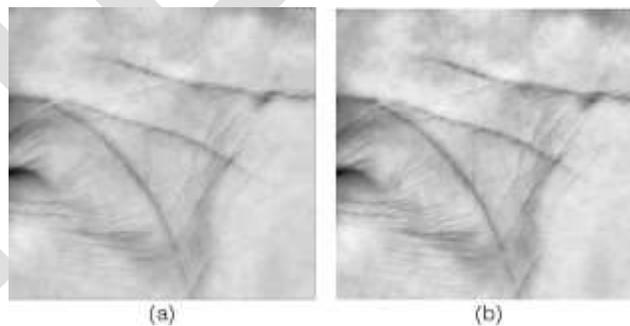


Fig. 4 (a) image before normalization (b) image after normalization

Feature Extraction and Matching -

After the input image is captured, pre-processing is done to extract region of interest. Noise is removed in pre-processing using median filter. The value of intensity is adjusted so that 1% of the data is saturated i.e. amount of white color present in entire image is enhanced to increase the brightness of the image at low and high intensities. Then thresholding is done by means of analyzing the histogram of an image, but the spreaded histogram of an image from 0 to 255(Gray Scale value) will make the analysis difficult and

results in poor thresholding. To overcome this, proposed method clustered the images into two categories i.e., having only two gray scale values. Finally thresholding is applied to each clustered image which results with a good threshold value.

LBP algorithm was used for face reorganization as a texture descriptor. Each pixel in the input image is labeled by thresholding 3x3 neighborhoods with the centre value and representing the fixed binary value. Its improved version has also been proposed and has versatility in image matching. The reason why LBP is receiving attention in biometrics is because it does not need any optimization. One of the disadvantages of LBP is that it cannot handle large deformation of images.

Gabor filtering is widely used for pattern matching in finger print and palm print authentication. However the Gabor filter proves inefficient for deformed images patterns as these methods assume that the images are completely aligned. Again unlike LBP, the Gabor filters need optimization depending on biometric threads.

We are using multi scale local binary pattern (MSLBP) in which the radius of LBP is varied. Considering H_1, H_2, \dots, H_n as vectors, the MSLBP histograms can be calculated by summing all the vectors over an interval 0 to n. The match between the captured image and stored image is obtained using Euclidian distance or Hamming distance.

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CONCLUSION

Palm print authentication proves to be very efficient, accurate and cost friendly technology for security purpose. The main application of palm print is in the field of security, forensic science and defense, etc. various algorithms have been discovered for feature extraction and matching. Proposed idea gives much accurate results as compared to other techniques.

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Designing Security Method for Cloud Environment Using Attribute Based Signature

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Abstract- In the world of technical life cloud computing has become integral part and also understanding the way of business is changing and is likely to continue changing into the future. Using cloud storage services means that you and others can access and share files across a range of devices and position. Files such as photos and videos can sometimes be unmanageable to email if they are too big or you have allot of data. You can upload your data to a cloud storage provider means you can speedily circulate your data with the help of cloud service and you can share your data files with anyone you choose. Since cloud computing shares distributed resources via network in the open environment thus it makes less secured. Data security has become a major issue in data sharing on cloud. The main motto behind our system is that it secures the data and generates the key for each transaction so every user can secure our shared data by the third party i.e. unethical hacker.

Keywords: Attribute Based Signature, Cloud Computing

INTRODUCTION

We determine Attribute Based Signature is a different primitive that clients are able to sign messages with any subset of their characteristics impact from a property focus. In ABS, an underwriter, who have a set of qualities from the power, can sign a message with a predicate that is fulfilled by his attributes [1] specifically, the mark cover the ascribes used to fulfill the predicate and any distinguishing data about the endorser (that could connect different marks as being from the comparative underwriter). Moreover, clients can't conspire to pool their characteristics together. [2] The principle disadvantages with OABS is that the three substances incorporate in OABS system, namely, the quality power, clients (incorporate underwriters and verifiers), and S-CSP. Normally, the endorsers hold their private keys from trait power, with which they are able to sign messages a while later for any predicate fulfilled by the had attributes, verifiers will be persuaded of the way that whether a mark is from one of the clients whose qualities fulfill the marking predicate, however remaining totally insensible of the personality of the endorser.

Propelled by the late improvements in secure outsourced trait based signature, in this paper, we introduce new information imparting securing on cloud utilizing quality based mark. Whatever is left of this paper is sorted out as takes after. We audit the related work in Section II. We depict the proposed approach in Section III. Furthermore we finish up this paper in Section IV

PROPOSED SYSTEM

In this paper we are proposing a system to provide security using same input, multiple output methodology and attribute based encryption. We will use cloud SaaS to generate key and send to multiple users. It provides data sharing services between multiple clients.

LITERATURE SURVEY

Jin Li¹, XiaoFeng Chen², Jingwei Li³, Chunfu Jia³, Duncan S. Wong⁴, WillySusilo [1] Author propose and formalize another picture called OABS, in which the computational overhead at client side is extraordinarily diminished through outsourcing such serious calculation to an untrusted marking cloud administration supplier (S-CSP). Besides, we apply this novel ideal model to existing ABS to lessen unpredictability and present two plans, i) in the first OABS plan, the quantity of exponentiations including in marking is diminished from $O(d)$ to $O(1)$ (about three), where d is the upper bound of limit worth characterized in the predicate; ii) our second plan is based on Herranz et al's development with consistent size marks.

Zhiwei Wang, Ruiruixie and Shaohuiwangappl. Math. [2] Author propose another thought called Attribute-Based Server-Aided Verification Signature. It is same as to typical ABS plan, however it further empowers the verifier to affirm the signature with the help of an outside server. In this paper, we find that there is a flaw in Wu et al's. security model against arrangement assault, and outline a cement server-helped confirmation convention for Li et al's. trait based mark. We likewise demonstrate that our convention is guarantee with arbitrary prophets.

R. Brindha, R. Rajagopal [3] author proposed attribute based encryption (ABE) is an open key based one-to-many encryption that permits clients to scramble and unscramble information focused around client traits. A guaranteeing application of ABE is adaptable access control of encoded information put away in the cloud, utilizing access policies and attributed traits connected with private keys and Cipher writings. One of the fundamental effectiveness downsides of the current ABE plans is that unscrambling includes costly blending operations and the quantity of such operations develops with the intricacy of the right to gain entrance approach. In ABE framework, a client gives an untrusted server, say a cloud administration supplier, with a change key that permits the cloud to interpret any ABE ciphertext fulfilled by that client's characteristics or access strategy into a basic figure content, and it just acquires a little computational overhead for the client to recoup the plaintext from the changed ciphertext. On the other hand, it doesn't promise the accuracy of the change done by the cloud. In the current framework, another necessity of ABE with outsourced unscrambling: irrefutability. Casually, certainty ensures that a client can proficiently check if the change is carried out effectively. In the proposed Categorical Heuristics on Attribute-based Encryption (CHAE) is an adjustment of Attribute Based Encryption (ABE) for the reasons of giving assurances towards the provenance of the marked information, and also towards the namelessness of the underwriter. At long last, demonstrate a usage of our plan and consequence of execution estimations, which shows a huge diminishment on registering assets forced on clients.

Shraddha U. Rasal, Bharat Tidke [4] author proposed Conventional framework in cryptography permits simply imparting of keys between the sender and beneficiary, for such a method just the mark stockpiling is accommodated the client's open key. Anyhow as the quantity of clients builds, it's turned into a testing occupation to have such a declaration stockpiling and also key conveyance, to defeat this Identity Based Encryption (IBE) was proposed, yet again it had made the tedious environment as it was supporting just to coordinated correspondence. After IBE Attribute Based encryption (ABE) made probability to give multicast correspondence between clients however it was constrained to just key approach based encryption and additionally couldn't give the repudiation sensation to keys. So this paper means to create a current framework utilizing MAMM (Multiple Authority Multiple Mediator) with the utilization of disseminated CP-ABE (Cipher Policy ABE) which upgrades the disavowal and enhances the execution.

Sun Changxia Ma Wenping [5] Author propose another characteristic based limit mark plan without a trusted focal power. At the point when the number of client's properties achieves the limit he can sign truly. Moreover, the focal power can be questioned. We demonstrate that the plan is existentially unforgeable under specific properties and versatile picked message assault and is guarantee against connivance assault.

S. Usha, Dr. A. Tamilarasi, K. Mahalakshmi [6] author proposed endeavor to give an upgraded information stockpiling security show in Cloud Computing and making a trust environment in distributed computing. There are a ton of convincing explanations behind organizations to send cloud-based capacity. For another business, start-up expenses are essentially decreased on the grounds that there is no compelling reason to contribute capital in advance for an inward IT framework to backing the business. By a wide margin, the most obvious inquiry customers considering a move to distributed storage ask is whether their information will be secure. Putting away information offsite doesn't change information security necessities; they are the same as those confronting information put away on location. Security ought to be focused around business necessities for particular applications and information sets, regardless of where the information is put away. We accept that information stockpiling security in Cloud Computing, a zone brimming with difficulties and of central significance, is still in its outset now, and numerous exploration issues are yet to be recognized. In this paper, we researched the issue of information security in cloud information stockpiling, to guarantee the rightness of customers' information in cloud information stockpiling. We proposed a Hierarchical Attribute-Based Secure Outsourcing for malleable Access in Cloud registering which likewise guarantees information stockpiling security and survivability consequently giving trust environment to the customers. To battle against unapproved data spillage, delicate information must be scrambled before outsourcing to give end-to-end information secrecy affirmation in the cloud and past. We have lessened the calculation time because of key size by executing ECDSA calculation for Cryptographical operations. Additionally we utilize push mail calculation for key trade in the middle of holder and customer. It upgrades the security in the proposed model adequately.

ZeynepAkataa,b, FlorentPerronnina, Zaid Harchaoui and CordeliaSchmidb [8]author proposed attributes are a halfway representation, which enables parameter offering between classes, an absolute necessity when preparing information is rare. We propose to view trait based picture classification as an issue inserting issue: each one class is implanted in the space of property vectors. We present a capacity which measures the similarity between a picture and a mark installing. The parameters of this capacity are adapted on a preparation set of named samples to guarantee that, given a picture, the right classes rank higher than the wrong ones. Comes about on the Animals With Attributes and Caltech-UCSD-Birds datasets demonstrate that the proposed structure beats the standard Direct Attribute Prediction benchmark in a zero-shot learning situation. The name inserting system offers different focal points, for example, the capacity to power option wellsprings of information notwithstanding properties (e.g. class chains of command) or to move easily from zero-shot figuring out how to learning with substantial amounts of information.

Ming Li, Shucheng Yu, Yao Zheng, Kui Ren, and Wenjing Lou [9]Author propose a novel patient-driven skeleton and a suite of systems for information access control to PHRs put away in semi-trusted servers. To accomplish fine-grained and versatile information access control for PHRs, they influence property based encryption (ABE) systems to scramble each quiet's PHR document. Unique in relation to past works in secure information outsourcing, they concentrate on the different information holder

situation, and part up the clients in the PHR framework into different security spaces that enormously lessens the key administration multifaceted nature for managers and clients. A high level of patient security is ensured at the same time by abusing multi-power ABE.

Amit Sahai, UCLA Hakan Seyalioglu [11] author Inspired by the inquiry of access control in distributed storage, we consider the issue utilizing Attribute-Based Encryption (ABE) in a setting where clients' certifications may change and figure writings may be put away by an outsider. Author find that an extensive answer for our issue should all the while take into consideration the denial of ABE private keys and also consider the capacity to upgrade cipher texts to reflect the latest upgrades. Our principle result is acquired via blending two commitments.

Tatsuaki Okamoto and Katsuyuki Takashima [12] Author exhibit the first decentralized multi-power quality based mark (DMA-ABS) plan, in which no focal power and no trusted setup are needed. The proposed DMA-ABS plan for general (non-monotone) predicates is completely secure (versatile predicate unforgeable and flawless private) under a standard presumption, the decisional straight (DLIN) supposition, in the irregular prophet model.

Javier Herranz, Fabien Laguillaumie, Benoit Libert, and Carla Rafols [13] Author propose the initial two characteristic based mark plans with invariant size marks. Their security is demonstrated in the particular predicate and versatile message setting, in the standard model, under picked message assaults, regarding some algorithmic suppositions identified with bilinear gatherings. The portrayed plans are for the instance of limit predicates, however they can be protracted to incorporate some other (more expressive) sorts of monotone predicates.

Dan. Tianzuo Wang, Xiaofeng Wang, Jinshu Su [14] author proposed attribute based marks (ABS) is another cryptographic primitive and can assume an incredible part in attribute based access control frameworks. In ABS, an endorser can pick its qualities fulfilling an arrangement of a verifier to create a substantial signature without uncover its character or traits, while the mark guarantees that the message is embraced by an individual owning characteristics the approach needing. Nonetheless, most existing works of ABS need irregular prophets, which is strange and brings about the reliance of security on hash capacities. In this paper, we allude to the experienced systems utilized as a part of character based encryption (IBE) to propose an ABS plan without arbitrary prophets. Our plan help any expressive strategy comprising of AND, OR, limit doors, which offers extraordinary adaptability to the usage of access control.

A Zia, Zhenfu Cao and Xiaolei Dong [15] Author Outlining a completely secure (versatile predicate unforgeable and consummately private) trait based mark (ABS), which permits an endorser to pick a set of traits rather of a solitary string speaking to the underwriter's personality, under standard cryptographic suspicion in the standard model is a testing issue. Existing plans are either excessively entangled or just demonstrated in the non-exclusive gathering model. In this paper, we display an effective completely secure ABS conspire in the standard model focused around q -parallel BDHE suspicion which is more pragmatic than the bland gathering model utilized as a part of the past plan. To the best of our insight, our plan is the most proficient one among all the past ABS conspires in the standard model. Additionally, our proposed plan is exceedingly expressive since it permits any endorser to tag case predicates regarding any predicate comprises of AND, OR, and Threshold entryways over the traits in the framework. ABS has discovered numerous essential applications in secure correspondences, for example, unknown validation framework and property based informing framework.

Hemanta K. Maji Manoj Prabhakaran Mike Rosulek [16] Author give a general structure for developing ABS plans, and after that demonstrate a few down to earth instantiations focused around gatherings with bilinear blending execution, under standard suspicions. Further, we give a development which is secure even against a malignant property power; however the security for this plan is demonstrated in the bland gathering model. We depict a few pragmatic issues that persuaded this work, and how ABS can be utilized to settle them. Additionally, we demonstrate how our systems permit us to extend Groth-Sahai NIZK evidences to be recreation extractable and character based with down overheard.

Alex Escala, Javier Herranz, and Paz Morillo [19] Author proposed an attribute based signature regarding a marking arrangement, picked impromptu by the underwriter, persuades the verifier that the endorser holds a subset of characteristics fulfilling that marking approach. In a perfect world, the verifier must acquire no other data about the personality of the endorser or the properties he holds. This primitive has numerous applications in true situations obliging both confirmation and namelessness/security fitting ties. We propose in this paper the first property based mark plan fulfilling in the meantime the accompanying properties: (1) it concedes general marking strategies, (2) it is demonstrated secure against completely versatile foes, in the standard model, and (3) the quantity of components in a mark depends just on the measure of the marking arrangement. Besides, our plan en- delights the extra property of revocability: an outside judge can break the secrecy of a mark, when important. This property may be exceptionally fascinating in genuine applications where powers are unwilling to permit full secrecy.

Dalia Khader University of Bath [20] Author proposed an Attribute Based Group Signature (ABGS) permits a verifier to demand a signature from a part of a gathering who has notable qualities. Hence, a mark ought to validate an individual in a gathering and

demonstrate responsibility for properties. The significant distinction between our plan and past gathering marks, is that the verifier can focus the part of the genuine endorser inside the gathering. In this paper we define the first ABGS plan, and security thoughts, for example, secrecy and traceability. We then build the plan and demonstrate it.

S Sharmila Deva Selvi, Subhashini Venugopalan, C. PanduRangan [21] author proposed Enlivened by advancements in characteristic based encryption and marks, there has as of late been a spurt of advancement toward limit property based marks (t-ABS). In this work we propose a novel methodology to develop edge quality based marks motivated by ring marks. Edge trait based marks, defined by a (t, n^*) limit predicate, guarantee that the underwriter holds at least out of a specified set of n^* credits to pass the verification. An alternate approach to take a gander at this would be that, the underwriter has at least 1 out of the blend of quality sets. In this manner, another methodology to t-ABS would be to let the endorser pick some n_0 sets of t traits each, from the $n^* t$ conceivable sets, and demonstrate that (s)he has at least one of the n_0 sets in his/her ownership. In this work, we give a flexible edge ABS conspire that understands this methodology.

PROPOSED METHOLOGY

I. Existing system

1) The proposed OABS plan with outsourced check diminishes the processing trouble at endorser side through conveying calculation to cloud however just lifting two exponentiations provincially. Since the outsourcing check system is the same as, the security can be additionally ensured focused around the suspicion that the third vendor does not connive with the cloud.

Disadvantages:-

- 1) Our strategy gives a practical approach to understand the "piecewise key era.
- 2) To take into consideration high proficiency and adaptability.

II. Proposed System

In our data shared security system of cloud server have four modules shown in Fig.1. This modules provide the security using same type of input and different type of output methodology and attribute based encryption. The cloud server uses the SaaS service to provide the different keys for each transaction. This will help user to secure the file as for each transaction the cloud generates a separate key for same attribute which in turn increases the security of the system.

User Authentication

Basically whenever a user wants to use the system he/she is required to register onto the system if not registered. After registration the email is verified by sending the temporary password on mail itself. Ones the user has id and password he can login into the system and use system services

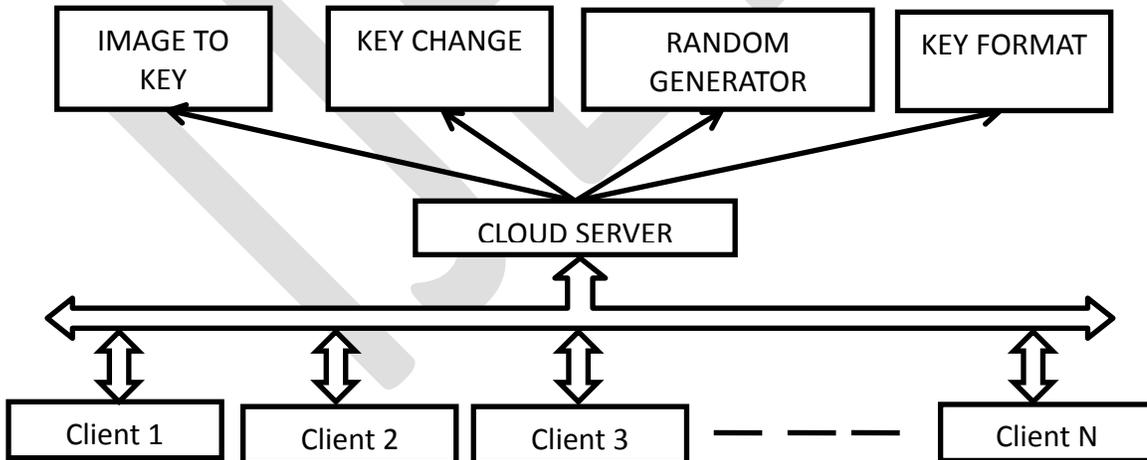


Fig.1: Proposed system architecture

The System have following four modules are as follows:

IMAGE TO KEY

Whenever a user wants to share data with another user the first user need to upload a key using which the server will generate a key. Basically it will work for image to key generator.

KEY CHANGE

Every time a user wants to share data with another user the key will be changed because even if the user uses the same image the server won't generate the same key.

RANDOM GENERATOR

Now the question arises how the server generates multiple different keys for the same image. The server uses a random key generator to access the image and add randomness to the key generation process.

KEY FORMAT

The key on server side will be generated using Key Generator class which will take image as an argument and will return the key of AES algorithm in object of Secret key.

CONCLUSION

The Proposed system provides security in cloud environment with the help of Attribute Based Signature (ABS) in the system the user signature (image uploaded by user) it outsourced to the cloud and key is generated by the same. The system proposed consist of the key generation logic for cloud server which helps random key generation security for ABS. The proposed system provides data security using random key generation in each transaction. The form of data that will be encrypted for sharing will be text and image

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A case study on Pizza Hut Pakistan

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Abstract- Undoubtedly, we are living in the age of information and knowledge era. The global competition has been increased. It becomes very difficult for any organization to survive in intensive competition environment. The main motive of this study to determine the linkage between consumer satisfaction, perception of service quality and the environmental factor which foster the relationship. For that purpose, we emerge the two models named north American School and Nordic school model and develop a combine model named dynamic process model. According to this model, customer perception is nonlinear function. And customer main focus on perception rather than expected outcome or result. We develop proposition, and proposition measure through five service quality dimensions. Furthermore we develop three propositions, in which two shows significant result while second proposition has not found any impact. Five service quality dimensions also used to measure the relationship of customer satisfaction and perceived service quality. At the end, it concluded that Tangibility and Responsiveness have high to moderate response (both from customer and employee perspective). While remaining dimension shows partial and negative result

Key Words: Customer Satisfaction, Perceived Service Quality, Service Quality, Service Quality dimensions

Introduction

Various researcher defined service quality. From (Bahia et al., 2000) service quality is making the general conclusion (feelings, thoughts) about an organizations pre- eminence quality service. The general conclusion made by customer at every step, as customer has turn out to be more aware about quality and demand more for it, so customer always prepared to inquire about which type of service he received in near future. The conceptualization of service quality has been in the form of what a consumer gives value and meet it (Parasuraman et al, 1988; Winsted, 2000). While fundamental dimensions, service quality capacity have accessible and have significant discussion, various quality writers have the opinion that quality service has connection between consumers preceding opportunities of service and their expectations about service familiarity. Adding together (Kasper et al, 1999; Palmer, 2001) express that quality service can be defined as to evaluate and determine how soundly a service is delivered and it equivalent to consumers need. (Kotler, 2003) express that an organizations quality service is experienced at each and every step. Consumers always make comparison between what they expect and what they actually receive quality service. But when perception of quality service less than they expect, then consumer disappointed. When it fulfill their needs, most of the time they utilize service another time. (Parasuraman et al, 1994) again define quality service as the divergence of what consumer perceive and expect. However (Gronross, 2001) stated that; perceive consumer quality service has two sides or extent: a technical or outcome side and functional or process- related side as well. The feature of quality in these days become more significant subject of research in quality service firms, the involvement of major factor (quality product or service) of firms contributing in quality service alive in business or difficult to stay in business world (East, 1993). Another view about service quality according to (Palmer, 2001) it's "fulfill the needs and expectations" means should declare their terms and condition related service quality. A universal approach related to business side presented brief description to quality service 'total uniqueness of any product and service that can convince direct or indirect requirement of customer (Lockwood, 1994). By providing the initial delivery quality service is very crucial strategy through which they take competitive advantage in

overall market. Therefore association between consumer satisfaction, quality service and buying activities has been very significant area for exploration (Sivas & Baker- Prewitt, 2000; Pettijohn et al., 1997). Earlier researches about consumer expectations, service quality insight the food industry has exposed few crucial traits like costless junk items value (junk items flavor, diet goods), characteristics of currency, image, service and brand name (Tam & Yung, 2003; John & Howard, 1998). There are five quality service construct; which briefly explained (Parasuraman, Zeithaml, & Berry, 1998) so the research will be conducted on all of these in the environment of Pakistan. Stability between consumer as profit making sense and consumer in loss bearing sense can obtain from services process that can further facilitate food service to improve more and make it perfect in quality wise. On the other hand, providing customer better service, lots of obstacles exist. That's reality that high competition in close at hand food industry has badly affected food industry, no matter there is gap exist that from customer adverse criticism from consumer about their services available and received expectation mainly to fulfilling the needs of customer during the process stays in the food court be a sign of a gap exist. This will be a case study and it will examine that how Pizza Hutt is following the Service Quality dimensions to maintain its Quality and control in the process of repositioning itself and expanding its product line.

Lots of studies have been carried out to investigate the amount of strength of SERVQUAL dimensions on consumer contentment like Dinesery produced by (Stevens et al., 1995). Yet, the difference exists between population sample size, cultural norms, background, earnings and feelings or emotions are very important to estimate these dimensions. As a result, the purpose of this study to perform a connection the gap in the literature by investigating the quality service effect on a customer of Pakistani food court industry. Very few researches have been conducted to identify and examine the service quality of Pakistani food industry especially Pizza Hut (Swanson & Davis, 2003; Heung et al., 2000). This will be a case study and it will examine that how Pizza Hutt is following the Service Quality dimensions to maintain its Quality and control in the process of repositioning itself and expanding its product line. The primary reason behind this study is to examine the connection between service quality and factor of satisfaction and rate of patronage in Pizza Hut in a developing country or third world country like Pakistan. It will be worth attending interest to understand which factors highly influence the service quality perception, satisfaction of customer. The remaining structure of the paper is based on literature review with proposition, briefly explain the research methodology. Next would be key findings, conclusion and at the end some limitations, future implications would be discussed.

Literature Review

From the era of 1990 work on product quality is enduring (Dale & Plunkett, 1990). Somehow, quality service has been broadly researched since 1980s. From the available literature, how it is defined and in quality service practice different approaches have been accept. (Brogowicz et al., 1990) different approaches could be divided in two different ways. The North American and Nordic schools signify these extensive approaches and conceptualizations. The Nordic school plays a very vital role (Gronroos, 1982; 1983; 1984; Lehtinen, 1985; Gummesson & Gronroos, 1987 and Ghobadian et al., 1994). On the other hand, the North American School has also played a key role (Parasuraman et al., 1985; 1988; 1990; Garvin, 1987; and Haywood- Farmer, 1988). (Brogowicz et al., 1990) both school represents the current way of thinking within quality service ground. In 1988, Gronroos express that actually quality is verity of resources (Smith, 1993). He explains that quality is used as independent variable, not as a function of resources and not as quality efficient .No doubt both variables are very much related to each other (Gronroos finalized that for consumer perception functional dimension is very crucial. (Gronroos, 1983) categorized quality service in to two variables: technical quality and non technical quality. He also draws the light that quality service experienced by consumer causes his /her potential consumption in future. So our first proposition is:

P1: The quality service perception would be the result of appraisal process approved by customer. Quality service is the measurement of quality service meets the needs of customer desires.

The quality service conceptualization depends upon fulfilling the customer expectations. (Ghobadian et al., 1994) express that customer is involve in delivery process and service process and service outcome both influenced from perception of quality.

P2: This will conclude that previous desires can influenced the acquit and quality perception is well prepared.

(Swan & Comb, 1976) found two constructs for a product or service desire performance. Expressive performance and Instrumental performance. Instrumental performance express the tangible distinctiveness of a product (Gronroos, 1983) while Expressive performance express the psychological distinctiveness of a product and very much a like functional construct. More like (Gronroos, 1983; Swan & Comb, 1976) express that for customer satisfaction, instrumental performance is somehow necessary but it's not sufficient. Swan and Comb further also make a review that a satisfied customer will make comment on functional attributes and against the technical attributes. (Gronroos, 1987) explained the vitalness of trained and skillful workers for service and manufacturing firms. The manufacturers also exist in the same economy world have to learnt the rule of services.

He advanced five rules for service quality. Like the writers from the Nordic School, the writers of North American School made their contributions from academic and marketing research perspective. Among the contemporary and prolific writers are the contributions from (Parasuraman et al., 1985; 1988; 1990). As part of the developments in service quality, they undertook their exploratory research during the decades of the 1980s and 1990s. These researchers developed a multi-construct to measure the degree of quality service perception.

The SERVQUAL reviewed and number of researchers makes critically analysis of it (Cronin & Taylor, 1992; 1994; Bolton & Drew, 1991; Carman, 1990). Most of the research issues under consideration of researchers are perception and expectations of quality. Very few researchers have a view that customer perception is very important component and easily measureable (Cronin & Taylor 1992; 1994; Teas, 1994). (Parasuraman et al., 1994) has taken part in debate of SERVQUAL is beneficial for further modification. The overall criticism related to SERVQUAL is that quality is a performance related dimension that is more precisely measure through perceptions of customer instead of expectations (Carman 1990; Asubonteng et al., 1996; Brady & Cronin, 2001). Haywood-Farmer (1988) have the same point of view that customer finalize quality by comparison of their perceptions not to expectations

P3: Finally, he propose that both perception and expectation experiential state of mind instead of reality.

Making a comparison with perceived service quality model from the Nordic School (Gronroos 1993; Ghobadian, 1994) and the GAP Analysis model from the North American, School (Boulding et al., 1993; Parasuraman et al., 1988; 1985) advance what they call the Dynamic Process model. They conceptualize service quality as performance based and take perceptions and not expectations as the foundation for their dynamic model. However, Boulding et al base their model on the perceptions element of (Parasuraman et al., 1988) five constructs of SERVQUAL items. After a long discussion on it two researchers names (Brady & Cronin, 2001) summarized all the discussion that quality service is different concept. The focal point of the discussion is two different aspects of the Nordic and American schools. They find the assumption that Nordic schools conceptualization about service quality in categorized form and American school express quality service in expressive forms. One of a qualitative study, break the statement and using the theory of Oliver's and Rust 1994, expressed quality perception is depend on consumer theory assessment of different variables of service

measure (1)The employer- customer dealings (Gronroos's quality function), (2) the environmental factor of service (Parasuraman et al's tangibles dimension), and (3) the consequence (Gronroos's outcome (Gronroos's systematical values).

(Brady and Cronin, 2001) found in their research that customers perform quality service perception by evaluating it on three dimensions of interactions, environment and outcomes,

Rust and Oliver's (1994) provide empirical evidence for dimensionalized of these three constructs of quality service. Service quality and their facets very much control the customer satisfaction (Finn, 2012). So, it's very important to identify those constructs which impact and measure the service quality factors. Evan in his study stated five dimensions for service quality. So these factors are; "Responsiveness" is the readiness of employees, all the time available for customer help. (Lee et al., 2011) Findings also reveal the fact those three basic dimensions having multiple sub constructs, which have the combination of consumer perception related to quality service. Findings also indicate that responsiveness, reliability and empathy from the American school (Parasuraman et al., 1985; 1988) are crucial modifier of sub constructs of quality service because it's different from direct determinants of quality service, other than this is necessary for consumer perception of extra ordinary quality service (Schembri & Sandberg, 2002) sum up quality service based on three models:

1. Perceived service quality (Gronroos, 1993; Ghobadian, 1994)
2. Gap analysis (Parasuraman et al., 1985; Zeithaml, Parasuraman & Berry, 1990)
3. Performance-based dynamic process model (Boulding et al., 1993)

Schembri and Sandberg both condemn due to limitations of approaches they used, by analysis as third party viewer. They concluded this quality service is evaluated and determined the way through researchers conceptualized about consumer perception not about how consumer in real experience and conceptualize as first independent party viewer. Both researchers found these models are non dynamic, linear, stagnant and useless to extend further understandings, so fulfill above gap they extend this quality service model by using interpretive approach to customer experience. Then they propose phenomenography as a methodology for researching and finding out about the experiences of consumers. They used interviews in their methodology as well as observations and written accounts, this approach permit them to conduct the research that how customer conceptualize quality service and disparity among them how it appears between them. This assignment turns up the broad range of variation in quality conceptions as primary guide to actions in the customer (Sandberg, 2000).

(Yoo & Park, 2007) identified in his research that internal customers play a primary role in service process, serious component in advancing the perceived quality service. In addition (Edvardsson, 2005) have declared that quality service perceptions are mostly produced during production phase, consumption and delivery process. (Vargo & Luch, 2004) disagree this point of view and confessed that service is a kind of competitive advantage and value creation that is displayed in service processes at the time of customer needs. Consequently, to fulfill customer needs and desires, provision of service is an essential task for managers in food industry while having a challenge to satisfy customers so that they become the potential customer for their food court.

In the same way (O'Neill & Palmer, 2003) have described that quality service related customer perceptions may huge amount be influenced on the basis of their previous experience with a service or product. Another study conducted by (Markovi & Raspor, 2010)

and they expressed that “reliability” has included as most significant predictor of perceived quality service. In food industry, his construct resolve the customers problems, error- free customer service provider, provide on time service, suitable opening hours of food court.

(Parasuraman et al., 1985 and Zeithaml et al., 1990) distinguished that important element for the survival in any type of business is the deliverance of service quality to customers. The service quality is used to find the customer loyalty and customer satisfaction on service quality scale (Ravichandran et al., 2010; Rahaman, Abdullah & Rahman, 2011) .

An appropriate delivery and services procedure to convene customer’s desires and requirements have now a day’s become significant objective for service organizations. Service procedure expresses the techniques and sequence in which service operating systems work and how they make connection between outcome and service experience by customers and valued them (Lovelock et al., 2005). (Oakland, 2005; and Kandampully et al., 2001) conducted the research and found that quality service would only be realized when organization gave power to their internal customer. Because internal satisfied customer bring more customer for the organization (Lovelock et al.,2005). The first construct is Tangibility (which include tangible assets like people, equipment) reliability (individual ability to perform a task effectively) next is responsiveness which means (it’s the responsibility of organization to listen internal and external customers problem) the next dimension is assurance (assure customer strong relation of trust), empathy (gave individual attention to every customer).

History of Pizza Hut:

The world first time familiar to the word “Restaurant” in 16th century and food which available was highly flavored soup. The late 18th century, the food courts were available for those people who like to eat outside. In 1765 boullion-seller named Boulanger, “fit for the gods” that was the first modern restaurant. To follow this stance by Pontaille and Roze in 1766 opened a maison de santé food restaurant. So the first Parisian restaurant was found by Beauvilliers in 1782 named Grand Taerne de Londres. The first time introduced the concept of food available on menu and served to tables. Furthermore, in Paris who had no family they formed customers in the form of businessmen and journalists. With the passage of time, the food industry become more and more modernized/updated and established institution. In Wichita USA 1958, two brothers named Frank and Dan had opened a worlds first restaurant in 600 dollars. After got success in America, they shifted towards UK in 1973. In London they started their business in a small hut, but now they have 700 restaurants only in UK. The C.E.O of the company declared that we entered the market in late 1973, but we have still market leader in UK. Now, there are hundreds and thousands of food chain in all over the world (internet source).

Research Methodology

Case study is a thick description of an individual or organization. A case study can be on an individual. (Yin, 1981 a, 1981 b) defined case study in two actions. First the case study is a

- quantitative examination of study that tried to be find current approach from the perspective of reality, particularly
- There is no any limitation exist between current approach and perspective.

Additionally, we used the case study method because it’s very near to our current approach of study. Therefore this distinguishes of case study help us to understand different research strategies. The main motive of current approach is to learn about five dimensions of

quality service and its implementation in Pizza Hut in Pakistan. The major understanding of this case study will be to learn about service quality system and its dimensions that how Pizza Hut implementing the service quality dimensions with ISO Certification what are the check and balances about service quality in the organization itself and what is the view customer about it?

Data Analysis

There are different data collection methods that can be used as interviews, survey, focus group, field study and ethnography. Our data collection method will be interviews, and interviews will be conducted from eight respondents. Four will be taken from organizational managers and remaining will conduct from the customers of Pizza Hut. I conducted interviews from customer via mail. On the other hand, my group fellow conducted interview of four employees from F10 markaz through face to face interview. So that knows about, which service quality dimension is implemented in their organization and what is their view about Pizza Hut.

ISO 10000- ISO 14999:

ISO 10001: 2007

This ISO standard deals with customer satisfaction both individual lays outside organization and internal customer. This standard also provides rules and regulation to any food industry.

ISO 10001: 2014

This ISO 10002:2014 providing the standard to measure customer complaints, taking feedback on regular basis. There should be 360 degree feedback process within pizza hut.

Another standard ISO 10003:2007 which provide standard to meet and resolve challenges outside the organization (pizza hut).

ISO 10005: 2005 to continuous improve and satisfied customer by providing safe and healthy food.

Customer Perspective

In the response to reliability dimension of service quality, customer's shows partial result about pizza hut. (Gronroos's technical quality) according to Gronroos's most of the time customer give importance to perceived service quality. Is the strong relationship of trust and care between management and customer of pizza hut? Overall it shows partial result In the same way (O'Neill & Palmer, 2003) have described that quality service related customer perceptions may huge amount be influenced on the basis of their previous experience with a service or product. (Oakland, 2005; and Kandampully et al., 2001) conducted the research and found that quality service can only be achieved if organizations give power to their employees to strengthen quality service constructs. About Tangibility, All opinion from customer side remains same and negative side of scale. For empathy, where one is neutral and other one is strongly disagree side. All customers related to assurance have strongly disagreed. Employees of PIZZA HUTT have knowledge to answer customers' questions. Only one customer is strongly agreed while remaining shows the partial results. Fast and efficient service is provided to customers: one is agreed while remaining is neutral behavior. Findings also reveal the fact those three basic dimensions having multiple sub constructs, which have the combination of consumer perception related to quality service. Findings also indicate that responsiveness, reliability and empathy from the American school (Parasuraman et al., 1985; 1988) are crucial

modifier of sub constructs of quality service because it's different from direct determinants of quality service, other than this is necessary for consumer perception of extra ordinary quality service (Schembri & Sandberg, 2002) sum up quality service based on three models:

1. Perceived service quality (Gronroos, 1993; Ghobadian, 1994)
2. Gap analysis (Parasuraman et al., 1985; Zeithaml, Parasuraman & Berry, 1990)
3. By combining above two different schools of thoughts (models), we found a new model called dynamic process model. By using this model we measure the indirect relation of all service dimensions. Which are difficult to measure directly (Zeithaml, Parasuraman & Berry, 1990)

It is also clear that customer come up to the mutual view that service quality dimensions of responsiveness and tangibility are interlinked and shows partial and negative outcomes. Summing it up it can be concluded form the results that overall Service Quality of Pizza Hutt falls in between a moderate to low (customer perspective) service style as it confirms to the service quality requirements as mentioned in literature.

Employees Perspective

In the response to Reliability dimension of Service Quality, an overall positive response was given by the managers/employees proving that Pizza Hutt. The service quality is used to find the employee loyalty and internal customer satisfaction on service quality scale (Ravichandran et al., 2010; Rahaman, Abdullah & Rahman, 2011) . The employees of Pizza Hutt are of the opinion that they fill in up to the standards of Tangibility. For Tangibility, (Swan & Comb, 1976) found two constructs for perceived performance of a product or a service: Expressive performance and Instrumental performance. Instrumental performance express the tangible distinctiveness of a product (Gronroos, 1983) while Expressive performance express the psychological distinctiveness of a product and very much a like functional construct. More like (Gronroos, 1983; Swan & Comb, 1976) express that for internal customer satisfaction, instrumental performance is somehow necessary but it's not sufficient Results show that employees in Pizza Hutt are of the view that they are sternly internal customer focused. (Swan & Comb, 1976) found two constructs for perceived performance of a product or a service: Expressive performance and Instrumental performance. Instrumental performance express the tangible distinctiveness of a product (Gronroos, 1983) while Expressive performance express the psychological distinctiveness of a product and very much a like functional construct. More like (Gronroos, 1983; Swan & Comb, 1976) express that for customer satisfaction, instrumental performance is somehow necessary but it's not sufficient. From employer of Pizza Hut assurance (assures courtesy to customer and built a relationship of trust); the last construct is empathy (customization or individual attention to every customer). It is also clear that employees come up to the mutual view that service quality dimensions of responsiveness and tangibility are fully met as they are rapid to customer's queries providing fast and efficient deliveries. Summing it up it can be concluded form the results that overall Service Quality of Pizza Hutt falls in between a high service style as it confirms to the service quality requirements as mentioned in literature.

Findings

Topic	Findings	Basic conclusion
Reliability	Findings reveal that instrument 2 and 3 not directly related to reliability. These should be lies in tangibility.	Customers intermingle the construct of reliability and Tangibility, while employees are satisfied and highly rated
Tangibility	All tangible facets very much represent the tangibility of service quality.	Customers intermingle the construct of reliability and Tangibility, while employees are satisfied and highly rated
Assurance	In this section we check the proposition 1, which depict that quality service assure by customer	It shows partial result.
Empathy	The third proposition also proved by farmer (1988): both perception and expectation experiential state of mind instead of reality.	Empathy shows partial result
Responsiveness	The second proposition, have not any approval from the literature.	Majority of customers and employees agreed

Conclusion

One of a qualitative study, break the statement and using the theory of Oliver's and Rust 1994, expressed quality perception is depend on consumer theory assessment of different variables of service measure (1)The employer- customer dealings (Gronroos's quality function), (2) the environmental factor of service (Parasuraman et al's tangibles dimension), and (3) the consequence (Gronroos's outcome (Gronroos's systematical values). By combining above two different schools of thoughts (models), we found a new model called dynamic process model. During comparison with perceived service quality model from the Nordic School (Gronroos 1993; Ghobadian, 1994) and the GAP Analysis model from the North American, School (Parasuraman et al., 1985; 1988; Boulding et al., 1993), we contribute the new model named Dynamic Process model. Dynamic process model is the combination of both American schools. The main purpose of this model is to measure the uncertain nature of customer perception. To sum up Schembri and Sandberg, customer's primary focus on what they perceive instead of expectation. The first dimension is Tangibility. The maximum view of customers about this constructs show partial result, while employees give it high to moderate (Gronroos's technical quality) according to Gronroos's most of the time customer give importance to perceived service quality. Is the strong relationship of trust and care between management and customer of pizza hut? Overall it shows partial result. (Oakland, 2005; and Kandampully et al., 2001) conducted). (Oakland, 2005; and Kandampully et al., 2001) conducted the research and found that quality service would only be realized when organization gave power to their internal customer. Because internal satisfied customer bring more customer for the organization (Lovelock et al.,2005). The first construct is Tangibility (which include tangible assets like people, equipment) reliability

(individual ability to perform a task effectively) next is responsiveness which means (it's the responsibility of organization to listen internal and external customers problem) the next dimension is assurance (assure customer strong relation of trust), empathy (gave individual attention to every customer). Only one customer satisfied out of 4 customers (Oakland., 2005). Most of the customer intermingle the dimensions named Responsiveness and Empathy. Finally it is concluded two dimensions of service quality (both customer and employee perspective) named: Tangibility and Responsiveness, demonstrated high to moderate outcome while remaining depict partial and negative result.

Limitations and Recommendation

The first and foremost limitation of our study is time constraint. Because it is conducted only one semester duration. Second factor which create an obstacle is taking only five dimensions of service quality. And third limitation factor, it is only conducted in food industry. For further research, the study should be conducted longitudinal. New researcher should choose some other factors other than customer satisfaction and quality service. And research should be implemented on other fields or sectors like banks, telecommunication etc. Because this case study only present the information of pizza hut. To collect more valid data, it's necessary to implement other sectors as well. The new researchers should take other manufacturing quality dimensions instead of service quality

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The RFID Based Smart Shopping Cart

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Abstract—Ever since the debut of wireless technology, electronic commerce has developed to such an extent to provide convenience, comfort and efficiency in day-to-day life. In this paper, we discuss a ground-breaking concept of RFID based smart shopping cart in the field of retail merchandise. Our whole shopping experience is often marred by the long checkout lines. Soon we can end this problem by replacing the ubiquitous Universal Product Code (UPC) bar code by smart labels, known as radio frequency identification (RFID) tag. The key idea here is to provide assistance in everyday shopping in terms of reduction in time spent, eliminating the daily hassle of locating the right product and standing in long lines. The primary goal is to provide a technology oriented, reduced cost, time saving, hassle free, commercially oriented system for an enhanced shopping experience.

Keywords— RFID (radio frequency identification), ZigBee, universal product code(UPC)

. introduction:

With the growing economy, urbanization, industrial growth in recent years, there has been a significant change in the global market. With the grocery sector playing an important part in the worldwide economy, it has become one of the most convenient and diverse business across the globe. The emergence of RFID makes the traditional retail process faster, transparent and efficient. With the proposed system, soon, when the UPC codes would be replaced by RFID tags these tags would communicate with an electronic reader (through an infrared sensor) that will detect every item in the cart and this reader would be connected to a large network that will send information of the products to the retailer and product manufacturers (through ZigBee). The bank will be notified and the amount of the bill would be deducted from one's account. No lines. No waiting. This smart shopping cart secures mobility of consumers and accelerates their purchasing thereby enhancing their shopping experience along with making the inventory control easier for the store management.

A comparison between the existing system and our proposed system is as shown below:

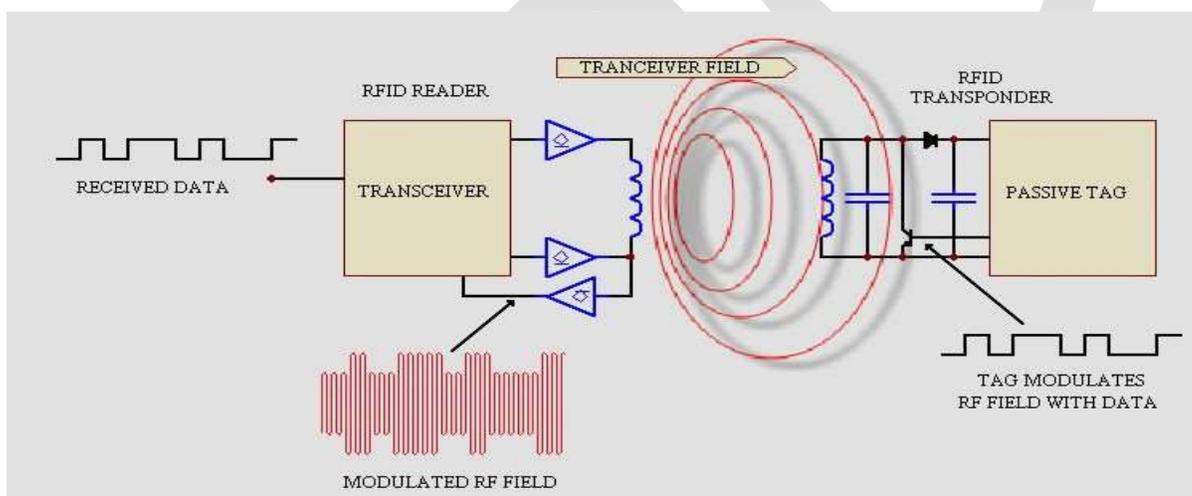
EXISTING SYSTEM	PROPOSED SYSTEM
Person is required to read barcode on product. Barcode must be visible on the surface of product. Line of sight required to a read barcode. The readability of barcodes can be impaired by dirt, moisture, abrasion, or packaging contours Short reading distance. Barcode does not have READ & WRITE capability	Automatic reading of RFID tag from product. RFID can be placed inside the product No line of sight required to read RFID. RFID tags are not affected by such conditions. Long reading distance. RFID tag having READ & WRITE capability.

SYSTEM ARCHITECTURE:

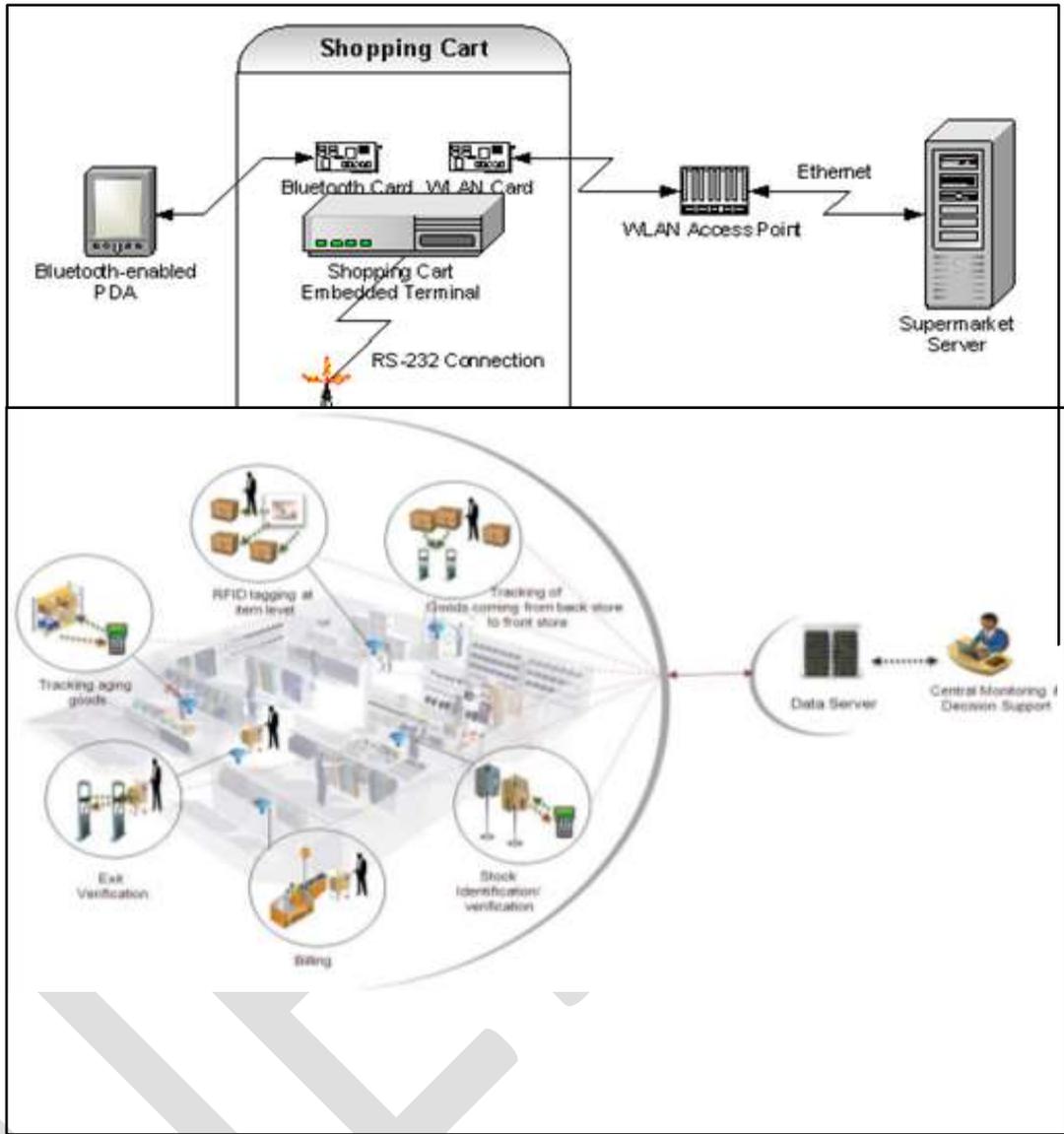
The architectural implementation of the system and the main end of the system is to allow the consumer a new enhanced way of shopping. The normal shopping experience till date, after the invent of various supermarkets is: 1] enter the store 2] take a trolley and push it around the entire store in search of the products needed 3] load them into the trolley 4] stand in queue 5] pay the bill 6] exit from store. From the proposed model, the usage of RFID comprehends benefits such as consequent reduction in product cost, reduced human intervention and labour cost, availability of accessing the real time information about the diverse products inside the shopping cart. The necessary requirements for the proposed system are:

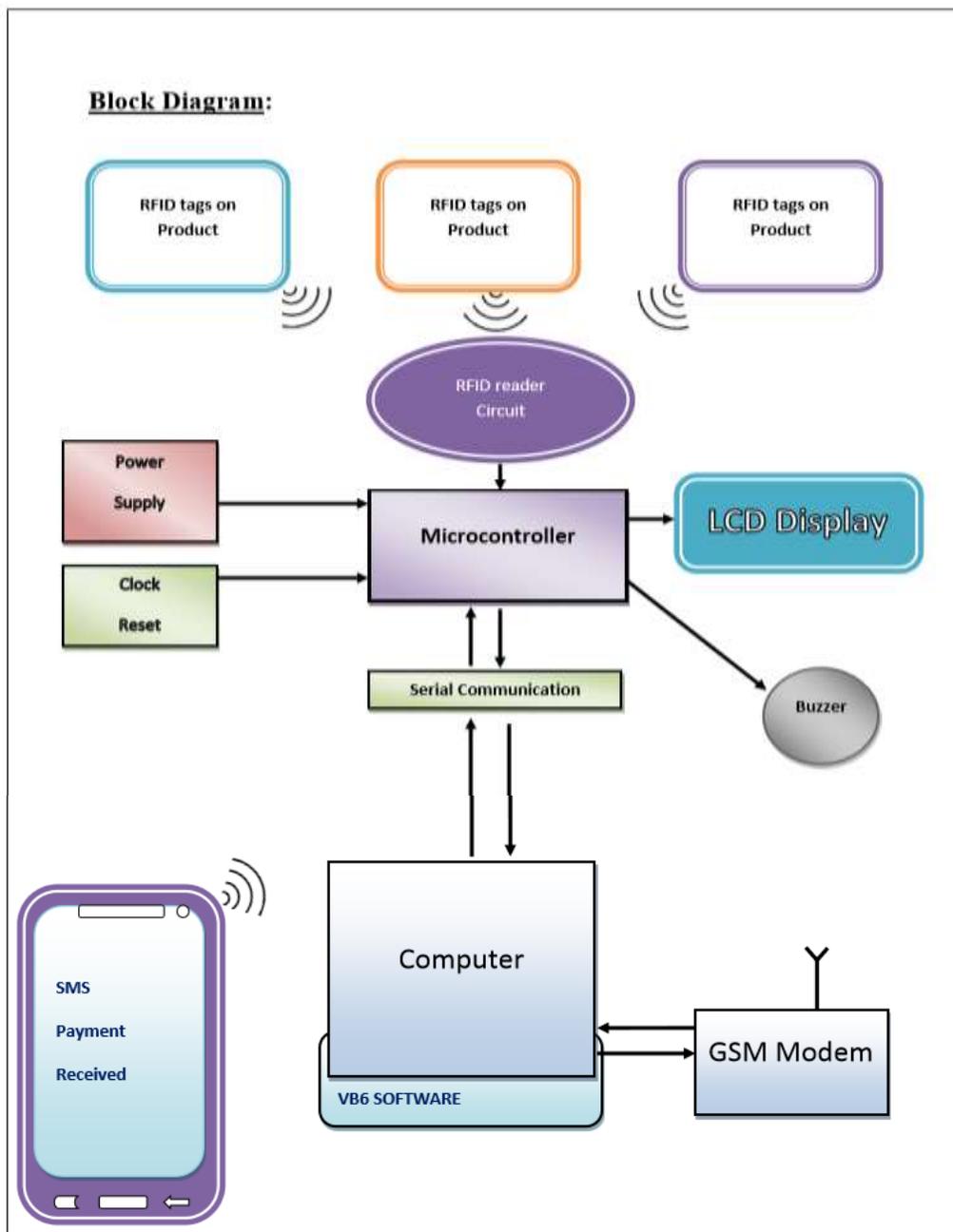
FREQUENCY	MODE	RANGE	TRANSFER RANGE	PENETRATING CAPABILITY
125-135 kHz	Passive	Short range (up to 0.5m)	low	Liquid
13.56 MHz	Passive	Medium range (up to 1.5m)	Moderate	Liquid
860-930 MHz	Passive	Medium range (up to 5m)	Moderate to high	Liquid and metal
433 MHz	Active	Ultra long range (up to 100m)	High	Liquid and metal
2.45 GHz	Active	Long range (up to 10m)	Very high	Liquid and metal

WORKING OF RFID TECHNOLOGY:



Every RFID system the transponder Tags contain information
 Information can be as little as a single binary bit, or large array of bits like an identity code, personal medical information, or literally any type of information that can be stored in digital binary format
 Reader generates RF carrier sine waves
 Once tag receives sufficient energy, Tags output transistor shunts the coil corresponding to the data being clocked out of memory array
 Reader performed digital data encoding.





WORKING OF SMART SHOPPING CART:

When a customer with the cart enters a shopping aisle, the cart is brought in range of the IR Receiver and the microcontroller checks for the aisle information code. The aisle information code is transmitted over the ZigBee wireless from the cart to the server. Based on the aisle number received the database is queried and relevant information is retrieved and transmitted to the cart via the ZigBee module. The received information is stored in the EEPROM present on the cart. This serves as a temporary database until the customer

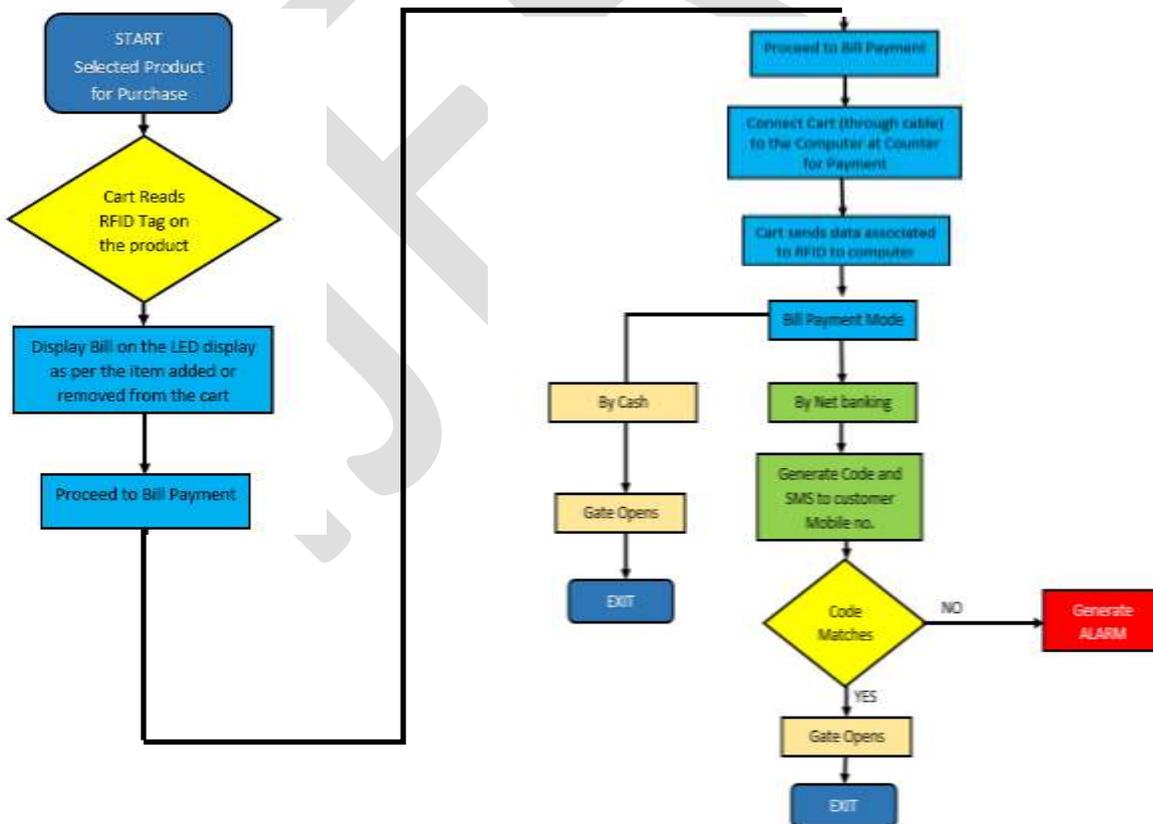
exits the particular aisle that he/she is in. The relevant products information is displayed on the display unit. Every product has an RFID tag which contains a Unique ID. These ID's are fed in the database assigned to the corresponding products. If there needs to be a purchase done, then that product can be dropped in the cart where the RFID reader reads the tag. The information of the product is extracted and displayed on the LCD screen. At the same time billing information is also updated. Upon exit of the aisle, the aisle info is sent to the server along with details of purchase. Server then stores them in the database. These steps are repeated until the end of shopping button is pressed. Once the "Complete" button is pressed there is an option provided to end the shopping with the same products or to delete some of the products from the cart. This goes by the customer choice. At the end of shopping, the customer can straight away pay the bill and leave. Inventory status of the products is also updated at the end of shopping.

PROBLEM FORMULATION:

Once the consumer gets his desired product from the shelf in the retail store and puts it into the cart, the RFID reader reads the tag on the product and the product information is displayed on the LCD screen. Side by side, the billing information is also updated. The working of the smart shopping cart can be explained in the following steps:

- 1) When shoppers with the cart press "start button" the system turns ON and then all the components such as RFID reader, microcontroller and ZigBee start working.
- 2) Every product has an RFID tag which contains a unique id. They are fed in the database assigned to the corresponding products.
- 3) When the shopper puts any product in the cart then the tag is read by the RFID reader. The information of the product is extracted and displayed on the LCD screen. Also side by side, the billing information is also updated.
- 4) These steps are repeated until the end of shopping button is pressed. Once the "End Shopping" button is pressed the total bill is send to master pc via Wi-Fi (ZigBee).
- 5) There is also an option provided to delete some of the products from the cart and the bill will be updated accordingly, this goes by the customer choice.
- 6) At the end of shopping, the customer can straight away pay the bill and leave.
- 7) Inventory status of the products is also updated at the end of shopping.

A simplified explanation is provided through the following flowchart:



PROJECT SIMULATION:

The following test case scenarios were used in the integrated system testing to prove the working of the developed system.

- a) Shopping cart and server communication using the wireless ZigBee module
- b) Identifying items based on RFID tags and synchronizing with central database.
- c) Automatic billing
- d) Display the product name & price.
- e) Complete listings of the products along with their price on LCD display.
- f) Update inventory in the central system upon each purchase of a product.
- g) Automatic billing update when the products are dropped in the cart or removed from the cart.
- h) Display of total bill on the master pc. All test cases were successfully tested. The system developed is user friendly and no special training is required to use the cart.

CONCLUSION:

The intended objectives were successfully achieved in the prototype model developed. The developed model has easy access, is economical and showcases an intelligent and easy shopping experience to reduce time, energy of the consumers. There are a few challenges/drawbacks to be resolved to make the proposed system more robust, but there is also no doubt that with the RFID having a wide scope in supply chain management, the proposed model has the potential to improve and ease the basic retail experience to a great extent.

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Gearbox Designing System of Dual Rotor Wind Turbine (DRWT) - a Technology of Future

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1. INTRODUCTION

A wind resource is one of the clean energy resources and has vast potential that covers more than two hundred times of annual world energy consumption [4]. It is very important to use this wind resource as an energy source for a reduction of fossil fuel dependency and sustainable development. To use the wind resource, a wind turbine that converts wind energy to mechanical energy through rotation of a rotor is used. A worldwide installed capacity of wind turbines has shown a high growth rate because power generation of a wind turbine has lower cost of generation and higher technology maturation than that of other renewable energy resources [3]. In order to reduce cost of wind energy further and maintain continued growth of wind power, it is required to improve the energy conversion efficiency of a wind turbine. The energy conversion efficiency of a wind turbine is usually characterized by its power coefficient that is the ratio of the power extraction from a wind to the power available in the wind. Based on the classical momentum theory, the maximum power coefficient of a wind turbine having an ideal single rotor without any losses is about 59% that is known as the Betz limit [5]. In practice, it is found that the maximum power coefficient of conventional horizontal axis wind turbines having a single rotor is about 40 to 50% due to some losses such as viscous loss, three dimensional loss, and transmission loss. Over the past few decades, many different concepts and blade designs of a wind turbine have been proposed to improve the maximum power coefficient. A Dual-rotating wind turbine having two rotors rotating in same or in opposite direction at the same axis has been proposed as a new concept to enhance the maximum power coefficient of a wind turbine. Using the classical momentum theory, Newman found that the maximum power coefficient of a wind turbine having two rotors without any losses was increased to about 64% [3]. Recently, based on this result, many researches for a counter-rotating wind turbine have been carried out to obtain more power from a wind than a conventional wind turbine having a single rotor.

The majority of wind turbines currently in operation have the conventional concept design. That is a single-rotor wind turbine system which is connected through transmission system (gearbox) to a generator. Recently, the research on dual-rotor wind turbine is undergoing in several companies and individual researchers have been introduced to the market. It has been proven that the steady state performance of the dual-rotor wind turbine system for extracting energy is better than the single-rotor wind turbine system [1]. The counter-rotating wind turbine has two rotors rotating in opposite or in same directions on the same axis. It has been proposed on the basis of the theory which states that a configuration of two rotors having the same swept area on the same axis has higher maximum power coefficient than a conventional configuration of a wind turbine having a single rotor. In this paper author has designed a gearbox of dual rotor wind turbine system. This gearbox composed of both compound and planetary gear train. The wind speed rotates the rotor of wind turbine 60-70 RPM in case of large wind turbines and 100-300 in small wind turbines. The large wind turbine requires efficient gearboxes to convert small rotational speed of 70 RPM to the high rotational speed of 1600-1800 RPM. The Author had designed a gearbox on CATIA which has two input shafts and one output shaft. The dual rotors in front and rear side capture wind energy. The captured wind energy is transformed into high speed rotational energy by transmission system. In this Wind turbine the radius of the wind blades for the dual rotor is taken as 1.5m. The rated speed for the wind turbine is taken 10m/s. Cut in speed is about 2.5m/s and Cut out speed is taken 25m/s. Lot of research has been done in application of gearless drive in dual rotor wind turbine but few researches has been done in application of mechanical gearbox in dual rotor wind turbine.

2. LITERATURE REVIEW

In order to increase the power efficiency of wind turbines on Counter Rotating Wind Turbine research have been carried out by many investigations and also comparison of power output in Counter Rotating Wind Turbine with that of Single rotor wind turbines was reported.

Jung[7] has obtained power curve experimentally and numerically for a 30 kW Counter Rotating Wind Turbine system and also the effects of distance and diameter ratio between two rotors by using Blade Element Momentum (BEM) theory.

Appa Energy Systems[1] has measured the rotor performance and numerical predictions using BEM theory for a prototype of 6 kW counter Rotating Wind Turbine. The field by Appa Technology tests conducted in this study demonstrated that power conversion efficiency could be increased by 25 to 40 % by means of a contra rotating rotor system. At low rotor speeds the net power coefficient is seen exceed Betz limit of 59%. This might be possible since the two rotors are in different planes having velocity compounding

characteristics. Possibly the interference effect between two slowly moving rotors seems to be minimal. Therefore there is a need to revisit this test using grid-connected models. Moreover, the buffeting phenomenon that is believed to be resulting from the interaction of the dual rotors was not observed in these tests. The second observation suggests that the contra rotation of two rotors appears to benefit large-scale wind turbines that operate at 15 to 20 rpm.

J.D. Booker[4] has designed A compact, high efficiency contra-rotating generator suitable for wind turbines in the urban environment design, development and performance testing of a permanent magnet generator for wind turbine applications in urban areas. The radially interacting armature windings and magnet array are carried on direct drive, contra-rotating rotors, resulting in a high torque density and efficiency. This topology also provides improved physical and mechanical characteristics such as compactness, low starting torque, elimination of gearboxes, low maintenance, low noise and vibration, and the potential for modular construction. The design brief required a 50 kW continuous rated prototype generator, with a relative speed at the air-gap of 500 rpm. A test rig has been instrumented to give measurements of the mechanical input (torque and speed) and electrical output (voltage, current and power) of the generator, as well as temperature readings from inside the generator using a wireless telemetry device. Peak power output was found to be 48 kW at a contra-rotating speed of 500 rpm, close to the design target, with an efficiency of 94%. It is anticipated that the generator will find application in a wide range of wind turbine designs suited to the urban environment, e.g. types sited on the top of buildings, as there is growing interest in providing quiet, low cost, clean electricity at point of use[6]. Seungmin Lee has calculated the Effects of design parameters on aerodynamic performance of a counter-rotating wind turbine In this study, a modified blade element momentum theory for the counter-rotating wind turbine is developed to investigate the effects of these design parameters such as the combinations of the pitch angles, rotating speeds and rotors' radii on the aerodynamic performance of the counter-rotating wind turbine[7]. Azhumakan Zhamalovich Zhamalov has designed Simulation Model of Two-Rotor Wind Turbine with Counter-Rotation. [2]

3. MATERIAL SELECTION

The gear material should have the following properties:

- Good manufacturability
- High tensile strength to prevent failure against static loads
- High endurance strength to withstand dynamic loads
- Low coefficient of friction

The material used for the manufacture of gears depends upon the strength and service conditions like wear, noise etc. The gears may be manufactured from metallic or non-metallic materials. The metallic gears with cut teeth are commercially obtainable in cast iron, steel and bronze. The non-metallic materials like wood, rawhide, compressed paper and synthetic resins like nylon are used for gears, especially for reducing noise. The cast iron is widely used for the manufacture of gears due to its good wearing properties, excellent machinability and ease of producing complicated shapes by casting method. The cast iron gears with cut teeth may be employed, where smooth action is not important. The steel is used for high strength gears and steel may be plain carbon steel or alloy steel. The steel gears are usually heat treated in order to combine properly the toughness and tooth hardness. We are using C60 plain carbon steel having tensile strength 600-700N/mm² [8]

4. METHODOLOGY

The Designing of gearbox is done on the powerful CAD software CATIA V-5R17.

For designing a gearbox first we have to determine its design considerations which are as follows:-

In the design of a gear drive, the following data is usually given [8]:

1. The power to be transmitted.
2. The speed of the driving gear,
3. The speed of the driven gear or the velocity ratio

Total Power of the wind on our front blades of Dual Rotor wind turbine system:-

$$P = \frac{1}{2} \rho A V^3 \dots \dots \dots (1)$$

Where ρ is density of air taken 1.25kg/m³

V is Rated wind velocity taken 10m/s

And A is Swept area of wind turbine rotors.

In this wind turbine we had taken the blade length of 1.5m

Hence the swept area of the wind turbine rotor is $A = \pi R^2$

On putting all these values in equation 1 we will get Total Wind power is

$$P = \frac{1}{2} * 1.2 * \pi * 1.5^2 * 10^3$$

$$P=4309.65W$$

Similarly we will calculate wind power in rear rotor also; however the wind speed on the rear rotor decreases due to obstruction of front wind blades. It has been found that maximum wind speed at the front rotor is $2/3^{rd}$ of the free stream hence only $1/3^{rd}$ of the wind speed will reach at the rear rotor. Hence the size of the rotor at the rear side is taken of larger size than of front one. In our rotor we had taken the blade size of the rear side equal to 3.5m.

Torque available at the gear,

$$T = \frac{P \cdot 60}{2 \pi N}$$

For our wind turbine system

Assuming tip speed ratio (λ) = 3

λ = speed of rotor/speed of wind

$$\begin{aligned} V &= \omega \cdot R \\ V &= (2 \times \pi \times N \times R) / 60 \\ V &= (2 \times 3.14 \times N \times 1.5) / 60 \\ 10 \cdot 60 &= 8.164N \\ N &= 63.69 \approx 65 \text{rpm} \end{aligned}$$

This is rotational wind speed, Rotor speed will be
 Tip speed ratio (λ) = speed of rotor/speed of wind

$$\begin{aligned} 3 &= \text{speed of rotor} / 65 \\ N &= 195 \text{ RPM} \end{aligned}$$

Hence torque will be,

$$\begin{aligned} T &= (4309.65 \cdot 60) / (2 \cdot \pi \cdot 195) \\ T &= 211.15 \text{ N-m} \end{aligned}$$

By the help of torque, power and gear ratio and by using the following formula's we can determine the design values of different gears, shafts and keys of our gearbox.

4.1 DESIGNING OF GEARS

In this gearbox design the assembly of sun and planet gears are bit different from other epicyclic train. The power from wind energy which is converted to rotational energy by rotor blades is transferred to the transmission system or its called gearbox system. The input wind energy from both front and rear side rotor in the form of torque transferred into the sun gear, the sun gears are in the direct mesh with planet gears. The torque from both sun gears is then transferred to crown wheel. The crown wheel is in direct mesh with output pinion gear. We had taken the gear ratio of crown wheel and output pinion gear as 1:4. From output pinion gear it goes to input spur gear.

4.2 DESIGNING OF THE SUN GEARS, PLANET GEARS AND BEVEL GEARS.

For designing any gear drive, first we have to assume the gear ratio. Let the gear ratio be G.

Minimum number of teeth to avoid interference

$$T_p = \frac{2A_w}{G \left[\sqrt{1 + \frac{1}{G} \left(2 + \frac{1}{G} \right) \sin^2 \delta} - 1 \right]}$$

T_p = Number of teeth on pinion

A_w = Fraction by which the standard addendum for the wheel should be multiplied,

G = Gear ratio of pinion and gear,

δ = Pressure angle of the gear,

we will take pressure angle 20° full depth involute system.

This will give us minimum number of teeth on pinion, and by using gear ratio problem we can calculate number of teeth on gear drive also as follows:-

$$\frac{T_g}{T_p} = G$$

Now we determine the pitch angle (Θ_{p1}) for the pinion and gear (Θ_{p2}).

$$\Theta_{p1} = \tan^{-1} \left(\frac{1}{v.r} \right) \dots \dots \dots (5)$$

$$\text{And } \Theta_{p2} = (90 - \Theta_{p1})$$

The Tangential load on the pinion is to be calculated, so that we can apply Lewis equation to determine the module.

Hence Tangential load on pinion is given by

$$F_T = 2T/D_p$$

Where T= Torque and D_p= pitch circle diameter of the pinion

We Knows that,

$$D_p = m.T_p$$

Here m is module of the gears,

The Length of the pitch cone element (L)of a bevel gear is calculated as follows,

$$L = \frac{D_p}{2 \sin \theta_{p1}}$$

The face width for the gear can be assumed between L/3 to L/4

In this gear we has assumed the face width (b)

$$b = L/3$$

Putting all these values in Lewis equation as follows,

$$F_T = (\sigma_{op} \times C_v) b \times \pi \times m \times y_p \times \frac{(L-b)}{L}$$

We will get the cubic equation in the form of m and by solving this equation we will get value of 'm'. The value of 'm' is used to calculate other dimensions of a gear. We had used above given formulae's to design the bevel gears, sun gear, planet gear, crown wheel and output pinion gear.

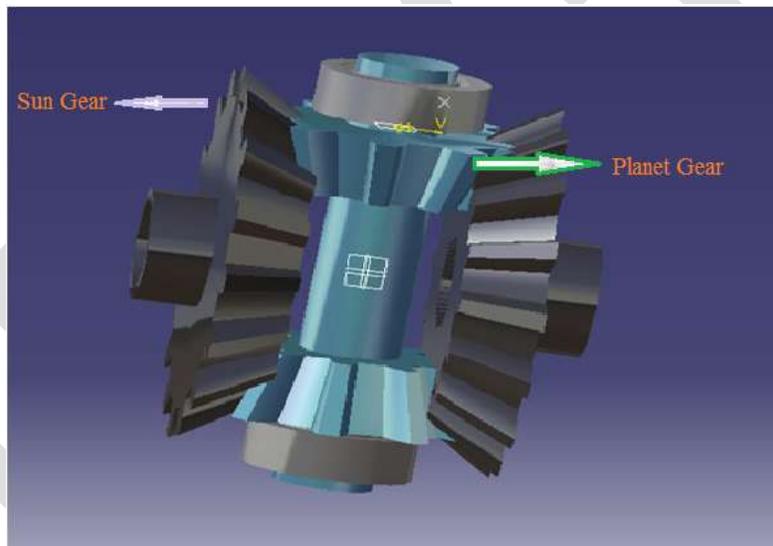


Figure 7 Sun & Planet Gears Designed on CATIA

4.2.1 DESIGNING OF SPUR GEARS

The Torque from output pinion gear is transmitted to input spur gear. The value of torque is calculated as follows.

$$\frac{\text{Torque on output pinion gear}(T)_1}{\text{Torque on input spur gear}(T)_2} = G$$

We know the values of torque on Output pinion gear; we can calculate torque on input spur gear by the help of gear ratio (G). After finding the torque we will apply the same procedure on spur gear calculation as in the case of bevel gear and find the dimensions of spur gears.

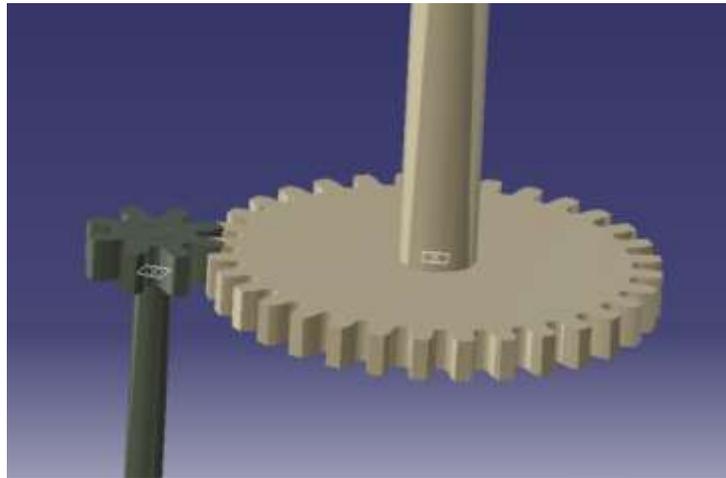


Figure 2 Spur Gear Drive on CATIA software

4.2.2 DESIGNING OF GEAR SHAFTS AND KEY SPLINES

A shaft is a rotating machine element which is used to transmit power from one place to another. The power is delivered to the shaft by some tangential force and the resultant torque (or twisting moment) set up within the shaft permits the power to be transferred to various machines linked up to the shaft. In order to transfer the power from one shaft to another, the various members such as pulleys, gears etc., are mounted on it. These members along with the forces exerted upon them causes the shaft to bending. In other words, we may say that a shaft is used for the transmission of torque and bending moment.

The shafts may be designed on the basis of

1. Strength, and
2. Stiffness & Rigidity

In designing shafts on the basis of strength, the following cases may be considered:

- (a) Shafts subjected to twisting moment or torque only,
- (b) Shafts subjected to bending moment only.
- (c) Shafts subjected to combined twisting and bending moments, and
- (d) Shafts subjected to axial loads in addition to combined torsional and bending loads.

In order to find the diameter of shaft for gears, the following procedure may be followed:-

1. First of all, find the normal load (F_N), acting between the tooth surfaces. It is given by

$$F_N = F_T / \cos \delta$$

2. The weight of the gear is given is calculated by

$$F_G = 0.00118 * T_G * b * m^2 \text{ (in N)}$$

3. Now the resultant load acting on the gear is calculated

$$F_R = \sqrt{F_N^2 + F_G^2 + 2F_N F_G \cos \delta}$$

4. If the gear is overhung on the shaft, then bending moment on the shaft due to the resultant load,

$$M = F_R \times X$$

Where X = Overhang i.e. the distance between the centre of gear and the centre of bearing.

5. Since the shaft is under the combined effect of torsion and bending, therefore we shall determine the equivalent torque. We know that equivalent torque,

$$T_e = \sqrt{(M)^2 + (T)^2}$$

6. Now the diameter of the gear shaft (d) is determined by using the following relation, We also know that equivalent twisting moment (T_E)

$$T_E = (\pi/16) \times \tau \times d^3$$

τ = Shear stress of the shaft

We have used above Equations to calculate the diameter of Gear Shafts.

4.2.3 SPLINES

Sometimes, keys are made integral with the shaft which fits in the keyways broached in the hub. Such shafts are known as splined shafts as shown in Fig. These shafts usually have four, six, ten or sixteen splines. The splined shafts are relatively stronger than shafts having a single keyway.

$$d = 1.25D \text{ and } b = .25d$$

Where D is diameter of the shaft

d = depth of the spline slots

b = width of the spline slots

The splined shafts are used when the force to be transmitted is large in proportion to the size of the shaft as in automobile transmission and sliding gear transmissions.

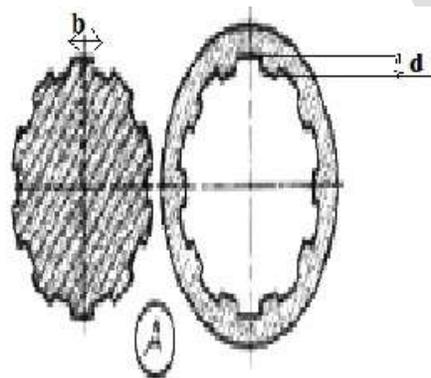


Figure 8 Shaft Spline

By using splined shafts, we obtain axial movement as well as positive drive is obtained.

4.2.4 BEARING DESIGN FOR GEARBOX

A bearing is a machine element which supports another moving machine element (known as journal). It permits a relative motion between the contact surfaces of the members, while carrying the load. Bearings in wind turbines operate at the extremes of operational environments in terms of temperature, load fluctuation, maintenance access and lubricant optimization. As rotor diameters increase, confidence in your bearings becomes even more critical.

Generally For wind turbine Gearbox spherical roller bearing for large wind turbine are used but for small gearboxes Ball bearing is used.

We are using radial ball bearings for our Gearbox.

In this Gearbox we have designed a radial ball bearing.

For Designing the Bearing we need basic dynamic load rating(C) & Diameter of Shaft.

Basic dynamic load rating(C)

$$C = W \times \left(\frac{L}{10^6} \right)^{1/6}$$

L = Life of bearing, in hours, Assuming of bearing life of wind turbine gearbox 100000 Hours.

Where W is the dynamic equivalent radial load, which is determined by radial load (F_R) and constant axial or thrust load (F_A)

$$W = X \cdot V \cdot F_R + Y \cdot F_A$$

Where V = A rotation factor,

F_R = Radial load,

F_A = Axial or thrust load,

X = radial load factor

Radial Load (F_A) and Axial Load (F_R) is Determined by following Formulae

$$F_A = F_T \tan \alpha \sin \delta$$

$$F_R = F_T \tan \alpha \cos \delta$$

α = Nominal angle of contact

δ = Pressure angle of gear

By putting all values in equation (14) we get dynamic load rating.

Hence we get the value of C and for the diameter of shaft of diameter d we can use standard value of Ball Bearing no. 6407 from PSG Design Data book.[12]

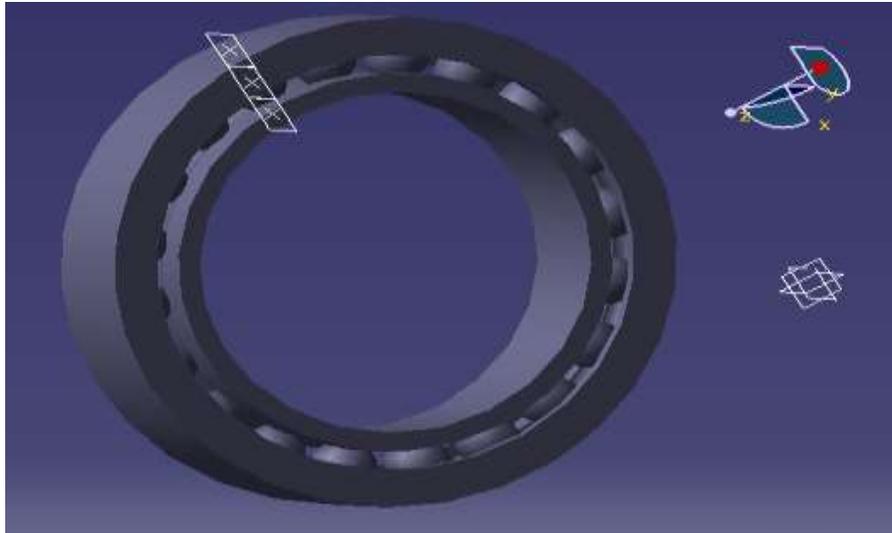


Figure 3 CATIA Design of Radial Ball Bearing

5. RESULT & DISCUSSION

The Design of the Dual Rotating Wind Turbine for is designed by using the CATIA V5 R17 Software. To Design the Gearbox of 1.5kW we have first calculated the Torque acting on the Gears. The author has assumed the value of blade length 1.5 m length, and Rated wind speed of RGPV Bhopal is 10m/s. These values are the base for designing of the Gearbox. The tables showing the design value of Gears such as crown wheel gear, output pinion gear, sun gear, planet gear, spur gears shafts and keys are shown in the Following Tables.

Table 2 Design perimeters for Spur Gears

s.no	Particulars	Standard proportion	Gear dimension (in mm)
1	Diameter of output spur gear	$m \cdot T_P$	49
2	Diameter input Spur gear	$m \cdot T_G$	245
3	Addendum	1m	$1 \times 3.5 = 3.5$
4	Dedendum	1.25 m	$1.25 \times 3.5 = 4.375$
5	Working depth	2 m	$2 \times 3.5 = 7$
6	Minimum total depth	2.25 m	$2.25 \times 3.5 = 7.875$
7	Tooth thickness	1.5708 m	$1.5708 \times 3.5 = 5.5\text{mm}$
8	Minimum clearance	0.25 m	$.25 \times 3.5 = .875\text{mm}$

Table 4 Design perimetres of Crown wheel Gear and output Pinion Gear.

S.N	Particulars	Standard proportions	Crown wheel Gear	Output Pinion Gear
1	Module	M	2mm	2mm
2	Outside diameter	$D_{OG} = D_G + 2 a \cos \Theta_p$	130	35mm
3	Pitch circle diameter	$D_G = m.T_G$	128	30
4	Number of teeth	T_G & T_P	64	16
5	Length of the cone (L)	$L = \frac{D_P}{2 \sin \theta_{P1}}$	66	66
6	Face width(b)	$b = L/3$	22	22
7	Addendum (a)	$a = 1m$	2	2
8	Dedendum(d)	$d = 1.2m$	2.4mm	2.4mm

Table 4 Design perimetres of sun and planet gear

S.no	Particulars	Standard proportions	Sun Gear	Planet gear
1	Module	m	2.5mm	2.5mm
2	Outside diameter	$D_{OG} = D_G + 2 a \cos \Theta_p$	52mm	35mm
3	Pitch circle diameter	$D_G = m.T_G$	45mm	30
4	Number of teeth	T_G & T_P	18	12
5	Length of the cone(L)	$L = \frac{D_P}{2 \sin \theta_{P1}}$	30mm	27mm
6	Face width(b)	$b = L/3$	10mm	10mm
7	Addendum (a)	$a = 1m$	2.5mm	2.5
8	Dedendum(d)	$d = 1.2m$	3.75mm	3.75mm

The Efficiency of Dual rotor wind turbine could be increased up to 40% than the Efficiency of a wind turbine with only one rotor. This increase in result will increased the power generation from a given tower installation. Energy conversion efficiency was high at low rotor speeds, suggesting application of Dual rotor at places where wind speed is low 4-5m/s.

6. AUTHORS' INFORMATION

The Author Mukesh Pandey is the Head of the Department of School of Energy and environmental management at Rajiv Gandhi Technical University (also known as RGPV). he has about 13 years of experience 14 years in academic and 4 years in industrial area. he had published 27 international journals and 58 national journals. he is also the writer of 6 books. author anurag gour is assistant professor in department of energy and environmental management in school of energy technology at Rajiv Gandhi Technical University. He has published 19 research paper in international journals and attended 2 international and national conferences. author Tipu sultan is research scholar in department school of energy technology at Rajiv Gandhi Technical University. He has completed his Graduation in Mechanical Engineering.

7. CONCLUSION

In this Research paper we have studied the designing of the Gearbox of dual rotor wind turbine system. We have used CATIA software for the designing of the gearbox, more accurate calculation for the dimensions of gear is done by basic formulae's. We assumed that the speed of wind in front rotors is reduced by 2/3rd times the original wind speed. Basic formulae's for calculating gear dimensions are discussed and tables of gear dimensions are drawn in this paper. This gearbox has two input shafts and one output

shaft. The dual rotors in front and rear side capture wind energy. The captured wind energy is transformed into high speed rotational energy by transmission system. In case of single rotor only single front rotor can convert wind energy into useful energy but in this research paper had designed a dual rotor wind turbine gearbox on CATIA which can generate about 5% more power than conventional wind turbine system.

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Database Reverse Engineering and Tampering

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Abstract- In today's modern world data is important entity. Data such as accounts, confidential documents, etc. is stored and managed by database in company. Database Reverse Engineering also works on extracting information and structure along with actual records stored in database table. Database Reverse Engineering means reconstructing ER model from existing schema, analysis and transformation. Various methods of Database Reverse Engineering are used in Digital forensic and tampering in data. Due to advance in technology growth of computer crime is increased. As the business data stored in these database is very important to investigate company dishonest act is necessary for that purpose fruitful database forensic technique should be used. Discrimination is mainly used to avoid tampering of data. It includes various strategies of discrimination.

Keywords: Database reverse engineering, Phases, Log Files, Forensic Investigation, Tampering Detection Approach, Discrimination, Discrimination strategy

I. Introduction

Database Reverse Engineering (DBRE) is a process of extracting database requirements from an implemented system. Traditionally, legacy systems suffer from poor design documentation and thus make the maintenance job more difficult. There are some problem in database reverse engineering like implicit structure, optimized structure, etc. The most frequent objectives of database reverse engineering are system maintenance, system extension, etc. The major goal of database reverse engineering is to reconstruct the conceptual data model of database system in the form of entity relationship diagram.

In recent database reverse engineering effort to derive a data model from table based database system. Different phases of database reverse engineering are data structure extraction, conceptualization, database structure modification. For the security of database forensic investigation is required. Secure storage of data is an everyday need for public businesses, government sectors and many institutions. For many organizations, if data is unauthorisely modified, whether by an outsider or by an internal intruder, it could cause severe problems for the company. And even for their clients as well. Therefore forensic investigation is necessary. Sometimes the original data is tampered that causes discrimination. Unfairly treating people on the basis of their belonging to a specific group, namely race, ideology, gender, etc., is known as discrimination. Mainly discrimination occurs due to favoritism.

II. Database Reverse Engineering

It is the process through which the logical and conceptual schemas of a legacy database, or of a set of files, are recovered from various information sources such as DDL code, data dictionary contents, database contents, or the source code of application. Database reverse engineering mainly works on schema extraction, analysis and transformation. Reverse engineering (RE) a piece of software consists, among others, in recovering or reconstructing its functional and technical specifications, starting mainly from the source text of the programs.

Need

The *Data Description Language* (DDL) is that part of the database management system facilities intended to declare or build the data structures of the database. The most frequent sources of problems have been identified.

Implicit structures: Such constructs have intentionally not been explicitly declared in the DDL specification of the database. They have generally been implemented in the same way as the discarded constructs mentioned above.

Optimized structures: For technical reasons, such as time and/or space optimization, many database structures include non semantic constructs. In addition, redundant and unnormalized constructs are added to improve response time.

Awkward design: Not all databases were built by experienced designers. Novice and untrained developers, generally unaware of database theory and database methodology, often produce poor or even wrong structures.

Cross-model influence: The professional background of designers can lead to very peculiar results. For instance, some relational databases are actually straightforward translations of IMS databases, of COBOL files or of spreadsheets.

III. Database Reverse Engineering Process

Bottom-up Modeling

Build a database design based on either one of the following:

- By importing metadata directly from an existing database.
- By importing a DDL script that reflects an existing database implementation.

1.Reverse Engineer from a database or DDL script :

The resulting database is represented as a **Relational Schema** and definitions for Physical & Relational Schema objects.

2.Reverse Engineer from the Relational Schema to a higher-level schema :

The resulting schema is represented as an **ER Diagram** (or Class Diagram) and definitions for ER model objects.

IV. Motivation and Objectives

Reverse engineering is just one step in the information system life cycle. Indeed, painfully recovering the specifications of a database is not a sufficient motivation. It is generally intended to re document, convert, restructure, maintain or extend legacy applications. Here follow some of the most frequent objectives of database reverse engineering.

1.System maintenance :

Fixing bugs and modifying system functions require understanding the concerned component, including, in data-centered systems, the semantics and the implementation of the permanent data structures.

2.System extension :

This term designates changing and augmenting the functional goals of a system, such as adding new functions, or its external behaviour, such as improving its robustness.

3.System migration:

Migrating a system consists in replacing one or several of the implementation technologies. IMS/DB2, COBOL/C, monolithic/Client-server, centralized/distributed are some widespread examples of system migration.

4.Data Administration:

DBRE is also required when developing a data administration function that has to know and record the description of all the information resources of the organization.

V. Database Reverse Engineering Phases

Database reverse engineering is the process through which the logical conceptual schemas of a legacy database or of a set of files are recovered from various information sources such as data dictionary contents or source code of application. In a recent database reverse engineering effort to derive a data model from a table-based database system .In many cases , the major goal of data reverse engineering efforts is to reconstruct the conceptual data model of a database system in the form of an entity-relationship diagram. There are certain phases in database reverse engineering.

VI. Phases

There are following three phases for database reverse engineering:

- Data structure extraction
- Data structure conceptualization
- Data structure modification

1.Data structure extraction:-

The data structure extraction, extracts the complete database schema. If there is a formal DDL description of the database, this process could be greatly expedited. Otherwise, a fair amount of data analysis, program analysis, and form analysis need to be performed. There are three steps, attributes extraction ,keys extraction, and constraints extraction in this extraction process. The aim of attributes extraction is to extract semantic information for database fields through field comparison, character comparison, data analysis, and code analysis.

Attribute Extraction:-

Field comparison is to compare form fields and database fields through instances in order to obtain the true meaning of each database field. First, we find the corresponding entries of forms fields in database fields, and then use captions of form fields and the context of the form to derive the meaning of database fields. In the process of comparison, form instances are the medium. Since the value of each field in form instances is different, by comparing values in form fields and database fields, we could identify the corresponding database fields readily. In this way, we are able to extract the semantics

of most attributes in the system

Key Extraction:-

After primary keys are established, we can apply primary keys to extract foreign keys in order to identify association among tables. During this process, every primary key is checked whether it is referred in fields of other tables (Alhaji, 2002). The referring field is a foreign key. The criterion is that the domains of the referring fields and the referred fields must match and the values of the referring field must be a subset of those of the referred field. Such criteria can be easily tested by designing appropriate SQL constraints

Constraints Extraction:-

The primary objective of constraints extraction is to obtain the association cardinality between primary keys and foreign keys. If a value of the primary key in a table shows in only one record in another table with the associated foreign key, the mapping cardinality is inferred to be one to one. Otherwise the mapping cardinality is considered done to many. In fact, if the foreign key relationship is already established, one only needs to check for the uniqueness of values in the foreign key fields to determine the cardinality.

2.Data structure Conceptualization:-

The conceptualization step concerns the formalization of the conceptual model and its refinement. For EED, the focus is on the identification of entities and relationships among these entities from the logical schema gathered from the previous step. In the process of designing table-based database, an entity might be transformed into several tables depending on its characteristics. For example, a multi-valued attribute is usually separated from the entity to become another table.

3. Database structure Modification:-

After establishing the database connection there is need to define the structure of your database. This structure is necessary to ensure that the database components can show meaningful data in your pages. There are two methods of the structure of database: There are two methods of informing for structure of your database .i.e. Automatic database structure definition Manual database structure definition:

Automatic database structure definition:-

Eg:The most common method of informing NetObjects Fusion 12 about the structure of your database is to let NetObjects Fusion 12 import the structure information from the Data Source server or file.

Manual database structure definition:-

If you are unable to connect to your database or want to add specific tables and fields, you can modify the database structure manually.

Need

Output in the form of entity relationship diagram is difficult to understand by user and it will not provide detailed information about every object. so, we can display the output in different forms.

VII. Advantages

Data extraction methods will be used for the digital forensics. Digital forensics is a branch of forensic science encompassing the recovery and investigation of material found in digital devices, often in relation to computer crime.

By acquiring these techniques it will be possible for the database user to detect database tampering and dishonest manipulation of database.

VIII. TAMPER DETECTION APPROACH

With the Database there are several things and ideas come with the database operation.

The First approach: Audit log maintain by the DBMS itself as a background. This background audit log representing individual relation and this individual relation is treated as a Transaction Time table. In DBMS we perform updating, Deletion and modification operation on data (Tuple) if this operation take long time the Audit log and Transaction time table Drill the DBMS to keep the previous tuple during this operation with their insertion and deletion/update time. During this The DBMS provide one important property with the stored Data in database that it is Modification. If want to modify the only add information at End no information is Deleted. If we change the old information that time the data get tampered.

The Second approach: The Transaction made the cryptographically hash for the modify data to generate the secure one-way hash of Transaction.

The Third approach: By using the external notarization service we notarize the hash value because of this the intruder, operating system and hardware cannot change the hash value. If the intruder, operating system and hardware makes any Changes in hash value it is very difficult to make the hash value for this change hash value regarding to the Audit Log.

The Fourth Approach: Finally the matching is performed between old hash values with rehash tuple. If hash value is same there is no problem but if matching is not occurred then we need to apply forensic analysis algorithm to find out where, when and why the tampering has been occurred.

IX. Database Forensic Investigation

Forensic investigation is a branch of forensic science relating to forensic study of database and their related metadata. Databases often contain information that may be useful during many forensic investigations. i.e. applying investigation technology to database contents and metadata. Forensic investigation focus on identifying transactions within database system. Forensic investigation is a field to investigate the computer crime. Here the forensics investigator should be able to track an attacker on the Internet. The IP address and Domain name tracing is used to detect the suspicious user.

X. Need of forensic investigation

As internet is widely used there is increased in cyber crime. So only security approach is insufficient therefore database forensic investigation is needed. Authenticated and authorized user access data using various mechanism provided by database server but some time authorized user makes data get tampered so system is also not secure and protected. Authorized user access database with the help of IP address and try to make some modification in database like changes in item price and changes in item quantity, this changes provides financial loss due to this issue forensic analysis is necessary. Authorized and unauthorized user detected by Tiled bitmap forensic analysis algorithm. It also helps to find at what time and possibly who and why tamper the database.

For ex. A cracker breaks into online shop's database and interchanges the cost price and selling price columns assuming a relational database. This leads to a significant loss for shop. Therefore, it is important to adopt a forensic investigation method for database system.

XI. Process of forensic investigation:

There are four major steps:

1. Collection
2. Examination
3. Analysis
4. Reporting

First of all there is need to collect the evidence from computer system. This evidence or data collection can do by various discussion related to crime. These collected evidences will have to examine. This examination pay attention to various factors related to crime. Examiner try to find the answer of “why” and “whom”. After this evidence will take place into analyses phase .After collecting various proof finally report will generate that show investigation result. Final report should consist four things:

Who did

What did

When did

How did

Log files are important to investigate crime. It is a file that lists actions that have occurred. Log file contains whole information regarding the user’s activity. These activities is written in various log files like web log, firewall log, network log. With log files it is possible to get good idea of where visitors are coming from, how often they return and navigate through a site.

The attacker can leave the evidence behind that can be collected by certain ways by forensic tools for the purpose of further investigations. The use of computer and digital devices in the act of crime is continuously grow day by day, so this gives challenges to forensic that how they collect information from the system after an incident. Most of the digital forensic tools are commercial version, which cost is high and operated by professional forensic, so we mostly use open source forensic tools because it is easy to use and less costly.

XII. Discrimination

Discrimination can be used in various fields such as in databases, data mining, forensic investigation, etc. Discrimination is simply known as injustice. Discrimination denies the members of one group with others. Unfairly treating people on the basis of their belonging to a specific group, namely race, ideology, gender, etc., is known as discrimination. Laws are designed to prevent discrimination. Antidiscrimination laws have been adopted by many democratic governments. The problems of assessing the presence, extent, nature, and trends of discrimination and of preventing discrimination in (possibly automated) decision making are thus of primary importance. There are several decision-making tasks which are supported by information system and lend to discrimination, e.g. loan granting, education, health insurances and staff selection. Thus, these collected data are auxiliary utilized by companies for decision making purpose .The association and or classification rules can be used in making the decision for loan granting and insurance computation. The use of information systems based on various technology for decision making has attracted the attention of many researchers in the field of computer science.

XIII. Types of Discrimination:

Direct Discrimination

Direct discrimination is intentional and “directed” towards individuals, typically on the basis of their visible traits. Direct discrimination is difficult to prove, since the complainant has to demonstrate the intent to discriminate. Direct discrimination consists of rules or procedures that explicitly mention minority or disadvantaged groups based on sensitive discriminatory attributes related to group membership. In this, classification of the data is done in such a way that focuses on independent sensitive attribute. Direct discrimination can be prevented by removing discriminatory attributes from the dataset.

Indirect Discrimination

Indirect discrimination consists of rules or procedures that, while not explicitly mentioning discriminatory attributes, intentionally or unintentionally could generate discriminatory decisions. A presumption of indirect

discrimination on a group is typically based on observing that the effects of some rules or practices have put the group in an adverse position. Indirect discrimination can be prevented by removing non-discriminatory attributes from datasets.

Causes of discrimination:

1. Prejudice

Prejudice means to judge another person or group a priori. Prejudice leads to discrimination when it concerns unfairly or unreasonably-formed negative attitudes against a protected group.

2. Statistical thinking

Statistical thinking is also known as rational racism. This is the case, when employers refer directly or indirectly to the average performance of the applicant's racial group as a decision element.

3. Unintentionally discrimination

This type of discrimination occurs due to indifference, incorrect (execution of) procedures or practices, lack of planning and analysis of decision outcomes. Indirect and unintentional discrimination have considerable problems for data analysts to carefully take into account the effects of decisions due to their unforeseen discriminatory effects.

XIV. Strategies

1. Affirmative

Affirmative actions are also called positive actions. A range of policies to overcome and to compensate the problem by providing opportunities for those who are traditionally discriminated

2. Reverse discrimination

Reverse discrimination, sometimes identified with affirmative actions, is the disadvantage that the non-members of protected groups suffer as a result of affirmative action. It is therefore important to assess and to monitor the application of affirmative actions.

3. Favoritism

Favouritism occurs when individuals are treated better than other for certain reasons. Discrimination and favoritism are dual concepts: if a protected group is discriminated against in a certain context, then the remaining people in the same context are favored. Strictly speaking, however, we reserve the term favoritism for the unfair (positive) treatment of members of a specific group, and not as the implicit consequence of the discrimination of other groups.

XIV. Acknowledgment

We take this opportunity to express our gratitude and indebtedness to our guide **Prof. P. D. Bodakhe**, and H.O.D, **Prof. A. B. Raut**, Computer Science and Engineering department, who is a constant source of guidance and inspiration in preparing this work. Her constant help and encouragement helped us to complete our seminar report. We are grateful to Principal **Dr. A.B. Marathe**, for his encouragement and support. We are also thankful to all the staff members of Computer Science and Engineering department, whose suggestions helped us to complete the seminar work and those who have directly and indirectly helped for completion of the seminar report.

XV. Conclusion

Database reverse engineering gives output in the form of ER diagram which is not easy to understand. So we can modify output using various methods. If tampering is done in our database then you can detect it by forensic investigation. Forensic analysis inaugurates at what time a crime has been identified and in this case the tampering of a database. Such analysis activities determine when the tampering occurred, and what data were altered.

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Automatic Load Frequency Control of Two-area interconnected Thermal Reheat Power System using Genetic Algorithm with and without GRC

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Abstract: The main objective of power system operation and control is to maintain the continuity of supply with an acceptable quality and reliability. The system will be in balanced condition, when there is a balance between the power demand and the power generated. In this paper, Load Frequency Control (LFC) of single area and two-area inter-connected thermal reheat power system has been carried out by the integral controller. The system responses have been simulated in MATLAB environment. In this paper genetic algorithm is used to obtain the optimal gain of integral controller for better dynamic response of the system. In the power system, reheat and generation rate constraints (GRC) are considered. The response with GRC is compared with the analysis done without the Generation Rate Constraint.

Keyword: Load Frequency Control (LFC), Automatic Generation Control (AGC), Two area power system, Genetic algorithm (GA), Generation Rate Constraint (GRC), Area control error (ACE) and Integral square error (ISR)

I. Introduction:

A Single area power system consists of a governor, a turbine and a generator with feedback of regulation constant. The system includes step load change input to the generator. The main objectives of the Load Frequency Control are to maintain uniform frequency, to divide the load between generators and to control the tie line interchange between the power systems. A simple block diagram of a single area power system with the integral controller is shown in fig.1. The integral term adds a pole at origin resulting in reducing the steady-state error. A two-area re-heat type thermal system consists of two single areas connected through a power line called the tie-line as shown in fig 2. Each area feeds its user pool and tie-line allows the electric power to flow between areas. Since both areas are tied together, a load disturbance in one area affects the output frequencies of both areas as well as the power flow on the tie-line [4]. In the power system, reheat and generation rate constraints (GRC) are considered. The Generation rate constraint (GRC) is realized by differentiating outputs from both the power sources, thereafter a saturation limiter is used to decide the upper and lower limit of the rate [1]. The signal is further integrated to get back to the original signal. GRC for the k_{th} subsystem is 0.0005 p.u. MW/s.

A step load perturbation of 1% of nominal loading has been considered in Area-1. The effect on frequency is observed on both areas. The gains of both areas are optimized using Genetic Algorithm technique to have the minimum frequency deviation.

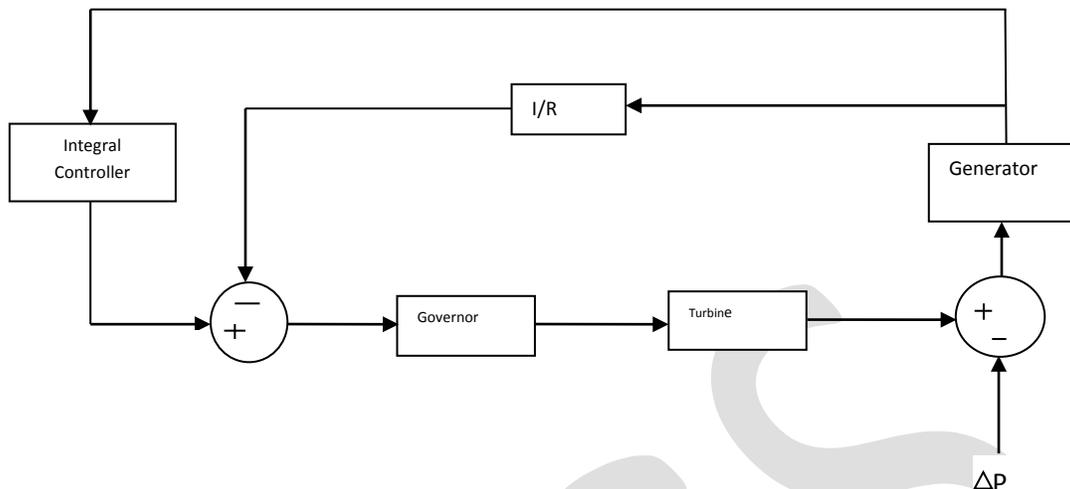


Figure.1 A single Area Power System with the integral controller.

Table-1 Nominal parameters of thermal system

Nominal parameters	Value
Rating of each area	2000MW
Base Power	2000MVA
$R_1=R_2$	$=2.4\text{Hz/p.u.MW}$
$B_1=B_2$	$=.425\text{puMW/Hz}$
f	$=60\text{ Hz}$
ΔP_{d1}	$=0.01\text{puMW/Hz}$
$T_{g1}=T_{g2}$	$= 0.08\text{s}$
$T_{r1}=T_{r2}$	$= 10\text{s}$
$K_{r1}=K_{r2}$	$= 0.5$
$T_{t1}=T_{t2}$	$= 0.3$
$K_{p1}=K_{p2}$	$= 120\text{Hz/p.u. MW}$
$T_{p1}=T_{p2}$	$= 20\text{s}$
A	$= 0.5$

II. System Description of two area interconnected power system

In a two-area reheat thermal system there are two single areas connected through a tie line as shown in fig 2. Each area feeds supply to its users and tie-line allows the electric power to flow between areas [2]. Since both the areas are tied together, therefore a load disturbance in one area affects the output frequencies of both areas as well as the power flow on the tie-line [4]. In figure-2, reheat and generation rate constraints (GRC) are considered. Transfer function for turbine and governor is given as follows:

$$T.F_{Turbine} = \frac{1}{1 + sT_t}$$

$$T.F_{Governor} = \frac{1}{1 + sT_g}$$

Where:

Tt: Turbine Time constant

Tg: Governor Time constant

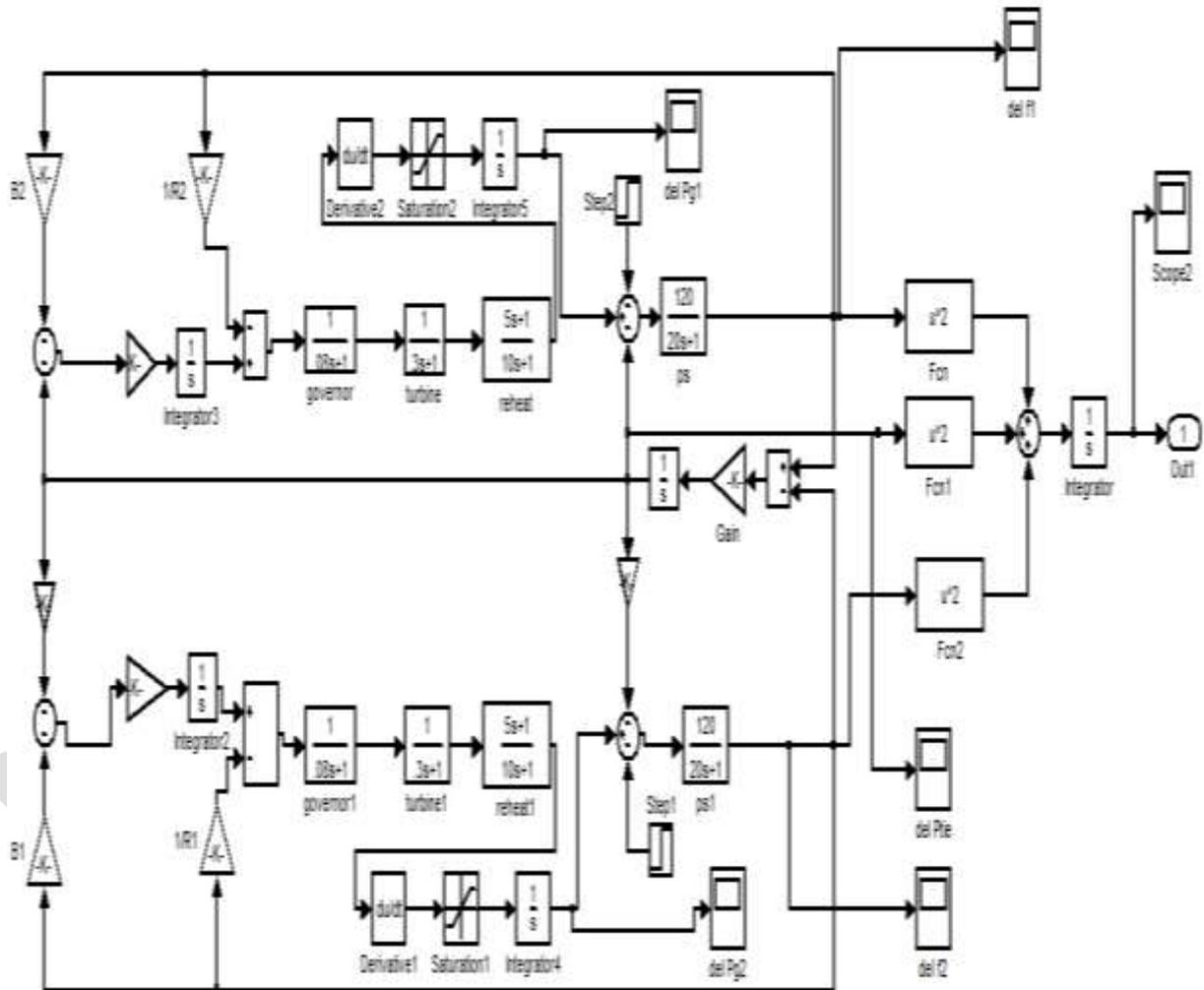


Figure- 2: Simulation Diagram Of LFC Of Two Area Power System With Proposed GA Based Integral Controller with GRC.

III. Genetic Algorithm

A Genetic Algorithm is a search technique that is used in computing to find exact or appropriate solutions to optimization and search problems by using natural operators, Genetic Algorithms can be applied to process controllers, for their optimization. They operate on a population of current approximations [3]. The individuals initially drawn at random, from which improvement is obtained. Individuals are encoded as strings (chromosomes) which are constructed over some particular alphabet, for example the binary alphabet {0, 1}, so that chromosomes values are uniquely mapped onto the decision variable domain. When the decision variable

domain representation of the current population is calculated, according to the objective function the individual performance is assumed, which characterizes the problem to be solved. It is also possible to use the variable parameters directly to represent the chromosomes in the Genetic algorithms (GA) solution. At the reproduction stage, a fitness value is derived from the raw individual performance measure which is given by the objective function that is used to bias the selection process. Genetic operators can be divided into three main categories, reproduction, cross over and mutation.

1. Reproduction: The reproduction operator selects the fittest individuals in the current population that is to be used in generating the next population.

2. Cross over: The cross over operator causes pairs, or larger groups of individuals to exchange genetic information with one another.

3. Mutation: The mutation operator causes individual genetic representations to be changed according to some probabilistic rule.

IV. Formation of objective function

In the present study the objective function (integral square error ISE) is formulated as the minimization of:

$$ISE = \int (\Delta f_1^2 + \Delta f_2^2 + \Delta P_{tie}^2)$$

Genetic Algorithms can be applied to process controllers, for their optimization. In this thesis we use the concept of Genetic Algorithm as an optimization tool. A real coded GA can be considered as an appropriate method for reaching optimal gains with fast response to system.

Considering “y” as output vector we can assume that:

$$y = [ACE_1 \quad ACE_2]^T$$

Where ACE_i is Area Control Error signal due to step type load disturbance can be calculated as:

$$ACE_i = \Delta P_{ie,i} + B_i \Delta F_i$$

In designing the controller, cost function can be assumed as minimization of “Integral of Square Error (ISE)” for step response of load deviation:

$$ISE = \int (ACE_i)^2 .dt$$

Practical cases show that “ISE” function will cause more minimization in overshoot and cause fast response with shorter settling time and consider this cost function as objective function.

$$F_{cost} = \int_0^t ACE_i^2 .dt \quad , For \quad i = 1, 2, \dots$$

In GA-consider the cost function- a fitness function is considered for each string of values, and in next stage initial population will be chosen in a way that we can use the probability of roulette. The fitness function for creating the initial population can be written as:

$$F_{Fitness} = \frac{1}{1 + F_{cost}}$$

V. Steps for Genetic Algorithm Programming using MATLAB

Parameters for Genetic algorithm

parameter	size
Population size	40
Chromosome length	14
Max Iterations	30
Elitism Probability	0.10
Cross over Probability	0.9
Mutation Probability	.001
No. of control variables	2

a. Algorithm

Step-1 Data initialization

Step-2 Set limits for gain K

Min It [0 0]

Max It [1 1]

Step-3 Create random initial population of 0's and 1's.

Step-4 Start the iteration from 1 to max no. of iterations.

- (a) Decode the population which is constructed over some particular alphabet i.e. (0 and 1), into integer.
- (b) Compute control variables.
- (c) Run the Simulink model.
- (d) Define the fitness function.
- (e) Evaluate the fitness of each individual in the population, and arrange them by applying sorting based on fitness value by using bubble sort.
- (f) Create a new population by repeating following steps until the new population is complete.
 - (i) First the best fit chromosomes are copied directly to the new population using elitism criteria.

- (ii) Select two parent chromosomes from a population according to their fitness.
 - (iii) Generate offspring using cross over operator. Generate a random number and compare it with cross over probability P_c . If random number is less than P_c cross over operation is performed, otherwise no cross over is performed and parent individuals are returned.
 - (iv) If crossover operation is called, a crossing point is selected between 1 and chromosome length. The crossing point is selected in the function round which returns an integer between lower and upper limits that is used for creating offspring.
- (g) Swap the generated offspring to parent.
- (h) Use mutation operator. Mutation alters one individual parent to produce a single new individual child.
- (i) Select a random number between 0 to 1 and compare with mutation probability P_m
 - (ii) If it is less than P_m , mutation operation is called. And at the mutating point, the bit is altered from 1 to 0 or 0 to 1.
 - (iii) Else bit is kept unchanged.
- (i) Place new offspring in the new population. Use new generated population for next iteration.
- (j) If the end condition is satisfied, stop, and return the best solution in current population.

Step-5 Go to Step -4.

Step-6 When iterations > max Iterations then print 'problem is not converged in max iterations'

Step-7 Print gain k_{i1} and k_{i2}

Step-8 Print total error and plot the error.

VI. Flow Chart

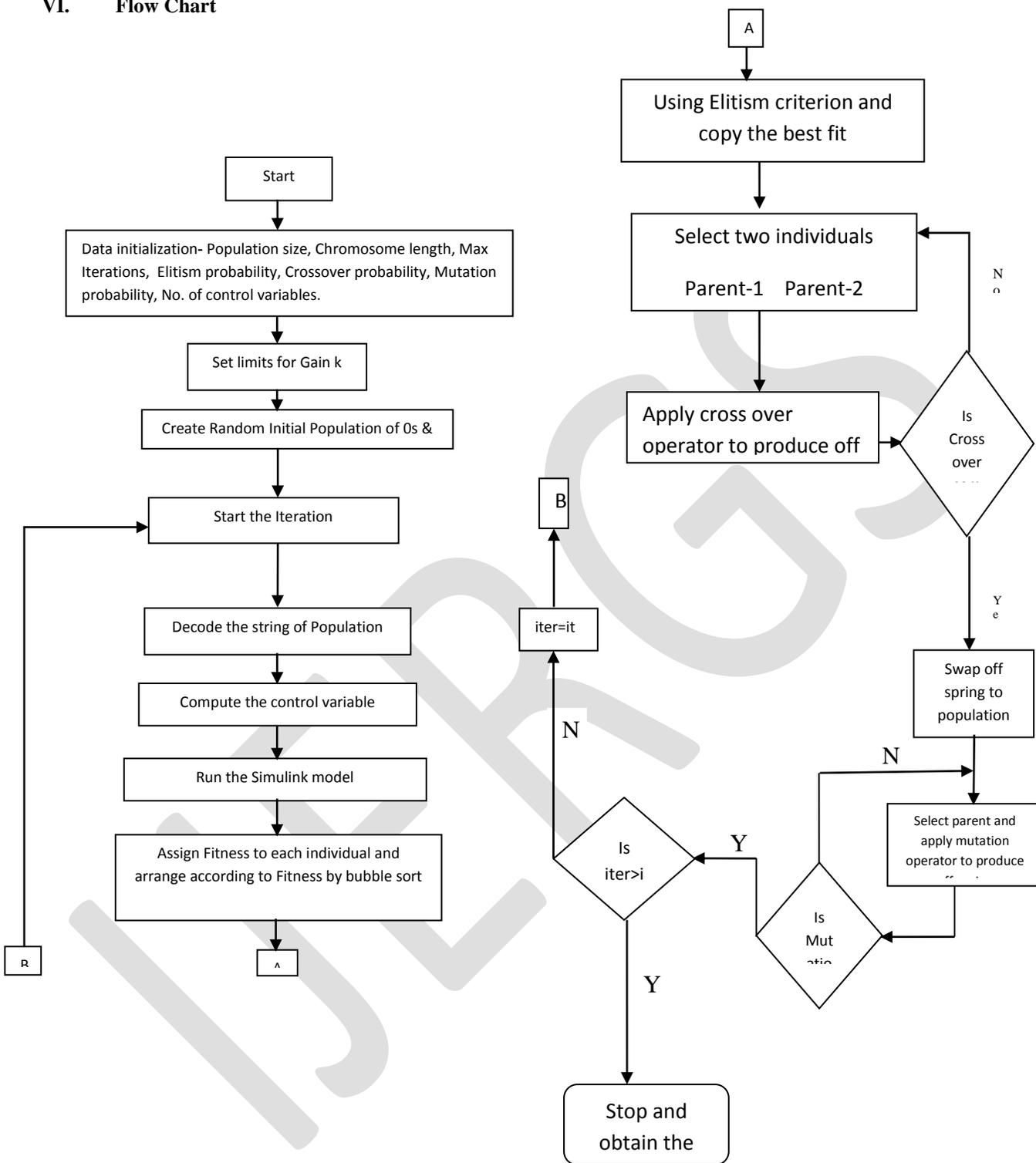


Figure 3 - Flow chart for Genetic Algorithm

VII. Simulation Results and Analysis

A two area thermal reheat power system, by using the integral controller that is tuned by Genetic Algorithm is shown in figure-2. The optimal controller gain values for the two areas obtained as shown in Table 2.

Table 2. Optimized values of system variables using Genetic Algorithm technique.

Interconnected Areas	Optimum Parameters	Controller & system parameters optimized by G.A.
Thermal power system -I	K_{i1} B_1 R_1	0.273438 0.425 2.4
Thermal power system -II	K_{i2} B_2 R_2	0.210938 0.425 2.4



Figure 4: Frequency deviation in area 1 with 1% step load perturbation in area-1 of a two area interconnected thermal reheat power systems using Integral controller tuned conventionally, $k_{i1} = .02810$ and $k_{i2} = .02035$, without GRC.

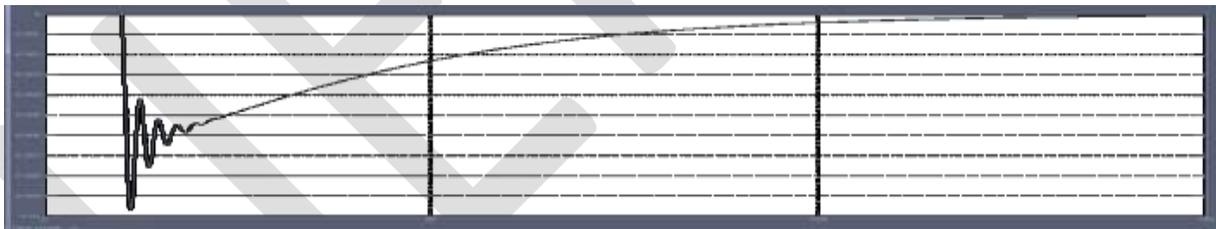


Figure 5: Tie - line power deviation with 1% step load perturbation in area-1 using Integral controller tuned conventionally, without GRC.



Figure 6: Frequency deviation in area 2 with 1% step load perturbation in area-2 using Integral controller tuned conventionally, $k_{i1} = .02810$ and $k_{i2} = .02035$, without GRC.

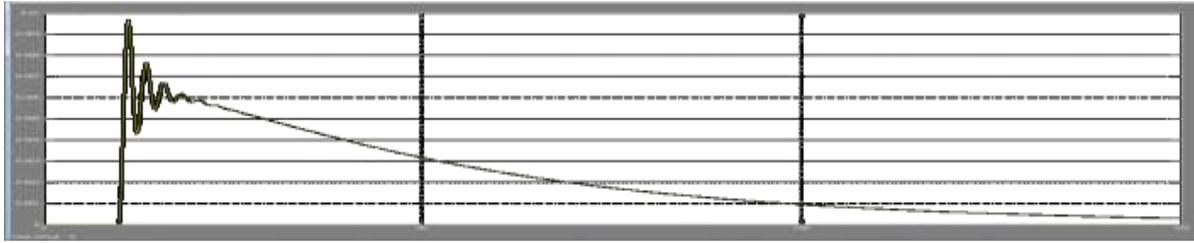


Figure 7: Tie - line power deviation with 1% step load change in area 2 with integral controller tuned conventionally without GRC.



Figure 8: Frequency deviation in area 1 of a two area interconnected thermal reheat power systems without and with GRC for 0.01 p.u.MW step load change in area 1, using Integral controller tuned by genetic algorithm.



Figure 9: Frequency deviation in area 2 without and with GRC for 0.01 p.u.MW step load change in area 1, using Integral controller tuned by genetic algorithm.



Figure 10: Frequency deviation in area 1 without and with GRC for 0.01 p.u.MW step load change in area 2, using Integral controller tuned by genetic algorithm.



Figure 11: Frequency deviation in area 2 without and with GRC for 0.01 p.u.MW step load change in area 2, using Integral controller tuned by genetic algorithm.

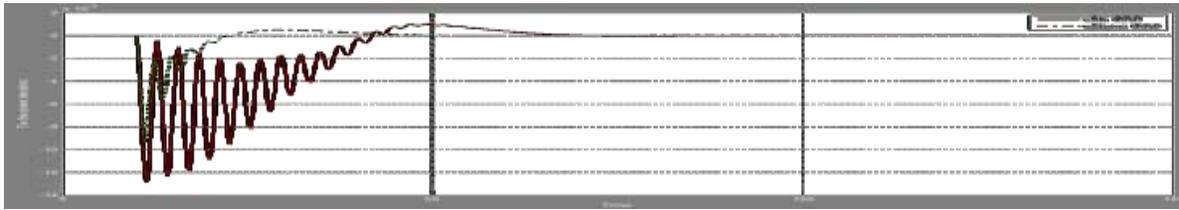


Figure 12: Tie - line power deviation with and without GRC for 0.01 p.u.MW step load change in area 1 with integral controller tuned by Genetic Algorithm.

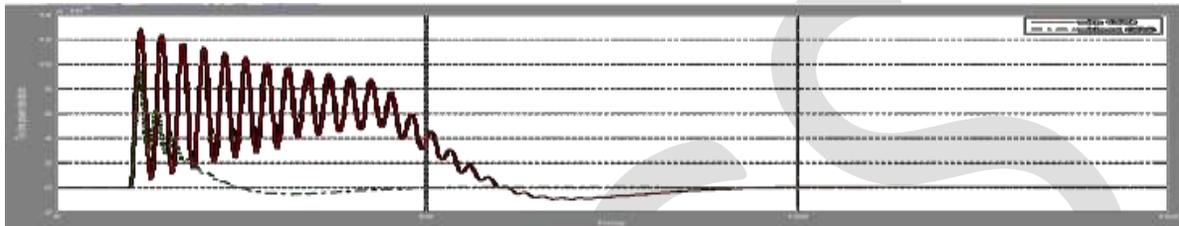


Figure 13: Tie - line power deviation with and without GRC for 0.01 p.u.MW step load change in area 2 with integral controller tuned by Genetic Algorithm.



Figure 14: Objective function (Integral square error), for 1% step load change in area-1 by Genetic Algorithm method with and without GRC



Figure 15: Objective function (Integral square error), for 1% step load change in area-2 by Genetic Algorithm method with and without GRC.



Figure-16: The performance index variation using Genetic Algorithm method.

VIII. Dynamic Response Analysis

When there is a change in an electrical load, the turbine-generator rotor accelerates or decelerates, and frequency undergoes a transient disturbance. The controller should not allow transient oscillations and trips the under-frequency relay connected in the system. Oscillations, settling time and overshoot are inter-related, and if there is a change in one parameter will affect the other parameter. Hence, the designed controller must be efficient for selecting the optimum gains to achieve better results. R is the speed regulation characteristic of the governor and value of R determines the slope of the governor characteristics and the change on the output for a given change in frequency. The speed governor system should be operated within the restricted control range of feedback gains due to system instability. Therefore, higher value of step load change P_d for a small R value will produce oscillations into the system. And with higher value of R , the oscillations of the system responses increase largely and settling time also increases. Hence value of R selected accordingly to obtain optimum results in terms of settling time & oscillations. If we increase the step load perturbations, then it is seen that due to increase of step load perturbation, i.e $\Delta P_{d1} > 0.01$ and $\Delta P_{d2} > 0$; the settling time for each of the controllers increase rapidly, which results much more oscillation. Therefore, the frequency response at small load change $\Delta P_{d1} = 0.01$ gives better response.

IX. Conclusion

Load frequency control of interconnected thermal reheat power system has been discussed in this paper by using the integral controller that is tuned by Genetic Algorithm, and optimum value of gain is obtained. The Integral controller is effective for controlling this frequency change along with suitable frequency bias feedback gain (B_i) and governor speed regulation parameter (R_i). The simulation studies on the systems have been done in MATLAB/SIMULINK, which shows that the Integral controller is effective for minimizing the frequency deviation, when GRC is taken into consideration. Further, the Genetic Algorithm technique used for optimization of K_i , B_i and R_i is very efficient and powerful computationally intelligent technique.

Nomenclature

R_1, R_2 Governor speed-regulation parameter of area 1 and area 2 (Hz/p.u. MW).

B_1, B_2 Frequency bias of area 1 and area 2.

$\Delta f_1, \Delta f_2$ Frequency deviation of area 1 and area 2

$\Delta P_{tie,i}$ Tie Line Power Deviation in Two Areas Systems

ACE Area control error

ISE Integral square error

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Reduction of power generation cost in generating station using IWO algorithm

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Abstract There are several units operating in the power generating station for satisfying the demand. But operating all units for the whole the day is not favour. So Unit Commitment (UC) problem always insisting on reducing the generating cost of the total operating units in the generating station by switching ON/OFF the units depending upon the load requirements. Most of the power stations uses Merit Order Scheduling for selecting the operating units in which the units are selected according to the ascending order of each units production cost which will lead to more wastages. In this project one of the evolutionary algorithms called Invasive Weed Optimization (IWO) Algorithm , a novel numerical stochastic optimization method inspired by colonizing weeds has been introduced for optimizing the operating cost of the power generating units, which gives more accurate result for reducing the generating cost and thus gives a better optimum solution.

Keywords— fuel cost, constraint, Unit commitment, Iwo, PSO ,comparison, optimization.

INTRODUCTION

In a power generating station, the main objective is to achieve the most economical power generation with satisfying the demand. Unit Commitment is used to select the generators in such a way that to satisfy the maximum demand with minimum generation cost. The unit commitment problem (UCP) is one of the high dimensional non linear most essential problem occurring in the power system. So it is necessary to solve this problem in an efficient way. Today's shortage of energy crises insists of developing many optimization technique for solving this unit commitment problem. Several algorithms like Genetic Algorithm (GA), Shuffled Frog Leaping Algorithm (SFLA), Particle Swarm Optimization (PSO) and others are successfully used for the unit commitment problem solution.

Even though GA is found to be efficient in global optimum searching, its running time is very long and limiting its usage. PSO keeps on tracking the information of the position and velocity of the particles. It is not employing any evolutionary operators like mutation and crossover and also it is easy to understand than GA. The control parameters of particle swarm optimization algorithm are number of particles, dimension of particles, maximum number of iteration, learning factors c_1 and c_2 and range of particles. Latterly the derivative free_ optimization algorithm called Invasive Weed Optimization (IWO) algorithm is developed which imitates the natural behaviour of the weeds colony. Here IWO and PSO are used to solve the Unit Commitment Problem (UCP) and comparison is made between IWO and PSO based upon its cost efficiency for UCP with 100 units of generators in the generating station using MATLAB programming.

PROBLEM STATEMENT

The power system network delivers hundreds of GWh of energy from the power generating stations to the power consumers. But the power demand varies for the whole day and its prediction is a tough process. So to ensure the economical and efficient power system with reliable power delivery there should be a careful schedule of operating units is required. Such ON/OFF scheduling the generating units is known as Unit Commitment. Since hundreds of units operating in the power station, it is a large scale optimization problem. The power generating has the following constraints are:

Power Balance Constraint:

Sum of the generated power of the power station at each hour must be equal to the demand requirement for the corresponding hour.

$$\sum_{k=1}^N P(k, t) U(k, t) = P(l, k)$$

Power generation limit:

There is a limit of power generation for all the generators

$$P(k, \min) \leq P(k) \leq P(k, \max)$$

Minimum Up Time (MUT):

The committed units must require minimum time for the units to be turned off and goes to offline.

$$T^{\text{Online}}(k, t) \geq \text{MUT}(k)$$

Minimum Down Time (MDT):

The decommitted units must require a minimum time for the units to be turned on and comes to online.

$$T^{\text{Offline}}(k, t) \geq \text{MDT}(k)$$

Spinning Reserve:

Spinning reserve means the total power generation by all the units in the power station minus the sum of demand requirement and power loss.

$$\sum_{k=1}^N P(k, t, \max) U(k, t) \geq P(l, t) + L(t)$$

OBJECTIVE FUNCTION

The objective function of unit commitment is to minimize the total power generating cost, FC, of the generating power from NU units over a particular time, TC. The total power generating cost from each generator for a given time period is the sum of fuel cost, C_k and the start-up cost, S_k during the given period.

The fuel cost, F_k , of the generator with output power, P_k , is,

$$F_k(P_k) = a_k + b_k P_k + c_k P_k^2$$

Where a_k , b_k , c_k are the cost coefficient of the units.

The start up cost, SC_k , of the generator depends on the unit's switched off time, T_{offtime} , before it start up.

$$SC(k) = \sigma_k + h_k (1 - e^{(-T_{\text{offtime},k}/z_k)})$$

Where σ_k , represents hot start up cost, h_k , represents cold start up cost. Then the total operating cost, TOC_T , for a time period, T , is the addition of the power production costs and the generator start up costs.

$$\text{TOC}_T = \sum_{t=1}^T \sum_{k=1}^N PC(k, t) U(k, t) + SC(k, t) [1 - U(k, t - 1)] U(k, t)$$

The fuel cost, C_k , depends on the generation of power $P_k(t)$ in the generating station. The start-up cost, S_k , depends on the unit state X_k , which means that the number of hours the generating units are either in ON or OFF state and U_k is the decision variable in discrete form which indicates whether the generating unit at the time t is either 1(up) or -1(down) from the generating unit at time $t+1$

INVASIVE WEED OPTIMIZATION

Bio inspired algorithms including evolutionary algorithms, swarm based algorithms and ecology based algorithms are the new revolution in solving optimization problem. Invasive Weed Optimization (IWO) is one of the ecology based bio inspired algorithms which is a stochastic search algorithm proposed by Mehrabian and Lucas in 2006 which simply imitates the natural behaviour of weeds in colonizing and searching place for growth and reproduction of the plants.

In IWO, the search space is represented as a vector in D dimensional space with the control parameters as weed population size, modulation index and standard deviation. The distinctive properties of IWO than other evolutionary algorithms are its method of reproduction, spatial dispersal and competitive exclusion. The process of IWO starts with initialization of a population which is the initial solution over the solution search space. Then the members in the population, based on the fitness, produce seeds. These produced seeds then randomly dispersed over the S dimensional search space by distributed random numbers with mean equal to zero and changing standard deviation. The equation of standard deviation for each generation is given as :

$$\sigma_{\text{itera}} = \{ [(I_{\max} - I)^{\text{nd}} / (I_{\max})^{\text{nd}}] * (\sigma_{\text{initial}} - \sigma_{\text{final}}) \} + \sigma_{\text{final}}$$

Where I_{\max} is the maximum number of iteration, σ_{itera} is the standard deviation at the particular current iteration and nd is the non-linear modulation index.

The steps of the IWO algorithm are explained as below:

Initialization

Initialization starts with inclusion of the initial solution population being scattered randomly over the S dimensional solution space.

Fitness Evaluation

Evaluate the fitness of individual plants and provide rank to the population based on their fitness.

Reproduction

Allow the plants to produce seeds according to on its own and the colony's lowest and highest fitness. This leads to concentrate on the highest fitness values in the search space and so the convergence increases towards the optimum value. The number of seeds produced by the weeds is based on the following equation:

$$W_n = [(\text{fit} - \text{fit}_{\min} / \text{fit}_{\max} - \text{fit}_{\min}) * (WS_{\max} - WS_{\min})] + WS_{\min}$$

where, fit is the present weed's fitness. fit_{max} and fit_{min} respectively stands for the maximum and the least fitness of the present population. WS_{max} and WS_{min} respectively stands for the maximum and the least weed's value.

Spatial Dispersal

The produced seeds are being scattered randomly over the S dimensional problem search space by normally distributed random numbers with mean equal to zero but changing variance. This is the condition required for staying the seeds near the weeds.

Competitive Exclusion

By invasive reproduction, the maximum number of seeds reached after certain iteration.. When each and every seeds found their position in the S dimensional search space, these seeds and the weeds will be ranked together. Since they have invasive nature, the lowest fitness weeds get eliminated while the highest fitness weeds only stay back and repeated.

Terminating criteria

When the number of iterations reached to I_{max} (maximum number of iteration), then the algorithm gets terminate.

PARTICLE SWARM OPTIMIZATION (PSO)

PSO is a stochastic method of population based search and is used for solving optimization problem. It takes the idea of social psychological behaviour of the swarm intelligence and applied it into many engineering optimization problems. This algorithm was first introduced by James Kennedy and Russell.C.Eberhart in 1995. In PSO, a swarm (group of fishes, group of horses, group of birds, etc..) consists of many particles (individuals) and each has a potential solution. A particle has its own position and velocity which will keep on changing for obtaining the optimized output.

Velocity updating equation:

$$V_k^{s+1}(t) = B * V_k^s(t) + C1 * \text{rand} * (P_{bk}^{RS} - P_k^{RS}) + C2 * \text{rand} * (P_{gk}^{RS} - P_k^{RS})$$

Position updating equation:

$$P_k^{RS} = P_k^{RS} + V_k^{s+1}(t)$$

Where V(t+1) is the updated velocity of the particle in the subsequent iteration, V(t) is the velocity of the particle in the present iteration, B is the inertial transitive which shows the effect of the particle's personal experience on the same particle's next position changing, P_{bk}^{RS} is the neighbourhood best position, V_k^S is the particle's current position, C1*rand is the evenly scattered number within the interval of [0,C1] and C2*rand is the evenly scattered number within the interval of [0,C2].

The followings are the processing steps of PSO:

Initialization

Initially the particles has to be selected arbitrarily as initial particles and then initialised the initial population. The swarm size has its limit as K_p*k, where K_p is the total number of particles in the swarm and k is the number of stages.

Velocity Updating

Velocity is updated by considering the particle's current velocity and the particle having best fitness function in the swarm. Velocity updating is done by using the equation (2).

Position Updating

Position updating for each particle is done by summing up the updated velocity and the particular position of the particles in the swarm.

COMPARING RESULTS

The performance of IWO and PSO for a 100 units generating system satisfying 24 hours demand is compared in terms of cost and convergence speed for solving the unit commitment problem is done and is shown in the table 1. The MATLAB program for a 100 units generating system for committing the units using both PSO and IWO technique is written and its performance is shown in the table 1. From that it is shown clearly that the IWO is cost efficient than PSO for committing the units in the generating station containing 100 generating units. Also the IWO converged very quickly with convergence speed 130 seconds than the PSO which is with 168 seconds due to its better performance. The number of iteration required for reaching the optimum solution is less for IWO than PSO

PSO (\$)	IWO(\$)
5263300	5252300

Table 1 Cost comparison of PSO and IWO

CONCLUSION

In this paper the performance comparison of the Invasive Weed Optimization and Particle Swarm Optimization technique is done for cost efficient and convergent speed for a 100 units system satisfying 24 hours demand. From the result it is found that the convergence speed of IWO is more than PSO algorithm and so IWO is more reliable than PSO for optimum result. IWO is not only robust but also it is easy to understand its steps and process. This paper shows that IWO reduces the execution time along with the optimized result with quicker convergence speed than the PSO algorithm.

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Efficient Classification of Lung Tumor using Neural Classifier

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Abstract- Lung Cancer, the dreaded disease is one of the dominant causes of sufferings and death in modern world. Cancer is due to the uncontrolled proliferation of the body's cells resulting in an abnormal growth or disruption of the body's auto-regulation. Its cure rate and prognosis of the patient depends mainly on the early detection and diagnosis of the disease. Manifestation of Lung cancer in the body of the patient reveals through early symptoms in most of the cases. This study is aim to find out the feasibility of Lung cancer detection by systematic study of the risk factors. An expert system is developed based on supervisory neural network based learning approach, where in initially the input parameters and the output is mappable.

Keywords—Signal & Image processing, neural network, Transformed domain techniques, MATLAB, Microsoft Office Excel etc.

INTRODUCTION:

Lung Cancer disease is a new growth of tissue resulting from a continuous proliferation of abnormal cells that have the ability to invade and destroy other tissues. Cancer, which may arise from any type of cell and in any body tissue, is not a single disease but a large number of diseases classified according to the tissue and type of cell of origin. In the Indian scenario Lung Cancer disease has become a one of the vital cause of death. Cancer deaths could be controlled to a large extent if this disease is diagnosed at an early stage and proper treatment is given to the patient. Knowledge-based expert systems, or expert systems, use human knowledge to solve problems that normally would require human intelligence. These expert systems represent the expertise knowledge as data or rules within the computer. These rules and data can be called upon when needed to solve problems. Mathematical models have been developed to predict output variable on the basis of input variable. The traditional approach involve simultaneous multiple linear regression analysis and backward elimination of variable to discriminate the most appropriate models [7]. In contrast, new Artificial intelligence models, namely artificial neural networks, can solve problems of classification and estimation even in the presence of non-linear relationship between dependent and independent variable, or of a large database with numerous non-homogeneous variables or of a large database with numerous non-homogeneous variables, or both [10]. The tumor is two types malignant and benign .A tumor does not invade the surrounding tissue called benign tumor. If tumor is invade and damage the surrounding of tumor called malignant tumor of cancer. Our objective was to develop and evaluate semiautomatic computer-aided diagnostic (CAD) schemes for distinguishing between benign and malignant pulmonary nodules by use of features extracted from CT Scan Images.

Research Methodology:

It is proposed to study Efficient Classification of Lung Tumor using Neural Classifier. Data acquisition for the proposed classifier designed for the diagnosis of Lung Cancer shall be in the form of CT Scanned images. Image data will be Collected from the different- different hospitals of the country .The most important un correlated features as well as coefficient from the images will be extracted .In order to extract features, statistical techniques, image processing techniques, transformed domain will be used.

For detection of lung cancer following technique will be used

Statistics, Image processing, Transformed domain techniques. The research work Software's such as Matlab, Neuro solutions, XL Stat will be used.

Research Objectives:

- 1] To maintain the correctness & accuracy in the diagnosis of lung cancer.
- 2] To increase the accuracy for the diagnosis of lung cancer.
- 3] To reduce confusion between of benign tumor, Malignant tumor.
- 4] To design feature and coefficient from, CT Scanning of chest.

Literature Survey-

1] Artificial Neural Networks classifiers have been used in a variety of applications ranging from industrial automation to medical diagnosis. Because of its characteristics like fast learning, adaptability, fault tolerance, solving complex non linear problems efficiently, good recognition Neural Networks are being used in the medical domain to benefit the medical fraternity and patient's community alike, as opposed to the conventional methods. In the present paper we have conducted a survey which includes a detailed review of the various applications where Neural Networks have been used in Lung Cancer diagnosis in the recent years. Neural Networks classifiers have been used in a medical diagnosis because of its characteristics like fast learning [1].

2] The Lung Cancer detection survey after applied several methods and a give an innovative way for Lung Cancer detection using Artificial Neural Network, Fuzzy Min-Max Neural Network and Fuzzy C Mean. The classification methods are applied to both FMN and FCM on the X-ray 130 cancerous and non-cancerous datasets available. Lung Cancer X-ray Image Datasets can be used in the future to identify the best results [2].

3] Lung cancer nodule at early stage using SVM Classifier has been proposed here. The Structural and Textural Features have been used for describing the nodule. A comparison of classification accuracy for ANN, KNN and SVM Classifiers was made on lung CT scan images of stage I and stage II [3].

4] The classification of lung nodules as normal/abnormal is done by using SVM. In this paper, it is shown that RBF kernel gives better classification performance. The future work is to do the classification performance by using multi-class classifier type [4].

5] Neural-digital computer-aided diagnosis system based on a parameterized two-level convolution neural network and on a special multi label output encoding procedure. In this Receiver Operating characteristic (ROC) method with area under the ROC(Az) as the performance index. And its outcome of research It is proven to be promising and to be extensible, problem-independent and applicable to other medical diagnostic task in 2-D image environments[5].

6] CAD system based on a two-level artificial neural network architecture. This was trained, tested and evaluated specifically on the problems of detecting lung cancer nodules found on digitized chest radio graphs. and its outcome of research The system is capable of detecting nodules when they are in their initial stages[6].

7] A three-layer, feed-forward, artificial neural network with a back-propagation algorithm. And its outcome of research is this scheme has improved the diagnostic accuracy of radiologist who is differentiating benign from malignant pulmonary nodules on high-resolution CT [8].

8] Recommendations of different Radiological diagnostics on size and number of years to develop these nodules. And its outcome of research Mentioned sensitivity, specificity and accuracy of the diagnostic method for different radiological diagnostic[9].

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CONCLUSION

Use of the proposed Efficient Classification of Lung Tumor using Neural Classifier will be result in more accurate and reliable diagnosis of lung cancer disease.

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Goal of Modern Industries: “Zero Defects, Zero Effect”

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Abstract- The requirement of global market is to produce highest grade quality products corresponding to world class standards. This can be achieved by providing services which are ecologically superior and economically viable. The efforts must be made to enhance the efficiency, minimizing waste and optimum use of resources. This paper presents an approach for the industries to produce zero defect products i.e. products with “**zero non-conformance/zero non-compliance and zero waste**”. It is also essential that during production industries should ensure that they cause zero effect to the environment i.e. “**zero air pollution/liquid discharge/solid waste and zero wastage of natural resources.**”

Keywords- Zero defect, Zero effect, Six sigma, DMADV, DMAIC, Total quality management, Benchmarking, sustainable environment.

I. INTRODUCTION

The objective of modern industry “Zero Defect, Zero Effect” indicates towards the competitiveness, from the perspective of an individual or an industry. The roles of business strategies, industrial development policies and individual initiatives in maximizing productivity, calls for quality improvement & environmental protection. Productivity is defined as an indicator of a nation potential for growing economically in short and medium run. Productivity is a culture of bringing and accepting about continuous improvements including the environmental concern.

Presently major countries of the world are facing a big challenge towards environmental protection. Due to neck to neck industrial competition in this century, no doubt unimaginable technological advancements have taken place which side by side has put an adverse impact towards the degradation of the environment. It is true that any kind of development can be successful only and only if it produces a zero effect on the environment and the surroundings.

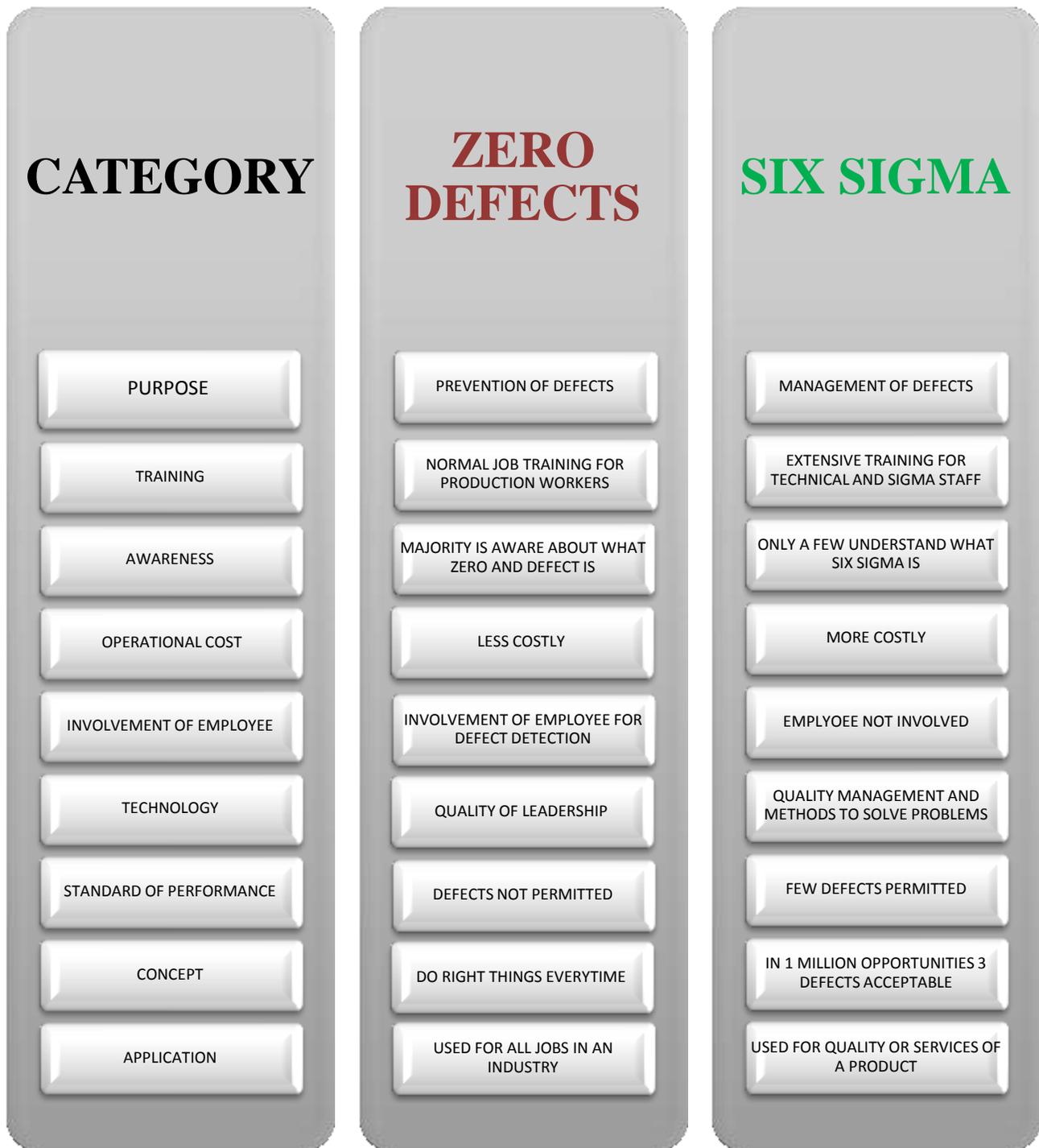
II. MODERN INDUSTRY APPROACH FOR ZERO DEFECT

Due to economical changes the world has brought about complications and increasing day to day level of competition in each and every sector of industry. As a whole productivity is one of the most important criteria in competitive market of each sector, nation or an industry. Quality output is a state of being able to perform in this competitive world. It is related with the ability to produce defect free and reliable products. It is the degree to which a modern industry can produce goods and services with zero defects, which meet the test of International Markets i.e. it does not come back (get rejected) from the world market

In the early 1960s, the idea of zero defects was discovered by Phil Crosby and was implemented at the Martin Company in Orlando, Florida. The various quality programs such as Total Quality Management (TQM), statistical process control (SPC) and ISO 9001 has taken up all the oxygen, and presently the zero-defect approach is followed by some industries.

In the late 1980s, Six Sigma approach entered the industry. It was a part of the capability study used in SPC. It has proved as a boon for the industries and is very popular today. It was developed by Motorola.

The minute differences between zero defects and six sigma are illustrated below:



III. QUALITY TOOLS FOR ZERO DEFECT

- Total quality management(TQM)
- Quality specifications and costs
- TQM Tools: external benchmarking
- ISO 9000
- Service quality measurement(SQM)
- Six sigma quality

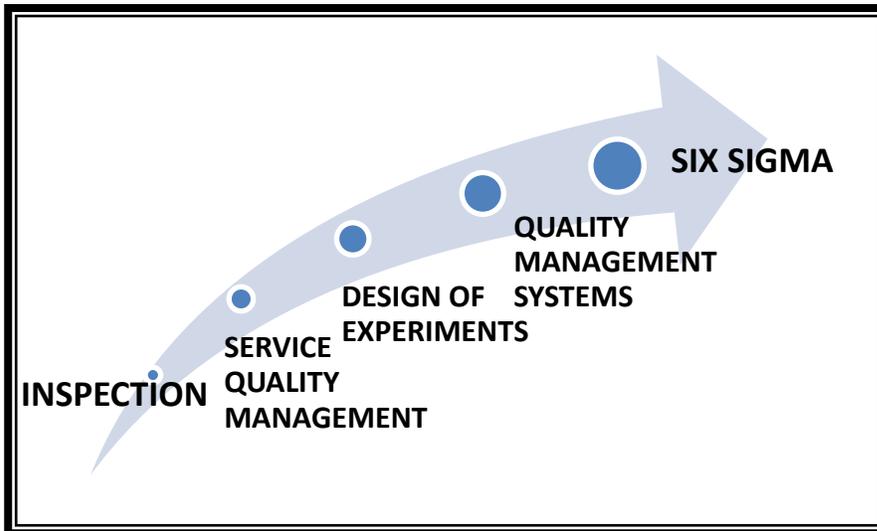


Fig. (1) Evolution of six sigma

3.1. TOTAL QUALITY MANAGEMENT

Organizations approach on management is mainly centered on the Quality, which is based on the active participation and membership of all of its member's. This aims at success in long term, through the satisfaction of customer, and profits and benefits to every member of the organization and to the society.

TQM mainly involves a cultural change which is based on continuous improvement.

3.1.1. ELEMENTS OF TQM

- Commitment of top management
- Involvement of the customer
- Process of design production for quality
- Process of control production for quality
- Developing partnerships with the supplier.
- Customer service, distribution
- Teams building of employees that are empowered.
- Continuous improvement
- Benchmarking.

3.2. EXTERNAL BENCHMARKING

- We can compare ourselves with a reference point called benchmarking.
- Constantly inculcating the best and thus bringing about a change.
- This benchmarking is used to produce a performer of world class.
- Identifying the core competency and improve on it - IT, miniaturization

3.2.1. STEPS

- Determine this benchmarking object
- Then select the partner
- Then compare to dig up gaps
- Then determine the action plans and the objectives of the process.

- Implement and review

3.3. SIX SIGMA QUALITY

Six sigma is basically a business process improvement approach which focuses on attaining the final quality level or defect level that is in parts per million, which is a pretty good level of quality. Six Sigma tries to eliminate the causes of defects and any errors that might be there in manufacturing service processes. It focuses on the output and those particular outputs that are critical customers, and tries to look for a clear financial return for the organization. Therefore the main objective of six sigma is to reach a defect level that is only in parts per million.

The origination of the term Six Sigma came from the terminology that is related with the [manufacturing](#), particularly terms related with the statistical modeling of industrial manufacturing [processes](#). The maturity in an industrial manufacturing process is described by the rating of sigma which indicates the percentage of zero defect products that it creates and its yield.

Also the term "six sigma processes" comes from the notion, that if any of the one has a deviation of six standards within the mean process and the nearby limit of specification, no items will fail to meet specifications. This process is mainly based on the method of calculation which is employed in capability study process.

Features that make Six Sigma differ from other quality improvement techniques include:

- A strong focus on achieving the measurable and determinable economic returns from any kind of the Six Sigma project.
- An additional prominence on strong and determined management support and leadership.
- A clear assurance to making recommendation on the basis of provable statistical methods and data, rather than guesswork and the assumptions.

Six Sigma approach follows the two project methodologies

- DMAIC aims to improve the prevailing business processes. This is articulated as "duh-may-icky".
- DMADV aims at developing new process designs and new product. This is articulated as "duh-mad-vie".

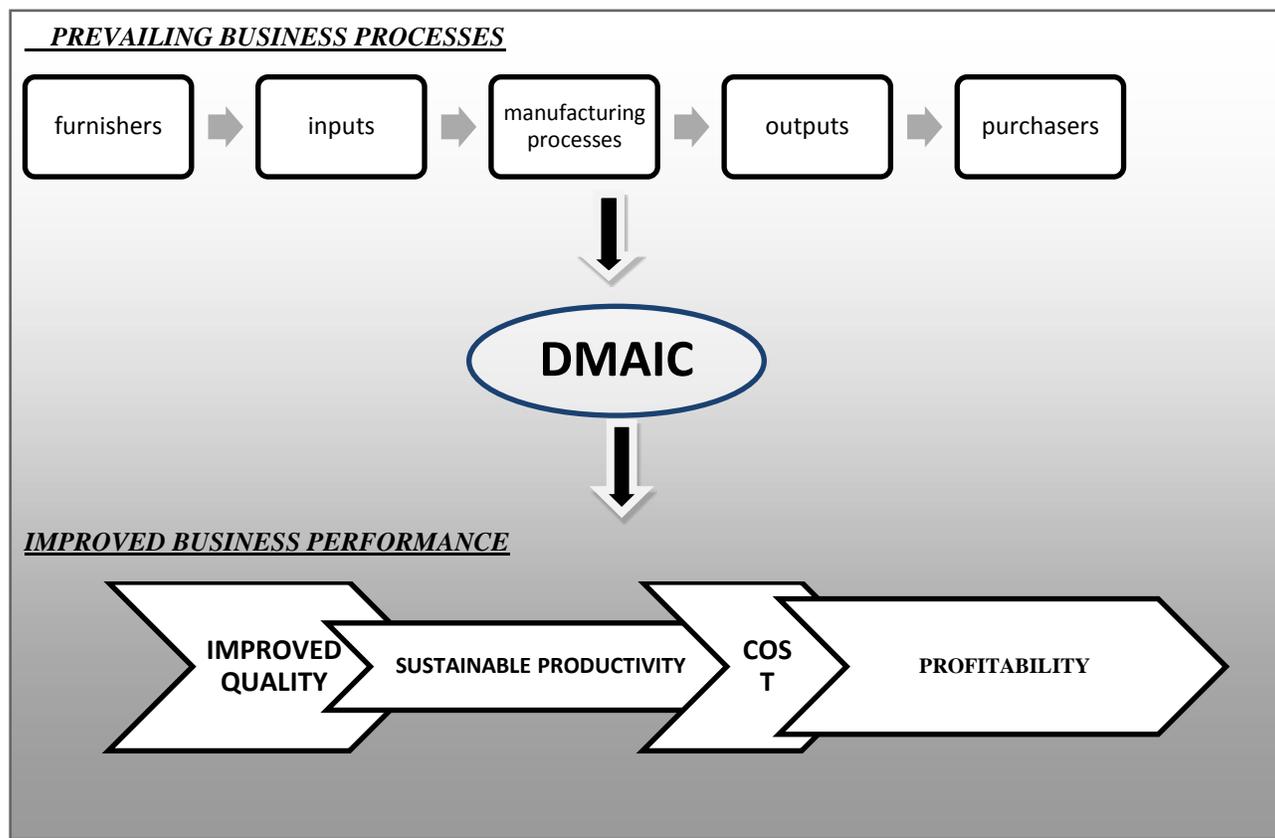


Fig. (2) DMAIC approach



fig. (3) DMADV approach

IV. SIX SIGMA IMPROVEMENT MODEL



V. MODERN INDUSTRY APPROACH FOR ZERO EFFECT

Developing countries have less efficient manufacturing practices than that of developed countries. It means the developing countries waste their income and resources by consuming more water, energy, materials than required as well as providing damage to the environment. But due to advancement in the manufacturing processes, there are ample of opportunities to save money, resources and in turn less harm to the environment.

As we know that, in the 21st century the technology has grown so much rapidly, a lot of industries have been developed and science has advanced a lot, due to which the manufacturing has come into existence. Because of the industrial revolution, the Homo sapiens have advanced a lot. Previously, the number of industries was very less, due to which the amount of environmental pollution and degradation caused by their manufactured components was also very less. But now, as the number of industries are growing and becoming full scale industries, the level of harmful and detrimental impact that their manufactured components are causing to the environment is increasing at a alarming rate.

Most of the pollution on the planet earth is mainly due to this increasing number of manufacturing industries. Most of the countries facing rapid and sudden growth of such number of industries are finding it to be a very critical problem that has to be brought under control immediately. The main issues concerning with the environmental impact of components is the use of volatile organic compounds, heavy metals and non-renewable oils that put an adverse impact on the surroundings. This problem can only be controlled only and only if the manufacturing industries produce such products which have a zero effect on the surroundings that is by bringing zero effect approach into practice.

An industry is a gathering of companies which manufacture a related set of goods and services that are finally in the hand of consumers. A number of industries, which manufacture a certain essential commodity or product, work together in collaboration with one another. These industries are further divided into three groups:

- **Primary industries** - These industries gather, collect, and harvest resources.

- **Secondary industries-** these industries collect raw materials, convert them into useful products.
- **Tertiary industries-** these industries are those which produce services for advertising or for individuals.

All the three groups differ in the level of pollution produced by their manufactured products.

Some of the industries have developed some new technologies which do not produce any harmful impact on the environment, whereas some of the factories still manufacture such products or components which have a detrimental impact on the surroundings and the nearby environment.

The secondary industry is the one which produces the highest amount of pollution, which degrades the environment the, most.

The objectives of industries must be

- To evaluate the efficiency and efficacy of resource utilization (i.e., people, machines and materials).
- To identify the areas of risk, environmental liabilities, weakness in management systems and problems in complying with regulatory requirements.
- To ensure the control on waste/pollutant generation from the products produced by them.

There must be a verification process, whereby the facilities must establish the extent to which it is complying with environmental regulations, rules, limits etc. Operational risk concentrates on the potential frequency and consequences of environmentally damaging activities in the raw material and product storage/handling and manufacturing process.

Waste audits must be intended to identify the possibilities for improvement. The recommendations contained in waste audits must not be based on objective comparisons between expectation and results, but instead should be based on technical and economic evaluation of various waste minimization alternatives.

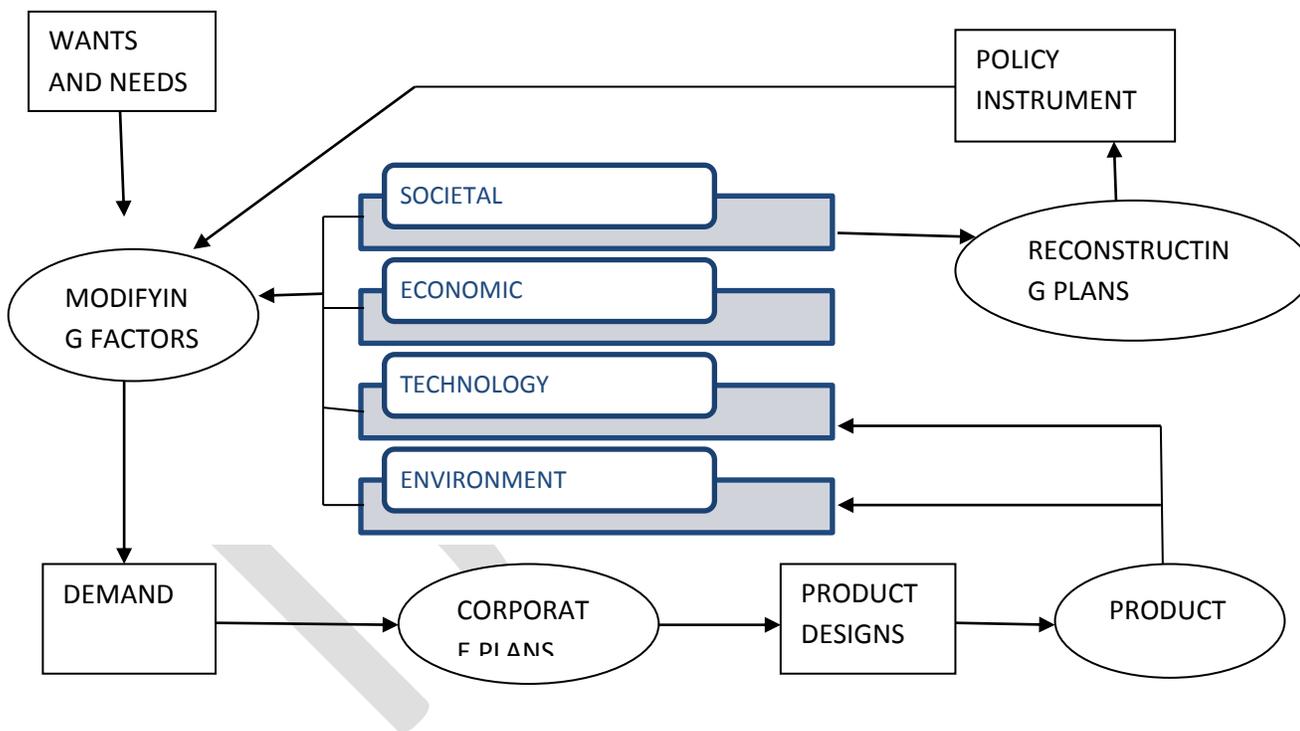


Fig. (4) Interactions that take place between Industry, Society, and the Environment

VI. CONCLUSION

It must be clear that the entrepreneurs should never compromise mainly on two points i.e. **first is the Zero defect and, second, Zero effect.** It is suggested that the products should be manufactured in such a way that they bear zero defects and if exported, the goods

should not get rejected in the international markets. These goods produced by manufacturing industries should also have zero effect that they should not produce any sort of detrimental or negative impact on the environment. Considerations towards environment should be taken at every stage of the manufacturing life cycle so as to manage and assess the possible potential risks. The inputs to and outputs from each stage of the manufacturing life cycle should be analyzed to assess their impact on the environment and surroundings.

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BIDIRECTIONAL DUAL ACTIVE BRIDGE LCL RESONANT CONVERTER WITH FUZZY LOGIC CONTROLLER

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Abstract— This project presents a bidirectional LCL resonant converter with dual active bridge for dc distribution applications. This converter allows both forward and reverse power transfer between the source and the load. To maintain the output voltage constant, irrespective of load and line disturbances, it is necessary to operate the converter as a closed loop system. In recent years, the Fuzzy Logic Controller (FLC) has become more popular due to its simplicity, automated control and need of less skilled labour. The proposed FLC for bidirectional DC to DC converter is validated through simulation in Matlab/Simulink environment. A hardware setup is also developed to validate the simulation.

Keywords— DC-DC Converter, Bidirectional power, LCL, Fuzzy logic, Dual active bridge.

INTRODUCTION

Power electronic circuits primarily process the energy supplied by a source to match the form necessary by the load, by means of using semiconductor devices to regulate the voltage and current. The energy is usually available from the utility grid or from a bank of batteries with the applications ranging from high-power conversion equipment processing megawatts to everyday low power equipment with requirements of a few milliwatts. With rising importance on compact, smaller and effective power systems there is increasing attention in the possibility of using bi-directional converters [1], [3]-[5], particularly in DC power based applications like planetary, telecommunication and computer systems. In[2], an auxiliary switch control for bidirectional dc converter is presented to improve the efficiency of the converter which can be used in electric vehicle. High power isolated bi-directional DC-DC converters afford galvanic isolation, V2G capability and diminish the cost and impression of the system. Maintaining high power efficiency in wide vehicle battery pack voltage range is required. Three full bridge based high power bidirectional DC-DC converters are conceptually designed for this application [6]. According to a recent report from the IEA, fossil fuels are subsidized at a rate about five times greater than renewables. Just as cellular telephony has brought telecommunications to remote parts of the globe that never had access to the technology before, distributed generation system offers hope for progress and a better standard of living for millions of people that have never had the opportunity before [7]. A current sourced bidirectional inductive power transfer interface which is suitable for simultaneous contactless charging / discharging of multiple electric vehicles or equipment [8]. A dual phase shift algorithm for DAB converter in whole operation range covering wide voltage ratio of primary and secondary side DC-link, whole possible duty ratio and phase shift angle is used in [9]. A bidirectional inductive power transfer system is used as the wireless interface between the electric vehicle and the DC bus while a bidirectional DC-DC converter serves as an interface between the battery system and DC bus to store and retrieve energy [10]. Bidirectional DC converter with single or three phase input, power factor correction for single phase input, controllable power factor for three phase input, isolation and voltage matching with high-frequency transformer that offers low volume, weight and cost is analysed in [11]. The control algorithms for bidirectional DC converter are Dual-Phase-Shift Control (DPSC), Model-based Phase-Shift Control (MPSC) and enhanced MPSC [12]. The intelligent technique based controlling strategy improves the dynamic behaviour of the converter [13]. Furthermore, several soft-switching converter topologies such as series/parallel resonant, dual active bridge, phase-shifted bridge, auxiliary resonant commutated bridge and hard switching PWM have been proposed [14], [15].

In this paper, a resonant bidirectional dual active bridge topology applied with soft switching technique is proposed. Bidirectional dc-dc converters exhibit as an ever-lasting key component to interface between a high-voltage bus and a low voltage bus. The two buses are interconnected by a bidirectional dc-dc power converter to permit power flow in both directions thus enabling the excessive energy to be stored in the battery and later delivered back to the system when it is necessary. Therefore, in order to connect those buses while keeping reduced volume, weight and cost, a high power density, high efficient bidirectional dc/dc converter is required and the analysis and design of a proposed solution based on Fuzzy Logic Controller is the subject of this paper.

PROPOSED TOPOLOGY

This paper proposes a bidirectional DC – DC converter controlled by Fuzzy Logic Controller. The circuit diagram of the proposed bidirectional converter is shown in Fig.1. For simplicity, the active source is represented by dc source which can be a PV system. The bidirectional DC converter allows both forward and reverse power transfer between the source and the load. During forward power transfer, bridge converter 1 acts as inverter and the other converter acts as rectifier and vice versa during reverse power transfer. The dynamic behaviour of the system can be improved by the application of Fuzzy Logic Controller

BIDIRECTIONAL DC CONVERTER (BDC) WITH LCL NETWORK

Fig.2 shows the block diagram of the bidirectional DC converter which consists of a high frequency transformer and two bridge converters located on the primary and

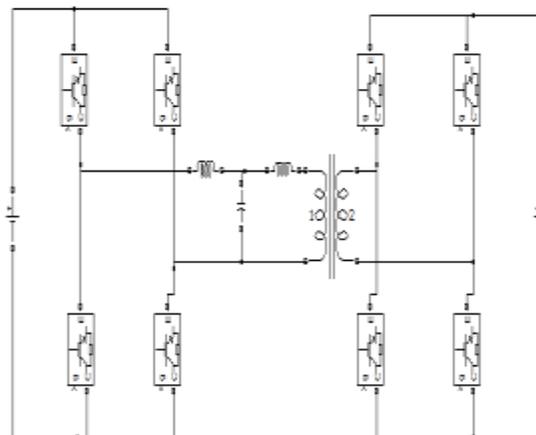


Fig.1. Proposed BDC converter

secondary sides of the transformer. The high frequency transformer provides the required isolation and voltage matching between the low and high voltage buses. The transformer leakage inductance serves as the instantaneous energy storage device. The operation is bidirectional, that is, each bridge converters can be considered as primary or secondary depending on the direction of power flow.

Applications that require exchange of power from the source to the load and viceversa have conventionally been implemented with two unidirectional converters; each processing the power in one direction. Then they are implemented by soft switching and resonant techniques. But it increases the component rating, circuit complexity and its losses. To overcome these difficulties bidirectional converter is proposed which has the advantage of low stress on switches, galvanic isolation and reduced components count. The BDC is located between the high voltage bus and the low voltage bus which is also connected to DC loads such as anti-lock brakes, fans, electric power steering, heated seats and electronic ignition in the vehicle.

Apart from out-dated applications in DC motor drives, novel applications of BDC comprise energy storage in renewable energy storage systems, fuel cell systems, hybrid electric vehicles (HEV) and uninterruptible power supplies. In HEV applications, BDCs are required to link different dc voltage buses and transfer energy between them.

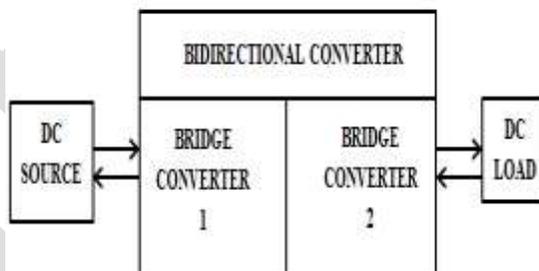


Fig.2 Block Diagram of BDC

High efficiency, less weight, compact size and high consistency are certain significant necessities for the BDC used in such applications.

At high frequencies, DC – DC converters experience high switching losses, reduced reliability, EMI and acoustic noise. These switching losses can be reduced by introducing a resonating tank circuit. The so called converters with resonating tank circuit are series resonance converters (SRC) and parallel resonance converters (PRC). In these converters, the tank circuit is made up of simple L and C components connected either in series or parallel to the load. Though SRC has better load efficiency, it suffers from poor load regulation. On the other hand, in PRC no load regulation is possible but it also suffers from poor load efficiency and lack of DC blocking for the isolation transformer. Moreover, both SRC and PRC draws large reactive current component and therefore incur large conduction losses. Therefore, in this paper it has been suggested to design resonant converter with three resonating component (LCL) for better voltage regulation.

MATHEMATICAL MODELLING OF LCL NETWORK USING STATE SPACE TECHNIQUE

The equivalent circuit of LCL network is shown in Fig.3. The mathematical modelling using state space technique can be obtained assuming all the components to be ideal.

The vector space equation for the converter is

$$\dot{X} = AX + BU \quad (1)$$

Where

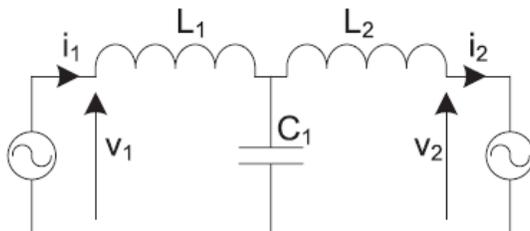


Fig.3 Equivalent circuit model of LCL network

$$\dot{X} = \frac{d}{dt} \begin{bmatrix} i_{L_1} \\ V_C \\ i_{L_2} \end{bmatrix}, X = \begin{bmatrix} i_{L_1} \\ V_C \\ i_{L_2} \end{bmatrix}, U = \begin{bmatrix} V_i \\ V_o \end{bmatrix}$$

The state space equation can be obtained from the Fig.3. The state equation for LCL converter is

$$\frac{di_{L_1}}{dt} = \frac{mV_i}{L_1} - \frac{V_C}{L_1}$$

$$\frac{dV_C}{dt} = \frac{1}{C} (i_{L_1} - i_{L_2})$$

$$\frac{di_{L_2}}{dt} = \frac{-nV_o}{L_2} + \frac{V_C}{L_2}$$

Where

$$A = \begin{bmatrix} 0 & -\frac{1}{L_1} & 0 \\ \frac{1}{C} & 0 & -\frac{1}{C} \\ 0 & \frac{1}{L_2} & 0 \end{bmatrix}, B = \begin{bmatrix} \frac{m}{L_1} & 0 \\ 0 & 0 \\ 0 & \frac{-n}{L_2} \end{bmatrix}$$

Equation (1) can be written as

$$A = \begin{bmatrix} 0 & -\frac{1}{L_1} & 0 \\ \frac{1}{C} & 0 & -\frac{1}{C} \\ 0 & \frac{1}{L_2} & 0 \end{bmatrix}, B = \begin{bmatrix} \frac{m}{L_1} & 0 \\ 0 & 0 \\ 0 & -\frac{n}{L_2} \end{bmatrix}$$

$$\frac{d}{dt} \begin{bmatrix} i_{L_1} \\ V_C \\ i_{L_2} \end{bmatrix} = \begin{bmatrix} 0 & -\frac{1}{L_1} & 0 \\ \frac{1}{C} & 0 & -\frac{1}{C} \\ 0 & \frac{1}{L_2} & 0 \end{bmatrix} \begin{bmatrix} i_{L_1}(t) \\ V_C(t) \\ i_{L_2}(t) \end{bmatrix} + \begin{bmatrix} \frac{m}{L_1} & 0 \\ 0 & 0 \\ 0 & -\frac{n}{L_2} \end{bmatrix} \begin{bmatrix} V_i \\ V_0 \end{bmatrix}$$

FUZZY LOGIC CONTROLLER (FLC)

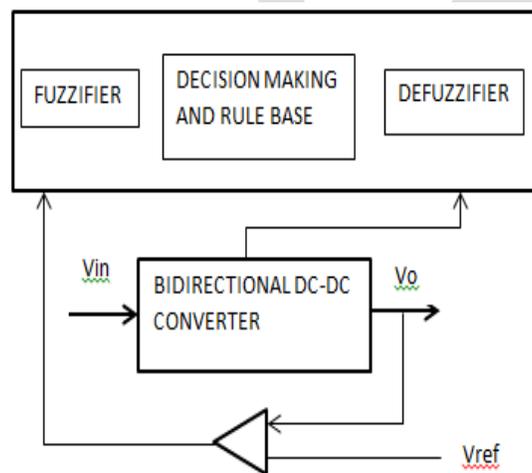


Fig.4 Block diagram of FLC

Fig.4 shows the block diagram of the FLC. In FLC, basic control action is determined by a set of rules. These rules are determined by the system. Meanwhile the numerical variables are converted into linguistic variables, mathematical modelling of the system is not required in fuzzy control. Converter circuits contain non – linearities like delay, overshoot, large settling time, rise time etc. Due to these non-linear characteristics of DC – DC converters, linear controllers do not allow disturbance rejection and also possess slow response time. So, there is more interest in using non-linear control techniques to improve the performance of the DC – DC converters. The process of FLC design includes the following process.

- (i) Fuzzification: Process of representing the inputs as suitable fuzzy value.
- (ii) Decision Making: Appropriate control action to carried out. It is based on the knowledge base and rule base.
- (iii) Defuzzification: Method of converting fuzzified output into crisp value.

The inputs to the FLC are error signal and difference of error signal. The output is the duty ratio of the switching signal.

$$E(k) = V_{ref} - V_o$$

$$CE(k) = E(k) - E(k - 1)$$

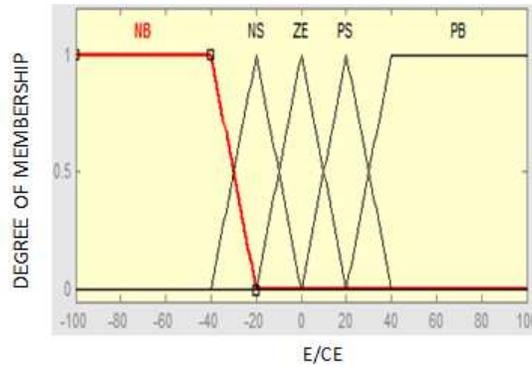


Fig.5 Membership functions of Error input (E) and Change in error(CE)

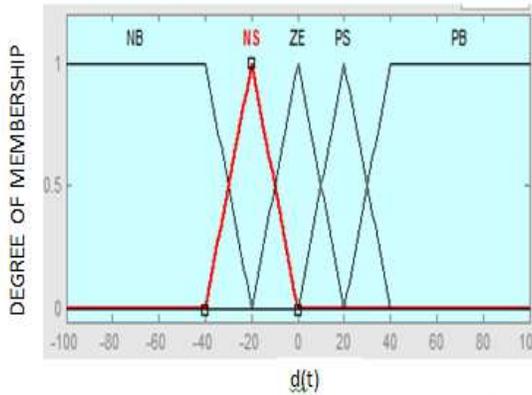


Fig.6 Membership functions of output duty cycle.

$$d(t) = d(t - 1) - d(X(t))$$

Where

- $E(k)$ – Error signal
- $CE(k)$ – Change in error signal
- $E(k - 1)$ – Previous error signal
- $d(t)$ – Duty cycle at t_{th} instant
- $d(t - 1)$ – Duty cycle at $(t-1)$ instant
- $d(X(t))$ – Change in duty cycle

Mamdani type controller is selected for this application and the basic rule of this type of controller is :

IF e is A and de is B THEN d(t) is C
 Where A and B –Fuzzy subsets
 C – Fuzzy singleton

The universe of discourse is distributed into five subsets such as Negative Big(NB), Negative Small(NS), Zero(ZE), Positive Small(PS), Positive Big(PB).

The Fig.5 shows the membership functions of the inputs. To maintain the voltage at desired level the triangular membership of error and control output are cramped near to zero for the given operating condition. For improving the controller performance, membership functions are further adjusted based on trial and error method.Fig.6 shows the membership functions of the output variable

SIMULATION RESULTS

In this section, the Matlab/Simulink simulation results for different operation modes of the bidirectional converter that interfaces the load to the source is shown. The proposed BDC converter operation and the closed loop FLC performance are also modelled.

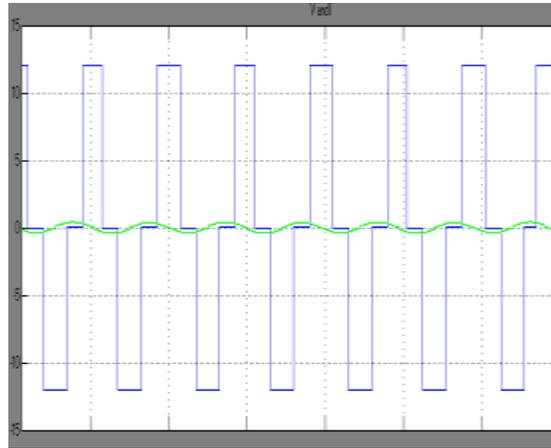


Fig.7 Output of the inverter during both forward and reverse mode

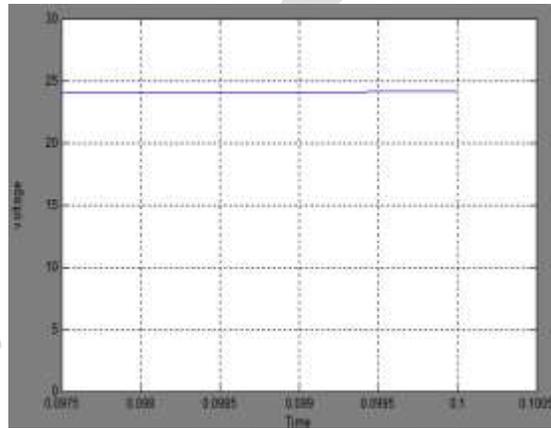


Fig.8 DC output during forward mode

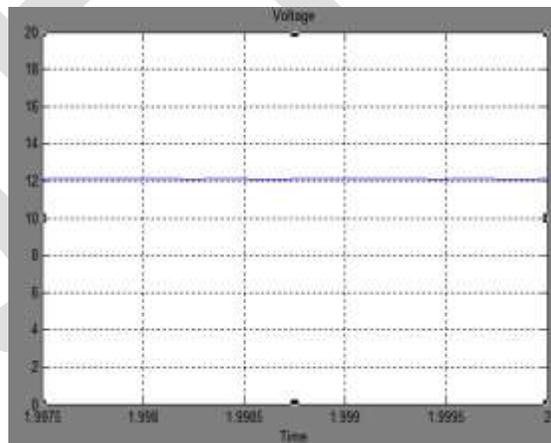


Fig.9 DC output during reverse mode

Fig.7 demonstrates the output of the inverter with voltage and current in the same axis. This output is given as an input to the LCL resonant network and then to the load via the bridge converter which acts as a rectifier.

Fig.8 and Fig.9 illustrate the closed loop performance of the converter. In a bidirectional system, the response of the system to power flow in both the forward and reverse direction is also important. The closed loop result analysis clearly shows that, the output voltage gets stabilized at a faster rate to the desired value (24V) in boost mode. Similarly in buck mode, output voltage gets stabilized at a very faster rate to the desired value (12V).

CONCLUSION

In this project work, LCL resonant network is used in bidirectional DC – DC converter. This resonant technique is used in full bridge as well as half bridge converters. The proposed converter is devoid of the transistors switching power dissipation within the whole operating range, therefore it is measured by high efficiency. In order to obtain the desired operating voltage irrespective of the source and load disturbances the converter must be operated in closed loop. All these problems are efficiently dealt with FLC. The FLC controller regulates the output voltage and helps in achieving smooth transition between the two operation modes of the bidirectional converter, namely buck and boost mode. Fuzzy control method does not need accurate mathematical model of a plant and hence, it outfits well to a process where the model is unknown or ill-defined. This system can be used for applications such as space and radar applications.

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Investigation on Level of service based on traffic projections for State Highway

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ABSTRACT

Transportation planning and highway network being the benchmark of any road project and the level of service stands as a deciding factor for its success. Providing an appropriate level of service to meet the present and future demands of the traffic is of prime importance to avoid economic loss due to congestion and delays due to drop in operating speed that result due to reduction in level of service. It also results in noise and air pollution thus, degrading the environmental quality.

Four typical stretches are selected in the present study for which widening is planned. Present investigation deals with change in level of service due to increased traffic volume year after year till planning horizon of 2035. Traffic volume is projected based on the future growth of traffic worked out on the basis of projected traffic assuming about 7.5% considering a block period of 5 years considering the practicality.

The level of service drop due to increase in traffic volume has been worked out for the planning period of 20 years for each block period. This facilitates the planning authorised to work out the expansion of road network and highway widening programs and also to deal with financial matter.

Keywords: Traffic volume, level of service, block period, planning period, widening, future growth, projected traffic

INTRODUCTION

The objective of this study is to estimate rational traffic growth rates and forecast traffic for the design period based on available /collected data and secondary data, to propose road widening scheme based on future traffic in a planned manner and Level of Service during design year of 20 years which facilitates to work out the financial scheme for the project.

In this present study, average daily variation of traffic is calculated from the classified volume count, seasonal factors are estimated from monthly petrol and diesel sales aiding the calculation of annual average daily traffic. Traffic projections are made for the design year of 20 considering a growth rate of 7.5% as per IRC 37-1984 (due to insufficient secondary data) for all homogeneous sections of the state highway. Volume to capacity ratio is calculated dividing the design period into 4 block periods of 5 year each, based on which widening schemes are predicted.

LITERATURE REVIEW

Traffic data is the foundation of highway transportation planning and is used in making numerous decisions. Since accurate traffic data is a very crucial element in the transportation planning process, understanding and implementing the process accurately can lead to better design decisions

In a comprehensive manner, traffic forecasting is the process of predicting the number of vehicles or people that are going to use different transportation facilities in the future. This process begins with the collection of data on present traffic. This traffic data is combined with secondary data, such as population and economic growth rates, employment rate, trip rates, travel costs etc., to develop a traffic demand model for the current situation^{[1][5]} Combining this with projected data for population, employment etc. results in prediction of future traffic, typically estimated for each segment of the transportation infrastructure in question^[4].

Traffic forecasting for the highways is mainly categorized with commercial vehicles as, they contribute more to the volume than passenger vehicles but, having said that avoiding the passenger vehicles may create errors in the estimation when adopted for the design and also when opened to the end design having to bear with the underestimation.

Growth rates are more reasonable when adopted through regressive iterations and correlation between various primary and secondary data. Although accuracy in forecasting is of imaginary value ,having a broadly analysed data is of confident in nature.

STUDY AREA CHARACTERISTICS

State Highway 86 usually referred to as Omalur - Sankari - Thiruchengode - Paramathi road, is one of the major State Highways in Tamil Nadu. It passes through the districts of Salem and Namakkal. The total length of SH-86 is 80.00 kms. The highway provides connectivity to major places such as Omalur, Sankari, Thiruchengode and Paramathi.

The project corridor section of SH-86 under study that is, **Omalur-Sankari-Thiruchengode-Paramathy road (SH 86) Km 0 to Km 45** passes through Salem district and has six urban settlements along the corridor that attract /generate traffic – Omalur,Mecheri,Tharamangalam,Pappampadi ,Konganapuram and Sankari.

Carriageway of the candidate roads is of bituminous surface with two lane configuration of approximately 7 m width. Entire project road is lined with earthen shoulder on either side of the carriageway.

The project stretch routes predominantly through plain terrain and in parts through rolling terrain. The land use is agricultural with pockets of major & minor built-ups.

APPROACH

After thorough site inspections the project corridor has been divided in to 4 homogeneous based on locations of major traffic generators as indicated below

Table 1: Homogeneous sections for corridor 1-Omalur-Sankari-Thiruchengode- Paramathy road.

Sl.no	sections	Chainage
1	Omalur to Tharamangalam	Km 0.000 to Km 10+500
2	Tharamangalam to Konganapuram	Km 10+500 to Km 28+500
3	Konganapuram to Sankari	Km 28+500 to Km 36+200
4	Sankari to pullipalayam	Km 40+000 to Km 45+000

Data collection

Traffic Volume count survey was done to estimate the Average Daily traffic (ADT) and Annual Average Daily Traffic (AADT) on the homogeneous sections. The survey was done on all homogenous section for seven continuous days covering both week days and weekends (7 X 24hrs). The count was recorded at 15-minute intervals for each vehicle category. Primary and secondary data collected on the project stretch are as mentioned below

Primary Data:

7-day Continuous Traffic Volume Count (manual count method was adopted) was carried out on the study stretch 24hrs a day in divided sessions. Strict adherence to IRC codes and manuals were followed for the traffic survey carried out. The main objective of the survey is to estimate the classified vehicular volumes on the selected roads. The counts were conducted for peak hours on a week day.

Secondary Data:

- Fuel sales data along the study stretch
- Previous year vehicle registration data of the influencing zones and Tamil Nadu state.
- Previous year data on Per capita Income, Net State Domestic Product (NSDP).

6. Estimation of Average daily traffic

Table 2: Average daily traffic for all homogeneous sections

Type of Vehicles	ADT at KM 7	ADT at km 23	ADT at Km 33	ADT at km 40
Standard Bus	338	258	291	394
Mini Bus(<3T)	48	17	8	14
Mini Bus(>3T)	74	124	103	72
Car/Jeep/Van	1014	927	848	1269
Two Wheelers	4626	2869	3568	5620
Auto Rickshaws	59	31	27	100
Mini Truck (<3T)	484	500	485	364
Type of Vehicles	ADT at KM 7	ADT at km 23	ADT at Km 33	ADT at km 40
Mini Truck (>3T)	235	361	278	80
Two Axle Trucks	948	765	945	457
Three Axle Trucks	1114	1093	1503	376
MAV	441	478	612	123
Others (MT)	3	56	94	99
Tractor+Trailer	18	7	14	7
Tractor	4	9	7	5
Cycles	108	30	25	24
Cycle Rick.	1	0	0	0
Carts	0	0	0	0
Carts (Iron Wheeled)	0	0	0	0
Others (NMT)	0	0	3	1
Total Vehicles	9515	7525	8811	9005
Total PCU	13712	12252	14877.5	9170.5

- Passenger car unit for the above analysis is adopted from IRC 64-1990
- Peak hour traffic for all the sections is listed as below

Table 3: Peak hour traffic details

Sl. No.	Location (KM)	Peak Hour Volume (PCU)	Total Volume (PCU)	Peak Hour share (%)	Peak Hour
1	7.0	776	13,714	5.66%	16:00 - 17:00
2	23.0	672	12,250	5.49%	16:00 - 17:00
3	33.0	813	14,879	5.46%	17:00 - 18:00
4	40.0	635	9,177	6.92%	08:00 - 09:00

Estimation of annual average daily traffic

The traffic plying on any road generally varies over different periods of the year depending on the cycle of different socio-economic activities in the regions through which it passes. Therefore, in order to have a more realistic picture of the traffic on the project road, it is required to assess its seasonal variation to estimate the annual average daily traffic (AADT)

Due to the absence of monthly toll data or any similar data, fuel sales data from the fuel stations from all the project corridors has been used. The ADT observed during the survey duration is multiplied by a seasonal correction factor (SCF) to derive an AADT.

Table 4: Estimated seasonal factors

Veh Type	Seasonal Factor
Car/Jeep/van	1.05
Mini Bus	1.00
Bus	1.00
Mini Truck (<3T & >3T)	1.03
Truck	1.03
Others	1.00
MAV	1.03

The AADT for the base year (2015) on all the homogeneous sections is shown in **Table 5**

Table 5: Annual average daily traffic of all homogeneous sections

Location	KM 7.0	KM 23.0	KM 33.0	KM 40.0
Passenger Vehicles				
Standard Bus	338	258	291	394
Mini Bus(<3T)	48	17	8	14
Mini Bus(>3T)	74	124	103	72
Car/Jeep/Van	1065	973	890	1332
Two Wheelers	4626	2869	3568	5620
Auto Rickshaws	59	31	27	100
Commercial Vehicles				
Mini Truck (<3T)	499	515	500	375
Mini Truck (>3T)	242	372	286	82
Two Axle Trucks	976	788	973	471
Three Axle Trucks	1147	1126	1548	387
MAV	454	492	630	127
Others	3	56	94	99
Slow Moving Vehicles				
Tractor+Trailer	18	7	14	7
Tractor	4	9	7	5
Cycles	108	30	25	24
Location	KM 7.0	KM 23.0	KM 33.0	KM 40.0
Cycle Rick.	1	0	0	0
Carts	0	0	0	0
Carts (Iron Wheeled)	0	0	0	0
Others	0	0	3	1
Total Vehicles	9,662	7,667	8,967	9,110
Total PCU	14,030	12,561	15,247	9,341
Passenger Vehicles	6,210	4,272	4,887	7,532
Commercial Vehicles	3,321	3,349	4,031	1,541
Slow Moving Vehicles	131	46	49	37

Traffic projections and volume to capacity ratio

Due to insufficient secondary data, projections to the present traffic volume are carried considering a growth rate of 7.5% (IRC 64-1990) for a design period of 20 years.

Correspondingly volume to capacity ratio is calculated for the annual average daily traffic projections using 15,000(PCU/day) as the design service volume as per IRC 64-1990

year	km 7	v/c ratio
2013	14030	0.94
2014	15082	1.01
2015	16213	1.08
2016	17429	1.16
2017	18736	1.25
2018	20141	1.34
2019	21752	1.45
2020	23492	1.57
2021	25371	1.69
2022	27401	1.83
2023	29593	1.97
2024	32108	2.14
2025	34837	2.32
2026	37798	2.52
2027	41011	2.73
2028	44497	2.97
2029	48502	3.23
2030	52867	3.52
2031	57625	3.84
2032	62811	4.19
2033	68464	4.56
2034	74626	4.98
2035	81342	5.42

year	km 23	v/c ratio
2013	12561	0.84
2014	13503	0.9
2015	14516	0.97
2016	15605	1.04
2017	16775	1.12
2018	18033	1.2
2019	19476	1.3
2020	21034	1.4
2021	22717	1.51
2022	24534	1.64
2023	26497	1.77
2024	28749	1.92
2025	31193	2.08
2026	33844	2.26
2027	36721	2.45
2028	39842	2.66
2029	43428	2.9
2030	47337	3.16
2031	51597	3.44
2032	56241	3.75
2033	61303	4.09
2034	66820	4.45
2035	72834	4.86

year	km 33	v/c ratio
2013	15247	1.02
2014	16391	1.09
2015	17620	1.17
2016	18942	1.26
2017	20363	1.36
2018	21890	1.46
2019	23641	1.58
2020	25532	1.7
2021	27575	1.84
2022	29781	1.99
2023	32163	2.14
2024	34897	2.33
2025	37863	2.52
2026	41081	2.74
2027	44573	2.97
2028	48362	3.22
2029	52715	3.51
2030	57459	3.83
2031	62630	4.18
2032	68267	4.55
2033	74411	4.96
2034	81108	5.41
2035	88408	5.89

year	km 40	v/c ratio
2013	9341	0.62
2014	10042	0.67
2015	10795	0.72
2016	11605	0.77
2017	12475	0.83
2018	13411	0.89
2019	14484	0.97
2020	15643	1.04
2021	16894	1.13
2022	18246	1.22
2023	19706	1.31
2024	21381	1.43
2025	23198	1.55
2026	25170	1.68
2027	27309	1.82
2028	29630	1.98
2029	32297	2.15
2030	35204	2.35
2031	38372	2.56
2032	41825	2.79
2033	45589	3.04
2034	49692	3.31
2035	54164	3.61

Table 6: Traffic projections and corresponding volume to capacity ratio

Analysis through block periods

Five year block period has been selected as the basis of this analysis, for the first 5 year block period design service volume of two lanes as per IRC guidelines is used (IRC IRC 37 1984 and IRC SP 73-2007) and for the rest of the block periods 4 lane design service volume is used. Using these design service volumes v/c(volume to capacity) ratio is calculated and average of these values is calculated for each block period. Based on these average values, widening scheme is predicted for each block period. And although analysis is carried out from year 2013, 2015 is considered as the base year for further analysis keeping in view with the fact of present

Nature of Terrain	LOS-B			LOS-C
	Two Lane without Paved shoulder(PCU/day)	Two Lane with 1.5m Paved Shoulder(PCU/day)	Four Lane(PCU/day)	Four Lane(PCU/day)
Plain	15,000	18,000	40,000	60,000
Rolling	11,000	13,000	40,000	60,000
Mountainous/Hilly	7,000	9,000	20,000	30,000

year running. All the analysis comprehend with Level of service “B” as per IRC guidelines and 2015 is considered as the base year

Table 7: Traffic Design Service Volume in PCU/Day

Table 8 Average values of v/c ratio for homogeneous section 1

Block periods	Average v/c ratio	For design service volumes(PCU/day)
2016 -2020	1.34	15000
	1.13	18000
2021-2025	0.74	40,000
2026-2030	1.12	40,000
	0.74	60,000
2031-2035	1.15	60,000

Table 9 Average values of v/c ratio for homogeneous section 2

Block periods	Average v/c ratio	For design service volumes(PCU/day)
2016 -2020	1.41	15000
	1.01	18000
2021-2025	0.67	40,000
2026-2030	1.008	40,000
	0.668	60,000
2031-2035	1.028	60,000

Table 10 Average values of v/c ratio for homogeneous section 3

Block periods	Average v/c ratio	For design service volumes(PCU/day)
2016 -2020	1.27	15000
	1.22	18000
2021-2025	0.81	40,000
2026-2030	1.22	40,000
	0.81	60,000
2031-2035	1.24	60,000

Table 11 Average values of v/c ratio for homogeneous section 4

Block periods	Average v/c ratio	For design service volumes(PCU/day)
2016 -2020	0.9	15000
		18000
2021-2025	0.496	40,000
2026-2030	0.74	40,000
2031-2035	1.14	40,000
	0.76	60,000

Conclusions and scope for further study

From the above average values of volume to capacity ratio, the following conclusions can be drawn with respect to widening scheme and level of service

- Homogeneous section 1 can cater four lanes from 2016 to 2025 and although it can cater 4 lane from 2026 to 2030 the Level of service will be at “C” hence, it needs to be upgraded to six lanes and the same widening scheme holds goods from 2031 to 2035.
- Homogeneous section 2 can cater 4 lane from 2016 to 2025 and although it can cater 4 lane at Level of service “C”, the section needs to be upgraded to six lanes to match with level of service “B” from 2026 to 2035
- Homogeneous section 3 can cater 4 lanes from 2016 to 2025 and for the same reason as above 2026 to 2035 can cater 6 lanes.
- Homogeneous section 4 can cater 2 lanes from 2016 to 2020, 4 lane from 2021 to 2030 and 6 lane from 2031 to 2035.

Above analysis can be further revised with the use of various secondary data's if available and an analysis of much broader sense can be carried out.

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Hybrid Book Recommendation Engine

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Abstract— Today, with the advancements in mobile technology and internet being a basic necessity in homes, people mostly prefer to buy and sell things online. With hundreds of websites and billions of products to select from, it becomes very difficult to know what a customer wants. Capturing interests of users and allowing them to narrow to best products has become the next thing. Most of the recommendations are based on conventional content, context and collaborative recommendations algorithms. All these algorithms alone fail to recommend best and efficient recommendations to user. So, there is a need to evolve a unique algorithm which combines the features of conventional algorithm along with its new features. A hybrid recommender system combines different recommender algorithms which fail individually and provide a unique and novel mix of recommendations.

Keywords— Hybrid, Recommendation, Ontology, Collaborative filtering, content-based filtering, Artificial Intelligence, Slope One, Min-wise independent permutation.

INTRODUCTION

Most of the recommendations are based on conventional content, context and collaborative recommendations algorithms. All these algorithms alone fail to recommend best and efficient recommendations to user. So, there is a need to evolve a unique algorithm which combines the features of conventional algorithm along with its new features. Recommendation systems were evolved as intelligent algorithms, which can generate results in the form of recommendations to users. They reduce the overhead associated with making best choices among the plenty. Now, Recommender systems can be implemented in any domain from E-commerce to network security in the form of personalized services. They provide benefit to both the consumer and the manufacturer, by suggesting items to consumers, which can't be demanded until the recommendations. Every recommender system comprises of two entities, one is user and other is item. A user can be any customer or consumer of any product or items, who get the suggestions. Input to recommendation algorithm can be a database of user and items and output obviously will be the recommendations. As in our case, inputs consist of database of customer and database of books and output denotes the book recommendations. Generally, Input belongs to recommendation algorithms lies into one of the following categories:

Rating based input:

It consists of votes of so many people called groups, who rate the particular item on the given scale of minimum to maximum. Collaborative based recommendation systems use this type of input.

Content based input:

It consists of users information such as the interest, date of birth, priorities etc. This type of information is hard to find for a particular user, so normally explicitly filled by the user. Content based recommendation systems take this type of inputs.

REMAINING CONTENTS

Ontology

An ontology is an engineering artifact:

It is constituted by a specific vocabulary used to describe a certain reality, plus a set of explicit assumptions regarding the intended meaning of the vocabulary. Ontology is used for database which is very efficient for generating recommendation than sql database.

Purpose

This hybrid book recommendation engine evaluates the possibility to combine the various recommendations techniques and incorporated with proposed hybrid algorithms to improve recommendation performance by exploiting the complementarities of different algorithms. It describes the conventional Content, Collaborative Filtering and Context Filtering recommendation approaches along with their precision, recall and accuracy parameters. On the bases of this study, Hybrid approach has been proposed in order to improve the basic algorithm. At this point, it is essential to include a categorization of the previously described algorithms based on different criteria. Finally, this paper has presented a number of utilized evaluation metrics, from which some were used to measure quality, while others to measure performance. Recommender systems are an extremely potent tool utilized to assist the selection process easier for users. Likewise, this analysis authenticated that the hybrid recommendation algorithm is a competent system to

recommend Books for e-users, whereas the other recommender algorithms are quite slow with inaccuracies. This recommender system will assuredly be a great web application, which can be club with todays high demanding online purchasing web sites.

Existing System

This study specifies the various conventional algorithms that are still used by some of the most top rated book purchasing websites. This case study specifies those algorithms along with their flow charts as follows:

Content based Book Recommendation Engine This type of system generates recommendations from source based on the features associated with products and the users information. It gives recommendation as a user specific classification problem and learn a classifier for the user’s likes and dislikes based on product features. So, in case of recommending books above figure describes the flowchart of content based book recommendation algorithm. **Collaborative based Book Recommendation Engine** In Collaborative recommendation engines, suggestions are generated on the basis of ratings given by group of people. It identifies users with a rating history similar to the current user and generates recommendations for the user. Most of the book recommendation engines based on this algorithm, described by the flowchart of collaborative based book.

Proposed System

All conventional recommendation algorithms suffer from the limitation of quality, accuracy, precision of recommendations criteria. The proposed system is a Hybrid Book recommendation system which aims at combining the various features of content, collaborative filtering and context based recommendation system. It provides an easy to use graphical user interface for user profiles and book information management. It generates optimal recommendations for the people that have not sufficient personal experience or competence to evaluate the, potentially overwhelming, number of alternatives offered by a website. To overcome the existing Book recommendation problem Hybrid Recommendation Algorithm has been proposed. It is a fusion of Content, Context, and Collaborative Recommendation algorithms. Complete description of proposed algorithm is as follows:

- Input: User Database and Book Database
- Output: Book Recommendations

Study of the system

Slope one collaborative filtering for rated resources

To drastically reduce over fitting, improve performance and ease implementation, the Slope One family of easily implemented Item-based Rating-Based collaborative filtering algorithms was proposed. Essentially, instead of using linear regression from one item’s ratings to another item’s ratings ($f(x)=cx+d$) it uses a simpler form of regression with a single free parameter ($f(x)=c+d$) The free parameter is then simply the average difference between the two items’ ratings. It was shown to be much more accurate than linear regression in some instances, and it takes half the storage or less.

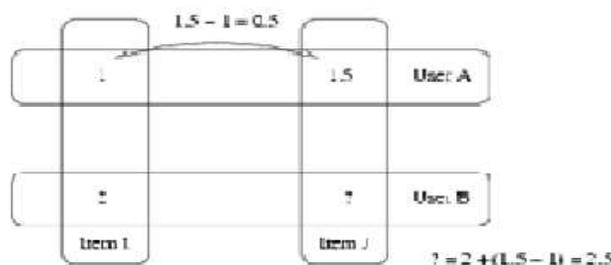


Figure 1

Example:

- User one gave a 1 to Item I and an 1.5 to Item J.

- User second gave a 2 to Item I.
- How do you think User second rated Item J?
- The Slope One answer is to say 2.5 ($1.5 - 1 + 2 = 2.5$).

Min-wise independent permutations

In order to implement the MinHash scheme as described above, one needs the hash function h to define a random permutation on n elements, where n is the total number of distinct elements in the union of all of the sets to be compared. But because there are $n!$ different permutations, it would require $(n \log n)$ bits just to specify a truly random permutation, an infeasibly large number for even moderate values of n . Because of this fact, by analogy to the theory of universal hashing, there has been significant work on finding a family of permutations that is "min-wise independent", meaning that for any subset of the domain, any element is equally likely to be the minimum. It has been established that a min-wise independent family of permutations must include at least different permutations, and therefore

$$|cm(1, 2, \dots, n)| \geq e^{n-o(n)}$$

Figure 2

that it needs (n) bits to specify a single permutation, still infeasibly large. Because of this impracticality, two variant notions of min-wise independence have been introduced: restricted min-wise independent permutations families, and approximate min-wise independent families.

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The completion of any inter-disciplinary project depends upon cooperation, co-ordination and combined efforts of several sources of knowledge. We are grateful to Prof. Mrs. Pratiksha R. Deshmukh for his even willingness to give us valuable advice and direction; whenever we approached him with a problem. We are thankful to him for providing immense guidance for this project. We are also thankful to Prof. Danny J. Pereira, HOD of computer department, Govt. COEARA. for his immense guiding in part of our project.

CONCLUSION

This paper has covered the core of recommendation experiments, and has examined how to incorporate information from metadata into recommendation algorithms. In addition, it evaluates the possibility to combine the various recommendations techniques and incorporated with proposed hybrid algorithms to improve recommendation performance by exploiting the complementarities of different algorithms. It describes the conventional Content, Collaborative Filtering and Context Filtering recommendation approaches along with their precision, recall and accuracy parameters.

On the bases of this study, Hybrid approach has been proposed in order to improve the basic algorithm. At this point, it is essential to include a categorization of the previously described algorithms based on different criteria. Finally, this paper has presented a number of utilized evaluation metrics, from which some were used to measure quality, while others to measure performance. Recommender systems are an extremely potent tool utilized to assist the selection process easier for users. Likewise, by utilizing, this analysis authenticated that the hybrid recommendation algorithm is a competent system to recommend Books for e-users, whereas the other recommender algorithms are quite slow with inaccuracies. This recommender system will assuredly be a great web application,

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IJERGS

Precision farming using Nano based wireless sensor network

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Abstract— The main aim of this paper is to propose a state of art nano wireless sensor technology in agriculture, which can replace some of the traditional techniques to the rural farming community. Nano sensors with their small form factor and reliability, these sensors display accurate multisensory capabilities to detect and collect environment data. Nano Sensors comprises temperature, micro temperature, humidity, electrical conductivity, moisture and pH with more in under development (integrated temperature and pH; integrated temperature, nitrate (N), phosphate (P) and potassium (K)). This paper suggests techniques for the corporations to improve on agriculture or farm produce without having to spend excessive time in fields or farms and have a concrete way to improve output. The value of soil pH sensor is sent to the base station and in turn base station intimates the farmer about the soil pH via SMS using GSM modem. obtaining the soil pH value in his mobile the farmer selects the necessary fertilizer and crop for his next season. Hereby the amount of fertilizer can be reduced. The information and technical support will be provided from the crop monitoring system using Nano WSN(wireless sensor network).The automated control of water sprinkling and ultimate supply of information to farmers is done as a result of this project using wireless sensor network.

Keywords—*Nano sensors ; sensing unit ; actuation unit ; power unit ; communication unit ; processing unit ; pams(precision agriculture management system)*

INTRODUCTION :

India being an agricultural country needs some innovation in the field of agriculture. This can be achieved through modern technologies which assist computing ,communication and control within the devices. Increasing the yield output by decreasing the input (such as herbicides ,fertilizer and pesticides) called precision or accurate farming has always remained a desired target of the agriculturists. Sensors and satellite systems are used to measure the crops growth at maximum efficiency with the accurate identification of issues and problems.by the controlled farming, pollution will be indirectly minimized by the decreased agricultural wastes. Monitory systems and small sensors prepared by the nanotechnology will greatly affect the near future precision farming practices.

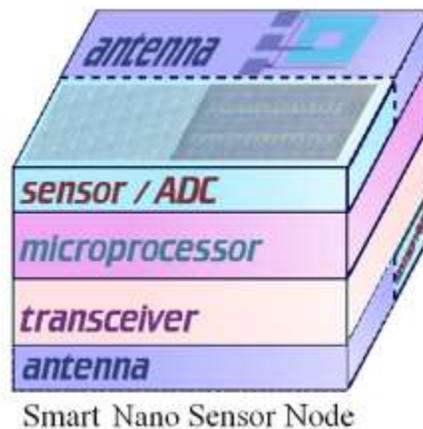
The Nano electronics has the potential to improve the quality, safety and availability of the food that we eat. Nano sensors, similar to those developed for healthcare applications ,that can respond to specific genes or proteins will enable the development of plant strains that are resistant to disease and adverse climatic conditions .Embedded into acting and labeling, nanosensors will provide consumers with an immediate indication of a food's sustainability for human consumption. Embedded into production processes they will ensure the quality, reliability and traceability of food processing operation.

Opportunities also exist in the agrochemical industry .for example, nanoelectronics will allow detection of the presence and degree of biodegradation of pesticides, herbicides and fertilizers, so that they do not enter the food chain or adversely affect biodiversity or the environment. Developing and implementing such applications will involve the design and fabrication of biologically sensitive nanosensors for the detection of specific chemical/biochemical signals, and micro-/nano- electromechanical actuators that can respond to those signals.For the communication purpose, a nano sensor is assumed with units for Sensing, Actuation, Power, Processing, Storage, and Communication.

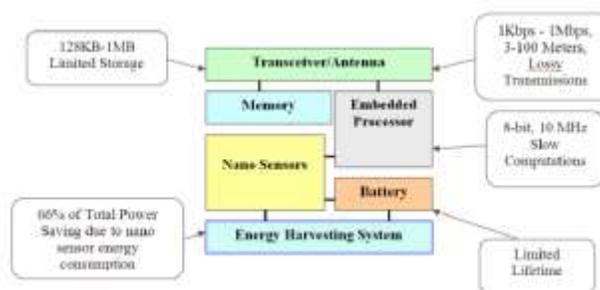
1. Nano sensors

Crop growth and field conditions like moisture level, soil fertility, temperature, crop nutrient status, insects, plant diseases, weeds, etc. can be monitored through advancement in nanotechnology. Such real-time monitoring is done by employing networks of wireless Nano-sensors across the cultivated fields, providing essential data for agronomic processes like optimal time of planting and harvesting of the crops. It is also helpful for monitoring the time and amount of water application, fertilizers, pesticides, herbicides and other treatments. This has moved precision agriculture to a much higher level of control, for instance, in water usage, leading eventually to conservation of water. More precise water delivery systems are likely to be developed in the near future. The factors

critical for such development include water storage, *in situ* water holding capacity, water distribution near roots, water absorption efficiency of plants, encapsulated water released on demand, and interaction with field intelligence through nano-sensor systems.



The above figure illustrates the structure of a single sensor node containing one or more MEMS/optical nano--sensors, an analog to digital interface, a processor for interpreting the nano--sensor data and controlling the network, and then a transceiver to share and receive the nano--sensor information with the outside world. The illustrated figure of the ad-hoc is based on nano--sensor network.

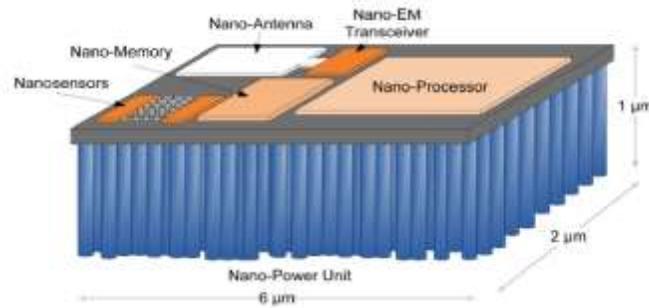


Due to small energy consumption by the nano sensors, processor, antenna and memory, the duration of battery embedded to the nano sensor mote is much longer than normal sensor node which used to be deployed to the body of plant. For the small size of sensor node the possibility of damaging of mote is reduced sharply.

2. The Nano-sensor Techniques and details

The electrolyte channel length is 70 μm and electrode gap is 3 μm , respectively. The potential responses of cathode during electro deposition of a (led) Pd wire at -1000 nA applied current does not require any electrolyte channel. Initially the cathode potential approaches a negative value, and then it gradually increases at the potential level of led wire growing from cathode to anode. When the wire is fully grown and contact to the anode, the potential drops to zero and it's turned off. The 7 μm long led wires were grown at -1000 nA within 1500 seconds. The changes in electrical resistance between gold electrodes during led wire growth at -1000 nA .

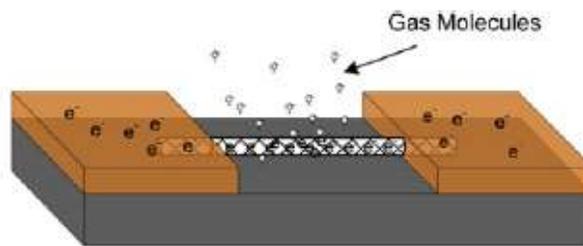
The electrical resistance gradually decreases as the led wire reduces the gap between cathodes to anode. When the led wire contacts the anode the measured resistance is less than 100 Ohm in the liquid electrolyte. The Optical images of the nano sensor containing the electrochemical led wires between gold electrodes are shown in Figure below:



By applying silicon nano-wires grown chemically as an etch masks, the nano-walls into thin films of silicon is stenciled through electronic transport effects. This similar lithographic

method can also be applied to create any patterned nano-structures of other materials besides Si like graphene. Under certain conditions, a periodical process nano-wire deployment can be obtained by producing a group of nano-wires stacked vertically from a single nano-wire mask. Together, these techniques highlight the potential of this nano sensing process through next generation nano--electronics, sensing, and electromechanical systems.

A. SENSING UNIT



Chemical nanosensors are used to measure magnitudes such as the concentration of a given gas, the presence of a specific type of molecules, or the molecular composition of a substance. The functioning of the most common type of chemical nanosensors is based on the fact that the electronic properties of CNTs and GNRs change when different types of

Molecules are adsorbed on top of them, which locally increase or decrease the number of electrons able to move through the carbon lattice. Similarly to physical sensors, when a nanotube or a nanoribbon is used in a transistor configuration, the presence of a specific type of molecules changes the on/off

Threshold voltage of the transistor. For the time being, hundreds of chemical nanosensors based on this simple principle have been manufactured with different specific detection targets

B. Actuation unit

An actuation unit will allow nanosensors to interact with their close environment. Several nano actuators have also been designed and implemented so far. Chemical and biological nanoactuators are mainly based on the interaction between nanomaterials and nanoparticles, electromagnetic fields and heat. Magnetic nanoparticles and gold nanoshells can also be used for targeted drug delivery, in which the drug containers are melted by applying local heat. For the time being, these nanoparticles are irradiated using external light sources. By using nanosensors and nanoactuators, they could be locally irradiated, requiring much less power and enabling less invasive treatments. The area of nanoactuators is at a very early stage when compared to nanosensors. The main research challenge, besides the design and fabrication of the actuation unit, is on how to precisely control and drive the nanoactuator. The majority of

potential applications of these nanosensors will be in the biomedical field, therefore, the accuracy is one of the fundamental requirements for nanoactuators.

Power unit

To date, a major effort has been undertaken to reduce existing power sources to the microscale and the nanoscale. Nanomaterials can be used to manufacture nanobatteries with high power density, reasonable lifetime and contained charge/discharge rates. For example, in lithium nanobatteries were constructed using alumina membranes having pores 200 nm in diameter. Each one of these pores was filled with PEO_lithium triflate electrolyte and capped with a cathode material, becoming an effective nanobattery. The measured volumetric capacity for each individual nanobattery was in the order of 45 mAh, 1 cm, 2mm proving their potential for powering nano-devices. However, having to periodically recharge them limits the usefulness of nanobatteries in realistic nanosensors applications. In order to overcome the limitations of nanobatteries, the concept of self-powered nano-devices has been recently introduced in. The working principle of these devices is based on the conversion of the following types of energy into electrical energy:

Mechanical energy: produced for example by the human

body movements, or muscle stretching.

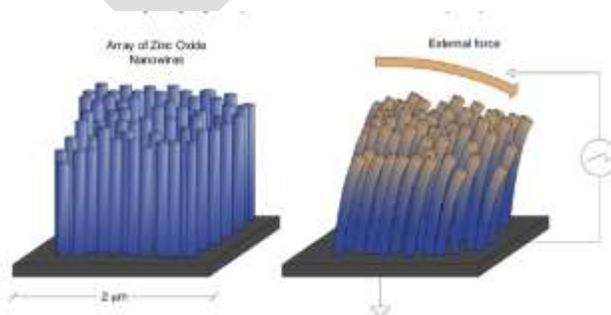
Vibrational energy: generated by acoustic waves or structural vibrations of buildings, amongst others.

Hydraulic energy: produced by body fluids, or the blood

flow.

This conversion is obtained by means of the piezoelectric effect seen in zinc oxide (ZnO) nanowires. Simply stated, when these nanowires are subject to mechanical deformation,

such as when they are bent, a voltage appears in the nanowires. In addition, nanotubes and nano cantilevers can be designed to absorb vibrational energy at specific frequencies. Moreover, it has been recently demonstrated that a nonlinear oscillator can be used to harvest energy from wide spectrum vibrations or even mechanical and thermal noise. The resulting energy can be directly used by the device or used to charge a nanobattery.



Our vision is that harvesting energy from the environment is the most useful solution for powering nanosensors. In addition to mechanical, vibrational or hydraulic energy, we believe that it will be possible to harvest energy from electromagnetic waves in the nanoscale. For example, a resonator based on a NEMS can be used to convert EM radiation into vibrational energy, and this can be converted into electricity by means of ZnO nanowires. Alternatively, nanoscale rectennas, i.e., rectifying antennas that convert electromagnetic waves into DC electricity, could be developed using CNTs. In addition, the use of CNTs to develop solar nano-cells is also suggested in. Another option would be to develop synthetic chemical batteries based on ATP or adenosine triphosphate, the

energy source of cells and living organisms, which could be harvested from the medium or even obtained by chemical reactions in the nano scale emulating cell respiration. Independently of the solution adopted, there will be a strong compromise between the power unit size, the total energy harvested and stored, and the capabilities of an integrated nanosensor device, and this should be taken into account in almost every detail of WNSNs design.

Processing unit

Nanoscale processors are being enabled by the development of tinier FET transistors in different forms. Nanomaterials, such as CNTs and specially GNRs, can be used to build transistors in the nanometer scale. For instance, the smallest transistor that has been experimentally developed up to date is based on a thin graphene nanoribbon, made of just 10 by 1 carbon atoms, i.e., less than 1 nm in all its dimensions. Graphene-based transistors are not only smaller, but predictably faster. Graphene shows almost ballistic transport of electrons. As a result, electrons can travel larger distances without being back-scattered and this allows for the development of faster switching devices. In addition, the reduction of the channel length also contributes to a faster response of the transistor. The theoretical predictions for the switching frequencies of graphene-based transistors are in the order of up to a few hundreds of terahertz, which is faster than any existing silicon FET transistor for the time being. The small size of nanosensor devices will limit the number of transistors in nanoscale processors, limiting the complexity of the operations that these will be able to do, but not the speed at which nano-processors will be able to operate. As an alternative to graphene, in, a transistor is developed whose active channel is composed of a single phosphorous atom in silicon. In this case, electrons were able to tunnel through the phosphorous atom or not depending on the voltage applied to a nearby metal electrode with a width of just a few tens of nanometers. While the concept of single atom transistors is apparently proved, it is still too early to think of the specific capabilities that a processor based on this technology and limited in size can achieve. Independently of the specific approach followed to design these nano-transistors, the main challenge is in integrating them in future processor architectures. Experimental testing of individual transistors has been successfully conducted, however, simple processing architectures based on these are still being investigated and, so far, the future processor architectures based on CNTs and graphene still need to be defined.

E. STORAGE UNIT

A Nano-memories utilizing a single atom to store a single bit are being enabled by nanomaterials and new manufacturing processes. Back in 1959, Richard Feynman introduced the concept of atomic memory, i.e., the possibility to store a bit of information in every single atom of a material. In the example he used, Feynman suggested a basic memory unit composed of 5 by 5 by 5 atoms, i.e., 125 atoms in total. He proposed this structure instead of using a single atom in order to prevent potential interference between adjacently stored bits. The resulting 125 atoms for a bit are comparable to the 32 atoms that store one bit of information in DNA. In terms of density, if this were realized with a carbon structure, in which the separation between two atoms is in the order of 0.142 nm, the equivalent storage density would be more than 1 bit=nm³ or 1 gigabit=mm³. While this is still a limit to reach, for the time being several types of atomic memories have been proposed. In, a memory that stores a bit by the presence or absence of one silicon atom was developed. Similarly to the tracks in a CD-ROM, the proposed memory was based on a silicon surface with deposited monolayers of gold defining the tracks. The writing process was performed by means of removing silicon atoms from the gold lattice. Reading the memory was performed by means of a nanotip able to detect the presence or the absence of silicon atoms. This type of memory is not rewritable, but ways to restore the gold tracks and reset the memory can be envisioned. More recently, IBM Corp. has demonstrated the concept of magnetic atomic memories. In a magnetic memory, single magnetic atoms are placed over a surface by means of magnetic forces. Each atom can be used to store a bit, as it was shown in. Similarly to gold-based memories, the density that can be achieved with this technology is several orders of magnitude higher than what can be obtained through classical mechanisms. While this technology is still behind the type of memories required in programmable nanosensor devices, it is a major step towards the realization of this paradigm. Several research challenges for nano-memories are summarized in what follows. First, for the time being, existing nanoscale memories require complex and expensive machinery to be written. Being able to read and write these memories in the nanoscale will be necessary for programmable nanosensor devices. Second, similarly to nano-processors, one of the main challenges is to mass manufacture compact nano-memories beyond simplified laboratory prototypes.

F. Communication unit

The Electromagnetic communication among nanosensors will be enabled by the development of nano-antennas and the corresponding electromagnetic transceiver. In the following, we describe the latest implementations for these two elements as well as an alternative based on a mechanical resonator.

a) *Nano-antennas:*

Reducing the antenna of a classical sensor device down to a few hundreds of nanometers would require the use of extremely high operating frequencies, compromising the feasibility of electromagnetic wireless communication among nanosensor devices. However, the usage of graphene to fabricate nano-antennas can overcome this limitation. Indeed, the wave propagation velocity in CNTs and GNRs can be up to one hundred times below the speed of light in vacuum depending on the structure geometry, temperature and Fermi energy. As a result, the resonant frequency of nano-antennas based on graphene can be up to two orders of magnitude below that of nanoantennas built with non-carbon materials. A few initial antenna designs based on graphene have been already proposed. In [1], the mathematical framework for the analysis of CNTs as potential dipole antennas was developed. In [2], more emphasis was given to the numerical performance analysis of these antennas when compared to classical dipoles. When it comes to GNRs, the propagation of EM waves on a graphene sheet was first analyzed in [3]. In [4], nano-patch antennas based on GNRs and nano-dipole antennas based on CNTs are quantitatively compared, illustrating that a graphene nano-antenna 1 μm long can efficiently radiate EM waves in the terahertz band (0.1-10.0 THz). While being the first time that the terahertz radiation properties are pointed out for nanoribbons, the interaction between terahertz waves and carbon nanotubes in reception was previously addressed in [5]. From the optical perspective, the emission of photons from nano-structures due to electron-phonon interaction, i.e., the interaction between electrons and vibrating ions in the material, has motivated the study of CNTs and GNRs as optical emitters and detectors. In [6], it is mathematically demonstrated that a quasi-metallic carbon nanotube can emit terahertz radiation when a time varying voltage is applied to its ends. Similarly in [7], the absorption of infrared radiation in a nanotube is experimentally demonstrated. In addition, several ongoing projects are conducting research on optical nano-antennas. An optical nano-antenna is a device which is able to emit energy to the free-space from a confined region with a size in the order of the wavelength of the light. The discovery of nanotubes enabled the development of resonant structures with a size in the order of the light wavelength and triggered the development of this new field. We summarize the research challenges for nanoantennas as follows. First, more accurate models for nanoantennas based on nanotubes and nanoribbons need to be defined by providing details on their specific band of operation, radiation bandwidth and radiation efficiency, amongst others. All these will determine the communication capabilities of nanosensor devices. Second, new nanoantenna designs and radiating nano-structures need to be developed by exploiting the properties of nanomaterials and new manufacturing techniques. Our vision is that it will be possible to create new atomically precise nanoantennas by using graphene, and in which symmetry will

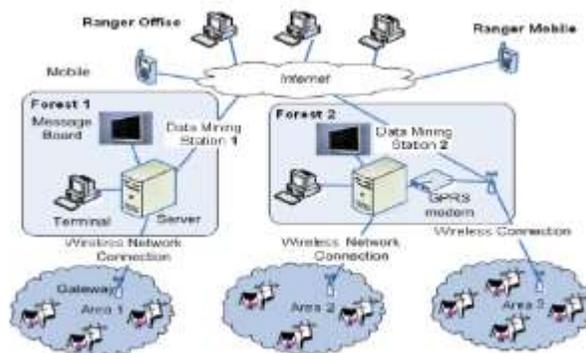
play an important role. For example, we can think of fractal nano-antennas able to efficiently resonate at different frequencies within the terahertz band. Last but not least, a new antenna theory must be defined by accounting for the quantum effects observed in the nanoscale.

b) *EM nano-transceivers*

The EM transceiver of a nanosensor device will embed the necessary circuitry to perform baseband processing, frequency conversion, filtering and power amplification, of the signals that have to be transmitted or that have been received from the free-space through the nano-antenna. Taking into account that the envisioned nano-antennas will resonate at frequencies in the terahertz band, RF FET transistors able to operate at these very high frequencies are necessary. Several graphene-based FET transistors operating in the sub-terahertz and lower part of the terahertz band have been demonstrated so far. IBM Corp. has recently announced the first RF transistor made with graphene which is able to switch at 100 GHz. Their next target is to make a RF transistor operating at 1 THz. In [8], the performance of epitaxial graphene FET transistors was measured, showing the potential of graphene transistors for RF applications. In [9], graphene-based frequency multipliers are implemented with graphene. Fast switching NEMS for RF applications are discussed in [10] by showing that graphene can be used to fabricate oscillators beyond 1 THz. Several research challenges for graphene-based transceivers

are summarized in the following. First, it is necessary to characterize and model electronic noise in graphene-based electronics. The electronic noise has a strong impact on the signal to noise ratio at the receiver and, thus, limits the communication range of nano-devices. Graphene shows almost ballistic transport of electrons for large lengths. As a result, the thermal noise created by inelastic scattering of electrons in the material is very low. More accurate models of noise are necessary. Second, new communication and information modulation techniques need to be developed. Our vision is that the EM transceivers of nanosensor devices will be limited in terms of complexity due to space constraints and integration limits, but not limited in terms of switching speed or electronic noise. For this, we think that it is necessary to simplify existing communication techniques and to develop new ways to exploit these two characteristics.

Precision agriculture monitoring system (PAMS)



PAMS allows online 24/7 viewing of field sensor data such as environment data, thresholds, alerts, network health and generate charts and reports of the data. Therefore, real estate monitoring can be done from anywhere in the world at any time. Each sink node placed in various places in the forest is connected to the central server of data storage for further processing through wireless connectivity. When a sink collects data from the sensor field, it first broadcasts a query request within the cluster where it resides. Since the leader of the cluster is always awake, it picks up the query and forwards it toward Sink node in the same way as event information is forwarded. When the query reaches Sink node, the Sink node checks its memory to find if there is a match of event information. If so, it sends the event data back to the sink along the reverse path. If there is no data found, the Sink node broadcasts the query in Sink node in the same way as an event is broadcasted

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CONCLUSION

In this paper, we proposed real-deployment of WSN based crop monitoring which is designed and implemented to realize modern precision agriculture. End Users can tailor the mote operation to a variety of experimental setups, which will allow farmers to reliably collect data from locations previously inaccessible on a micro-measurement scale. Such a system can be easily installed and maintained. This paper successfully applies the wireless sensor networks on agro-ecology fields by investigating environmental situations. The complete real-time and historical environment information is expected to help the agro-ecological specialists achieve efficient management and utilization of agro-ecological resources

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A Review on GSM and GPS Based Vehicle Tracking System

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Abstract— In this paper a survey is done on various vehicle method of tracking techniques using GSM & GPS. Vehicle navigation is one of the most important factors in the context of navigation which is mostly used by many drivers. A vehicle tracking system combines the installation of an electronic device which is mounted in a vehicle, or inside of vehicles, with purpose-designed computer software to allow the owner or a user to track the vehicle's location, collecting data in the process. Today vehicle tracking systems commonly use Global Positioning System (GPS) technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed and located on the electronic google maps via the Internet or specialized software.

Keywords— GSM (Global Services for Mobile Communication), GPS (Global Positioning System). Vehicle Tracking, Navigation .

I. INTRODUCTION

Vehicle navigation is one of the most important applications in the field of navigation which is mostly used by drivers. The maps given to the driver in the system plays most important role in this field. When large object or vehicles were spread out over ground, the owner corporations often found it difficult to keep track of what was happening[8]. They required some type of system to determine where each object was at any given time and for how long it travelled. Also the need of tracking in consumer's vehicle use to prevent any kind of theft because police can use tracking reports to locate stolen vehicle. GSM and GPS based tracking system will provide effective, real time vehicle location, and reporting. [7] A GPS- GSM based tracking system will inform where your vehicle is and where it has been, how long it has been. The system fetches the geographic location and time information from the Global Positioning Satellites. During vehicle motion, its real-time parameters such as location are reported by SMS message [9]. The system takes advantage of wireless technology in providing powerful management transportation engine.

II. LITERATURE SURVEY

1. Advanced Vehicle Tracking System on Google Earth Using GPS and GSM

In this paper GPS based vehicle tracking/navigation system is implemented. This is done by fetching the information of the vehicle like location, distance, etc. by using GPS and GSM. The information can be transformed with the following features: The information of the vehicle like location, etc. is obtained after every specified time interval defined by the user. Then this periodic information of location is transmitted to monitoring or tracking server. This transmitted information is displayed on the display unit by using the google earth to display vehicle location in the electronic google maps. [1]

2. Vehicle tracking and accident warning System using GPS and its implementation in FPGA

In this paper also the location of the vehicle is determined by using the Global Positioning System. The information from the GPS receiver is sent in the form of SMS to the user with the help of GSM. Once this SMS is received from the user, a response type of message is sent to the owner of the vehicle through the GSM modem. A sensor which is named as accelerometer sensor is then used to detect any kind of mishaps or accidents happened with the vehicle also it will trigger some kind of signal in case of any mishappenings. Unlike the microcontroller used in many system this system also uses a FPGA Spartan processor is used which manages all the parts responsible in system as according to the program done. [2]

3. GSM & GPS based tracking system

This system is helpful for public transport vehicles such as buses and taxis, it provides Tele monitoring and management system for the transportation of the taxis and buses within the city. In this paper the system mentioned consists of an “On- board module” which is mounted in the vehicle which is to be tracked. This on-board module consists of Global Positioning System, a GSM modem and ARM processor. The navigation message which is broadcasted by the GPS position satellite is received and resolved by the GPS receiver of the vehicle terminal. This satellite computes the longitudes and latitudes of vehicle coordinates, then transform it into the short message form by using GSM communication controller and this message is sent to the monitoring center through the GSM network. [3]

4. Design and development of GPS-GSM based Tracking system with google map based Monitoring

This system uses Global Positioning System (GPS) which is used to receive the coordinates of latitude and longitude form the satellite during the critical information. We all know that tracking system is now-a-days a very important in modern world. This system can be used in the monitoring of soldiers, also in tracking the theft of the vehicle and in many more other applications. This system uses microcontroller, Global Positioning System (GPS) and Global System for Mobile Communication (GSM). This system uses only one GPS device and GSM enable a two way communication process. GSM modem is provide with a SIM card which uses the same and regular communication process as we are using in regular phone.[4]

5. GSM and GPS based vehicle location and tracking System

This paper uses to a RF transmitted; the RF transmitter is attached with the vehicle which consists of its own identification. The data which will be continuously transmitting to the RF receiver that is connected to the microcontroller. The GPS will receive the location of the vehicle and will transmit this data to the microcontroller. Supposedly the RF transmitter is not receiving the signal from the RF transmitter then the receiving unit triggers a signal to the microcontroller, and from this signal we can identify the theft. If it is identified that the vehicle is theft then it automatically sends location of the vehicle to its user as the owner of the vehicle receives the information in the form of SMS through the GSM modem. This system is much simpler and cost effective than the others. The vehicle is automatically stopped if a password like SMS sent by the user. [5]

III. COMPARATIVE STUDY

From the above mentioned vehicle tracking techniques we can say that each technique is appropriate with its function but in some system we need continuous net access and this system can go down if net fails. In the first system the GPS tracks the vehicle location and send it to the controller and the google maps display the location of the Vehicle on the display unit, this system is useless without net because the location of vehicle can only be presented by the google maps. In the other system FPGA is used to detect all the parts according to program. By considering all these factors the upcoming implementation should overcome all the disadvantages and introduce many more facilities which will make the system user friendly and efficient.

III. CONCLUSION

Tracking system is nowadays the most important system for the person who want their car security in efficient hands this is the main reason why the vehicle tracking system are getting popular day by day not only in metropolitan areas but also in small cities. This system is completely integrated and it becomes possible to the user to track his car very easily at any time and from anywhere. As the vehicle theft is increasing day by day but due to this people can't avoid buying vehicles but they found an efficient way to keep an eye on their vehicle without being very close to them. These systems can keep a good control on the thefts and help avoiding them to some extent. Basically in all these system the GPS & GSM are used to track the vehicle. Using this system the user can determine where the vehicle is, how much has it travelled, and the distance completed by it. The user is able to access the position of his vehicle at any instant of time. This system is reliable any very secure. Upgrading this setup is very easy which makes it open to future requirements without the need of rebuilding everything from scratch, which also makes it more efficient.

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A Detail Review on Multiprotocol Label Switching (MPLS)

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Abstract— Multiprotocol level switching is rapidly emerging technology which plays a main role in new generation network by improvising QoS scalability speed and other features like traffic engineering. MPLS provide a framework that efficient for routing, switching and forwarding. MPLS allow for creating end-to-end circuits by using any transport protocol. The main goal of MPLS is to eliminate the dependency of OSI model data link layered technology i.e. frame relay, Ethernet, asynchronous transfer mode. This paper provides a detail overview on MPLS with its terminologies, functioning and the services that it offers

Keywords— MPLS, VPN, LSR, LDP, LER, LSP, FEC.

I. INTRODUCTION

IP based networks typically provide minimum QOS features available in circuit switch network such as ATM and frame relay. MPLS brings the mundanely of a connection oriented protocol to the connectionless IP protocols [2]. MPLS is an Internet Engineering Task Force (IETF) specified framework that offers efficient routing, switching and traffic forwarding. It is a technology for delivering IP based services. It provides the ability to offer highly advance IP services and highly scalability features with easy configuration and management for both customers and service providers. In a conventional IP networks each router performs an IP lookup determines the next hop based on its routing tables and forewords the packet to the nearby neighbors due to this creating lot of load at each router interface [3]. On the other hand MPLS makes packet forwarding decision that based on timestamp of label. MPLS works in OSI,DLL and network layer so due to this reason it is also known as layer 2.5 networking protocol. MPLS is an innovative technique that using label based forwarding paradigm [4].

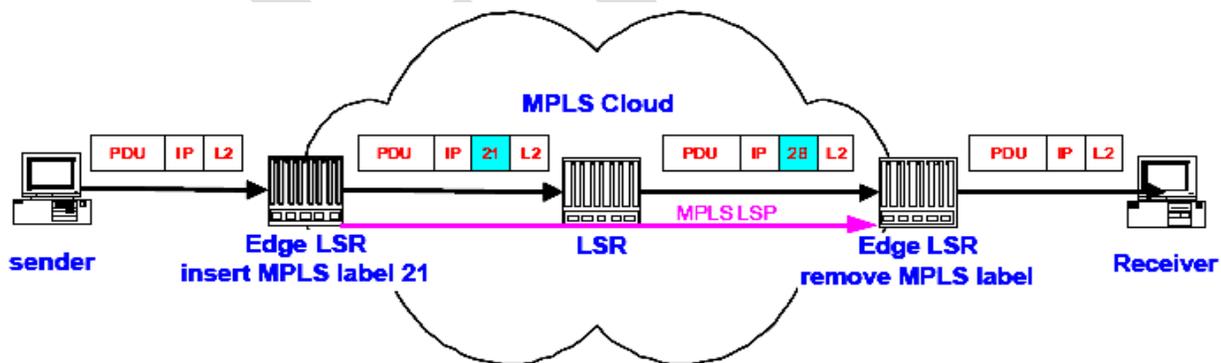


Figure 1: MPLS Infrastructure

II. MPLS

MPLS is standardized by the Internet Engineering Task Force (IETF) is a packet switching technology that support QOS on internet and transmits traffic efficiently. MPLS improves the routing performance in the network layer [3].

MPLS is used by internet service provider networks and provide QOS and guaranteed efficient bandwidth to internet protocol. MPLS supports layer 2 protocols such as Ethernet, ATM and frame relay. Because of different type of network structure, MPLS is able to constitute end-to-end IP connections with multiple QOS characteristics associated with multiple transport media; its aim is to give router a big power communication. So it especially basses on label instead in between layer 2(data link layer) and the layer 3 (network layer) in OSI mode that's why it is called layer 2.5 protocol [5].

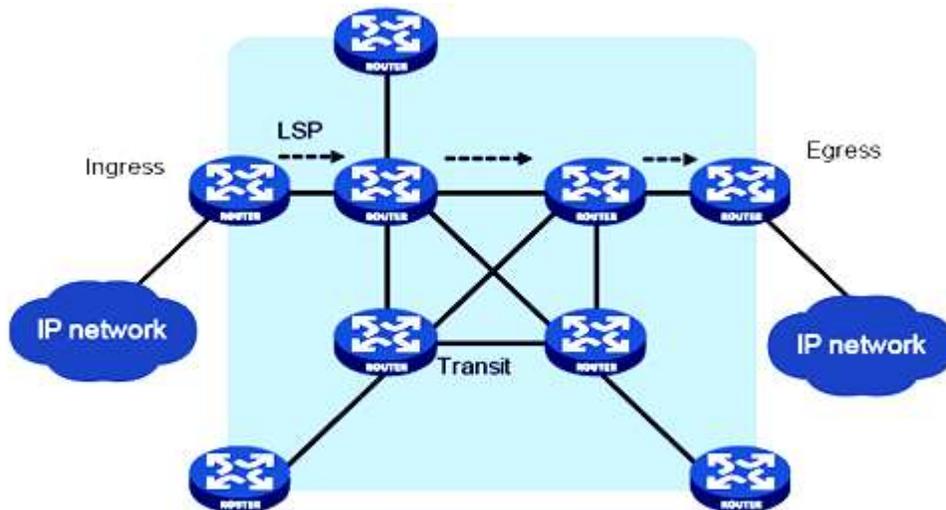


Figure: 2 MPLS Network

In MPLS network, arriving packets are allotted a “label” by a “LER (label edge router)” according to their forwarding equivalence class (FEC) [5]. Packets are forwarded along a “label switch path (LSP)” where each “LSR (label switch router) Makes forwarding decision based entering on the contents of the label, eliminating the need of the IP address so that intermediate router does not have to execute a time consuming routing lookup [6]. For each hop, the LSR acquires the existing label and put on a new label for the next hop. The forwarding of packet is also decided by next hop by reading the label on the packet these established paths, label switch paths can ensure a certain label of performance or to create IP tunnels for network based virtual private networks [7].

Applications		
TCP	UDP	
IP		
MPLS		
PPP	FR	ATM
Physical (Optical- Electrical)		

Figure: 3 OSI Reference Model for MPLS

2.1 MPLS Shim Header

Data packets when reaches the LER, ”Shim Header” is placed in between Data link Layer of OSI model. This MPLS Shim Header is structured in four parts has total length of 32 bits, for label 20 bits, for experiment 3bits, for bottom of stack 1 bit and for time to live (TTL) 8 bits [6]. MPLS Shim Header comprises of an identifier called “label“. It acts as identifier of forwarding equivalence class (FEC); and also for determining the label switched path (LSP). Followed by label is experimental field (exp) that is reserve for the experimental use or often used for QOS purpose [8]. Stack field is used to indicate that the label is in the lower level of the stack. The value of the label is set to one else is set to ZERO if the label is at the last entry of the stack [8].

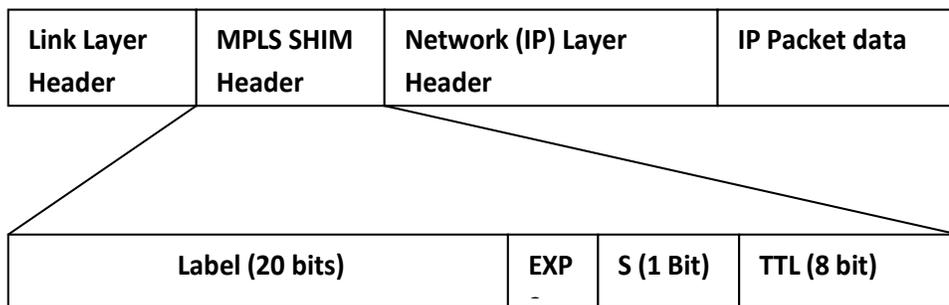


Figure: 4 MPLS shim header

The last one is the (TTL) value. The value of TTL decreases by 1 at every hop when it goes through the LSRs. when TTL value reaches to 0 the packet is dropped. Level and SHIM HEADER plays a very important role among all the fields of MPLS [8].

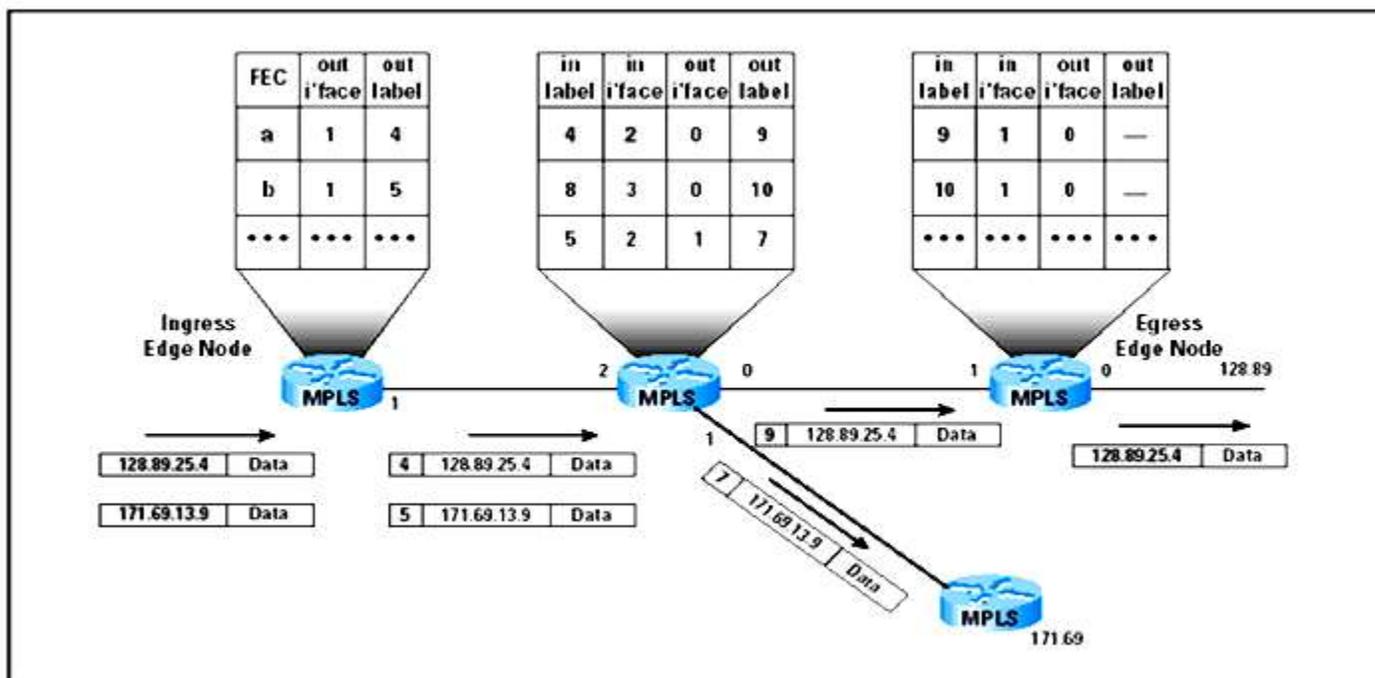


Figure 5 : MPLS Packet Forwarding.

III. MPLS Elements

Label: It identify the path that is followed in the MPLS network which allows the routers to enhance the routing speed [9].

Label switch routing (LSR): A router which is plays in the MPLS domain and send the packets based on label switching is called LSR and usually provider cloud is located by this type; whenever LSR receive a packet it check only lookup table and then determines next hop value [9]. After that before sending the packet to the next hop it removes label from the header and then attaches new label [9].

Label edge router (LER): it handles L3 lookups that is responsible for removing or adding the labels from packets when they leave or enter the MPLS domain [10]. Whenever a packet is leaving an entering in MPLS domain it has to pass across LER router, whenever packet enter into MPLS domain via LER which is called “ingress router” or whenever a packet levels the MPLS domain via LER which is called “egress router” [10].

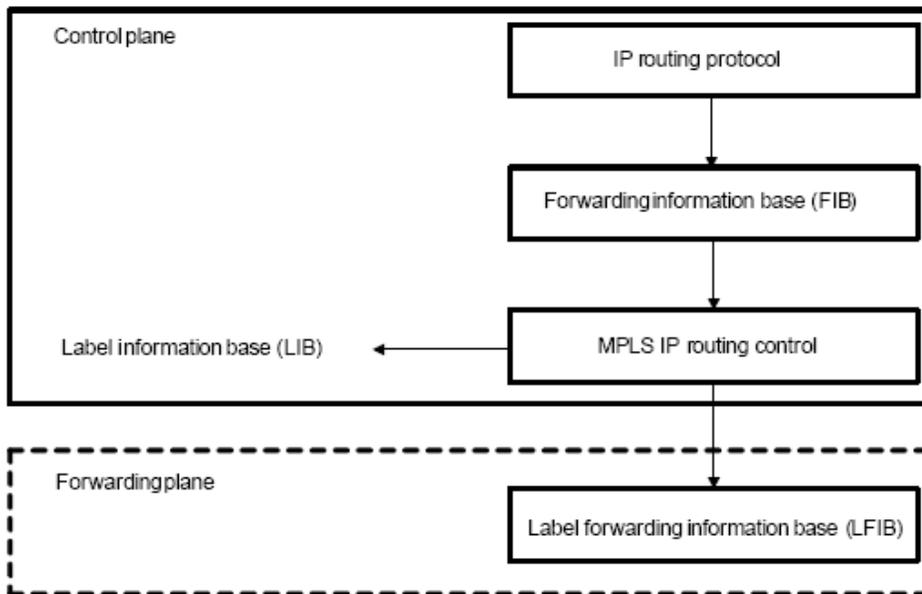


Figure: 6 Structure of an LSR

Label distribution protocol (LDP): LDP protocol where the information of label mapping is exchange between LSRs. It is responsible for maintaining a establishing Labels between routers and switches [10].

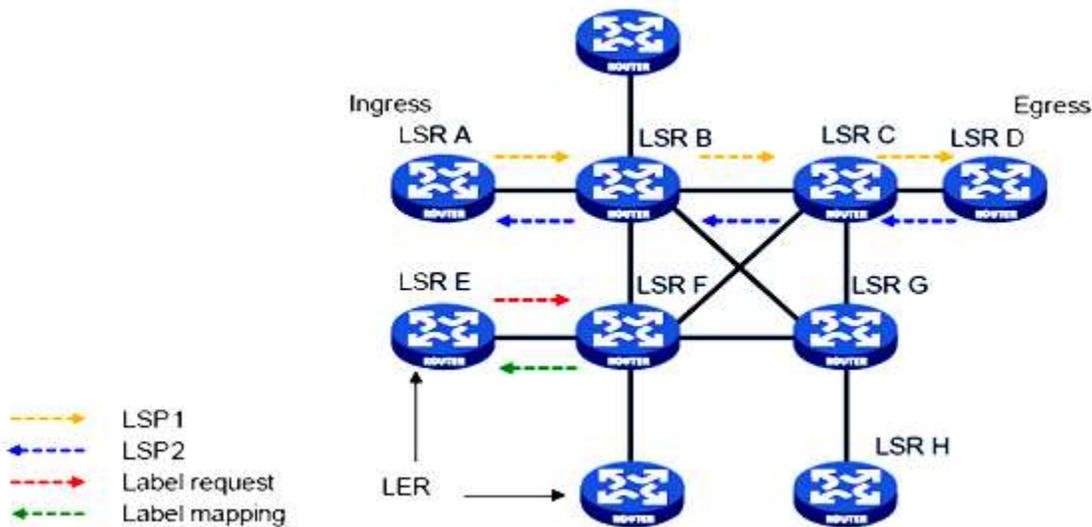


Figure: 7 Label distribution

Forward equivalence class (FEC): In FEC , set of packets that having same behavior and priority are forwarded to the same path this set of packet has same MPLS label [10]. IN MPLS network is packet is assigned with FES only once at the ingress router [9].

Label switched path(LSP): In MPLS domain the path is set by signaling protocols. In MPLS domain there are lots of LSPs that are coordinated at ingress router and traverses one or more core LSRs and stop egress router.there are two nodes to create LSPs in MPLS network, one is control driven LSP and another one is explicitly routed LSP [9]. Control driven are also known as hop-by –hop LSP that are set by using LDP protocol [10].

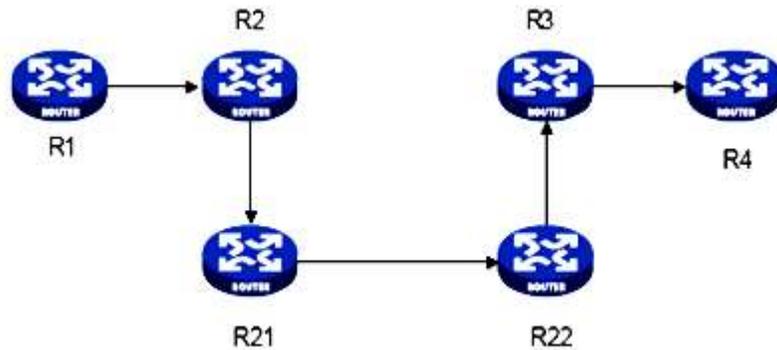


Figure: 8 Diagram for an LSP

IV. Traffic Engineering

It is the process of ensuring traffic across the network with the purpose of balancing load on various switches, links and routers to increase the cost efficiency and make the use of available bandwidth easy [11]. In MPLS the traffic engineering is performed by ATM or IP dependency upon the protocol. The goal of traffic engineering is to promote the reliable and efficient IP network operation. While simultaneously optimizing network performance and resource utilization [12].

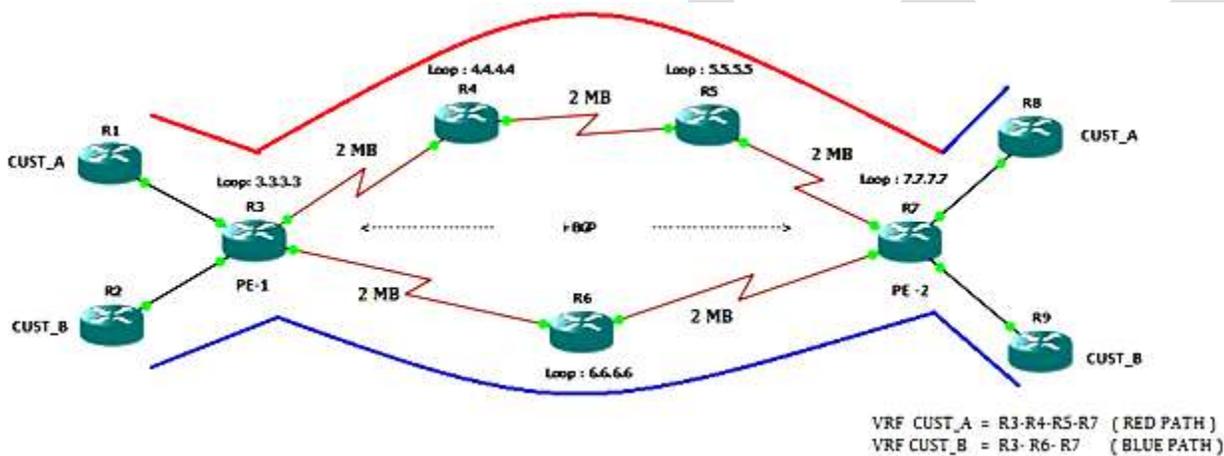


Figure: 9 Traffic Engineering

The LSPs are produced independently, specifying various paths that are based on user defined policies. On other hand it may require extended operator intervention. CR-LDR and RSVP are the two possible approaches to supply QoS and dynamic traffic engineering in MPLS [12]. Voice over IP (VOIP) route specify by MPLS, VOIP maintain high linkage consumption and takes less congested area by avoiding packet loss [13]. To provide efficient mapping of network of network resource to traffic stream traffic engineering modifies the routing patterns. This mapping can lessen the occurrence of congestion and can play an necessary role in implementing network services with quality of service (QoS) guarantees. These MPLS traffic engineering efficiency bring bandwidth reservation, constraint-based routing and explicit routing to MPLS network [12].

V. MPLS OPERATION

Step1:- The network automatically forms routing tables as MPLS enabled router participate in interior gateway protocols over the network [14]. Label to destination network mappings are establish by label destination protocol (LDP). To establish label values between the adjacent devices label distribution protocol uses the routing topologies in the table [14].

Step 2:- When a packet enter the ingress edge label switching router then firstly it is processed to find out which layer 3 services it requires ,such as bandwidth management and (QoS) and also edge LSR selects and applies a label to the packet header and applies a label to the packet header and forwards it [14].

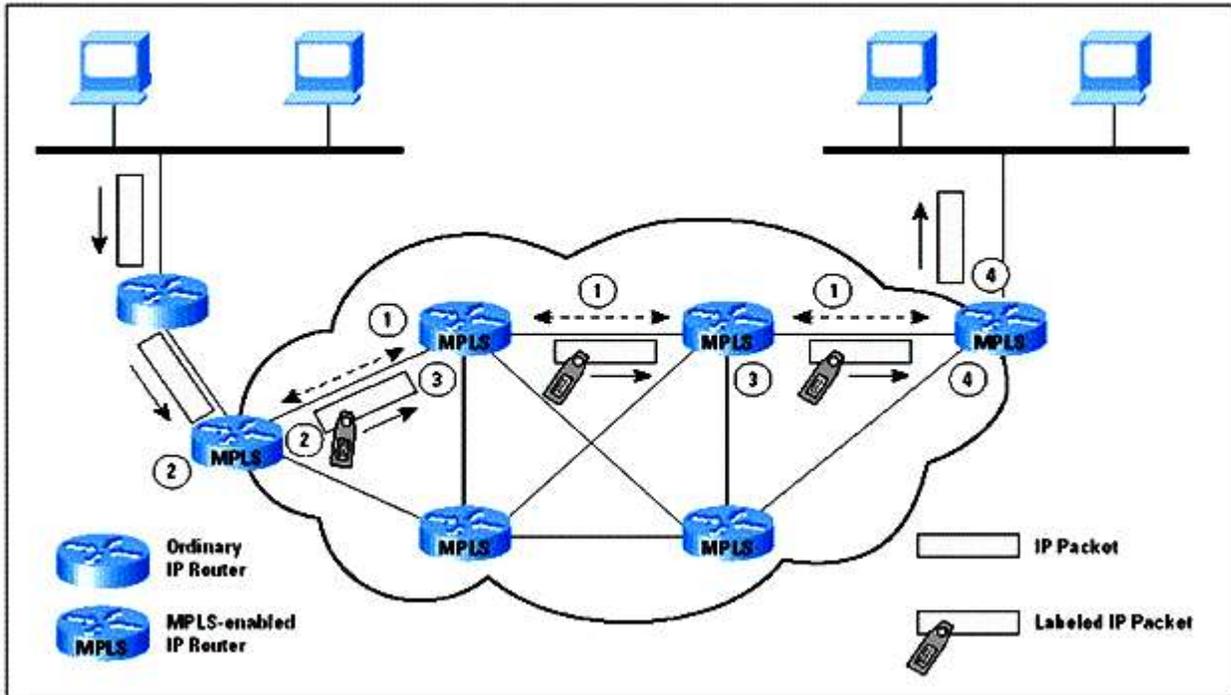


Figure: 10 MPLS OPERATIONS

Step3:- The LSR reads the label values first on each packet then replace with new one as listed in the table and then forward the packet [14].

Step4:- Egress edge routers strip the label value first then read the packet head and then forward it to the final destination [14].

VI. MPLS Services

MPLS VPN: - virtual private networks (VPNs) are a technique of interconnecting multiple sites belonging to the different client employing a service provider network in place of dedicated charted lines [15].

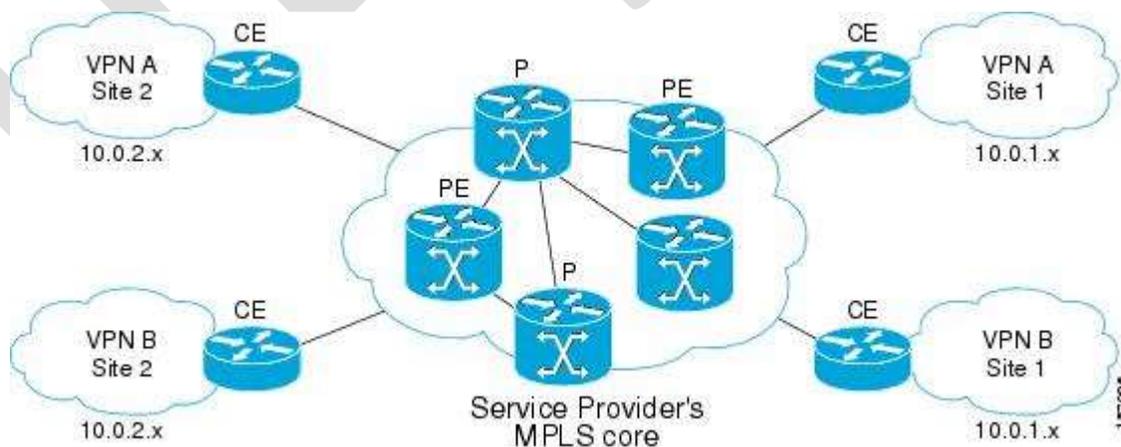


Figure: 11 MPLS VPN

Every client employing a service provider network in place of dedicated charted lines. Every client site is directly connected to the SP backbone. The SP offers a VPN services more economically then dedicated non-public VPNs are engineered by every individual client as a result of SP will share a similar backbone network resource between many shoppers [16]. The client conjointly gains by

outsourcing the complicated task of planning, provisioning and managing a geographical distributed network to SP. MPLS enabled informatics VPN are connectionless IP networks with similar privacy as frame relay and multiple IP services categories to enforce business based policies. MPLS based VPN builds operations router more economical [16].

The classical overlay VPN solution need tunneling or encryption deployed over a frame relay ATM or IP network. This mesh answer is made point-to-point requiring spate configuration of every tunnel or virtual circuit [17]. Moreover fails the traffic tunnel or overlapped the circuit doesn't grasped which sort of traffic it carries. By contrast if the client traffic are often classified by application client like voice, email or mission critical application, the network will simply assign traffic to the acceptable VPN while not configuring point-to point meshes [18]. Compare to the VPN overlay answer associate degree MPLS enabled VPN network will separate traffic and supply privacy while not tunneling or encryption. Using labels MPLS enabled network give privacy on a network-by-network basses very much like frame relay provides it a connection- by-connection basses. The frames relay VPN offers transport whereas MPLS enabled network supports services MPLS is that technology which offers switches and routed networks. It allows fast and cost efficient preparation of VPN of all sizes all over a similar infrastructure [18].

MPLS & QOS: Some form of traffic like video, place specific demand on network for flourishing transmission. QOS outlined as those mechanism that provide network manager the power to rectangle the combination of information measure delay jitter and packet class within the network at the ingress to the MPLS network internet protocol precedence information may be traced as class of service (COS) bits or may mapped to line the suitable MPLS (COS) worth within the MPLS label [19]. This can be the excellence between IP QOS that supported IP precedence field within the IP header and MPLS QOS that's that supported the COS bits within the MPLS label. MPLS COS information is employed to produce differentiated services. Thus MPLS COS allows end-to-end IP QOS across the network [19].

MPLS Tunneling: In the MPLS network when a packet enters firstly a label is inserted within the front of the packet header therefore the packet is encapsulated inside the MPLS network. MPLS creates a label switch path through the network for tagged packets. Then the packet change follows this label switch path rather than routing the packet supported the destination address within the IP header. Therefore PMLS effectively creates tunnel through the network [20].

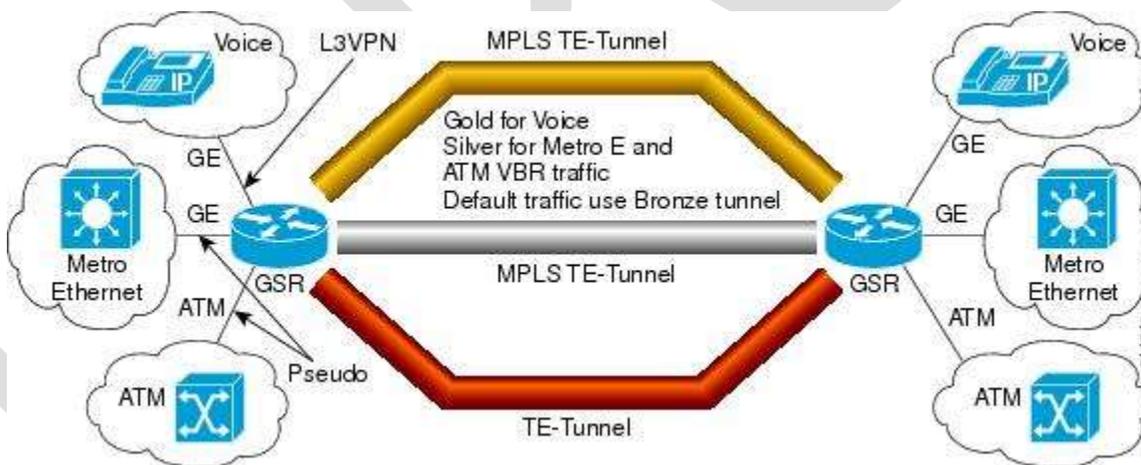


Figure: 12 MPLS Tunneling

This tunnel encompasses well defined entrance. A well defined exit and a gate to manage what's allowed into tunnel. Packets getting into the tunnel should pass the getting criteria once within the tunnel there are no branch exist since the packet isn't routed at intermediate mode. Since only the network operator will produce label switched methods, malicious users cannot produce further tunnel entrance or dispute the network The overhead caused by the MPLS tunneling depend upon the depth of the label stack [20]. Flow Merging:-MPLS permits the mapping from IP packets to forwarding equivalence class should be performed only one time at the ingress to the MPLS domain a forwarding equivalence category could be a set of packet which will be handled equivalently for the aim of forwarding and therefore it is appropriate for binding to a single label form a forwarding point of view packet inside constant subset are treated by the label switching router within the same approach even through the packet dissent from one another with relevance the knowledge within the IP header [20]. The mapping between information carried within the IP header of the packet and also the forwarding equivalence class is many to one. That is packet with completely different content of their IP header may will be mapped into constant forwarding equivalence category. For instance a collection of packet whose IP destination address matches a specific IP address prefix are often mapped into a specific forwarding equivalence category so the packet area unit tagged with constant label value and follow constant label switched path within the MPLS domain [19].

CONCLUSION

Multiprotocol Label Switching (MPLS) combines the intelligence of routing with the performance of switching and provides considerable benefits to networks with a pure IP architecture as well as those with IP and ATM or a mix of other Layer 2 technologies. This paper highlights the need for implementing MPLS technology to overcome some of the limitations involved in pure IP based forwarding. The innovative label based system simplifies IP based traffic routing from source to destination without affecting and manipulating the IP packets, thus highlighting the security aspect of MPLS networks. The paper also explains in-depth the technological standards involved and the use of these standards. The paper provides a detailed insight over the improved packet forwarding performance in MPLS based networks. MPLS operation and the signalling protocol called LDP which is most widely used in service provider networks are discussed at length.

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A Survey : Intrusion Detection System for database using data mining techniques

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Abstract: There are various security mechanisms available the security of the database is compromised by various attacks such as sql injection attack, zero day attacks, insider threats and various unknown attacks. To overcome such issues Intrusion Detection System (IDS) are developed, to detect malicious activity occurred in database. The IDS system sometimes are not able to detect the attacks as a false positive or false negative so to overcome such problems the detection method should be modified and enhanced using advance techniques. The efficiency of detection is also less as the unknown attacks are not recognized thus a technique can be delivered by combining security methods to deliver efficient intrusion detection system. The objective of various method is to detect the anomalies using various data mining techniques and provide accurate detection for malicious and intrusive activity. The attack can be done by any external entity or the threat may be caused by the insider, thus to detect the malicious activity and to take action against it the various methods are employed to increase detection of the intrusion and the reduction of false positives. This work provides analysis of various data mining based approaches and shows their efficiency and drawbacks with a vision of an advanced IDS that provides accurate results and reduces false detection.

Keywords: data mining; association rule mining; log mining; transaction-based technique, false positives.

1.INTRODUCTION

The main goal of data security can be divided into three separate, areas as follows. Secrecy is concerned with disclosure of information. The terms confidentiality or non-disclosure are the synonyms for secrecy. information or processes. to information. The term denial of service is also used as a synonym for availability. The secrecy is concerned with the problem of confidential data where there is extreme necessity of hiding the information of the users stored in a database. For example, in a credit card system, the card no., user name, its code and other confidential details are store, if such kind of sensitive data is leaked, or it is accessed by some hacker there can be a big loss and the misuse of the data is possible. The ultimate target of any attacker is a database thus it is highly essential to protect it from intrusion so as to maintain secrecy and data integrity. These three objectives also differ with respect to understanding of the objectives themselves and of the technology to achieve them. It is easiest to understand the objective of secrecy. Integrity is a less tangible objective on which experts in the field have diverse opinions. Availability is technically the least understood aspect. In terms of technology, the dominance of the commercial sector in the marketplace has led vendors to emphasize mechanisms for integrity rather than for military-like secrecy needs. These are severe attacks possible on a database system, and many detection techniques have been found to detect as well as prevent the intrusions, still there is scope of improving the mechanism, so as to provide accurate results and detect the anomalies as well as misuse of the data. The main motivation of this has emerged with the deliberate amount of work still in progress and remaining in order to provide an intrusion detection system as such on database management level which detects the known and unknown attacks. Hence in order to increase the efficiency of the intrusion detection this method has been motivated by two observations made on existing systems. First, despite of many existing intrusion detection systems the attacks are present in the database system and the attacks can be performed by the insider of the organization thus it is difficult to find out the malicious user in the system. Second, it is important to note that the intrusion detection systems on database level are having an overhead of storing large datasets and to increase the efficiency of the intrusive activity detection Data mining has attracted a lot of attention due to increased, generation, transmission and storage of huge volume data and an imminent need for extracting useful information and knowledge from them. In recent year's research have started looking into the possibility of using data mining techniques in the emerging field of computer security especially in the challenging problem of intrusion detection. Intrusion is commonly defined as a set of actions that attempt to violate the integrity, confidentiality or availability of a system. Intrusion detection is the process of finding important events occurring in a computer system and analyzing them for possible presence of intrusion. Intrusion detection is a second line of defense, when all the prevention technique is compromised and an intrusion has

potentially entered into the system. In general, that are two types of attacks: (i) Inside attack are the ones in which an intruder has all the privilege to access the application or the system, but it perform malicious actions. (ii) Outside attack are the ones in which the intruder does not have proper rights to access the system. Detecting inside attack is usually more difficult compare to outside attack.

2. DATA MINING TECHNIQUE

2.1 Misuse detection or Signature based: In signature based approach a signature of known attack is generated. The generated attack signature has been kept in for intrusion detection. A signature is a feature of an intruder. This approach detects only known attacks. The problem with this approach is that it is not capable to detect new attack introduced by intruder that has a no signature in database. In signature based false negative alarm rate increase. Chung et al. [12] present DEMIDS, misuse detection system for relational database systems. This method assumes that the legitimate users show some level of consistency in using the database system. If this assumption does not hold, it results in a large number of false positives. Lee et al. [13] designed a signature based database intrusion detection system (DIDS) which detects intrusions by matching new SQL statements against a known set of transaction fingerprints. However, generating the complete set of fingerprints for all transactions and maintaining its consistency is a rigorous activity. Moreover, if any of the legitimate transaction fingerprints are missing, it can cause many false alarms. The main problem with this approach is that it is difficult to ensure that the fingerprints thus learned are indeed precise and complete.

2.2 Anomaly or Profile based: In profile based intrusion detection approach, a profile of normal user is used for intrusion detection. This approach is suitable for finding unknown attack in database. The profile of normal user is stored in database for intrusion detection. The problem with this approach is it requires more training data set. In this approach false negative alarm increased. Another problem is that significant time and effort is required for training. Zhong et al. [6] use query templates to mine user profiles. Bertino et al. [14] proposed a database IDS that has similarity with role-based access control (RBAC) model in profile granularity. The problems resume by Rao et al. [19], this approach extracts the correlation among queries of the transaction. In this approach database log is read to extract the list of tables accessed by transaction and list of attributes read and written by transaction.

2.3 Association rule or dependency mining: Association refers to the correlation between items in a transaction. This approach work on data dependency, in which one item is modify another item refer with this also modify. Hu et al [16] determine dependency among data items where data dependency refers to the access correlations among data items. These data dependencies are generated in the form of classification rules, i.e., before one data item is updated in the database, which other data items probably need to be read and after this data item is updated, which other data items are most likely to be updated by the same transactions. Transactions that do not follow any of the mined data dependency rules are marked as malicious transactions. The problem with this concept is that they consider only those attribute that appeared more frequently either they are sensitive or not. They treat all the attributes at the same level and of equal importance, which is not always the case in real applications. In this approach there is no concept for attribute sensitivity. Some attribute may be accessed less frequently but their modification made a more inconsistency in database. Wang et al [17] have proposed a weighted association rule mining technique in which they assign numerical weights to each item to reflect interest/intensity of the item within the transaction. Tao et al [18] use weighted support for discovering the significant itemsets during the frequent itemset finding phase. Also have recently studied a proposed method the use of weighted association rule mining for speeding up web access by prefetching the URLs. These pages may be kept in a server's cache to speed up web access. Existing techniques of selecting pages to be cached do not capture a user's surfing patterns correctly. It use a Weighted Association Rule (WAR) mining technique that finds pages of the user's current interest and cache them to give faster net access. This approach captures both user's habit and interest as compared to other approaches where emphasis is only on habit. Data mining techniques can be used to mine these logs and extract association rules between the URLs requested by the users. The association rules will be of the form $X \rightarrow Y$ where X and Y are URLs. It means if a user accesses URL X then he would be accessing URL Y most likely. Database intrusion detection system is design using various approach here with we explain using data mining techniques. In this work, we have identified some of the limitations of the existing intrusion detection systems in general, and their incapability in treating database attributes at different levels of sensitivity in particular. In every database, some of the attributes are considered more sensitive to malicious modifications compared to others. Here with we explain an algorithm for finding dependencies among important data items in a relational database management system. Any transaction that does not follow these dependency rules are identified as malicious. The importance of this approach is it minimizes the number of false positive alarm. This approach generates more rules as compared to non-weighted approach. So there is a need for a mechanism to find out which of the new rules are useful for detecting malicious transactions. Such a mechanism helps in discarding redundant rules. However, the main problem with attribute dependency mining is the identification of proper support and confidence values.

2.4 Database Intrusion Detection based on Improved Association Rule Algorithm [1] It presents an improved association rule algorithm, based on which it builds a database intrusion detection system on the basis of association rules. This system is a circularly and dynamically updated system, but it must first create a set of legitimate access rules from a static database as the basis for the system's judgment. After entering the dynamic intrusion detection management process, the normal data may be extracted from the historical network data stream through the intrusion detection, or the additional data judged to be legitimate, which strictly removes all the possible invasion data, so the rules extracted from the normal data are normal rules, of course, the better the more training data, thus the extracted rules are more complete. Apriori algorithm has the following two defects: 1) Algorithm must spend a lot of time to deal with huge candidate item sets. 2) It must repeatedly scan the transaction database to carry out pattern matching for the candidate item sets. Just because the above two flaws, it presents the technology based on the data partition to improve the adaptability and efficiency of the Apriori algorithm. It can use data partition technique for mining frequent item sets with only two times of the whole database scan. As shown in figure, it contains two main processing stages. The first phase, the algorithm will divide the transactional database D into n independent parts For each division (part), to mine all the frequent item sets in which, they are called local frequent item sets. In terms of the whole database D , a local frequent item set is not necessarily the global frequent item set, but any global frequent item set will certainly occur in the local frequent item sets obtained by the partition. This is very easy to get evidence to the contrary. Therefore, the local frequent item sets mined from n partitions can be as the candidate item set of the frequent item sets in the whole database D ; and in the second stage again scanning the

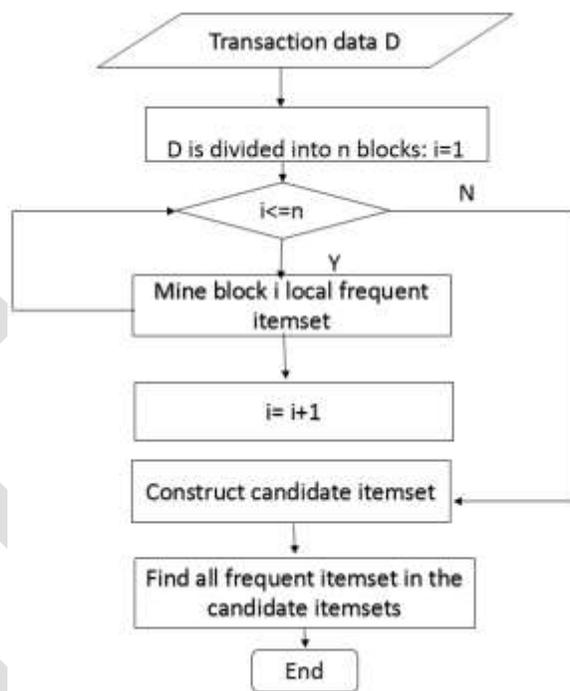


Fig. 1 Data Partitioning algorithm

entire database for the support frequency of all candidate item sets, to finally confirm the global frequent item set. The partition size and number has the standard that each partition can be entirely placed into memory, so each stage only needs to read the database content once, and the entire mining needs to scan the entire database twice.

2.5 Hybrid Approach for Database Intrusion Detection with Reactive Policies[2] It describes an approach for finding the intrusive activity using advanced apriori algorithm and also it introduces the concept of Reactive Policies. The Reactive Policies are the action rules defined to be taken against the intrusive activity. These policy are created based on the severity of an intrusion and an appropriate response is generated for the users who performed intrusive activity. Misuse and Anomaly detection are the two measure techniques used for IDS. Misuse detection is also known as signature based detection. Misuse detection technique is used for known attacks whereas Anomaly detection is based on finding the unknown attacks. Misuse detection is unable to detect the zero day attack and hence anomaly detection is employed in the system alongside the misuse detection. Both techniques have their own advantages and disadvantages: Misuse detection technique has already defined attack patterns so rate of false alarms is less, but it detects only

known attacks. On the other hand anomaly detection technique detects novel attacks but the rate of false alarms is high. The important components of the HRDIDS are discussed below. A. Pre-processed Audit Log. The very first step in designing the DIDS is to collect the logs of user activity. The information regarding the user activity should be collected properly and need to be processed properly. Preprocessing of collected logs is done. This is done by collecting the user activity in a proper format. This format consists of attributes of a user and its corresponding activity. Each activity is identified by an operation ID and operation status ID. B. Data mining Data Mining is very useful for market-basket applications, to analyse the trends of market. Association rule mining is very popular and useful technique in extracting patterns in a large database; it is a very well researched technique. Large datasets are observed which contain items that frequently occur with each other and a threshold level is defined; if the percentage of threshold is crossed for certain association, a strong rule is generated. These rules can be very useful for deciding future trends and in our case; this will give us exact strategy of intruders. One of the very popular techniques in association rule mining is Apriori algorithm. Apriori algorithm gives us the important associations and gives us association patterns that can be very useful for detecting the intrusions. We are using data mining technique to find out the associations in a user activity. Each activity is monitored with several attributes and corresponding associations are observed. One of the most popular data mining approaches is to get frequent itemsets from a transaction dataset and derives association rules. Apriori algorithm generates the associations that are hidden in the operations. For every abnormal event a reactive policy is applied. Test phase is the most important part of IDS. The decision of an audit log being intrusive or normal is taken in test phase.

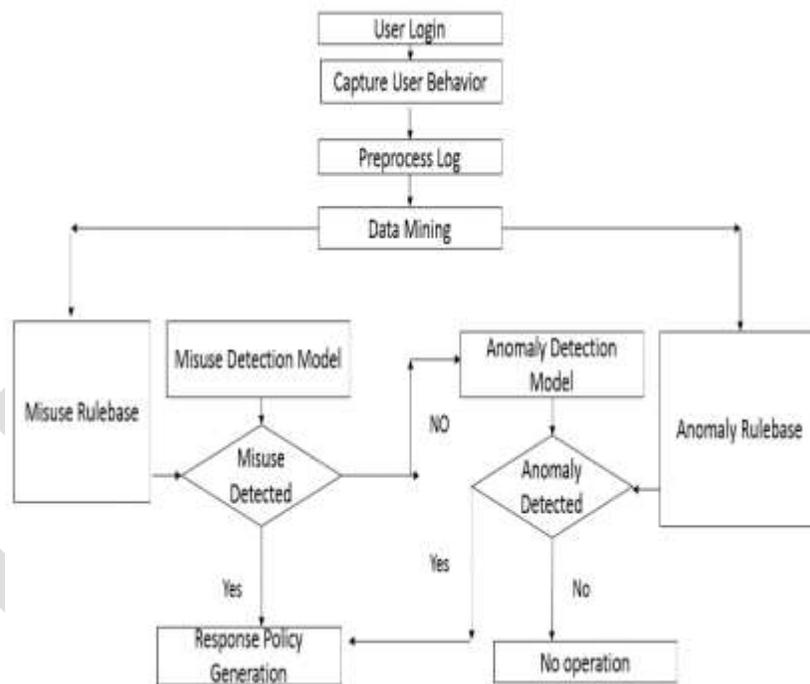


Fig. 2 System architecture of HRDS

We capture both normal as well as abnormal activities of the users and we test these activities with the normal patterns which we have identified during the training phase current data (audit log) is matched with trained rule base in case of anomaly detection process. If the process uses signature based intrusion detection technique then current data is matched with the updated rule base consisting of all previous intrusive signatures. System detects known as well as unknown intrusions and enhances the security by generating more selective and sensitive rules. This process is made faster by implementing the improved Apriori algorithm.

2.6 Detection of Malicious Transaction in Database using Log Mining Approach [4] This paper defines the log mining technique as automatic discovery for identifying anomalous database transactions. This approach can achieve desired true and false positive rates when the confidence and support are set up appropriately. The implemented system incrementally maintain the data dependency rule sets and optimize the performance of the intrusion detection process. There are two phases in which the approach is divided 1. Training phase 2. Detection phase. Training phase is to capture the behaviour of database objects, this monitor and audit the system operation. This auditing system helps to collect necessary data for building database profiles. To be more accurate, whatever technique the profiler utilizes to build the profiles, data gathered by auditing system provides necessary input for it. Depending on the suspicious

level or sensitivity of intrusion, detection mechanism can contribute to access control system to deny access and prevent the intruder from causing malicious transaction. The log file consists the information about the committed transactions those are executed in the secure environment by the authorized users. Transactions profile are considered as authorized profiles and stored at the system, after that these authorized transactions profile are used at the detection phase.

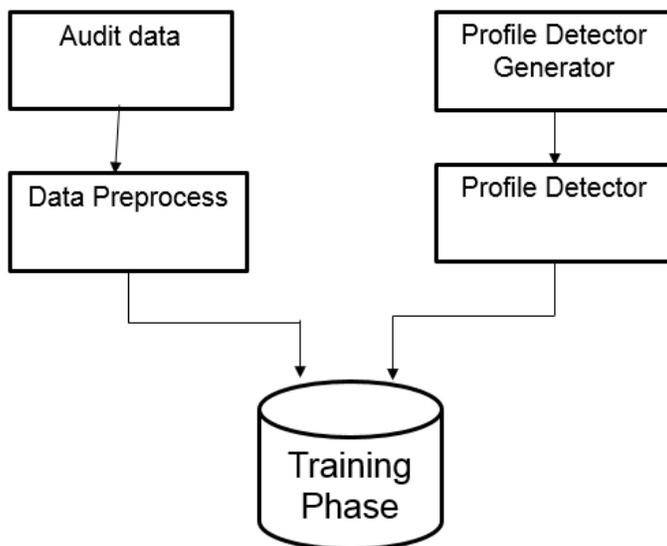


Fig. 3 Training phase the training phase for proposed system.

To capture the behavior of database objects, this monitor and audit the system operation. This auditing system helps to collect necessary data for building database profiles. To be more accurate, whatever technique the profiler utilizes to build the profiles, data gathered by auditing system provides necessary input for it. Detection system for Database. Depending on the suspicious level or sensitivity of intrusion, detection mechanism can contribute to access control system to deny access and prevent the intruder from causing malicious transaction.

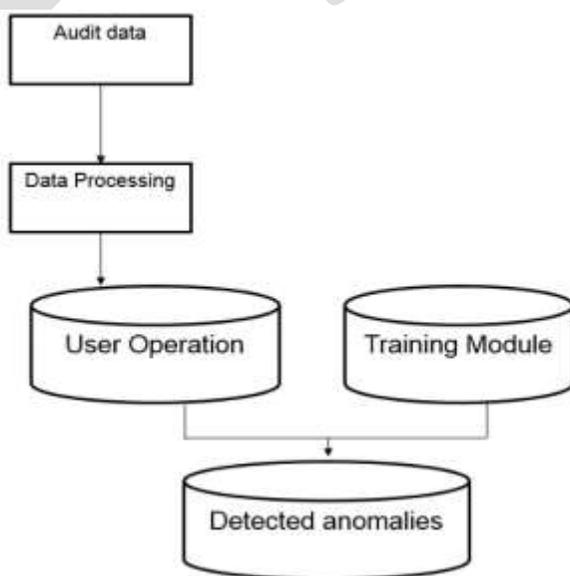


Fig. 4 Detection phase

The log file consists the information about the committed transactions those are executed in the secure environment by the authorized users. Transactions profile are considered as authorized profiles and stored at the system, after that these authorized transactions profile are used at the detection phase.

2.8 Database Intrusion Detection by Transaction Signature [3] The method evaluated here is located on the level of database management system .It focuses on security policies permitted on database system, it is designed to mine audit log of legitimate transaction performed with database and generate signature for legal transactions. The transaction which does not match the signature are declared a malicious transaction according to the policies defined. False positives are valid transactions identified as malicious transactions. In this mechanism the existence of false positives depends on how complete the definition of authorized transaction is. The proposed approach is based on using transaction signature and has learning, detection and response phase. Very briefly, the behaviour of database transaction is collected as a first step to feed the learning phase. Once the database utilization signatures is established, the behaviour learned from audit data is used to concurrently detect database intrusions in detection phase. For intrusive behaviour, this mechanism will alert database administrator. The central theme of my approach will be to learn and create signature from the collected audit data. A basic foundation for intrusion detection is collecting various normal behaviours of Database describe our architecture model in three phases.

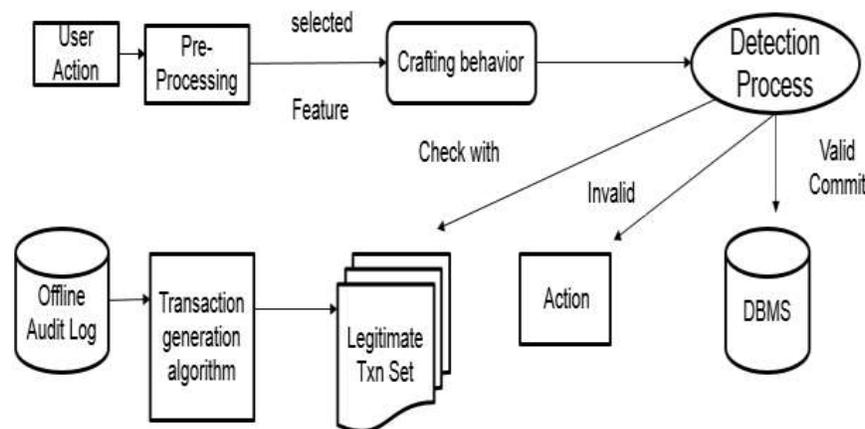


Fig. 5 Architecture of Transaction Signature Model

1) Phase I: Learning Phase For propose system first phase can be identify as learning phase. Normal or legitimate behaviour is understood in this phase. We have records in audit log of DBMS which contains users' action as per security policy of system. In propose system as in Fig. 5 ,we have offline audit log data store and Legitimate Transaction signature generation modules, which both actually used for identifying normal and acceptable behaviour of user's database transactions. All historical transaction with database is accessed to understand behaviour of legitimate transactions. Various techniques like trigger generation or enabling audit log with database is used for same purpose. 2) Phase II: Generating signature for user's action Preprocessing module as in Fig. 5 is used for extracting necessary information from transactions user performs with database. Normally user transaction is between BEGIN and END statement in transaction and contains various clause like select, insert, update etc. and attributes of database upon which operations are performed. In pre-processing we will extract key words, operations and target entities and kept it in dataset. So output of pre-processing is dataset or transaction set which can be used for next module. 3) Phase III: Response This module will be responsible for deciding action depending on whether user's action is legitimate or not. Whatever the output of the signature generation algorithm, will be compared with signature derived from historical data. Based on this comparison this module will decide what action should be taken. B. Design and Implementation Here we are going to use sample dataset of transactions with database. We are using sample database with table order, product, order-line and stock. Various operations are performed on this database.

2.9 An Immune Based Relational Database Intrusion Detection Algorithm [9] In this paper, intrusion detection approaches for relational database systems were studied. An immune based intrusion detection algorithm for relational databases was proposed. According to the algorithm, the data to be detected were encoded into binary strings after preprocessing. Intrusion detection was fulfilled by comparing the strings of audit data with immune detectors. The results show that the immune based intrusion detection algorithm for relational databases is more effective reducing the false alarm ratio and promoting correctness ratio. Immune detectors functioned like the immune cells in biological immune systems. The detectors attempted to recognize suspect user behaviors, which

patterns were highly similar to the patterns of the detectors. The matched behaviors were thought as anomalies. The philosophy of negative selection was adopted to generate the immune detectors. 1) Candidate detector generation: Candidate detectors are the initial binary strings generated for training. In some computer immunology systems, the candidate detectors were generated randomly. In this paper, since the length of each binary code is 8, there are at most $2^8 = 256$ binary strings. As the number of possible detectors is limited, the candidate detectors were not generated randomly, but by enumerating all the 256 binary strings. 2) Mature detector generation: The philosophy of negative selection in biological immune systems was adopted to generate the mature detectors. That is, only the lymphocytes that have immune reactions to the external antigens can live. The lymphocytes that have immune reactions to the self-cells will be killed. The mature detectors in the immune based intrusion detection system were generated similarly. Each string in candidate detectors set was compared with all the binary strings in self set. Only such detectors that cannot match any self-string should be reserved. The candidate detectors that matched the self-strings were deleted. All the reserved strings made up of the mature detectors set. Once mature detectors generated, they can be applied to detect anomalies by comparing with the strings of audit data collected in real time. The contiguous bit matching rule is also adopted. Since after negative selection, none of the mature detectors may match self-strings. When a string that matches one of the mature detectors is discovered, an anomaly is detected.

3. CONCLUSION

There are various methods for detecting the intrusion but still the intrusive activity occurs and malicious transaction takes place. Due to such intrusion the security of confidential and sensitive data is compromised. There is a scope for an improvement in the detecting methods for intrusive activity in database management system and optimizing the detection rate. The future work will be to enhance the approaches and to overcome the limitation of the processing power and the data storage issues to handle huge amount of information.

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A COMPARISON OF ACCURACIES OF VARIOUS CLASSIFIERS TO PROCESS EEG SIGNALS FOR PROSTHESIS CONTROL USING VARIATIONAL MODE DECOMPOSITION

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Abstract - Modern prosthetics use electroencephalogram (EEG) signals to receive signals from individual's muscles to control the prosthesis. The prosthetic of an amputee which cannot accurately detect the brain signals is a dead investment for him. This paper tries to maximize the classification accuracies of these signals so as to improve prosthetics by comparison between two main algorithms namely using Naïve Bayes and Part rule algorithms. The EEG dataset for the conditions using 27 different subjects with four different hand movements viz., finger open (fopen), finger close (fclose), clock wise wrist rotation (cw) and counter clock wise wrist rotation (ccw) were obtained from the NINAPRO DATABASE, a resource for bio robotics community of hand movements. The introduction of Variational Mode Decomposition (VMD) as a new signal pre-processing technique along with the different decision trees have provided good classification performance. VMD allows decomposition of the signal into various modes by identifying a compact frequency support around its central frequency, such that adding all the modes reconstructs the original signal. The statistical features were extracted. Out of these the useful features were identified using the J48 decision tree algorithm and selected features were classified using Naïve Bayes and Part rule algorithms. The classification accuracies of both classifiers have been compared for the EEG signals.

Keywords - Prosthetics, EEG signal classification, VMD, Decision Tree, Signal Processing, J48 algorithm, Naïve Bayes and Part rule algorithms

1. Introduction

Prosthesis is an artificial device that replaces a missing body part. The loss of the human forearm is a major disability that profoundly limits the everyday capabilities and interactions of individuals with upper-limb amputation (Kuiken et al., 2009). The interaction capability with the real-world can be restored using myoelectric control (Englehart & Hudgins, 2003; Hudgins, Parker, & Scott, 1993), where the electroencephalogram (EEG) signals generated by the human muscles are used to derive control commands for powered upper-limb prostheses. A person's prosthesis should be designed and assembled according to the patient's appearance and functional needs. It could be mechanical, electrical or myoelectric.

Electroencephalogram (EEG) or myoelectric signals are an electrical potential generated by the muscles. Normally, EEG signals can be measured by either an invasive method using a needle electrode sensor or a non-invasive method using a surface electrode sensor. Among the non-invasive techniques for probing human brain dynamics, electroencephalography (EEG) provides a direct measure of cortical activity with millisecond temporal resolution. EEG is a record of the electrical potentials generated by the cerebral cortex nerve cells. The EEG signal is highly complex; it is one of the most common sources of information used to study brain function and neurological disorders (Agarwal, Gotman, Flanagan, & Rosenblatt, 1998; Adeli, Zhou, & Dadmehr, 2003; Hazarika, Chen, Tsoi, & Sergejew, 1997).

EEG signals are complex due to the non-stationary characteristics and subject dependency of the signals (Aschero & Gizdulich, 2009). There are some difficulties in extracting sufficient information from the EEG for prosthetic control like electrode placement, electrode type, skin and the muscle. The Autoregressive model will overcome the electrode placement noise. The classification of actions associated with EEG signals for multifunction Myoelectric Control Systems (MCSs) is not simple when there are a number of simultaneously active muscles and when the muscle activity is weak (Arjunan, 2008; Arjunan & Kumar, 2010; Maitrot, Lucas, Doncarli, & Farina, 2005; Naik, Kumar, & Arjunan, 2009, 2010; Singh & Kumar, 2008).

The present study makes use of a new pre-processing technique to decompose the signal into various modes or IMFs using calculus variations. The modes have compact frequency support around the central frequency. Alternating Direction Multiplier Method (ADMM) was used as optimization tool to find such central frequencies concurrently. The main purpose of decomposing a signal is to identify various components of the signal. This work focuses on a new algorithm - variational mode decomposition (VMD), which extracts different modes present in the signal. In the present study, an attempt is made to compare the accuracy of the EEG Signal using Naïve Bayes and Part Rule algorithms. To extract best possible features, the signals were preliminarily pre-processed for finding the modes and IMFs. Then, descriptive statistical features like mean, median, kurtosis etc. were extracted. With the extracted statistical features, feature selection is done using J48 decision tree algorithm, further classification was carried out using above mentioned decision tree algorithms.

2. SYSTEM ARCHITECTURE AND DATA ACQUISITION

The EEG signal is acquired after proper skin preparations and are amplified before being filtered and sampled. The pre-processed signals are then used to extract features and subsequently the extracted features are given to a classifier.

2.1 DATA ACQUISITION

NINAPRO database consists of kinematic and SEEG data from the upper limbs of 27 intact subjects while performing 52 finger, hand and wrist movements. The database is publicly available to download in standard ASCII format [5]. Surface EEG was collected from a subject's forearm skin while performing a number of movements of interest, or producing force patterns of interest. While intact subjects were examined by recording SEEG from the same arm, in the case of amputees recording of SEEG was from a stump while eliciting movements of interest either by imitation or bilateral coordinated motion. Surface EEG activity was gathered using ten active double-differential OttoBock MyoBock 13E200 surface EEG electrodes which had an amplification factor of 14000.

The Electroencephalogram (EEG) experimental setup performs four different classes viz., fopen, fclose, cw and ccw, principally focusing on data from 27 healthy subjects. The EEG signals were collected from the subject's four different hand movements. The data in the EEG database were obtained by the following procedure: The subject was made to sit on an adjustable chair and instructed to have electrodes (C3, C4, CZ, FZ and PZ) with conductive gel medium on scalp surface. Initial signal artefacts due to head motion will be generally ignored in the analysis. Experiment will be scheduled based on specific time series with respect to the classes. Signals from neurons are acquired with the help of these five electrodes which in turn connected with Electroencephalogram device with the frequency ranges from 8 to 3 Hz.

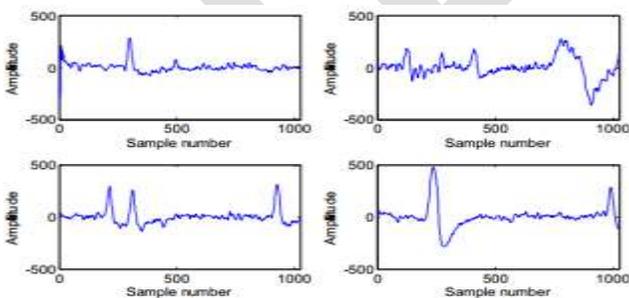


Fig.1 Time Domain EEG Signal

2.2 FILTERING AND SAMPLING

The EEG signals for various classes of hand movements have to be filtered to extract the region of activity. In the spectrum of signals most of information is contained in frequencies up to 500 HZ. Second order Butterworth band pass filter with cut off frequencies 20 Hz and 500 Hz is used. Butterworth filter exhibits a maximally flat response without any ripples in the pass band region. With amplitude distinction being very critical in EEG analysis, low distortion Butterworth filter is preferred. Sampling is done in accordance with the nyquist criterion the signal is then sampled at 2 KHZ.

3. Pre-Processing using Variational Mode Decomposition

Variational Mode decomposition decomposes the signal into various modes or intrinsic mode functions using calculus of variation. Each mode of the signal is assumed to have compact frequency support around a central frequency. VMD tries to find out these central frequencies and intrinsic mode functions centred on those frequencies concurrently using an optimization methodology called ADMM. The original formulation of the optimization problem is continuous in time domain.

VMD is formulated as; Minimize the sum of the bandwidths of k modes subject to the condition that sum of the k modes is equal to the original signal. The unknowns are k central frequencies and k functions centred at those frequencies. Since part of the unknowns is function, calculus of variation is applied to derive the optimal functions.

Bandwidth of an AM-FM signal primarily depends on both, with the maximum deviation of the instantaneous frequency $\Delta f \sim \max(|\omega_k(t) - \omega_k|)$ and the rate of change of instantaneous frequency. Dragomiretskiy and Zosso proposed a function that can measure the bandwidth of an intrinsic mode function $u_k(t)$. At first they computed Hilbert transform of $u_k(t)$. Let it be $u_k^H(t)$. Then formed an analytic function $(u_k(t) + ju_k^H(t))$. The frequency spectrum of this function is one sided (exists only for positive frequency) and assumed to be centered on ω_k . By multiplying this analytical signal with $e^{-j\omega_k t}$, the signal is frequency translated to be centered at origin. The integral of the square of the time derivative of this frequency translated signal is a measure of bandwidth of the intrinsic mode function $u_k(t)$.

$$\text{Let } u_k^M(t) = (u_k(t) + ju_k^H(t))e^{-j\omega_k t}$$

It is a function whose spectrum is around origin (baseband). Magnitude of time derivative of this function when integrated over time is a measure of bandwidth. Hence,

$$\Delta\omega_k = \int (\partial_t (u_k^M(t))) (\overline{\partial_t (u_k^M(t))}) dt$$

$$\text{where, } \partial_t (u_k^M(t)) = \partial_t \left[\left(\delta(t) + \frac{j}{\pi t} \right) * u_k(t) \right].$$

By absorbing the last inner product which is basically $\int \lambda(t) \left(f(t) - \sum_i u_i(t) \right) dt$ into the term

$$\left\| f - \sum_i u_i \right\|_2^2 = \int \left(f(t) - \sum_i u_i(t) \right)^2 dt, \text{ then}$$

$$\left\| f - \sum_i u_i \right\|_2^2 + \left\langle \lambda, f - \sum_i u_i \right\rangle = \left\| f - \sum_i u_i + \frac{\lambda}{2} \right\|_2^2$$

Therefore

$$u_k^{n+1} = \arg \min_{u_k(t)} \alpha \sum_k \left\| \partial_t \left[\left(\left(\delta(t) + \frac{j}{\pi t} \right) * u_k(t) \right) e^{-j\omega_k t} \right] \right\|_2^2 + \left\| f - \sum_i u_i + \frac{\lambda}{2} \right\|_2^2$$

This problem can be solved in spectral domain by noting the fact that norm in time domain is same as norm in frequency domain.

The following results are used in Fourier transform

$$u_k(t) \Leftrightarrow \hat{u}_k(\omega) \Rightarrow \partial_t(u_k(t)) \Leftrightarrow (j\omega)\hat{u}_k(\omega)$$

$$u_k(t) \Leftrightarrow \hat{u}_k(\omega) \Rightarrow \left(\delta(t) + \frac{j}{\pi t}\right) * u_k(t) = u_k(t) + \frac{j}{\pi t} * u_k(t) \Leftrightarrow (1 + \text{sgn}(\omega))\hat{u}_k(\omega)$$

Note that,

$$\text{for negative } \omega, (1 + \text{sgn}(\omega))\hat{u}_k(\omega) = 0$$

$$\text{and for positive } \omega, (1 + \text{sgn}(\omega))\hat{u}_k(\omega) = 2\hat{u}_k(\omega)$$

$$u_k(t) + \frac{j}{\pi t} * u_k(t) \Leftrightarrow (1 + \text{sgn}(\omega))\hat{u}_k(\omega) \Rightarrow \left(u_k(t) + \frac{j}{\pi t} * u_k(t)\right) e^{-j\omega_k t} \Leftrightarrow (1 + \text{sgn}(\omega + \omega_k))\hat{u}_k(\omega + \omega_k)$$

Therefore

$$u_k^{n+1} = \arg \min_{\hat{u}_k(\omega)} \alpha \left\| j\omega(1 + \text{sgn}(\omega + \omega_k))\hat{u}_k(\omega + \omega_k) \right\|_2^2 + \left\| \hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right\|_2^2$$

Replacing $\omega \rightarrow \omega + \omega_k$

$$u_k^{n+1} = \arg \min_{\hat{u}_k(\omega)} \alpha \left\| j(\omega - \omega_k)(1 + \text{sgn}(\omega))\hat{u}_k(\omega) \right\|_2^2 + \left\| \hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right\|_2^2$$

In the above expression, the first term vanishes for negative frequencies

$$\begin{aligned} \left\| (1 + \text{sgn}(\omega + \omega_k))\hat{u}_k(\omega + \omega_k) \right\|_2^2 &= \int_w (j(\omega - \omega_k)(1 + \text{sgn}(\omega))\hat{u}_k(\omega)) \overline{(j(\omega - \omega_k)(1 + \text{sgn}(\omega))\hat{u}_k(\omega))} d\omega \\ &= \int_0^\infty 4(\omega - \omega_k)^2 |\hat{u}_k(\omega)|^2 d\omega \end{aligned}$$

Second term is symmetric around origin, therefore

$$\left\| \hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right\|_2^2 = \int_{-\infty}^\infty \left(\hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right) \overline{\left(\hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right)} d\omega = 2 \int_0^\infty \left(\hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right) \overline{\left(\hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right)} d\omega$$

Also $\left(\hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right)$ being a complex number

$$\left(\hat{f}(\omega) - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right) \left(\overline{\hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2}} \right) = \left| \hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right|^2, \text{ where } || \text{ represent magnitude of the complex number.}$$

Therefore,

$$\hat{u}_k^{n+1} = \arg \min_{\hat{u}_k(\omega), \omega > 0} \int_0^\infty \left(4\alpha(\omega - \omega_k)^2 |\hat{u}_k(\omega)|^2 + 2 \left| \hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right|^2 \right) d\omega$$

Here unknown is a function. Hence, apply Euler Lagrangian condition to obtain the solution.

$$\text{Let } F = 4(\omega - \omega_k)^2 |\hat{u}_k(\omega)|^2 + 2 \left| \hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right|^2$$

$$\frac{dF}{d\hat{u}_k} = 0 \Rightarrow 8\alpha(\omega - \omega_k)^2 \hat{u}_k + 4 \left(\hat{f} - \sum_i \hat{u}_i + \frac{\hat{\lambda}}{2} \right) (-1) = 0$$

$$\Rightarrow 2\alpha(\omega - \omega_k)^2 \hat{u}_k + \hat{u}_k = \left(\hat{f} - \sum_{i \neq k} \hat{u}_i + \frac{\hat{\lambda}}{2} \right) \Rightarrow \hat{u}_k (1 + 2\alpha(\omega - \omega_k)^2) = \left(\hat{f} - \sum_{i \neq k} \hat{u}_i + \frac{\hat{\lambda}}{2} \right)$$

$$\hat{u}_k^{n+1} = \left(\hat{f} - \sum_{i \neq k} \hat{u}_i + \frac{\hat{\lambda}}{2} \right) \frac{1}{(1 + 2(\omega - \omega_k)^2)}, \quad \omega \geq 0$$

Update for ω_k s

$$\omega_k^{n+1} = \arg \min_{\omega_k} \left\| \partial_i \left[\left(\left(\delta(t) + \frac{j}{\pi t} \right) * u_k(t) \right) e^{-j\omega_k t} \right] \right\|_2^2$$

$$\omega_k^{n+1} = \arg \min_{\omega_k} \left\| j\omega(1 + \text{sgn}(\omega + \omega_k)) \hat{u}_k(\omega + \omega_k) \right\|_2^2$$

$$\omega_k^{n+1} = \arg \min_{\omega_k} \left\| j(\omega - \omega_k)(1 + \text{sgn}(\omega)) \hat{u}_k(\omega) \right\|_2^2$$

$$\omega_k^{n+1} = \arg \min_{\omega_k} \int_0^\infty (\omega - \omega_k)^2 |\hat{u}_k(\omega)|^2 d\omega$$

Here

$$\omega_k^{n+1} \text{ is given by the solution of } \int_0^\infty \frac{d}{d\omega_k} \left((\omega - \omega_k)^2 |\hat{u}_k(\omega)|^2 \right) d\omega = 0$$

$$\int_0^{\infty} -2(\omega - \omega_k) |\hat{u}_k(\omega)|^2 d\omega = 0$$

$$\Rightarrow \omega_k^{n+1} = \frac{\int_0^{\infty} \omega |\hat{u}_k(\omega)|^2 d\omega}{\int_0^{\infty} |\hat{u}_k(\omega)|^2 d\omega}$$

Update for λ (Lamda)

$$\lambda^{n+1} \leftarrow \lambda^n + \tau(f - u_k^{n+1}(t))$$

Final algorithm for VMD:

initialize $\hat{u}_k^1, \hat{\omega}_k^1, \hat{\lambda}^1, n \leftarrow 0$

repeat

$n \leftarrow n + 1$

for $k = 1 : K$ do

Update \hat{u}_k for all $\omega \geq 0$

$$\hat{u}_k^{n+1} \leftarrow \frac{\hat{f} - \sum_{i < k} \hat{u}_i^{n+1} - \sum_{i > k} \hat{u}_i^n + \frac{\hat{\lambda}^n}{2}}{1 + 2\alpha(\omega - \omega_k^n)^2} \quad (2)$$

Update ω_k :

$$\omega_k^{n+1} \leftarrow \frac{\int_0^{\infty} \omega |\hat{u}_k^{n+1}(\omega)|^2 d\omega}{\int_0^{\infty} |\hat{u}_k^{n+1}(\omega)|^2 d\omega} \quad (3)$$

end for

Dual ascent for all $\omega \geq 0$:

$$\hat{\lambda}^{n+1} \leftarrow \hat{\lambda}^n + \tau(\hat{f} - \sum_k \hat{u}_k^{n+1}) \quad (4)$$

until convergence: $\sum_k \|\hat{u}_k^{n+1} - \hat{u}_k^n\|_2^2 / \|\hat{u}_k^n\|_2^2 < \epsilon$

3.1 Discretization of Frequency

It is first assumed that length of the mirrored signal in the time domain is 1. If total length of the mirrored signal in terms of number of discrete values is T, then sampling interval is 1/T.

The discrete frequency is assumed to vary from -0.5 to +0.5 so that it represents normalized discrete frequency. It must be noted that algorithm construct Fourier transform of different mode function values for positive frequencies only. The other half can be easily created by conjugating and reflecting on the left side.

Once all the mode functions in the frequency domain are obtained, then obtain the time domain mode functions by taking inverse Fourier transform. These mode functions correspond to mirrored signal. Then cut off the appended (reflected portions) part of the signal to obtain the desired intrinsic mode functions.

4. Feature Extraction

Descriptive statistical parameters such as kurtosis, mean, variance and standard deviation extracted from the vibrational signals are computed to serve as features. They are named as 'statistical features' here. Brief descriptions about the extracted features are given below.

- (a) **Standard deviation:** This is a measure of the effective energy or power content of the vibration signal. The following formula was used for computation of standard deviation.

$$\text{Standard Deviation} = \sqrt{\frac{\sum x^2 - (\sum x)^2}{n(n-1)}}$$

- (a) **Standard error:** Standard error is a measure of the amount of error in the prediction of y for an individual x in the regression, where x and y are the sample means and 'n' is the sample size.

$$Y = \sqrt{\frac{1}{n-2} \left[\sum y - \bar{y}^2 - \frac{[\sum x - \bar{x} \quad y - \bar{y}]^2}{x - \bar{x}^2} \right]}$$

- (b) **Sample variance:** It is variance of the signal points and the following formula was used for computation of sample variance.

$$\text{Sample Variance} = \frac{\sum x^2 - (\sum x)^2}{n(n-1)}$$

- (c) **Kurtosis:** Kurtosis indicates the flatness or the spikiness of the signal. Its value is very low at normal condition.

$$\text{Kurtosis} = \left\{ \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum \left(\frac{x_i - \bar{x}}{s} \right)^4 \right\} - \frac{3(n-1)^2}{(n-2)(n-3)}$$

where 's' is the sample standard deviation

- (d) **Mean:** Mean is computed as arithmetic average of all points in the signal.

$$\text{Mean} = \sum_{i=1}^n x_i$$

5 Feature Selection using J48 Decision tree

It is essential to make use of only those statistical features which actually contribute to the classification accuracy. Some of the features are purely irrelevant and adds to the computational load of the system. The process of selecting only the relevant statistical features for the classification process so as to reduce the computational effort and improve classification accuracy is known as feature selection. In the present study, the dataset is used with J48 algorithm to generate the decision tree which facilitates the feature selection process, here we have achieved an accuracy of **91.67%**. The decision tree generated for EEG signals is shown in Fig.2

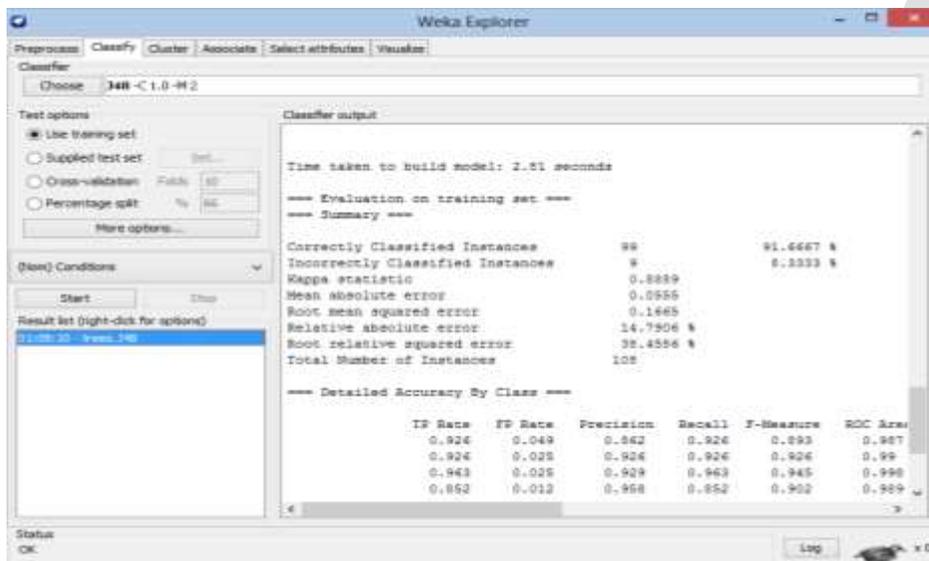


Fig.2a Result of EEG signals for J48

```

=== Confusion Matrix ===
 a  b  c  d  <-- classified as
25  1  0  1 | a = Fclose
 2 25  0  0 | b = Fopen
 1  0 25  1 | c = WCCW
 1  1  2 23 | d = WCW
    
```

Confusion Matrix using J48

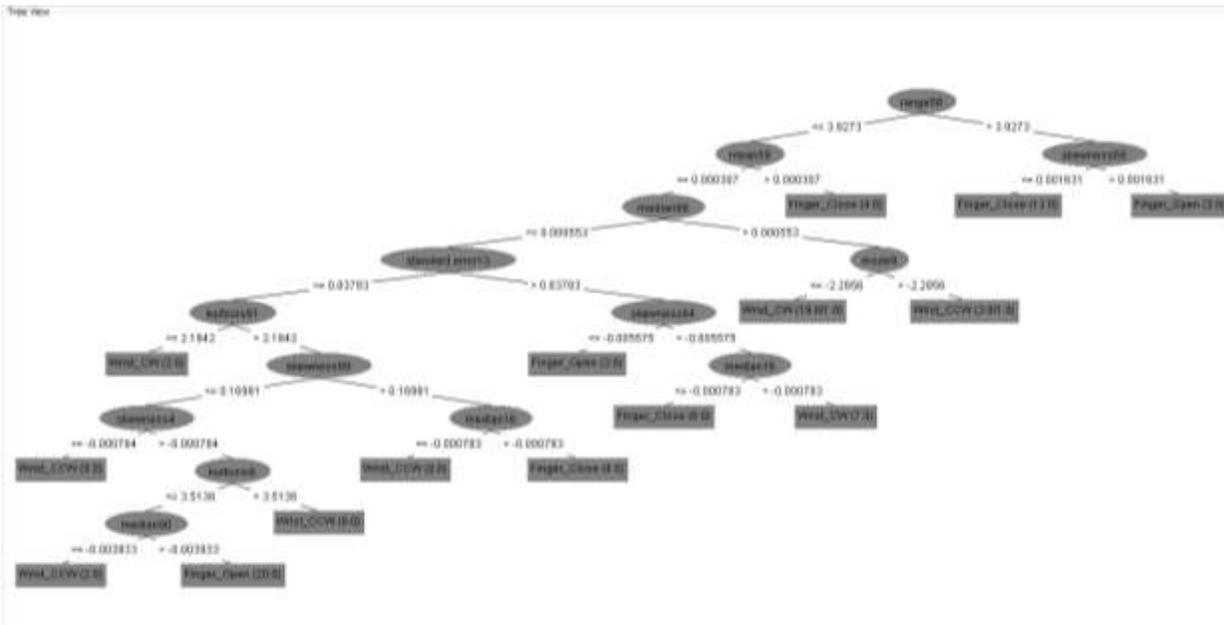


Fig.3 Decision tree of EEG signal

The features that are appearing on top of the decision tree are good for classification. The ones that do not appear are not useful for classification. The features appearing in the bottom of the tree are relatively less important ones. Hence, one can consciously choose or omit depending on the classification accuracy requirement and computational resources available.

6 Classifier

In machine learning, classification is considered an instance of supervised learning, i.e. learning where a training set of correctly identified observations is available. A path from the root to a leaf represents the rules for classification (Mohamed et al. 2012, Breiman et al. 1984). An algorithm that implements classification, especially in a concrete implementation, is known as a classifier. In the present study, classifier used is, Naïve Bayes and Part rule algorithm. A brief description is given below

6.1 Naïve Bayes

Naïve Bayes Classifier uses estimator classes to classify. Numeric estimator precision values are chosen based on analysis of the training data. For this reason, the classifier is not an Updateable Classifier (which in typical usage are initialized with zero training instances)

6.2 Part Algorithm

Part Algorithm is a Class for generating a PART decision list. Uses separate-and-conquer. Builds a partial C4.5 decision tree in each iteration and makes the "best" leaf into a rule. It has the Following parameters, that can be varied to improve the classification efficiency

Confidence Factor -The confidence factor used for pruning (smaller values incur more pruning).

debug - If set to true, classifier may output additional info to the console.

minNumObj - The minimum number of instances per rule.

numFolds - Determines the amount of data used for reduced-error pruning. One fold is used for pruning, the rest for growing the rules.

reducedError Pruning - Whether reduced-error pruning is used instead of C.4.5 pruning.

seed - The seed used for randomizing the data when reduced-error pruning is used.

7 Results and Discussion

Data from 27 healthy subjects while performing four different classes viz., fopen, fclose, cw and ccw were taken and necessary statistical features like mean, median, standard deviation, kurtosis were computed for each signal for EEG signals. J48 algorithm was used to select the features necessary for classification purpose. With these features, the classification accuracy was computed using Naïve Bayes and Part Rule algorithm

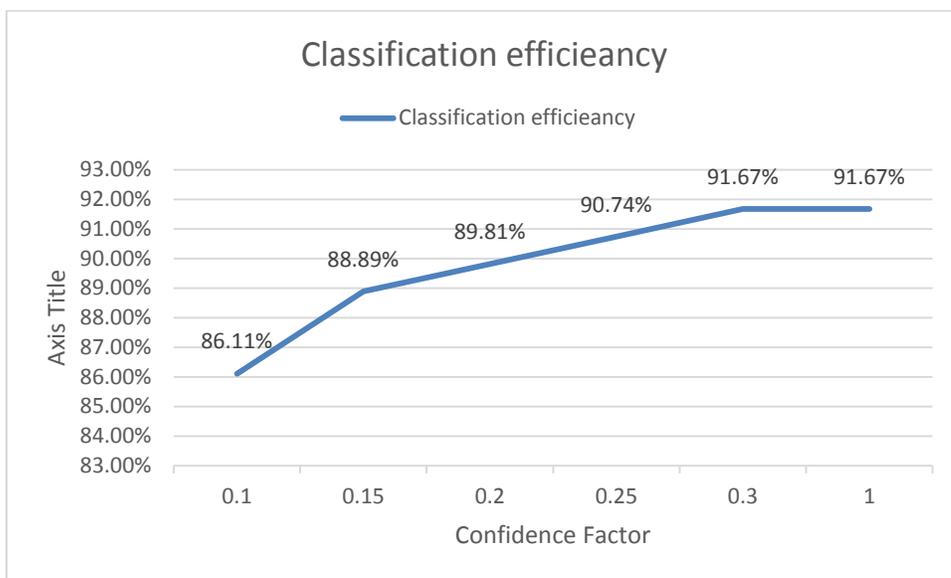
7.1 Statistical Features with Decision Tree

Ramalingam et al, 2013 recorded signal samples and used it for generating decision tree for the purpose of feature selection. The class wise accuracy generated by this study is illustrated in Table 1. The results indicate that it generates a classification accuracy of **38.88%** for EEG signals.

Table 1: Class wise accuracy of EEG signals

	fopen	fclose	cw	ccw
fopen	9	9	7	2
fclose	12	6	2	7
cw	3	6	16	2
ccw	5	6	5	11

Graph 1: Variation of Classification Efficiency with respect to Confidence Factor



As it can be seen from the graph, the maximum classification efficiency is 91.67% and is found at confidence factor 0.3 and remains the same till confidence factor of 1.

7.2 Variational Mode Decomposition with Naïve Bayes algorithm

This section discusses the results obtained from Naïve Bayes Algorithm. Confusion matrix obtained by optimizing the parameters for EEG signals is shown in the Fig. 4. The diagonal elements of the confusion matrix represent the correctly classified instances indicating an overall accuracy of **84.2593 %** for the EEG signals.

```

=== Confusion Matrix ===
  a  b  c  d  <-- classified as
24  0  3  0 | a = Fclose
 5 20  2  0 | b = Fopen
 1  1 25  0 | c = wccw
 2  0  3 22 | d = wcw
    
```

Fig.4 Confusion matrix of Naïve Bayes:

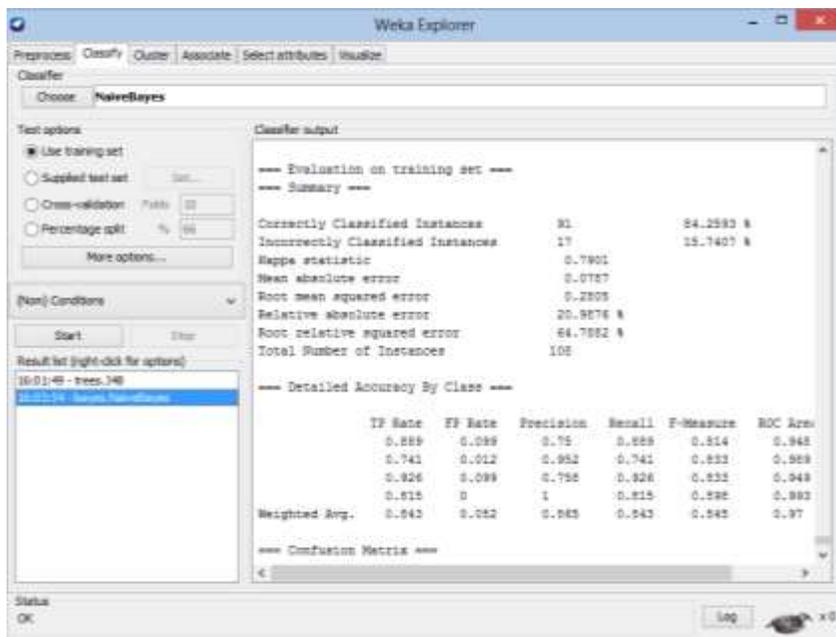


Fig.5 Results of Naïve Bayes:

7.3 Variational Mode Decomposition with Part rule algorithm:

Part is a Class for generating a PART decision list. Uses separate-and-conquer. Builds a partial C4.5 decision tree in each iteration and makes the "best" leaf into a rule. This section discusses the results obtained from Part rule Algorithm. Result obtained by optimizing the parameters for EEG signals is shown in the Fig. 6. The diagonal elements of the confusion matrix represent the correctly classified instances indicating an overall accuracy of **97.22 %** for the EEG signals

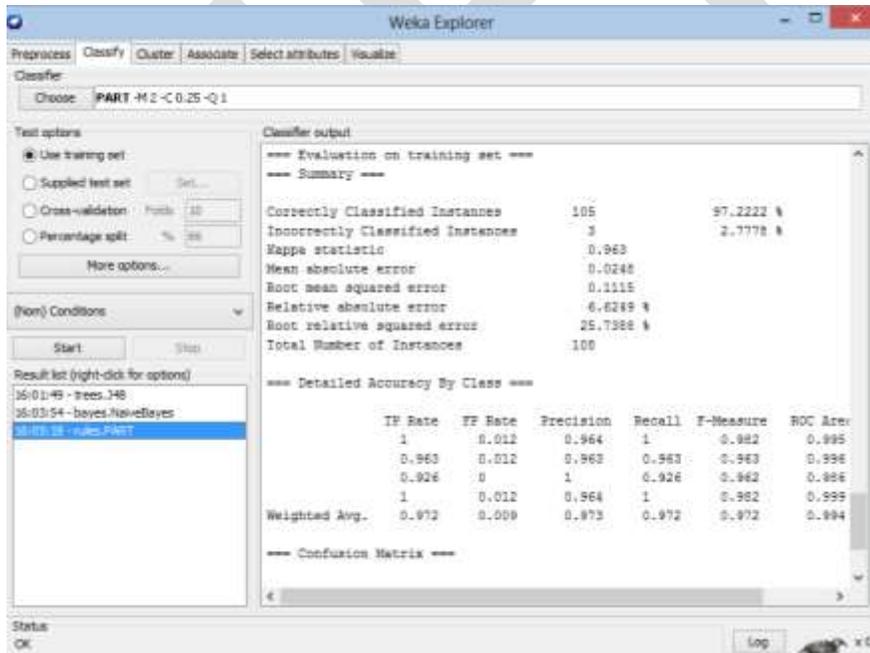


Fig.6 Results of Part:

=== Confusion Matrix ===

```
a b c d <-- classified as
27 0 0 0 | a = Fclose
0 26 0 1 | b = Fopen
1 1 25 0 | c = wccw
0 0 0 27 | d = wcw
```

Fig.7 Confusion Matrix of Part rule Algorithm

8 Conclusion

The results and observations from the present study suggest that prosthetic arm using decision tree based approach is a viable option. An attempt is made to compare the performances of EEG signals using different classifiers. The introduction of Variational Mode Decomposition (VMD) as a new signal pre-processing technique along with the **Part rule algorithm** have provided outstanding performance characteristics with a classification accuracy reaching **97.22 %** and **84.2593%** using **Naïve Bayes for EEG Signals**. Statistical features extracted from raw signal (without VMD pre-processing) and various decision tree algorithms have been studied for bench marking the new features and classifier. The accuracy achieved by VMD pre-processed signals (**91.67%**) is far superior to that generated using the signals which were not VMD pre-processed (**38.88%**). From the results and discussions, one can conclude that Part Rule Algorithm is better suited for classifying EEG signals (**with an accuracy of 97.22%**) for the application in prosthetic arm.

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Wastewater Recycling In Cotton Textile Wet Processing: An Experimental Study

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Abstract

Textile industry is water intensive industry. Mostly textile wet processing industry use more water for their production. Water is expensive to buy, treat & dispose and as it is becoming a scarce commodity, sustainable developments of the textile industry needs recycling of waste water generated and conservation of water to reduce the water requirements and also dependency on other water sources. As the cost of water supplied to industry keeps increasing, recycling becomes more important. Many textile industries in water scarce areas are installing water recycle plants. Municipal wastewater after treatment is disposed to environment. This abundant water is wasted which can be recycled in to the industry with required amount of treatment. This research paper comprises of experimental analysis of recycling municipal treated wastewater for cotton textile wet processing after a necessary treatment.

Key words: Wastewater recycling, Pilot treatment plant, Whiteness index, k/s value, rubbing index, cost-benefit analysis

Introduction

Last few years inadequate water supply is becoming hurdle in the progress, modernization and diversification of textile industry. Textile industries in are having water sources as ground water source, municipal water and water supplied by private water tankers. Day by day these industries are facing water scarcity problems severely. This water scarcity is becoming more severe because of increased exploitation of ground water, increasing urbanization and civilization. To fulfill the increasing water demand of textile processing units, treated Municipal wastewater can be recycled to utilize it in textile processing units. At present this thousands of liters of treated municipal wastewater is disposed on land and river which can be reutilized with techno-economical treatment.

Conceptual Framework of Wastewater Recycling

In the conceptual framework of wastewater recycling considered here, nearest textile industrial estate can directly use this water with recycling concept as shown in Fig 1. The retreated water can be recycled in to various textile industries in two ways. First option is to provide this all treated water to nearest textile industrial estate. The treated water from recycling plant will be collected in receiving chamber or collection sump. From collection sump it can be supplied to various industries. Water used by this industry is treated in their common effluent treatment plant (CETP) and return the water to wastewater treatment plant (WWTP) as shown option 1 in the Fig 1. Another way is that the water used by textile industry after necessary treatment can be directly returned to wastewater recycling plant as shown in option 2.

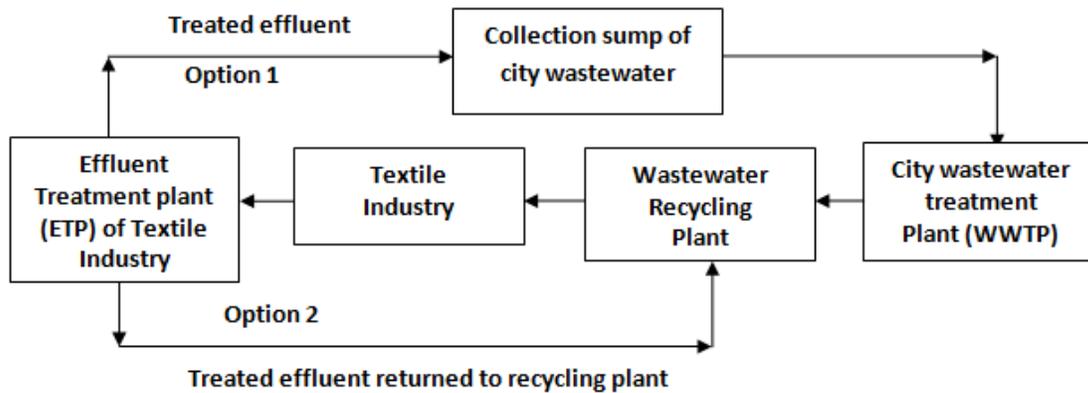


Fig 1 Conceptual framework of wastewater recycling

Pilot treatment plant

Experimental setup of laboratory Scale Pilot Treatment Plant is shown in Fig 2. Pilot treatment plant comprises various treatment processes and units as under-

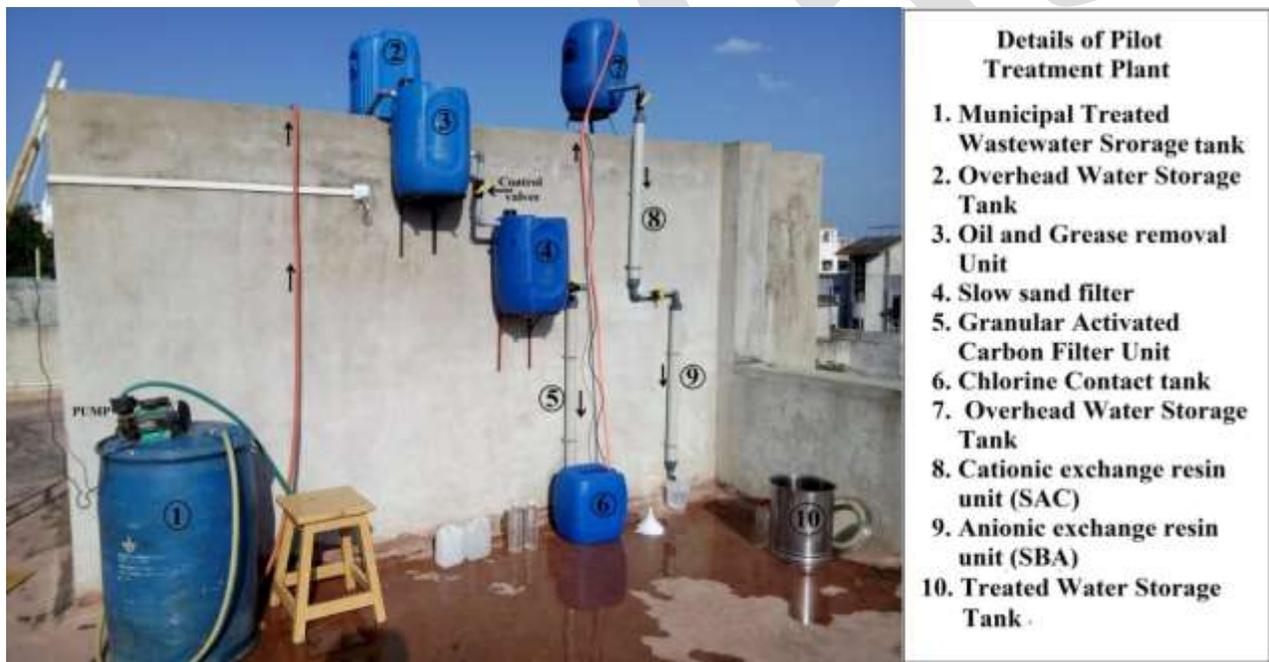


Fig 2 View of Pilot Treatment Plant

1. Municipal treated water storage tank: To store the treated wastewater for further treatments. Also acts as a sedimentation tank.
2. Oil & Grease removal unit: Oil & Grease can be removed with this unit.
3. Slow Sand filter (SSF): Slow sand filter is provided with various layers of sand of different particle size.
4. Granular Activated Carbon filter (GAC): Through this the color and odor from the wastewater is removed.
5. Chlorination unit: This is carried out to disinfect the treated wastewater. For this sodium hypochlorite solution (22 gpl) with various dosages was used.
6. Cationic Exchange Resin (SAC): Here cations like Na^+ , Mg^{++} , Ca^{++} etc. was exchanged with H^+ ions. The cationic exchange resin used was strong acid type

7. Anionic Exchange Resin (SBA): Here anions like SO_4^{2-} , CO_3^{2-} , Cl^- etc. was exchanged with OH^- ions. The anionic exchange resin used was strong base type. It is a strong base anion exchange resin based on polystyrene matrix, containing quaternary Ammonium group.

Experimental analysis

Laboratory analysis has been carried out on the effluent from wastewater treatment plant. The same effluent has been taken to the laboratory scale pilot treatment plant which comprises various treatment processes and units includes slow sand filter (SSF), Granular Activated Carbon (GAC) treatment, Ion exchange processes using cationic exchange resin (SAC), Anionic exchange resin unit (SBA). Detailed laboratory investigation of influent and effluent of pilot plant water is carried out. Results are compared with Indian Standard specifications for water to be used in textile wet processing.

Textile processing units are using municipal tap water or groundwater in processing of fabric. Comparative analysis has been carried out for treated water from pilot plant, tap water and groundwater in processing of cotton fabric. Use of treated water from the pilot plant in textile processing along with various dyes has been analyzed through various laboratory tests. Cotton fabric samples are bleached with groundwater, tap water and pilot plant water. These bleached fabric samples are checked for whiteness index. Detailed experimental analysis has been carried out for testing and analysis of wastewater using pilot treatment plant, including the statistical analysis by 'T-test: Paired Two Sample for Means'.

Properties of cotton fabric processed by using all three types of water as mentioned above has been checked for dyeing, desizing, scouring and bleaching comprises detailed investigation of K/S values of fabric dyed and whiteness index for bleached fabrics with washing and rubbing fastness investigations of fabric samples by ISO and AATCC method. The results obtained are processed by statistical tools for acceptance or rejections of the values has been carried out by 'Anova: Two-Factor without Replication' method.

On acceptance of the type of water used for process by the statistical as well as quality test, the cost benefit analysis has been carried out and the suitability of the type of water has been finalized.

Results

Recycling of Wastewater in Textile Wet Processing

1. Table 1 shows range of values obtained at outlet of pilot treatment plant. It also shows percentage removal of each parameter and corresponding I.S. standard.

Table 1 Pilot plant water outlet values and I.S. limits for water for Textile Industry

S. N.	Parameters	Range of Inlet values	Range of outlet Values	Average % removal	I.S. Limit for textile (IS 201:1992)
1.	Total Dissolved Solids mg/l	791 to 998	402 to 457	53.91	< 500
2.	Total Hardness mg/l	223 to 270	15 to 31	90.75	< 50 *
3.	Oil and Grease mg/l	73 to 92	0	100	< 1
4.	p^H	7.05 to 7.14	7.03 to 7.09	1.24	6.0 to 8.5*
5.	Chlorides mg/l	55 to 78	41 to 59	27.20	< 100*
6.	Nitrates mg/l	0.0124 to 0.027	0.0111 to 0.0154	21.26	< 0.50
7.	Sulphates mg/l	73 to 91	49 to 62	30.58	< 100*

9.	Alkalinity mg/l	153 to 233	123 to 145	30.43	< 150*
12.	Chlorine mg/l	0.1	0.1	00	0.1 to 0.2
13.	Suspended solids mg/l	56 to 123	0	100	< 5
14.	Electrical conductivity	0.73 to 1.01	0.46 to 0.74	30.47	-
15.	Colour	Yellowish	Colourless	100	20 HazenUnits
16.	Odour	Pungent	Odourless	100	-
17.	MPN (/100 ml.)	82 to 126	0	100	-
18.	COD mg/l	56 to 89	12 to 25	74.87	< 50

From the Table it is clear that outlet values of pilot plant water are not violating I.S. standard 201:1992 for water to be used in textile industry. This shows that pilot plant water is suitable for cotton textile wet processing.

2. Treated water from pilot treatment plant was checked for its suitability for the usage in textile wet processing. Comparison between three types of water sample is done for more precision. For analysis Groundwater, Tap Water and pilot plant water were used. Results obtained from all textile related tests shows that pilot plant water is suitable for textile wet processing. Average values various water parameters of ground water, Tap water and Pilot plant water. From this table it is clear that pilot plant water is suitable for textile process usage. From the table it is clear that T.D.S. mg/l, Total Hardness mg/l, Oil and Grease mg/l, P^{H} , Chlorides mg/l, Nitrates mg/l, Sulphates mg/l, Alkalinity mg/l, Suspended Solids mg/l, E.C. (μ mhos/cm), M.P.N. (/100 ml.), B.O.D. , C.O.D. and Res. Chlorine (mg/l) are less than other two types and all parameters of pilot plant water are comply with I.S. standard.

3. Whiteness Index of fabric processed with Ground water varies within 59.42 to 63.21. For Tap water it is 58.26 to 62.24 and that of for pilot plant water it varies within 59.42 to 63.21. This shows that pilot plant water gives good whiteness index compared to other two. From study in it is revealed that average whiteness index of cotton fabric bleached with Ground water is 61.832 and that of bleached with Tap Water is 60.158 and pilot plant water 59.144. It can be concluded that average whiteness index of fabric sample is 98.31% of whiteness index bleached with Tap Water which is 60.158 and 95.65% of Ground water which is 61.832. This confirms that pilot plant water gives comparatively good performance in bleaching of cotton fabric in removing impurities. This is because hardness value of pilot plant water is less than other two categories. This shows that pilot plant water is suitable for bleaching of cotton fabric in textile wet processing and with satisfactory whiteness Index.

4. K/s values of cotton fabric dyed with various dyes using Percentage shade in evaluation ranges from 0.5 % to 3.0 % with an interval of 0.5 %. From the results obtained it is clear that k/s values fabric samples dyed by using pilot plant water are more effective than other two types of water. Average dye dearth increase of 5% to 10% can be observed in case of Pilot plant water compared with other two. This ultimately results in saving in quantity of dye of the textile industry.

5. On experimental basis, nine dyes were checked for the processing purpose. These dyes are mostly used in the industry. Cold brand dyes Reactive red M8B, Procion brill Yellow-M4G, Procion blue MG MR show Good –Average rating. All fastness ratings all

samples found above 3. Similarly Hot brand dyes Reactive red HE8B, Procion yellow HE4G, and Reactive Navy blue HER Show fastness rating above 3. Remazol dyes Remazol red RB, Remazol Golden yellow RNL, and Remazol turquoise blue G show good – average performance. Pilot plant water can be utilized in textile wet processing with same quality of fabric received by utilizing fresh water as Ground water or Tap water. Washing Fastness values as per AATCC and ISO-105, rubbing fastness standards as per WET AATCC values and DRY AATCC values and Rubbing Fastness values both ISO-105 DRY and ISO-105 WET are lying between range 3-4 and gray scale standards suggest values between range 1-5.

6. Disinfection: Pilot plant water analyzed for MPN value and found 56/100 ml for first dose of 0.25 mg/l. Residual chlorine found below 0.10 mg/l. At 0.50 mg/l NaOCl dose MPN reduced to 47/100 ml with residual chlorine less than 0.10 mg/l and at 0.75 mg/l NaOCl dose MPN reduced to 12/100 ml with residual chlorine less than 0.15 mg/l. At the dose 1.00 mg/l of NaOCl, MPN value found 0/100ml and continuously observed zero with residual chlorine of 0.20 mg/l. Outlet values of plant show residual chlorine 0.1 mg/l which as per IS standard value between 0.1 to 0.2 mg/l. With proper disinfection Pilot plant water can be utilized without any harm. Additionally most of the textile processes are carried out in hot condition, which is supporting to disinfection process.

7. Cost – benefit analysis: Cost benefit analysis has shown that industry can purchase this pilot plant water at Rs. 18.95 per 1000 liter.

Table 2 Type of water and Cost/day in Rs.

S. N.	Type of water	Cost/day in Rs.	Cost / 1000 liter of water in Rs.
1.	Ground water	Rs. 450000.00	22
2.	Tap water	Rs. 396000.00	25
3.	Pilot plant water	Rs. 341079.50	18.95

From Table 2, Savings or benefit per day in comparison with other two types of waters can be calculated as

1) Ground water = Rs. 396000.00 - Rs. 341079.50 = Rs. 54920.50/day

2) Municipal tap water = Rs. 450000.00- Rs. 341079. 50 = Rs. 108920. 50/day

Conclusion

Analysis of Total Dissolved Solids, Hardness, Oil and grease, P^H, Chlorides, Alkalinity, Sulphates, Nitrates, Suspended Solids, Biochemical Oxygen Demand, Chemical Oxygen demand, Electrical conductivity, Most Probable Number shows that Pilot plant water is suitable for cotton textile wet processing. As per Quality tolerance for water for Textile Industry: Specification (IS 201:1992), specification for water usage in textile wet processing all the values obtained from Pilot Plant are within the prescribed limit.

Overall recycle and reuse by above method helps to reduce the effluent load viz-a-viz effluent treatment cost reduces substantially with saving in quantity of water.

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Design And Implementation Of Interactive Graph Simulator

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Abstract— The field of mathematics plays important role in most of fields. The most important areas in mathematics is graph theory which is used in structural models. This structural arrangement of various objects or technologies leads to new inventions and modifications in the existing environment for enhancement in most fields. Graph simulator is concern with output of algorithms which can be applied on graph. There are many different algorithms which can be applied on graph and studying those algorithms theoretically is quite difficult. So, the graph simulator is the simulator, which helps us to learn different graph algorithms easy and get the output for the given input easily. These mechanisms which can easily solve graph algorithm according to the user requirements. The graph simulator is mainly dealing with the shortest path algorithms which will be sufficient to generate results as required. Those results will have efficiency in an execution as well as understanding.

Keywords— Simulator, TSP(Travelling Salesman Problem),BFD(Bellman-Ford),Dijkstra,GC(Graph Coloring), $G=(V,E)$ -Graph having nodes as V and edges as E,dist-distance from particular ,cost is the weight on that edge.

INTRODUCTION

The term graph is an ordered pair $G = (V, E)$ comprising a set V of vertices or nodes together with a set E of edges or lines, which are 2-element subsets of V (i.e., an edge is related with two vertices, and the relation is represented as an unordered pair of the vertices with respect to the particular edge). To avoid ambiguity, this type of graphs may be

described precisely as undirected and simple [11]. In one more generalized notion E is a set together with a relation of incidence that associates with each edge of two vertices. In another generalized notion, E is a multi-set of unordered pairs of vertices. The vertices belonging to an edge are called the ends, endpoints, or end vertices of the edge. A vertex may exist in a graph and not belong to an edge. V and E are usually taken to be finite, as many of the well-known results are not true for infinite graphs because many of the arguments fail in the infinite case. In computer science, graphs are used to represent networks of communication, data organization, computational devices, the flow of computation, etc. For instance, the link structure of a website can be represented by a directed graph, in which the vertices represent web pages and directed edges represent links from one page to another. A similar approach can be taken to problems in travel, biology, computer chip design, and many of the other fields. The development of algorithms to handle graphs has been therefore it is a major interest in computer science. The transformation of graphs is often formalized and represented by graph rewrite systems. Graph theory is also widely used in sociology as a way, for example, to measure actors' prestige or to explore rumor spreading, notably through the use of social network analysis software. Under the umbrella of social networks, there are many different types of graphs they are Acquaintanceship and friendship graph [9]. As there are very less a tool which simulates graph algorithms, the project aims to create such an interface that accepts number of edges & vertices from user along with their weights as input and produce the graph according to give input. It will be extended towards simulation of graph based algorithms such as TSP,

Graph coloring, Bellman-ford algorithm, Dijkstra algorithm. The system will also be applicable to solve the graph related problems like finding shortest path, graph coloring. Graph coloring is utilized in resource allocation, scheduling the paths, walks and circuits in graph theory are used in tremendous applications such as traveling salesman problem, database design concepts, resource networking [12]. This leads to the development of new algorithms, which can be used in many applications.

REMAINING CONTENTS

I. PROPOSED SYSTEM

The system consists of three sections which are as follows:

- A. Input section
- B. Graph section
- C. Algorithm section.

A. *Input section*

This section is used for user input. User has to provide number of nodes and edges between the nodes along with their weights. The edges between the nodes are user defined so user has to provide edges according to requirement

B. *Graph Section*

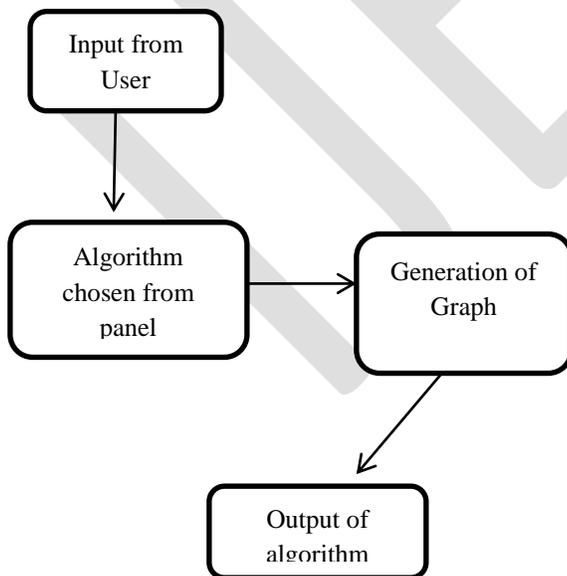
After the entire input gather from user there is a provision in the system that it automatically generate the graph.

C. *Algorithm Section*

In this section system provides graph algorithms in which User has to select algorithm for generated graph and the output of the selected algorithm will be displayed.

II. FLOW DIAGRAM

Fig(1) shows how the Graph simulator will work:



Fig(1): Process flow of proposed system

III. PROBLEM ALGORITHMS

The major role of Graph in Computer Science is to develop the graph Algorithms. the algorithms are used to solve problems that are models in form of graph. These algorithms can solve the graph theoretical concepts which are used in computer science applications [9].

Some Algorithms are as follows:

- A. Graph coloring algorithm
- B. Travelling salesman problem
- C. Bellman-ford Algorithm
- D. Dijkstra Algorithm

- **Graph coloring algorithm**

Given a graph $G=(V,E)$ where $V=\{V_1,V_2,\dots,V_n\}$ is the set of vertices or the nodes is the set of edges and then assign colors 'm' to the nodes according to following constraints:

The first node V_1 is assign the color number 1. Once the node V_1 has assigned color number 1, V_{i+1} cannot assigned same color number. Now the second constraint is number of color should be less than equal to the 'm' where m is integer value of colors such as 1 for red, 2 for green and so on [8].

Algorithm for Graph coloring

Graph_coloring (index i)

```
{  
Enter Number of colors;  
If (processing (i))  
    If (i= n)          \\ plainer graph logic  
Display vcolor[i] through vcolor[n]  
Else  
For(color=1;color<=m;coor++)  
{  
    Assign color to next immediate node;  
m.coloring (i+1);  
}  
}
```

- **Travelling salesman Problem**

Consider $G<V, E>$ graph and C_{ij} be cost of edge (i, j), $C_{ij}>0$, if edge exists otherwise edge does not exist.

Let n be number of vertices.

The objective of this algorithm is to carry a tour starting with a vertex 'I' and ending with same vertex (cycle), visiting each vertex only once; such that cost of tour should be minimum[3].

Algorithm for Travelling Salesman Problem

Consider the matrix of Figure 1. The entry at position (i,j) , say $c(i,j)$, represents the cost (distance) for going from city i to city j . A tour is a set of city pairs, e.g.,

$t = [(1,3) (3,2) (2,5) (5,6) (6,4) (4,1)]$ which spell out a trip that goes to each city once and only once. Let z be the cost of a tour. From Figure 1 it may be seen that the above tour would cost:

$$z = 43 + 13 + 30 + 5 + 9 + 21 = 121.$$

If a constant is subtracted from each element of the first row of Figure 2, that constant is subtracted from the cost of every tour. This is because every tour must include one and only one element from the first row. The relative costs of all tours, however, are unchanged and so the tour which would be optimal is unchanged. The same argument can be applied to the columns. The process of subtracting the smallest element of a row from each element of a row will be called reducing the row. Thus the first row in Figure 2 can be reduced by 16. Note that, in terms of the unreduced matrix, every trip out of city 1 (and therefore every tour) will have a cost of at least 16. Thus, the amount of the reduction constitutes a lower bound on the length of all tours in the original matrix.

-	27	43	13	30	20
7	-	16	1	30	25
20	13	-	35	5	0
21	16	25	-	18	18
12	48	27	48	-	5
23	5	5	9	5	-

Figure(2): Example of Travelling Salesman Problem

Evaluation

Step 1: Reduce the rows and columns of the cost matrix. Save the sum of the reductions as a lower bound on the cost of a tour.

Step 2: Given the node, say X , from which to branch next, and given the cost matrix associated with X , find the city pair (k,l) which maximizes and extend the tree from X to a node $k, \{ \}$. Add $Q(k,X)$ to the lower bound of X to set the lower bound of the new node.

Step 3: If the number of city pairs committed to the tours of X is $n-2$, go to Step 6. Otherwise continue.

Step 4: Finish the branching based on (k, \wedge) by extending the tree from X to a node $k, \wedge^{m,p}$. Here (m,p) is the city pair which would join the ends of the longest connected path involving (k,Q) in the set of committed city pairs of the new node. Delete row k and column \wedge in the cost matrix and set $c(m,p) = c/j$. Reduce rows and columns if possible and add the amount of the reduction to the lower bound of X to set the lower bound for the new node.

Step 5: If no node has been found which contains only a single tour, find the terminal node with the smallest lower bound and return to Step 2 for branching. Otherwise continue.

Step 6: If entry to this step is from Step 3, the next node is k,l, m, P where (m,p) is the only city pair left after crossing out row k and column X . The node contains a single tour. Calculate its cost. Entry to the step.

- **Bellman Ford Algorithm**

The Bellman Ford algorithm solves single source short path problem in the case in which edge may have negative weights. If the graph has a negative weight cycle, the algorithm will tell us otherwise it gives us a shortest path from source to every node.

If there is a negative weight cycle on some path from 'u' to 'v' in a graph $G = \langle V, E \rangle$, then shortest path may not exist between 'u' to 'v' because algorithm may not terminate due to negative weight cycle [13].

Algorithm

Bel_ford (v, cost, dist, n)

```
{  
    For (i=1 to n)  
Dist[i] =cost [v,i];  
For (k=2 to n-1)  
For each u such that u! =v and u has at least one incoming edge  
    For each (I, u) in the graph  
If (dist[u]>dist[i]+cost[I,u])  
Dist[u] =dist[i] +cost [I,u];  
}
```

Overall complexity of this algorithm is $O(n^3)$.

Evaluation

Step1. Initialize distance array for all vertices. i.e. $dist[i]=cost[v,i]$;

.Step2. Note there is single source and multiple destinations for each destination 'u' such that $u! =v$ ('v' is source) and 'u' has at least one incoming edge.

Assumptions- there are intermediate nodes present between source and destination (intermediate is 'I' which is from 1 to n)

For each (i,u) in graph

If $dist[u] > dist[i] + cost[I,u]$ then

Add the $dist[i]$ and $cost[I,u]$ to get $Dist[u]$;

- **Dijkstra Algorithm**

The Dijkstra algorithm is a greedy class of algorithm. Which works as finding optimum value in each step [10]. The Dijkstra algorithm finds the path with lowest cost (i.e. the shortest path) between that vertex and every other vertex (although Dijkstra originally only considered the shortest path between a given pair of nodes). It can also be used for finding costs of shortest paths from a single vertex to a single destination vertex by stopping the algorithm once the shortest path to the destination vertex has been determined [2].

Algorithm

Dijkstra_algorithm

```
{  
distance to source vertex s is zero then
```

```
for all  $v \in V - \{s\}$ 
do
{
    Set all other distance of  $v$  as infinity;
    The set of visited vertices  $S$  is initially empty;
    Q the queue initially contain set all vertices;
}while
    Queue 'Q' is not empty;
do
    Select the element of Q with the min. distance;
    Add up to list of visited vertices;
    for all  $v \in \text{neighbors}[u]$ 
    do
        if new shortest path found then
            set new value of shortest path;
Return Dist }
```

CONCLUSION

The aim of the system is to provide interactive environment to study graph algorithms which can be easy to understand for user. This system can be used in educational institutes for practical implementation of graph algorithms which they study theoretically in classrooms.

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A Review On : PALM VEIN TECHNOLOGY

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ABSTRACT- Biometric Authentication is a system which deals with the physiological as well as behavioral traits of a person. Palm vein structure is unique for every human being even for the twins also. Palm vein authentication has a high level of authentication accuracy due to the uniqueness and complexity of vein patterns of the palm. Because the vein patterns of palm are internal to the body, they are impossible to forge. Also, the system is non-intrusive and hygienic for use in public areas. It is more accurate than other biometric authentication such as face, iris, and retinal authentication system. In this paper we study the palm vein technology, various approaches for different kinds of palm vein features extraction, various palm vein segmentation schemes, accuracy and processing speed of various approaches

Keywords:- Palm vein, CASIA, Biometric, Authentication, Wavelength, Obstacles, Ridges

INTRODUCTION

According to Fujitsu in the ubiquitous network society, any person can easily access their information anytime and anywhere, people are also facing the problem that others can easily access their information like password anytime and anywhere. Because of this problem, personal authentication technology, which can distinguish between registered legitimate users and forged user, is now generating interest. Now a days, passwords, Personal Identification Numbers (4-digit PIN numbers) or identification cards are used for personal authentication. However, identification cards can be lost somewhere, and passwords and numbers can be forged or forgot. To solve these problems, biometric identification technology, which identifies people by their unique biological characteristics, is attracting people attention. According to Fujitsu in biometric authentication, legitimate user body characteristics, behavior or body part image are registered in a database and then compared with the person traits who may try to access that account. characteristics are compared to check that if the access is by the same or legitimate person or not.

In biometric authentication system Characteristics or traits of a person that must be checked in order to have access to the system purposes are

- Uniqueness - The same trait does not appear in two different people.
- Measurability - The trait can be measured with some technical or physical instruments.
- User friendliness - The trait can be easily Captured and compared with minimal discomfort.

Vein Authentication

In this field, "vein authentication" which uses image recognition and optical technology to scan the normally invisible palm vein pattern, hand from back, fingers, etc. has the properties of being highly accurate and highly efficient to recognize, impersonation and other forged actions.

Palm vein authentication uses an infrared beam to penetrate in the users hand and scan veins as it is held over the sensor; the veins within the palm of the user hand are viewed as black lines. Palm vein authentication system has a high level of efficiency due to the uniqueness and complexity of vein patterns of the palm. Because the palm vein patterns are internal to the body, this is impossible to forge. Also, the system is non-intrusive and hygienic for use in public areas[1]. The palm vein pattern is an ideal part of the body for

this technology; as their does not have hair which can be an obstacle for scanning the blood vessel pattern, and its susceptibility is less to a skin color, opposition to finger or the back of a hand [2].

Vascular pattern authentication principle

Infrared rays (IR) are electromagnetic radiation whose wavelength is longer than that of the visible light, and Infrared light has a range of wavelength that lies between 750nm and 1mm, similar to visible light having wavelengths ranging from red light to violet. Infrared light is commonly divided into 3 spectral regions: near infrared, mid infrared and far infrared light, but the boundaries ranges are very closer to separate. [3].

Vein patterns of palm cannot be seen using normal, visible rays of light since they are under the skin's surface. There are two choices that focuses on imaging or scanning of vein patterns in the palm by the infrared light

1. The far-infrared (FIR) imaging
2. The near-infrared (NIR) imaging

They are suitable to capture images of human parts in a non-hygienic way [4].

Acc to fujiitsu hemoglobin contain in the blood is oxygenated in the lungs and carries oxygen to the tissues of the body through arteries. After it releases the carried oxygen to the tissues, the deoxidized hemoglobin go back to the heart through the veins. The hemoglobin have two types that have different rates of absorbency¹. Deoxidized hemoglobin absorbs light at a wavelength of about 760 nm in the near-infrared region. When the hand is illuminated with near infrared light, unlike the pattern seen by the human eye [Figure 1(a)], the deoxidized hemoglobin in the palm veins absorbs this light, thereby minimizing the reflecting rate and causing the veins to appear as a black pattern [Figure 1(b)]. In vein authentication system based on this principle, the region used for authentication is scanned and photographed with near-infrared light rays, and the vein pattern is extracted by image processing [Figure 1(c)] and gets registered in the system. The vein pattern of the person being want to access system is then verified against the preregistered legitimate user pattern.

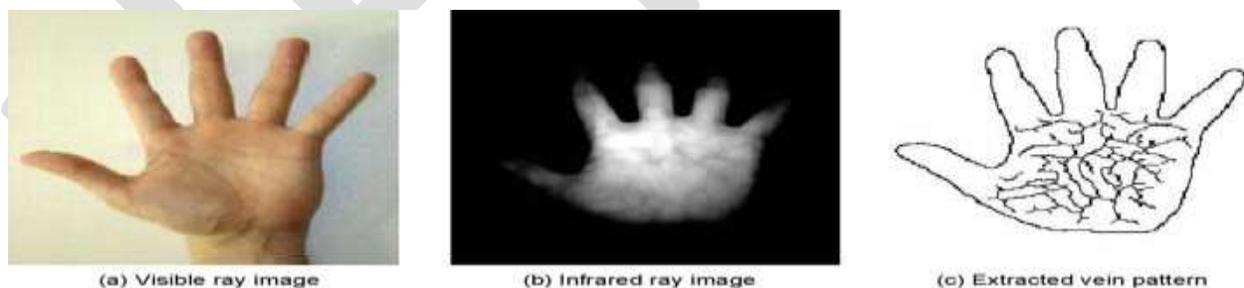


Figure1: Extracting palm vein pattern

The still image captured by the camera, which photographs in the near-infrared range, appears as a black network, reflecting the palm's vein pattern against the lighter background of the palm.

An individual's palm vein image is converted by algorithms into data points, and then compressed, encrypted, and stored in the software and get registered along with other details in his profile as a reference for future. Then, each time a person want access his account by a palm in a securely manner, the person palm newly captured image is again processed and compared with the registered

one for verification, all in a micro seconds. Numbers, orientation and positions of veins and their crossing points are all compared with the registered image and, depending on verification; the person is either granted or denied access to the system.

Reason for considering palm vein for authentication:

1. Vein patterns are unique to each individual; even identical twins have different vein patterns.
2. The palm has no hair; it is easier to photograph its vascular pattern.
3. **Secure:-** It is difficult to forge for intruders because blood vessels are hidden within the body.
4. **Non-Intrusive:-** It does not involve any physical contact between the user and the system.
5. Palms have a broad and complicated vascular pattern and thus contain a significant amount of differentiating features for personal biometric identification.

Related Work:

A number of studies showing the advantages of palm vein authentication system have appeared in the literature.

Palm vein model

Palm vein technology works by identifying the unique vein patterns in an individual's hand. When a user's palm is held over a scanner, a near-infrared light finds the location of the veins. The red blood cells or deoxidized blood present in the veins absorb the light and reflect on the map as black lines, whereas the remaining hand structure visible as white. This vein pattern is then verified against a preregistered legitimate pattern to authenticate the person. As veins are internal in the body and have a millions of differentiating traits, attempts to forge an identity are impossible, thereby enabling a high level of security [5].

Steps involved in processing a palm vein images are:

1. Image Acquisition

The CASIA database that contains 7200 multi spectral palm vein images is considered as base of palm vein images. The image is verified using a palm vein image in the CASIA database as reference.

2. ROI Selection

ROI segmentation of palm vein is to automatically and reliably segment a small region from the captured palm vein image and palm vein extraction is to extract the palm vein from a ROI. This is considered one of important stages in these four stages because it greatly influences the overall identification accuracy and processing speed of the whole system [9].

Kai-Wen Chuang et.al In this paper, presented a palm vein ROI extraction algorithm which combines

1. Otsu thresholding scheme,
2. Morphological opening operation
3. Sobel edge detector
4. Reference points
5. Line construction
6. Palm vein image alignment.

The performance of the proposed palm vein ROI segmentation scheme is verified using a palm vein image database, Poly U database (version 2). The experimental results show that the proposed algorithm is effective and efficient in palm vein ROI segmentation and is robust for noises surrounding palm vein images [9].

Yingbo Zhou et. al in this paper presented a palm vein ROI extraction technique:

The acquired palm vein images are firstly normalized to minimize the rotational changes, translational changes and scale changes.

1. The co-ordinate system is constructed through those variations.

2. The web between index finger and middle finger together with the web between ring finger and little finger were utilized as the reference points line to build up the coordinate system (figure 2).

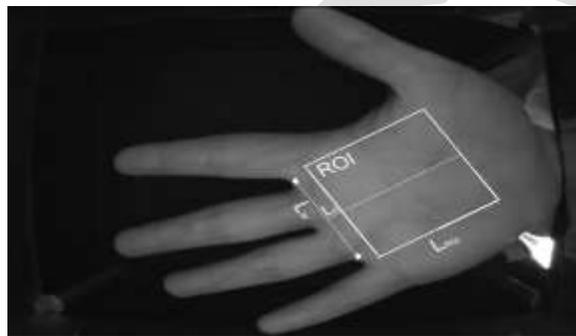


Figure 2: Palm vein ROI from contactless images

3. The location as well as the size of region of interest (ROI) is selected based on the distance between the two webs (LW) [10].

3. Vein Pattern Extraction

Yingbo Zhou et.al in this paper investigates new approaches, which extract different kinds of palm vein features and illustrate good performance. **The localized Radon transform** based approach achieves best performance and also offers computationally simpler alternative to existing palm vein identification approaches. The idea of this approach is that curved/straight lines can be estimated by small piecewise joint integrated segments and it integrates the intensity value in the local region in all defined orientations, but instead of integrating all the pixel values inside the local region, only the pixel that fall in the confined line width area is integrated, and the orientation gives the minimum or maximum integration value [10].

Mohit Soni et. al presents a technique which extracts the forking from the skeleton image by examining the local neighborhood of each ridge pixel using a 3X3 window. It can be seen from the preprocessing image that an ROI contains some thinned lines/ridges. These ridges representing vein patterns can be used to extract features. Features like ridge forking are determined by computing the number of arms originating from a pixel. This can be represented as A . A given pixel P is termed as a ridge forking for a vein pattern if the value of A for the pixel is 3 or more. This ridge forking pixel is considered as a feature point which can be defined by (x, y, θ) where x and y are coordinates and θ is the orientation with respect to a reference point [11].

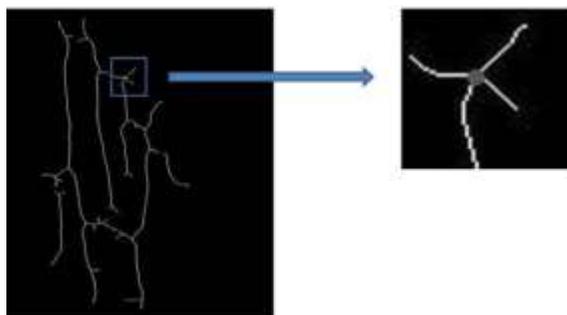


Figure 3: Four Arms emitting from a forking point

4. Skeletonization

As human beings grow the size of veins in palm also grow, only the shape of the vein pattern is used as the sole feature to recognize each person. A good representation of the vein pattern's shape is via extracting its skeleton. Figure 4 shows the skeleton of the vein pattern after applying the thinning algorithm proposed by Zhang and Suen [12]. It can be seen that after the pruning process, the skeletons of the vein pattern are successfully extracted and the shape of the vein pattern is well preserved [6].



Figure 4: After Skeletonization

5. Vein Pattern Matching

Sunita Aeri et.al proposed a new approach for biometric authentication system using infrared thermal hand vein patterns. The proposed work presents a Euclidean distance based vein's pattern based biometric authentication that can be used for matching the biometric identity of person under scanner. The vein patterns are grabbed using the infra red (IR) thermal cameras and after applying some image pre-processing operations, a binary image is obtained consisting of veins crossings and intersections. The binary image is thinned using the morphological operations and a single line thinned image pattern is obtained. The thinned image pattern is now examined for intersections extractions and inter-distance between intersections. The inter-distance among intersections of vein patterns are stored in a data base. Further, when a test vein pattern is brought under test, the data base information is compared to that of the test pattern using Euclidean distances. Minimum the Euclidean distance, more is the equivalency of the test pattern to data base pattern [13].

Lingyu Wang et.al Vein pattern matching is done by measuring the line segment Hausdorff distance between a pair of vein patterns. Hausdorff distance is a natural measure for comparing similarity of shapes. It is a distance measure between two point sets.

Hausdorff distance uses the spatial information of an image, but lacks local structure representation such as orientation when it comes to comparing the shapes of curves. To overcome this weakness, in this paper, the line segment Hausdorff distance (LHD) is calculated to match the shapes of vein patterns. It incorporates the structural information of line segment orientation and line-point association, and hence is effective to compare two shapes made up of a number of curve segments [6].

Conclusion

Biometric refers to automatic recognition of an individual based on her behavior or traits. However the palm vein authentication system uses the vein's patterns of one's palm for making access to the system. This technology is highly secure because it uses information contained within the body and is also highly accurate because the pattern of veins in the palm is complex and unique to each individual. Moreover, its non-intrusive feature gives it a hygienic advantage over other biometric authentication technologies.

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PERSONALIZED MOBILE SEARCH ENGINE BASED ON MULTIPLE PREFERENCE, USER PROFILE AND ANDROID PLATFORM

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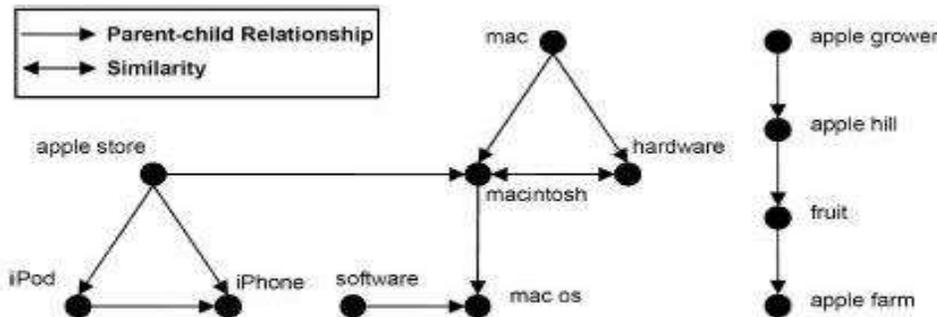
Abstract — Mobile search needs better interaction between user and server usually this interaction is not efficient due to many adopting the meta search approach, click through data, user profiling which is based on client server model. In this model client sends request to the server and server forward this request to the commercial search engine also training and re-ranking is done on server side, we call it PMSE server. We also involve a method to maintain the user's interests over his ongoing search activity and to personalize the search results. The profiles of specific users are stored on the Personalization clients, thus preserving privacy to the users.

Keywords — Clickthrough data, content ontology, location ontology, personalization, user profiling, privacy preservation, spyNB, IR.

1. INTRODUCTION

The proliferation of mobile technologies such as (PDAs and mobile phones) has made access to huge and heterogeneous collection of documents on the web, possible anywhere and anytime. This brings big challenges for researches in the information retrieval (IR) domain. Studies on logs of mobile Internet user queries show that user queries are shorter (thus more ambiguous), that there are fewer requests by session and fewer users who consult farther than the first page of the results list. Furthermore, 72% of the information needs of mobile users are related to contextual factors such as user interests, location and time. So it is very difficult to user to get relevant result or expected result. In our system, we propose User Interest Profile. Each user has its own profile, in the sense which provide user a privacy. When user send query to PMSE server for getting reply, search history is created. So for every user, history is created and it is maintained by ontology DB. This web history will be in use for further query. Personalization aims to alter large amounts of information and returns a view on the information which matches the user's preferences and interests improving therefore the precision of the search results. Observing the need for different types of concepts, we present in this paper a personalized mobile search engine, PMSE, which represents different types of concepts in different ontologies. In particular, recognizing the importance of location information in mobile search, we separate concepts into location concepts and content concepts. Previous research shows that

researcher concentrated only on content preference but in our system we are going to use location of user also for better result. We propose our system on android platform so for getting location of user, we can use GPS system.



Example Content Ontology Extracted for the Query "apple".

Fig.1 Content Ontology Extracted

2. RELATED WORK

Most commercial search engines return roughly the same results to all users. However, different users may have different information needs even for the same query. For example, a user who is looking for a laptop may issue a query .apple. to find products from Apple Computer, while a housewife may use the same query .apple. to find apple recipes. The objective of personalized search is to disambiguate the queries according to the users' interests and to return relevant results to the users. Clickthrough data is important for tracking user actions on a search engine.

Doc	Search Results	c_i	l_i
d_1	Hotels.com	room rate	international
d_2	JapanHotel.net	reservation, room rate	Japan
d_3	Hotel Wiki	accommodation	international
d_4	US Hotel Guides	map, room rate	USA, California
d_5	Booking.com	online reservation	USA
d_6	JAL Hotels	meeting room	Japan
d_7	Shinjuku Prince	facility	Japan, Shinjuku
d_8	Discount Hotels	discount rate	international

Table.1. Clickthrough Data.

Table I is an example clickthrough data for the query. It consists of the search results of a user's query and the results that the user has clicked on by bold. c_i 's are the content concepts and l_i 's are the location concepts extracted from the corresponding results. Many personalized web search systems are based on analyzing users clickthroughs. Joachims proposed to use document preference mining and machine learning to rank search results according to user's preferences. Later, Agichitein et al. proposed a method to learn users' clicking and browsing behaviour from the clickthrough data using a scalable implementation of neural networks called Rank Net. Gan et. al suggested that search queries can be classified into two types, content (i.e., non-geo) and location (i.e., geo). Typical examples of

geographic queries are hotels, football ground. A classifier was built to classify geo and non-geo queries, and the properties of geo queries were studied in detail. It was found that a significant number of queries were location queries focusing on location information. Hence, a number of location-based search systems designed for geo queries have been proposed. These include Yokoji et al., who proposed a location-based search system for web documents. A parser was employed to extract location information from web documents, which was converted into latitude longitude pairs or polygons. When a user submits a query together with the location information specified in a latitude longitude pair, the system creates a search circle centered at the specified latitude-longitude pair and retrieves documents containing location information within the search circle.

The differences between our work and existing works are:

- Existing works such as require the users' to manually define their location preferences explicitly (with latitude-longitude pairs or text form). With the automatically generated content and location user profiles, our method does not require users to explicitly define their location interest manually.
- Our method automatically profiles both of the user's content and location preferences, which are automatically learnt from the user's clickthrough data without requiring extra efforts from the user.
- Our method uses different formulations of entropies derived from a query's search results and a user's clickthroughs to estimate the query's content and location ambiguities and the user's interest in content or location information. The entropies allow us to classify queries and users into different classes and effectively combine a user's content and location preferences to rerank the search results.
- In Existing works there was nothing about users privacy and profile, but in our system we are going to maintain user profile.
- Most existing location-based search systems require users to manually define their location preferences or to manually prepare a set of location sensitive topics. PMSE profiles both of the user's content and location preferences in the ontology based user profiles, which are automatically learned from the clickthrough and GPS data without requiring extra efforts from the user.

3. PROPOSED SYSTEM

Most of the previous work assumed that all concepts are of the same type. We separate concepts into location concepts and content concepts to recognize information importance. So far there have been many papers written & researched on search engines. There is tremendous evolvement in this field. In this paper, we propose a realistic design for PMSE by adopting the metaearch approach which relies on one of the commercial search engines, such as Google, Yahoo, or Bing, to perform an actual search. The client is responsible for receiving the user's requests, submitting the requests to the PMSE server, displaying the returned results, and collecting his/her clickthrough in order to derive his/her personal preferences. The PMSE server, on the other hand, is responsible for handling heavy tasks such as forwarding the requests to a commercial search engine, as well as training and reranking of search results before they are returned to the client. The user profiles for specific users are stored on the PMSE clients, thus preserving privacy to the users. PMSE has been prototyped with PMSE clients on the Google Android platform and the PMSE server on a PC server to validate the proposed ideas. Studies the unique characteristics of content and location concepts, and provides a coherent strategy using client-server architecture to integrate them into a uniform solution for the mobile environment. By mining content and location concepts for user profiling, it utilizes both the content and location preferences to personalize search results for a user.

4. SYSTEM DESIGN

1. Weight vector- content weight vector and user weight vector describes the user interests based on the user's content and location preferences extracted from the user clickthroughs respectively.

2. Feature vector- feature vector is a n dimensional vector of numerical feature that represent some object. feature vector are often combined with weights using a dot product in order to construct a linear predictor function that is used to determine a score for making prediction.

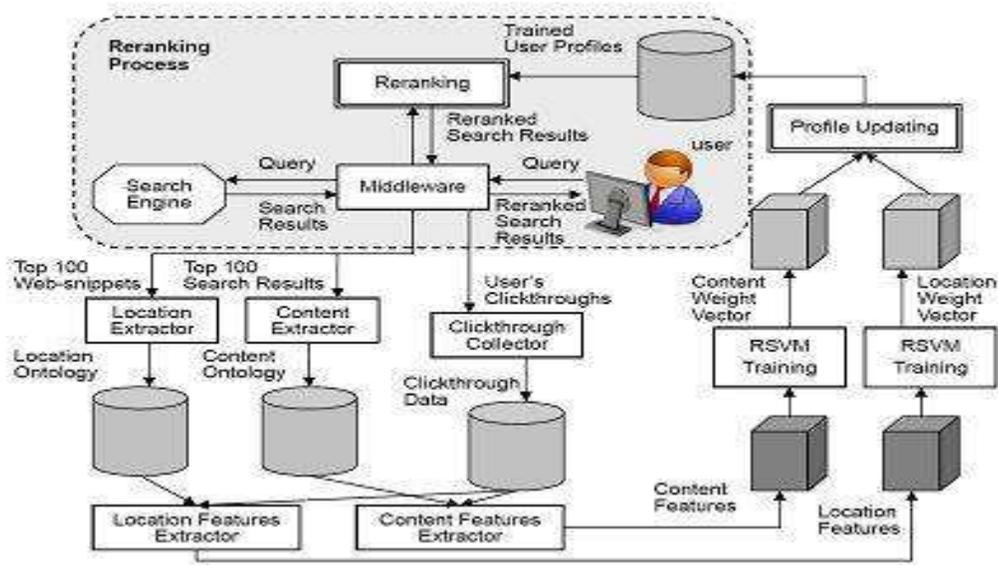


Fig. 2. System Design

Content ontology - if a keyword/phrase exists in web-snippets arising from the query, we would treat it as an important concept related to the query.

Location ontology - extract location concepts from full documents. The predefined location ontology is used to associate location information with the search results. All of the keywords from the documents returned for query are extracted. If a keyword or key-phrase in a retrieved document matches a location name in our predefined location ontology, it will be treated as a location concepts.

4.1 MODULES

- User Interest Profiling

PMSE uses “concepts” to model the interests and preferences of a user. Since location information is important in mobile search, the concepts are further classified into two different types, namely, content concepts and location concepts. The concepts are modeled as ontologies, in order to capture the relationships between the concepts. We observe that the characteristics of the content concepts and location concepts are different. Thus, we propose two different techniques for building the content ontology and location ontology. The ontologies indicate a possible concept space arising from a user's

queries, which are maintained along with the clickthrough data for future preference adaptation. In PMSE, we adopt ontologies to model the concept space because they not only can represent concepts but also capture the relationships between concepts. Due to the different characteristics of the content concepts and location concepts.

- Diversity and Concept Entropy

PMSE consists of a content facet and a location facet. In order to seamlessly integrate the preferences in these two facets into one coherent personalization framework, an important issue we have to address is how to weigh the content preference and location preference in the integration step. To address this issue, we propose to adjust the weights of content preference and location preference based on their effectiveness in the personalization process. For a given query issued by a particular user, if the personalization based on preferences from the content facet is more effective than based on the preferences from the location facets, more weight should be put on the content-based preferences; and vice versa.

- User Preferences Extraction and Privacy Preservation

Given that the concepts and clickthrough data are collected from past search activities, user's preference can be learned. These search preferences, inform of a set of feature vectors, are to be submitted along with future queries to the PMSE server for search result re-ranking. Instead of transmitting all the detailed personal preference information to the server, PMSE allows the users to control the amount of personal information exposed. In this section, we first review a preference mining algorithms, namely SpyNB Method, that we adopt in PMSE, and then discuss how PMSE preserves user privacy. SpyNB learns user behavior models from preferences extracted from clickthrough data. Assuming that users only click on documents that are of interest to them, SpyNB treats the clicked documents as positive samples, and predict reliable negative documents from the unlabeled (i.e. unclicked) documents. To do the prediction, the "spy" technique incorporates a novel voting procedure into Naïve Bayes classifier to predict a negative set of documents from the unlabeled document set. The details of the SpyNB method can be found in. Let P be the positive set, U the unlabeled set and PN the predicted negative set ($PN \subset U$) obtained from the SpyNB method.

- Personalized Ranking Functions

Upon reception of the user's preferences, Ranking SVM (RSVM) is employed to learn a personalized ranking function for rank adaptation of the search results according to the user content and location preferences. For a given query, a set of content concepts and a set of location concepts are extracted from the search results as the document features. Since each document can be represented by a feature vector, it can be treated as a point in the feature space. Using the preference pairs as the input, RSVM aims at finding a linear ranking function, which holds for as many document preference pairs as possible. An adaptive implementation, SVM light available at, is used in our experiments. In the following, we discuss two issues in the RSVM training process:

- 1) how to extract the feature vectors for a document.
- 2) how to combine the content and location weight vectors into one integrated weight vector.

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6. CONCLUSION

The proposed personalized mobile search engine is an innovative approach for personalizing web search results. By mining content and location concepts for user profiling, it utilizes both the content and location preferences to personalize search results for a user. The possible outcome will improve retrieval effectiveness for location queries (i.e. queries that retrieve lots of location information). For future work, we will investigate methods to exploit regular travel patterns and query patterns from the GPS and clickthrough data to further enhance the personalization effectiveness of PMSE.

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Lagrange Interpolating for Error Detection and correction in antijamming attack

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Abstract- Due to vulnerable signals in wireless channels or through jamming of one or multiple channels, Errors affected all transmitted data . Therefore errors detection and correction can be effective technique to reduce the effect of these errors. The proposed method in this research achieved using Lagrange Interpolating Polynomial to minimize the errors of transmitted data after detecting it. This technique produces Lagrange polynomials arranged in eight columns and rows. Using this technique will increase the probability of finding the correct data in less time comparing with other techniques. Moreover it reduces the spending time for error correcting. Proposed technique applied in raw data emitted through simulated channel using NS2 simulator.

Keywords: L.I.P. (Lagrange Interpolation Polynomial), NS2, jamming, Error Correction Code, Galois Field ,Packets, Shift Registers

Introduction

Various application domains such as environmental monitoring and surveillance wireless sensor networks were applied. Open transmission media, a sensor network may suffer from radio jamming attacks, which are easy to launch but difficult to defend. Attacked by jamming signals, a sensor network may experience corrupted packets and low network throughput.

In the real world scenario, jamming attacks may be very different in nature and may change over time. In addition, radio signals are unstable as many factors may cause jamming signal attenuated in different ways for different environments. As a result, different nodes suffer different degrees of radio jamming. Thus, it is inefficient for a whole sensor network simply to apply a single antijamming technique. This may result in poor performance of antijamming and/or still suffer serious performance degradation of energy consumption [1]. There are a variety of anti jamming techniques; some of them are suitable under a slight of antijamming conditions. The parameters of choosing proper antijamming technique are cost of energy saving and level of jamming signals. So, in a wireless sensor network, there are. For each node, there are n antijamming techniques available for different jamming conditions. For the node, each antijamming technique has different cost.

In A Mathematical Theory of Communication, Shannon proved that channel noise limits transmission rate and not the error probability. According to his theory, every communication channel has a capacity C (measured in bits per second), and as long as the transmission rate, R (measured in bits per second), is less than C, it is possible to design an error-free communications system using error control codes. The now famous Shannon-Hartley theorem, describes how this channel capacity can be calculated. However, Shannon did not describe how such codes may be developed. This led to a wide spread effort to develop codes that would produce the very small error probability as predicted by Shannon. There were two major classes of codes that were developed, namely block codes and convolutional codes[2].

Antijamming methods

Although jamming still an open problem to the wireless security community, there are several defense strategies and techniques used in the traditional computing to cope with this problem. Such strategies are: avoid jammed region (i.e. routing around jammed region), escape jammed channel (channel-hopping, frequency-hopping techniques), and spatial retreats.

Transmission Power Adjustment

With this technique, a sender node increases its transmission power, and thus increases the SNR at the receiver node [3]. This technique is suitable under a slight jamming condition, for example, at the periphery of the jamming area. In that area, the jamming signal is relatively weak, so the nodes usually only need to raise its transmission power by one or two levels. This technique introduces modest energy cost.

Error-Correcting Code

An error-correcting code is used for correcting some error bits that occurred during transmission [4]. Before transmission, the node encodes the packet. When the receiver has received the packet, the decoding process is capable of correcting some error bits by using the redundancy information contained in the encoded packet (under a certain condition, e.g., the number of error bits is smaller than a given threshold).

Applying error-correcting codes as an antijamming technique is energy efficient as it largely relies on computation and transmission of extra bits. Many detecting and error-correcting codes have been used as Reed-Solomon, forward error correction, hamming codes, and cyclic redundancy code, etc.

Channel Hopping

With this technique, a sensor node will change the working channel when it detects strong jamming signals in the current channel [1]. As shown in Figure (1), node B in the shaded area is jammed. Node A is an intermediate node which works on two channels. It switches between the two channels, so it can keep the network connected. When it changes its working channel, it will notify its neighbor working on the same frequency immediately.

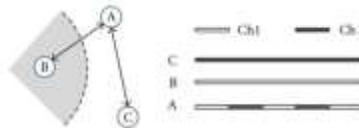


Figure [1] Illustration of the channel hopping technique.

General Errors and polynomials

The information sent by the internet, where the information (say a file) is broken up into packets, and the unreliability is manifest in the fact that some of the packets are lost during transmission: Suppose that the message consists of n packets and suppose that at most k packets are lost during transmission. Note that in this setting the packets are labeled and thus the recipient knows exactly which packets were dropped during transmission. The contents of the packet might be a 32-bit string and can therefore be regarded as a number between 0 and 2^{32-1} . The properties of polynomials over $GF(q)$ (i.e., with coefficients and values reduced modulo q : q a prime number) are perfectly suited to solve this problem and are the backbone of this error-correcting scheme. To see this, let us denote the message to be sent by m_1, \dots, m_n and make the following crucial observations: 1) There is a unique polynomial $P(x)$ of degree $n-1$ such that $P(i) = m_i$ for $1 \leq i \leq n$ (i.e., $P(x)$ contains all of the information about the message, and evaluating $P(i)$ gives the contents of the i -th packet). 2) The message to be sent is now $m_1 = P(1), \dots, m_n = P(n)$ [5][6].

Lagrange Interpolating Polynomial

The proposed algorithm introduces and modifies Lagrange Interpolating polynomial and its useful specification to construct simulated polynomials for transmitted and received data of emitted packets. The algorithm reduces the error bits for redundant and jammed packets compared with other techniques. Moreover, in spite of increasing errors in transmitted data, the researcher find with this technique there is increasing the probability of finding correct data and reduce the spending time for errors correcting.

Polynomial Interpolation Theory

Let A be a finite set of the values of unknown function $f(X)$ such that $A = \{f(X_0), f(X_1), \dots, f(X_n)\}$ and we want to find an approximation to the value of $f(X^*)$. if $X^* \in \{X_0, X_1, \dots, X_n\}$ then this process is called interpolation. While if $X^* \notin \{X_0, X_1, \dots, X_n\}$ then this process called Extrapolation. Practically, the above process is always called interpolation [7].

One of the most useful and well-known classes of functions mapping the set of real numbers into itself are the algebraic polynomials, the set of functions of the form:

$$P_n(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0 \dots (1)$$

Where n is a nonnegative integer and a_0, a_1, \dots, a_n are real constants. One reason for their importance is that they uniformly approximate continuous functions. This result is expressed precisely in the Weierstrass Approximation Theorem as shown in Figure (2).

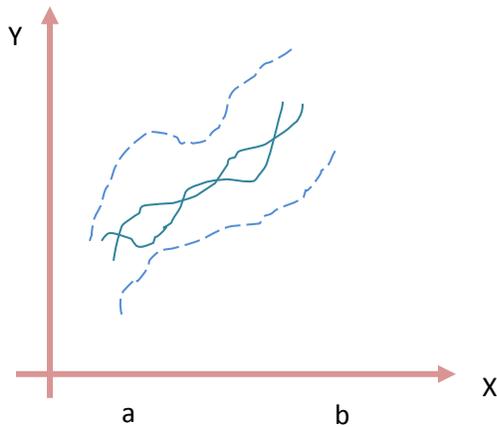


Figure [2] bounded Polynomials

Weierstrass Approximation

Suppose that f is defined and continuous on $[a, b]$. For each $\epsilon > 0$, there exists a polynomial $P(x)$, with the property that

$$|f(x) - P(x)| < \epsilon \quad \forall x \text{ in } [a, b] \dots (2)$$

Interpolated Polynomial

If X_0, X_1, \dots, X_n are $n+1$ distinct numbers and f is a function whose values are given at these numbers, then a unique polynomial $P(x)$ of degree at most n exists with

$$F(X_k) = P(X_k) \quad \forall k = 0, 1, 2, \dots, n$$

This polynomial is given by:

$$P(X) = F(X_0)L_{n,0}(X) + \dots + F(X_n)L_{n,n}(X) \\ = \sum_{k=0}^n F(X_k)L_{n,k}(X) \dots \dots \dots (3)$$

Where, $\forall k = 0, 1, \dots, n$

$$L_{n+k}(X) = \frac{(x-x_0)(x-x_1) \dots (x-x_{k-1})(x-x_{k+1}) \dots (x-x_n)}{(x_k-x_0)(x_k-x_1) \dots (x_k-x_{k-1})(x_k-x_{k+1}) \dots (x_k-x_n)} \\ = \prod_{\substack{i=0 \\ i \neq k}}^n \frac{(X-x_i)}{(x_k-x_i)} \dots \dots \dots (4)$$

Proposed Algorithm

This challenge of antijamming technique which is presented in this research formulated by combining L.I.P and binary search method. With NS2 simulator, the researcher simulates various transmitter and receiver nodes with different packets. Proposed ECC used to correct error bits that occurred during transmission after the encoding process. The block diagram of the proposed algorithm can be shown in figure [3].

Matrix constructed frame performed in GF(8) using Equation (4), where the tuples value are 8th Interpolated Lagrange Polynomials, while the final attributes involve the precise numerical value of I.L.P, after powered the content of each position by the multiple of 2 in ascending order, as shown in table[1].

Single parity check bit (S.P.B) shown in table (1) be performed and allocated in column number 10 to monitor the data packet as additional policy for detecting errors in data transmitted, while constructed Lagrange polynomial be the first check guard.

Table [1] Matrix Tabular Polynomial of GF (8)

<i>Index</i>	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	S. P. B.	L.I.P
0	1	0	0	0	0	0	0	1	0	N_0
1	0	1	0	0	0	0	1	1	1	N_1
2	1	0	1	0	0	0	0	1	1	N_2
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
254	0	1	1	0	1	1	1	0	1	N_{254}
255	1	1	1	1	1	1	1	1	.	N_{255}

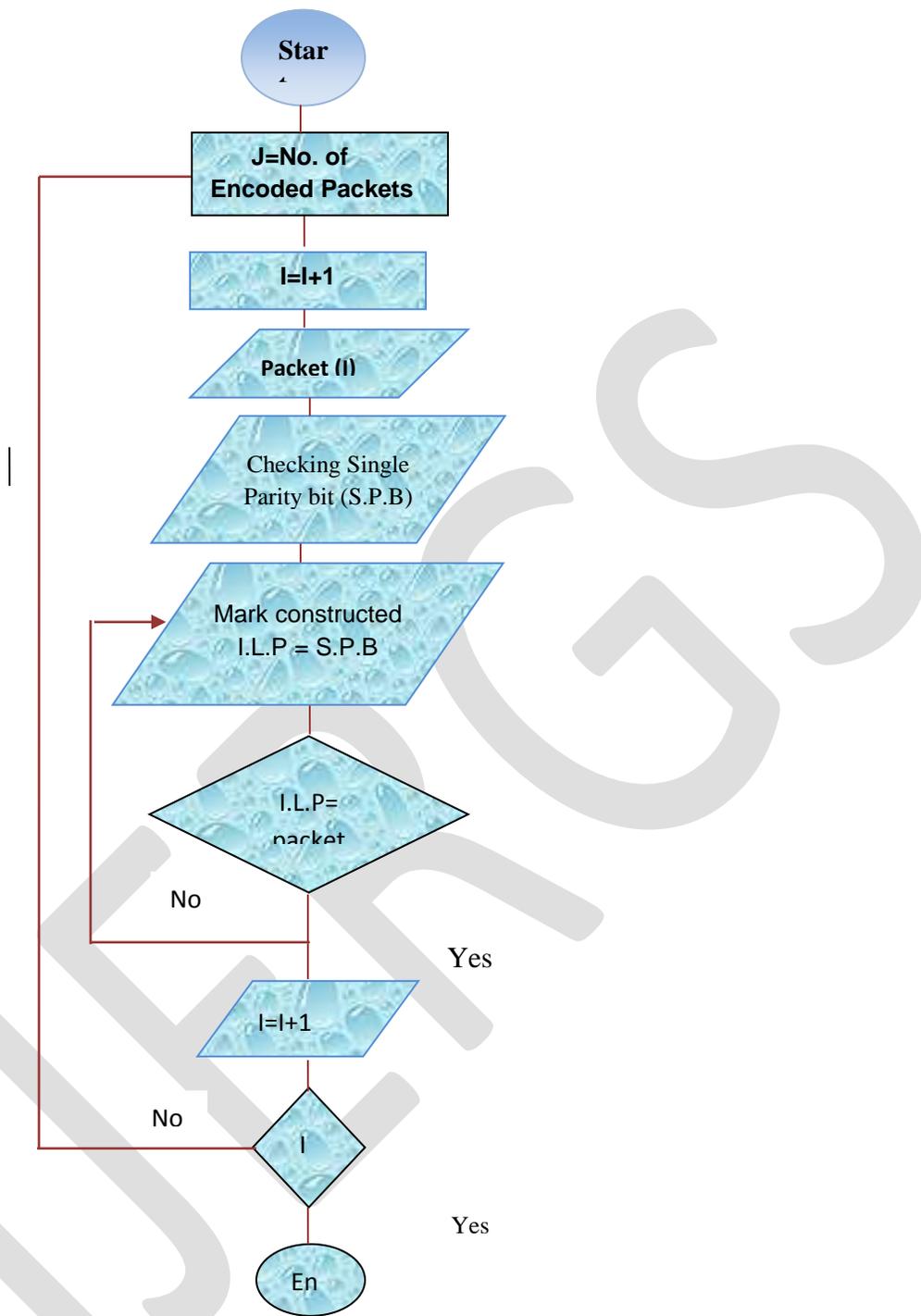


Figure [3] Block Diagram of the Proposed Algorithm

Moreover, in the proposed algorithm, the generated packets can be simulated using logical circuits containing eight stages of shift registers with (XOR) gate. Each shift register contains one binary bit, where the contents of the second and fourth shift registers are xored to feed the first shift register. Figure [4] depicts the architecture of this design.

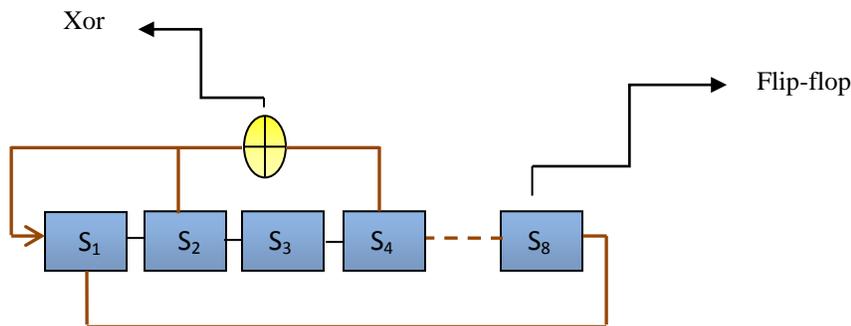


Figure [4] simulated of the generated Packets

So the simulated logical circuits and its output can be represented in Figure [5] by the following $p(x)$ matrix. Where the left hand side of each equation represent single parity bit.

$$P(x) = \begin{array}{l}
 \left[\begin{array}{l}
 C_1 \oplus C_2 \oplus C_3 \oplus C_4 \oplus C_5 \oplus C_7 \\
 C_2 \oplus C_3 \oplus C_4 \oplus C_5 \oplus C_7 \\
 C_3 \oplus C_4 \oplus C_5 \oplus C_7 \\
 C_4 \oplus C_5 \oplus C_7 \\
 C_1 \oplus C_5 \oplus C_7 \\
 C_2 \oplus C_7
 \end{array} \right] \begin{array}{l}
 \oplus \\
 \oplus \\
 \oplus \\
 \oplus \\
 \oplus \\
 \oplus
 \end{array} \left[\begin{array}{l}
 C_8=0 \\
 C_8=0 \\
 C_8=1 \\
 C_8=1 \\
 C_8=0 \\
 C_7=1 \\
 C_8=1
 \end{array} \right]
 \end{array}$$

Figure [5] Simulated Shift Register Matrix

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CONCLUSION

Minimizing errors in data transmitted through vulnerable channels is an important case. Using any technique should increase the probability of finding the correct data in less time. So this work overcome the errors in transmitted data using Lagrange interpolating polynomials. Comparing the results of this work with previous techniques, we can find more accurate data in a less time.

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OPTIMIZATION OF PROCESS PARAMETERS OF FINGER MILLET – SOY PASTA USING RESPONSE SURFACE METHODOLOGY

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Abstract— The experiment was conducted to develop cold extrudate with microwave puffing to prepare pasta. The cold extrudate was obtained from finger millet flour, soy flour and potato mash in Dolly mini P3 pasta machine and puffed in microwave oven. A four factor five level response surface methodology central composite rotatable design (CCRD) was adopted to study the effect of process parameters convective heating temperature (CT), convective heating time (Ct), microwave power, % of 1350W (MP) and microwave puffing time (Mt) on the quality of product. Analysis of variance indicates that quadratic effects significantly ($p < 0.001$) affected the response in terms of moisture content (MC), expansion ratio (ER), hardness (HD), crispness (CSP), colour (L-value) and colour difference (ΔE). The optimal microwave puffing of the cold extrudate could be conducted by convective heating at 200 °C for 300 sec followed by microwave puffing with 90 % of 1350 W for 90 sec. The optimum predicted responses in terms of MC, ER, HD, CSP, L-value and ΔE value were 0.088 kg/kg dm, 2.58, 1424.93 g, 20.21 +ve peaks, 49.93 and 16.98 respectively.

Keywords— Millet, finger millet, soybean, pasta, extrusion technology, microwave puffing, response surface methodology

INTRODUCTION

Pasta is a staple food of traditional Italian cuisine, now renowned worldwide. Pasta products, traditionally manufactured from durum wheat semolina, known to be the best raw material suitable for pasta production. Pasta is a source of carbohydrates (74–77%, dm) whose interest is increasing due to its nutritional properties, particularly its low glycaemic index (GI—a measure of carbohydrate quality). Pasta also contains 11–15% (dm) proteins but is deficient in lysine and threonine. Therefore, many researchers have focused on improving the quality of pasta by the addition of other ingredient.

At present, small millets account for less than 1% of food grains produced in the world [8]. Finger millet (Ragi, *Eleusine coracana*) is an important staple food in the eastern and central Africa as well as some parts of India. Finger millet is rich in calcium (344mg %) and potassium (408mg %) and has a good amino acid profile which is closer to milk. Various nutritional and health benefits of finger millet were discussed especially chronic disease preventive potential. Finger millet being low cost millet with higher dietary fiber contents, several micronutrients and phytonutrients with practically no reports of its adverse effect, deserves attention. Soybean is a rich source of soluble carbohydrate, proteins (rich in lysine), lipids, dietary fiber, minerals and vitamins. Fortification of soybean in other millets is use to improve bone health, brain functionality, body immunology and also controls heart attack and prevent cancer [3][4] and also solving the problem of protein-energy malnutrition.

Extrusion technology is one of the contemporary food processing technologies applied to food and can be applied to mitigate the problems associated with processing of traditional cereal based products in terms of improvement in functionality, physical state and shelf stability. It offers many advantages over other process technologies in terms of, preparation of ready – to – eat foods of desired shape, size, texture and sensory characteristics at relatively low processing cost [27]. In puffing process the starchy food stuff is expanded with sudden application of heat at atmospheric pressure or by sudden pressure drop in high pressure chamber at high temperature. Snack foods with desirable colour, texture, flavor and shape appeals to the consumer. Texture is one of the most important quality attributes of snack food [17] and hot air puffing ideally makes an aerated, porous, crispy texture with added benefits of dehydration.

Response surface method (RSM) is a statistical – mathematical tool which uses quantitative data in an experimental design to determine, and simultaneously solve multivariate equations, to optimize processes or products [23]; it has been successfully used for developing, improving and optimizing processes [30].

The review of past research reveals that there are various process technologies to develop RTE foods from whole grain cereals like rice, legumes, potato and millets but no work has been done on preparation of puffed food from finger millet (*Eleusine coracana*) flour and soybean flour blend with potato mash. In developing countries, the commercial processing of these locally grown grains into value-added food products is an important driver for economic development [28]. Considering the nutritional importance of finger millet and to make value added products, present study was undertaken to develop finger millet-soy product.

MATERIAL AND METHOD

Production of flours and potato mash

The finger millet was sorted and winnowed manually. The finger millet flour was obtained by grinding the finger millet grain in the mixer grinder and soybean was processed into cooked soy flour to remove all anti-nutritional factors. Soybean grains were cleaned to remove immature grains, and other foreign materials. The clean grains were blanched at 100 °C for 30 min. The blanched grains were drained and then dried at 65 °C for 24 hr. Flours passing through 40 mesh sieve were used. The potatoes were cooked in a domestic cooker for 13 minutes and immediately removed for cooling. After complete cooling cooked potatoes were peeled and mash was prepared by hand.

Preparation of material for puffing

The basic ingredients were selected as finger millet flour, soybean flour and potato mash. The finger millet flour, soybean flour and potato mash was taken in the ratio of 45:10:45, respectively and a common salt of 1.5% of the total flour were added for taste. These ingredients were mixed thoroughly in a plate with hand. The mixed ingredients were taken and then kneaded in Dolly Mini P3 Pasta machine (LaMonferra, Italy) for 10-15 min till granules of dough were formed. Then it was cold extruded through a die in rectangular shape [20][21].

Experimental design for Convective Heating and Microwave Puffing

The convective heating and microwave puffing was done in the microwave oven. The Combo Microwave oven available in laboratory of AICRP on Post Harvest Technology, Dr. PDKV, and Akola was used for the experimentation of microwave puffing. The process parameters like convective heating temperature, convective heating time, microwave power and microwave heating time, on the basis of product qualities viz., final moisture content, expansion ratio, hardness, crispness, colour score and colour difference are described under experimental design along with the levels and combinations of treatments.

Moisture content

The moisture content of the sample was determined by using hot air oven (0 to 300 °C) as described by AOAC (1984).

Expansion Ratio

Expansion ratio was measured using rape seed displacement method [24]. For this the following expression was used:

$$\text{Expansion ratio} = \frac{\text{volume after puffing}}{\text{volume before puffing}} \quad \dots (1)$$

Textural Measurement (Hardness and Crispness)

The texture characteristics of puffed product in terms of hardness and crispness were measured using a Stable Micro System TA-XT2 texture analyzer (Texture Technologies Corp., UK) fitted with a 5 mm dia. circular punch. The studies were conducted at a pre test speed of 1.0 mm/s, test speed of 0.5 mm/s, distance of 30% strain, and load cell of 5.0 kg. Hardness value was considered as mean peak compression force and expressed in grams and crispness was measured in terms of major positive peaks. For measurement of crispness a macro was developed which count number of +ve peaks obtained in the product during compression. For measurement of crispness a macro was developed which counts number of major peaks obtained in the product during compression. Average values of 10 replications are reported.

Colour measurement (L value and ΔE)

The colour score (L value) and colour difference (ΔE) was measured using a simple digital imaging method [31]. A scanner was used to measure colour by scanning the colour image of the sample [30]. Once the colour images of the samples were scan, the colour was analyzed quantitatively using Photoshop 8.0 [1]. Photoshop can display L, a* and b* value in the palette and Histogram window.

Experimental design and optimization

The process variables considered were convective heating temperature (190 to 230 °C), convective heating time (120 to 360 sec), microwave power (60 to 100 % of 1350 W), microwave heating time (0 to 120 sec). The experimental design was applied after selection of the ranges. Thirty experiments were performed according to a second order central composite rotatable design (CCRD) with four variables and five levels of each variable. Experiments were randomized in order to minimize the effects of unexplained variability in the observed responses due to extraneous factors. The center point in the design was repeated six times to calculate the reproducibility of the method [15]. Microwave puffing experiments were conducted according to the CCRD design and RSM was

applied to the experimental data using a commercial statistical package, Design Expert - version 8.0 (Stat-ease Inc., Minneapolis, USA).

The following second order polynomial response surface model (Eq. 1) was fitted to each of the response variable (Y_k) with the independent variables (X_i)

$$Y_k = b_{k0} + \sum_{i=1}^4 b_{ki} X_i + \sum_{i=1}^4 b_{kii} X_i^2 + \sum_{i \neq j=1}^4 b_{kij} X_i X_j \quad \dots (2)$$

Where b_{k0} , b_{ki} , b_{kii} , and b_{kij} are the constant, linear, quadratic and cross-product regression coefficients, respectively and X_i are the coded independent variables of X_1, X_2, X_3 and X_4 .

Numerical optimization technique of the Design-Expert software was used for simultaneous optimization of the multiple responses. The desired goals for each factor and response were chosen. The aim may apply to either factors or responses. The possible aim is: maximize, minimize, target, within range, none (for responses only). All the independents factors were kept within range while the responses were either maximized or minimized. In order to search a solution optimizing multiple responses, the goals are combined into an overall composite function, $D(x)$, called the desirability function [16], which is defined as:

$$D(x) = (d_1 \times d_2 \times \dots \times d_n)^{1/n} \quad \dots (3)$$

Where, d_1, d_2, \dots, d_n are desirability of responses and n is the total number of responses in the measure.

Desirability is an objective function that ranges from zero outside of the limits to one at the goal. It reflects the desirable ranges for each response (d_i). The desirable ranges are from zero to one (least to most desirable, respectively). The numerical optimization finds a point that maximizes the desirability function. The characteristics of a goal may be altered by adjusting the weight or importance (Stat ease, 2002).

Table 1 Levels, codes and intervals of variation for microwave puffing process

Name of process variable	Range	Code (X_i)	LEVELS					Interval of variation
			X_{i1}	X_{i2}	X_{i3}	X_{i4}	X_{i5}	
			-2	-1	0	+1	+2	
Convective heating temperature, °C	190-230	X_1	190	200	210	220	230	10
Convective heating time, sec	120-360	X_2	120	180	240	300	360	60
Microwave Power, % of 1350 W	60-100	X_3	60	70	80	90	100	10
Microwave heating times, sec	0-120	X_4	0	30	60	90	120	30

RESULT AND DISCUSSION

Experimental values of the response variables at different combinations of CT, Ct, MP and Mt are presented in Table 1. Response surface analysis was applied to the experimental data using a commercial statistical package 'Design Expert-version 8.0'. The second order polynomial response surface model (Eq. 2) was fitted to each of the response variable (Y_k). ANOVA and Regression analysis were conducted for fitting the statistical significance of the model model terms examined. Analysis of variance showed that the models are highly significant ($p < 0.001$) for all the responses are given in Table 2. The estimated regression coefficients of the quadratic polynomial models for the response variables, along with the corresponding R^2 and coefficient of variation (CV) values are given in Table 3.

The lack of fit (Table 2), which measures the fitness of the model, did not result in a significant F-value in case of moisture content, expansion ratio, hardness, crispness, colour value and colour difference, indicating that these models are sufficiently accurate for predicting those responses. The coefficient of determination (R^2) values of all responses are quite high (> 0.9) indicating a high proportion of variability was explained by the data and the RSM models were adequate. As a general rule, the coefficients of variation should not be greater than 10%. In this study, the coefficients of variation was less than 10% for all the responses, a relatively lower value of the coefficient of variation indicates better precision and reliability of the experiments carried out.

Effect of various process parameters on final moisture content (MC, kg/kg dm) during microwave puffing

The quadratic model was fitted to the experimental data and statistical significance for linear and quadratic terms was calculated for MC as shown in Table 2. The experimental range of MC from 0.066 to 0.291 kg/kg dm was obtained with proportion of 45:10:45.

The regression equation describing the effect of the process variables on MC of finger millet-soy pasta in terms of actual level of variables are given as.

$$MC = 0.458 - 5.99 \times CT - 4.93 \times Ct + 0.018 \times MP - 4.48 \times 10^{-3} \times Mt - 1.40 \times 10^{-5} \times Ct \times MP + 1.86 \times 10^{-5} \times Ct^2 + 2.16 \times 10^{-5} \times Mt^2 \dots (4)$$

The analysis of variance (ANOVA) data (Table 2) shows a high model F value of 26.69 (p<0.001) and a non significant lack of fit test which indicated that quadratic model can be successfully used to fit the experimental data. The higher F-values for linear terms (p<0.001) and moderate values for quadratic terms (p<0.001) of microwave puffing time (Mt) indicated that their highly significant effect in reducing moisture content of puffed product and followed by convective heating time (Ct), microwave power (MP) and convective heating temperature(CT) had less influencing effect on moisture content. The interaction term of Ct and MP have less significant effect on moisture content (MC). The negative linear regression coefficients and positive quadratic regression coefficient of estimate (Table 3) indicated that there was decrease in moisture content with the increase in process parameters.

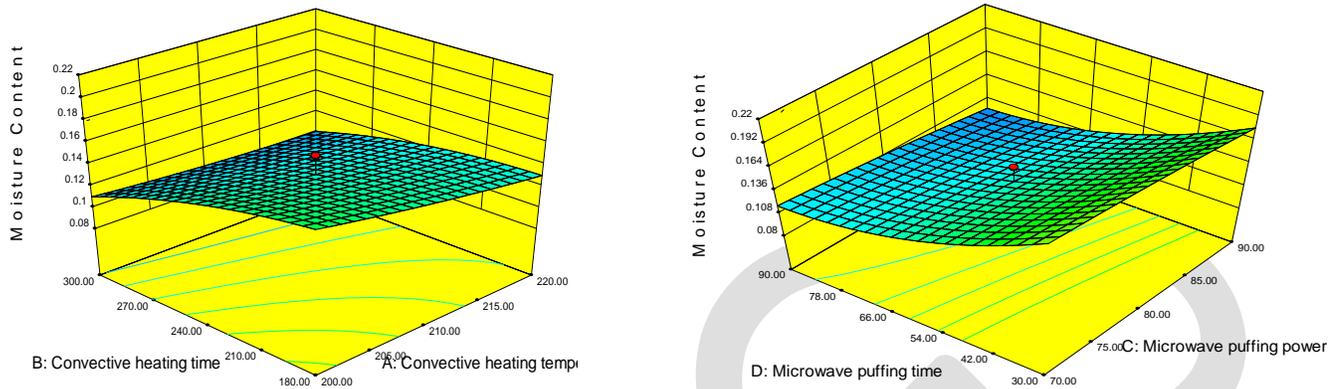
From Fig 1(a and b) shows moisture content of finger millet-soy pasta as a function of convective heating temperature (CT), convective time (Ct), microwave puffing power (MP) and microwave puffing time (Mt) respectively. From Fig 4.1(a) shows maximum (0.16 kg/kg, dm) and minimum (0.11 kg/kg, dm) values of MC were observed at CT=200-203 °C / Ct=180-200 sec and CT=280-300 °C / Ct=216-220sec respectively. It was observed from Fig 4.1(b) that maximum (0.20 kg/kg, dm) and minimum (0.10 kg/kg, dm) values of MC observed at MP=70-73 % of 1350W/ Mt=30-36 sec and MP=85-90 % of 1350W/ Mt= 88-90 sec respectively.

Table 2 CCRD with uncoded values and experimental result for response variables of finger millet-soy pasta

Run	Process variables				Responses					
	CT	Ct	MP	Mt	MC	ER	HD	CSP	L value	ΔE
1	200	180	90	90	0.15	2.178	2000	16	43.75	16.07
2	210	360	80	60	0.068	2.421	1443.73	20	46	12.48
3	210	240	80	60	0.128	2.184	1537.42	14	42.25	10.71
4	210	240	80	120	0.119	1.999	1422.18	19	47.75	19.26
5	220	300	90	30	0.129	2	1798.92	12	44.75	13.56
6	200	180	90	30	0.229	2.367	1692.16	6	34	6.53
7	220	300	70	30	0.18	1.234	1521.76	15	37.25	8.07
8	210	120	80	60	0.129	2.149	1715.88	11	36	7.8
9	210	240	100	60	0.086	2.182	1823.37	16	45.77	15.06
10	200	300	90	30	0.154	2.458	1625.65	10	36	8.41
11	220	180	70	30	0.211	1.199	1431.32	12	37.48	7.25
12	210	240	80	60	0.149	2.273	1449.29	14	44.25	12.51
13	230	240	80	60	0.1	2.118	1523.43	16	48.25	16.47
14	200	180	70	90	0.123	2.098	1839.75	8	44	13.28
15	200	300	70	90	0.108	2.211	1245	15	49.55	14.98
16	190	240	80	60	0.169	2.361	1720.42	10	43.75	13.83
17	210	240	80	60	0.112	2.785	1467.49	9	39.5	8.8
18	220	300	70	90	0.107	2.333	1267.52	15	46.25	13.18
19	210	240	80	60	0.148	2.389	1538.12	12	46	8.93
20	200	300	90	90	0.072	2.786	1493.22	22	50.25	17.12
21	200	300	70	30	0.163	1.882	1585.84	13	45	8.97
22	220	180	90	90	0.098	2.219	1723.87	19	49.75	13.99
23	210	240	80	0	0.291	1.021	1400	6	29.1	6.81
24	200	180	70	30	0.23	1.345	1536.66	6	31.75	7.06
25	210	240	80	60	0.121	2.149	1590.31	11	42	8.51
26	210	240	80	60	0.131	2.168	1429.56	10	43.25	12.56
27	220	300	90	90	0.066	2	1789.84	22	50.34	18.39
28	220	180	70	90	0.116	2.247	1365.58	12	37.25	6.68
29	220	180	90	30	0.201	1.823	1268.4	10	46	11.16
30	210	240	60	60	0.153	1.098	1657.37	11	41	11.21

In figure the parentheses denote coded level of variables: CT, convective temperature: Ct, convective time: MP, microwave power: Mt, microwave time: MC, moisture content: ER, expansion ratio: HD, hardness: CSP, crispness:L value, colour score: ΔE, colour difference

The above finding revealed that during convective heating and microwave puffing there was continuous decrease in MC of finger millet-soy pasta with time at all level of convective temperature and microwave power respectively. Optimum moisture content of 11.03 %, (d.b) and 3.35 %, (d.b) was obtained for RTE potato soy snacks at optimized temperature and time by [17] with HTST process and [19] with oven toasting method respectively



a) At MP = 80% and Mt=60 sec

b) At CT = 210 °C and Ct = 240 sec

Fig. 1 The response surface plots showing the effect of (a) CT and Ct and (b) MP and Mt on MC (kg/kg dm) for microwave puffing.

Table 3 ANOVA for different models

Variables	df	F value					
		MC	ER	HD	CSP	L	ΔE
Model	14	26.687	9.46	8.03	23.67	12.18	9.98
Intercept	0						
A-CT	1	13.98*	7.844*	8.32*	27.87*	4.80	0.42
B-Ct	1	52.30**	4.016	6.19*	71.90**	26.09**	14.24**
C-MP	1	15.53*	30.67***	20.00***	24.60*	10.92*	17.67**
D-Mt	1	208.80***	33.78***	0.51	129.04***	78.65***	72.17***
CT X Ct	1	2.59	2.498	23.47***	6.49*	4.69*	1.36
CT X MP	1	3.19	2.321	1.23	0.34	19.29**	7.75
CT X Mt	1	0.04	2.707	0.001	1.88	6.56*	7.91
Ct X MP	1	5.69*	0.020	2.67	0.96	4.96*	0.03
Ct X Mt	1	3.85	0.098	24.29***	0.34	0.79	1.04
MPX Mt	1	0.003	11.24**	7.72*	52.56**	0.76	1.98
CT ²	1	0.48	0.010	2.69	1.33	4.19	10.05**
Ct ²	1	6.98*	0.039	1.03	13.84*	0.82	0.75
MP ²	1	0.49	16.04**	11.56**	2.78	0.25	2.39
Mt ²	1	52.11**	23.55***	2.23	0.41	5.91*	2.15
Lack of Fit	10	0.89 ^{NS}	0.530 ^{NS}	2.48 ^{NS}	0.072 ^{NS}	1.01 ^{NS}	0.63 ^{NS}

ns, not significant. *Significant at P < 0.05. **Significant at P < 0.01. ***Significant at P < 0.001

Effect of various process parameters on final expansion ratio (ER) during microwave puffing

The observations for expansion ratio with different combination of the process parameter were recorded as shown in (Table 2). Maximum volume of expansion of 2.786 obtained 90 % of 1350 W microwave power for 90 s. The quadratic model was fitted to the experimental data and statistical significance for linear and quadratic terms was calculated for ER as shown in Table 2. The regression

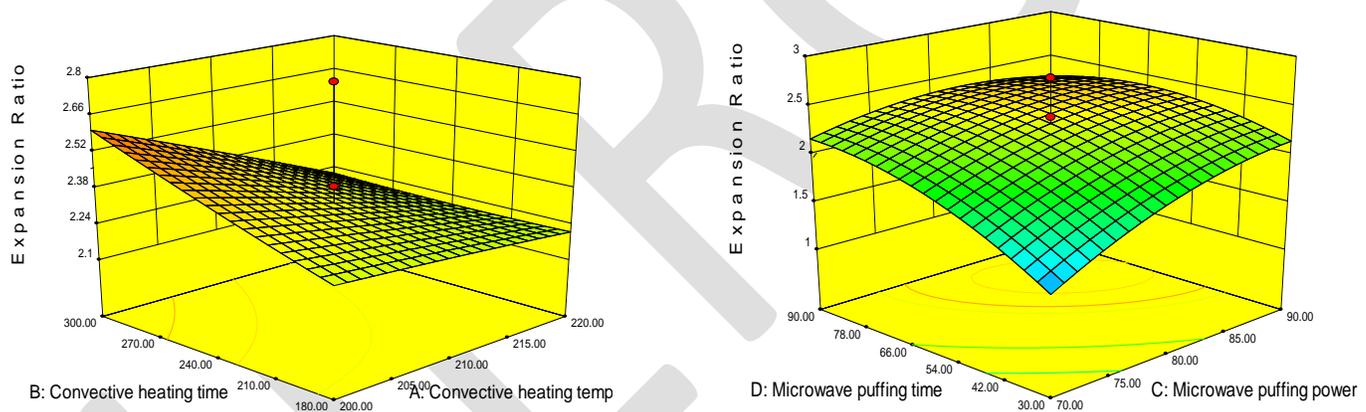
equation describing the effect of the process variables on expansion ratio of finger millet-soy pasta in terms of actual level of variables are given as:

$$ER = - 28.78 + 0.079 \times CT + 0.462 \times MP + 0.021 \times Mt - 5.68 \times 10^{-4} \times MP \times Mt - 1.54 \times 10^{-3} \times MP^2 - 2.07 \times 10^{-4} \times Mt^2 \quad \dots (5)$$

It could be observed from ANOVA (Table 2) data that a high model F value of 9.46 and R² value of 0.898 indicated that the quadratic model can be fitted at high level of significance (p<0.001). The high F value of linear and quadratic terms of MP and Mt have highly significant effect on expansion ratio (p<0.001) followed by linear term CT and interaction term of MP and Mt have moderate effect on expansion ratio of the product. The negative linear (CT) and interaction (MP and Mt) regression coefficient indicated (Table 3) that expansion ratio (ER) decreased with increase of these process parameters at linear level. The positive linear and negative quadratic regression coefficient of MP and Mt indicated that there was increase in expansion ratio with the increase in process parameters initially but decreased it when the parameters were increased at higher level.

Fig 2(a) shows that maximum (2.5) and minimum (2.25) values of expansion ratio were observed at CT= 200-206 °C / Ct = 260-300 sec and CT = 210-218 °C / Ct = 180-300 sec respectively and it could be observed that CT and Ct had linear effects and ER decreased with increase in convective heating temperature. The Fig 2 (b) shows that maximum (2.4) and minimum (1.7) value of expansion ratio were observed at MP = 80-90% of 1350W/ Mt = 59- 85 sec and MP = 74-76% of 1350W/ Mt = 42-48sec respectively and it can be observed that ER was higher at higher microwave puffing power and puffing time.

High expansion is primarily dependent on starch content in the raw material to be puffed. Potato flour is rich in starch while soy flour adds more protein in the product and therefore addition of soy flour showed significant reduction in expansion ratio [19]. This ER was similar to that obtained 2.90 of extrudate product prepared from finger millet, maize and full fat soy flour by [22], 2.06 for barnyard millet puffed product by [10].



(a) At MP = 80% and Mt=60 sec

(b) At CT = 210 °C and Ct = 240 sec

Fig. 2 The response surface plots showing the effect of (a) CT and Ct and (b) MP and Mt on ER for microwave puffing.

Effect of various process parameters on Hardness (HD, g) during microwave puffing

It could be observed (Table 2) that the values of hardness ranged between 1248 g and 2000 g within the combination of variables studied. The regression equation describing the effect of the process variables on hardness of finger millet-soy pasta in terms of actual level of variables are given as

$$HD = 32416.14 - 183.238 \times CT - 41.563 \times Ct - 161.485 \times MP + 0.1779 \times CT \times Ct - 0.0603 \times Ct \times Mt + 0.0204 \times MP \times Mt + 0.5721 \times MP^2 \quad \dots (6)$$

Analysis of variance (ANOVA) showed (Table 2) that the model F value of 8.029 and R² value of 0.88 were moderate but quadratic model could be fitted with high level of significance (p<0.001). The F values of linear terms of MP and interaction terms of CT and Ct as well as Ct and Mt have highly significant effect on Hardness (p<0.001) whereas linear term of CT and quadratic term of MP have moderate effect on hardness (HD) of the product. The positive and negative sign of linear and quadratic regression coefficient of estimate indicated (Table 3) that hardness (HD) increase and decrease with the increase these process parameters. However positive and negative regression coefficient of interaction terms suggested that increase and decrease of these process parameters resulted in decrease and increase of hardness value.

Fig 3 (a) shows that hardness of finger millet-soy pasta as a function of CT and Ct, maximum (1700 g or 16.67 N) and minimum (1500 g or 14.70) values of hardness were observed at CT = 200-205 °C / Ct = 180-210 sec and CT = 215-220 °C / Ct = 270-300 sec respectively. Fig 3 (b) shows that hardness of finger millet-soy pasta as a function of MP and Mt, maximum (1650) and minimum (1450) values of hardness were observed at MP = 85-90% of 1350W/ Mt = 66-90 sec and MP = 70-77% of 1350W/ Mt = 72-90 sec respectively. Similar finding had been reported by [17] for hardness of HTST air puffed potato snack. Hardness of extrudate product have high value (59.68 N) due to incorporation of soy flour while least value (15.39 N) due to high amount of finger millet flour [22]. While Chandrashekhar (1989) reported that decrease in hardness with increase in expansion ratio in case of rice puffing. Similar finding also reported by [18] in HTST air puffed potato snack. These finding were in accordance with the present study.

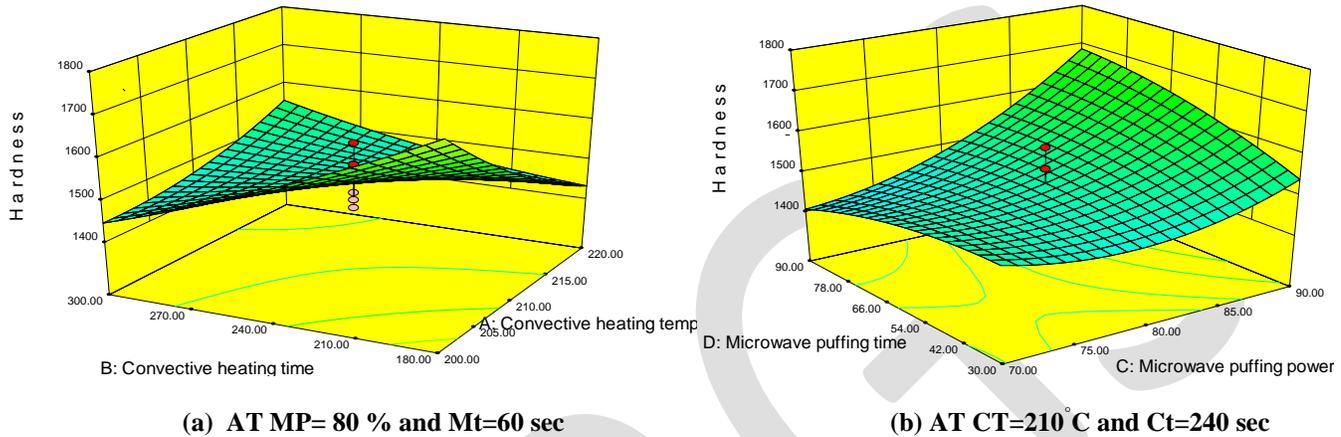


Fig. 3 The response surface plots showing the effect of (a) CT and Ct and (b) MP and Mt on HD for microwave puffing.

Table 4 Regression coefficients of the second order polynomial model for the response variables (in coded units)

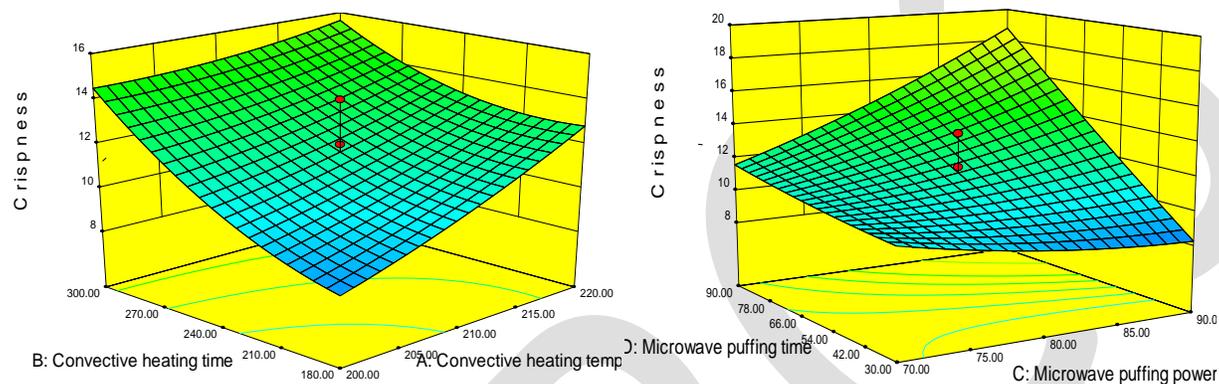
Variables	df	Coefficient of estimate					
		MC	ER	HD	CSP	L	ΔE
Model	14						
Intercept	0	0.131	2.324	1502.03	11.66	42.87	10.33
A-CT	1	-0.011	-0.114	-51.87	1.37	0.99	0.21
B-Ct	1	-0.021	0.082	-44.76	2.21	2.31	1.25
C-MP	1	-0.011	0.227	80.44	1.29	1.49	1.39
D-Mt	1	-0.041	0.238	12.85	2.96	4.01	2.81
CT X Ct	1	0.005	-0.079	106.73	-0.81	-1.19	0.47
CT X MP	1	-0.006	-0.076	24.44	-0.19	2.432	1.13
CT X Mt	1	-0.001	0.082	-0.70	-0.44	-1.42	-1.14
Ct X MP	1	-0.008	-0.007	36.02	-0.31	-1.23	-0.07
Ct X Mt	1	0.007	-0.015	-108.57	0.19	0.49	0.41
MPX Mt	1	0.0001	-0.168	61.22	2.31	0.49	0.51
CT ²	1	0.001	-0.003	27.61	0.28	0.86	0.98
Ct ²	1	-0.007	0.007	17.07	0.91	-0.38	-0.27
MP ²	1	-0.002	-0.153	57.22	0.40	0.21	0.48
Mt ²	1	0.019	-0.186	-25.10	0.15	-1.03	0.45
Lack of Fit	10						
R ²		0.961	0.90	0.882	0.96	0.92	0.90
Adj. R ²		0.925	0.80	0.772	0.92	0.84	0.81
Pred. R ²		0.838	0.62	0.407	0.91	0.65	0.63
CV		10.00	9.77	5.63	9.76	5.20	13.93

Effect of various process parameters on Crispness (CSP) during microwave puffing

It was observed that the value of CSP was ranged between 3.00 and 22.00 with different combinations of the process parameters are presented in Table 2. The quadratic model was fitted to the experimental data and statistical significance for linear and quadratic terms was calculated for CSP. The regression equation describing the effects of the process variables on CSP in terms of actual levels of variables is given as,

$$CSP = 33.239 - 0.481 \times CT + 0.235 \times Ct - 0.464 \times MP - 0.257 \times Mt - 1.354 \times 10^{-3} \times CT \times Ct + 7.708 \times 10^{-3} \times MP \times Mt + 2.517 \times Ct^2 \dots (7)$$

The model F value of 23.67 and R² value of 0.96 at high significant level (p<0.001) was calculated by a least square technique, showing good fit of model to the data. The F values (p<0.001) of linear terms and interaction term (MP and Mt) have highly significant effect on CSP whereas quadratic term of Ct and interaction term of CT and Ct (p<0.01) have moderate effect on crispness of the product. All linear and quadratic regression coefficients (Table 3) were positive indicating improvement in CSP with increase in these variables.



(a) At MP = 80% and Mt=60 sec

(b) At CT = 210 °C and Ct = 240 sec

Fig. 4 The contour and response surface plots showing the effect of (a) CT and Ct and (b) MP and Mt on CSP for microwave puffing.

Fig 4(a) shows crispness of finger millet-soy pasta as a function of CT and Ct. Maximum (14) and minimum (10) values of crispness were observed at CT = 216-220 °C / Ct = 288-300 sec and CT = 206-210 °C / Ct = 288 sec respectively. Fig 4(b) shows crispness of finger millet-soy pasta as a function of MT and Mt. Maximum (18) and minimum (9) values of crispness were observed at MP = 86-90% of 1350W/ Mt = 80-90 sec and MP = 78-90% of 1350W/ Mt = 30-40 sec respectively.

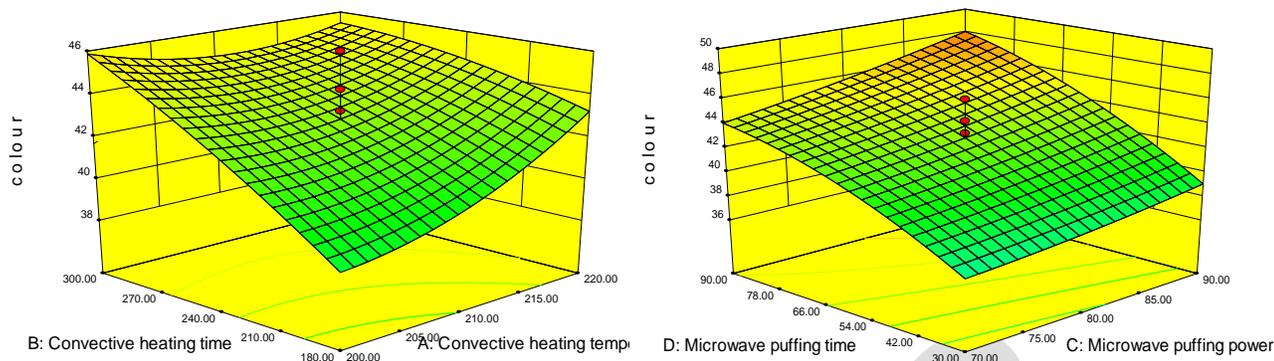
As a result of this there was no considerable increase in crispness with corresponding increase in CT and Mt. When puffing was continued after 30 sec, pores and cracks were developed in the microstructure of the product as a result of which vaporized moisture get released rapidly due to which there was considerable improvement in crispness and at the end of 90 sec the product achieved crispness value of 22 peak at moisture content of around 0.062 kg/kg dm. [11] recorded maximum crispness of 37 during the production of optimized RTE dehydrated potato cube.

Effect of various process parameters on colour (L value) during microwave puffing

The experimental values of colour were in the range of 29.1 to 50.34 and data recorded for colour (L value) after each set of experiment shown in Table 2. The regression equation describing the effects of the process variables on L value in terms of actual levels of variables is given as,

$$L \text{ value} = 603.36 - 4.739 \times CT + 0.656 \times Ct - 4.866 \times MP + 1.067 \times Mt - 1.999 \times 10^{-3} \times CT \times Ct + 0.0243 \times CT \times MP - 4.7270 \times 10^{-3} \times CT \times Mt - 2.0552 \times 10^{-3} \times Ct \times MP - 1.137 \times 10^{-3} \times Mt^2 \dots (8)$$

It could be observed from ANOVA (Table 2) that model F-value (12.18) and R² value (0.92) highly significant (p<0.001) and the linear terms and interaction term of CT and MP shows their highly significant (p<0.001) effect on colour of puffed product. Whereas quadratic term of Mt and interaction terms (p<0.01) have moderate effect on colour of product. The all linear regression coefficient were positive indicating improvement in colour with increase in these variables while negative quadratic regression coefficient was indicated that further increase of this process parameter resulted decrease of colour.



(a) At MP = 80% and Mt=60 sec

(b) At CT = 210 °C and Ct = 240 sec

Fig. 5 The response surface plots showing the effect of (a) CT and Ct and (b) MP and Mt on colour (L value) for microwave puffing.

Fig 5 (a) showed L value of finger millet-soy pasta as a function of convective heating temperature (CT) and convective heating time (Ct). Maximum (44) and minimum (40) value of CL were observed at CT= 215-220 °C / Ct= 240-270 sec and CT=205-210 °C / Ct= 180-210 sec, respectively. While Fig 5 (b) showed L value of finger millet-soy pasta as a function of microwave puffing power (MP) and microwave puffing time (Mt). Maximum (46) and minimum (38) values of CL were observed at MP=80-90% of 1350W/ Mt= 66-90 sec and MP=70-82 % of 1350W / Mt= 30-42 sec respectively.

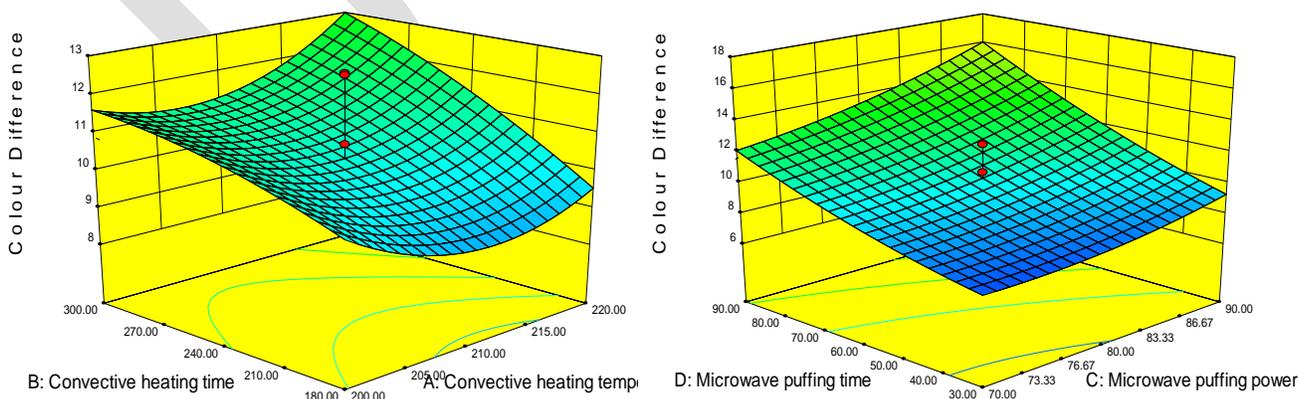
In case of puffing process, there is improvement in L-value with increase in both MP and Mt initially and reaches to a maximum. After initiation of puffing, when product gets expanded rapidly upto 60 sec microwave puffing time, there was increase in L-value. After 90 sec of puffing time the L-value reduced slowly due to non-enzymatic browning and pigment destruction reactions of product surface [6].

Effect of various process parameters on colour difference (ΔE) during microwave puffing

It could be observed that the values of colour difference (ΔE) were ranged between 6.53 to 19.26 and the ANOVA for colour difference (Table 2) of the puffed product indicated moderate model F value (9.98) and R² value (0.90) highly significant at p<0.001 suggesting that the quadratic model can be used to fit the experiment data. The quadratic equation relating response colour difference with independent variable in terms of actual values after deleting the non significant terms is given as

$$\Delta E = 637.57 + 0.1127 \times Ct - 3.0857 \times MP + 0.6252 \times Mt + 0.0113 \times CT \times MP - 0.0038 \times CT \times Mt + 0.0098 \times CT^2 \dots(9)$$

The analysis of variance showed that the high F value of 72.17 for linear term of Mt was most influencing parameters (p<0.001) followed by MP and Ct. While quadratic terms of CT (p<0.001) and interaction terms CT and MP as well as CT and Mt (p<0.01) were found to be least influence on colour difference. The entire positive linear regression coefficient of estimate (Table 4.6) indicated that colour difference values increase with increase of these processing parameters. However, positive and negative coefficient of their quadratic term (CT) and interaction term of (CT and Mt) suggested that the ΔE value increase and decrease with increase the these process parameters respectively. Similar finding was obtained by [17] for RTE potato-soy snack. The regression model explained 90 % of the total variability in ΔE value.



(a) At MP = 80% and Mt=60 s

(b) At CT = 210 °C and Ct = 240 s

Fig. 6 The contour and response surface plots showing the effect of (a) CT and Ct and (b) MP and Mt on Sensory colour score (CL) for microwave puffing.

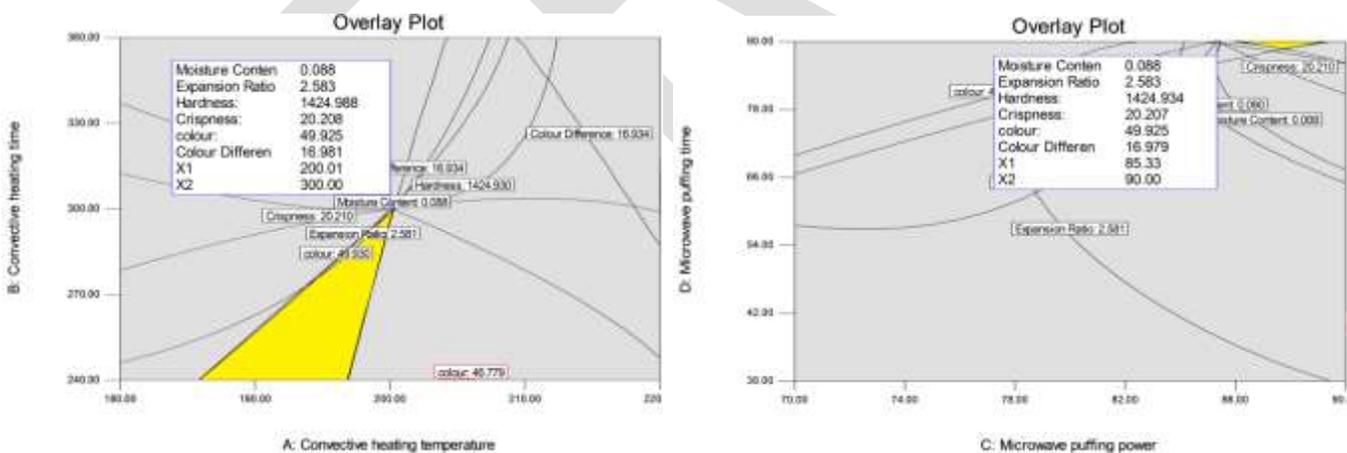
Table 5 Optimization criteria for different process variables and responses for microwave puffing of finger millet-soy pasta

Process parameter	Goal	Lower limit	Upper limit
CT, °C	is in range	200	220
Ct, sec	is in range	180	300
MP, % of 1350W	is in range	70	90
Mt, sec	is in range	30	90
MC, kg/kg dm	minimize	0.066	0.291
ER	maximize	1.021	2.786
HD, g	minimize	1245	2000
CSP, +ve peaks	maximize	6	22
L value	maximize	33.1	54.34
ΔE	maximize	6.53	19.26

Optimization of puffing process for finger millet-soy pasta

Numerical and graphical optimization was carried out for the process parameters for microwave puffing for obtaining the best product. To perform this optimization, Design-Expert program (Version 8.0) of the STAT-EASE software (Stat-Ease, 2002), was used for simultaneous optimization of the multiple responses. The desired goals for each factor and response were chosen as shown in Table 4.

Table 5 shows that the software generated ten optimum conditions of independent variables with the predicted values of responses. Solution No.1, having the maximum desirability value (0.877) was selected as the optimum conditions of puffing. The optimum values of process variables obtained by numerical optimization.



(a) At MP = 80% and Mt=60 sec

(b) At CT=210°C and Ct = 240sec

Fig. 7 Superimposed contour for MC (kg/kg dm), ER, CSP (+ve peaks), colour (L value) and colour difference (ΔE) for microwave puffing of finger millet-soy pasta at (a) CT and Ct and (b) MT and Mt.

Verification of the model for microwave puffed finger millet-soy pasta

Microwave puffing experiments were conducted at the optimum process condition and the quality attributes of the resulting product were determined. The observed experimental values (mean of 5 measurements) and values predicted by the equations of the model. The values of C.V. (<10%) and closeness between the experimental and predicted values of the quality parameters indicated the suitability of the corresponding models. No significant differences between the actual and predicted values were found at $p \leq 0.05$.

The optimum process parameters were obtained from the responses in terms of MC, ER, H, CSP, L value and ΔE by the numerical optimization method and the minimum MC (0.088 kg/kg dm), maximum ER (2.58), minimum H (1425 g), maximum CSP (20.21),

maximum L-value (49.95) and maximum ΔE (16.98) were obtained at the process condition of convective heating temperature (200 °C), convective heating time (300 sec), microwave power (85.39 % 1350 W) microwave heating time (90 sec).

Table 6 Solutions generated by the software for microwave puffing process

CT	Ct	MP	Mt	MC	ER	HD	CSP	L value	ΔE	Desirability	Remark
200	300	85.33	90	0.088	2.58	1425	20.21	49.93	16.98	0.870	Selected
200	300	85.43	90	0.088	2.58	1427	20.25	49.91	16.99	0.870	
200	299.98	85.04	90	0.089	2.58	1418	20.10	49.97	16.95	0.870	
200	299.91	84.35	90	0.090	2.59	1404	19.82	50.07	16.86	0.870	
200	299.88	84.28	90	0.090	2.59	1403	19.79	50.08	16.85	0.869	
200	300	87.02	90	0.086	2.57	1462	20.88	49.69	17.21	0.869	
200	299.76	84.89	89.87	0.089	2.59	1416	20.00	49.96	16.90	0.869	
200	300	85.23	89.46	0.088	2.59	1424	20.07	49.85	16.86	0.867	
200.36	300	84.25	89.82	0.089	2.58	1403	19.74	49.98	16.75	0.867	
200	300	89.21	90	0.082	2.55	1516	21.79	49.39	17.55	0.865	

CONCLUSION

The optimization technique of CCRD and RSM was used in design of experiments and optimization of the effect of process parameters for microwave puffing for development of finger millet soy pasta using moisture content, expansion ratio, hardness, crispness, colour value and colour difference as responses. The responses (MC, ER, HD, CSP, L-value and ΔE) of puffed finger millet-soy pasta by microwave puffing process were dependent significantly on the process variables namely, convective heating temperature, convective heating time, microwave puffing power and microwave puffing time for developing finger millet-soy pasta. Microwave puffing temperature and microwave puffing time had the maximum influence, whereas the effects of convective heating temperature and convective heating time was comparatively less on the quality attributes of finger millet soy pasta. The regression models were found to be significantly valid and represented adequate information about the behavior of response with change in process parameters.

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Genetic Mosaicism: Introduction and Applications

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Abstract— This paper sheds light on the clinical applications of Genetic Mosaicism. The recent advancements in creating mosaics (genetically different cell types arising from a single zygote) and chimeras (from more than one zygote) in a lab environment can be extraordinarily useful in the study of biological systems, and can be created intentionally in many model organisms in a variety of ways. The paper explains how this phenomenon can be used to study gene functions, modelling of genetic disorders, understand embryonic development and evaluate therapeutics. It also focuses on how this technique is a better evaluation tool than the conventional genetic testing methods.

Keywords— Chimerism, Somatic Mosaicism, X-inactivation, Tetragametic Mosaicism, Tortoiseshell cat, Gene Autonomy, Epigenetics.

Introduction- The phenomenon of genetic mosaicism denotes the presence of two or more populations of cells with different genotypes in one individual who has developed from a single fertilized egg. [10]

It was discovered by Curt Stern in the 1930s. He demonstrated that genetic recombinations (that usually takes place in meiosis) can also take place in mitosis resulting in somatic mosaics. These are organisms which contain two or more genetically distinct types of tissue. The term somatic mosaicism was used by C.W. Cotterman in 1956 in his seminal paper on antigenic variation.

A. *Mosaics and Chimeras: A Comparison*

Mosaics may be contrasted with chimerism, where two or more genotypes arise from the fusion of more than one zygote in the early stages of embryonic development. Mosaics are common; in fact, roughly half of the mammals on earth are a type of mosaic. A chimera can only be acquired as a result of an embryology experiment.

B. *Types of Mosaicism*

Different types of mosaicism exist, such as gonadal mosaicism or somatic mosaicism.

Somatic mosaicism occurs only in the somatic cells when different genotypes arise from a single fertilized egg cell, mostly due to mitotic errors at first or later cleavages. In rare cases, intersex conditions can be caused by mosaicism where some somatic cells in the body have XX and others XY chromosomes. The most common form of somatic mosaicism is encountered in trisomies, when only a selection of cells is affected by non-disjunction. (46/47 XY/XXY). [2][10]

Revertant somatic mosaicism is a rare recombination event in which there is a spontaneous correction of a mutant allele. Gonadal mosaicism or germline mosaicism is a special form of mosaicism, where some gametes, i.e. either sperm or oocytes, carry a mutation, but the rest are normal. [9]

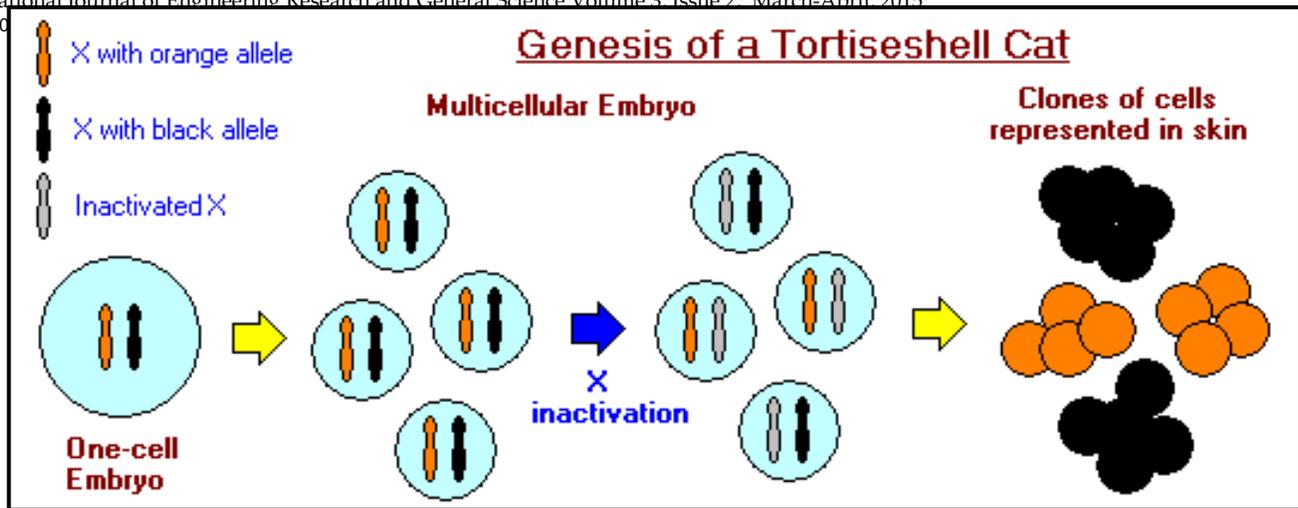


Fig.1 X-chromosome inactivation mosaicism in Tortoiseshell cat

Mechanisms- A genetic mosaic is a creature whose body is built of a mixture of cells of two or more different genotypes. In mammals they arise by several different mechanisms:

A. *Placental Exchange*

The sharing of blood supplies by separate embryos. This occurs with the occasional fraternal cattle twins and also —less often — with human fraternal twins who have shared the same placenta. Blood stem cells of each twin seed the bone marrow of the other. Only their blood cells are mosaic.

B. *Mitotic Errors*

During early development, errors during mitosis can produce stem cells that go on to populate a tissue or organ with, for example, a chromosomal aberration (e.g., aneuploid).

Example: Occasionally a baby is born with blood cells that have three copies of chromosome 21 (the same set responsible for Down syndrome). This can produce a leukemia-like illness that, fortunately, often disappears as that cell population declines. [5]

C. *X-inactivation*

All female mammals are mosaic for the genes on the X chromosome because of the random inactivation of one or the other X chromosome in all their somatic cells.

D. *Cancer*

Anyone having a cancer is a genetic mosaic because all cancers are made up of the descendants of cells carrying a suite of mutations not found in normal cells.

E. *Mitotic Mutations*

Recent advances have enabled the coding portions of the genome of single cells to be sequenced. Early results indicate that even normal cells in an adult have accumulated a suite of somatic mutations that differs from cell to cell. However, the rate of somatic mutations in these normal cells is only a fourth of that in cancer cells. All multicellular organisms are likely to be somatic mosaics to some extent. Since the human intergenerational mutation rate is approximately 10⁻⁸ per position per haploid genome and there are 10¹⁴ cells in the human body, it is likely that during the course of a lifetime most humans have had many of the known genetic mutations in our somatic cells and thus humans, along with most multicellular organisms, are all somatic mosaics to some extent. To extend the definition, the ends of chromosome 'telomeres', shorten with every cell division and can vary from cell to cell thus representing a special case of somatic mosaicism. [2] [4]

X-Inactivation Mosaicism- To compensate for the presence of only one X-chromosome in male cells, compared to female cells, one of the two active X-chromosomes in every cell of the female blastocyst is randomly and stably inactivated. However, this cannot be said to be true mosaicism since, X-inactivation is not maintained, within cells of the female germ line. The inactive X-chromosome of each female germ cell is reactivated at the oogonium stage. Both X-chromosomes then remain active throughout

meiosis and development of the definitive oocyte. Thus, male zygotes inherit an active X-chromosome from the oocyte (which remains active throughout the life-time of the male), and a Y chromosome from the spermatozoon. On the other hand, female zygotes inherit two active X-chromosomes, one from the oocyte and one from the spermatozoon. Both X-chromosomes remain active in all cells through early cleavage until random, stable inactivation of one of them in each cell occurs again in the late blastocyst. The consequence of X-inactivation in cells of the female blastocyst is that their clonal descendants differ with respect to whether the paternal or maternal X-chromosome remains active and thus, whether they express specific maternal or paternal genes. The classical example of this phenomenon is the female calico cat which inherits an X-linked yellow allele from one parent and an X-linked non-yellow allele from the other. One or the other colour is expressed in patches which represent clones descending from cells with the respective active X-chromosome.

A. Occurrence in cats



Cats provide a unique opportunity to observe X-chromosome inactivation and help visualize how it affects all females. Tortoiseshell cats, as seen below, have a coat that is a mixture of black and orange hair. Calico cats are similar, but also have patches of white, which is encoded by another gene.

The gene encoding orange coat color is X-linked (that is, on the X chromosome). Black color is encoded by either a co-dominant allele on the X chromosome or, more likely, an autosomal gene that is masked by the orange gene. For explanatory purposes, we will consider the orange gene (O) and its non-orange allele (o), to both be X-linked. Normal male cats have a single X chromosome and can carry either the O or o gene, leading them to have an orange or black coat, respectively.

Female cats, with two X chromosomes, can have any of three genotypes relative to the orange gene: OO (orange coat), oo (black coat) or Oo (tortoiseshell or calico). The tortoiseshell pattern of fine patches of black and orange reflects the pattern of X chromosome inactivation in the hair follicles, as shown in Fig. 1.

Fig. 2 Venus the Mosaic Cat

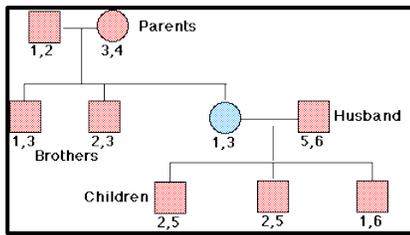
In black patches, the X chromosome bearing the orange allele has been inactivated and the X chromosome bearing the non-orange allele is active. Precisely the converse is present in patches of orange fur. The random nature of X-chromosome inactivation is evident - there are relatively large patches of both black and orange, but most of the coat is a fine mixture of orange and black. Fig. 2 depicts how X chromosome inactivation leads to unevenly coloured patches.

The pattern of X chromosome inactivation seen as black and orange fur in the coat of a tortoiseshell cat is present in all tissues of all female mammals. That pattern is just not usually visible because, for example, human skin colours are not encoded by X-linked genes. However, understanding X chromosome inactivation and mosaicism is of great importance in all species for understanding the pathophysiology of X-linked genetic diseases. [1]

Existence of Mosaicism- Genetic Mosaics since their discovery have solved many mysteries of human physiology and have contributed to better healthcare. A few examples are as follows:

A. A. Tetragametic Human Mosaic

In 2002 there was a discovery of a tetragametic woman- that is a woman derived from four different gametes, not just two. Since she needed a kidney transplant, the following tests were performed leading to various results. [4]



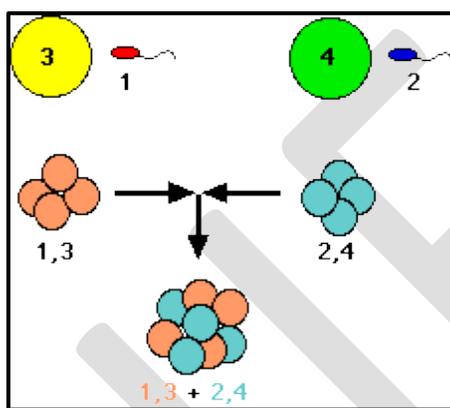
Tissue typing, which is done with blood cells, showed her to have inherited the "1" HLA region of her father (who was 1, 2) and the "3" region of her mother (who was 3, 4). See Fig. 3. Her husband was typed 5, 6. Of her three sons, one was 1, 6 which was to be expected, but the other two were both 2, 5.

When tissue typing was done for other tissues like skin, hair, thyroid, bladder, and cells scraped from inside her mouth revealed that DNA of not only 1 and 3 but also 2 and 4 existed in her body.

Fig. 3 Tissue Typing Results

The woman can accept a kidney from any one of her brothers as well as her parents without fear of rejecting it since she has all four sets of transplantation antigens. The HLA region on chromosome 6 carries a set of genes that encode the major transplantation antigens; that is, the antigens that trigger graft rejection. Ordinarily, there is only a 1 in 4 chance that two siblings share the same transplantation antigens if both parents were heterozygous as in her case.

This was possible because mostly her mother had simultaneously ovulated two eggs one containing a chromosome 6 with HLA 3; the other with HLA 4. Her father would, of course, have produced equal numbers of 1-containing and 2-containing sperm. Soon thereafter the resulting early embryos fused into a single embryo. As this embryo developed into a fetus, both types of cells participated in constructing her various organs including her oogonia (but not, apparently, the blood stem cells in her bone marrow). Although she was a mosaic for the HLA (and other) genes on chromosome 6, all her cells were XX. So both the father's successful sperm cells had carried his X chromosome. Refer Fig.4.



Tetraparental humans have been found that were mosaic for sex chromosomes as well; that is, some of their cells were XX; the other XY. In some cases this mosaic pattern results in a hermaphrodite — a person with a mixture of male and female sex organs.

Fig. 4 Tetraparental cells

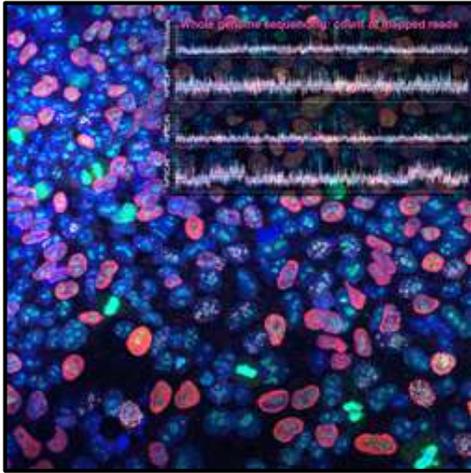
B. Skin cells reveal DNA's genetic mosaic

The study paves the way for assessing the extent of gene variation, and for better understanding of human development and disease. 30% of skin cells harbor copy number variations (CNV), which are segments of DNA that are deleted or duplicated. The mosaic seen in the skin could also be found in the blood, in the brain, and in other parts of the human body.

Whole genome sequencing was used to study induced pluripotent stem cells lines (iPS), (which are stem cells developed from a mature-differentiated cell). Cells taken from the inner upper arms of two families were grown. Characterization of these iPS cell lines and comparison to the original skin cells was done.

While observing that the genome of iPS cells closely resembles the genome of skin cells from which they originated, several deletions or duplications involving thousands of base pairs of DNA were identified. Additional experiments to understand the origin of those differences were performed, which showed that at least half of them pre-existed in small fractions of skin cells. These differences were revealed in iPS cells because each iPS line is derived from one, or very few, skin cells. Refer Fig. 5.

The observation of somatic mosaicism has far-reaching consequences for genetic analyses, which currently use only blood samples. When we look at the blood DNA, it's not exactly reflecting the DNA of other tissues such as the brain. There could be mutations that we're missing.



Many other examples of genetic chromosomal mosaicism occur in humans. Nonetheless, the most common involve sex chromosomes (XO/XX, XX/XY, XXX/XX, XY/XO). Indeed, a high proportion of Turner syndrome individuals are mosaics.

Fig. 5 Skin cells showing Mosaicism

Uses of Genetic Mosaics-

A. *To study gene function in stem cells*

Genetic mosaics can be extraordinarily useful in the study of biological systems, and can be created intentionally in many model organisms in a variety of ways. They often allow for the study of genes that are important for very early events in development, making it otherwise difficult to obtain adult organisms in which later effects would be apparent.

B. *To determine gene autonomy and to study epigenetics*

They can be used to determine the tissue or cell type in which a given gene is required and to determine whether a gene is cell autonomous. That is, whether or not the gene acts solely within the cell of that genotype, or if it affects neighbouring cells which do not themselves contain that genotype, but take on that phenotype due to environmental differentiation.

C. *To analyse complex systems*

Mosaics are routinely used to investigate cell lineages, patterns of growth and gene function, and provide a means to clear analytical hurdles that otherwise limit standard genetic approaches. They are employed as a means to test whether genes act cell autonomously or non-autonomously in different tissues and to dissect tissue-tissue interactions in less tractable, complex systems. [6]

D. *In genetic engineering*

Mosaics can be used in somatic or germline cell therapy. The specific organs and tissues can be targeted to correct a mutation or provide a new function in human cells. It holds the promise of treating genetic disorders. Any genetic modification in somatic cells is not passed on to the progeny. It has been successfully used to treat multiple diseases, including X-linked SCID (severe combined immunodeficiency), chronic lymphocytic leukemia and Parkinson's disease. Germline cell therapy could treat congenital disorders but has not been attempted on humans as yet.

Recent Mosaicism Studies-

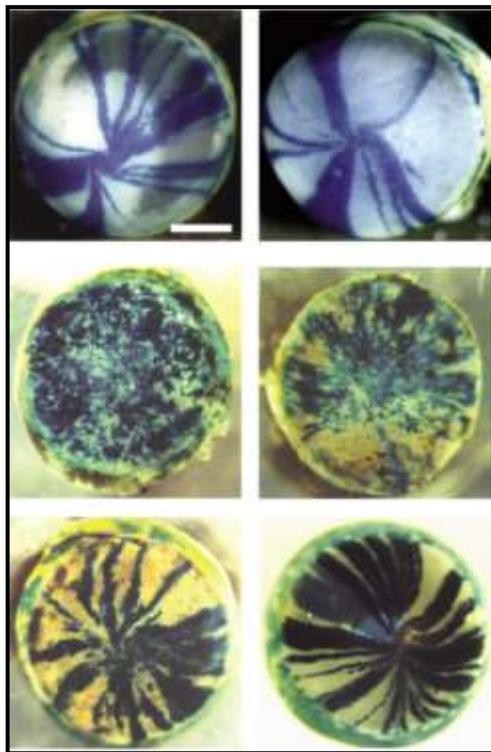
A. *In Fruit Flies and Drosophila*

Genetic mosaics are a particularly powerful tool when used in the commonly studied fruit fly, where they are created through mitotic recombination. Mosaics were originally created by irradiating flies heterozygous for a particular allele with X-rays, inducing double-strand DNA breaks which, when repaired, could result in a cell homozygous for one of the two alleles. After

further rounds of replication, this cell would result in a patch, or "clone" of cells mutant for the allele being studied. More recently the use of a transgene incorporated into the *Drosophila* genome has made the system far more flexible. [11]

B. In nematode *Caenorhabditis elegans*

In *Caenorhabditis elegans*, genetic mosaics have been generated, identified, and analysed for the purpose of defining where in the animal a gene of interest must be expressed to cause a particular phenotypic effect. Most *C. elegans* mosaics that have been studied were homozygous mutant for a recessive mutation in all cells and carried additionally, in some cells, one or more copies of the wild-type allele of the same gene on an extrachromosomal element. Before mosaic analysis is undertaken, a mutant phenotype corresponding to the absence of the wild-type gene from all cells is analysed and described. Some mutant phenotypes are described in whole-animal terms, such as uncoordinated movement, longer-than-normal lifespan, abnormal body shape, or inviability. Such traits can be analysed in mosaic animals. The overall phenotypes are recorded for mosaic animals in which it is known which cells carry the wild-type gene and which do not, with the goal of establishing which cells must carry the wild-type gene to prevent the appearance of the mutant phenotype. The responsible cell or group of cells is referred to as the anatomical focus of the action of the gene with respect to the phenotype under study. [7]



C. In Mice for testing Mosaicism in Mammalian Eyes

Analysis of experimental mouse mosaics provides a means of investigating patterning and differentiation within the developing mammalian eye. Mosaic mice carry two or more genetically distinct cell populations and extend the repertoire of analytical tools available to the geneticist. Here we review the impact these techniques have had on our understanding of eye organogenesis. Mosaics are routinely used to investigate cell lineages, patterns of growth and gene function, and provide a means to clear analytical hurdles that otherwise limit standard genetic approaches. Mouse X-inactivation mosaics can be generated easily by appropriate genetic crosses. The first useful X-linked cellular marker was *Is(In7;X)1Ct* (Cattanach's translocation), resulting from the insertion of an inverted piece of chromosome 7 into the X chromosome (Cattanach, 1961). The inserted length of chromosome 7 includes the wild-type C allele of the albino locus. Homozygous albino female mice (*c/c*) that are hemizygous for the *Is(In7;X)1Ct* insertion have variegated coat and eye pigment. Refer Fig. 6. [3]

Fig.6 Mosaicism in mice cornea

D. In maize

Perhaps the first observed occurrences of Mosaicism were in *Zea mays*- Maize when Barbara McClintock discovered the phenomenon of jumping genes that led to mottling in maize kernels. She noticed insertions, deletions, and translocations, caused by these elements. These changes in the genome could, for example, lead to a change in the color of corn kernels. About 85% of the genome of maize consists in TEs which results in the varied colouring and patterns in the kernels. On comparing the chromosomes of the current generation of plants and their parent generation, she found certain parts of the chromosomes had switched positions on the chromosome. She disproved the popular genetic theory of the time that genes were fixed in their position on a chromosome. She found that genes could not only move, but they could also be turned on or off due to certain environmental conditions or during different stages of cell development. She also showed that gene mutations could be reversed. Refer Fig. 7. [8]



Fig.7 Mosaicism due to TE's in maize

Conclusion- The frequencies of chimerism and mosaicism are unknown, but doctors might benefit from a better understanding of both conditions. In recent years, tantalizing hints have emerged that pockets of genetically mismatched cells may contribute to conditions as common as infertility, autism and Alzheimer's disease.

Personalised medicine is the future of clinical technology. And if chimeras and mosaics are more common than we realize, they will complicate future efforts to tailor drug treatments to people's individual genetic constitutions. Two genetically different tissues in one body might produce an unpredictable response to a drug. Hence, it becomes essential to study Mosaicism in detail in humans to formulate new medical technologies and drugs so that their efficacy can be optimized and drugs can be devised specifically.

It is speculated that Mosaicism could be used to change physical appearance, metabolism and even improve physical capabilities and mental faculties like memory and intelligence although for now these uses are limited to science fiction.

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Detailed Comparative Study of Various Routing Protocols in Vehicular Ad-hoc Networks

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Abstract— Vehicular Ad-hoc Network (VANET) has become a research area for analysis and development. VANET is a subclass of MANET (Mobile Ad-hoc Networks), which provides a communication among nearby vehicles and between vehicles and nearby fixed infrastructure. VANET is different from MANETs in terms of high mobility and dynamic topology. Maintaining High mobility and information routing in VANETs is very difficult and challenging task. Key characteristics of VANETs are time-varying nature of vehicle density, time critical safety applications, self-organizing, distributed communication, road pattern restrictions and high mobility. Sudden change in network topology and sporadic connectivity are also the characteristics of VANET. VANET provides facilities regarding road safety, traffic management, internet access, map location, for passengers and drivers. In this paper we describe a brief overview on some topology based protocol: proactive routing protocol and reactive routing protocol.

Keywords— MANET, VANET, Routing Protocols, Proactive Routing, Reactive Routing, WAVE.

INTRODUCTION

A Vehicular Ad-hoc Network (VANETs) is a special case of MANET, which aims are to reduce congestion, optimize traffic flow and to improve road safety. VANET is autonomous and self-configured communication network, where nodes act as a server and/or clients for sharing and exchanging information. There are many difficulties in VANETs system design implementation, regarding: security, routing, privacy, connectivity and quality of services (QoS) [2, 3]. One of the outcomes to avoid bad traffic areas has been a novel type of Wireless Access for Vehicular Environment (WAVE) for Vehicle-to-Vehicle (V2V) and Vehicle-to-Roadside (V2R) communications. WAVE standards based on the emerging specification IEEE 802.11p. This paper will focus on routing problem and the main goal for routing protocol is to provide optimal paths between network nodes via minimum overhead.

This paper divided into five main sections where section 1 provides general introduction to the VANET, Section 2, describe the network architecture and characteristics. Section 3 provides the brief introduction to the different routing protocols with their pros and cons. Section 4 introduces the literature survey on VANET taken from various papers. At last Section 5 concludes the paper.

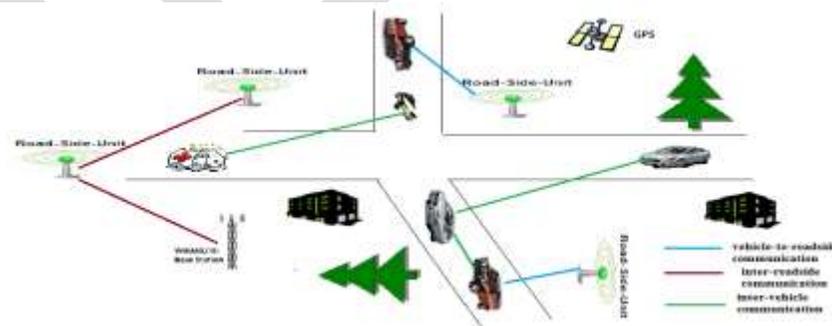


Figure 1: VANET

1. VANET ARCHITECTURE AND CHARACTERISTICS

Wireless Ad-hoc network do not depend on fixed infrastructure for communication and dissemination of information [1]. Vehicular networks are composed of vehicles equipped with On Board Units (OBU), mobile nodes and stationary nodes called Roadside Units (RSUs). OBU communicate with RSUs in ad-hoc manner. Dedicated Short Range Communications

(DSRC), enhanced version of Wi-Fi technology is developed to support data transfer in rapidly changing communication environments, where high data rates and time-critical responses are required [11].

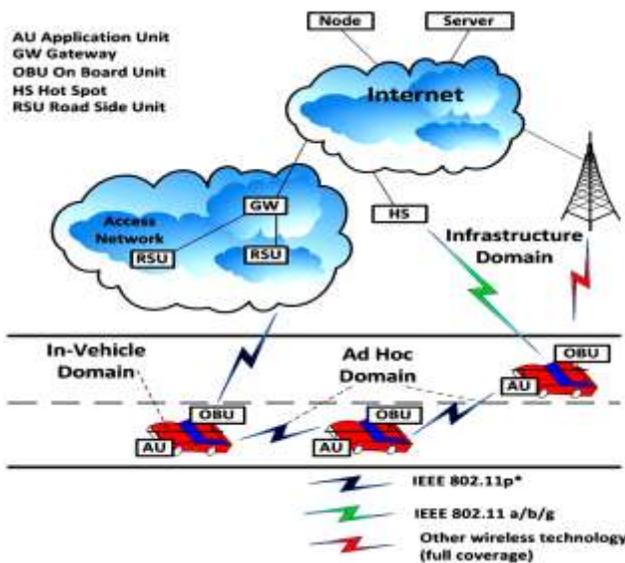


Figure 2: VANET Architecture

VANET Characteristics:

VANET are characterized by high relative speed means high mobility and are governed by restricted rules. Frequent network topology changes reduce overhead for exchanging new topology information. Safety messages which are the main goal of VANET must be delivered on time and vehicles use GPS (Global Positioning System) with great accuracy in VANET [11].

2. ROUTING PROTOCOLS

Routing protocols ensure that information is exchange between entities, and follow the procedure in establishing a route, decision in forwarding and covering or maintaining from route failure. These protocols are classified on the basis of area/application: Topology based routing protocol, cluster based routing protocol, position based routing protocol, and Geo cast routing protocol and broadcast routing protocol. We only study Topology based Protocols:

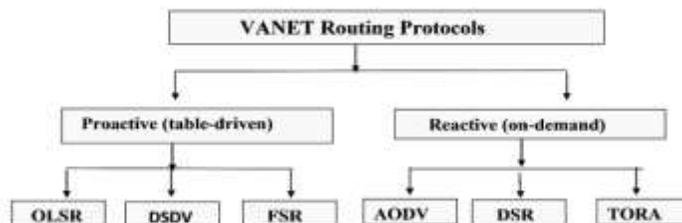


Figure3: Routing Protocols For VANET

2.1 TOPOLOGY-BASED ROUTING PROTOCOL

Topology-based routing protocol uses link's information about the network topology, which stored information in routing table to forward packets from source to destination [11]. They commonly categorized into Proactive (periodic or table-driven), Reactive (On-demand) routing protocols.

2.1.1 PROACTIVE ROUTING PROTOCOLS

There is no route discovery in table-driven (Proactive) routing protocol. It has the following features: such as the next hop used is maintained in the background irrespective of communication requests. As the network topology changes, the table must be updated frequently and should be broadcast to the neighbors periodically [5,6,9].

Pros:

- i. No route discovery is required.
- ii. Low delay in real time application.

Cons:

- i. Overhead increases in periodically sharing tables.
- ii. Significant part of available bandwidth is wasted.

2.1.1.1 DESTINATION SEQUENCE DISTANCE VECTOR ROUTING(DSDV)

DSDV is based on the Bellman-Ford algorithm and it is a table-driven routing scheme. It uses a shortest path algorithm and it implements the distance vector strategy and used only one route to destination which stored in routing table. All information about all accessible network nodes is stored in routing table and each entry in the routing table contains a sequence number initiated by the destination node. DSDV protocol control message overhead and guarantees the loop free routes and information is distributed between nodes by sending full dumps infrequently and smaller incremental updates more frequently[6,13].

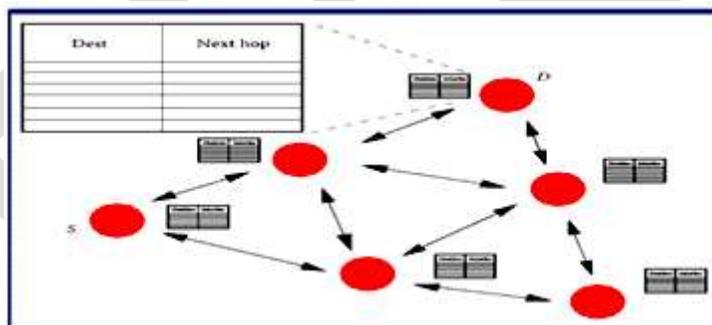


Figure 4: Routing in DSDV

Pros:

- i. It generates a loop free path to the destination.

Cons:

- i. Full dumps packets decrease the bandwidth because only updates are not sent the complete information.

2.1.1.2 OPTIMIZED LINK STATE ROUTING PROTOCOL(OLSR)

OLSR is a table-driven and proactive protocol, implements the link state strategy. Only symmetric links are used in OLSR for route setup processes and relays. Each node in the network must send its updated information to some selective nodes called as Multi Point Relays (MPR), which retransmit this information to its other selective nodes. The nodes which are not in MPR set can read and process the packet. MPRs are also used in route calculation to form the route from source to destination node. Protocol may cause network congestion and it uses the MPRs for efficient flooding of control messages in the network [13].

Pros:

- i. It well works in high density networks.

Cons:

- i. Requires a routing table for all possible routes, resulting constraints scalability and overhead.

2.1.2 REACTIVE ROUTING PROTOCOLS

Reactive routing protocols (also known as On-demand), reduce the overheads and saves bandwidth by maintaining routes only when needed. It offers high latency while finding the routes, is the drawback of reactive routing protocols. Unicast communication is used by destination node to send route reply message back to source node.

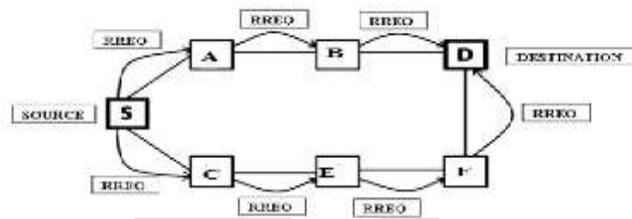


Figure5: Route Request Propagation in reactive routing protocol

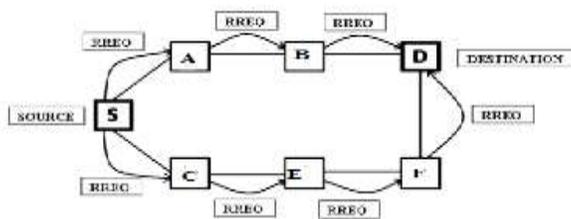


Figure6: Route Reply propagation in reactive routing protocol

Pros:

- i. Beaconless, so it saves the bandwidth.
- ii. Less overhead to update routing table. Flooding requires only when it is demanded.

Cons:

- i. Latency is high for route discovery.
- ii. Extra bandwidth is required for periodically sending beacon messages.

2.1.2.1 ADHOC ON-DEMAND DISTANCE VECTOR(AODV)

AODV [6,7,14,15] is a loop free protocol in ad-hoc network, reduces flooding in the network and provides low overhead as compared to proactive protocols. It causes large delays in a route discovery, also require new state information when a link gets failed and

notification is sent to the affected nodes. An important feature of this protocol is the maintenance of time-based states in each node is that a routing entry not recently used is expired.

The following messages are used by AODV: Route Requests (RREQ), Route Errors (RERRs), and Route Replies (RREPs). RREQ is broadcasted by a node requiring a route to another node. IP address is used as a source address, when it request for a route. A message RERR is generated upon failure of any link; RERR message contains the information of nodes, which cannot access due to this failure. HELLO messages are used for detecting and monitoring links to neighbors.

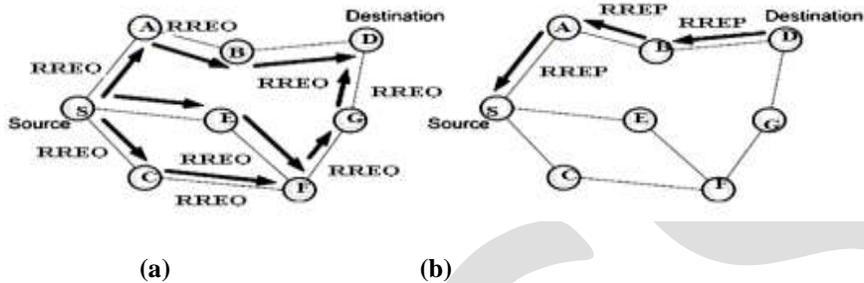


Figure7: AODV route discovery process

Pros:

- i. The path to the destination is updated because of using destination sequence number.
- ii. Reduces route redundancy and excessive memory requirement.

Cons:

- i. It takes long time for connection setup and establishment of route.
- ii. Extra bandwidth is needed because of periodic beaconing.

2.1.2.2 DYNAMIC SOURCE ROUTING(DSR)

DSR routing protocol is reactive protocol, designed for multi-hop wireless ad-hoc networks. DSR has potentially more routing overhead than AODV because in DSR, data packets carry the full routing information as compared to AODV in which data packets contains only destination address [14, 7].

DSR follows two main approaches: Route discovery and Route maintenance. In route discovery, on requirement of a route a source node initially broadcast a route request message using a unique “Request id”, address of source and destination. If an error is generated, source node should delete the failed route from its cache and initiate a new route discovery process.

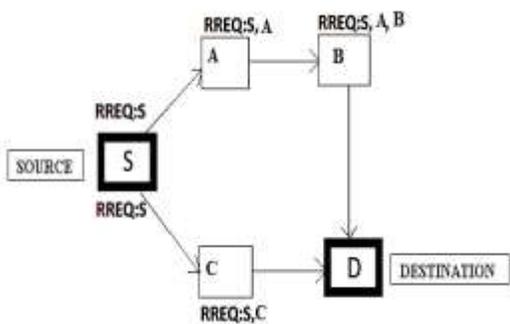


Figure8: Route Request Propagation in DSR

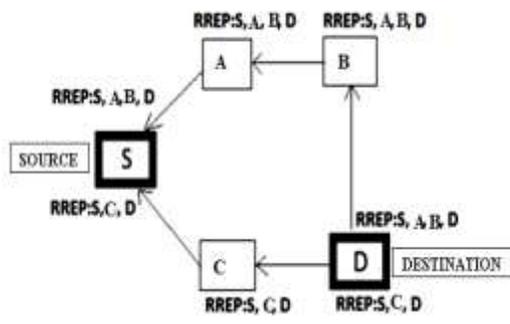


Figure9: Route Reply Propagation in DSR

Pros:

- i. It uses caching to reduce load on the network.
- ii. No periodic update is required in DSR.

Cons:

- i. Unable to repair broken links locally.
- ii. In high mobility it performs worse.

3. LITERATURE SURVEY

- ◆ Uma Nagaraj, Dr. M.U Kharat and Poonam Dhamal in [3] have studied various Routing Protocols in VANET. From this paper they concluded that Position based, Geocast and Cluster based Protocols provides more reliability in most of the applications in VANET.
- ◆ Aarja Kaur and Sabia in [18] have surveyed of various Routing Protocols in VANET. They studied that sudden changes and sporadic connectivity in network topology are the characteristics of VANET. The authors have observed that Routing Protocols works better only in some particular scenario like city, urban environment etc. A specific Routing Protocol needed to fulfill the requirements of a particular VANET application, because still there is no universal protocol which is comfortable or suitable with all VANET’s application scenario.
- ◆ Ginni Tonk, S.S Tyagi in [19] used Network Simulator NS-2 to evaluate the performance of Ad-hoc Network Routing Protocols in different network sizes. The overall conclusion of this paper showed that in high network size DSDV gives highest PDF, Routing Overhead, lowest NRL and shortest End-to-End delay and provides highest Throughput while DSR gives Lowest Packet Loss. But in case of low network size; DSDV gives the lowest NRL, lowest Routing Overhead and shortest End-to-End delay, whereas DSR provides highest Throughput and gives lowest Packet loss.
- ◆ Prabhakar Ranjan and Kamal Kant Ahirwar in [1] compared VANET and MANET Routing Protocols and this paper showed that MANET Routing Protocols does not provide Optimum Throughput, i.e. required for fast changing topology in VANET. After comparison authors found that Protocols which are feasible for MANET also feasible for VANET but there performance varies with varying densities and traffic conditions. The result showed that AODV is best among the various Routing Protocols for both MANET and VANET and analyzed that very few Routing Protocols can be well suited for both the VANET and MANET.
- ◆ Sherali Zeadally in[12] studied about VANETs: status, results and challenges and present a review of Wireless Access Standards for VANETs and outlined some of the VANET research challenges like scalability, reliability, robustness, secure VANET architectures, Protocols, technologies and services. In this paper authors highlighted and achieved some salient results of security, routing, QoS and broadcasting techniques. They analyzed of various simulation tools that are available for VANET simulations.

Table 1: Comparison of VANET with MANET [20]

Parameters	VANET	MANET
Mobility	High	Low
Range	Up to 500m	Up to 100m
Reliability	High	Medium
Nodes Moving Pattern	Regular	Random
Bandwidth	1000 kps	100 kps
Density in Nodes	Frequent variable and dense	Sparse
Node Lifetime	It is depend on Vehicle life time	It is depend on power source

Table 2: Comparison of some popular Topology Based Protocols

Protocol	Routing Structure	Frequency of Updates	Advantages	Disadvantages
DSDV	Freeway	Periodic	Loop free	Knowledge required of 2 hops
OLSR	Freeway	Periodic	Improve the QoS, Reduce Network load, Reduce Contention	Optimal node is calculated
AODV	Freeway	Unicast & Multicast	Up-to-date information of paths, use in large area of network, reduce excessive memory requirement, responses to the link failure.	Connection setup takes more time; high bandwidth is required and creates inconsistencies in the route.
DSR	Freeway	Unicast	Periodically updating is not required, Beaconless, Caching approach is used which reduces load on the network.	Unable to repair broken links locally, unnecessary flooding and in the high mobility performance get worse.

CONCLUSION

We have considered various Routing Protocols in VANET. For all VANET applications it is very difficult to design an efficient Routing Protocol. This paper provides two categories of VANET routing protocols, giving a brief introduction with architectures and comparisons of Protocols working with their pros and cons. Packet Delivery ratio of AODV is better than OLSR,DSDV,DSR but fails in End-to-End delay where time is very short. Performance of OLSR is average. DSR works well in short time but loss of packet information is high. In this brief overview different related research limitations/difficulties are represented that require more efforts and research to address them. Privacy is a major issue which should be address and research the various approaches for QoS, security, reliability all are Routing related difficulties in VANET.

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Arduino Based Weather Monitoring System

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Abstract— Weather is the state of the atmosphere, to the degree that it is hot or cold, wet or dry, calm or stormy, clear or cloudy. Most weather phenomena occur in the troposphere, just below the stratosphere. Weather generally refers to day-to-day temperature and precipitation activity, whereas climate is the term for the average atmospheric conditions over longer periods of time. When used without qualification, “weather”, is understood to mean the weather of earth. Monitoring the weather conditions manually is difficult. The present work is to develop an automated system which monitors the weather condition. The weather condition is driven by air pressure (temperature and moisture) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot. Through this system we can automatically collect the information about humidity and temperature. The details are stored in a database and according to current and previous data we can produce the results in graphical manner in the system. The objective of this paper is to formulate the weather and be able to forecast the weather without human error.

Keywords— Climate control, Weather analysis, Temperature Moderation, Moisture Control, Humidity Control, Arduino, Monitoring.

1. INTRODUCTION

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Human beings have attempted to predict the weather informally for millennium and formally since the nineteenth century. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere on a given place and using scientific understanding of atmospheric processes to project how the atmosphere will evolve on that place.

Weather is driven by air pressure (temperature and moisture) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot, which varies by latitude from the tropics. The atmosphere is a chaotic system, so small changes to one part of the system can grow to have large effects on the system as a whole. This makes it difficult to accurately predict weather more than a few days in advance, though weather forecasters are continually working to extend this limit through the scientific study of weather, meteorology. It is theoretically impossible to make useful day-to-day predictions more than about two weeks ahead, imposing an upper limit to potential for improved prediction skill.

Once an all-human endeavor based mainly upon changes in barometric pressure, current weather conditions, and sky condition, weather forecasting now relies on computer-based models that take many atmospheric factors into account. Human input is still required to pick the best possible forecast model to base the forecast upon, which involves pattern recognition skills, tele-connections, knowledge of model performance, and knowledge of model biases.

2. LITERATURE REVIEW

Through weather monitoring system we can collect the information about humidity and temperature and according to current and previous data we can produce the results in graphical manner in the system. After reviewing many articles, there are presently no papers that mention monitoring the combination of temperature, lighting and humidity in one integrated system and have actuators to modify these settings. In addition to this, there is one research paper that has discussed monitoring these three environmental conditions; however, there has been no mention about having actuators to modify. So our main idea was to coin a system that can sense the main components that formulates the weather and can be able to forecast the weather without human error.

Ancient weather forecasting methods usually relied on observed patterns of events, also termed pattern recognition. For example, it might be observed that if the sunset was particularly red, the following day often brought fair weather. This experience accumulated over the generations to produce weather lore. However, not all of these predictions prove reliable, and many of them have since been found not to stand up to rigorous statistical testing. The simplest method of forecasting the weather, persistence, relies upon today's conditions to forecast the conditions tomorrow. This can be a valid way of forecasting the weather when it is in a steady state, such as during the summer season in the tropics. This method of forecasting strongly depends upon the presence of a stagnant weather pattern. It can be useful in both short range forecasts and long range forecasts. Measurements of barometric pressure and the pressure tendency (the change of pressure over time) have been used in forecasting since the late 19th century.

3. PROPOSED SYSTEM

There are a lot of high end systems available these days for round the clock weather monitoring. But these systems are implemented on a very large scale, for monitoring real time weather for a whole city or state. Implementing such system for a small area is not feasible, since they are not designed for it and the overhead for maintaining such systems for a small area is very high.

Our proposed system makes use of 3 sensors to measure the weather/environment factors such as temperature, humidity, light intensity, dew point and heat index. The values read from the sensors are processed by the Arduino micro-controller and stored in a text file which can be processed upon to derive analysis. The readings are also displayed on an on board LCD for quick viewing. All these readings can be analyzed to get the weather characteristics of a particular area and record the weather pattern. These recorded parameters are essential and vary from places to places. All these requirements are fed into the database and these values are essentials and recorded over time. Using these values as input we can plot a weather chart of a particular area over time. Based on the present weather factors and preset values the set actions are done. The set action can include turning on the heating system when the temperature is colder than the set value and turning on the cooling system when the temperature is hot or humid beyond the set values. The serial output from the Arduino micro-controller which are the values read from the sensors can also be stored in a database. The database can be used as a source for data if we want to display values through a website or a standalone application.

The modules that make up the weather monitoring system have been carefully and well thought of, to make sure that the sensors used are giving the most accurate reading and are compatible with the Arduino micro-controller. The modules used for the weather monitoring system can be summarized as follows:

Humidity Sensor:

This sensor will provide the current humidity reading of the surrounding.

Temperature Sensor:

This sensor is used for reading the temperature and also to calculate dew point and heat index.

Light sensor:

This sensor is used for measuring the light intensity falling on the sensor.

LCD:

16x2 LCD display is used to display the readings in real time manner. This is also human interface to the system.

Altitude sensor:

To measure the altitude of the region. It is used to calculate the atmospheric pressure.

Atmospheric pressure sensor:

The readings provide the atmospheric pressure incident experienced on the given region.

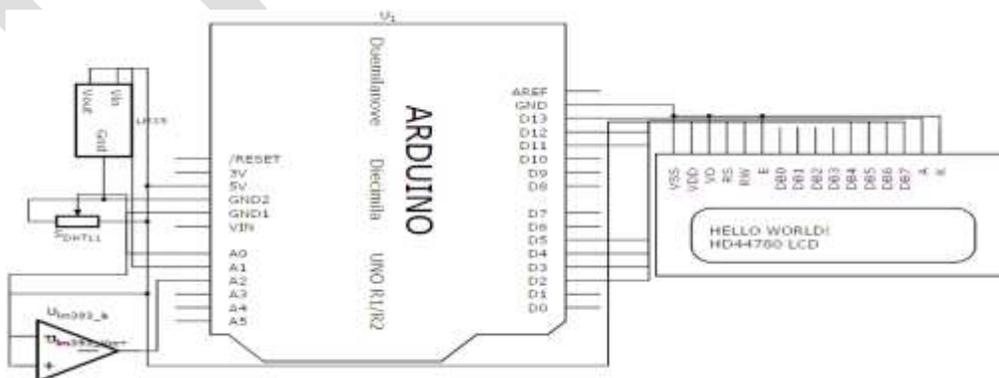


Fig. 1: Circuit Diagram

4. WORKING PRINCIPLE

The working principle of this work describes the interdependent functionality of the components and their output. The circuit diagram is shown in Fig. 1. Firstly, all the components are initialized by supplying the required power of +5v. There are two temperature sensors, lm35 and dht11; we are using two temperature sensors to get a accurate value of temperature reading and taking the average of the two values. Depending on the temperature, hot air or cool air introduced to maintain the temperature threshold value, which is preset. If the temperature is too low for the particular area hot air is blown in to bring the temperature to moderation. Otherwise, if the temperature is too high, cold air is blown and thereby raising the temperature to the required level. This is how temperature is manipulated. Secondly, there is an LDR which work based on light intensity. When the sunlight is too much or not enough for the plant to handle, the servo motor opens or closes the door of the glass box based on the readings of the LDR. This helps in recording the natural light incident on the area. The natural light intensity may vary from time to time. This is important in agricultural applications, where light is required for the growth of plants and some plants may not grow well in low light. On the other hand, when the light intensity is high throughout the year, such areas or places are suitable to set up solar power stations. Light intensity along with other parameters such as temperature and humidity can be used in predicting weather forecast without the use of any satellite data.

The gathered data is serially fed into a computer, which uses the com port to communicate with the Arduino device and the data recorded is stored in a text file. The text file can be directly imported to an excel file with the functionality of a macro. The imported data is then sorted and formatted, and charts are then plotted with the imported data. The charts present a visual representation of the data, which shows the weather pattern over a recorded period of time. The visual patterns indicate the weather behavior of the particular region. This is the primary objective of the present work.

The DHT11 sensor provides the current temperature and humidity readings. The DHT11 gives out analog output and is connected to the analog input of the Arduino micro-controller A0. The dht11 sensor has 3 pins. Along with temperature and humidity the other values that are calculated or derived from the dht11 sensor is the dew point, heat index etc. The dew point is the temperature at which air in the atmosphere freezes to become water droplets and the heat index is the heat felt by the human skin from the environment. This is important in places with high humidity. Even though the temperature maybe lower, the body still feels warm. This is due to the high humidity in the air. Humidity is the moisture content in the air. High humidity in the air generally makes one to sweat or perspire.

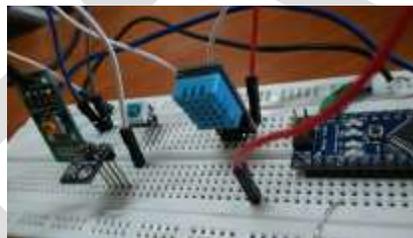


Fig. 2: Sensor Arrays

The lm35 is a general purpose temperature sensor. The need of this sensor is to get an additional reading of the temperature. Along with the dht11 sensor's temperature reading, we calculate the lm35 sensors temperature reading as well and an average of the two readings are taken to get an accurate reading of the surrounding temperature. Fig. 2 sensor arrays used in the system. Bmp180 sensor is used to measure the atmospheric pressure and the temperature as well. The atmospheric pressure is used to determine the relative air pressure experienced in the surrounding. This is very useful if we are using the system in high altitude environment and a calibrated value of the altitude along with other environmental readings provides a good projection of the surroundings weather pattern and we can notice changes with increase or decrease in altitude.

The readings from the sensors are displayed in a 16x2 LCD shown in Fig. 3 which is directly connected to the Arduino micro-controller. This is useful when we are using the device indoors or only to get the readings on a screen. The LCD is also functional when the device is connected to a laptop where the readings are recorded. There is on-board switch provided to turn on/off the LCD in order to preserve the battery in case we are powering the device using external batteries. There is a switch provided to turn on/off the LCD's back-light display. The back-light display consumes a lot of battery power. This is useful when we want to preserve the battery and also keep the LCD on.



Fig. 3: 16x02 LCD

Through weather monitoring system we can collect the information about humidity and temperature and according to current and previous data we can produce the results in graphical manner in the system. The graphical charts can also be uploaded to websites from where in it can be accessed from anywhere. The data can also be used for pattern analysis, where in the weather parameters are recorded for a long period of time. The accumulated data is used for analysis for weather prediction. So our main idea was to coin a system that can sense the main components that formulates the weather and can be able to forecast the weather without human error. However, regardless how small the average error becomes with any individual system, large errors within any particular piece of guidance are still possible on any given model run.

5. COMPONENTS

Arduino is an open source tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple micro-controller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP). The boards can be assembled by hand or purchased pre-assembled; the open-source IDE can be downloaded for free. Arduino micro-controller is shown in Fig. 4.

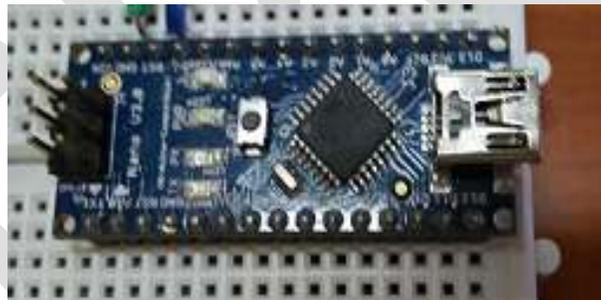


Fig. 4: Arduino Micro-controller

The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the micro-controller; connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. All the modules in the circuit are connected to Arduino module.

DHT11 – Temperature and Humidity Sensor

This sensor is used to sense humidity. It facilitates us with analog and digital output. We are using digital output pin to connect it directly with the Arduino to Arduino's digital pin (pin 7). there is a step up register in the sensor to control the power. VCC and GND pins are also connected to Arduino. Fig. 5 shows a DHT11 sensor.

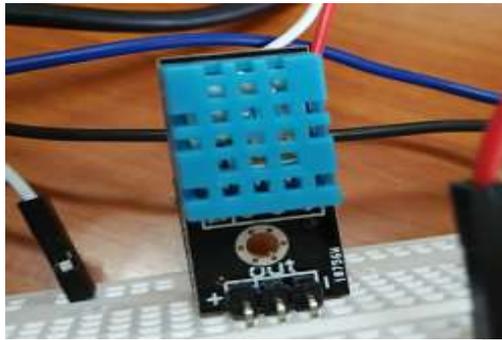


Fig. 5: DHT11 sensor

DHT11 has a full range temperature compensation, low power consumption, long term stability and calibrated digital signal. The DHT sensors are made of two parts, a capacitive humidity sensor and a thermistor. There is also a very basic chip inside that does some analog to digital conversion and spits out a digital signal with the temperature and humidity. A high-performance 8-bit micro-controller is integrated in the sensor with calibration-coefficient saved in OTP memory to provide accurate temperature readings. With the new 3 pin connector that includes several soldering pads and a sturdy casing, plugging in and out the sensor is not going to be a problem anymore. The 3 pin connector is perfect to get it going fast, and extremely easy to use. It is reliable and inexpensive.

LDR – Light Dependent Resistor

An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. A light-dependent resistor (LDR) is a light-controlled variable resistor. The resistance of this decreases with increasing incident light intensity; in other words, it exhibits photo-conductivity. An LDR can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits. An LDR is made of a high resistance semiconductor. In the dark, an LDR can have a resistance as high as a few mega ohms ($M\Omega$), while in the light, an LDR can have a resistance as low as a few hundred ohms. If incident light on an LDR exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their whole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of an LDR can substantially differ among dissimilar devices.

LM35 – Temperature Sensor

It is a 3-pin temperature sensor IC that measures temperature in degree Centigrade and gives output response of $10\text{ mV}/^\circ\text{C}$. Its response is linear and highly suitable for interfacing with the analogue-to-digital converter (ADC) of any micro-controller. For example, if temperature is 25°C , then its output is 250 mV . The sensor operates off 5V DC supply. The output of the temperature sensor is connected to analogue input A5 of the Arduino board. The LM 35 temperature sensor is an easy to use, cost-effective sensor with decent accuracy. LM35 is shown in Fig. 6.



Fig. 6: LM35 Sensor

The sensor is essentially a Zener diode whose reverse breakdown voltage is proportional to absolute temperature. We are not using LM 35 directly to connect with the system but we have made a circuit to connect so that the damage ratio can be decreased. One amplifier is there to enhance the voltage or power. A One step up resistor is there to control the voltage power. LM 35 sensor circuit provides analog input and we connect it with the Arduino analog pin for input (pin 1). Three pins are there for analog input, output n ground.

Test Point	Module	Data
Tp0	Temperature	22.6 C
Tp1	Humidity	27%
Tp2	Dew Point	10.2 C
Tp3	Heat Index	23 C
Tp4	Light Intensity	675 Lux
Tp5	Temperature 2	23.2 C
Tp6	Power	+5v

8. CONCLUSIONS AND FUTURE SCOPE

This concludes that the present work was a success and it will provide a competent method for recording real time weather readings and help farmers whose livelihood depends on the weather in a country like India to produce better quality crops. It can be used to gather information about the requirements for each area over the years. The gathered information is used to determine the optimal conditions for plants to grow and the farmer can modify the environment suitable for the growth of the plant. This, in turn will have a huge impact on agriculture and also on farmers throughout the world. Limitations of the weather system is mentioned below

- This system is developed for Small area.
- It is not web based system.

In future, sensors to analyze air quality using gas detectors could be included and a web interface or service to feed the data directly to Internet could also be built.

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Authentication of secret data using video and audio steganography with wireless transmission

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Abstract— Steganography is a science of covered writing in which the data is hidden in the carrier vessel. The carrier vessel can be image, audio, video, text. The video has more hiding capacity to store more data than the rest of the vessel media. Various algorithms are available such as LSB substitution algorithm, DCT algorithm, SLSB algorithm, etc. All of these algorithms have less hiding capacity; moreover, they are less secure and easily detectable by unauthorized users. BPCS algorithm (Bit plane complexity segmentation) in which the image frame of video is decomposed into bit planes from LSB to MSB. The data is stored in complex areas of the bit planes so the hiding becomes undetectable and moreover the capacity to store data increases. To increase more security, the video steganography is combined with the LSB audio steganography. Both transmitting party and receiving party is provided with the authorization key, thus the unauthorized user cannot access secret data without the authorization key. The level of hiding capacity is thus increased along with enhanced security level.

Keywords— Bit planes, BPCS, Carrier vessel, cryptography, data or information hiding, LSB, steganography, stego audio, stego frame, stego image, stego video.

INTRODUCTION

In the real time digital world, steganography has produced an atmosphere of vigilance that has explored interesting applications, thus its further evolution is possible [24]. This theory makes use of terms mostly used by steganography and watermarking techniques. To our existing knowledge no prior work has discussed the combination of video and audio steganography. All of the previous steganographic methods affect from intolerance to any kind of modification in image applied to the stego-image. If steganography is a process which does not take into account the robustness of image as it is then there is ambiguity to differentiate it from watermarking. The robustness is an essential requirement for a steganographic system. "Many of the steganographic systems are designed so as to be robust against a class of mapping." [25]. It is required to create an undetectable or unrecognizable steganography algorithm that resists common image processing modification that may occur by accident and may or may not be an attack.

RELATED WORK

A number of steganographic methods have been introduced. They can be divided into following 3 categories: spatial domain method, frequency domain methods and adaptive methods or model based. In the spatial domain a steganographer manipulates the secret data and the cover vessel which encodes at the level of the LSBs (least significant bits). LSB is a method that involves modifying the least significant bit of the three colors in a pixel of a 24-bit color image. The problem with colored BMP images is that they are not mostly used on web and tend to stand out (except JPEG and PNG). S-Tools is based on LSBs in the spatial domain, considering that least significant bits of image frame of video is nothing but uncorrelated noise [24]; it hides messages by manipulating the DCT (discrete cosine transform) coefficients. The central procedure done in F5 is matrix hiding or embedding with the aim of reduction in the changes made to the DCT coefficients. [15] uses vector quantization method known Linde-Buzo-Gray (LBG) combined with Block codes (BCH code) and 1-Stage DCT Wavelet transforms. They reaffirm that manipulation of data using a wavelet transformation method preserves better quality with least perceptual changes. [16] propose a data embedding technique in the (DWT) domain. Both secret image and cover vessel images are decomposed by using DWT, each of which are divided into 4x4 blocks. Blocks of the secret image are placed into the cover blocks for determining the match. After that, error blocks are created and hidden into coefficients of the better matched blocks in HL of cover image. The extracted payload is not perfectly identical to embed version. Adaptive steganography is special case of two above methods. It is also called as Statistics-aware embedding [17], Masking [18], Model-Based method [19] and block complexity [20]. This method explores statistical global properties of image before interacting with its LSB/DCT coefficients. The statistics will explore where to make the modification at [21, 22]. It is characterized by a random adaptive selection of pixels which depends on the cover image and the pixels are selected in a block with large standard deviation.

Then it is meant to ignore the areas of uniform or similar color, e.g., smooth areas. This behavior enable adaptive steganography get images with present or added noise and images that gives color complexity. Spatial domain algorithms are subjected to statistical attacks such as Chi-Square [23] and steganalysis. Frequency domain, that is JPEG, method is subjected to attacks of double compression effect, statistical distributed DCT coefficients and merged statistical properties.

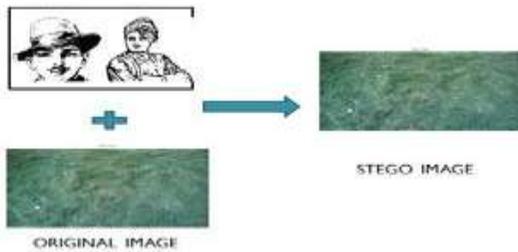


Fig 1: Generation of stego image from original image and secret image

The steganographic algorithms were initially developed for digital images frames and video clips, research and interest in audio steganography started later than above vessel media. Fig.1, represents the generation of the stego image frame from carrier vessel image frame. Few years ago, various algorithms for hiding and extraction of message in audio have been given. All developed algorithms make an advantage of the perceptual feature or properties of the HAS (human auditory system) in order to add a message into a host signal in a transparent way. Hiding additional secret data into audio sequences is a more tedious or difficult task as compared to images, due to superiority of the HAS over human visual system.

On the other hand, many treats that are malicious or harmful against image frame steganography algorithms such as spatial scaling, geometrical distortions, etc cannot be applied to audio steganography. Consequently, hiding information into audio seems more secure due to least steganalysis techniques for attacking to audio. The obvious advantage of substitution algorithm or the reason for selecting this technique, is its high storage capacity for hiding a data or message; the use of only one LSB of the host audio files gives a storage capacity of 44.1 kbps. The capacity of substitution algorithm is not comparable with the storage capacity of other robust algorithm like spread spectrum technique that is highly robust but has a low hiding, embedding the information capacity i.e. 4 bps.

A) LEAST SIGNIFICANT BIT STEGANOGRAPHY

The mostly used technique or algorithm to embed secret data, is the use of the LSB. Although prevalent several disadvantages in this approach, the easiness to implement this algorithm, makes it a popularly used method. To hide or embed a secret data or message inside a image frame of video, a proper cover image is required. Because this method make use of bits of pixel in the image frame, it is necessary to make use of a lossless compression, otherwise the embedded information will get lost in the transforming of a lossy compression algorithm.

While using a "24 bit color image", a bit of each of the pixels of blue, red and green color components can be used, a total of three bits is stored in each pixel. Thus, a 800 x 600 size pixel image frame can contain a total of 1.440.000 bits (180 bytes) of secret information. While using a '24 bit image' gives a large amount of storage space to hide messages, it is possible to use a eight bit image as a cover image source. Because of the small space and different properties, eight bit images requires a more careful technique. Where 24 bit color images use three bytes to represent a pixel, an eight bit image uses only one byte. Modifying the LSB of byte will result in a visible change in color, as another color in the present palette will be displayed in that place. Therefore, the cover image needs to be selected more carefully and preferred in grayscale format, as the human eye will not recognize the difference between different gray values of image as easy as with different colors. Disadvantages of using LSB substitution method, is the fact that it needs a large cover image to generate a usable amount of embedding space. Even now a days, uncompressed images frame of 800 x 600 size pixels are not used on the Internet or web, so using these may rise doubt or suspicion. Another disadvantage arises when compressing an image frame consisting of a secret data using a lossy compression algorithm. The hidden or embedded message will not sustain or survive in this procedure and is lost after the transforming.

VIDEO STEGANOGRAPHY

Out of the image and audio steganography mentioned, this steganographic technique have storage capacity. The storage capacity of secret information or data increases in video. The video is made up of audio and image. Video steganography enables to hide data in audio as well as in image and create the stego video. Other algorithm embed or hide the secret data or information in a particular band of the spatial frequency coefficient of the carrier. Some other algorithm uses the sampling error property in image digitization. However, all of those Steganographic algorithm are limited in capacity of information hiding. They can hide or embed only 5-15 percentage of the carrier vessel image frame of video efficiently. We call this steganography as BPCS steganography which is stands termed a "Bit-Plane Complexity Segmentation" Steganography.

We made an experimental system to observe this technique in depth. The advantages of BPCS-Steganography found as follows.

- 1) The information hiding or storage capacity of a color image frame of video is around 50%.
- 2) A sharpening operation on the carrier image frame of (video) increases the embedding or hiding capacity quite a bit..
- 3) Randomizing of the secret information or data by a compression techniques makes the hidden data more undetectable and intangible.
- 4) Customizing BPCS - Steganography program for each party(user) is easy. It protects unauthenticated user from eavesdropping on the hidden information
- 5) It is secured technique and provides high level of security.

PROPOSED SYSTEM

In steganography, data or information is hidden or embedded inside a vessel media or container that looks like itself and contains nothing . A variety of vessels media are possible, such as executable files , sound clips, and digital images. All of the present traditional steganographic algorithm or techniques have limited data-hiding capacity. They can hide or embed only 10 percent or less of the data amount or capacity of the vessel carrier . This technique uses an image frame from video as the vessel carrier and we embed secret information in the bit-planes of the vessel. We replace all of the noise-like regions in the “bit-planes ”of the vessel image frame of video with secret information or data without degrading or deteriorating the quality of image .This video is known as stego video. This steganography is called as “BPCS-Steganography,”

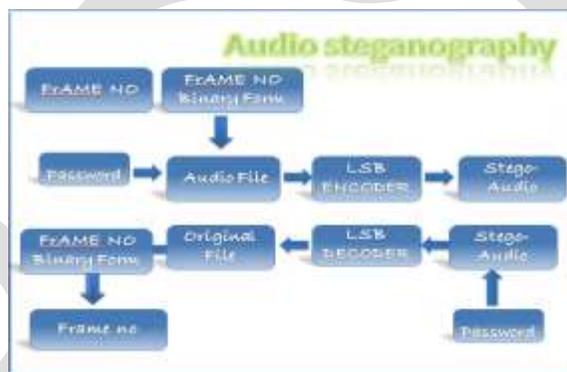
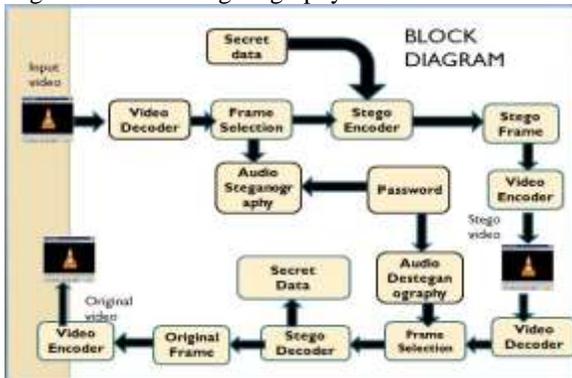


Fig 2:Video Steganography

Fig 3:Audio Steganography

Fig .2. represents the block diagram of video steganography and its linkage with audio steganography through password.Fig.3. represents the internal block diagram audio steganography.

A)Bit Plane Slicing Concept in BPCS: The bit plane slicing can be better understood best with the help of fig3 .The operation of splitting or decomposing the image frame of video into its binary pixel planes is called Bit plane slicing. Pixels are digital numbers composed of bits. In an eight bit image, intensity of each pixel is represented by eight bits. The eight bit image is composed of eight 1-bit plane regions from bit plane zero (LSB) to bit-plane seven (MSB). Plane “zero” contains all lowest order bits of all pixels in the image frame while plane seven contains all higher order bits of all pixels. Bit plane Slicing is very useful for image compression. Complexity of each bit–plane of pixel of image frame increases from MSB to LSB .

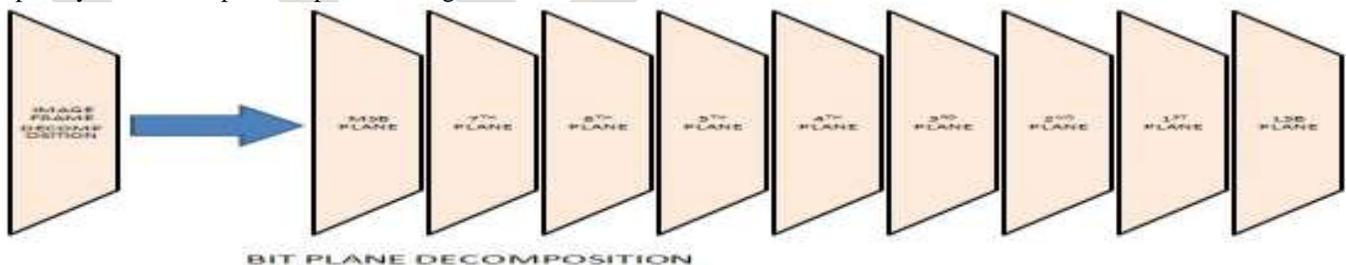


Fig 4: Binary pixel blocks on bit-planes and decomposition

The decomposing of image frame into bit planes is represented in Fig 4 .

B)The definition of image complexity

The length of black-and-white edge in a binary image frame is a good measurement of complexity of image . If the edge is long, the image is termed as complex, otherwise it is termed simple. The sum of length of the white and black edge equals to the summation of the number of color-changes or transition along the column and rows in an image frame . For e.g., a single white pixel surrounded by black background pixels has the boarder length of 5.We will define the image complexity β by the following.

$$\Omega = \frac{l}{(\text{The max.possible } B - W \text{ changes in the image})} \dots\dots\dots(1)$$

Where, l is the total length of black-and-white border in the image. So, the value ranges over $0 \leq \Omega \leq 1$.

β is calculated over the whole image frame area. It gives us complexity of a binary pixel image.

C)Conjugation of a binary image

Let R be an 8X8 size white and black image with black as the foreground area and white as the background area. We have introduced two Checker board patterns W_c and B_c , where W_c is a white pixel at the upper left position, and B_c is its complement, the upper-left pixel is black. We termed black and white pixels as having a binary value of '1' and '0', respectively represented in Fig 5.

R is interpreted as follows. Pixels in the background area have the W pattern and pixels in the foreground area have the B pattern. Now we define R^* as the conjugate of R. The most important property about conjugation is the as follows:.

Let $\Omega(R)$ be the complexity of a given image R, then we have, $\Omega(R^*) = 1 - \Omega(R)$(2)

The complexity value of R^* is always symmetrical against R regarding $\Omega = 0.5$. For example, if R has a complexity of 0.7, then R^* has a complexity of 0.3. Replace complex image-data information block to message block



Fig .5. Illustration of binary pixels

SYSTEM ARCHITECTURE

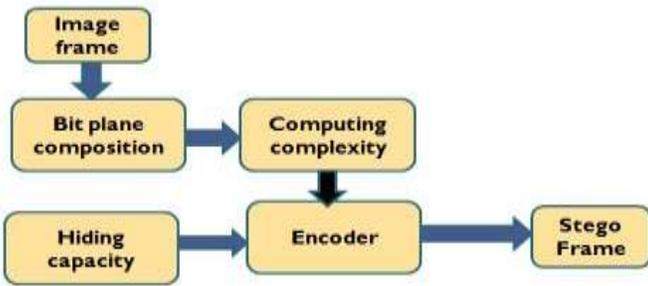


Fig 6.Stego Encoder

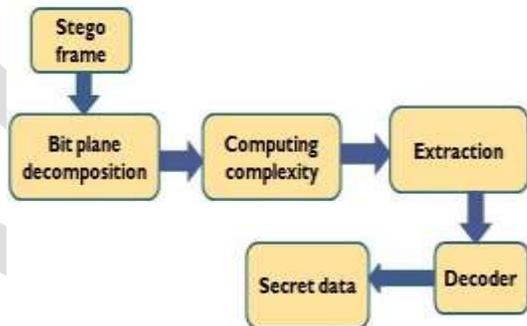


Fig 7:Stego Decoder

Fig.6. represents the block diagram of stego encoder in which the image frame is decomposed or splitted into planes and complexity of each plane is calculated using (1). If more is complexity of frame more data can be hidden in carrier. Thus the frame created is called as stego frame.Fig.7.represents the block diagram of stego decoder in which the stego image frame is decomposed or splitted into bit plane and complexity of each bit plane is calculated using (1) and the secret data or information can hidden in frame is extracted.

MECHANISM

- A. Histogram
- B. Size estimation.
- C. BPCS video steganography
- D.LSB audio steganography
- E. Wireless transmission
- F. De-steganography.
- G.Error analysis

A. Histogram:

Histograms are functions defining information extracted from the image .The histogram function is described over all intensity levels. For each level of intensity, its value is equal to the number of the pixels with that present intensity.

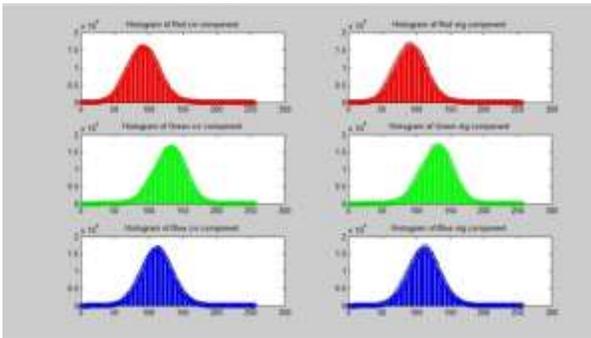


Fig.7.Graph of the histogram function of images

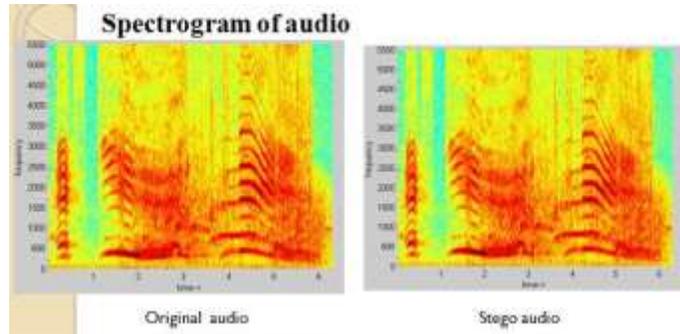


Fig 8.Spectrogram of original and stego audio

B. Size estimation:

In size estimation we have to calculate the regions where maximum color transition or variations are observed. After this we have to insert pixel value of secret image at that variation regions, we do so using the concept of embedding capacity. For a image frame, embedding capacity can be traded with quality of image by changing the complexity threshold. If image used has a threshold of twenty four border or edge pixels per “8 × 8 “region; so regions having more border pixels value than this are eligible for hiding or embedding.

C.. BPCS Steganography: .

- 1) Convert the carrier image from PBC format to CGC format system i.e. convert file into png format.
- 2) Segmentation process on carrier image is performed i.e. each bit-plane of the carrier image is represented in form of informative and noise-like regions by using a threshold value (β_0). This means complexity of image is calculated.
- 3) Group the bytes of the secret data file into a series of secret blocks.
- 4) If a block is less complex as compared to the threshold (β_0), then take its conjugate making it a more complex block .
- 5) The conjugate block must be more complex than β_0 .
- 6) Replace all the noise like regions with a series of secret information blocks where more color changes are observed.
- 7) Convert the embedded image from CGC back to PBC format.

D. LSB Audio steganography

Least significant bit (LSB) coding is the easiest way to store information in a digital audio file format. With substituting the least significant bit of each sampling point with a binary message, LSB enables for a large quantity of data to be encoded but less than BPCS method. This increases the amount of data that can be embedded but also increases the resulting noise in the audio file. The image frame number of video is stored in binary format in LSB bits of audio file. The authorization key is given to both transmitter and receiver side the image frame number used in bpcs steganography is stored in binary format in LSB bit of audio file.

To extract a secret message from an LSB encoded sound file, the receiver needs access to the authorization key used in the embedding process

E. Wireless transmission

In mailing we create an environment just like Bluetooth, drop box, cloud and send video from one user to other. After receiving the stego video and password from server the authenticated user can get image frame containing secret information from video and extract the hidden data from it by performing de-steganography.

F. De-steganography:

De-steganography is exactly opposite of steganography. Here we will extract secret image frame from vessel or carrier image frame of video. In this way we will get the secret image/information from stego video hiding it from the third person.

G:Error analysis

i)Bit Error Rate: For the successful recovery of the hidden information or data communication channel must be ideal but for the real communication channel, there will be error while retrieving or extracting hidden information and this is measured by BER cover image as “cov” and stego image as “steg” in the given equation.

$$BER = \frac{1}{|imagecov|} \sum_{l=0}^{all\ pixels} |imagecov - imagesteg| \dots \dots \dots (3)$$

ii) Peak Signal to Noise Ratio: It is the ratio of the maximum signal to noise in the stego image.

$$\text{PSNR} = 20 \log_{10} \frac{255}{\sqrt{\text{MSE}}} \dots\dots\dots(4)$$

ADVANTAGE/SCOPE . Less prone or subjected to attacks, worms, viruses, vulnerabilities ,unmatched clients Sensitive data stored on secure servers 4) Encrypted transmission of all data between server and clients.

RESULT

We have discussed the following points and showed our experiments. We can decompose the bit-planes of a natural image in terms of informative areas and noise-like areas by the complexity thresh holding. We can replace complex regions with secret information in the bit-planes of a natural image without changing the image/video quality. This leads to our BPCS-Steganography. Gray coding provides a better means of identifying which regions of the higher bit planes can be embedded Gray coding provides a better means of identifying which regions of the higher bit planes can be hidden. Combining least bit audio steganography with BPCS video steganography has enhanced the level of security .The histogram of original and stego image frame of video are same as shown in Fig.7.The spectrogram of original and stego audio is almost similar as shown in Fig 8..The original video and stego video were equal in terms of size, frame rate, quality.

CONCLUSION

The objective of this paper was to combine our BPCS- video Steganography, which is dependent on a property of the human visual system with LSB audio steganography ,which is based on human auditory system.. The most important point for this BPCS technique is that humans cannot see any information in the bit-planes of a color image if it is very complex, We have hidden the frame number as message bit in audio's LSB bit .So the storage capacity increases with using video steganography. We are transmitting this stego video so generated through wireless media like Bluetooth, drop box, cloud etc to receiver along with authorization key without which the data cannot be retrieved from both audio and video. Thus combination of audio video steganography further enhances the security level. The histogram of both original and stego image frame of video is same. The spectrogram of original and stego audio are same .So, there is no change in original video and stego video.

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Time Series Forecasting of Packet Loss Rate Using Artificial Neural Network Based on Particle Swarm Optimization

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Abstract— Packet loss severely degrades the quality of service of multimedia communication in a Wi-Fi network. In this paper, a time-series prediction model for the packet loss rate (PLR) is developed. The reason for prediction of PLR is very much useful in congestion control mechanisms. An accurate prediction method would therefore be very helpful. An artificial neural network is used as a prediction model and it is trained with Particle swarm Optimization (PSO) as a training algorithm in order to get accurate prediction of packet loss rate.

Keywords— Artificial Neural Network, packet loss rate, Particle Swarm Optimization, Time series forecasting.

INTRODUCTION

The quality of service is severely degraded by the packet loss multimedia applications. Packet loss generally occurs during the time of heavy congestion as nodes gets overburdened with packets and hence some packets have to be discarded. For that reason, any system that will help in reducing the Packet Loss will be very much useful. There are several reasons which leads to predicting the packet loss rate. As the TCP protocol is based on a complex retransmission algorithm which is not appropriate for the real time applications, hence UDP-based transmission are used for such applications. The main difference between UDP based traffic and TCP based Traffic is that if congestion occurs then TCP will reduce the traffic rate but UDP don't have such provision. That will not only worsen the congestion but also violates the fairness issue. Hence UDP traffic should also use the traffic rate control mechanisms as it is used by the TCP traffic. The two entities that define the rate adjustment mechanism is Packet Loss rate (PLR) and round-trip time (RTT). RTT can be defined as the length of time the signal takes to reach to the receiver and acknowledged back by the receiver. So a new approach is to predict PLR instead of using the earlier measured values. Rather than using the reactive approach a predictive approach will be faster to trace congestion problems. The other reason for predicting packet loss rate is UDP based real time multimedia traffic in which extra packets are added using Forward error correction mechanism to recover lost packets. This leads to excessive bandwidth usage. Hence it is imperative to send only the required amount of packets. An accurate prediction of packets will be helpful in such conditions.

Artificial Neural networks are a type of nonlinear systems competent of learning and performing tasks achieved by other systems. Neural network systems are robust as even the small occurrence of errors does not interfere with the proper operation of the system having neural network building blocks. This feature of the neural networks makes them rather appropriate for the prediction task. Artificial neural network is a kind of machine learning approach which models human brain and consists of a number of artificial neurons that are linked together according to a specific network architecture. The main function of the neural network is to transform the inputs into meaningful outputs. These systems have the potential to capture highly non-linear mappings between input and output.

TIME SERIES FORECASTING

A time series is defined as a collection of data recorded over a period of time—weekly, monthly, quarterly, or yearly. A time series is an order which is measured at successive points in time spaced at a uniform time interval. Time series analysis consists methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. It is a stochastic process which has sequence of observations of a random variable. For example the monthly demand for a product, the annual sale of a product and the daily volume of the flow of the river. The foundation for decision models is provided by the forecasting of time series data in

operations research. Time series analysis gives tools for choosing a model that can be useful in forecasting future events. Modelling of a time series is a type of statistical problem. The parameters of a model are estimated with the help of forecast in computational procedures. These models work on the assumption that probability distribution varies with the observations within an underlying function of time. There exist many models used for time series, however, there are three very broad classes that are used most often. These are the autoregressive (AR) models, the integrated (I) models, and the moving average (MA) models. These models are often combined to form a new model. For example, the autoregressive moving average model (ARMA) combines the (AR) model and the (MA) model. Another example of this is the autoregressive integrated moving average (ARIMA) model, which combine all three of the models previously mentioned. Autoregressive (AR) models are the mostly used model for time series data. The autoregressive process is basically a difference equation determined by random variables. The key component in modelling time series is the distribution of such random variables.

FORECASTING MODELS

1. Autoregressive (AR) Model

A model which depends only on the previous outputs of the system is called an autoregressive model (AR). One of the most important consideration is the choice of the number of terms in the AR model, this is known as its order p . The AR-model of a random process in discrete time is defined by the following expression:

$$X_t = \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \dots + \alpha_p X_{t-p} + Z_t$$

The model parameters are found by solving a set of linear equation obtained by minimizing the mean squared error. The characteristic of this error is that it decreases as the order of the AR model is increased.

2. ARMA Model

ARMA models combine auto regressive (AR) and moving average (MA) models. AR models are a pole-only model:

$$H(z) = \frac{1}{1 + a_1 z^{-1} + a_2 z^{-2} + \dots + a_p z^{-p}}$$

where p is the model order and a_1, a_2, \dots, a_p are the model coefficients. MA models are zero-only models:

$$H(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2} + \dots + b_q z^{-q}}{1}$$

where q is the model order and b_0, b_1, \dots, b_q are the model coefficients. Although both models are based on time domain samples and can be expressed as sample-by-sample algorithms in the time domain, they possess very important spectral properties. AR models have the ability to estimate the *power spectral density* (PSD) of processes whose spectra contain sharp peaks and broad valleys, while MA models can estimate the PSD of processes whose spectra contains sharp valleys and broad peaks.

An ARMA model has the form:

$$H(z) = \frac{b_0 + b_1 z^{-1} + b_2 z^{-2} + \dots + b_q z^{-q}}{1 + a_1 z^{-1} + a_2 z^{-2} + \dots + a_p z^{-p}}$$

$$1+a_1z^{-1}+a_2z^{-2}+\dots+apz^{-p}$$

where the model denominator has order p and coefficients a_1, a_2, \dots, a_p and the numerator has order q and coefficients b_0, b_1, \dots, b_q .

3. ARIMA Model

Auto Regressive Integrated Moving-Average (ARIMA) is another important forecasting approach, going over model validation, parameter estimation, and model identification. The main advantage of this method is that it relies on the accuracy over a wider domain of series, despite being more complex, in terms of usability and computational effort, than Holt-Winters. The global model is based on a linear combination of past values (AR components) and errors (MA components), being named Auto Regressive Integrated Moving-Average (ARIMA).

The non seasonal model is denoted by the form ARIMA(p ; d ; q) and is defined by the equation:

$$\Phi_p(L)(1 - L)^d y_t = \theta_q(L)e_t$$

where y_t is the series; e_t is the error; L is the lag or backshift operator ;

$\Phi_p = 1 - \Phi_1 L - \Phi_2 L^2 - \dots - \Phi_p L^p$ is the AR polynomial of order p ; d is the differencing order; and

$\theta_q = 1 - \theta_1 L - \theta_2 L^2 - \dots - \theta_q L^q$ is the MA polynomial of order q .

When the series has a non zero average through time, the model may also contemplate a constant term in the right side of the equation. To create multi-step predictions, the one step-ahead forecasts are used iteratively as inputs.

ARTIFICIAL NEURAL NETWORKS

An Artificial neural network can be defined as a processing device, or an algorithm. ANNs have three great advantages over traditional methods. At first, they have universal approximation capabilities second, they can recognize “on their own” implicit dependencies and relationships in data third, they can “learn” to adapt their behavior viz., prediction, to changed conditions quickly and without complication. Neural models are innate candidates for forecasting due to their nonlinear and noise tolerance capabilities. The basic idea is to train a NN with past data and then use this network to predict future values. The use of NNs for TSF began in the late eighties with encouraging results and the field has been consistently growing since. Although different types of NNs have been applied in the forecasting literature (e.g. Recurrent Networks , the majority of the studies uses the Multilayer Perceptron network).

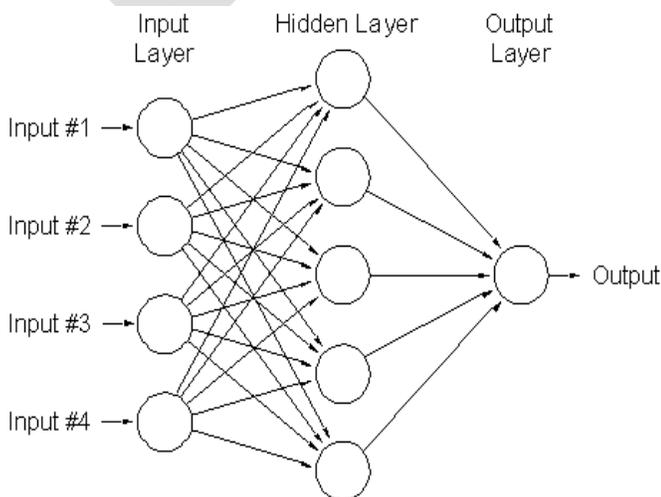


Fig. 1. The Multilayer Perceptron architecture

These architectures have a group of neurons -the input layer-, which are fed by external stimuli. The input units send these stimuli to hidden neurons, which are combined in one or more internal layers. These hidden units process the information they receive, and forward their results to the last layer of neurons i.e the output layer. The neurons in the output layer gives the final output. The layers are connected through information links, whose weights have to be determined in order to relate desired outputs to inputs. The computations carried out inside each neuron refers to: i) performing the weighted average of its impinging inputs, ii) sending this average through a activation function, and iii) forwarding the activation function output to the next layer of neurons. These calculations are generally performed simultaneously by all the neurons in a given layer, so that the response delay depends on the number of layers. The process of adjusting weights and biases is known as network training, and the algorithm which performs this task is the so called backpropagation algorithm. It essentially consists of a gradient-descent algorithm to reduce the error between actual and desired network outputs by modifying weights and biases going backward from the output-layer to the input-layer connections. The other type of learning algorithms that can be used are Genetic algorithm and Particle Swarm Optimization (PSO) algorithm.

PARTICLE SWARM OPTIMIZATION (PSO)

The PSO is based on the behavior of colony of living things. PSO is based on the behavior of colony or a swarm of insects such as ants, bees, termites, wasps, and a flock of birds or school of fish. It mimics the behavior of social organism. It is a population based algorithm. The word "Particle" denotes a bird in a flock or bee in a colony." Swarm" means moving particles which have certain velocity."Optimization" means obtaining best results from given circumstances. The PSO algorithm was originally proposed by Kennedy and Eberhart in 1995. They proposed an algorithm where each particle is located randomly in space. Particle is assumed to have two characteristics: a) Position b) Velocity. Each particle wanders around in the space and remembers its best position. This individual best position (obtained by using its own knowledge) is called "Pbest". Particle achieve best position in a group (obtained by sharing knowledge among a group) is called "Gbest". The formulae used to find modified position and velocity are shown in equation (1) and (2)

$$X_i(t) = X_i(t-1) + V_i(t) \quad (1)$$

$$V_i(t) = w * V_i(t-1) + \Phi_1 * r_{d1} * (P_i - X_i(t-1)) + \Phi_2 * r_{d2} * (P_g - X_i(t-1)) \quad (2)$$

$$V_i(t) = Inertia + Cognitive + Social. \quad (3)$$

Where, $X_i(t)$ = New particle position

$X_i(t-1)$ = Previous position

$V_i(t)$ = New particle Velocity

$V_i(t-1)$ = Previous Velocity

W = Inertia Weight

Φ_1 & Φ_2 = Two positive numbers

r_{d1} & r_{d2} = Two random numbers with uniform distribution in the range of (0,1)

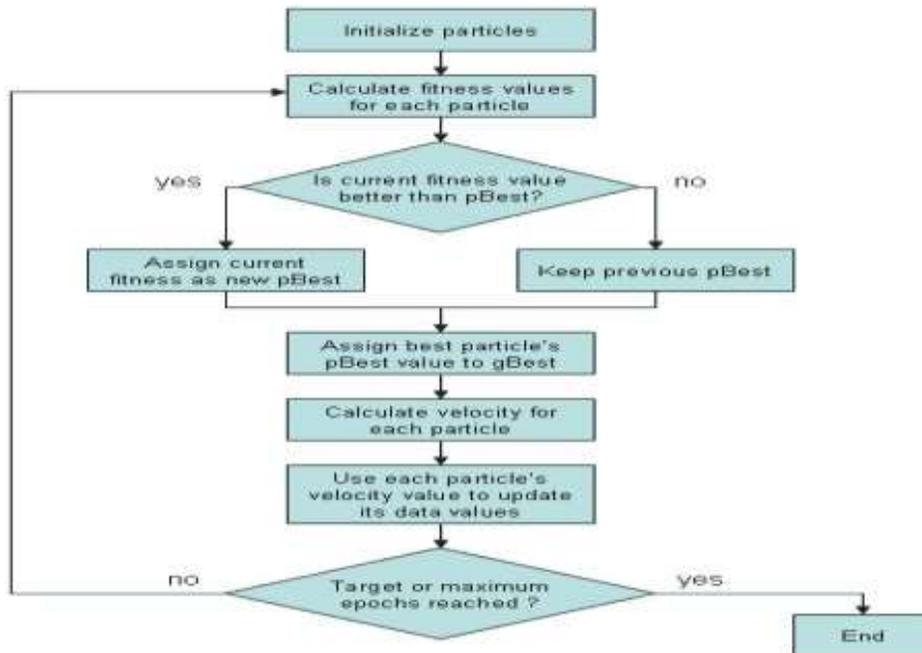
P_i = Individual best position (Pbest)

P_g = Global best position (Gbest)

Equation (3) shows three components.

First component shows the term inertia which develop the tendency of the particle to continue in the same direction in which it was travelling. Second component shows the linear attraction towards the best position found by the given particle. This component is referred to “self knowledge”. Third component shows linear attraction towards the position found by any particle. This component is referred to “group knowledge”.

PSO FLOWCHART



PSO ALGORITHM

Consider a objective function which has to maximize or minimize. Suppose Maximize, Take maximizing function to be $f(x)$.

With $X^l \leq X \leq X^u$

Where $X^l \rightarrow$ Lower bounds of X

$X^u \rightarrow$ Upper bounds of X

The PSO can be applied through the following steps:

1. Assume Size of the swarm (number of particles) is N .
2. Generate the initial position of X in the range X^l and X^u randomly as X_1, X_2, \dots, X_N .

Particle position ‘ j ’ in iteration ‘ i ’ is given by X_j^i . Initially particles are having values $X_1(0), X_2(0), \dots, X_N(0)$.

And the objective function is given by $f_1(0), f_2(0) \dots f_N(0)$.

3. Set iteration number as $i = 1$.

4. a) i) Find Pbest with highest value of objective

Function for j^{th} particle.

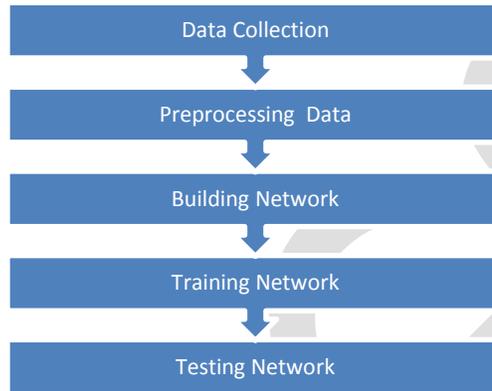
ii) Find Gbest with highest value of objective function for any particle in N number of particles.

b) Find Velocity of particle j in i_{th} iteration using equation(2)

c) Find position of particle j in i_{th} iteration using equation(1)

5. Check the convergence of current solution. If position of all particle converges to same set of values stop iteration. Unless repeat step 4 by updating equation number as $i = i+1$. And computing new values of Pbest and Gbest. The process is continued until all particles converge to same optimum solution.

DESIGNING ANN MODELS



Designing ANN models follows a systematic procedure which includes collection of data from a database then preprocessing the data, building the network and training the network with a training algorithm and finally testing the network for accurate predictions.

DATABASE COLLECTION

The database is collected from the open source site <http://crawdad.org> where the experiment performed by researchers at outdoor rural measurement campaign using two IBM Thinkpad R40e laptops (Celeron 2 GHz with 256 MB ram running Debian Linux with a 2.6.8 kernel), equipped with CNet CNWLC-811 IEEE 802.11b PCMCIA wireless cards and standard drivers. The rural environment was a wide uncultivated field with an unobstructed line of sight, far from buildings, cell phone antennas and power lines. The database contains 1000 samples of packet loss rate.

PREDICTION ANALYSIS AND RESULT COMPARISON

A time series of 1000 samples is used as a database to train the MLP neural network using different training algorithms. The 700 samples are used for training the network. 150 samples are used for testing the network and the remaining 150 samples used to validate the neural network model. The training process stops when the error between the predicted value and actual value is minimized. The MLP neural network used contains one input layer, one hidden layer and one output layer with sigmoidal activation function in the hidden layer and linear activation function in the output layer. The MLP network is trained with different training algorithms and compared with respect to their mean square error values. Mean square error is defined as the difference between the predicted value and actual value.

$$MSE = \frac{1}{n} \sum_{i=1}^n (\hat{Y}_i - Y_i)^2$$

Type of Algorithm	MSE
PSO	0.04
LM	0.15
SCG	0.28

Table 1. Comparison of different training algorithms

Table I summarizes the prediction results on input samples for the proposed methods as well as the competing methods. The notation PSO means Particle swarm Optimization. LM means Lavernberg-Marquardt Algorithm. SCG means Scaled Conjugate Gradient Algorithm. MLP trained with PSO gives least mean square error as compared to other algorithms.

The comparison of the real and forecast values

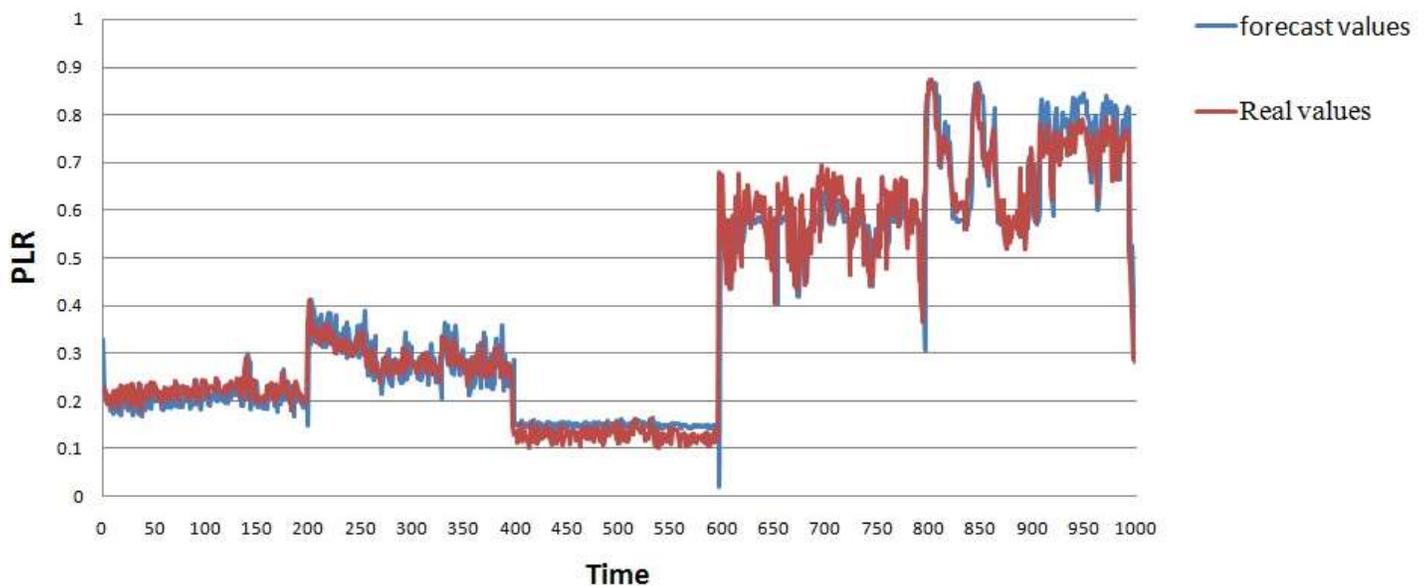


Fig. 3. Prediction and actual time series for the input samples for the PSO-ANN model. The time axis unit is “sample number,” while the PLR axis unit is lost packets.

CONCLUSION

In this paper, the problem of PLR prediction is considered. The quality of real-time multimedia traffic can be improved by accurate prediction thereby reducing the congestion. Several neural network models for Packet Loss Rate forecasting are studied in this work. The neural network model when trained with Particle Swarm Optimization gives good prediction accuracy as compare to other algorithms. In addition, it is faster than the other methods. According to the discussion and the comparison of model forecast accuracy shows that Particle Swarm Optimized Artificial Neural Network is the best model for PLR forecasting. This type of network can be very efficient in terms of predicting future values.

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Maturing an operating system for single board system-cubieboard

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Abstract— The advances in the programmable hardware have lead to new architectures, where the hardware lead dynamically adapted to the application to gain better performance. One of the many challenging problems in realizing a general purpose reconfigurable system is the placement of the modules on the reconfigurable functional unit (RFU). Reconfigurable computing systems still lack an established OS foundation that covers both software and hardware parts. This implies that tomorrow's applications will make use of both the instruction set processor (ISP) and the reconfigurable logic in order to provide the user with maximum performance.

In this paper we present , The design and implementation of a Monolithic-Kernel Single Board Computer (SBC) - Cubieboard GNU/Linux-like operating system on ARM (Advanced RISC Machine) platform in technical details, including boot loader design - UBOOT, building the Kernel - uImage, design of root file system and init process. The Single Board Computer Operating System (SBC OS) is developed on Linux platform with GNU tool chain.

Keywords— Single board computer, UBOOT, ARM, UImage, Cubieboard, Monolithic Kernel, Init Process.

INTRODUCTION

RECONFIGURABLE computing (or RC), as a discipline, has now been in existence for well over a decade. During this time, significant strides have been made in fabrication that are now providing hybrid computer processing unit (CPU)/field programmable gate array (FPGA) components with millions of free logic gates, as well as diffused intellectual property (IP) in the form of high-speed multipliers and SRAM blocks. Unfortunately, researchers have thus far struggled to develop tools and programming environments that allow programmers and system designers—not just hardware designers—to tap the full potential of the new reconfigurable chips [9]. This deficiency is in part due to the absence of modern operating system and middleware services that extend across the CPU/FPGA boundary. These layers, along with a high-level language, form an abstract computational model of a virtual machine. Importantly, these layers provide the concurrency and synchronization mechanisms used within modern software concurrency models such as asynchronous threads.

In this paper, we first outline and discuss the issues of currently accepted computational models for hybrid CPU/FPGA systems. We then discuss the need to adopt a modern virtual machine approach and associated abstract computational model, which hides the platform specific CPU/FPGA distinctions from the programmer.

We then present Monolithic-Kernel Single Board Computer GNU/Linux like operating system on ARM platform. The advantage of the system is described in the following.

A. Monolithic-Kernel Architecture

Unlike micro-kernel in MINIX operating system which slower processing system due to additional message passing, the SBC OS is designed as a Monolithic-Kernel analogous to the famous GNU/Linux. With such kind of architecture, the faster processing, the modularity and structure can be improved significantly therefore is suitable for Single Board Computers.

B. For both Single Board Computer Development and Curriculum Teaching

On one hand, the essential techniques related to operating systems and ARM machines are involved, e.g., boot loader design - UBOOT, building the Kernel - uImage, design of root file system and init process. All of these are obviously helpful for development

on ARM based Single Board Computer as well as for students to learn and study [2]. On the other hand, the SBC OS is designed more readable, of which the source codes can be provided to students, guiding them to design tiny Single Board Computer operating system on ARM platform from scratch.

C. Modularity and Structure

Each functionality should be found in a separate module, and the file layout of the paper should reflect this. Depending on their function, many capabilities can also be built into optional, runtime-loadable, modular components [8]. These can be loaded later when the particular capability is required. Within each module, complex functionality is subdivided in an adequate number of independent functions. These (simpler) functions are used in combination to achieve the same complex end-result.

RELATED WORK

The operating system ReconOS [2] extends the multithreaded programming model to the domain of reconfigurable hardware. Instead of regarding hardware modules as passive coprocessors to the system CPU, they are treated as independent hardware threads on an equal footing with software threads running in the system. In particular, ReconOS allows hardware threads to use the same operating system services for communication and synchronization as software threads, providing a transparent programming model across the hardware/software boundary. This transparency makes the design space exploration regarding the hardware/software partitioning of an application a straightforward task and facilitates self-adaptation. Since all threads use identical programming model primitives such as semaphores, mailboxes or shared memory, they do not need to know whether their communication peers are software threads executed on the CPU or HW threads mapped to the reconfigurable fabric. Thus, the HW/ SW partitioning of an application can be changed at design or run-time by simply instantiating the appropriate threads. ReconOS supports dynamic reconfiguration of hardware threads by taking advantage of the partial reconfiguration capabilities of Xilinx FPGAs.

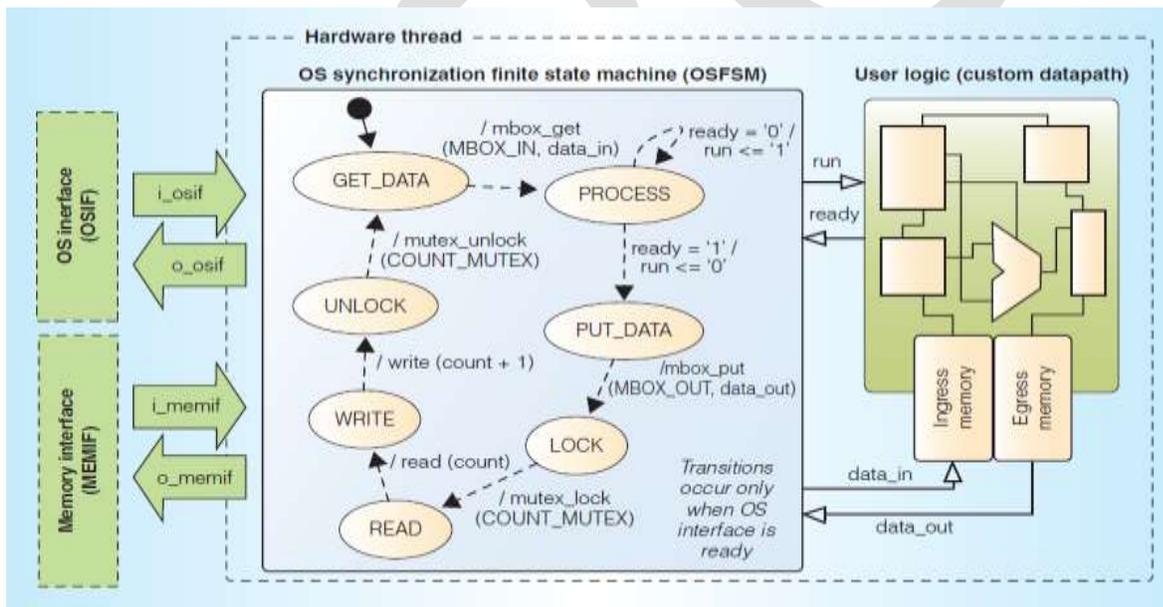


Fig. 1 A ReconOS hardware thread comprises the OS synchronization finite state machine and the user logic implementing the data path. Together with the OS interface (OSIF), the OS synchronization finite state machine enables seamless OS calls from within the hardware thread. The memory interface (MEMIF) provides the hardware thread with access to the ReconOS memory subsystem.

Basic Programming Architectures

Before introducing new architecture variants, we must first consider existing systems [3]. Traditional FPGA structures have primarily been serially programmed single-context devices, allowing only one configuration to be loaded at a time. This type of Field Programmable Gate Arrays (FPGA) is programmed using a serial stream of configuration information, requiring a full reconfiguration if any change is required. Designers of reconfigurable systems have found this style of configuration to be too limiting to efficiently implement run-time reconfigurable systems.

In some cases, configurations do not occupy the full reconfigurable hardware, or only a part of a configuration requires modification. In both of these situations a partial reconfiguration of the array is desired, rather than the full reconfiguration supported by the serial device mentioned above. In a partially reconfigurable FPGA, the underlying programming layer operates like a RAM device. Using addresses to specify the target location of the configuration data allows for selective reconfiguration of the array. Frequently, the undisturbed portions of the array may continue execution, allowing the overlap of computation with reconfiguration [10]. When configurations do not require the entire area available within the array, a number of different configurations may be loaded into otherwise unused areas of the hardware. Partially run-time reconfigurable architectures can allow for complete reconfiguration flexibility such as the Xilinx 6200 [Xilinx96], or may require an full column of configuration information to be reconfigured at once, as in the Xilinx Virtex FPGA [Xilinx99].

In contrast, a multi-context FPGA includes multiple memory bits for each programming bit location. These memory bits can be thought of as multiple planes of configuration information [DeHon, Trimberger]. Only one plane of configuration information can be active at a given moment, but the device can quickly switch between different planes, or contexts, of already-programmed configurations [11]. In this manner, the multi-context device can be considered a multiplexed set of single context devices, which requires that a context be fully reprogrammed to perform any modification to the configuration data. However, this requires a great deal more area than the other structures, given that there must be as many storage units per programming location as there are contexts.

SYSTEM ARCHITECTURE – SINGLE BOARD COMPUTER SYSTEM CUBIEBOARD

The SBC OS normally reside in large-capacity devices such as hard disks, CD-ROMs, USB disks, network servers, and other permanent storage media is shown in Fig.2 [4]. When the processor is powered on, the memory does not hold an operating system, so special software is needed to bring the SBC OS into memory from the media on which it resides. This software is normally a small piece of code called the boot loader. On a desktop PC, the boot loader resides on the master boot record (MBR) of the hard drive and is executed after the PC's basic input output system (BIOS) performs system initialization tasks.

- Kernel 3.4.105 with broad hardware support, headers and some firmware included
- Ethernet adapter with DHCP and SSH server ready on default port (22) with regenerated keys
- Enabled audio devices: analog, HDMI, spdif and I2S.
- Advanced IR driver with RAW RX and TX (disabled by default / you need an IR diode)
- PWM ready on pin PB2 (Cubietruck)
- Bluetooth ready (working with on-board device / disabled by default – insserv brcm40183-patch)
- I2C ready and tested with small 16×2 LCD. Basic i2c tools included.
- SPI ready and tested with ILI9341 based 2.4" TFT LCD display.
- Drivers for small TFT LCD display modules.

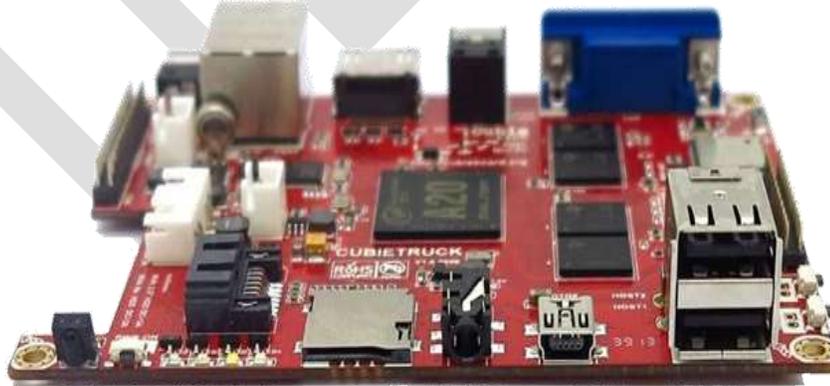


Fig. 2: Single Board Computer – Cubieboard

Performance tweaks:

- /tmp & /log = RAM, ramlog app saves logs to disk daily and on shut-down (ramlog is replaced with busybox-syslogd on Jessie)
- IO scheduler NOOP for SD, CFQ for sda (mechanical hard drive). (change in /etc/sysfs.conf)
- journal data writeback enabled. (/etc/fstab)
- commit=600 to flush data to the disk every 10 minutes (/etc/fstab)
- optimized CPU frequency scaling 480-1010Mhz with interactive governor (/etc/init.d/cpufrequtils)
- eth0 interrupts are using dedicated core

Limitations

- Some drivers compile successfully some displays fatal error: mach/sys_config.h: No such file or directory. Currently no idea how to fix this.
- On board Bluetooth firmware loading sometime fails. Reboot helps.
- NAND install script sometime fails. Dirty but working workaround – installing Lubuntu to NAND with Phoenix tools and run the nand-install again.
- Gigabit ethernet transfer rate is around 50% of its theoretical max rate (hardware or firmware issue)
- Shutdown, reboot and battery troubles regarding poor AXP chip driver (fixed in mainline kernel).
- Due to bad PCB placement, there is some crosstalk between Wifi and VGA in certain videomodes.
- No serial console under Jessie & Ubuntu
- No LIRC under Ubuntu

PERFORMANCE OF THE MONOLITHIC KERNEL OPERATING SYSTEM

Cubieboard is Single Board Computer, is the 3rd board of Cubieteam, also name it Cubieboard3 [5]. It's a new PCB model adopted with Allwinner A20 main chip, just like Cubieboard2. But it is enhanced with some features, such as 2GB memory, VGA display interface on-board, 1000M nic, WIFI+BT on-board, support Libattery and RTC, SPDIF audio interface.

A) Building and Configuring the Kernel

The Kernel is responsible for managing the bare hardware within our chosen target system. It takes care of scheduling use of the available hardware resources within a particular SBC OS. Resources managed by the Kernel include system processor time given to programs, use of available RAM, and indirect access to a multitude of hardware devices—including those customs to our chosen target [7]. Kernel configuration allows us to add and remove the peripheral devices. Depending on their function, many capabilities can also be built into optional, runtime-loadable, modular components.

We need to configure the options that are needed to have it in our Kernel before building it. The target is to have an appropriate .config file in our Kernel source distribution. Depending on our target, the option menus available will change, as will their content [6]. Some options, however, will be available no matter which embedded architecture we choose. After the environmental setup, make menuconfig runs a text-based menu interface

B) File structure Hierarchy

The most operations conducted by the Linux Kernel during system startup is mounting the root file structure is shown in Fig.3. The Linux Kernel itself doesn't dictate any file system structure, but user space applications do expect to find files with specific names in specific directory structures [12]. Therefore, it is useful to follow the de facto standards that have emerged in Linux systems.

Each of the top-level directories in the root file system has a specific purpose. Many of these, however, are meaningful only in multiuser systems in which a system administrator is in charge of many servers or workstations employed by different users. In most embedded Linux systems, where there are no users and no administrators, the rules for building a root file system can be loosely interpreted.

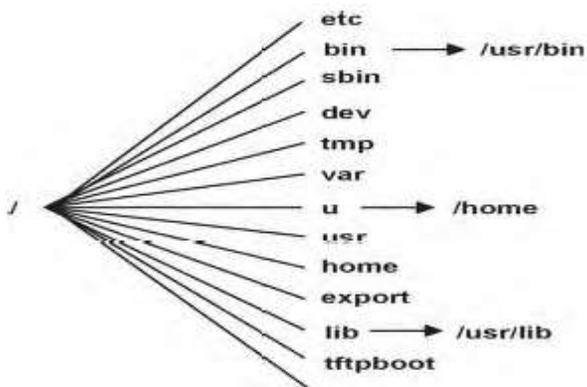


Fig. 3: Structure of file system

C) Init Process and Run levels

In conventional Linux systems, init is the first process started when a Linux Kernel boots, and it is the ancestor of all processes [5]. Its primary role is to start appropriate service processes for the “state” the system is to run in at boot and to shutdown/start appropriate services if the system state changes (such as changing to the halt/shutdown state). It can also create consoles and respond to certain types of events.

Init's behavior is determined by its configuration file /etc/inittab. Lines in /etc/inittab have the following

syntax: id:runlevels:action:process

where:

- id — 1-4 (usually 2) character name for the line, totally arbitrary;
- runlevels — a list of runlevels the line applies to;
- action — what init is to do and/or under what conditions;
- process — program/command to be run.

The ID for a line is completely arbitrary though there are some conventions for standard lines. For example, the IDs for lines that start services are “ln” where n is the runlevel. UNIX had runlevels 0-6, and these are the most commonly used runlevels, though Linux can use 0-9. The runlevel 1 can also be denoted by “s” (on some systems s may cause password checking that 1 does not). The runlevels component of an inittab line can be a list of runlevels. E.g., 123 would mean the line applies to runlevels 1, 2, and 3.

CONCLUSION

In this paper, we have presented single board computer operating system, which framework embrace, ARM based Monolithic kernel Operating System. Kernel is one of the most integrating areas of computer operating systems, Many kernel approaches have been proposed in previous sessions even though Monolithic kernel Operating System provide good performance than traditional

methods and are very much suitable to single board computer system. Our experience in ARM based Monolithic kernel operating system shows that these features can significantly higher the entry barrier for reconfigurable computing technology.

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FEATURES OF INTEL CORE i7 PROCESSORS

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Abstract---Intel's Core i7 processors are based on the Penryn manufacturing process the company introduced last year, but otherwise there are few similarities with the Core 2 Duo, Core 2 Quad, and Core 2 Extreme lines. A Core i7 processor fit in familiar LGA775 motherboard chip sockets the Intel norm for years now. Core i7 processors employ a new technology the Intel Quick Path Interconnect (QPI), for increased bandwidth and reduced latency. Hyper-Threading has also been reintroduced the line, so each core process two threads simultaneously making eight-core processing a reality. And in case that not enough multiprocessing for the technology can support as eight physical cores meaning that 16-core processing. The road to the Core i7 actually started with the demise of Intel's Netburst architecture. Intel's old strategy for producing microprocessors was to simply increase the core clock speeds, instruction sets and cache sizes a few ticks every year. Every time this happened the power draw and heat levels would increase as well, until eventually Intel hit a brick wall with the Pentium 4. They are 64 bit processors in computer architecture, 64-bit integers, memory addresses or other data units are those that are at most 64 bits wide. Also 64-bit CPU and ALU architectures are those that are based on registers, address buses or data buses of that size. The need for core i7 processors requires a comparison with their immediate predecessors. The comparison can be summarized as follows. The Core i7 is a completely new architecture which is much faster and more efficient than the Core 2 Duo. Currently only the Core i7 920, 945 and 965 XE versions are available. Of that the Core i7 920 is available at just offers better performance than almost all Core 2 Duo processors.

Keywords---Intel core i7, Penryn manufacturing, Motherboard chip, Quick Path Interconnect(QPI), Hyper-Threading, Intel's Netburst architecture, ALU architecture, Core 2 Duo .

1. INTRODUCTION

The Intel Penryn microarchitecture, which included the Core 2 family of processors, was the first mainstream Intel microarchitecture based on the 45nm fabrication process. This allowed Intel to create higher-performance processors that consumed similar or less power than previous-generation processors. The Intel Nehalem micro architecture that encompasses the Core i7 class of processors uses a 45nm fabrication process for different processors in the Core i7 family. Besides using the power consumption benefits of 45nm, Intel made some dramatic changes in the Nehalem microarchitecture to offer new features and capabilities in the Core i7 family of processors. This white paper explores the details on some key features and their impact on test, measurement, and control applications.

Intel core i3, i5, and i7 naming scheme for their CPUs for quite a while now, but what these labels mean tends to slowly change over time as new features are introduced or older ones get replaced. On top of this, the naming scheme between desktop and mobile CPUs is often different as well. In this article, we will go over what differentiates i3, i5, and i7 processors for both mobile and desktop Haswell CPUs. The biggest thing you need to know in regards to the i3, i5 and i7 naming scheme is that it is primarily a way for Intel to separate their CPUs into three performance tiers:

- a. *Intel Core i7*: High-end
- b. *Intel Core i5*: Mainstream
- c. *Intel Core i3*: Entry-level

There are a few differences in features (notably Hyperthreading, cache size and number of cores), but as we will show later in this article there is actually very little that differentiates an i5 CPU from an i7 CPU. The biggest thing that this naming scheme gives you is a starting place when choosing a CPU. If you use your computer for basic tasks like surfing the web, then an i3 CPU is likely a great choice. If you use your computer for a variety of tasks that require a bit more power (including gaming), then an i5 CPU might be a better choice. If you run multiple applications that require a lot of CPU power, then an i7 CPU is probably right for you.



Figure1: The Intel Core i7 920 processor

2. FEATURES OF INTEL COURE i7 PROCESSORS

A. New Platform Architecture

An Intel microarchitecture for a single processor system included three discrete components a CPU, a Graphics and Memory Controller Hub (GMCH), also known as the north bridge and an I/O Controller Hub (ICH), also known as the south bridge. The GMCH and ICH combined are referred to the chipset. The older Penryn architecture, the front-side bus (FSB) was the interface for exchanging data between the CPU and the north bridge. If the CPU had to read or write data into system memory or over the PCI Express bus, then the data to traverse over the external FSB.

The new Nehalem microarchitecture Intel moved the memory controller and PCI Express controller from the north bridge to the CPU die, reducing the number of external data bus that the data to traverse. These changes help increase data-throughput and reduce the latency for memory and PCI Express data transactions. These improvements make the Core i7 family of processors ideal for test and measurement applications such as high-speed design validation and high-speed data record and playback.

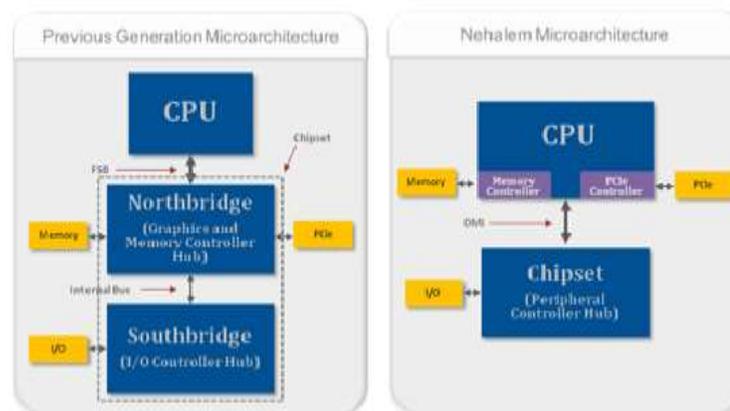


Figure1: The higher-level architectural differences between the previous generation and the new Nehalem microarchitecture for Single-processor systems.

B. Higher-Performance Multiprocessor Systems with QPI

Not only was the memory controller moved to the CPU for Nehalem processors, Intel also introduced a distributed shared memory architecture using Intel Quick Path Interconnect (QPI). QPI is the new point-to-point interconnects for connecting a CPU to either a chipset or another CPU. It provides up to 25.6 GB/s of total bidirectional data throughput per link. Intel's decision to move the memory controller in the CPU and introduce the new QPI data bus an impact for single-processor systems. However, this impact is much more significant for multiprocessor systems.

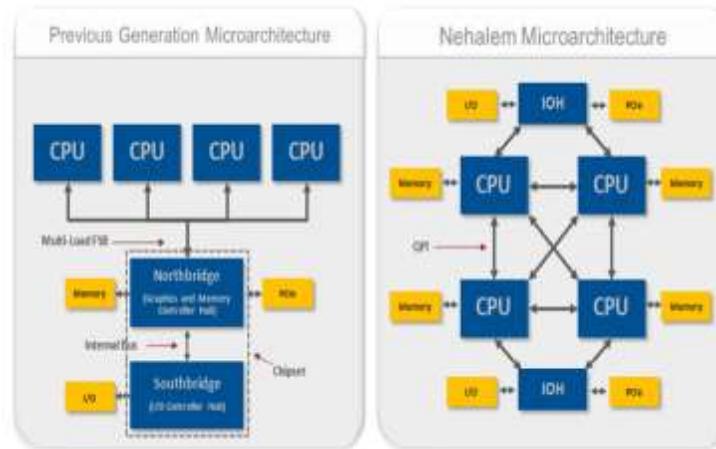


Figure2: The higher-level architectural differences between the previous systems and the new Nehalem microarchitecture for multiprocessor systems.

The Nehalem microarchitecture integrated the memory controller on the same die as the Core i7 processor and introduced the high-speed QPI data bus. In a Nehalem-based multiprocessor system each CPU has access to local memory but they also can access memory that is local to other CPUs via QPI transactions. For example, one Core i7 processor can access the memory region local to another processor through QPI either with one direct hop or through multiple hops. With these new features, the Core i7 processors lend themselves well to the creation of higher-performance processing systems. For maximum performance gains in a multiprocessor system, application software should be multithreaded and aware of this new architecture. Also, execution threads should explicitly attempt to allocate memory for their operation within the memory space local to the CPU on which they are executing. By combining a multiprocessor computer with PXI-MXI-Express to a PXI system, processor intensive applications can take advantage of the multiple CPUs. Examples of these types of applications range from design simulation to hardware-in-the-loop (HIL).

C. CPU Performance Boost via Intel Turbo Boost Technology

About five years ago, Intel and AMD introduced multicore CPUs. Since then a lot of applications and development environments have been upgraded to take advantage of multiple processing elements in a system. However, because the software investment required re-architecting applications, there are still a significant number of applications that are single threaded. Before the multicore CPUs, these applications saw performance gains by executing on new CPUs that simply offered higher clock frequencies. With multicore CPUs, this trend was broken as newer CPUs offered more discrete processing cores rather than higher clock frequencies.

To provide a performance boost for lightly threaded applications and to also optimize the processor power consumption, Intel introduced a new feature called Intel Turbo Boost. Intel Turbo Boost is an innovative feature that automatically allows active processor cores to run faster than the base operating frequency when certain conditions are met. Intel Turbo Boost is activated when the OS requests the highest processor performance state. Turbo Boost is Intel's terminology for overclocking CPUs, allowing them to run faster than their base clock speed. Both Core i7 and i5 processors support Turbo Boost.

The maximum frequency of the specific processing core on the Core i7 processor is dependent on the number of active cores and the amount of time the processor spends in the Turbo Boost state depends on the workload and operating environment. The processing cores in the quad-core Core i7 processor change to offer the best performance for a specific workload type. In an idle state, all four cores operate at their base clock frequency. If the application creates only two execution threads, then two idle cores are put in a low-power state and their power is diverted to the two active cores to allow them to run at an even higher clock frequency. Similar behavior would apply in the case where the applications generate only a single execution thread.

D. Improved Cache Latency with Smart L3 Cache

Cache is a block of high-speed memory for temporary data storage located on the same silicon die as the CPU. If a single processing core, in a multicore CPU, requires specific data while executing an instruction set, it first searches for the data in its local caches (L1 and L2). If the data is not available, also known as a cache-miss, it then accesses the larger L3 cache. Exclusive L3 cache, if that attempt is unsuccessful, then the core performs cache snooping searches the local caches of other cores – to check whether they have data that it needs. Attempt also results in a cache-miss it then accesses the slower system RAM for that information. The latency of reading and writing from the cache is much lower than that from the system RAM, therefore a smarter and larger cache greatly helps in improving processor performance.

The Core i7 family of processors features an inclusive shared L3 cache that can be up to 12 MB in size. Figure 4 shows the different types of caches and their layout for the Core i7-820QM quad-core processor used in the NI PXIe-8133 embedded controller. The NI PXIe-8133 embedded controller features four cores, where each core has 32 kilobytes for instructions and 32 kilobytes for data of L1 cache, 256 kilobytes per core of L2 cache, along with 8 megabytes of shared L3 cache. The L3 cache is shared across all cores and its inclusive nature helps increase performance and reduces latency by reducing cache snooping traffic to the processor cores. An inclusive shared L3 cache guarantees that if there is a cache-miss, then the data is outside the processor and not available in the local caches of other cores, which eliminates unnecessary cache snooping. The L3 is designed to use the inclusive nature to minimize snoop traffic between processor cores. The latency of L3 access may vary as a function of the frequency ratio between the processor and the uncore sub-system.

This feature provides improvement for the overall performance of the processor and is beneficial for a variety of applications including test, measurement and control. Each physical processor may contain several processor cores and a shared collection of subsystems that are referred to as "uncore". Specifically in Intel Core i7 processor the uncore provides a unified third-level cache shared by all cores in the physical processor, Intel Quick Path Interconnect links and associated logic.

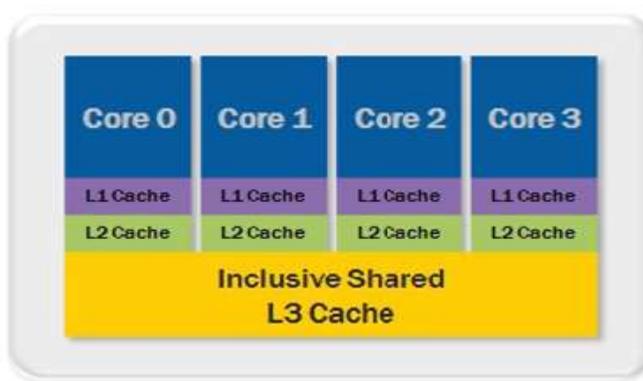


Figure 3: The Core i7 processor offers better cache latency for increased performance

E. Optimized Multithreaded Performance through Hyper-Threading

Intel introduced Hyper-Threading Technology on its processors in 2002. Hyper-threading exposes a single physical processing core as two logical cores to allow them to share resources between execution threads and therefore increase the system efficiency (see Figure 5). Because of the lack of OSs that could clearly differentiate between logical and physical processing cores, Intel removed this feature when it introduced multicore CPUs. With the release of OSs such as Windows Vista and Windows 7, which are fully aware of the differences between logical and physical core, Intel brought back the hyper-threading feature in the Core i7 family of processors.

Hyper-Threading Technology benefits from larger caches and increased memory bandwidth of the Core i7 processors, delivering greater throughput and responsiveness for multithreaded applications. Intel Hyper-Threading increases CPU performance for multithreaded tasks and is helpful for multitasking when several applications are running simultaneously.

As discussed above, all Core i7 processors and mobile i5 processors support hyper-threading.

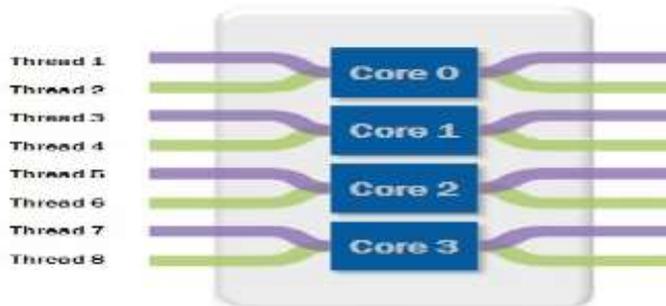


Figure 5: Hyper-threading allows simultaneous execution of two execution threads on the same physical CPU core.

F. Higher Data-Throughput via PCI Express 2.0 and DDR3 Memory Interface

To support the need of modern applications to move data at a faster rate, the Core i7 processors offer increased throughput for the external databus and its memory channels. The new processors feature the PCI Express 2.0 databus, which doubles the data throughput from PCI Express 1.0 while maintaining full hardware and software compatibility with PCI Express 1.0. A x16 PCI Express 2.0 link has a maximum throughput of 8 GB/s/direction. To allow data from the PCI Express 2.0 databus to be stored in system RAM, the Core i7 processors feature multiple DDR3 1333 MHz memory channels. A system with two channels of DDR3 4/4 www.ni.com to allow data from the PCI Express 2.0 databus to be stored in system RAM, the Core i7 processors feature multiple DDR3 1333 MHz memory channels. A system with two channels of DDR3 1333 MHz RAM had a theoretical memory bandwidth of 21.3 GB/s.

This throughput matches well with the theoretical maximum throughput of an x16 PCI Express 2.0 link. The NI PXIe-8133 embedded controller uses both of these features to allow users to theoretical stream data at 8 GB/s in a PXI Express system. Certain test and measurement applications – such as high-speed design validation and RF record and playback – that require continuous acquisition or generation of data at extremely high rates benefit greatly from these improvements.

G. Improved Virtualization Performance

Virtualization is a technology that enables running multiple OSs side-by-side on the same processing hardware. In the test, measurement, and control space, engineers and scientists have used this technology to consolidate discrete computing nodes into a single system. With the Nehalem microarchitecture, Intel has added new features such as hardware-assisted page-table management and directed I/O in the Core i7 processors and its chipsets that allow software to further improve their performance in virtualized environments. These improvements coupled with increases in memory bandwidth and processing performance allow engineers and scientists to build more capable and complex virtualized systems for test, measurement and control. Intel core i5 and i7 specifications are in two ways:

a) Specifications for Desktop i5 and i7 CPUs All Core i5 and Core i7 Ivy Bridge processors for desktop have 4 cores and a Direct Media Interface with Integrated GPU.

b) Specifications for Mobile i5 and i7 Processors For the mobile versions of Ivy Bridge i5 and i7 processors (used in [laptops and notebooks](#)), things are a little different. Core i5 mobile processors are dual-core and so are some i7 processors, while other i7 CPUs are quad-core. All Core i5 and i7 mobile processors support hyper-threading. So there is a smaller performance gap between i5 and dual-core i7 mobile processors. Quad-core i7 mobile processors do deliver increased performance but may sacrifice some [battery](#) life to do so.

H. Remote Management of Networked Systems with Intel Active Management Technology (AMT)

AMT provides system administrators the ability to remotely monitor, maintain, and update systems. Intel AMT is part of the Intel Management Engine, which is built into the chipset of a Nehalem-based system. This feature allows administrators to boot systems from a remote media, track hardware and software assets, and perform remote troubleshooting and recovery. Engineers can use this feature for managing deployed automated test or control systems that need high uptime. Test, measurement, and control applications are able to use AMT to perform remote data collection and monitor application status. When an application or system failure occurs, AMT enables the user to remotely diagnose the problem and access debug screens. This allows for the problem to be resolved sooner and no longer requires interaction with the actual system. When software updates are required, AMT allows for these to be done remotely, ensuring that the system is updated as quickly as possible since downtime can be very costly. AMT is able to provide many remote management benefits for PXI systems. For customers using the NI PXIe-8133, National Instruments offers a NI Labs download that enables AMT capabilities on this embedded controller.

3. THE ADVANTAGES OF INTEL i7 PROCESSORS

The Core i7 is Intel's current most powerful processor, most have clock speeds or GHz just below the absolute best Core 2 Duo processor or higher than the Core 2 Duo and unlike the best Core 2 Duo processors have larger cache (the larger the cache, the faster the processor can work), 4 physical processing cores instead of 2 and with hyper-threading 4 cores plus 4 virtual cores so almost like having 8 cores in one computer. Obviously the major difference is the amount of processing cores, the more cores your computer, the more things you can do at once on your computer but overall the i7 kills the Core 2 Duo in terms of performance. Now that does come at a price, i7 processors require DDR3 RAM which is more expensive than the DDR 2 you can get away with Core 2 Duo's, it requires more expensive motherboards and if you're buying an i7 to really take advantage of it expensive graphics cards and large power supplies are necessary as well. Bottom line, because the i7 at least matches the Core 2 Duo in most models on GHz clock

speed, has 2 more physical processing cores, 4 more virtual ones (the Core 2 Duo has none) and a larger cache it is definitely a better processor all around.

4. DISADVANTAGES OF INTEL i7 PROCESSORS

Talking about the two laptop makers above, I don't see that very good Integrated Graphics is going along with the Core i7. Just something in an Nvidia GeForce 9800GT mobile GPU (Graphics Processing Unit) . But that's purely a disadvantage of the laptop makers, and not a disadvantage of the Intel Core i7. As for 'talking' about the Intel Core i7 as a whole and its new technology, it depends on what you wish to do with a computer. The Intel Core i7 is a quad core processor. Intel also brought back HT, Hyperthreading Technology. In the old Pentium 4 processors that had HT, the Operating System, (WinXP is an example of an O/S. Not trying to insult your intelligence), saw the Pentium 4 as having TWO processor cores. One was a physical, real, processor core. The other was a virtual core. If two threads are being used by EACH core of an Intel Core i7, the O/S 'sees' it as having EIGHT processor cores.

5. CONCLUSION

The Core i7 family of processors based on the Intel Nehalem microarchitecture offers many new and improved features that benefit a wide variety of applications including test, measurement and control. Engineers and scientists can expect to see processing performance gains as well as increases in memory and data throughput when comparing this microarchitecture to previous microarchitectures. Intel Core i7 processor is Intel's first CPU designed based on **Nehalem micro architecture**. This processor is ideal for computer 3D games, multitasking and multi-threading applications. The main thing to remember is that i7 CPUs are at the high end of the product line, i5 CPUs are in the middle, and i3 CPUs are entry level. The Intel Ark is one way to, and it allows you to select multiple CPUs to compare side by side. Additionally, if you are in the market for a new computer based on these CPUs, our sales staff is always happy to answer questions at sales@pugetsystems.com. This gives you a decent starting place to look for a CPU based on what you will be using your computer for, but you will likely need to look at the individual specs for multiple CPUs to determine which is actually the right fit for you. While there are a few things that the i3/i5/i7 naming scheme tells you, it is really no substitution for actually looking at the specifications of individual CPUs.

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Design and Computational Analysis of Scramjet Inlet

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ABSTRACT- Scramjet inlets are a critical component in its function and their design has significant effects on the overall performance of the engine. Thus, the forward capture shape of the engine inlet should conform to the vehicle body shape. These geometric changes have remarkable influence on the flow in several aspects. A computational study for scramjet inlet with different ramp angles are studied to compress the air by rounding leading edge, moving the whole cowl up and down, rotating the cowl lip and axisymmetric inlet with rounded edge. However, the performance of the inlet tends to degrade as Mach number range increases. An air intake consisting of various ramps producing oblique shocks followed by a cowl shock is chosen in order to increase air mass capture. An impinging shock may force the boundary layer to separate from the wall, resulting in total pressure recovery losses and a reduction of the inlet efficiency. Design an inlet to meet the requirements such as Low stagnation pressure loss, High static pressure and temperature gain and deceleration of flow to a desired value of Mach number. A two dimensional analysis is carried out in this project. CATIA is used to create the model. GAMBIT is used to create the mesh. FLUENT is used to cover the flow analysis.

KEYWORDS: scramjet inlet, contraction ratio, ramp, cowl lip, normal shock

INTRODUCTION

A supersonic combustion ramjet (scramjet) is a variant of a ramjet air-breathing combustion jet engine. The definition of a ramjet engine is first necessary, as a scramjet engine is a direct descendant of a ramjet engine. Ramjet engines have no moving parts, instead operating on compression to slow free stream supersonic air to subsonic speeds, thereby increasing temperature and pressure, and then combusting the compressed air with fuel. Finally, a nozzle accelerates the exhaust to supersonic speeds, resulting in thrust. Due to the deceleration of the free stream air, the pressure, temperature and density of the flow entering the burner are "considerably higher than in the free stream". At flight Mach numbers of around Mach 6, these increases make it inefficient to continue to slow the flow to subsonic speeds. Thus, if the flow is no longer slowed to subsonic speeds, but rather only slowed to acceptable supersonic speeds, the ramjet is then termed a 'supersonic combustion ramjet,' resulting in the acronym scramjet.

To study the inlet performance, multiple standard parameters need to be evaluated. This study involves comparison of performance parameters for scramjet inlet which are evaluated as a result of FEM computation of 2-D turbulent flow field around six different scramjet inlet geometries. The salient geometrical parameters which are varied are; inlet ramp angle and length, cowl lip angle, leading edge and axisymmetric inlet [1].

The 2-D computation of turbulent flow is obtained by implementing high Reynolds number k-omega compressible turbulent formulation. The boundary and initial conditions are carefully selected to the free stream conditions that pertain to a cruise altitude of 25km. The simulations were performed for two free stream Mach number 8. Thus from the obtained result, comparative studies of performance parameters are carried out by parameterising geometrical variables and free stream Mach number. It is necessary to simulate the inlet design to obtain the appropriate inlet performance. Computational Fluid Dynamics (CFD) is used to study flight simulations in both steady and un-steady flow. A time-averaged, viscous, 2 Dimensional, CFD scheme used to compute aero-thermo dynamic quantities including boundary layer effects.[3,4] A variety of turbulent models available ranging from one to three equations transport models. Oblique shock waves, expansion waves and shock wave interactions are mainly considered. Accuracy of the solution is dependent on many parameters like size of the control volume, orientation of boundaries, discretization and its order of accuracy.

SCRAMJET INLET

Intake is the most vital component of the engine. It converts the K.E of the air flow into a static pressure rise that helps in deceleration of flow at lower speeds. This deceleration takes place as the flow passes through a series of oblique shocks that are formed due to the presence of ramps in the inlet, also called as staged compression [7,8].

The internal inlet compression provides the final compression of the propulsion cycle. The forebody along with the internal inlet is designed to provide the required mass capture and aerodynamic contraction ratio at maximum inlet efficiency. The air in the captured stream tube undergoes a reduction in Mach number with an attendant increase in pressure and temperature as it passes through the system of shock waves in the fore body and internal inlet. It typically contains non-uniformities, due to oblique reflecting shock waves, which can influence the combustion process. A scramjet air induction phenomenon includes vehicle bow shock and isentropic turning Mach waves, shock boundary layer interaction, non-uniform flow conditions, and three-dimensional effects.

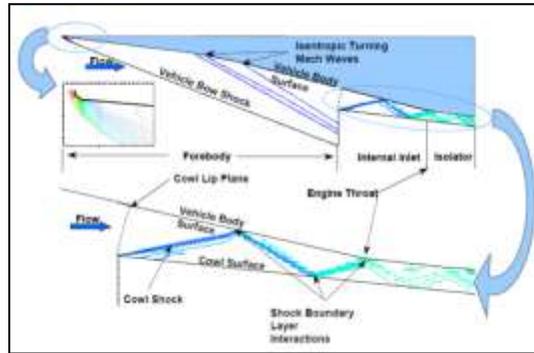


Fig .1: Summary of Important Forebody and Internal Inlet Physics

The design of this type of critical inlet component alters the overall performance of the engine. The major purpose of the air inlet is to compress the supersonic flow into subsonic flow and to diffuse the condition such that proper combustion takes place. Also to provide required amount of air to engine ensuring a stable flow and to keep the total pressure loss minimum. In hypersonic case inlets are often called as Inlet diffusers [9]. Here the compression is performed by shocks both external and internal to the engine, and the angle of the external cowl relative to the free stream can be made very small to minimize external drag. These inlets are typically longer than external compression configurations, but also spill flow when operated below the design Mach number. Depending on the amount of internal compression, however, mixed compression inlets may need variable geometry in order to start.

MODELLING OF SCRAMJET INLET IN CATIA

Geometry creation in CATIA is done with the required commands from the geometry creation tool pad. The geometry creation tool pad contains specification of scramjet inlet with leading edge, ramps, ramp angle and length, cowl deflection and contraction ratio (CR) to design a seven models of scramjet inlet with different specifications.

A. Create Of Inlet Geometry

The inlet to be optimized in this paper comprises six models,

- Rounded and sharp leading edge with three ramps and without deflection.
- Four Ramped Inlet model with deflection.
- Two Ramped Inlet model with deflection.
- Axisymmetric Inlet model with rounded and sharp leading edge.

The internal geometry is represented by five parameters: the leading-edge, ramp lengths, ramp angle, ramp angle increments, and exit radius. For rounded leading edge the inlet radius is fixed at 0.6mm to ensure constant mass flow entry, which effectively makes one of the ramp parameters dependent on the others for a given value of the combustor radius. Also fixed is the leading edge nose-tip radius 0.6mm in order to focus on the influence of ramp geometries by freezing the entropy layer effect originating from the leading edge. For axisymmetric inlets are two models are sharp and rounded leading edge with three ramps different angles. These assumptions, in effect, leave these parameters as design variables, or decision variables for optimization.

Table 1: Scramjet inlet 1 Specification

Leading edge	Rounded
No.of ramps	Three
Ramp angles	5.5°,10.8°,14.1°
Ramps length (mm)	75,69,35
Cowl angle	0°
Throat area (mm)	35



Fig 2: Rounded leading edge with three ramps and without deflection

Table 2: Scramjet inlet 2 Specification

Leading edge	sharp
No.of ramps	Three
Ramp angles	5.5°,10.8°,14.1°
Ramps length (mm)	75,69,35
Cowl angle	0°
Throat area (mm)	35

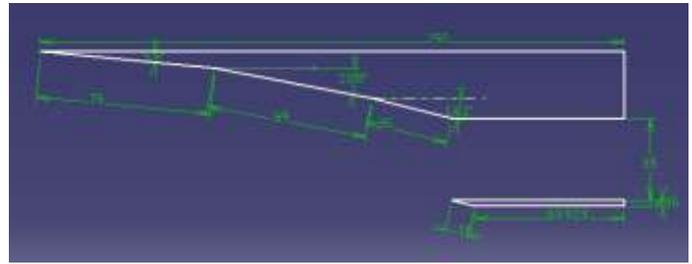


Fig 3: Four Ramped Inlet model with deflection

Table 3: Scramjet inlet 3 Specification

Leading edge	Sharp
No.of ramps	Four
Ramp angles (degree)	5.5,7.55,9.05,12.5
Ramps length (mm)	212,113,106,44
Cowl angle (degree)	12.5
Cowl lip length (mm)	44
Throat area (mm)	60



Fig.4: Four Ramped Inlet model with deflection

Table 4: Scramjet inlet 4 Specification

Leading edge	Sharp
No.of ramps	Two
Ramp angles (degree)	9,20.5
Ramps length (mm)	300,150
Cowl angle (degree)	10
Cowl lip length(mm)	20
Throat area (mm)	20.066



Fig.5: Two Ramped Inlet model with deflection

Table 5: Scramjet inlet 5 Specification

Leading edge	Rounded
Inlet type	Axisymmetric
No.of ramps	three
Ramp angles (degree)	5,10.6,13.6
Ramps length (mm)	75,69,39
Throat area (mm)	30



Fig.6: Axisymmetric Inlet model with rounded leading edge

Table 6: Scramjet inlet 6 Specification

Leading edge	sharp
Inlet type	Axisymmetric
No.of ramps	three
Ramp angles (degree)	5.5,10.8,14.1
Ramps length (mm)	95,75,40
Throat area (mm)	30

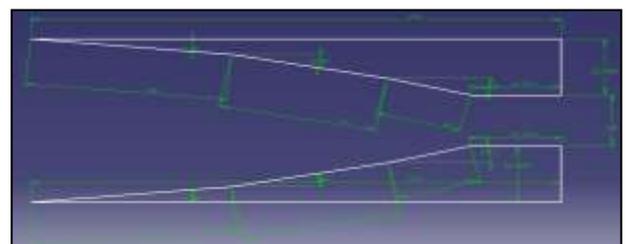


Fig.7: Axisymmetric Inlet model with sharp leading edge

GRID GENERATION

Meshing creation in gambit is done with the help of required commands from the meshing creation tool pad. The meshing creation tool pad contains command buttons that allows performing operations which include creating edge meshing, face meshing and boundary conditions. For the numerical study, inlet geometry parameters such as inlet ramps angles, length, number of ramps, cowl deflection and contraction ratio are varied. Axisymmetric inlets with sharp and rounded leading edge also meshing with rectangle domain can be create in this Chapter

A. Computational Domain

The 2D modeling scheme was adopted in GAMBIT. The structured grids were generated using ANSYS Gambit meshing tool.

- Meshing can be done in forms namely edge meshing, face meshing.
- Meshed edge, faces can be copied, moved, linked or disconnected from one another.
- Structured grid cells are used for entire domain. Cells are clustered at the region.
- Grading schemes includes successive ratio. Double sided grading also can be performed. The interval count can be specified for the starting mesh based on the model. In face or 2D meshing the following parameters can be specified. Meshing schemes mesh node spacing and face meshing options.

The meshing schemes include the elements and the types. Quadrilateral can be used as the elements. The meshing type pave are used.

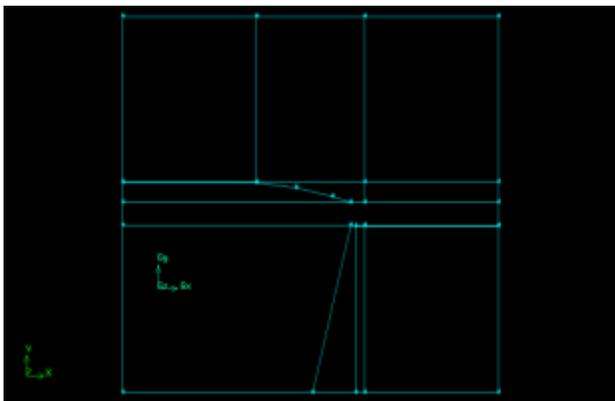


Fig .8: Rectangle domain created around model

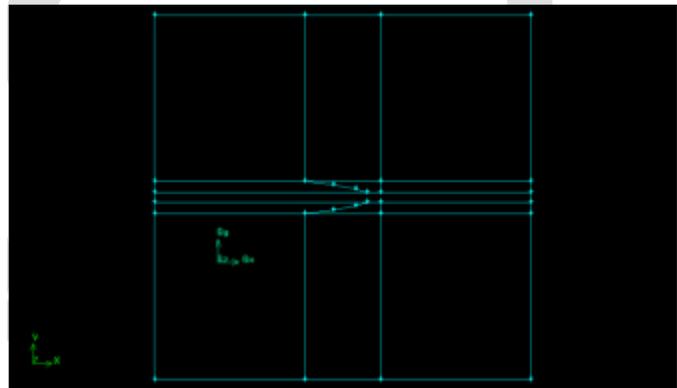


Fig .9: Rectangle domain created around axisymmetric inlet

Above figure show the rectangle domain into various section for meshing can be more around the scramjet inlet and axisymmetric scramjet inlet.

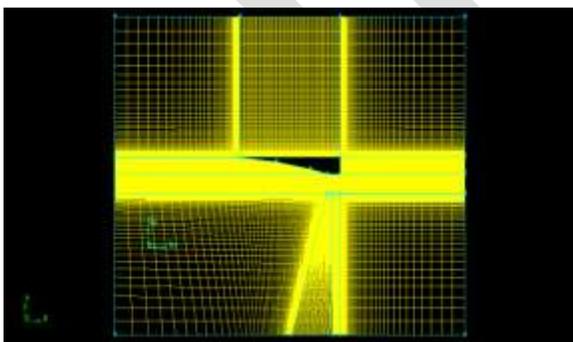


Fig .10: Two Ramped Inlet model without deflection

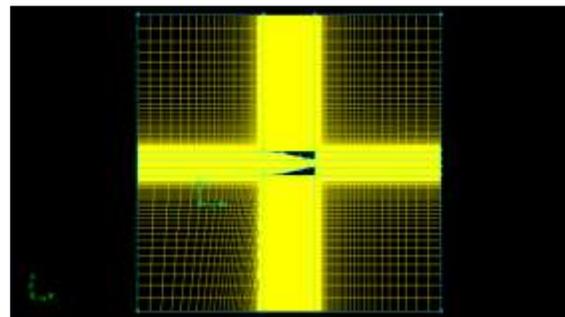


Fig .11: Axisymmetric Inlet model with rounded leading edge

The grid independence test is done which involves transforming the generated physical model into a mesh with number of node points depending on the fineness of the mesh. The various flow properties were evaluated at these node points. The extent of accuracy of result depended to a great extent on the fact that how fine the physical domain was meshed. After a particular refining limit the results changes no more. At this point it is said that grid independence is achieved. The results obtained for this mesh is considered to be the best. This mesh formation was done with GAMBIT

B. BOUNDARY CONDITIONS

For two dimensional computations over the model a structured grid consists of quadrilateral cells are made. The overall rectangular domain is made of several iterations were chosen for all models. Inlet exit was the part of the outlet boundary face whereas

the model base was situated on the boundary which was assigned as wall boundary. The grid generation scheme is quad/tri type cells of volume meshing. Grid with approximately 20000 cells is made for every inlet models. The initialize boundary condition for all the scramjet inlet models after the meshing can be done.

Table 7: Boundary conditions for all models

Inlet	Velocity inlet
Outlet	Pressure outlet
Upper boundary	Wall
Lower boundary	Wall
Fore body	Wall
cowl	Wall
Fluid	Air

The grid for the scramjet inlet 2D models generated using the software GAMBIT and the other specification discussed. Grid independence study results in formation of fine grids to obtained desired results. Separated domains was selected based on several iterations were chosen. The initialize boundary condition for all the scramjet inlet models is given been chosen.

RESULTS AND ANALYSIS

Two dimensional simulations of the flow field using FLUENT are to be made. Computations validated through a simulation of hypersonic inlet at desired Mach number. Boundary conditions and properties of the model defined as reference to the literature.

ANALYSIS OF SCRAMJET INLET IN FLUENT

Table 8: Inlet Boundary Conditions for Mach 8

Gauge Pressure	1197 pa
Mach number	8
Reference temperature	226.5 k
Turbulent Viscosity	0.01
Turbulent Ratio	10
Altitude	30 km

Model 1: Rounded leading edge with three ramps and without deflection

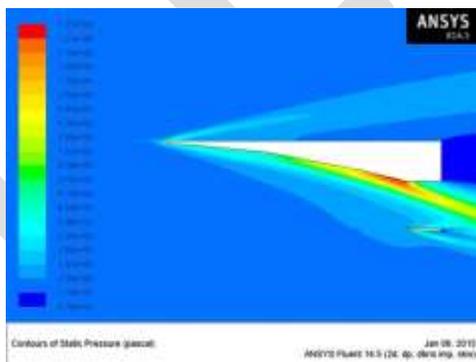


Fig 12: Pressure Contour

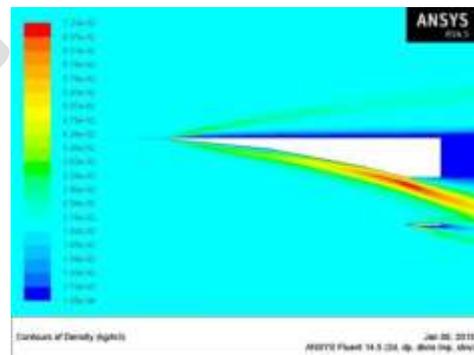


Fig 13: Density Contour

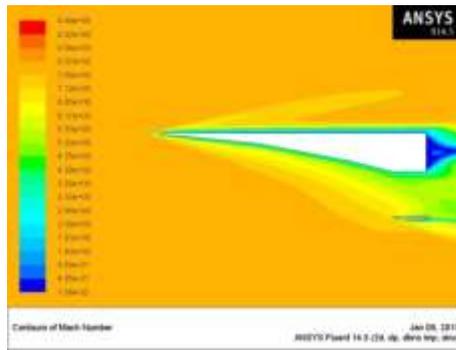


Fig 14: Mach Contour

Mode 2: Sharp leading edge with three ramps and without deflection

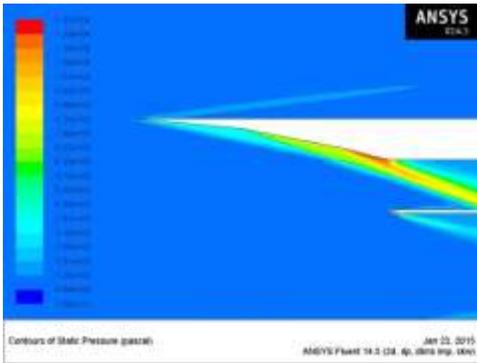


Fig 15 Pressure Contour

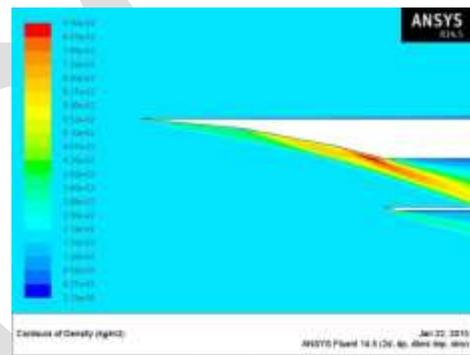


Fig 16 Density Contour

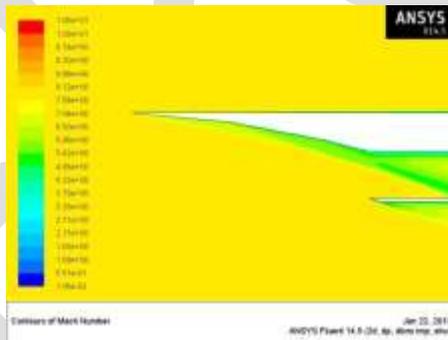


Fig 17 Mach Contour

Model 3: Four Ramped Inlet model with deflection

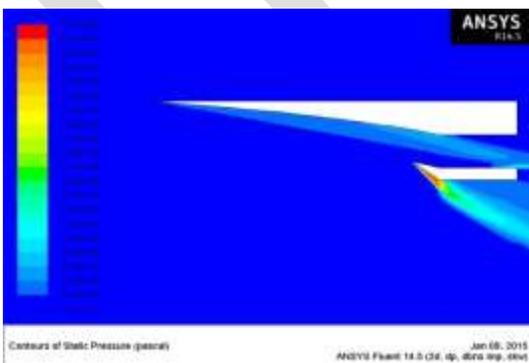


Fig 18 Pressure Contour

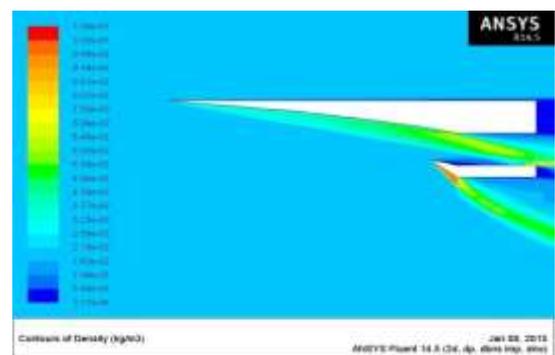


Fig 19 Density Contour

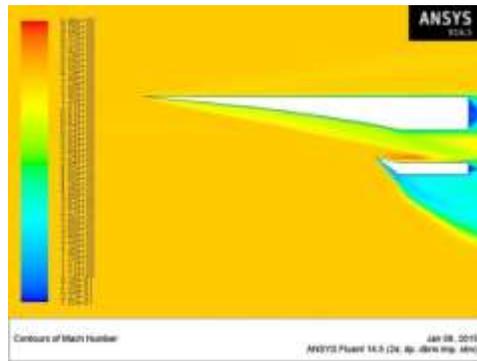


Fig 20 Mach Contour

Model 4: Two Ramped Inlet model with deflection

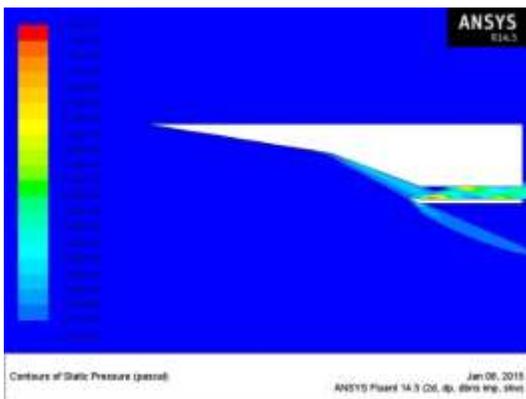


Fig 21 Pressure Contour

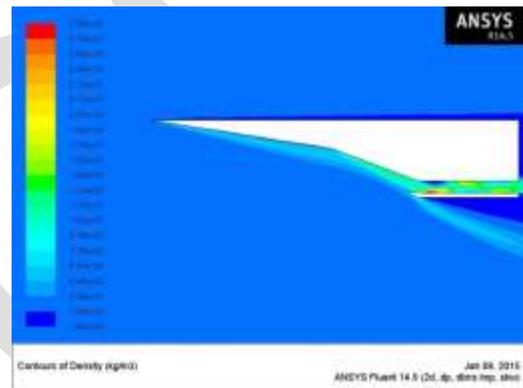


Fig 22 Density Contour

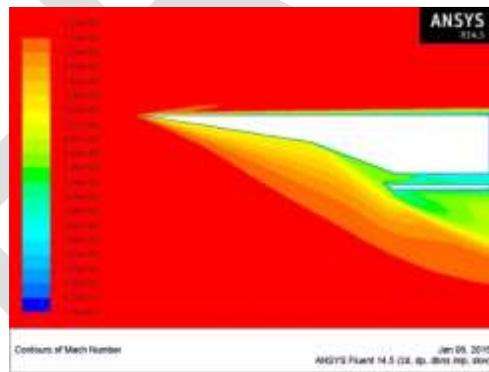


Fig 23 Mach Contour

Model 5: Axisymmetric Inlet model with rounded leading edge

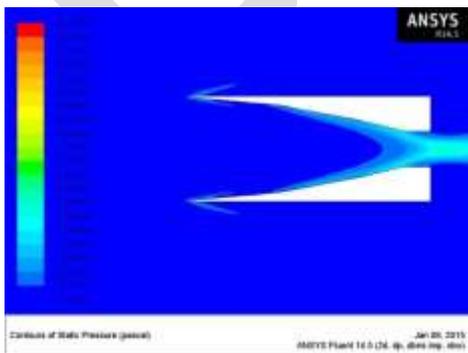


Fig 24 Pressure Contour

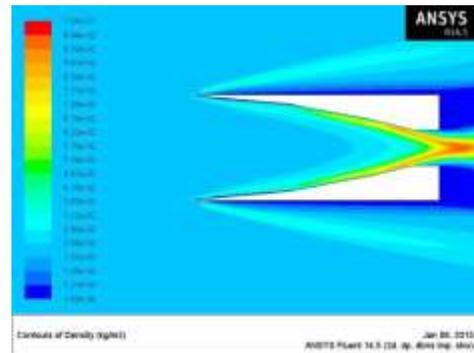


Fig 25 Density Contour

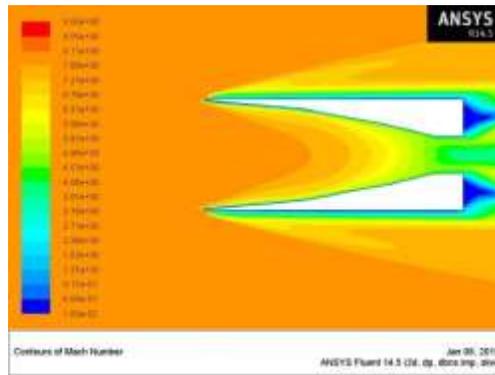


Fig 26 Mach Contour

Model 6: Axisymmetric Inlet model with sharp leading edge

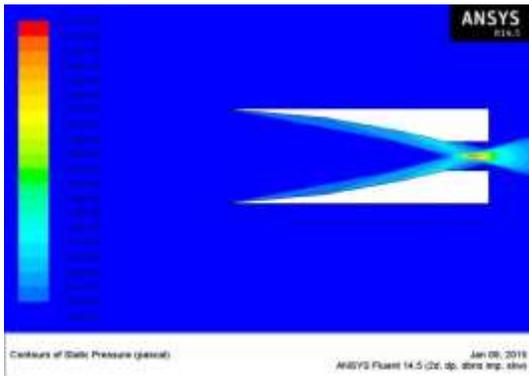


Fig 27 Pressure Contour

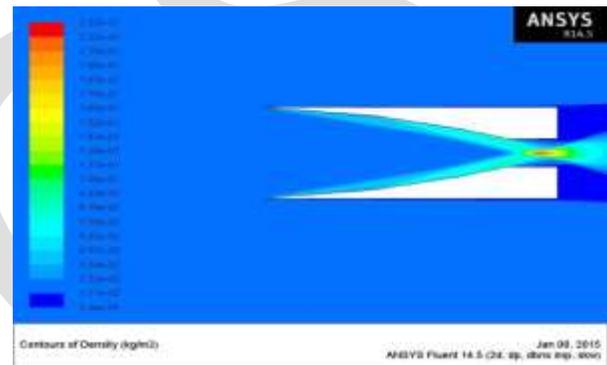


Fig 28 Density Contour

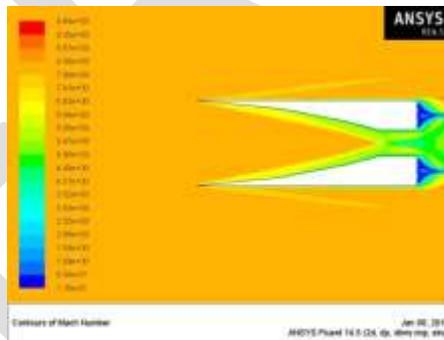


Fig 29 Mach Contour

CONCLUSION

The purpose of this paper was to determine which model is best when compared to other model with higher Mach number. Hence, a Scramjet engine was then modeled in GAMBIT and analysis was carried out in FLUENT for the same with different design models. Amongst all designs, a design with four ramps yielded better results than the other designs. By this Analysis we can conclude the “K-omega turbulence model exactly simulates the flow field characteristics in hypersonic conditions” in capturing shocks at leading edges. The result obtained in the present study and its analysis is applicable only to a similar or a congruent geometry to the geometry that has been proposed in this work. Thus the vital performance parameters obtained from the FEM numerical simulation are compared and analyzed by parameterizing various inlet ramp contour, Mach number and cowl angle at hypersonic limits.

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Comparative Analysis of T- Sugeno and Mamdani Type Fuzzy Logic Controller for PMSM Drives

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Abstract— An electric drive performance is paramount for crucial motion application and greatly influenced by capabilities of controller. For high performance application, vector control technique is normally applied with the permanent magnet induction motor (PMSM) drive. Instead of conventional PID controller fuzzy logic controller (FLC) has been widely used for such application. In this paper, presented for two different inference system namely T-Sugeno and Mamdani FLCs for the performance of vector controlled PMSM drives. The performance of the drive has been investigated for speed control at different loading condition. For T-Sugeno type FLC the performance of drive system is found superior as compared to the Mamdani type FLC in terms of rise time, settling time, under shoots and over shoots. The complete viability of above mentioned vector control strategy is implemented in the MATLAB/Simulink environment and a performance comparison of proposed drive system with different inference system based fuzzy logic controller used in fuzzy logic controller as speed controller for PMSM at no load and with fixed step load has been presented.

Keywords— PMSM drives, Vector control, FLC, Inference system, T-Sugeno Type FLC, Mamdani Type FLC, Speed Controller.

I. INTRODUCTION

From the last three decades AC machine drives are becoming more and more popular, especially Induction Motor Drives (IMD) and Permanent Magnet Synchronous Motor (PMSM), but with some special features, the PMSM drives are ready to meet sophisticated requirements such as fast dynamic response, high power factor, and wide operating speed range like high performance applications, as a result, a gradual gain in the use of PMSM drives will surely be witness in the future market in low and mid power applications.

In recent years, for its superior performance in speed control application FLC is distinguished and captured the attention of researchers. FLC's have the advantage to handle the system nonlinearities [8], and its control performance is not much affected by system parameter variation [3-4].

The objective of this paper is to use the Takagi-sugeno type and mamdani type FLC and compare the performance of FLC for PMSM drives speed control. The stator current vector is represented in the stator flux reference frame, the T-S fuzzy controller calculate the quadrature component of stator current vector. For the proposed controller the rule based is defined in function of speed error and change in speed error using triangular membership function.

The simulation result shown the performance of T-S is good in terms of settling time (t_{st}), rise time (t_r) and torque ripple as compare to mamdani FLC. For two different condition at no load and at full load performance evaluation was carried out through simulation result. The system is dynamically simulated using Simulink/MATLAB Software [5-6].

II. PERMANENT MAGNET SYNCHRONOUS MOTOR DRIVE SYSTEM

The motor drive consists of four main components, the PM motor, inverter, control unit and the position sensor. The components are connected as shown in Fig.1.

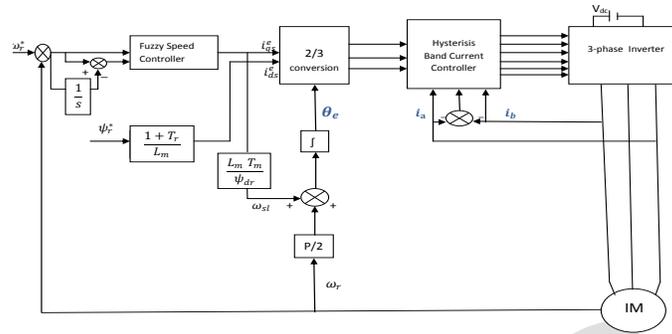


Fig.1 Schematic diagram of indirect vector control PMSM drive

In this work for high performance the indirect vector control technique is incorporated. The actual rotor speed ω_r measured and compared with the ω_r^* . The reference torque T_r^* is calculated as the output, when the resulting error generated from the comparison of the two speeds processed in the controller. A limiter is used to limit the reference torque T_r^* in order to generate the q-axis reference current i_{qs}^* . The d-axis reference current set to zero. Both d-axis and q-axis stator current generate three phase reference current (i_a^* , i_b^* and i_c^*) through Park's Transformation which are compared with sensed winding current (i_a , i_b and i_c) of the IM. The control signals generated after the comparing the sensed current and reference current will fire the power semiconductor devices of the three-phase voltage source inverter (VSI) to produce the actual voltage to be fed to the induction motor.

In synchronously rotating reference frame the mathematical model for a three-phase y-connected squirrel-cage induction motor under steady state condition and load is given as [7-10].

$$\begin{bmatrix} I_{qs}^e \\ I_{ds}^e \\ I_{qr}^e \\ I_{dr}^e \end{bmatrix} = \begin{bmatrix} R_s & \omega_s L_s & 0 & \omega_s L_m \\ -\omega_s L_s & R_s & -\omega_s L_m & 0 \\ 0 & \omega_{sl} L_m & R_r & \omega_{sl} L_r \\ -\omega_{sl} L_m & 0 & -\omega_{sl} L_r & R_r \end{bmatrix} \begin{bmatrix} v_{qs}^e \\ v_{ds}^e \\ 0 \\ 0 \end{bmatrix} \quad (1)$$

$$T_e = \frac{3}{2} \frac{p}{2} L_m (i_{qs}^e i_{dr}^e - i_{ds}^e i_{qr}^e) \quad (2)$$

$$T_e - T_L = J \frac{d\omega_r}{dt} + B\omega_r \quad (3)$$

$$\frac{d\theta_r}{dt} = \omega_r \quad (4)$$

Where i_{ds}^e, i_{qs}^e are d,q-axis stator current respectively, are v_{ds}^e, v_{qs}^e are d,q-axis stator voltages respectively, i_{dr}^e, i_{qr}^e are d,q-axis rotor current respectively R_s, R_r are stator and rotor resistance per phase respectively, L_s, L_r are the self inductances of the stator and rotor respectively, L_m is the mutual inductance, ω_e is the speed of the rotating magnetic field, ω_r is the rotor speed, p is the number of poles, T_e is the developed electromagnetic torque, T_L is the load torque, J is the inertia, B is the rotor damping coefficient and θ_r is the rotor position. The key feature of the vector control is to keep the magnetizing current at a constant rated value by setting $i_{dr}^e = 0$. Thus, by adjusting only the torque-producing current component the torque demand can be controlled. With this assumption, the mathematical formulation can be rewritten as

$$\omega_{sl} = \frac{R_r i_{qs}^e}{L_r i_{ds}^e} \quad (5)$$

$$i_{qs}^e = \frac{L_m}{L_r} i_{qr}^e \quad (6)$$

$$T_e = \frac{3 P L_m}{2 \cdot 2 L_r} \psi_{dr}^e i_{qs}^e \quad (7)$$

Where ω_{sl} is the slip speed ψ_{dr}^e is the d-axis rotor flux linkage. The indirect vector controlled drive system with FLC assisted speed controller model is represented from equation (1) to equation (7).

III. Vector Control PMSM Drive

The vector control separates the torque and flux channels in the machine through its stator excitation inputs. The vector control for PMSM is very similar to the vector control of induction motor drives. In this section, the vector control of the three-phase PMSM is derived from its dynamic model. Considering the currents as inputs, the three-phase currents are:

$$i_a = i_s \sin(\omega_r t + \delta) \quad (8)$$

$$i_b = i_s \sin(\omega_r t + \delta - \frac{2\pi}{3}) \quad (9)$$

$$i_c = i_s \sin(\omega_r t + \delta + \frac{2\pi}{3}) \quad (10)$$

Where δ is the angle between the rotor field and stator current pastors.

The previous currents obtained are the stator currents that must be transformed to the rotor reference frame with the rotor speed ω_r , using Park's transformation. The q and d axis Currents are constants in the rotor reference frames since δ is a constant for a given load torque. As these constants, they are similar to the armature and field currents in the separately excited dc machine. The q axis current is distinctly equivalent to the armature Current of the dc machine; the d axis current is field current, but not in its entirety. It is only a Partial field current; the other part is contributed by the equivalent current source representing the permanent magnet field. For this reason the q axis current is called the torque producing component of the stator current and the d axis current is called the flux producing component of the stator current.

Using park's transformation this stator current must be transformed to rotor reference frame [11-12]

$$\begin{bmatrix} i_q \\ i_d \\ i_0 \end{bmatrix} = \frac{2}{3} \begin{bmatrix} \cos \theta_r & \cos(\theta_r - 120) & \cos(\theta_r + 120) \\ \sin \theta_r & \sin(\theta_r - 120) & \sin(\theta_r + 120) \\ \frac{1}{2} & \frac{1}{2} & \frac{1}{2} \end{bmatrix} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} \quad (10)$$

Putting the equation (7), (8) and (9) in (10) and solving, then we get

$$\begin{pmatrix} i_q \\ i_d \end{pmatrix} = (i_s) \begin{pmatrix} \sin \delta \\ \cos \delta \end{pmatrix} \quad (11)$$

Using equation (7) and (11) the electromagnetic torque is obtained as given below

$$T_e = \frac{3}{2} \cdot \frac{p}{2} \left[\frac{1}{2} (L_d - L_q) i_s^2 \sin 2\delta + \lambda_f i_s \sin \delta \right] \quad (12)$$

In order to achieve dc motor like behavior, the control needs knowledge of position of the instantaneous rotor flux or rotor position of PM motor. Knowing the position, the three phases current can be calculated.

Its calculation using the current matrix depends on the control desired.

a. Constant Torque Operation.

b. Flux weakening Operation.

These options are based in the physical limitation of the motor and the inverter. The limit is established by the rated speed of the motor, at which speed the constant torque operation finishes and flux weakening starts shown in Fig.2.

IV. Constant Torque Operation

In this control strategy the d-axis current is kept zero, while the vector current is align with the q-axis in order to maintain the torque angle equal with 90° . This is one of the most used control strategy because of the simplicity, especially for SPMSM. In case of IPMSM, with a high saliency ratio it is not recommended to use this control strategy because of the reluctance torque produced.

The torque equation can be rewritten as:

$$T_e = \frac{3}{2} \left(\frac{p}{2} \right) \lambda_f i_q \quad (13)$$

So,

$$T_e = K_t \cdot i_q \text{ where, } K_t = \left(\frac{3}{2} \right) \left(\frac{p}{2} \right) \lambda_f \quad (14)$$

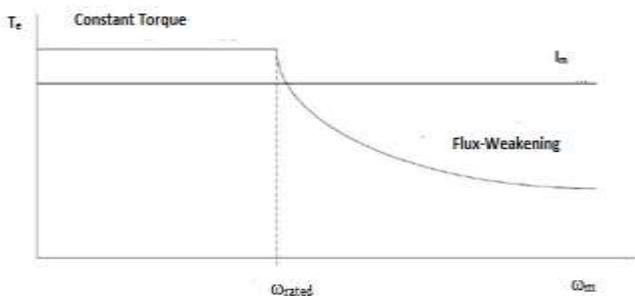


Fig.2 PMSM Characteristics in Constant Torque and Field- Weakening Regions

Note that the torque equation (14) resembles with that of the dc machine where the torque is only dependent on quadrature axis current when we consider the field flux constant and hence provide its equivalent operation.

V. FLC DESIGNING

Fig.3 show the general block diagram of FLC. The main objective of the designed FLC is to maintain the performance obtained by 'standard design' while reducing the complexity of fuzzy rule base design . FLC has mainly four intrnal component from which input has to be processed to come out as output.

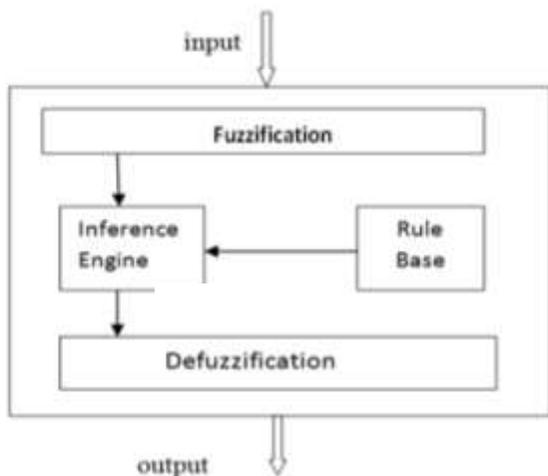


Fig.3 Block diagram of FLC

These component are –

Fuzzification- is the conversion of crisp numerical values into fuzzy linguistic quantifiers. Fuzzification is performed using membership functions. Each membership function evaluates how well the linguistic variable may be described by a particular fuzzy qualifier.

Inference Engine- The inference engine uses the fuzzy vectors to evaluate the fuzzy rules and producing an output for each rule. Mandani type fuzzy inference engine is used for this particular work.

Defuzzification- in this process the combined output fuzzy set produced from the inference engine into a crisp output value of real- world meaning. Center of gravity defuzzification.

VI. FUZZY INFERENCE SYSTEM

Fuzzy inference is the process of formulating the mapping from given input(s) to output(s) using fuzzy logic. This mapping provides a basis from which decisions can be made, or patterns discerned. It has found successful applications in a wide variety of fields, such as automatic control, data classification, decision analysis, expert systems, time series prediction, robotics, and pattern recognition. Because of its multidisciplinary nature, the fuzzy inference system is known by numerous other names, such as fuzzy-rule-based system, fuzzy expert system, fuzzy model, fuzzy associative memory, fuzzy logic controller and simply (and ambiguously) fuzzy system [1].

A fuzzy inference system with crisp inputs and outputs implements a nonlinear mapping from its inputs space to output space. This mapping is accomplished by a number of fuzzy if-then rules, each of which describes the local behavior of the mapping. In particular, the antecedent of a rule defines a fuzzy region in the input space, while the consequent specifies the output in the fuzzy region. Basically a fuzzy inference system is composed of five functional blocks as shown in Fig.4.

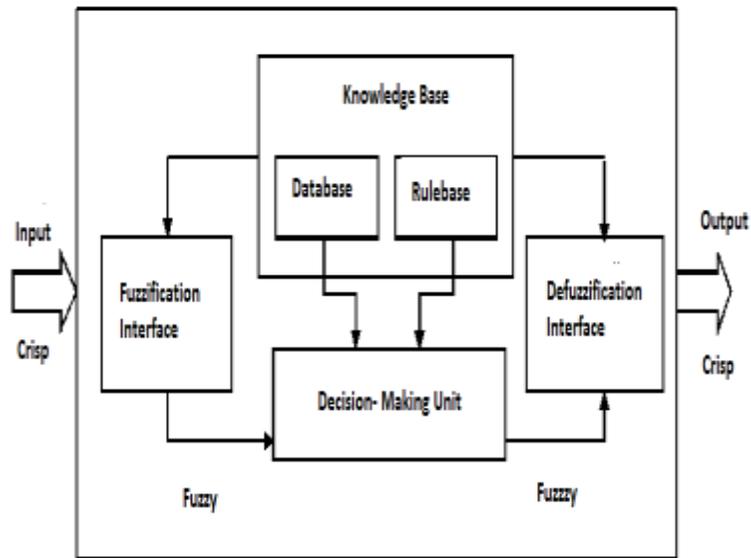


Fig.4 Structure of the Fuzzy Inference System

The Structure of the Fuzzy Inference system is described as

- A rule base containing a number of fuzzy if-then rules.
- A database which defines the membership functions of the fuzzy sets used in fuzzy rules.
- A decision-making unit which performs the inference operations on the rules.
- A fuzzification interface which transforms the crisp inputs into degrees of match with linguistic values.
- A defuzzification interface which transform the fuzzy results of the inference into a crisp output.

The rule base and the database are jointly referred to as the knowledge base. Fuzzy if-then rules or fuzzy conditional statements are expressions of the form: If x is A Then y is B. where, x and y are input and output linguistic variables. A and B are labels of the fuzzy sets characterized by appropriate membership functions. A is the premise and B is the consequent parts of the fuzzy rule. Fuzzy values A and B are described by the membership functions. The forms of membership functions are different and problem depended. The steps of fuzzy reasoning (inference operations upon fuzzy IF–THEN rules) performed by FISs are described as follows

- Compare the input variables with the membership functions on the antecedent part to obtain the membership values of each linguistic label (this step is often called fuzzification).
- Combine (usually multiplication or min) the membership values on the premise part to get firing strength (weight) of each rule.
- Generate the qualified consequents (either fuzzy or crisp) of each rule depending on the firing strength.
- Aggregate the qualified consequents to produce a crisp output (This step is called defuzzification).

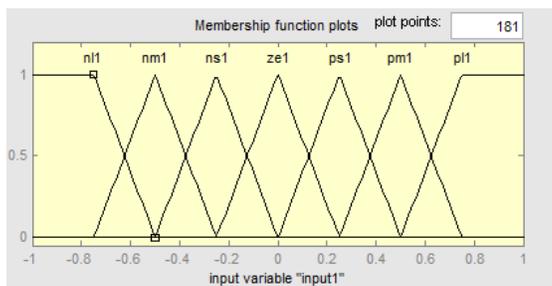
The most common types of fuzzy reasoning that have been introduced in the literature and applied to different applications are Mamdani and Sugeno type models [1], [8]. The most fundamental difference between Mamdani-type FIS and Sugeno-type FIS is the way the crisp output is generated from the fuzzy inputs. Mamdani-type FIS uses the technique of defuzzification of a fuzzy output, while Sugeno-type FIS uses weighted average to compute the crisp output. Hence, Mamdani FIS has output membership functions whereas Sugeno FIS has no output membership functions. Mamdani type is widely accepted for capturing expert knowledge [2]. It allows describing the expertise in more intuitive, more humanlike manner. However, Mamdani-type entails a substantial computational burden. On the other hand, Sugeno method is computationally efficient and works well with optimization and adaptive

techniques, which makes it very attractive in different applications. Mamdani-type FIS is less flexible in system design in comparison to Sugeno-type FIS [1-2].

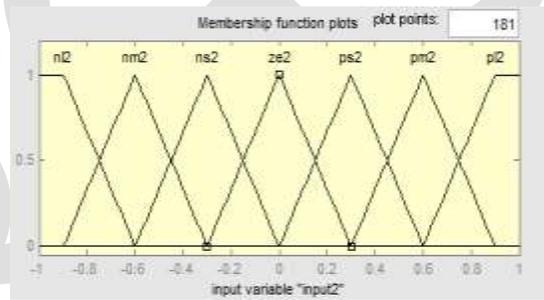
(A) Mamdani Inference System

The most commonly used fuzzy inference technique is the so-called Mamdani method (Mamdani&Assilian, 1975) which was proposed, by Mamdani and Assilian, as the very first attempt to control a steam engine and boiler combination by synthesizing a set of linguistic control rules obtained from experienced human operators. Their work was inspired by an equally influential publication by Zadeh (Zadeh, 1973). Interest in fuzzy control has continued ever since, and the literature on the subject has grown rapidly. A survey of the field with fairly extensive references may be found in (Lee, 1990) or, more recently, in (Sala et al., 2005). In Mamdani's model the fuzzy implication is modeled by Mamdani's minimum operator, the conjunction operator is min, the t-norm from compositional rule is min and for the aggregation of the rules the max operator is used. In order to explain the working with this model of FLC will be considered the example from (Rakic, 2010) where a simple two-input one-output problem that includes three rules is examined

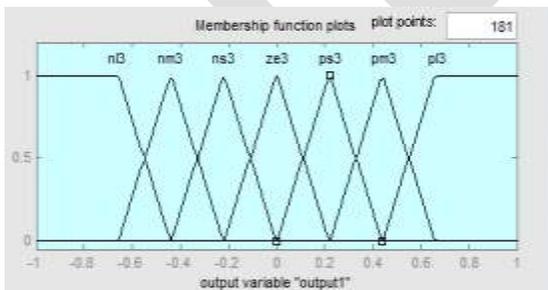
In this thesis, mamdani inference used with center of gravity defuzzification method and 49 rules, Fig.5 (a), (b), (c), and (d) shows the input1, input2 and output, which are speed error, change in speed error and d-axis stator current respectively and surface plot.



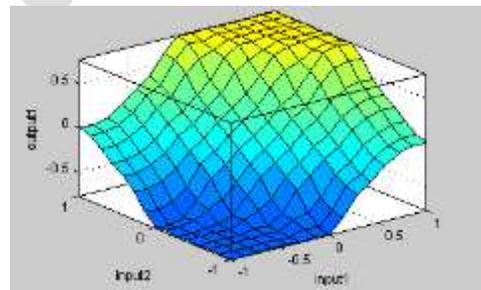
(a)



(b)



(c)



(d)

Fig. 5 Membership Functions for Input1, Input2, Output and Surface Plot.

(B). Sugeno-Type Fuzzy Inference

The fuzzy inference process we've been referring to so far is known as Mamdani's fuzzy inference method, the most common methodology. In this section, we discuss the so-called Sugeno, or Takagi-Sugeno-Kang, method of fuzzy inference. Introduced in 1985 [Sug85], it is similar to the Mamdani method in many respects. The first two parts of the fuzzy inference process, fuzzifying the inputs and applying the fuzzy operator, are exactly the same. The main difference between Mamdani and Sugeno is that the Sugeno output membership functions are either linear or constant.

A typical rule in a Sugeno fuzzy model has the form

$$\text{If Input 1} = x \text{ and Input 2} = y, \text{ then Output is } z = ax + by + c$$

For a zero-order Sugeno model, the output level z is a constant ($a=b=0$).

The output level z_i of each rule is weighted by the firing strength w_i of the rule. For example, for an AND rule with Input 1 = x and Input 2 = y , the firing strength is

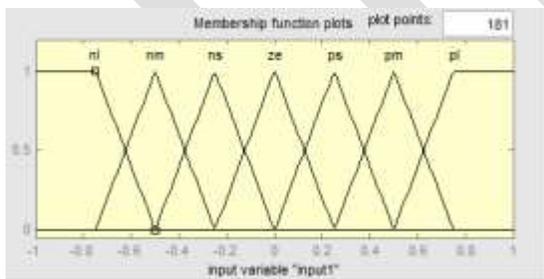
$$W_i = \text{AndMethod}(F_1(x), F_2(y)) \tag{15}$$

where F_1, F_2 are the membership functions for inputs 1 and 2. The final output of the system is the weighted average of all rule outputs, computed as:

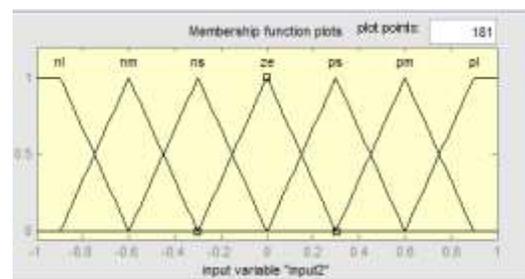
$$\text{FinalOutput} = \frac{\sum_{i=1}^N w_i z_i}{\sum_{i=1}^N w_i} \tag{16}$$

Where $w_i = \prod_k x_i^k$ and z_i is the corresponding output.

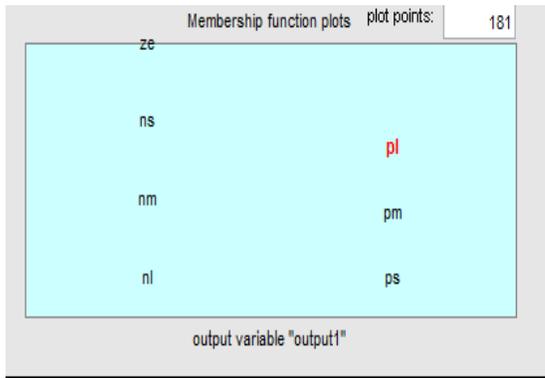
In this work T-S inference used with witage average defuzzification method and 49 rules for speed control PMSM drives. Fig.6 (a), (b), (c) and (d) shows the input1, input2, output which are the speed error, change in speed error and d-axis stator current respectively and surface plot.



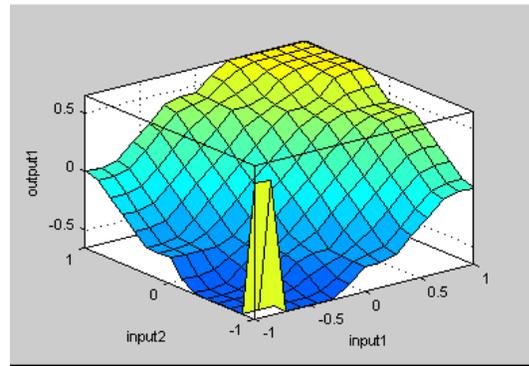
(a)



(b)



(c)



(d)

Fig.6 Membership Function for Input1, Input2, Output and Surface Plot

VII. Result and Discussion

For the comparison of the performance of T-S and Mamdani type FLC for speed control of PMSM drives simulink model was developed. For the performance evaluation of the proposed fuzzy logic controllers based indirect vector control PMSM drive, simulated under no load and sudden step change in load condition. The parameters values are tabulated in Appendix A. The motor is operated in constant torque mode. In the designed model for performance improvement of PMSM drive system, two controllers have been integrated: One as outer speed controller and other as inner current controller.

The simulation runs for a period of 0.4 second with reference speed of 52.3 rad/sec. and load torque 1.05 N-m.

Case. 1 No load with reference speed 52.3 rad/sec.

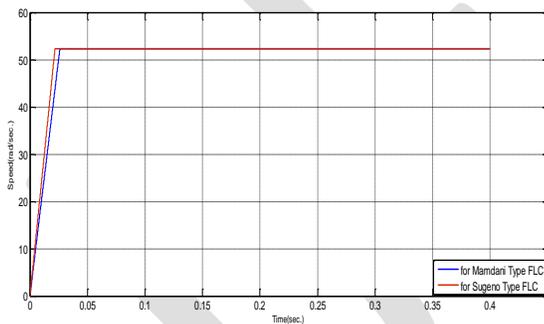


Fig. 7(a) Speed Response of Mamdani Type and T-Sugeno Type FLC at No-Load with Reference speed is 52.3 rad/sec.

From the Fig.7(a) it is clear that the settling time is reduced, when used the Sugeno type FLC as compared to Mamdani type FLC. Here settling time is 0.018 sec. for Sugeno type FLC and 0.024 for Mamdani type FLC at no load condition with reference speed is 52.3 rad/sec.

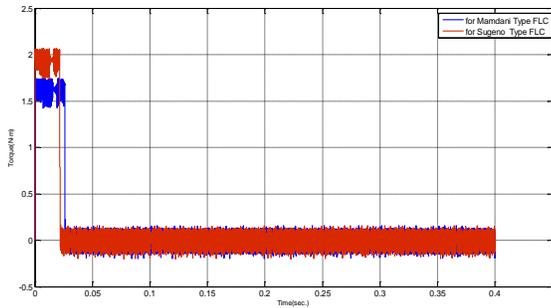


Fig.7(b) Torque Response of Mamdani Type and T-Sugeno Type FLC at No-Load with Reference speed is 52.3 rad/sec.

In Fig.7(b) red color shows the torque response of Sugeno type FLC and blue color shows the Mamdani type FLC torque response. It is clear that the starting torque is higher, lesser settling time, rise time and ripples, when used the Sugeno type FLC as compared to Mamdani type FLC. Here settling time is 0.018 sec. for Sugeno type FLC and 0.024 for Mamdani type FLC.

Case II- Transient loading with step load and reference speed is 52.3 rad/sec.

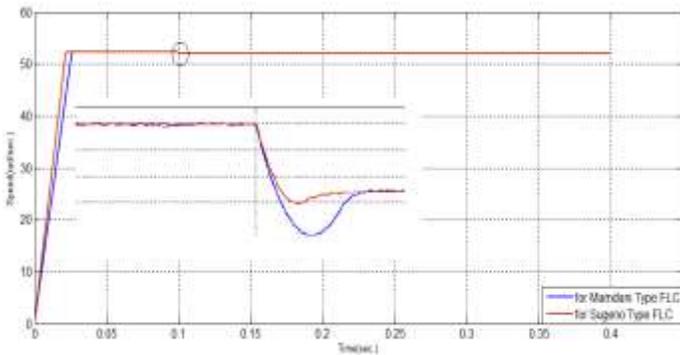


Fig.8(a) Speed Response of Mamdani Type and T-Sugeno Type FLC at Transient loading condition (Step-Load) with Reference speed is 52.3 rad/sec.

Transient speed response is shown in the Fig.8(a) red color shows the response of Sugeno type FLC and blue color shows the response of Mamdani type FLC. The step load is suddenly applied at 0.1 sec, speed is reduced from 52.3 rad/sec. to 52.04 rad/sec. After the loading undershoot is present in speed response of Mamdani type FLC and no undershoots and overshoots are present in speed response of Sugeno type FLC. Final value of speed is reached by both type of FLC is 52.04 rad/sec.

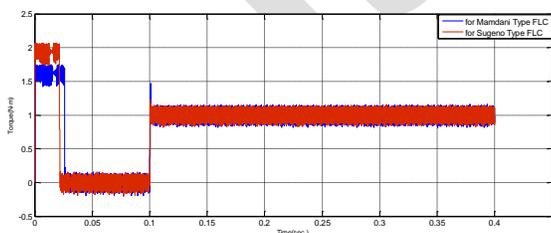


Fig. 8(b) Torque Response of Mamdani Type and T-Sugeno Type FLC at Transient loading condition (Step-Load) with Reference speed is 52.3 rad/sec.

Fig.8(b) shows the torque response of both type of FLC. Red color shows the Sugeno type FLC response and blue color Mamdani type FLC response. Torque ripples, rise time and settling time are lesser in response of Sugeno type FLC as compared to Mamdani type FLC. Larger starting torque is provide by Sugeno type FLC. Final value of torque is 1N-m reached by both type of FLC.

Case.III – Dynamic loading condition with Step-Load applied from the starting of the machine and reference speed is 52.3 rad/sec.

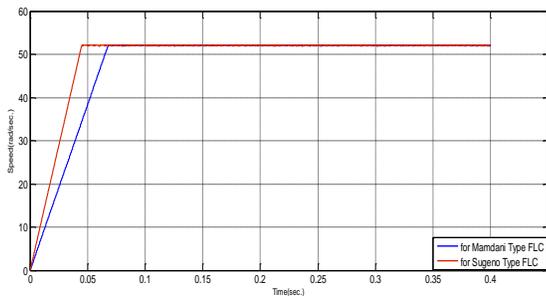


Fig. 9(a) Speed Response of Mamdani Type and T-Sugeno Type FLC at Dynamic Loading Condition with Reference speed is 52.3 rad/sec.

Fig.9(a) shows the response of both the FLC at dynamic loading condition. Here step-load is applied from the starting time on the motor with reference speed is 52.3 rad/sec. Here settling time is .049 sec. when Sugeno type FLC used and 0.069 sec. when Mamdani type FLC is used for speed control. Final value of speed is reached by both type of FLC is 52.04 rad/sec.

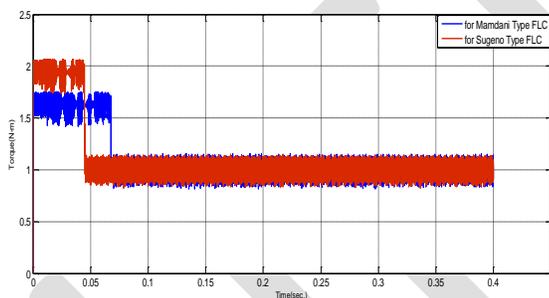


Fig.9(b) Torque Response of Mamdani Type and T-Sugeno Type FLC at Dynamic Loading Condition with Reference speed is 52.3 rad/sec.

In Fig.9(b) torque response is shown. From the Fig. rise time, settling time and ripple are lesser in Sugeno type FLC response as compared to Mamdani type FLC. Here settling time is 0.49 sec. for Sugeno type FLC and 0.069 sec. for Mamdani type FLC. Final value of torque is 1 N-m reached by both type of FLC and starting torque is also higher when Sugeno type FLC is use for speed control.

VIII. ACKNOWLEDGEMENT

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IX. Conclusion

This paper is mainly emphasized on the study of performance of PMSM drive systems using two different inference system namely Mamdani and T-Sugeno. In order to run PM motor at the desired speed, a closed loop with vector control PMSM drive was successfully designed and operated in constant torque mode. The feasibility of the above mentioned integrated control strategy is modeled and verified in the MATLAB/Simulink environment for effectiveness of the study.

From the obtained results we observed that, during both no load and step load conditions T-S type FLC reduces the settling time and rise time and does not exhibit any overshoot and undershoot. Starting torque is higher when Sugeno type FLC is used for speed control. Higher starting current is one and only drawback of Sugeno type FLC. While comparing with the Mamdani type FLC and this technique has superior performance. The simulation results are presented in forward motoring under no-load, sudden change in step load operating conditions

So the proposed model with T-S type FLC as speed controller improved performances as compared to mamdani type FLC controller that have been taken in consideration in this work.

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Magnified Coherency Technique for Effective Relational Keyword Search

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Abstract-In the past decade, extending the keyword search paradigm to relational data has been an active area of research within the database and information retrieval community. Many approaches have been proposed but there remains severe lack of standardization for system evaluations. This paper presents the most extensive empirical performance evaluation of relational keyword using an enhanced coherency technique in a peer to peer system. In this paper consider a peer to peer system having same databases for relational keyword searching and evaluations. From one remote system we can directly access all the other relational databases that is connected to a network and evaluate the efficiency of new proposing searching algorithm with traditional searching method. The results indicate that traditional approach have little time consuming whenever the number of nodes increases. In summary my work confirms the unacceptable performance of traditional approach by using an enhanced coherency technique.

Keywords-Relational data, performance evaluation, tuples, sampling, DISCOVER, coherency technique, random walk.

1. INTRODUCTION

Keyword search is the most popular information discovery method. When a set of keyword is provided by the user, the search engine results all the documents that are related with these keywords. Unfortunately, keyword search techniques used for locating information from collections of web documents cannot be used on data stored in databases. In relation databases, information needed to answer a keyword query is split across the tuples in tables, due to normalization. This paper describes the keyword search in relational databases in a peer to peer system using DISCOVER algorithm. It explores the most extensive empirical performance evaluation of relational keyword search compared with the traditional approach. Typically the user of a relational database needs to know the schema of the database SQL or QBE-like interface, and the roles of the different entities and terms used in the query. The user of the DISCOVER does not need a vast knowledge of any of the above. It enables a straight forward keyword search interface to the database. DISCOVER does not require from the user to know the relations and the attributes where the keywords are found.

This paper present a thorough empirical performance evaluation of relational keyword search system dynamically based on the benchmark and introducing the DISCOVER algorithm, which is more powerful and efficient than the existing keyword search technique in relational databases.

Overview of Relational Keyword Search

The implicit assumption of keyword search is, the search terms are related complicates the search process because typically there are many possible relationships between two search terms. This realization leads to little tension between the compactness and coverage of search results. This paper proves that DISCOVER finds without redundancy all relevant candidate networks by exploiting the structure of the schema. DISCOVER operates on relational databases and facilitates information discovery on them. A high level representation of the architecture DISCOVER used to find the joining networks shown in figure 1.

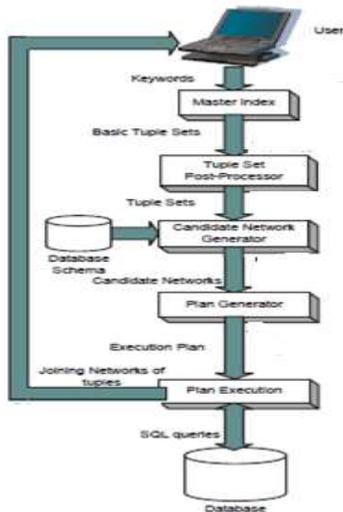


Figure 1. Architecture of discover algorithm.

First user gives a set of keywords k_1, \dots, k_m to the system. These keywords are looked up in Master Index, which returns the tuple sets $R_i^{k_1}, \dots, R_i^{k_m}$ for each relation R_i . Every tuple of $R_i^{k_j}$ contains keyword K_j as part of an attribute value. Then DISCOVER calculates all candidate networks. The set of candidate networks is guaranteed to produce all the minimal joining networks. Then DISCOVER evaluates the candidate networks. The candidate networks share join to expressions. So this causes an opportunity to build a set of intermediate results and use these in the calculation of multiple candidate networks. The Plan Generator generates an execution plan that calculates the intermediate results for evaluating the candidate networks. Finally an SQL statements are passed to the DBMS. Then DBMS returns the joining networks of tuples that are the solution to the query problem.

Contribution of this paper.

- Propose a cost model. The plan generator module uses intermediate results to minimize the total cost of the evaluation of all candidate networks.
- Prove that candidate network generation algorithm creates a complete (the set of candidate networks produces all minimal joining networks of tuples up to a given size T) and non-redundant (if any candidate network of the set is excluded then there are DB instances where there are minimal joining networks of tuples that are not discovered) sets of candidate networks.

2. Related Works

A framework for keyword search on databases when the schema is not known to the user is presented in [4] [5]. An extension of SQL called Reflective SQL (RSQL) is treats data and queries uniformly. The main limitation of this work is that all keywords must be contained in the same tuples. BLINKS [3] an indexing and query processing scheme for ranked keyword search over node-labeled directed graphs. It uses the backward search strategy of BANKS [6] but based on cost-based expansion. BLINKS needs to use separate cursors not just for each keyword cluster but also for each block that it has to traverse. So overhead of maintaining these cursors adversely affect the overall performance. BLINKS lack approximation and run-time guarantees because of the use of indexes and a different metric. STAR [2] runs simple breadth first search iterators from each terminal instead of running single source shortest path iterators from each node of v in BANKS. STAR has to maintain only two iterators per improvement step so we have to avoid performance degradation. It uses fairly tight upper bounds on the lengths of the paths and prunes the possible paths that can be included in the result tree. It achieves $o(\log n)$ approximation for the optimal Steiner tree problem. The drawback of this approach is that a graph of the tuple must be created and maintained for the database.

In contrast DISCOVER is tuned to keyword search on relational databases and uses the properties of the schema of the database. Its main algorithm works on the schema graph and it does not need to keep any extra data representations. It produces the minimum number of SQL queries needed to answer to the keyword query. DISCOVER operates directly on the databases, so it does not have a main memory space limitation.

The use of common sub expressions by the plan generator is a form of multi-query optimization [7][8][9]. The candidate networks in DISCOVER have special properties that allows to develop a more better straight forward and efficient algorithm. The first property is

that the candidate networks have small relations as leaves. Second, the candidate networks are not random queries. The existing search techniques are adhoc with little standardization. The previous work [11] compares relational keyword search techniques but does not consider run time performance. So this work aims to evaluate the runtime performance of relational keyword search technique with DISCOVER method dynamically in a peer to peer system.

3. Frameworks

3.1 Data Model and Keyword Queries

Consider a database that has n relations R_1, \dots, R_n . Each relation R_i has m_i attributes $a_1^i, \dots, a_{m_i}^i$. The schema graph G is a directed graph that captures the primary key to foreign key relationships in the DB schema. So an edge $R_i \rightarrow R_j$ identifies the corresponding primary and foreign key attributes. Assume that no sets of attributes of any relation in schema are both a primary key and foreign key for two other relations in database schema.

Definition 1 (Joining network of tuples in a relational schema)-A joining network of tuples j is a tree of tuples where for each pair of adjacent tuples $t_i, t_j \in j$ where $t_i \in R_i$ and $t_j \in R_j$, there is an edge (R_i, R_j) in G_u and $(t_i \bowtie t_j) \in (R_i \bowtie R_j)$.

Definition 2 (Keyword Query)-A keyword is a set of keywords k_1, \dots, k_m . The result of the query is the set of all possible joining networks of tuples in the schema that are both minimal and total.

Definition 3 (Joining network of tuple sets in a relational schema)-A joining network of tuple sets J is a tree of tuple sets $R_i^k R_j^M$ in J there is an edge (R_i, R_j) in G_u .

Definition 4 (Candidate network)-A candidate network C is a joining network of tuple sets, such that has a MTJNT (minimal total joining networks of tuples) $M \in C$ and no tuple $t \in M$ that maps to a free tuple set $F \in C$ contains any key words.

Definition 5 (Execution Plan)- Consider a set of candidate networks C_1, \dots, C_r , an execution plan is a list of assignments A_1, \dots, A_s of the form $H_i \leftarrow B_i, \bowtie, \dots, B_i, t$.

3.2 Architecture of DISCOVER

In this section, formally define the architecture of DISCOVER algorithm.

The Master Index inputs a set of keywords k_1, \dots, k_m and outputs a sets of basic tuple sets denoted as $R_i^{-k_j}$ for $i=1, \dots, n$ and $j=1, \dots, m$. It consist of all tuples of relation R_i that contain the keyword k_j . The master index is implemented using the Oracle8i interMediaText8.1.5 extension. It builds full text indices on single attributes of relations. Then it inspects the index of each attribute and combines the results. Then the tuple set post-processor takes the basic tuple sets and produces tuple sets R_i^k for all subsets k of $\{k_1, \dots, k_m\}$. The non-empty tuple sets passed to the candidate network generator. Then the set of candidate networks transferred to the plan generator, which optimizes the evaluation of networks. Finally the execution plan is going to the Plan Execution module, which translates the assignments of the plan to SQL. The assignments that build intermediate results are translated to "CREATE TABLE" statements and the candidate network evaluation assignments to "SELECT-FROM-WHERE" statements is the result of the keyword search and the result is returned to the user.

4. Candidate Network Generation

Candidate network generator outputs a complete and non-redundant set of candidate networks. Ensures that the joining networks of tuples are total and minimal.

4.1 Candidate networks generation algorithm

Algorithm Candidate Networks Generator

Input: tuple set graph G, T, k_1, \dots, k_m

Output: set of all candidate networks in the relational database with size up to T

{

Q: queue of active joining networks of all possible tuple sets in a relation

```

    Pick a keyword  $kt \in \{k_1, \dots, k_m\}$ 
    for each tuple set  $R_i^K$  where  $i = 1 \dots n$  and  $kt \in K$  do
        Add joining networks of tuple sets  $R_i^K$  to Q
    while Q not empty do {
        Get head C from Q
    if candidate network C satisfies the pruning condition of the Discover then ignore C
    else if C satisfies the acceptance conditions of the DISCOVER then output C
        /*There is no reason found to extend accepted joining networks of tuple sets in a relation*/
    else
    for each tuple set  $R_i^K$  adjacent in GT S (ignoring edge direction) to a node of C
    if  $(K = \{ \} \text{ OR } \exists R_j^M \in (CU R_i^K, M \neq \{ \} \wedge \text{keywords}(C \cup R_i^K) = \text{keywords}((C \cup R_i^K) - R_j^M))$ 
        /*Expansion rule*/
    and (size of C < T) then {
    if  $R_{ii}^K$  is adjacent to  $R_j^M$   $C = R_j^M [ \dots ]$  then  $C \leftarrow R_i^K [R_j^M [ \dots ]]$ 
        Put C in Q
    }
    else ignore  $R_i^K$ 
    } }
    
```

5 Evaluation of candidate networks

Cost Model- Assign a cost of 1 to each join. The actual cost model of DISCOVER exploits the fact that we can get the sizes of the non-free tuple sets from the master index. The cost of the execution plan is the sum of the costs of its joins.

5.1 Greedy Algorithm

It produces a near optimal execution plan, with respect to the actual cost model.

Algorithm Select list of intermediate results generated by the Naïve method

Input: set S of candidate networks of size $\leq T$

Output: Produce a list L of intermediate results to build for the evaluation.

```

{
    While not all candidate networks generated in S have been added to L do
    {
    Let Z be the set of all small join sub expressions of 1 join contained in at least one candidate network in S ;
    Add the intermediate result m with the maximum value in Z to L;
    Rewrite all candidate networks in S to use m with possible;
    }
    }
    
```

6 . Experiments

Consider a peer to peer system having the same SQL databases. Using the sampling mechanism to find out the active nodes in the network. Random walk is used to find out the visited and non-visited nodes based on the systems having SQL database or not. It is

shown in figure 4 and 5. Sampling is one of the basic statistical tools used heavily in information integration and knowledge discovery for approximating results from large datasets.

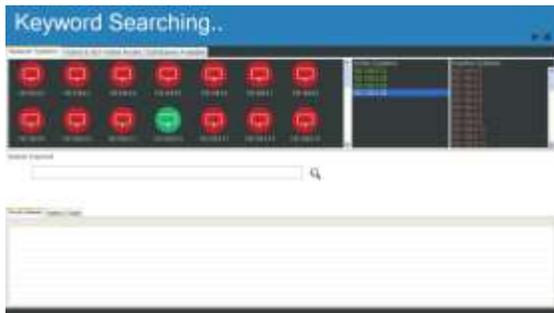


Figure 4 Active systems

Random walk based techniques have been developed to collect uniform samples from the distributed data. In a graph G random walk is a sequence of nodes visited where at each step the next destination node is selected with a fixed probability.

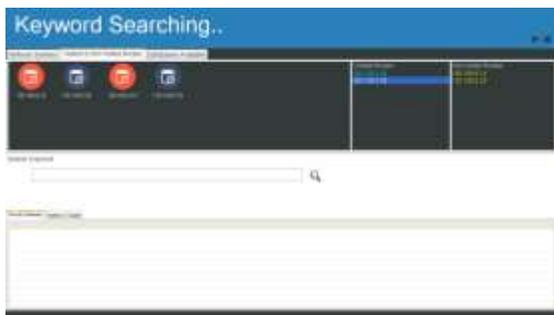


Figure 5 Visited nodes

In tuples clustering apply the fast clustering method to the classification of the database tuples. The similarity of sample is measured by distance. Then implement the DISCOVER algorithm to find out the relevant data from all the connected databases in a network from one remote system. Then analyse the results with the traditional approach and DISCOVER algorithm. Performance evaluation use two metrics to measure the run time performance. Execution time and response time. Execution time ,which is the time elapsed from issuing a query until an algorithm terminates because there are large number of potential results for each query, search techniques typically returns only the top-k results where k specifies retrieval depth. The response time is the time elapsed from issuing the query until I results have been retrieved. The graph of response times of both techniques (traditional and DISCOVER) is plotted in figure 6.

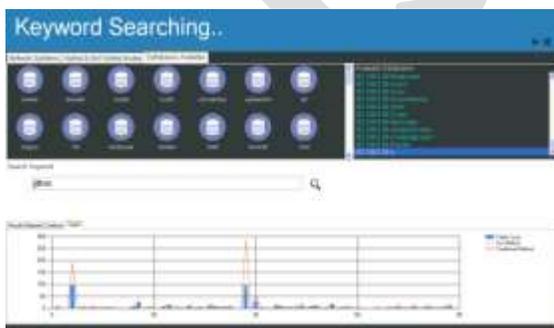


Figure6..Response time comparison.

Then the memory is measured for both the techniques. The schema based systems consumes very little memory. In contrast graph based approaches require considerably more memory to store their data graph.



Figure 7 Table counts.

Then calculate the no of counts of tables for searching the keyword in both methods. From the results we can conclude that the DISCOVER algorithm is little accurate than the traditional method.

ACKNOWLEDGEMENT

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7. CONCLUSION AND FUTURE WORK

The importance of internet and internet users increasing day by day. Internet users increasingly demand keyword search interfaces for accessing information and it is natural to extend this paradigm to relational data. The lack of technology transfer with discrepancies among existing evaluations indicates a need for independent evaluation of search techniques dynamically in relational databases with minimum cost and maximum efficiency.

The DISCOVER algorithm covers the drawbacks of traditional method and it gives an opportunity to the user to extract the data easily without knowing the detailed knowledge of the query language.

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MAXIMUM POWER POINT TRACKING OF A PV SYSTEM BY BACTERIA FORAGING ORIENTED PARTICLE SWARM OPTIMIZATION

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ABSTRACT: This paper proposes a Bacteria Foraging oriented by Particle Swarm Optimization algorithm (BF-PSO) with open circuit voltage maximum power point tracking (MPPT) method is used to track the maximum power for the photovoltaic (PV) system. The proposed method has ability to track the maximum power point (MPP) for different insolation levels and maintains the constant output voltage. In this, MPPT is employed in conjunction with the boost converter, where boost converter is used to rise the voltage generated by PV module to required voltage level. The implementation of this proposed algorithm is very simple and performs quick calculations. At the end, the effectiveness of the proposed BF- PSO is compared with 'without MPPT' and highlighted by simulation results.

INDEX TERMS: Photo voltaic (PV) system, maximum power point tracking (MPPT), bacteria foraging (BF), particle swarm optimization (PSO), bacterial foraging –particle swarm optimization (BF-PSO), Boost Converter.

I. INTRODUCTION

Energy crisis over the last decades and environmental problems gives great attentions on energy management. This paper deals with one of the renewable energy source like solar photovoltaic (PV) system, which is predicted to be a popular source due to numerous advantages, especially low maintenance, operational cost and no emission of harmful gases, hence environmentally friendly[1-4]. These PV systems directly give electrical energy from solar energy without into other energy conversion, thereby efficiency of the solar PV system is high. The challenge in PV system is tracking of maximum efficiency, due to climate changing. In this paper maximum power point tracker (MPPT) is generally used with dc–dc converter to set the maximum power point. To optimize the utilization of large PV arrays or modules, MPPT is normally employed in conjunction with the power converter[1]. This tracking technique is needed in solar power generation due to non linear I-V characteristics of solar cell.

In general there are several MPPT methods[5] are there but they are different in various aspects and controlling variables such as voltage, current and firing angle. 1) Perturb & Observe method (P&O), this method introduce some perturbation and maintain operating point around maximum point and but the only disadvantage with this method is it can't track MPP under fast shading conditions, 2) Incremental conductance method, which evaluates the proportion of derivative of conductance with the instant conductance, 3) short circuit current method will calculate I_{MP} based on I_{SC} similarly 4) Open circuit voltage method, this method will calculate V_{MP} based on V_{OC} . However in all these before mentioned algorithms the open circuit voltage method has some advantages such as simple structure and less cost. Due to these advantages of open circuit voltage method, the evolutionary algorithm is combined with this method to get MPP with reduced steady state oscillation.

In the next generation artificial intelligence approach such as fuzzy logic and neural network has proposed by the researchers to overcome the drawbacks of conventional methods. Although these methods are suitable for dealing nonlinear $I-V$ characteristics of solar PV module, they necessitates wide calculations and also implementation of low-cost processor is not possible with this proposed method[6]. An evolutionary algorithm (EA) approach is the new advanced technique to deal nonlinear objective functions. There are several EA's such as genetic algorithm (GA) and Particle Swarm Optimization (PSO), etc. In this paper BF-PSO is proposed with the combination of BF and PSO as it can deal MPPT very effectively due to its simple structure, fast computation capability and easy implementation[7-8].

The research gap has been found in this area is that no researcher has combined PSO with BF, hence eliminates the steady-state oscillations generally exist in conventional MPPT methods. Finally this paper concludes that by applying this proposed BF-PSO, the system has fewer oscillations at MPP and can effectively track the MPP for large change in insolation. Another advantage of this proposed method over conventional MPPT techniques is, it has a faster tracking speed.

The remainder of this paper is organized as follows. Section II discusses the modeling of the PV cell and PV module based on work published in[9-10].This would be basis for the simulation work. In section III, Open circuit voltage method is briefly explained. Section IV describes the over view of PSO, BF and BF-PSO[11]. In this dc to dc boost converter is used for rise the module output voltage. Section V describes the simulation results. Finally the conclusion is made in last section.

II. MODELING OF PV CELL AND PV MODULE

A. Modeling of a PV Cell

The simplest model of a PV cell is shown in fig.1 as an equivalent circuit below that consists of an ideal current source in parallel with an ideal diode. The current source represents the current generated by photons (often denoted as I_{ph} or I_L), and its output is constant under constant temperature and constant incident radiation of light.

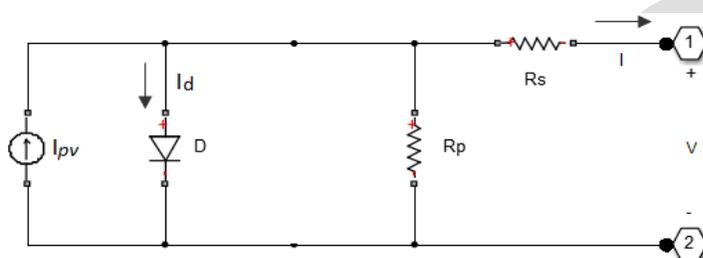


Fig.1: Single-diode model of a PV cell.

The output current equation can be expressed as follows

$$I = I_{PV} - I_d - \left(\frac{V + IR_s}{R_p} \right) \quad (1)$$

Where,

$$I_d = I_o \left[\exp \left(\frac{V + IR_s}{aV_T} \right) - 1 \right] \quad (2)$$

The two-diode model of the PV cell has been modeled in this project due to its more accuracy compared to single diode model and is illustrated in Fig.2. The output current equation can be expressed as follows

$$I = I_{PV} - I_{d1} - I_{d2} - \left(\frac{V + IR_s}{R_p} \right) \quad (3)$$

Where,

$$I_{d1} = I_{o1} \left[\exp \left(\frac{V + IR_s}{\alpha_1 V_{T1}} \right) - 1 \right] \quad (4)$$

$$\text{And } I_{d2} = I_{o2} \left[\exp \left(\frac{V + IR_s}{\alpha_2 V_{T2}} \right) - 1 \right] \quad (5)$$

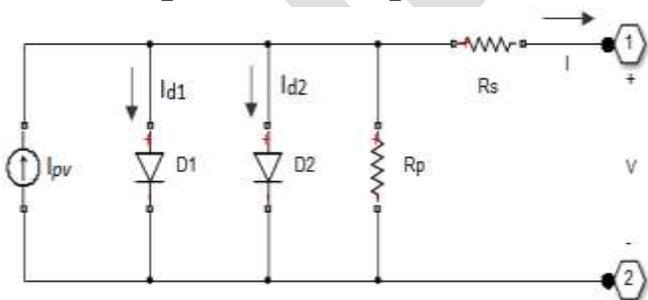


Fig.2: Two-diode model of a PV cell.

Where I_{PV} is the Photon current generated by the incidence of light; and I_{o1} and I_{o2} are the reverse saturation currents of diode 1 and diode 2 respectively. The I_{o2} term is introduced to compensate for the recombination loss in the depletion region. V_{T1} and V_{T2} (both are equal to kT/q) are the thermal voltages of the PV cell, q is the electron charge (1.602×10^{-19} C), k is the Boltzmann constant (1.38×10^{-23} J/K), and T is the p-n junction temperature in Kelvin. Variables a_1 and a_2 are ideal factors of diode1 and diode2 respectively. The developed current equation is for two-diode model has been presented in following equations given by

$$I = I_{PV} - I_0(I_P + 2) - \left(\frac{V + IR_S}{R_P} \right) \tag{6}$$

Where

$$I_P = \exp\left(\frac{V + IR_S}{V_T}\right) + \exp\left(\frac{V + IR_S}{(P-1)V_T}\right) \tag{7}$$

And $P = 1 + a_2$ (8)

B. Modeling of a PV Module

The modeling of a PV module is as same as PV cell modeling but here we are taking 72 solar cells connected in series. A single PV cell produces an output voltage less than 1V, about 0.6V for crystalline-silicon (Si) cells, thus a number of PV cells are connected in series to achieve a desired output voltage. When series-connected cells are placed in a frame, it is called as a module. Most of commercially available PV modules with crystalline-Si cells have either 36 or 72 series-connected cells. A 36-cell module provides a voltage suitable for charging a 12V battery, and similarly a 72-cell module is appropriate for a 24V battery.

TABLE I
 Parameters of the BPSX-150 PV module at stc: temperature = 25 °c,
 insolation = 1000w/m2

Electrical Characteristics	Rating
Maximum Power (P_{max})	150W
Voltage at P_{max} (V_{mp})	34.5V
Current at P_{max} (I_{mp})	4.38A
Open-circuit voltage (V_{oc})	43.5V
Short-circuit current (I_{sc})	4.75A
Temperature coefficient of I_{sc}	0.065 ± 0.015 %/ °C
Temperature coefficient of V_{oc}	-160 ± 20 mV/ °C
Temperature coefficient of power	-0.5 ± 0.05 %/ °C

Fig.3 shows the I-V curves of a PV module for different number of cells, fig.4 shows I-V curves of a PV module for different irradiation levels, fig.5 shows P-V curves of a PV module for different irradiation levels, and fig.6 shows I-V and P-V curves for commercial PV module(BPSX-150).The parameters of this particular module under the standard test condition (STC) are shown in Table I.

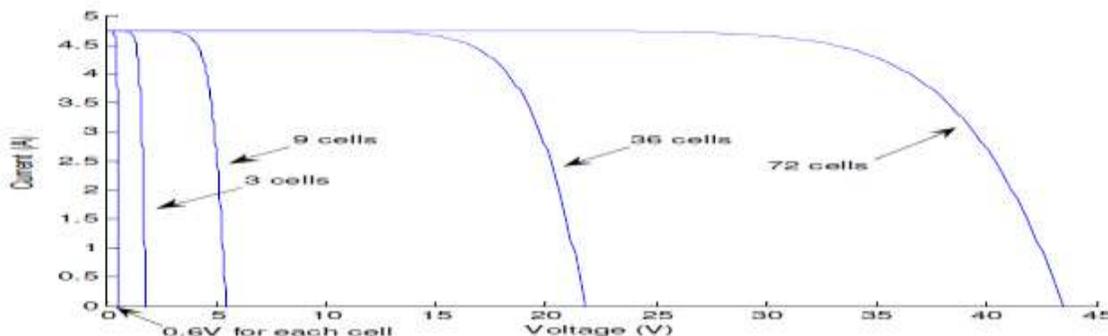


Fig.3: I-V curves of a PV module for different number of cells

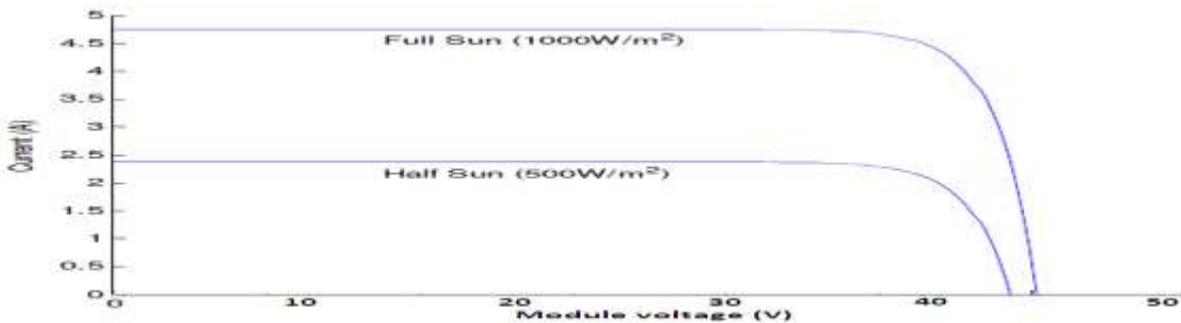


Fig.4: I-V curves of a PV module for different irradiation levels

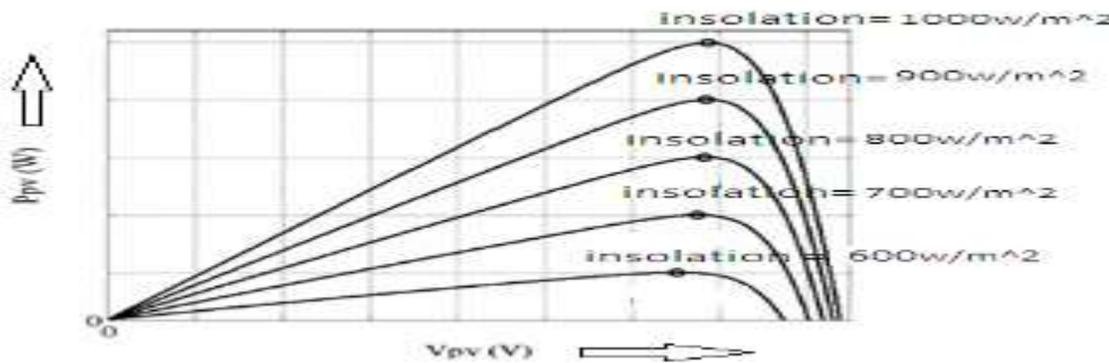


Fig.5: P-V curves of PV module for different irradiation levels

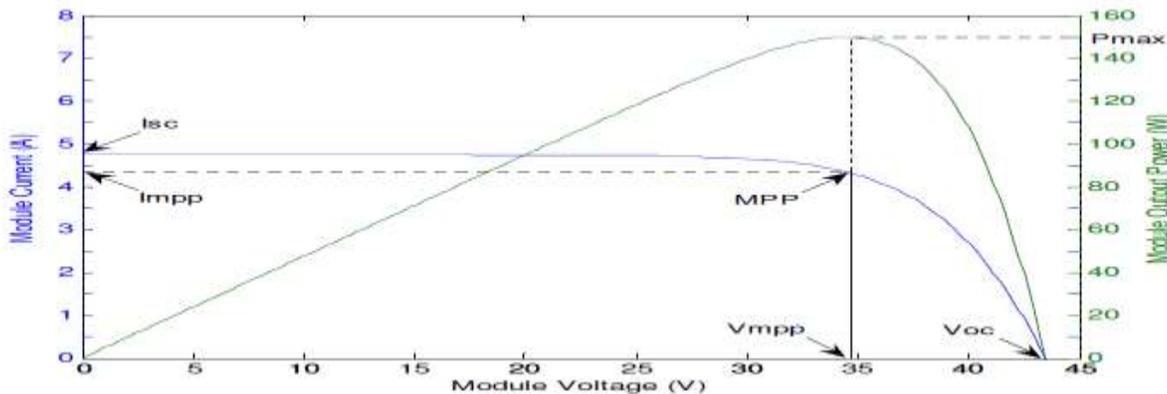


Fig.6: I-V and P-V curves of a BPSX 150PV module

III. OPEN CIRCUIT VOLTAGE METHOD

In general there are so many MPPT methods are existed. In this paper Open circuit voltage method is proposed over afore mentioned methods, because of its advantages such as simple structure and less cost due to one sensor. The flow chart of open circuit voltage method for mppt is shown in fig.7. In this method the maximum tracked voltage is given by

$$V_{MPP} = K * V_{OC} \tag{9}$$

Where V_{MPP} is maximum voltage, V_{OC} is open circuit voltage and K is constant and the range of K is 0.73 to 0.8 for polycrystalline PV module.

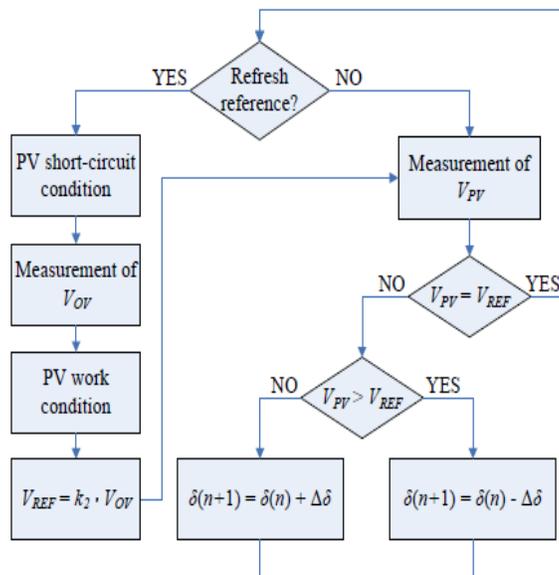


Fig.7: Flowchart of the open circuit voltage method

IV. BF- PSO BASED MPPT

A. Basic Particle Swarm Optimization (PSO)

The PSO model consists of swarm of particles, which are initialized with a population of random candidate solutions. They move iteratively through the d-dimension problem space to search the new solutions. Each particle has a position represented by a position vector X_k^i where i is the index of the particle and velocity represented by a velocity vector V_k^i . Each particle remembers its own best position P_{Lbest}^i . The best position vector among swarm then stored in a vector P_{Gbest}^i . During the iteration time k , the update of the velocity from the previous velocity to the new velocity is determined by

$$V_{k+1}^i = V_k^i + C_1 R_1 \{P_{Lbest}^i - X_k^i\} + C_2 R_2 \{P_{Gbest}^i - X_k^i\} \quad (10)$$

The new position is then determined by the sum of the previous position and new velocity

$$X_{k+1}^i = X_k^i + V_{k+1}^i \quad (11)$$

Where C_1 and C_2 are acceleration coefficients, R_1 and R_2 are random numbers. A particle decides where to move next, considering its own experience of the most successful particle in the swarm.

B. Basic Bacterial Foraging optimization(BF)

The selection behavior of bacteria tends to improve successful foraging strategies and eliminate poor foraging strategies. The E-coli bacteria has a control system that enables it to search for food. The distribution of bacteria motion can be modeled as following four stages.

B.1 Swarming and Tumbling(N_s)

The flagellum is a left-handed helix configured so that as the base of the flagellum (i.e . where it is connected to the cell) rotate counterclockwise, as shown in below figure.

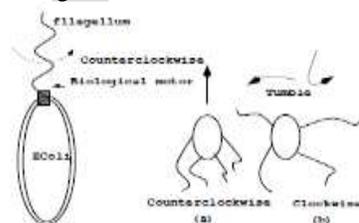


Fig.8: E-coli bacteria while it is swimming and tumbling

From the free end of the flagellum looking toward the cell, it produces a force against the bacterium then pushing the cell. This mode of motion is called swimming. Bacteria swims either for maximum number of steps N_s or less i.e. depending on the concentration of nutrition and condition of environment. But if the flagellum rotate clockwise each flagellum pulls on the cell as shown in fig.8(b), so that the net effect is that each flagellum operates relatively independently of the others and so the bacterium tumble. Tumbling mode indicates a change in the future swim direction.

B.2 Chemotaxis (N_C)

A set of consequence swim steps following by tumble is called chemotaxis step . A maximum of swim steps with a chemotactic step is predefined by N_s . The actual number of swim steps is determined by the environment. If the environment shows good concentration OF nutrients in the direction of the swim, the (E- coil) bacteria swim more steps. The end of the chemotactic step is determined by either reaching the maximum number of steps N_s or poor environment. When the swim steps is stopped a tumble action takes place. To represent a tumble, a random unit length vector with direction $\Delta(n,i)$ is generated. Where j be the index for the chemotactic step, i is the index of bacterium that has the maximum number of bacteria S . This vector is used to define the direction of movement after a tumble. Let $c(i) > 0 \ i=1,2,\dots,S$ denote a basic chemotactic step size that we will use to define the lengths of steps during runs. The step size is assumed to be constant. The position of each bacterium is denoted by $p(n,i,j,k,ell)$ where n is the dimension of search space, k is the index of reproduction step and ell is the index of elimination-dispersal events. The new bacterium position after tumbling is given by.

$$P_{n,j+1,k,ell}^i = P_{n,j,k,ell}^i + \Delta(n,i) * c(i) \tag{12}$$

B.3 Reproduction(N_{re})

A reproduction step is taken after N_c chemotactic steps. Let N_{re} be the number of reproduction steps to be taken. For convenience, we assume that S is a positive even integer. Let

$$S_r = \frac{S}{2} \tag{13}$$

be the number of population members who have had sufficient nutrients so that they will reproduce (split in two) with no mutations. For reproduction, the population is sorted in order of ascending accumulated cost (higher accumulated cost represents that it did not get as many nutrients during its lifetime of foraging and hence, is not as “healthy” and thus unlikely to reproduce). The S_r healthiest bacteria each split into two bacteria, which are placed at the same location.

B.4 Elimination and Dispersal(N_{ed})

Elimination event may occur for example when local significant increases in heat kills a population of bacteria that are currently in a region with a high concentration of nutrients. A sudden flow of water can disperse the bacteria from one place to another. The effect of elimination and dispersal events is possibly destroying chemotactic progress, but they also have the effect of assisting in chemotaxis, since dispersal may place bacteria near good food sources.

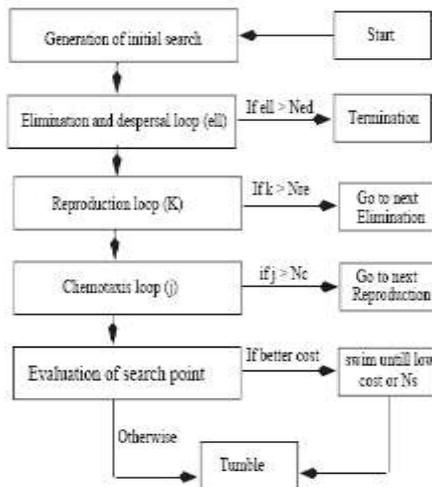


Fig.9: Bacteria Foraging algorithm flowchart

C. Bacterial Foraging optimization oriented by Particle Swarm Optimization (BF-PSO)

The BF-PSO combines both algorithms BF and PSO. This combination aims to make use of PSO ability to exchange social information and BF ability in finding a new solution by elimination and dispersal. In this project BF-PSO method reduces the error(which is produced by comparing the output voltage with its reference), gives constant voltage and changing the dynamic characteristics of PV system to tracks maximum power always.

For initialization, the user selects $n, S, S_r, N_s, N_c, N_{re}, N_{ed}, P_{ed}, C_1, C_2, R_1, R_2$ and $c(i), i=1,2,3,\dots,S$. Also initialize the position $P_{n,1,1,1}^i, i=1,2,3,\dots,S$ and velocity randomly initialized.

Where n is dimension of search space, S is the number of bacteria in the population, S_r is the half of the total bacteria, N_s is

the maximum number of swim length, N_c is the number of chemotactic steps, N_{re} is the number of reproduction steps, N_{ed} is the number of elimination and dispersal steps, P_{ed} is the elimination and dispersal with probability, $c(i)$ is the step size taken in the random direction, C_1, C_2 are the PSO random parameters and R_1, R_2 are the PSO random parameters.

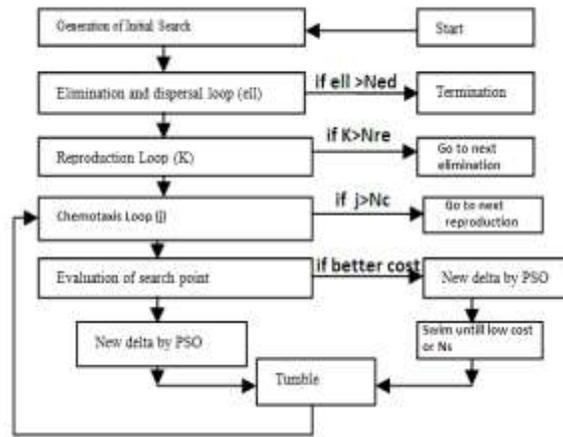


Fig.10: Bacteria foraging oriented by PSO algorithm flowchart

This algorithm produces the globally best values of K_p, K_d and K_i for PID controller in PV system by iterative process to get MPP for PV system with constant voltage.

V. SIMULATION CIRCUIT AND RESULT ANALYSIS

The Fig.11 shows the MATLAB-Simulink simulation model of the PV system used in this study. The dc to dc boost converter is used to step up the dc voltage to our requirement and has an advantage i.e. it reduces the usage of PV modules. The converter is designed for continuous inductor current mode with following specifications: $L=80\mu H$, $C=20.8\mu F$ and 20KHZ switching frequency. The utilized PV module is the BPSX-150. The key specifications of the module are shown in Table- I.

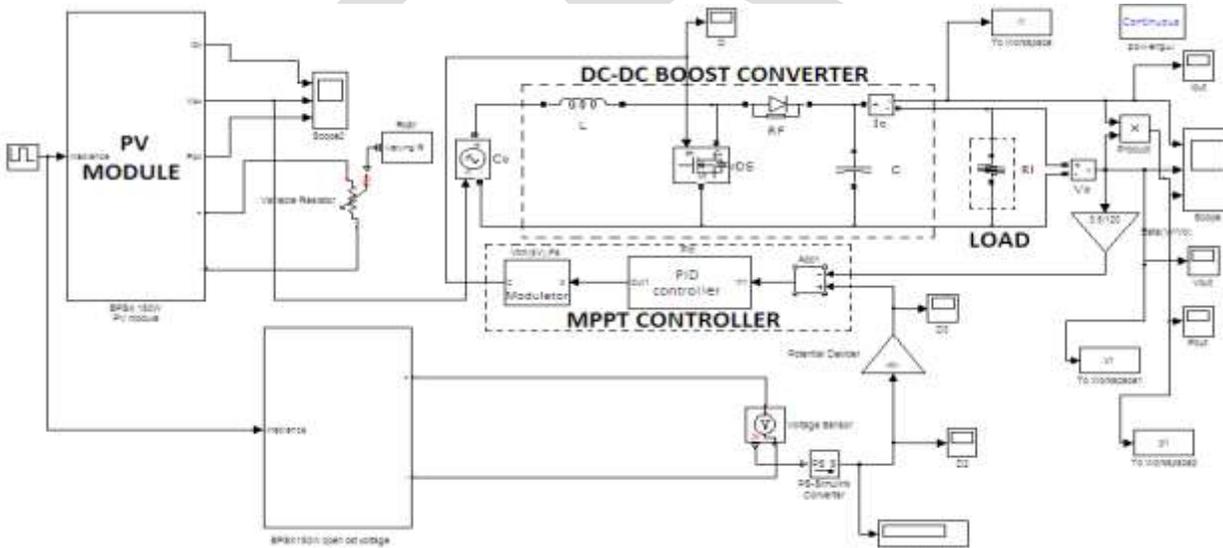


Fig.11: MATLAB-Simulink model for the PV system with the boost converter and proposed MPPT controller

The voltage given by the solar PV array is variable and is of low magnitude. To provide a constant and high magnitude of voltage a MPPT based DC - DC boost converter is used. In order to obtain maximum power from the solar PV module MPPT technique is used. DC power from the boost converter is given to a load.

For the case of uniform change in insolation, the insolation is stepped from low to high, step down from high to low, and stepped to high again. The initial level is set at $700w/m^2$, at $t=0.2s$, the insolation is suddenly stepped up to $1000w/m^2$, and at $t=0.4s$, the insolation is stepped down to $700w/m^2$.

Fig.12 shows the simulation results for current, voltage and power respectively obtained by using without MPPT method. In this method, at $t=0$ s the tracked power is 65w for 700w/m^2 insolation, at $t=0.2$ s the tracked power is 130w for 1000w/m^2 insolation, and at $t=0.4$ s the tracked power is 65w for 700w/m^2 insolation. By observing the waveforms we noticed that, the output voltage is not maintained constant for different insolation levels, so the connected load will not work properly and also noticed that the tracked power is not maximum, so the efficiency of PV system is less.

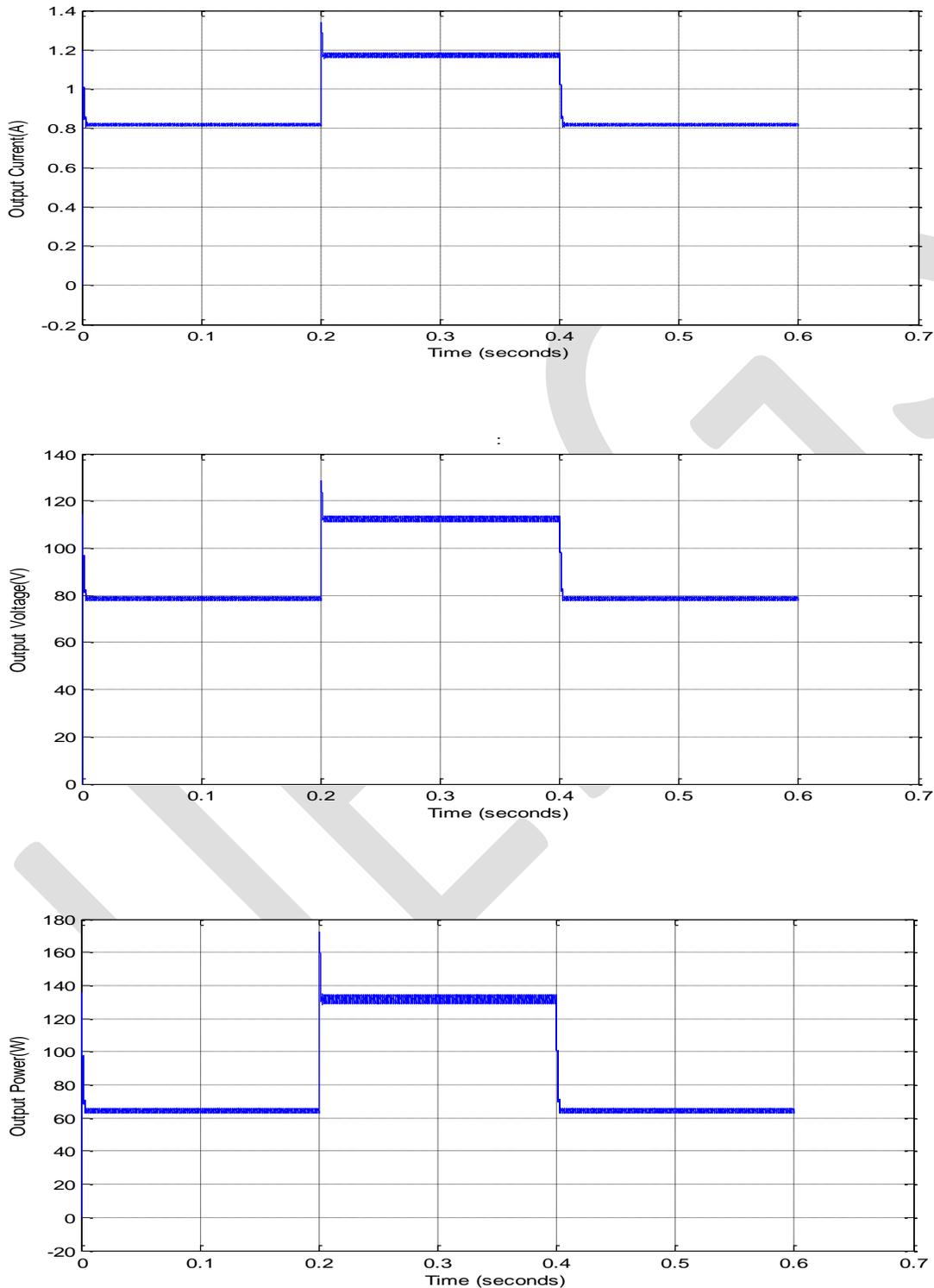


Fig. 12: Tracking output current, output voltage and output power waveforms by Without mppt method

Fig.13 shows the simulation results for current, voltage and power respectively obtained by using proposed BF-PSO MPPT method. In this method at $t=0s$ the tracked power is 140w for $700w/m^2$ insolation, at $t=0.2s$ the tracked power is 150w for $1000w/m^2$ insolation, and at $t=0.4s$ the tracked power is 140w for $700w/m^2$ insolation. By observing the waveforms we can say that, the output voltage is nearly maintained constant so no problem about connected load and also we can say that, the tracked power is maximum so the efficiency of PV system improved.

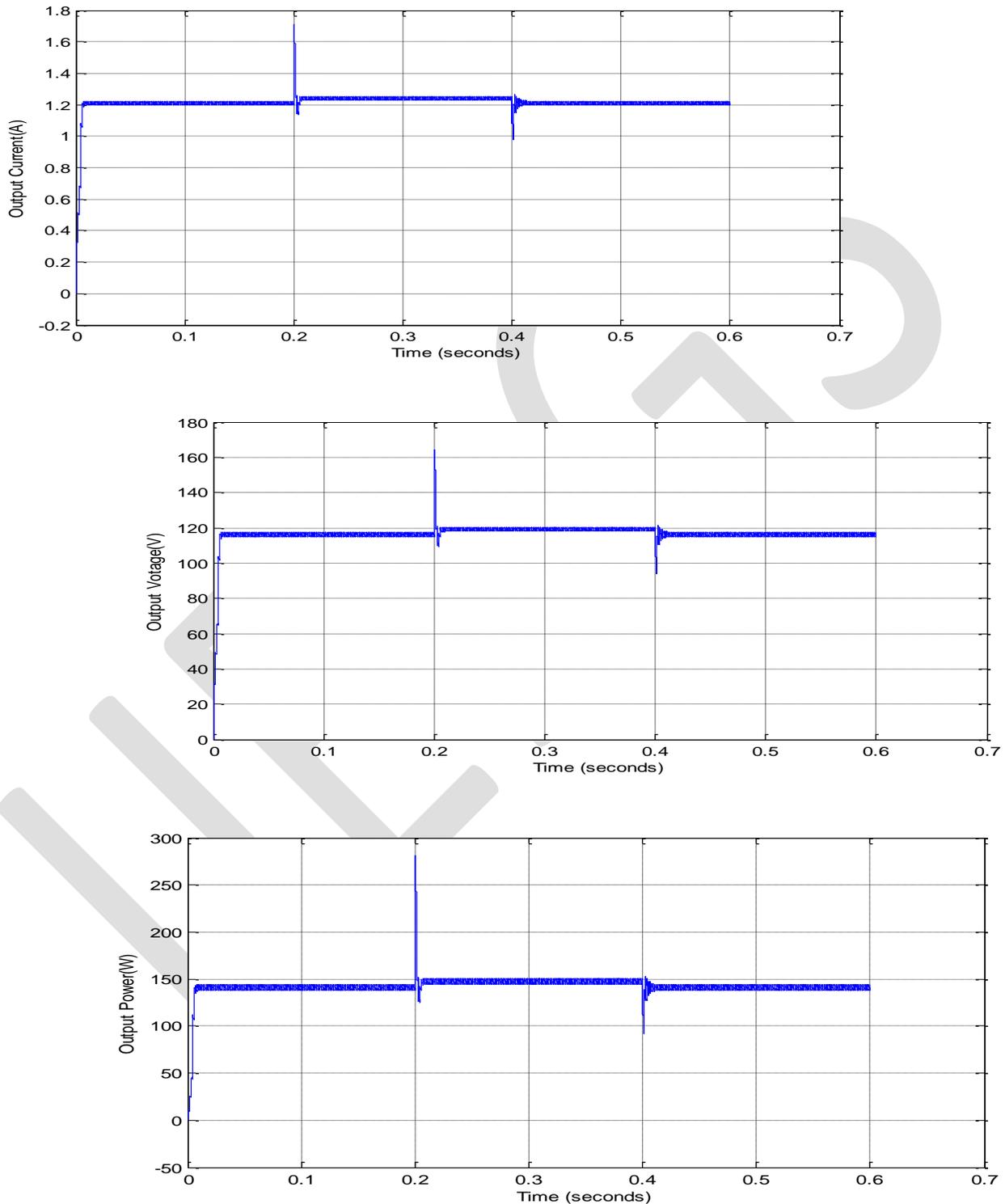


Fig. 13: Tracking output current, output voltage and output power waveforms by proposed BF-PSO method

By comparing the simulation results of both the methods, before mentioned drawbacks in without MPPT method, overcome by proposed BF-PSO mppt method. The proposed method tracks the maximum output power and maintains the constant voltage level at the output.

VI. CONCLUSION

In this paper, a BF-PSO with open circuit voltage mppt method is used to track the MPP for a PV system. In this open circuit voltage mppt method is used because of its simplicity and reduced cost. The proposed system was simulated and from the results acquired during the simulation by comparing this proposed method with 'without MPPT', it was confirmed that proposed controller has a number of advantages: 1)It could locate the MPP for different insulations,2) It maintains the constant output voltage.

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Automatic Surveillance using Motion Detection

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Abstract— The current video surveillance techniques store the complete video even if there are many idle frames in the video. To go through the complete video is a cumbersome task. The storage requirement of such videos is also huge. So we are attempting to design an application which ignores the idle frames from the video, with effective and real time object detection and video surveillance system with the help of SOBEL operator algorithm, for edge detection, in order to reduce the amount of storage space and remove the redundancy from the video. The aforementioned system can be implemented using a webcam or a CCTV and an efficient algorithm to detect the motion and robustly distinguishes the changes in consecutive frames and ignores the lighting changes. Once the motion is detected, the application will send SOS and activate the alert system and start storing the video. Storing of the video will automatically come to halt when there is a stagnancy in the scene.

Keywords— Intelligent Video Surveillance, Real-time Motion Detection, Automatic Surveillance, optimum storage surveillance, Sensor less surveillance, Motion Detection in Spatial domain, Alarm trigger on motion detection.

I. INTRODUCTION

Traditional video surveillance takes a huge amount of storage space. Recording everything captured by a surveillance camera consumes the large storage space and hence limits the duration of video that can be stored. In addition, recording everything makes it time-consuming for a human to review the stored video. All these disadvantages limit the effectiveness of traditional video surveillance. To solve these problems, recording only crucial images that contains important information is the only way. This project uses a robust motion detection algorithm for real-time motion detection by considering and information, i.e., image that contains motion in the scene. This can be done with a web camera and a motion detection algorithm that detects motion. The motion detection algorithm robustly distinguishes motion from lighting changes. Web camera can take the snapshot of the moving object and at the same time, it will activate the warning system before storing the frames on the memory.

Identifying moving objects from a video sequence is a fundamental and critical task in many computer vision applications. We will be using SOBEL filter which comes under edge detection algorithms, and creates an image which emphasizes edges and transitions. The SOBEL operator is based on convolving the image with a small, separable, and integer valued filter in horizontal and vertical direction and is therefore relatively inexpensive in terms of computations.

II. ACKNOWLEDGED RELEVANT WORK

We studied various techniques that are related to motion detection, especially those that detect the moving object in a stagnant scene. Parameters such as shadow, lighting change over time and the slow processor, negatively affects the degree of accuracy of an algorithm.

Many pundits have worked to raise the degree of accuracy of algorithms under indoor scenes and tried to provide solutions to the aforementioned problems.

“*Implementation of motion detection system*” [2] put forward a motion detection system which provides an efficient method for surveillance purposes and provide a facility to use an audio file as alarm signal. “*Tracking And Recognizing The Moving Object In Real Time Using Frame Difference Method*” [3] states motion detection and object tracking method which is simple and direct with which the changing part in video can be quickly detected. “*Improved Background*

Matching Framework For Motion Detection [4] proposed a temporal differencing to detect the moving object and give the alarming in time and produces high accuracy. This method is fast and achieves better detection performance.

Motion Detection and Object Tracking mentioned in **“Motion and Feature based Person Tracking in Surveillance Videos”** [5] is a popular technique which is robust against the complex, deformed and changeable shape. This method is scale and rotation invariant, as well as faster in terms of processing time.

“Detecting Moving People in Video Streams” [6] proposed a motion segmentation method to detect with high accuracy the motion inside the monitored scene. In “High Definition Surveillance System Using Motion Detection Method Based on FPGA DE-II 70 Board” [7], motion detection approach will reduce the unwanted recording of surveillance videos. This method consumes low power. . In “LOBS: Local Background Subtractor for Video Surveillance” [8] background subtraction technique are used to detect the moving object and then remove the shadow in subsequent phase.

III. OVERVIEW

The proposed model will work in following steps:

- Continuous capturing of the video using a CCTV/webcam and division of the video into an array of frames.
- Converting the current frame into GREYSCALE format for easier and quick detection of edges.
- Comparing the extracted information from the current GREYSCALED image to the image captured before it (residing in buffer).
- If there both the images are identical i.e. there is no motion in the scene, then discard the image in the buffer and store the current GREYSCALED image in the buffer and use it as a reference to next image.
- Else i.e. the images are not identical, start storing the video and trigger the alarm.
- In the meantime, SMS/E-mail will be sent to the owner of the place or to whomsoever in charge.
- As soon as there is stagnancy in the scene i.e. no motion is detected, the system will stop storing the video in the HDD.

The architecture of the proposed system is shown in fig.1 whereas the flow of the system is illustrated in fig.2. The various algorithms used in the system are also described in the following section.

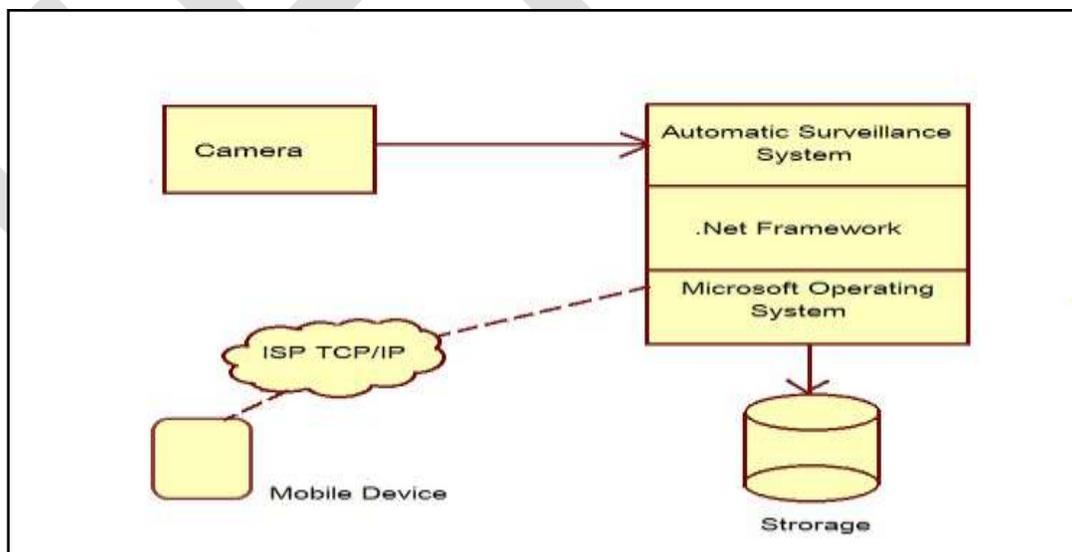


Fig.1 Architecture of the proposed system

Since the framework is restricted to Microsoft’s OS, our system will only work Microsoft OS. If the system is connected to Internet then auto-generated E-mail will be sent to respective person.

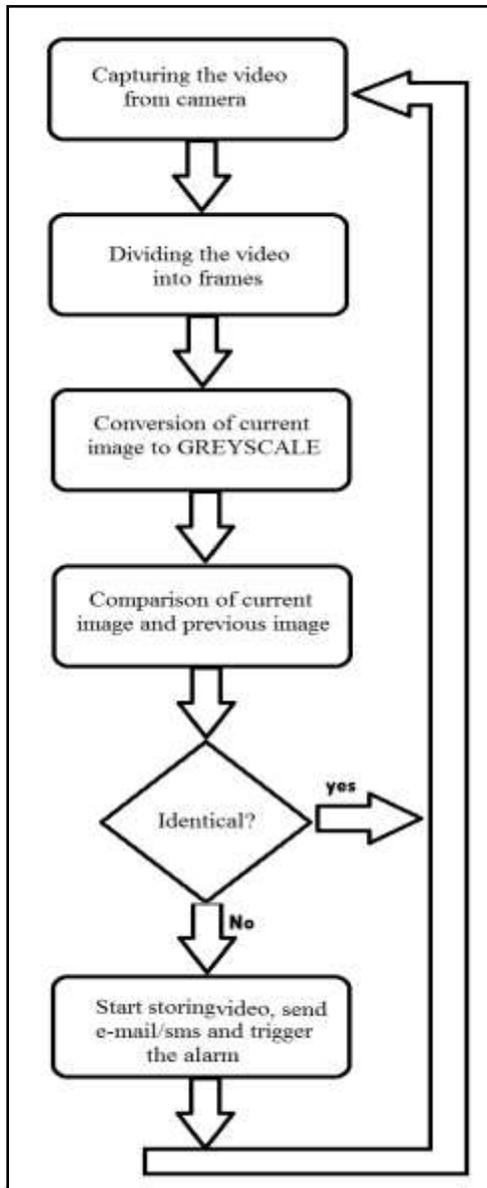


Fig.2 Flow of the proposed system

IV. DETAILS OF TECHNIQUES USED

A. Pre-Processing

Initially, the real-time video is divided into frames and pre-processing is used to improve the contrast of the image, removal of noise and for color conversion. The aim of pre-processing is improvement of the image as a data that suppresses unwanted distortions or enhances some image features important for further processing. There are four categories of pre-processing techniques namely, pixel brightness transformations, Geometric transformation, Local neighborhood of the processed pixel, Image restoration. We have used pixel brightness transformation for increased brightness without regard to position in the image.

B. SOBEL OPERATOR

- The SOBEL operator performs a 2-D spatial gradient measurement on an image and so emphasizes regions of high spatial frequency that correspond to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input grey-scale image.

This algorithm is based on absolute difference as well as region combination. Active regions are obtained by frame difference with an effective selected threshold value. Absolute difference is calculated by comparing the current frame captured with previous frame from the video sequence. This algorithm is efficient in moving object detection for video surveillance application.

The Sobel operator is slower to compute than the Roberts Cross operator, but its larger convolution kernel smooths the input image to a greater extent and so makes the operator less sensitive to noise. The operator also generally produces considerably higher output values for similar edges, compared with the Roberts Cross.

C. ALARM and SMS/E-mail

- This module is started using a thread which will enable the system to run this module simultaneously with video storage module.
- SMS and E-mail feature will be active iff the system is connected to the internet.
- The SMS/E-mail will be sent if the camera fails to give the input or the image received is completely black.

- Under such circumstances, alarm can also be triggered but completely depends on the user to enable the option.

D. Video Storage

This module is also started with the help of thread. It is enabled as soon as there is motion in the scene.

The video can be stored in AudioVideoInterface(.avi) or .wmv format so as to make it compatible with most of the video players.

The quality of the video is completely dependent on the camera used while the size of the video is dependent on both quality of camera as well as the time for which the motion is present in the scene.

V. RESULT AND ANALYSIS

The proposed system was tested in normal light as well as in medium dark light by using 4MP Camera. Detection works smoothly in both aforementioned scenarios.



Fig 3.1(a) Normal Frame

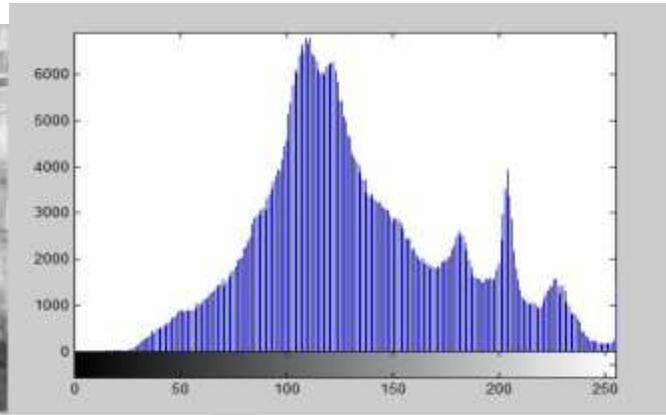


Fig 3.1(b) Histogram of Normal Frame



Fig 3.2(a) Frame with moving object

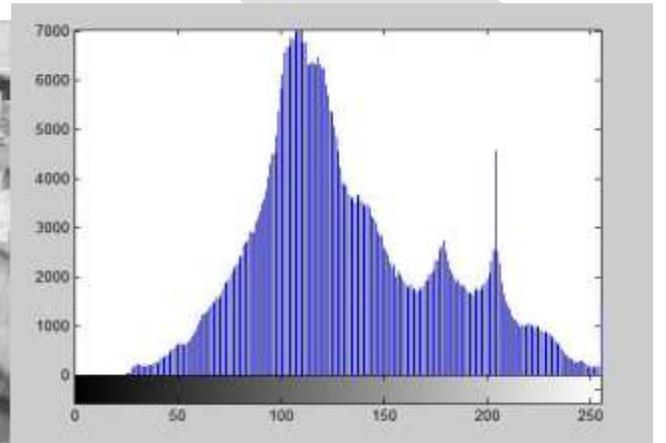


Fig 3.2(b) Histogram of frame with moving objects

Fig 4.1 is the normal frame where there is no movement and Fig 4.3 is the frame with movement. Fig 4.2 and 4.4 represents the histogram of normal frame and frame with movement respectively, which shows difference between two frames.

ACKNOWLEDGMENT

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CONCLUSION

Various existing motion detection algorithms like Sobel operator, Robert's cross, and Prewitt gradient edge detector available to video surveillance systems are studied. But while comparing the algorithms with each other we found that Sobel operator can be relatively easy to implement and results are decent. Roberts cross is quicker in computation but the results are far from the desired degree of accuracy and are mostly dependent on the noise present in the frame. We have an algorithm that analyze and classify video frames captured from surveillance camera help of some parameters like edge of object, gesture variations of object in that frame.

In our proposed scheme, therefore, Sobel operator motion detection algorithm with respect to the requirement of memory and time and the accuracy of result is selected for detecting the moving object without presence of shadow, particularly for banking applications and sensitive areas to improve the security.

Furthermore, include an option to take snaps periodically, manually or automatically to store the image with less number of bytes. We are implementing this system in real time and results so far, are positive.

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Carbon Scrubbing from Exhaust of Diesel Generator Set

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Abstract— The effect of Global warming is growing at an alarming rate year by year and one of the major contributors to this is CO₂ emissions. In that, Diesel engine exhaust emission has a significant contribution. If we take a break down it is found that CO₂ around constitutes 12-15 % of total exhaust emissions. One of the easiest and clean methods for reducing the CO₂ emissions is using carbon scrubber to capture the CO₂. The project deals with capturing from the exhaust of Diesel generator Set. For this a carbon scrubber arrangement is used in which NaOH solution is taken as the scrubber. Along with carbon scrubbing one of the main advantages of this project is that the waste heat from flue gas is utilized to recover the NaOH which is lost. This is done with the help of a heat exchanger. This adds to the economy of the entire project in such a way that the NaOH lost during the scrubbing process is recovered in the regenerator by the heat exchanger and pumped back to the scrubber column.

Keywords— Carbon scrubbing, Waste heat, NaOH solution, Carbon di Oxide, Flue Gas, Heat Exchanger, DG Set

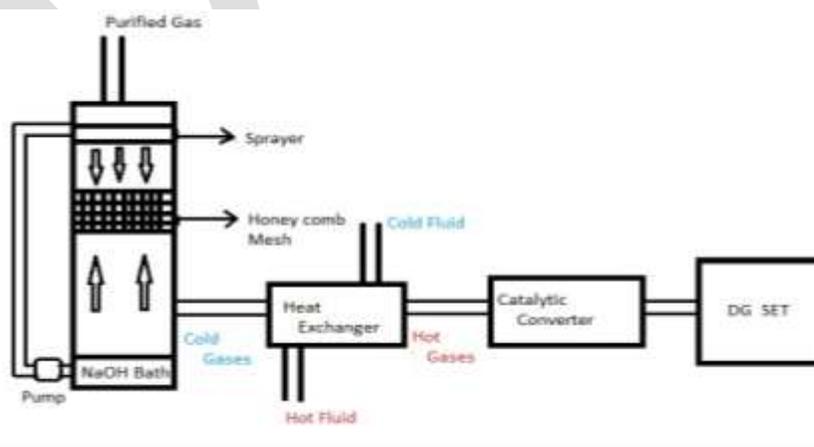
INTRODUCTION

One of the major environmental concerns that exist today is Global warming which is mainly caused by green house gas emissions. Carbon di oxide alone contributes around 72% of total GHG emission. The effect of global warming can be reduced to a greater extent by capturing the CO₂ at source level itself. The CO₂ can be mainly classified as stationary sources like power plant and non stationary sources i.e. mainly automobile emissions. Along with this various chemical processes like cement, refinery, iron and steel also contributed to CO₂ emission. In the present scenario capturing CO₂ has a great importance in respect to climate change. Many power plants and refineries are setting up their own carbon capturing technologies because of the CDM benefits and environmental concerns. Some of the commonly employed carbon scrubbing methods is amine scrubbing, solvent based absorption, regenerative carbon scrubbing, using activated carbon, algae based capture etc.

The method described in this project is post combustion capture of CO₂ from the exhaust of DG set. The system here captures CO₂ directly from the exhaust using a NaOH bath which is sprayed on the flue gas path. Using a heat exchanger the heat from flue gas is taken and NaOH can be regenerated.

SCHEMATIC LAYOUT AND WORKING

1. Layout

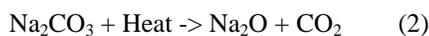


Working

The study was conducted on a 500 KVA DG set and the flue gas temperature is around 440 – 460 °C. The flue gas is the passed to a Diesel Oxidation Catalyst (DOC) catalytic converter so as to convert the un burnt hydrocarbons and carbon monoxide to carbon dioxide and remove the particulate matters. It is done because the presence of toxic gases in flue gas can degrade the quality of NaOH solution thus reducing the concentration required for the process. From DOC flue gas enters a shell and tube heat exchanger where heat is exchanged with incoming sodium bicarbonate solution so as to regenerate NaOH.

The Carbon scrubber arrangement is basically a tower like structure fitted with a sprayer and honey comb mesh so as to increase the time and surface area of contact between scrubber solution and flue gas thereby increase the capture rate. The scrubber solution used is NaOH at 85% concentration so that solution will not vaporize at high temperature. The flue gas is made to pass through a jet spray of scrubber solution where the carbon capture takes place. The following are the chemical reaction that takes place.

The NaOH solution after reacting with flue gas is regenerated by passing the sodium bicarbonate solution to a heat exchanger where the heat from flue gas is used to regenerate the NaOH back and CO₂ formed is distilled and is cooled and compressed for storage. The following are the chemical reaction taking place:



2. Analysis

The assumptions made for the analysis are :

- The absorption process is counter current.
- The regeneration time is taken to be 15mn
- The heat loss from flue gas inside scrubber column is transferred to the NaOH at a constant process
- The concentration of NaOH almost remains the same after regeneration
- The temperature of cold fluid in the system is taken as 170deg C

The following table shows the test data for analysis

Table 1. Test data for analysis

Parameters	Value
Flue gas temperature (°C)	450
Flue gas flow rate (kg/s)	1.86
Fuel consumption at 100% load (l/hr)	107
Density of NaOH (g/cm ³)	2.13
Boiling point of NaOH (°C)	1388
Density of diesel (kg/l)	0.832
Density of CO ₂ (kg/l)	1.977

Diesel Reaction Equation is given by:-



Total Fuel Consumed = 0.832 * 107 = 89.02 kg/hr

Molar Concentration (Diesel) = 4.11 mol /l
Molar Concentration (CO₂) = 0.044 mol /l.
439.77 mole of diesel react to give 6596.55 moles of CO₂ per hr.



Weight of CO₂ = 290 kg CO₂
Weight of NaOH = 527 kg
Weight of Na₂CO₃ = 699 kg
Weight of H₂O = 118 kg

Conversion into liters

Volume of NaOH = 247.41 l
Morality = 0.16 M solution
Excess quantity to make up the loss in regeneration = 53 l
Total quantity of NaOH = 300 l
Actual quantity of NaOH that to be stored in the Scrubber Column is 75 l.

CONCLUSION

The project described here is a pilot scale one and with the integration of latest technologies and advancement the same thing can be implemented in bigger industries where the carbon emissions are more. The main advantage with this project is that all the raw materials and equipment used are readily available which adds to the overall economy and cost reduction. Also Sodium Hydroxide solution can be regenerated with the same heat recovered from the exhaust which is an add on advantage. One of the main limitations of this project is the use of higher concentration of Sodium Hydroxide solution due to boiling point problem as NaOH vaporizes. This is an area to work upon in which techniques which reduce the temperature of exhaust gases are to be found out. Also some assumptions are taken for doing out theoretical analysis, which when implemented physically may not stand for. In nut shell with the implementation of this arrangement a considerable amount of CO₂ released into the atmosphere can be controlled there by reducing the global warming effects which is a major threat in the present scenario.

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Chemical Spray pyrolysis of Copper Indium Disulphide Thin Films for Solar Cell Application: Review

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Abstract: Chalcopyrite I-III-IV₂ type Copper Indium Disulphide (CuInS₂) is an effective light absorbing material in thin film solar cells. Since last decade CuInS₂ has been emerged as credible alternative to other solar cell materials. Great efforts have been put in to the development of cheaper, relatively high efficient CuInS₂ thin films using different cost effective thin film deposition techniques. The chemical spray pyrolysis technique (SPT) has been, one of the low cost technique to deposit high quality CuInS₂ based absorber thin films for solar cell applications. This paper presents an extensive review on application of spray deposited CuInS₂ thin films in different CuInS₂ based solar cells modules.

Keywords: CuInS₂ thin films, Spray pyrolysis, chalcopyrite semiconductors, photovoltaics, thin films, Solar Cell, Solar cell parameters

1. Introduction:

The spray pyrolysis technique has been applied to deposit wide variety of thin films. The materials like simple oxides, mixed oxides, metallic spinel type oxides, group I-VI, II-VI, III-VI, IV-VI, V-VI, VIII-VI binary chalcogenides, group I-III-VI, II-II-VI, II-III-VI, II-VI-VI, ternary chalcogenides such as CuInS₂, CuInSe₂, CuInTe₂, adamantine copper compounds such as Cu₂ZnSnS₄/Se₄, Cu₂CdSnS₄/Se₄, CuGaSnS₄/Se₄, Cu₂InSnS₄/Se₄, CuIn₅S₄/Se₄ have been deposited, successfully applied in solar cells, sensors, fuel cells applications. A number of thin film deposition techniques have been examined for production of high quality thin films. These include co- evaporated of elemental metal, reactive, nonreactive sputtering, chemical vapour deposition etc., a number of solution growth methods, so-called chemical techniques.

Review articles pertaining to spray pyrolysis processing of variety of material have been reported in the literatures [1]. An extensive survey on physico-chemical properties, preparation conditions of deposition of thin films of transition metal oxides, metallic spinel type oxides, binary, ternary, quaternary chalcogenides, superconducting thin films are discussed by Patil [2]. However, a comprehensive review of all possible semiconductor chalcopyrite Copper Indium Disulphide (CuInS₂) thin film materials that could be deposited by spray pyrolysis technique for solar cell applications has not been undertaken so far. Currently CuInS₂ (CIS) based technology have been largely dominated by solar cell industry. CuInS₂ is a promising material for solar cell application because of its high optical absorption coefficient in the range of 10⁵ cm⁻¹. It has a crystal bulk band gap around 1.55 eV, for polycrystalline thin films; direct optical band gap varies between 1.3, 1.5 eV. This covers the maximum of Sol. Energy spectrum. CuInS₂ is an exceptional stable material for the solar cell applications. CuInS₂ can be obtained in both n-type, p-type since its conduction type depends on the intrinsic defects, such as cation vacancies, anti-site defects etc. Theoretically solar conversion efficiency of 27-32% has been calculated with CuInS₂ as an absorber [3]. Laboratory solar cell efficiency of polycrystalline CIS as an absorber has been reported to be about 13% [4]. The preparation of CuInS₂ as an absorber layer in the solar cell is strongly dependent on the preparation conditions, the experimental conditions during the test. While reporting on CIS based solar cells, synthesis, preparative parameters, experimental

conditions of copper CuInS₂ based absorber thin films, of are needed. In the present review we outlined properties of spray deposited CuInS₂ based solar cell. The solar cell parameters of sprayed CuInS₂ absorber material in different CuInS₂ based solar cell module are discussed and summarized in table 2.

1.1 Structure of CuInS₂:

Compound CuInS₂ semiconductors often simply referred as chalcopyrites because of their tetragonal crystal structure. CuInS₂ is a chalcogenide material belonging to I-III-VI₂ ternary semiconductor with molecular formula ABX₂. Crystal structure of CuInS₂ can be changed between two polymorph forms: chalcopyrite, sphalerite. These materials are easily prepared in a wide range of compositions, their corresponding phase diagrams have been intensively investigated. The crystal structure parameters, the physical properties are summarized in the table 1.

Table1: Physical properties of the bulk CuInS₂ material.

Sr.No.	Physical Properties	Specification/ Value	Ref.
1	Crystal Structure	Tetragonal (Chalcopyrite) a=b= 0.5517, c= 1.11, c/a = 2.01	[5] [6]
Transport Properties (n-CuInS₂), T=300 K			
2	Resistivity	1Ωcm	[7]
3	Carrier concentration	$3 \times 10^{16} \text{ cm}^{-3}$	
4	Motilities	$15 \text{ cm}^2 \text{ V}^{-1} \text{ S}^{-1}$	
Transport Properties (p-CuInS₂), at Room Temperature.			
5	Carrier concentration (p)	6×10^{17} to 2×10^{18}	
6	Mobility (μ_b)	$4-12 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$	[8]
7	Conductivity (σ)	11/ Ωcm	
8	Seeback Coefficient(s)	$2.7 \times 10^{-1} \text{ VK}^{-1}$	
9	Refractive Index	2.83 (hw = 0.5ev)	[9]
10	Melting Point	1140 K	[10]
Electronic Properties			
11	Energy B, Gap	153 eV (T=300K)	
12	Splitting Energies, $\Delta_{cf}(\Gamma), \Delta_{Sg}(\Gamma),$	> - 0.005 eV, - 0.02 eV	[11]
13	D like Character	45%	
14	Excitoinic Energy Gap	(A) 1.536 eV (T=2K); (B) 1.554 eV	[10]
15	Effective Mass(m_p)	$1.3m_0$	[9]
Impurities , Defects			
16	Acceptor, donor binding energy	0.15 eV,0.35 eV	[7]
17	Decay times , diffusion lengths	$\tau = 0.1-2.4 \times 10^{-3} \text{ s}$ $\tau_n = 1.2 \times 10^{-10} \text{ s};$ $L_n = 2.5 \times 10^{-5} \text{ cm}$ $\tau_p = 6.5 \times 10^{-7} \text{ s};$	[12,13]

$$L_p = 2.5 \times 10^{-4} \text{ cm}$$

2. Thin films synthesis by Chemical Spray Pyrolysis technique:

Spray pyrolysis is a process in which thin films are deposited by spraying a solution on a heated surface. The schematic of spray pyrolysis processing is shown in figure 1. Droplets impact on the substrate surface, spread into a disk shaped structure, undergo thermal decomposition, where the constituents react to form a chemical compound. Chemical spray deposition processes can be classified according to the type of reaction taking place during the formation of compound. In process A, the droplet resides on the surface as the solvent evaporates, leaving behind a solid that may further react in the dry state. In process B, the solvent evaporates before the droplet reaches the surface, the dry solid impinges on the surface, where decomposition occurs. In process C, the solvent vaporizes as the droplet approaches the substrate; the solid then melts, vaporizes, the vapor diffuses to the substrate, there to undergo a heterogeneous reaction. In process D, the entire reaction takes place in the vapor state. In all processes, the significant variables are the ambient temperature, carrier gas flow rate, nozzle-to-substrate distance, droplet radius, solution concentration, solution flow rate, - for continuous processes substrate motion.

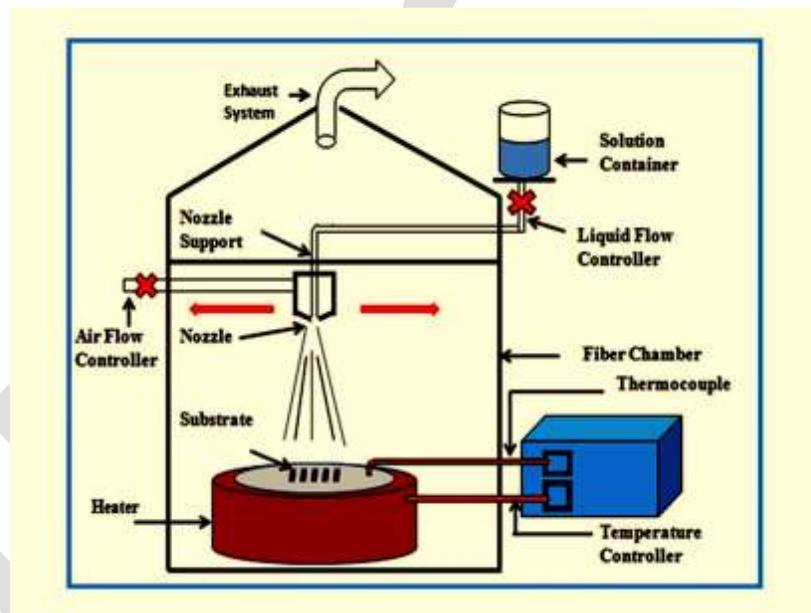


Figure1: The schematic experimental setup of the spray pyrolysis method.

3 CuInS₂ Based solar cells:

Solar cell is a junction device obtained by placing different electronically dissimilar materials together with a thin electronic barrier in between to ensure high conversion efficiency of solar photons, high collection efficiency of excited charge carriers. The efficiency of the cell can be expressed in terms of the short circuit current (I_{SC}), the open circuit voltage (V_{OC}) of the device, once the fill factor is defined:

$$FF = \frac{V_m \cdot I_m}{V_{oc} I_{sc}} \quad (1)$$

Here, V_M , I_M represent the voltage, the current intensity for the conditions of maximum output power of the device. Therefore, the cell efficiency (η) defined as the ratio of the generated power with respect to the power of the incident radiation (P_m), may be written as:

$$\eta = \frac{FF V_{oc} \cdot I_{sc}}{P_{in}} \quad (2)$$

The quantum efficiency of solar cell device is an important parameter. It is related to number of electrons collected per incident photon. The quantum efficiency can be the device quantum efficiency which includes reflection, absorption losses, or the internal quantum efficiency (per photon absorbed).

3.1 Structure of CuInS₂ based solar cell:

The basic structure of heterojunction CIS based thin film solar cell consists of substrate, back contact, absorber, buffer layer, window layer, top contact grid, antireflection coating is shown in figure 2.

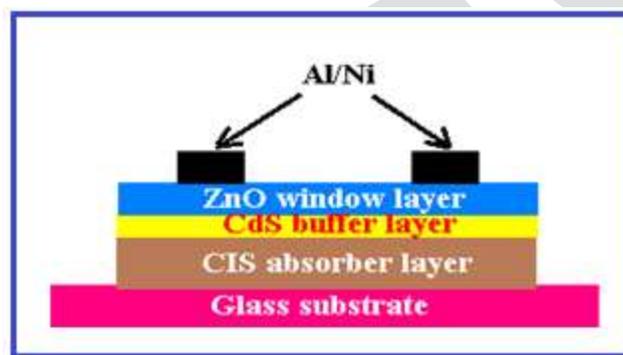


Figure 2: Schematic representation of CIS based chalcopyrite solar cell (not to the scale).

3.1.1 Absorber Layer:

The main function of absorber layer is to absorb light, to convert photon energy into energy of electron-hole pairs. The energy gap of the absorber material should match the spectral region where the cell is expected to operate. Energy band gap of chalcopyrite materials usually correlated with the lattice constant for isovalent isostructural materials using the formula $(\frac{2}{3}a + \frac{1}{6}c) \text{ eV}$, for CuInS₂ the direct energy gap is sufficiently wide (1.5 eV) to absorb most of photons in visible region so that large absorption coefficients can be achieved. Because of a high absorption coefficient, a 2- μm -thick layer is sufficient for absorption of maximum incident radiation. The quality of CuInS₂ absorber layer is mostly depends on the deposition technique used for its fabrication.

3.1.2 Buffer Layer:

The role of the buffer layer is to produce an optimal transparent front junction to the absorber. Buffer layer should have large energy band gap for high optical transmission in the visible region. In CIS module with wide band gap materials (CdS, In₂S₃) separation of electron-hole pairs across the junction can be achieved when the energy band discontinuity between the wide band gap buffer layer, the absorber material is distributed in such a way, that there is no band offset for the majority carriers, but there is a large barrier for the minority carriers. If there is a band offset for the majority carriers in the buffer layer, then it may lead to a formation of a 'spike', or 'cliff'. If the band offset produces a cliff, the probability of the interface cross-recombination is increased, the flat band condition is achieved at a bias smaller than E_g/q of the absorber. The sufficiently large doping density in the buffer layer than that in the absorber is essential, in order to confine the space charge region in the absorber.

3.1.3 Window layer:

Window layer should be highly transparent, conductive. This leads to the optical absorption in the infrared region. Therefore, it is necessary to increase the mobility in the window material in order to get larger conductivity while keeping the carrier concentration low. The band gap of the materials should be large enough (ZnO) to show a large transmission of light photon.

3.1.4 Substrate:

Solar cell substrate should be stable at the cell production temperature. Another important issue is a good adhesion to the layers of the cell. Depending on the application, it may be cheap like a soda lime glass, or light like a polyimide film.

3.1.5 Top Contact:

The top layer of the grid has to be a good electrical conductor, it has to be readily connectable. Aluminum is often used as the top layer.

3.1.6 Back Contact:

Wider band gap material should be used for the back contact in order to increase the carrier type selectivity, to reduce the interface recombination. Since this contact is not transparent, an appropriate metal–semiconductor junction will generally perform well at a bias close to zero.

4 Chemical Spray Deposited CuInS₂ Based Solar cells:

First photovoltaic device, using CuInS₂ as an absorber material, was fabricated by Kazmerski et al. [14]. They employed dual-source deposition technique for the fabrication of n, p CuInS₂ homojunction solar cell. They reported 3.62 % conversion efficiency for 0.124 cm² device. The maximum efficiency reported for CIS based solar cell is 12.5% by Klaer et al. [15]. They employed dc magnetron sputtering of the metals, sulfurisation in elemental sulfur vapour. Siemer et al. [16] obtained efficiency of 11.4% by using rapid thermal process for the preparation of CuInS₂ absorbers. CuInS₂ absorber thin films with Cu rich phases were prepared using thermal evaporation method, employed in the device that could achieve efficiency of 10.2%. Chemical bath deposited (CBD) CdS buffer layer were used in the device. The cell structure In₂O₃/CdS/CuInS₂ with conversion efficiency of 9.7% was fabricated by Ogawa et al. [17]. They employed atom beam sputtering to deposit In₂O₃ films.

However from the selenide based devices conversion efficiency of 15.7% has been achieved with cadmium-free In_x(OH,S)_y as buffer layer for a Cu(In,Ga)Se₂- based solar cell. The conversion efficiency of 19.2% has been achieved for the cell structure ZnO/CdS/CuInGaSe₂. Co-evaporation technique was used to deposit absorber layer, which is the maximum efficiency reported for CIS based thin film solar cells. Naghavi et al. [18] used Indium sulfide as a buffer layer deposited by atomic layer chemical vapour deposition (ALCVD) for copper-indium-gallium-diselenide (coevaporation) solar cells yielded an efficiency 16.4%.

Highest efficient CIS-based solar cells were prepared using sophisticated high vacuum instruments. It is fairly advantageous to fabricate reliable, efficient non-vacuum processes instead of the expensive vacuum technique for solar cells based on the CuInS₂ absorber. Among a variety of non-vacuum processes, spray pyrolysis is an attractive method for deposition of CuInS₂ thin films as discussed in article 2. Because of easiness to deposit the high quality CuInS₂ films over a large area spray pyrolysis technique has emerged as a tool for the thin film deposition process. Spray pyrolysis technique has been employed for deposition of variety of materials.

The spray deposited CuInS_2 films have been employed in the CuInS_2 based modules. In the following discussion we have made review on solar cell modules fabricated from chemical spray deposited CuInS_2 as an absorber material, the solar cell parameters from different literature are presented in table 3. Naciri et al. [19] investigated effect of thickness of chemical bath deposited CdS on the performance of ZnO/CdS/CuInS_2 module. For the module 3.24 % efficiency were reported for 60 nm thickness of CdS buffer layer. Presence of CdS produces favorable condition for b, alignment between CuInS_2 , ZnO layer. Mere et al. [20] reported superstrate ZnO/CdS/CuInS_2 configuration from Indium rich solution composition (0.9 –1.1). The carrier concentration of absorber CuInS_2 was $10^{17}/\text{cm}^3$, which enhanced the short circuit current in the device. Ikeda et al. [21] investigated the effect of annealing temperature of sprayed CuInS_2 films on solar cell performance. The CuInS_2 thin films annealed with 600°C showed larger open circuit voltage, short circuit current, 5.1% conversion efficiency was reported with these films as an absorber layer in Al: $\text{ZnO/CdS/CIS/Mo/glass}$ device. However the Ga doped CIS absorber showed greater efficiency of about 5.8%. CdS/CIS heterojunction on ITO coated glass were synthesized by Hou et al. [22]. They employed Electrostatic Spray Assisted Vapor Deposition (ESAVD) method, 0.65% efficiency reported for 1.5 A.M. Light absorption in the CdS layer ($E_g \sim 2.4 \text{ eV}$) reduces the spectral response in the blue region, which results in the reduced photocurrent. This has been identified as a major problem in the total photocurrent loss. Khan et al. [23] reported 7.2 % conversion efficiency from CdS/CIS heterojunction onto ITO coated glass.

3D CIS/ TiO_2 solar cell were prepared by Hayre et al. [24], the effect of cell thickness, buffer layer thickness, the morphology of the TiO_2 nanoparticulate matrix were studied. Efficiency of about 3.0% was reported for 500 nm thick TiO_2 , above, below this thickness the cell performance was not good.

Use of CdS as buffer layer in solar cell has demonstrated excellent potential for cost-effective production of solar electricity. However, element Cd, which is a stable compound in thin-film modules therefore issues raised includes the hazards associated with this materials in fabrication of CIS based solar cells. So the quest for an alternative buffer layer is being pursued. Serious efforts are made to replace CdS as a buffer layer by other wide b, gap materials such as ZnS, ZnSe, ZnO, In_xS_y , $\text{In}_x(\text{OH},\text{S})_y$, In_2S_3 etc. with considerable conversion efficiencies.

Effect of In_2S_3 on the performance of $\text{CuInS}_2/\text{In}_2\text{S}_3/\text{TiO}_2$ was investigated by Goossens et al. [25], reported 7.00% of efficiency of the solar cell. In such type of device Cu diffusion from absorber CuInS_2 in In_2S_3 becomes the serious problem. Cherian, et al. reported [26] double layer of CuInS_2 by spray deposition with In_2S_3 as a buffer layer could be more advantageous for stability of the device. Conversion efficiency of 5.87 % was reported from CIS/ In_2S_3 module, investigated that the efficiency could be improved by precise control of the thickness of the absorber CuInS_2 buffer layer In_2S_3 , their atomic concentrations. A record 9.5 % efficiency of were reported by John et al. [27] with oxygen free In_2S_3 as a buffer layer investigated that diffusion of Cu from absorber to In_2S_3 layer creates Cu-deficiency at the surface of the CuInS_2 layer, makes the interface more photosensitive responsible for resulting high efficiency. Nanu et al. [28] fabricated 3D solar cell based on $\text{TiO}_2/\text{In}_2\text{S}_3/\text{CuInS}_2$ nanocomposite resulted in 5% efficiency. I-V characteristics of the module are shown in the figure 3. Table 2 summarizes the efficiencies of different solar cell module. In all modules absorber layer CuInS_2 is synthesized using spray pyrolysis technique.

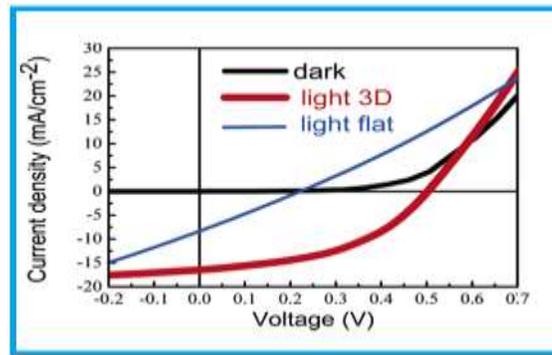


Figure 3: I-V characteristics of 5 % efficient 3D solar cell based on $\text{TiO}_2/\text{In}_2\text{S}_3/\text{CuInS}_2$ nanocomposite (Figure adapted from 28).

Table 3: Spray deposited CuInS_2 based solar cell modules, solar cell parameters. (* for spray deposited layer)

Substrate	CIS(CuInS_2) based module	Thickness of layer	V_{oc} (mV)	J_{sc} (A/cm^2)	FF (%)	Efficiency	Ref.
Glass/ITO	$\text{ZnO}^*/\text{CdS}/\text{CuInS}_2^*$	1-2 μm /60nm/1-2 μm	270	2.8	43	3.24	[19]
Glass/Mo	$\text{Al}:\text{ZnO}/\text{CdS}/\text{CuInS}_2^*$	-	590	18.1	48	5.1 (AM-1.5)	[21]
Glass/ITO	$\text{CdS}^*/\text{CuInS}_2^*$	300nm/ 2 μm	205	10.4	30	0.65	[22]
Glass/ITO	$\text{CdS}/\text{CuInS}_2^*$	300nm/500nm	650 0.567 7.60	21.5	56.7	7.60 (AM-1.5) 100 mW/cm^2	[23]
TCO/LOF Glass	3D $\text{CuInS}_2^*/\text{TiO}_2^*$	500 nm/ 150nm	460	13.2	46	2.8	[24]
TCO/LOF Glass	$\text{TiO}_2^*/\text{In}_2\text{S}_3^*/\text{CuInS}_2^*$	150nm/60nm/500nm	400	19.8	38	3 (AM-1.5)	[24]
Quartz Glass	$\text{CuInS}_2^*/\text{In}_2\text{S}_3^*/\text{TiO}_2^*$	-	710	23	43	7 (AM-1.5)	[25]

Glass/ ITO	CuInS ₂ */In ₂ S ₃ */Ag,	-/1µm/0.5µm/-	450	44.03	29.5	5.87	[27]
Glass/ ITO	CuInS ₂ */In ₂ S ₃ */Ag	1 µm/0.85µm/45nm	588	48.2	33.5	9.5	[28]
Glass/ ITO	TiO ₂ /In ₂ S ₃ / CuInS ₂		503	17	55	5	[29]
					(AM-1.5)		
Glass/ITO	ZnO*/CdS*/ CuInS ₂ *	-/500nm/-	443	5.5	37	-	[30]
Glass	CuInS ₂ */ZnO/ (0.03 cm ²)	0.9 µ/ -/ -	280	13.3	38	2	[31]
Glass/ ITO	ZnO/TiO ₂ /In ₂ S ₃ / CuInS ₂ *	-	425	12.0	43	2.2	[32]

5 Results and discussions:

Chacopyrite CuInS₂ thin films can be deposited with low cost spray pyrolysis technique. According to the analysis of the result outlined above it reveals that the properties of the CuInS₂ thin films prepared by spray pyrolysis technique mainly influenced by substrate temperature, chemical composition of the precursor solution , pH, spray rate ambient atmosphere, carrier gas, droplet size , post-deposition cooling rate etc. To improve the quality , thickness of CuInS₂ absorber (µm range), many thin layers may be deployed sequentially. Annealing plays a vital role to remove organic residuals from the solution, to increase film density, , crystallize of the film. Unfortunately film treated at high temperature can still contain structural defects that lead to limited carrier lifetime , mobility. Substrate material is observed to be one of the constraints to the high temperature treatments in the solar cell device fabrication process. In terms of solar cell applications, the title compound CuInS₂ prepared by low cost chemical spray pyrolysis technique, contributes to the novel absorbing materials (efficiency up to 10%) with precisely controlled absorber properties. However the design of appropriate hetero-structures with CuInS₂ absorber, suitable wide b, gap buffer , window layer material is great challenge to CuInS₂ based solar cell modules.

6 Conclusions:

This review has described the non vacuum based, low cost , versatile chemical spray pyrolysis method for preparation of CuInS₂ absorber thin films for solar cell application. CuInS₂ thin films prepared by spray pyrolysis technique mainly influenced by substrate temperature, chemical composition of the precursor solution , pH, spray rate ambient atmosphere, carrier gas, droplet size , post-deposition cooling rate etc. To improve the quality , thickness of CuInS₂ absorber (µm range), many thin layers may be deployed sequentially. Annealing plays a vital role to remove organic residuals from the solution, to increase film density, crystallize of the film. Unfortunately film treated at high temperature can still contain structural defects that lead to limited carrier lifetime, mobility. Substrate material is observed to be one of the constraints to the high temperature treatments in the solar cell device fabrication process. In terms of solar cell applications, the title compound CuInS₂ prepared by low cost chemical spray pyrolysis technique, contributes to the novel absorbing materials (efficiency up to 10%) with precisely controlled absorber properties. However the design

of appropriate hetero-structures with CuInS₂ absorber, suitable wide b, gap buffer, window layer material is great challenge to CuInS₂ based solar cell modules. Low cost chemical spray pyrolysis technique for deposition of CuInS₂ absorber thin film is one of the suitable alternative to sophisticated, vacuum based techniques. Chemical spray pyrolysis of CuInS₂ thin-films as an absorber material for solar cells has high potential in the photovoltaic industries.

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Controlling the Active Power and Frequency of Single and Multi Area Interconnected Power System Using PID Controller

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Abstract— The main objective of this paper is to control the active power and frequency known as Load Frequency Control of single area thermal and hydro plant as well as two area thermal and hydro power systems. During the transportation, both the active power balance and the reactive power balance must be maintained between generating and utilizing the AC power. For this purpose proportional, conventional (integral) and derivative control configurations in various combinations are used and studied. The systems have been simulated on computer and analyzed. This paper presents the application of P controller, PI controller and PID controller to attain LFC in order to keep the frequency constant against the randomly varying power loads (active), which are also described as unknown external disturbance. LFC is also essential to regulate the tie-line power exchange error.

The single and multi-area interconnected systems responses have been obtained for uncontrolled and controlled cases and studied for comparison using the MATLAB/SIMULINK. The controller's response can be described in terms of the sensitivity of the controller to an error, the degree to which the controllers outreach the set point and the degree of system oscillation.

Keywords— Load Frequency Control, Active power and frequency control, P controller, PI controller, PID controller, tie-line power exchange error, responsiveness, MATLAB/SIMULINK.

INTRODUCTION

The main objective of any power systems is to convert natural energy into electric power. In order to make the performance of electrical equipment optimal, it is essential to ensure that the degree of quality of the electric power must be as high as possible. In the process of transportation, the two balances must be maintained named as the active power balance and the reactive power balance between generating and utilizing the AC power. It will be not be possible to maintain the balances of both the active and reactive powers without any proper control action. As a result of the imbalance, the frequency and voltage levels will vary with the change of the loads. Hence it is required to build a control in order to cancel the effects of the random load changes and to maintain the frequency and voltage at the desired values. In this paper various configurations of Proportional, Integral and Derivative controllers are used to modulate and adjust the active power and frequency of the single area as well as two area power plants. The values of K_p , K_d , K_r and K_i are calculated by manual tuning method. This paper deals with a design method for LFC in a multi area electric power system using a PID and controller whose parameters are tuned using MATLAB/SIMULINK

MECHANICAL-HYDRAULIC GOVERNOR

A schematic arrangement of the main features of a speed governing system of the kind used on speed turbine is shown in figure 1. To develop mathematical representation of the system, it is assumed that the system is operating under steady state condition.

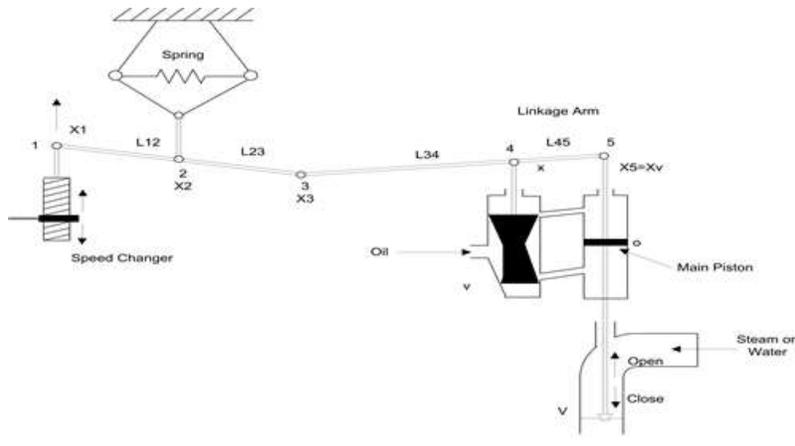


Figure 1: Mech. Hydraulic Governor

The mathematical equations are obtained as[1]:

$$\Delta X_1 = K \Delta P_c$$

$$\Delta X_3 = -K_1 \Delta P_c$$

$$\Delta X_4 = K_3 \Delta X_3 + \Delta K_3 \Delta X_5$$

$$\Delta X_5(s) = -K_5 \frac{1}{s} \Delta X_4(s)$$

$$\Delta X_5(s) = \frac{K_1 K_3 \Delta P_c(s) - K_2 K_3 \Delta F(s)}{K_4 + \frac{s}{K_5}}$$

$$\Delta X_5(s) = [\Delta P_c(s) - \frac{1}{R} \Delta F(s)] * \frac{K_g}{1 + sT_g}$$

Where

$$R = \frac{K_1}{K_2} = \text{speed regulation of the governor}$$

$$K_g = \frac{K_1 K_3}{K_4} = \text{gain of speed governor}$$

$$T_g = \frac{1}{K_4 K_5} = \text{time constant of speed governor}$$

ELECTRO – HYDRAULIC SPEED GOVERNOR

An electro hydraulic speed control mechanism provides flexibility through the use of electronic circuits in place of mechanical components in the low power positions.

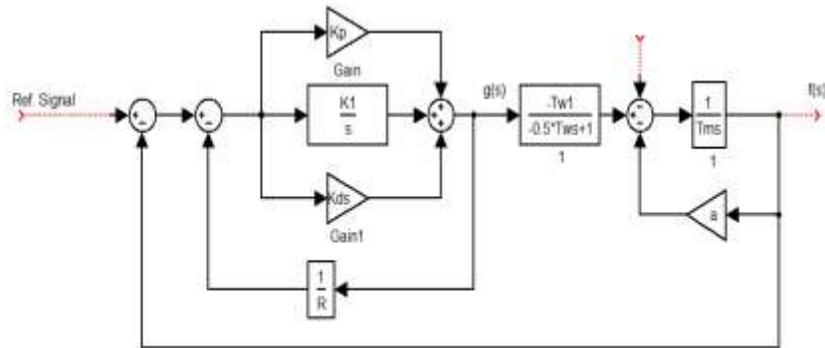


Fig 2. Electro-Hydraulic Governor

The surplus power is given as[2]

$$\Delta P_G - \Delta P_D = \frac{2H}{f^0} \frac{d\Delta f}{dt} + B\Delta f \quad \text{per MW}$$

Taking the Laplace transform,

$$\Delta P_G(s) - \Delta P_D(s) = \frac{2H}{f^0} s\Delta f(s) + B\Delta f(s)$$

Or we can write $\Delta f(s) = G_P(s) [\Delta P_G(s) - \Delta P_D(s)]$

$$G_P(s) \approx \frac{K_P}{1+sT}$$

$$\frac{1}{K_P} = \frac{2H}{f^0 B} \text{ sec}$$

$$T_P = \frac{1}{B} \text{ Hz/P.U. MW}$$

Murthy and Harihara have shown the temporary droop governor as:

$$K_P = \frac{1}{\delta}, K_i = \frac{1}{\delta T_Y} \text{ and } K_d = \frac{T_n}{\delta} [1]$$

LOAD FREQUENCY CONTROL OF A SINGLE AREA POWER SYSTEM

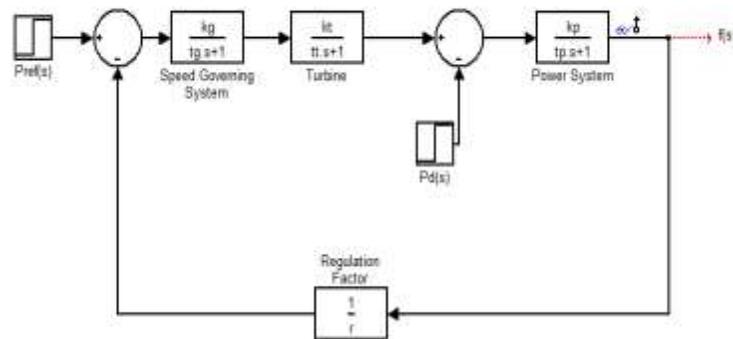


Fig 3. Block Diagram of Single Area Power Plant

CONTROLLED CASE: INTEGRAL CONTROL

Simulated frequency response of single area non-reheat thermal plant is given in fig. (3.4).

Integral gain value has been taken as

$P_D = 0.01$

$K_i = 0.6$

$T_G = 0.08 \text{ sec}$

$K_P = 120 \text{ (generator gain)}$

$$F(S) = \Delta f(s) = - \frac{K_p}{(1+sT_p) + (\frac{1}{R} + \frac{K_i}{s}) \times \frac{K_p}{(1+sT_g)(1+sT_t)}} \times \frac{M}{s} \quad [2]$$

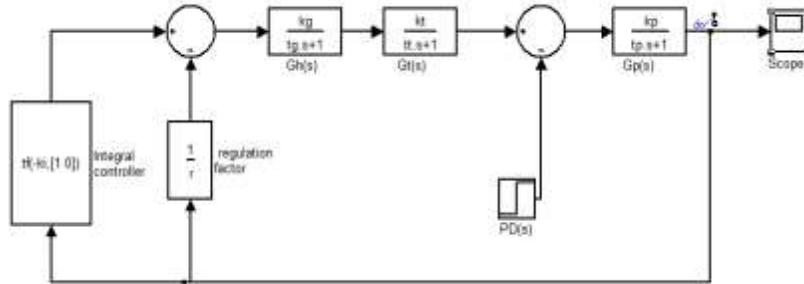


Fig 4. Block Diagram of Single Area Power Plant (controlled)

Simulation Result:

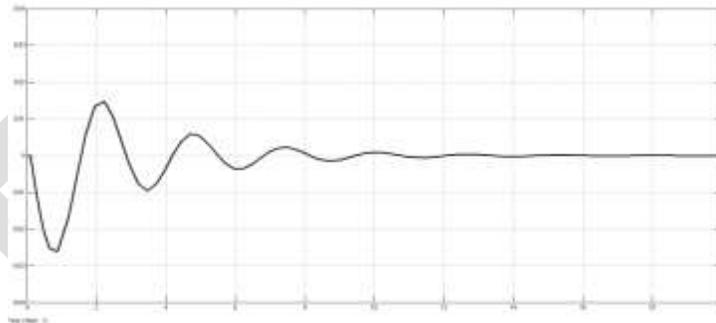


Figure 4.1: Response of Single Area Power Plant

TWO AREA INTERCONNECTED POWER SYSTEMS

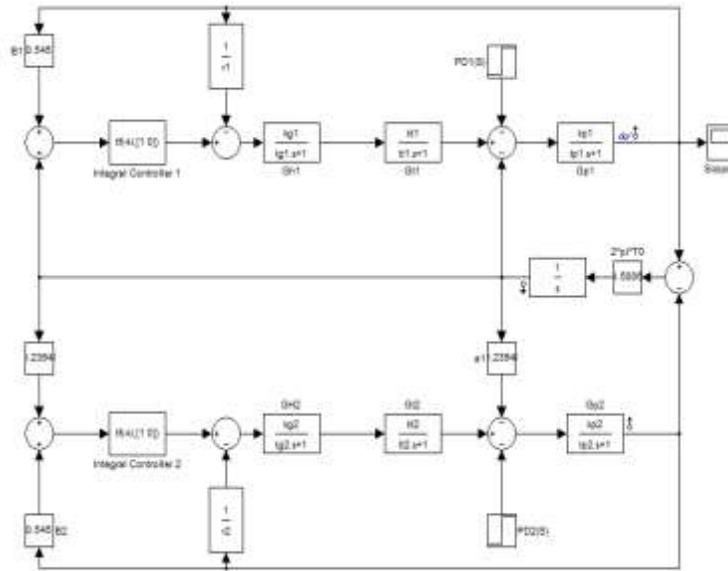


Fig 5. Block Diagram of Two Area Interconnected Power System (controlled)

Simulation Result:

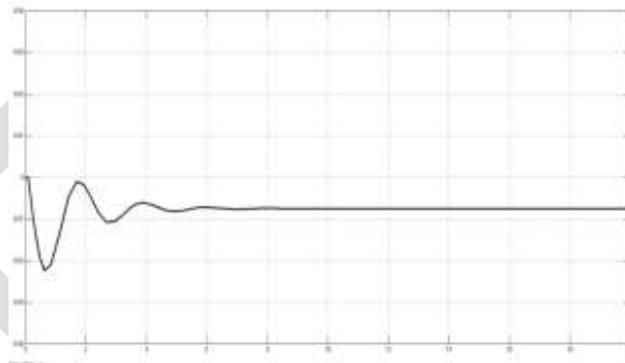


Fig 5.1. Response of Two Area Interconnected Power System (controlled)

PROPORTIONAL, INTEGRAL (CONVENTIONAL) AND DERIVATIVE CONTROL ON POWER SYSTEMS

Two controllers together, normally proportional plus derivative, proportional plus integral and integral plus derivative are used in forward path as well as feedback path to arrive at appropriate control configurations which yields best response.

Parameter	Value
K_P	120 Hz/P.U.MW
K_I	0.5
R	2.4 Hz/P.U.MW
ΔP_t	0.01

Table 1: Value of different Parameters

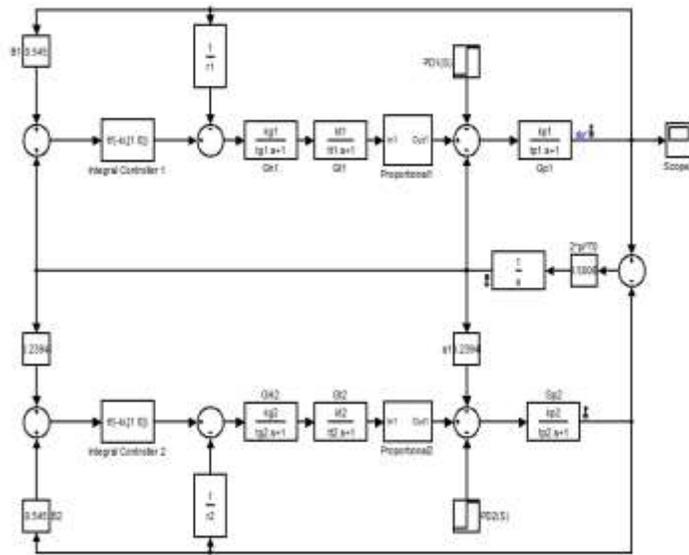


Figure 7. Block Diagram of Power System using proportional plus integral controller

Simulation Result:

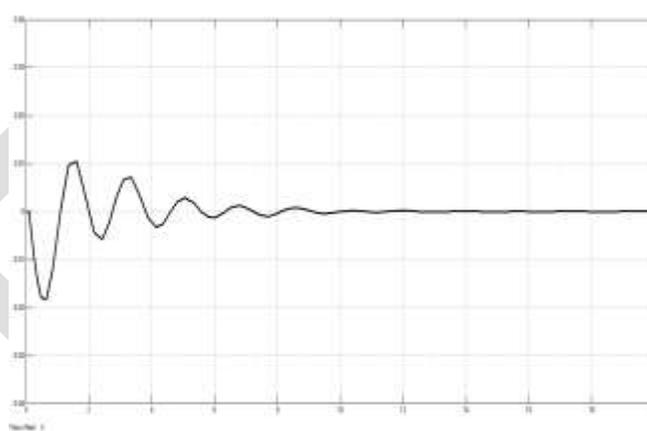


Fig 6.1. Response of Power System (prop. & integral in forward path)

INTEGRAL PLUS DERIVATIVE CONTROLLER

Here the two controllers together, i.e. integral plus derivative are used in forward path to arrive at appropriate control configurations which yields best response. The block diagram of the configuration is shown below:

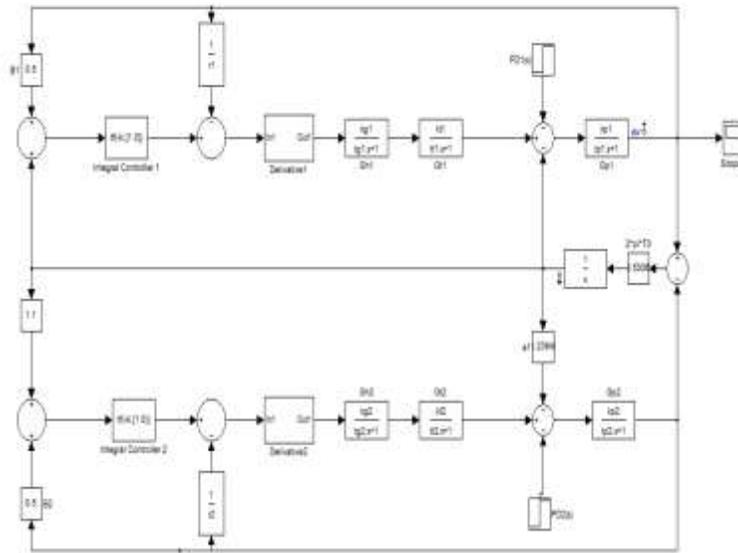


Figure 8. Block Diagram of Power System using integral plus derivative controller

Simulation Result:

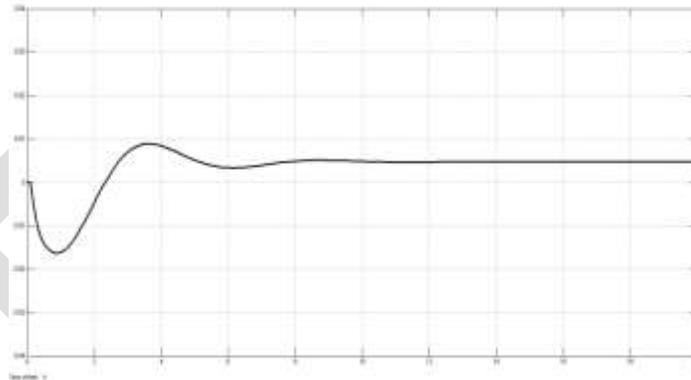


Figure 8.1 Response of Power System (integral & derivative in forward path)

P.I.D (PROPORTIONAL PLUS INTEGRAL PLUS DERIVATIVE) CONTROL

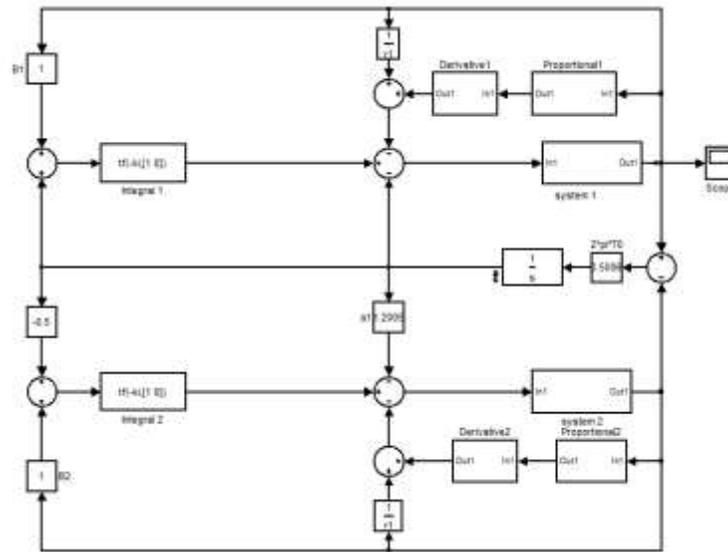


Figure 9. Block Diagram of Power System using proportional plus integral plus derivative controller

Simulation Result:

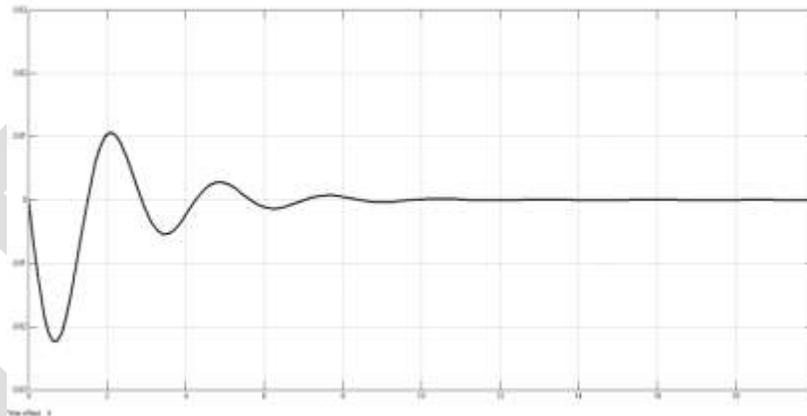


Figure 9.1 LFC Response of two area thermal plant with PID

CONCLUSION

This paper has been devoted to the active power and frequency control of single area thermal and hydro plant as well as two area thermal and hydro power systems. For this, proportional, conventional (integral) and derivative control configurations in various combinations are used and studied. Load frequency control of interconnected power systems when P. I. D. controller is implemented, yields low over shoot (less than 0.03 Hz), lesser transient oscillations and reduced settling time. Hence a better control of frequency and active power has been obtained during random load change.

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PERSONALIZED MOBILE SEARCH ENGINE BASED ON MULTIPLE PREFERENCE, USER PROFILE AND ANDROID PLATFORM

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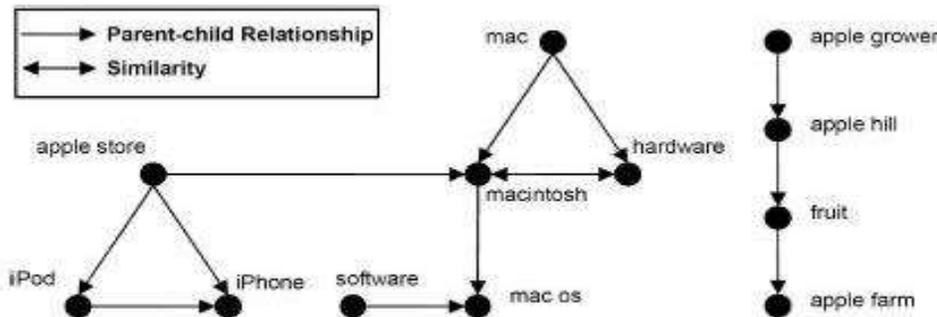
Abstract — Mobile search needs better interaction between user and server usually this interaction is not efficient due to many adopting the meta search approach, click through data, user profiling which is based on client server model. In this model client sends request to the server and server forward this request to the commercial search engine also training and re-ranking is done on server side, we call it PMSE server. We also involve a method to maintain the user's interests over his ongoing search activity and to personalize the search results. The profiles of specific users are stored on the Personalization clients, thus preserving privacy to the users.

Keywords — Clickthrough data, content ontology, location ontology, personalization, user profiling, privacy preservation, spyNB, IR.

1. INTRODUCTION

The proliferation of mobile technologies such as (PDAs and mobile phones) has made access to huge and heterogeneous collection of documents on the web, possible anywhere and anytime. This brings big challenges for researches in the information retrieval (IR) domain. Studies on logs of mobile Internet user queries show that user queries are shorter (thus more ambiguous), that there are fewer requests by session and fewer users who consult farther than the first page of the results list. Furthermore, 72% of the information needs of mobile users are related to contextual factors such as user interests, location and time. So it is very difficult to user to get relevant result or expected result. In our system, we propose User Interest Profile. Each user has its own profile, in the sense which provide user a privacy. When user send query to PMSE server for getting reply, search history is created. So for every user, history is created and it is maintained by ontology DB. This web history will be in use for further query. Personalization aims to alter large amounts of information and returns a view on the information which matches the user's preferences and interests improving therefore the precision of the search results. Observing the need for different types of concepts, we present in this paper a personalized mobile search engine, PMSE, which represents different types of concepts in different ontologies. In particular, recognizing the importance of location information in mobile search, we separate concepts into location concepts and content concepts. Previous research shows that

researcher concentrated only on content preference but in our system we are going to use location of user also for better result. We propose our system on android platform so for getting location of user, we can use GPS system.



Example Content Ontology Extracted for the Query “apple”.

Fig.1 Content Ontology Extracted

2. RELATED WORK

Most commercial search engines return roughly the same results to all users. However, different users may have different information needs even for the same query. For example, a user who is looking for a laptop may issue a query .apple. to find products from Apple Computer, while a housewife may use the same query .apple. to find apple recipes. The objective of personalized search is to disambiguate the queries according to the users' interests and to return relevant results to the users. Clickthrough data is important for tracking user actions on a search engine.

Doc	Search Results	c_i	l_i
d_1	Hotels.com	room rate	international
d_2	JapanHotel.net	reservation, room rate	Japan
d_3	Hotel Wiki	accommodation	international
d_4	US Hotel Guides	map, room rate	USA, California
d_5	Booking.com	online reservation	USA
d_6	JAL Hotels	meeting room	Japan
d_7	Shinjuku Prince	facility	Japan, Shinjuku
d_8	Discount Hotels	discount rate	international

Table.1. Clickthrough Data.

Table I is an example clickthrough data for the query. It consists of the search results of a user's query and the results that the user has clicked on by bold. c_i 's are the content concepts and l_i 's are the location concepts extracted from the corresponding results. Many personalized web search systems are based on analyzing users clickthroughs. Joachims proposed to use document preference mining and machine learning to rank search results according to user's preferences. Later, Agichitein et al. proposed a method to learn users' clicking and browsing behaviour from the clickthrough data using a scalable implementation of neural networks called Rank Net. Gan et. al suggested that search queries can be classified into two types, content (i.e., non-geo) and location (i.e., geo). Typical examples of

geographic queries are hotels, football ground. A classifier was built to classify geo and non-geo queries, and the properties of geo queries were studied in detail. It was found that a significant number of queries were location queries focusing on location information. Hence, a number of location-based search systems designed for geo queries have been proposed. These include Yokoji et al., who proposed a location-based search system for web documents. A parser was employed to extract location information from web documents, which was converted into latitude longitude pairs or polygons. When a user submits a query together with the location information specified in a latitude longitude pair, the system creates a search circle centered at the specified latitude-longitude pair and retrieves documents containing location information within the search circle.

The differences between our work and existing works are:

- Existing works such as require the users' to manually define their location preferences explicitly (with latitude-longitude pairs or text form). With the automatically generated content and location user profiles, our method does not require users to explicitly define their location interest manually.
- Our method automatically profiles both of the user's content and location preferences, which are automatically learnt from the user's clickthrough data without requiring extra efforts from the user.
- Our method uses different formulations of entropies derived from a query's search results and a user's clickthroughs to estimate the query's content and location ambiguities and the user's interest in content or location information. The entropies allow us to classify queries and users into different classes and effectively combine a user's content and location preferences to rerank the search results.
- In Existing works there was nothing about users privacy and profile, but in our system we are going to maintain user profile.
- Most existing location-based search systems require users to manually define their location preferences or to manually prepare a set of location sensitive topics. PMSE profiles both of the user's content and location preferences in the ontology based user profiles, which are automatically learned from the clickthrough and GPS data without requiring extra efforts from the user.

3. PROPOSED SYSTEM

Most of the previous work assumed that all concepts are of the same type. We separate concepts into location concepts and content concepts to recognize information importance. So far there have been many papers written & researched on search engines. There is tremendous evolvement in this field. In this paper, we propose a realistic design for PMSE by adopting the metaearch approach which relies on one of the commercial search engines, such as Google, Yahoo, or Bing, to perform an actual search. The client is responsible for receiving the user's requests, submitting the requests to the PMSE server, displaying the returned results, and collecting his/her clickthrough in order to derive his/her personal preferences. The PMSE server, on the other hand, is responsible for handling heavy tasks such as forwarding the requests to a commercial search engine, as well as training and reranking of search results before they are returned to the client. The user profiles for specific users are stored on the PMSE clients, thus preserving privacy to the users. PMSE has been prototyped with PMSE clients on the Google Android platform and the PMSE server on a PC server to validate the proposed ideas. Studies the unique characteristics of content and location concepts, and provides a coherent strategy using client-server architecture to integrate them into a uniform solution for the mobile environment. By mining content and location concepts for user profiling, it utilizes both the content and location preferences to personalize search results for a user.

4. SYSTEM DESIGN

1.Weight vector- content weight vector and user weight vector describes the user interests based on the user’s content and location preferences extracted from the user clickthroughs respectively.

2.Feature vector- feature vector is a n dimensional vector of numerical feature that represent some object. feature vector are often combined with weights using a dot product in order to construct a linear predictor function that is used to determine a score for making prediction.

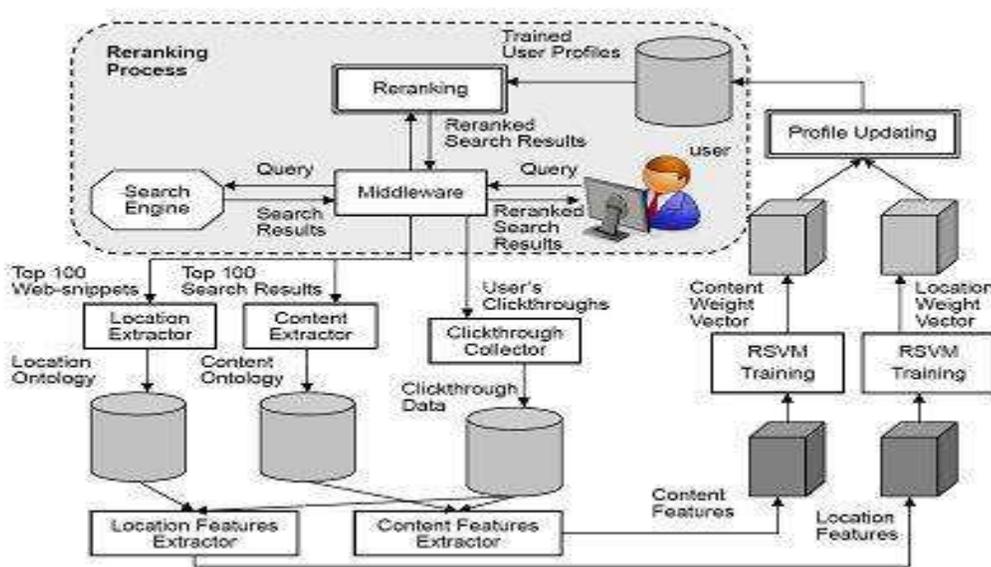


Fig. 2.System Design

Content ontology - if a keyword/phrase exists in web-snippets arising from the query, we would treat it as an important concept related to the query.

Location ontology - extract location concepts from full documents. The predefined location ontology is used to associate location information with the search results. All of the keywords from the documents returned for query are extracted. If a keyword or key-phrase in a retrieved document matches a location name in our predefined location ontology, it will be treated as a location concepts.

4.1 MODULES

- User Interest Profiling

PMSE uses “concepts” to model the interests and preferences of a user. Since location information is important in mobile search, the concepts are further classified into two different types, namely, content concepts and location concepts. The concepts are modeled as ontologies, in order to capture the relationships between the concepts. We observe that the characteristics of the content concepts and location concepts are different. Thus, we propose two different techniques for building the content ontology and location ontology. The ontologies indicate a possible concept space arising from a user’s queries, which are maintained along with the clickthrough data for future preference adaptation. In PMSE, we adopt ontologies to model the concept space because they not only can represent concepts but also capture the relationships between concepts. Due to the different characteristics of the content concepts and location concepts.

- Diversity and Concept Entropy

PMSE consists of a content facet and a location facet. In order to seamlessly integrate the preferences in these two facets into one coherent personalization framework, an important issue we have to address is how to weigh the content preference and location preference in the integration step. To address this issue, we propose to adjust the weights of content preference and location preference based on their effectiveness in the personalization process. For a given query issued by a particular user, if the personalization based on preferences from the content facet is more effective than based on the preferences from the location facets, more weight should be put on the content-based preferences; and vice versa.

- User Preferences Extraction and Privacy Preservation

Given that the concepts and clickthrough data are collected from past search activities, user’s preference can be learned. These search preferences, inform of a set of feature vectors, are to be submitted along with future queries to the PMSE server for search result re-ranking. Instead of transmitting all the detailed personal preference information to the server, PMSE allows the users to control the amount of personal information exposed. In this section, we first review a preference mining algorithms, namely SpyNB Method, that we adopt in PMSE, and then discuss how PMSE preserves user privacy. SpyNB learns user behavior models from preferences extracted from clickthrough data. Assuming that users only click on documents that are of interest to them, SpyNB treats the clicked documents as positive samples, and predict reliable negative documents from the unlabeled (i.e. unclicked) documents. To do the prediction, the “spy” technique incorporates a novel voting procedure into Naïve Bayes classifier to predict a negative set of documents from the unlabeled document set. The details of the SpyNB method can be found in. Let P be the positive set, U the unlabeled set and PN the predicted negative set ($PN \subset U$) obtained from the SpyNB method.

- Personalized Ranking Functions

Upon reception of the user's preferences, Ranking SVM (RSVM) is employed to learn a personalized ranking function for rank adaptation of the search results according to the user content and location preferences. For a given query, a set of content concepts and a set of location concepts are extracted from the search results as the document features. Since each document can be represented by a feature vector, it can be treated as a point in the feature space. Using the preference pairs as the input, RSVM aims at finding a linear ranking function, which holds for as many document preference pairs as possible. An adaptive implementation, SVM light available at, is used in our experiments. In the following, we discuss two issues in the RSVM training process:

- 1) how to extract the feature vectors for a document.
- 2) how to combine the content and location weight vectors into one integrated weight vector.

5. ACKNOWLEDGMENT

I would like to express my special thanks of gratitude to my guide Assistant Professor Mrs. Nemade S.B. madam who gave me the golden opportunity to write this important paper on the topic personalized mobile search engine, which also helped me in doing a lot of Research and I came to know about so many new things, I am really thankful to them.

6. CONCLUSION

The proposed personalized mobile search engine is an innovative approach for personalizing web search results. By mining content and location concepts for user profiling, it utilizes both the content and location preferences to personalize search results for a user. The possible outcome will improve retrieval effectiveness for location queries (i.e. queries that retrieve lots of location information). For future work, we will investigate methods to exploit regular travel patterns and query patterns from the GPS and clickthrough data to further enhance the personalization effectiveness of PMSE.

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IJERGS

Use of Powerless Material Moving Facility for Assembly Line Balancing

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Abstract— Among various production systems assembly line production system is most widely adapted system. Basically assembly line is distribution of various activities among workstations utilizing man power and facilities for enhancing work distribution. Major problem related to assembly line balancing is uncertain distribution of activities as per capabilities of workstation and improper use of human resources. In this paper problem of line balancing in oil tank manufacturing has been discussed using power less material moving facility (PMMF). The paper basically aims at reducing bottleneck time by proper interlinking of machineries and thereby increasing productivity.

Keywords— Line balancing, moving facility, cycle time, bottleneck time, powerless, production system, interlinking, workstations.

INTRODUCTION

For any production system any assembly line consists of set of workstation arranged in one particular fashion interlinking each other with material handling device. It can be linear, circular, u shaped, ladder etc. The movement of material via assembly line begins with part or material fed at initial point with particular feed rate. Basically workstation is considered any point on assembly line in which task is assigned and performed on part. The work or task carried out can be brought out by manually operated machinery, computer controlled machinery, hydraulic equipments etc. In simple once the material enters the first station task begin to perform sequentially. The work piece is subjected to various tasks one after the other as per sequence assigned. The time taken to compute each task at each operation is known as process time. The time required for single work piece to undergo all the task from starting point to end point is cycle time.

The cycle time is predetermined by desired production rate in assembly line. Also the desired production rate is set so that end product is produced within stipulated time period. The concept of manufacturing assembly line was first introduced by Henry ford in early 1990's [1]. It was designed with an intention of increasing productivity by enhancing manufacturing method.

Certain conditions are to be followed for designing the assembly lines are as follows;

- 1) Number of workstations and number of work elements should suffice each other in quantity. Minimum number of workstation should be = 1
- 2) The process time should not exceed cycle time.
- 3) Interlinking of workstations.

LITERATURE REVIEW

The literature survey (Hadi Gokcen, Kursad Agpak , Recep Benzer “ Balancing of parallel Assembly lines, 2005) states that productivity improvement in assembly line is important because it increases capacity and reduces cost so constructing parallel lines is one of the best methods which can affectively enhance assembly line balancing.

In April 2007, author Nuchsara Kreingkorakot and Nalin Pianthong studied assembly line balancing [2]. This study is focussed on assigning task to an ordered sequence relations among task are that the precedence relations among tasks are satisfied and performance measure is optimized. They also concluded that research has made significant algorithm development in solving simple problems.

In literature survey of Generalised Assembly line balancing problem (cf. Becker and Scholl, 2006) shows that relevant problems have been identified and modeled but development of sophisticated solution procedure has just begun. Then additional research is necessary to adopt state of the art solution concept like meta heuristics and highly developed algorithms of or SALBP to variety of GALBP.

In literature survey of SALBP (cf. R.B.Breginski, M.G.Cleto, J.L.Sass Junior Asseby line balancing using eight heuristics) shows that line balancing is a critical problem that affects productivity and cost of production [3]. It shows that methodology adopted for assembly line balancing in different countries do affect their respective productivity.

Assembly Balancing problems The problem of assembly line balancing is closely associated with distribution of activities among the workstations which ultimately tends to maximum utilization of human resources and facilities without disturbing the work sequence [1, 2]. Assembly line balancing problems are classified in 2 types:-

Production Rate & Task time The problem deals with production rate, assembly task, task time, etc. The problem statement clearly reveals that number of workstations are required to be minimized. These constraints are taken into consideration while designing new assembly line[4]. Minimum number of workstation simply implies minimum labour cost, education in space requirement and optimum use if time[5,6]. It also handles modification in assembly line by adding workstation as per requirement.

Employee & Workstation Condition prescribed is fixed number of employee with fixed number of workstation. The aim is to minimize the cycle time. The contemplation of minimizing the cycle time is to increase production rate but with constraints applied. Generally type b problem occurs when organization wants to produce the optimum number of items by using fixed number of workstations without expansion.

In general “production rate and task time” problems occur more frequently but still if any industry or company having trivial methodology for assembly line balancing give rise to “Employee and workstation” problems.

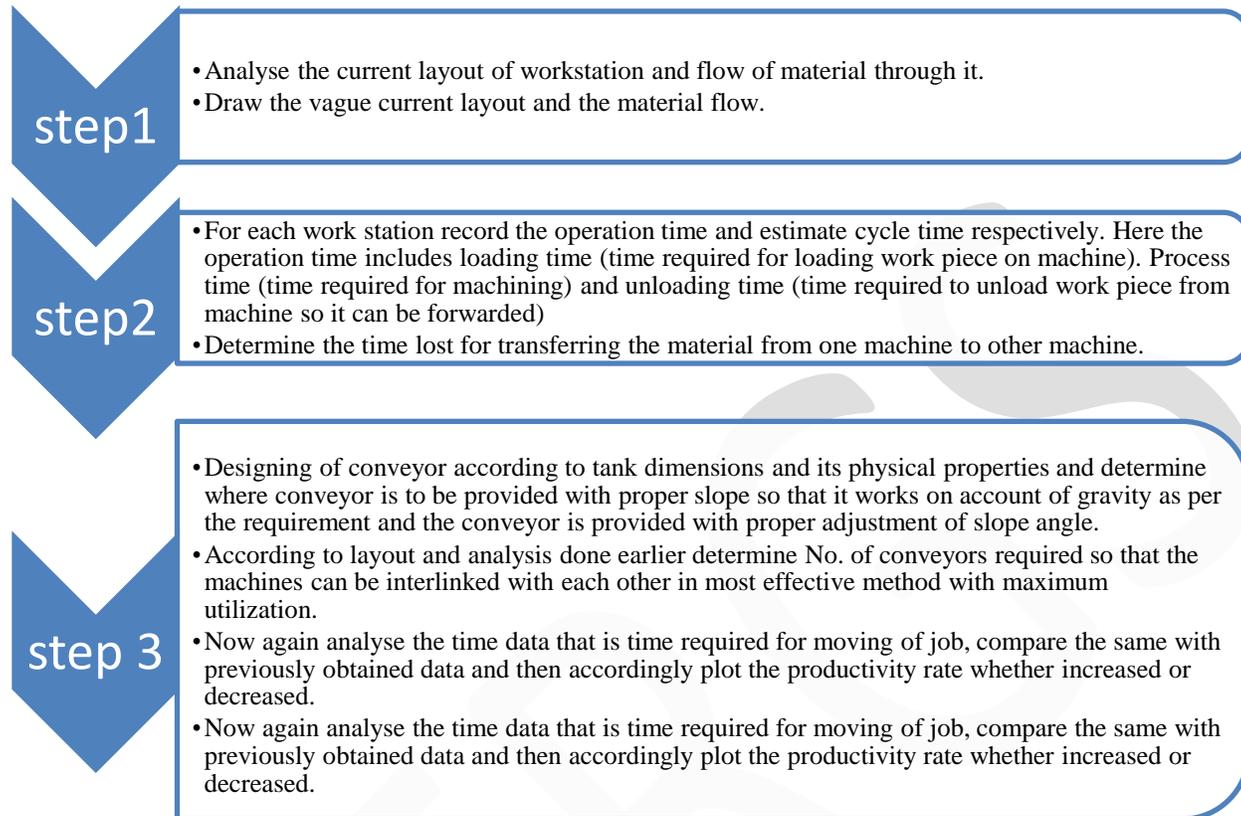
Some of methods generally used for line balancing are enlisted below:-

- Moodie- young method.
- Ranked position weighed method.
- Hoffmans matrix.
- Immediate update first fit method.
- Powerless material moving facility method.

As per other methods mentioned of line balancing powerless material moving facility method for assembly line balancing B the best solution obtained for solving the problem of oil tank manufacturing system [7].In this powerless MMF method number of workstations are fixed but by aligning the material moving facility from one machine to other the productivity can be increased and thus it could be effective solution for the problem arising in manufacturing company

POWERLESS MATERIAL MOVING FACILITY METHOD (PMMF METHOD)

Steps followed in PMMF method are as follows:-



CASE STUDY (VIRAJ ENGINEERING SERVICES, NASHIK)

Viraj Engineering services Nashik is manufacturing oil tank for hydraulic operated automobiles like earth movers, locomotives and etc. Viraj Engineering services is servicing excellence from past many years in manufacturing of oil tank and is proved to be best as the company by holding 2nd position in tank manufacturing industries. Initially there was no proper assembly line set up in the company but the modifications were brought about as per the requirement of customer time to time.

Company intends for mass production with maximum utilization of sources. Thus to achieve this objective Assembly line balancing is proposed by PMMF method. After monitoring time required for tank manufacturing and its assembly it was decided to set up material handling equipment to interlink the machinery [8]. So based on observations and requirement the conveyors were lined up between machineries and the aisle (gang way) was shifted. The study was again carried out to find out the total cycle time using PMMF method.

For final assignment of oil tank line balancing simple metallic roller conveyors were used. With the help of these conveyors line was balanced by achieving interconnection between all machineries [9, 10]. Initially 12 labourers were required 10 operators and 2 for material moving and now currently in total 11 operators are required for complete assembly that is 10 operators and only 1 for material handling there by eliminating 1 labourer [11, 12].

CALCULATIONS

Time calculations for manufacturing;

Total TIME

- Total task time :- **14 minutes 13 seconds**
(Before conveyer)

Now Bottle neck time = 7 minutes ----- before conveyer

Therefore total lead time for 1 tank (before conveyer)

$$\begin{aligned} &= 14 \text{ mins } 13 \text{ sec} + 7 \text{ mins} \\ &= 21 \text{ mins } 13 \text{ sec} \end{aligned}$$

After this 21 mins 13 seconds another tank continues and is forwarded for complete assembly

So for 8 hours of shift we have $8 * 60 = 480 \text{ mins}$

Reducing lead time $= 480 - 21.13 = 458.87 \text{ mins}$

Also labourer consume time for tea break that is 40 mins

So eliminating this time from shift hours

$$458.87 - 40 = 418.87 \text{ mins}$$

Now for calculating no of tanks

$$= (\text{time of duty} / \text{no of mins for 1 tank})$$

$$= 418.87 / 7 = 59.83 \approx \mathbf{60 \text{ tanks}}$$

Thus for one shift before conveyer 60 tanks are manufactured.

After conveyors were installed

Again for 8 hours of duty =

$$= 8 * 60$$

$$= \mathbf{480 \text{ minutes}}$$

Total task time: - **13 minutes 08 seconds**

(After conveyer)

Bottleneck time here is 2 minutes

And process time for one tank =13min 08 seconds

Therefore total lead time =13.08+2

=15.08mins

Eliminating lead time for one tank after conveyors=

=480-15.08

= **464.92 minutes**

Again eliminating recess time utilized by workers =

=464.92-40

=424.92 mins

After conveyer one tank is forwarded and is out within 5.5 minutes

Thus no of tanks = 424.92/5.5

=77.25

=**78 tanks (Approximately)**

Now for one shift tanks manufactured = 78 Tanks

Additionally 18 tanks more will be manufactured.

Time saved from previous method = bottle neck time before conveyor – bottle neck time after conveyor

$$= 7 \text{ minutes} - 2 \text{ minutes}$$

$$= \mathbf{5 \text{ minutes}}$$

Cost Calculations:-

Approximate cost / tank = 2200 Rs.

Before conveyor

No of tanks manufactured = 60 tanks

Thus cost = $60 * 2200$

$$= 1,32,000/-$$

for 1 shift cost incurred = 1,32,000/-

Thus monthly income incurred = $1,32,000 * 26$

$$= 34,32,000/-$$

After Conveyor

No of tanks manufactured = 78 tanks

Thus cost = $78 * 2200$

$$= 1,71,600/-$$

for 1 shift cost incurred = 1,71,600/-

Thus monthly income incurred = $1,71,600 * 26$

$$= 44,61,600/-$$

Therefore monthly increment in income is

=44, 61,600-34, 32,000

=10, 29,600/-

Therefore monthly increment in income =**Rs 10,29,600/-**

Labour cost saving

Now 1 labour is reduced

1 labours daily wage = 250/-

So monthly wage is =250*26

=6500/-

Thus in companies income 6500/- per month is saved by reducing 1 labour.

CONCLUSION

The main purpose of this paper is to emphasize use of PMMF method to develop assembly line and balancing that line. With the study and analysis it is observed that PMMF method is suitable and proper for problem developed. Also with this method one can find best method to synchronize work stations for work flow and sequencing and thus bottlenecking time can also be reduced. Before lining of conveyors the tank manufacturing rate was about 60 tanks per shift which has been increased to 78 tanks per shift. In total increment of 18 tanks per shift is achieved by this adopted technique. Approximately percentage growth in productivity is 30%. Due to above adopted method monthly increment in income is increased by 10, 29,600/- also labour cost of 6500/- is saved per month.

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EXPERIMENTAL INVESTIGATION ON DIESEL ENGINE USING FISH OIL METHYL ESTER AS ALTERNATIVE FUEL

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Abstract— The depletion of world petroleum reserves results in two crisis that are rising prices of fuel and global warming problems. The energy security can be maintained by improving the efficiency of energy producing components. Efforts are being made to find the alternatives. Bio-fuels are those whose energy is derived from carbon fixation. Biodiesel is made from vegetable oil, animal fats, and non edible seeds. These resources are available and also can be grown in plenty. Bio-fuels can be used blended with diesel and can be used to run engines which reduces the dependence on the non renewable resources.

There are different types of bio-fuels like Karanja, Jatropha, Mahua etc. These fuels can be blended with ordinary diesel and can be used. Karanja, Jatropha are already being used in engines along with diesel. Bio-fuels can be blended alone with a diesel or two bio-fuels blended separately can be mixed with ordinary diesel. Bio-fuels are still a new entry and a lot of research is being carried to find more effective bio-fuels so that it adds to the overall performance wherever it is used.

Our project concentrates mainly on preparing biodiesel from fish oil and then comparing the properties of these with ordinary diesel and also experiments were conducted on Injection pressures of 200 and 225bars and compression ratio's 17.5:1 and 14:1 as constant to study the performance and emission characteristics of a TV1, Kirloskar make, direct injection, Four Stroke single cylinder diesel engine using blends of Fish oil methyl esters with diesel. The performance related parameters like BSFC and BTE were studied at different mixing proportions of bio-diesel and diesel. The emission tests also show that Carbon dioxide, Carbon monoxide and Hydro carbon are less for almost all of our blends when compared with diesel.

Keywords— Biofuels, Karanja, Jathropa, BSFC, BTE, Hydrocarbon.

I. INTRODUCTION

Energy is considered as a critical factor for economic growth, social development and human welfare. Since their exploration, the fossil fuels continued as the major conventional energy source with increasing trend of modernization and industrialization, the world energy demand is also growing at faster rate. To cope up the increasing energy demand, majority of the developing countries import crude oil apart from their indigenous production. This puts extra burden on their home economy. Hence, it is utmost important that the options for substitution of petroleum fuels be explored to control the burden of import bill.

There are limited reserves of the fossil fuels and the world has already faced the energy crisis of seventies concerning uncertainties in their supply. Fossil fuels are currently the dominant global source of CO₂ emissions and their combustion is stronger threat to clean environment. Increasing industrialization, growing energy demand, limited reserves of fossil fuels and increasing environmental pollution have jointly necessitating the exploring of some alternative to the conventional liquid fuels, vegetable oils (edible and non edible oil) have been considered as appropriate alternatives to the conventional liquid fuels, vegetable oils have been considered as appropriate alternative due to their prevalent fuel properties. It was thought of as feasible option quite earlier. However despite the technical feasibility, vegetable oils as fuel could not get acceptance, as they were more expensive than petroleum fuels. This led to the retardation in scientific efforts to investigate the further acceptability of vegetable oils as alternate fuels. Later, due to numerous factors as stated above created resumed interest of researchers in vegetable oils as substitute fuel for diesel engines. In view of the

potential properties, large number of investigation has been carried out internationally in the area of vegetable oils as alternate fuels. Some of the vegetable oils from farm and forest origin have been identified. The most predominantly sunflower, soybean, cottonseed, canola, jatropha, corn, peanut oil etc. have been report as appropriate substitute of petroleum based fuels. The vegetables oils can be used in diesel engines by various techniques such as fuel modification by esterification, diesel-vegetable blends, vegetable oil heating etc.

II. OVER VIEW ON BIODIESEL

Bio-Diesel is not the regular vegetable oil and is not safe to swallow. However, biodiesel is considered biodegradable, so it is considered to be much less harmful to the environment if spilled. Biodiesel also has been shown to produce lower exhaust emissions than regular fuel. The best thing about biodiesel is that it is made from plants and animals, which are renewable resources. Bio-diesel is defined as the mono alkyl esters of long chain fatty acids derived from renewable lipid sources. Bio-diesel, as defined, is widely recognized in the alternative fuels industry as well as by the Department of Energy (DOE), the Environmental Protection Agency (EPA) and the American Society of Testing and Materials (ASTM).

Bio-diesel is typically produced through the reaction of a vegetable oil or animal fat with methanol in the presence of a catalyst to yield glycerin and methyl esters. The reaction is depicted in below. Virtually all of the bio-diesel used and produced in the U.S. to date has been made by this process, however, one additional process of importance is the direct reaction of a fatty acid with methanol, also in the presence of a catalyst, to produce a methyl ester in water.

The greatest driving force for the use of bio-diesel and bio-diesel blends is the need to have a fuel that fulfils all of the environmental and energy security needs previously mentioned which does not sacrifice operating performance. One of the largest roadblocks to the use of alternative fuels is the change of performance noticed by users. There are several advantages of biodiesel as compared to conventional diesel.

Advantages of biodiesel are:

It helps to reduce carbon dioxide and other pollutants emission from engines.

Engine modification is not needed as it has similar properties to diesel fuel.

It comes from renewable sources whereby people can grow their own fuel.

Diesel engine performs better on biodiesel due to a high cetane number.

High purity of biodiesel would eliminate the use of lubricant.

Biodiesel production is more efficient as compared to fossil fuels as there will be no underwater plantation, drilling and refinery.

Biodiesel would make an area become independent of its need for energy as it can be produced locally.

III. PREVIOUS WORK

Sharanappa Godiganur et al. This paper reviews that Combustion tests for methyl ester of fish oil and its blends with diesel fuel were performed in a kirloskar H394 DI diesel engine, to evaluate fish biodiesel as an alternative fuel for diesel engine, at constant speed of 1500 rpm under variable load conditions. The tests showed no major deviations in diesel engine's combustion as well as no significant changes in the engine performance and reduction of main noxious emissions with the exception on NOx. Overall fish biodiesel showed good combustion properties and environmental benefits. [1]

F.Halek et al. This paper evaluated the method of transesterification of biodiesels and properties of biodiesels are compared with diesel also studied the emission characteristic like carbon monoxide, unburned hydrocarbons and particulate matter. From this work, it can be concluded that use of biodiesel in diesel engine results in substantial reductions of unburned hydrocarbons, carbon monoxide, and particulate matter. [2]

Cherung-Yuan Lin et al. In this study, the discarded part of mixed marine fish species were used as raw material to produce biodiesel using NaOH as a alkali catalyst which was used thereafter as engine fuel to investigate. The experimental results shows that, compared with commercial biodiesel and diesel fish biodiesel can be used as a alternate fuel. [3]

Rasim Behçet This paper deals with fish oils transesterification with the purpose of achieving the conditions for biodiesel usage in a single cylinder, direct injection compression ignition. Biodiesel produced from anchovy fish oil, biodiesel–diesel fuel blends of 25%:75%, 50%:50%, 75%:25% and diesel fuels were used in the engine to specify how the engine performance and exhaust emission

parameters changed. Tests were performed at full load engine operation with variable speeds of 1000, 1500, 2000 and 2500 rpm engine speeds. As results of investigations on comparison of fuels with each other, there has been a decrease with 4.14% in fish oil methyl ester and its blends' engine torque, averagely 5.16% reduction in engine power, while 4.96% increase in specific fuel consumption have been observed. On one hand there has been average reduction as 4.576%, 21.3%, and 33.42% in CO₂, CO, HC, respectively. [4]10

GVNSR Ratnakara Rao et al. Experimental investigations were carried out on a single cylinder variable compression ratio C.I engine using neat mahua oil as the fuel. Both the performance and exhaust analysis were carried out to find the best suited compression ratio. Tests have been carried out at 7 different compression ratios. All the experiments were carried out at standard test conditions like 70°C cooling water temperature and at constant speed of 1500rpm. The result shows that 15.7 is the best compression ratio with mahua oil. [5]

Sharanappa Godiganur et al. A Cummins 6BTA 5.9 G2-1, 158HP rated power, turbocharged, DI, Water cooled diesel engine was run on diesel, methyl ester of mahua oil and its blends at constant speed of 1500rpm under variable load conditions. The volumetric blending ratios of biodiesel with conventional diesel fuel were set at 0,20,40,60 and 100. The results indicate that with the increase of biodiesel in blends CO, HC reduces significantly, fuel consumption and NO_x emissions of biodiesel increases slightly compared with the diesel. Brake specific energy consumption decreases and thermal efficiency of engine slightly increases when operating on 20% biodiesel than that operating on diesel. [6]

Cherng-Yuan Lin et al. Biodiesel, which is manufactured from vegetables oils, animal fats, or algae can be an excellent alternative fuel to petroleum diesel due to its superior fuel properties and lower pollutant emissions. In contrast, fishing-boat fuel generally has much poorer fuel properties and a high sulfur content that can reach several hundred times that of the premium diesel used in land-based vehicles. Pollutant emissions from fishing boats are known to be a significant source of air pollution in the global environment. This study examines the use of biodiesel to replace fishing-boat fuel A to reduce pollutant emissions from fishing boats. The incremental cost, reduction in emissions, and cost-benefit corresponding to various weight proportions of biodiesel to replace fishing-boat fuel A are evaluated. This study also finds that a replacing 20 wt% of fishing-boat fuel A with biodiesel has the highest cost-benefit ratio, which implies a larger reduction in emissions with a lower fuel cost increase, and is the most suitable option for fishing boats in Taiwan. [7]

Metin Gumus et al. In this study, the effects of fuel injection pressure on the exhaust emissions and brake specific fuel consumption of a direct injection diesel engine have been discussed. The engine was fueled with biodiesel-diesel blends when running the 11 engine at four different fuel injection pressures (18, 20, 22, and 24 MPa) and four different engine loads in terms of mean effective pressure (12.5, 25, 37.5, and 50 kPa). The results confirmed that the BSFC, carbon dioxide, nitrogen oxides and oxygen and carbon monoxide emissions decreased due to the fuel properties and combustion characteristics of biodiesel. On the other hand, the increased injection pressure caused to decrease in BSFC of high percentage biodiesel-diesel blends (such as B20, B50, and B100), smoke opacity, the emissions of CO, UHC and increased the emissions of CO₂, O₂ and NO_x. The increased or decreased injection pressure caused to increase in BSFC values compared to original injection pressure for diesel fuel and low percentage biodiesel-diesel blends (B5). [8]

Sukumar Puhana N et al. In this study, mahua oil was transesterified with methanol using sodium hydroxide as catalyst to obtain mahua oil methyl ester. This biodiesel was tested in a single cylinder, four stroke, direct injection, constant speed, compression ignition diesel engine to evaluate the performance and emissions. [9]

Rosca Radu et al. The paper presents the results of a research concerning the use of a biodiesel type of fuel in D.I. Diesel engine, the fuel injection system and the engine were tested. The results indicated that the injection characteristics are affected when a blend containing 50% methyl ester and 50% petrodiesel is used as fuel. As a result, the engine characteristics are also affected, the use of biodiesel blend leading to lower output power and torque; the lower autoignition delay and pressure wave propagation time led to changes of the cylinder pressure and heat release traces and to lower peak combustion pressures. [10]

IV. PROPOSED METHODOLOGY

To prepare a biodiesel firstly its FFA(Free Fatty Acid) is checked and based on the value of FFA number of process needed to prepare a biodiesel is determined.

4.1 Determination of Free Fatty Acid Content in the Oil

It involves following steps:

- Prepare 0.1N Sodium Hydroxide solution by mixing 4grams of NaOH crystals with 1 liter of water.
- Take 25 ml of 0.1N NaOH solution in a clean and dry burette.
- Take 50 ml of Isopropyl alcohol in a clean and dry 250 ml conical flask.
- Add few drops of NaOH solution and shake well.
- Measure 10 grams of oil to the flask and shake it well.
- Heat the mixture above 60° c.
- Allow the mixture to cool a little.
- Add few drops of phenolphthalein indicator.
- Titrate against 0.1N NaOH from burette.
- Titrate till colour persists for at least one minute.
- Note down the burette reading. Free fatty acid content is obtained by using the below formula.

$$\text{FFA Content} = \frac{28.2 \times (\text{Normality of NaOH}) \times (\text{Titration value})}{\text{Weight of oil}}$$

When the FFA value is more than four both esterification and transesterification are done to prepare a biodiesel.

4.2 Esterification

Esterification is the chemical process for making esters, which are compounds of the chemical structure R-COOR', where R and R' are either alkyl or aryl groups. The most common method for preparing esters is to heat a carboxylic acid R-CO-OH, with an alcohol R'-OH, while removing the water that is formed. A mineral acid catalyst is usually needed to make the reaction occur at a useful rate.

Esters can also be formed by various other reactions. These include the reaction of an alcohol with an acid chloride (R-CO-Cl) or an anhydride (R-CO-O-COR'). Early studies into the chemical mechanism of esterification, concluded that the ester product (R-CO-OR') is the union of the alkyl group (R-C=O-) from the acid, RCO-OH, with the alkoxide group from the alcohol rather than other possible combinations.

4.3 Transesterification

Transesterification is a chemical reaction used for the conversion of vegetable oil/Seed oil to biodiesel. In this process vegetable oil is chemically reacted with an alcohol like methanol in presence of a catalyst like sodium hydroxide. After the chemical reaction, various components of vegetable oil break down to form new compounds.

The triglycerides are converted into alkyl esters, which is the chemical name of biodiesel. If methanol is used in the chemical reaction, methyl esters are formed, but if ethanol is used, then ethyl esters are formed. Both these compounds are Bio-Diesel fuels with different chemical combinations. In the chemical reaction alcohol replaces glycerin.

Glycerin that has been separated during the transesterification process is released as a byproduct of the chemical reaction. Glycerin will either sink to the bottom of the reaction vessel or come to the surface depending on its phase. It can be easily separated by centrifuges, and this entire process is known as transesterification.

The biodiesel produced by the process of transesterification has much lower viscosity, which makes it capable of replacing petroleum diesel in diesel engines. In earlier years when the process of transesterification was not known, the viscosity of vegetable oil was the major hindrance for its use as a fuel for motor engines. The transesterification process has been able to remove this problem. The byproduct of the transesterification chemical reaction is the glycerin that originally formed the bond between the chains of fatty acids. Glycerin can be used for various purposes. Thus during transesterification process nothing goes to waste. All the products and byproducts are utilized for various purposes.

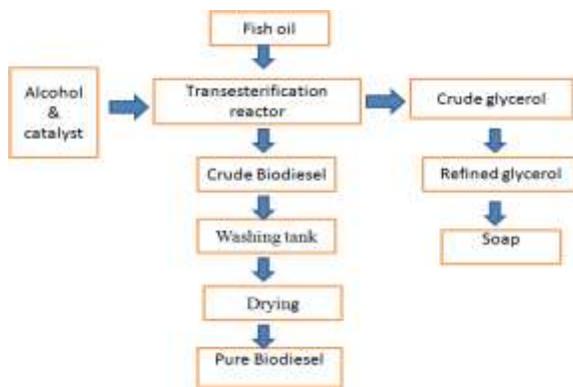


Figure 4.1: Transesterification Process flow chart

4.5 Steps Involved in Transesterification:

- Measuring the Free fatty acid content in the oil.
- Heating the oil up to 65°C.
- Adding required amount of Sodium Hydroxide and methanol.
- Heating the solution using a magnetic stirrer for two hours.
- Keeping the oil for settling process in a settling funnel for five hours.
- After settling methanol is recovered from the solution through distillation

4.5.1 FFA-NAOH CHART

F.F.A(of oil)	NaOH(in gm)
0	3.5
1	4.5
2	5.5
3	6.5

Table 5.1: FFA-NaOH

4.5.2 FFA-H2SO4 CHART

F.F.A(of oil)	H2SO4(in gm)
1	0.25
2	0.5
3	0.75
4	1
5	1.25
6	1.5
7	1.75
8	2
9	2.25
10	2.5
11	2.75
12	3
13	3.25
14	3.5
15	3.75
16	4

Table 5.2: FFA-H2SO4



Fig 4.2: Magnetic stirrer used for transesterification

5.5.3 METHANOL RECOVERY FROM BIO-DIESEL

- Transfer the Bio-diesel into the reaction vessel (3 neck flask).
- Make the necessary arrangement for the distillation set up, like heating and fixing the double wall condenser along with the recovery flask.
- Maintain the temperature at 343K.
- Methanol starts evaporating.
- Collect the methanol in a conical flask.
- Switch off the system when the methanol condensation stops.



Fig 4.3: Methanol recovery through distillation

4.5.4 WASHING OF BIO-DIESEL

- Transfer the Bio-Diesel after methanol recovery into the plastic washing funnel.
- Spray 300 ml of warm water slowly into Bio-Diesel.
- Water gets collected in the bottom of funnel.
- Keep 15 minutes for settling for each trail.
- Remove the water and check the pH value.
- Repeat the process till pH of water reaches



Fig 4.4: Biodiesel washing

4.5.5 HEATING OF BIO-DIESEL

- Transfer the washed Bio-Diesel from the washing funnel to the 1 liter beaker.
- Add the magnetic pellet and adjust rpm to suitable speed.
- Heat the Bio-Diesel to the temperature of 393K(moisture evaporates)
- Allow the Bio-Diesel to cool gradually.
- Measure the quantity of final finished Bio-Diesel.
- Store it in a clean and dry container.



Fig 4.5: Biodiesel heating

5. PROPERTIES OF FISH OIL BIO-DIESEL 6.1 BIO-DIESEL DENSITY

A hydrometer is the instrument used to measure the specific gravity (relative density) of Bio Diesel that is the ratio of density of Bio-Diesel to the density of water. The Hydrometer is made of glass and consists of cylindrical stem and a bulb weighed with mercury or lead shot to make it float up right. The hydrometer contains a paper scale inside the stem, so that specific gravity can be read directly.

5.2 KINEMATIC VISCOSITY TEST AT 40 °c Viscosity is the fluid's resistance to flow (shear stress) at a given temperature. Kinematic Viscosity takes into account the fluid density and centistokes is the engineering unit used to express kinematic viscosity.

5.3 COPPER TEST CORROSION TEST Copper Corrosion assesses the relative degree of corrosivity of a petroleum product due to active sulphur compounds. Results are rated by comparing the stains on a copper strip to a colour match scale from 1-4.

Result: No Copper corrosion

5.4 PENSKY-MARTENS CLOSED CUP TEST 6.4.1 FLASH POINT The flash point of a volatile material is the lowest temperature at which it can vaporize to form an ignitable mixture in air. Measuring a flash point requires an ignition source. At the flash point, the vapour may cease to burn when the source of ignition is removed.

5.4.2 FIRE POINT The fire point of a fuel is the temperature at which it will continue to burn for at least 5 seconds after ignition by an open flame. At the flash point a lower temperature, a substance will ignite briefly, but vapor might not be produced at a rate to sustain the fire. Most tables of material properties will only list material flash points, but in general the fire points can be assumed to be about 10 °C higher than the flash points. However, this is no substitute for testing if the fire point is safety critical. This is a point on which oxidation of a lubricating oil starts.

5.4.3 MEASUREMENT: There are two basic types of flash point measurement: open cup and closed cup. In open cup devices the sample is contained in an open cup which is heated, and at intervals a flame is brought over the surface. The measured flash point will actually vary with the height of the flame above the liquid surface, and at sufficient height the measured flash point temperature will coincide with the fire point The best known example is Cleveland open cup (COC).

VI. EXPERIMENTAL SET UP AND PROCEDURE

6.1 EXPERIMENTAL SET UP:

The experimental work carried out for the objectives, requires an engine test set-up adequately instrumented for acquiring necessary performance and emission characteristics. Fish oil methyl ester blends and pure Diesel were used to test a TV1, Kirloskar, single cylinder, 4-stroke, water-cooled diesel engine having a rated output of 5.2 kW at 1500 rpm and a compression ratio of 17.5:1. The engine was coupled with an eddy current dynamometer to apply different engine loads. The emissions from the engine were studied at different engine loads. After the engine reach stabilized working condition, emissions like carbon monoxide (CO), Hydrocarbon (HC), Nitrous oxide (NOx), carbon dioxide (CO₂) and exhaust gas temperature (EGT) were measured using a smoke-meter and an

exhaust gas analyzer. The experimental set-up and photographic views of engine are as shown. in fig 6.1, 6.2, 6.3, 6.4& 6.5 and table 6.1 provides the engine specification.



Fig 6.1: Photographic view of TV1, Kirloskar made, 4 stroke single cylinder Engine



Fig 6.2: Photographic View across Load cell



Fig 6.3: Photographic View across the Control Panel



Fig 6.4: Photographic view of Exhaust gas analyzer

6.3 METHODOLOGY & EXPERIMENTAL PROCEDURE:

1. Switch on the mains of the control panel and set the supply voltage from servo stabilizer to 220volts. 2. The main gate valve is opened, the pump is switched ON and the water flow to the engine cylinder jacket (300 liters/hour), calorimeter (50 liters/hour), dynamometer and sensors are set. 3. Engine is started by hand cranking and allowed to run for a 20 minutes to reach steady state condition. The engine has a compression ratio of 17.5:1 and a normal speed of 1500 rpm controlled by the governor. An injection pressure of 200bar and 225bar are used for the study of best performance as specified by the manufacturer. The engine is first run with neat diesel at loading conditions such as 6.5, 13, 19.5 and 26 N-m. Between two load trials the engine is allowed to become stable by running it for 3 minutes before taking the readings. At each loading condition performance parameters namely speed, exhaust gas temperature, brake powers etc are measured under steady state conditions and diesel is drained out from the engine. The engine is next run with the fish oil biodiesel blend (B10) sample is poured into engine fuel tank and engine is started by hand cracking, the engine is allowed to become stable by running it for few minutes and then the engine is loaded using eddy current dynamometer and at each loading condition performance parameters namely speed, exhaust gas temperature, time taken for 20cc fuel consumption, brake

powers etc. are measured under steady state conditions and are tabulated. Next the experiments are repeated for various combinations of fish oil biodiesel blends. With the experimental results, the parameters such as total fuel consumption, brake specific fuel consumption, brake mean effective pressure, brake thermal efficiency are calculated. Finally graphs are plotted for brake specific fuel consumption, brake thermal efficiency with respect to loading conditions for diesel and bio-diesel blends. From these plots, performance characteristics of the engine are determined.

VII. EXPERIMENTAL RESULTS

This chapter contains the results of the experiments and analysis concerning the engine investigations carried out with biodiesel operation in a single cylinder diesel engine. With the observed experiments results for various combinations of diesel and Fish oil biodiesel blends parameters such as total fuel consumption, brake specific fuel consumption, brake thermal efficiency are calculated and tabulated for different Compression Ratio (CR) and different Injection Pressures (IP) as shown below. 7.1 PERFORMANCE RESULT

CR17.5	IP200 bar	DIESEL					
Load Nm	Speed rpm	Time For 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %
6.5	1441	110	0.98098	0.5432	0.5538	23252.07	15.1880
13	1402	86	1.9088	0.6948	0.3640	29741.02	23.1059
19.5	1392	67	2.8428	0.8919	0.3137	38175.04	26.8090
26	1389	54	3.7823	1.1066	0.2925	47365.33	28.7465

Table 7.1: Engine performance for Diesel, CR 17.5, IP 200 bar

CR17.5	IP200 bar	B10						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1442	110	0.9816	0.5465	0.5567	23149.48	15.2659	189
13	1401	84	1.9075	0.7157	0.3752	30314.79	22.6524	228
19.5	1386	63	2.8306	0.9542	0.3371	40419.73	25.2111	304
26	1390	51	3.7850	1.1788	0.3114	49930.25	27.2905	382

Table 7.2: Engine performance for B10, CR 17.5, IP 200 bar

CR17.5	IP200 bar	B20						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1444	108	0.9830	0.5600	0.5696	23473.52	15.0761	200
13	1407	83	1.9156	0.7286	0.3803	30543.86	22.5788	245
19.5	1393	64	2.8449	0.9450	0.3321	39611.57	25.8553	318
26	1384	52	3.7687	1.1630	0.3086	48752.7	27.8290	392

Table 7.3: Engine performance for B20, CR 17.5, IP 200 bar

CR17.5	IP200 bar	B30						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1441	107	0.9809	0.5685	0.5796	23587.72	14.9719	216
13	1405	81	1.9129	0.75111	0.3926	31159.09	22.1015	268

19.5	1392	62	2.8428	0.9812	0.3451	40707.85	25.1410	335
26	1390	52	3.7850	1.1700	0.3091	48356.28	28.0743	398

Table 7.4: Engine performance for B20, CR 17.5, IP 200 bar

CR17.5	IP225 bar	DIESEL						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1426	112	0.9707	0.5335	0.5496	22836.86	15.3032	191
13	1385	86	1.8857	0.6948	0.3684	29741.02	22.8257	248
19.5	1374	68	2.8061	0.8788	0.3131	37613.65	26.8573	335
26	1355	51	3.6895	1.1717	0.3175	50151.53	26.4859	424

Table 7.5: Engine performance for Diesel, CR 17.5, IP 225 bar

CR17.5	IP225 bar	B10						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1425	103	0.9701	0.5636	0.6016	24722.74	14.1259	196
13	1384	79	1.8843	0.7610	0.4038	40419.73	25.0110	245
19.5	1375	63	2.8081	0.9542	0.3398	40419.73	25.011	343
26	1348	50	3.6706	1.2024	0.3275	50928.85	25.946	431

Table 7.6: Engine performance for B10, CR 17.5, IP 225 bar

CR17.5	IP225 bar	B20						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1426	105	0.97077	0.5760	0.5933	24144.19	14.4746	208
13	1379	76	1.8775	0.7957	0.4238	33357.11	20.2631	257
19.5	1368	64	2.7938	0.9450	0.3382	39611.57	25.3913	359
26	1349	48	3.6734	1.2600	0.3430	52815.42	25.0387	452

Table 7.7: Engine performance for B20, CR 17.5, IP 225 bar

CR17.5	IP225 bar	B30						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1417	101	0.9646	0.6023	0.6244	24988.98	13.8970	220
13	1379	80	1.8775	0.7605	0.4050	31548.58	21.4247	271
19.5	1375	64	2.8081	0.9506	0.3385	39435.73	25.6350	386
26	1352	50	3.6815	1.2168	0.3305	50477.73	26.2565	459

Table 7.8: Engine performance for B30, CR 17.5, IP 225 bar

CR14	IP200 bar	DIESEL						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1445	106	0.9830	0.5640	0.5730	24129.50	14.6720	178

13	1406	81	1.9140	0.7380	0.3860	31576.88	21.8180	234
19.5	1390	66	2.8380	0.9050	0.3190	38753.45	26.3630	327
26	1363	50	3.7100	1.1950	0.3220	51154.56	26.1120	438

Table 7.9: Engine performance for Diesel, CR 14, IP 200 bar

CR14	IP200 bar	B10						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1444	103	0.9827	0.5836	0.5938	24722.74	14.3095	202
13	1398	80	1.9031	0.7515	0.3948	3183053	21.5210	240
19.5	1377	63	2.8118	0.9542	0.3393	40419.72	25.0391	332
26	1362	46	3.7083	1.3069	0.3542	55357.45	24.1112	450

Table 7.10: Engine performance for B10, CR 14, IP 200 bar

CR14	IP200 bar	B20						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1442	101	0.9815	0.5981	0.6071	25100.39	14.0770	208
13	1407	78	1.9150	0.7753	0.4048	32501.79	21.2120	259
19.5	1386	62	2.8302	0.9751	0.3445	40889.35	24.9141	349
26	1364	48	3.7137	1.2600	0.3392	52815.42	25.3092	458

Table 7.11: Engine performance for B20, CR 14, IP 200 bar

CR14	IP200 bar	B30						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1448	100	0.9856	0.6084	0.6172	25238.86	14.0583	215
13	1402	78	1.9086	0.7800	0.4086	32357.52	21.2312	265
19.5	1390	62	2.8384	0.9806	0.3454	40707.84	25.0971	368
26	1378	49	3.7518	1.2416	0.3309	51507.88	26.2180	478

Table 7.12: Engine performance for B30, CR 14, IP 200 bar

CR14	IP225 bar	DIESEL						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1436	98	0.9774	0.6097	0.6237	26099.26	0.13481	248
13	1394	77	1.8977	0.7761	0.4089	33217.24	20.5702	324
19.5	1374	57	2.8061	1.0301	0.3672	44098.75	22.9075	427
26	1360	44	3.7362	1.3283	0.3556	56838.40	23.6641	530

Table 7.13: Engine performance for Diesel, CR 14, IP 225 bar

CR14	IP225 bar	B10						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1435	95	0.9767	0.6328	0.6478	26804.66	13.1175	265
13	1394	76	1.8977	0.7863	0.4196	33505.82	20.3829	335
19.5	1377	57	2.8118	1.0547	0.3750	44672.87	22.6591	430

26	1360	44	3.7028	1.3663	0.3689	57871.00	23.0341	532
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Table 7.14: Engine performance for B10, CR 14, IP 225 bar

CR14	IP225 bar	B20						
LOAD Nm	SPEED rpm	TIME FOR 20cc(sec)	BP KW	TFC kg/hr	BSFC kg/kw-hr	TEC kJ/hr	BTE %	EGT (°C)
6.5	1430	96	0.9733	0.6300	0.6472	26407.71	12.7190	267
13	1391	75	1.8936	0.8064	0.4258	33801.86	20.1674	343
19.5	1370	57	2.7975	1.0610	0.3792	44473.93	22.6447	448
26	1365	43	3.7165	1.4065	0.3784	58956.26	22.6937	543

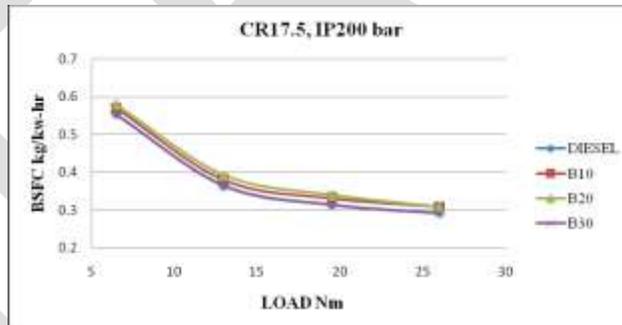
Table 7.15: Engine performance for B20, CR 14, IP 225 bar

CR14	IP225 bar	B30						
6.5	1405	98	0.9563	0.6208	0.6491	25753.94	13.3675	284
13	1389	76	1.8909	0.8005	0.4233	32209.03	21.1345	362
19.5	1374	56	2.8057	1.0862	0.3871	45059.92	22.4157	461
26	1363	45	3.7110	1.3520	0.3643	56086.36	23.8196	556
6.5	1405	98	0.9563	0.6208	0.6491	25753.94	13.3675	284

Table 7.16: Engine performance for B30, CR 14, IP 225 bar

Based on the above results, graphs are plotted to compare Performance parameters such as variation of brake thermal efficiency, brake specific fuel consumption and exhaust gas temperature against the varying load.

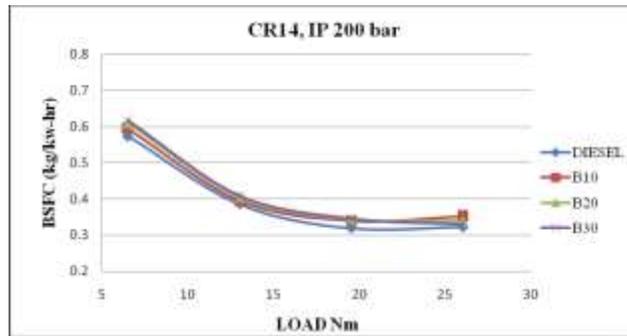
7.1.1 Brake Specific Fuel Consumption (BSFC): The brake specific fuel consumption is the mass rate of fuel consumption per unit brake power.



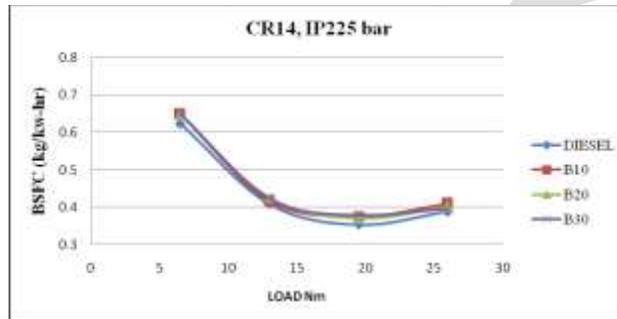
Graph 7.1: Load v/s Brake specific fuel consumption for CR17.5, IP200 bar



Graph 7.2: Load v/s Brake specific fuel consumption for CR17.5, IP225 bar



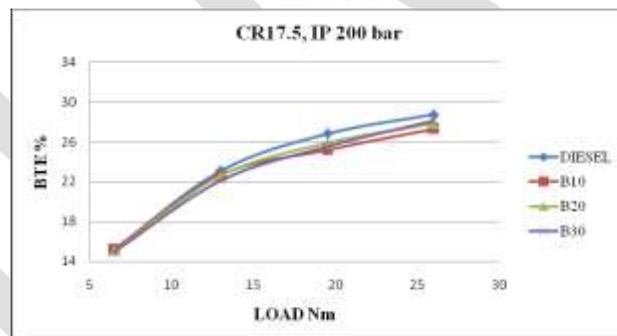
Graph 7.3: Load v/s Brake specific fuel consumption for CR14, IP200 bar



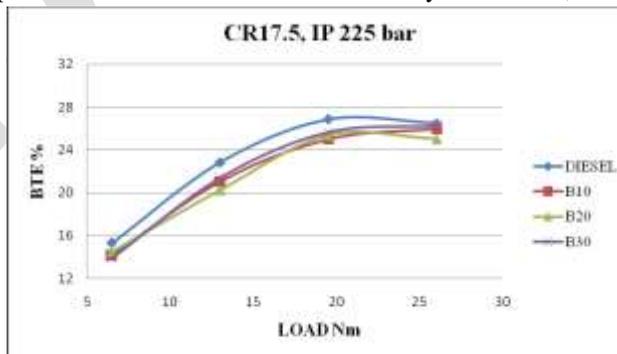
Graph 7.4: Load v/s Brake specific fuel consumption for CR14, IP225 bar

Graph 7.1, 7.2, 7.3 & 7.4 shows the variation of brake specific fuel consumption (BSFC) with load for different diesel–biodiesel blends & neat diesel at compression ratio of 17.5:1 and 14:1 and injection pressure of 200 bar and 225 bar. As the load increases, BSFC decreases for all fuel blends. It is found that the specific fuel consumption for the blend B30 is close to diesel. It can be due to the fact that engine consumes more fuel with diesel–biodiesel blend fuels than with neat diesel fuel to develop the same power output due to the lower calorific value of diesel–biodiesel blend fuel.

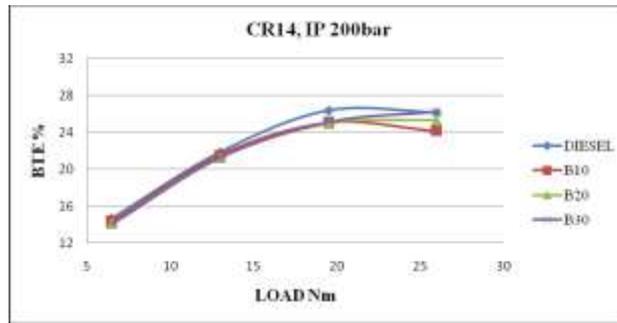
7.1.2 Brake Thermal Efficiency (BTE): This is defined as the ratio between the brake power output and the energy of the oil/fuel combustion.



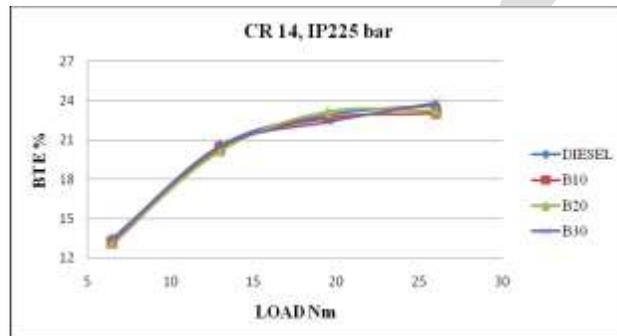
Graph 7.5: Load v/s Brake thermal efficiency for CR17.5, IP200 bar



Graph 7.6: Load v/s Brake thermal efficiency for CR17.5, IP225 bar



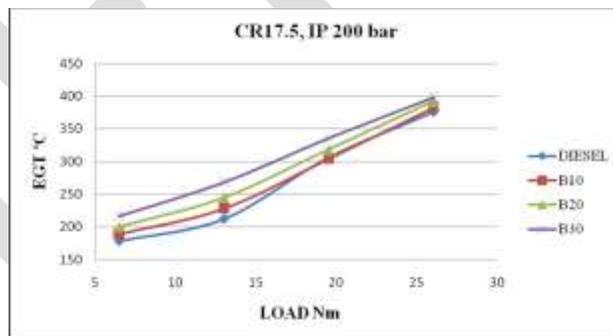
Graph 7.7: Load v/s Brake thermal efficiency for CR14, IP200 bar



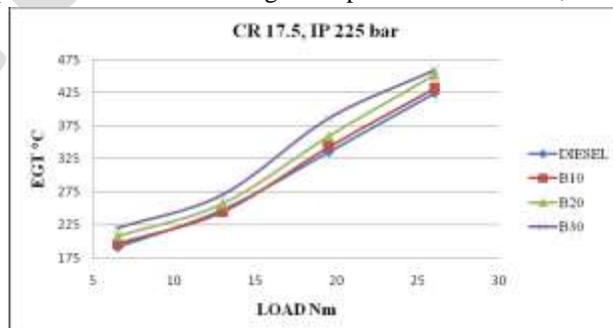
Graph 7.8: Load v/s Brake thermal efficiency for CR14, IP225 bar

Variation of Brake Thermal efficiency for CR 17.5 & 14 and injection pressure of 200bar and 225bar with load for different fuel blends are shown in graphs respectively. Brake thermal efficiency is increased due reduced heat loss with increase in load. From the graphs, it is found that brake thermal efficiency for biodiesel in comparison to diesel engine is a better option for part load on which most engine runs. The maximum thermal efficiency for B30 (28.07 %) was slightly less than that of diesel (28.7465) for the CR17.5 & IP200bar. The lower brake thermal efficiency obtained could be due to reduction in calorific value and increase in fuel consumption as compared to B30.

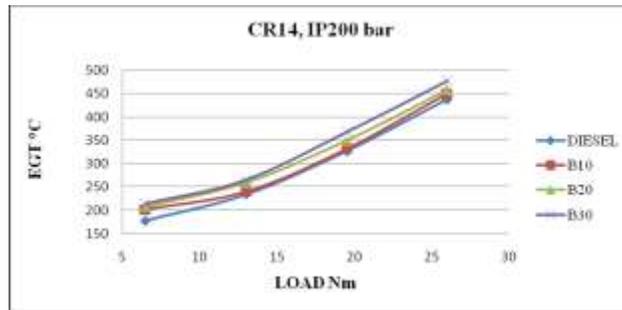
7.1.3 Exhaust gas temperature (EGT):



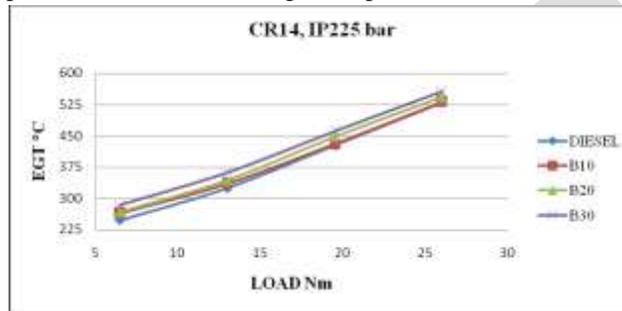
Graph 7.9: Load v/s Exhaust gas temperature for CR17.5, IP200 bar



Graph 7.10: Load v/s Exhaust gas temperature for CR17.5, IP225 bar



Graph7.11: Load v/s Exhaust gas temperature for CR14, IP200 bar



Graph 7.12: Load v/s Exhaust gas temperature for CR14, IP225 bar

Graphs show the variation of exhaust gas temperature with load for various blends and diesel. The results show that the exhaust gas temperature increases with increase in load for all blends. At all loads, diesel was found to have the lowest temperature and the temperatures for various blends show an upward trend with increasing concentration of fish oil biodiesel in the blends. The biodiesel contains oxygen which enables the combustion process and hence the exhaust gas temperatures are higher in the engine to generate that extra power needed to take up the additional loading.

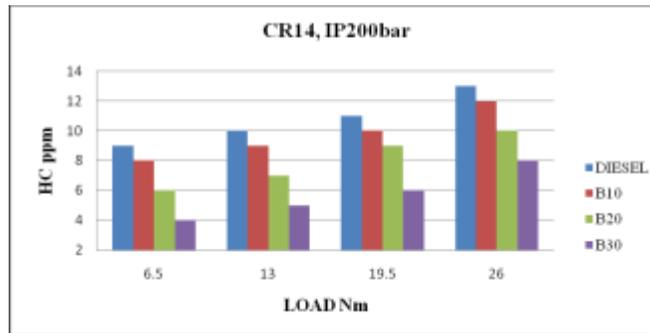
7.2 ENGINE EMISSION TEST RESULT

7.2.1 Hydrocarbon Emission (HC):

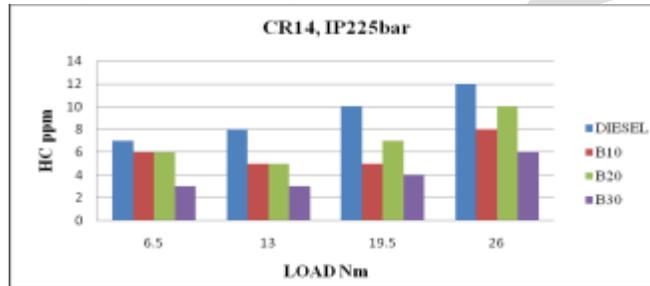
Hydrocarbons (ppm)								
LOAD (Nm)	CR=17.5,IP=200bar				CR=17.5,IP=225bar			
	DIESEL	B10	B20	B30	DIESEL	B10	B20	B30
6.5	4	3	3	2	5	4	3	3
13	5	4	4	3	6	5	5	5
19.5	5	5	4	3	7	6	5	5
26	7	6	6	5	9	8	7	7

Hydrocarbons (ppm)								
LOAD (Nm)	CR=14,IP=200bar				CR=14,IP=225bar			
	DIESEL	B10	B20	B30	DIESEL	B10	B20	B30
6.5	9	8	6	4	7	6	6	3
13	10	9	7	5	8	5	5	3
19.5	11	10	9	6	10	5	7	4
26	13	12	10	8	12	8	10	6

Table 7.17: Hydrocabon emission for different CR & IP



Graph7.15: Load v/s Hydrocarbon for CR14, IP200 bar



Graph 7.16: Load v/s Hydro carbon for CR14, IP225 bar

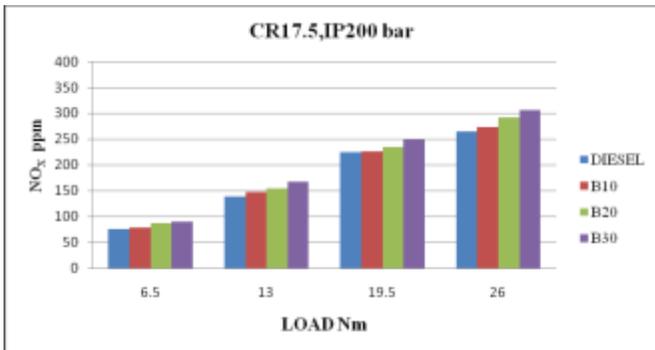
Graph shows the variation of hydro carbon emission with different load for different diesel–biodiesel blends & neat diesel. It is observed that HC emission of the various blends was lower at partial load, but increased at higher engine load. This is due to the availability of less oxygen for the reaction when more fuel is injected into the engine cylinder at higher engine load. It is also observed from the graphs that biodiesel blends give relatively lower HC as compared to the diesel. This is because of better combustion of the biodiesel inside the combustion chamber due to the availability of excess content of oxygen in the biodiesel blends as compared to clean diesel. The HC emissions are almost same for all blends & neat diesel at both injection pressures.

7.2.2 Nitrogen Oxides (NOx):

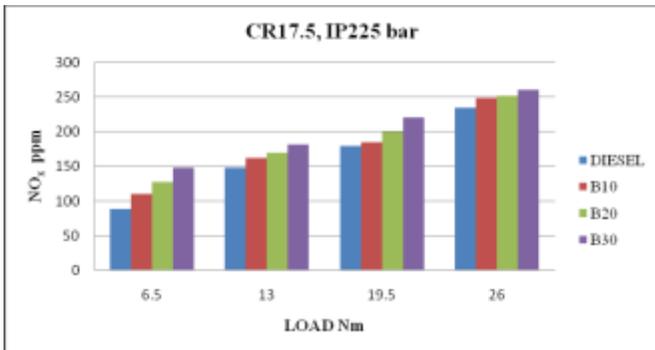
Nitrogen Oxides (ppm)								
LOAD (Nm)	CR=17.5,IP=200bar				CR=17.5,IP=225bar			
	DIESEL	B10	B20	B30	DIESEL	B10	B20	B30
6.5	76	79	87	90	88	110	127	148
13	139	148	155	167	148	162	170	181
19.5	224	226	235	249	179	185	200	220
26	265	274	292	306	235	249	252	260

Nitrogen Oxides (ppm)								
LOAD (Nm)	CR=17.5,IP=200bar				CR=17.5,IP=225bar			
	DIESEL	B10	B20	B30	DIESEL	B10	B20	B30
6.5	54	68	70	74	50	51	56	58
13	127	141	141	151	61	64	71	74
19.5	139	153	155	168	66	68	78	80
26	158	168	179	181	78	81	84	89

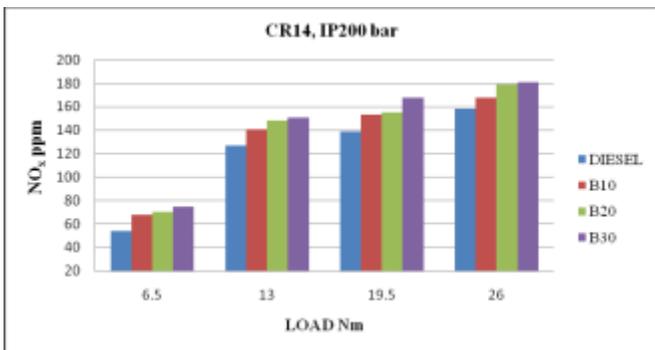
Table 7.18: Nitrogen Oxides emission for different CR & IP



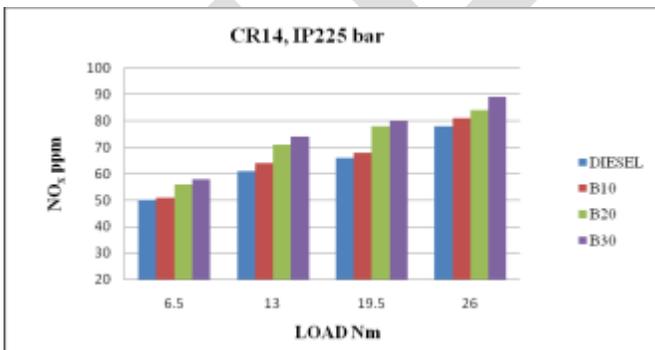
Graph 7.17: Load v/s Nitrogen Oxides for CR17.5, IP200 bar



Graph 7.18: Load v/s Nitrogen Oxides for CR17.5, IP225 bar



Graph 7.19: Load v/s Nitrogen Oxides for CR14, IP200 bar



Graph 7.20: Load v/s Nitrogen Oxides for CR14, IP225 bar

Variation of nitrogen oxides for CR 17.5 & 14 and injection pressure of 200bar and 225bar with load for different fuel blends are shown in graphs respectively. Anything which causes combustion temperatures to rise will also cause NOx emissions to rise. Misfire can also cause NOx to rise because of the increase in oxygen that it causes in the catalytic converter feed gas. NOx is more likely to cause respiratory problems such as asthma, coughing, etc.

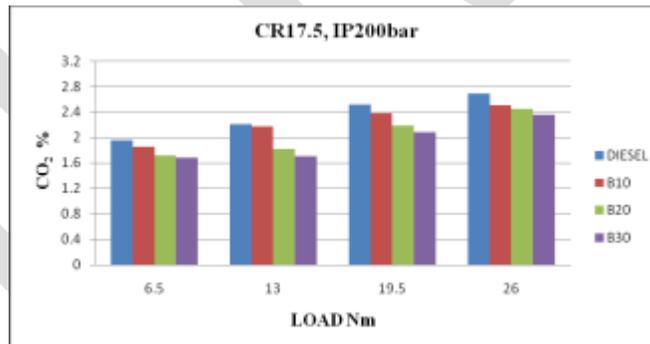
NOx emissions are extremely undesirable. Three conditions which favor NOx formation are higher combustion temperature, more oxygen content and faster reaction rate. The above conditions are attained in biodiesel combustion very rapidly as compared to neat diesel. Hence, NOx formations for biodiesel blends are always greater than neat diesel. It can be observed from graphs that at higher power output conditions, due to higher peak temperatures, the NOx values are likely higher for diesel-biodiesel blends.

7.2.3 Carbon dioxide (CO2)

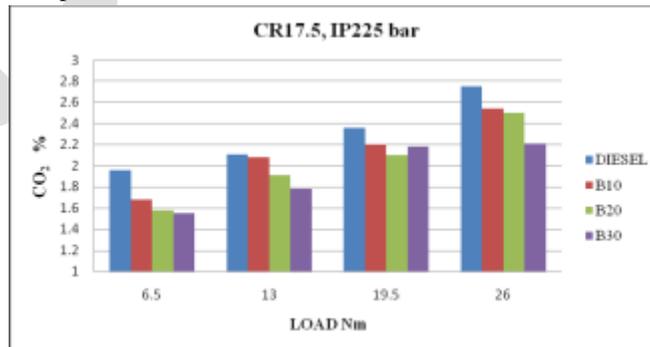
Carbon dioxide %								
LOAD (Nm)	CR=17.5,IP=200bar				CR=17.5,IP=225bar			
	DIESEL	B10	B20	B30	DIESEL	B10	B20	B30
6.5	1.96	1.85	1.72	1.68	1.96	1.68	1.58	1.55
13	2.21	2.28	1.82	1.71	2.11	2.08	1.91	1.78
19.5	2.52	2.38	2.19	2.08	2.36	2.22	2.1	2.18
26	2.69	2.51	2.45	2.38	2.75	2.54	2.5	2.21

Carbon dioxide %								
LOAD (Nm)	CR=17.5,IP=200bar				CR=17.5,IP=225bar			
	DIESEL	B10	B20	B30	DIESEL	B10	B20	B30
6.5	1.81	1.76	1.74	1.69	1.68	1.42	1.44	1.38
13	1.96	1.87	1.84	1.80	1.65	1.38	1.31	1.29
19.5	2.05	1.94	1.96	1.95	1.81	1.52	1.51	1.32
26	2.48	2.18	1.805	2.11	1.97	1.44	1.48	1.36

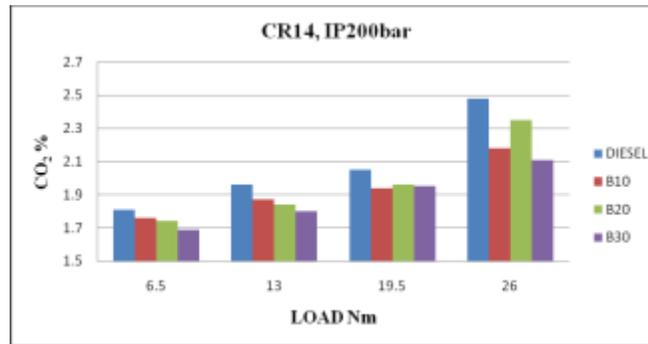
Table 7.19: Carbon dioxide emission for different CR & IP



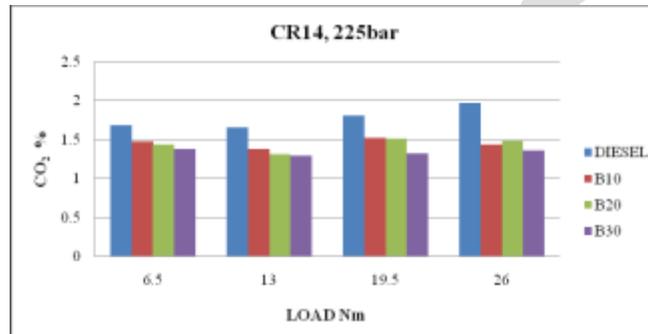
Graph 7.21: Load v/s carbon dioxide for CR17.5, IP200 bar



Graph 7.22: Load v/s carbon dioxide for CR17.5, IP225 bar



Graph 7.23: Load v/s carbon dioxide for CR14, IP200 bar



Graph 7.24: Load v/s carbon dioxide for CR14, IP225 bar

Graph shows the variation of CO₂ emissions with load for different diesel–biodiesel blends & neat diesel at compression ratio of 17.5:1 and injection pressure of 200 bars and 225bars and 14:1 and injection pressure of 200 bars and 225bars. Carbon Dioxide is measured by an exhaust analyzer in percent (%) or parts per hundred. Carbon dioxide is a by-product of efficient and complete combustion. Near perfect combustion will result in carbon dioxide levels which approach the theoretical maximum of 15.5%. Carbon dioxide levels are affected by air/fuel ratio, spark timing, and any other factors which effect combustion efficiency.

Graph shows the emission levels of CO₂ for various blends and diesel. Test measurements reveals that the CO₂ emission for all blends were less as compared to diesel at all loads. The rising trend of CO₂ emission with load is due to the higher fuel entry as the load increases. Bio-fuels contain lower carbon content as compared to diesel and hence the CO₂ emission is comparatively lower.

7.3 CALCULATIONS

Sample calculation

For 10% Fish oil + 90% diesel (CR 17.5, Injection Pressure 200 bar)

- Brake power,

$$BP = (2\pi NT) / 60000 = (2\pi \times 1442 \times 6.5) / 60000 = 0.9816 \text{ KW}$$
- Total Fuel Consumption,

$$TFC = (20 \times 3600 \times \text{Specific gravity}) / (t \times 1000) = (20 \times 3600 \times 0.835) / (110 \times 1000) = 0.5465 \text{ Kg/ hr}$$
- Specific fuel consumption

$$SFC = TFC / BP = 0.5567 \text{ Kg/ KW hr}$$
- CV of blend

$$CV = [\text{density of diesel} \times \% \text{ of diesel} \times CVD] + [\text{density of BD} \times \% \text{ diesel} \times CV \text{ of BD}] + [\text{Density of diesel} \times \% \text{ diesel}] + [\text{density of BD} \times \% \text{ of BD}]$$

$$CV = [830 \times 0.9 \times 42800] + [885 \times 0.1 \times 38604] + [830 \times 0.9] + [885 \times 0.1] = 42356 \text{ KJ / kg}$$

- Brake Thermal Efficiency

$$= (BP \times 3600 \times 100) / (TFC \times CV) = (0.9816 \times 3600 \times 100) / (0.5465 \times 42356) = 15.2662 \%$$

7.4 Cost Analysis of Fish Oil Biodiesel

- Cost of the raw fish oil from market
- Cost of the materials required for the processing

o NAOH

o Methanol

- Miscellaneous cost includes Transportation, power required for processing

Item	Cost per unit(lit/Kg)
Raw fish oil	32 Rs/lit
NAOH	70 Rs/kg
Methanol	35 Rs/lit

Table no 7.2

To produce 890 ml fish oil biodiesel requires one liter of raw fish oil. So recovery of fish oil biodiesel is 89%

For the processing of 1 lit of fish oil of FFA 2.3, it requires

□□300 ml of Methanol

- 6.5 gm of NAOH

So total processing cost = $(35 \times 0.3) + (70 \times 0.0065) + 5 = 16 = 16 \text{ Rs}$

The total cost per liter = $(32 + 16) \text{ Rs} = 48 \text{ Rs/lit}$

The by-product glycerin can also be sold and around 30 to 40% of methanol recovered, hence the cost can again be decreased.

So total final cost = $(48 - 4) = 44 \text{ Rs}$

VIII. FUTURE SCOPES

Need to study on biodiesel from Fish oil using different catalyst like CaO, CaTiO₃, MgO.

Need to study the effect of biodiesel derived from Fish oil and its blend with diesel when directly injected at different injection pressures & injection timings in a single cylinder water-cooled compression ignition engine.

Conduct the experiment on multi-cylinder engine fuelled by Fish oil biodiesel and compare with single cylinder engine performance and emissions to know the effect of biodiesel operation in higher rated engines.

Performance of bio-fuelled engines can be improved by adding oxygenated fuel additives.

More blends of fuel can be brought under investigation

Need to study the performance and emission characteristics on modified piston and compare the results with base piston.

CONCLUSION

- In comparison with the diesel, fish oil biodiesel shows higher fuel consumption rate, kinematic viscosity, brake fuel consumption.
- Engine performance with biodiesel does not differ greatly from that of diesel fuel. The B30 shows good brake thermal efficiency in comparison with diesel. A little increase in fuel consumption is often encountered due to the lower calorific value of the biodiesel
- At higher loads engine suffers from nearly 1 to 1.5% brake thermal loss for blends.
- Most of the major exhaust pollutants such as CO, CO₂ and HC are reduced with the use of biodiesel and the blend as compared to neat diesel. But NO_x emissions increase when fuelled with diesel– biodiesel fuel blends as compared to conventional diesel fuel. This is one of the major drawbacks of biodiesel.
- The exhaust gas temperature increases by increasing the blends as compared to neat diesel due to different characteristics of the diesel and biodiesel.

- Among the blends, B30 shows the better performance and emission characteristics
- Results obtained at compression ratio 17.5 and injection pressure 200bar showed better performance characteristics when compared with others.
- In terms of fuel properties and exhaust emission characteristics, fish oil biodiesel can be regarded as an alternative to diesel fuel

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REVIEW ON ERROR DETECTION AND CORRECTION

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Abstract— Majority logic decodable codes are suitable for memory applications because of their capability to correct large number of errors. Another method of decodable logic is Majority Logic Decoder/Detector which reduces not only the decoding time but also memory access time as well as area utilization. Euclidean Geometry Low-Density Parity-Check (EG-LDPC) codes are used for error correction, because of their fault-secure detector capability. EG-LDPC codes are used to avoid high decoding complexity. The application of a similar technique to a class of Euclidean geometry low density parity check (EG-LDPC) codes that are one step majority logic decodable. The obtained results show that the method is also effective for EG-LDPC codes. The proposed design of error detection and correction will be coded using VHDL, verified and synthesized on Modelsim and Xilinx FPGA respectively.

Keywords— Fault detection, Error correction, Serial one step MLD, Majority logic decoder/detector, Memory, Soft error, Sorting network.

INTRODUCTION

Now a day, data communication is an essential part of life and a lot of data has been transferred. Many communication channels are subject to channel noise, and therefore errors may be introduced during transmission from the source to a receiver. There are various ways of hacking, when the intruder modifies the data while communication. Not only to protect the confidentiality of the data but also to retain the correctness of the data, secure communication is very important. There are various methods of implementing the secure communication. Every method has its own advantages and disadvantages. This project is used for the improvement on most of the available methods for secure communication.

For reliable communication, errors must be detected as well as corrected. Some multi error bit correction codes are BCH codes, Reed Solomon codes, but in which the algorithm is very difficult. These codes can correct a large number of errors, but need complex decoders. Among the error correction codes, cyclic block codes have higher error detection capability as well as low decoding complexity and that are majority logic (ML) decodable. A low-density parity-check (LDPC) code is a linear error correcting code, used to avoid a high decoding complexity. One specific type of low density parity check codes, namely Euclidean Geometry-LDPC codes are used due to not only their fault secure detector capability but also higher reliability and lower area overhead.

To protect the memories from so-called soft errors error correction codes are commonly used, which change the logical value of memory cells without damaging the circuit. Memory devices become larger and more powerful error correction codes are needed, as technology scales. To end this, recently proposed the use of more advanced codes. These codes can correct a larger number of errors, but require complex decoders. The use of one step majority logic decodable codes was first proposed for memory applications, to avoid a high decoding complexity. One step majority logic decoding is implemented serially with very simple circuitry, but required long decoding times. This would increase the access time in memory which is an important system parameter.

Fig.1 shows the generic schematic of a memory system with MLDD. It consists of Encoder, Memory and MLDD.

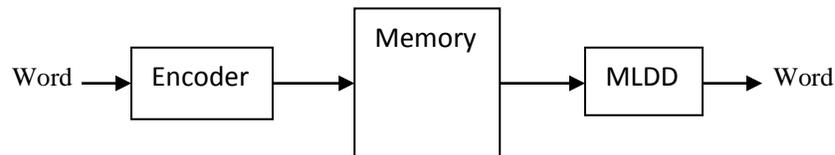


Fig -1: Memory system schematic with MLDD

First the data words are encoded and which is stored in the memory. When the memory is read then the codeword is fed through the MLDD before sent to the output for the processing. And this decoding process, the data word is corrected from all bit flips that it might have suffered while being stored in the memory.

LITERATURE REVIEW

[1]. Pedro Reviriego, Juan A. Maestro, and Mark F. Flanagan presented Error Detection in Majority Logic Decoding of Euclidean Geometry Low Density Parity Check (EG-LDPC) Codes. A method was proposed to accelerate the logic decoding of various set low density parity check codes. In the serial one step Majority Logic Decoder of EG-LDPC codes has been studied for the detection of errors during the first iteration. The objective was to minimize the decoding time by stopping the decoding process when no errors are detected. The obtained simulation results show that all the tested combinations of errors affecting up to four bits are detected in the first three iterations of decoding. These results are extend the ones recently presented for DS-LDPC codes, for memory application the modified one step majority logic decoding more attractive. The designer now has a larger choice of word lengths as well as error correction capabilities.

[2]. P. Kalai Mani, V. Vishnu Prasath, presented Majority Logic Decoding of Euclidean Geometry Low Density Parity Check (EG-LDPC) Codes. Error detection in memory applications was proposed to accelerate the majority logic decoding of various set low density parity check codes. LDPC is useful as majority logic decoding can be implemented serially with simple hardware but a large decoding time is required. For memory applications, this is increases the memory access time. This method detects whether a word has errors in the first iterations of majority logic decoding, if there are no errors then the decoding process is stop without completing the rest of the iterations. Therefore most words in a memory will be error free, and then the average decoding time is greatly reduced. The obtained results show that the method is also effective for EG-LDPC codes.

[3]. M. Pramodh Kumar, S. Murali Mohan, presented Serial one-step majority logic decoder for EG-LDPC code. In this brief, the detection of errors during the first iterations of serial one step Majority Logic Decoding of EG-LDPC codes has been studied. The objective was to minimize the decoding time by stopping the decoding process when no errors are detected. The obtained simulation results show that all the tested combinations of errors affecting up to four bits are detected in the first three iterations of decoding. These result was extend the ones recently presented for DS-LDPC codes.

[4]. Adline Priya, presented Low Power Error Correcting Codes Using Majority Logic Decoding. Moreover, the decoder architecture for LDPC codes are designed. And the simulation results for encoder, decoder, memory and detector are obtained. And also the majority logic decoder is implemented serially.

[5]. Senbagapriya. S. presented An Efficient Enhanced Majority Logic Fault Detection with Euclidean Geometry Low Density Parity Check (EG-LDPC) Codes for Memory Applications. In this paper, the detection of errors during first iterations of serial one step Majority Logic Decoding of EG-LDPC codes has been presented. The obtained simulation results show that to decode a codeword of 15-bits the one step MLD would takes 15 cycles, which would be excessive for applications. The MLD design requires small area but large decoding time is required and which can be able to detect two or few errors. Hence, memory access time increases. Another method, called MLDD can detect up to five bit-flips and consumes the area of majority gate. These designs are under progress.

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CONCLUSION

In this paper majority logic decoder/detector can be detect the number of errors and correct it. Fault secure detector can be detect error and serial one step majority logic decoder can be correct these errors. MLDD have the capability of reduces the area of majority gate by using sorting network.

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Designing of Neuro-Fuzzy Based Thermal Imaging System on MATLAB for Detection of Rheumatoid Arthritis

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Abstract— Infrared thermography is one of the options available over the traditional diagnosis methods for measuring and analyzing human body dysfunctions. Thermography gives vital information about temperature variations in different parts of a human body. As infection and inflammation causes temperature changes, thermography exists as a valuable tool for monitoring dysfunctions. Rheumatoid arthritis (RA) is an auto-immune disease that attacks and destroys lubricating elements and healthy tissues of joints of fingers, wrist and feet, causing pain and inflammation over there. Present advanced computer technology can be used to automate the analysis and diagnosis of RA using thermal images of affected area. Thermal Image analysis can be utilized to generate statistics that could be used as input parameters to a Neuro-fuzzy network which can predict the presence of RA. This paper propose to derive important statistical parameters from thermal images and a method to auto-detect RA by using statistical parameters with the help of neuro-fuzzy hybrid network.

Keywords— Rheumatoid arthritis, thermography, infrared, thermal imaging, skewness, kurtosis, Neuro-fuzzy.

INTRODUCTION

Rheumatoid arthritis is an autoimmune disease, in which the immune system starts attacking body's own tissues, causing inflammation. It affects the primary peripheral joints like fingers, wrists, shoulders and feet. This disease results in joint pain, stiffness, swelling of the joints, sometime leads to deformity of joints [2]. Heat is one of the oldest clinical signs of inflammation. So, in case of inflammation the basis of thermography is detection of heat generated by increased tissue blood flow as result of local inflammatory response. [9] Thermography may be used as an valuable tool for diagnosing the rheumatoid arthritis patients [12].

The technique detects infrared radiation intensity which correlates with the temperature distribution of a body region [7]. Infrared thermography provides a digitized output called thermogram. For a normal person, the thermogram shows uniform and symmetric temperature variations. In case of abnormality, abnormal regions show abrupt variations in temperature. The RA region appears as hot spot in the thermogram. [1]

Traditional assessment of the activity of the rheumatoid arthritis includes measurements of the subjective clinical variables, laboratory values and radiographic findings. Considering the change of temperature being basic physical characteristic of the inflammatory process and related reactions, it is justified to consider thermography as a potential, sensitive, noninvasive method for monitoring the severity of the inflammatory disease in both animal models and humans. But there are still two major limitations for infrared thermography used in biological applications. First, the accuracy for low-temperature applications is poor; second, energy distribution is uneven. [3]

Today's improved and advanced software solutions make it possible to incorporate anatomical and physiological information by image processing, which helps to generate information of affected areas. With the advanced computer technology and image processing tools available today, analysis of the images could be done faster with accuracy. Artificial neural networks (ANN) have been used successfully for pattern recognition problems. Once the ANN is properly trained, it can be used to generate consistent output for new sets of inputs reliably and objectively. [4]

METHODOLOGY

Fig. 1 shows the various stages involved in proposed system for detection of Rheumatoid Arthritis which is implemented on MATLAB 2012a.

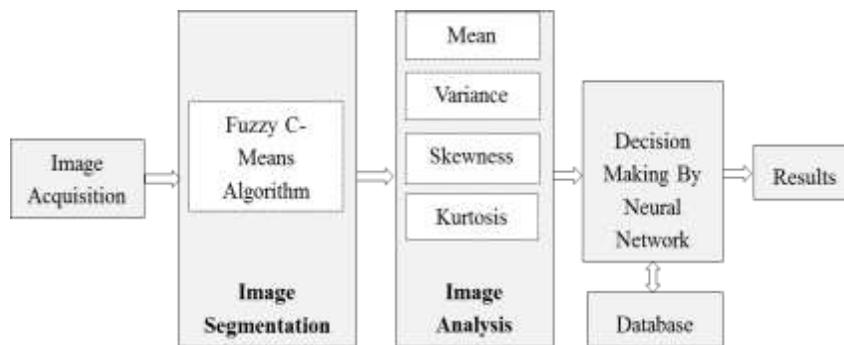


FIG1- STAGES INVOLVED IN DETECTION OF RHEUMATOID ARTHRITIS

1. Image Acquisition

Patients with Rheumatoid Arthritis and the normal persons were included in the study. Thermal image of the affected region of RA patients and normal participants was obtained using FLIR thermal camera. Region to be diagnosed was exposed for 10 minutes in a temperature controlled room set at 20°C. The camera was placed at the distance of 3m to obtain a thermal image in relaxed position. A uniform background was maintained for better segmentation of thermal image.

2. Image Segmentation

The most important step in detection of RA using thermal images is to identify and to segment the region of interest. This can be done by applying segmentation algorithms. Various studies have concluded that Fuzzy C-Means algorithm is better over the other available algorithms. [1, 2] Fuzzy c means (FCM) algorithm uses following steps [1]

For each point x , a coefficient giving the degree of being in the k^{th} cluster $u_k(x)$ is calculated and the sum of all those coefficients is defined to be 1:

$$\forall x (\sum_{k=1}^{num.cluster} u_k(x) = 1) \dots \dots \dots (1)$$

IN FCM, the centroid of a cluster is the mean of all points, weighted by their degree of belonging to the cluster:

$$Center\ k = \frac{\sum_x u_k(x)^m x}{\sum_x u_k(x)^m} \dots \dots \dots (2)$$

The degree of belonging is related to the inverse of the distance to the cluster center

$$u(k)_x = \frac{1}{d(center_k, x)^t} \dots \dots \dots (3)$$

Then the coefficients are normalized and fuzzified with a real parameter $m > 1$ so that their sum is 1. So

$$u(k)_x = \frac{1}{\sum_j \left(\frac{d(center_k, x)}{d(center_j, x)} \right)^{\frac{2}{m-1}}} \dots \dots \dots (4)$$

The steps involved in fuzzy c means algorithms are as follows:

- The number of clusters are chosen.
- Random co-efficient are assigned to each point in the cluster
- Exponent weight m is chosen.
- The membership function u_k is initialized.
- The centroid for each cluster is found by using the equation (2).
- The coefficients for each points in the clusters are computed using the equation (3) and (4).

3. Image Analysis

Statistical parameters can be used as pre-processing model for various digital image processing technique to improve the effectiveness of complex image processing technique in the next levels [11]. This section aims to derive various statistical parameters from segmented image that could be used as input to a neuro-fuzzy network for predicting the presence of RA. The image intensity directly

depends on thermal energy distribution of an object. A histogram expresses the delivery intensity and explains image combination. A histogram provides statistical information about the texture of the image. [10]

If P_j is the probability density of the j^{th} bin in the histogram and N is the total number of bins then these parameters can be defined as follows:

$$\text{Mean } \mu = \frac{1}{N} \sum_{j=1}^N P_j \dots\dots\dots (5)$$

$$\text{Variance } \sigma^2 = \frac{1}{N-1} \sum_{j=1}^N (P_j - \mu)^2 \dots\dots\dots (6)$$

$$\text{Skewness} = \frac{1}{N} \sum_{j=1}^N \left(\frac{P_j - \mu}{\sigma} \right)^3 \dots\dots\dots (7)$$

$$\text{Kurtosis} = \frac{1}{N} \sum_{j=1}^N \left(\frac{P_j - \mu}{\sigma} \right)^4 \dots\dots\dots (8)$$

The acquired thermal image as well as segmented image have variable pixel values over a long range, therefore extraction of useful information from both the images is quite complex to detect the presence of disease. For better feature extraction original image is first inverted and then added to segmented image. Statistical parameters are calculated in MATLAB by using the standard equation as expressed in equation (5), (6), (7) and (8) for the overlapped image.

4. Decision Making by Neural Network

Back Propagation neural network is applied extensively in pattern recognition problems. In this paper a feed forward network with an input layer, an output layer and at one hidden layer is used. Neural Fitting Tool (nftool) of Neural Network toolbox is used in MATLAB 2012a to create a neural network. The number of neurons in input layer and hidden layer is set to 4 while the number of neuron in output layer is set to 1. The four parameters Mean, Variance, Skewness and Kurtosis act as input to the Neural Network. The Network is trained for 20 input samples with corresponding target outputs by using Bayesian Regularization algorithm. A MATLAB function is generated at the end of training which returns the output of neural network to main program. Returned value is compared to a threshold value and according to predefined rules results are displayed on MATLAB GUI.

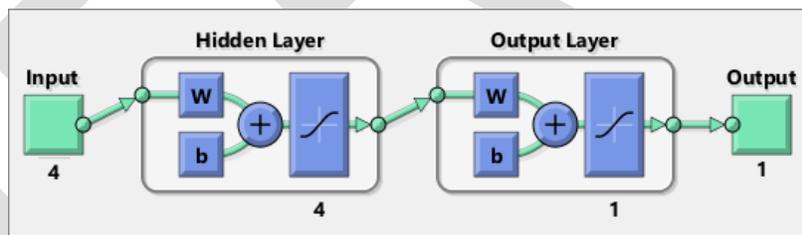


Fig. 2 Neural Network Architecture in MATLAB 2012a

RESULTS AND DISCUSSIONS

The calculated mean, variance, skewness and kurtosis values of pixels in thermal image of four RA patients and four normal participants for palm is listed in the Table-I.

Table I: Derived Parameters Value For Palm of Normal persons

Sample No.	Mean	Variance	Skewness	Kurtosis
Sample 1	242.55	56.462	-0.069	0.136
Sample 2	243.21	53.704	-0.063	0.123
Sample 3	244.63	55.888	-0.054	0.126
Sample 4	243.58	63.126	-0.046	0.142

Table II: Derived Parameters Value For Palm Of Persons With Rheumatoid Arthritis.

Sample No.	Mean	Variance	Skewness	Kurtosis
Sample 1	240.21	53.704	-0.063	0.233
Sample 2	235.64	56.897	-0.055	0.112
Sample 3	241.16	56.376	-0.052	0.195
Sample 4	238.40	55.550	-0.060	0.201

Fig 3 shows the GUI created in Matlab 2012a. The MATLAB program was capable of detecting disease correctly with the hit rate of approximately 60% for total 20 thermal images of normal and abnormal cases.

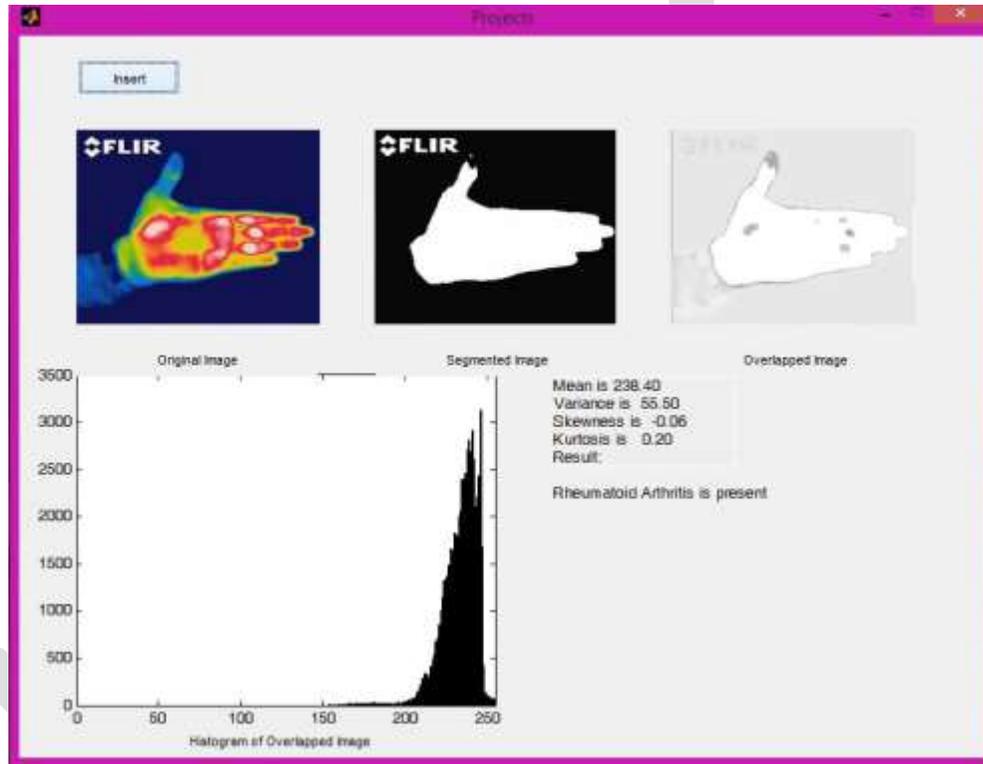


FIG3- MATLAB GUI FOR DETECTION OF RHEUMATOID ARTHRITIS USING THERMAL IMAGES

CONCLUSION

Thermography is a diagnostic method useful as a complementary method to other medical tests. It is concluded that some standards need to be defined for improving the diagnostic strength of thermography. So, further intensive researches in thermography application with creating specific data bases that can be used as algorithms are needed.

Neural Network provides intelligence to the system and makes it capable of auto detecting the RA disease. Multiple configurations have been checked by changing the number of neurons but a 4-4-1 network is found most suitable.

In conclusion, thermal imaging with neural network provides an alternative method to existing technology for auto-detection of the Rheumatoid Arthritis. This technique can be further expanded for detection of some other diseases.

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Survey – A Comparative Analysis of Face Recognition Technique

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Abstract- In this paper we survey some of the most prominent published literature in face recognition system based on 2DPCA technique published in last Ten years. A comparative analysis is done between various approaches using 2DPCA technique in order to recognizing the faces. There is an attempt to estimate the best approach that could be used that satisfies all the indicated parameters in order to develop the computational model for face recognition that will be fast, simple and accurate in different environments. The important of such work cannot be underestimated as for the disabled and the older ones, face recognition may remain the only mechanism to recognize the faces, so that a truly automatic face recognition system is feasible, current feature extraction methods improved and extended with regards to robustness in natural environments as well as independence of manual intervention during initialization and development.

Keywords- Face recognition, PCA, ICA, LDA, 2DPCA, TD2DPCA, B2DPCA, DWT

INTRODUCTION

Face recognition: A very popular research topic in recent years. Early face recognition algorithm used in simple geometric models but now matured into a science of mathematical representation and matching processes. In the past 10-15 years major advancement have propelled face recognition technology into the spot light. The subject face recognition is as old as computer vision, both because of the practical importance of the topic and theoretical interest from cognitive scientists. Face recognition has always remains a major focus of research because of its non-invasive nature. Despite the fact that other method of identification such as finger print and retina scan can be more accurate.

Beginners of automated face recognition are Woody Bledsoe, Helen Chan Wolf and Charles Bissy. During 1960's Bledsoe, Chan Wolf and Bisson developed the first semi-automated system using the computer to recognized human faces. It used featured such as eyes, ears, nose, mouth. These distances and ratio were calculated using these marks to a common reference point and compared reference data. This recognition problem is made difficult by the great variability in head rotation and angel, facial expression, aging, etc. some other attempts at facial recognition by machine have a loud for little or no variability is great. In particular, the correlation is very low between two pictures of the same person with two different head rotation [1].

Goldstein, Harmon and Lesk used a set of 21 specific subjective marker such as hair color, lip thickness, chick, jaw etc. in the early 1970's. During 1988 Kirby and Sioovich applied principle component analysis using less than 100 marker to the face recognition problem. Later Kohonen demonstrated that a simple neural net could perform face recognition for aligned and normalized face recognition. He computed a face description by just approximating the Eigen vector of the face image's autocorrelation matrix and these Eigen vector known as Eigen faces and at the end Kohonen's system do not have any practical success, because of the need for precise alignment and normalization [2]. Turk and Pentland in 1991 discovered that while using the Eigen faces technique the residual error could be used to detect faces in images.

FACE RECOGNITION

Face recognition is a subfield in a larger field of pattern recognition research and technology. Statistical techniques used by pattern recognition to detect and extract patterns from data in order to match it with patterns stored in database.

Face recognition is a biometric software computer application used for identifying or verifying a specific individual from a digital image or a video source by comparing the selected face with the image stored in database.

Face recognition is an important method as compared to other biometrics such as fingerprint when probes are uncooperative or in uncontrolled environments. The image used to test the algorithm are called probes. A probe is either a new image of individual in the database or an image not in the database or gallery. The probes are presented to an algorithm, and algorithm returns the best match between the each probe and image in the database. The estimated identity of a probe is the best match.

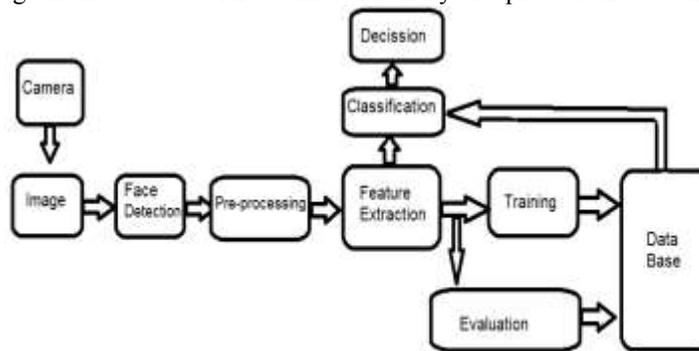


Fig.1. Face recognition system

Face recognition system has three stages: (1) Preprocessing (2) Feature extraction and (3) Classification which is shown in Fig. 1. The first stage includes face detection, normalization and elimination of background and parts of the face which may affect the recognition rate. The second stage in face recognition is categorized in two groups, namely featured based and holistic based [3]. Feature based methods basically rely on facial features like eyes, nose, chin and mouth which are analyzed and try to identify the position and relationship between them[4]. But in the holistic approaches images are analyzed as a whole. As facial features detection is difficult against rotation, scale and illumination variation, holistic approaches are generally implemented features are extracted by using deterministic or statistical transformation for feature vectors [5], [6]. In the holistic approaches proper depending upon database [7]. Among deterministic approaches Discrete Cosine Transform (DCT) [8], [9], Discrete Fourier Transform (DFT) [10], and Discrete Wavelet Transform (DWT) [11] are the most important powerful in face recognition application whereas Principal Component Analysis (PCA) [12] and its variations like Kernel PCA [13], Modular PCA [14], Diagonal PCA [15], Curvelet based PCA [16] and 2DPCA [17], Linear Discriminate Analysis (LDA) [18],[19] and Independent Component Analysis (ICA) [20],[21] are mostly used for feature extraction and dimension reduction been found that most efforts are given mainly on developing feature extraction methods and employing powerful classifiers reduction as statistical transformations. In the literature it has such as Euclidean distance classifier [22], Neural Networks [23], [24], Hidden Markov Models (HMMs) [25], Support Vector Machine (SVM) [26], Extreme Learning Machine (ELM) [27].

VARIOUS APPROACHES FOR FACE RECOGNITION

Geometric Approach

Face geometry was the first historical way to recognize people. There are lot of geometric features based on the points. These geometric features may be generated by segments, perimeters and areas of some figures formed by the points [28]. Geometric features includes Lip thickness, Nose profile, eyes separation etc. The approach is automatic point location, which may cause problem to bad quality images [28].

Elastic face matching

Elastic graph matching (EGM) is a biologically inspired algorithm for object recognition in the field of computer vision. Visual objects in EGM are represented as labeled graphs, where the nodes represent local textures based on Gabor wavelets and the edges represent distances between the nodes location on an image [29].

Neural Network for access control

Face recognition is a widespread technology used for access control. A multilayer perceptron neural network is considered for access control based on face recognition. The NN architecture if in explored from may be used in real time application [30].

Principal Components Analysis

PCA is a technique pioneered by Kirby and Sirovich in 1988, it is commonly referred to as the use of Eigen face. The size of the probe and gallery image must be of same size and normalized to a line up the eyes and mouth of the subject within

the images. PCA technique is used to reduce the dimension of the data by means of data compression basics [31] and reveals the most effective low dimensional structure of the facial patterns. The reduction in the dimension will remove the information that is not useful [32] and it will decomposes the face structure into orthogonal component known as Eigen face and each of the Eigen face are represented as the weighted sum of the Eigen face, which are stored in 1D array. Then the probe image is compared with the gallery image by measuring the distance between their between their respective feature vectors. Basically in PCA technique requires the full frontal face which is to be presented each time otherwise the image will result in poor performance.

Principal Component Analysis also called Karhunen- Loeve transform (KLT), is a classical feature extraction and data representation technique widely used in the area of pattern recognition and computer vision [17]. PCA was invented in 1901 by Karl Pearson, as an analogue of the principal areas theorem in mechanics; it was later independently developed and named by Harold Hotelling in the 1930's. Sirovich and Kirby used PCA to represent pictures of human face recognition in 1991. The problem of dimensionality of the face space was discussed by the Penev and Sirovich when Eigen faces was used for representation. PCA is a statistical procedure that uses an orthogonal transformation to convert a set of observation of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components.

It is technique that effectively and efficiently represent picture of faces into its Eigen faces components. It reduces data dimensionality by performing a covariance analysis between factors [2]. If we consider an object as a point in dimension space then these components are the Eigen vectors of the related covariance matrix of this set of image, these face image are individual known as Eigen faces and these are represented by a linear combination of Eigen faces or we can say best Eigen faces.

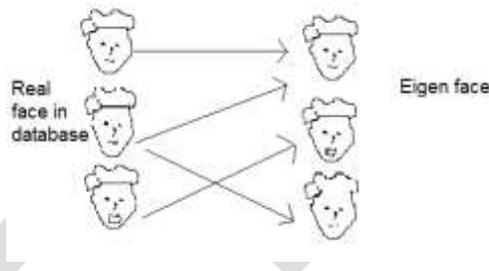


Fig. 2. Faces are linear combination of Eigen faces

Two- Dimensional Principal Component analysis

2DPCA technique is developed for image representation and for image feature extraction. 2DPCA is totally opposite to the PCA, 2DPCA is based on 2D matrices rather than 1D vectors due to be previously transformed into a vector prior to feature extraction. Instead of this image covariance matrix is constructed directly by using the original image matrix and by which size of the image covariance matrix using 2DPCA is much smaller. Basically 2DPCA have lots of advantages like it is easier to evaluate the covariance matrix accurately and also it take less time to determine the corresponding Eigen vector [17].

Independent Component Analysis

ICA derived from a linear representation of non-Gaussian data. The most common method for generating spatially localized features is to apply independent component analysis (ICA) to produce basis vectors that are statistically independent. A number of algorithms for performing ICA have been proposed and has been proved successful for separating randomly mixed auditory signals (the cocktail party problem) and for separating electroencephalogram (EEG) signals and functional magnetic resonance imaging (MRI) signals.

Independent component analysis, or ICA is a statistical technique which in many cases characterizes the data in a natural way. ICA and the related blind source separation (BSS) problem have grown important research and application topics both in unsupervised neural learning and statistical signal processing. Comparisons between PCA and ICA are complex, because differences in tasks, ICA algorithms and distance metrics must be taken into an account. ICA chooses a different subspace than PCA. PCA is only sensitive to the power spectrum of images suggests that it might not be particularly well suited for representing images. However ICA is sensitive to high-order statistics in the data, not just the covariance matrix.

Linear Discriminant Analysis

LDA is a classification method originally developed in 1936 by R.A. Fisher. It is a simple mathematically robust and often produces models whose accuracy is as good as more complex methods. Discriminant analysis is a classical method of classification that has stood the test of time. LDA is based upon the concept of searching for a linear combination of variables (predicators) that best separates two classes (targets). LDA is closely related to analysis of variants (ANOVA) and regression analysis, which also attempt to express one dependent variable as a linear combination of other features of measurements. LDA is an enhancement to PCA and factor analysis constructs a discriminant subspace that minimizes the scatter between images of same class and maximizes the scatter between different class images. LDA does not perform very well due to the testing samples are from persons not in the training set and also when markedly different samples of trained classes are presented, samples are presented from different background. Therefore later on LDA is overcome from these drawbacks [33], [34].

Gabor Wavelets

Gabor acts as a filtering device. It transforms the facial image into small wavelets that helps in easier recognition of the desired feature. Gabor is a very effective tool because the Gabor filtered images stand strong and unaffected to the variations or changes made in illumination and facial expression or poses. Further Gabor wavelet representation has higher degree of correlation with human semantic ratings.

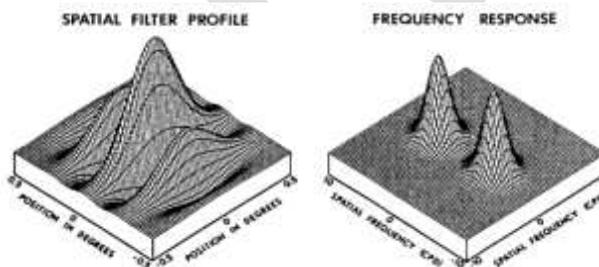


Fig. 3. Gabor filter in space (left) and frequency (right) domain [35]

Gabor wavelets are represented by a 2-D plane waves in the spatial domain. One characteristic of wavelets is that they can be located somewhere between the space and the frequency domain. In the frequency domain as shown in Fig. 3 the Gabor wavelet filters can be represented as Gaussian windows.

Discrete Cosine Transform (DCT)

DCT is basically a technique for image compression. It compresses the image by removing the information which is not of use.

The DCT mechanism transfers an image from the time domain.

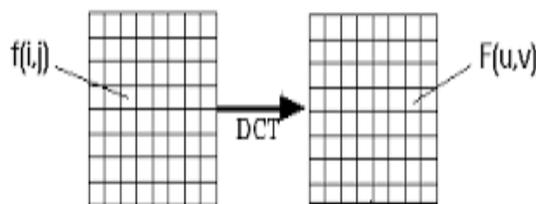


Fig. 4. Discrete Cosine Transform [36]

$$f(u, v) = \frac{\Lambda(u)\Lambda(v)}{4} \sum_{i=0}^7 \sum_{j=0}^7 \cos \frac{(2i+1).u\pi}{16} \cdot \cos \frac{(2j+1).v\pi}{16} \cdot f(i, j)$$

$$\Lambda(\xi) = \begin{cases} 1/\sqrt{2} & \text{for } \xi = 0 \\ 1 & \text{otherwise} \end{cases}$$

Harr Wavelet Transforms

It is another frequently used image filtering method. It is based on the mechanism of filtering the image by separating the frequency bands into two groups-low and high.



Fig. 5. One filter stage in 2-D DWT

Wavelet functions for 2-D DWT can be obtained by multiplying two wavelet functions or wavelet and scaling function for one-dimensional analysis. Also, in higher dimensions as the two-dimensional case, there can be three wavelet functions that scan details in horizontal $\Psi_1(x, y) = \Phi(x) \Psi(y)$, vertical $\Psi_2(x, y) = \Psi(x) \cdot \Phi(y)$, and diagonal directions $\Psi_3(x, y) = \Psi(x), \Psi(y)$. This may be represented as a four channel perfect reconstruction filter bank as shown in Fig. 5. Now each filter is 2-D with the subscript indicating the type of filter (HPF or LPF) for separable x-axis and separable x-axis and y-axis components. The resulting four transform components consist of all possible combination of high and low pass filtering in the two directions.

FILTERED FEATURE CLASSIFICATION

FFC is the next very important and sensitive stage in the face recognition system. It is sensitive in the sense that even the slightest changes in the movement of the face expression, poses, illumination variation and rotation determine that is exactly what is need to be captured and differentiated during this stage. Since facial features detection is difficult against rotation, scale and illumination variation.

To overcome the above problem very recently, some newer approaches have been used. There are two main categories of feature classification approach:

Statistical non-machine learning approach such as Euclidean and linear discrimination analysis.

Machine learning approach such as Feed forward Neural Network, Multilayer Perceptron, Radial Basis Function Network, etc

RESULT AND ANALYSIS

We have studied 12 recent papers that were good in this research area. All researchers have tried to improve the performance of the face recognition system by enhancing feature extraction techniques and classification techniques. Table shows the summary of research work (chronological order starting from 2004 to 2014).

Reference	Feature extraction technique	Database	Classifier	Sample size	Performance	Important mark
Jain Yang, David Zhang, 2004 [17]	2DPCA	ORL, AR, YALE face database	Nearest Neighbor Classifier	ORL database contain 40 individuals each providing 10 different images (92×112) Pixels AR database contains 4000 of 126 people (50×40) pixels, YALE face database contains 165 images (100×80) pixels	ORL=96.0% (using first five images for training), 98.3% (leave-one-out) AR= 96.1% YALE = 84.24% recognition accuracy	2DPCA is better than PCA in terms of recognition accuracy. 2DPCA was not efficient as in terms of storage requirements.
Maataz M. Abdelwahab, Wasfy B. Mikhael, 2006 [36]	TD2DPCA for face recognition in the presence of salt and pepper as well as Gaussian noise	ORL and YALE dataset	Euclidean distances between the feature matrix of testing images and training images	ORL dataset consist of 400 images of 40 different individuals (112×92) pixels, YALE database consist of 165 images of 15 different subjects	ORL= 73.61% (experiment 1), 92.0% (experiment 2) YALE=78.3% recognition accuracy	This technique retains its high accuracy for noisy images. It reduced the storage requirement by 90% and computational speed by a factor of two relative to existing

				(243×320) pixels		techniques of comparable recognition accuracy.
P. Sanguansat, W. Asdornwied, S. Jitapunkul, S. Marukatat, 2006 [37]	B2DPCA+ FSS	YALE database	Nearest Neighbor Classifier	165 images of 15 subjects , 11 images per subject (100×80) pixels	Accuracy = 94.44%	The excellent performance over conventional 2DPCA and B2DPCA under variations in expression and illumination, it shows the improvement recognition accuracy on well-known face database. It require more memory for storing each classes and recognition rate.
Lin Wang, Yongping Li, Chengbo Wang, Hongzhou Zhang, 2007 [38]	Gabor face based 2DPCA and $(2D)^2$ PCA classification with ensemble and multichannel model	ORL and YALE database	Gabor face – based 2DPCA and $(2D)^2$ PCA classifier	ORL database consist of 400 frontal faces (112×92) pixels, YALE database consist of 165 images of 15 subjects. In both the dataset each face image is rescaled to 3232 using a bi-cubic interpolation to facilitate	ORL dataset EGFR+ $(2D)^2$ PCA = 98.0%, YALE database EGFR+ $(2D)^2$ PCA = 96.67%	This method is based on 2D Gabor Face matrices rather than 1D sampled feature vectors. Therefore there is no loss of information due to down sampling

				the Gabor face representation and reduced the computational complexity		
Yanwei Pang, Dacheng Tao, Yuan Yuan and Xuelong Li, 2008 [39]	Binary 2DPCA	YALE face dataset	Threshold Q determine the approximation precision and the number of selected 1D Haarlike function	YALE database contains face images collected from 15 individual, with 11 images	B-2DPCA outperforms B-PCA, particularly when the number of selected features is small	The important observation is that the performance degenerate little when threshold θ is large. By increasing θ , the number of Haarlike functions reduces in a dictionary. So the time cost of testing procedure can be reduces in a dictionary.
Jun Ying Gan, Si-Bin He, 2009 [40]	Improved 2DPCA	ORL and YALE face dataset	Nearest Neighbor Classifier	ORL database contains 400 images, including 40 distinct people and reach with 10 images (112×92) pixels, YALE face database contains 15 distinct people each with 11 images (243×320) pixels	ORL= 98.33%, YALE = 97.78% Recognition accuracy	Experiment performed on ORL and YALE face database and no. of class and samples is limited. Therefore, the validity of algorithm on a large face database and in a more complex condition need to be studied.
Dongmin Jeong, Minhoo Lee, Sang-	$(2D)^2$ PCA-ICA	ORL and YALE B face database	Nearest Neighbor Classifier	ORL contains images from 40	ORL = 92.5%, YALE= 91.0%	In future work consider an incremental

<p>Woo Ban, 2009 [41]</p>				<p>individuals, each providing 10 different images (112×92) pixels, YALE B face database contains 200 images of 10 individuals each person has 20 different images (60×50) pixels</p>	<p>Recognition accuracy</p>	<p>scheme to properly deal with a large- scale database, which can incrementally learn high dimensional data without computing the corresponding covariance matrix and without knowing a prior knowledge about the data in advance.</p>
<p>Lin Yang, Yuan Liang, 2011 [42]</p>	<p>Improved Modular 2DPCA</p>	<p>YALE face dataset</p>	<p>Nearest Neighbor Classifier</p>	<p>it contains 15 person 11 images each person total 165 images</p>	<p>Recognition rate = 90.7%</p>	<p>Weight the sub matrix can increase the recognition rate effectively. Increase the weight of these sub images can increase the different among classes, and improve the fault tolerance. But, luck of correlative research stop us to set the weight accurately, this problem can be further research.</p>

<p>Zhao Lihong, Yang Caikun, Pan Feng, Wang Jiahe, 2012 [43]</p>	<p>PCA+ 2DPCA + Gabor</p>	<p>ORL dataset</p>	<p>Nearest Neighbor Classifier</p>	<p>Total 400 people, 40 people, 10 images per people</p>	<p>Recognition rate = 96%</p>	<p>2DPCA with PCA method based on the Gabor wavelet is superior to single 2DPCA or PCA. It recognition rate is higher.</p>
<p>Shimin WANG, Jihua YE, Dequan uan YING, 2013 [44]</p>	<p>2DPCA Principal component uncertainty</p>	<p>ORL database</p>	<p>Euclidean distance</p>	<p>ORL database contains 400 face images contains 40 people, 10 images per person</p>	<p>Recognition rate= 97.80%</p>	<p>From the uncertainty principal we obtained α and β with α increase, β also increase. So, as to enhance or suppress the 2DPCA principal component and the capability of face recognition also increase. But it only can increase to a certain extent, since excessively enhance or suppress, the capability of face recognition decrease.</p>
<p>Swarup Kumar Dandpat, Sukadev Meher, 2013</p>	<p>PCA and 2DPCA</p>	<p>ORL and YALE database</p>	<p>Euclidean distance between two principal component</p>	<p>ORL contains 400 images that having 40 people with each person in</p>	<p>ORL = 92.8% (experiment A) YALE = 92.3% (experiment A)</p>	<p>Further experiment on different database with more subject.</p>

[45]			vectors. In this paper it consider the three Nearest distance for all test.	10 different poses (92×112) pixels, YALE database 165 images in GIF format 15 individual 11 images per person (100×100) pixels.	ORL = 93.8 % (experiment B) YALE = 92.8% (experiment B)	
Aili Wang, Na Jiang and Yuan Feng, 2014 [46]	Wavelet transform and improved 2DPCA	ORL dataset	Nearest Neighbor Classifier	40 volunteers have 10 images individual total 400 faces (112×92) pixels	Recognition rate = 92.0%	In wavelet transform, the higher decomposition layers will lost a lot of information by which reduce the recognition rate.

Table 1. A Summary of some face recognition system based on 2DPCA (2004-2014)

LIMITATION IN PREVIOUS WORK

- (1) Recognition accuracy is not achieved up to the mark.
- (2) 2DPCA was not efficient as in terms of storage requirements.
- (3) Experiment performed on ORL and YALE face database and no. of class and samples is limited. Therefore, the validity of algorithm on a large face database and in a more complex condition need to be studied.
- (4) Increase the weight of these sub images can increase the different among classes, and improve the fault tolerance. But, luck of correlative research stop us to set the weight accurately, this problem can be further research.
- (5) From the uncertainty principal we obtained α and β with α increase, β also increase. So, as to enhance or suppress the 2DPCA principal component and the capability of face recognition also increase. But it only can increase to a certain extent, since excessively enhance or suppress, the capability of face recognition decrease.
- (6) In wavelet transform, the higher decomposition layers will lost a lot of information by which reduce the recognition rate.
- (7) Some paper, have shown that their results and performance are database dependent. Further experiment on different database with more subject.

PROPOSED WORK

In light of the deficiencies explored by the detailed comparative analysis in the studied papers, we have chosen in the current work to overcome the following deficiencies:

- (1) Remove the difficulty against rotation, scale, and uneven lighting and illumination variations.
- (2) Further experiment on different database with more subject.
- (3) In future work consider an incremental scheme to properly deal with a large- scale database, which can incrementally learn high dimensional data without computing the corresponding covariance matrix and without knowing a prior knowledge about the data in advance.
- (4) Improving the recognition rate.
- (5) Develop the computational model for face recognition that will be fast, simple and accurate in different environments.

CONCLUSION

Under the comparative analysis of the various state of the art techniques available for face recognition, we have encountered various pitfalls. This covers the major shortcomings specified under the 'proposed work' as well as others. We also plan to conduct further experiments on different databases with more subjects. The research will be focused to develop the computational model for face recognition that will be fast, simple and accurate in different environment.

Finally, it can be stated that if truly automatic face recognition system are to be feasible, current feature extraction methods have to be improved and extended with regard to robustness in natural environments as well as independence of manual intervention during initialization and deployment.

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Derived method to measure Receiver Sensitivity and Receiver Overload for optical ports of Transponder in DWDM System

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Abstract — This article covers the signal sensing capability of optical ports in an optical network and a derived procedure to measure parameters related to signal sensing capability for optical ports of transponder of a DWDM system. Attenuation, RS and RO are key factor during transmission and optical strength of light signal in an optical network depends on these parameters. Basic concept and theory of attenuation, RS and RO is discussed. Experimental Procedure for measure RS and RO for a traditional SDH system is discussed in this paper. On basis of this, a derived arrangement and procedure is defined to measure RS and RO for client side and line side optical ports of transponder in a DWDM system. A description for signal flow in this new arrangement is also discussed. Experimental results to calculate RS and RO with this derived arrangement for different types of client side and line side ports are also given in this article.

Keywords — DWDM, Receiver Sensitivity, Receiver Overloading, Optical Ports, Acceptance Testing, SDH, Transponder, Attenuation

INTRODUCTION

DWDM stands for Dense Wave Division Multiplexing. It is the new era of optical communication. DWDM is a technology by which we can transmit multiple optical signals through a single fiber cable simultaneously. Idea of DWDM based on basic characteristics of light. We all know that light wave with different wavelength can travel together without distorting each other. Light waves of 7 different colors travel together without affecting each other which form white light and can be separated and recombine with the help of prism. It was first discussed in Newton's classic experiment on dispersion of white light, which define white light have different component color which travel along each other and can be separate and re align. These component colors of white light will be depend on that wavelength of their light wave. Each color wave belongs to a particular band of wavelength and all these light waves can travel simultaneously without affecting each other. Figure shown below is the arrangement used in Newton's experiment to show this property of light.

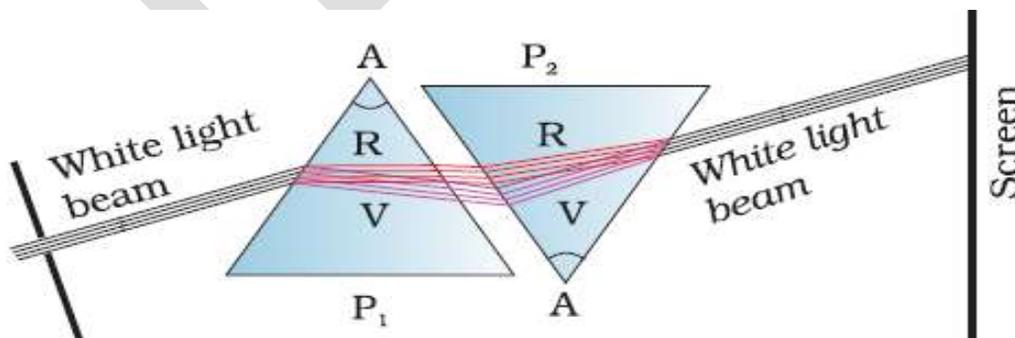


Fig-1. Schematic diagram of Newton's classic experiment on dispersion of white light

Same fundamental we use in DWDM. Multiple light signals with different wavelength transmit through single optical fiber cable.

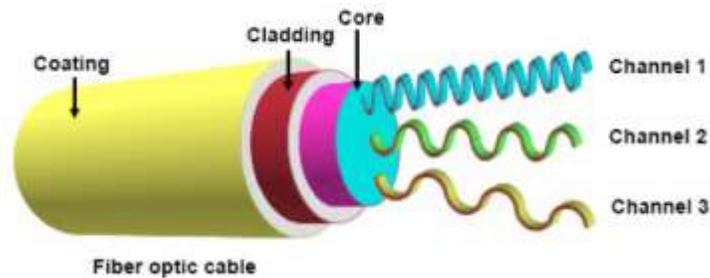


Fig-2. Propagation of different optical wavelengths in single optical fiber in a DWDM system

Light signal of one wavelength will not affect light signal of other wavelength and all light signals will survive simultaneously. Standard optical signal of 1310 nm and 1550nm is tuned with particular wavelength .for DWDM these wavelengths belong to C band. After this tuned signals multiplexed. As this multiplexed signal has to travel for a long distance, hence first amplify and then transmitted over optical fiber cable.

Transponder- Transponder is one of the basic components of a DWDM system. Transponder receives optical signal from external equipment on its client side optical port, tuned them at predefined wavelength of a C-Band and then send it to multiplexer from its line side optical port. Vice versa happens at receiver end. Hence transponder has two type of optical ports, client and line side optical ports which deal with different type of optical signal. Light signal on optical ports of transponder which are coming from long distance, are degrade because of attenuation over fiber. Hence selection of optical ports for transponder will be done on the basis of attenuation over the network as it will decide optical strength of Rx signal at transponder. Therefore attenuation over the path and sensing and overloading capabilities of both types of optical port should be measured for successful design, implementation and operation of a DWDM system.

Attenuation- Attenuation is the loss of optical power of a light signal in optical fiber communication. It may also define as reduction in the intensity of light as it propagates within the fiber. Hence it is also known as transmission loss throughout the length, as it reduces optical strength of light signal. Reduction in optical streangth will cause poor quality of light signal and increase error probability. Further reduction even after certain limit may cause insensitivity of signal at receiver and will lead to traffic outage. Hence attenuation is a measure factor consider during design and operation of DWDM network. In optical fiber communication attenuation is usually expressed in decibels per unit length (dB/km). Types of attenuation in DWDM system-

- i. **Fiber loss-** Fiber loss is defined as attenuation of optical strength during light signal pass through optical fiber. Fiber loss happen because of composition of core cladding material ,composite shape of waveguide, preparation and purification technique and implementation of network. Main causes of attenuation in fiber are
 - a. **Absorption loss-** it is caused by absorption of light signal by itself. It is also cause by impurities in fiber.
 - b. **Scattering loss-** interaction of photons with glass in fiber cable cause scattering of photons which cause degradation in intensity of light signal.
 - c. **Bending loss-** it is induced by physical stress applied on the fiber. More stress on fiber, may cause complete loss of signal and even damage optical fiber permanently.
- ii. **Insertion loss-** In a DWDM system light signal has two paths through different type of passive components like MUX, DMUX, and patch panel etc. loss of intensity of light signal due to these components known as insertion loss.
- iii. **Connection loss-** Different types of connectors and couplers are used in DWDM system to connect different cables and components .every time these connectors introduced in the network, they will increase attenuation on light signal.

Receiver sensitivity (RS) - Receiver sensitivity of Optical Receiver Port is defined as the minimum acceptable values of optical strength of light signal for that port. It means after certain degrade in intensity of light signal, optical ports are unable to distinguish optical pulses and cause errors on signal. Minimum threshold value of signal that can be sense properly is termed as Receiver sensitivity or Optical receiver sensitivity.

Receiver overload (RO) - Receiver overload of Optical Receiver Port is defined as the maximum acceptable values of optical strength of light signal for that Port. It means after a certain increment in intensity of light signal, optical ports are unable to handle optical pulses and cause errors of signal. Maximum threshold value of signal that can be sense properly is termed as Receiver sensitivity or Optical receiver sensitivity.

TRADITIONAL ARRANGEMENT TO MEASURE RS/RO IN SDH SYSTEM

Components of arrangement-

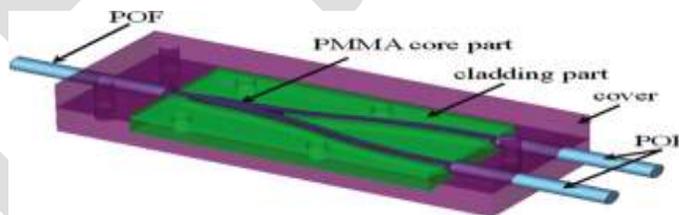
- i. **SDH/Ethernet Analyzer-** SDH analyzer is a testing device which is capable to generate a SDH optical signal and receive and analyze an incoming SDH optical signal. If incoming SDH signal has any alarm or error then SDH analyzer is capable to read it and analyzed its intensity. Ethernet also work in same way but for Ethernet signal.



- ii. **Variable Optical Attenuator-** Variable Optical Attenuator, also termed as VOA is a device which is capable to generate attenuation on light signal. This attenuation can be vary as per requirement using increasing or decreasing button without making any physical change in system.



- iii. **50/50 Coupler-** 50/50 coupler is used to send one optical signal in to two directions. It is just like a T connector in RF network. One incoming signal will be transmitted from two outputs. Signals from both outputs are similar and twins to each other.



- iv. **Optical Power Meter-** Optical power meter testing device which is used to measure optical intensity of light signal.



- v. **Optical Fiber Patch chords (for connectivity)** - These are the fiber cable use to connect different equipments and test devices.

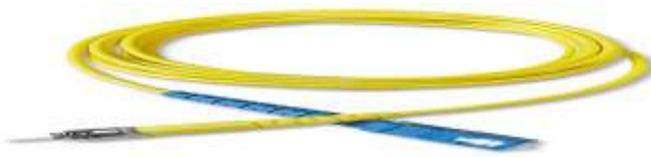


Diagram-

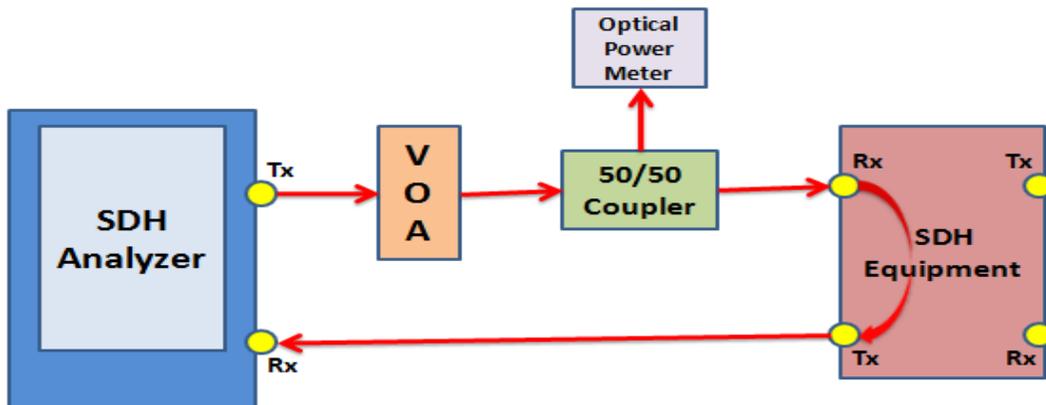


Fig-3. Traditional arrangement to measure RS/RO in SDH System

Arrangement and Theory-

In this traditional arrangement the transmit side port of the SDH analyzer is connected with Variable Optical Attenuator (VOA). SDH analyzer may have multiple types of ports. We have to select as the configuration of the Optical port of equipment which is undergone testing. VOA will apply attenuation as per our requirement on optical signal and send it to the output. Output of VOA is connected to 50-50 coupler. It will transmit same signal in two directions, one will go to the Rx of optical port under testing and other will go to optical power meter. Measurement of the optical strength of light signal at Rx will be same as the optical strength of light signal at power meter. If we change attenuation from VOA then same effect will observe on both light signal of 50-50 coupler output. In this way we are able to know what optical power is received by the Rx of optical port under testing. Signal of this Rx port will be logically loopback to the Tx of same port using EMS software. Hence the same signal will be retransmitted from the Tx of optical port under testing. This Tx of optical port will be connected to Rx of SDH analyzer where the quality of incoming light signal will be analyzed and recorded. As this signal is under loopback hence SDH analyzer should receive the same signal which it transmitted. If not so, there is some error in this optical circuit.

Test Procedure - Experiment will start with initial working state. Now we start the analyzer. Light signal from SDH analyzer will go to VOA where we can put attenuation as per our requirement. Then light signal will go to 50-50 coupler from where it will transmitted in dual direction, one to

- i. **RS** - In initial working state light signal quality will be good and Rx of analyzer will show no error. Now we will start increasing attenuation from VOS which will cause decrease in optical strength of light signal at Rx of optical port. Same optical strength will be measured on optical power meter. At the same time we will analyzed the quality of light signal on Rx port of analyzer. After certain increase in attenuation of signal we will see errors on the receiver of analyzer. This error observed due to low strength light signal at Rx of Optical Testing port and it is unable to sense the signal correctly. Optical pulses of light signal are either missed or read wrongly by Optical port. The point at 1×10^{-12} BER will be consider as at threshold point and value of optical power of light signal at Rx of Optical port under testing will be Receiver Sensitivity of this optical port.
- ii. **RO** - Again we will start SDH analyzer with initial working state. This time we will start decreasing attenuation on light signal. Change of strength of light signal on optical port will be measured on optical power meter. After a certain increment

in optical power of light signal we will observe errors on analyzer. It is because Rx of optical port is unable to read such high intensity light signal. The point at 1×10^{-12} BER will be considered as the threshold point. And optical strength of light signal at Rx of optical port under test will be defined as the receiver overload of this optical port.

DERIVED ARRANGEMENT TO MEASURE RS/RO FOR CLIENT SIDE OPTICAL PORT OF TRANSPONDER-

Diagram-

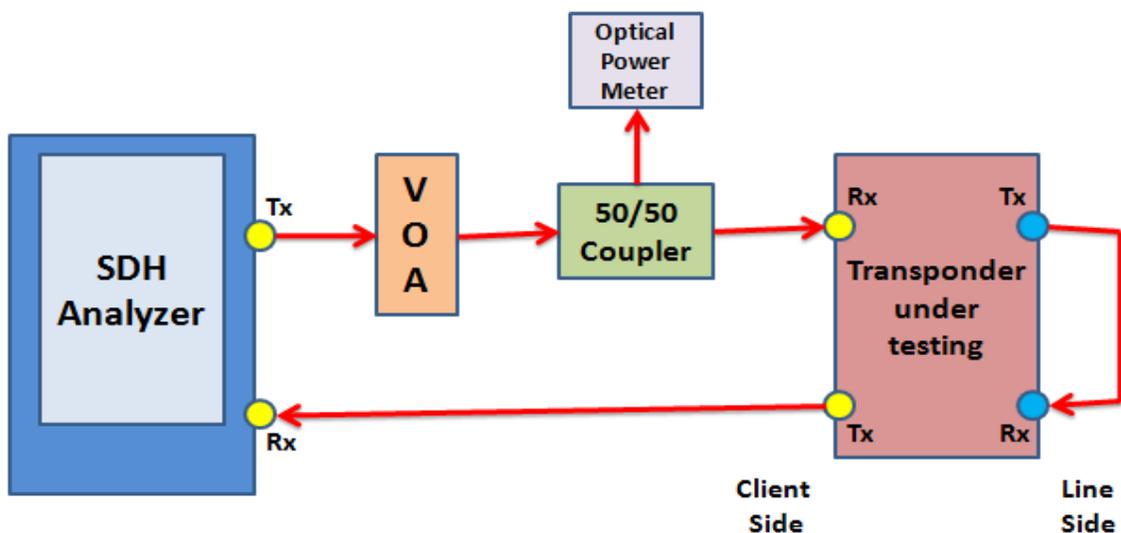


Fig-4. Derived arrangement to measure RS/RO of client side optical ports of transponder

Arrangement - This arrangement is same as in SDH system with little difference as logical cross connect is not available in transponder of DWDM system .hence we are unable to give logical loop back of Rx to Tx. Therefore input light of Rx of client optical port will be tuned on specific wavelength and will transmit out from line side Tx of transponder. As we know Tx and Rx of line side of transponder work on same wavelength. We will loop back this line side Tx of transponder to line side Rx of transponder with the help of a lopping fiber cable .signal from line side Tx will receive at line side Rx of transponder which will retune to standard light signal and out from client side Tx from where it will go to line side of transponder.

Test procedures-

- i. **RS** - Experiment start with initial working state .now we slowly increase the attenuation from VOA and signal strength will start to decrease the point where BER will be on threshold value will be noted .the optical strength of light signal at client side RX of transponder will be consider as receiver sensitivity of this optical port.
- ii. **RO** - Experiment start again with initial state .now we will slowly decrease the attenuation from VOA which will cause increase in the optical strength of light signal. After a certain value ,BER measure at SDH analyzer will reach at its threshold value at this point the value optical at client side Rx of transponder will be define as receiver overload for this port.

DERIVED ARRANGEMENT TO MEASURE RS/RO FOR LINE SIDE OPTICAL PORT OF TRANSPONDER –

Diagram-

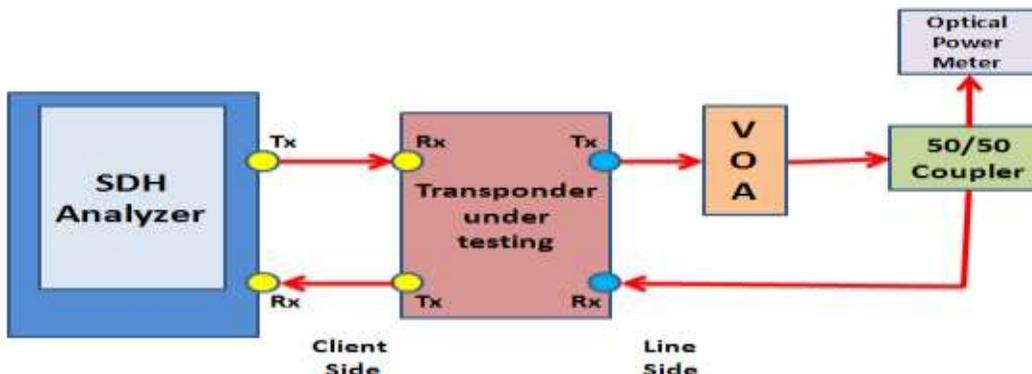


Fig-5. Derived arrangement to measure RS/RO of line side optical ports of transponder

Arrangement - This arrangement is very different from previous one. in this the transmit of analyzer is connected directly with client side Rx of transponder, same like it connected with any other network equipment during operations. Now standard optical signal from analyzer will be tuned to specific wavelength and will transmit from line side Tx .this line side Tx will connect to the input of VOA. Output of VOA will connect to 50/50 coupler from where one output will to optical fiber and other will to line side Rx of transponder module. Optical strength of light signal at RX can be measure3 on power meter. Now this tuned signal wavelength signal will returned to standard signal at transponder and from client side Tx it will transmit to Rx port of analyzer.

Test Procedure - Experiment will start with initial working state. Now slowly increase attenuation from VOA. This will cause decrease in optical strength of light side signal at line side Rx .after a certain decrement in optical strength of light signal, the reading at analyzer will reach on threshold for BER. This point will be consider as thresholds and value of optical power of light signal at line side Rx will be define as RS. Now with similar arrangement we can calculate RO by decreasing the attenuation from VOA. Optical power at line side Rx at threshold point of BER on analyzer will be consider as RO.

RESULT

Our experiment will give us the value of RS AND RO for client side and line side optical ports of transponder. As client side port are connected to standard network hence they are manufactured with RS and RO as per standard defined by ITU. We also find same value for client side optical port during our experiment. Different optical ports have different RS/RO as per their configuration. As STM1/STM4 use in access network and have to travel less distance so RS/RO is low for them. But STM16/STM64 use on core network and has to travel at large distance. Hence RS and RO value is high. Similarly for short haul optical ports RS/RO value is low while for long haul optical port RS/RO value is high.

Optical Port Type	Receiver Overload	Receiver Sensitivity
S-1.X	-8 dBm	-28 dBm
L-1.X	-10 dBm	-34 dBm
S-4.X	-8 dBm	-28 dBm
L-4.X	-8 dBm	-28 dBm
S-16.X	0 dBm	-18 dBm
L-16.2	-9 dBm	-28 dBm
I-64.2	-1 dBm	-18 dBm
S-64.2a	-8 dBm	-18 dBm
S-64.2b	-1 dBm	-14 dBm
L-64.2a	-9 dBm	-26 dBm

Table-1. Results for client side optical ports

As line side is internal part of DWDM system it does not have to maintain as per industry/ITU standards. It is manufacturer dependent and may vary with photodiode use for line side of transponder.

Port/Diode Type	Receiver Overload	Receiver Sensitivity
2.5G PIN Type	0 dBm	-18 dBm
2.5G APD Type	-9 dBm	-28 dBm
10G PIN Type	0 dBm	-14 dBm
10G APD Type	-9 dBm	-21 dBm

Table-2. Results for line side optical ports

CONCLUSION

RS and RO play an important role in transmission network design of an optical network, Network operation and fault troubleshooting. In this article we have discussed a derived arrangement and procedure to measure RS and RO for optical ports of a DWDM system. Then we evaluated RS and RO for different types of optical ports. Experiment results shows that different type of optical port have different value of RS/RO. Light signal on client side optical port from locally placed equipment will have low attenuation, hence has good optical strength. In such case short haul optical ports will be used by network designer. But light signal from some remote equipment has to travel a long distance over fiber cable and hence applied with high attenuation and has low optical strength. Hence long haul optical ports will be used in such case. Similarly designer can plan for different line side optical ports as per requirement or availability. A part from network design RS/RO also play vital role during network operation and fault troubleshooting. Optical engineers have to maintain optical strength of light signal within the range of RS and RO for stable and efficient network. In case of fault or fiber cut, they will consider it as a reference point and restore the network with defined range of RS and RO. Therefore we can conclude that RS and RO of optical ports as vital optical parameters in a DWDM system.

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Design of Micro-strip star patch Antenna for WLAN/Bluetooth Application

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Abstract— This paper presents a micro strip star patch antenna on a FR4 substrate (glass epoxy) having thickness of 3.2mm. This antenna consists of a star shape radiating patch along with a partial ground plane. Two equilateral triangles of same dimensions (30x30 mm) are mounted to get a star shaped patch. The star patch and the ground plane is made up of conducting material (copper). The star patch is excited using a micro-strip feed line from the edge of the patch which results in enhanced bandwidth. Antenna parameters such as return loss; radiation pattern; gain & Voltage Standing Wave Ratio (VSWR) are investigated. The proposed antenna has high gain at 2.4GHz frequency. This antenna finds application in Wireless Local Area Network (WLAN) and Bluetooth. Advanced Design System (ADS) software is used to model and simulate this micro-strip patch antenna.

Keywords— Antenna; Micro strip star patch; Probe feed; ADS software; Return loss; Radiation pattern; VSWR.

INTRODUCTION

The rapid development of wireless communication systems and the subsequent burst of wireless devices place several demands on the antenna designs. Compared to conventional microwave antennas, Microstrip antennas (also known as Printed antennas) have several advantages, and therefore various applications cover the broad frequency range from 100MHz to 100GHz [1]. Microstrip antennas are characterized by a large number of physical parameters and they can be designed to have numerous geometric shapes and dimensions. A Microstrip Patch Antenna (MPA) consists of a radiating patch of any planar or non-planar geometry on one side of the dielectric substrate with ground plane on other side. Various patch configurations such as square, annular-ring, ellipse, rectangular, equilateral triangular and dipole have been investigated for past few years [2][6].

These patch antennas possess many desirable features like low profile, light weight, relatively inexpensive to manufacture, thin profile configuration, linear and circular polarization are possible with simple feed and can be easily integrated with microwave integrated circuits. These antennas have excellent low power handling capacity and hence they can be used in low power transmitting and receiving applications. These features make microstrip patch antennas useful for many applications in radar and wireless communication systems [7][10].

Besides having more advantages, one of the principal limitations of such microstrip patch antennas is their very narrow bandwidth, which is on the order of a few percent and low directive gain. Many techniques have been suggested to enhance the impedance bandwidth of microstrip antennas. Among the various patch configurations available the equilateral triangle patch has more advantages. They occupy less metalized area on the dielectric substrate than other existing configurations and a low radiation loss.

In this paper two equilateral triangles of same dimensions are considered and are placed one above the other to get a star shape patch [11][15]. The star shape radiating patch is energized by probe-feed line. Microstrip line feed is one of the easier methods to fabricate as it is a just conducting strip connecting to the patch and therefore can be consider as extension of patch. It is simple to model and easy to match by controlling the inset position. The modified equilateral triangle patch in the form of star is simulated using ADS momentum software. The results obtained in accordance with the proposed antenna are given below. The designed antenna has high gain at the frequency 2.4GHz respectively.

ANTENNA GEOMETRY

Figure.1 shows the structural view of equilateral triangular patch of dimension 30mm. Two equilateral triangles of same dimensions (30mm) are considered. The star shaped patch is formed by inverting and adding these two equilateral triangles of same dimensions as shown in figure 2.

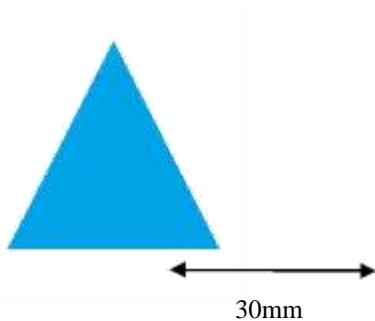


Figure 1: Equilateral triangle

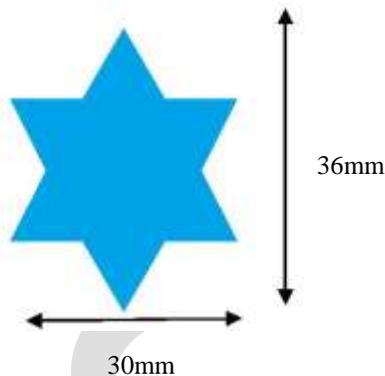


Figure 2: Star shaped patch

Figure 3: shows the antenna with patch size of 30mm × 36mm with substrate size of 38mm × 48mm is preferred in this design. A microstrip probe-feed line of 0.5mm × 13.7mm is used to energize the radiating patch. The dimension of the ground plane is 17.5mm × 11.5mm. Star patch and ground plane is made up of copper. The antennas are printed on one side of a FR4 Epoxy substrate of thickness 3.2 mm, relative permittivity $\epsilon_r = 4.4$ and loss tangent $\tan \delta = 0.019$.

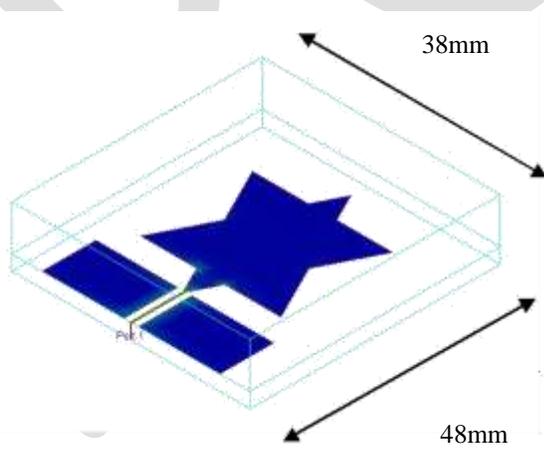


Figure 3: 3D representation of simulated antenna

RESONANT FREQUENCY

The resonant frequency of the microstrip star patch antenna can be determined from the empirical formula is given in equation (1)

$$f_r = \frac{2c}{3a_{eff} \sqrt{\epsilon_{eff}}} \quad (1)$$

Where,

f_r = Resonant frequency(GHz)

c = Velocity of light ($3 \times 10^8 \text{ ms}^{-1}$)

Equations (2) and (3) are used to calculate the side length of the equilateral triangle and relative permittivity of the substrate effectively.

$$a_{eff} = a + \frac{h}{\sqrt{\epsilon_r}} \quad (2)$$

Where,

a_{eff} = Effective side length of the equilateral triangle(mm)

$$\epsilon_{eff} = \frac{1}{2} (\epsilon_r + 1) + \frac{1}{4} \frac{(\epsilon_r - 1)}{\sqrt{1 + \frac{12h}{a}}} \quad (3)$$

Where,

ϵ_r = Substrate relative permittivity

ϵ_{eff} = Effective relative permittivity

a = Side length of the equilateral triangle(mm)

h = Height of dielectric substrate (mm)

SIMULATED RESULTS

Figure 4 shows the Voltage Standing Wave Ratio (VSWR) plot against the frequency in terms of GHz. The proposed star patch antenna has a value of 1.181 at 2.4GHz. Figure 5 shows the plot of return loss (dB) against the frequency(GHz).The value of S_{11} at 2.4 GHz is -21.592dB. Figure 8 and 9 shows the radiation pattern of the star patch antenna.

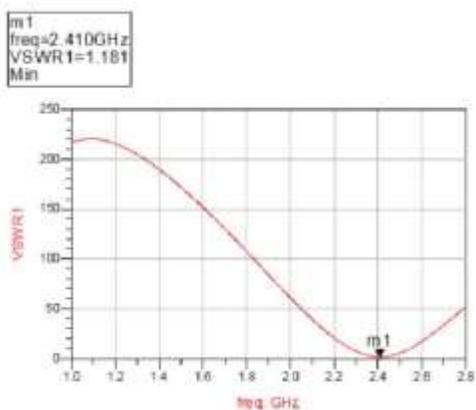


Figure 4: Voltage standing wave ratio (VSWR)

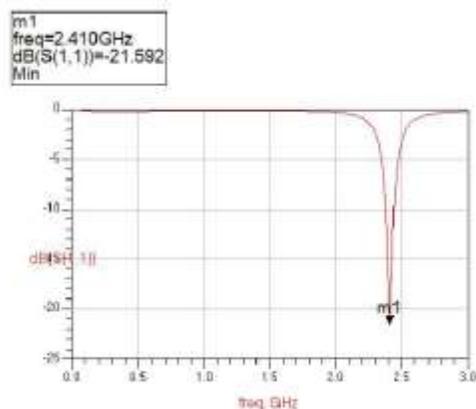


Figure 5: Return loss (S_{11})

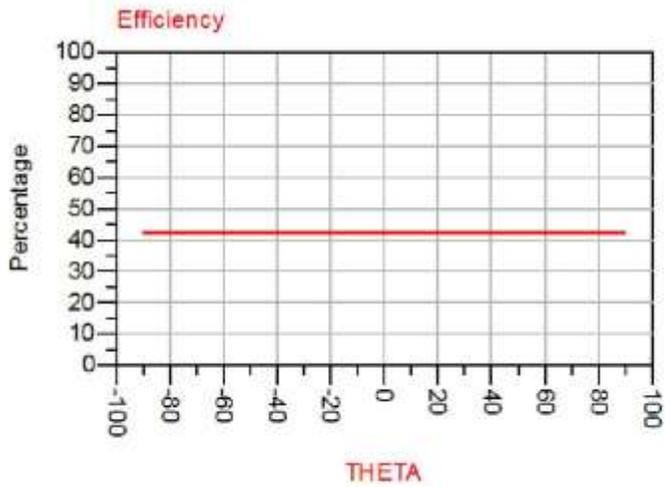


Figure 6: Efficiency of the star patch antenna

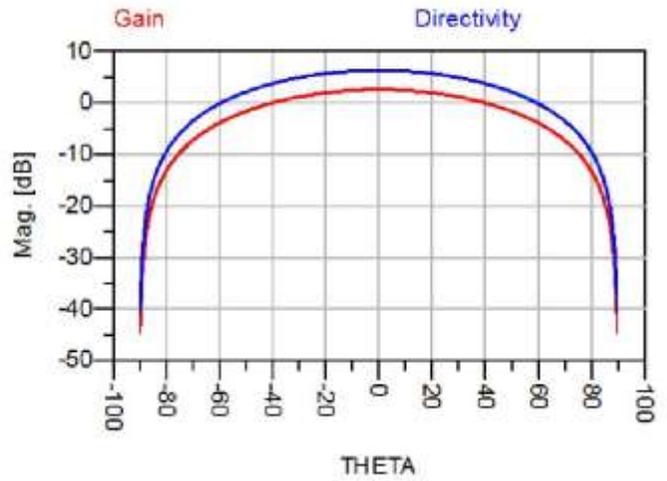


Figure 7: Gain and Directivity of the star patch antenna

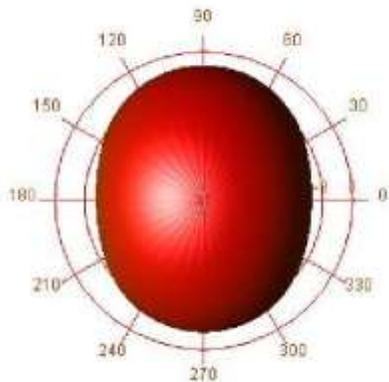


Figure 8: Radiation pattern (E)

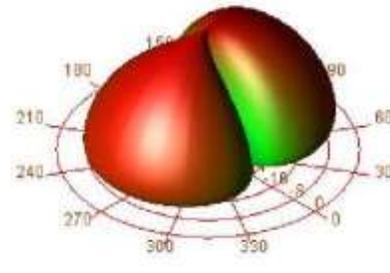


Figure 9: Radiation pattern (E- Theta)

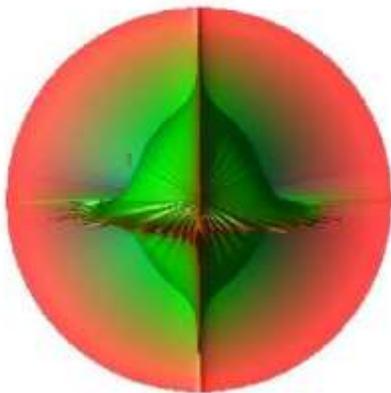


Figure10: Circular axial ratio

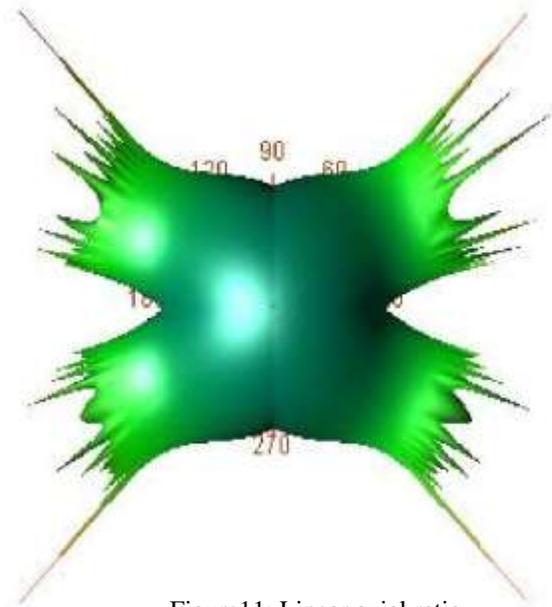


Figure11: Linear axial ratio

CONCLUSION

The compact microstrip star patch antenna with a probe-feed line is presented. A partial conducting ground plane was used to enhance the bandwidth of the antenna. The design and simulated results were performed using ADS software. Antenna parameters such as return loss, VSWR, gain, directivity and radiation pattern are shown in the figures achieves relatively high gain. This antenna is applicable for various wireless applications like Bluetooth, Wireless Local Area Network (WLAN).

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Analysis of outlier detection in categorical dataset

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Abstract— Outlier mining is one of the most important tasks of discovering the data records which has an exceptional i.e. different behaviour comparing with rest of remaining records in the dataset. Outlier contains different behaviour from other data objects in the dataset. There are various kinds of effective approaches to detect outliers in numerical dataset. But for categorical dataset there are some few limited approaches. This paper describes about different classification and clustering algorithms. The time complexity defines the amount of time taken by an algorithm to perform the given operation on a dataset. Hybrid approach can be developed for outlier detection analysis for Categorical dataset by using NAVF (Normally distributed attribute value frequency) and Ranking algorithm. In this paper we have considered the Networking Dataset in which we will detect outlier as virus or intrusion which will be different than behaviour in normal data object.

Keywords— Outlier , categorical dataset, NAVF, ROAD, Hybrid Algorithm, Networking Dataset, intrusion.

I. INTRODUCTION

A generalization of the binary variable in that it can take on more than two states is called as categorical variable. For example, map color is a categorical variable that may have, say, three states: red, green, and blue [12].

Outlier detection is one of the most important processes of detecting instances with unusual behavior that occurs in a given system. The discovery of valuable information in the data can be made by doing effective detection of outliers. From many years, mining for outliers has received significant attention because of its wide applications in various areas such as detecting fraudulent usage of credit cards in banking sector, unauthorized access in computer networks, medical field, weather prediction and environmental monitoring [11].

Most of the existing methods are designed for detecting outliers in continuous i.e. numeric data, but the problem of outlier detection in categorical data is still evolving. The basic difficulty is defining a suitable similarity measure over the categorical values. Because most of the values that a categorical variable can assume are not inherently ordered [1].

This paper describes about various clustering and classification algorithm applied to categorical data for finding out outliers. This paper is organized as follows; section 2 gives an overview of different categorical classification clustering algorithms and its methodologies and time complexity of various categorical clustering and classification algorithms. Finally in section 3, conclusions and future work are provided.

II. EXISTING CATEGORICAL ALGORITHM

There are two main learning approaches for detection of Outliers in a categorical dataset, which are supervised and unsupervised learning approaches.

Type 1- Supervised learning determines the outliers with background knowledge of the data. This approach is analogous to supervised classification and requires pre-label data, tagged as normal or abnormal.

Type 2 – Unsupervised learning determine the outliers with no background knowledge of the data. This is essentially a learning approach analogous to unsupervised clustering [11].

A. Algorithms for classification method:

The computational complexity of classification based techniques depends on how the classification algorithm being used.

Training Phase- The complexity of training classifiers has been discussed in [14].

Testing Phase- The testing phase of classification techniques is usually very fast as compare to training phase since it uses a learnt model for classification method.

Advantages - Use of Powerful Algorithms and Fast testing Phase are two advantages of classification technique.

Disadvantages- Non-Availability of Accurate Labels for Various Normal classes and Assigning Label to Each Test Instance are two disadvantages of classification technique. [13]

1. AVF algorithm

Statistic and density based algorithms are linear with respect to data size and requires k-scans each time. When we select low threshold value to find frequent item sets from dataset then these techniques can be-come very slow [11].

Attribute Value Frequency (AVF) algorithm is simple and faster approach to detect outliers in categorical dataset which minimizes the number of scans over the data. It does not create more space and more search for combinations of attribute values or item sets. An outlier point x_i is de-fined based on the AVF Score in [1].

1.1. Methodology for AVF Algorithm

Input: Database D (n points and m attributes),

Target numbers of outliers are k

Output: detected outliers k

Initially label all data points as non outliers;

Step1: Count frequency $f(x_{ij})$ of attribute value x_{ij} for each point x_i , $i = 1..n$ and attribute j , $j = 1..m$

Step2: Calculate AVF Score $(x_i) += f(x_{ij})$ and

AVF Score $(x_i) /= m$ for each point x_i and attribute j .

Step3: Return k detected outliers with mini (AVF Score); [1].

AVF algorithm requires only one scan to detect outliers. The complexity is $O(n * m)$. It needs 'k' value as input [1].

2. Methodology used for N AVF algorithm

Normally distributed attribute value frequency algorithm (NAVF) is a advance of AVF algorithm. It gives good precision and low recall value. This method calculates 'k' value itself based on the frequency. This method uses AVF score formula to find AVF score but no k-value is required [1].

Input: Dataset – D,

Output: detected outliers are k

Step 1: Read data set D

Step 2: Initially label all the Data points as non-outliers

Step 3: calculate normalized frequency of each attribute value for each point x_i

Step 4: calculate the frequency score of each record x_i as, Attribute Value Frequency of x_i is discussed in[1]

Step 5: compute the N-seed values a and b as $b = \text{mean}(x_i)$, $a = b - 3 * \text{std}(x_i)$, if $\max(F_i) > 3 * \text{std}(F_i)$

Step 6: If $F_i < a$, then declare x_i as outlier and return KN detected outliers.

B. Algorithms for clustering method:

Clustering is also called as data segmentation in few applications because clustering partitions large data sets into many groups by considering their similarity measure [12].

1. ROAD Algorithm

ROAD Algorithm is a two-phase algorithm for unsupervised detection of outliers. The object density computation and exploration of a clustering of the given data set is done by first-phase of this algorithm. The set of big clusters is identified in order to determine the

distance between various data objects and their corresponding nearest big clusters by using the resulting clustering structure. The frequency-based ranks as well as the clustering-based rank of each data object are determined by the second-phase. A unified set of the most similar outliers is constructed by using these two individual rankings. So, name of the method as Ranking-based Outlier Analysis and Detection (ROAD) algorithm.

The computational complexity of the proposed algorithm is basically contributed by the initial three steps. The first step requires $O(nms)$ computations, where the maximum number of unique values of an attribute is s . Generally, s is called as small quantity compared to n . Second step requires $O(nmk^2)$ computations, as discussed in [15]. The third step contains the k-modes algorithm, which needs $O(nmkt)$ computations, where t is said to be the number of iterations.

The ranking phase requires $O(n\log(n))$ iterations. Thus, the computational complexity of the proposed algorithm becomes to be $O(nm + n\log(n))$. The number of outliers to be detected dose not affected by computational complexity of this algorithm[2].

1.1. Methodology used for ROAD Algorithm

Input: Data set D with n data objects which is m -dimensional and values need for the parameters k and α .

Output: Set of likely outliers identified.

Phase (1): Computational phase

Step1: Compute density (X_i) of each data objects using (Equation 3) described in [2].

Step 2: Determine the initial set of k cluster representatives, using the method described in [15].

Step 3: Perform the k-modes clustering [16] on D using the distance measure given in Equation 2 and Determine the set of big clusters BC (Equation 4).

Step 4: Determine its cluster distance For each data object X_i , (as defined in Equation 5)[2].

Phase (2): Ranking phase

Step 5: Determine the frequency-based rank and the clustering-based rank of each data object as described in (Definition 6 and 7 respectively)[2].

Step 6: Using the two ranked sequences, for a given p value constructs the likely set LS (Definition 9).

2. ROCK

ROCK is a **RO**bstust **C**lustering using **linK**s [17]. It uses an Agglomerative hierarchy clustering. Links are used to measure similarity between different data point. Firstly all tuples are assigned as a separate cluster. Merging of Clusters is based on the smaller distance between clusters. It is convenient for Boolean and categorical datasets. The sample size decides scalability of the algorithm referred the criterion function and goodness measure[13].

2.1. Methodology used for ROCK algorithm

1. Draw a random sample
2. Compute the similarity of Link
3. Make Cluster with the link
4. Label it on the disk

3. Hierarchical clustering on feature selection for categorical data of biomedical application

. The author [18] concentrated on the feature association mining rule. Based on the contingency table, the distance (closeness) between different cluster features is calculated. Then hierarchical agglomerative clustering is used. The clustered results helps the domain experts to identify the feature association of their own interest. It works only for categorical data, which is the drawback of this system.

III. CONCLUSION AND FUTURE WORK

The paper describes a review on different classification and clustering methodologies associated with the categorical data for finding out outliers. Its advantage and limitation are discussed. Time complexities of various categorical classification and clustering algorithms are discussed. In future, there is possibility of developing a hybrid approach by using NAVF and ROAD algorithm.

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CAR INTERIOR ATMOSPHERE SAFETY MONITORING SYSTEM

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Abstract—The car's interior atmosphere must always be favorable for the passengers to survive. But if the passengers inside the car experience any of these situation like pollution entering inside the cabin, tail gate leakage, A/C compartment leakage and for a prolonged time all windows of the car are closed with passengers in it then it will slowly pave the way to unpleasant situation i.e. hazardous for the passengers to survive and finally even leads to death. All over the world these situation prevailed and are still prevailing. Thus this proposed embedded solution is an alert system that monitors the toxic gases inside the enclosed space. The oxygen sensor, microcontroller and GSM help to be better monitoring alert system for the safety of the passengers inside the car.

Keywords—Sensor, microcontroller, GSM modem, carbon monoxide, volatile organic compounds, nitrogen oxide, hydrocarbons

INTRODUCTION

The interior atmosphere of the car must always be good for the passengers. The passengers have to survive inside the car without undergoing any form of disturbances. But all over the world many people had died because of unpleasant atmosphere they faced inside the car. Unpleasant atmosphere is nothing but toxic gases. Toxic gases like carbon monoxide, volatile organic compounds, nitrogen oxide, hydrocarbons and volatile organic compounds [1-3] and even increase in carbon dioxide gas are main threat to the passengers inside the car.

These toxic gases occur mainly due to pollution entering inside the cabin, tail gate leakage, block inside the tail gate and A/C compartment leakage. When these gases are found in higher level inside the vehicle cabin then it will lead increase in drowsiness of the passengers and the driver of the car which tends the drivers to get into accidents. During the closed environment i.e. enclosed space inside the car's cabin, then these gases will be recirculates inside the closed cabin of the car. This recirculate air will gradually decrease the oxygen for the passengers to survive pave way to drowsiness will later lead to fatigue.

Fatigue is frequently coupled with feelings of drowsiness or sleepiness, loss of alertness, inability to concentrate, lack of sleep and slowed reactions. The fatigue symptoms can derive from exhaust pollutants such as nitrogen oxide, hydrocarbons and carbon monoxide causing headaches, nausea, and dizziness finally reducing the hand-eye coordination that may increase the possibility of accidents [4, 5]. The Department of Transport in Australia has once stated that fatigue is the root cause for 20% of crashes involving a fatality [6].

An O₂ deficient environment has been termed "hazardous" by OSHA when the O₂ concentration is less than 19.5% [7]. Low O₂ levels can damage the driver's decision, increase heart rate and weaken the muscular coordination. Thus fatigue will lead to head ache, lack of concentration, muscular coordination, hand-eye coordination and increased heart rate finally lead to slow death of the passengers inside the car cabin.

A particular report stated that the motor vehicle exhaust gas suicides caused by CO poisoning. A study of U.S. deaths found that 57% of unintentional CO poisoning deaths occurred in automobiles [8]. The year 2002 in Australia, statistics indicate that 416 persons (18%) died from motor vehicle exhaust gas [9].

The Finest method to prevent these poisonous gas consumed by any living being is to ensure proper oxygen is consumed by them with the help of oxygen therapy. Breathing pure oxygen can carry the oxygen level in the blood of any living being back to normal. Therefore proper ventilation is very essential [10-12] to maintain the oxygen level to the standard level and thereby avoiding any dangerous situation. Therefore, the oxygen concentrations must be measured and estimated accurately for the safety, health and comfort of any living being inside the vehicle.

PROPOSED SYSTEM

An embedded based safety monitoring and alert system is proposed based on the microcontroller and oxygen sensor, GSM modem. The oxygen sensor help to identify the level of oxygen that any number of passengers need to survive. If the threshold value says 19% ppm is lowered then incremented of any form of toxic gases like carbon monoxide, volatile organic compounds, nitrogen oxide, hydrocarbons and volatile organic compounds and even increase in carbon dioxide gas are prevailed inside the enclosed space of the car. This oxygen sensor will help to monitor the O₂ level inside the car's enclosed cabin to make sure that that all the passengers and the drivers are safe and comfortable. This oxygen sensor will be placed inside the car in such a way that it will help to detect the oxygen gas that are found inside the car for the passengers to survive.

A. SYSTEM DESIGN

Proposed System is to ensure that how to avoid these critical situations to the passengers inside the closed car cabin, the main motive is the lives of the passengers must be saved. The complete overview of the system is found in the Figure 1.

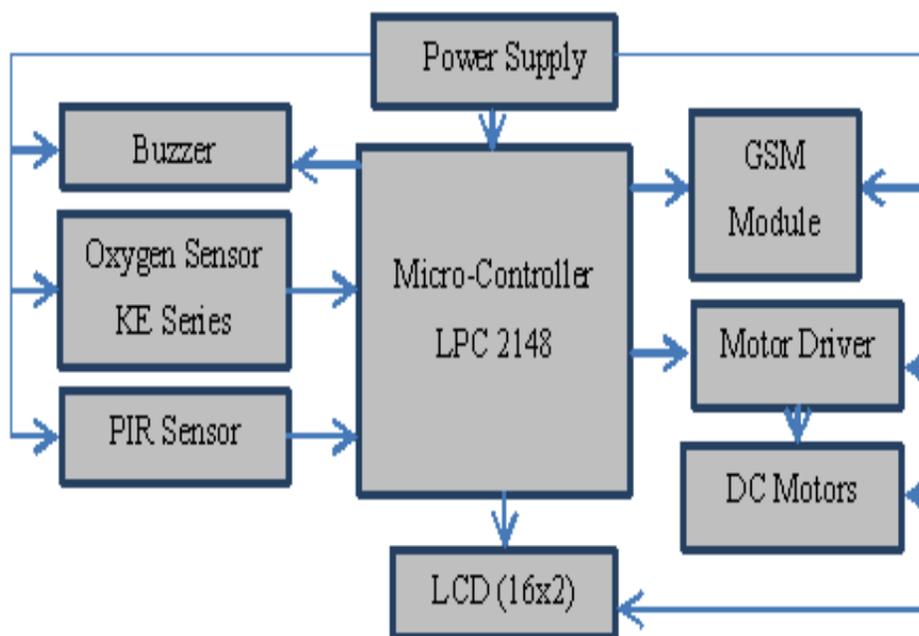


Figure 1. Block Diagram of the Proposed System

The stepwise procedure of the proposed system

- ❖ Oxygen reading will be continuously checked by the microcontroller if it has crossed the critical limit.
- ❖ If the critical limit is reached then the microcontroller will check the PIR sensor is true or false. True means passengers are found inside the enclosed space, false means no passengers are found.
- ❖ If the PIR sensor is true then the condition is satisfied, buzzer will ring, SOS (save our soul) message will be sent to the respective person and the window will be lowered automatically.

Thus, the flowchart Figure 2, gives a complete schematic of these proposed system steps. These steps will help in specifying on how the proposed system works on the real time world. Figure3. Shows the final overview of the Proposed System

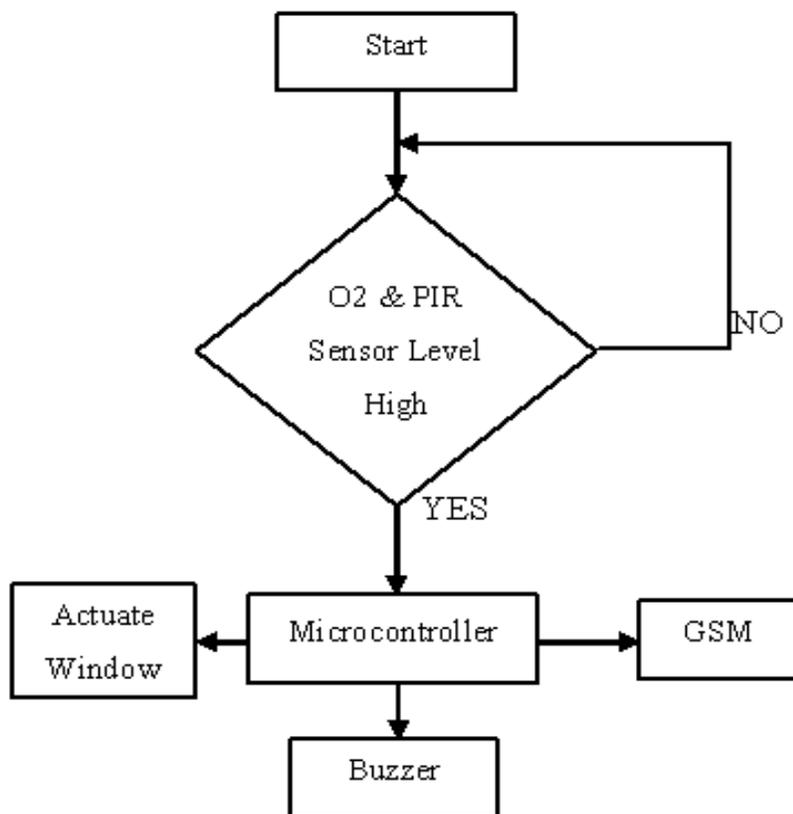


Figure 2. Flowchart of the Proposed System

A. HARDWARE SPECIFICATIONS

LPC 2148 MICROCONTROLLER

The LPC2148 is a 32-bit microcontroller platform with Thumb extensions. The features included are 512KB on-chip Flash ROM along with In-Application Programming and In-System Programming i.e. (IAP) and (ISP) respectively, ADCs, USB 2.0 Full Speed Device Controller, Two I2C serial interfaces, two SPI serial interfaces, PWM unit, optional battery backup and General purpose I/O pins.

OXYGEN SENSOR

The KE-25 Oxygen Sensor is a unique galvanic cell type sensor which provides a linear output voltage signal relative to percent oxygen present in a specific atmosphere. The sensor features long life expectancy, excellent chemical durability, and it is not influenced by CO₂, making it ideal for oxygen monitoring.

PIR SENSOR

PIR sensor detects any living being moving around within 10m distance i.e. the detection range is between 5m to 12m from the sensor. PIR detects the levels of infrared radiation of any living being. Power is usually up to 5V.

GSM MODEM

GSM modem is used for Wireless connectivity. Any GSM network operator SIM card can be accepted by this modem. The Save our soul messages can be sent to the respected person say driver, the vehicle owner, and even nearest police stations using this modem which will be connected along with the microcontroller.

POWER SUPPLY

Variable power supply is needed since the actuating window needs 24 volts and the microcontroller needs 5 volts and all the sensors to need 5 volts. So a variable power source of 1.5 V to 24 V is needed.

LCD DISPLAY

Here 16x2 LCD Display is used for displaying the monitored Temperature reading.

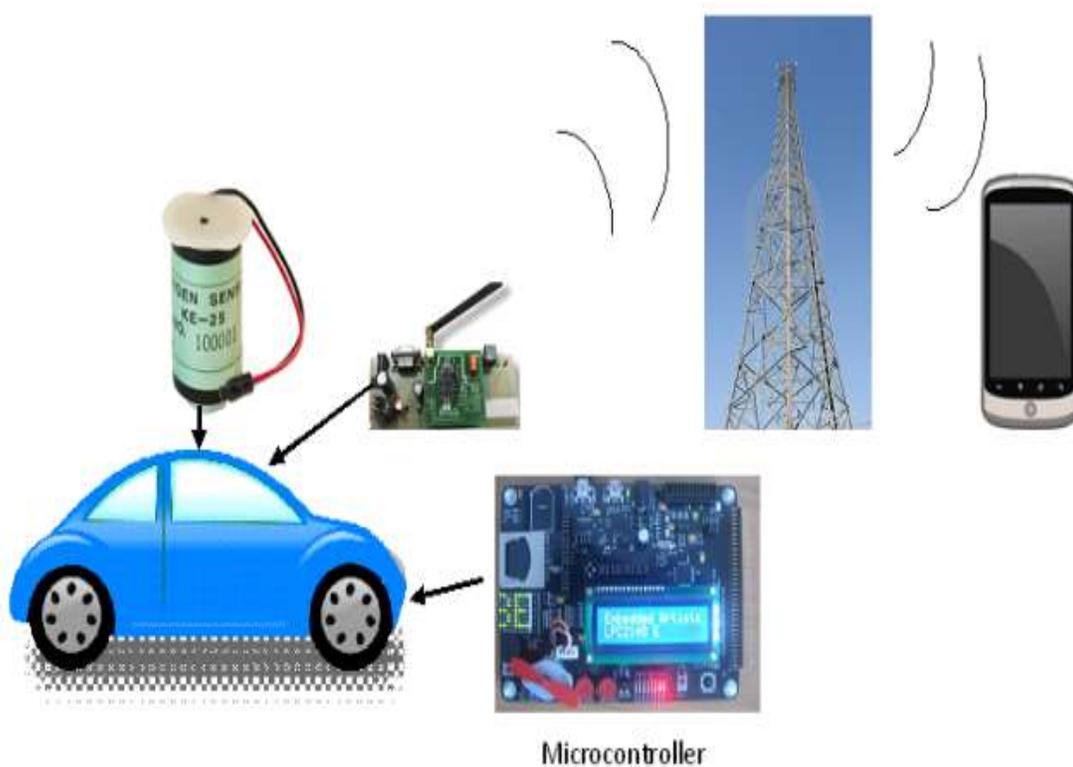


Figure 3. Overview of the Proposed System

ACKNOWLEDGMENT

I would like to thank Aswanth my friend whose has guided me on all the bad times which showed me a way that help me prove that this project is truly possibly. I would sincerely thank my guide Venkatesan Sir for encouraging me on all aspect of my proposed project work for patting me up for all the work I did.

CONCLUSION

Thus this proposed system has more advantage of real time scenarios. With the help of this oxygen sensor which is more reliable, durability and efficiency can be achieved. Thus this system for the existing problem that has been prevailed for a very long time must be made mandatory in all the vehicles i.e. old or new so that the world will have a better solution.

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Digital Dining System using Android

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Abstract— Technology's influence on the restaurant industry over the years has caused traditional dining experience to steadily evolve. In existing systems, patrons can only order food online. Through this research work, we aim to design and implement an Android application in which customer can place order and book tables in advance by selecting desired table from a canvas. Additionally, diet-conscious customers can customize their menu and play games in order to win exciting prizes and offers. We have created a website for restaurant managers. Android platform being one of the most widely used operating systems has been chosen to build this application.

Keywords— Technological revolution; mobile technology; digital dining; Android application; canvas; digitized menu; table booking; gaming.

INTRODUCTION

Technological revolution in the late nineteenth century has caused a prodigious shift in human consumption and the restaurant industry. The food and restaurant industry is one of the most important industries in the world today [1]. Everyone needs food for survival, and most of us live to eat rather than eat to live. Technology has always affected every part of our lives and with the emergence of smart phones making more of an impact than ever, people are looking out for simplification of tasks in almost every field. The changing face of mobile technology has played a vital role in the development of the restaurant industry [2]. These advances have made an impact everywhere, and one of the places where more and more technology is seen is in the food and restaurant industry [3]. Between the arrivals of mobile devices on the table, online reservations, and new payment methods, technology has surreptitiously penetrated the food and restaurant industry like never before. These advances will serve to improve the experience — both for the industry and for the patron. Nowadays, savvy restaurant operators are turning to software to streamline operations and deliver a better customer experience [1].

Certainly, while dining out, some inconveniences are faced by patrons. Some of these inconveniences include waiting in hunger, discordance in the order, inconsistent bill generation and many more. All this technology impregnating the restaurant industry has sparked the idea for an application that could potentially decrease waiting times at restaurants. Many a times, when restaurants do not accept reservations, customers arrive, write their names on a list, and wait for an agonizingly long time for a table. Thus, there is an indigence to build an android application that incorporates correctness, ease and efficiency.

We have divided this project in to two parts – one for the patron, which is an Android application and the other for the restaurateur, which is a web-based application. The Android application on patron's mobile device allows the patron to search for restaurants, select menu and place order, and book table. The manager of a particular restaurant is in-charge of all the transactions and activities happening with respect to his restaurant. Duties of a restaurant manager are to send confirmation to customer upon receiving payment; updating table arrangement in his restaurant whenever there is a change.

We have used a canvas to show two dimensional view of the arrangement of tables in a restaurant. Customer can choose a table simply by clicking on it. Different color codes have been used to represent available, reserved and selected tables. Available tables are shown green in color, reserved tables are shown red in color and selected tables are shown yellow in color. This provides the customers a very interactive and easy experience with the application.

EXISTING SYSTEMS

Existing systems like Zomato and Food Panda only allow patrons to view details of restaurants, trending food items, and order food online. Zomato allows users to search for restaurants according to a particular area, and particular food item. It lets users to write reviews about a restaurant and its food [4]. In Food Panda, users can search for restaurants and also order food online [5].

These systems are most widely used today but there is a necessity of new features like table booking and tailored order, which we aim to provide through this research work.

PROPOSED SYSTEM

A. System Overview

The Android application on customer's mobile device enables patrons to search for restaurants based on trending food, trending restaurants, new arrivals, nearby locations, price ranges and discounts. Patrons can then choose desired restaurant from the list appeared, place order by selecting items from a digital menu, select a table from a canvas and make requisite payment. After receiving payment, the manager of that restaurant sends a confirmation message to the customer by means of e-mail or SMS. Once a table has been booked, it is marked 'red' till the time it is freed. Based on the arrival time of the customer, the kitchen staff can prepare the menu and serve the patron's food hot as soon as he arrives, decreasing the waiting time to a large extent.

In this application, patrons can also play games in order to win exciting prices, discounts and offers. Customer's location is traced and if the location of the customer is within the restaurant, the 'game' mode in the customer's mobile device is turned on and upon victory, customer is offered prices and/or discounts. The manager of that restaurant is in-charge of deciding the price and/or discount to be offered to the patron.

In this application, patrons have a profile of their own, where the patron can edit/update his/her personal details, contact details, and health details; view his/her current orders, previous orders, and favorites. By updating health details, customers can customize their menu; for example, by turning less oil content on, all the items in the selected menu will have less oil content. Similarly, customer can ask for sugar free deserts; low, medium, or high spice level and/or calorie content. To develop the manager website, we have used HTML5, JavaScript and PHP Laravel.

B. System Specification

1. Digitized Menu:

Each item in the menu of a restaurant is associated with a checkbox and a button to select quantity of that item. Patron can choose as many items as desired by simply clicking on the checkboxes and the selected items will be added. Some items may also be removed from the list if desired. This saves time and makes the application interactive.

2. Table Selection:

Patrons can view the arrangement of tables in a particular restaurant and select desired table from a canvas which provides a two-dimensional view. Available tables are shown green, reserved tables in red and selected table in white. This is another feature that makes the application interactive.

3. Gaming:

Patrons can play games to win exciting prices and offers. These offers and prices are decided by restauranters themselves and if a particular restaurant agrees to offer such prices and discounts, customer can play games for that restaurant.

C. Mathematical Model

Mathematical model of Digital Dining System using Android is shown in Figure 1. It is a state machine diagram that illustrates the flow of the application. There are 7 states, each representing an activity performed by patron and/or restaurant manager. The 7 states are represented as S0, S1, S2, S3, S4, S5, and S7.

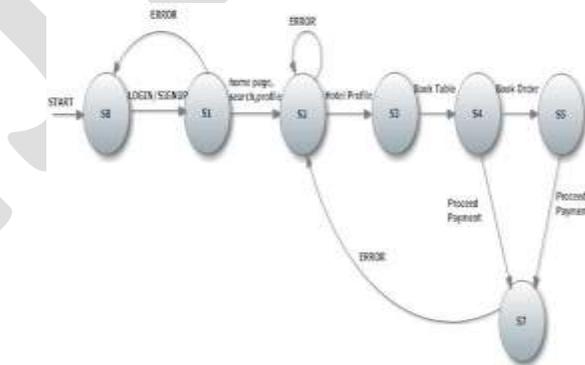


Fig 1. Mathematical Model

D. System Architecture

System architecture of Digital Dining System using Android is shown in Figure 2. There are three modules in this system and they are as follows:

1. Android application for the patron
2. Web-based application for restaurant manager and
3. Application for admin to control all the activities.

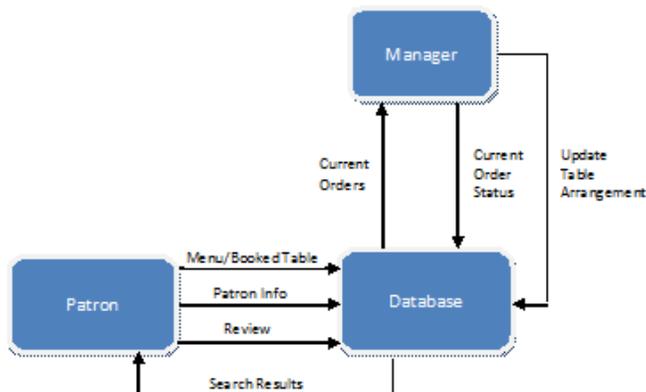


Fig 2. Architecture Diagram

E. Canvas

In this application, we have used a canvas to two-dimensionally represent the arrangement of tables in a restaurant so that patrons can select desired tables. This makes the application easy to use and interactive for patrons. On the other hand, restaurant manager can view the arrangement of tables and selected ones; also, manager can update the arrangement of tables in his restaurant whenever there is a change. A canvas is an element that can be used to draw graphics with the help of scripting in JavaScript, in case of HTML and is represented as <canvas>. The canvas can be used to draw graphs, make photo compositions, create animations or do real-time video processing or rendering [6]. The <canvas> element is also used by WebGL to do hardware-accelerated 3D graphics on web pages. It was originally introduced by Apple for the OS X Dashboard and Safari. Internet Explorer supports <canvas> from version 9 onwards. Google Chrome and Opera 9 also support <canvas>. Mozilla applications also support <canvas> starting with Gecko 1.8 [7].

Example:

HTML

```
<canvas id="canvas"></canvas>
```

JavaScript

```
var canvas = document.getElementById("canvas");  
var ctx = canvas.getContext("2d");  
ctx.fillStyle = "red";  
ctx.fillRect(5, 5, 100, 100);  
ctx.strokeRect(0, 0, 400, 200);
```

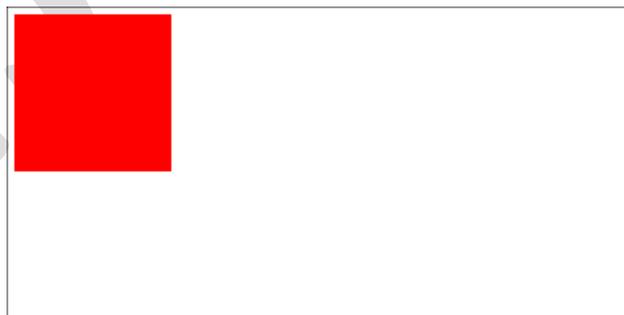


Fig 3. Example of Canvas

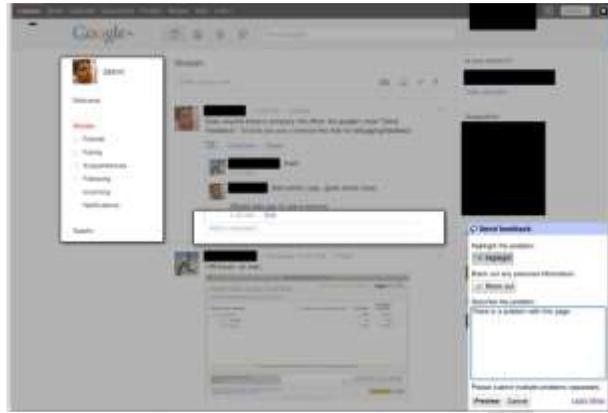


Fig 4. Usage of Canvas in a Sample Application

F. Assumptions

The proposed system has been designed by keeping in mind some assumptions, as listed below:

- Patrons should use smart phones and tablets running Android OS.
- Network should always be connected.
- Security of server is maintained.

G. Risks

The proposed system is associated with risks and some of them are listed below:

- Loss of network connection during payment may cause inconsistency in bill payment.
- Technology at the time of building the application may become out-dated. New smart phones get introduced in the market every now and then.
- Reaching peak limit of server bandwidth.
- No internet access on Wi-Fi network.
- Malicious activities such as activity monitoring, data retrieval, unauthorised payments, and system modification may occur.

RESULTS

We have made use of a canvas to display the arrangement of tables in a restaurant and let patrons select desired table from that arrangement. Given below are the screenshots of the canvas as viewed by the restaurant manager. To describe the arrangement of tables in his restaurant, a restaurant manager can simply drag and drop required tables onto the canvas as shown. There are three types of tables used – tables with 2 chairs, 4 chairs and 8 chairs. The arrangement described by the restaurant will only be shown to the patron so that the patron can choose desired table.



Fig 5. Usage of Canvas in a Manager Website

In Figure 6 and Figure 7, restaurant manager can add items to his restaurant's menu so that patrons can view those items and select desired items from their respective devices.



Fig 6. Selection of Categories to Add Items to Menu



Fig 7. Manager Adding Items to Restaurant's Menu

ACKNOWLEDGEMENT

It gives us immense joy in presenting our research work on “Digital Dining System using Android”. This satisfaction and euphoria would be incomplete without mentioning the names of the people whose encouragement and constant guidance has made this project happen. We extend our gratitude towards all the teaching faculty, guest faculties and non-teaching staff for their contribution.

CONCLUSION

Thus, we present a digital dining system where patrons can place order before visiting a restaurant along with new features such as digitized menu, digitized table booking, and gaming. This system is consistent, accurate, and efficient thereby providing customer satisfaction. This system would cater to the needs of a variety of customers, attract potential customers and ultimately improve a restaurant's business.

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Factors Affecting Higher Order Solitons in Soliton Transmission

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Abstract— Transmission of solitons at data rate of Tb/s effected by different factors. In this Paper, we analyzed some of the effects like third order dispersion effect , stimulated raman scattering and self-steeping and their influence on higher order solitons in soliton transmission through optical fiber.

Keywords— Intrapulse Raman scattering (IRS), Silicon-on-Insulator (SOI),Third Order Dispersion (TOD).

INTRODUCTION

In fibers, solitons were first observed by Mollenauer [1]-[2] and several authors have discussed the applications of solitons in future for high-transmission-rate communication system [3]-[5]. In the third-order dispersion helps in determining the required soliton power levels with limiting the bandwidth of the system [6]. The effects of higher-order dispersion on soliton propagation and pulse broadening with breakup in the time domain has also been shown [7]-[8]. Demonstration of stable propagation of dispersion-managed solitons with zero average dispersion has been experimentally done [9]. Analytic solutions for the nonlinear Schrödinger equation model with changing dispersion, nonlinearity, and gain or loss were presented [10]. In SOI waveguides some Parametric investigations have been carried out to control the TOD effect on the generation of optical solitons [11]. Full numerical simulation of the nonlinear Schrödinger equation has been done to identify influence of higher order terms on pulse propagation [12]. At high transmission rate as at 100 Gb/s and beyond intrapulse Raman scattering (IRS), third order dispersion and self-steeping effects can become very appreciable [13]. with periodically modulated core diameter the impact of stimulated Raman scattering in the fiber on the fission of high-order solitons has been done [14]. Intrapulse Raman scattering may result in slowing and stopping of solitons [15]. Dynamics of dual-frequency solitons under the effect of frequency-sliding filters, intrapulse Raman scattering and third-order dispersion has also been studied [16]. For high speed data transmission through fiber, our other simulative analysis for optical telecommunication has been recently done [17]-[22].

SIMULATION SETUP

The simulation setup for studying the higher order soliton in the presence of different effects is shown in Fig.1. A user defined bit sequence is generated at the rate of 4×10^{10} bits/s and sample rate of 512×10^{10} Hz. Here samples per bit are 128 with 1024 number of samples for studying TOD and changed to 2048 samples per bit with 4096 number of samples for stimulated raman scattering and self-steeping. This bit sequence is given to the soliton optical pulse generator working at the frequency and power of 1272.54nm and 105.394mW respectively. Output waveforms are analyzed using optical spectrum analyzer and time domain visualizer. Nonlinear dispersive fiber with the effects of third order dispersion and group velocity dispersion is taken for transmitting data. Allowed maximum nonlinear phase shift is 40mrad. Dispersion parameters β_2 , β_3 re taken as $-0.217825 \text{ps}^2/\text{km}$ and $0.0744876 \text{ps}^3/\text{km}$. Self-phase modulation is also taken into account. Dispersion of $16.75 \text{ps}/\text{nm}/\text{km}$ and attenuation of $0.2 \text{db}/\text{km}$ is there. Avalanche photodiode is used at the receiver to detect optical pulse and convert it into electrical form. For further analysis electrical visualizers can also be used. The outputs at the receiver are observed with different optical analyzers.

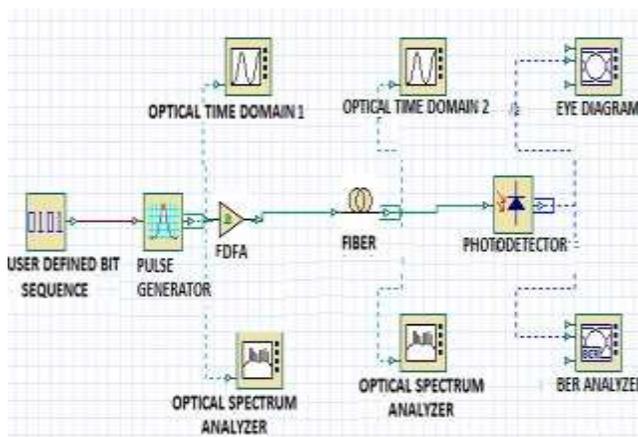
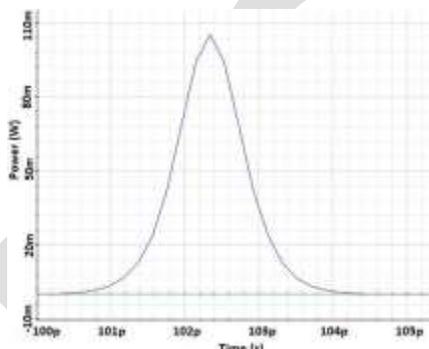


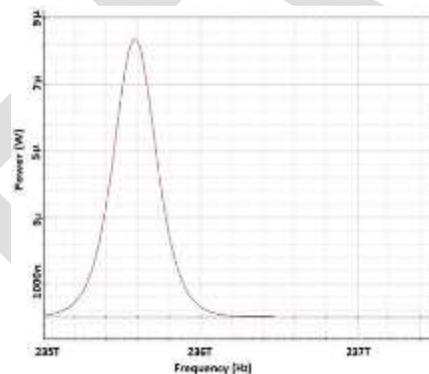
Fig.1 Simulation Setup for the study of different effects on higher order

RESULTS

The input pulse shape shown in figure in the Fig.2. It is a 1 ps wide (FWHM) fundamental soliton propagating near the zero-dispersion wavelength.



(a)



(b)

Fig.2 Input pulse shape (a) and spectrum (b)

The output pulse shape and spectrum are shown in Fig.3. Output (at 10 soliton periods) pulse shape (c) and spectrum (d) are shown. Resonance radiation peak is evident. The principal effect of the third-order dispersion term is to stimulate radiation resonantly at a frequency [8]:

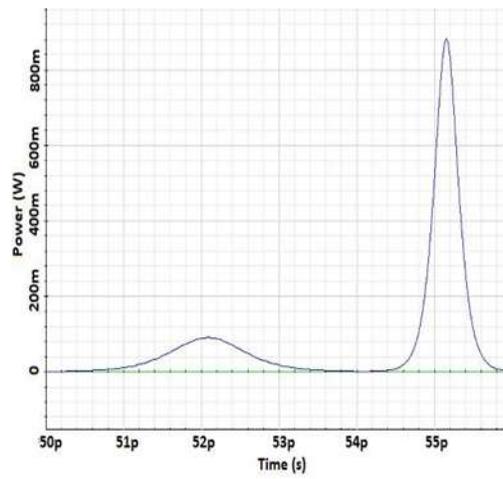
$$\omega - \omega_0 = k \cdot |\beta_2| / \beta_3$$

where β_2, β_3 are dispersion parameters and k is some constant (generally k is taken as 3).

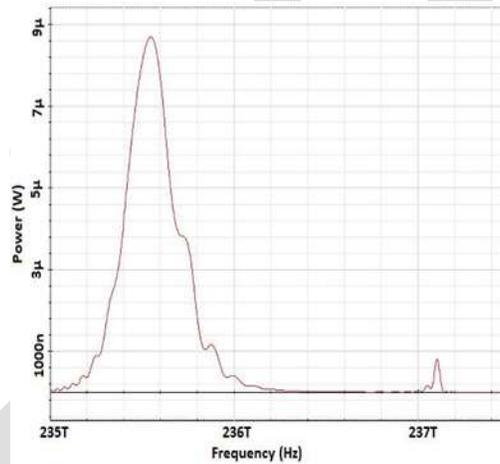
Fig. 4 shows the influence of stimulated Raman scattering on soliton pulses. The effect of stimulated Raman scattering on the higher-order soliton is to break it into its parts. The delayed response of Raman scattering effects the nonlinear response function and also allows extending the investigation for pulse time widths under 1 ps, ranging from 10 to 1000 fs. The starting point is the nonlinear response function $R(t)$, written as [22] :

$$R(t)=(1-f_R)\delta(t)+f_R h_R(t)$$

Where $\delta(t)$ indicates the delta function, f_R is the fractional contribution of the delayed Raman response to nonlinear polarization and $h(t)$ is responsible for the Raman gain spectrum.



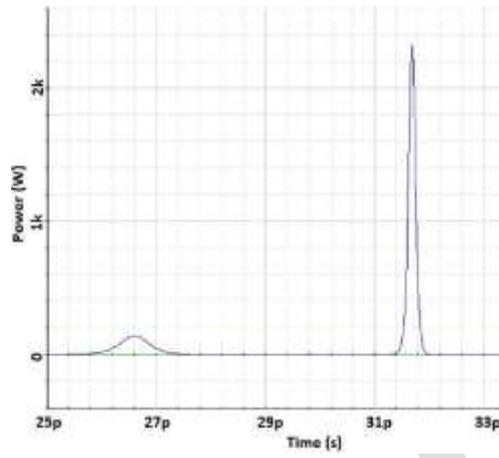
(c)



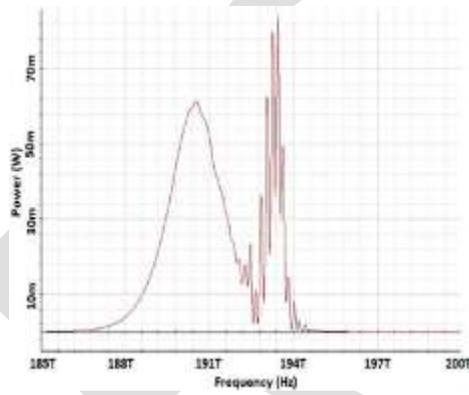
(d)

Fig.3 Output pulse shape (c) and spectrum (d) at 10 soliton periods as a result of TOD effect.

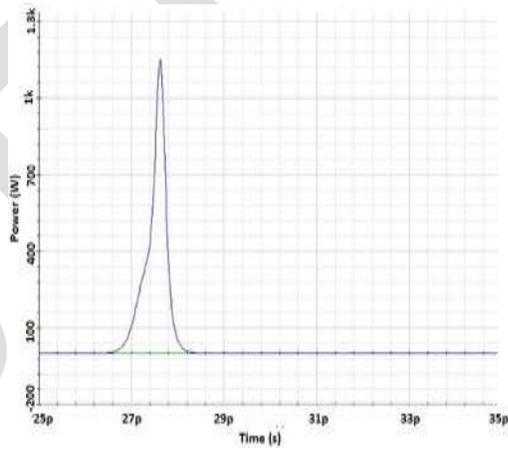
Next we will consider self-steepening effect on solitons. While the soliton splitting has occurred within a distance of five soliton periods in the case when the intrapulse Raman scattering effect is present, the splitting is still in its initial stage (for the same input configuration) here.



(e)



(f)



(g)

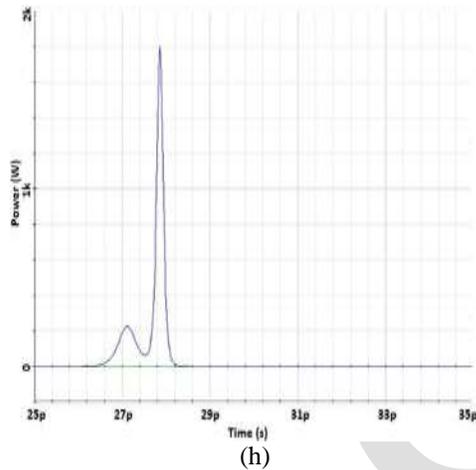


Fig.5 Output pulse shape at five (g) and ten (h) soliton periods because of self-steeping effect.

The self-steeping effect is weaker than the stimulated Raman scattering. Fig.5 shows the effect of presence of self-steeping on higher order solitons.

CONCLUSIONS

For high transmission of data in soliton transmission TOD, self-steeping and stimulated Raman scattering results in decaying of higher order solitons. TOD leads to stimulate radiation resonantly where as influence of other two on the higher-order soliton is to split soliton into its fractions.

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Improvement of Quantum Efficiency and Reflectance of GaAs Solar Cell

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Abstract—In this work authors presented improvement performance of GaAs solar cell of antireflection coating and texturing using PC1D simulation. About 32.58% light reflect from a bare GaAs surface and giving external quantum efficiency about 67.32%. This paper presented the improvement of external quantum efficiency (EQE) of GaAs solar cell about 14.23% using antifriction coating (ARC) of Silicon-di-Oxide (SiO₂) with refractive index 1.55 at thickness 121 nm and about 14.77% using ARC of Indium Tin Oxide (ITO) with refractive index 1.92 at 100 nm. The structure of SiO₂/GaAs is showing reflectance about 4.370% and the structure of ITO/GaAs is showing reflectance about 0.0087% based on AM1.5 photon flux from 300-1200nm. Further EQE can be improved about 1.62% using SiO₂ ARC and 2.56% using ITO ARC with deposition of 5-10 nm front surfaces texturing over ARC by texturing angle of 54.740. Combination of ARC and texture improve the reflectance about 4.36%.

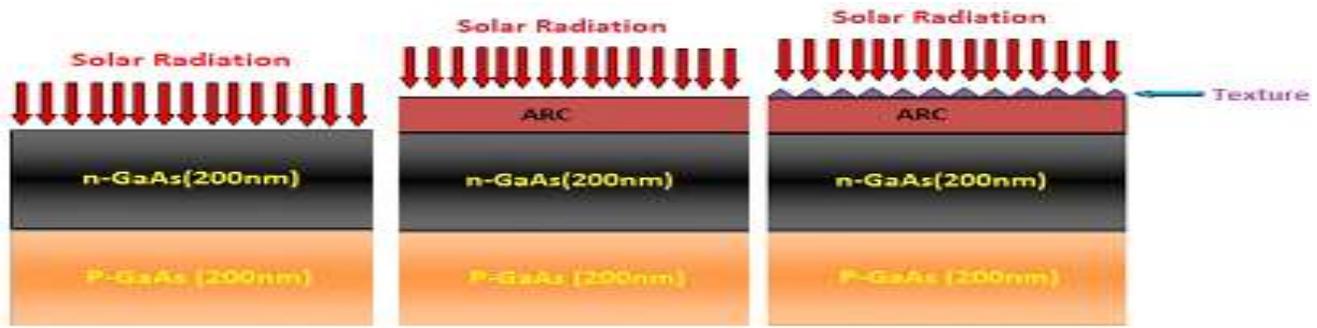
Keywords—Solar cell; ARC; PC1D; ITO; Texture; Reflectance; Efficiency; SiO₂; Refractive Index.

INTRODUCTION

One of the main barriers of solar cell efficiency is reflection of light from front of its surface. A bare silicon surface reflects the light about 30% and GaAs reflect the light about 32.58% light from their front surface. GaAs-based solar cells have attracted much interest because of their high conversion efficiencies of ~29.1%-40% under one sun illumination [5,6,7]. However, they are too expensive for terrestrial large-area applications because of the high device fabrication cost and the availability of relatively rare elements (In, Ga) [4]. The reflection of light from GaAs surface is over 32% due to its high refractive index. The reflectivity, R , between air and GaAs surface is determined by Fresnel reflection using equation.1. One of the main barriers of solar cell efficiency is reflection of light from front of its surface. A bare silicon surface reflects the light about 30% and GaAs reflect the light about 32.58% light from their front surface. GaAs-based solar cells have attracted much interest because of their high conversion efficiencies of ~29.1%-40% under one sun illumination [5,6,7]. However, they are too expensive for terrestrial large-area applications because of the high device fabrication cost and the availability of relatively rare elements (In, Ga) [4]. The reflection of light from GaAs surface is over 32% due to its high refractive index. The reflectivity, R , between air and GaAs surface is determined by Fresnel reflection using equation.1.

DEVICE STRUCTURE

In this paper we have simulated texturing and ARC layer structure consisting of SiO₂, ITO and GaAs p-n junction. SiO₂ is an excellent material which transmits light about 97% in visible spectrum range is achieved for few nm thin films [1,17]. Indium tin oxide (ITO) film has been widely used as transparent conducting material in many electronic and optoelectronic devices such as flat panel display, anti-reflection coating, solar cell and heat mirror for its high transmission in visible light range and high conductivity property [9,13,14]. By iteratively varying the thicknesses of the ARC layers, we were able to establish an optimized structure with respect to the total reflectance. Hence we estimated the obtainable short circuit current (J_{sc}) and EQE of GaAs solar cell. Solar cell structure of GaAs with bare surface, with ARC and with ARC/texture is shown in Fig. 1.



Solar cell structure of bare surface, with ARC and with ARC/texture

In this study, a GaAs solar cell based on PC1D simulations has been carried out. The structure of simple p-n junction was selected for all simulations. This choice was made due to the excellent results obtained from this structure. This structure is the simplest structure, most widely used method, is highly accurate and can be adapted for all types of solar cells. PC1D has been chosen as a simulation tool for this research regarding its user-friendly system. PC1D is the most common and perhaps simplest simulation software. The process parameters can be adjusted by choosing the appropriate layers in the schematic diagram of the device. PC1D is usually used for solving the one-dimensional semiconductor equations based on Shockley–Read Hall recombination statistics (Shui-Yang *et al.* 2009). Based on these considerations, PC1D was chosen to describe GaAs solar cell of antireflection coating and texturing in this study [15].

SIMULATION

In this work a homo-junction of GaAs has chosen to simulate ARCs and texture structures and calculate their reflectance spectra and External Quantum Efficiency (EQE). The ARCs structures were simulated on 5-125 nm thin films of SiO₂ and ITO. The texturing depth was simulated on 5-10 nm. List of the parameters used in simulation are given in TABLE I.

We have considered that there is no surface recombination, no surface charge, no internal shunt element for simplicity [3]. The solar structure without ARCs, with ARCs and texturing are shown in the Fig.1.

LIST OF PARAMETERS USED IN SIMULATION.

Parameters	Value
Device area	100 cm ²
Thickness of p- GaAs	200 nm
Thickness of n- GaAs	200 nm
p- type background doping	1×10 ¹⁸ cm ⁻³
n- type background doping	1×10 ¹⁸ cm ⁻³
Others parameters	From internal model of PC1D
Excitation mode	Transient
Temperature	25°c
Primary light source	AM1.5D spectrum
Wavelength range	300-1200 nm

ARC MATERIAL WITH THEIR THICKNESS AND REFRACTIVE INDEX

ARC	Thickness	Refractive Index
SiO ₂	5-125 nm	1.55
ITO	5-125 nm	1.92

RESULTS AND DISCUSSION

When n-GaAs/p-GaAs simulated without any ARC and texturing with 0% front surface reflection, the results are showing that EQE is about 99.85% in violet and blue range and decrease exponentially to invisible range, because most of the light of 300-500 nm wavelength are absorbed and penetrate deeper into the semiconductor in this range of wavelength. When we assume that reflection is about 32.58%, EQE decreases about 32% in the same range, because of few photon energy absorbed by the semiconductor. Electric

field increases rapidly from 185 nm of depth about 53kV/cm, because of carrier extraction of photon energy and higher charge density near the depletion region and electric field decreases linearly from 216 nm. Total current density increases at depletion region as electron current density increases. By using the parameters listed in TABLE I and TABLE II with 32.58% reflection, the simulation results have been shown in the following Figures. The Fig.2., Fig.3. and Fig.4. are showing the energy band diagram, electric field and charge density of GaAs solar cell respectively. Fig.5. and Fig.6. are showing current density and base current & power without any ARC and texturing.

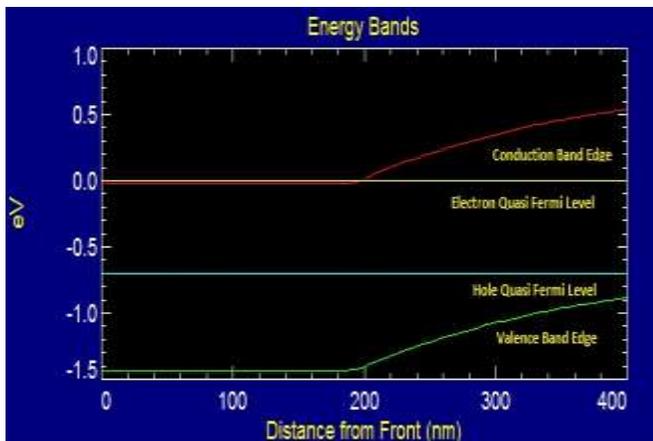


Fig.2 Energy band diagram of GaAs solar cell without any ARC and texture.

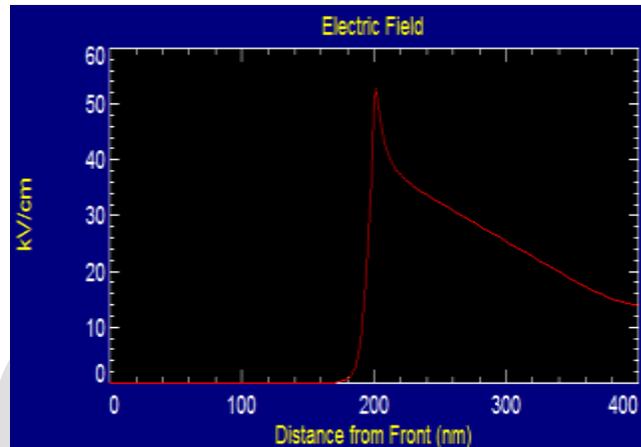


Fig. 3 Electric field of GaAs solar cell without any ARC and texture

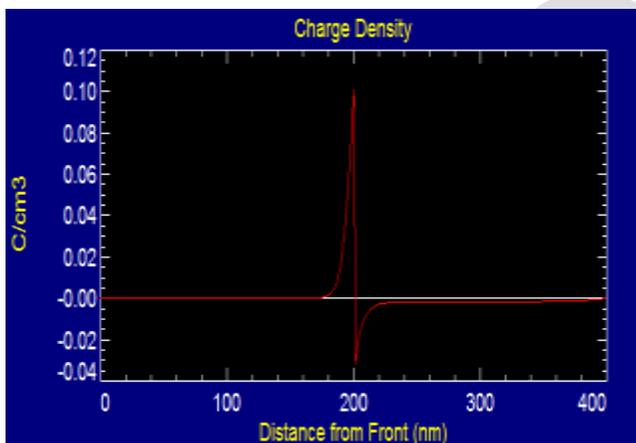


Fig. 4 Charge density of GaAs solar cell without any ARC and texture.

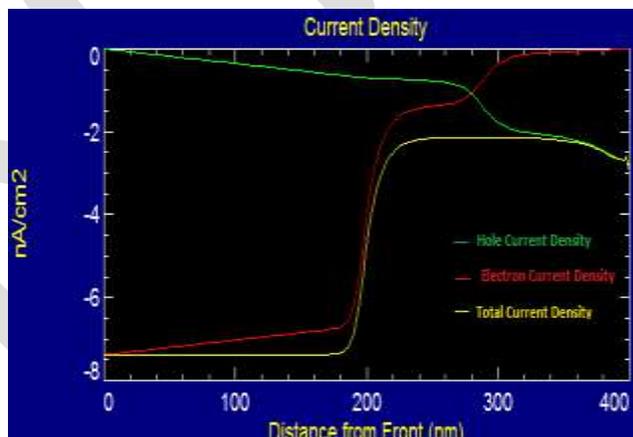


Fig. 5 Current density of GaAs solar cell without any ARC and texture.

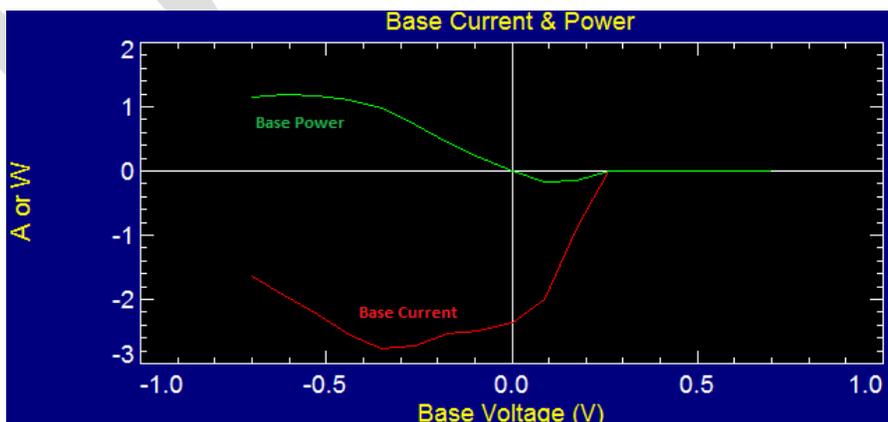


Fig. 6 Base current & power of GaAs solar cell without any ARC and texture.

SiO₂ ARC AND SiO₂ ARC /TEXTURE

Deposition of SiO₂ ARC on top of surface, initially current density increases linearly from 5 nm to 121 nm thickness of SiO₂ and after that current density get saturated. Further increasing the thickness of SiO₂ above of 123nm, current density again starts to decrease linearly. The thickness of SiO₂ ARC between 121-123 nm shows the best solar cell structure which gives EQE about 81%. Further deposition of 5 nm texturing over the SiO₂ ARC increases the EQE about 2%. The reflection of light without any ARC and the reflection of light after deposition of SiO₂ have been shown in Fig.6. EQE of GaAs solar cell of 32.58% reflection, EQE of SiO₂ ARC structure and EQE of SiO₂ ARC/texture structure are shown in Fig.8.

Initially reflection increases in the middle of violet range and after that reflection decreases rapidly upto red range. The reflection of light again starts to increase in higher wavelength range. The reflectivity of SiO₂ ARC has shown in Fig.7.

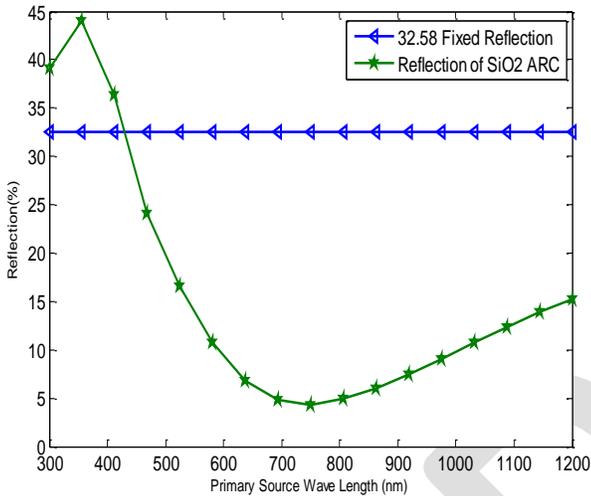


Fig.7. Reflectivity of SiO₂ ARC

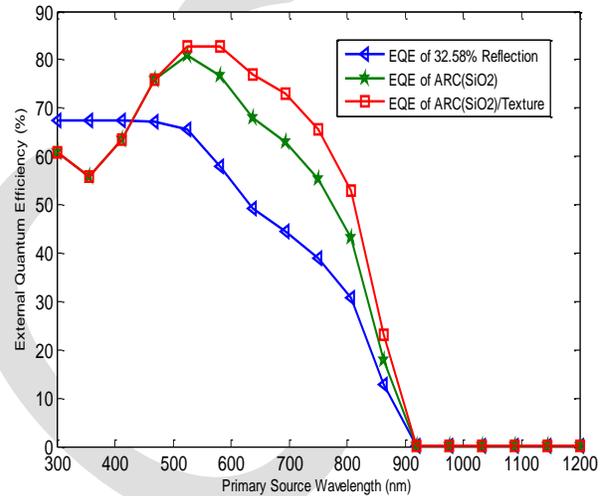


Fig.8. EQE of 32.58% reflection, EQE of SiO₂ ARC and EQE of SiO₂ ARC/texture

ITO ARC and ITO ARC /Texture

The simulation of GaAs solar cell with deposition of ITO ARC structure on the top of the surface shows that initially most of the light below of the violet range reflected by ITO surface and the pre-surface total reflection reaches to 44.84%. After violet range of light reflectivity decreases linearly and reflectivity can be decreased about 0.008135% at red range. The best structure of ITO ARC obtained at 100 nm thickness and gives the EQE about 82.09%. Further, deposition of 5 nm depth of texture over ITO ARC increases the EQE about 2.56% at yellow range. Reflectivity of ITO ARC compared to 32.58% reflection has shown in Fig.9. The EQE of GaAs solar cell of 32.58% reflection, EQE of ITO ARC structure and EQE of ARC/texture structure are shown in Fig.10.

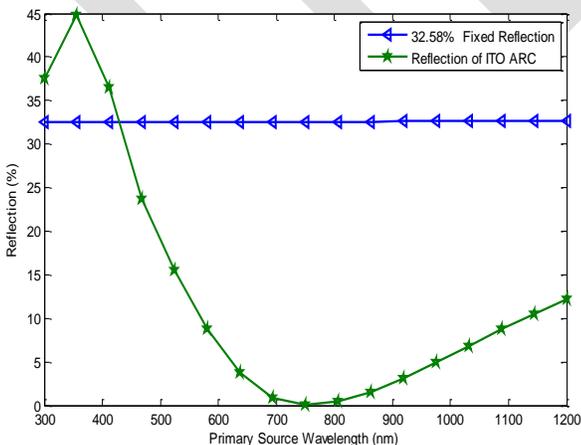


Fig.9. Reflectivity of ITO ARC

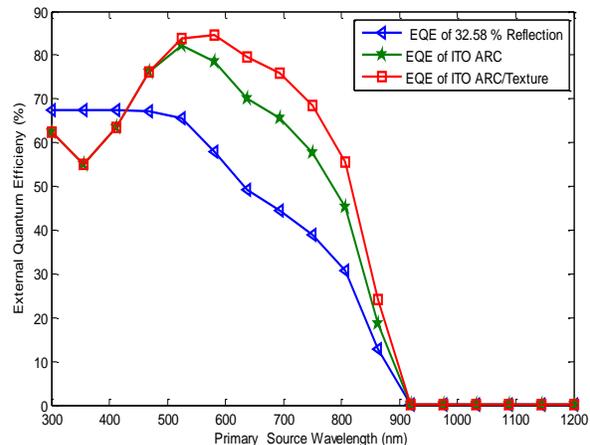


Fig.10. EQE of 32.58% reflection, EQE of ITO ARC and EQE of ITO ARC/texture.

In the both cases of ARC, the short circuit current (Jsc) increases due constructive interference property of light. Constructive interference properties of light shows that different waves of light added to each other and increase the amplitude of resultant light

wave which in turns increases the short circuit current (Jsc) in solar cell. Similarly short circuit current (Jsc) may be decreased due to destructive interference property of different light waves [16]. The best structures of GaAs solar cell of our simulation have shown in table III.

THE BEST STRUCTURE OF SiO₂ ARC AND ITO ARC.

Material	Thickness of ARC	Maximum EQE without Texture	Jsc(A) without texture	Maximum EQE with Texturing of 5 nm depth	Jsc(A) with texturing of 5nm depth
SiO ₂	121 nm	81%	3.340	83%	3.962
ITO	100 nm	82.09%	3.491	84.65%	4.142

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CONCLUSION

In this paper, Authors presented a fundamental optical analysis framework for designing light reflection schemes of thin film SiO₂ and ITO ARC structures for a GaAs solar cell. The improvement of External Quantum Efficiency (EQE) of GaAs solar cell was calculated for both cases of ARCs. The reflectivity of SiO₂ and ITO of different thickness give the idea about the properties of these two materials in the presence of light. The EQE gives the idea about the designing of GaAs solar cell by antireflection coating on the top of the surface. Quantum efficiency of solar cell depends on photon absorption co-efficient of solar cell materials. Result shows that transmission of photon energy through SiO₂ ARC increases from 5nm and 121 nm. Most of the incident light energy passes through SiO₂ layer and absorbed by GaAs solar cell. Only 4.370% light reflected back from the surface. Therefore an optimized structure of SiO₂ ARC was obtained at 121 nm thickness for 81% EQE. Similarly, an optimized ITO ARC can be obtained at 100 nm thickness for 82.09% EQE. Almost all of the incident light energy passes through ITO and absorbed by GaAs solar cell. Therefore, it was observed that ITO shows higher transparency property than a SiO₂ ARC which was expected. Further improvement of EQE of GaAs solar cell was also calculated after deposition of texturing over the surface. The deposition of ARC and texturing on top of the surface are showing very encouraging results about GaAs solar cell. Further, an optimization of presented result is needed to improve the performance of GaAs solar cell, though the simulation results are showing a higher improvement in the performance of GaAs solar cell.

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E-GOVERNANCE-AN APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY

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Abstract— In the Era of Computer Technology, We need to communicate and accelerate our life with the help of Information and Technology (ICT). We all require certain types of services on online, which require less workout or interference of Human being. E-Governance is a live example of it. E-Governance is an application of Information and communication technology, which provide all government related services online, which limits human errors as well as human interference. In today's time E-Governance provide certain roadmap for efficient delivery of services at door step. E-Governance plays vital role while reducing corruption from our society. It provides Government– customer, Government–Business and Government– Government Services with proper utilisation of resources. It has widely successful in India using PPP models. This illustrates the Common concepts of E-Governance using Information and communication technology references. It mainly concentrates on an E-Governance in India.

Keywords— E-Governance, ICT, models, requirements, benefits, problems, Impact

INTRODUCTION

With increasing the Technology used in worldwide, now we have to fully move towards the concept of E-Governance. With Fast development of IT sectors we move towards deployment of E-Governance project With help of private public partnership (PPP). E-Governance is more than just government website on internet. It is such type of well formed structure that encompasses the interaction between customer and business with the Government. It is one of the forms of E-Business that deals with private sector companies for efficient service providing to the customer with the help of E-Governance. There are three Basic groups that can be important in any E-Governance that are Government, Customer and Business that provides backbone to any E-Governance System. With increasing the craze of technology worldwide, Indian government established the Department of Electronics in 1970. Just after seven years Government of India established National Informatics centre (NIC) in 1977 was first major step towards E-Governance in India. The first E-Governance project was started in India in 18th May 2006 in New Delhi called as E-Shasan Yojana. This project was designed by Department of Electronics and Information Technology Department of Indian Government. There are certain types of models which we use for transformation of E-Governance System are: _ Government to Citizen _ Citizen to Government _ Government to Business _ Government to Government These models are used for transformation of Communication and Information between the groups of E-Governance.

2. Objective of E-Governance

There are some important objectives of E-Governance:

1. To Enhance Public Services:

One of the important objectives of E-Governance is to be enhancing the services that are provided to public by the government. By providing all the services online, it reduces human effort as well as enhancing the public services as well.

2. To Increase Interplay between Government and Citizen:

In today's speedy world, everyone needs to communicate in lightning fast speed as well as they need fast interaction with government as well. So using E-Governance platform, it provides all the services at lightning fast speed and they gets all information in certain time span.

3. Availability of Information at any place:

Due to Internet, we can easily provide government related information to any citizen at anywhere they want using E-Governance. It is also very easy to E-Business stakeholders to participate in Auction from anywhere.

4. To promote citizen participation in government:

With increased in population day by day, it is also an important thing that each and every people of any country should have to participate in Government of their countries. E-Governance plays vital role while participating each and everyone in government process, by improving overall participation of citizens in the decision making.

5. To Reduces the Corruption:

One of the most important objectives of E-Governance is to reduce the corruption from governing system. By all things related to government becomes digitalise including information transfer, online auction, providing All certificates to the people online, it just reduces the corruption from the system.

6. To Reduce The Cost Of Services:

By using E-Governance services our aim to reduce the cost of services. By reducing the expenditures on physical transfer of information and services. By using digital transfer of all the information related to government using E-mails we can cutting down the expenditures of government by reducing the cost on stationeries used for information transfer.

7. To Reduce Reply Time by the government:

Using E-Governance we can easily reply to the citizen's complaints and queries in limited time period. E-Governance provides services to citizen to Enhance their feedback facility provided to citizens by the government.

These are the main objectives of E-Governance for providing an excellent facilities and transparency to the citizens of any country by using E-Governance. To make passive information access to citizen participation by informing, representing, encouraging, consulting, and involving the citizens into the Governing system.

3. Different models of E-Governance:

There are basic four types of e-Governance models are present, which includes:

- Government to Government
- Government to citizen
- Government to Business
- Government to employee

1. Government to Government Model:

In this case, the flow of information and communication flows only between the different governments bodies. This model is used for the government by government, where all information related to government has transfer between government bodies using E-Governance. Main objective of this model is to be increased the speed of work and performance of government.

2. Government to Citizen Model:

In this case, this model creates an interface between government and citizens. This model is used for efficient transfer of services of government to citizen in the form of E-Governance model. Where it provides 24 hours and 7 days services to citizen for interacting with government without any time bound, which also reduces the citizens effort for accessing the government services.

3. Government to Business model:

In this case, government provides easy access to business community for accessing the government services for different business purposes, including permits, license, tax payments services directly through online gateways. The main goal of this model is to be increased transparency and speed of work between different government bodies and business community.

4. Government to Employee model:

In this model, Government provides online tools and resources to employee to maintain the communication between government and their own community. It Provides e-benefits to employee to pay their tax, bills and other payments online using online gateways. It also benefits to employee to communicate with their colleagues via email and other communication mediums provided by E-Governance model. G2E is adopted in many foreign countries for efficient transfer of information.

4. Requirements of E-Governance:

For Best implementation of any

E-Governance Project we all are required to fulfil its needs, which includes Availability of computers centres, fast internet, Literature percentage must be increased as well as proper utilization of resources will be must as well.

1. Availability of Computer centres:

Because of poverty in our country, we need computer centres setup by government, because only 3.56% of sharing percentage of world PC's are presented in India. So we need well settle computer centres for Implementation of E-Governance project

2. Availability of Broadband Internet: For accessing E-Governance services

We have to well connect with broadband internet facility. And with connected with broadband internet facility the cost of internet facility must be low.

3. High literature percentage:

For use of E-Governance services for each and every people, they must know how to use it in proper way, so literature percentage must be high to use it. Because illiterate people cannot get how to use E-Governance in proper way.

4. Proper utilization of Resources:

The resources provided by E-Governance project must be used in proper way for better utilization of E-Governance project.

5. Impact of technology on E-Governance:

In E-Governance, we can use all the services of E-Governance online. So Technology Impact is more on E-Governance.

1. Security:

Security plays vital role when information are available for more users at one platform. External attacks have overcome on system by hacking the information related to user and government. this information is prevent only by using different virus defending technique such as using antivirus and different encryption techniques for data or information transfer. This reduces virus attacks and data hacking from unwanted users or peoples. By using standard security measures we can easily overcome these security failures.

2. Privacy:

Because of open access of information related to peoples or any business community on E-Governance website or portal, it creates serious problem with their privacy. So to overcome this problem using technology we can used some privacy measures or setting up some privacy measures, we can easily overcome these problem by using technology impact.

3. 24/7 services available to user:

Using E-Governance technology we can easily provide 24/7 services to the user for their convenience. Where user can easy to access their services on any time when they want.

4. Updating the content:

In any E-Governance model, services of Government facility and new projects related to government are updated day by day, so updating the information related to new government projects are becomes very easy to updating the information on E-Governance sites online using technology.

5. Access of services of E-Governance:

Using technology which we were used for implementing the E-Governance project, it becomes very easy to accessing the information related to government projects.

6. Challenges faced by E-Governance in India:

1. Low technology literacy:

In India, there is less awareness and understanding about Information technology. Due to these most of people in India cannot use E-Governance. So one the important challenge in front of us to literate everyone not in just education but also in use of technology.

2. Language Problem:

In India, Most of the people only Understand Hindi. They cannot understand English, and haul E-Governance project is in English language. That's why we have to create an E-Governance projects in different languages.

3. Contradiction regarding Government services:

Most of people in India, considered government services as late mark, So when E-Governance model implemented by government, we have to provide fast services than others to the people. By using it we can remove the contradiction between citizens and government.

4. Lack of Internet facility in Villages:

In India, there is lack of internet facility; Due to this most of peoples are unable to use E-Governance services mainly coming from villages. So to overcome this problem we have to spread wide area network widely in India in low cost, because cost also plays an important role while developing anything regarding to government project.

5. Population:

One of the most important challenges in front of India is to control the population. In implementing the E-Governance project in India become difficult because of the population. It's very hard to store update of each of the people because of number of peoples are more as compared to other countries. In any E-Governance activity, we have to store a unique identity of each of the citizen in large database. Because of large database, its handling becomes more complex as well as all database related problems arises.

7. E-Governance Initiative till now in India:

E-Governance plays an important in modern governance. Due to these usage of E-Governance becomes more and more.

- Finance Ministry in India:
Due E-Governance following transactions becomes online:
 - 90% of import and 96% of export documentation becomes computerised
 - 85% of income tax and service tax return becomes online.
- Railway Ministry in India:
Under railway ministry online booking of train tickets, online catering services, online complaints registry and Schedule of Any train that are display online with the help of E-Governance.
- Agricultural Ministry in India:
In agricultural ministry, it provides machineries, research etc. Detailed information on the government policies, schemes, agriculture loans, market prices, animal husbandry, fisheries, horticulture, loans & credit, sericulture etc. is also available with help of E-Governance.
- Rural Development Ministry:
It provides complete information on initiatives taken by the government for bridging the urban-rural divide by upgrading the standard of living of people in rural areas. Information about programmes, schemes, employment opportunities, Panchayati Raj institutions, development authorities, drinking water, sanitation, road construction, electrification of villages and food supply etc. is provided by E-Governance
- Human Resource and Development Ministry:
This ministry is very helpful in getting information related to the elementary, secondary, higher secondary, higher and adult education etc. We can also find details of educational institutions, courses, admission procedure, scholarships, student loans, technical and medical education and vocational studies etc. Detailed information related to foreign scholarships, exchange programmes and universities etc. is provided. Related documents and forms are also provided by E-Governance.
- Health and Welfare Ministry:
It provides information pertaining to health programmes, policies, schemes, forms etc. for specific beneficiaries who include women, children, senior citizen, etc. Details of Union and state government agencies, departments, organisations, research institutions, hospitals are also available with the help of E-Governance.
These are some Services that are provided by different ministries under E-Governance facility, where it plays very important while upgrading the human life with the coordination of Government Projects.

8. MyGOV: A platform for citizen's engagement towards Surajya

A platform that empowers the citizens of India to contribute towards surajya. This is an idea of hon'ble Prime minister of India Shri Narendra Modi, He said that "Stating that in the past, there used to be a big gap between the people and the processes of governance, In the past sixty days, the experience of his Government was that there were many people who wanted to contribute towards nation-building, and devote their time and energy. The only thing they required was an opportunity to shine and showcase their contribution. The Prime Minister said the MyGOV platform is a technology-driven medium that would provide this opportunity to contribute towards good governance".

The platform – MyGOV - presents an opportunity to the citizens to both ‘Discuss’ and ‘Do.’ There are multiple theme-based discussions on MyGOV where a wide range of people would share their thoughts and ideas. Further, any idea shared by a contributor will also be discussed on these discussion forums, allowing constructive feedback and interaction.

For those who wish to go beyond discussions and wish to contribute on the ground, MyGOV offers several avenues to do so. Citizens can volunteer for various tasks and submit their entries. These tasks would then be reviewed by other members and experts. Once approved, these tasks can be shared by those who complete the task and by other members on MyGOV. Every approved task would earn credit points for completing the task.

National Informatics Centre (NIC), Department of Electronics and Information Technology (DeitY) would implement and manage the platform MyGOV which would facilitate Citizen Engagement in Good Governance.

Groups and corners are an important part of MyGOV. The platform has been divided into various groups namely Clean Ganga, Girl Child Education, Clean India, Skilled India, Digital India, and Job Creation. Each group consists of online and on ground tasks that can be taken up by the contributors. The objective of each group is to bring about a qualitative change in that sphere through people’s participation.

This is an idea of E-Governance with proper utilisation of its resources with well formed participation of peoples in E-Governance as well. With this platform peoples are easily communicate with government as well as Prime minister of India. And with this project people can easily know what the government are done for them. MyGOV is very Good example of E-Governance project and how we implement E-Governance for People use. And we will gain Lots of ideas from people also regarding to E-Governance and Government also with proper Communication.

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CONCLUSION

As we are in the Era of Information and Communication Technology (ICT), E-Governance has to increase their performance as well. It gives a basic idea about E-Governance that what are the challenges that can be faced by any E-Governance model and how we will overcome it with some simple steps as well as I have mention some better services that are provided by Government with the help of E-Governance in India. Citizens are plays vital role while implementing any E-Governance project, where any E-Governance is not complete one without citizens participation. So with the help of good governance we can easily communicate with citizens and increase their participation in government decision making.

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Modern Multipurpose Security And Power Management System

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Abstract — The Automatic power saving system for a home/office/shopping mall with security system is a method for automatic control of devices (lights, fans, or AC s) throughout home or in a shopping mall. A unique architecture of occupancy sensors include entry/exit sensors for detecting movement through doorways that separate rooms in the home, room motion sensors for detecting room occupancy, spot sensors to detect occupancy of specific locations within the rooms. A central embedded controller communicates with the sensors and controlled objects over a communication network, where the sensors and controlled objects can be added to the system in a 'plug and play' manner. According to the proposed system, the number of visitors entering into and exiting from the shopping mall is calculated and is displayed. Apart from this, the appliances are made ON and OFF according to the number of persons present in the shopping mall by which power can be utilized with great efficiency and also implemented with security provision by which if unauthorized person enter to room means the dc siren gives alarm sound.

INTRODUCTION

The design and development of a smart monitoring and controlling system for household electrical appliances in real time has been reported. The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The novelty of this system is the implementation of the controlling mechanism of appliances in different ways. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers. The prototype has been extensively tested in real-life situations and experimental results are very encouraging. Task scheduling on single or multiple processing elements is considered as one of the most common methods to achieve lower power consumption. In particular, in light-weight embedded systems, scheduling saves power by shutting down devices when they are not operating. Processing elements in embedded systems usually serve different requests at different times. Ordering task execution adjusts the lengths of idle periods and exploits the opportunities for power management several approaches have been proposed for task scheduling on low-power embedded systems that consider highly constrained energy source and environmental sources. The automatic standby power cut off outlet is composed of an AC/DC conversion, one two port relay, a power monitoring circuit and a microcontroller. The AC input is connected to the two port relay. One output port of the relay is connected directly to the AC output outlet and the other. Remote-Controllable and Energy-Saving Room Architecture based output port is connected to it via the power monitoring circuit. The power monitoring circuit consists of a transformer, rectifying diodes and additional components. It converts the measured power consumption into a voltage. The microcontroller digitizes the voltage and calculates the consumed power.

Now-a-days it is need to avoid wastage of power in home. As more and more consumer electronics and home appliances are power consumption in home area tends to grow. Moreover, useless power consumption occurs during day time and also when the human being is not present in the room. Energy saving can be achieved by using sensors like Passive Infrared sensor, light dependent resistor sensor, level sensor, temperature sensor, power monitoring circuit to trip off the home appliance which draws more power than the normal power consumption.

EXISTING SYSTEM

People flow rate means the number of people passing a specific location during a selected time interval. It is measured using a visitor counting sensor triggered by physical signals caused by the passing person such as visual appearance, heat emission, reflections of the body surface, or pressure against the floor. Building maintenance applications of visitor counting include monitoring

customer circulation patterns in commercial facilities and determining the number of people occupying a certain zone. The zone population information can be further used in automatic control of environmental settings, such as demand-controlled ventilation (DCV) that responds to changes in the generation rate of indoor pollutant by adjusting ventilation rate. Ventilation recommendations are usually given in outdoor airflow rates per person, and during unoccupied periods the system can be turned to minimum flow settings or totally shut off. Thus a DCV can provide an acceptable indoor air quality and energy savings. The most notable benefits are achieved in over ventilated facilities and in rooms with high and varying populations, and where the occupants are the main source of indoor air contaminants. While a DCV that operates by monitoring the room's carbon dioxide (CO₂) level or temperature is always more or less retrospective, the use of visitor counting sensors enables a real-time response to changing occupancies. For statistical counting of visitors the direction in sensitive sensors are also applicable, but in zone population detection bidirectional counting is practically always needed. Previous research on sensor-based DCV has focused on CO₂ sensor-controlled solutions.

To enhance security, GSM is used to give an alert message to the mobile. The system has been designed for measurement of electrical parameters of household appliances. Important functions to the system are the ease of modeling, setup, and use. From the consumer point of view, electrical power consumption of various appliances in a house along with supply voltage and current is the key parameter. The functional description of the developed system to monitor electrical parameters and control appliances based on the consumer requirements. The use of advanced lighting controls can determine significant energy savings, but its quantification is not always clear. The standard offers the directives to be pursued and also reference values for a preliminary evaluation that are to be better specified in order to obtain more accurate provisions for an advanced evaluation. All visitor counting sensors are suitable for all installation environments or all volumes of people flow. Instead, choosing a sensor should be based on the physical dimensions and the estimated overall people flow rate of the monitored passage. Based units good performance the triangulation proximity switch seems to be the most suitable one for the directional counting needed in as long as the visitor flow rates are moderate and people proceed mostly in a single file.

PROPOSED SYSTEM

The Automatic power saving system for a home/office/shopping mall with security system is a method for automatic control of devices (lights, fans, or AC s) throughout home or in a shopping mall. A unique architecture of occupancy sensors include entry/exit sensors for detecting movement through doorways that separate rooms in the home, room motion sensors for detecting room occupancy, spot sensors to detect occupancy of specific locations within the rooms. A central embedded controller communicates with the sensors and controlled objects over a communication network, where the sensors and controlled objects can be added to the system in a plug and play manner.

According to the proposed system, the no. of visitors entering into and exiting from the shopping mall is calculated and is displayed. Apart from this, the appliances are made ON and OFF according to the numbers of persons present in the shopping mall by which power can be utilized with great efficiency and also implemented with security provision by which if an unauthorized person enter to room means the dc siren gives alarm sound.

The proposed system split in to two ways. First one is power saving system. Second one is security system. The power saving system having the blocks is IR sensor, power supply, LCD display and light and fan control. The security system having the blocks is panic switch, dc siren and auto door lock. Now a day's power consumption is a challenging task in each and every place .One such example is shopping mall, so much of power is wasted here even though no customer available in particular shop by use of lights and AC waste. The light and AC will work according to customer density in the shops. For example, Consider 4 shops. Shop 1&2 à light and AC ON because density high Shop 3 à no customer hence light and OFF Shop 4 à density low hence light glows dim For the project 5V power supply is needed.

In this circuit first the 230V is applied to the step down transformer. Then the 230V is converted into 15V. The rectifier converts this AC voltage into DC voltage. The panic switch is used for emergency. It is similar to the ordinary switch. The IR sensor senses the visitors and also counts. The LCD display displays the light on or off in simulation result. In hardware dimming of light control is shown. Similarly the fan and AC working based on the visitors present in room. The fan and AC speed is increase or decrease based on density of visitors. If unauthorized persons enter means the panic switch is pressed the siren indicates alarm sound, the door is automatically lock. It provides voice communication to the nearest police station. GSM provides short messaging service with telephone connection. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers. A unique architecture of occupancy sensors include entry/exit sensors for detecting movement through doorways that

separate rooms in the home, room motion sensors for detecting room occupancy, spot sensors to detect occupancy of specific locations within the rooms.

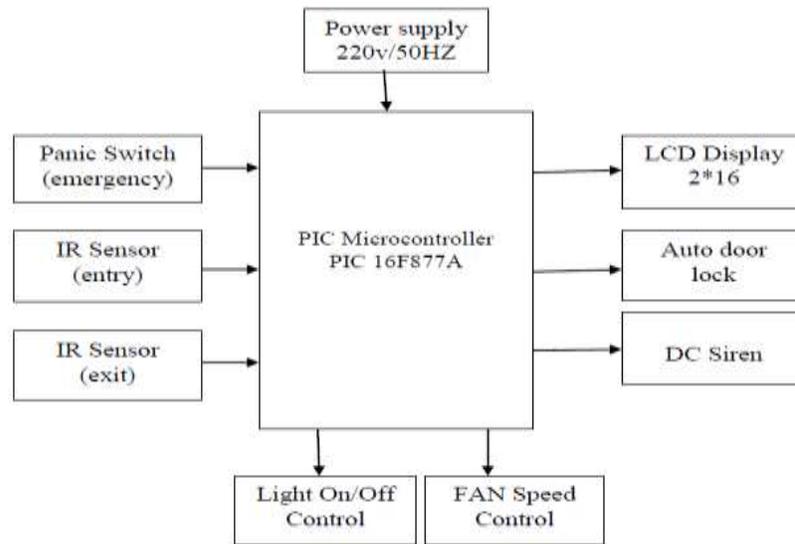


Fig .1. Block diagram of proposed system

ALGORITHM

The algorithm of proposed system is given below.

Step1: Start the program.

Step2: Initiate microcontrollers.

Step 3: Check for IR interrupt signal. Then increment count.

Step4: When count >0 do the following:

1. If Count>10 then send a command to receiver to switch ON fan else send a command to receiver to switch OFF fan
2. If Count<50 then send a command to receiver to switch ON Light but Produces Dim light
3. If Count>50 then send a command to receiver to switch ON Light with full brightness

Step5: If room intensity is dark then send a command to receiver to switch ON light else send a command to receiver to switch OFF light.

Step6: When count<0 send command to receiver to switch OFF fan and light.

Step7: Repeat the steps 3, 4 5 and 6 in parallel.

EXPERIMENTAL RESULT

The system specifications include the software requirements for the simulation of the project. The project is simulated with the help of a desktop computer or laptop. The development tool used for the simulation of this project is MATLAB 9.0. The light control mainly based on the principle mass detection if no one present in the class then the light automatically OFF with the help of matrix sensor.

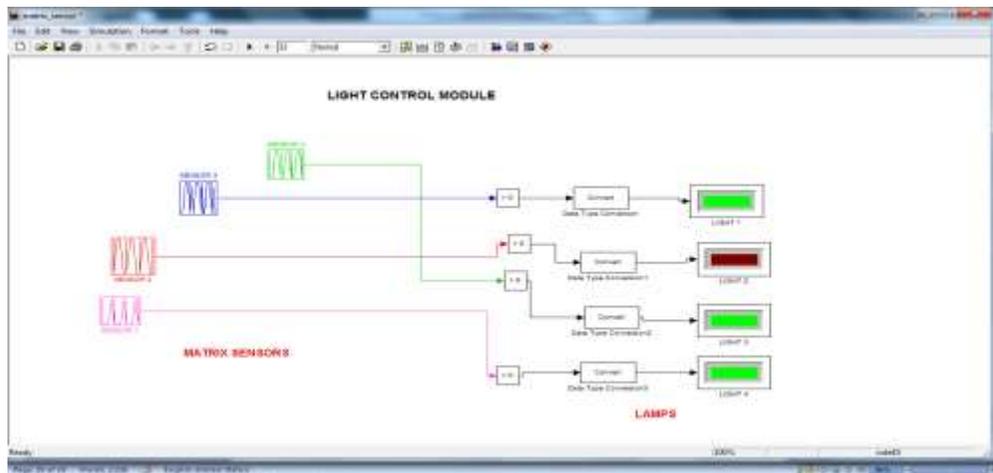


Figure.2. Light Control Module

The timing values same for every sensor if the time value range is between 10 to 20 then the sensor 1, 2, and 4 in same ON condition the sensor 3 will be OFF. Based on the timing value and output values of all sensors, the load is on or off.

Table.1. Matrix sensor output

TIME VALUES	OUTPUT VALUES			
	SENSOR 1	SENSOR 2	SENSOR 3	SENSOR 4
0	0	1	1	0
10	1	1	0	1
20	1	1	1	1
30	1	0	0	0
40	1	1	1	0

The fan control mainly based on the principle mass detection and temperature variation if no one is present then the fan automatically OFF if the persons are less than 10 and based on the condition the fan speed is also decreased.

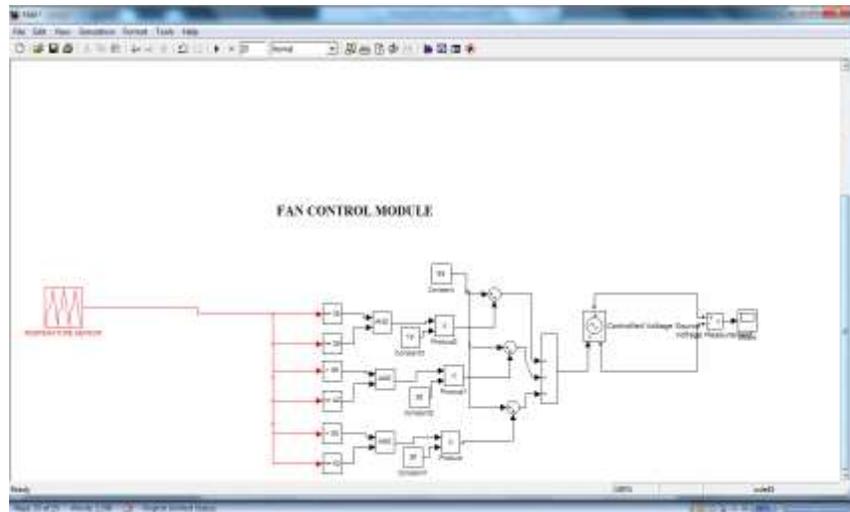


Figure 3. Fan Control Module

The graphs show the decrease in speed of the fan and automatically switch OFF it, because no one is present.



Figure 4. Fan control output

CONCLUSION

It proposes automatic detection of human and Energy saving room architecture to reduce standby power consumption and to make the room easily controllable with an IR remote control of a home appliance, shopping malls, industry. The proposed system divided into two parts as power saving system and security system. The power saving system gives controlling of appliances. The security system gives alarm sound, if unauthorized person enters in room. It gives only alarm intimation. It can extend with voice communication.

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Self Powered Wireless Sensor Network Using Hybrid PV-Wind System

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Abstract:-A Wireless Sensor Node in a sensor network is capable of performing different processing, gathering sensory information and communicating with other connected nodes in the network. Rechargeable batteries are used to power the sensor nodes. But frequent recharging and replacement of these batteries becomes a burden in network. So mitigate this problem many energy harvesting schemes have been proposed which is to convert the energy from the environment into electricity to recharge the sensor nodes. Energy harvesting from single source have environmental limitations like if the sensor is installed inside a building solar energy is unable to used and with wind generators is that they are too big, and are expensive if the size has to be decreased. Hence proposed system is design to provide multisource and self powered power supply to wireless sensor node which could stay charged by generating power on its own.

Keywords: Energy Harvest, WSNs, MPTT, Super capacitor, Photovoltaic effect, ANSM, WEH

I. INTRODUCTION

Wireless sensor network (WSN) are utilized in a wide range of applications, including military applications and the monitoring of oceans and wildlife. WSN comprise many low cost devices called sensors, which monitor the status of the environment and send sensing data to the sink node. Wireless sensor nodes are becoming more and more popular due to the technological advancements in the field of microelectronics technology and the development of ultra-low power microcontrollers that can be used in the embedded system. Wireless sensor network (WSN) consisting of several sensor nodes are used to monitor various parameters. The wireless sensor networks are commonly deployed in civilian and military applications such as natural disaster detection, healthcare system, traffic control system, building security system etc. Because of limitations on the energy supply, available storage space and the computational capacity of the sensor nodes, the data that are transmitted between a sensor node and the sink node must be forwarded by other sensor nodes. Rechargeable batteries are used to power the sensor nodes. Frequent recharging and replacement of these batteries become a burden in WSN. So WSN nodes can gain and store energy from its surrounding environment. Harvesting of energy from single source has many limitations. Thus renewable resources based on single source may not be effective in-terms of cost, reliability and efficiency for which hybrid systems offer a better option. Solar panel usually generate maximum power during mid of day and gradually decrease during the night where windmill usually generates maximum power during the night. So reliability can be achieved to an extent to make these method more reliable a power storage system such as battery can be added to the system so that when maximum power is generated above the demand, instead of wasting that energy the power can be stored and it can be discharged during the time when power generation is below the actual need. Hence proposed system is designed to provide multisource and self powered power supply to any wireless sensor node which could stay charged by generating power on its own.

II. RELATED WORK

Energy harvesting scheme which is based on solar power works on photo-voltaic effect [1]. A recharging assembly is also developed that recharges the batteries of the sensor node. Solar energy harvesting through photo-voltaic conversion technique provides the highest power density. Maximum Peak Power Tracking (MPPT) is adopted in this harvesting method. The point at which the output power is the maximum at the given level of light intensity is called Maximum Power Point (MPP) shown in fig 1.

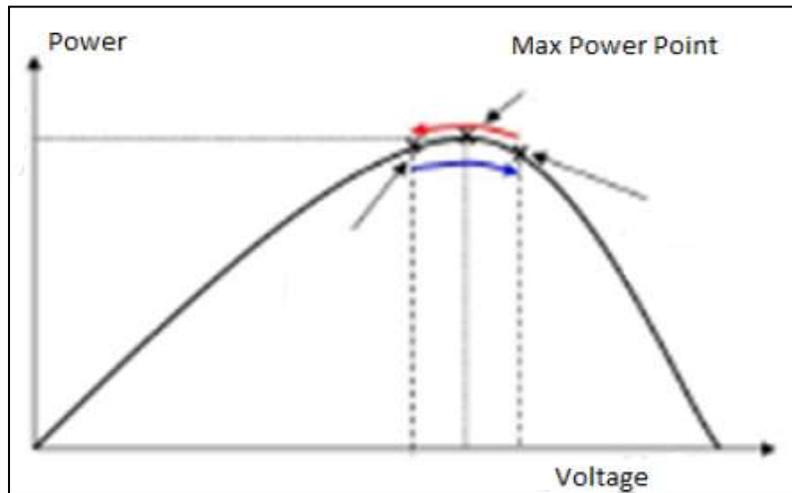


Figure 1. Maximum peak power tracking

To increase the performance of wireless sensors, adaptive node-selection based on solar power is used [2]. To solve node-selection problem, an adaptive node-selection mechanism (ANSM) scheme is proposed. This mechanism selects the least active node to reduce the overlapping of the sensor but keep constant coverage of the target area in wireless sensor networks.

There is a difficulty of utilizing extra energy when the battery is fully charged. It is utilized to adaptively adjust the redundancy level of erasure codes so that the reliability of communication is improved while the network lifetime is remain constant [3]. In reality, a fully charged battery cannot harvest more energy; there is a possibility to utilize that energy so that node can harvest more energy. As a result, the extra spending has no effect on the node lifetime since this energy otherwise would be wasted. By exploiting its inherent properties, an effective solution called Solar Code is proposed.

Wind energy harvesting is very much attractive because of the large availability of wind power and its power density is also high. The design of a wireless sensor node which is powered by a micro wind turbine generator accept power management to make the node working neutrally which will never dies out of energy [4]. To determine whether wind energy is active for supplying power to WSN, wind energy harvester (WEH) was designed, and built [5]. The WEH consisted of a wind generator and a unit of power management to store and provide the generated energy. The wind generator consist of aero – elastic flutter to convert wind energy into electrical energy.

Renewable resources based on single source may not be effective in-terms of cost, reliability and efficiency. So to mitigate this problem hybrid systems of multiple sources is designed. There is an unique way of using the hybrid solar and wind energy effectively for pumping solution in rural parts of India. A hybrid generation system consist photo voltaic, wind turbine and battery to supply stable power [6]. Maximum Power Point Tracker (MPPT) is used for extraction of maximum power from the solar and wind generator and to compensate power difference of renewable energy. When PV and WT generate power is lower than demanding power, the battery is discharged power to overcome the difference of supply and demanding power. If PV and WT generated power is higher than demand power, the battery is charged.

III. PROPOSED WORK

Wireless sensor network (WSN) is a solution that consists of spatially distributed autonomous devices. These devices consist of sensor that monitor temperature, sound, vibration motion or pollutants from different locations. Proposed system is designed to provide multisource and self powered power supply to any wireless sensor node which could stay charged by generating power on its own. Main goal of the system is to design a power generator which can work in maximum possible weather situation and to take the advantage from sun and wind both.

Block diagram of proposed work:

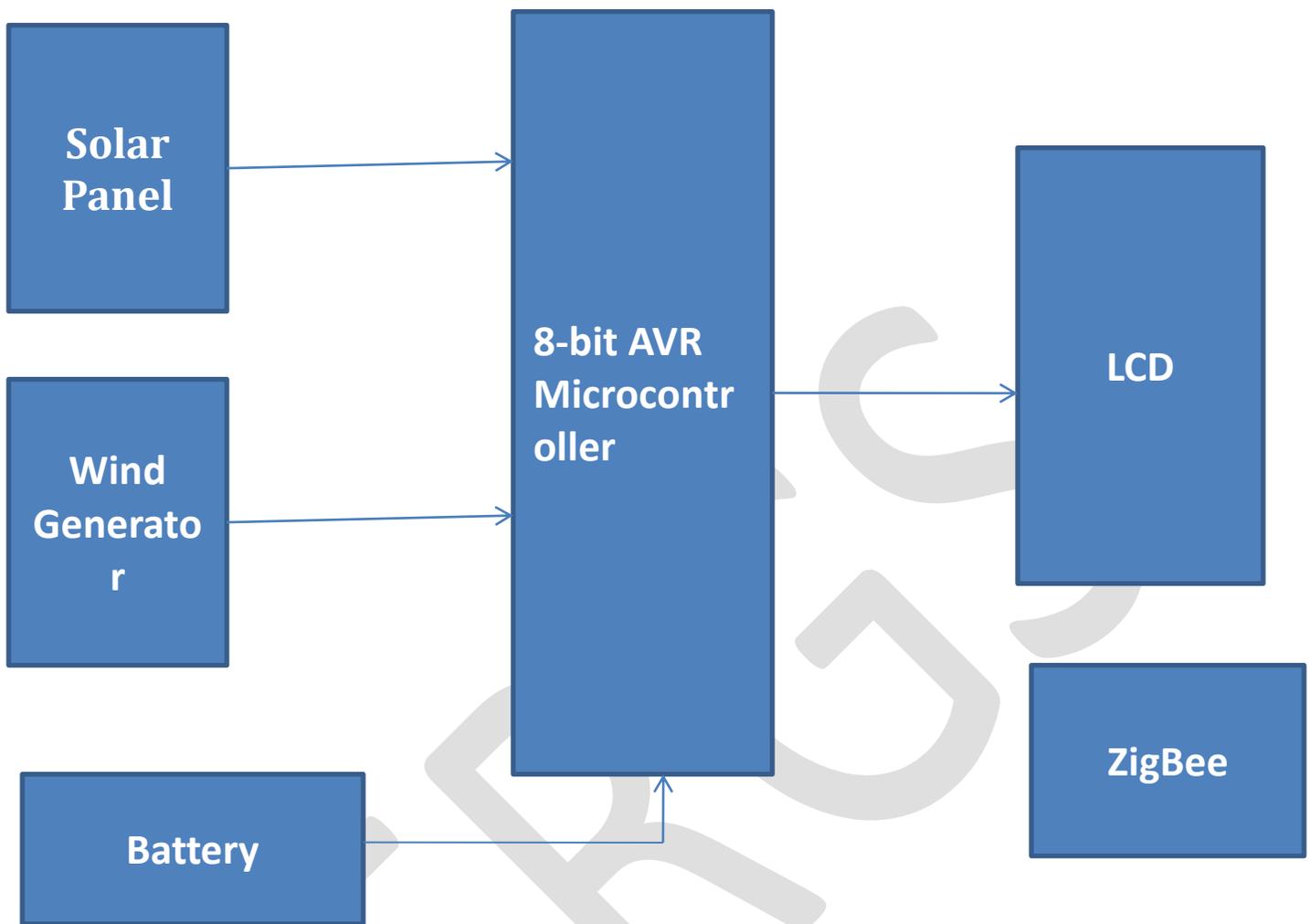


Fig 2 : Block diagram of proposed work:

Fig.2 shows the block diagram for the proposed system. Here Solar panel and wind turbine generator act as a voltage source for the entire component used in the circuit. The regulator circuit regulates the input voltage drawn from solar panel to about 5 volt. In case where there is no solar power, wind turbine generator is used to recharge the circuit. DC-DC convertor which in series with the generator, step up or step down the input voltage. Power management unit is also designed to increase the reliability of network. It stored the generated energy for future use in case where there is no solar or wind energy Super capacitor or battery is used as an energy storing element for both the sources.

3.1 Principle of Solar Panel:

Solar radiations contain photons, when hit the solar panel and are absorbed by semiconducting materials, such as silicon. Due to impact of photons electrons in silicon are energized and flow through the material to produce electricity. Due to the special composition of solar cells, the electrons are only allowed to flow in a single direction. The positive charged holes are also created flow in the opposite direction of the electrons in a silicon solar panel.

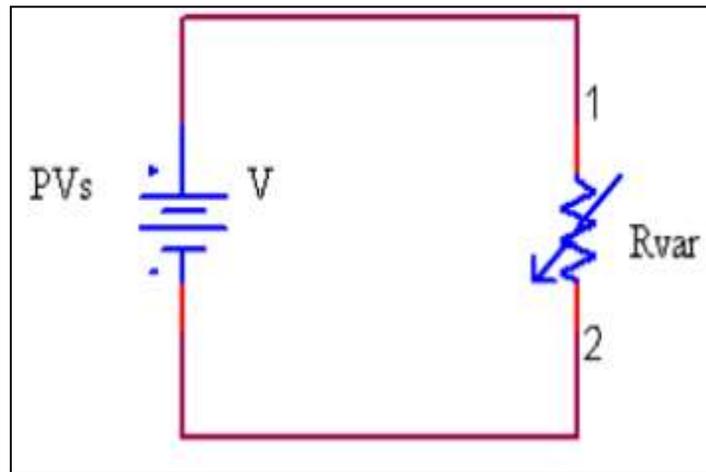


Figure 3: Photovoltaic-super capacitor energy system.

3.2 D.C Geared Motor for harvesting wind energy

The wind generator consisted of d.c motor whose geared ratio is 1:100,so that for one rotation, rotor rotates motor turns hundred times to convert wind energy into electricity as electromagnetic flux flow through it.

3.3 Energy storage technologies

Perhaps the most complex (and crucial) design involves the energy storage mechanism. The two choices available for energy storage are batteries and electrochemical double layer capacitors,also known as ultra capacitors.Batteries are a relatively mature technology and have a higher energy density than ultra capacitors.

3.3.1 Super Capacitor:

The power efficiency becomes difficult when the power comes from a renewable source such a solar cell or a windmill.The output voltage and power of these sources are highly variable depending on the current draw. Moreover, the current that maximizes the power also changes with the environmental conditions (solar irradiation or wind intensity). In general, the output impedance of the renewable energy sources changes based on the surrounding environment. The maximum power point tracking (MPPT) method dynamically adjust the output current to match the output impedance so that the maximum amount of power can be drawn from the power generating device.

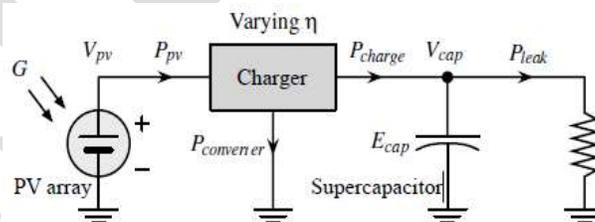


Figure 4: Photovoltaic-supercapacitor energysystem.

Figure 4 illustrates a simplified schematic diagram from energy generation to storage. The total system efficiency enhancement seeks to maximize the power that is transferred into the supercapacitor, Pcharge.

IV. CONCLUSION

Hence proposed system is designed to provide multisource and self powered power supply to any wireless sensor node which could stay charged by generating power on its own. Main goal of the system is to designed a power generator which can work in maximum possible weather situation and to take the advantage from sun and wind both.

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Data Security using Image Steganography and Processing

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Abstract— Steganography is an art that contained communication of secret data in an appropriate carrier. Steganography's goal is to hide the embedded data so as not to arouse an eavesdropper's suspicion. For hide secret data in digital images, large varieties of steganography techniques are available same more complex and hard than others. Steganography has various use and different application. It covers and integrates of recent research work without going in to much details of steganography, which is the art and science of defeating steganography techniques.

Keywords— Digital image steganography, data hide, cover image, Data encryption, Data stego.

INTRODUCTION

Steganography word is of Greek source and essentially means that concealed writing. Protection of the transmitted data secret from being intercepted or tampered has led to the development of various steganography techniques. Steganography has been manifested long way back during the ancient Greek Times. Greek tyrant Histiaeus in 499 BC shaved the head of Back, slave was dispatched with the hidden message. Pliny the His slave and wrote message on his scalp. After the hair grew Elder explained how the milk of the Thithymallus plant dried to transparency when applied to paper but darkened to brown when subsequently heated, thus providing the way for hide Information. Giovanni Battista Porta described how to conceal a message within a hardboiled egg by writing on the shell with a special ink. In World War II long sentences of regular letters were used to disguise secret messages. With the tremendous advancement in digital signal processing, use of internet, Computing power, steganography has gone digital. The data hide process starts by identifying a cover image's redundant.

1.1. Application of steganography

Steganography can be used for wide range of applications such as, in defense organizations for safe circulation of database, in military and secrete agencies, in smart identity's cards where personal details are embedded in the photograph itself for copyright control of materials. In medical imaging's patient details are embedded within image providing protection of information and reducing transmission time, cost¹, in online voting system so as to make the online election secure and robust against a variety of fraudulent behaviours².

1.3. Classification of Steganography Techniques

Classifications of steganography techniques based on the types of cover files as shown in Fig 2. Almost all digital file formats can be used for steganography, however only those with a degree of redundant bits are preferred. The larger size of audio and video files makes them less popular as compared to images. The term protocol steganography refers to embedding information within network protocols such as TCP

In Spatial domain, cover-image is first decomposed into bits planes and then least significant bit (LSB) of the bits planes are replaced with the secret data bits. Advantages are high embedding capacity, ease of implementation and imperceptibility of hidden data. The major drawback is its vulnerability to various simple statistical analysis methods. Frequency domain embedding techniques, which first transforms the cover-image into its frequency domain, secret data is then embedded in frequency coefficients. Advantages include higher level of robustness against simple statistical analysis. Unfortunately, it lacks high embedding. In compression domain, secret data is

Embedded into compression codes of the cover-image which is then sent to the receiver. It is of paramount importance where bandwidth requirement is a major concern.

2. SPATIAL DOMAIN-BASED STEGANOGRAPHY TECHNIQUES

The most direct way to represent pixel's color is by giving an ordered triplet of numbers: red (R), green (G), and blue (B) that comprises particular color. The other way is to use a table known as palette to store the triplet, and put a reference into the table for each pixel. The spatial domain-based steganography techniques use LSB algorithm for embedding/extraction of data as shown in Fig 3.

2.1 E Stego Data Hide

Ez Stego data hide scheme was given by Machado^{4, 5}. In this method palette is first sorted by luminance to minimize the perceptual distance between consecutive colors. Ez Stego then embeds the secret data into the LSB of the indices pointing to the palette colors. This approach works quite well in gray scale images and may work well in images with related colors. The major drawback is, since luminance is a linear combination of colors R, G, and B ($Luminance = 0.299 R + 0.587 G + 0.144 B$), occasionally colors with similar luminance values may be relatively far from each other. Other drawbacks are the ease of extraction of hidden data, dependency of stego-image quality on number of palette colors, and ease of detection of presence of data using simple statistical histogram analysis.

Fridrich⁷ proposed a palette modification scheme for hide data. In this method, both the cost of removing an entry color in a palette and the benefit of generating a new one to replace it are calculated. If the maximal benefit exceeds the minimal cost, entry color is replaced. His method remarkably reduces the distortion of the carrier images, but suffers with the low embedding capacity as Ez Stego does. Cheng⁸, *et al.* proposed high embedding capacity technique that can hide.

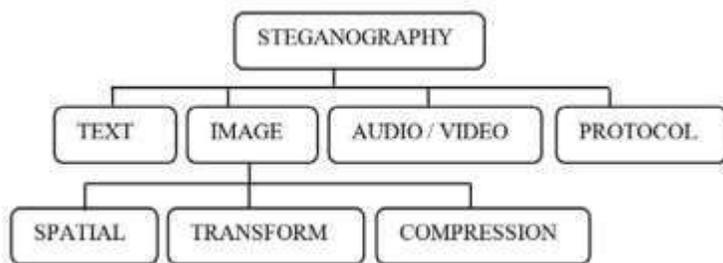


Figure 2. Classifications of steganography technique

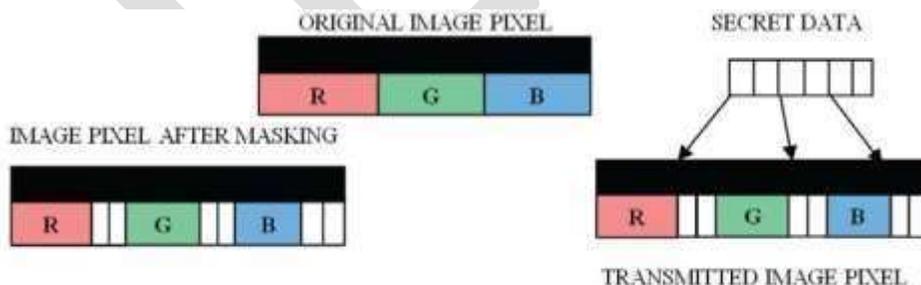


Figure 3. Basic spatial domain data hide.

2.2 S-Tools, Hide & Seek, StegoDos, White Noise Storm, and other techniques

S-Tools by Andy Brown^{5,6} reduces the number of colors on. In each segmented bit-plane its complexity is A from 256 to 32 while maintaining the image quality. Instead of and based on a threshold value block is divided into simply going with adjacent colors as Ez Stego does, S-Tools 'informative region' and 'noise-like region' and the secret manipulate the palette to produce colors that have a

difference of data is hidden in noise regions without degrading image one bit. As compared to Ez Stego, non-linear insertions in S-quality. BPCS provides high embedding capacity and least Tools method make the presence and extraction of secret data degradation of the cover-image as compared to traditional more difficult and achieve better results in terms of visual LSB manipulation techniques. Maya13, *et al.* uses variance of perceptibility. Figures 4 and 5 shows cover image before and image block as a parameter for complexity measure. Prime after embedding data. Hide & Seek given by Maroney⁵ uses LSB advantages achieved are high embedding capacity and of each pixel to encode characters of secret data and has robustness against noise as compared to BPCS technique. Embedding capacity which is restricted to 1/8th of the size of the cover-image. StegoDos⁵ works only with 320 X 200 pixels.

2.4 Information Theory-based Data Hide

Image and involves much effort in encoding and decoding of the Hadhoud¹⁴, *et al.* proposed a technique based on entropy secret message. White Noise Storm includes encryption to Calculation. In this method entropy of the '4' most randomize the bits within an image and suffers with the problem significant bits (MSBs) are calculated first which contains of using large cover file. Most detail of each pixel. If the entropy is > 2 then it inserts '4'

Younes¹⁰, *et al.* proposed a method in which data is bits into the '4' LSBs, if not then the entropy of the '5' MSBs is inserted into LSB of each byte within the cover-image in calculated. If it is > 2 then it inserts '3' bits into the '3' LSBs, if encrypted form. Mandal¹¹ proposed a method with minimum not then it inserts '2' bits into '2' LSBs. Flowchart for entropy deviation of image fidelity resulting high quality stegno based data hide is shown in Fig 6. This method provides high image with better embedding capacity. Embedding and high level of image transparency.



Figure 4. S-Tools: Before embedding



Figure 5. S-Tools: After embedding

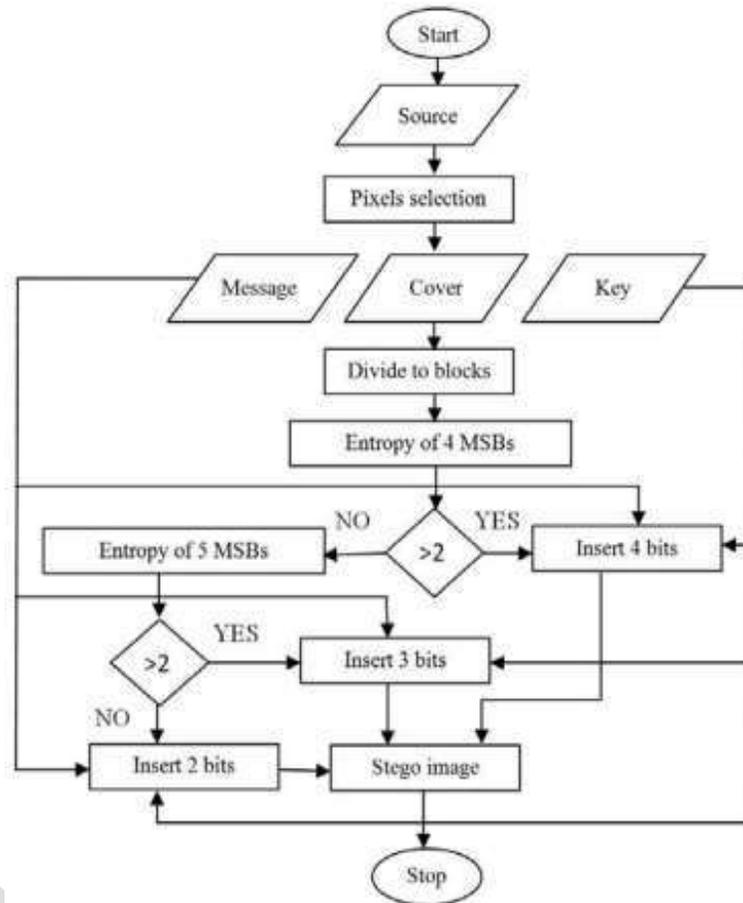


Figure 6. Entropy-based data hide

3. DATA HIDE TECHNIQUES IN FREQUENCY DOMAIN

Frequency domain methods hide messages in significant Areas of the cover-image which makes them more robust to attacks such as compression, cropping or image processing methods than LSB approach and moreover they remain imperceptible to the human sensory system as well. Many transform domain variations exist, one of which is discrete cosine transform (DCT). Some of the important frequency domain-based steganography data hide methods are:

3.1 J Steg, J Steg-Shell, JP Hide, and Out Guess

JSteg developed by Derek Upham^{25,26} sequentially replaces the LSB of the DCT coefficients with the message's data. This technique does not require a shared secret; as a result, anyone who knows the steganography system can retrieve the message easily, thus not so secure. JSteg-Shell is a windows user interface to JSteg developed by Korejwa²⁶. It supports encryption and compression of the content before embedding the data with JSteg. Both methods can be easily detected using χ^2 -test given by A. Westfield in 1999. JP Hide steganography system was given by Allan Latham²⁶. Two versions 0.3 and 0.5 are available. Version 0.5 supports additional compression of the secret message. As the DCT coefficients are not selected sequentially from the beginning of the image, JP Hide is not vulnerable to χ^2 test; however detected using its extended version²⁵.

Outguess was proposed by Provos^{25,26} as a response to the statistical tests given by Andreas Westfield. It improves embedding by selecting DCT coefficients randomly. Two versions are available: Outguess 0.13b which is vulnerable to extended version of χ^2 -test and Outguess 0.2 which has the ability to preserve frequency counts statistics and hence remain undetected. Provos observed that while embedding not all the redundant bits were used and thus it is possible to use the remaining bits to correct statistical deviations that embedding created. Outguess 0.2 uses this phenomenon to avoid class of 2 -tests. χ

3.2 Data Hide Techniques: F3, F4 and F5

F3 decrements the non-zero coefficient's absolute value only if the LSB does not match with the secret bit. Zero coefficients are skipped completely. Advantage is its 2-test). Major resistance to statistical attack (χ shortcomings are its less capacity, surplus of even coefficients caused by shrinking and repetitive embedding required since receiver cannot differentiate between skipped 0 and the 0 generated due to shrinkage. The F5 algorithm was introduced by German researchers

Pfitzmann and Westfeld²⁷. F5 embeds message bits into randomly-chosen DCT coefficients and employs matrix embedding that minimizes the necessary number of changes to embed a message of certain length. F5 comes after a series of F3 and F4. F5 is similar to F4 except of the fact that F4 does not use matrix encoding in embedding process. The major strengths of F5 are its high embedding capacity without sacrificing security and its resistance to statistical and visual attacks.

3.3 Genetic Algorithm-based Data Hide

Chang²⁸, *et al.* proposed a JPEG and quantization table Modification (JQTM) method that improves the standard JPEG quantization table for better quality of the stage-image. In this method only 26 middle frequency components of the quantized DCT coefficients for each block are used to hide the secret message. JQTM suffers with its low embedding capacity and low security level. Li and Wang²⁹ modified the quantization table used in JQTM and uses Particle swarm optimization³⁰ to approach optimal LSB substitution, which guarantees a higher security level and better quality for the cover images.

To further increase the embedding capacity of the JQTM, Fazli³¹, *et al.* modified quantization table proposed by Li and Wang. Fazli, *et al.* first transformed secret message using optimal substitution matrix calculated using PSO algorithm and then embed transformed results into the quantized coefficients. This technique differs from Li and Wang's method in the sense that in this substitution matrix is calculated for each 8 x 8 block of the cover-image instead of a single matrix for the whole cover-image. The great achievement of this method is a high security level, high embedding capacity, and high image quality as compared to the JQTM and Li and Wang's method.

In vector quantization (VQ)³², a block image is imported; the VQ encoder seeks the most similar code word from the codebook to substitute for the block and the index value is then exported as the compressed code for the block. Example of

VQ encoding is shown in the Fig 9. Side-match VQ (SMVQ), improving VQ compressing performance was proposed by Kim³³. In SMVQ instead of using the original pixels to encode the X block, Kim uses the upper U block and the left L block to encode the X block. SMVQ encoder is shown in Fig 10. Yang³⁴, *et al.* presented a reversible data hide scheme based on SMVQ for VQ compressed images. This method makes the corresponding code words in the current state codebook and the next state codebook close. Results show that Yang's scheme has higher capacity, better visual quality, and lower running time as compared to Chang's method³⁵.

Chang³⁶, *et al.* provided a VQ-based embedding method with high embedding capacity. In their method, a codebook is partitioned into clusters. Data are embedded into the VQ index table by transferring index values from one cluster into another cluster. Data hide schemes for VQ-compressed images are based on index modifications. These schemes may cause distortions and hence are not suitable for authentication of VQ compressed images. To overcome this limitation Jiafu³⁷, *et al.* proposed an image authentication scheme for VQ-compressed images. This scheme utilized an information.

4. Methodology (Design and implementation)

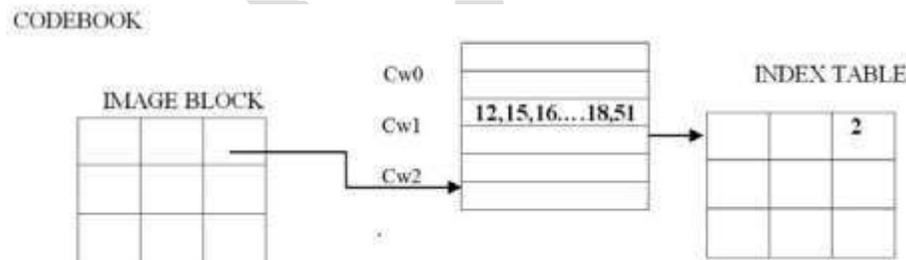


Figure 9. Example of VQ encoder

						U	
				U12	U13	U14	U15
		L3	X0	X1	X2	X3	
	L	L7	X4				
		L11	X8		X		
		L15	X12				

Figure 10. Example of SMVQ encoder.

Hide method based on covering codes³⁸. It only modifies few indices slightly to hide authentication information. Yang³⁹, *et al.* further increases the embedding capacity of VQ-based data hide scheme. Under the same sorted VQ codebook, the experimental results demonstrate that this data hide algorithm has higher capacities and better compression rates. For the VQ-based algorithms discussed above only limited amount of information can be hidden, to overcome this, Kekre⁴⁰, *et al.* proposed a method based which can achieve hide capacity of 100 per cent or more, that means secret message can be of same or more size than the cover image.

4.2 Data Hide in Block Truncation Coding

Xiaotian Wu⁴¹, *et al.* presented a technique of data hide Method by modifying the bitmaps generated from the block truncation coding (BTC) method given by Delp and Mitchell⁴². In the encoding phase of BTC, the original image is firstly divided into non-overlapping blocks with $n \times n$ pixels. For each block, the mean value is calculated. All the pixels in the block are separated into two groups, greater and smaller than or equal to the mean value. A bitmap with the same size of the block is used to record the output of the BTC compression. The bit in bitmap is set to 1 and classified to G1, when the corresponding pixel in the block is greater than the mean value; otherwise, it is set to 0 and classified to G0. Two mean values XH and XL are calculated, representing mean of pixel values in G1 and G0. Using this each block of the original image is compressed into a bitmap and two quantization levels, XH and XL. Wu uses BTC compression where each bit of the secret message is sequentially embedded into the bitmap of the corresponding compressed non-overlapping block. It results in higher imperceptivity.

4.3 Data Hide in Compressed Images Using Histogram Analysis

Keissarian⁴³ proposed a method that decomposes the host image into blocks of variable sizes according to histogram analysis of the block residuals. Variable block sizes are then encoded at different rates based on their visual activity levels. The key point is to embed majority of secreta data into smooth area of the image. Results confirmed that the proposed scheme can embed a large amount of data while maintaining satisfactory image quality. Keissarian⁴⁴ proposed further improvement in which the computation of the gray values, are carried out through analysis of the block residuals' histogram.

Experimental Results

Encryption Process

IMAGE FILE

INFORMATION FILE



BMP FILE



Decryption Process



INFO FILE

IMAGE FILE



5. CONCLUSION AND SUMMARY

This paper presented the recent research work in the Field of steganography deployed in spatial, transform, and compression domains of digital images. Transform domain techniques make changes in the frequency coefficients instead of manipulating the image pixels directly, thus distortion is kept at minimum level and that's why they are preferred over spatial domain techniques. But when it comes to embedding capacity, spatial domain techniques give better results. However, there exists a trade-off between the image quality and

the embedding capacity. Hide more data results directly into more distortion of the image. So the steganography technique deployed is dependent on the type of application it is designed for. In recent years, some researchers have concentrated on embedding secret data into the compression codes of images. Such need arises keeping in mind the bandwidth requirements.

Steganography can also be used misused like other technologies. For instance terrorists may use this technique for their secret secure communication or anti-virus systems can be fooled if viruses are transmitted in this way. However, it is evident that steganography has numerous useful applications and will remain the point of attraction for researchers.

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Design and Analysis of Metal Matrix Composite Connecting Rod

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Abstract-The connecting rod is the intermediate member between the piston and the Crankshaft. Its primary function is to transmit the push and pull from the piston pin to the crank pin, thus converting the reciprocating motion of the piston into rotary motion of the crank. Existing connecting rod is manufactured by using Carbon steel. This paper describes modeling and analysis of connecting rod. In this project connecting rod is replaced by Aluminum reinforced with Boron Silicide for Suzuki GS150R motorbike. A 2D drawing is drafted from the calculations. A parametric model of connecting rod is modelled using CATIA V5 software. Analysis is carried out by using ANSYS Workbench software. The best combination of parameters like Von misses stress and strain, Deformation, Factor of safety and weight reduction for two wheeler piston were done in ANSYS software. Compared to carbon steel, and aluminum boron carbide.

Keywords-Connecting rod, Static analysis, Carbon steel, Aluminum, Aluminum reinforced with Boron Silicide.

1. INTRODUCTION

The automobile engine connecting rod is a high volume production, critical component. It connects reciprocating piston to rotating crankshaft, transmitting the thrust of the piston to the crankshaft. Every vehicle that uses an internal combustion engine requires at least one connecting rod depending upon the number of cylinders in the engine. Fracture took place on the small head of the connecting rod. Multiple-origin fatigue fracture is the dominant failure mechanism of the fractured connecting rod [1]. High bolt assembly stress coupled with cycle stress during engine operations could cause the generation and extension of the cracks [2]. The spalling of connecting rod, crank pin and roller bearing is attributed to the high-localized interfacial pressure that developed due to the design of the web and flange of the connecting rod [3]. Now, with the acute competition the product quality and price, the aluminum alloy connecting rod of air compressor is being manufactured with advanced liquid die forging technology, replacing common hot die forging and it possessed higher practical useful value [4]. When predicting the critical buckling of connecting rod, complicated shape gradients and actual boundary conditions cannot be reflected in the conventional formula. Thus accurate elastic buckling stress must be calculated by FEA with the real shape and boundary conditions. The critical plastic stress should be taken as the increased yield strength by work hardening during rod forging; both elastic and plastic values are entered to give the buckling stress [5]. The engine collapse as a result of forming laps at the groove tops of on connecting rod bolt. To avoid future failures, some design improvements were suggested: design a flat bolt shank at the cap interface region to reduce stress concentration and increase of the assembly torque to reduce stress amplitude [6]. Numerical 3-D forming simulation is best suited for the quantitative analysis of local process variables, which enables to study the influence of these variables on local microstructure and mechanical properties both governing the performance of the whole component [7]. The thermal expansion behavior of the aluminium silicon carbide fiber reinforced composite relies on the thermal expansion of the fibers, and influenced by the onset of interfacial strength and residual stress state [8]. The production and wear properties of an in-situ boride particles/ Al-Cu composite have been studied. Aluminium boride particle reinforced composite was prepared by liquid reaction of Al-Cu matrix with boron oxide (B_2O_3) at 1400° C. The reinforcement concentration increased by a mechanical filtration of the matrix alloy following by holding at 1000° C for 1 h [9]. Static FEA of the connecting rod using the software and said optimization was performed to reduce weight. Weight can be reduced by changing the material of the current forged steel connecting rod to crackable forged steel (C70) [11]. Stress analysis of connecting rod by finite element method using pro-e wild fire 4.0 and ansys work bench software. And concluded that the stress induced in the small end of

the connecting rod are greater than the stresses induced at the bigger end, therefore the chances of failure of the connecting rod may be at the fillet section of both end [12].

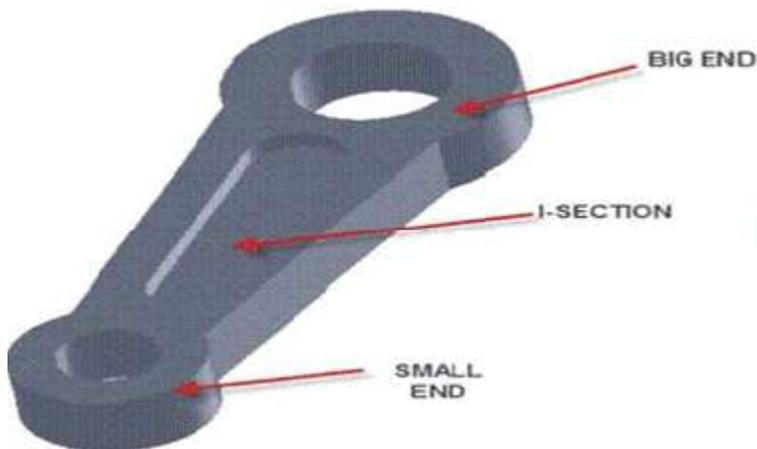


Fig 1: Schematic Diagram of Connecting Rod

2. SPECIFICATION OF THE PROBLEM

The objective of the present work is to design and analyses of connecting rod made of Aluminum LM25 alloy Reinforced with Boron Silicide. Steel and aluminum materials are used to design the connecting rod. In this project the material (carbon steel) of connecting rod replaced with Aluminum Reinforced with Boron carbide. Connecting rod was created in CATIA V5. Model is imported in ANSYS Workbench for analysis. After analysis a comparison is made between existing carbon steel and aluminum connecting rod viz., Aluminum Reinforced with Boron carbide in terms of weight, factor of safety, stiffness, deformation and stress

3. DESIGN OF CONNECTING ROD

A connecting rod is a machine member which is subjected to alternating direct compressive and tensile forces. Since the compressive forces are much higher than the tensile force, therefore the cross-section of the connecting rod is designed as a strut and the rankine formula is used.

A connecting rod subjected to an axial load W may buckle with x -axis as neutral axis in the plane of motion of the connecting rod, {or} y -axis is a neutral axis. The connecting rod is considered like both ends hinged for buckling about x -axis and both ends fixed for buckling about y -axis. A connecting rod should be equally strong in buckling about either axis.

According to rankine formulae

W_{cr} about x -axis

$$= [\sigma_c \times A] / (1 + a[l / K_{xx}]^2) = [\sigma_c \times A] / (1 + a[l / K_{xx}]^2) \quad [\because \text{for both ends hinged } L=l]$$

W_{cr} about y -axis

$$= [\sigma_c \times A] / (1 + a[l / K_{yy}]^2) = [\sigma_c \times A] / (1 + a[l / 2K_{yy}]^2) \quad [\because \text{for both ends fixed } L=l/2]$$

In order to have a connecting rod equally strong in buckling about both the axis, the buckling loads must be equal. i.e.

$$= [\sigma_c \times A] / (1 + a[l / K_{xx}]^2) = [\sigma_c \times A] / (1 + a[l / 2K_{yy}]^2) \quad [\text{or}]$$

$$[l / K_{xx}]^2 = [l / K_{yy}]^2$$

$$K_{xx}^2 = 4K_{yy}^2 \quad [\text{or}] \quad I_{xx} = 4I_{yy} \quad [\because I = A \times K^2]$$

This shows that the connecting rod is four times strong in buckling about y -axis than about x -axis. If $I_{xx} > 4I_{yy}$, Then buckling will occur about y -axis and if $I_{xx} < 4I_{yy}$, then buckling will occur about x -axis. In Actual practice I_{xx} is kept slightly less than $4I_{yy}$. It is usually taken between 3 and 3.5 and the Connecting rod is designed for buckling about x -axis. The design will always be satisfactory for buckling about y -axis. The most suitable section for the connecting rod is I-section with the proportions shown mfg.

Area of the cross section $= 2[4t \times t] + 3t \times t = 11t^2$

Moment of inertia about x -axis

$$I_{xx} = 1/12 [4t \{5t\}^3 - 3t \{3t\}^3] = 419/12 [t^4]$$

And moment of inertia about y -axis

$$I_{yy} = 2 \times 1/12 \times t \times \{4t\}^3 + 112 \{3t\}t^3 = 131/12 [t^4]$$

$$I_{xx}/I_{yy} = [419/12] \times [12/131]$$

$$= 3.2$$

Since the value of I_{xx}/I_{yy} lies between 3 and 3.5 therefore I-section chosen is quite satisfactory.

3.1 Design Calculations for Existing Connecting Rod

Thickness of flange & web of the section = t

Width of section B = $4t$

The standard dimension of I - SECTION.

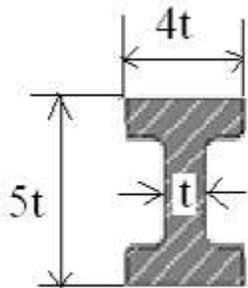


Fig2: Standard Dimension of I – Section

Height of section $H = 5t$

Area of section $A = 2(4t \times t) + 3t \times t$

$$A = 11t^2$$

Moment of inertia about x-axis

$$I_{xx} = 1/12 [4t \{5t\}^3 - 3t \{3t\}^3]$$

$$= 419/12[t^4]$$

And moment of inertia about y-axis

$$I_{yy} = 2 \times 1/12 \times t \times \{4t\}^3 + 112 \{3t\}t^3$$

$$= 131/12[t^4]$$

$$I_{xx}/I_{yy} = [419/12] \times [12/131]$$

$$= 3.2$$

Length of connecting rod (L) = 2 times the stroke

$$L = 117.2 \text{ mm}$$

Buckling load W_B = maximum gas force \times F.O.S

$$W_B = (\sigma_c \times A) / (1 + a (L/K_{xx})^2)$$

$$= 37663 \text{ N}$$

σ_c = compressive yield stress

$$= 415 \text{ MPa}$$

$$K_{xx} = I_{xx} / A \times t$$

$$K_{xx} = 1.78t$$

$$a = \sigma_c / \pi^2 E$$

$$a = 0.0002$$

By substituting σ_c , A , a , L , K_{xx} on W_B then

$$4565t^4 - 37663t^2 - 81639.46 = 0$$

$$t^2 = 10.03$$

$$t = 3.167 \text{ mm}$$

$$t = 3.2 \text{ mm}$$

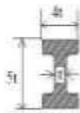
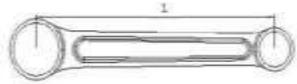
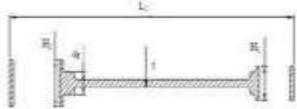
Width of section $B = 4t$
 $= 4 \times 3.2$
 $= \mathbf{12.8mm}$

Height of section $H = 5t$
 $= 5 \times 3.2$
 $= \mathbf{16mm}$

Area $A = 11t^2$
 $= 11 \times 3.2 \times 3.2$
 $= \mathbf{112.64mm^2}$

Height at the big end (crank end) $H_2 = 1.1H$ to $1.25H$
 $= 1.1 \times 16$
 $H_2 = \mathbf{17.6mm}$

Height at the small end (piston end)
 $H_1 = 0.9H$ to $0.75H$
 $H_1 = \mathbf{12mm}$



Stroke length (l) $= \mathbf{117.2mm}$
 Diameter of piston (D) $= \mathbf{57mm}$
 P $= \mathbf{15.5N/mm^2}$

Radius of crank (r) $= \text{stroke length} / 2$
 $= 117.2 / 2$
 $= \mathbf{58.6}$

Maximum force on the piston due to pressure
 $F_p = \pi/4 \times D^2 \times P$
 $= \pi/4 \times (57)^2 \times 15.469$
 $= \mathbf{39473.16N}$

Maximum angular speed
 $W_{max} = [2\pi N_{max}] / 60$
 $= [2\pi \times 8500] / 60$
 $= \mathbf{768 \text{ rad/sec}}$

Ratio of the length of connecting rod to the radius of crank
 $N = l / r$
 $= 117.2 / (58.6)$
 $= \mathbf{3.8}$

Maximum Inertia force of reciprocating parts

$$F_i = Mr (W_{max}) 2 r (\cos\theta + \cos 2\theta) \text{ (Or)}$$

$$F_i = Mr (W_{max}) 2 r (1 + 1/n)$$

$$= 0.11 \times (768)^2 \times (0.0293) \times (1 + (1/3.8))$$

$$F_i = \mathbf{2376.26N}$$

Inner diameter of the small end

$$d_1 = F_g / P_{b1} \times l_1$$

$$= 6277.167 / (12.5 \times 1.5 d_1)$$

$$= \mathbf{17.94mm}$$

Where,

Design bearing pressure for small end

$$p_{b1} = 12.5 \text{ to } 15.4 \text{ N/mm}^2$$

Length of the piston pin

$$l_1 = (1.5 \text{ to } 2) d_1$$

Outer diameter of the small end

$$= d_1 + 2t_b + 2t_m$$

$$= 17.94 + [2 \times 2] + [2 \times 5]$$

$$= \mathbf{31.94mm}$$

Where,

Thickness of the bush (t_b) = 2 to 5 mm

Marginal thickness (t_m) = 5 to 15 mm

Inner diameter of the big end

$$d_2 = F_g / (P_{b2} \times l_2)$$

$$= 6277.167 / (10.8 \times 1.0 d_2)$$

$$= \mathbf{23.88mm}$$

Where,

Design bearing pressure for big end

$$p_{b2} = 10.8 \text{ to } 12.6 \text{ N/mm}^2$$

Length of the crank pin $l_2 = (1.0 \text{ to } 1.25) d_2$

$$\text{Root diameter of the bolt} = (2F_i / (\pi \times S_t))^{0.5}$$

$$= (2 \times 6277.167)^{0.5} / (\pi \times 56.667)^{0.5}$$

$$= \mathbf{4mm}$$

$$\text{Outer diameter of the big end} = d_2 + 2t_b + 2d_b + 2t_m$$

$$= 23.88 + 2 \times 2 + 2 \times 4 + 2 \times 5$$

$$= \mathbf{47.72mm}$$

Where,

Thickness of the bush [t_b] = 2 to 5 mm

Marginal thickness [t_m] = 5 to 15 mm

Nominal diameter of bolt [d_b] = 1.2 x root diameter of the bolt
= 1.2 x 4

$$= \mathbf{4.8mm}$$

3.2 Specifications of connecting rod

S.NO	SPECIFICATIONS OF THE CONNECTING ROD	MEASUREMENTS(mm)	
		CARBON C40 STEEL	ALUMINIUM BORON SILICIDE
1	Thickness of the connecting rod (t)	3.2	3.56
2	Width of the section (B = 4t)	12.8	14.24
3	Height of the section(H = 5t)	16	17.8
4	Height at the big end $H_2 = (1.1 \text{ to } 1.125)H$	17.6	19.58
5	Height at the small end $H_1 = 0.9H \text{ to } 0.75H$	14.4	16.02
6	Inner diameter of the small end	17.94	
7	Outer diameter of the small end	31.94	
8	Inner diameter of the big end	23.88	
9	Outer diameter of the big end	47.72	

Table 1 : Specifications of connecting rod

4.MODELLING OF CONNECTING ROD

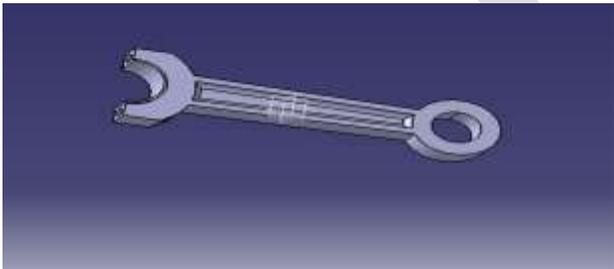


Fig 3:Connecting rod stem(steel)



Fig4 : Connecting rod Head(steel)



Fig 5: Connecting rod bolt

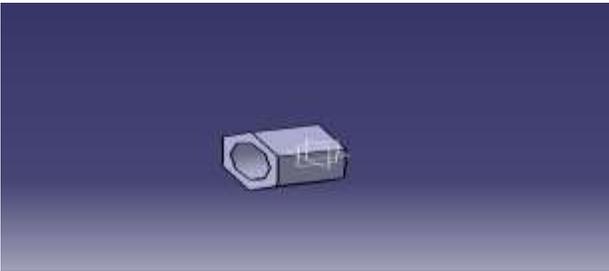


Fig 6: Connecting rod nut

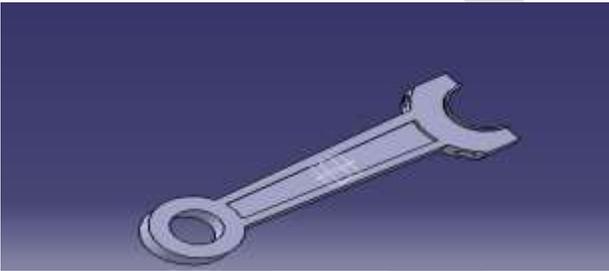


Fig7 : Connecting rod stem (Al b₄si)

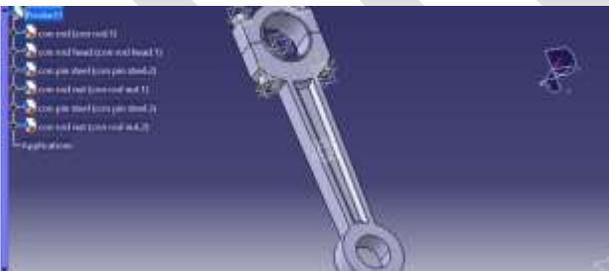


Fig 8: Connecting rod assembly

5.RESULTS AND DISCUSSIONS

5.1 Analysis of connecting rod

For the finite element analysis 15.5 Mpa of pressure is used. The analysis is carried out using ANSYS software. The pressure is applied at the small end of connecting rod keeping big end fixed. The maximum and minimum vonmises stress, strain, displacement and frequency are noted from the ANSYS

S.No	Material	Deformation (mm)	Von misses Stress (Mpa)		Elastic Strain
			Max	Min	
1	Carbon steel	0.01495	79.399	7.79e ⁻⁵	3.97e ⁻⁴
2	Aluminium Boron silicide	0.0155	61.383	3.9e ⁻⁴	3.507e ⁻⁴

Table 2 :Deformation, Von-mises stress and Elastic strain for different materials

5.2 Material properties used for analysis

S.NO	PARAMETERS	CARBON STEEL (C40)	ALUMINIUM BORON SILICIDE
1	Ultimate tensile strength(Mpa)	620	452
2	Yield strength(Mpa)	415	363
3	Endurance strength(Mpa)	310	226
4	Youngs modulus(Gpa)	200	70
5	Poisson ratio	0.33	0.33
6	Density(g/cm ³)	7.85	2.661

Table 3: Material properties of carbon c40 steel and Aluminium boron silicide

5.3 Analysis of carbon steel connecting rod

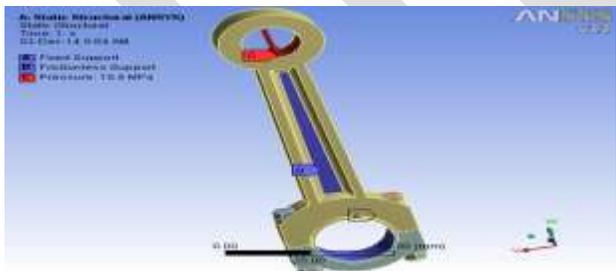


Fig 9: supports and pressure applied

Fixed support applied at big (crank) end and frictionless support applied at small(piston) end. Pressure of 15.5Mpa applied downwards at piston end

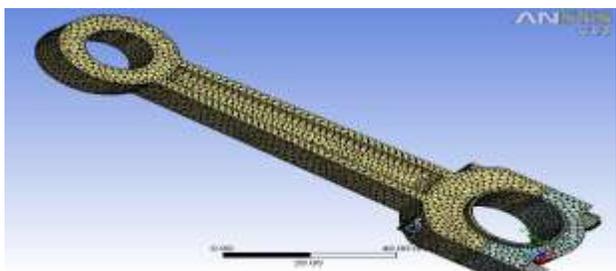


Fig10: Meshed model of connecting rod

Type	Tetrahedral
Nodes	65530
No of elements	35507

Table 4 : Nodes and Element type of meshed model of connecting rod

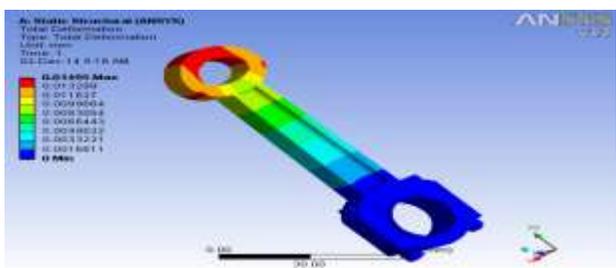


Fig 11 : Deformed model of connecting rod

High deformation occurs at piston end of 0.01495 mm and slowly reduces to get minimum at crank end

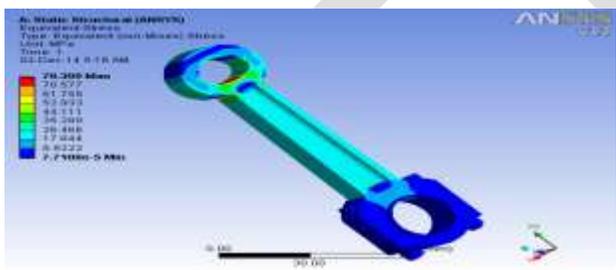


Fig12: Von misses stress on connecting rod

High von-misses stress occurs at piston end of 79.399 Mpa and slowly reduces to get minimum $7.7108e^{-5}$ crank end

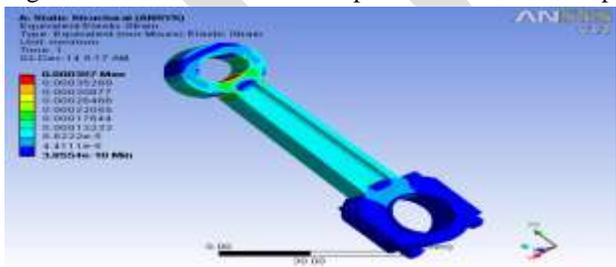


Fig 13: Elastic strain on connecting rod

High strain occurs at piston end of 0.000397 and slowly reduces to get minimum $3.8554e^{-10}$ at crank end

5.4 Analysis of Aluminium boron silicide connecting rod

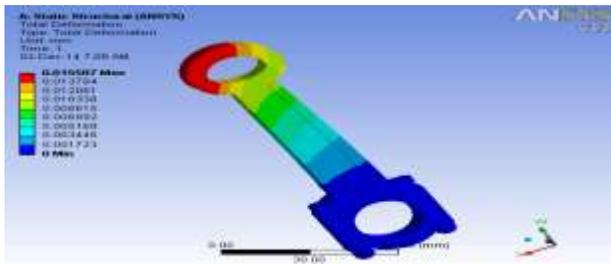


Fig 14: Deformation of connecting rod

High deformation occurs at piston end of 0.0155 mm and slowly reduces to get minimum at crank end

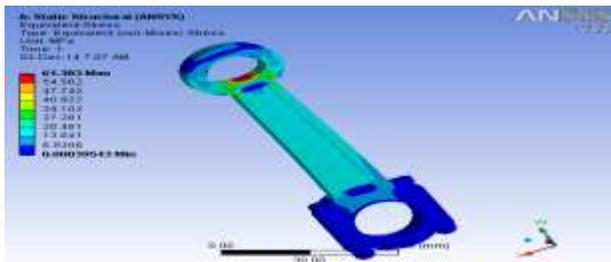


Fig 15: Von misses stress on connecting rod

High von-misses stress occurs at piston end of 61.383 Mpa and slowly reduces to get minimum $3.9543e^{-4}$ crank end

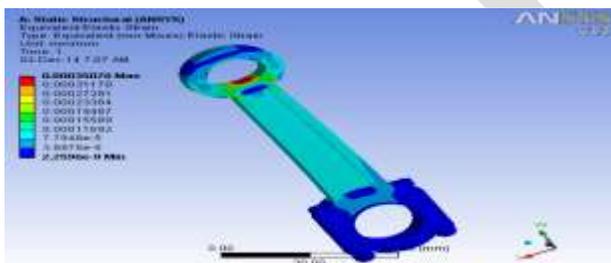


Fig 16: Elastic strain on connecting rod

High strain occurs at piston end of 0.00035076 and slowly reduces to get minimum $2.2596e^{-9}$ at crank end

5.5 Calculation for factor of safety of connecting rod

f.s = factor of safety

σ_m = mean stress

σ_y = yield stress

σ_v = variable stress

σ_e = endurance stress

$$(1 / f.s) = (\sigma_m / \sigma_y) + (\sigma_v / \sigma_e)$$

For Carbon Steel (C40)

$$\sigma_{\max} = 79.399 \text{ Mpa} \quad \sigma_{\min} = 7.7108 \times 10^{-5} \text{ Mpa}$$

$$\sigma_m = (\sigma_{\max} + \sigma_{\min})/2 = 39.699$$

$$\sigma_y = 415 \text{ Mpa}$$

$$\sigma_v = (\sigma_{\max} - \sigma_{\min})/2 = 39.699$$

$$\sigma_e = 310$$

$$1 / \text{F.S} = 0.223$$

$$= 4.469$$

Factor of safety [F.S]= 4.469

$$N = 1000 (S_f/0.92\sigma_u)^{3/\log(\sigma_e/0.9\sigma_u)}$$

$$= 7046.303 \times 10^3 \text{ cycles}$$

Where, $S_f = \frac{f \cdot \sigma_{yy}}{1 - f \cdot \sigma_m / \sigma_u}$

$$= 248.51 \text{ Mpa}$$

For Aluminium boron silicide

$$\sigma_{\max} = 61.38 \text{ Mpa} \quad \sigma_{\min} = 3.981 \times 10^{-4} \text{ Mpa}$$

$$\sigma_m = (\sigma_{\max} + \sigma_{\min})/2 = 30.69$$

$$\sigma_y = 415 \text{ Mpa}$$

$$\sigma_v = (\sigma_{\max} - \sigma_{\min})/2 = 30.69$$

$$\sigma_e = 310$$

$$1 / \text{F.S} = 0.220$$

$$= 4.538$$

Factor of safety [F.S]= 4.538

$$N = 1000 (S_f/0.92\sigma_u)^{3/\log(\sigma_e/0.9\sigma_u)}$$

$$= 2095 \times 10^4 \text{ cycles}$$

Where, $S_f = \frac{f \cdot \sigma_{yy}}{1 - f \cdot \sigma_m / \sigma_u}$

$$= 201.31 \text{ Mpa}$$

5.6 Calculation for Weight

For Carbon Steel:

$$\text{Density of carbon steel} = 7.7 \times 10^{-6} \text{ kg/mm}^3$$

Volume = 41050 mm³
 Deformation = 0.01495 mm
 Weight of forged steel = volume × density
 = 41050 × 7.7 × 10⁻⁶
 = 0.31 kg

For Aluminium boron silicide

Density of carbon steel = 2.637 × 10⁻³ kg/mm³
 Volume = 57472.72 mm³
 Deformation = 0.0155 mm
 Weight of forged steel = volume × density
 = 57472.72 × 2.637 × 10⁻³
 = 0.151 kg

S.NO	MATERIAL	FATIGUE LIFE (N)	WEIGHT kg
1	Carbon steel	7046.36 × 10 ³ cycles	0.31
2	Aluminium boron silicide	2095 × 10 ⁴ cycles	0.151

Table 5: Comparison of Fatigue Life and Weight between Carbon steel and Aluminium boron silicide

6.CONCLUSION

ANSYS Equivalent stress for the both the materials are almost same. For the Aluminium boron silicide metal matrix composite material factor of safety (from Soderberg’s) is increased compared to existing carbon steel. Weight can be reduced by changing the material of existing carbon steel connecting rod into Aluminium boron silicide metal matrix composite connecting rod. And also no. of cycles for Aluminium boron silicide (2095 × 10⁴) is more than the existing carbon steel connecting rod (7046.36 × 10³). When compared to both of the materials, Carbon steel is cheaper than the existing connecting rod material

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Masking of Data For ERP Test Environment

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Abstract— Since the last few years, many companies are migrating their posting on cloud-based solution, thus increasing the access to confidential data like personal information, payroll data, customer-information, etc. to hosting provider team. Also even in case of in-house hosting, development has access to testing/development server which is cloned copy of Production to be sent to Non-production. It's very critical to help companies to secure their data by means of Scrambling/Masking data so that development and hosting team can continue to work without really having access to real data. There is a need to develop application that is scalable and cost effective and help clients secure their data. We have suggested various ways of masking data in such a way that the masking preserves the format and consistency of data by enabling data privacy.

Keywords — Confidential Data, Non-Production, Scrambling, Masking, Testing, Data Privacy, Substitution.

INTRODUCTION

Data masking enables organizations to generate realistic and fully functional data with similar characteristics as the original data to replace sensitive or confidential data. This contrasts with encryption or Virtual Private Database, which simply hides data instead of masking it, and the original data, can be retrieved with the appropriate access or key after encryption. Data masking does not allow the original sensitive data to be retrieved or accessed. Names, addresses, phone numbers, social security number and credit card details are examples of data that require protection of the information content from inappropriate and unauthorized visibility. Live production database environments contain valuable and confidential information—access to this information is tightly controlled and highly restricted. However, each production system usually has cloned development copies, and the restrictions on such test environments are less stringent. This greatly increases the possibility that the data might be used inappropriately for personal gains. Data masking can modify sensitive databases records so that they remain usable for testing, but do not contain important confidential or personally identifiable information which causes privacy concerns. Yet, the masked data used for testing resembles the original in appearance to ensure the integrity of the application [1].

Companies and agencies of all types can gather, store, and process large amount of data. Improving business process using analytical and data mining tools to retrieve information from the data is the primary objective of gathering such data. Organizations run the risk of compromising sensitive information when copying Production data in to Non-Production environments for the purposes of application development, testing, or data analysis [4]. Data Masking helps reduce this risk by irreversibly replacing the original sensitive data with fictitious data so that production data can be shared safely for use in non-production environment. An increasing

number of enterprises are depending on data masking to actively secure organizational data, ameliorate data security measures and lower costs associated with data breach. Data masking protects data by de-identifying sensitive information contained in non-production environments and enables enterprises to extend their traditional security platforms. It masks sensitive or confidential data so that it can be replicated safely to non-production systems. Using previously built or customized complex masking techniques; IT organizations can safeguard the original information characteristics (data types, formats, etc.) and maintain data and referential integrity. For application development and testing realistic data is required. Usually, development teams are given copies of production environment databases that are created using internally developed scripting. However this method is not fully secure since real data with sensitive information could fall in wrong hands [3]. While testing an online banking system, application tester can manipulate customer records and as a result can view names, addresses, social security numbers, phone numbers and other private information of individual causing great security and privacy concerns.

Architecture

Contrary to the proposed system, the architecture of the project is rather less complex, although there is ample scope for improvement and extension to each and every module associated with the same.

There can be various phases derived out in order to get the basic idea behind the Architecture as follows :-

- A. Authentication
- B. Fetching
- C. Algorithm Execution
- D. Delivery

A. Authentication

Authentication is the process by which it is ensured that the person or system requesting access to a piece of information has valid authority to access it. In private and public computer networks (including the Internet) this method is used. A basic username-password system is provided for authenticating the user and letting him enter into the system.

B. Fetching

A successful authentication paves way for fetching of all the tables in the database. On the whole, tables get fetched for selection in order to get them a valid participation in the next phases, listing the tables along with their key relations (e.g.: Foreign key).

C. Algorithm Execution

Once the user scrambles / masks the specified table or even rows / columns, the algorithm fed to the system gets triggered and the data is manipulated for further use.

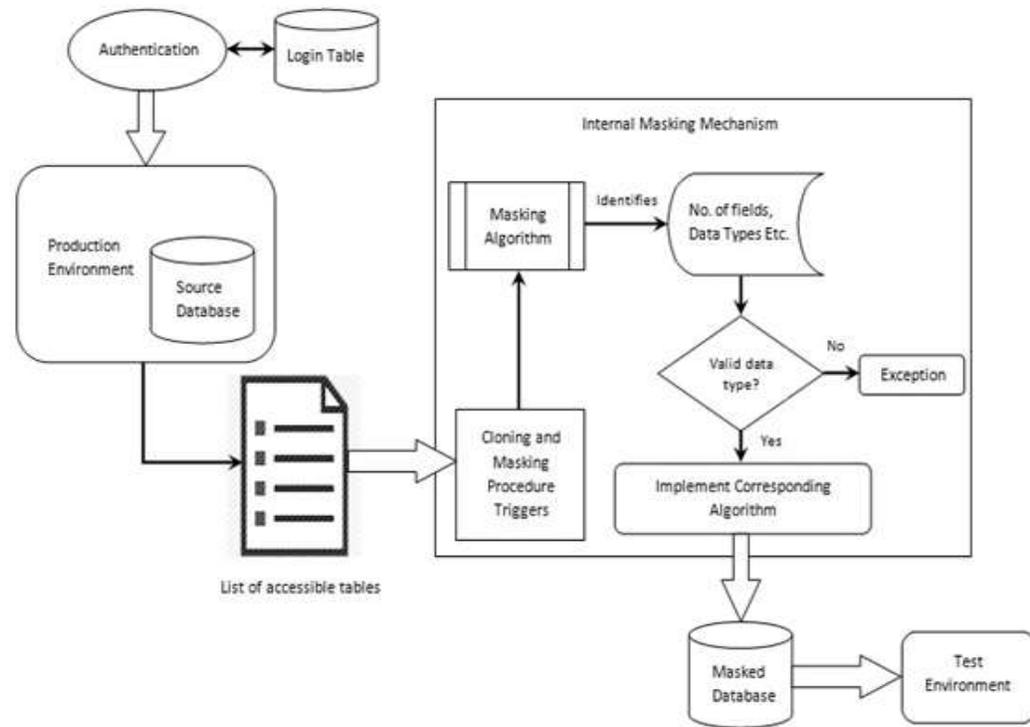


Fig. 1 : System Architecture

Fig. 1 System Architecture

D. Delivery

Finally, the Masked Database is sent to the Test Environment, which may then implement various new developmental and analytical processes with data (masked) in hand as good as original data without compromising the security.

Different types of Data Masking Techniques

A. Substitution

Substitution is one of the most effective methods of applying data masking and being able to preserve the authentic look and feel of the data records. Substitution is the technique used to cover or mask original values with a exact substitute for it. Substitution is used for encryption of data where there is a need for providing the user with such data that looks authentic but is not useful to him. Using substitution various data and data types can be altered. It is very much similar to encrypting data with an old encryption cipher. There are various methods of substitution which can be used based on provided circumstances. This technique can be used in places with large customer information or in a banking system that stores values regarding client's transactions [1]. The example of such a system can be of a table in database having customer records with the customer's name, last name and sex provided, by using substitution we can replace the first few characters of names of male customers with particular character and do the same with the first few characters of the female customer's name. Substitution can be done on various database fields like zip code, salaries, social security number and even for addresses [15].

B. Shuffling

Shuffling is a data obfuscation technique that derives a new value for the current set of value by replacing it with the values that are being masked in the column. Though data shuffling is somewhat similar to substitution it has different approach to masking the data. But it is much easier to gain knowledge about the original information by placing a particular scenario on the data set. It will also be a cause of concern if the original algorithm for ciphering the shuffle of data is deciphered. The shuffling technique has some real advantages over substitution in certain scenarios where there are certain requirements for mask to be provided in such a way that it affects only required fields of data [4]. Example of shuffling can be of a social security number which has 111-222-888 format before shuffling and after shuffling it can become 888-111-222.

C. Encryption

Broadly, speaking there are three types of cryptographic algorithms: secret key algorithms, public key algorithms and hashing algorithm. Secret key algorithms are symmetric in the sense that both participants in the communication share a single key. In contrast to a pair of participants having a private key that is shared with no one else, a public key is published so it is known to everyone. In case of data masking we can apply encryption on the data in the fields by using any of the available encryption techniques. There are various standardized algorithms which can be used while applying masking operation. The various encryption algorithms are DES, MD5, SHA, 3DES, etc. [13]. Use of these algorithms help in masking of the data in a highly secured manner as these algorithms apply many iterations of encryption on the data.

D. Number and Date variance

Numeric and date variance technique can be used to mask various numeric and date related field in the table which are of importance. The numeric and date variance can be used to make the date or a numeric value seem different from its original value [1]. If the numeric variance is applied on a salary column for a +20/-20 variance then the data obtained is still useful for the range of salaries that are paid to the employees and can still be used for testing applications. The same can be done on a field having dates where one can increase or the decrease the current date by +40/-40 days for masking. This can prevent anyone with improper authorization from viewing correct salaries or date of birth of other recipients.

E. Nulling out or Deletion

Another technique for masking data is use of null and deletion operation. Though the null value prevents anyone from viewing important data but it certainly fails the requirements of the data used for testing. The nulling out method is generally used on fields which are either highly important or are too complicated to mask. Another problem with nulling is that it exposes to anyone who wishes to penetrate the system that masking has been applied on the dataset. Deletion is the other method for masking though it is very rarely applied.

Methodology

Scrambling/Masking of sensitive and confidential data requires an extensive research on zeroing upon a single strategy. The most common yet effective approach is discussed as follows using fig 2. :

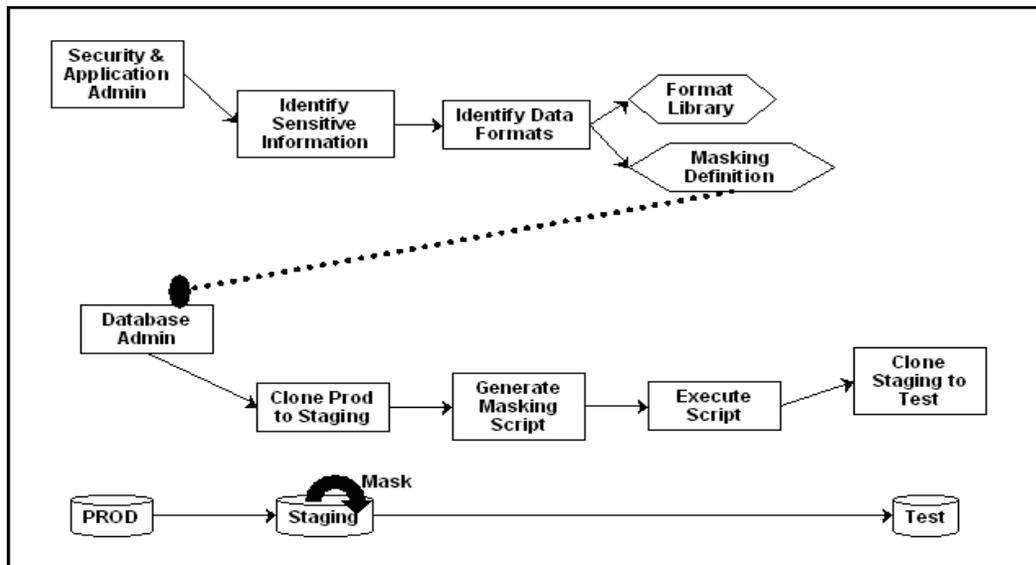


Fig 2. Data Masking Methodology

1. Security and Application Administrator carries out tasks such as Authentication, Firewall Protection, etc.
2. Sensitive Information is identified and selected for masking by the user.
3. Data Formats / Contents are modified with the use of Format Library and Masking Definition.
4. Database Administrator surveys the output and surveillance is carried out for clone production from Live Production environment.
5. Masking Script is generated in case DBA or any concerned authority requires decryption or de-masking algorithm provided secrecy of confidential information.
6. Script is executed on clone data, which is the most important step.
7. Cloned data is provided to the Test Environment for Test and Development purpose.
8. Masked data is used by this environment to carry out developmental tasks.

Result

Production Environment, with the help of the proposed Data Scrambling/Masking application, masks the cloned data and this data is sent to the Non-Production Environment which in a way, does two things; Format and data confidentiality, both get preserved at the same time. Plus the Non-production environment can make changes to the as-good-as-original data and test, develop and analyze new modules to it.

Conclusion

Summarizing the discussed points as a whole, we can say that Data Security is the need of the hour and to achieve it in an ERP system which requires a good stability involves various databases and relationships, we can conclude that Intra-Enterprise data transfers must have secure Scrambling and Masking Systems in order to emphasize confidentiality and security in the company. The system discussed is a primitive version of what can be extended as a whole for a large-scale ERP system and can be thought of as a feasible (cost-effective and labor-saving) option for Data Masking.

Thus, with incremental support and extension to the said module, this tool has the ability to serve as an ERP companion for data masking and scrambling during interaction of Database with Test Environment.

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Modeling of Driver Behaviour Recognition and Prediction using Dynamic Bayesian Network

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Abstract— With the numbers of vehicles increasing, the numbers of road accidents which are causing fatalities are also increasing. So human lives are lost and thus cause instability in their family and the organization in which they work. This paper focuses on recognizing the behaviour by observing the driver's facial gestures and predicts a context aware system architecture which is proposed to collect the information related to the driver's behaviour to detect the abnormal behaviour among the drivers. Dynamic Bayesian network is used to capture static and dynamic aspects related to the behaviour of driver which leads to accurate detection of behaviour.

Keywords— Dynamic Bayesian Network, Driver-behaviour, safety, Reckless behaviour, Fatigue, Normal Behaviour

INTRODUCTION

At the present time, large number of people are using cars and private vehicles. The biggest concern regarding the increased use of private transport is the rising number of deaths that is occurring as a result of accidents on the roads; the associated expense and related dangers have been recognized as a serious problem that is being confronted by modern society. According to the U.K. Department of Transport's report for road casualties in Great Britain for the first quarter of 2011, there were 24 770 people killed or seriously injured due to road accidents. This number represents a small decrease of 5%, as compared with the previous 12 mo period [1]. Driver errors due to being affected by fatigue, being drunk, or being reckless are the main factors responsible for most road accidents. Many researchers have been working in the area of driver monitoring and detection over recent decades; therefore, multiple systems have been proposed to monitor and detect the status of drivers. Some researchers have tried to monitor the behavior of the vehicle or the driver in isolation, whereas others have focused on monitoring a combination of the driver, the vehicle, and the environment, to detect the status of the driver in an attempt to prevent road accidents. However, there is still no comprehensive system that can effectively monitor the behavior of a driver, the vehicle's state, and environmental changes to perform effective reasoning regarding uncertain contextual information (driver's behavior). In this paper, we propose a context-aware architecture for a driver behavior detection system that can detect four types of driving behavior in real-time driving: normal, fatigued, drunk, and reckless driving. It will then alert the driver by operating in vehicle alarms and sending corrective action, respectively. The functionality of the architecture is divided into three phases, which are the sensing, reasoning, and acting phases. In the sensing phase, the system collects information about the driver, the vehicle's state, and environmental changes. The reasoning phase is responsible for performing reasoning about uncertain contextual information to deduce the behavior of the driver. The behavior of the driver is considered as an uncertain context (high-level contextual information); therefore, effective reasoning techniques about uncertain contextual information must be performed. Driver behavior is developed over the course of driving; therefore, we have designed a dynamic Bayesian network (DBN) model to perform a probabilistic reasoning to infer the behavior of the driver. You can put the page in this format as it is and do not change any of this properties. You can copy and past here and format accordingly to the default front. It will be easy and time consuming for you.

A. Related Work

Several researchers have examined the development of driver monitoring and detection systems using range of methods. Some have attempted to measure the driver's state or the vehicle's behavior to detect fatigued and drunk drivers. Meanwhile, other researchers have tried to monitor the driver, the vehicle, and the environment to detect the state of the driver. The main studies are summarized in the following. In [5], the focus of the paper was on building a context-aware smart car by developing a hierarchical model that is able to collect, to reason about, and to react to contextual information about the driver, the vehicle, and the environment, providing a safe and comfortable driving environment. However, this system is restricted to warning the driver and controlling the vehicle and does not warn other vehicles on road by sending warning messages. In [6], a context-aware system is proposed that is used to collect and analyze contextual information about the driver, the vehicle, and the environment in real-time driving. It also collects information from questionnaires completed by the drivers to create driving situations. The Bayesian network is used to reason about this contextual information, which is relatively uncertain information, by using a learning process to observe and predict the future behavior of the driver. The system was able to predict the future behavior of the driver and cannot detect the current state of the driver and warn other vehicles on the road. In [7]–[9], the detection of the fatigue level of the driver using a video camera to extract different cues such as eye state, eyelid movement, gaze movement, head movement, and facial expression is attempted to measure the fatigue level and warn the driver

via in-vehicle alarms. In [10], a program that works on a mobile phone and that contains an accelerometer and orientation sensors placed in the vehicle to detect a drunk driver in real time is developed. The program compares current accelerations with typical drunk driving patterns. When the program indicates that the driver is influenced by alcohol, warning messages are generated to alert the driver, and a message is sent to inform police. In [11], a drunk and drowsy driver detection system combining breath and alcohol sensors in a single device is developed. This device is able to measure the degree of alertness of the driver to detect charged water clusters in the driver's breath to detect the presence of alcohol using breath and alcohol sensors. In [12], a system for drowsy driver detection in real-time driving by collecting information about the driver's behavior, such as the speed of the vehicle, the vehicle's lateral position, the yawing angle, the steering wheel angle, and the vehicle's lane position is proposed. Their system uses artificial neural networks to combine different indications of drowsiness and to predict whether a driver is drowsy and to issue a warning if required. In [13], a noncontact system to prevent driver drowsiness by detecting the eyes of the driver and checking whether they are opened or closed using a charged-coupled device (CCD) camera has been developed. The system is based on capturing the face of the driver and on using image processing techniques to check if the eyes are closed for long intervals.

If the eyes are closed, the driver is drowsy, and the system will issue a warning to the driver. The driver behavior detection systems described earlier focus on the detection of driver's status (drunk, affected by fatigue, drowsy) by monitoring the driver or the vehicle and by issuing warning messages to the driver to prevent road accidents. While these systems have achieved good results in terms of improving road safety, they are limited to alerting the driver or controlling the vehicle itself. Moreover, they have not considered the behavior of the driver as a high-level context (uncertain context). This paper attempts to construct a comprehensive system that is able to detect normal and abnormal driving behavior using a context-aware system to collect and analyze contextual information about the driver, the vehicle's state, and environmental changes and to perform reasoning about certain and uncertain contexts. The driver and other vehicles are then alerted by operating an in-vehicle alarm and by sending warning messages containing corrective actions via wireless technology provided by VANETs, thus providing a flexible yet more accurate proactive driver behavior detection system.

B. Overview of Driver Behaviour

The behavior of the driver can be represented as follows:

$$B = \{St=1, St=2, \dots, St=n\}$$

where B is the behavior of the driver, S is the state, and t is the time. The states of the driver were classified into four classes: normal driving Sn , drunk driving Sd , fatigued driving Sf , and reckless driving Sr . As defined, each state may be characterized by capturing observable context C . The state may be referred to as:

$$(St=i) = \{C1, C2, C3, \dots, Ck\}.$$

In conclusion, the behavior of the driver is considered as the current unobservable state $St=i$ that can be characterized by capturing a set of observable context Cj , where $St=i$ is the state at time = i , and Cj is the context that need to be captured to characterize the state. Based on the previous definitions [15]–[23] of the driving behavior, we have defined four categories of driving behavior. 1) Normal behavior: Behavior is considered to be normal when driver concentrates on the driving task. This can be characterized by controlling the speed of the vehicle, avoiding sudden acceleration, driving without alcohol intoxication, maintaining a proper position between lane markers, and the driver having his or her eyes open while driving. When the driver matches the aforementioned criteria, behavior is considered normal.

2) Drunk behavior: This refers to driving while intoxicated by alcohol and is characterized by a set of observable actions such as sudden acceleration, driving without maintaining the proper lane position, driving with out controlling the speed, and usually having closed eyes for more than 80% for a period of time.

3) Fatigue Behavior: In [24], fatigue is defined as an evolving process that increase during driving and is associated with a loss of effectiveness in driving. In [24]–[26], it is stated that a driver driving after a period of 17 h with no sleep behaves exactly as a driver who has 0.05% intoxication of alcohol. A driver driving after a period of 24 h with no sleep behaves exactly as one who has 0.1% intoxication of alcohol. Based on this argument, fatigue driving was defined as driving that exhibits the same characteristics as drunk driving but without alcohol intoxication in the driver's blood. 4) Reckless behavior: The reckless driver is defined as a driver who drives at high speed and a high degree of acceleration and puts other traffic participants at risk. The driver is classified as driving in this category when there is no alcohol intoxication and the driver's eyes are opened, but the following behaviors are exhibited: driving with sudden acceleration, not maintaining the proper lane position, and not controlling the vehicle's speed.

C. Flowchart

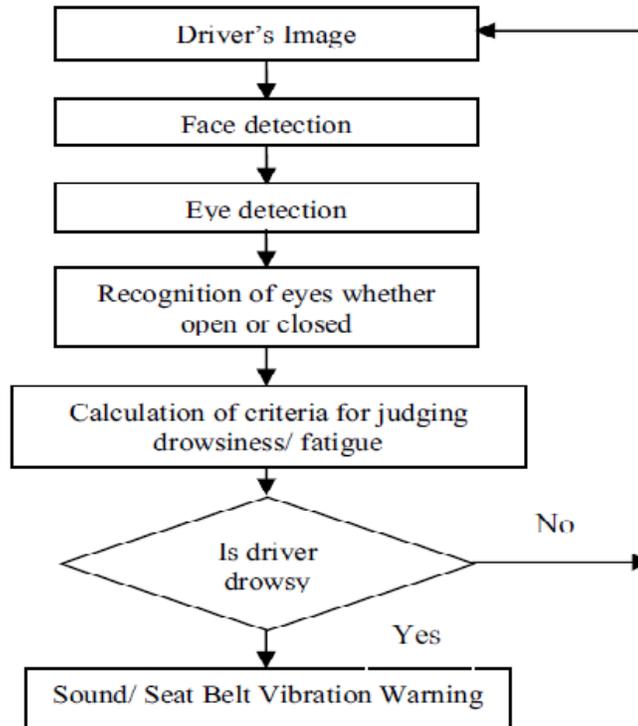


Fig 1. Eye Tracking System

This system will detect a driver fatigue by processing of eye region as shown in flow chart in Fig.1. After image acquisition, face detection is the first stage of processing. Then symptoms of hypo-vigilance are extracted from the eyes. If eyes are blinking normally no warning is issued but when the eyes are closed for more than half second this system issues warning to the driver in form of alarm and vibration.

PROPOSED SYSTEM

Firstly the face will be detected with the help of camera This is the process of gathering the contextual information which is done by sensors. Then reasoning is done by a subsystem. This level employs the extraction of the situation of the driver and calculates the parameters. And finally the detection part is performed which is done by Bayesian network. As stated previously in the definition driver behavior, this refers to a transition between a set of states during the course of driving. For example, the alcohol level in the driver's blood may be low at the beginning of the driving but will become higher if the driver is drinking while driving; the level of fatigue may also increase during driving. This fact indicates that, in addition to the observable context at the current time slice, the driver's state at the previous time slice is also considered an indicator for the state at the current time slice.

CONCLUSION

Comparison between all possible evidences of drunk behavior. Monitoring and detecting the behavior of drivers is vital to ensuring road safety by alerting the driver and other vehicles on the road in cases of abnormal driving behavior. Driver behavior is affected by many factors that are related to the driver, the vehicle, and the environment, and over the course of driving, a driver will be found to be in a particular state; the driver can then stay in this state for a period of time or shift to another state. Hence, it is important to capture the static and dynamic aspects of behavior and take into account the contextual information that relates to driver behavior. In this paper, we have proposed a driver behavior detection system from viewpoint of context awareness. Our contributions are threefold: 1) A context-aware architecture, which can detect the behavior of the driver, is presented by capturing information about the driver, the vehicle, and the environment; 2) a DBN algorithm for inferring driver behavior from different kind of sensors under uncertainty has been formulated to capture the static and dynamic aspects of the behavior; and 3) definitions for normal and abnormal driving behaviors are given. The evaluation result has demonstrated the detection accuracy of the proposed model under uncertainty and the importance of including a great amount of contextual information within the inference process. Our future work comprises designing a corrective action algorithm to calculate the appropriate corrective actions for other vehicles on the road.

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Review Paper - Expressive Sentiment Analysis of Online Reviews

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Abstract— Now a days posting reviews on products is one of the popular way for expressing opinions and grievances toward the products brought or services received. By making Analysis of those number of reviews available would produce useful as well as actionable knowledge that could be of economic values to vendors and other interested parties. From this the problem of mining reviews for product and predicting the sales performance are tackled. Currently, there are many challenges in translating human affect into explicit representations. The current and sentiment analysis algorithms uses simple terms to express opinions about a product or particular service. But the cultural factors, traditional linguistic barriers and differing contexts make it extremely difficult to turn a string of written text into a simple pro or con sentiments. The research in the field started with sentiment and subjectivity classification, which treated the problem as a text classification problem. Sentiment classification classifies whether product reviews or sentence expresses a positive or negative opinion. Subjectivity classification determines whether a sentence is subjective or objective. Many real-life applications, however, require more detailed analysis because users often want to know the subject of opinions. The present work focuses on the categorization of a plain input text to inform a Text To Speech system about the most appropriate sentiment to automatically synthesize expressive speech at the sentence level. A new task in text sentiment analysis adds usefulness scoring to opinion extraction to improve ranking services of product reviews, in helping shoppers and vendors leverage information from multiple sources. In order to model the multifaceted nature of sentiments, the reviews and the sentiments behind them are viewed as an outcome of the joint contribution of a number of hidden factors, and propose a novel approach to sentiment mining based on Probabilistic Latent Semantic Analysis, which is called Sentiment Probabilistic Latent Semantic Analysis. In addition to this reviews are also evaluated using Text To Speech System with other language and consider a temporal analysis for the evolution of conversation. Text-to-speech system converts normal language text into speech; other systems render symbolic linguistic representations like phonetic transcriptions into speech.

Keywords— Review mining, sentiment analysis, Text To Speech, polarity, opinion mining, wordnet, domain driven datamining.

INTRODUCTION

The ever-growing amount of available information in the Social Web fosters the proliferation of business and research activities around the relatively new fields of opinion mining and sentiment analysis. The automatic analysis of user-generated content such as online news, reviews, blogs, and tweets, in fact, can be extremely valuable for tasks such as mass opinion estimation, corporate reputation measurement, political orientation categorization, stock market prediction, customer preference, and public opinion study. Communication platforms, such as blogs, wikis, online forums, and social-networking groups, have become a rich data-mining source for the detection of public opinions [3],[8],[9],[22]. It has become a common practice for e-commerce websites to

provide the venues and facilities for people to publish their reviews, with a prominent example being Amazon (www.amazon.com). Reviews are also prevalent in blog posts, social networking websites as well as dedicated review websites such as Epinions. A lot of conceptual rules, in fact, govern the expression of opinions and sentiments and there exist even more clues that can convey these concepts from realization to verbalization in the human mind. For instance, a company can study the public sentiment in tweets to obtain users' feedback towards its products; while a politician can adjust his/her position with respect to the sentiment change of the public. Publicly available opinions provide valuable information for decision-making processes based on a new collective intelligence paradigm referred to as crowd sourcing. This has inspired research in opinion mining and sentiment analysis to develop methods for automatically detecting emotions, opinions, and other evaluations from texts.

One of the most relevant applications of opinion mining and sentiment analysis is aspect-based summarization.[8],[17] Broadly speaking, given a collection of opinion posts, this task is aimed at obtaining relevant aspects(such as product features), along with associated sentiment information expressed by customers (usually an opinion word and/or a polarity score).Aspect-based summarization is usually composed of three main tasks: aspect identification, sentiment classification, and aspect rating. Aspect identification is focused on extracting the set of aspects or product features from the source collection. The word aspect is intended to represent the opinion or sentiment targets, which are also referred to as product features³ when the collection of posts—typically, customer reviews—is about products or services. For example, given the sentence, “The bed was comfortable” in a review about a hotel room, the aspect being referred to is “bed” and the opinion is positively expressed by means of the opinion word “comfortable.”

The sentiment classification task consists of determining the opinions about the aspects and/or their polarities, where as aspect rating leverages the relevance of aspects and their opinions to properly present them to users.

RELATED WORK

A growing number of recent studies have focused on the economic values of reviews, exploring the relationship between the sales performance of products and their reviews [1], [6], [23], [24]. Since what the general public thinks of a product can no doubt influence how well it sells, understanding the opinions and sentiments expressed in the relevant reviews is of high importance, because collectively these reviews reflect the “wisdom of crowds”(what the general public think) and can be a very good indicator of the product's future sales performance. This work concerned with generating actionable knowledge by developing models and algorithms that can utilize information mined from reviews. Such models and algorithms can be used to effectively predict the future sales of products, which can in turn guide the actions of the stakeholders involved.

Prior studies on the predictive power of reviews have used the volume of reviews or link structures to predict the trend of product sales [1], [5], failing to consider the effect of the sentiments present in the blogs. It has been reported [1],[5] that although there seems to exist strong correlation between the volume of reviews and sales spikes, using the volume or the link structures alone do not provide satisfactory prediction performance. Indeed, as we will illustrate with an example, the sentiments expressed in the reviews are more predictive than volumes.

In addition ,another important aspect that has been largely overlooked by those prior studies, is the effect of the reviews' quality on their predictive power. Quality wise, not all reviews are created equal. Especially in an online setting where anybody can post virtually anything, the quality of reviews can vary to a great extent. Examples of “bad” reviews include very short insulting comments with no substance like “This book sucks,” or long and tedious reviews that are simply duplicates of the product descriptions. Reviews poorly written, reviews containing no subjective judgment, or even spam reviews, may actually negatively affect the accuracy of the prediction, if they are not properly taken care of.

Previous work on extracting product features from customer reviews has mainly relied on natural language processing (NLP).[2] Part-of-speech (POS)tagging, shallow parsing techniques, and dependency grammars have been widely applied to identify both noun phrases that act as potential features and opinion words that affect them through syntactical dependencies.

Using the double-propagation strategy[11] allows the incremental identification of features and opinion words from a predefined initial set (usually a lexicon of opinion words). Generally, NLP-based approaches present good precision but low recall figures because they depend on the definition of extraction patterns, which are dependent on both the particular language and the reviews application domain. Another limitation of NLP-based approaches is that they don't account for feature relevance. Thus, an additional process is required for scoring the identified features. Most approaches just apply simple statistics such as word counts to rank the features.

[21] A recent approach [20] applies the Hyperlink-Induced Topic Search (HITS) [19] algorithm to score the identified features according to their interaction with opinion words. In contrast to our proposal, these scoring schemes aren't used to discover new features and opinion words from customer reviews, but only to rank features already identified through some NLP-based method. Other recent approaches propose to extract sentiment and aspect words from corpora [7], [12]-[14]. In these approaches, the objective isn't to find specific product features, but some predefined broader aspects. Usually, these approaches state the problem as a particular case of statistical inference such as Latent Dirichlet Allocation(LDA), where latent topics are intended to represent the aspects and/or sentiments. The main limitation of all such approaches is that they need to fix a number of latent topics that aren't known a priori. Furthermore, even if an optimal number of topics is found, topics aren't ensured to represent true aspects.

There have been a large number of research studies and industrial applications in the area of public sentiment tracking and modeling. Previous research like O'Connor *et al.*[4] focused on tracking public sentiment on Twitter and studying its correlation with consumer confidence and presidential job approval polls. Similar studies have been done for investigating the reflection of public sentiment on stock markets [15] and oil price indices [14]. They reported that events in real life indeed have a significant and immediate effect on the public sentiment on Twitter. However, none of these studies performed further analysis to mine useful insights behind significant sentiment variation, called *public sentiment variation*. One valuable analysis is to find possible reasons behind sentiment variation, which can provide important decision-making information. For example, if negative sentiment towards Barack Obama increases significantly, the White House Administration Office may be eager to know why people have changed their opinion and then react accordingly to reverse this trend. Another example is, if public sentiment changes greatly on some products, the related companies may want to know why their products receive such feedback.

MINING ONLINE REVIEWS

1. Domain-Driven Data Mining (D3m)

In the past few years, domain-driven data mining has emerged as an important new paradigm for knowledge discovery [9], [10]. Motivated by the significant gap between the academic goals of many current KDD methods and the real-life business goals, D3 advocates the shift from data centered hidden pattern mining to domain-driven Actionable Knowledge Discovery (AKD). The work presented in this paper can be considered as an effort along this direction in that 1) we aim to deliver actionable knowledge by making predictions of sales performance, and 2) in developing the prediction model, we try to integrate multiple types of intelligence, including human intelligence, domain intelligence, and network intelligence (Web intelligence).

2. Review Mining

With the rapid growth of online reviews, review mining has attracted a great deal of attention. Early work in this area was primarily focused on determining the semantic orientation of reviews. Among them, some of the studies attempt to learn a positive/negative classifier at the document level. Pang et al. [11] employ three machine learning approaches (Naive Bayes, Maximum Entropy, and Support Vector Machine) to label the polarity of IMDB movie reviews. In follow-up work, they propose to first extract the subjective portion of text with a graph min-cut algorithm, and then feed them into the sentiment classifier [12]. Instead of applying the straightforward frequency-based bag-of-words feature selection methods, Whitelaw et al. [7] defined the concept of “adjectival appraisal groups” headed by an appraising adjective and optionally modified by words like “not” or “very.” Each appraisal group was further assigned four type of features: attitude, orientation, graduation, and polarity. They report good classification accuracy using the appraisal groups. They also show that the classification accuracy can be further boosted when they are combined with standard “bag-of-words” features. We use the same words and phrases from the appraisal groups to compute the reviews’ feature vectors, as we also believe that such adjective appraisal words play a vital role in sentiment mining and need to be distinguished from other words. However, as will become evident in Section 4, our way of using these appraisal groups is different from that in [7]. There are also studies that work at a finer level and use words as the classification subject. They classify words into two groups, “good” and “bad,” and then use certain functions to estimate the overall “goodness” or “badness” score for the documents. Kamps and Marx [13] propose to evaluate the semantic distance from a word to good/bad with WordNet. Turney [14] measures the strength of sentiment by the difference of the Mutual Information (PMI) between the given phrase and “excellent” and the PMI between the given phrase and “poor.” Extending previous work on explicit two-class classification, Pang and Lee [15], and Zhang and Varadarajan [16] attempt to determine the author’s opinion with different rating scales (i.e., the number of stars). Liu et al. [17] build a framework to compare consumer opinions of competing products using multiple feature dimensions. After deducting supervised rules from product reviews, the strength and weakness of the product are visualized with an “Opinion Observer.” Our method departs from conventional sentiment classification in that we assume that sentiment consists of multiple hidden aspects, and use a probability model to quantitatively measure the relationship between sentiment aspects and reviews as well as sentiment aspects and words.

3. Economic Impact Of Online Reviews

Whereas marketing plays an important role in the newly released products, customer word of mouth can be a crucial factor that determines the success in the long run, and such effect is largely magnified thanks to the rapid growth of Internet. Therefore, online product reviews can be very valuable to the vendors in that they can be used to monitor consumer opinions toward their products in real time, and adjust their manufacturing, servicing, and marketing strategies accordingly. Academics have also recognized the impact of online reviews on business intelligence, and have produced some important results in this area. Among them, some studies attempt to answer the question of whether the polarity and the volume of reviews available online have a measurable and significant effect on actual customer purchasing. To this end, most studies use some form of hedonic regression to analyze the significance of different features to certain function, e.g., measuring the utility to the the consumer. Various economic functions have been utilized in examining revenue growth, stock trading volume change as well as the bidding price variation on commercial websites, such as Amazon and eBay. In most of the studies, the sentiments are captured by explicit rating indication such as the number of stars; few studies have attempted to exploit text mining strategies for sentiment classification.

4. Assessing the Review Helpfulness

Compared to sentiment mining, identifying the quality of online reviews has received relatively less attention. A few recent studies along this direction attempt to detect the spam or low-quality posts that exist in online reviews. Jindal and Liu [17] present a categorization of review spams, and propose some novel strategies to detect different types of spams. Liu et al. [18] propose a classification-based approach to discriminate the low quality reviews from others, in the hope that such a filtering strategy can be incorporated to enhance the task of opinion summarization. Elkan develops a complete framework that consists of six different components, for retrieving and filtering online documents with uneven quality.

SENTIMENT CLASSIFICATION

Sentiment classification classifies whether product reviews or sentence expresses a positive or negative opinion. Subjectivity classification determines whether a sentence is subjective or objective. Many real-life applications, however, require more detailed analysis because users often want to know the subject of opinions. The present work focuses on the categorization of a plain input text to inform a Text To Speech system about the most appropriate sentiment to automatically synthesize expressive speech at the sentence level. A new task in text sentiment analysis adds usefulness scoring to polarity/ opinion extraction to improve product review ranking services, helping shoppers and vendors leverage information from multiple sources. In order to model the multifaceted nature of sentiments, the sentiments embedded in reviews are viewed as an outcome of the joint contribution of a number of hidden factors, and propose a novel approach to sentiment mining based on Probabilistic Latent Semantic Analysis, which is called Sentiment Probabilistic Latent Semantic Analysis. In addition to this reviews are also evaluated using Text To Speech System with other language and consider a temporal analysis for the evolution of conversation. Text-to-speech system converts normal language text into speech; other systems render symbolic linguistic representations like phonetic transcriptions into speech.

The present work focuses on the automatic detection and classification of such emotions with the specific perspective of an eventual integration into a text-to-speech (TTS) system. Emotion detection is thus viewed as the requisite first step in the generation of *naturally expressive* synthetic speech, where ideally any emotion conveyed would be congruent with the subject matter and discourse context at hand. In future it can be used to review the websites. So, that user can found related data from large databases.

LIMITATIONS OF EXISTING SYSTEM

- Existing system in sentiment classification classifies whether product reviews or sentence expresses a positive opinion or negative opinion.
- Text to speech synthesis was not there.
- Whereas in an existing system an user can only give only limited reviews. Whereas Proposed system can provide a user unlimited review for particular product as per his emotions along with Text to speech.

PROPOSED SYSTEM

Measuring the information content from the information of an ontology is an important task. Information Content is useful for further measurement of the similarities in reviews. Although the state-of-art metrics measure IC, makes use of external knowledge based or intrinsic hyponymy relations only. A current complex form of ontology conceptualizes a class explicitly with the help of the hyponymy classes and the asserted relations and restrictions. Therefore, we propose a modified metric for measuring IC intrinsically taking both the concept-to-concept and the concept-to-property relations. We evaluate our system theoretically andwith experimental data. Our evaluation shows the effectiveness of our modified metric for extracting intrinsic information content to measure semantic similarity among concepts in an ontology.

Moreover, the conventional SA solutions borrowed from the NLP scenario may need to be adapted to the Text To Speech environment because they are usually set to work with compilations of long texts that are not analyzed at sentence-level . Some previous work has tackled this short text setting with heuristic approaches by effectively weighting the lexicon and then spotting keywords in the sentences. The present work focuses on the categorisation of a plain input text to inform a TTS system about the most appropriate sentiment (positive, negative and neutral) to automatically synthesize expressive speech at the sentence level.

Given that the information provided by a sentence is rather reduced, some approaches based on the latter ML methods also proposed using additional texts to infer further links with affect .Other works, instead, delved into the relevant characteristics of the available text of analysis without enlarging the data. Figure of Overview of the Sentiment Analysis framework under study, which considers both the diversity in the nature of the features extracted from the text and the diversity in the learning principles of the classifiers, and selects the most effective system for the problem at hand. to process. In a TTS environment, which is expected to perform in real time, the SA task shall not overburden the TTS conversion process. What is more, collecting useful text for the problem at hand is difficult as it requiresmany human evaluators. Due to resource limitations, experiments are restricted to existing labelled corpora. Hence, this work focuses on exploiting only the available short text of analysis. In any case, though, a comprehensive study of the size of the corpus and its impact on the computational performance is left for future works.

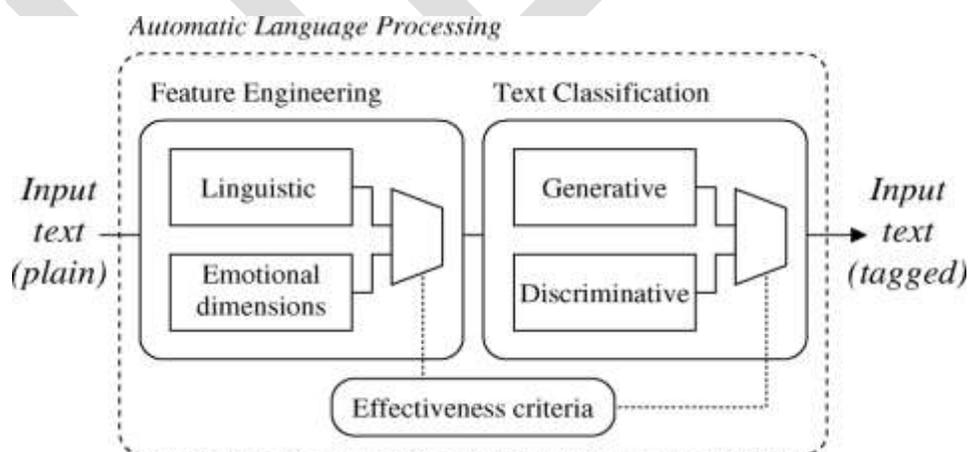


Fig 1. Overview of the Sentiment Analysis framework .

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CONCLUSION

We have proposed a new strategy for the data-driven analysis of emotion in text. This strategy articulates around two coupled phases: (i) separately encapsulate both the foundations of the domain considered and the overall affective fabric of the language, and (ii) exploit the emergent relationship between these two semantic levels of description in order to inform the emotion classification process. We address (i) by leveraging the latent topicality of two distinct corpora, as uncovered by a global LSM analysis. Domain and affective descriptions are then superimposed to produce the desired connection between all terms and emotional categories. It thus appears to be a promising solution for automatic emotion analysis in text. Future efforts will concentrate on expanding the basic premise underlying latent affective analysis into a more general framework which supports different mapping instantiations. And integrating the new framework into the text analysis component of our TTS system. In order to achieve affective congruence, it is necessary to properly translate any emotion detected into appropriate prosodic effects.

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ELECTRONIC SYSTEM FOR ACCIDENT PREVENTION

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Abstract - Many accidents are happening due to driver's drowsiness and over speed and alcohol consumption. If these mistakes are corrected accidents can be reduced, not hundred percent but up to the satisfied level. If accidents occurred, immediate first aid and treatment is necessary to save life. We cannot expect a neighbor always to help the injured people. So by keeping these entire in mind a new idea is proposed which can automatically send a text message to ambulance service via GSM network. In order to prevent accident we are using alcohol sensor which alerts the owner such that "Drunk and Driving" and it will not allow engine to start. In case alcohol consumption is sensed at the time of driving, engine will slowly OFF after giving pre-warning sound. Steering wheel grip sensor is used to detect driver's drowsiness and alert the diver not to sleep. Temperature sensor is used to detect the engine temperature. MEMS accelerometer is used to detect the accident and record the speed and engine temperature in permanent memory for later reference.

Keywords – UART, ADC, PWM, GSM, MEMS accelerometer, Temperature, Alcohol, Grip sensors.

INTRODUCTION

1.1 An Overview of Existing system

When you think of work-related safety hazards, you probably think about what goes on inside the workplace. But one of the greatest threats to your safety is not in the workplace, but rather on the road. Someone is injured every 18 seconds. Over 2 million of those injuries turn out to be disabling. A person dies in a crash on roads every 11 minutes. In fact, motor vehicle accidents are the most common cause of death more than cancer or heart attacks. When we think about the serious accident, it could change your life- and not for the better. Before any new motorcycle model can ever go on sale to the public, it must first undergo a battery of testing to make sure it'll be safe, reliable and reasonably in tune with the demands of the motoring public. The government demands some of this testing, while other major components of it are devised by the companies themselves in an effort to ensure they meet specific standards for performance, fuel economy, comfort and other measures, but those which don't are axed.

There are three dominant causes of road accidents- drowsiness, Overtaking, Use of alcohols are related to driver. The main reason for driving drunk is that the police are not able to check each and every motorcycle and even if they catch any one the police can be easily bribed. So there is a need for an effective system to check drunken drivers.



Fig.1

By observing above chart we are able to conclude that there are three dominant causes of road accidents- Negligence, Overtaking, Use of alcohols are related to driver. So there is a need for an effective system.

1.2. Proposed System

Our approach collects information available when a traffic accident occurs, which is captured by sensors installed on-board the vehicles. Based on this information, our system directly estimates the accident severity by comparing the obtained data with information coming from previous accidents stored in a database. This information is of utmost importance, for example, to determine the most suitable set of resources in a rescue operation. Since we want to consider the information obtained just when the accident occurs, to estimate its severity immediately, we are limited by the data automatically retrievable, omitting other information, e.g., drowsiness, temperature, speed etc.

2. BLOCK DIAGRAM

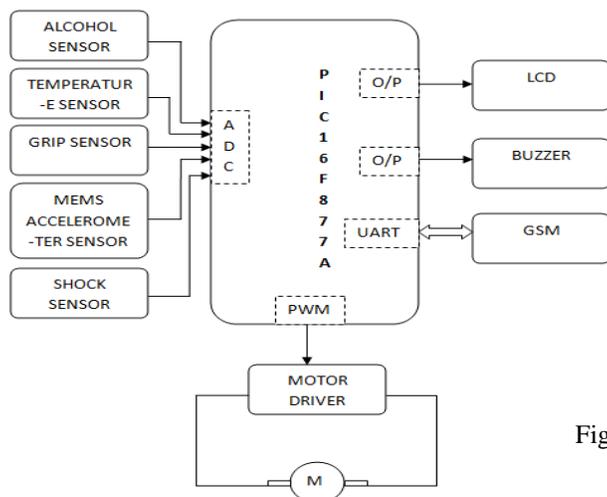


Fig.2

To convert the output of sensor into electrical form we will use signal conditioning (transducer). As controller operates only on digital data, so this analog data is to be converted into digital form by using ADC. But ADC is inbuilt in PIC. So the output of the signal conditioner circuit is directly connected to PIC. For speed measurement purpose we are going to use RPM counter. Nowadays the vehicles have a mechanical speedometer. The speedometers we have made use the digital technique. This displays the speed of vehicle in km/hr. The disc rotates through the optical assembly having infrared LED and phototransistor. The total assembly gives the digital pulses from which we can derive the RPM and speed of the vehicle. All this data will store & display on LCD also on computer whenever the accident switches are pressed which are placed in front of bike.

2.1. Hardware Description

PIC MICROCONTROLLER:

The heart of system is MICROCONTROLLER which will access the data.

- High-performance RISC CPU
- Only 35 single word instructions
- Low-power, high-speed CMOS FLASH/EEPROM technology
- Wide operating voltage range: 2.0V to 5.5V

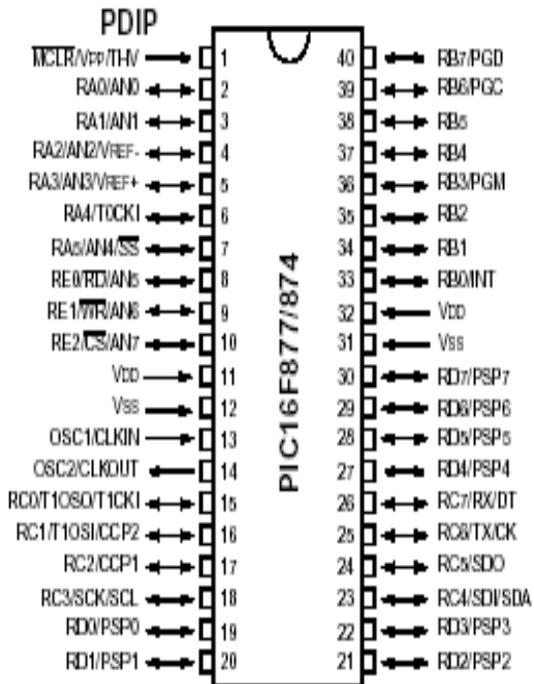


Fig .3

ALCOHOL SENSOR:



Fig.4

If the driver is found to have alcohol in the breath, it warns and then turns the ignition off and hence possibility of accident is avoided. MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapour.

- Good sensitivity to alcohol gas
- Long life and low cost

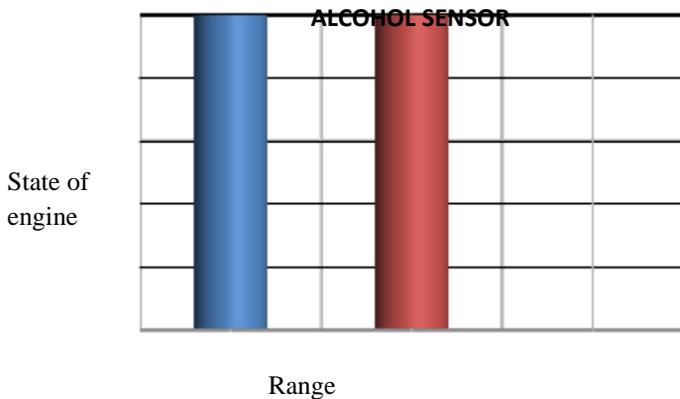


Fig.4.1.

- ✓ 5 - ON
- ✓ 0 - OFF

When value exists from 80 to 120 the engine goes to off state than other values.

TEMPERATURE SENSOR:



Fig.5

To measure temperature of motorcycle there will be a temperature sensor. The temperature meter indicates the temperature of engine body. It also indicates the overheating of the vehicle by announcing frequent beeps.

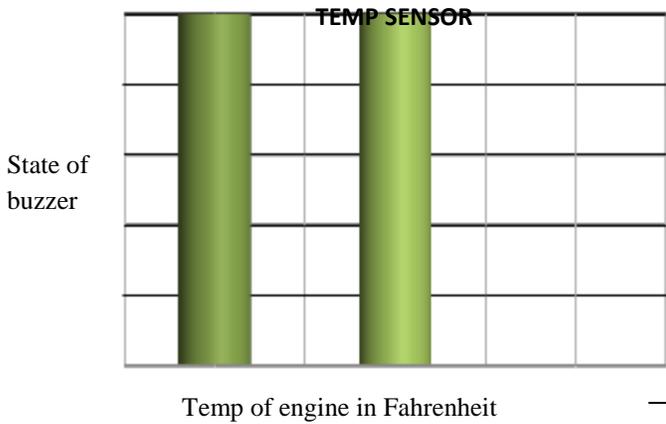


Fig.5.1

GRIP SENSOR:



Fig.6

- Cost effective
- Ultra thin; 0.45mm
- Simple and easy to integrate

GSM:



Fig.7

Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. If accident happened, after collecting all information which is stored in internal memory, μC send this data to base or surveillance unit via SMS using GSM modem.

RESULT

We continuously scan for various parameters of motorcycle, such as engine temperature, speed, and alcohol sensors. The μC stores all this data in the internal memory. If the driver is found to have alcohol in the breath, it warns and then turns the ignition off (if μC is set with threshold values is set. Also applicable to other sensors too) and hence possibility of accident is avoided.

If accident happened after collecting all information which is stored in internal memory, μC send this data to base or surveillance unit via SMS using GSM modem. On the base side we receive the data such as engine temperature, speed, alcohol level etc.



Fig 8. System Developed

CONCLUSION

Traffic accidents keep with a yearly increasing of a high rate. This paper shows the new fatigue detection techniques using alcohol, temperature, speed sensors etc., We can also propose an intelligent motorcycle system for accident prevention using ABS and GPS module and making the world a much better and safe place to live.

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A Review on Energy-Balanced Routing Method for Wireless Sensor Network

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Abstract— Wireless sensor networks are an emerging technology for monitoring physical world. The energy constraint of Wireless sensor networks makes energy saving and Prolonging the network lifetime become the most important goals of various routing protocols. Clustering is a key technique used to extend the lifetime of a sensor network by reducing energy consumption. Also putting few nodes in wireless sensor network is an effective way to increase the network lifetime and stability. The energy saving schemes for homogeneous wireless sensor networks do not perform efficiently when applied to heterogeneous wireless sensor networks. Thus, Energy efficient clustering protocols should be designed for the characteristic of each wireless sensor networks. This paper surveys different energy efficient clustering protocols for wireless sensor networks.

Keywords— wireless sensor network, clustering protocol, energy efficient, heterogeneous. Energy balance, forward-aware factor, industrial application (IA), routing.

INTRODUCTION

A collection of mobile or static nodes which are able to communicate with each other for transferring data more efficiently and autonomously can be defined as wireless sensor network. A lot of applications of wireless sensor network can be found in different field such as events, battlefield surveillance, recognition security, drug identification and automatic security [1].

In wireless sensor network, one of the main constraints is limited battery power which plays a great influence on the lifetime and the quality of the network. Several routing protocols have been designed for wireless sensor networks to satisfy energy utilization and efficiency requirement. Efficiency, scalability and lifetime of wireless sensor network can be enhanced using hierarchical routing. Here, sensors are organized themselves into clusters and each cluster has a cluster head [1].The main role of cluster head is to provide data communication between sensor nodes and the base station efficiently[2].

Another way to prolong the lifetime of wireless sensor network is to insert a percentage of heterogeneous nodes. Wireless sensor network consists of sensor nodes with different ability, such as different computing power and sensing range. Heterogeneous wireless sensor networks are very much useful in real deployments because they are more close to real life situations [3, 4].

There are two types of clustering techniques. The clustering technique applied in homogeneous sensor networks is called homogeneous clustering schemes, and the clustering technique applied in the heterogeneous sensor networks is referred to as heterogeneous clustering schemes. Many existing clustering techniques such as LEACH consider homogeneous sensor networks where all sensor nodes are designed with the same battery energy. Thus, Energy efficient clustering protocols should be designed for the characteristic of heterogeneous wireless sensor networks [3].

In this paper, we provide a complete survey of different energy efficient clustering protocols for wireless sensor networks.

2.ROUTING PROTOCOLS

A. ENERGY EFFICIENT CLUSTERING PROTOCOLS

Katiyar et al. [4] surveyed clustering algorithms for wireless sensor networks. They classified clustering algorithms based on two main criterions: according to the stability and energy efficiency. They also surveyed several energy-efficient clustering protocols for heterogeneous wireless sensor networks. In this section, we want to survey and compare other energy efficient protocols for clustering in wireless sensor networks.

B. ENERGY EFFICIENT HETEROGENEOUS CLUSTERED SCHEME

Dilipand and Patel [5] proposed an energy efficient heterogeneous clustered scheme (EEHC), for electing cluster heads in a distributed fashion in hierarchical wireless sensor networks. The election probabilities of cluster heads are weighted by the residual energy of a node relative to that of other nodes in the network. The algorithm is based on LEACH and works on the election processes of the cluster head in presence of heterogeneity of nodes. Simulations results show that EEHC is more effective in prolonging the network lifetime compared with LEACH.

C. DISTRIBUTED ENERGY BALANCE CLUSTERING PROTOCOL

Changmin Duan and Hong Fan [7] proposed a distributed energy balance clustering (DEBC) protocol for wireless sensor networks. Cluster heads are selected by a probability depending on the ratio between remaining energy of node and the average energy of network. The high initial and remaining energy nodes have more chances to be the cluster heads than the low energy nodes. This protocol also considers two-level heterogeneity and then it extends the results for multi-level heterogeneity. DEBC is different from LEACH, which make sure each node can be cluster head in each $n_i=1/p$ rounds. Simulation results show that the performance of DEBC is better than LEACH and SEP.

D. WEIGHTED ELECTION PROTOCOL

Rashed et al. [1] proposed an energy-efficient routing protocol in order to enhance the stability period of wireless sensor networks. This protocol is called weighted election protocol (WEP). It introduces a scheme to combine clustering strategy with chain routing algorithm for satisfy both energy and stable period constrains under heterogeneous environment in wireless sensor networks. In the scheme, the authors have considered the following assumptions:

- Each sensor node has power control and the ability to transmit data to any other sensor node or directly to the base station.
- In the model, two types of nodes are used such as advanced node and normal node where advanced nodes have more energy than normal ones.
- Advanced nodes have to become cluster heads more often than that of normal nodes by separate threshold for each type of nodes.
- There is no mobility.

WEP assigns a weight to the optimal probability p_{opt} for each node. This weight must be equal to the initial energy of each node divided by the initial energy of the normal node. After assigning weighted probability of each type nodes, this protocol can elect cluster head and their associated non-cluster head as the same way as it done in LEACH protocol. Then that can use greedy algorithm to make a chain among the selected cluster heads. After constructing chain among cluster head nodes, a chain leader is selected randomly. Using TDMA schedule, all non-cluster head nodes send their data to their respective cluster head nodes. The cluster head nodes in each cluster then fused those data and finally send to the base station. Simulation results show that WEP performs better than LEACH, SEP and HEARP in terms of stability period and network lifetime.

E. DISTRIBUTED ENERGY EFFICIENT CLUSTERING ALGORITHM

Qing et al [8] proposed a distributed energy efficient clustering scheme for wireless sensor networks, which is called DEEC. In DEEC, the cluster heads are elected by a probability based on the ratio between residual energy of each node and the average energy of the network. The epochs of being cluster heads for nodes are different according to their initial and residual energy.

The authors have assumed that all the nodes of the sensor network are equipped with different amount of energy, which is a source of heterogeneity. DEEC is also based on LEACH; it rotates the cluster head role among all nodes to expend energy uniformly.

Two levels of nodes are considered in the algorithm and after that a general solution for multi-level heterogeneity is obtained. To avoid that each node needs to know the global knowledge of the networks, DEEC estimates the ideal value of network life-time, which is used to compute the reference energy that each node should expend during a round. Simulation results show that DEEC achieves longer lifetime and more effective messages than LEACH, SEP and LEACH-E.

F. DEVELOPED DISTRIBUTED ENERGY-EFFICIENT CLUSTERING (DDEEC)

Elbhiri et al. [9] proposed a developed distributed energy efficient clustering scheme for wireless sensor networks. This technique is based on changing dynamically and with more efficiency the cluster head election probability.

DDEEC is based on DEEC scheme, where all nodes use the initial and residual energy level to define the cluster heads. To evade that each node needs to have the global knowledge of the networks, DDEEC like DEEC estimate the ideal value of network lifetime, which is used to compute the reference energy that each node should expend during each round.

In the scheme, the network is organized into a clustering hierarchy, and the cluster heads collect measurements information from cluster nodes and transmit the aggregated data to the base station directly. Moreover, The authors have supposed that the network topology is fixed and no-varying on time. The difference between DDEEC and DEEC is localized in the expression which defines the probability to be a cluster head for normal and advanced nodes. Simulation results show that the protocol performs better than the SEP and DEEC in terms of network lifetime and first node dies.

G. STOCHASTIC DISTRIBUTED ENERGY EFFICIENT CLUSTERING (SDEEC)

An improvement of DEEC is proposed as stochastic DEEC by Elbhiri et al. [10]. SDEEC is a self-organized network with dynamic clustering concept. This protocol introduces a dynamic method where the cluster head selection probability is more efficient. In this protocol, The cluster head selection in overall network is based on nodes' residual energy.

According to the protocol, all non-cluster head nodes send data to respective cluster heads in their allocated transmission time. The cluster head node must keep its receiver on, in order to receive all the data from the nodes in the cluster. Some signal processing is performed by cluster head to compress the data into a single signal when all the data is received. After this phase, each cluster head sends the aggregated data to its prime cluster head. Each non-cluster head can turn off to the sleep mode to conserve the energy. The drawback in the protocol is that if non-cluster head nodes turn off to the sleep mode when cluster head is performing aggregation, how they will come to know about the next round of cluster head selection. Simulation results show that SDEEC performs better than SEP and DEEC in terms of network lifetime.

H. THRESHOLD DISTRIBUTED ENERGY EFFICIENT CLUSTERING PROTOCOL

Saini and K. Sharma [2] proposed an energy efficient cluster head scheme for wireless sensor networks, which is called TDEEC (Threshold Distributed Energy Efficient Clustering) protocol.

In the scheme, the authors have considered the following assumptions:

- Sensor nodes are uniformly randomly deployed in the network.
- Nodes are location-unaware, i.e. not equipped with GPS capable antennae.
- Nodes have similar processing and communication capabilities and equal significance.
- Sensor nodes have heterogeneity in terms of energy i.e., different energy levels. All nodes have different initial energy; some nodes are equipped with more energy than the normal nodes.

I. CLUSTER-BASED SERVICE DISCOVERY

Marin et al. [11] proposed an energy efficient service discovery protocol (C4SD) for wireless sensor networks. The protocol relies on a clustering structure that offers distributed storage of service descriptions. In the protocol, each node is assigned a unique hardware identifier and weight (capability grade). Higher the capability grade more suitability for cluster head role. These nodes act as a distributed directory of service registrations for the nodes in the cluster. The structure ensures low construction and maintenance overhead, reacts rapidly to topological changes of the sensor network by making decisions based only on the 1-hop neighborhood information and avoids the chain-reaction problems. A service lookup results in visiting only the directory nodes, which ensures a low discovery cost. Simulation results show that C4SD performs better than DMAC (Distributed Mobility Adaptive Clustering).

J. IMPROVED AND BALANCED LEACH

Said et al. [12] proposed an improved and balanced LEACH which is called IB-LEACH. IB-LEACH is a self-organizing, adaptive clustering protocol that uses randomization to distribute the energy load evenly among the sensors in the network. In the scheme, some high energy nodes called NCG nodes (normal node/cluster head/gateway) become cluster heads to aggregate the data of their cluster members and transmit it to the chosen gateways that requires the minimum communication energy to reduce the energy consumption of cluster head and decrease probability of failure nodes.

Working of IB-LEACH is as follows: Sensor nodes elect themselves to be gateway at any given time with a certain probability. Base station confirms that whether those nodes suit to be gateway. These nodes broadcast their status to the other sensors in the network using advertisement message (ADV). The non-gateway nodes elect themselves to be cluster heads with a certain probability. These cluster head nodes broadcast their status to the other sensors in the network using advertisement message (ADV). The non-cluster head nodes wait the cluster head announcement from other nodes. Each sensor node determines to which cluster it wants to belong by choosing the cluster head that requires the minimum communication energy, and send the join-request (Join-REQ) message to the chosen cluster head, and the cluster head nodes wait for join-request message from other nodes.

Once all the nodes are organized into clusters, each cluster head creates a schedule for the nodes in its cluster. This allows the radio components of each non-cluster head node to be turned off at all times except for its transmit time, thus minimizing the energy dissipated in the individual sensors.

K. DISTRIBUTED CLUSTER HEAD ELECTION (DCHE) SCHEME

Kumar et al. [3] proposed a distributed cluster head election scheme for heterogeneous sensor networks. The election of cluster heads is based on different weighted probability. The cluster's member nodes communicate with the elected cluster head and then cluster heads communicate the aggregated information to the base station via single-hop communication. The authors have considered three types of nodes where type-3 and type-2 nodes are equipped with more battery energy than type-1 node. All the nodes are uniformly distributed over the field and they are not mobile. Simulation results show that the DCHE scheme offers a much better performance in terms of lifetime and stability than LEACH, DEEC and Direct Transmission (DT).

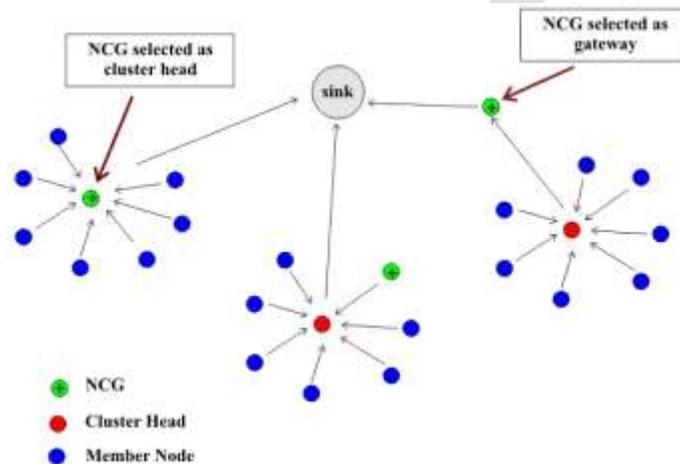


Fig 1. IB-LEACH Network Model [12]

L. HETEROGENEOUS-HYBRID ENERGY EFFICIENT DISTRIBUTED PROTOCOL

Kour and Sharma [13] proposed a Heterogeneous-hybrid energy efficient distributed protocol (H-HEED) for Wireless Sensor Network to prolong the network lifetime. The authors have assumed that a percentage of the node population is equipped with more energy than the rest of the nodes in the same network which creates heterogeneity in terms of node energy.

Cluster head selection is primarily based on the residual energy of each node. The authors introduced different level of heterogeneity: 2-level, 3-level and multi-level in terms of the node energy. Simulation results demonstrate that H-HEED achieves longer lifetime and more effective data packets in comparison with the HEED protocol.

M. CLUSTER BASED ENERGY BALANCING SCHEME

Jing et al. [14] proposed a novel cluster based energy balancing scheme. They have assumed the existence of a fraction of "strong" nodes in terms of abundant storage, computing and communication abilities as well as energy. The strong nodes act as cluster heads to gather information from the sensor nodes within the cluster via multi-hop link and then communicate with the sink directly via single-hop link.

In the scheme, the cluster heads should be able to form a connected backbone between themselves such that they can communicate without relying on regular nodes. Two types of communication are assumed: one between the regular nodes and the cluster heads with low transmission power, and the communication between cluster heads with higher transmission range spanning larger distances. In a practical deployment, these two types of traffic may be carried on different frequency bands or encoding techniques.

The clustering scheme reduces the depth of the average multi-hop path to the cluster head and transforms the single heavy "hot spot" around the sink to various distributed lighter "hot spots" around corresponding cluster heads. The ratio of the strong nodes to regular nodes determines the average depth of the multi-hop path inside the cluster. The essence of the scheme explores the tradeoff between the multi-hop communication within the clusters and single-hop communication among clusters to achieve a better utilization of the energy resources.

N. CLUSTER HEAD RELAY ROUTING PROTOCOL

Du and Lin [15] proposed a cluster head relay (CHR) routing protocol for heterogeneous sensor networks. This protocol uses two types of sensors to form a heterogeneous network with a single sink: a large number of low-end sensors, denoted by L-sensors, and a small number of powerful high-end sensors, denoted by H-sensors. Both types of sensors are static and aware of their locations using some location service. Moreover, both L-sensor and H-sensors are uniformly and randomly distributed in the sensor field. The CHR protocol partitions the heterogeneous network into clusters, each being composed of L-sensors and led by an H-sensor. Within a cluster, the L-sensors are in charge of sensing the underlying environment and forwarding data packets originated by other L-sensors toward their cluster head in a multi-hop fashion. The H-sensors, on the other hand, are responsible for data fusion within their own clusters and forwarding aggregated data packets originated from other cluster heads toward the sink in a multi-hop fashion using only cluster heads. While L-sensors use short-range data transmission to their neighboring H-sensors within the same cluster, H-sensors perform long-range data communication to other neighboring H-sensors and the sink. Simulation results demonstrate that CHR performs better than directed diffusion and SWR.

O. ENERGY EFFICIENT CLUSTER HEAD ELECTION PROTOCOL

LI Han proposed [16] an energy efficient cluster head election protocol for heterogeneous wireless sensor networks and using the improved Prim's algorithm to construct an inter cluster routing. He has considered three types of sensor nodes. Some fraction of the sensor nodes are equipped with the additional energy resources than the other nodes. He has assumed that all the sensor nodes are uniformly distributed.

In the protocol, the cluster head node sets up a TDMA schedule and transmits this schedule to the nodes in the cluster. This ensures that there are no collisions among data messages and also allows the radio components of each non-cluster head node to be turned off at all times except during their transmit time, thus minimizing the energy dissipated by the individual sensors.

In order to reduce the energy consumption of the cluster heads which are far away from the base station and balance the energy consumption of the cluster heads which are close to the base station, a multiple-hop routing algorithm of cluster head has been presented, which introduces into the restriction factor of remainder energy when selects the interim nodes between cluster heads and base station, and also the minimum spanning tree algorithm has been included. The protocol can not only reduce the consumption of transmit energy of cluster head, but also the consumption of communication energy between non-cluster head and cluster head nodes. Simulation results show that this protocol performs better than LEACH and EECHE in terms of network lifetime.

P. CLUSTER MULTI-HOP TRANSMISSION (CMHT)

Xuegong et al. [17] proposed a new protocol of the Cluster Multi-Hop Transmission (CMHT) for sensor networks. The algorithm selects cluster head nodes by calculating weight-value and transfers data by using nodes in cluster and cluster-head multi-hop transmission manner.

CMHT protocol has advantages such as following:

- Improving the method of election of cluster head and introducing the concept of weighting factor, so each node can determine their own probability of being cluster head in accordance with its own situation. Through dynamic adjustment of proportion of three parameters of the ratio of energy consumption, the remaining energy and the average of energy consumption, location and the numbers of being cluster head, optimize the cluster.
- Balancing the energy consumption, reducing the phenomenon of rapid death of the cluster head caused by excessive energy consumption, also preventing the situation of cluster chain block caused by one cluster head failure to work, ensure that the cluster chain work normally.
- Through extending the stable phase of data communication time, it extends the time of each cycle, thereby reducing number of cyclical re-establishment of cluster. Then it reduces the frequency of cluster head election, so saves a large number of energy cost of the frequent cluster head election and prolonging the survival time of the network.
- Using cluster and cluster head multi-hop transmission manner, it saves excessive energy consumption for long-distance transmission, increased energy utilization of the entire network.

The simulation results show that this protocol could suitably form clusters and effectively prolonging the survival time of the entire networks.

Q. LOW ENERGY ADAPTIVE CLUSTERING HIERARCHY (LEACH) PROTOCOL

LEACH protocol is one of the most famous WSN hierarchical routing algorithms. In LEACH, the nodes organize themselves

into local cluster, the protocol is divided into a setup phase when the clusters are organized and a steady-state phase when data are transferred from the nodes to the cluster head and on to the sink [18]–[19]. In the setup phase, each node choose a random number between 0 and 1, if this number is less than a certain threshold $T(n)$, the node will broadcast itself as the cluster head. The non cluster head node chooses the cluster head with greater signal strength and join the cluster, and then the cluster head node receives data from all of the cluster members and transmits data to the remote sink [20]–[23].

In the steady-state phase, data are transferred from the nodes to the cluster head and on to the sink. After each round, a new cluster head will be chosen, and in this way the energy load of being a cluster head is evenly distributed among the nodes.

R. ENERGY-EFFICIENT UNEVEN CLUSTERING (EEUC) PROTOCOL

EEUC is an uneven clustering routing protocol in which tentative cluster heads use uneven competition ranges to construct clusters of uneven sizes [24]–[27]. It shows that the clusters closer to the sink have smaller sizes than those farther away from the sink, thus the cluster heads closer to the sink can preserve some energy for the inter-cluster data forwarding.

S. BALANCED ROUTING METHOD BASED ON FORWARD AWARE FACTOR

Degang shang et al. have done based on the detailed analysis of the data transmission mechanism of WSN, they quantify the forward transmission area, define forward energy density, which constitutes forward-aware factor with link weight, and propose a new energy-balance routing protocol based on forward-aware factor, thus balancing the energy consumption and prolonging the function lifetime.

CONCLUSION

Wireless sensor networks are not always homogeneous, they may be heterogeneous too. The life time and reliability of the network can be improved by heterogeneity in wireless sensor networks. Clustering is a good technique to reduce energy consumption and to provide stability in wireless sensor networks. To operate under wireless sensor networks, several protocols are proposed. Most of the recent energy efficient protocols designed for networks are based on the clustering technique, which are effective in energy saving for wireless sensor networks. In this paper, we surveyed energy efficient clustering protocols in wireless sensor networks and compared these protocols based on clustering attributes. Studies of the performance of the clustering algorithms in saving energy for heterogeneous wireless sensor networks, showed that energy efficient clustering protocols for heterogeneous wireless sensor network, have better performance than energy efficient clustering protocols for homogeneous wireless sensor network in prolonging the network lifetime.

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DESIGN OF UNIFIED POWER QUALITY CONDITIONER FOR IMPROVEMENT OF POWER QUALITY USING NEURAL NETWORK TOOLBOX

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Abstract— The electric power quality is affected by many factors like harmonic contamination, voltage instability, sag and swell due to the non-linear loads such as adjustable speed drives, switching of loads etc. The UPQC is an effective custom power device for the enhancement of power quality due to its quick response and high reliability. The UPQC can compensate these power quality problems. The control strategy used here are based on ANN controller of the UPQC with back propagation learning algorithm. An algorithm is also proposed to minimize the overall VA rating of UPQC which comparatively brings down the manufacturing cost. The harmonics are also reduced using the controller. The control strategy are modeled here using MATLAB / SIMULINK.

Keywords— Non-Linear load ,PQ, UPQC, Harmonics, VA Rating ,ANN ,Back Propagation

I.INTRODUCTION

In recent decades, power demand has increased tremendously while the expansion of power generation and transmission has been severely limited due to less availability of resources. As a consequence, some transmission lines are heavily loaded and the system stability becomes a power transfer-limiting factor. Flexible AC transmission systems (FACTS) controllers have been mainly used for solving various power system steady state control issues. Flexible AC transmission systems or FACTS are devices which allow the flexible and dynamic control of power systems. UPQC is one of the FACTS devices which are used here for the improvement of power quality [1],[9] and it has superior performance compared to other FACTS controllers despite of its high cost and complex structure.

Nowadays, the area of UPQC are directed towards operating the UPQC with minimum volt-ampere (VA) loading to reduce the manufacturing cost of the entire UPQC system and to reduce the overall losses by minimizing the harmonics there by increasing the power quality [2]. The UPQC system is designed in this paper considering the individual shunt and series inverter VA loadings under different operating conditions like steady state, voltage sag, voltage swell, and voltage and current harmonics compensation.

Power quality enhancement in Power Distribution system using artificial intelligence were proposed in several papers [3],[4],[5]. UPQC used to compensate input voltage harmonics and current harmonics caused by non-linear load. and power factor correction in a power distribution network using ANN with Hysteresis Control [3]. The Artificial Neural Network (ANN) controlled DVR is designed and the performance of the rectifier load connected system is investigated with the conventional ANN controller. The Levenberg- Marquardt (LV) Back propagation algorithm is used to implement the control scheme of the Voltage Source Inverter (VSI) [4]. The problem of power quality of voltage sag is detected by artificial neural network then it is trained and the neural network output is simulated in neural network block set, then it will be removed using DSTATCOM with neural network control block. Different features or power line status were taken into account and simulated using Artificial Neural Network [5].

The main focus of this project is to simulate & design a UPQC system for improving the power quality by minimizing the VA Rating and the harmonics and by improving the voltage stability using an artificial neural network controller (ANN) [6]. Back propagation learning algorithm is used here which is a common method of training in artificial neural network which is used in conjunction with an optimization method and it takes less computational time. The ANN is trained to store solutions without excessive memory storage requirements. The control strategy are modeled here using MATLAB / SIMULINK.

II. Power Quality and its Problems

The power quality refers to maintaining a nearly sinusoidal bus distribution voltage at regulated magnitude and frequency[7]. Power quality determines the fitness of electrical power to consumer devices. The issue of electric power quality is achieving great importance because of many reasons like the society is becoming increasingly dependent on the electrical supply. New equipments are more prone to power quality variations.

Power quality problem can be defined as any problem disclosed in voltage, current or frequency deviation that leads to the failure of the customer equipment reveals itself as an economic difficulty to the user, or generates negative effect on the environment. The major types of power quality problems are:

- Interruption
- Voltage Sags.
- Voltage Swells
- WaveformDistortion
- Harmonics

III. Power Quality Improvement using UPQC

The power quality is an index to qualify of current and voltage available to industrial, commercial and household consumers of electricity. To eradicate this power quality issues, various devices are used such as Dynamic Voltage Restorer (DVR), Distributed Static Compensator (DSTATCOM), Static VAR Compensator (SVC) etc is used. Although all devices can improve the power quality, the UPQC is effective of all these FACTS devices. DSTATCOM, SVC etc provide shunt compensation only and TCSC, TCR, DVR etc provide series compensation only. But UPQC can provide both series and shunt compensation equally.

The UPQC is the the most advanced controlling FACT device over the all basic power system parameters that can compensate various voltage disturbances of the power supply, correction of voltage fluctuations and to hinder harmonic load current from entering into the power system[10]. It is a type of hybrid APF and is the only versatile device which can mitigate several power quality problems related with voltage and current simultaneously. It is also the combination of DSTATCOM and DVR, so it provide both series and shunt compensation simultaneously. The fundamental arrangement of UPQC is defined as there are two voltage source inverters which are connected through a common DC storage capacitor. First voltage source inverter is used in shunt with the transmission system with the help of shunt transformer. On the other hand second voltage source inverter is used in series with the help of series transformer. The shunt inverter provides VAR support to the load. Whenever the supply voltage undergoes sag then the series converter injects suitable voltage with supply. The DC Capacitor link allows bidirectional real power exchange between both inverters under steady state conditions. The schematic diagram of UPQC is shown in fig.1.

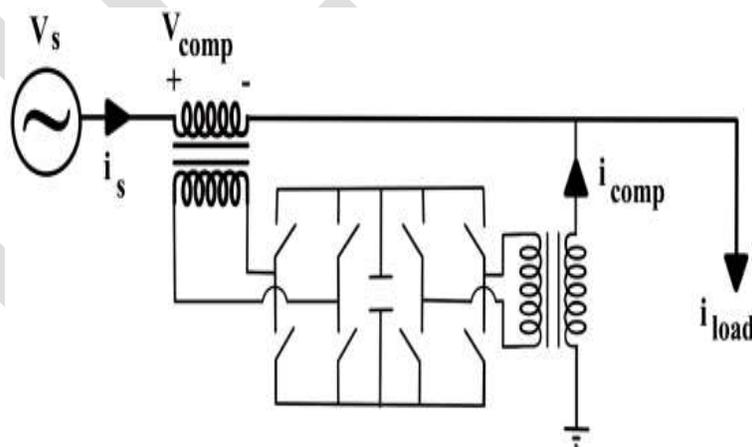


Fig.1: Schematic diagram of the unified power-quality conditioner (UPQC).

IV Artificial Neural Network

Artificial neural network are simplified model of the biological neuron system.It is a extensively parallel circulated processing system made up of highly interconnected neural computing elements that have the ability to learn and thereby acquire knowledge[8]. Their ease of use, inherent reliability and fault tolerance has made ANNs a viable medium for control..It possess information in parallel at high speed.Most important advantage compared to other controllers is its adaptability to new situations and it is trained to new frequencies.Back propagation algorithm is used here for the training.Other controllers like PI and PID Controllers need precise mathematical model for their analysis which is difficult to obtain under parameter variations and nonlinear load disturbances and another drawback of the system is that the proportional and integral gains are chosen experimentally.And the fuzzy controllers is based on rules and it is not adaptive to new situations[6].

Typical artificial neural network includes three layers:input layer, hidden layer and output layer. Fig 2 shows an ANN with hidden layer.

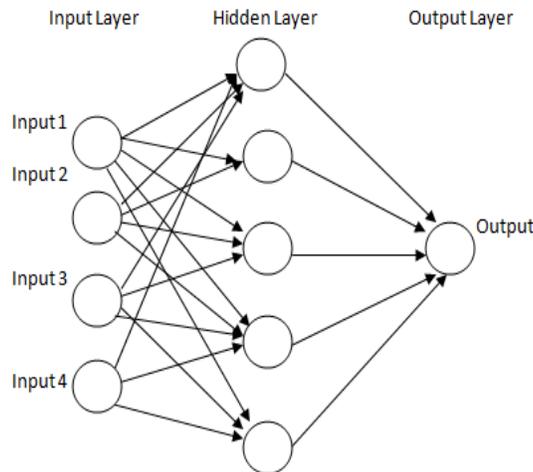


Fig 2: Artificial Neural Network Diagram

V.Neural Network Toolbox

The Neural Network toolbox is the proposed topology used here.Neural network toolbox in the MATLAB environment is one of the commonly used powerful,commercially and accurately available software tools for design of neural network.Neural network toolbox makes it easier to use neural networks in matlab software.The toolbox includes a set of functions and structures that handle neural network,so we do not need to write code for all activation function,training algorithms etc that we want to use. It can interface with other toolboxes also.It can support feedforward networks like perceptrons,radial basis network,back propogation,Hopfield etc.In this paper,enhancement of power quality using UPQC with the help of neural network tool box is proposed by minimizing the harmonics the VA rating and improving the voltage stability.

VI.Generalized Equations of UPQC for the proposed design for calculating the VA rating

The operation of UPQC with any arbitrary displacement angle between the source voltage (KV_s) and load voltage (V_L) under following condition are shown in the figure below, ie Steady state ($\kappa = 1$), Voltage sag ($\kappa < 1$), Voltage swell ($\kappa > 1$) where κ is the Ratio between actual source and rated source voltages.

To keep the magnitudes of load voltage(V_L) and the displacement Angle(δ) constant, the voltage injected by the series Inverter (V_{se}) and its angle γ with source voltage (κV_s) are to be controlled according to the operating condition as shown in the figures 3,4 and 5.

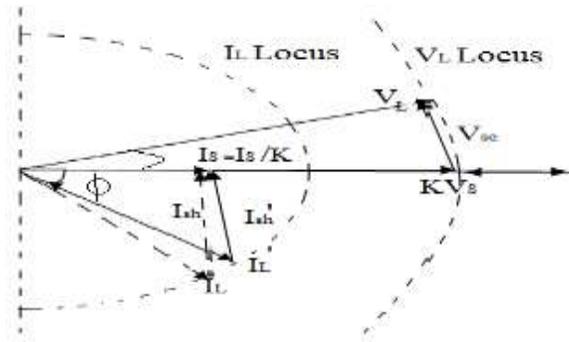


Fig.3 Operation of UPQC with displacement angle during steady state, k=1

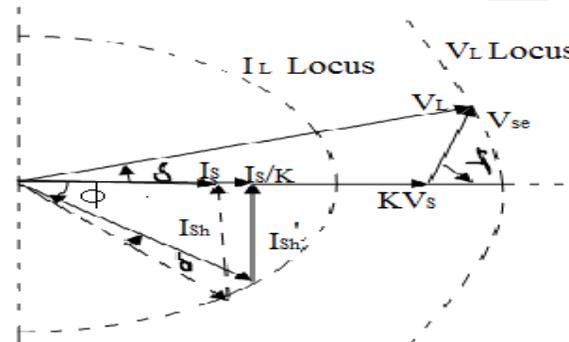


Fig4. Operation of UPQC with displacement angle during voltage sag

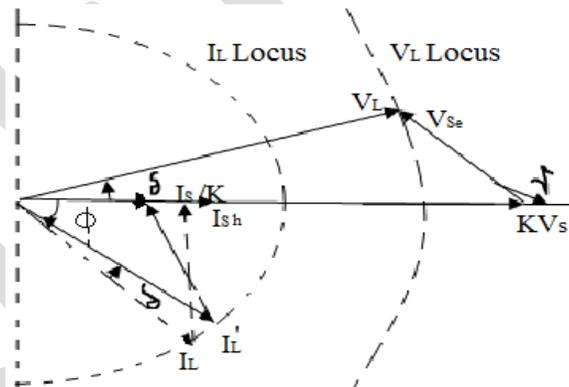


Fig5. Operation of UPQC with displacement angle during voltage swell, k>1

A. VA Loading of the Series Part of UPQC

The magnitude of injected series voltage can be written as:

$$V_{se}(\delta, k) = \sqrt{(V_L \cos \delta - kV_S)^2 + (V_L \sin \delta)^2} \quad (1)$$

Where δ – Displacement angle between source and load voltages

The angle between the source voltage and injected voltage can be calculated as :

$$\gamma = 180^\circ - \tan^{-1} \left[\frac{V_L \sin \delta}{kV_s - V_L \cos \delta} \right] \text{ if } V_L \cos \delta \leq kV_s \quad (2)$$

The active and reactive powers handled by the series inverter as a function of δ and κ are:

$$P_{se}(\delta, \kappa) = V_{se} \times I_s / \kappa \times \cos \gamma \quad (3)$$

$$Q_{se}(\delta, \kappa) = V_{se} \times I_s / \kappa \times \sin \gamma \quad (4)$$

The VA loading of the series inverter at any operating condition is :

$$S_{se}(\delta, k) = \sqrt{(P_{se}(\delta, k))^2 + (Q_{se}(\delta, k))^2} \quad (5)$$

B. VA Loading of the Shunt Part of UPQC

The current injected by the shunt inverter can be calculated as:

$$I_{sh}' = \sqrt{\left(I_L' \cos(\phi - \delta) - \frac{I_S}{k} \right)^2 + \left(I_L' \sin(\phi - \delta) \right)^2} \quad (6)$$

where ϕ -Rated load power factor angle

In the above equation, $I_L' = I_L$ because maximum rms load current magnitude remains the same while the UPQC is in operation. The angle computed using the vector calculation is

$$\alpha = \tan^{-1} \left[\frac{I_L \cos(\phi - \delta) - \frac{I_S}{k}}{I_L \sin(\phi - \delta)} \right] \quad (7)$$

Using (3.18) and (3.19), the active and reactive powers handled by the shunt inverter are represented as:

$$P_{sh}(\delta, \kappa) = V_L \times I_{sh}' \times \cos[90 - \delta + \alpha] \quad (8)$$

$$Q_{sh}(\delta, \kappa) = V_L \times I_{sh}' \times \sin[90 - \delta + \alpha] \quad (9)$$

The VA loading of the shunt inverter at any operating condition is

$$S_{sh}(\delta, k) = \sqrt{(P_{sh}(\delta, k))^2 + (Q_{sh}(\delta, k))^2} \quad (10)$$

C. Total VA Loading of the UPQC

By adding (5) and (10), the total VA rating of UPQC as a function of δ and κ can be determined as:

$$S_{UPQC} = S_{sh}(\delta, \kappa) + S_{se}(\delta, \kappa) \quad (11)$$

Above equation represents the VA loading of any UPQC system for any given load during different operating conditions such as steady state ($k=1$), voltage sag ($k<1$), and voltage swell ($k>1$).

In the proposed design method, [2]for every small step change (.01°) in δ the individual VA loadings of the series inverter, shunt inverter, and series transformer are computed under the full-load condition with: 1) $\kappa=1$; 2) $\kappa < 1$; and 3) $\kappa > 1$ separately using (1)–(10). Then, it selects the maximum VA loading of the series inverter among the set of three values computed separately. This occurs simultaneously for shunt inverter VA loading, series-injected voltage, and the series transformer VA rating. These individual VA loadings/ ratings are stored in an array against the corresponding δ . This process continues until the delta reach a value of 45°. The sum of the shunt inverter rating and series inverter rating , which represents the total VA rating of the UPQC, is then plotted against the angle stored in the same array. The valley point on the curve (A_{UPQC}) is the minimum possible VA rating of the UPQC (S_{UPQC}) , and the corresponding is the optimum displacement angle between the source voltage and load voltage that guarantees minimum VA rating of the system. Once the optimum angle, δ is obtained, corresponding values are given as outputs from the data stored in internal memory. From Fig 6, the valley point on the total VA rating curve of UPQC is (15°, 5161 VA). The ratings of the series and shunt inverters corresponding to the minimum VA rating, using the proposed design method are: 2563 VA and 2598 VA, respectively. Hence, the total VA rating of the designed UPQC is 5161 VA [3(2563+2598)].

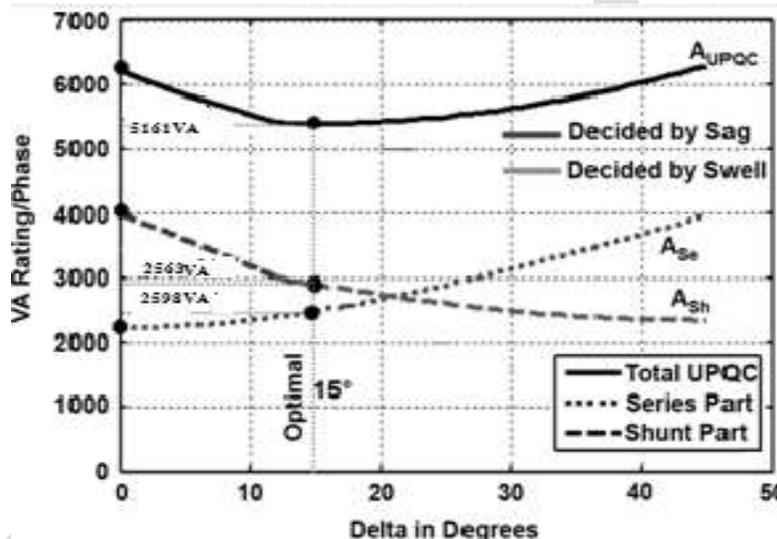


Fig 6: VA Rating Curve.

VII DESIGN OF UPQC WITH HARMONIC COMPENSATION

Another main focus of this paper is harmonic compensation using ANN Controller in the UPQC. Source voltage harmonics/unbalance can be mitigated by the series part of the UPQC only and current harmonics/unbalance can be tackled by the shunt part of the UPQC only [10]. Total Harmonic Distortion of source voltage (THD_v) and load current (THD_i) is found out using Fast Fourier Transform (FFT) analysis. THD_v of source voltage is 0.01% and load current is 0.44%.

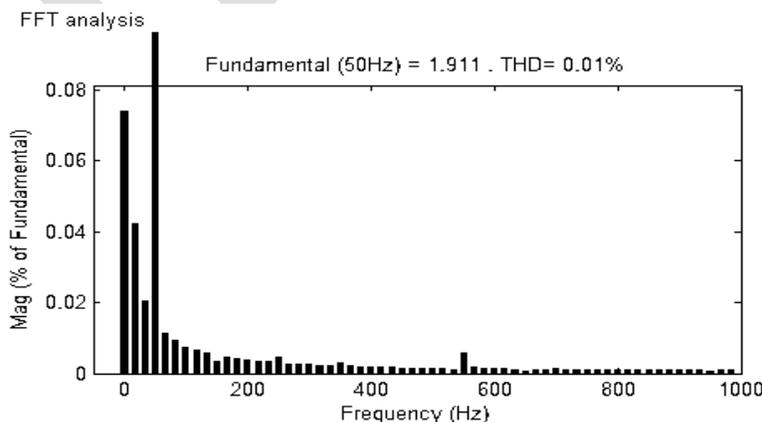


Fig 7: THD of source voltage

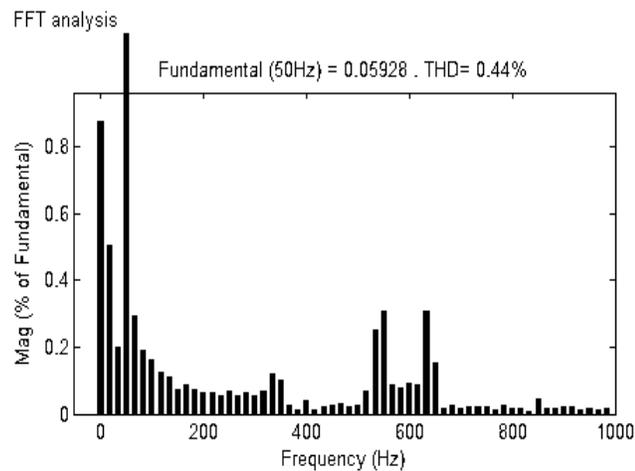


Fig 8. THD of load current

VII CONCLUSION

UPQC is designed with minimum VA rating and minimum harmonics. Generalized loading equations has been developed to identify the minimum possible VA rating of the UPQC system and that result in the calculation of corresponding optimal displacement angle, series inverter, shunt inverter, and series transformer ratings. This reduction in the VA rating of power-electronic converters comparatively brings down the manufacturing cost of the entire UPQC system. The harmonics produced in the system is reduced using the ANN Controller using back propagation learning algorithm and the THD is also calculated using the Fourier transform analysis.

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A STRUCTURAL WEIGHT BASED MINIMUM DISTANCE PATH METHOD USED FOR IDENTIFICATION, ISOMORPHISM AND DISTINCT MECHANISMS OF KINEMATIC CHAINS

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Abstract— This work presents a new method to identify distinct mechanism(DM) desired as in from the given family of kinematic chains(KCs). In this method the given KCs are represented in the form of structural link valued shortest path distance matrix (SLVSPDM) thus representing the identification number of each link. The equivalent links have the same identification number resulting a distinct mechanism. Same identification number of KCs resulting isomorphism . The method is examined for one degree of freedom (1-D.O.F), 8 links,16 Kinematic planner kinematic chains. Result is useful for designer to deduct isomorphism and distinct mechanism from the available kinematic chains family.

Keywords— Kinematic chain, Isomorphism, Distinct Mechanism, Structural Weighted Link Values.

INTRODUCTION

Structural synthesis of kinematic chain(KCs) and mechanism has been the subject of a number of studies in recent years. One important aspect of structural synthesis is to develop all possible mechanism derived from a given kinematic chain so that the designer has the liberty to select the best or optimum mechanism depending upon the application. In the course of development of mechanisms, duplication or isomorphism among kinematic chains with same number of links is necessary to prevent duplication and omission of a chain which is mechanically more useful than its isomer. A lot of literature related to isomorphism detection and detection of distinct mechanism (DM) is available but still there is scope for an efficient simple and reliable method and this paper is an attempt in this direction. Graph theory (Hsu and Lam, 1992)¹¹ has been widely adopted for representation of mechanism. Therefore, plenty of literature dealing with this topic in the area of graph theory as well as kinematic exists. The characteristic polynomial methods were developed by Uicker and Raicu(1975)⁽²²⁾, Yan and Hall(1981,1982)^(23,24), Mruthyunjaya (1984a, 1984b)^(13,14) and Mruthyunjaya and Balasubramaniam (1987)⁽¹⁶⁾. These methods have the disadvantage of dealing with large numerical and later counter examples were also reported by (He et al.(2005)⁽⁸⁾). Canonical code approaches (Ambeker and Agrawal, 1987)⁽¹¹⁾ require highly sophisticated algorithms and greater computational effort, when large applied to large kinematic chain. Hamming number technique (Rao and Rao 1993a, 1993b)^(19,20) is very reliable and computationally efficient, however when the primary Hamming string fails, the cumbersome computation of the secondary Hamming string is needed. Hsu (1993a, 1993b)^(9,10) using the concept of admissible graphs synthesized all possible graphs of planetary gear trains by the process of edge transformation. Then, the structural codes of graphs are used to identify the isomorphism. The adjacent- chain table method (Chu and Cao, 1994)⁽³⁾ had been proposed to identify isomorphism, but it is not suitable for computerised structural synthesis. The fuzzy logic method (Rao, 2000)⁽¹⁸⁾ requires computation of not only the first adjacency matrix but also the adjacency matrix of higher, even up to N/2. The method of eigenvectors and eigenvalues of adjacency matrices (Chang et al., 2002; Cubillo and Wan, 2005)^(2,4) possesses the advantages of using standard matrix theory, but it does not belong to the code based method and it is hard to analysis the topological structure of kinematic chains. The unconventional approaches, such as the artificial neural networking approach (Kong et al., 1999)⁽¹²⁾ and the genetic algorithm (Rao, 2000)⁽¹⁷⁾ are also applied to isomorphism identification, but the effectiveness of these methods still needs testing (Mruthyunjaya, 2003)⁽¹⁵⁾. Sunkari and Schmidt (2006)⁽²¹⁾ first time established the reliability of the existing spectral techniques for the isomorphism detection. Ding and Hung (2009)⁽⁶⁾ addresses the problem of isomorphism identification by finding a unique representation of graph. The unique representation of graph database feasible. It remains efficient even when the links of kinematic chains increases into the thirties. Hasan and Khan (2009)⁽⁷⁾ presented a method based of degrees of freedom of kinematic pairs, Darger et al. (2010)⁽⁵⁾ proposed a method based on first and second adjacency value of links, but no mathematical proof was presented. In this paper a new topological description (based on minimum path distance link structural value matrix) (MPDLSVM) is proposed. The proposed method has

following very fruitful characteristics:

2. Definition of Terminology:-

The following definition are to be understood clearly before applying this method. Various definitions with their abbreviations are given below.

1. Degree of link (D): A numerical value for the link, based on its connectivity to other links. Therefore quaternary link has degree equal to four and ternary link has equal to three.
2. Link value (LV) - For a particular link it is defined as the ratio of number of design parameter associated with the link to be degree of that link. The link values of various types of links are determined by equation 1 and listed in Table-1.

Table-1

Type of link	Link value
Binary link	$1 \div 2 = 0.5$
Ternary link	$3 \div 3 = 1$
Quaternary link	$(4+1) \div 4 = 1.25$
Quinternary link	$(5+2) \div 5 = 1.4$

3. **Link Structural value (LSV)** - For a particular link it is defined as the product of a link value to degree of links are connected to link in question. It can be explained by the example 1(Watt mechanism) shown in Fig.1.

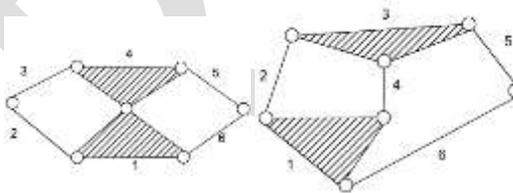


Figure-1 Watt Mechanism

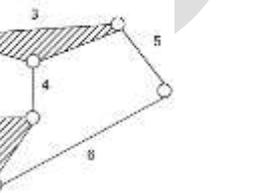


Figure-2 Stephen chain

Link 1 of figure 1 is connected with three links, one ternary and two binary hence connected degree of links to link 1 is $(3+2+2) = 7$ -----(1)

And link structural value of link 1 is equal to

Link value \times connected degree of links to link in question

For link no 1 of watt mechanism shown in figure1 = $1(\text{from table 1}) \times 7(\text{from eq.1}) = 7$

------(2)

Similarly for link 2,3----6 are

$0.5 \times (3+2) = 2.5, 0.5 \times (3+2) = 2.5, 1 \times (3+2+2) = 7, 0.5 \times (3+2) = 2.5$ and $0.5 \times (3+2) = 2.5.$

------(3)

4.- Structural weighted link label V_i – Usually the canonical labels depends only on the connectivity of the links being labeled together with its immediate neighbor. However, in a closed kinematic chain links are connected by joints, so as form loop and every link has a distinct relation with every other link in the form of minimum distance between them which is constant and is presented to have a matrix is called link path matrix of the chain. Considering this in mind the usual canonical labeling is extended to include all links of the chain. Canonical label V of a link of kinematic chain, is defined to have a sum of path weighted with structural link value. Each link L ia assigned a label V_i as follows-

$$V_i = \sum_{j=1}^n (LSV)_j \times D_{ij}$$

-----(4)

Where (LSV) is the link structural value already explained in section 3 and by equation 2.

And D is the minimum path from link to link.

Hence Kinematic chain structural weighted labeling is

$$KCSWL = \sum (V_i)^2$$

-----(5)

For example for a graph of Watt mechanism shown in Fig.1

LSV of Watt mechanism is shown in Table 2 by equation 2-

Table-2

Link No.	1	2	3	4	5	6
SLV	7	2.5	2.5	7	2.5	2.5

-----(6)

Minimum distance matrix of watt mechanism shown in fig,1 is-

Link → ↓	1	2	3	4	5	6
1	0	1	2	1	2	1
2	1	0	1	2	3	2
3	2	1	0	1	2	3
4	1	2	1	0	1	2
5	2	3	2	1	0	1
6	1	2	3	2	1	0

-----(7)

Hence Structural weighted link labeled matrix by equation no.4,6 and 7

Link → ↓	1	2	3	4	5	6	V _i
1	0	2.5	5	7	5	2.5	22
2	7	0	2.5	14	7.5	5	36
3	14	2.5	0	7	5	7.5	36
4	7	5	2.5	0	2.5	5	22
5	14	7.5	5	7	0	2.5	36
6	7	5	7.5	14	2.5	0	36

-----(8)

And KCSWL (by equation 5) is- 6132

Hence identification code of watt mechanism is

6132/4(36)/2(22)/ and distinct mechanisms are 2.

Consider Stephenson chain shown in Fig.2

By using equations 4,6,7 and 8

Identification code is 4981/2(32.5)/2(28)/2(25.5)/

And KCSWL is 4981

5.Detection of Isomorphism:- The set of link labels (V_i) can directly be used to distinguish kinematic chains. To make it more meaningful the structural weighted link labels calculated above can be combined to generate a numerical code for a kinematic chain. Squared sum of link(V_i) defined as the kinematic chain structural weighted label (KCSWL) as an index for testing of isomorphism. If two chains having identical KCSWL will be isomorphic to each other.

6. Application of concept is illustrated with no. of several examples:-

By comparison of KCSWL of Watt chain and Stephenson chain it is clear from the result that two chains are non-isomorphic. And Watt chain having two distinct mechanisms (by inspection of structural weighted link labels- /4(36)/2(22)/), Stephenson chain having three distinct mechanisms (SWLL- /2(32.5)/2(28)/2(25.5)/).

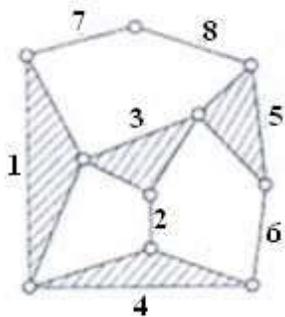


Fig.3(a)

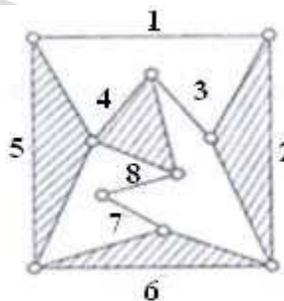


Fig.3(b)

Eight Link Isomorphic chains

For Fig. 3(a) the structural weighted link labels or labels are-

[77.5/72.5/66/64.5/56.5/54.5/48.5/48/]

KCWL is 30597.5 and identification code is

488[77.5/72.5/66/64.5/56.5/54.5/48.5/48/]

[77.5/72.5/66/64.5/56.5/54.5/48.5/48/]

KCWL is 30597.5 and identification code is

488[77.5/72.5/66/64.5/56.5/54.5/48.5/48/]

For Fig. 3(b) the structural weighted link labels or labels are-

727

The label and corresponding KCWL of both the figures are identical hence the chains are isomorphic.

Example-2:-Consider the two chains shown in Fig.4(a) and fig.4(b) (Nine links two degree of freedom kinematic chains,

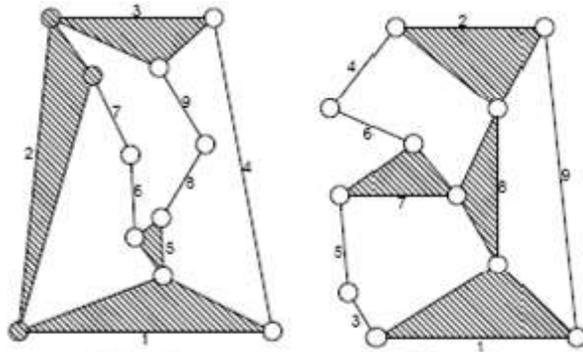


Fig.4(a)

Fig.4(b)

Nine links two degree of freedom kinematic chains

For chain shown in Fig.4(a), the labels, identification code , KCWL and distinct mechanisms are

Labels-/85/84.5/84/78.5/64.5/61/59/54.5/52/

Identification code-623[85/84.5/84/78.5/64.5/61/59/54.5/52]

KCWL-44620

Distinct mechanisms-9

For chain shown in Fig.4(b), the labels, identification code , KCWL and distinct mechanisms are-

Labels - /86/86/84/84/78/62.5/62.5/61/47/

Identification code- 651[86/86/84/84/78/62.5/62.5/61/47],

KCWL- 48730 and distinct mechanisms-6

The chain label and KCWL for nine links two degree of freedom chains shown in Fig.4(a) and Fig.4(b) are non identical, so it is clear from result that two chains are non – isomorphic.

Example-3 :- Three 12 links non-isomorphic kinematic chains are considered from ^(x) shown in Figures 5(a), 5(b) and 5(c) respectively. They have identical characteristic polynomial^(x). The labels and corresponding KCWL for the Figures are-

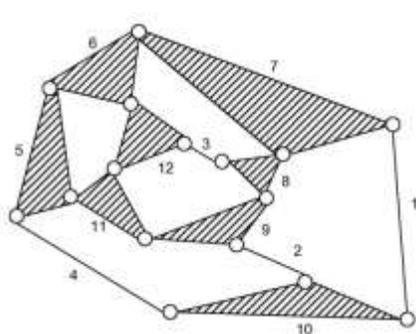


Figure 5(a)

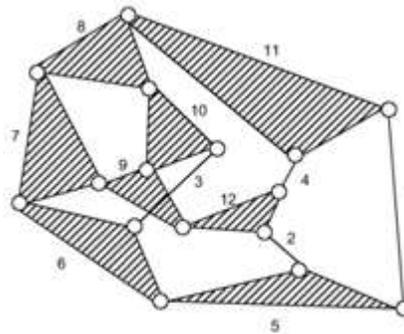


Figure 5(b)

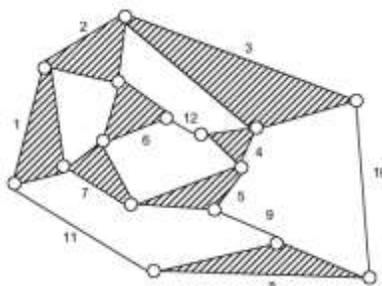


Figure 5(c)

Fig 5 Twelve-link 1-dof kinematic chains

For Figure 5(a)- /185/179/179/178/177/162/139/137/132/131/130/130/ and KCWL is 294039

For Figure 5(b) - /178/177/177/165/153/146/146/137/131/130/130/128/ and KCWL is 273722

And For Figure 5(c) /185/179/179/178/177/162/139/137/132/131/130/130/ and KCWL is 294039

Chain shown in Fig. 5(a) and 4(c) are isomorphic to each other, only links are relabeled in a different manner. Result clearly show that the invariant is independent of relabeling of links. KCWL for Fig 5 is different hence it clearly reflects that the chains are uniquely identified by KCWL.

Example 4:- Complete set of 8 links, 1 degree of freedom 16 kinematic chains are shown in Figure 6. The KCWL is calculated for each chain and shown in table-3 . All of these chains have distinct value of KCWL. The total distinct mechanism made by 8 links, 1 degree of freedom 16 kinematic chains are shown in same table.

RESULT AND CONCLUSIONS:-

Though no proof has been offered in the present work, but authors strongly believe that this method is unique and reliable as it takes care of nature and all inherent properties of the mechanism. In this paper a new heuristic method for detection of isomorphism among kinematic chains is presented. The proposed method is also tested to obtain all DM derived from a family of planar kinematic chain. It is hoped that the proposed method presents a new concept on which a new classification system for distinct mechanism and isomorphism of k-chains can be based. Method is simple, reliable and can easily be implemented on computer. A program is written in C++ and entire calculations was carried out in a personal computer with Pentium dual core ES200 @2.5 GH2 with 1 GB random access memory. With the help of present method kinematic chains can be checked with single numerical invariant. Also DM of a kinematic chain are derived from the family of 1 DOF 8 links 16 k chains in accordance is shown by table no-3.

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TABLE 3 ,(FIG.6) – KINEMATIC CHAIN LABELS AND DM OF EIGHT – LINK SINGLE DEGREE – OF – FREEDOM KINEMATIC CHAINS

S.NO.	K.CHAIN NO.	IDENTIFICATION CODE	KCWL	DISTINCT MECHANISMS
1	1	544[4(84)/4(52)]	39040	(1,4,5,8),(2,3,6,7)=2
2	2	492[4(73.5)/4(49.5)]	31410	(1,2,5,6),(3,4,7,8)=2
3	3	544[89.5/84.5/72.5/66/62.5/60.5/56.5/52]	38225	1,2,3,4,5,6,7,8=8
4	4	512[2(77.5)/2(71.5)/58/2(56.5)/43]	33834	(1,5),(2,4),3,(6,7),8=5
5	5	511[78.5/75.5/2(66.5/2(61.5)/2(50.5)]	33372	(1,4),(2,8),(3,7),5,6,=5
6	6	487[70/(63)/4(61)/47]	29931	1,(2,6,7,8),(3,5),4=4
7	7	491[77.5/68.75/63.5/63/2(57.75)/63/40]	30398	1,2,3,4,5,6,(7,8)=7
8	8	488[74/73.5/72.25/66.25/59.75/56.5/43.75/42]	30927.75	1,2,3,4,5,6,7,8=8
9	9	503[2(79.5)/2(67)/2(56.5)/2(48.5)]	32707.5	(1,8),(2,7),(3,6),(4,5)=4
10	10	464[4(63)/4(53)]	27112	(1,3,4,7),(2,5,6,8)=2
11	11	481[2(68)/2(63)/62/2(55)/47]	29289	(1,3),(2,7),(4,6),5,8=5
12	12	504[4(66)/4(60)]	31824	(1,2,4,5),(3,6,7,8)=2
13	13	461[71.5/68.5/2(57.5)/55/53.5/52/46]	27124.25	1,(2,8),3,4,5,6,7=7
14	14	523[2(85)/2(69.5)/69/2(53.5)/38]	36048	1,(2,8),(3,7),(4,6),5=5
15	15	502[6(70.5)/2(39.5)]	32942	(1,4),(2,3,5,6,7,8)=2
16	16	452[4(64)/2(52)/2(46)]	26024	(1,4),(2,3,5,6),(7,8)=3

TOTAL DM-71

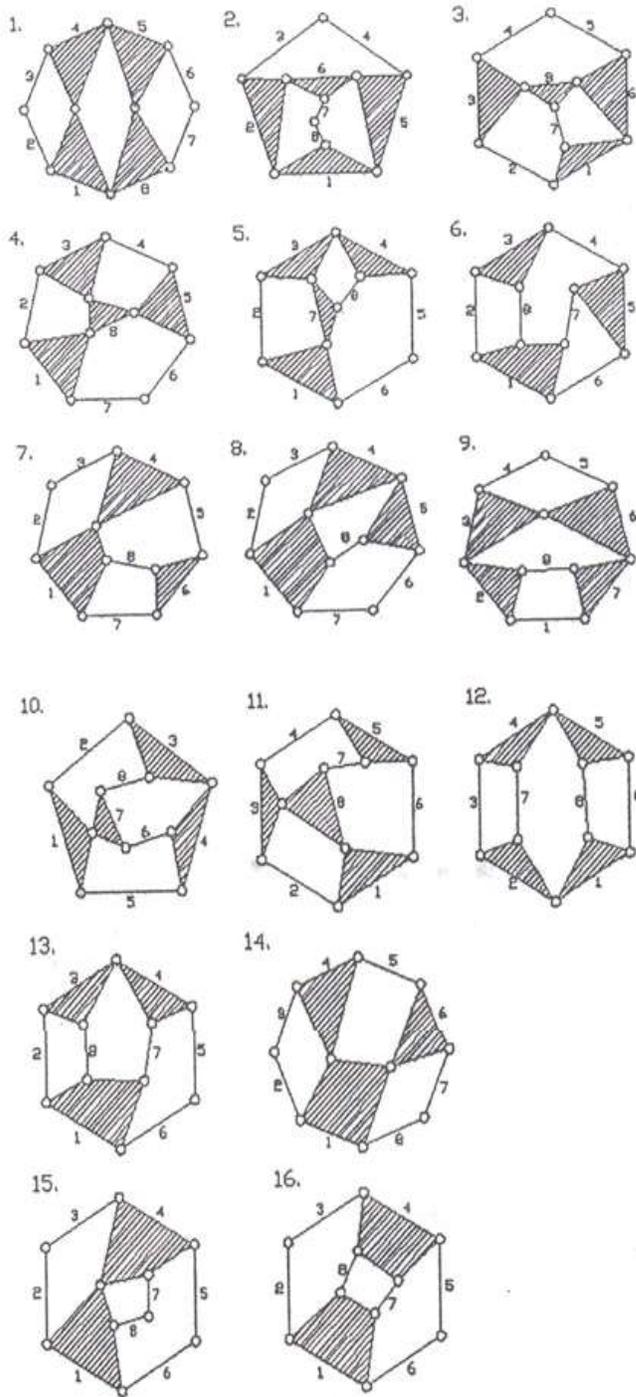


Figure-6, Eight links 1 degree of freedom 16 K-Chains

GMINESYS: Efficient approach to reduce storage area using LZW compression

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Abstract—Now days there are several graph visualization tools exist to represent the graph. However, they are not able to handle large graphs, and/or they do not allow interaction. We are interested on large graphs, with hundreds of thousands of nodes. Such graphs bring two challenges: the first one is that any straightforward interactive manipulation will be prohibitively slow. The second one is sensory overload: even if we could plot and replot the graph quickly, the user would be overwhelmed with the vast volume of information because the screen would be too cluttered as nodes and edges overlap each other. Our GMine system addresses both these issues, by using summarization and multi-resolution. GMine offers multi-resolution graph exploration by partitioning a given graph into a hierarchy of communities-within-communities and storing it into a novel R-tree-like structure which we name G-Tree. GMine offers summarization by implementing an innovative subgraph extraction algorithm and then visualizing its output. Storage and processing of large data of the large graph is a significant challenge so by using LZW compression technique we can reduce the storage area required to store the huge data of the sparse graph without occurring the data loss.

Keywords— Large Graph, Gmine System, Graph Tree, Graph Representation, Graph Partitioning, LZW compression and LZW decompression.

INTRODUCTION:

An important support for graph exploration is interactive visualization, which can help to quickly identify the main components of a graph, its outliers, the most important edges and communities of related nodes. Large graphs can be found in numerous real-life settings: web graphs, computer communication, recommendation, bipartite graphs of web-logs of who visits what page; blogs and similar [1]. At this magnitude, efficient graph visualization becomes prohibitive because of the excessive processing power requirements that prevent interaction. Besides that, hundred-thousand-node drawings result in unintelligible cluttered images that do not aid the user's cognition. To face these challenges we present a system that explores two new ideas to address scalability in large graph visualization [5]. Thus here we put two ideas one is to represent large graph using Gmine system and then second to reduce the storage area required to store the huge data. The rest of this paper is structured as follows. Section 2 introduces the DBLP dataset that will be used along this work. Section 3 describes our graph representation in Gmine system idea and section 4 illustrates LZW compression algorithm to reduce the storage area. Section 5 concludes the work.

2. DBLP DATASET:

Throughout this text we employ the DBLP dataset to illustrate the functionalities of our system. This dataset originates from the Digital Bibliography & Library Project (or DBLP). DBLP is a publicly available database of publication data that embraces authors (also co-authors) from the Computer Science community [7], Titles of the book and their published works. The version of DBLP dataset that we use defines a graph with $n = 315,688$ nodes and $e = 1,659,853$ edges, where each node represents an author or publication or title and each edge denotes a relationship between the authors or titles or publications.

3. GRAPH REPRESENTATIONS IN GMINE SYSTEM:

3.1 Construction of the GraphTree:

For this work, initially we need to recursively and hierarchically partition a given graph. For the partitioning task we adopted METIS k-way partitioning [1]. The choice for a specific graph partitioning is independent of the Graph-Tree methodology [15]. Hence, given a graph, we perform a sequence of recursive partitioning to achieve a hierarchy of communities within-communities. At each recursion, each partition is submitted to a new partitioning cycle that will create another set of partitions [20]. This process repeats until we get the desired granularity for the partitions (communities).

3.2 Visualization and Interaction:

We propose an innovative interactive presentation for large graphs. For this purpose, our system promotes the navigation across the levels of the tree that represents the partitioning of a large graph which is shown in figure 1. As the user interacts with the visualization, the system keeps track of the connectivity among communities of nodes at different levels of the partitioned graph [17]. When the user changes the focus position on the tree structure, the system works on demand to calculate and present contextual information [10]. Also, the system provides different graph representation layout views to view the large graph in a different angle, which are Spring layout, KK layout, FR layout, ISOM layout and circle layout. The system provides zoom facilities with increase and decrease forms to zoom the graph to see a portion or whole large graph in one view clearly and in detail. Node information is also displayed when clicked on the node in the Node Information text box.

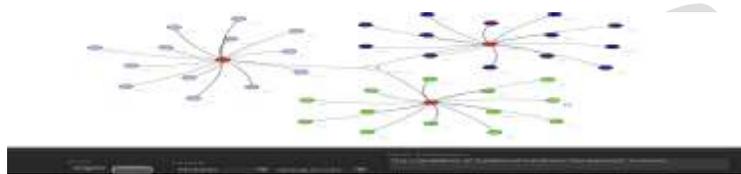


Figure 3.1 Large graph representation using Gmine system

3.3 Graph Search:

The system provides search facilities to search a graph according to Author or Title or Publication by entering author name/ publication name/ title name whatever selected user can search the particular graph and view it.

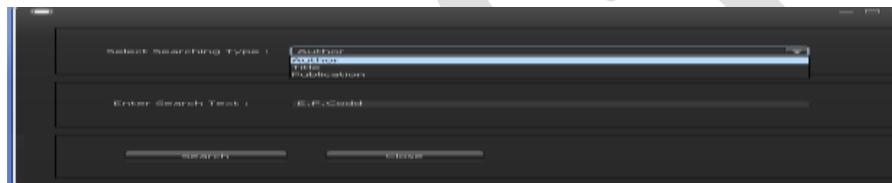


Figure 3.2 Search Graph

4. LZW COMPRESSION AND DECOMPRESSION TECHNIQUE:

LZW is a data compression and decompression method that takes advantage of this repetition. LZW compression technique converts [27] a big file into a smaller file using a table-based lookup algorithm invented by Abraham Lempel, Jacob Ziv, and Terry Welch. A particular LZW compression algorithm takes each input sequence of bits of a given length (for example, 12 bits) and creates an entry in a table (sometimes called a "dictionary" or "codebook") for that particular bit pattern, consisting of the pattern itself and a shorter code and for decompression it reverse the process and get the original data back [27].

4.1 LZW Compression Algorithm:

1. Initialize the existing dictionary
2. Take the input character say s.
3. Check s is exist in the dictionary
4. If exist then
{take next input character say c
Check s+c exist in the dictionary
If s+c exist in the dictionary then s= s+c

else add s+c in the dictionary with new code

}
 else add s in the dictionary with a new code

5. Repeat this process until end of the file =0

4.2 LZW Decompression Algorithm:

1. Initialize the existing dictionary with code and its appropriate characters.

2. Take the input code

3. Initially input string is empty

{Take the first input code

Write the character represented for the first input code in the dictionary}

4. Take the next input code

5. Write the character for next input code

6. Add the previous code character and first character in the next input code character.

7. Print it in the output string.

8. Assign a new code for {(previous code character)+(next input code character)}

9. Repeat this process until EoF=0

LZW Compression and Decompression Result:

Now take the input string is “ABABBABCABABBA”, and apply the LZW compression algorithm which gives output codes as 1 2 4 5 2 3 4 6 1. Instead of sending 14 characters, only 9 codes are here. After decompression of these codes we get apparently, the output string is “ABABBABCABABBA”, a truly lossless result! [27].

Compression Result Table:

Result Table1.1.For LZW Compression

S	C	Output	Code	String
			1	A
			2	B
			3	C
A	B	1	4	AB
B	A	2	5	BA
A	B		6	ABB
B	A	4	7	BAB
BA	B	5	8	BC
A	C	2	9	CA
C	A	3		
A	B		10	ABA
AB	A	4		
A	B		11	ABBA
ABB	A	6		
A	EOF	1		

Result Table 1.2 for LZW Decompression

S	K	Entry/Output	Code	String
			1	A
			2	B
			3	C
Nll	1	A		
A	2	B		AB
B	4	AB		BA
AB	5	BA		ABB
BA	2	B		BAB
B	3	C		BC
C	4	AB		CA
AB	6	ABB		ABA
ABB	1	A		ABBA
A	EOF			

4.3. Result:

The result of the proposed system to reduce the storage area required to store the huge graph data is given as below. This graph shows the memory size comparison for the existing and proposed system which results the memory size of proposed system used is less than the existing system required.

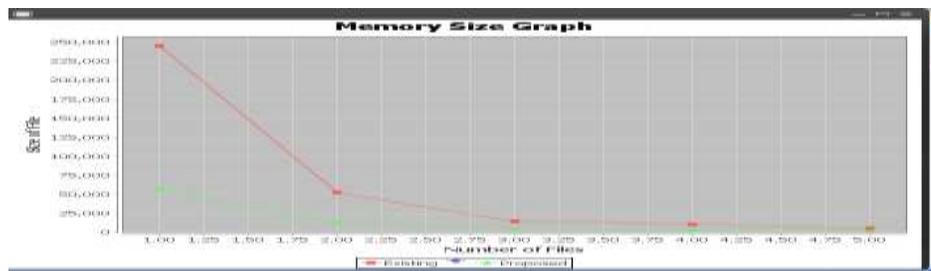


Figure 4.1 Comparison Graph for memory Size

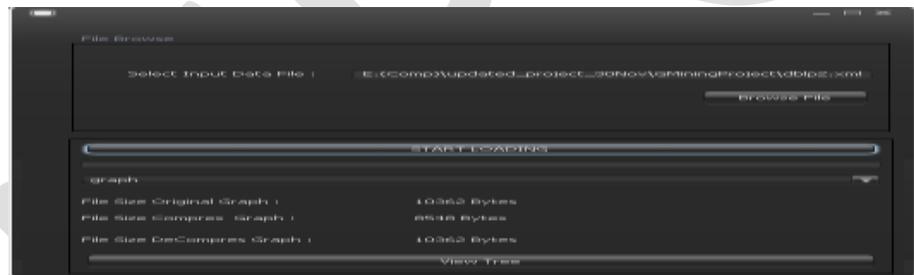


Figure 4.2 memory size Result of proposed system.

This is the output result of the application which shows the data analysis for the selected dblp data file in memory size.

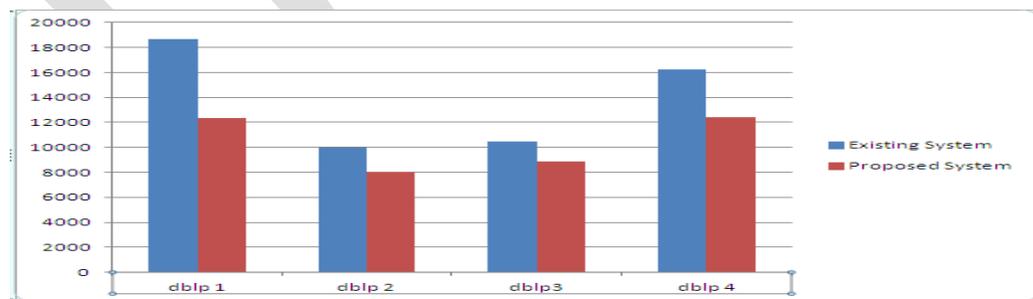


Figure 4.3 Memory size comparison for different dblp files

This is the column graph for the comparison in the proposed system and existing system for memory size required for the dblp file for graph representation.

5. CONCLUSION AND FUTURE SCOPE:

We have demonstrated a system that supports the visualization of large graphs in an interactive environment with different layouts and storage area can be reduced by applying LZW compression and decompression techniques. Also any graph can be searched and viewed clearly and neatly. In future we can apply the both algorithms on different pictures images and calculates the final results for very large and complex graphs.

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REDUCING DYNAMIC POWER DISSIPATION IN LFSR USING LOOK AHEAD CLOCK GATING AND DOUBLE EDGE TRIGGERING

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ABSTRACT: In normal LFSR consumes large dynamic power dissipation. A linear feedback shift register (LFSR) is constructed by N number of flip flops. LFSR is a shift register whose input bit is a linear function of its previous state. This novel paper presents the two methods to reduce power dissipation and increases the speed of the operation in LFSR. One of the method is LACG, it computes the clock enabling signals for each FF ahead of time and based on the present cycle data of those FFs on which it depend. It reduces the dynamic power dissipation. And other method is double edge triggering in which the FF is operate on both positive and negative edge of the clock cycle. So it increases the speed of operation. The power reduction 25% is achieved. Xilinx ise 8.1i is used for power analysis.

Index terms: clock gating, LACG, LFSR

1.INTRODUCTION

The main challenging area in VLSI area performance, cost, test, area, reliability and power. In this power consumption is major challenging. The power consumption increased due to the power dissipation in the circuits. Most of the power dissipation occurs due dynamic power. In normal LFSR consumes large dynamic power dissipation.

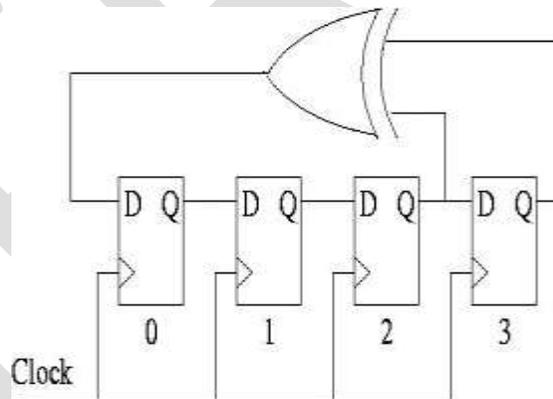


Fig.1.Normal LFSR

A linear feedback shift register is constructed by N number of flip flops. LFSR is a shift register whose input bit is a linear function of its previous state. In this continuous clock pulse is given as input[4]. LFSR is based on XOR or XNOR feedback logic is the initial value of the shift register, shift register taps and feedback logic determines the output sequence. The shift register taps is nothing but combination of XOR or XNOR logic and the feedback input to the shift register. LFSRs are very easy to implement.

The taps of an LFSR can be represented as a polynomial mod. It shows the coefficient of polynomial must be 1's or 0's. The powers of the terms represent the tapped bits, counting from the left. The first and last bits are always connected as an input and tap respectively.

In this major drawback is power dissipation, it occurs due to continuous clock pulse is given whether the data is toggle or not to the next state[4] and [5].

II.LFSR USING LACG AND DOUBLE EDGE TRIGGERING.

The proposed method to increase the speed of operation and reduce dynamic power dissipation there are two methods used. The methods are look ahead clock gating and double edge triggering.

LOOK AHEAD CLOCK GATING

The increased dynamic power dissipation in the digital system can be reduced by deactivating the clock signal to flip flop when the output signal is same as the input signal[3],[6] and [7]. There are several techniques has been developed for reducing dynamic power dissipation, the clock gating plays the major role. There are three techniques in clock gating: synthesis based, data driven method and auto gated flip flop. Synthesis based is deriving clock enabling signal for the flip flop based on the logic. In data driven method to reduce the overhead of the gating logic several FF are driven by the same clock signal generated by ORing the enabling signal of individual FF[1] and[2]. In auto gated FF the master slave ff is used to reduce the size and saving the power[1].

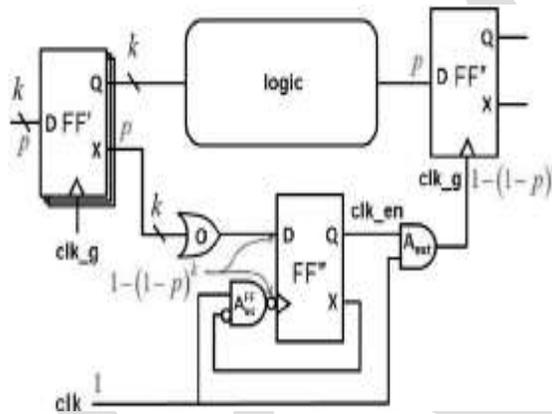


Fig.2. General logic of LACG

The look ahead clock gating is the combination of these three methods. LACG computes the clock enabling signals of each FF one cycle ahead of time, based on the present cycle data of those FFs on which it depend[1] .LACG is very useful in reducing the clock switching power. The computation of the clock enabling signal one cycle ahead of the time avoids the tight time constraints existing in other gating methods.

Fig.2.illustrates the general logic for LACG. The FF' is the source and FF'' is the target. The target FF is based on the source FF, it does not have any external input of the block. The XOR is used to perform XOR operation between the outputs of any two FF, it define the data to clock toggling probability. The AND gate is used to enabling the clock signal based on the clock gating and XOR output.

The overall block diagram is designed as a single block

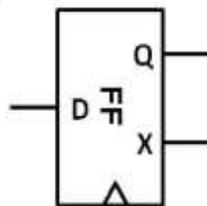


Fig.3. LACG flip flop

The separate gating logic for each target FF, it consumes the considerable amount of power and area[1]. The gating logic should be minimized, therefore in many cases target FF depend on the similar source FF. To develop logic sharing model to minimize the

gating cost. The ORing logic is merged and a single gater is used for the two FFs. In addition to logic reduction, the number of clock drivers and gaters will also be reduced.

The dynamic power overhead of LACG has been considerable in the break even analysis. There is also static power overhead. It should be noted that due to the full cycle allotted for the derivation of the enabling signals, the logic involved uses high threshold voltage and smallest device.

MODELING THE POWER SAVINGS

Let X be a random variable of the FFs data to clock toggling and let $p = Pr[X=1]$ be its probability [1]. The FFs are toggling their data independently of each other exists

$$Pr[\sum_{X(D^n)} X(t) = 0] = (1 - p)^k$$

Let X is independently that the probability of enabling the clock while it could be disabled is

$$Pr[\sum_{X(D^n)} X(t) = 1 \wedge X^n(t + 1) = 0] = [1 - (1 - p)^k](1 - p)$$

The power savings in terms of capacitance and data toggling probability, since the frequency and voltage do not matter for relative savings calculation. The product of capacitance and data toggling probability is called dynamic capacitance or c_{dyn}. Let c_{FF} be the clock input capacitance of a FF and let c_{FF+CLK} include the clock driver. The net c_{dyn} savings per target FF, denoted by C_{dyn^{save}} is

$$C_{dyn}^{save} = (1 - p)^k (c_{FF} + CLK + c_{FF} + c_o) - p (C_x + kc_o) - (\frac{c_{FF} + CLK}{3} + c_{Aint} + c_{FF} + c_o)$$

The C_{dyn^{save}} is decreasing with the increase of p and k.

DOUBLE EDGE TRIGGERING

Most of the flip flops are designed to operate in single clock edge that is either operates in positive edge or negative edge. In double edge triggering the flip flop is made to operate in both clock edges. So, it will not waste the clock pulse and also speed of operation is increased.

III. OPERATION OF PROPOSED LFSR

The operation of LFSR using look ahead clock gating and double edge clock triggering as same a normal LFSR. In this input is given as clock gating, it deactivating the clock signal when there is no change in the state and when the output is same as the input signal [1]-[3],[6] and [7]. The clock gating it operates on the both clock edges are positive edge and the negative edge.

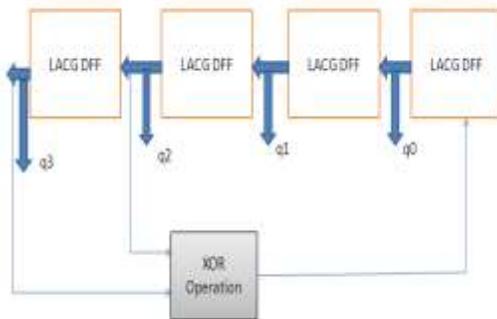


Fig.4. Proposed LFSR

In this LACG flip flop is used as four times as LFSR. The initial input to first LACG FF is XOR feedback logic. The output determines by initial value of shift register taps, shift register taps and XOR feedback logic. The tapped bits determine the polynomial mod. The characteristics polynomial is x^4+x^3+1 .

The power terms are represented by tapped bits, it counting from the left. The output of 3rd and 4th bits are XORED and given as input to the initial FF. It reduces the dynamic power dissipation, increases the speed of operation, increases throughput and reduces the delay.

IV. APPLICATION OF LFSR

LFSR can be implemented in the hardware and it makes useful in applications that may require fast generation of a pseudo random sequence.

USES AS COUNTERS

The LFSR allows the repeating sequence of states is to be used as clock divider. LFSR counters have simpler feedback logic than natural binary counters or gray code counters and it operate at higher clock rates. It is necessary to ensure that the LFSR never enters an all zero state.

USES IN CRYPTOGRAPHY

LFSRs have been used as pseudo random generators for used in stream ciphers, due to construction from simple electro mechanical or electronics circuits and very uniformly distributed output streams.

USES IN DIGITAL BROADCASTING AND COMMUNICATION

SCRAMBLING:

To prevent short repeating sequences from forming that complicate symbol tracking at the receiver or it may interfere with other transmission, LFSR are often used as “randomize” the transmitted bit stream. This randomization removes at the receiver after demodulation. When LFSR runs at the same rate as the transmitted symbol stream, this technique is refer as scrambling[4]s. When the LFSR runs faster than the symbol stream the transmitted signal bandwidth is expanded, this is direct sequence spread spectrum.

VII. SIMULATION

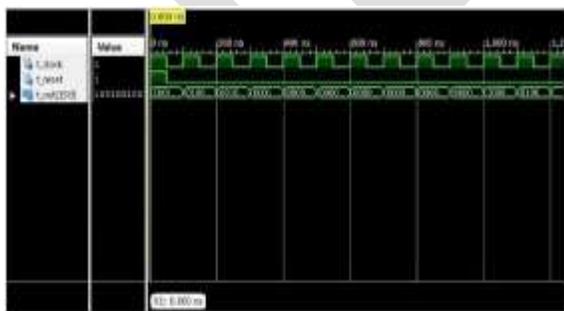


Fig.5. Waveform of normal LFSR

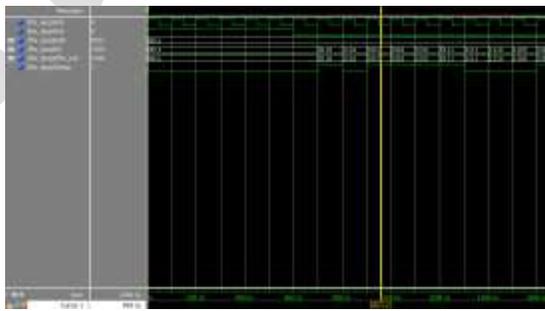


Fig.6. Waveform of proposed LFSR

V. EXPERIMENTAL RESULTS

The EDA tool is used to verify the circuit. In this Modelsim SE 6.5 is used analysis and run simulation output. Xilinx ISE8.1i is used for power analysis and gets synthesized output. The table.1.shows the comparison between LFSR and proposed LFSR. In order to evaluate the power reduction obtained by applying proposed LFSR, have evaluate the power consumption in the normal LFSR and power consumption proposed LFSR for same input vector and the same clock cycle. VHDL code of proposed LFSR was simulated and synthesized.

	LFSR	PROPOSED LFSR
TOTAL POWER	67.00 mW	63.00 mW
DYNAMIC POWER	33.33 mW	29.05 mW
QUIESCENT	27.00 m W	26.95 mW

Table.1.Comparison between LFSR and proposed LFSR

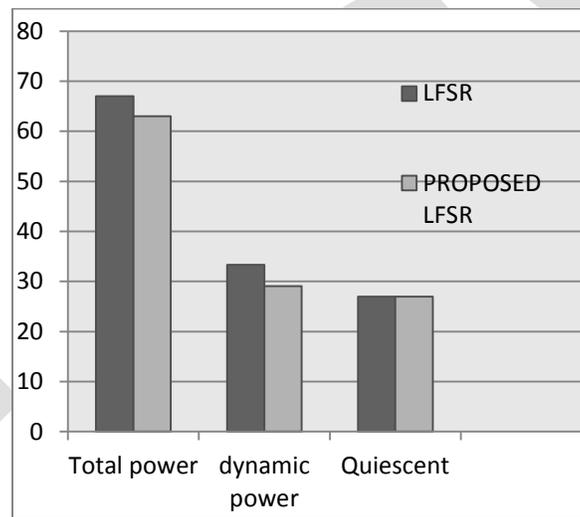


Fig.7. Comparison between LFSR and Proposed LFSR

VI.CONCULSION

The proposed LFSR has been shown to be very useful in reducing the dynamic power dissipation and increases the speed of operation. The proposed LFSR has been used in many application were at all normal LFSR is used. As, a result reduced dynamic power dissipation, increases speed, throughput and reliability.

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Privacy-Preserving Public Auditing for Secure Cloud Storage

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Abstract— The cloud storage has a lot of problems about the security and data Integrity. So we need to prevent the all problems. In cloud storage users can remotely store their data and enjoy the on-demand high quality applications and services from shared resources, without the burden of local data storage and maintenance. Users are not able to check his data again and again from the cloud storage it is secure or not. Moreover, users should be able to just use the cloud storage as if it is local, without worrying about the need to verify its integrity. Thus, enabling public auditability for cloud storage is of critical importance so that users can resort to a third party auditor (TPA) to check the integrity of outsourced data and be worry-free. To securely introduce an effective TPA, the auditing process should bring in no new vulnerabilities towards user data privacy, and introduce no additional online burden to user. In this paper, we propose a secure cloud storage system supporting privacy-preserving public auditing. We further extend our result to enable the TPA to perform audits for multiple users simultaneously and efficiently.

Keywords— Privacy-preserving, auditability, Cryptographic protocols, cloud computing, data compression, Data integrity, Third Party Auditor (TPA).

1. INTRODUCTION

The cloud services mainly include sharing, online storage, Web-based email and database processing. By adapting the Cloud computing, it becomes easy to share the virtualized resources. Here Users do not need any background knowledge of the services and it's very easy to maintain when compared to any traditional technologies. Cloud computing is of three types named Infrastructure as a Service, Platform as a Service, and Software as a service .By these three; it is possible to make complex things very easy. Infrastructure as a Service delivers basic storage and computing capabilities as standardized services over the network.

Third Party Auditor is kind of inspector. There are two categories: private auditability and public auditability. Although private auditability can achieve higher scheme efficiency, public auditability allows anyone, not just the client, to challenge the cloud server for the correctness of data storage while keeping no private information. To let off the burden of management of data of the data owner, TPA will audit the data of client. It eliminates the involvement of the client by auditing that whether his data stored in the cloud are indeed intact, which can be important in achieving economies of scale for Cloud Computing. The released audit report would help owners to evaluate the risk of their subscribed cloud data services, and it will also be beneficial to the cloud service provider to improve their cloud based service platform. Hence TPA will help data owner to make sure that his .data are safe in the cloud and management of data will be easy and less burdening to data owner.

2. OBJECTIVE

1. Storing of user data in the cloud despite its advantages has many interesting Security concerns which needs to be extensively investigated for making it reliable solution to the problems in local storage of data.
2. The main problem with cloud storage is securities of information as the cloud server we use are the third party. So we need to use the encryption algorithm which will give security to our data. We also need to keep some auditor who will take care of data integrity by monitoring the data.
3. We are compressing the data using algorithm for Data optimization. Algorithm works by manipulate bits of data to reduce the size and optimize input. Algorithm is to split the input data into two data where the first data will contain original nonzero byte and the

second data will contain bit value explaining position of nonzero and zero bytes. Data then can be compress with data compression algorithm to achieve maximum compression ratio.

3. RELATED WORK

The public auditability in their defined “provable data possession” model for ensuring possession of data files on untrusted storages. Their scheme utilizes the RSA based homomorphic non-linear authenticators for auditing outsourced data and suggests randomly sampling a few blocks of the file.

However, the public auditability in their scheme demands the linear combination of sampled blocks exposed to external auditor. When used directly, their protocol is not provably privacy preserving, and thus may leak user data information to the auditor. Jules et al describe a “proof of irretrievability” model, where spot-checking and error-correcting codes are used to ensure both “possession” and “irretrievability” of data files on remote archive service systems. However, the number of audit challenges a user can perform is fixed a priori, and public auditability is not supported in their main scheme. Although they describe a straightforward Merkle-tree construction for public PoRs, this approach only works with encrypted data. Dodis et al. give a study on different variants of PoR with private auditability. Shacham et al. design an improved PoR scheme built with full proofs of security in the security model defined. Similar to the construction, they use publicly verifiable homomorphic non-linear authenticators that are built from provably secure BLS signatures. construction, a compact and public verifiable scheme is obtained. Again, their approach does not support privacy preserving auditing for the same reason. The propose allowing a TPA to keep online storage honest by first encrypting the data then sending a number of pre-computed symmetric-keyed hashes over the encrypted data to the auditor. The auditor verifies both the integrity of the data file and the server’s possession of a previously committed decryption key. This scheme only works for encrypted files, and it suffers from the auditor state fullness and bounded usage, which may potentially bring in online burden to users when the keyed hashes are used up.

The dynamic version of the prior PDP scheme, using only symmetric key cryptography but with a bounded number of audits. Consider a similar support for partial dynamic data storage in a distributed scenario with additional feature of data error localization. In a subsequent work, Wang et al. propose public auditability and full data dynamics. Almost simultaneously developed a skip lists based scheme to enable provable data possession with full dynamics support. However, the verification in these two protocols requires the linear combination of sampled blocks and thus does not support privacy preserving auditing. While all the above schemes provide methods for efficient auditing and provable assurance on the correctness of remotely stored data, none of them meet all the requirements for privacy preserving public auditing in cloud computing. More importantly, none of these schemes consider batch auditing, which can greatly reduce the computation cost on the TPA when coping with a large number of audit delegations.

3. EXISTING SYSTEM

Cloud improves due to centralization of data, increased security-focused resources, etc., but concerns can persist about loss of control over certain sensitive data, and the lack of security for stored kernels. Security is often as good as or better than other traditional systems, in part because providers re able to devote resources to solving security issues that many customers cannot afford.

To securely introduce an effective third party auditor (TPA), the following two fundamental requirements have to be met: 1) TPA should be able to efficiently audit the cloud data storage without demanding the local copy of data, and introduce no additional on-line burden to the cloud user; 2) he third party auditing process should bring in no new vulnerabilities towards user data privacy.

Drawbacks of existing system:

- Cloud Storage system provides the user for safe and consistent place to save valuable data and documents. However, user's files are not encrypted on some open source cloud storage systems. I.e. TPA demands retrieval of user data, here privacy is not preserved.
- The storage service provider can easily access the user's files. This brings a big concern about user's privacy. The user has no supreme control over the software applications including secret data. User has to depend on the provider’s action, maintenance and admin it.

4. PROPOSED SYSTEM

In this paper, the TPA will be fully automated and will be able to properly monitor confidentiality and integrity of the data and uniquely integrate it with random mask technique to achieve a privacy-preserving public auditing system for cloud data storage security while keeping all above requirements in mind. Extensive security and performance analysis shows the proposed schemes are provably secure and highly efficient. We are encrypt the data using RSA algorithm cloud computing can be applied to the data transmission security. Transmission of data will be encrypted, even if the data is stolen, there is no corresponding key that cannot be restored. Only the user knows the key, the clouds do not know the key. Also, because the properties of encryption, the cloud can operate on cipher text, thus avoiding the encrypted data to the traditional efficiency of operation. User's privacy is protected because user's files are encrypted in cloud storage.

The main issue with the cloud is data integrity, in this paper we are going to use MD5 algorithm for maintain the integrity of data. This MD5 algorithm has more expensive and more secure than other algorithms. MD5 Message Digest is a widely used hash technique, such that it will produce 128-bit hash value we need to convert the input data into bytes in order to convert it to hash value. This is useful in many security applications and it ensures data integrity. Sender creates input message (M) and computes its message digest. Then he uses his private key and encrypts message digest. Encrypted message digest is attached to the input message and the whole message is sent to receiver. Receiver gets the message and extracts the encrypted message digest. Then he computes his own message digest of the received message. He also decodes received message digest with sender's public key and gets decoded message digest. Then he compares both message digests. When both message digests are equal, the message was not modified during the data transmission.

Advantages:

1. We motivate the public auditing system of data storage Security in Cloud Computing and provide a privacy-preserving auditing protocol. Our scheme enables an external auditor to audit user's cloud data without learning the data content.
2. To the best of our knowledge, our scheme is the first to support scalable and efficient privacy preserving public storage auditing in Cloud. Specifically, our scheme achieves batch auditing where multiple delegated auditing tasks from different users can be performed simultaneously by the TPA in a privacy preserving manner.
3. We prove the security and justify the performance of our proposed schemes through concrete experiments and comparisons with the state-of-the-art.
4. Interoperability
 - Access information from anywhere
 - Can be accessed using different devices
4. A fragment technique is introduced in this paper to improve performance and reduce extra storage.
5. The data integrity will be safer.

Architecture of Cloud Data Storage Service

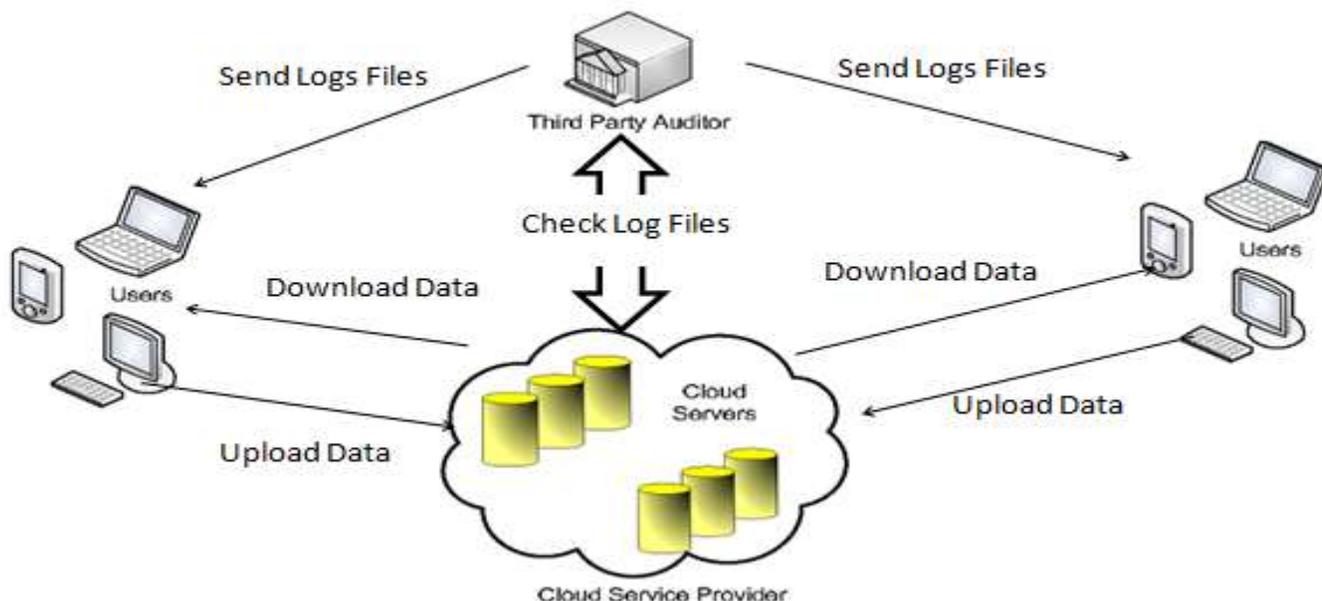


Fig -Architecture of Cloud Data Storage Service

In the above figure there three main parts i.e Users, Cloud service provider and Third Party Auditor(TPA). The user uploads the data on to the clouds and downloads from the cloud using cloud service provider. Then user needs a integrity to his data that integrity maintain using TPA. It maintain the all logs file and check simultaneously the data on to the cloud. The main purpose of the TPA is to maintain and check the integrity of data. If small changes occurs into the data then TPA send that report to the user. The integrity of the data can be maintain using the MD5 algorithm. The MD5 algorithm is intended for digital signature applications, where a large file must be "compressed" in a secure manner before being encrypted with a private (secret) key under a public-key cryptosystem such as RSA."

For the compression of data we are using huffman code algorithm in which tree generated from the exact frequency of text. This algorithm is an optimal compression algorithm when only the frequency of individual letters are used to compress the data. The technique works by creating a binary tree of nodes. These can be stored in a regular array, the size of which depends on the number of symbols, n . A node can be either a leaf node or an internal node. Initially, all nodes are leaf nodes, which contain the symbol itself, the weight (frequency of appearance) of the symbol and optionally, a link to a parent node which makes it easy to read the code (in reverse) starting from a leaf node. Internal nodes contain symbol weight, links to two child nodes and the optional link to a parent node. The process of decompression is simply a matter of translating the stream of prefix codes to individual byte values, usually by traversing the Huffman tree node by node as each bit is read from the input stream

APPLICATION

This system will be used to store the data on cloud server with safety and the data integrity of data can be maintain automatically using the third party authenticator.

ACKNOWLEDGMENT

My deepest thanks to Prof.N.L Chourasiya, the guide of the project for guiding and correcting various documents of ours with attention and care. She has taken a pain to go through the project and make the necessary correction as and when needed.

We would also thank my Institution and my Faculty members without whom this project would have being a distant reality. We are grateful for their constant help and support.

CONCLUSION

In this paper, we propose a privacy-preserving public auditing system for data storage security in Cloud Computing. We utilize the homomorphic linear authenticator and random masking to guarantee that the TPA would not learn any knowledge about the data

content stored on the cloud server during the efficient auditing process, which not only eliminates the burden of cloud user from the tedious and possibly expensive auditing task, but also alleviates the users' fear of their outsourced data leakage. Considering TPA may concurrently handle multiple audit sessions from different users for their outsourced data files, we further extend our privacy-preserving public auditing protocol into a multi-user setting, where the TPA can perform multiple auditing tasks in a batch manner for better efficiency. Extensive analysis shows that our schemes are provably secure and highly efficient.

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Bidirectional WDM-PON system with OFDM downlink and uplink transmission using TWSOA remodulation

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Abstract— Rapid increase of global data traffic and massive deployment of new networks are becoming a key environmental, social and economic issue. The access network consumes about 70% of overall network energy. Passive Optical Networks (PON) has been considered to be one of the most promising solutions for access networks due to its immense bandwidth and low cost infrastructure. The combination of Orthogonal Frequency Division Multiplexing (OFDM) and WDM-PON technique is a subject of great interest to increase the system capacity and dispersion tolerance. A 20-Gb/s downlink signal transmission based on an OFDM signal and a 2.5-Gb/s uplink signal transmission using remodulation of a semiconductor-optical-amplifier are realized.

Keywords— Passive Optical Network (PON), Orthogonal Frequency Division Multiplexing (OFDM), Semiconductor Optical Amplifier, TWSOA, Wavelength Division Multiplexing-PON.

INTRODUCTION

The combination of an exponential increase in bandwidth-intensive applications and customer base has resulted in the rapid increase of fiber networks in the access network segment in recent years. In terms of fiber access technology, the point-to-multipoint passive topology in the form of the Passive Optical Network (PON) has been proven to be beneficial to both customers and operators. With the popularity of broadband services of the terminal users, such as Internet video, online gaming, high-quality Internet Protocol TV (IPTV), etc., the demands of bandwidth in access networks is rapidly increasing. Rapid increase of global data traffic and massive deployment of new network is becoming a key environmental, social and economic issue.

To address this issue, great effort has been expended on researching the high-speed, cost-effective, flexible bandwidth allocation and future-proof NG-PON system. Among these techniques, WDM based PON systems have attracted a great deal of research and development interest, due to their capable of providing cost-effective way for increasing the overall bit rate and transmission reach of networks.

The Orthogonal Frequency Division Multiplexing (OFDM) is widely considered as one of the strongest candidate for WDM-based PON system, owing to its unique advantages of superior tolerance to chromatic dispersion impairments, dynamic provision of multi-granularity bandwidth allocation both in time and frequency domains, and fully exploiting the rapid advances in modern digital signal processing technology.

SYSTEM MODEL

In the bidirectional WDM-OFDM-PON system each OLT consist of transmitter and receiver units are multiplexed by an arrayed waveguide grating (AWG) or bidirectional WDMUX to achieve aggregate data rates for downstream. Before the AWG the downstream and upstream data signals are correctly routed using a bidirectional circulator. The basic block diagram of bidirectional WDM-OFDM-PON system is shown in the Figure 1.

In each transmitter Pseudo Random Binary Sequence (PRBS) generator is used to generate 10Gbps data to drive the OFDM modulator using the QAM sequence coder. Depending on the type of OFDM (either direct detection or Coherent detection) modulator there should a Local Oscillator in the ONU. Direct-Detection Optical OFDM (DDO-OFDM) looking into a simple realization based on low-cost optical components and CO-OFDM aiming to achieve high spectral efficiency and receiver sensitivity.

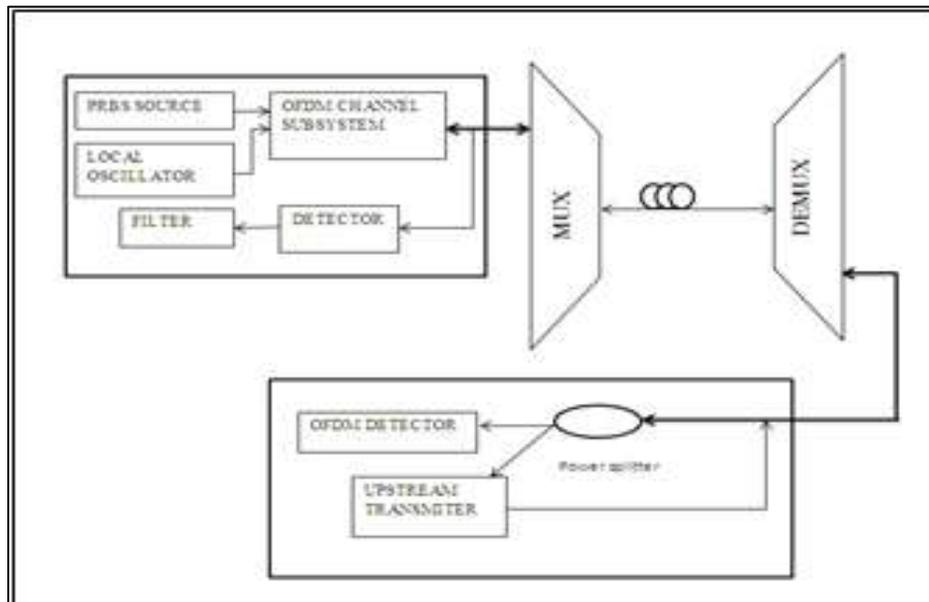


Fig: 1 Basic block diagram of Bidirectional WDM-OFDM-PON System with uplink transmission with SOA remodulation.

The spectral efficiency can be further improved by using higher order QAM modulation. The practical implementation of coherent OFDM system, the optical spectral efficiency will be reduced by needing a sufficient guard band between WDM channels. This guard band can be avoided by using orthogonally across the WDM channels.

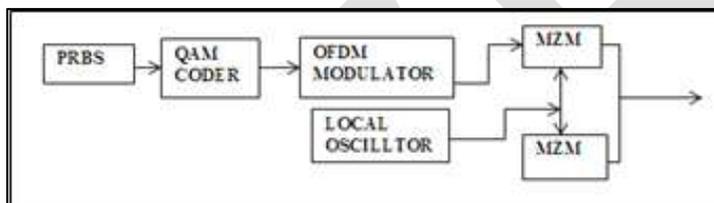


Fig: 2 OFDM Channel structure

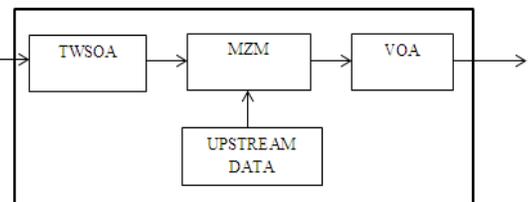


Fig:3 Uplink remodulation at ONU

At the ONU the signal is split into two portions. One portion is used for detection of OFDM downlink signal; the other portion is used for generating the uplink signal by SOA remodulation of the optical carrier. The upstream signal transmission is done by using a travelling wave semiconductor optical amplifier (TWSOA) with a Mach-Zehnder modulator. The upstream data can be detected using pin photodiode circuitry in the OLT. In the case of bidirectional data transmission, bidirectional fibers are used. The structure of OFDM channel and uplink remodulation is shown in Figure 2 and Figure 3.

DESIGN AND SIMULATIONS

It provides an easy user interface which is common to many other electrical engineering tools. The OptiSystem software is suitable to be used to model and simulate fiber optic system, free space optic system, OWC system and also the advanced communication systems including OFDM modulation.

In the OLT the PRBS is coded and modulated using QAM encoder and OFDM modulator respectively. In coherent detection system a Continuous Wave laser and two Mach-Zehnder modulators are used to up-convert the RF data to the optical domain. At the ONU demultiplexed signal is detected using coherent detector circuitry which incorporates a local oscillator. The detected signals are demodulated and decoded using OFDM demodulator and QAM decoder.

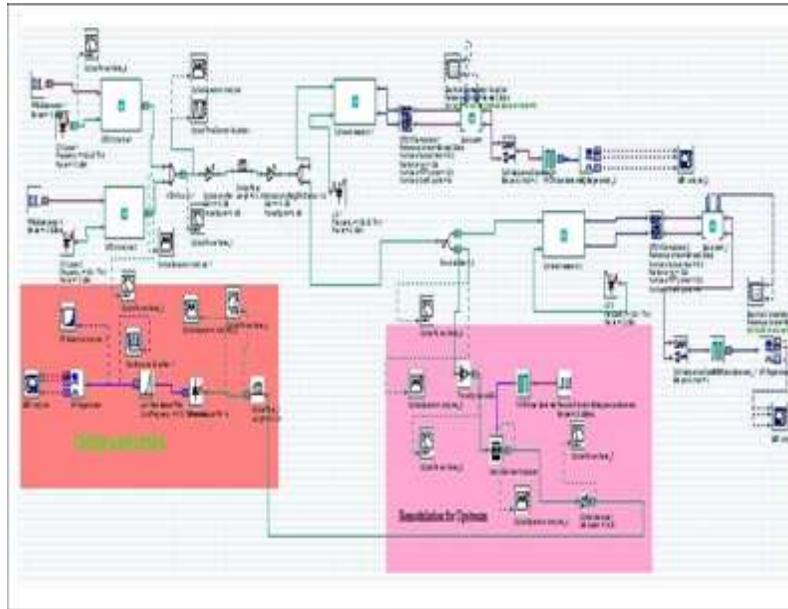


Fig:4 Simulation diagram of bidirectional WDM-OFDM-PON

For the downstream OFDM transmission the modulation part contains two MZMs. The bit stream is generated by a PRBS generator and mapped by a 4-QAM encoder. The resulting signal is modulated by an OFDM modulator. The OFDM modulated signal is fed to two MZMs through two low pass filters. The local oscillator frequencies 193.05 THz and 193.1 THz are used for each of the OLT. The optically modulated signals are combined using a multiplexer and given to fiber.

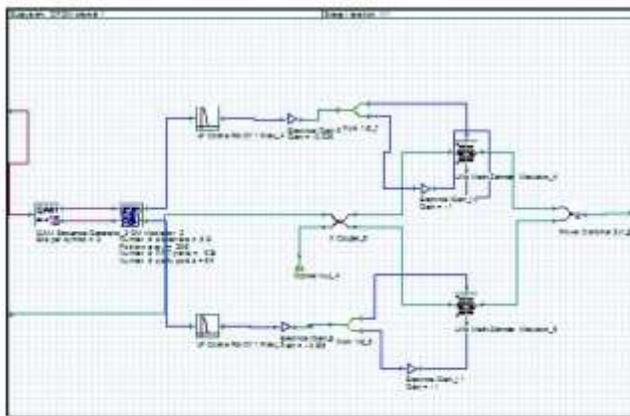


Fig: 5 OFDM transmitter section

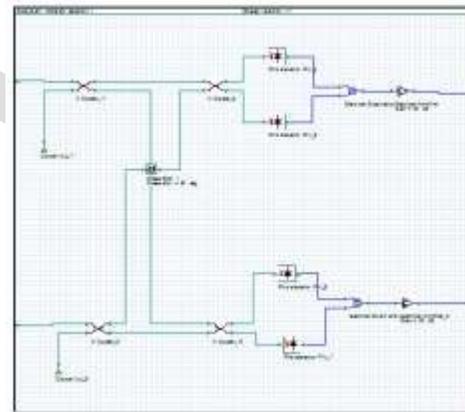


Fig:6 OFDM detection section

At receiver there are four detectors. Using the received signal and reference local oscillator signal here occurs a frequency mixing process which obtains the required data signal. The balanced detectors perform the I/Q optical to electrical conversion and also perform the noise cancellation. Electrical amplifiers are used to adjust the signal intensity. This data is demodulated and decoded using the OFDM demodulator with similar parameters as the OFDM modulator and QAM decoder. The detailed simulations of the transmitter and receiver subsystems are shown in Figure 5 and Figure 6.

For the upstream data transmission, one part of the downstream signal is remodulated using TWSOA and transmitted through fiber. At the OLT the upstream data is detected using detector circuitry. The simulation diagram for the bidirectional transmission is shown in the Figure 4.

RESULTS AND DISCUSSIONS

Simulation is done with the OptiSystem V.12 software and the entire block for the optical detection systems are set as per the previous section to do simulation. A fixed data rate of 10Gbps and 10dBm power PRBS data is given as the input data to the coherent detection system. For the two channel system, the output from the multiplexer and demultiplexer is shown in the Figure 7.

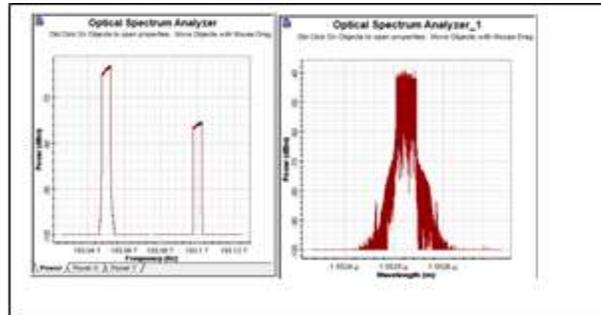


Fig: 7 Spectrum output from the multiplexer and demultiplexer

The downstream data transmission is done by OFDM modulation. Figure 8 shows the input and output constellations diagrams of downstream data transmission for 50km distance.

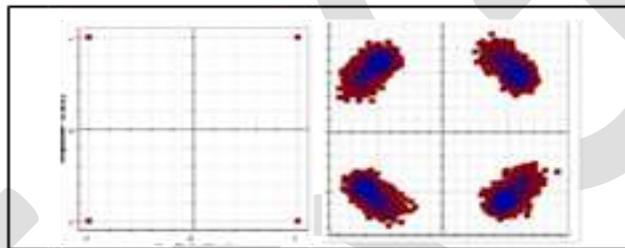


Fig:8 Input and output constellations diagrams of downstream data transmission

The upstream data transmission is done by the remodulation of downstream signal. The different stages are shown in the Figure 9. From the observations the uplink signal gets with -6.5dBm receiver sensitivity.

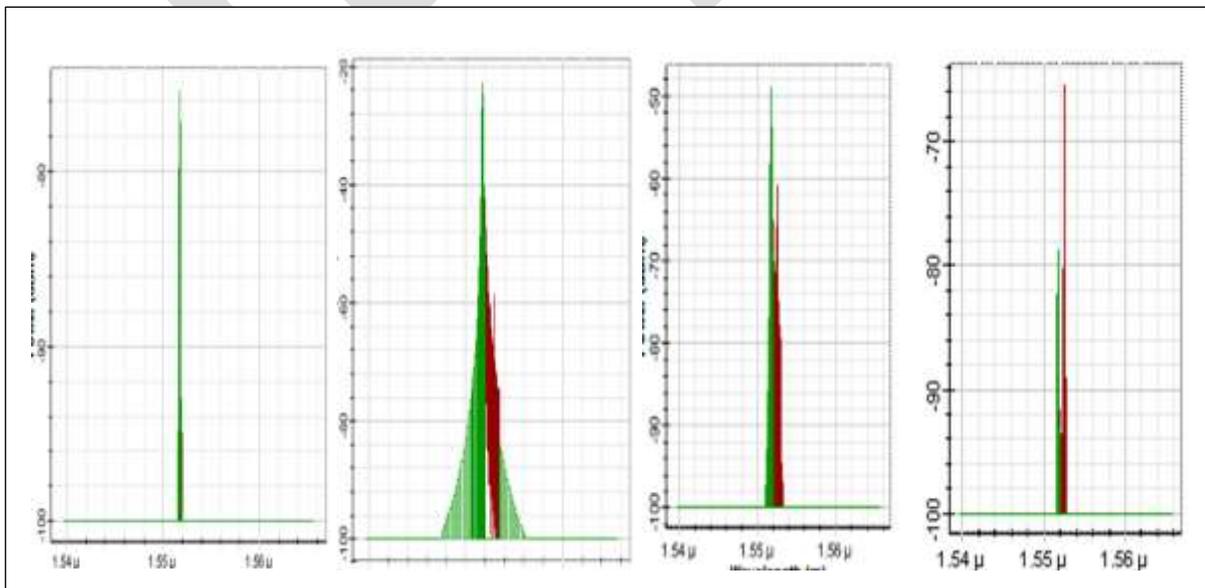


Fig:9 (a) received pulse at ONU (b) amplified pulse at ONU (c)retransmitted pulse from ONU (d) received pulse at OLT

CONCLUSION

Provisioning broadband services for downloading and uploading high definition data has become a difficult requirement for data providers. An easy way to provide multipath, which are used in most broadband systems between transmitters and receivers, is to use OFDM. Here an OFDM bidirectional WDM-PON is designed that is modulated by QAM for the downstream, and uses a travelling wave semiconductor optical amplifier to remodulate the downstream signal into upstream signal. OptiSystem software from Optiwave is used to simulate the bidirectional WDM-OFDM-PON systems.

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Design of Fuzzy C-Means Computed Torque Controller for 2-Link Flexible Robot Manipulator

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Abstract: One of the important challenges that control engineers face in the field of robotics is manipulator control with acceptable performance. The main objective of this paper is to design a Fuzzy C-Means (FCM) controller for the position control of 2-link flexible robot manipulator. The robot manipulators are highly nonlinear, time variant and multiple input multiple outputs (MIMO) in nature. Computed Torque Controller (CTC) is an efficient nonlinear controller for controlling the position of robot manipulators. CTC works well when all the physical and dynamic parameters are known but when the robot manipulator has variation in dynamic parameters, and practically have large amount of uncertainties. Because of this reason, the controller has no acceptable performance. In order to overcome the disadvantages of CTC like not obtaining minimum error, fine trajectory, good disturbance rejection, a two input Fuzzy C-Means controller is proposed to control the position of the robot manipulator. Integration of this Fuzzy C-Means Proportional Derivative controller with Computed Torque Controller (CTC), and its application to two link flexible robot manipulator is also presented. The error in the each joint angle is also observed in this proposed work. In this paper the presented clustering algorithm allows us in classifying the data as distinct groups by using and/or functions. The optimal rule base for the proposed system in this paper is designed by using the clustering technique i.e. FCM technique. The optimal rule base is graphically obtained by using Phase Plane Analysis. The efficacy of the proposed controller is proved by comparing the results with results obtained with the normal conventional Computed Torque Controller (CTC).

Keywords: Flexible robot manipulator, CTC, FCM controller.

1. Introduction

The robotic applications are of wide range in field of engineering and technology. An important section of robot anatomy is the end manipulator. These manipulators are widely used in applications like welding, assembling, painting, grinding, mechanical handling and other industrial applications. These applications may require exact path planning, trajectory generation and control design. The robot manipulators are highly nonlinear in nature. Computed Torque Controller (CTC) is powerful nonlinear controller which is widely used in controlling the position of robot manipulator. The main targets in designing control systems for robot manipulators are stability, good disturbance rejection, and small tracking error when all dynamic and physical parameters are known, computed torque controller works efficiently. But practically these systems have large amount of uncertainties. Therefore in this paper design of Fuzzy C-Means controller in integration with CTC, and its application to 2-link flexible robot manipulator is presented. The mathematical model of with computed torques is taken and is implemented in SIMULINK. This design of CTC is based on feedback linearization and computes the required arm torques using the nonlinear Feed-back control law. A non-classical method i.e. Mamdani type Fuzzy C-Means control is used here in order to obtain better results. The error in the angle is obtained by using equation $e(\theta) = \theta_d - \theta_a$, where θ_d is desired position and θ_a is the actual position of the manipulator. The obtained results are compared with that of the results obtained in the normal conventional Computed Torque Controller (CTC). The remaining part of the paper is organised as follows: section II explains about the mathematical model of 2-link flexible robot manipulator, Section III explains about design aspects of Fuzzy C-Means controller, Section IV explains about the simulation results and discussion.

2. Mathematical model of 2-link flexible robot manipulator:

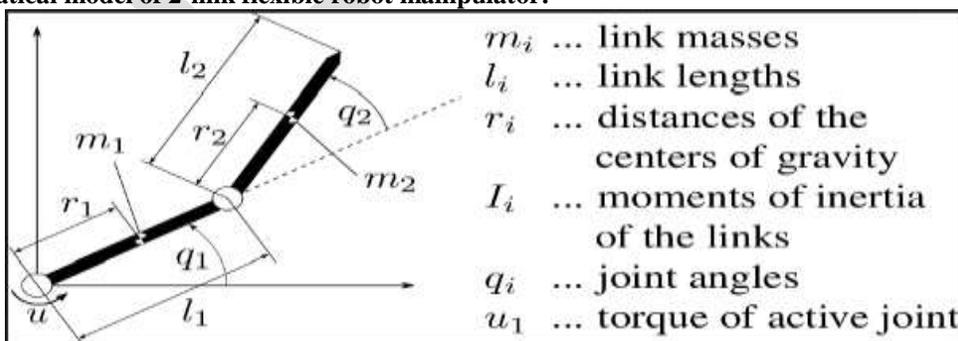


Figure 1: The two link flexible robot manipulator

The mathematical model with computed torques of the 2-link flexible robot manipulator is derived by using Lagrange's equation, which is given by [1] [2]

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{q}} \right) - \frac{\partial L}{\partial q} = \tau_i \quad \text{----- (1)}$$

$$\text{Where } L = K - P \quad \text{----- (2)}$$

$$K = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2 \quad \text{----- (3)}$$

Thus, the kinetic energy for the link 1 with the linear velocity $v_1 = \frac{1}{2} L_1 \dot{\theta}_1$, angular velocity $w_1 = \dot{\theta}_1$, moment of inertia $I_1 = \frac{1}{12} m_1 L_1^2$, and mass is m_1 .

$$K_1 = \frac{1}{2} I_1 v_1^2 + \frac{1}{2} I_1 w_1^2 = \frac{1}{8} m_1 L_1^2 \dot{\theta}_1^2 + \frac{1}{24} m_1 L_1^2 \dot{\theta}_1^2 = \frac{1}{6} m_1 L_1^2 \dot{\theta}_1^2 \quad \text{----- (4)}$$

And its potential energy is

$$P_1 = \frac{1}{2} m_1 g L_1 \sin \theta_1 \quad \text{----- (5)}$$

Where g is the magnitude of acceleration due to gravity in the negative direction of Y-axis. For the second link, link 2, the Cartesian position coordinates (x_2, y_2) of the center of mass of link are:

$$x_2 = L_1 \cos \theta_1 + \frac{1}{2} L_2 \cos(\theta_1 + \theta_2); \quad y_2 = L_1 \sin \theta_1 + \frac{1}{2} L_2 \sin(\theta_1 + \theta_2) \quad \text{----- (6)}$$

Differentiating Equation (6) gives the components of velocity of link 2 as

$$\dot{x}_2 = -L_1 \sin \theta_1 \dot{\theta}_1 - \frac{1}{2} L_2 \sin(\theta_1 + \theta_2) (\dot{\theta}_1 + \dot{\theta}_2)$$

$$\dot{y}_2 = L_1 \cos \theta_1 \dot{\theta}_1 + \frac{1}{2} L_2 \cos(\theta_1 + \theta_2) (\dot{\theta}_1 + \dot{\theta}_2) \quad \text{----- (7)}$$

From these components, the sequence of the magnitude of velocity of the end of link 2 is

$$v_2^2 = \dot{x}_2^2 + \dot{y}_2^2 \quad \text{or} \\ v_2^2 = L_1^2 S_1^2 \dot{\theta}_1^2 + \frac{1}{4} L_2^2 S_{12}^2 (\dot{\theta}_1 + \dot{\theta}_2)^2 + L_1 L_2 S_1 S_{12} (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) + L_1^2 C_1^2 \dot{\theta}_1^2 + \frac{1}{4} L_2^2 C_{12}^2 (\dot{\theta}_1 + \dot{\theta}_2)^2 + L_1 L_2 C_1 C_{12} (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) \quad \text{----- (8)}$$

Simplifying

$$v_2^2 = L_1^2 \dot{\theta}_1^2 + \frac{1}{4} L_2^2 (\dot{\theta}_1 + \dot{\theta}_2)^2 + L_1 L_2 C_2 (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) \quad \text{----- (9)}$$

Where $C_i = \cos \theta_i$, $S_i = \sin \theta_i$, $C_{12} = \cos(\theta_1 + \theta_2)$ and $S_{12} = \sin(\theta_1 + \theta_2)$

Thus the kinetic energy of link 2 with $w_1 = \dot{\theta}_1 + \dot{\theta}_2$ and $I_2 = \frac{1}{12} m_2 L_2^2$

$$K_2 = \frac{1}{2} m_2 v_2^2 + \frac{1}{2} I_2 w_2^2 = \frac{1}{2} m_2 \left[L_1^2 \dot{\theta}_1^2 + \frac{1}{4} L_2^2 (\dot{\theta}_1 + \dot{\theta}_2)^2 + L_1 L_2 C_2 (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) \right] + \frac{1}{24} m_2 L_2^2 (\dot{\theta}_1 + \dot{\theta}_2)^2 \\ = \frac{1}{2} m_2 L_1^2 \dot{\theta}_1^2 + \frac{1}{6} m_2 L_2^2 (\dot{\theta}_1^2 + \dot{\theta}_2^2 + 2\dot{\theta}_1 \dot{\theta}_2) + \frac{1}{2} m_2 L_1 L_2 C_2 (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) \quad \text{----- (10)}$$

The potential energy of link 2, from Equation (6), is

$$P_2 = m_2 g L_1 S_1 + \frac{1}{2} m_2 g L_2 S_{12} \quad \text{----- (11)}$$

The Lagrangian $L = K - P = K_1 + K_2 - P_1 - P_2$ is obtained and rearranging and simplifying, the Lagrangian is

$$L = \frac{1}{2} \left(\frac{1}{3} m_1 + m_2 \right) L_1^2 \dot{\theta}_1^2 + \frac{1}{6} m_2 L_2^2 (\dot{\theta}_1^2 + \dot{\theta}_2^2 + 2\dot{\theta}_1 \dot{\theta}_2) + \frac{1}{2} m_2 L_1 L_2 C_2 (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) - \left(\frac{1}{2} m_1 + m_2 \right) g L_1 S_1 - \frac{1}{2} m_2 g L_2 S_{12} \quad \text{--- (12)}$$

From (2.3) the torque at joint1 is

$$\tau_1 = \frac{d}{dt} \left(\frac{\partial L}{\partial \dot{\theta}_1} \right) - \frac{\partial L}{\partial \theta_1} \quad \text{----- (13)}$$

The Lagrangian function L in (12) is differentiated w.r.t. θ_1 and $\dot{\theta}_1$ to give

$$\frac{\partial L}{\partial \dot{\theta}_1} = \left(\frac{1}{2} m_1 + m_2 \right) g L_1 C_1 - \frac{1}{2} m_2 g L_2 C_{12} \quad \text{----- (14)}$$

$$\frac{\partial L}{\partial \theta_1} = \left(\frac{1}{2} m_1 + m_2 \right) L_1^2 \dot{\theta}_1^2 + \frac{1}{2} m_2 L_2^2 (\dot{\theta}_1 + \dot{\theta}_2) + \frac{1}{3} m_2 L_1 L_2 C_2 (2\dot{\theta}_1 + \dot{\theta}_2) \quad \text{----- (15)}$$

Differentiating (15) w.r.t. time.

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{\theta}_1} \right) = \left[\left(\frac{1}{3} m_1 + m_2 \right) L_1^2 + \frac{1}{3} m_2 L_1^2 + m_2 L_1 L_2 C_2 \right] \ddot{\theta}_1 + m_2 \left[\frac{1}{2} L_1^2 + \frac{1}{2} L_1 L_2 C_2 \right] \ddot{\theta}_2 - m_2 L_1 L_2 S_2 \dot{\theta}_1 \dot{\theta}_2 - \frac{1}{2} m_2 L_1 L_2 S_2 \dot{\theta}_2^2 \quad \text{---- (16)}$$

Substituting the results obtained in (14) and (16) in (13), the torque at joint 1 is obtained as

$$\tau_1 = \left[\left(\frac{1}{3} m_1 + m_2 \right) L_1^2 + \frac{1}{3} m_2 L_1^2 + m_2 L_1 L_2 C_2 \right] \ddot{\theta}_1 + m_2 \left[\frac{1}{2} L_1^2 + \frac{1}{2} L_1 L_2 C_2 \right] \ddot{\theta}_2 - m_2 L_1 L_2 S_2 \dot{\theta}_1 \dot{\theta}_2 - \frac{1}{2} m_2 L_1 L_2 S_2 \dot{\theta}_2^2 + \left(\frac{1}{2} m_1 + m_2 \right) g L_1 L_2 + \frac{1}{2} m_2 g L_2 C_{12} \quad \text{----- (17)}$$

Similarly the derivatives of Lagrangian (12) for joint 2 are

$$\frac{\partial L}{\partial \dot{\theta}_2} = \frac{1}{2} m_2 L_1 L_2 S_2 (\dot{\theta}_1^2 + \dot{\theta}_1 \dot{\theta}_2) - \frac{1}{2} m_2 g L_2 C_{12} \quad \text{----- (18)}$$

$$\frac{\partial L}{\partial \dot{\theta}_2} = \frac{1}{3} m_2 L_2^2 (\dot{\theta}_1 + \dot{\theta}_2) + \frac{1}{2} m_2 L_1 L_2 C_2 \dot{\theta}_1$$

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{\theta}_1} \right) = \left[\frac{1}{3} m_2 L_2^2 + \frac{1}{2} m_2 L_1 L_2 C_2 \right] \ddot{\theta}_1 + \frac{1}{3} m_2 L_2^2 \ddot{\theta}_2 - \frac{1}{2} m_2 L_1 L_2 S_2 \dot{\theta}_1 \dot{\theta}_2 \quad \text{---- (19)}$$

So that torque at joint 2

$$\tau_2 = \left[\frac{1}{3} L_2^2 + \frac{1}{2} L_1 L_2 C_2 \right] \ddot{\theta}_1 + \frac{1}{3} m_2 L_2^2 \ddot{\theta}_2 - \frac{1}{2} m_2 L_1 L_2 S_2 \dot{\theta}_1^2 + \frac{1}{2} m_2 g L_2 C_{12} \quad \text{---- (20)}$$

Equations (17) and (20) are the EOM (dynamic model) of the 2-link planar manipulator. Because both the joints are revolutes, the generalized torques t_1 and t_2 represent the actual joint torques.

From (17) and (20), the generalized torque equation can be written as:

$$\begin{aligned} \tau_1 &= M_{11} \ddot{\theta}_1 + M_{12} \ddot{\theta}_2 + H_1 + G_2 \\ \tau_2 &= M_{21} \ddot{\theta}_1 + M_{22} \ddot{\theta}_2 + H_2 + G_2 \end{aligned} \quad \text{---- (21)}$$

Where

$$\begin{aligned} M_{11} &= \left[\left(\frac{1}{3} m_1 + m_2 \right) L_1^2 + \frac{1}{3} m_2 L_2^2 + m_2 L_1 L_2 C_2 \right] \\ M_{12} &= M_{21} = m_2 \left[\frac{1}{3} L_2^2 + \frac{1}{2} L_1 L_2 C_2 \right] \end{aligned}$$

$$M_{22} = \frac{1}{3} m_2 L_2^2 ; H_1 = -m_2 L_1 L_2 \dot{\theta}_1 \dot{\theta}_2 - \frac{1}{2} m_2 L_1 L_2 \dot{\theta}_2^2$$

$$H_2 = \frac{1}{2} m_2 L_1 L_2 \dot{\theta}_1^2$$

$$G_1 = \left[\left(\frac{1}{2} m_1 + m_2 \right) L_1 C_1 + \frac{1}{2} m_2 L_2 C_{12} \right] g$$

$$G_2 = \frac{1}{2} m_2 L_2 C_{12} g$$

3. Design of Fuzzy C-Means controller:

3.1 Design procedure

In the present practice, fuzzy logic technique [3] [4] is an emerging research area due to its application to complex systems is very much successful, where some conventional methods like PID controllers are difficult to apply. The Fuzzy Logic model is empirically-based, relying on an operator's experience rather than their technical knowledge of the system [5] [6]. Fuzzy C-Means (FCM) is a clustering [7] method which allows one piece of data belong to two or more clusters. The design methodology of FCM controller is as follows:[8]

Step 1: The Normal Fuzzy controller is designed heuristically with fuzzy linguistic rules.

Step 2: The Fuzzy C-Means controller is tuned to the normal fuzzy controller.

Step 3: The phase-plane plot of the input space is obtained.

Step 4: The input space is divided into clusters using Fuzzy C-Means and the cluster centers are identified.

Step 5: The sequence of rules of the original fuzzy controller is super imposed onto the phase-plane plot of the input space with cluster centers.

Step 6: Hence the required rules are identified and the non-cooperative rules are thus eliminated.

$$J_m = \sum_{i=1}^N \sum_{j=1}^c u_{ij}^m \|x_i - c_j\|^2 \quad \text{---- (22)}$$

where m is any real number greater than 1, u_{ij} is the degree of membership of x_i in the cluster j , x_i is the i^{th} of d -dimensional measured data, c_j is the d -dimension center of the cluster [15] [16], and $\|*\|$ is any norm expressing the similarity between any measured data and the center.

Fuzzy partitioning is carried out through an iterative optimization of the objective function shown above, with the update of membership u_{ij} and the cluster centers c_j by:

$$u_{ij} = \frac{1}{\sum_{j=1}^c \left(\frac{\|x_i - c_j\|}{\|x_i - c_k\|} \right)^{\frac{2}{m-1}}} \quad \text{where } C_j = \frac{\sum_{i=1}^N u_{ij}^m x_i}{\sum_{i=1}^N u_{ij}^m} \quad \text{---- (23)}$$

This iteration will stop when $\left\{ \left| u_{ij}^{(k+1)} - u_{ij}^{(k)} \right| \right\} < \epsilon$, where ϵ is a termination criterion between 0 and 1, whereas k is the iteration step [9]. This procedure converges to a local minimum or a saddle point of J_m . In a batch mode operation, FCM determines the cluster centers c_i , and the membership matrix U using the following steps [10] [11]:

Step 1: Set the number of clusters c . Initialize the membership matrix U with random values between 0 and 1 such that the summation of degrees of belongingness of a data point to all clusters is always equal to unity.

Step 2: Calculate c Fuzzy cluster centers, $1, c_i$ where $i = 1, 2, \dots, c$, using eq. (3).

Step 3: Compute the objective function according to eq. (2). Stop if either it is below a certain tolerance value or its improvement over previous iteration is below a certain threshold.

Step 4: Compute a new U using eq. (3). Go to Step 2.

3.2 Phase Plane plots

The Fuzzy C-Means model is an empirical based, relying on an operator’s experience rather than their technical knowledge of the system [12]. And the major drawback is the design of the rule base. By using the phase-plane plots for the given to the fuzzy controller rule base is obtained. Stability of fuzzy system requires characterization of the relation between the rule base and state space with the dynamic system under control. This relation is based on the relative of influence of every rule of the rule base by fuzzy inference engine. A closed loop trajectory can be mapped on the position of the space. A sequence of rules obtained according to the order in which they are fired forms the solution called linguistic trajectory. This provides guidelines to obtain the necessary rule base from the phase plane plots of the inputs given to the fuzzy controller. The clusters are formed in entire position space of the inputs using Fuzzy C-Means. The cluster centers are identified and marked on the phase-plane plot [13] [14]. These plots are mapped with the closed-loop trajectory and the required.

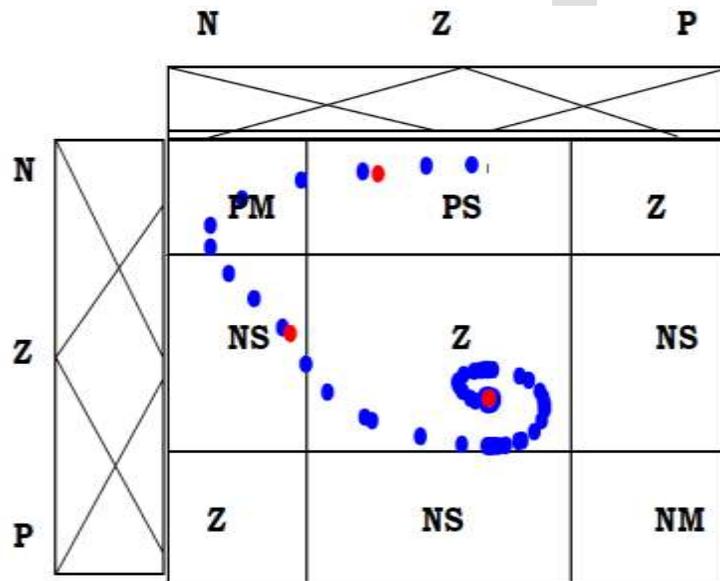


Figure 2: Phase Plane plot

Table 1 The effective rule base

Input 1	PB	NS	NS	NB	PS
Input 2	PS	PB	NS	NB	NB
Output	NB	NS	PM	PB	NM

4. Results and Discussions

The proposed Fuzzy C-Means controller applied to 2-link flexible robot manipulator has been tested for both step and ramp inputs and compared with normal CTC and reference signal. Therobotic arm mathematical model with computed torques was simulated to evaluate the performance of the controller. The difference between the desired location and current location is an input vector to the controller that generates joint rate commands. The performance of the proposed controller is tested in the presence of uncertainties such as inertial and gravitational constants. The results presented in this paper prove the effective performance of the proposed controller. The development of the control algorithm, simulation, testing, results, and the performance of the controller are reported. From Figures (3-8) it can be observed that the responses of theta value with Fuzzy C-Means controller when both ramp and step inputs are given. The numerical data analysis is shown in Tables (2-6). The similar analysis was done for the remaining three links. The minimized fuzzy rule base is shown in Table 1. This work concludes that the Fuzzy C-Means based controller outperformed the other controllers. The peak time, delay time, rise time, settling time and the peak overshoot are reduced considerably.

Conclusions:

Here in this article a novel approach, designing of Fuzzy C-Means Controller (FCM) is presented. It is a fuzzy rule based approach for robot motion control to eliminate the computational complexity associated with the conventional mathematical algorithm. The errors in the joint angles of manipulator are minimized considerably. In this paper fuzzy computed torque controller with minimum rules is obtained by validating the clusters to choose most contributed rules. The fuzzy clustering technique in addition with the phase-plane plot of the inputs of the fuzzy controller is utilized and finally required rules are identified, the non-cooperative or unfired rules are thus eliminated. The numerical analysis shows the effectiveness of the proposed FCM controller in minimizing the error in joint angles when compared to Computed Torque Controller (CTC) and that of the reference signal.

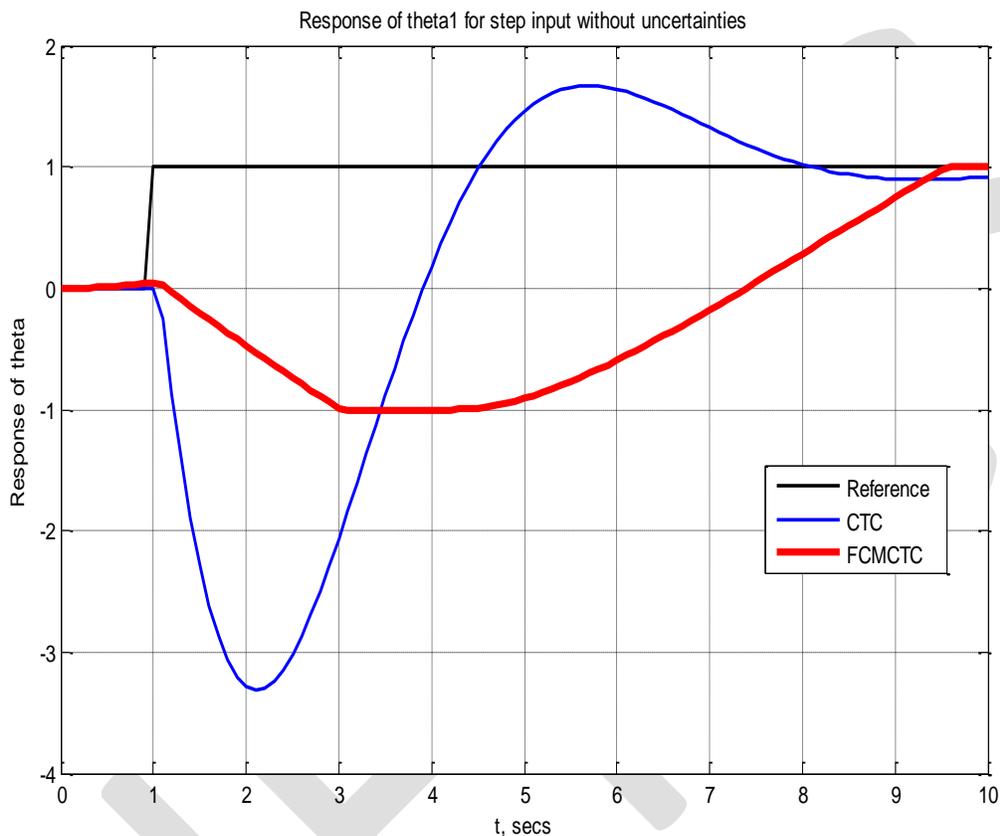


Figure 3: Response of theta1 for step input without uncertainties

Table 2: Response of theta1 for step input without uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	e_{ss}
CTC	5.89	4.5	12.3	5.05	0.655	0.21
FCM	9.41	6.51	9.41	7.85	0	0

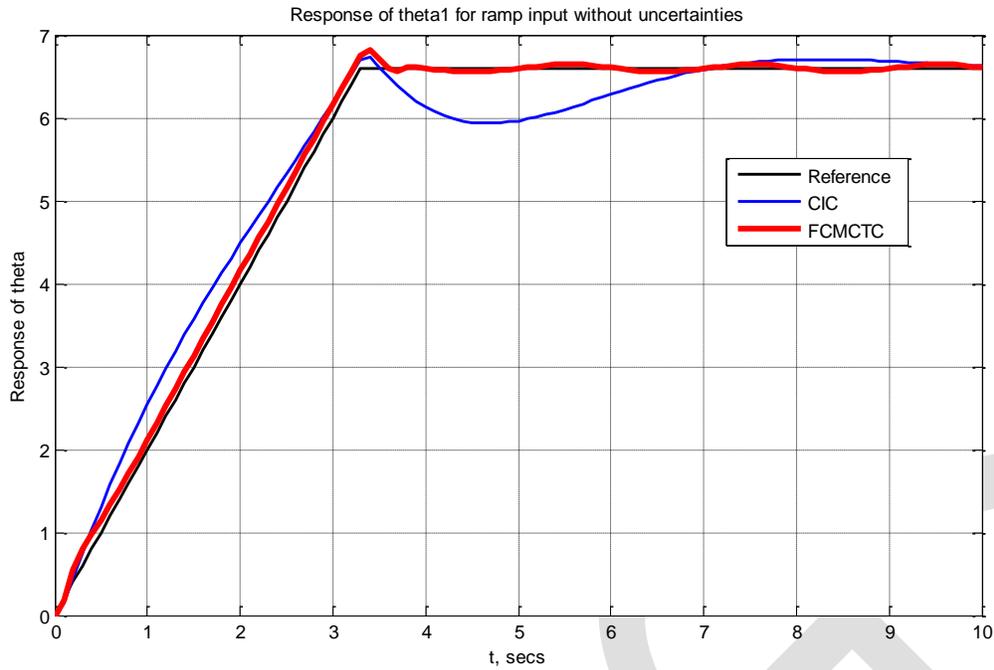


Figure 4: Response of thta1 for ramp input without uncertainties

Table 3: Response of thta1 for ramp input without uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	e_{ss}
CTC	3.4	1.75	8.95	2.982	0.241	0.21
FCM	3.23	1.58	3.5	2.935	0.225	0.04

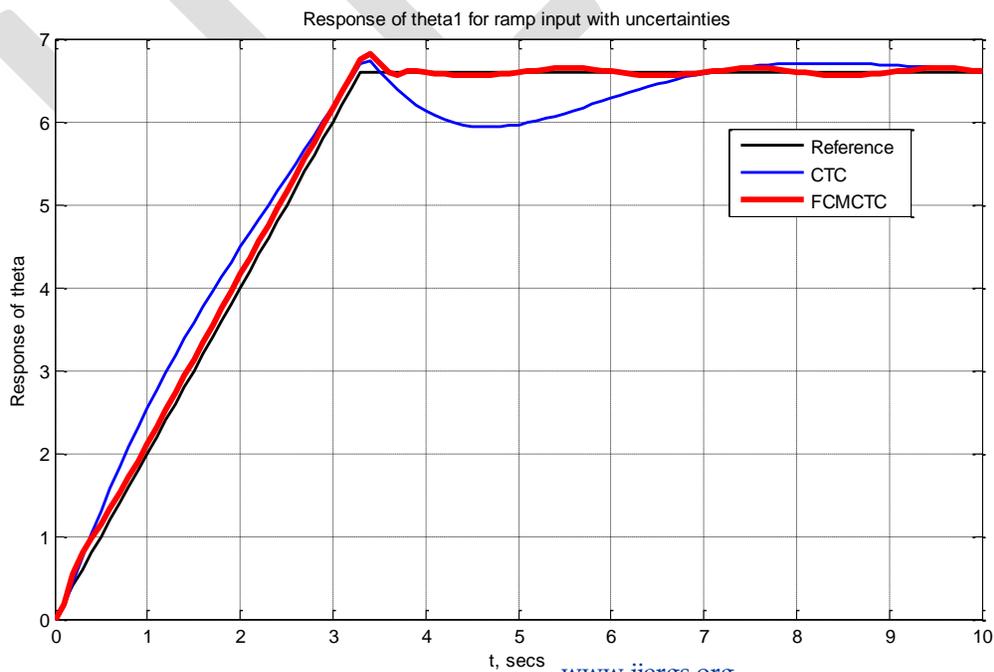


Figure 5: Response of thta1 for ramp input with uncertainties

Table 4: Response of thta1 for ramp input with uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	e_{ss}
CTC	3.4	1.75	8.95	2.982	0.241	0.21
FCM	3.23	1.58	3.5	2.935	0.225	0.04

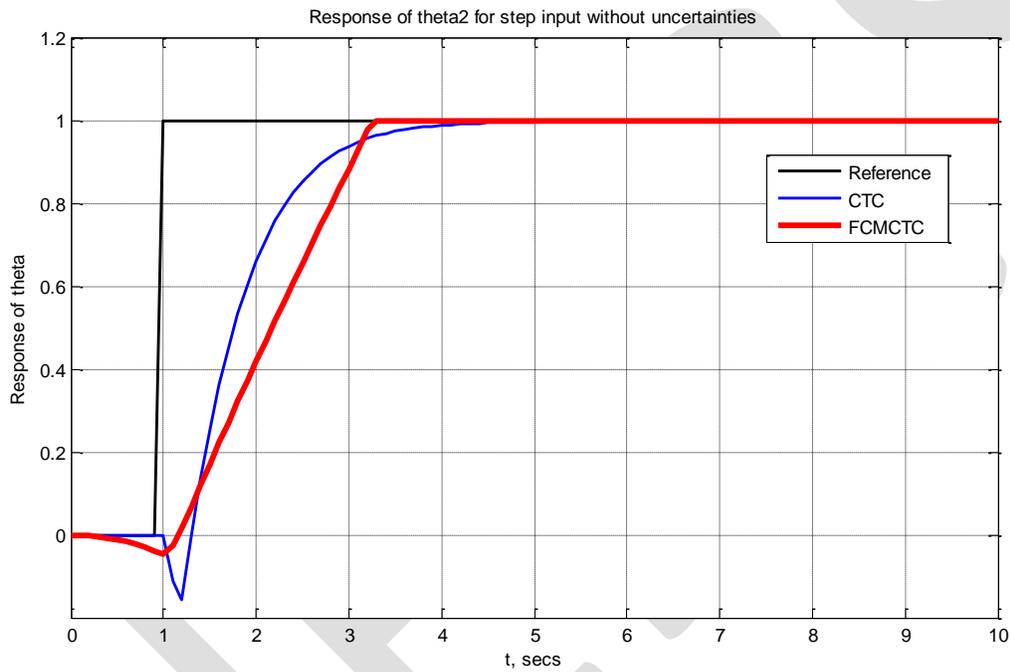


Figure 7: Response of thta2 for step input without uncertainties

Table 5: Response of thta2 for step input without uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	Control technique
CTC	3.74	1.68	4.53	2.82	-0.157	CTC
FCM	3.17	2.08	3.21	2.94	-0.043	FCM

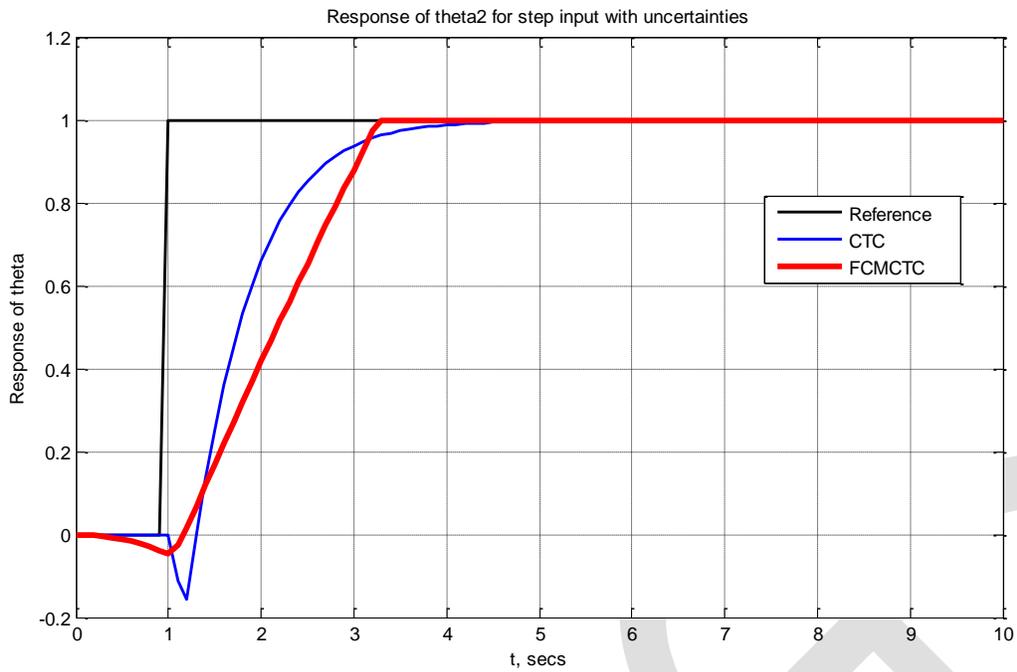


Figure 8: Response of thta2 for step input with uncertainties

Table 6: Response of thta2 for step input with uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	M_p
CTC	3.74	1.68	4.53	2.82	-0.157	-0.157
FCM	3.17	2.08	3.21	2.94	-0.043	-0.043

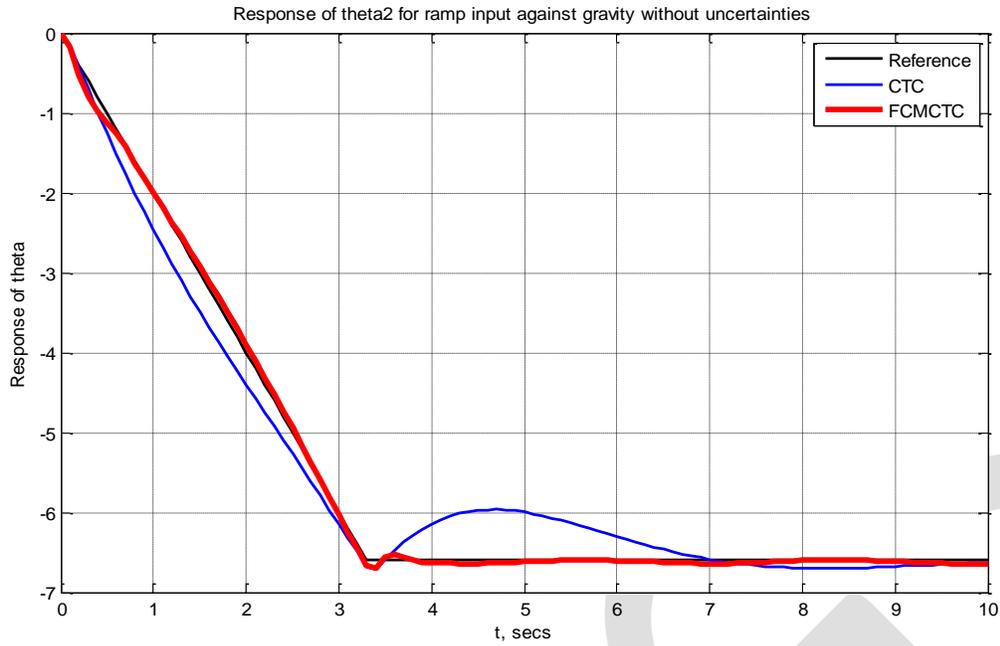


Figure 9: Response of theta2 for ramp input against gravity without uncertainties

Table 7: Response of theta2 for ramp input against gravity without uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	e_{ss}
CTC	3.4	1.74	6.6	3.1	0.205	0.22
FCM	3.35	1.578	3.75	2.96	0.125	0.0075

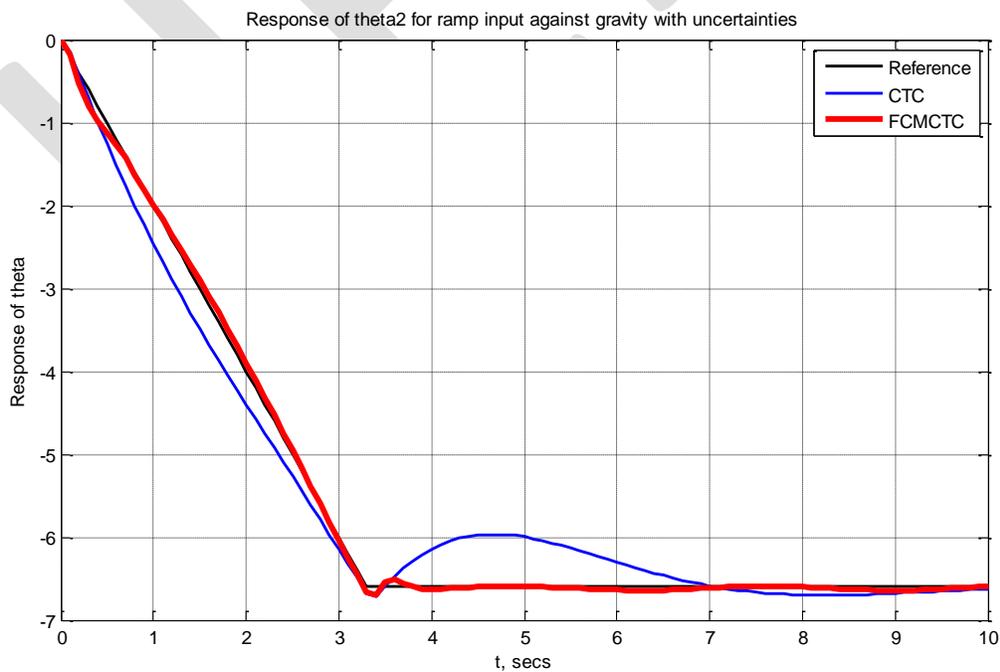


Figure 10: Response of theta2 for ramp input against gravity with uncertainties
Table 8: Response of theta2 for ramp input against gravity with uncertainties

Control technique	T_p (sec)	T_d (sec)	T_s (sec)	T_r (sec)	M_p	e_{ss}
CTC	3.4	1.74	6.6	3.1	0.205	0.22
FCM	3.35	1.578	3.75	2.96	0.125	0.0075

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Intelligent Electric Power Management using Wireless Sensor Network with Advanced Metering Infrastructure

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Abstract—This paper describes about the development of advanced electric metering infrastructure and the power management system. Energy saving is the very important one in the world scenario. We need energy to do anything in this world. The demand of power is growing at a faster rate than the transmission capacity due to the increase in population growth and also increase in coal, fuel prices. To overcome the shortage of power supply, this paper provides an overview of wireless sensor network by managing an equal distribution of power to the consumers by using Zigbee technology and also to avoid the power theft problem. The Zigbee Digital Power meter (ZPM) which uses the Wireless sensor network to send the energy usage reading of the consumer node to the energy provider section. The energy provider side will display the energy unit consumed by the consumer in the LCD which placed in their homes. At the energy provider side they have the control to change priority of the devices when power distributed in low range.

Keywords— Power management system, wireless electric meter, Wireless sensor network, Zigbee, Smart Energy Meter, etc

I. INTRODUCTION

The World is now facing a most critical problem of not getting a uninterrupted power supply. In many countries, the people living there had not even getting the supply for their primary needs such as light, fan, tv etc. This occurs due to shortage of power supply. Due to enormous growth in population the power distributed by the base station cannot be able to utilise equally by all the people living in the country. Because of over population, the demand of energy is increasing day-by-day.

In order to overcome the shortage of power supply, government is underlying many projects to provide continuous supply to the consumers by implanting nuclear power plants, by having MOU with foreign countries to get coal, fuel etc, and many more. And also scientists are doing many experiments, researches to provide more power supply to fulfil the peoples need. The governments are now taking many steps to save the energy instead of underlying power generation projects and this paper will be one of key for that.

At existing system, the energy provider are shutting down the power supply in order to save energy during the energy crisis time for more than 4 hours per day. This causes discomfort to the below averaged and the middle class peoples are affecting more by power cut. The industries, companies, factories are having inverters to get continuous power supply. The peoples who does not have the inverters are suffering more. During the power shortage times many of them using AC (Air Conditioner), Fridge, Heater etc so demand of power is more i.e., the inductive loads consuming more energy so the people who having single phase supply are having low-voltage problems. Through this method we can able to manage the power by providing energy only to the low power consuming devices like fans, light, computer etc which are the primary needs. And not allowing the power to the high power consuming devices like air conditioner, heater, etc.

To achieve this, system can be created which will differentiate between high power and low power devices at every node and allow only low power devices to be ON. This can be done by creating a wireless sensor network having number of nodes which communicate with each other in full duplex mode. The communication will consist of data transfer, controlling node operation. We are using zigbee protocol for the wireless communication.

The main advantage of using ZigBee protocol is that the nodes require very less amount of power so it can be operated from battery. If any node which consumes more power than the allotted energy then the power flows that node gets cutted through the interrupt given through the zigbee so we can avoid the power theft. Each node is measuring the power, which is being consumed by the appliance and it is sent to the energy provider section through wireless sensor network and also the units consumed by the node is displayed in LCD which is place at the consumer side. The appliance is controlled by the end device i.e. node. An overall operation of the system controlled by the control device.

The main purpose of the project is that the wireless sensor network will differentiate and control the devices in the network on the basis of power consumed by appliances to make the efficient use of power also to avoid power theft and units consumed by the node can also be intimated to the consumer side and the energy provider side. Through that the consumer can be able to monitor the usage of energy.

Also we proposed the e-billing system in this paper. Billing system for electricity consumption is manually done by human operator. Readings collected by human operator are used for bill calculation. Manual processing of billing system is very time consuming and it can cause human error also. The manual bill entry is inaccurate and inefficient. Due to the technology development we are using digital meter instead of analog meter. It is convenient to implement wireless electric meter by interfacing Zigbee module with the digital electronic meter. All digital electronic meter along with Zigbee module can form a network. The use of Wireless Personal Area Networks has been steadily increasing in recent years. The inconvenience and logistical concerns of laying wires for a communication network lay the ground for a much more appealing technologies incorporating wireless transmission. Removing the constraints of the physical installation of wires, wireless solutions provide diversity and in many applications can reduce cost.

Data from electric meter such as meter reading can be transmitted to the energy provider Station from consumer node by forming a path using network topologies. Zigbee module support Star, Tree, and Mesh topology. Zigbee networks facilitate many applications, such as Commercial Building and Home Automation, Security, Healthcare Medical Monitoring, Vehicle Monitoring, Agriculture and Environmental Monitoring and so on.

The Zigbee protocol stack based on IEEE 802.15.4 offers a practical, cost-effective solution for low-cost and low power consumption WPANs. Zigbee is based on the IEEE 802.15.4 standard along with other protocols like Wi-Fi and Bluetooth. Zigbee operates in the industrial, scientific and medical (ISM) radio band, specifically at 2.4 GHz internationally and 868MHz or 915 MHz in specific parts of the world. The simplicity and cost of Zigbee networks makes them a greater one for wireless control and monitoring applications. The Zigbee protocol can support over 65,535 nodes and can operate in three network topologies: Mesh, Star and Ring.

II. BLOCK DIAGRAM

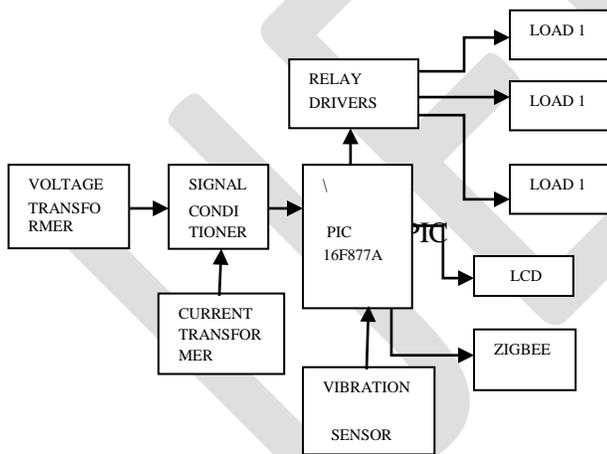


Fig 2(a). Customer Section

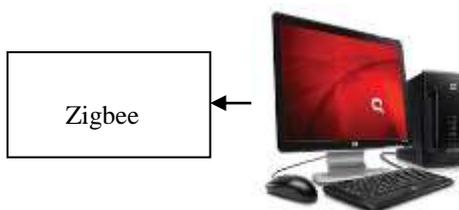


Fig 2(b). Admin Section

III. HARDWARE DESCRIPTION

3.1 PIC16F877A Microcontroller

It is a 40 pin 8-Bit CMOS FLASH microcontroller. The microcontrollers are similar to microprocessors, but they are designed to work as a true single-chip system by integrating all the devices needed for a system on a single-chip. The timing and control unit will generate the necessary control signals for internal and external operation of the microcontroller. Microcontrollers with internal ADC can directly accept analog signals for processing.

The switching pulses required for inverter operation are generated using PIC16F877A Microcontroller, thus reducing the overall system cost and complexity. The Microcontroller generates a PWM pulse at Particular frequency and switching pulses for the MOSFET switches.

The crystal oscillator is used to generate the required clock for the Microcontroller. Here we used Quartz Crustal oscillator. The maximum clock frequency of quartz crystal that can be connected to Pic16f877a microcontroller is 20MHz. The internal clock frequency of microcontroller is same as crystal frequency or externally supplied clock frequency. The Reset switch is used to reset the microcontroller in order to bring the controller to a known state, for proper reset the RST should be held low for at least 2 machine cycles.

3.1.1 Analog To Digital Converter

The Analog-to-Digital (A/D) Converter has eight inputs. The analog input charges a sample and hold capacitor. The output of the sample and hold capacitor is the input into the converter. The converter then generates a digital result of this analog level via successive approximation. The A/D conversion of the analog input signal results in a corresponding 10-bit digital number. The A/D module has high and low voltage reference input that is software selectable to some combination of VDD, VSS, RA2, or RA3. The A/D converter has a unique feature of being able to operate while the device is in SLEEP mode. To operate in SLEEP, the A/D clock must be derived from the A/D's internal RC oscillator.

3.1.2 LCD (Liquid Crystal Display)

LCD screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD, The data register stores the data to be displayed on the LCD. Liquid crystal displays are used for display of numeric and alphanumeric character in dot matrix and segmental displays.

3.1.3 Power Supply Section

Step down Transformer

When AC is applied to the primary winding of the power transformer it can either be stepped down or up depending on the value of DC needed. In this circuit the transformer of 230V/12-0-12V is used to perform the step down operation where a 230V AC appears as 12V AC across the secondary winding. One alteration of input causes the top of the transformer to be positive and the bottom negative. The next alteration will temporarily cause the reverse. The current rating of the transformer used in this project is 500mA. Apart from stepping down AC voltages, it gives isolation between the power source and power supply circuits.

3.1.4 Bridge Rectifier

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification. A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full-wave rectification. This is a widely used configuration, both with individual diodes wired as shown and with single component bridges where the diode bridge is wired internally.

3.1.5 Current Transformer

Instrument transformers (ITs) are designed to transform voltage or current from the high values in the transmission and distribution systems to the low values that can be utilized by low voltage metering devices. There are three primary applications for which ITs are used: metering (for energy billing and transaction purposes); protection control (for system protection and protective relaying purposes); and load survey (for economic management of industrial loads).

Generally, the metering ITs require high accuracy in the range of normal operating voltage and current. Protection ITs require linearity in wide range of voltages and currents. During a disturbance, such as system fault or overvoltage transients, the output of the IT is used by a protective relay to initiate an appropriate action (open or close a breaker, reconfigure the system, etc.) to mitigate the disturbance and protect the rest of the power system.

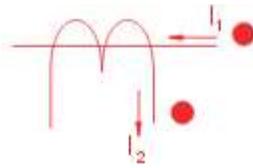


Fig 3.1.5 (a) Symbol of Current transformer

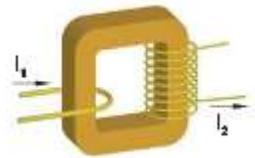


Fig 3.1.5 (b) Conceptual diagram of Current Transformer

3.1.6 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are doublethrow (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

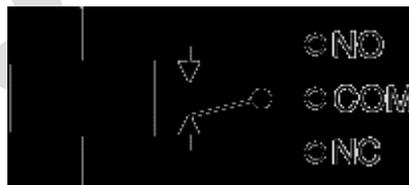


Fig. Relay Connection

3.1.7 Zigbee IEEE 802.15

Zigbee is the advanced version of Bluetooth. Zigbee is discovered in 1998, standardized in 2003, and revised in 2006. The name refers to the waggle dance of honey bees after their return to the beehive. It has 60 to 256 kb internal flash memory. It is the way of communication between paired devices. Zigbee is based on an IEEE 802.15 standard. Zigbee has a defined rate of 250 kbit/s, best

suitable for periodic or intermittent data or a single signal transmission from a sensor or input device. In home automation applications, transmission distances range from 10 to 100 meters line-of-sight, depending on power output and environmental characteristics. Here we are using TARANG F4 ZIGBEE module. Tarang modules are designed with low to medium transmit power and for high reliability wireless networks. The modules require minimal power and provide reliable delivery of data between devices. The interfaces provided with the module help to directly fit into many industrial applications. The modules operate within the ISM 2.4-2.4835 GHz frequency band with IEEE 802.15.4 baseband.

Zigbee networks support operating in Star, Tree, and Mesh topologies. Depending on the application of the Zigbee network, topology selection can drastically affect the behaviour of the network. For this reason, proper topology selection is very important. For every Zigbee network there must be one and only one coordinator. The coordinator's responsibilities include initializing the network, selecting the transmission channel and permitting other Zigbee nodes to connect to its network. Router

A Zigbee router is responsible for message routing within a network. A routing device can also act as an end device; however, its routing capabilities would be inactive. A router can have child nodes connected to it depending on the network topology implemented. End devices are the endpoints of a ZigBee network and contain limited functionality to talk to parent nodes (coordinator or a router).

IV. ZIGBEE SPECIFICATION

TRANSMISSION BAND	2.4GHZ
TRANSMISSION RANGE	100 METERS
NETWORK SIZE	65536 NODES (SHORT ADDRESSING MODE)
	1.8×10^{19} NODES (EXTENDED ADDRESSING MODE)
DATA RATE	250 Kbps
CHANNELS	16

Table 4(a). Zigbee Specification

A. Star Topology

In Star topology, a coordinator is surrounded by a group of either end devices or routers. This topology is attractive because of its simplicity, but at the same time it is having some key disadvantages. In the event that the coordinator stops functioning, the entire network stops functioning because all traffic travels through the centre of the star.

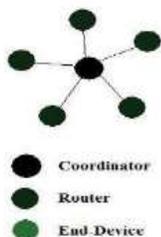


Fig 4.A (a) Star topology

B. Mesh Topology

In Mesh topology, Coordinator and routers are interring connected forming a spider-net like structure. End-devices are connected to routers. Communication between end-device is possible if a router is present in between them for data routing. Coordinator is solely responsible for network formation. End device neither add external device in the network nor communicate with external device or end-device in the network

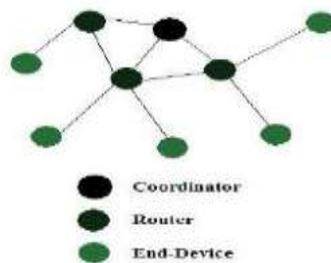


Fig 4.B (b) Mesh topology

C. Tree Topology

In a tree network, the coordinator is at the top (root) of the tree. End devices can connect to this root via a direct point to point connection or through a child router of the coordinator. For every child router connected, additional child routers can also be connected, creating different levels of nodes.

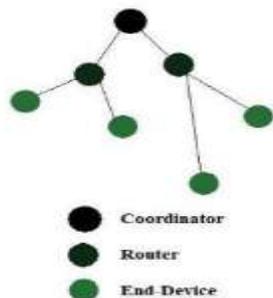


Fig 4.C (c) Tree topology

V. VIBRATION SENSOR

The vibration / shock sensor detects shock intensity caused by sudden knocks or hits and continuous vibration due to faulty ball-bearings on fans and other equipment. In this paper we used vibration sensor for tampering purpose. If anybody tried to change the meter or cause any disturbance to the meter means the warning message will be displayed to the admin section.

VI. LOAD

In this paper we are going to use lamp and a 5V DC motor as a load and two plugs are provided to add additional loads.

VII. HARDWARE SPECIFICATION

The Fig 7 (a), shown below represents the home section. It consists of power supply unit, Microcontroller unit, Vibration sensor, Voltage transformer, current transformer, Relay drivers, LCD, Loads, Switches etc.

The Power supply is given from the 230v transformer and it is converted to dc supply from ac using Bridge rectifier and it is rectified. Voltage transformer and current transformer is connected to the microcontroller section to sense the voltage and current produced in the node. The amount of energy consumed by the load is shown in the LCD which is interfaced to the MCU. And the relay drivers is also connected with the MCU unit to control the load by switching on/off the relay drivers through an interrupt given by the admin section via zigbee. Two plugs are provided to add additional loads. Vibration sensor is added to the customer section for tampering purpose. If any disturbance created by the user or any other things it will be intimated to the admin section and also displayed in the LCD with an alarm.

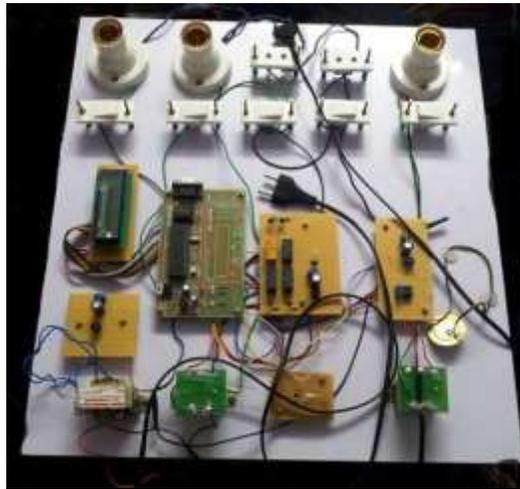


Fig.7 (a) Customer Section

Zigbee is used to transmit and receive the data from customer section and admin section. It is interfaced to MCU and the PC. The energy consumed by each load is sent to the PC via Zigbee. The interrupt is sent to the customer section via Zigbee for priority purpose. All these process can be done through Visual basic programming, We use MP lab for simulation and flash magic tool to dump the code in the PIC microcontroller.

7.1 PROPOSED TOPOLOGY

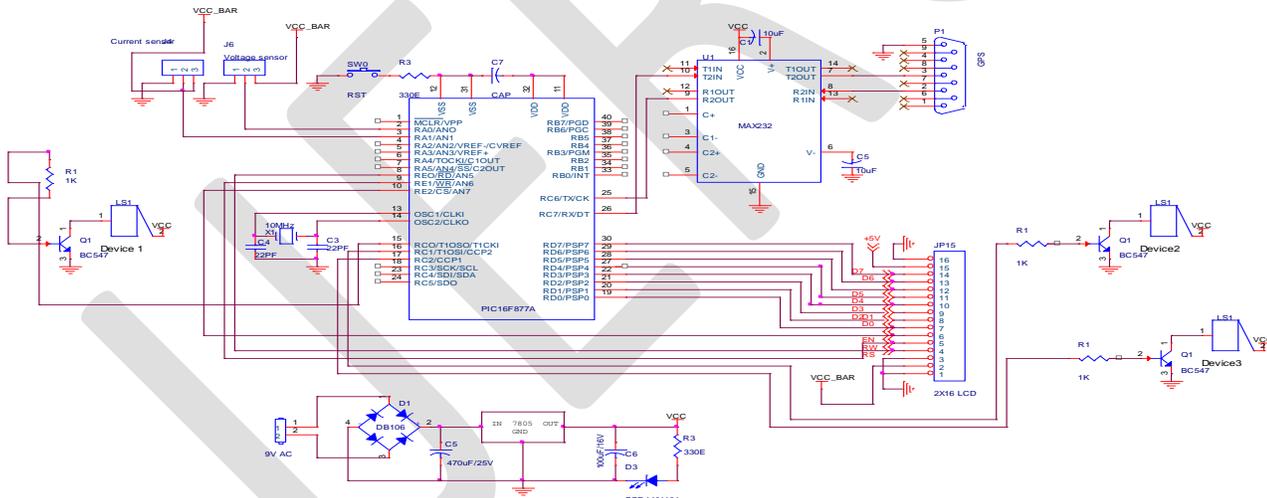


Fig 7.1 (a) Proteus Design

VIII. ADVANTAGES OF PROPOSED SYSTEM

- Efficiency is high for fundamental frequency switching.
- Theft can be detected through continuous monitoring of power consumption by the load.
- Power cut achieved from EB office through wireless
- Man power can be decreased
- Customer service well

- Power Management

IX. APPLICATIONS

- Fan/blower loads
- Drilling rigs for oil
- Variable speed drive for high-power medium-voltage motor

X. FUTURE SCOPE

- We can interface printer to the home section, so that the customer can take the printout of e-bill, after paying the amount through mobile or net banking.
- We can also interface GSM with Microcontroller section to receive a message about the unit consumed by the customer.
- We can use Raspberry pi instead of PIC to make the kit compact and efficient.

XI. ACKNOWLEDGEMENT

We are extremely thankful to our Professors who have helped us in understanding the concept and inspired us by encouraging in everything we did. This helped us to publish this paper successfully.

XII. CONCLUSION

Through this design the Zigbee which send the unit consumed by the load to the admin section and it also display the cost of the unit and previous month unit. If any load which consumes more energy it can be controlled through zigbee and tampering can be detected by interfacing vibration sensor to the home section.

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Particle Swarm Optimization based PID controller for two area Load Frequency Control System

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Abstract-- In this work PID controllers tuned with PSO are used in two area Control system. The two areas when interconnected could result in area control error. ACE is nothing but the frequency deviation and tie line power deviation occurred in the tie line. In such a complex situation, proper tuning of individual area's PID controller became indispensable. So the load frequency control is very important issue in the interconnected power system. This ensures the zero steady state error in frequency dynamics and proper sharing of load by generators of interconnected areas. The controller transfer function is then used to simulate the overall system response of two areas Load Frequency Control. The proposed system is PSO optimized PID controller based two area load frequency control system enhances smooth and efficient control of area control error (ACE). The PSO is having good converging rate than genetic algorithm for all the types of control system. The experimental result shows the frequency response and tie line power response of PID controller, Fuzzy-PID, and PSO-PID controller. Finally the PSO based PID controller based optimization technique is giving good response than other mentioned existing system.

Index Terms—Load frequency control(LFC) PID Controller, Two-area control, Particle swarm optimization.

I. INTRODUCTION

Reliable and good quality power transfer is maintained in interconnected power system under deregulated environment through proper choice of automatic generation control components. Sudden change in load introduces frequency fluctuations and tie-line power exchange. Suitable load frequency control with the consideration of bilateral contracts between participating areas nowadays became mandatory. Optimal output feedback, linear feedback, Kalman estimator are such few control strategies adopted elsewhere to accomplish the same. Several optimization techniques like Genetic algorithm, Particle Swarm Optimization, Bacterial Foraging are currently being applied for the automatic generation control in multi-area system under deregulation.

Such optimization techniques have also been used for automatic generation control of interconnected power system without deregulation. These techniques are used either to tune the different types of controllers or to set the parameters for power system stabilizers. These action sensible operators to improve the control of the frequency deviation situation and restoration of the tie line power fluctuations quickly. In deregulated environment participation contract between two or more areas are regulated by an independent system operator. Contract violation and its effects are also important in these situations.

In this paper, two area automatic generation control has been studied in a deregulated environment to observe the effect of load change in system dynamics. One GENCO and one DISCO are considered in each area under study. GENCOs share load of its own area as well as that of the other area as demanded by the DISCO. This participation is based on the contract made between the two systems as per the corresponding DISCO Participation Matrix (DPM) matrix. It is generally developed in restructured environment. The PID controller is used here to nullify the effect of frequency and tie-line power deviations in both the areas. MATLAB code has been developed to achieve PID controller tuning based on genetic algorithm. PID controller tuning ensures the improvements in the system response in terms of settling time, rise time, overshoot and steady state value. Studies are made for different contract conditions. The results are compared with step response of similar system having a PID controller tuned with PSO in conventional interconnected power system without deregulation.

II. LOAD FREQUENCY CONTROL

Load frequency control (LFC) of an interconnected power system is concerned with two main objectives i) matching the electrical power generation to the load, ii) adjusting the frequency and iii) tie line power loading to their scheduled values. It is technically feasible to operate the power system in an interconnected manner. Frequency deviation and tie line power deviation are the

two prime parameters with respect to LFC. In interconnected power system, load variations in any areas disturb the frequency and tie-line power of other interconnected areas. The primary objective of LFC is to maintain zero steady state errors in interconnected areas, with the condition to fulfill the requested dispatch conditions. The operating point of a power system changes continuously, however, because of the inherent characteristics of the changing loads. It is also desirable that a well designed and operated interconnected power system should cope with changes in the load and it should provide acceptable level of power quality while maintaining frequency and voltage within the stipulated tolerance.

Power systems are used to convert natural energy into electric power. They transport electricity to factories and houses to satisfy all kinds of power needs. To optimize the performance of electrical equipment, it is important to ensure the quality of the electric power. It is well known that three-phase alternating current (AC) is generally used to transport the electricity. During the transportation, both the active power balance and the reactive power balance must be maintained between generating and utilizing the AC power. Those two balances correspond to two equilibrium points: frequency and voltage.

When either of the two balances is broken and reset at a new level, the equilibrium points will float. A good quality of the electric power system requires both the frequency and voltage to remain at standard values during operation.

Thus a control system is essential to cancel the effects of the random load changes and to keep the frequency and voltage at the standard values. although the active power and reactive power have combined effects on the frequency and voltage, the control problem of the frequency and voltage can be decoupled. The frequency is highly dependent on the active power while the voltage is highly dependent on the reactive power. Thus the control issue in power systems can be decoupled into two independent problems. One is about the active power and frequency control while the other is about the reactive power and voltage control. The active power and frequency control is referred to as load frequency control (LFC)

The foremost task of LFC is to keep the frequency constant against the randomly varying active power loads, which are also referred to as unknown external disturbance. Another task of the LFC is to regulate the tie-line power exchange error. A typical large-scale power system is composed of several areas of generating units. In order to enhance the fault tolerance of the entire power system, these generating units are connected via tie-lines. The usage of tie-line power imports a new error into the control problem, i.e., tie-line power exchange error.

Otherwise there would be economic conflicts between the areas. Hence each area requires a separate load frequency controller to regulate the tie-line power exchange error so that all the areas in an interconnected power system can set their set points differently. Another problem is that the interconnection of the power systems results in huge increases in both the order of the system and the number of the tuning controller parameters. As a result, when modeling such complex high-order power systems, the model and parameter approximations cannot be avoided. Therefore the requirement of the LFC is to be robust against the uncertainties of the system model and the variations of system parameters in reality.

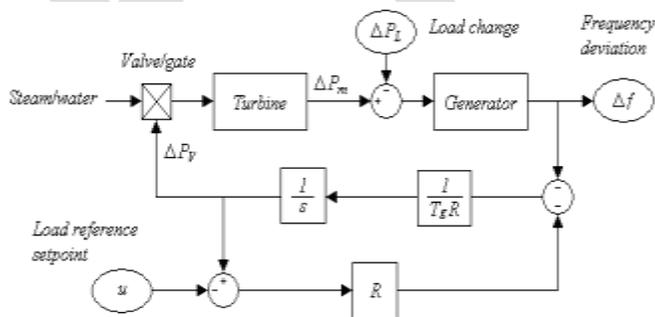


Fig.1 Block diagram of load frequency control

In summary, the LFC has two major assignments, which are to maintain the standard value of frequency and to keep the tie-line power exchange under schedule in the presences of any load changes. In addition, the LFC has to be robust against unknown external disturbances and system model and parameter uncertainties. The high-order interconnected power system could also increase the complexity of the controller design of the LFC.

The Interconnected Power Systems: Power systems are interconnected for economy and continuity of power supply. For the interconnected operation fuel costs, generation limits, tie line capacitors, spinning reserve allocation and area commitments are important considerations. Compared to stand alone power system, interconnected networks have special features that need to be addressed such as load sharing, frequency error minimized and reliable power supply.

While interconnecting two or more stand alone power system, it should be noted that,

- Generators in two areas have same power rating.
- All areas are connected through tie-line.
- Each area regulates its own load variations.

Area Control Error: The goals of LFC are not only to cancel frequency error in each area, but also to drive the tie-line power exchange according to schedule. Since the tie-line power error is the integral of the frequency difference between each pair of areas, if we control frequency error back to zero, any steady state errors in the frequency of the system would result in tie-line power errors. Therefore we need to include the information of the tie-line power deviation into our control input.

III. PSO CONTROLLER FOR THE INTERCONNECTED POWER SYSTEM

PSO is a robust stochastic optimization technique based on the movement and intelligence of swarms. PSO applies the concept of social interaction to problem solving. It was developed in 1995 by James Kennedy (social-psychologist) and Russell Eberhart (electrical engineer). It uses a number of agents (particles) that constitute a swarm moving around in the search space looking for the best solution. Each particle is treated as a point in a N-dimensional space which adjusts its “flying” according to its own flying experience as well as the flying experience of other particles. Each particle keeps track of its coordinates in the solution space which are associated with the best solution (fitness) that has achieved so far by that particle. This value is called personal best, *pbest*. Another best value that is tracked by the PSO is the best value obtained so far by any particle in the neighborhood of that particle. This value is called *gbest*. Unlike in genetic algorithms, evolutionary programming and evolutionary strategies, in PSO, there is no selection operation. All particles in PSO are kept as members of the population through the course of the run. PSO is the only algorithm that does not implement the survival of the fittest. No crossover operation in PSO. In EP balance between the global and local search can be adjusted through the strategy parameter while in PSO the balance is achieved through the inertial weight factor (w) of eq. 1(a)

Steps of PSO: Steps of PSO as implemented for optimization :

Step 1: Initialize an array of particles with random positions and their associated velocities to satisfy the inequality constraints.

Step 2: Check for the satisfaction of the equality constraints and modify the solution if required.

Step 3: Evaluate the fitness function of each particle.

Step 4: Compare the current value of the fitness function with the particles previous best value (*pbest*). If the current fitness value is less, then assign the current fitness value to *pbest* and assign the current coordinates (positions) to *pbest*.

Step 5: Determine the current global minimum fitness value among the current positions.

Step 6: Compare the current global minimum with the previous global minimum (*gbest*). If the current global minimum is better than *gbest*, then assign the current global minimum to *gbest* and assign the current coordinates (positions) to *gbest*.

Step 7: Change the velocities.

Step 8: Move each particle to the new position and return to step 2.

Step 9: Repeat step 2-8 until a stop criterion is satisfied or the maximum number of iterations is reached.

This computational technique is developed inspired by social behaviour of bird flocking or fish schooling. In this technique, a group of random particles (solutions) are generated. According to fitness value the best solution is determined in the current iteration and also the best fitness value is stored. The best solution is known as *pbest*. Another best fitness value is also tracked in the iterations obtained so far. This best fitness value is a global best and its corresponding particle (solution) is called *gbest*. In every iteration all the particles will be updated by following the best previous position (*pbest*) and best particle among all the particles (*gbest*) in the swarm.

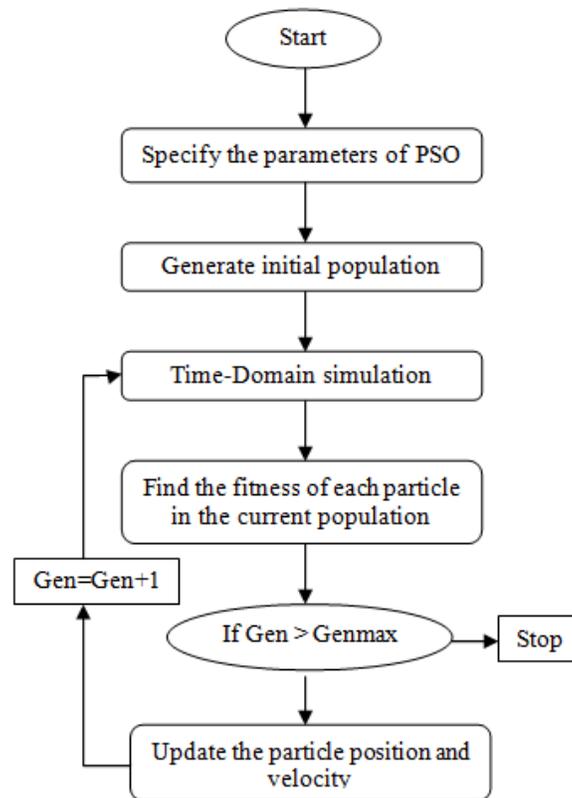


Fig 2. Flow chart for PSO technique

FUZZY-PID:

When the control problem is to regulate the process output around a set point, it is natural to consider error as an input, even to a fuzzy controller, and it follows that the integral of the error and the derivative of the error may be useful inputs as well. In a fuzzified PID controller, however, it is difficult to tell the effect of each gain factor on the rise time, overshoot.

Steps involved in the fuzzy-PID controller:

- Fuzzification block, transforming input physical values into corresponding linguistic variables
- Knowledge base, containing rules table for logic output block;
- Logic output block, transforming input linguistic variables into output with some belonging functions Con;
- Defuzzification block, transforming output linguistic variables into physical control influence.

Membership functions for the output parameter are here, NB means Negative Big, NS means Negative Small, ZE means Zero and PB means Positive Big & PS means Positive Small. The error, e and change in error, de are inputs of FLC. Two input signals are converted to fuzzy numbers first in fuzzified using five membership functions: Positive Big (PB), Positive Small (PS), Zero (ZZ), Negative Small (NS), Negative Big (NB), Small (S), Medium (M), Big (B), Very Big (VB) and Very Very Big (VVB). The conventional controller for LFC scheme is replaced by a fuzzy PID type controller. The gains K_{Pi} , K_{Ii} and K_{di} in Equation are tuned on-line in terms of the knowledge base and fuzzy inference, and then, the conventional PID controller generates the control signal.

The motivation of using the fuzzy logic for tuning gains of PID controllers is to take large parametric uncertainties, system nonlinearities and minimizing of area load disturbances.

IV. SIMULATION RESULTS AND COMPARISON

PSO-PID FITNESS FUNCTION:

The pso is used to the find best K_p K_i K_d values for the PID controller. 100 particles are assumed for each particle to give 1 best fitness value. Number of group is set by 30, the single population have 3 members such as K_p K_i K_d .

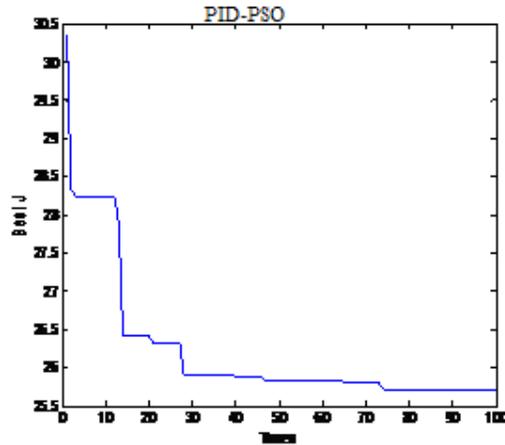


Fig.3. PSO-PID Fitness function

Fitness function is reduced to 25.5 which is constant from 52 to 100. So the best fitness function is 25.5. fitness function is nothing but is a particular type of objective function that is used to summaries single figure of merit, which is to close a given design solution for achieving the set items.

PID RESPONSE:

PSO-PID best fitness function's set of k_p k_i k_d values are applied to the PID controller. The PID waveform gives better response, it reduces the overshoot occurred in a system.

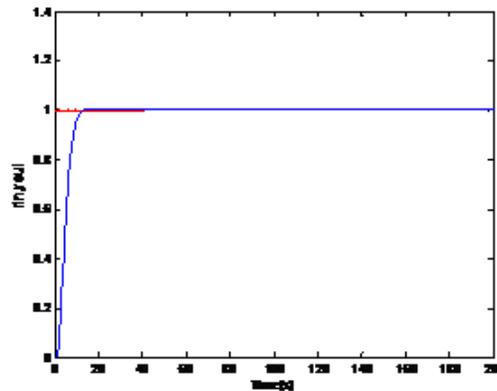


Fig.4. PID Response

FREQUENCY DEVIATION OF INTERCONNECTED AREA:

Frequency deviation in interconnected power system is cleared by using the fuzzy-PID, PID, and PSO-PID. Here output response is compared. Fuzzy-PID is better response compared to the PID controller. PSO-PID is best response compared to the fuzzy-PID. Settling time of the PSO-PID is minimum compared to the other 2 methods.

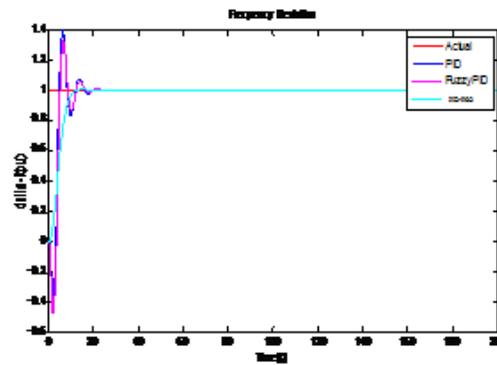


Fig.5. Frequency Deviation of Interconnected Area

TIE LINE POWER DEVIATION OF INTERCONNECTED AREA:

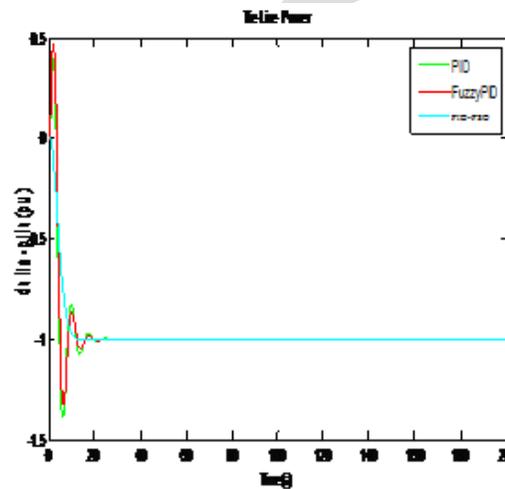


Fig.6. Tie line power deviation of Interconnected Area

Tie line power deviation in interconnected power system is cleared by using the fuzzy-PID, PID, and PSO-PID. Here output response is compared. Fuzzy-PID is better response compared to the PID controller. PSO-PID is best response compared to the fuzzy-PID. Settling time of the PSO-PID is minimum compared to the other 2 methods.

V. CONCLUSION

In this work, two area load frequency control is established by using the PSO tuned PID controller. Inter connection of the two area is very important issue in the power system because of the frequency deviation and tie line power deviation. Compare this result by using the PID and Fuzzy-PID controlling methods. Fuzzy PID give the better response compare to the PID controller. The PID controller which is used to bring the system dynamics within comfortable limits is tuned with the help of genetic algorithm. This PSO tuned PID controller gives best response compare to the Fuzzy PID controller. The frequency deviation, tie line power deviation are settled with the minimum duration and the overshoot of the waveforms will be reduced.

Future work of this project will be developed by using another optimization method.

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Design of Arterial Pulse Detection System for Detection of Prakriti of Person”

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Abstract

In Traditional Ayurvedic Medicine (TAM) and Traditional Chinese Medicine (TCM), diagnosing the disease is based on pulse detection. Arterial pulse diagnosis has been used to the great extent for prediction of the disease for thousands of years. On the basis of balance of the tridosha i.e. Vata, Pitta and Kapha of the pulse, the health of entire body constitution can be determined. In this paper, the prakriti i.e. body constitution of the individual is determined through the questionnaires and pulse detection system. According to the prakriti, the pulses of tridosha are obtained through the sensors. From pulse morphologies, the tridosha pulses for constant pressure in normal and abnormal health conditions are studied for the group of subjects and the disease is detected.

Keywords: Ayurveda, Prakriti, Tridosha, Pulse detection, feature extraction, MATLAB

I. INTRODUCTION

Ayurveda Theory

In Traditional Indian Medicine (Ayurveda), pulse signals carry important information that provides healthy status of the body. Pressure applied while observing the pulse signal plays an important role in the analysis of the body conditions based on dynamic nature of the pulse signal. In pulse diagnosis, doctors use fingertips to feel the pulse and diagnose patients. The fingers represent 3 doshas i.e. Vata, Pitta & Kapha of the radial artery. The index finger (Vata prakriti), middle finger (Pitta prakriti) and ring finger (Kapha prakriti) are placed at the root of the thumb to senses the pulse (Figure1).



Figure1. Classical Method

The Ayurvedic medicine is the concept related to health and balance between three principle doshas such as Vata, Pitta and Kapha. The presence of tridosha in every individual is distinct due to the different characteristics of human being and accordingly prakriti is detected. These three doshas differ in combinations and permutations with every person. This is mainly used to determine the physiological constitution (Prakriti) of an individual.

Vata Qualities: The person with vata quality is active, astringent, dry, cold, clear, and it is dispersing. They have a light body frame, thin, light muscles and underweight.

Pitta Qualities: The person with Pitta quality has sharp, liquid, hot, oily and spreading qualities light. It has a sharp nose, teeth, eyes, mind and while talking uses sharp words. They also have very sharp memory.

Kapha Qualities: The person with Kapha quality will have slow, heavy, oily, liquid, cool and static qualities. Kapha people have thick wavy hair, and big, attractive eyes.

According to characteristics based on body size, hair, weight, appetite, voice, skin, personality, habits the prakriti of the person can be determined.

Many models and the methods are implemented for detecting the diseases on the basis of feature extraction of the pulse. The sensor consisting ultrasound transmitter and receiver pair pressure [1], photoelectric, and ultrasonic sensors[2], strain sensor for detection of blood pressure [3] are used for the detection of pulse through wrist. A method for automatic identification of human pulse

parameters[4] like frequency, strength, rhythm, depth and shape of pulse are identified by Bayesian networks. Lisheng Xu et. al.[5] proposed the pulse acquisition device using pulse sensor in which 17 feature parameters of the pulse image are determined. In this study 4 fuzzy neural network (FNN) classifiers are integrated for extracting position, trend, rhythm, and shape of pulse. For the diagnosis of the other diseases multiple kernel learning (MKL) algorithms [6] can be used. Normal and abnormal health conditions are considered with Dicrotic Notch Suppression Ratio (DNSR) and BAD Notch Ratio [7][9].

II. SYSTEM ARCHITECTURE

The system consists of a set of three force sensitive resistors which are operated on the constant pressure range. These three sensors are attached to the three locations of the arterial pulse namely vata, pitta and kapha of the wrist. Here the sensors measures the pressure experienced by the artery. These signals are then digitized by using analog to digital converter. The amplitude of the pulse is displayed on LCD. Through the communication protocol unit, by using RS232 the pulse patterns with pulse rate are observed in MATLAB.

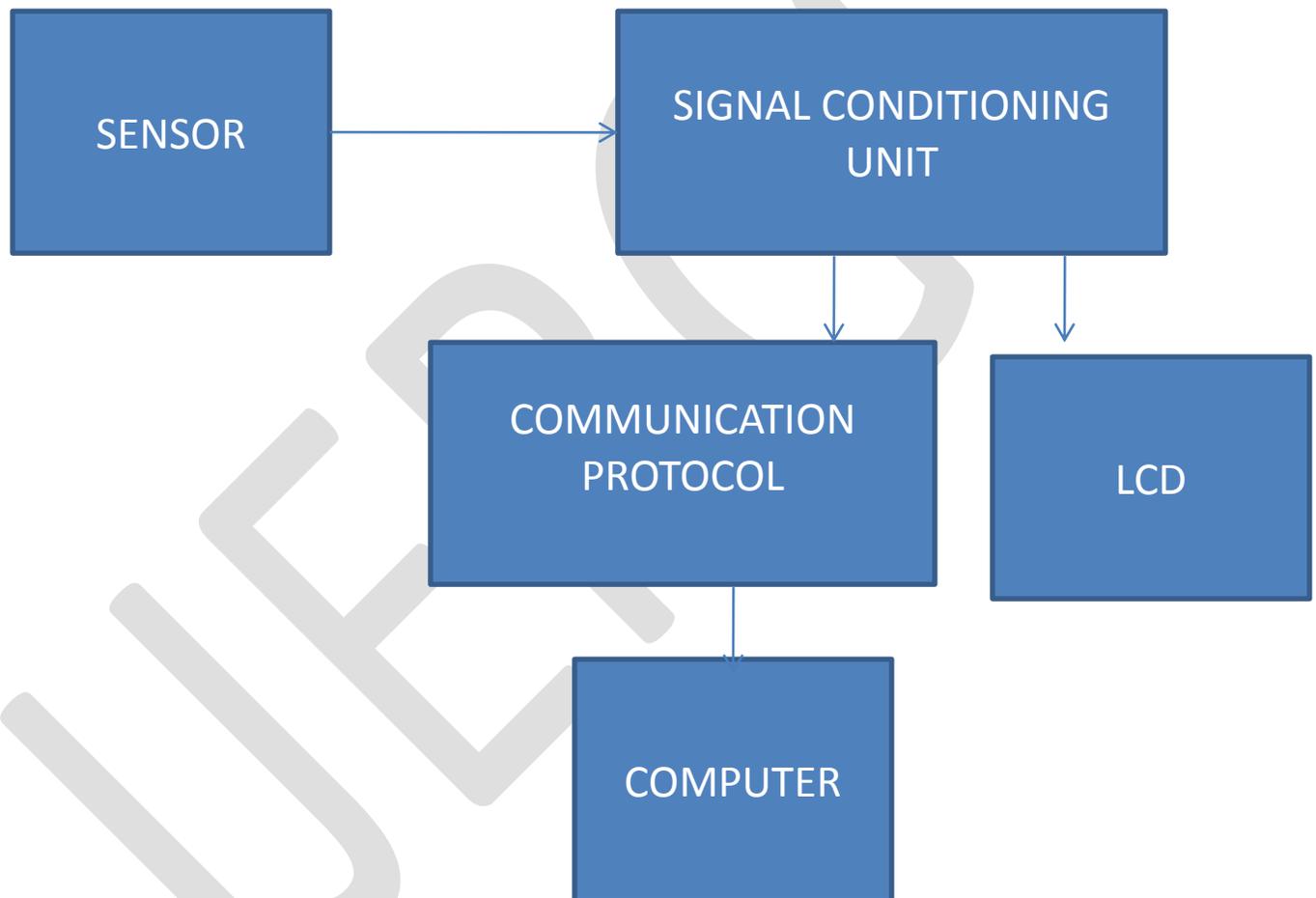


Figure2: Arterial pulse detection system

III. METHODOLOGY

A. Detection of pulse:

The wrist pulse is very weak and it is easily affected by the noise because of movements of the human body, mental overstress and so on [12].By considering these, the Force sensitive resistor is selected for detection of pulse which is sensitive to responses the low frequency signal. Figure3 shows FSR with 10kohm resistor connected to it.

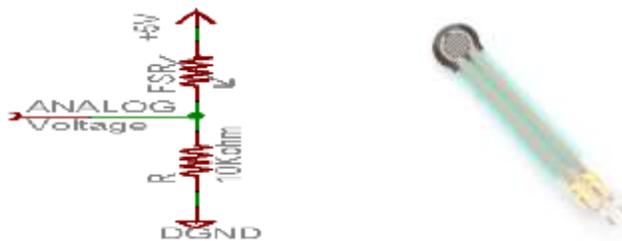


Figure3: FSR with circuit diagram

The sensor is attached to the wrist by using velcro for maintaining constant pressure. It prevents the sensor from moving and getting damage. The sensors are attached to the wrist according to the right position of vata, pitta and kapha. The arrangement of the hardware circuitry is shown in figure4.

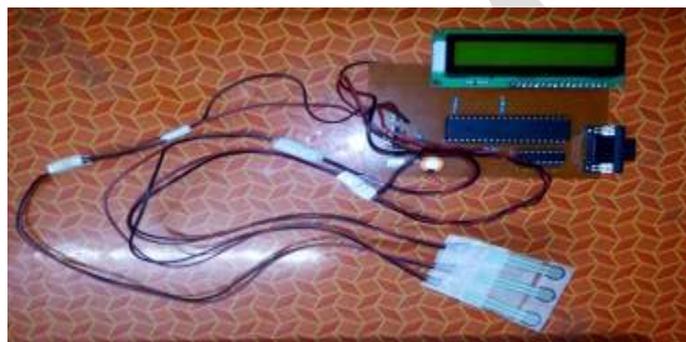


figure4. Hardware design

B. Feature extraction

The pulse is detected in MATLAB and the features are determined. The five parameters of the pulse i.e. shape, rhythm, amplitude, frequency and the pulse rate is determined. The pulse rate for vatta, pitta and kapha can be determined according to the table given in figure5. The pulse rate of the normal person is given as for vata 80-95, pitta 70-80 and kapha=50-60.

	VATA	PITTA	KAPHA
Characteristics	Fast,light,thin, disappears on pressure	Prominent,strong,high amplitude,forceful	Deep,slow,broad, regular
Location	Index	Middle	Ring
Gati	Sarpa(cobra)	Manduka(frog)	Hansa(Swimming Swan)
Rate	80-95	70-80	50-60
Force	Irregular	Regular	Regular

figure5: Characterise of VPK

C. Data collection

The data is collected on the basis of gender, age group, blood group, weight, blood pressure of the person. It also includes the person’s medical history.

IV. RESULTS AND ANALYSIS

For the detection of prakriti of a person, the questionnaires are provided to the person. For getting the pulse pattern of specific prakriti, the groups are classified as female and male candidates with the specific age group. As mentioned before, the data has been collected on the basis of different parameters of the individuals. Two classes for the same age groups are considered, one for normal class and another for abnormal class (who is having some diseases like hyper tension, indigestion etc). For the individuals, data is collected for 1 minute to check the pulse rate. According to the prakriti, the pulse patterns are determined. The threshold value is determined for measuring the pulse rate of the person. The amplitude and frequency spectrum is considered for determining irregular pulse. Following result shows pulse pattern for vata, pitta and kapha. The sensor system is attached to the left hand of the

female. Here, Total 350 samples are taken in 60 seconds from which pulse rate can be detected. The pulse pattern of female for the age 25 is detected and the prakriti of same lady is predicated as pitta-vatta prakriti depending on pulse rate and answers of questionnaires given to her. The pulse rate $V=96$ $P=62$ and $K=54$ is given in the figure.

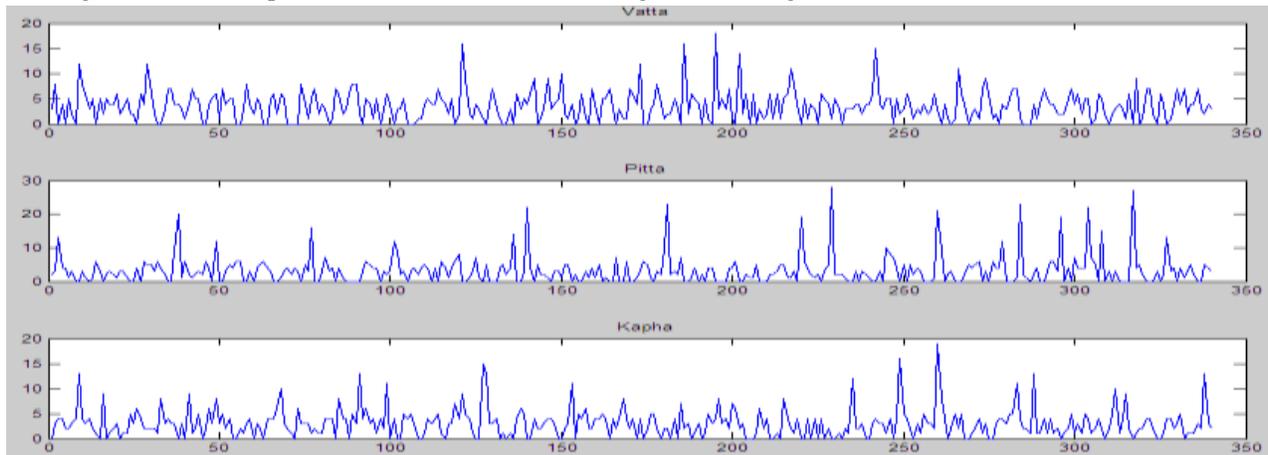


Figure6: Pulse pattern for female

In figure7, pulse pattern for male is taken. The sensor system is attached to the right hand of the male. Total 350 samples are taken in 60 seconds from which pulse rate can be detected. Here, the pulse pattern of male for the age 25 is detected and as per the questionnaires, prakriti of the same male is predicated as pitta-vatta prakriti. The pulse rate $V= 102$ $P=72$ and $K=57$ is given in the figure7.

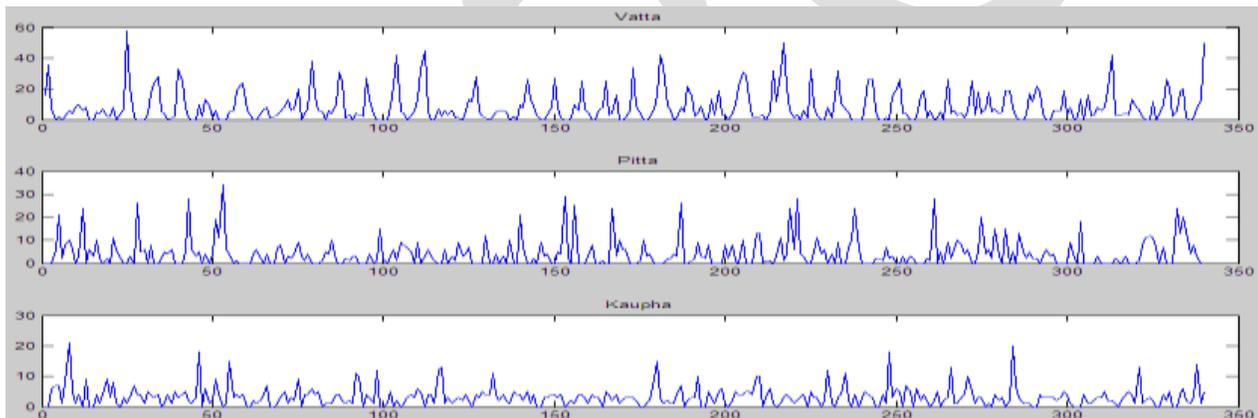


Figure7: Pulse pattern for male

If the person is suffering from any type of disease then the pulse rate of the person is varying with the pulse pattern.

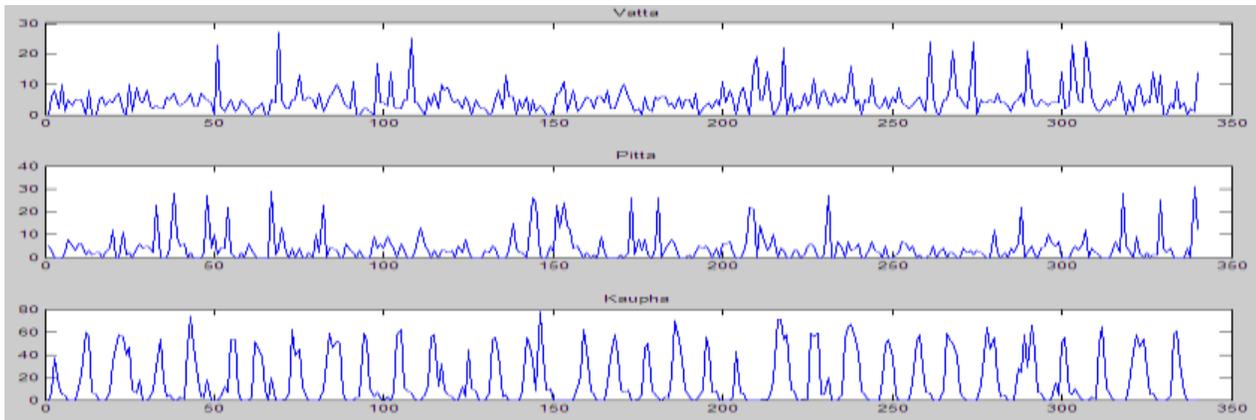


Figure 8: Pulse pattern for male having imbalance in kapha dosha

Figure 8 shows pulse pattern for abnormal functionality in kapha dosha. The pulse rate from figure7 is $V= 85$ $P=77$ and $K=79$. In this pattern we are getting high amplitude with high peak values and the pulse pattern is broad due to imbalance of kapha dosha. The person was predicted as abnormal person as he was suffering from indigestion on that day.

V.CONCLUSION

In this paper, the prakriti of a person is predicted according to the characteristics of individuals. Due to imbalance of tridosha, the irregularity of the pulse is obtained by which the disease can be detected. From the results; the normal health condition shows the same pattern of the pulse while in the abnormal health condition the pulse patterns are having broadening effects in the pulse. Further research work can be enhanced with prediction capability of fuzzy logic system.

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Secure Cloud Storage using Decentralized Access Control with Anonymous Authentication

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Abstract—We propose a new decentralized access control scheme for secure data storage in clouds that supports anonymous authentication. In the proposed scheme, the cloud verifies the authenticity of the series without knowing the user's identity before storing data. Our scheme also has the added feature of access control in which only valid users are able to decrypt the stored information. The scheme prevents replay attacks and supports creation, modification, and reading data stored in the cloud. We also address user revocation. Moreover, our authentication and access control scheme is decentralized and robust, unlike other access control schemes designed for clouds which are centralized. The communication, computation, and storage overheads are comparable to centralized approaches.

Keywords—Decentralized Access, Authentication, Attribute-based signatures, Attribute-based encryption, Cloud storage, Policy based access, Renewal policy.

introduction

Cloud computing is a rising computing standard in which assets of the computing framework are given as a service over the Internet. As guaranteeing as it may be, this standard additionally delivers a lot of people new challenges for data security and access control when clients outsource sensitive data for offering on cloud servers, which are not inside the same trusted dominion as data possessors. Numerous services like email, Net banking and so forth... are given on the Internet such that customers can utilize them from anyplace at any time. Indeed cloud storage is more adaptable, how the security and protection are accessible for the outsourced data turns into a genuine concern. The three points of this issue are availability, confidentiality and integrity. To accomplish secure data transaction in cloud, suitable cryptography method is utilized. The data possessor must encrypt the record and then store the record to the cloud. Assuming that a third person downloads the record, they may see the record if they had the key which is utilized to decrypt the encrypted record. Once in a while this may be failure because of the technology improvement and the programmers. To overcome the issue there is lot of procedures and techniques to make secure transaction and storage.

Recently addressed Anonymous authentication for data archiving to clouds. Anonymous authentication is the procedure of accepting the client without the details of the client. So the cloud server doesn't know the details of the client, which gives security to the clients to conceal their details from other clients of that cloud.

REMAINING CONTENTS

Existing System

Much of the data stored in clouds is highly sensitive, for example, medical records and social networks. Security and privacy are, thus, very important issues in cloud computing. In one hand, the user should authenticate itself before initiating any transaction, and on the other hand, it must be ensured that the cloud does not tamper with the data that is outsourced. User privacy is also required so that the cloud or other users do not know the identity of the user. The cloud can hold the user accountable for the data it outsources, and likewise, the cloud is itself accountable for the services it provides. The validity of the user who stores the data is also verified. Apart from the technical solutions to ensure security and privacy, there is also a need for law enforcement.

Efficient search on encrypted data is also an important concern in clouds. The clouds should not know the query but should be able to return the records that satisfy the query. This is achieved by means of searchable encryption [3], [4]. The keywords are sent

to the cloud encrypted, and the cloud returns the result without knowing the actual keyword for the search. The problem here is that the data records should have keywords associated with them to enable the search. The correct records are returned only when searched with the exact keywords. Security and privacy protection in clouds are being explored by many researchers. Wang et al. [2] addressed storage security using Reed-Solomon erasure-correcting codes. Authentication of users using public key cryptographic techniques has been studied in [5]. Many homomorphic encryption techniques have been suggested [6], [7] to ensure that the cloud is not able to read the data while performing computations on them. Using homomorphic encryption, the cloud receives ciphertext of the data and performs computations on the ciphertext and returns the encoded value of the result. The user is able to decode the result, but the cloud does not know what data it has operated on. In such circumstances, it must be possible for the user to verify that the cloud returns correct results. Accountability of clouds is a very challenging task and involves technical issues and law enforcement. Neither clouds nor users should deny any operations performed or requested. It is important to have log of the transactions performed; however, it is an important concern to decide how much information to keep in the log. Accountability has been addressed in Trust Cloud [8]. Secure provenance has been studied in [8].

Proposed System

The new system provides the user privacy as well as data security. It also provides the access control over the data. The user privacy is maintained by anonymous authentication. Existing work [2], [3], [4], [5], [6] on access control in cloud are centralized in nature. The scheme in [8] uses a symmetric key approach and does not support authentication. The schemes [2], [3], [6] do not support authentication as well. Earlier work by Zhao et al. [5] provides privacy preserving authenticated access control in cloud. However, the authors take a centralized approach where a single key distribution center (KDC) distributes secret keys and attributes to all users. Unfortunately, a single KDC is not only a single point of failure but difficult to maintain because of the large number of users that are supported in a cloud environment. We, therefore, emphasize that clouds should take a decentralized approach while distributing secret keys and attributes to users. It is also quite natural for clouds to have many KDCs in different locations in the world. Although Yang et al. [4] proposed a decentralized approach, their technique does not authenticate users, who want to remain anonymous while accessing the cloud. In an earlier work, Ruj et al. [6] proposed a distributed access control mechanism in clouds. However, the scheme did not provide user authentication. The other drawback was that a user can create and store a file and other users can only read the file. Write access was not permitted to users other than the creator.

CONCLUSION

We have presented a decentralized access control technique with anonymous authentication, which provides user revocation and prevents replay attacks. The cloud does not know the identity of the user who stores information, but only verifies the user's credentials. Key distribution is done in a decentralized way. One limitation is that the cloud knows the access policy for each record stored in the cloud.

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Rectangular Microstrip Patch Antenna With Truncated Ground For Ultra Wide Band

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Abstract— In this study, a rectangular patch with truncated ground microstrip antenna for ultra wide bandwidth is presented. The antenna has compact dimension of 16 mm x 18 mm ($W_{sub} \times L_{sub}$), is constructed on FR4 substrate with thickness of 1.6 mm and relative dielectric constant of 4.4. The dimensional parameters for the antenna are introduced and their effects on the frequency characteristic have been investigated through a parametric study. The antenna is designed to operate over 3.1 to 11 GHz for $S_{11} < -10$ dB. The simulated results show good agreement with the measured results. These characteristics make the antenna suitable for UWB applications.

Keywords— Patch antenna, truncated ground plane, microstrip-fed, monopole, UWB antenna, FR4 substrate, HFSS

INTRODUCTION

The applications of UWB antenna are in the medical imaging, high-accuracy radar, wall imaging and wireless communications [1]. The most important characteristics of these antennas are low cost, compact size and a good omnidirectional pattern. Therefore the monopole planar antennas are suitable for designing and fabrication [2].

The design of wideband antenna is very difficult task especially for hand-held terminal since the compromise between size, cost, and simplicity has to be achieved. In UWB communication systems, one of key issues is the design of a compact antenna while providing wideband characteristic over the whole operating band. Due to their appealing features of wide bandwidth, simple structure, omnidirectional radiation pattern, and ease of construction several wideband monopole configurations, such as circular, square, elliptical, pentagonal, and hexagonal have been proposed for UWB applications [3]–[5].

Thus, a microstrip-fed monopole antenna is suitable candidate for integration with hand-held terminal owing to its attractive features such as low profile, low cost, and light weight.

In this paper, a compact ultra wideband microstrip-fed printed monopole antenna. To achieve the maximum impedance bandwidth, a pair of notches is placed at the two lower corners of the patch and the notch structure is embedded in the truncated ground plane. Simulated and experimental results are presented to demonstrate the performance of a suggested antenna.

ANTENNA CONFIGURATION AND DESIGN

For patch antenna the length and width are used as calculated from the equations. The expression for ϵ_{reff} is given by Balanis as [6]:

$$\epsilon_{reff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \left[1 + 12 \frac{h}{W} \right]^{1/2} \quad (1)$$

The dimensions of the patch along its length have now been extended on each end by a distance ΔL , which is given empirically by Hammerstad as:

$$\Delta L = 0.412h \frac{(\epsilon_{reff} + 0.3) \left(\frac{W}{h} + 0.264 \right)}{(\epsilon_{reff} - 0.258) \left(\frac{W}{h} + 0.8 \right)} \quad (2)$$

The effective length of the patch L_{eff} now becomes:

$$L_{eff} = L + 2 \Delta L \quad (3)$$

For a given resonance frequency f_o , the effective length is given by

$$L_{eff} = \frac{c}{2 f_o \sqrt{\epsilon_{reff}}} \quad (4)$$

For a rectangular microstrip patch antenna, the resonance frequency for TM_{mn} mode is given by James and Hall as-

$$f_o = \frac{c}{2\sqrt{\epsilon_{reff}}} \left[\left(\frac{m}{L} \right)^2 + \left(\frac{n}{W} \right)^2 \right]^{1/2} \quad (5)$$

For efficient radiation, the width W is given by –

$$W = \frac{c}{2f_0 \sqrt{\frac{\epsilon_r + 1}{2}}} \quad (6)$$

The first step is to design substrate of dimension 16 mm x 18 mm. The width W_f of the microstrip feedline is fixed at 2 mm. On the front surface of the substrate, a rectangular patch with size of 7 mm x 11 mm ($W \times L$) is printed. The rectangular patch has a distance of L_3 to the ground plane printed on the back surface of the substrate.

Following Steps are applied to design an optimized geometry:

- 1) By cutting the two notches of suitable dimensions ($W_1 \times L_1$) at the monopole's two lower corners, it is found that much enhanced impedance bandwidth can be achieved for the antenna. This phenomenon occurs because the two notches affect the electromagnetic coupling between the rectangular patch and the ground plane [7].
- 2) In addition, to achieve good wideband matching of the antenna, the separation L_3 between the rectangular patch and the notch in the ground plane is used.

The modified truncated ground plane acts as an impedance matching element to control the impedance bandwidth of a square monopole [8]. The dimension of the notch ($W_2 \times L_2$) embedded in the truncated ground plane and feed gap distance L_3 are important parameters in determining the sensitivity of impedance matching. Figure 1 shows the configuration of the proposed wideband antenna and the final optimal dimensions of the designed antenna are given in the table 1. The 3-D view of antenna simulated is shown in figure 2.

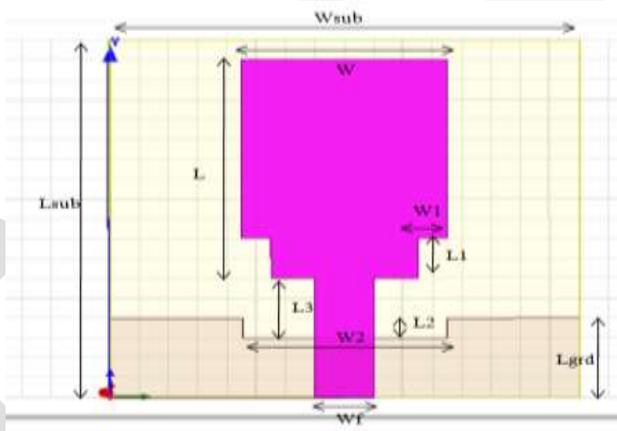


Figure 1: Configuration of the antenna

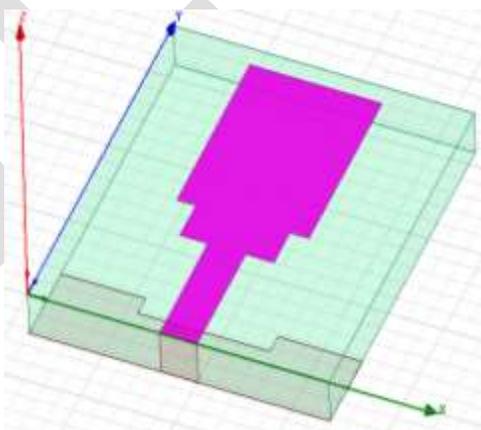


Figure 2: 3-D view of antenna

Table 1: Dimensions of Antenna (After Optimization)

W_{sub}	L_{sub}	W	L	W_1	L_1	W_2	L_2	L_3	W_f	L_{grd}
16	18	7	11	1	2	7	1	3	2	4

RESULTS

A) SIMULATED RESULTS

The microstrip-fed monopole antennas with various parameters (L_1 and L_2) were constructed and studied to demonstrate the proposed bandwidth-enhancement technique. The simulated results are obtained using the Ansoft simulation software high-frequency structure simulator (HFSS) [9].

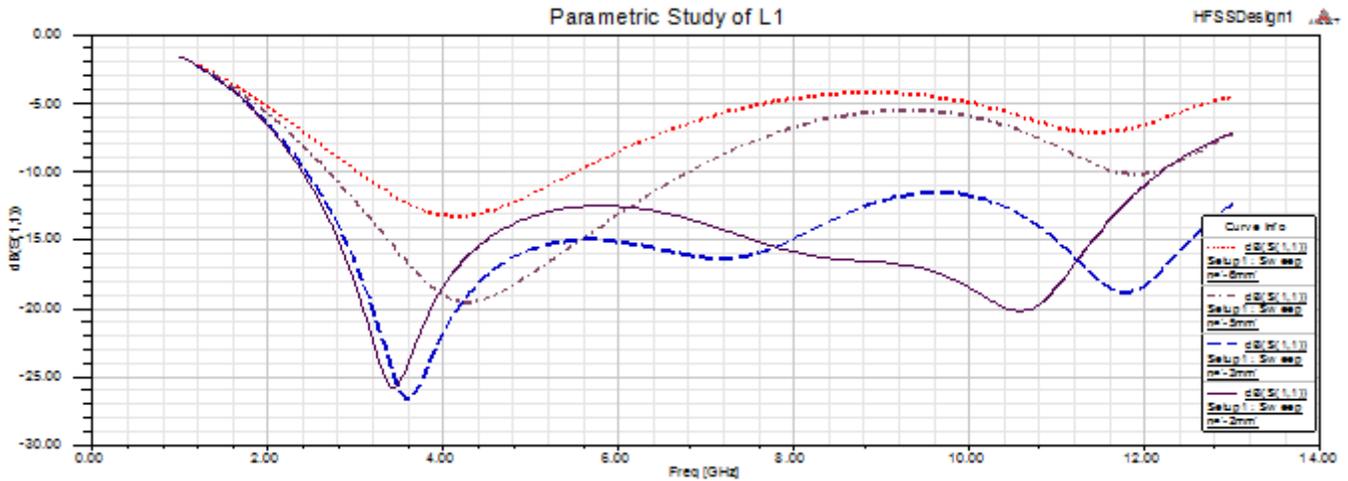


Figure 3: Simulated return loss for various L_1 at the two lower corner of the proposed monopole antenna. (W_1 is fixed at 1mm)

Figure 3 shows the simulated return loss curves for various notch sizes ($W_1 \times L_1$). As the notch sizes ($W_1 \times L_1$) are changed from 1 mm x 6 mm to 1 mm x 2 mm, the impedance bandwidth becomes greater than 6 GHz, with decrease of the upper frequency f_U . It is also observed that the upper frequency f_U is significantly affected by the variation in notch length L_1 . On the other hand, the lower frequency f_L is insensitive to the change of L_1 .

The simulated return loss curves with different values of L_2 are plotted in Figure 4 when W_2 is fixed at 7 mm. From the simulation results in Figure 4, it is found that the 10 dB impedance bandwidth decreases as the notch length L_2 decreases.

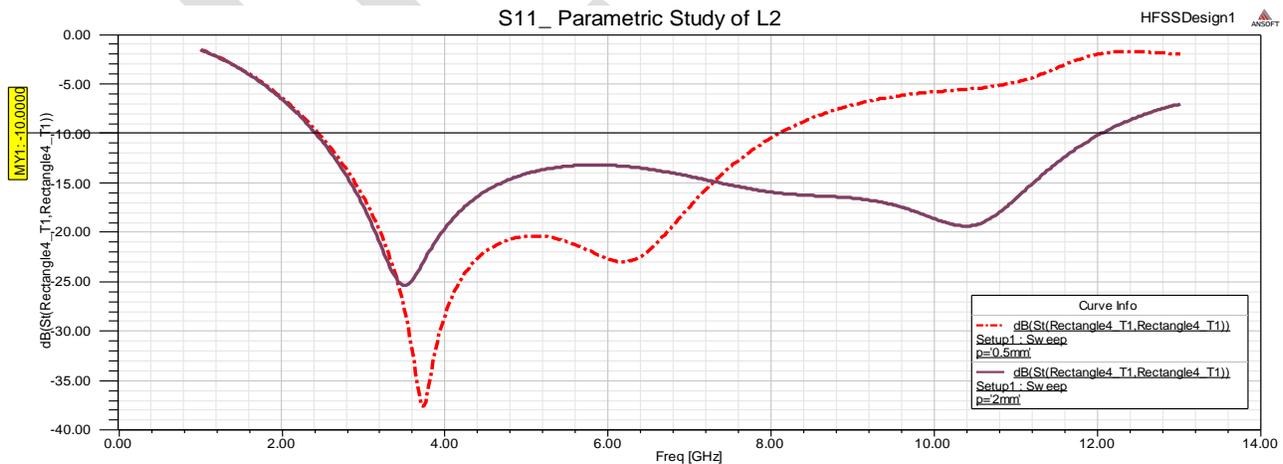


Figure 4: Return loss curves with different values of L_2

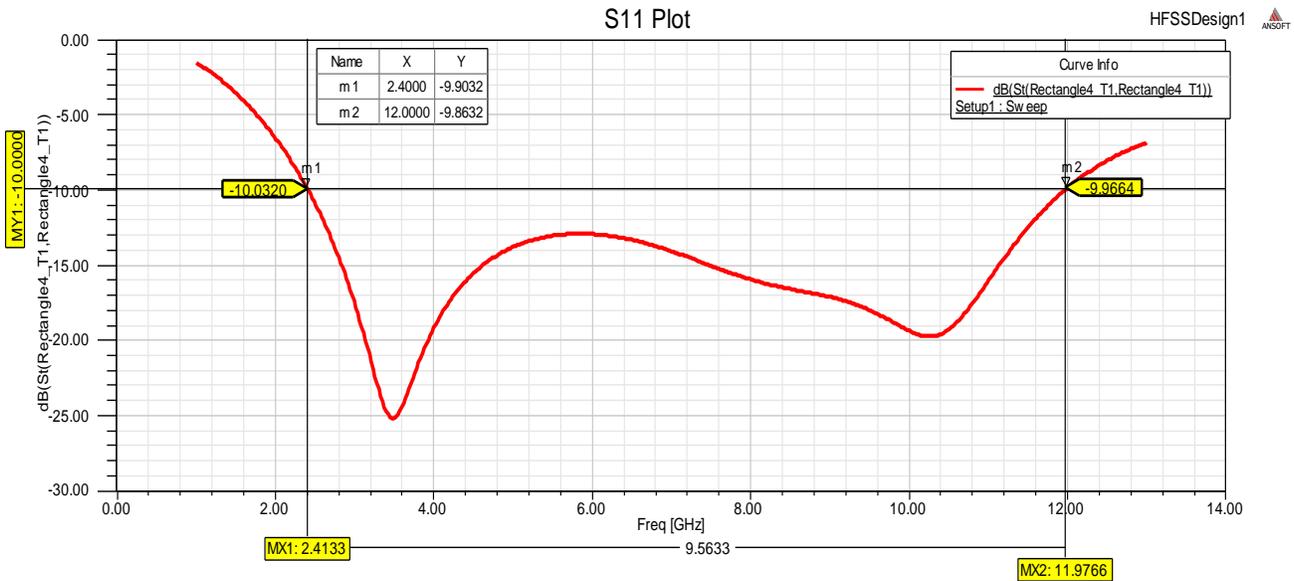


Figure 5: Return loss curves with Optimized value of L_2 (ie $L_2 = 1\text{mm}$)

The optimized notch length L_2 on the truncated ground plane is 1 mm. The simulated return loss curves with the optimal notch length $L_2 = 1\text{mm}$ for various notch widths W_2 on the truncated ground plane are plotted in Figure 6. As the notch width W_2 increases, the lower frequency f_L is slightly changed and the upper frequency f_U is markedly increased. It is observed that the notch width W_2 is the most critical parameter to determine the upper frequency f_U . The notch width W_2 is chosen as 7 mm to yield near optimal bandwidth.

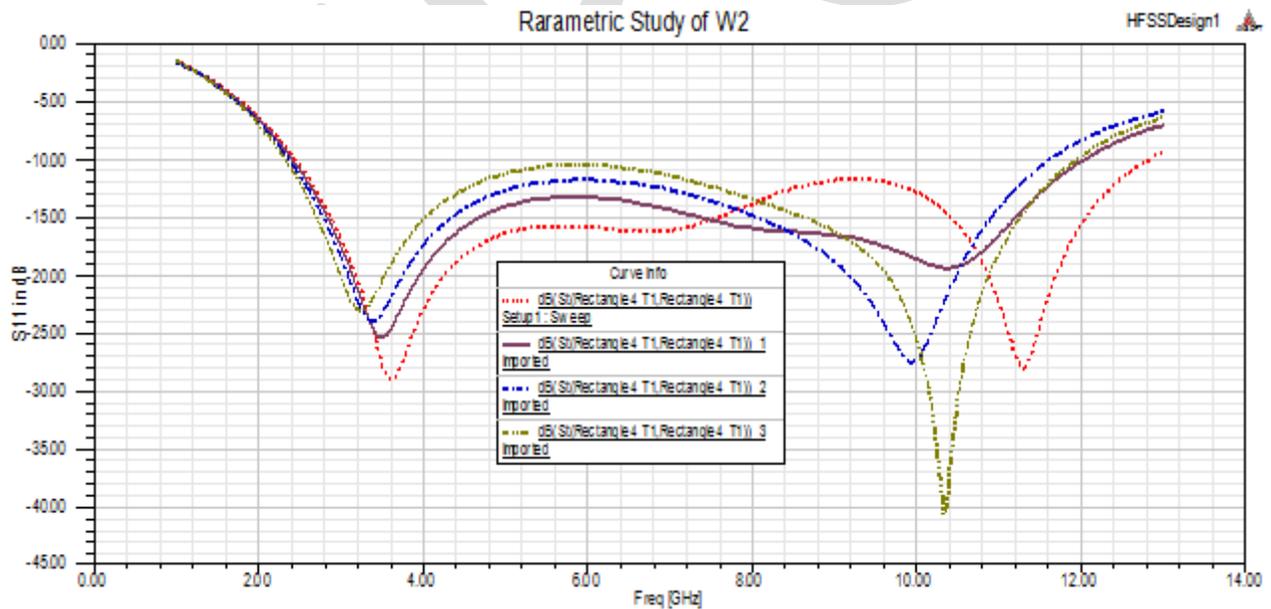


Figure 6: Return loss curves with various values of W_2

Figure 7 shows the simulated voltage standing wave ratio (VSWR) against frequency of the antenna. Based on the simulated result, the VSWR value ranges from 1 to 2 throughout the frequency range of 2.41GHz to 12.05GHz. The result indicates that the VSWR complies with the UWB characteristic and the same frequency info region also displays the return loss curve less than -10 dB , as seen in figure 5.

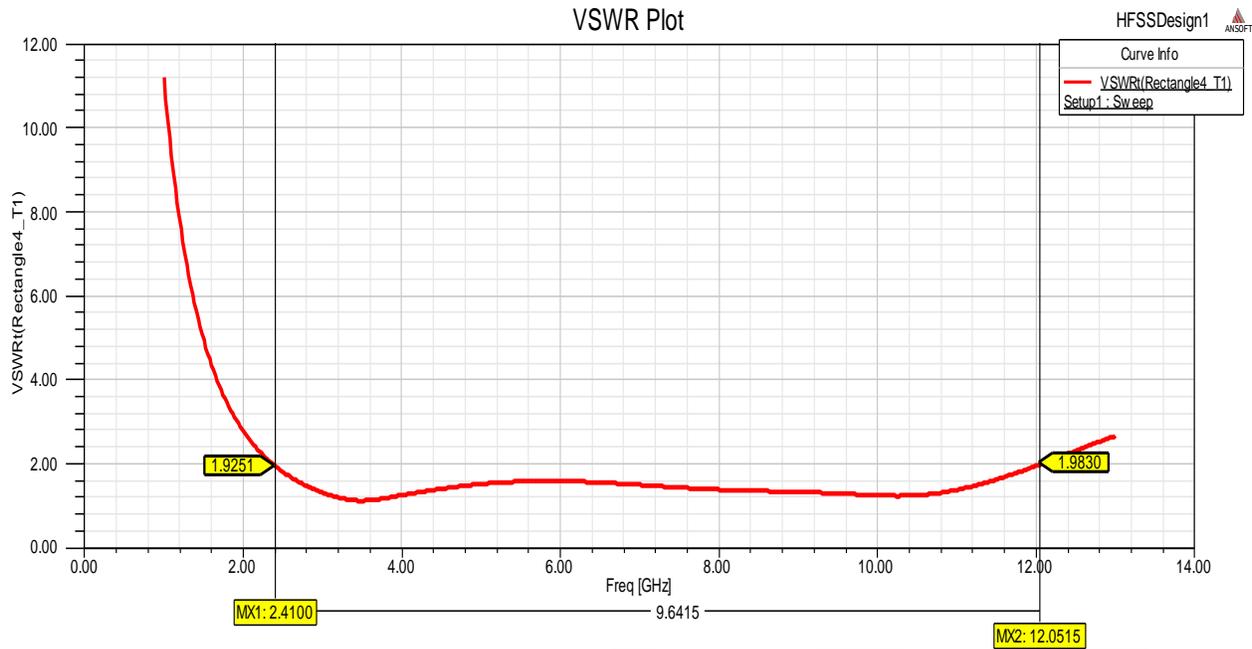


Figure 7: Simulated voltage standing wave ratio (VSWR)

OTHER CALCULATED PARAMETERS:

Some of the other important parameter of antenna are also calculated from the simulation out of which antenna gain plays a vital feature in determining antenna performance. The peak gain is shown in figure 8 at frequency 10GHz. Similarly the simulated directivity, radiation efficiency, radiated power, accepted power and incident power are also shown in figure 9 to figure 13 respectively.

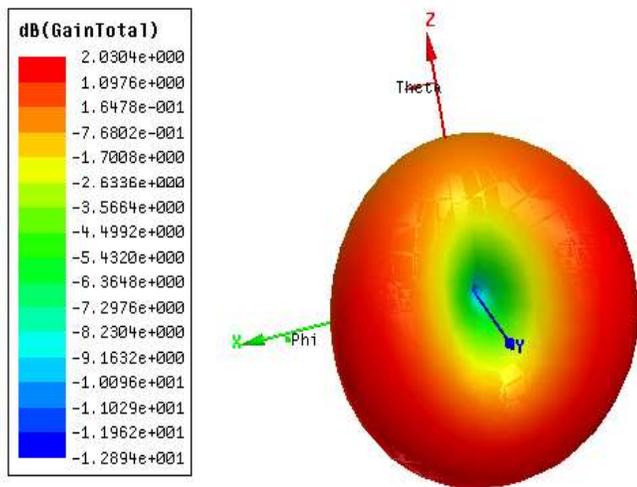


Figure 8: 3D polar plot for gain of antenna

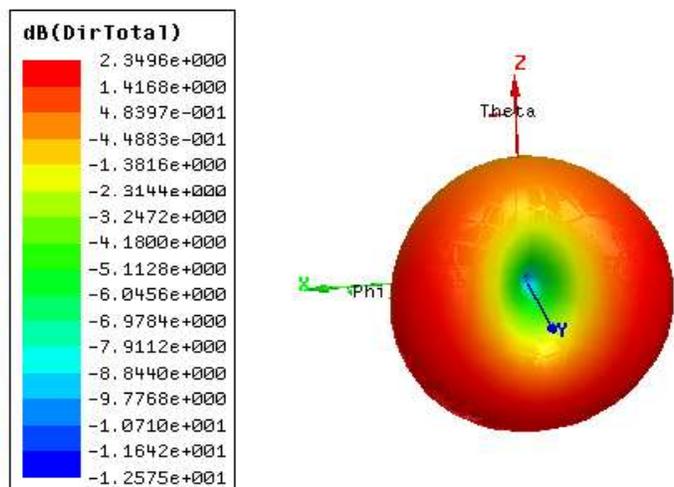


Figure 9: 3D polar plot for directivity of antenna

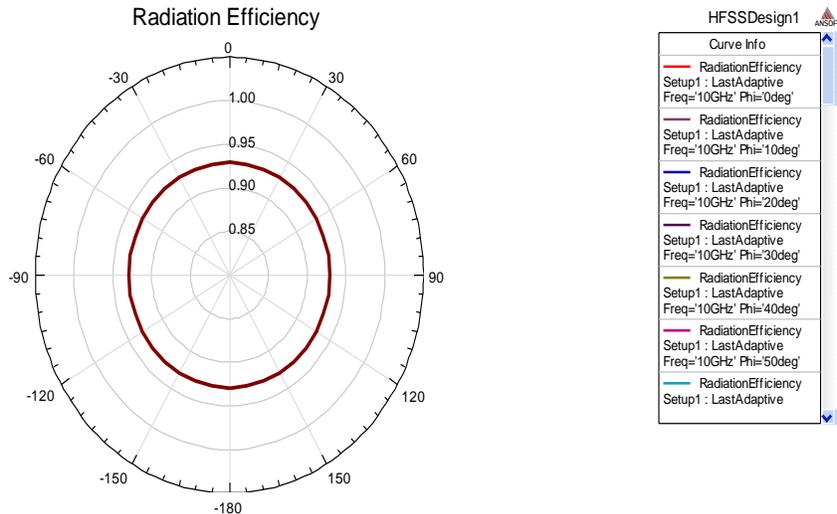


Figure 10: Plot for Radiation Efficiency of antenna

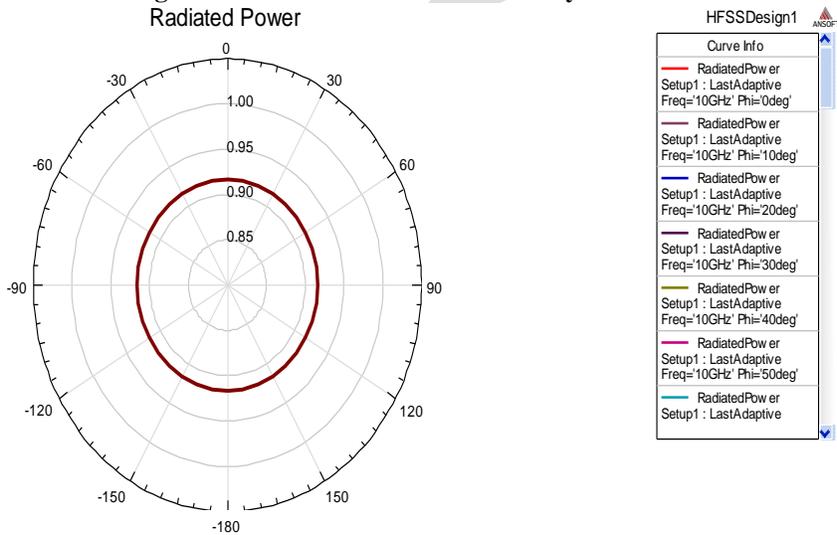


Figure 11: Plot for Radiated Power of antenna

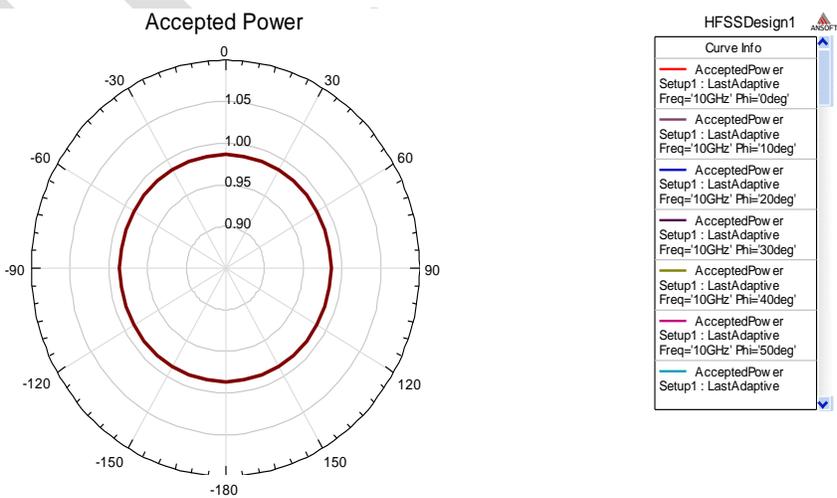


Figure 12: Plot for Accepted Power of antenna

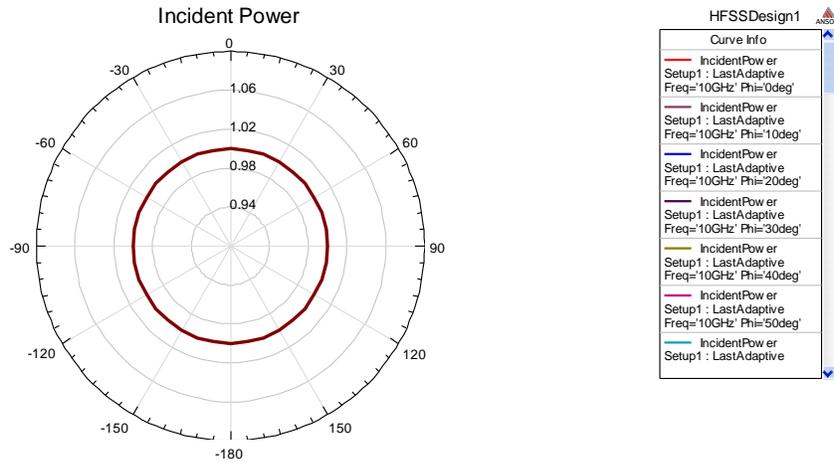


Figure 13: Plot for Incident Power of antenna

The mathematical values of simulated gain, directivity, radiation efficiency, radiated power, accepted power and incident power at frequency 10 GHz are also given in table 2

Table 2: Mathematical Values of antenna Parameter

Parameter	Value
Gain	2.03 dB
Directivity	2.34 dB
Radiation efficiency	93%
Radiated power	92%
Accepted power	98%
Incident power	99%

B) MEASURED RESULTS

The set up for antenna measurement using vector network analyzer is used for the calculation of return loss values at DRDO, Jodhpur and it is concluded that the antenna covered less than -10dB value for almost UWB range. Using the vector network analyzer instrument, result of return loss values for 1.44GHz to 11.2 GHz is obtained and compared with simulated results for designed antenna. Figure 14 shows measured return loss characteristics and figure 15 shows the measured VSWR characteristics of the antenna of the antenna. Measured impedance bandwidth is nearly similar as compare to simulated one. The fabricated antenna satisfies the 10-dB return loss requirement from 1.44 GHz to 11.2 GHz.

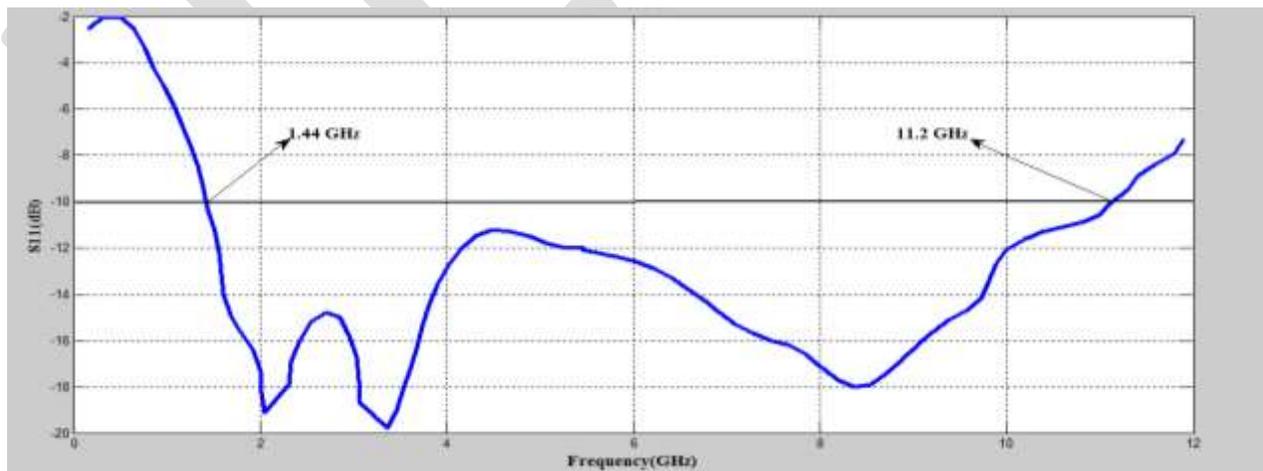


Figure 14 : Measured return loss characteristics of the antenna.

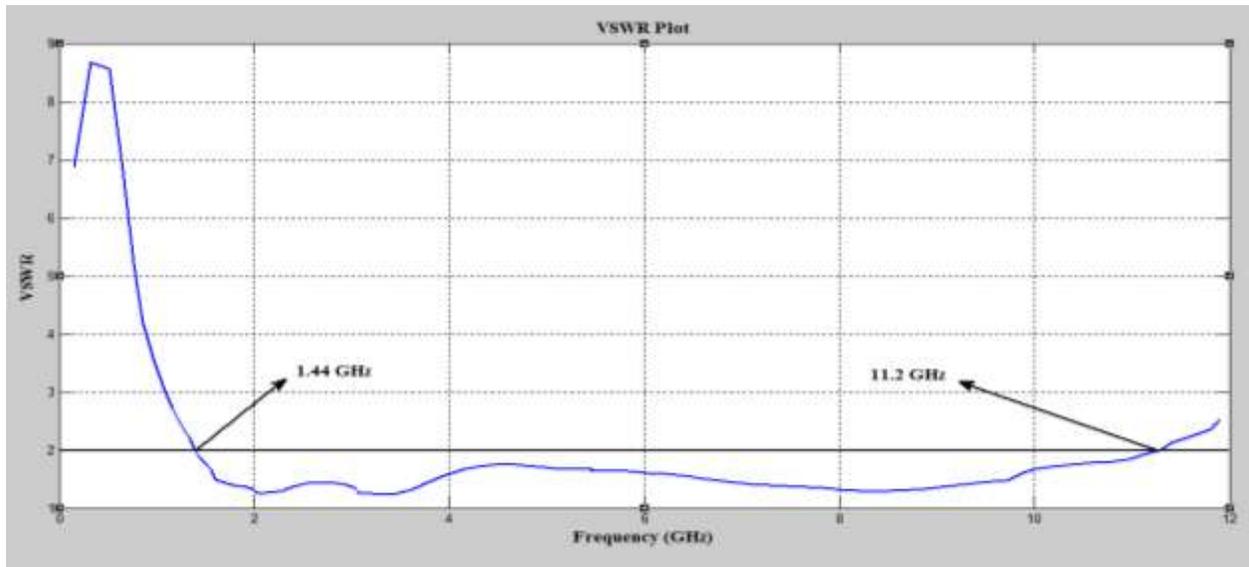


Figure 15: Measured VSWR characteristics of the antenna.

FABRICATION

The antenna structure is fabricated on a printed circuit board (PCB) using Photolithography technique and tested. The top and bottom view fabricated antenna is shown in Figure 16.

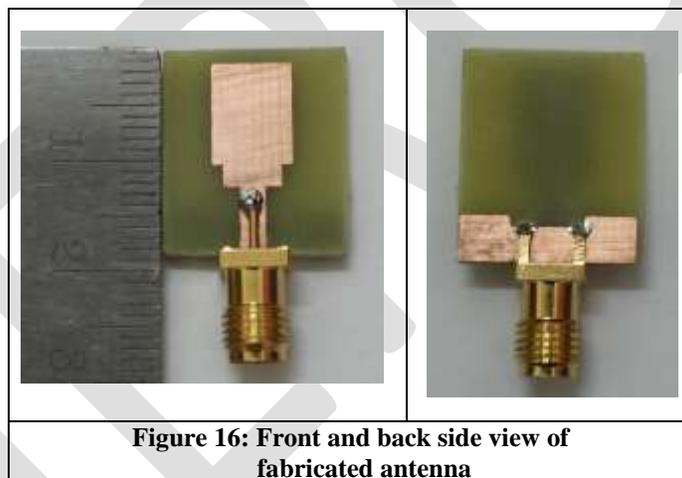


Figure 16: Front and back side view of fabricated antenna

ACKNOWLEDGMENT

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CONCLUSION

The fabricated antenna has advantages of small size, easy fabrication and simple construction. Antenna operates at 1.44GHz -11.2 GHz with Absolute Bandwidth 9.2 GHz. Radiation performance of patch antenna is also presented in this paper. The radiation efficiency 93% is achieved and we conclude that proposed geometry is applicable for ultra wide band from 3.1 GHz to 10.6 GHz. In future the radiation performance of rectangular patch antenna can be improved by using different feeding techniques.

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Review on Experimental Investigation of Heat Transfer Enhancement Techniques in Two Phase Closed Thermosyphon

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Abstract— The performance of heat transfer is one of the most important research areas in the field of thermal engineering. Due to the high heat transfer effectiveness, thermosyphon has its own importance in the low temperature heat transfer. Researchers observed that geometrical factors have significant influence on the performance of thermosyphon. Therefore the experimental study of thermosyphon is essential to find out the factors affecting the performance of thermosyphon. In this review paper main focus is given to parameters like filling ratio, aspect ratio, heat load, mass flow rate and inclination angle, which affects the thermal performance of thermosyphon. From the literature it seems to be need of binary solution, new efficient and minimum ODP and GWP refrigerants and mathematical modelling of thermal performance of thermosyphon. Also, in this review paper focus is given to working fluids which affect the thermal performance of thermosyphon.

Keywords— Thermosyphon, Heat Pipe, Heat transfer limitations, Mechanical and surface modifications, Working fluid, Inclination angle, Heat Input, Coolant flow rate.

I. INTRODUCTION

Gears are the most common means of transmitting power in the modern mechanical engineering world. Energy is an important part of most aspects of daily life. The quality of life and even its substance depends on the availability of energy. Hence energy plays a vital role in day to day life as well as in heat transfer applications. Due to the human need for energy, a more efficient way of using it is a major challenge in the scientific community. The heat pipe and the thermosyphon specially designed by the engineers for transferring heat from a distance. The thermal performance of thermosyphon is one the most important part of these types of investigation in the field of heat transfer.

A. Thermosyphon

Thermosyphon is an enclosed two phase heat transfer devices. They make use of the highly efficient heat transport process of evaporation and condensation to maximize the thermal conductance between a heat source and a heat sink. They are often referred to as thermal superconductors because they can transfer large amounts of heat over relatively large distances with small temperature differences between the heat source and heat sink. The amount of heat that can be transported by these devices is usually several orders of magnitude greater than pure conduction through a solid metal. They are proven to be very effective, low cost and reliable heat transfer devices for applications in many thermal management and heat recovery systems. They are used in many applications including but not restricted to passive ground/road anti-freezing, baking ovens, heat exchangers in waste heat recovery applications, water heaters and solar energy systems and are showing some promise in high-performance electronics thermal management for situations which are orientation specific.

B. Thermosyphon Geometry and Working Principle

A cross section of a closed two-phase thermosyphon is illustrated in Fig. 1; the thermosyphon consists of an evacuated sealed tube that contains a small amount of liquid. The heat applied at the evaporator section is conducted across the pipe wall causing the liquid in the thermosyphon to boil in the liquid pool region and evaporate and/or boil in the film region. In this way the working fluid absorbs the applied heat load converting it to latent heat.

The vapour in the evaporator zone is at a higher pressure than in the condenser section causing the vapour to flow upward. In the cooler condenser region the vapour condenses and thus releasing the latent heat that was absorbed in the evaporator section. The heat

then conducts across thin liquid film and exits the thermosyphon through the tube wall and into the external environment. Within the tube, the flow circuit is completed by the liquid being forced by gravity back to the evaporator section in the form of a thin liquid film. As the thermosyphon relies on gravity to pump the liquid back to the evaporator section, it cannot operate at inclinations close to the horizontal position.

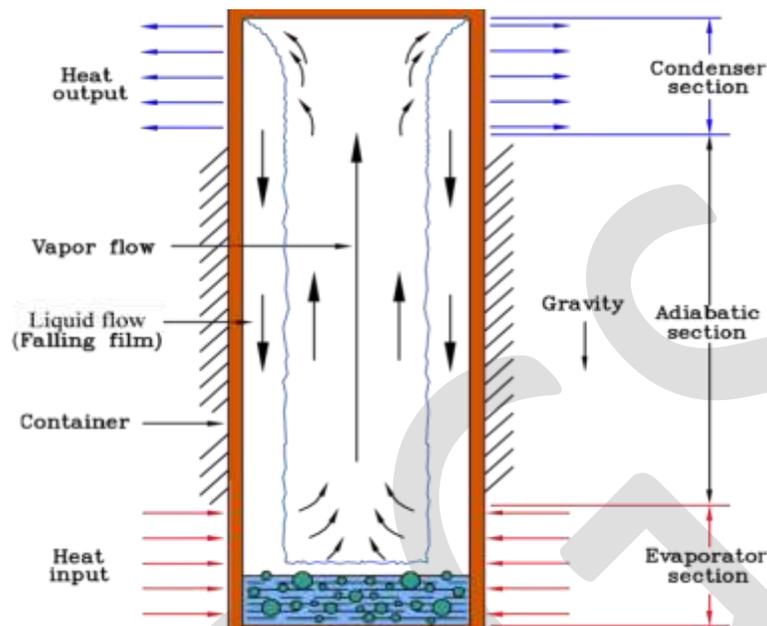


Figure 1: Two-phase closed thermosyphon working principle

II. REVIEW OF WORK CARRIED OUT

Many investigations were carried out in order to analyse and to enhance the thermal performance of thermosyphon. These are as follows.

Grover [1] (Los Alamos Laboratory, USA) introduced the term heat pipe in 1964. The two-phase closed thermosyphon used in this study is essentially a gravity-assisted wickless heat pipe, which is very efficient for the transport of heat with a small temperature difference via the phase change of the working fluid. It consists of an evacuated-closed tube filled with a certain amount of a suitable pure working fluid. The simple design, operation principle, and the high heat transport capabilities of two-phase closed thermosyphons are the primary reasons for their wide use in many industrial and energy applications. Since there is no wick material, the thermosyphon is simpler in construction, smaller in thermal resistance, and wider in its operating limits than the wicked heat pipe.

Z.Q.Long, P.Zang [2] investigated the thermal performance of cryogenic thermosyphon charged with N₂-Ar binary mixture. They have discussed heat transfer of the binary mixture in the thermosyphon theoretically by considering the mass transfer of the components. They built an experimental setup for investigating the heat transfer performance of the cryogenic thermosyphon. They found that the N₂-Ar binary mixture can widen the operational temperature range of the cryogenic thermosyphon and it can work in the range of 64.0–150.0 K. The dry-out limit appears in the experiments for the cases with Ar fraction below 0.503. The heat transfer rate of the dry-out limit increases with the increase of Ar molar fraction until film boiling appears on the top of the condenser.

M. Karthikeyan, S. Vaidyanathan and B. Sivaraman [3] investigated the thermal performance of an inclined two phase closed thermosyphon with distilled water and aqueous solution of n-Butanol as a working fluid. They carried out the experiments for filling ratio of 60%. The thermosyphon was tested for various inclinations of 45°, 60° and 90° to the horizontal. Flow rate of 0.08Kg/min, 0.1 Kg/min and 0.12 Kg/min and heat input of 40 W, 60 W and 80 W. The thermosyphon was of a copper material with inside and outside diameter of 17mm and 19mm respectively. The overall length of thermosyphon was 1000mm (400mm-evaporator length, 450mm-condenser length). They obtained the result that the thermosyphon charged with aqueous solution has the maximum thermal performance than compared to thermosyphon charged with distilled water.

H.Z. Abou-Ziyan, A. Helali, M. Fatouh and M.M. Abo El-Nasr [4] investigated the thermal performance of two phase closed thermosyphon under stationary and vibratory conditions with water and R134a as a working fluid. They carried out the experiments for filling ratio of range (40% to 80%). The thermosyphon was tested for various adiabatic lengths of (275,325 and 350mm), vibration

frequency (0.0-4.33Hz) and input heat flux (160-2800 kW/m²). They obtained the result that adiabatic length of 350mm and liquid filling ratio of 50% provide the highest heat flux.

Negishi and Sawada [5] made an experimental study on the heat transfer performance of an inclined two-phase closed thermosyphon. They used water and ethanol as working fluids. The highest heat transfer rate was obtained when the filling ratio (ratio of volume of working fluid to volume of evaporator section) was between 25% and 60% for water and between 40% and 75% for ethanol. The inclination angle was between 20° and 40° for water, and more than 5° for ethanol.

M. R. Sarmasti Emami, S. H. Noie and M. Khoshnoodi [6] made an experimental study on the effect of aspect ratio and filling ratio on the thermal performance of inclined two-phase closed thermosyphon under normal operating conditions. They used distilled water as a working fluid. They carried out the experiments for filling ratio of range (20% to 60%) and aspect ratio of 15, 20 and 30 for an inclination angle of range (15° to 90°). The thermosyphon was of a copper material with inside and outside diameter of 14mm and 16mm respectively. The overall length of thermosyphon is 1000mm. They obtained the following results that the maximum thermal performance at inclination angle of 60° for all three aspect ratios and filling ratio of 45%.

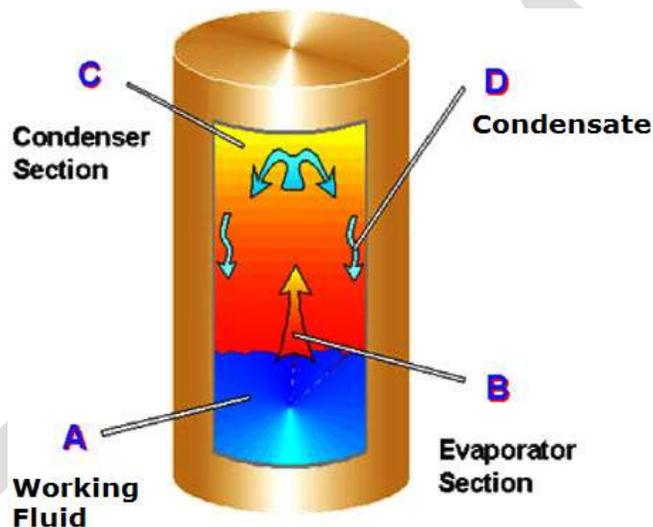


Figure 2: Schematic diagram of a two-phase closed thermosyphon

K.S. Ong and Md. Haider-E-Alahi [7] investigated performance of an R134a filled thermosyphon. They carried out the experiments to study the effects of temperature difference between bath and condenser section, fill ratio and coolant mass flow rate. The thermosyphon was of a copper material with inside and outside diameter of 25.5mm and 28.2mm respectively. The overall length of thermosyphon was 780mm (300mm-evaporator length, 300mm-condenser length). They obtained the results that the heat flux transferred increased with increasing coolant mass flow rate, fill ratio and temperature difference between bath and condenser section.

Sameer Khandekar, Yogesh M. Joshi and Balkrishna Mehta [8] investigated the thermal performance of closed two-phase thermosyphon using water and various water based nanofluids (of Al₂O₃, CuO and laponite clay) as a working fluid. They observed that all these nanofluids show inferior performance than pure water.

Gabriela Humnic, Angel Humnic, Ion Morjan and Florian Dumitrache [9] performed an experiment to measure the temperature distribution and compare the heat transfer rate of thermosyphon with diluted nanofluid (with 0%, 2% and 5.3% concentration) in DI-water and DI-water. The thermosyphon was a copper tube with internal and external diameter of 13.6mm and 15 respectively. The overall of length of thermosyphon was 2000mm (evaporator length-850mm, condenser length-850mm, adiabatic section-300). They obtained the results that the addition of 5.3% (by volume) of iron oxide nanoparticles in water improved thermal performance of thermosyphon.

P.G. Anjankar and Dr. R.B. Yarasu [10] investigated the effect of condenser length, coolant flow rate and heat load on the performance of two-phase closed thermosyphon. The thermosyphon was a closed copper tube of length 1000mm (evaporator length-300mm, condenser length- 450mm/400mm/350mm) and internal and external diameter of 26 and 32mm respectively. They obtained

the results that thermal performance of a thermosyphon was higher at flow rate 0.0027kg/s and heat input 500W with a condenser length of 450mm.

H. Mirshahi and M. Rahimi [11] investigated experimentally the effect of heat loads, fill ratio and extra volume on the performance of a partial-vacuumed thermosyphon. They obtained the results that the change in heat flux, fill ratio and employing different extra volumes has a significant effect on the performance of thermosyphon.

Masoud Rahimi, Kayvan Asgary and Simin Jesri [12] studied the effect of the condenser and evaporator resurfacing on overall performance of thermosyphon. They obtained the result that by making the evaporator more hydrophilic and the condenser more hydrophobic the thermal performance of thermosyphon increases by 15.27% and thermal resistance decreases by 2.35 times compared with plane one.

Asghar Alizadehdakheel, Masoud Rahimi and Ammar Abdulaziz Alsairafi [13] carried out experiments to investigate the effect of various heat loads and fill ratio on the performance of thermosyphon. They obtained the results that increasing the heat load up to certain limit increases the performance of thermosyphon further increase in heat load decreases the performance of thermosyphon. Also there is an optimum value of fill ratio for every energy input. Experimental results were compared with CFD modelling (FLUENT™ version 6.2) and there was a good agreement observed between CFD and experimental results.

S. R. Raja Balayanan, V. Velmurugan, R. Sudhakaran and N. Shenbagavinayaga Moorhy [14] have been carried out experimental and theoretical research to investigate the thermal performance of water to air thermosyphon heat pipe heat exchanger. They selected independent controllable process parameters heat input, water temperature and air velocity to carry out experimental work and correlation was developed for effectiveness of heat pipe heat exchanger. They developed mathematical model using regression coefficient method which is helpful in analyzing the performance of heat pipe heat exchanger.

III. HEAT TRANSFER LIMITATIONS

The maximum heat transfer rate of thermosyphon is limited due to the various parameters. Each working fluid has its own limiting points. These limiting parameters are as follow.

➤ Flooding Limitation

This limitation is due to the interaction between the counter current liquid and vapour flows occurring at the liquid-vapour interface in the thermosyphon.

➤ Boiling Limitation

This limitation is due to the large liquid fill ratio and high radial heat fluxes in the evaporator section. Under this limitation, at the critical heat flux, vapour bubbles coalesce near the pipe wall prohibiting the contact of working liquid to wall surface, resulting in the rapid increase in evaporator wall temperature.

➤ Dry-out Limitation

This limitation is due to the relatively small filling ratio. The condensate falls down along the wall and reaches the evaporator. The condensate starts evaporating and boiling by the input power and as it comes closer and closer to the bottom, the thickness of the condensate film is thinner. It eventually dries out, so the wall temperature rises from the bottom of the evaporator at the limitation.

IV. FACTORS AFFECTING THE THERMAL PERFORMANCE OF THERMOSYPHON

From the literature survey it is observed that following factors affects the thermal performance of thermosyphon.

- Properties of working fluid
- Filling ratio
- Coolant flow rate
- Coolant temperature
- Heat load
- Inside pressure of tube
- Tube material properties and dimensions
- Length of various sections (Evaporator section, Adiabatic section and Condenser section).

V. EXPERIMENTAL SETUP DESCRIPTIONS

It consists of an enclosed evacuated copper tube having evaporator section at base and condenser section at the top. 8-10 thermocouples are attached on the copper tube at similar distances. Temperature indicator displays the temperature. Coil heaters or

band heaters are attached to the evaporator section for heat supply and it is controlled by controlling the voltage and current. Condenser section is surrounded by concentric cylinder through with coolant flows. Flow of coolant is measured by rotameter and controlled by a valve. For initial evacuation of tube arrangement is made to attach vacuum pump at the top and also pressure gauge is attached to measure the pressure inside the tube.

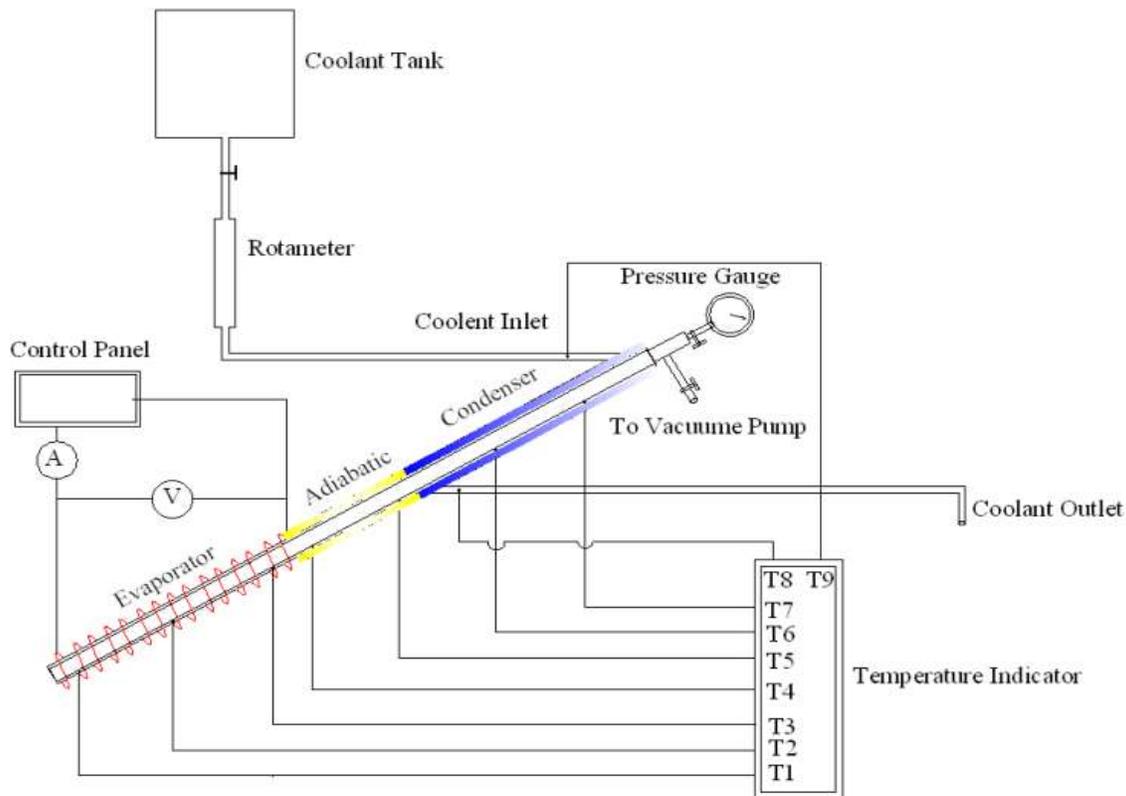


Figure 3: Schematic diagram of thermosyphon experimental setup

Following table shows the general configuration of experimental setup which may vary according to researchers requirement.

Table 1: Experimental Setup Description

Tube Material	Copper	
Diameter (mm)	Internal	20.5
	External	22.5
Dimensions (mm)	Total	1000
	Evaporator	300
	Condenser	450
	Adiabatic	250
Aspect Ratio (L_e/D_i)	14.63	
Filling Ratio	60 %	
Working Fluid	Mixture Of Methanol-Ethanol and Distilled Water	
Inclination Angle ($^\circ$)	40 to 90	
Heat Input (W)	Variable	
Coolant Flow Rate (Kg/s)	Variable	

VI. CONCLUSION

Researchers have done experimental, mathematical and computational investigation to find out various factors affecting the thermal performance of thermosyphon and their effects. The following results are observed.

- Working fluid, filling ratio, tube material and dimensions, lengths (evaporator, condenser and adiabatic section), heat load, Coolant flow rate and temperature, operating pressure affects the thermal performance of thermosyphon.
- Copper ($k = 386\text{W/m-K}$) is having better thermal conductivity therefore during heat transfer it shows very small variation in temperature distribution of entire tube which is favourable condition for effective heat transfer. Also it is most economical metal to use as a tube material.
- For the effective heat transfer surface area of condenser section should be greater than the surface area of evaporator section. This condition can be achieved by varying diameter or length of sections.
- For lower temperature range, refrigerants show effective heat transfer performance. Considering the effect of global warming due to the refrigerants having high global warming potential (GWP), it is necessary to use and research new refrigerants having less GWP.
- Considering the flooding and dry-out limitations the filling ratio between the ranges of 45% to 65% show the best heat transfer performance.
- Evacuation of thermosyphon tube is compulsory to eliminate the inferior effects of non condensable gases. So considering the boiling point of working fluid and effect of non condensable gases, inside pressure of tube should be kept at appropriate level.
- Circulation of working fluid in the tube complete due to the gravity effect, so thermosyphon can't work at horizontal position. Heat transfer performance is superior between the angles of 50° to 90° .
- As per the necessity of heat transfer coolant temperature and coolant flow rate can be controlled and varied.

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OFDM Deciphering to Minimize BER for Hydro Acoustic Communication

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Abstract— The hydro acoustic communication is used for military purpose for under water communication. The acoustic communication is only possible under water and its free from license unlike electromagnetic spectrum. Orthogonal Frequency Division multiplexing (OFDM) is used for security purpose in wireless network because it becomes difficult to access the wireless network by unwanted users at lesser bandwidth unlike spread spectrum technique. But most of the previous methods having more Bit Error Rate (BER) at higher baud rate. The spread spectrum technique requires much more bandwidth. Therefore for security purpose the OFDM has been chosen which is band limited spread spectrum. The proposed Bit Error Rate Minimizing Orthogonal Frequency Division multiplexing (BERMOFDM) algorithm will lower the BER of the OFDM system at receiver end.

Keywords— *Orthogonal Frequency Division Multiplexing (OFDM), Bit Error Rate (BER), Bit Error Rate Minimizing Orthogonal Frequency Division multiplexing (BERMOFDM), local area network (LAN), initial frequency detection (IFD), remaining frequency detection (RFD), compute hopping pattern (CHP).*

INTRODUCTION

Underwater acoustic communication is a rapidly growing field of research and engineering. The wave propagation in an underwater sound channel mainly gets affected by channel variations, multipath propagation and Doppler shift which keep lot of hurdles for achieving high data rates and transmission robustness. In order to achieve high data rates it is natural to employ bandwidth efficient modulation. Orthogonal frequency-division multiplexing (OFDM) has recently emerged as a promising alternative to single-carrier systems for UWA communications because of its robustness to channels that exhibit long delay spreads and frequency selectivity. To support high spectral efficiencies over long intervals of time in a non-stationary environment such as the UWA channel, we consider communication systems employing adaptive modulation schemes. While adaptive signaling techniques have been extensively studied for radio channels, only preliminary results for UWA channels are reported in [1], where simulations and recorded data are used to demonstrate the effectiveness of the proposed adaptation metrics. The need for underwater wireless communications exists in applications such as remote control in off-shore oil industry, pollution monitoring in environmental systems, collection of scientific data recorded at ocean-bottom stations, speech transmission between divers, and mapping of the ocean floor for detection of objects, as well as for the discovery of new resources. Wireless underwater communications can be established by transmission of acoustic waves. Underwater communications, which once were exclusively military, are extending into commercial fields. The basic block diagram of OFDM system is shown below in fig.1.

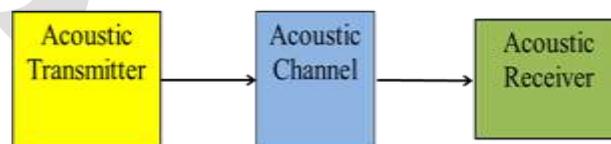


Fig.1. Basic block diagram of OFDM system.

LITERATURE SURVEY

Authors explored design aspects of adaptive modulation based on orthogonal frequency division multiplexing (OFDM) for underwater acoustic (UWA) communications, and study its performance using real-time at-sea experiments [1]. Numerical and experimental results obtained from real-time at-sea experiments, respectively, show that the adaptive modulation scheme provides significant throughput improvements as compared to conventional, non-adaptive modulation at the same power and target BER.

Authors experimentally compared the performance of OSDM and orthogonal frequency-division multiplexing (OFDM) with respect to communication quality, data rate, frame length, and calculation complexity. The OSDM achieves far better BER performance compared to the other schemes in both static and dynamic channels [2].

Authors defined and derived the sensitivity to channel time variations and the effects of different performance target BER threshold by numerical results. The RC-LDPC codes have good performances with wide range of rates in SWA channels [3].

The Lloyd algorithm is employed to quantize the CSI at the receiver and construct the codebook, which is adopted to achieve the limited feedback process. After selecting an initial bit loading vector upon the current CSI, the receiver will broadcast its index to the transmitter, then the transmitter will compute the bandwidth efficient bit loading algorithm and allocate the corresponding power and bits to each subcarrier. Results revealed the proposed iterative loading algorithm is an effectively minimized the transmission power while maintain constraint conditions simultaneously [4].

METHODOLOGY

The proposed OFDM Detector algorithm will maximize the system throughput under a target average bit error rate (BER) for underwater acoustic communication. The block diagram of OFDM transmitter and receiver is shown below.

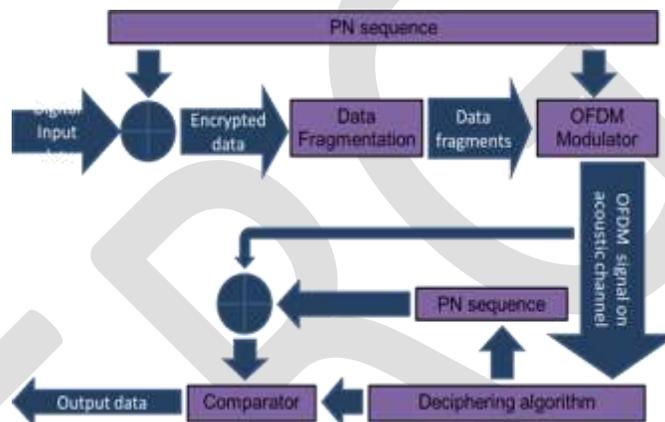


Fig. 2. BERM OFDM algorithm in hydro acoustic system.

OFDM Demodulator to Improve BERM OFDM algorithm for Hydro Acoustic Communications :

- Stage 1 Initial Frequency Detection (IFD), locates the first frequency in the network.
- Stage 2 Remaining Frequencies Detection (RFD), detects the remaining frequencies.
- Stage 3 Compute Hopping Pattern (CHP), calculates the entire hopping pattern.
- Stage 4 Demodulate the OFDM signal.
- Stage 5 Retrieve the PN sequence.
- Stage 6 Decode data using retrieved PN sequence.

The initial frequency detection stage (IFD) is used to identify the first frequency denoted as f_0 . This method is used to scan through all the frequencies, and if no frequency is found scan all the frequencies again. When f_0 is found then it is passed to the second stage. When the IFD is complete & passes f_0 to the Remaining Frequencies Detection (RFD). The RFD records when frequencies stops transmission with respect to the end of the f_0 signal. After RFD the output is fed to CHP. The CHP sort the input array t_x , calculates the dwell time for f_0 . Calculate the rest of the dwell times. Then the output of the previous stage is fed to the demodulator and then retrieved the PN sequence and data.

The proposed algorithm retrieves the data by EXORING the retrieved PN sequence to the rest of the sequence. After EXORING the PN sequence the 8-bit string of 0 or 1 is generated. The numerical representation for the decoding data is shown in Fig. 3.

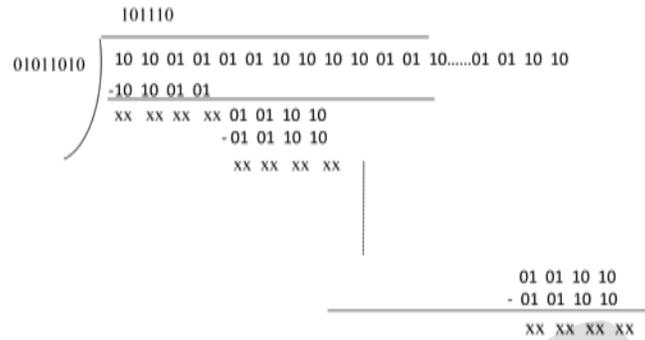


Fig. 3. The numerical representation for the decoding data.

The proposed algorithm will provide more security to the hydro acoustic communication. This algorithm significantly decreases the BER and increases the throughput of the system.

ANALYSIS

The BER is directly proportional to the baud rate and inversely proportional to bit duration. For the analysis of the BER of proposed BERM OFDM system with respect to conventional OFDM method is constant and does not increase. The mathematical analysis is shown below:

$$E = (nB)/T \tag{1}$$

Here, n is coefficient of proportionality, B baud rate, Time period of each bit and E bit error rate. For the proposed protocol n will always be 1. Therefore the BER will be constant.

SIMULATION RESULTS

The Simulation result of the PN sequence, i/p data, encrypted data, OFDM o/p, frequency count, retrieved encrypted data and retrieved PN sequence & receiver o/p (6-bit) is shown below in fig. 4.

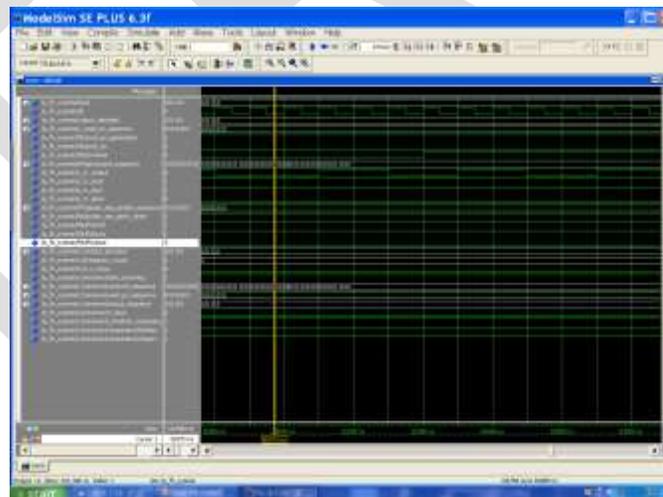


Fig. 4. Simulation results of the proposed BER minimizing OFDM algorithm.

The simulation results above shows that the 6 bit input data is encrypted with 8 bit PN sequence. This Encrypted data string is therefore 48 bit long. This 48 bit long encrypted sequence is then fragmented in two bit symbol then modulated signal is available at s_tx_output. Then the deciphered output is available at the output_decoded.

The ModelSim ISE 6.3f package is utilized for the design and simulation of the proposed BERM OFDM algorithm for hydro acoustic system. This tool ModelSim ISE 6.3f from the Altera is very simple and versatile tool for development in VHDL.

CONCLUSION

The simulation results show that the proposed system will efficiently control the BER. Therefore the proposed system is more efficient as compared to the existing OFDM system in hydro acoustic communication.

Due to three times data encryption at transmitter the communication is highly secure for under water communication. With the more data encryption and lower BER the proposed algorithm has higher throughput. This algorithm has one drawback that first LSB of the input sequence must be 0 for its operation.

This system can also be utilized for various purposes like military industrial and commercial communication to users in future. The optimum development of this proposed algorithm in hydro acoustic system can support the intercontinental communication to users at free.

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Analyze the Frames of Video Transmission by using OFDM System

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Abstract : The effect of two modulation schemes for video transmission using an OFDM (Orthogonal Frequency Division Multiplexing) transceiver. The main aim is to transmit frames by using OFDM hardware. The frames are generated by C#. We evaluate the performance of these modulation schemes using C#. For analyzing the quality of the video is evaluated by SNR (Signal to Noise Ratio) and BER (Bit Error Rate). Which modulation is better we use QAM and PSK for the image transfer using OFDM transceiver. Which modulation technique gets more affected by the channel effects and more number of errors occurs, as compared to another one is analysis by computer simulation and standard quality of videos.

INTRODUCTION

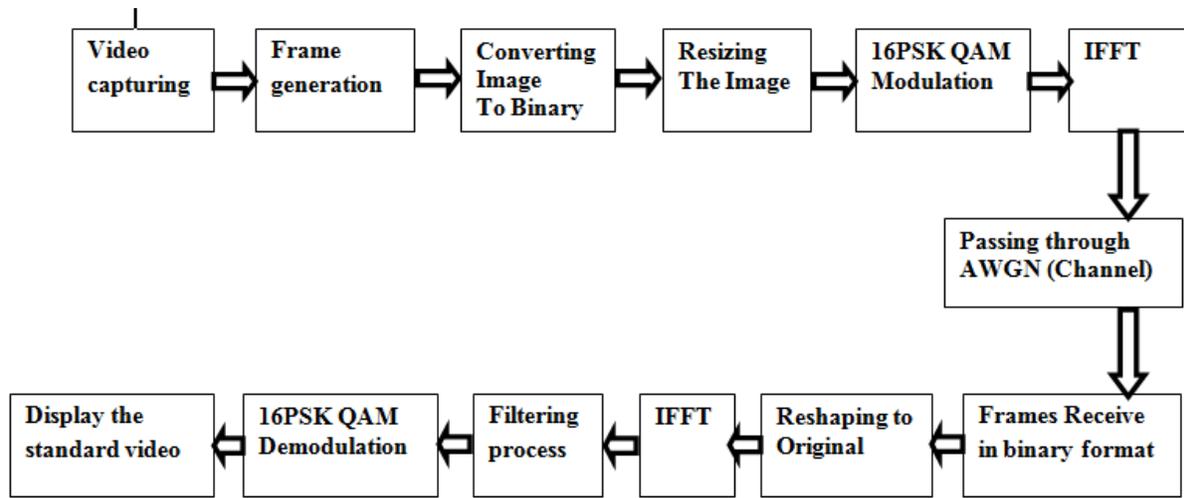
Due to the huge progress in the field of Wireless communication, the demand of high capacity wireless networks was felt, either by upgrading present technology or by devising new methods and techniques. The use of Orthogonal Frequency Division Multiplexing (OFDM) technology in the newer WLAN technologies promises a much improved and higher data rate and with further improvements, higher data rates can be achieved. The use of OFDM in LTE offers peak data rates of 100 Mbps for the cellular purposes. The main goal of 3rd and 4th generation wireless technologies is to entertain people with higher data rates along with the provision of wide range of services, like voice communication, video services (e.g. video call) and internet services, over the same platform. Channel estimation for video OFDM systems requires transmission of pilot image. This addresses the important issue of selecting these pilot image, so as to achieve a good quality estimate. It is shown that the best set of image to be used are those which are equally spaced. Furthermore, it is shown using the case of a first order Markov channel, that it is more efficient to use a few pilot image in all symbols, rather than use all image as pilot image in some symbols. Recently, there has been considerable interest in using Orthogonal Frequency Division Multiplexing (OFDM) transmission for mobile wireless channels. OFDM transmission invariably requires an estimation of the channel frequency response Blind channel estimation techniques try to estimate the channel without any knowledge of the transmitted data. However, whereas blind estimation methods are attractive because of the possible savings in training overhead, they are only effective when a large amount of data can be collected. This is clearly a disadvantage in the case of video wireless because the time-varying channel would preclude accumulation of a large amount of data. Therefore, it would seem that channel estimation for this case would need training

RELATED WORK

Digital Video Broadcasting combination of FFT size and guard interval are investigated channel estimation based on both Least Square (LS) and Linear Minimum Mean-Square Error (LMMSE) is performed to evaluate the performance by measuring the bit error rate (BER) with the help of computer simulation. Digital Video is the second-generation terrestrial transmission system for digital television broadcasting. The motivation to offer high definition television (HDTV) services as efficiently and effectively as possible. DVB-T2 builds on the technologies used as part DVB-T and adopts lots of advanced technologies, such as Physical Layer Pipe technology and low-density parity check (LDPC) codes to support highly flexible and reliable transmission. we mainly focus on the pilot aided channel estimation for DVB-T2. Least Square (LS) and Linear Minimum MeanSquare Error (LMMSE) based channel estimation are analyzed and compared by measuring the bit error rate. Here QPSK modulation schemes shown in table no.1 are used for Digital Video Broadcasting. Simulation results shown that LMMSE estimate has better performance than the LS estimate.

PROPOSED WORK

In this section the OFDM design for the image transmission is enlightened. How the image is transferred using PSK and QAM and a comparison for both the modulation schemes is made.



OFDM Hardware



Fig. Transmitter



Fig. Receiver

Hardware part consists of various components. Orthogonal frequency-division multiplexing (OFDM) is a method of encoding digital data on multiple carrier frequencies. At transmitter side The RF transceiver controls and modulates the radio frequencies that the antenna transmits and receives. The transceiver filters and amplifies the backscatter signal. Transformers are static device which convert the electrical energy from one circuit to another circuit without any change in frequency and power. Rectifier is a circuit which converts the AC electrical energy into Dc electrical energy. These components are used in transmitter and receiver part of hardware. The output of the rectifier is not pure DC, because it contains some amount of AC component which is called as ripple factor which gives the fluctuation and hence to minimize the ripple in the output the filter circuit is used.

PROBLEM DEFINITION

We analyse that during transmission the quality of video is degraded because of noise interference. This problem is overcome by using filtering process. We analyse this problem by evaluating SNR (signal to noise ratio) and BER (bit error rate) by using C#.

Result

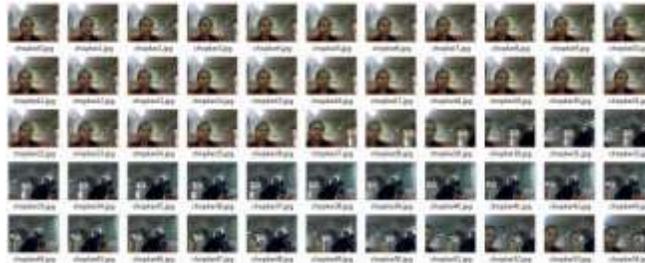


Fig. Frames generation

Above fig shows the frame generation of video. These are transmitted through OFDM transmitter in the binary form and receive also in binary form. This frame generation method is done by using C# and C++.



Fig. Frames in binary format

Conclusion

As per the increasing demand for increased channel capacity in wireless and mobile communications has been rapidly increasing. For recovered data quality is an important factor for communication. Here we have presented a method to evaluate the performance of OFDM system. The effects of two different modulation schemes for image transmission using an OFDM (Orthogonal Frequency Division Multiplexing) transceiver. We evaluate the performance of video quality using C # simulations. We analyse the interference problem by evaluating SNR (signal to noise ratio) and BER (bit error rate).

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Quantification of Urea in Milk- A review of Existing Methods

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Abstract— The nutritional value of milk to human health needs no introduction. But it is alarming that many unscrupulous vendors are adulterating it with water, detergents, caustic soda, starch, formalin, urea, ammonium sulphate, sodium carbonate which have harmful effect on the human health. The greed for money has pushed them to the extent of producing synthetic milk which has no nutritional content. Many analytical techniques have been developed to qualitatively and quantitatively measure these adulterations. In this work we focus on the quantification of urea which is one amongst the many adulterants and provide an exhaustive literature survey of the available techniques for doing the same.

Milk being highly perishable product, it is desirable to test it at the earliest opportunity rather than taking it to laboratory for analysis. With this mindset we propose a new technique to quantify the amount of urea in milk.

Keywords—urea detection, biosensor, adulteration in milk, spectroscopic method, chemical method, piezoelectric crystal method, chromatographic method.

INTRODUCTION

Milk is an important food component in our regular diet. The milk that contains high solid non-fat is of good quality and valuable to the customers for its dietary value and flavor and also to the manufactures for the production of milk products, particularly relating to cheese yields [1]. Other than fat, all solids present in milk are there in solids non-fats. Protein is the most essential component of milk because of its functional properties and nutritional value. The components like lactose, fat also add to the quality of milk and give a certain characteristic to milk products which are to a lesser degree. Table 1 gives a typical composition of the whole raw milk.

Table 1: average composition of whole raw milk

Components	Quantity
Protein	3.5%
Lactose	4.9%
Fat	3.5%
Minerals	0.7%
Water	87.4%
Total	100%

Milk provides calcium and is recommended to people of all age groups for regular intake. Hence adulteration becomes common due to the demand for milk. Urea in cow's milk varies from 20mg to 70mg/100mg of urea and urea content above this range is said to be adulterated or deliberately added. These unhygienic materials are mainly added to compensate the expenses of transportation, processing, storage and so on and hence to yield higher profit by cheap and low quality adulterants in order to increase the solid non-fat in milk. It is a common practice in many developing countries. The consumption of these adulterants causes vomiting, gastritis, nausea and even poisoning [2].

Traditional techniques based on chemical and quantitative methods were used to determine the presence of urea. Many urea biosensors have been developed based on several methods such as potentiometric, conductometric and amperometric transducers using electrochemical detection [3].

EXISTING DETECTION AND MEASUREMENTS METHODS

There are various quantitative and qualitative methods that have been developed for the detection and measurement of urea in milk. Some of them are:

1) Chemical method:

- (a) **Qualitative estimation-** Urea is one of the natural constituent of milk and is present to an extent of 70 mg per 100 ml (700 ppm). Trichloroacetic acid (TCA) is added to precipitate the proteins in the milk. For the estimation of urea in milk, a test based on the use of Para-dimethylaminobenzaldehyde (DMAB) is performed [4]. This method is based on the principle that urea forms a yellow complex with DMAB in a low acidic solution at room temperature. It is a preliminary test. There is no calibration required and hence it's the simplest of all. This method can be used for detection of urea but quantification is not achieved. Also, other drawbacks being wastage of chemicals and possibility of human contact with harmful reactants.
- (b) **Quantitative estimation-** Pipette 5ml of aliquots of working standard solutions into 20x150ml (25mm) test tubes and add 5ml DMAB solution to each. Prepare a reagent blank of 5ml buffer and 5ml DMAB solution. Shake the tubes thoroughly and let it stand for 10 minutes. 10ml of milk sample is mixed with 10ml of TCA (Trichloroacetic acid) to precipitate the proteins and filtered using Whatman 42 filter paper. 5ml of this filtrate is then treated with 5ml of DMAB reagent to develop the color. Reagent blank is prepared by taking 5ml of diluting reagent and treating with 5ml of DMAB reagent. The optical density of the yellow color is measured at 420nm. From the standard curve the amount of urea in milk is calculated [4]. This method is the most economical method adopted by many industries in India. However, exact amount of urea content cannot be quantified.

2) IR Spectrophotometer method:

The carbon dioxide evolved during the urea hydrolysis by urease can be quantized in milk by measuring the amount of CO₂ through optical method. This method works on the principal that carbon dioxide absorbs the infrared at a characteristic wavelength of 4260nm. The level of absorption is directly proportional to the quantity of urea present in milk. The contents of urea present in milk can be estimated using this method. Figure 1 shows the block diagram of a spectroscopic method.

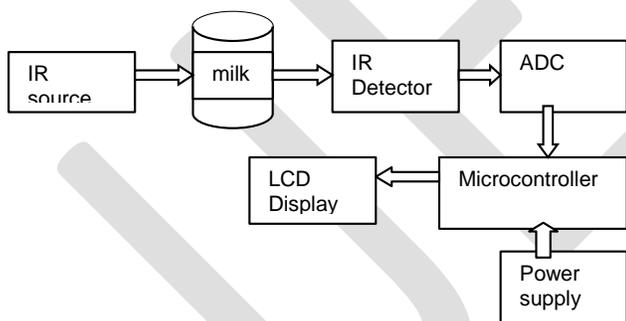
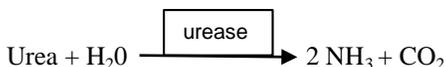


Figure 1: Block diagram of spectroscopy method

This method proves to be very promising and is used widely. It does not use any fragile material such as glass etc. The work proposed is very accurate but not cost effective. Also, Commercial range available is only up to 920 nm.

3) UV method:

This is a rapid, simple and enzymatic specific method that is used for the simultaneous determination of urea and ammonia (ammonium ions) in foodstuffs such as wine, fruit juice, bakery products, dairy products, egg products, meat and seafood, as well as in paper, fertilizers, pharmaceuticals, cosmetics, water and biological samples. This method is used to find adulterants as mentioned above by measuring the intensity of light in a part of the spectrum, especially transmitted or emitted by a particular spectrum. The working principle of this method is based on the following equation



The amount of NADP⁺ formed through the combined action of urease and glutamate dehydrogenase (GIDH), measured at 340 nm, is stoichiometric with the amount of urea and ammonia in sample volume.

This method involves determining the absorbance difference for both blank and sample (A1-A2). Subtract the absorbance difference of the blank from the absorbance difference of the sample, thereby obtaining $\Delta A_{\text{Ammonia}}$. Determine the absorbance difference for both blank and sample (A2-A3). Subtract the absorbance difference of the blank from the absorbance difference of the sample, thereby obtaining ΔA_{Urea} [5].

The concentration of ammonia (g/L) and urea (g/L), based on the ϵ of NADH at 340 nm ($6300 \text{ L} \times \text{mol}^{-1} \times \text{cm}^{-1}$), are calculated as follows:

If the sample has been diluted or a different sample volume was used during the reaction, then the result must be multiplied by the corresponding dilution/concentration factor.

$$C (\text{ammonia}) = 0.07082x \Delta A_{\text{Ammonia}} [\text{g/L}]$$

$$C (\text{urea}) = 0.1258x \Delta A_{\text{Urea}} [\text{g/L}]$$

UV method is mainly used in industries for applications that require high accuracy. The reagents used in the simultaneous determination of urea and ammonia are not hazardous materials. However, the general safety measures that apply to all chemical substances should be followed. Also, The equipment is bulky, expensive, and excitation energy is required.

4) Teflon temperature sensing method:

RTD that is coated with Teflon is dipped into milk containing ammonia. The property of Teflon is such that it attracts ammonia towards it [6]. This increases the temperature and RTD is used to convert this change in temperature into an equivalent resistance change that is used in a bridge circuit. The unbalance in the bridge circuit is proportional to the level of ammonia present in the milk. The drawback in this method is that output signal needs to be amplified as it is very low. Figure 2 gives the general block diagram of Teflon temperature sensing method.

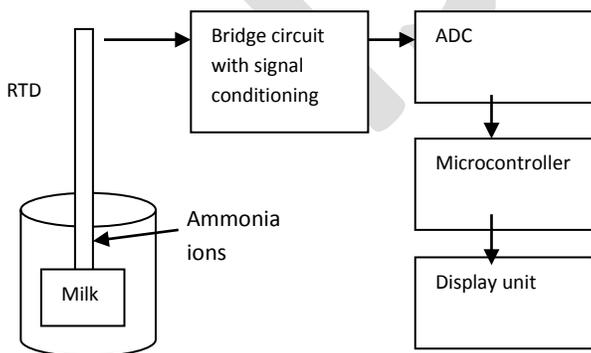


Figure 2: Block diagram for Teflon temperature sensing method

5) Piezoelectric Crystal Method:

Urea ($\text{CH}_4\text{N}_2\text{O}$), on hydrolysis in the presence of Urease gives ammonia and carbon dioxide. The two products of the reaction in turn exert a certain pressure on the piezoelectric sensor which converts the mechanical pressure into electrical signal. The signal is further amplified and programmed to give the quantity of ammonia present by using a calibration method [7]. Figure 3, shows the block diagram of a piezoelectric crystal method.

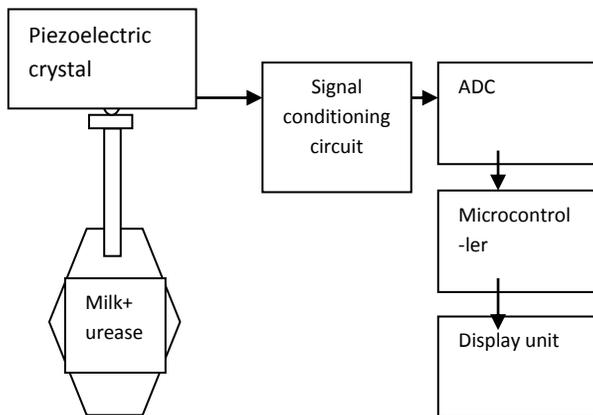


Figure 3: Block diagram of piezoelectric crystal method

The drawbacks of this method are that the output of the sensor is too low and that the crystal is prone to cracking.

6) Chromatographic method:

It is a method based on the liquid chromatography isotope dilution mass spectrometry (LC-IDMS) used to determine urea in milk. It is an indicator to check the diet status of lactating animals. The sequential addition of acetonitrile and chloroform to milk precipitates proteins and separates them directly with the help of normal phase liquid chromatography where the derivatizing chemicals are not used. Milk should be treated twice the same way as mentioned above. To achieve accuracy, linearity and a very little uncertainty in the determination of milk urea, exact matching IDMS can be used[7].

PROPOSED METHOD

In recent years, various biosensors have been developed for food industries, environmental monitoring and clinical applications. The demand and interest in the development of portable devices for the detection, measurement and quantification of a specific analyte has led to the emergence of biosensors. A biosensor is a device which consists of a biological component or a sensing element for detection and a transducer for conversion of the biochemical signals to quantified measurable signal. Figure 4, shows schematic of a biosensor.

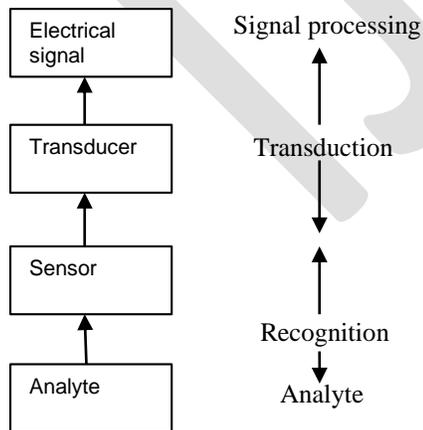


Figure 4: Schematic diagram of a biosensor

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Relationships Between Structure-Thermodynamics And Functional Properties Of Charge-Stabilized Colloidal Systems

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Abstract— in this paper, we present results of computer simulations for determination of the structure and thermodynamics of charge-stabilized colloidal suspensions. We assume that the interaction potential between colloids is of Sogami type. The former is purely repulsive, while the second, it involves, in addition to a repulsive part, a Van der Waals attractive tail. We compute the structure factor and thermodynamics properties, using, the integral equation one with the hybridized mean spherical approximation. We first compare the results relative to this theory, with this obtained within Monte Carlo simulation and with this obtained Jellium modified. We show that results from integral equation method with a Sogami potential and those of simulation are in good quantitative agreement.

Key words— Charged colloids, Pair-potential, Structure, Thermodynamics, Monte Carlo simulation, integral equation.

INTRODUCION

A Charge-stabilized colloidal suspensions (CSCS) consist of (spherical or anisotropic) mesoscopic colloidal particles suspended in a polar solvent with co- and counterions. The radius of the co- and counterions is comparable to that of the solvent molecules, i.e. of the order of 0.1- 0.3 nm. A statistical mechanics description of these highly asymmetric multicomponent fluids represent a major challenge as very different length and time scales are involved for the various species [1]. (CSCS) have been the subject of intense theoretical [2,3] , experimental study[4,5] and computer simulations [6-12]. The great effort is well justified by the importance that these systems play in industrial, biological, and medical applications [13]. A practical problem that arises is how to stabilize suspensions against flocculation and precipitation, resulting. Charged colloidal particles suspended in water interact through hard core repulsions, van der Waals attractions, Coulomb interactions, and hydrodynamic coupling. The particles influence on the surrounding medium modifies these interactions, for instance leading to screening of Coulomb interactions by atomic-scale simple ions.

From a theoretical point of view, colloids constitute special statistical systems. Thus, to study their physical properties such as structure, thermodynamics and phase diagram, use is made of statistical mechanics methods. Among these, we can quote variational and integral equation approaches.

The more reliable approach is the Ornstein-Zernike (OZ) [14] integral equation method [15]. The quantity solving this equation is the pair-correlation function $g(r)$ which is a crucial object for determining most physical properties. But, this equation involves another unknown that is the direct correlation function $c(r)$. Thus, this necessitates a certain closure, that is, a supplementary relationship between these two correlation functions. Integral equation has been intensively used in the modern liquid theory. It has been solved using some techniques, which are based on the analytical or numerical computation. One has used different closures, namely, the Percus-Yevick approximation [16], the hypernetted chain [17], the mean spherical approximation and its modification that is the hybridized-mean spherical approximation [18] (HMSA) we apply in this work.

We assume that particles interact through Sogami (SI) [19,20] potential. To investigate the structure and thermodynamics of the system, we have used the integral equation with HMSA. Finally, we have compared results obtained with Monte Carlo (MC) simulation results [21-23,32] and with Jellium modified (m-J) [22-25]. We have shown that results from integral equation method and those of MC and (m-J) are in good quantitative agreement.

This paper is organized according to the following presentation. In Sec. II, we describe the theory of integral equation with HMSA enabling us to compute the physical properties of interest. We present in Sec. III the results and make discussion. Comparison between

results from integral equation method and those of MC and (m-J) is the aim of Sec. IV. A brief summary with conclusions are given in section V.

I. THEORY

A. PAIR-POTENTIAL

In this paper, the pair-potential used is that derived by Sogami (SI)[19,20], which describes the effective electrostatic interactions between macrions of charge Ze . This potential involves a short-range Coulomb repulsion, whose origin is self-evident, in addition to a long-range exponential attractive tail. This latter was derived using a self-consistent method [19, 20]. The Sogami potential has been used to describe the vapor-liquid transition and crystallization of charged colloids observed in experiments [33]. Its expression is then [19,20]

$$U^{SI}(r) = \frac{(Ze)^2}{\epsilon\epsilon_0\sigma} \left(\frac{\sinh^2(\kappa\sigma/2)}{\kappa\sigma} \right)^2 \left[\frac{2 + k \coth(k/2)}{r} - \kappa \right] \exp(-\kappa r), \quad r > \sigma, \quad (1)$$

$$k = \kappa\sigma$$

We have used the notations $x = r/\sigma$ and $k = \kappa\sigma$, to mean respectively the renormalized interparticle distance and the renormalized electric screening parameter. With $A = 2 + k \coth(k/2)$, we have the following expression

$$U^{SI}(r) = \frac{(Ze)^2}{\epsilon\epsilon_0\sigma} \left(\frac{\sinh(k/2)}{k} \right)^2 \left[\frac{A}{x} - k \right] \exp(-kx), \quad x > 1, \quad (2)$$

There, r is the interparticle center-to-center distance, σ the hard-sphere diameter, ϵ the relative permittivity of solvent (water), the permittivity of free space, and κ the Debye-Hückel inverse screening length. Parameter, is defined as usual by

$$\kappa^2 = \frac{4\pi e^2}{\epsilon\epsilon_0 k_B T} \sum_i n_i Z_i^2, \quad (3)$$

where n_i stands for the number density of ions of type i and Z_i , in the limit of weak screening, $\kappa\sigma \ll 1$ [26]. The shape of such a potential is depicted in Fig. 1.

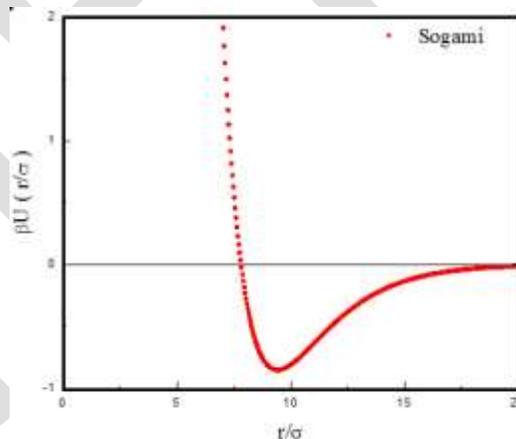


Figure 1: Reduced Sogami potential $U(r)/k_B T$ versus the renormalized interparticle distance r/σ ,

Sogami potential is canceled in both cases, either $r = 2(2 + k \coth(k/2))/\kappa$, or when $r \rightarrow \infty$

The first derivative of the expression of the potential of Sogami he presented as follows

$$\frac{\partial}{\partial r} U^S(r) = -\frac{(Ze)^2}{\epsilon\epsilon_0\sigma} \frac{\sinh^2(k/2)}{k^2} \frac{\exp(-kx)}{x^2} \left[-k^2 x^2 + Akx + A \right], \quad (4)$$

The position of the potential minimum R_m is given as

$$R_m = \left\{ A + [A(A+4)]^{1/2} \right\} / 2\kappa = \left\{ 2 + \kappa \coth(k/2) + [(2 + \kappa \coth(k/2))(6 + \kappa \coth(k/2))]^{1/2} \right\} / 2\kappa. \quad (5)$$

R_m decreases monotonically, with increasing $k = \kappa\sigma$, to the limiting value 2σ . The depth of the pair potential grows rapidly in the interval $0 < \kappa\sigma < 1$, reaches its maximum around $\kappa\sigma \approx 1.19$, and then decreases gradually to

zero. Since R_m behaves as $R_m \approx 2(1 + \sqrt{2})/\kappa$ for small $\kappa\sigma$, the interparticle distance can take a very large value in the suspension with small latex particle concentration so far as the potential minimum keeps up a sufficient depth. [19,33]

Table 1. Comparison of the calculated distance R_m and the observed interparticle distance R_{exp} in dilute colloidal suspensions of charged (charge number $Z=4 \times 10^3$) and spherical polymer particles for different particle concentrations [19]

Concentration vol (%)	$\kappa\sigma$	$U^S(R_m)$	$R_m (10^3 \text{ \AA})$	$R_{exp} (10^3 \text{ \AA})$
0.4	0.48	-0.49	18.0	18.0
0.55	0.56	-0.55	15.0	15.0
1.5	0.92	-0.73	11.0	10.0
4	1.50	-0.33	7.2	8.0

The following step consists in recalling the essential of the integral equation method used in this work.

B. METHOD OF EQUATIONS INTEGRALS (MEI)

Several approaches exist to study the structural property and thermodynamic a fluid from its interactions. The method of integral equations is one of these techniques which allows to determine the structure of a fluid in a thermodynamic state given, characterized by its density ρ and its temperature T, for a potential pair of $u(r)$ which mobilize the interactions between the particles. The calculation of the structure, represented by the function of radial distribution $g(r)$, is a own approach to the theory. In fact, the fact that in a liquid the particles are partially disordered implies his ignorance apriority. The function $g(r)$, which describes the arrangement medium of particles as a function of distance from an origin theory on the one hand, the Fourier transform of $g(r)$ is the factor of structure

$$S(q) = 1 + \rho \int (g(r) - 1) \exp(iqr) dr \quad (6)$$

That is measured by the experiences of diffraction of X-ray or neutron in function of the vector transfer q . On the other hand, the thermodynamic quantities of the fluids are functions of $g(r)$ and the $u(r)$ as the internal energy per particle

$$E / \langle N \rangle = (3/2)k_B T + 2\pi \int u(r) g(r) r^2 dr, \quad (7)$$

k_B is the constant of Boltzmann, the pressure of the viriel

$$P = \rho k_B T - 2 \frac{\pi \rho^2}{3} \int \frac{r du(r)}{dr} g(r) r^2 dr \quad (8)$$

Or the isothermal compressibility χ_T . This last can be obtained by two independent see, either by deriving the pressure (6) by report to the density:

$$\chi_T^{-1} = \rho \left[\frac{\partial P}{\partial \rho} \right]_T = \rho k_B T - \left(\frac{4\pi \rho^2}{3} \right) \int r \left(\frac{du(r)}{dr} \right) \left\{ g(r) + \left(\frac{\rho}{2} \right) \left(\frac{\partial g(r)}{\partial \rho} \right) \right\} r^2 dr, \quad (9)$$

Either share the intermediare of a study of fluctuations in the number of particles in the whole grand canonical

$$S(q=0) = \rho k_B T \chi_T = 1 + 4\pi\rho \int (g(r)-1)r^2 dr \tag{10}$$

We can note that the isothermal compressibility χ_T deduced from the pressure of virial is equal to that calculated from the angle limit the diffusion of the zero factor structure.

C. INTEGRAL EQUATION APPROACH

The starting point of such a method is the Ornstein-Zernike (OZ) integral equation satisfied by the total correlation function $h(r) = g(r) - 1$. The OZ integral equation that involves the so-called direct correlation function [27][28] is given by

$$h(r) = c(r) + n \int c(|r-r'|) h(r') dr', \tag{11}$$

where n is the number density of macroions. This equation, however, contains two unknown quantities $h(r)$ and $c(r)$. To solve it, we need a closure relation between these two quantities. In this paper, we decide to choose the HMSA, and write

$$g^{HMSA}(r) = \exp[-\beta U_1(r)] \times \left\{ 1 + \frac{\exp [f(r) \{ \gamma(r) - \beta U_2(r) \} - 1]}{f(r)} \right\}, \tag{12}$$

where the interaction potential is divided into short-range part $U_1(r)$ and long-range attractive tail $U_2(r)$ as prescribed by Weeks et al [29]. There, the function $\gamma(r)$ is simply the difference between the total and direct correlation functions, $\gamma(r) = h(r) - c(r)$, and is illustrated in figure 2. $Q(r)$ is the mixing function [30], whose a new form was proposed by Bretonnet and Jakse [18]. The virtue of such a form is that, it ensures the thermodynamic consistency in calculating the internal compressibility by two different ways. The form proposed by the authors is [30]

$$f(r) = f_0 + (1-f_0)\exp(-1/r), \tag{13}$$

where the f_0 is the interpolation constant. This is an adjustable parameter such as $0 \leq f_0 \leq 1$. This constant that serves to eliminate the incoherence thermodynamic, can be fixed equating the compressibility deduced from virial pressure to that calculated from the zero-scattering angle limit of the structure factor, i.e.,

$$S(0) = nk_B T \chi_T. \tag{14}$$

Now, it remains the presentation and discussion of our results, and their comparison with those relative of MC simulation [32] and (m-J) [12].

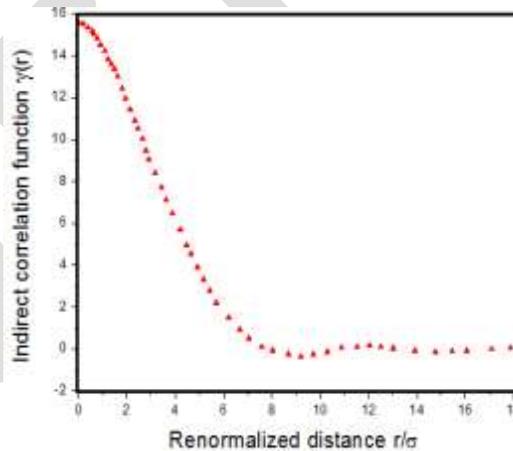


Figure 2: Example plot of $\gamma(r)$, the 'indirect' correlation function, for a Fluid colloid system interacting via an exponential decay potential $U(r) \propto \exp(-r/\sigma)$ at a reduced density $\rho^* = \rho d^2 = 0,015$.

[30].

II. RESULTS AND DISCUSSION

According to Eq. (1), the interaction between colloidal particles is determined by many factors, such as the salt concentration, surface charge density and volume fraction of the colloid, etc. Different values of those factors which influence the interactions will result in different phase behaviors of the system. In this paper, we have used those parameters values reported by [22,23]. These are, $T = 293 \text{ K}$ (absolute temperature), $\epsilon = 78$ (Relative permittivity of water), $\lambda_B = e^2 / (4\pi\epsilon k_B T) = 7.198 \text{ \AA}$ is the Bjerrum length.,

System	σ (\AA)	$k = \kappa\sigma$	λ_B / σ	$Z \lambda_B / \sigma$	λ_B / σ
A	20	0.419	0.3558	5.877	0.3558
B	40	0.360	0.1779	5.093	0.1779
C	160	0.386	0.0445	4.972	0.0445

Our purpose is a quantitative investigation of thermodynamic and structural properties of a dilute solution of polyballs (in water), using the integral equations method.

INTEGRAL EQUATION METHOD RESULTS

The HMSA integral equation is applied here for accomplishing an alternative computation of structural and thermodynamics properties of the colloidal solution under investigation. Potential used here is of (SI) type, and the choosing mixing function $f(r)$ pointed out in [29].

First, we have computed the main object that is the pair-correlation function $g(r)$ versus the renormalized interparticle distance r/σ . In Fig. 3, we plot the macroion-macroion correlation functions calculated using the HMSA integral equation above and compare it with the results of the Jellium modified (m-J) and MC simulations.

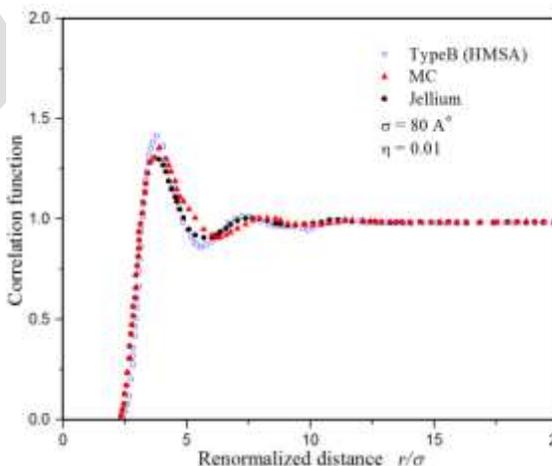
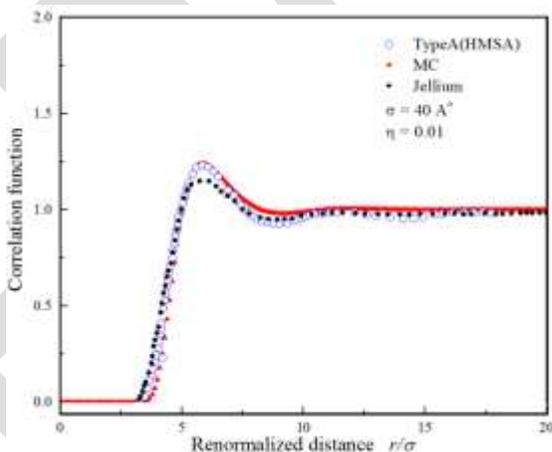


Figure 3: Correlation function with a (SI) potential using HMSA integral equation theory compared with,

(m-J) and MC simulations for three system have the same volume fraction and particle size is respectively $\sigma_A = 40(\text{\AA})$, $\sigma_B = 80(\text{\AA})$ and $\sigma_C = 160(\text{\AA})$.

Second, we have reported in Fig. 4 the pair-correlation function for a (SI) potential, together with that computed using the MC simulation or (m-J) [22,23]. In fact, the three curves are in good quantitative agreement. The effective charge, the coupling parameter, the radius of the colloids and the value of the contact potential of each system are summarized in Table 3. The renormalized parameters were calculated according to the (m-J) model. The selected values are for the regime saturation dictated by Fig 4.

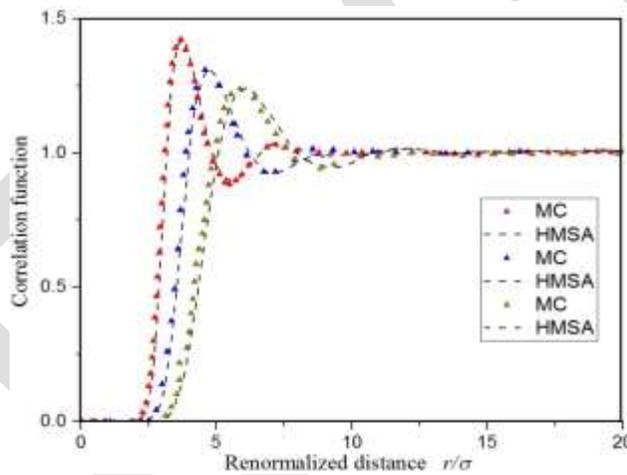


Figure.4: Macroion-macroion correlation functions calculated using the HMSA integral equation theory

(dashed lines), and MC simulations from left to right, the volume fractions are respectively

(\blacktriangle - $\eta = 0.08$), (\blacktriangle - $\eta = 0.04$), and (\blacktriangle - $\eta = 0.02$)

for a deionized colloidal suspension with coupling parameter $\lambda_B / \sigma = 0.3558$.

$T (K)$	E_{int} / N	$P / \rho k_B T$	$\rho k_B T \chi$
90	-0.207614	0.635371	1.484716
	-0.992903	0.524017	4.864628
	-1.804557	2.286026	11.257641
	-2.539001	5.544148	15.065502
	-3.034279	7.093886	10.820960
	-2.766866	10.676855	4.1048034
100	-0.322489	0.6746724	1.2576419
	-1.032450	0.6026200	2.4192139
	-1.906250	1.6048034	3.4497816
	-2.380813	3.8973799	1.8340611
	-1.684033	7.5131004	0.3930131
	-0.373335	11.338427	0.1397379
120	-0.175600	0.7336244	1.1004366
	-0.815884	0.9956331	1.5807860
	-1.550327	2.4759825	1.6593886
	-1.804557	5.7117903	1.0043668
	-1.228302	8.2860262	0.4454148
	-0.435480	10.997816	0.1222707
160	-0.100272	0.9235807	1.0567685
	-0.633215	1.0152838	1.1790393
	-0.974072	2.0567685	1.0567685
	-1.120960	4.6899563	0.5240174
	-0.684061	7.1921397	0.1921397
	-0.001419	9.2554585	0.1222707

The table shows that for a fixed temperature, there is a decrease of the compressibility and the internal energy has a certain value, while the pressure increases. It is therefore interesting to study the variation in detail the thermodynamic properties of charge-stabilized colloidal suspensions.

Table 3. Thermodynamic proprieties for Sogami potential, within HMSA integral equation method

$T (k)$	$E_{\text{int}}^{\text{min}} / N$	η^*
90	-3.032396	0.049902
100	-2.363864	0.045300
120	-1.808324	0.043099
140	-1.420387	0.042058
160	-1.132259	0.041698

In the table 3, we shows that as the temperature increases, we notice a peak deviation of minimum energy and takes an oval shape with the Rating Decrease volume fraction and thus the system becomes more stable.

III. CONCLUSIONS

Dispersions of charge-stabilized colloidal particles are ubiquitous in environmental and food industry, and in life sciences. Examples of such dispersions are viruses or proteins in water, paints, waste water, and model systems of strongly charged spherical latex or silica spheres. This work is devoted to the structural and thermodynamic properties of three system (A,B and C) It has the same volume fraction and particle size respectively $\sigma_A = 40(\text{\AA})$, $\sigma_B = 80(\text{\AA})$ and $\sigma_C = 160(\text{\AA})$. We have computed the structure and thermodynamics, using, the integral equation one with HMSA. We compared the results relative to this theory to the obtained within MC and (m-J) . We have shown that results from integral equation method and those of MC are in good quantitative

Further developments such as the studies of the phase behavior and density effects are in progress.

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IJERGS

Wired vs Wireless Using Advanced Network

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Abstract- As technology advances in society the need for wired and wireless networking has become essential. Each of these types of networking has their advantages and disadvantages according to security. Wired networking has different hardware requirements and the range and benefits are different. Wireless networking takes into consideration the range, mobility, and the several types of hardware components needed to establish a wireless network. As you read on you will understand different types of configurations of networks and the security measures that need to be taken to ensure a secure network.

Keyword- Wi-Fi, mobility, local area network technology, Ethernet cables, broadband, fiber-optic, Wired Equivalent Privacy

INTRODUCTION

Organizations rely heavily on the ability to share information throughout the organization in an efficient and productive manner. Computer networks have allowed for this technology and are now a part of almost every business. An organization has two options when it comes to setting up a network. They can use a completely wired network, which uses networking cable to connect computers, or they can use a wireless network, which uses radio frequencies to connect computer. Wireless networks have allowed organizations to become more mobile; therefore, organizations are now using a combination of both wired and wireless networks.

They basic hardware layout for the two types of networks are fairly similar but for an organization to go wireless it requires a few more hardware components. Although networks provide convenience they do open the organization up to security and privacy risks. If a company is faced with a security they are ways that they can fix and prevent future security risks. As you read on, you will learn how the network has become an essential part of today's organizations.

Hardware Components

Before one can begin to setup a network they must first be sure they have a network interface card, commonly referred to as a NIC. A NIC is a device that connects a computer or other device to a network. For computers, the NIC is usually installed in an expansion slot and has a chip that handles the physical and data-link layers of network communications.

To establish your network you will need a few key components. If you plan to access the internet you will start your network off with a cable modem. This type of modem is designed to operate using your existing cable lines. Cable internet has a high bandwidth and can support most, if not, all applications you will be using. The second component is a router. A router is a device that routes data from one network to another network. A router is connected to at least two networks, commonly two networks or a network and its ISP's network. A router allows for everyone on the network to access the internet.

The next component that you will need to setup a network is a hub or sometimes a switch. A hub is a device that connects the cables from computers and other devices such as printers in a network. Traditionally, hubs are used for star topology networks, but

they are often used with other configurations to make it easy to add and remove computers without bringing down the network. A hub can be either active or passive; simply forwarding messages or amplifying or refreshing the data. A switch is a device similar to a hub that enables the connection of multiple computers, access points, and other network enabled devices. The difference between a hub and a switch is that a switch filters the data that passes through it and a hub does not.

These components have all been modified and are capable of establishing wireless networks. A router can be purchased with wireless capability but a more efficient way of adding wireless to your network is to simply add wired access points. An access point will bridge a wired network with a wireless network and can be hard wired in to your existing system. This option allows for the mobility of a wireless network.

Another key component is a print server. A print server is used to connect printers to a network to allow for network printing. The server will act as a buffer; storing the messaging and printing them in order of the queue. This device can drastically reduce the cost of networking because now everyone can use the same printer without having a printer attached to every computer.

wired networks

Wired networks, also called Ethernet networks, are the most common type of local area network (LAN) technology.

A wired network is simply a collection of two or more computers, printers, and other devices linked by Ethernet cables. Ethernet is the fastest wired network protocol, with connection speeds of 10 megabits per second (Mbps) to 100 Mbps or higher. Wired networks can also be used as part of other wired and wireless networks. To connect a computer to a network with an Ethernet cable, the computer must have an Ethernet adapter (sometimes called a network interface card, or NIC). Ethernet adapters can be internal (installed in a computer) or external (housed in a separate case). Some computers include a built-in Ethernet adapter port, which eliminates the need for a separate adapter (Microsoft). There are three basic network topologies that are most commonly used today. (Homenthelp.com)

The star network, a general more simplistic type of topology, has one central hub that connects to three or more computers and the ability to network printers. This type can be used for small businesses and even home networks. The star network is very useful for applications where some processing must be centralized and some must be performed locally. The major disadvantage is the star network is its vulnerability. All data must pass through one central host computer and if that host fails the entire network will fail.

On the other hand the bus network has no central computer and all computers are linked on a single circuit. This type broadcasts signals in all directions and it uses special software to identify which computer gets what signal. One disadvantage with this type of network is that only one signal can be sent at one time, if two signals are sent at the same time they will collide and the signal will fail to reach its destination. One advantage is that there is no central computer so if one computer goes down others will not be affected and will be able to send messages to one another.

The third type of network is the ring network. Similar to the bus network, the ring network does not rely on a central host computer either. Each computer in the network can communicate directly with any other computer, and each processes its own applications independently. A ring network forms a closed loop and data is sent in one direction only and if a computer in the network fails the data is still able to be transmitted.

Typically the range of a wired network is within a 2,000-foot-radius. The disadvantage of this is that data transmission over this distance may be slow or nonexistent. The benefit of a wired network is that bandwidth is very high and that interference is very limited through direct connections. Wired networks are more secure and can be used in many situations; corporate LANs, school networks and hospitals. The biggest drawback to this type of network is that it must be rewired every time it is moved.

WIRED VS WIRELESS IN THE ENTERPRISE:

The world around us is going wireless; we stream music and movies from our home PCs to any room in the house, we can play music from our phones on car stereos and we can go to any number of public places and hook up to the internet. But one place has stayed resolutely wired the enterprise. Yes, many offices these days will have Wi-Fi but often it is reserved for senior management or visitors. Even if it is available for all workers, the connection is rarely the most reliable

Benefits of wired connection



It is easy enough to see why enterprises want to remain wired – control and security, reliability and speed are the primary benefits of using physical connections. It is also relatively cost-effective, as the price of cabling – even at the lengths needed to cover an average office – is pretty cheap. One great advantage of having a wired infrastructure, which seems particularly relevant in today’s mobile world, is the control it provides. If a physical connection is needed to access the corporate network, the business is in full control of whom and what gets online. While this has obvious security benefits of keeping unauthorized visitors out of your network, it also means your network will not be overloaded with non-business critical traffic.

Benefits of wireless connection

While a physical infrastructure may be good from a management point of view and offer cheap deployment, having all those wires running throughout a building can be costly and awkward to maintain. For example, if a business increases its workforce, all those new workers will need physical connections at their desk – connections that will need to be manually set up. Any breakages in the wired connection will also have to be manually fixed as there is no software solution to a broken Ethernet pin. With the explosion in mobile devices over the last few years – Apple alone has sold around 100 million iPads since the tablet was introduced in 2010 – many workers are bringing their own devices into the office. It is vital these employees have access to the corporate network to get the most out of them, and that means giving them wireless access. As well as being able to use their own devices, wireless infrastructure means freedom to move around the office, from desk to desk or meeting room to meeting room. A wireless network is also neater, getting rid of all those unsightly cables that usually run around an office.

Disadvantages of wireless connection

But while enabling workers to use their own devices at work connect up with the corporate network and move around the building brings obvious productivity benefits, it also causes huge headaches for the IT department from a security point of view. The threat of malware getting onto the corporate network via a compromised device is one particular issue. If the mobile or tablet is owned by the business, security is obviously easier to take care of – but employee-owned devices are another question, as most are not protected

A combination of wired and wireless is the way forward:

Prior to allowing workers to connect their personal device to the wireless network, it is important for a business to ensure employees are aware of the risks. Updating security policies to reflect changing ownership is one good step, but educating employees through initiatives such as workshops is vital. There are other threats to a wireless enterprise. Your network will now extend beyond the physical walls of the office, giving attackers another potential route into the business. All that critical corporate data is now flying

across the airwaves, and if your wireless network is not secured to the same extent as your wired infrastructure, it could very easily end up in the wrong hands. This means elements such as authentication, intrusion detection, prevention, reporting and security event management (SEM) must be included in the security set-up of a wireless infrastructure. It is also worth pointing out more simple measures – such as changing the default SSID and password to a more secure one – can be very effective.

Beyond the security implications there are other drawbacks to wireless connections. Speeds are much slower than with a wired connection and the signals can be affected by outside influences, such as walls and floors, as well as other electronic items. Another issue is the range offered by wireless access points. Not only can these be limited in terms of how far the signal travels but the signal can also fade the further away from it you are. This means to ensure full, reliable coverage across a building, a business must install plenty of access points, driving up the cost of the installation.

Legacy infrastructure and mixed environments

There are pros and cons to having a wireless and a wired enterprise and it is fair to say that wireless becoming the norm is still some way off. For example, there is too much legacy infrastructure in place to rip it out and replace it with a wireless set up. A combination of wired and wireless is the way forward, at least for now. That way a business can satisfy the needs of its mobile workers and ensure all security, control and reliability requirements are met.

Having a mixed environment does not need to mean a nightmare from a management point of view. Cisco, for example, recently unveiled its new Unified Access platform, which brings together wired and wireless connections in one switch. The 5760 Unified Access WLAN controller enables wireless connections to be managed on top of existing wired infrastructure.

Juniper Networks also integrates wireless LANs with existing wired infrastructure, giving businesses the best of both worlds. Managing both together means businesses can run the same policies across the wired and wireless infrastructure, meaning business will see the benefit of having both while, hopefully, reducing the negatives associated with either installation.

Wired vs Wireless Networking

Computer networks for the home and small business can be built using either wired or wireless technology. Wired Ethernet has been the traditional choice in homes, but Wi-Fi wireless technologies are gaining ground fast. Both wired and wireless can claim advantages over the other; both represent viable options for home and other local area networks (LANs).

Wired LANs: Wired LANs use Ethernet cables and network adapters. Although two computers can be directly wired to each other using an Ethernet crossover cable, wired LANs generally also require central devices like hubs, switches, or routers to accommodate more computers. For dial-up connections to the internet, the computer hosting the modem must run Internet Connection Sharing or similar software to share the connection with all other computers on the LAN. Broadband routers allow easier sharing of cable modem or DSL internet connections, plus they often include built-in firewall support.

Installation: Ethernet cables must be run from each computer to another computer or to the central device. It can be time-consuming and difficult to run cables under the floor or through walls, especially when computers sit in different rooms. In some new home builds, homeowners are installing CAT5 cable right up front to make the cabling process easier and to hide the cable runs. Your organization's mix of devices (such as the type of internet connection, whether your modem is internal or external) will have a direct impact on the cabling configuration for a wired LAN, but it will not make the configuration more complex. Once you have installed your hardware, the final steps for configuring your wired or wireless LAN are pretty much the same as the both rely on standard IP and network configuration options. Laptops and other portable devices often enjoy greater mobility in wireless home network installations.

Cost: Ethernet cables, hubs and switches are very inexpensive. Some connection sharing software packages, like ICS, are free; some cost a nominal fee. Broadband routers cost more, but these are optional components of a wired LAN, and their higher cost is offset by the benefit of easier installation and built-in security features.

Reliability: Ethernet cables, hubs and switches are extremely reliable, mainly because manufacturers have been continually improving Ethernet technology over several decades. Loose cables likely remain the single most common and annoying source of failure in a wired network. When installing a wired LAN or moving any of the components later, be sure to carefully check the cable connections.

Broadband routers are relatively new, multi-function devices which have suffered from some reliability problems in the past. They have however, matured over the past several years and as a result, their reliability has improved greatly.

Performance: Wireless LANs using 802.11b support a maximum theoretical bandwidth of 11 Mbps – roughly the same as that of old, traditional Ethernet. 802.11a and 802.11g WLANs support approximately one-half the bandwidth of fast Ethernet. In addition to that the further away you are from the original access point the greater the degradation of WI-FI signal. Should you increase the number of wireless devices which utilize the WLAN this will also have a negative impact on performance. Overall, the performance of 802.11a and 802.11g is sufficient for home internet connection sharing and file sharing, but generally not sufficient for home LAN gaming.

Although there is a performance disadvantage with wireless LANs, this is offset by the advantage of greater mobility. Mobile computers do not need to be tied to an Ethernet cable and can roam freely within the WLAN range. However, many home computers are larger desktop models, and even mobile computers must sometimes be tied to an electrical cord and outlet for power. This undermines the mobility advantage of WLANs in many homes.

Security: If you accept that you should protect your home network like you protect your physical home, then the security issues surrounding wireless versus wired LANs becomes a moot point. While data travelling via a wireless LAN can be intercepted, WLANs do protect their data through Wired Equivalent Privacy (WEP). Take additional security steps such as ensuring your home's internet-firewall is properly configured, and being alert to spoof emails and spyware. Do also be wary of who you give access to your home's network. No computer network is completely secure and homeowners but being forewarned is being forearmed.

Wireless Routers vs. Wired Connections

Wired connection speeds: Wired connections can achieve extremely fast speeds, which work well if you have a fast broadband or fiber-optic Internet connection, making wired options superior to wireless when it comes to speed. These speeds are almost always theoretical maximum speeds, so you will probably see a lower speed in actual performance, depending on the actual conditions.

Wired Options:

- **Ethernet:** These connections for home routers and computers typically support transmissions up to 100 megabits per second (Mbps).
- **Phone-line:** A phone-line connection between your network router and computer can allow for varying speeds from 1 Mbps to 128 Mbps, depending on the hardware you have available.
- **Power-line networking:** This option, which uses the existing power outlets and electrical wiring to transmit network signals, can be a cheap solution although it only supports speeds up to 14 Mbps.

Wireless connection speeds: Wireless networks are also typically rated with theoretical maximum speeds, so these numbers may not reflect actual performance. In general, you'll get slower performance from a wireless connection than from a wired connection. Wireless routers, laptops and other devices typically use one of the following signal standards.

Wireless Options:

- **802.11a:** Also known as "Wireless-A," this wireless standard can transfer at speeds up to 54 Mbps.
- **802.11b:** Wireless-B networks are slower, only transferring at 11 Mbps.
- **802.11g:** Wireless-G is backwards-compatible with wireless-B although an older device will obviously operate at the slower of the two speeds. Wireless-G devices can transfer at up to 54 Mbps.
- **802.11n:** Wireless-N promises transfer rates of up to 600 Mbps although actual reported performance is much lower, depending on other conditions and what type of hardware you're using.

Installation: A wired connection is rather simple to set up. All you need is a connecting cable from your computer to your router or modem. You may need to change some settings to get your computer to recognize the connection. Wireless networks take a bit more work to set up, and you'll need to place the router in a location where your computers will receive a clear signal. You'll also need to set up security settings and a network passkey, which you'll need for every single computer on the network. Depending on your wireless router and the operating system software running on each computer, you may have to install additional software or change the network settings to get the computers to recognize the connection.

Compatibility: Wired connections only require that your computer and network devices be compatible with a technology like Ethernet or HomePNA. Ethernet is the most widely used wired connection for desktops and laptop computers, requiring an actual Ethernet port. If you don't have the appropriate port, you might be able to install an Ethernet adapter card that adds the port to your computer. Wireless networks, in comparison, need no connection ports. Instead, you'll need wireless capability that uses a signal compatible with your wireless router's signal. This means that many different Wi-Fi devices can use the network as long as they use the right signal. If your computer doesn't have built-in wireless, you can add that capability by installing a wireless-network adapter through a USB port.

Wired vs. Wireless Networking

The biggest difference between these two types of networks is one uses network cables and one uses radio frequencies. A wired network allows for a faster and more secure connection and can only be used for distances shorter than 2,000 feet. A wireless network is a lot less secure and transmission speeds can suffer from outside interference. Although wireless networking is a lot more mobile than wired networking the range of the network is usually 150-300 indoors and up to 1000 feet outdoors depending on the terrain. (Homelanextream.com)

The cost for wired networking has become rather inexpensive. Ethernet cables, hubs and switches are very inexpensive. Some connection sharing software packages, like ICS, are free; some cost a nominal fee. Broadband routers cost more, but these are optional components of a wired network, and their higher cost is offset by the benefit of easier installation and built-in security features.

Wireless gear costs somewhat more than the equivalent wired Ethernet products. At full retail prices, wireless adapters and access points may cost three or four times as much as Ethernet cable adapters and hubs/switches, respectively. 802.11b products have dropped in price considerably with the release of 802.11g. (Homelanextream.com)

Wired LANs offer superior performance. A traditional Ethernet connection offers only 10 Mbps bandwidth, but 100 Mbps Fast Ethernet technology costs a little more and is readily available. Fast Ethernet should be sufficient for file sharing, gaming, and high-speed Internet access for many years into the future. (Wi-Fi.org) Wired LANs utilizing hubs can suffer performance slowdown if computers heavily utilize the network simultaneously. Use Ethernet switches instead of hubs to avoid this problem; a switch costs little more than a hub.

Wireless networks using 802.11b support a maximum bandwidth of 11 Mbps, roughly the same as that of old, traditional Ethernet. 802.11a and 802.11g LANs support 54 Mbps, that is approximately one-half the bandwidth of Fast Ethernet. Furthermore, wireless networking performance is distance sensitive, meaning that maximum performance will degrade on computers farther away from the access point or other communication endpoint. As more wireless devices utilize the 802.11 LAN more heavily, performance degrades even further. (Wi-Fi.org)

The greater mobility of wireless LANs helps offset the performance disadvantage. Mobile computers do not need to be tied to an Ethernet cable and can roam freely within the wireless network range. However, many computers are larger desktop models, and even mobile computers must sometimes be tied to an electrical cord and outlet for power. This undermines the mobility advantage of wireless networks in many organizations and homes.

For any wired network connected to the Internet, firewalls are the primary security consideration. Wired Ethernet hubs and switches do not support firewalls. However, firewall software products like Zone Alarm can be installed on the computers themselves. Broadband routers offer equivalent firewall capability built into the device, configurable through its own software.

In theory, wireless LANs are less secure than wired LANs, because wireless communication signals travel through the air and can easily be intercepted. The weaknesses of wireless security are more theoretical than practical. (Wi-Fi.org) Wireless networks protect their data through the Wired Equivalent Privacy (WEP) encryption standard that makes wireless communications reasonably as safe as wired ones.

No computer network is completely secure. Important security considerations for organizations tend to not be related to whether the network is wired or wireless but rather ensuring that the firewall is properly configured, employees are aware of the dangers of spoof emails, they are away of spy ware and how to avoid and that anyone outside the organization does not have unauthorized access to the network.

Wireless Network Security

Network security is a big concern for individuals and organizations because vital information is stored on the network and most critical process of the business are done through the network. If a network is to fail or security is compromised an organization could be completely crippled. For example, if Wal-Mart was to lose their cash register network than they would suffer a huge loss of business and would take, depending on the severity of the breach, several hours to days to fix. Also at risk is employee and client privacy. If an organization's network is hacked into they would have access to client databases as well as employee databases. The most important thing to keep in mind when it comes to wireless network security is keeping unauthorized users from accessing your network. The first step is to know your wireless network's range and to use specific software to grant access only to authorized users.

CONCLUSION

Wired and Wireless networks are very common in the workplace as well as in the home. Technology has been created to store, transmit and receive data through networks at very high rates of speed. Networks have become essential to completing daily business tasks and most business, those who rely heavily on information technologies, would be crippled without their networks. Advances in networking storage have allowed for organizations to use their networks not only for the sharing of resources but to store large pools of data to be used for data analysis. Companies can now store detailed profile information for customers at a very low cost. In the future, the speed of networks will increase as they have in past years. The cost of networks will continue to decline and using a network will be essential for every organization. As computing technology increases in power, and decreases in size, the price of creating a high-powered full featured network will decrease rapidly.

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ARM based 3-axis seismic data acquisition system using Accelerometer sensor and Graphical User Interface

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Abstract— Seismology is the scientific study of earthquakes & the propagation of seismic waves through the earth. The large improvement has been seen in seismology from around hundreds of years. The seismic data plays an important role in the seismic data acquisition. The recorded seismic data is used by seismologists for analysis purpose. This analysis includes mapping of Earth's interior, locating an earthquake properly, and measuring magnitude of an earthquake. The more efficient systems are used now a day to locate the earthquakes as large improvements has been done in this field. In older days analog systems are used for data acquisition. The analog systems record seismic signals in a permanent way. These systems are large in size, costly and are incompatible with computer. Due to these drawbacks these analog systems are replaced by digital systems so that data can be recorded digitally. In this paper, a recent development in seismic data acquisition has been focused. A cost-effective, small size seismic data acquisition system is implemented successfully based on ARM. The system consists of an Accelerometer sensor for sensing seismic signal along 3-axis corresponding to accelerations and can save the respective data in the memory which can be used for further analysis. The software routines written in MATLAB give graphical representation of seismic data along X, Y, and Z axis. An ARM processor compares the input signal with reference signal which is already set into the ARM processor. If the value of input signal exceeds reference signal then an alarm about possibility of an earthquake rang in PC.

Keywords— Seismic Data Acquisition, Earthquake, ARM, Accelerometer, ADC, MATLAB, Graphical User Interface (GUI)

INTRODUCTION

An earthquake is a natural disaster which can cause damage and loss of lives. It is the result of a sudden release of energy in the Earth's crust that creates seismic waves. During earthquake, degree of the damage caused is depends on the magnitude that indicates the amount of energy released from Earth's crust [1]. The magnitude of earthquake which is less than 5 is measured using local magnitude scale called as Richter magnitude scale. However earthquakes having magnitude greater than 5 are reported for world. The Richter Scale is used to measure magnitude of the earthquake by observing the amplitude on a seismogram. The Richter Scale is used because it is capable to measure decreased wave amplitude as the distance from the epicenter is increased. Richter's scale is also a logarithmic scale [12]. In recent years, a standard magnitude scale is used which represents energy released at the time of earthquake more precisely including large magnitude events. The earthquakes can be measured using a recording device such as seismometers in the form of seismograph. Seismometers are sensors that sense and record the seismic waves. The seismic waves are captured by using Seismometer, Hydrophone (in water), Geophone, or Accelerometer. A seismogram is written by seismograph in a response to vibrations produced by earthquake, or explosion. The seismograms are recorded for finding the location and magnitude of the earthquakes. In older days, seismograms were recorded on the paper in a permanent manner while now seismograms are recorded in a digital format [14]. In seismological experiments, each component of acceleration that is along x, y, and z axes is important, however in seismological calculations only one component has been taken into account. The surface waves, primary waves (p-waves) and secondary waves (s-waves) are among the important types of seismic waves which are consider mainly in earthquake detection. P-waves arrive first at seismograph stations as they travel faster than other waves. P-waves are longitudinal and are also called as compression waves. S-waves arrive after p-waves at seismograph station therefore called as secondary waves and are transverse in nature. S-waves are also called as shear waves. The surface waves are most disastrous waves because of their long duration and large amplitude. The surface waves travel along Earth's surface. Figure 1 shows structure of p-wave and s-wave [15].

The seismic data is useful in detection of earthquakes and in studying effects of the earthquake. The same seismic methods can be used for exploration of oil and natural gas. The seismic methods are based upon seismic wave measurement. This measurement can be done when any seismic source start generating seismic waves. The collection and recording of continuous seismic signals and use it for further analysis is known as seismic data acquisition. The analysis of these recorded signals to eliminate noise and create map of

the subsurface is called seismic data processing.

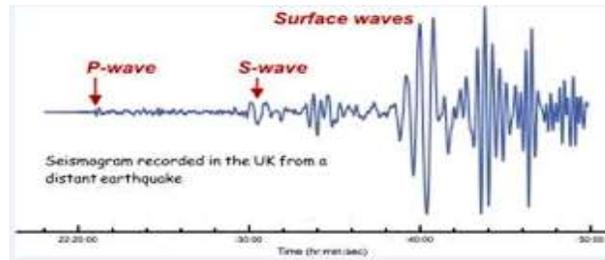


Figure 10: p-wave and s-wave from seismograph

LITERATURE REVIEW

According to survey we know that seismic data acquisition is very important factor in detection of the earthquake before arrival of it. Seismic waves are used for seismic data acquisition. Seismic waves are elastic waves that can travel through solid or liquid material. These waves are studied by seismologists to determine the location of the earthquake and measure size of sources. In previous days Seismometers are used at seismological stations for data acquisition. Conventional Seismometers use chart or drum recorder to record seismic signals. The diagram of drum recorder is as shown in Fig.2. These signals were recorded permanently. The Seismometers are costly, large in size, hard for maintenance and are not compatible with computer [1].

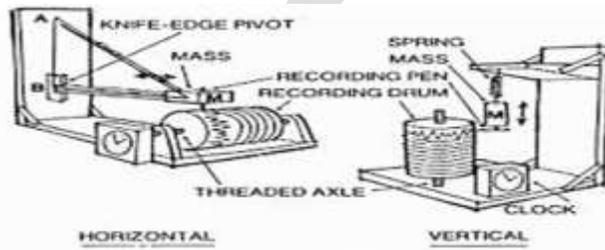


Figure 11: Drum recorder

In oil exploration, the area of exploration is large and the number of channels, sampling rate used for data acquisition are less. This decreases the efficiency of oil exploration. A multi-channel seismic data acquisition system was developed to improve the efficiency of oil exploration by means of increasing number of channels. This system is based on the wireless sensor network. The utilization of many channels at same time decreases production cost as well as efficiency also the data acquisition is improved [2]. There are many types of accelerometer sensors available in the market. The accelerometers can be used for tilt measurement, vibration or shock analysis, and to detect motion. The accelerometers available include both dual axis as well as 3-axis accelerometer sensors. The dual axis accelerometer is capable to measure dynamic and static accelerations. This dual axis accelerometer sensor can be simultaneously used as vibration or shock analysis as well as for tilt measurement. The 3-axis accelerometer sensor senses vibration, shock and gravity. This accelerometer measures accelerations along x, y, and z axes. The selection of MEMS accelerometer sensor which is to be used depends upon the requirement of the system and on the parameter which is to be measured. Micro Electro Mechanical System (MEMS) accelerometer acquires both low and high-frequency data as their frequency response is linear. MEMS accelerometer is a low cost, small size 3-axis acceleration sensor that gives acceleration value of X, Y, and Z axis. In 2008, Agoston Katalin developed microcontroller based system for vibration analysis. This system was constructed using dual axis accelerometer ADXL202 sensor and ATtiny2313 microcontroller. The system can be used for seismic monitoring, vehicle security system, inertial navigation, motion sensing. The system was based on LabWindows /CVI which gives data representation and analysis. An angle of tilt and acceleration measurement was represented corresponding to X and Y axis [3]. An inexpensive seismic network that is Quake-Catcher Network (QCN) was constructed by using distributed computing techniques and MEMS accelerometers. The QCN combine MEMS technology with computing and allows volunteers to collect seismic data and compute results. The QCN gives better earthquake recognition and helps in study of earthquakes [4]. Geophones are light in weight and require no electrical power for its operation. They are able to detect extremely small ground displacements. In older systems cables are used to carry seismic signals from geophones to recorders. In these seismic systems the number of cables and plugs used were large this causes number of troubles. In cordless seismic data acquisition system, geophones are replaced by a wireless network. The new system is based on an ARM and GSM/GPS module. This system avoids problems caused by use of geophone as well as reduces cost and manpower. Here, seismic data which is recorded was uploaded on FTP server and then converted to SEG-Y file using internet. On downloading files uploaded on FTP server, SEG-Y file was created and recorded seismic signal was represented graphically [5]. In 2010, Li Ming, Yuan Zi, Jiang Chunlan developed a multi-channel data acquisition system based on data acquisition card, seismic sensor and an amplifying circuit. This system requires 8 sensors along with 8 amplifying circuits, 8-channel data acquisition board, a computer and data acquisition software. The 8-channel data was stored using spreadsheet and two waveforms are selected from 8 channels. The selected waveforms were displayed using virtual oscilloscope [6]. In recent years the use of embedded computers along with software platform in seismology has been increasing. This helps in performance improvement and offers reduced system cost. The seismic data acquisition system based on

ARM-Linux is one of the systems which are based on the hardware and software platform. This system is based on ARM9 and embedded Linux that uses high-resolution ADC. In this system a device driver that interacts with Direct Memory Access (DMA) is developed. This feature helps processor to read large amount of data from ADC. This reduces processor workload up to 25% [7]. In recent years, the use of GPS technology is increased and is helpful in examination of accelerations and motions. The disadvantage of high-rate GPS is that it gives uncertain output at high frequencies because of instrumental noise. In 2013, a new system is proposed which gives measurements from a GPS as well as a MEMS accelerometer. The sensors are low-priced as compared to Global Navigation Satellite Systems. This combined system is capable of recording ground displacements along with acceleration changes which is important factor in earthquake detection [8]. It is essential to keep record of environmental factors such as pressure, vibration, acceleration, and temperature for any device's Prognostics and Health management. These factors are helpful in estimation of process failure. The system based on MEMS sensors, ARM and FLASH is used to keep record of all these parameters. The data collected by MEMS sensors is stored in a memory and via wireless module transmitted to computer. This system offers advantage of reduced size and power consumption [9]. To analyze proper working of machines, engines, in earthquake detection, or in many scientific researches vibration measurement and its visual presentation is of important concern. A system based on accelerometer, PIC microcontroller and C# .NET was constructed which measure vibrations as well as the output can be shown graphically on the computer. This low cost system gives stable and good response in correspondence to vibration analysis up to 5 KHz frequency [10]. An earthquake alarm system using ATmega328p, ADXL335 and XBee S2 is a low cost system which can be used at home as a consumer product to save their lives. This system also consumes less power and can be used in sleep mode too [11].

SEISMIC DATA ACQUISITION SYSTEM

In recent years significant improvement and wide-spread use of digital embedded computers in seismology have been increased. This includes embedded computers consisting of a powerful microprocessor unit (MPU), a high-resolution analog to digital converter (ADC) and storage memory. However, these commercial devices are costly and restricted to modification or upgrade as well as not compatible with the computer. The use of open-source software with common hardware platform has been increasing because of advantages like open platform, improved performance, and lower cost. The seismic signals have very large dynamic range and wide bandwidth; hence ADC resolution is a key factor of designing a digital acquisition system. Here, a cost-effective seismic acquisition system based on ARM, without compromising its performance is developed. Figure 3 indicates the block diagram of the system. The first block is an accelerometer sensor which converts nonelectrical signal into electrical quantity which is in the range of (0-1.76V). Here; we are using an accelerometer sensor ADXL 335 to measure accelerations. It is a 3-axis small, thin, low power accelerometer with signal conditioned voltage outputs. When any seismic like activity happens vibrations are generated at that time accelerometer sensor senses seismic data along X, Y, and Z axis corresponding to accelerations. After sensing the vibrations the sensor converts the vibrations in to some voltage levels then an accelerometer transfers the signal to the low pass filter which is inbuilt in an accelerometer. LPF is used to reduce the high frequency component from the received signal means it reduces the distortions present in the signal. The LPF output is then passed to the ADC of an ARM 7 microprocessor. ADC converts the analog signal in to the digital form. Then the signal is given to ARM processor.

The output of ADC is transmitted via wireless transmitter Xbee S1 module. On receiver side another wireless XBee S1 module is used which receives signal from transmitter. The Xbee S1 wireless module is based on 802.15.4 protocol 1mW with wire antenna and it allows communication between microcontrollers, computers, systems, etc. with a serial port. The received data is then transferred to computer and can be saved using excel sheet which can be used later for analysis by seismologists at seismological station. PC will contain MATLAB code with GUI which will have routines for serial communication and graph plotting. It will show real time display of graph of received data verses time. ARM processor compares the input seismic signal and referenced signal which is already set in to the processor. If input signal is greater than the referenced signal then an alarm blows in computer about possibility of arrival of an earthquake.

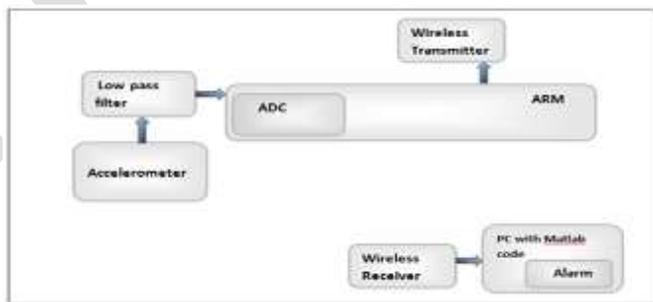


Figure 12: Block diagram of proposed seismic data acquisition system

RESULTS AND DISCUSSION

Figure 4 shows complete hardware seismic data acquisition system. The circuit operates on 5V power supply voltage. The experimental setup for data acquisition is as shown in Fig.5. An experimental setup consists of whole circuitry require for seismic data acquisition, PC and a wooden sheet of near about 7feet. The accelerometer sensor ADXL 335 is placed at one end of the sheet. When accelerometer sensor senses vibrations it produces corresponding analog output voltage. The voltage converted by ADC is transmitted using one wireless XBee module to another XBee module present at receiver side and finally transferred to PC.



Figure 4: Complete hardware system



Figure 5: Experimental setup

The GUI is as shown in Fig.6. There are three push buttons present in the GUI (1. Initialize serial port 2. Stop serial 3. Run). For the system to show graphical representation of collected seismic data, initialize serial port button is pressed due to which serial port is initialized as indicated in Fig.7.



Figure 6: Graphical user interface



Figure 7: Initialization of serial port

After pressing “Run” button on GUI, the graphical representation appears on the screen along X, Y, Z axes corresponding to voltage. For experiment, vibrations are given by steel hammer at different distances from accelerometer sensor. The experimental setup when vibrations are given at distance 1 foot from sensor is given in Fig.8 and the values obtained at X, Y and Z axis are as shown in Fig.9. Similarly, other readings are taken at distance 3 feet and 7 feet and readings are mentioned in Table 1.



Figure 8: Experimental setup for vibrations given at less than 1 foot

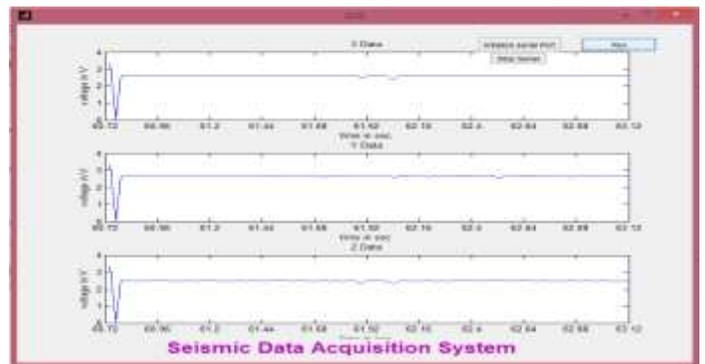


Figure 9: GUI for vibrations given at less than 1 foot

Figure 10 indicates the condition where input signal exceeds reference signal. Here, vibrations are given on wooden sheet by steel hammer with greater force as compared to vibrations given at different distances. At this situation, an alarm “An earthquake has been

detected” rang in PC to inform us about arrival of an earthquake. As the sensitivity of ADXL335 is 270 mV/g to 330 mV/g, the minimum reference value selected here is 2.7V and maximum is 3.3V. The Table 1 shows outcome seismic data values obtained from experiment along X, Y, and Z axes for vibrations given at different distances from accelerometer sensor.

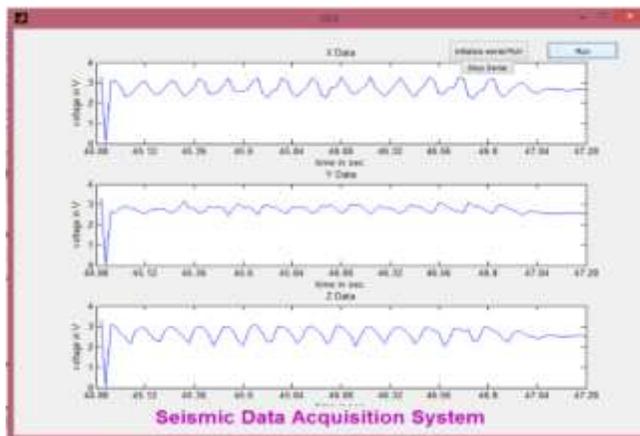


Figure 10: GUI when input signal exceeds reference signal

Table 1: Outcome seismic data values from experiment

Sr. No.	Distance Sensor	From	X data	Y data	Z data	Critical Condition Indicator
1	Less than 1 foot		2.5	2.6	2.4	-
2	At 3 feet		2.5	2.6	2.5	-
3	At 7 feet		2.5	2.6	2.4	-
4	NA		3.1	3.1	3.1	Alarm in PC rang out indicates the possibility of an earthquake

From above table, it is observed that when the vibrations are given on a wooden sheet using steel hammer with same force at various distance from accelerometer sensor it is sensing data and produces the same output. This means that the accelerometer is capable of sensing data from larger distances too and gives same output as it gives at shorter distance. Also, from reading no.4 it was seen that when vibrations are given with greater force the seismic data exceeds reference value 2.7 and an alarm is generated at PC to inform about seismic like activity.

Acknowledgment

I kindly regret Mr. V. D. Chaudhari for his guidance during this task and Dr. K. P. Rane for his suggestions to improve my work.

CONCLUSION

Here, the seismic data acquisition system based on ARM7 is constructed successfully. The graphical representation along X, Y, Z axes can be seen using GUI effectively. To improve the sensitivity, high sensitivity sensor ADXL335 and high range wireless XBee series 1 module are selected. The accelerometer sensor senses the vibrations along three directions X, Y, and Z and produces corresponding output voltage within very short timing. The software routines written in MATLAB for GUI helps to represent the collected data graphically and this data is stored using excel sheet. The data stored in excel sheet can be used for further analysis by seismologists. If input signal is greater than reference signal then an alarm rang in PC to alert peoples about possibility of an earthquake. This system helps in significant reduction of cost, size and weight which help to improve its versatility and mobility as well as it is compatible with computer as compared to existing systems. As compared to already existing seismic data acquisition systems, this system is data acquisition system as well as an earthquake alarm system.

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Design of DRAM with Coupled Sense Amplifier for Low Power Applications

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Abstract—For more than four decades the simple structure of the dynamic RAM cell and continuous improvement in lithography and dry etching technology has made DRAM to grow exponentially in a large scale integration and has decreased the minimum feature size in memory chips. The 2010 ITRS roadmap reports that the minimum feature size of DRAM will be 20 nm in 2017 and 10 nm in 2023. Sense amplifier which is a part of DRAM circuit consumes a power of $0.422\mu\text{w}$. But circuit level modifications in sense amplifier circuitry will help to achieve a power reduction of 5-10%.

Keywords-DRAM, Feature size, Large scale integration, memory chips, lithography, etching, circuit level techniques

I. INTRODUCTION

Very-large-scale integration (VLSI) is the process of creating an integrated circuit (IC) by combining thousands of transistors into a single chip. VLSI began in the 1970s when complex semiconductor and various communication technologies were being developed[1]. The microprocessor is a VLSI device. Before the introduction of VLSI technology most ICs had a limited set of functions they could perform.

VLSI lets IC makers add all of these into one chip. The increasing speed and complexity of today's designs implies a significant increase in the power consumption of VLSI chips. To meet this challenge researchers have developed many different design techniques to reduce power. The complexity of today's ICs with over 100 million transistors, clocked at over 1 GHz means manual power optimization would be hopelessly slow and all too likely to contain errors. One of the key features that led to the success of complementary metal-oxide semiconductor or CMOS technology was its intrinsic low-power consumption. This meant that circuit designers and electronic design automation (EDA) tools could afford to concentrate on maximizing circuit performance and minimizing circuit area. Another interesting feature of CMOS technology is its nice scaling properties, which has permitted a steady decrease in the feature size (Moore's law) allowing for more and more complex systems on a single chip, and working at higher clock frequencies.

Dynamic Random Access Memory (DRAM) devices are used in a wide range of electronics applications. Although they are produced in many sizes and sold in a variety of packages, their overall operation is essentially the same. DRAMs are designed for the sole purpose of storing data. The only valid operations on a memory device are reading the data stored in the device, writing (or storing) data in the device, and refreshing the data periodically. To improve efficiency and speed, a number of methods for reading and writing the memory have been developed. DRAMs evolved from the earliest 1-kilobit generation to the recent 1-gigabit (Gb) generation through advances in both semiconductor process and circuit design technology. Tremendous advances in process technology have dramatically reduced feature size, permitting ever higher levels of integration. These increases in integration have been accompanied by major improvements in component yield to ensure that overall process solutions remain cost effective and competitive. Technology improvements, however, are not limited to semiconductor processing. Many of the advances in process technology have been accompanied or enabled by advances in circuit design technology. In most cases, advances in one have enabled advances in the other. A DRAM circuit consists of row decoder, column decoder, input and output buffers, sense amplifier and memory array.

This paper is organized as follows. Section II introduces the simplified DRAM architecture. Section III explains simulation results obtained by using Tanner13.0. Finally Section IV concludes the paper.

II. BACKGROUND

A. DRAM OVERVIEW

Figure 1 shows a circuit diagram of the basic one transistor one capacitor (1T1C) cell structure used in modern DRAM devices as the basic storage unit. In the structure illustrated in figure 1 when the access transistor is turned on by applying a voltage on the gate of the access transistor a voltage representing the data value may be placed onto the bit line and used to charge the storage capacitor. The storage capacitor then retains the stored charge for a limited period of time after the voltage on the

word line is removed and the access transistor is turned off. However due to leakage currents through the access transistor the electrical charge stored in the storage capacitor gradually dissipates. As a result before the stored charge decays to indistinguishable values the data stored in DRAM cells must be periodically read-out and written back in a process known as refresh. Otherwise the stored electrical charge will gradually leak away and the value stored in the capacitor will no longer be resolvable after some time.

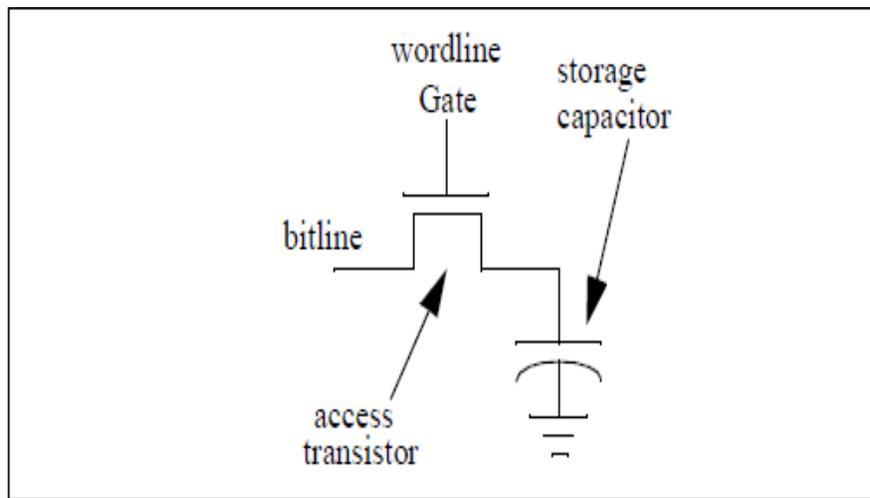


Figure 1. Basic 1T1C DRAM Cell structure

B.DRAM ARCHITECTURE

DRAM chips are large, rectangular arrays of memory cells with support logic that is used for reading and writing data in the arrays, and refresh circuitry to maintain the integrity of stored data. The gates of the DRAM cells are tied to the row decoder and the bit-line pairs are connected to the sense amplifier as shown in figure2 [2].The bit-line pairs are connected in parallel to the sense amplifier to reduce the bit-line coupling noise. This array architecture is called the folded bit-line array. This array usually has a small feature size of $8F^2$ (F : feature size) and has proven to be the most reliable design. Another array scheme called the open bit-line array has smaller feature sizes ($6F^2$ or $4F^2$) than the folded bit line[3]. This scheme has high density and cell efficiency, and is also used when reducing the number of word lines to ease the impact of a bit-line interference noise on DRAM scaling. But there is no difference in operating the DRAM cells between the folded bit line and open bit-line architecture[4]. Therefore the folded bit-line array architecture is used here for better understanding. With the down-scaling trend of the minimum feature size and power, many problems (capacitor/bit-line/word-line bridges, coupling noise, P-MOS/N-MOS ratio, leakage current and so on) need to be considered. With the short length of the word-line channel, the sub threshold leakage current will increase more. To prevent this sub threshold leakage-current problem, channel doping should be increased in order to maintain adequate control of short-channel effects. However, junction leakage current due to band-to-band tunneling and gate-induced drain leakage current may increase as a result of high channel doping. The variability of the threshold voltage can also increase due to defects resulting from manufacturing aberrations [5]–[9].

Memory Arrays

Memory arrays are arranged in rows and columns of memory cells called word lines and bit lines respectively. Each memory cell has a unique location or address defined by the intersection of a row and a column.

Memory Cells

A DRAM memory cell is a capacitor that is charged to produce a 1 or a 0. Over the years several different structures have been used to create the memory cells on a chip. In today's technologies, trenches filled with dielectric material are used to create the capacitive storage element of the memory cell.

Support Circuitry

The memory chip's support circuitry allows the user to read the data stored in the memory's cells, write to the memory cells, and refresh memory cells. This circuitry generally includes:-

- Sense amplifiers to amplify the signal or charge detected on a memory cell
- Address logic to select rows and columns
- Row Address Select (RAS) and Column address Select (CAS) logic to latch and resolve row and column addresses and to initiate and terminate read and write operations.

The gates of the DRAM cells are tied to the row decoder and the bit-line pairs are connected to the sense amplifier as shown in figure2. A sense amplifier is composed of a pair of cross-connected inverters between the bit lines[10].

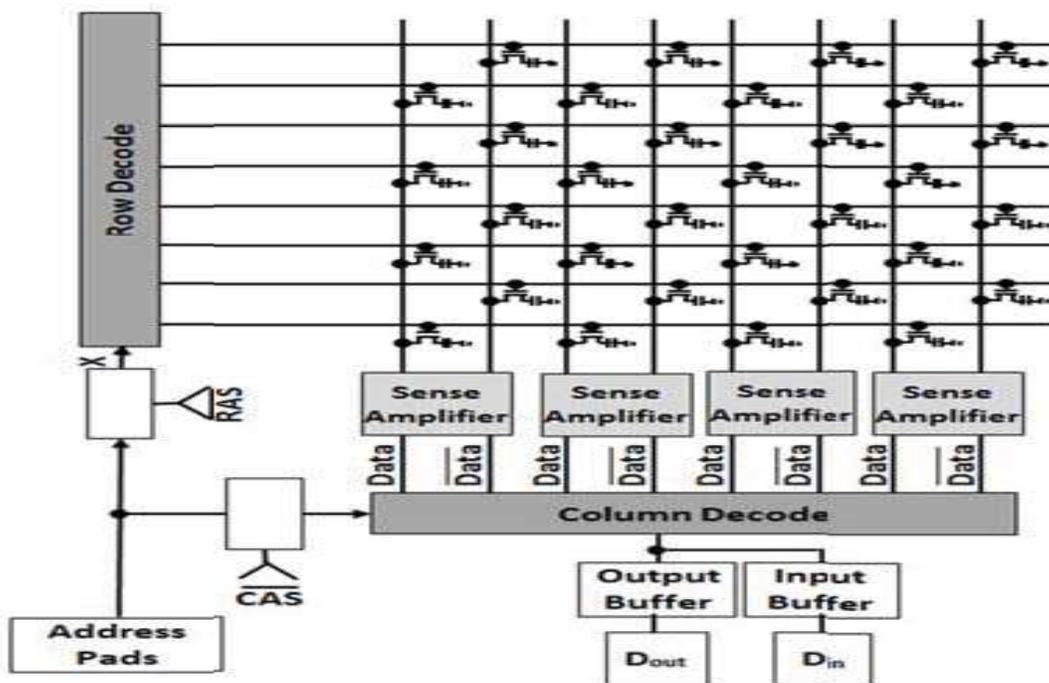


Figure 2.Simplified DRAM diagram

III.SIMULATION RESULTS

Today's computers CPUs and cell phone make use of CMOS technology due to several key advantages. CMOS offer low power dissipation, relatively high speed and high noise margin. So here we are designing row decoder, sense amplifier, column decoder and thus the DRAM circuit and simulation is done using Tanner tool.

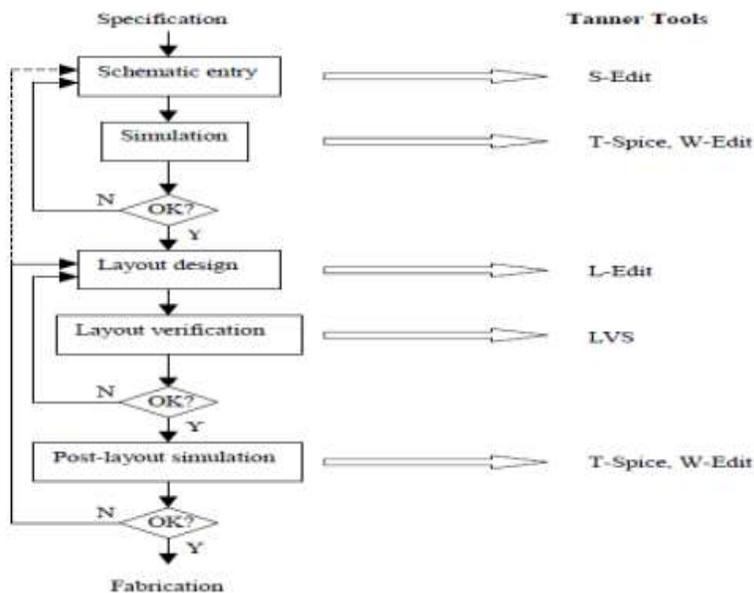


Figure 3.Steps of methodology and implementation plan for Tanner13.0

A.ROW DECODER

Decoders address a specific cell in the memory cell array[11]. Row decoders are used to select a particular row of cells in the memory array. Decoders can be implemented using simple logic gates. In the DRAM circuit (fig.2.) gates of transistors are tied to the row decoder. Fig.4. shows row decoder circuit schematic diagram using nand, nor (universal gates) and not gates in s-edit.

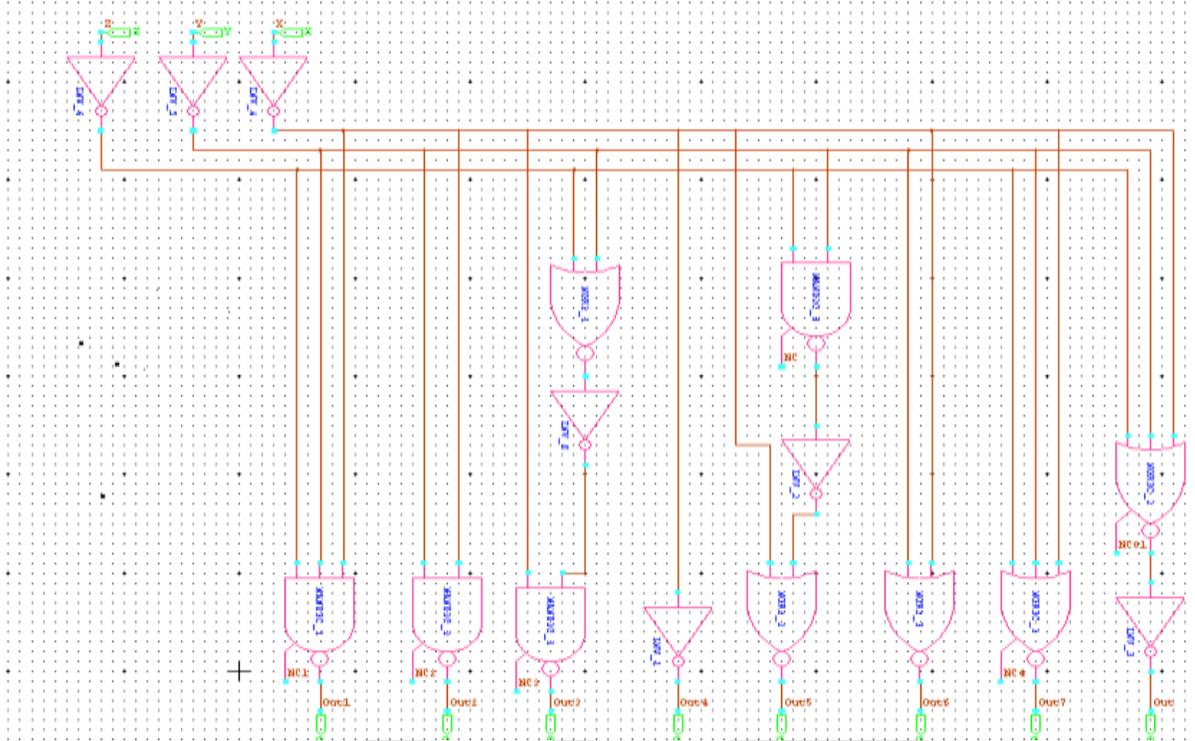
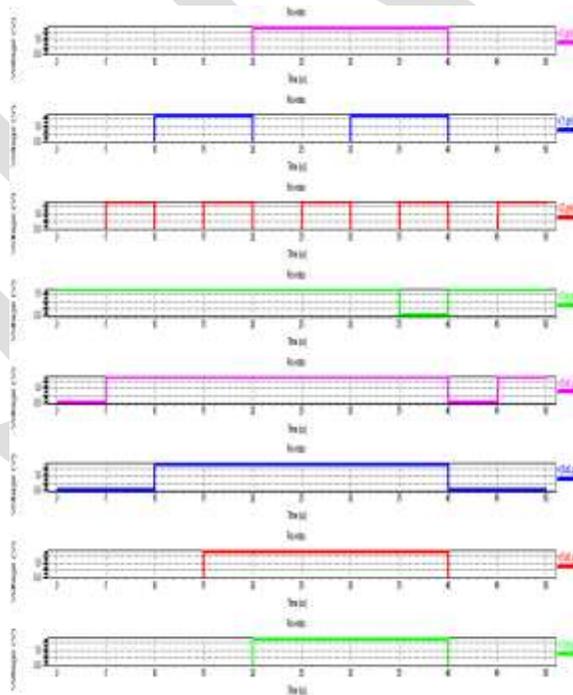


Figure 4. Row decoder circuit schematic



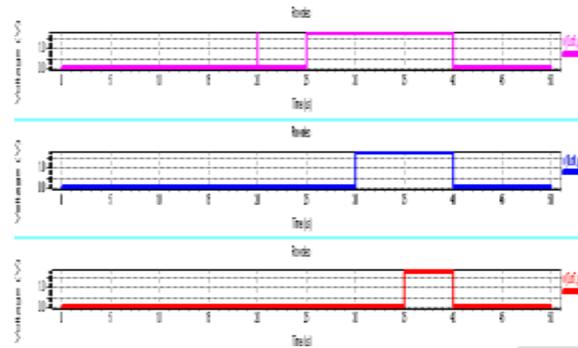


Figure 5. Input and output waveforms of row decoder in w-edit

Row decoder circuit schematic (fig.4) is designed in s-edit and simulated to obtain output waveforms which can be viewed in w-edit. Here we designed a 3 to 8 decoder circuit. So it has 8 decoded outputs. When address and RAS (Row Access Signal) are loaded a specific row of cells will get selected using this row decoder. When we simulate the row decoder circuit output waveforms are obtained as shown in figure 5.

B.SENSE AMPLIFIER

Sense amplifier is not only an amplifier but a positive feedback device that quickly pushes the readout voltage to 1 or 0. The gates of the DRAM cells are tied to the row decoder and the bit-line pairs are connected to the sense amplifier. A sense amplifier is composed of a pair of cross-connected inverters between the bit lines. When the address and Row Access Signal (RAS) instruction are loaded to the device each row of the selected cells is active. In this operation, the data stored in the cells of the selected row address are amplified and stored again by the sense amplifiers. The bit-line pairs are connected in parallel to the sense amplifier.

The sense amplifier circuit (figure 6) schematic is designed in s-edit and simulated to obtain output waveforms in w-edit which is shown in figure 8. The symbol for sense amplifier is shown in figure 7. Sense amplifier will work properly when enable line is high. But this high enable line turn on all four sense amplifiers since we use a single enable line for all sense amplifiers. So this leads to higher power consumption.

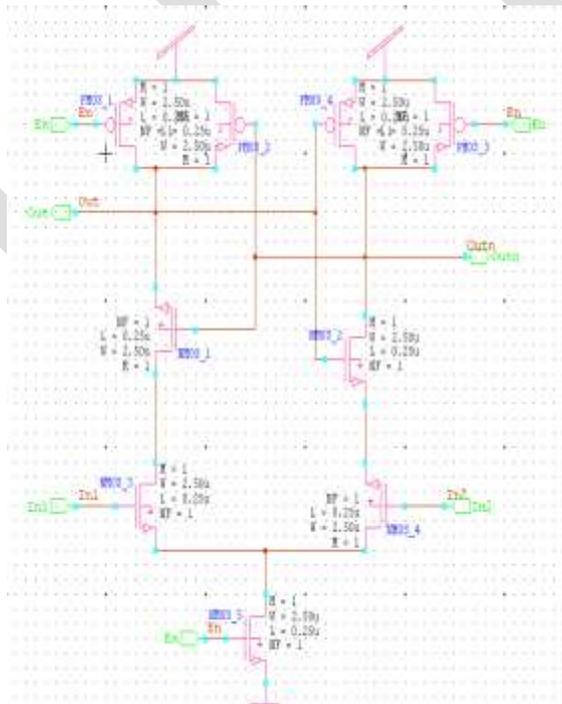


Figure 6. Sense amplifier circuit schematic in s-edit

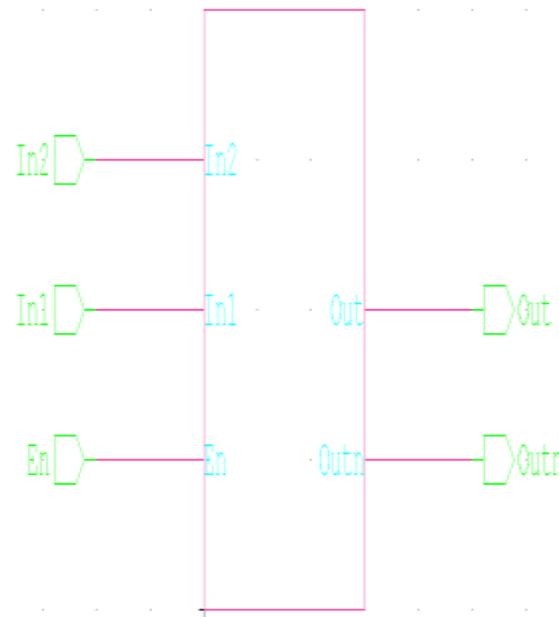


Figure 7. Symbol for sense amplifier

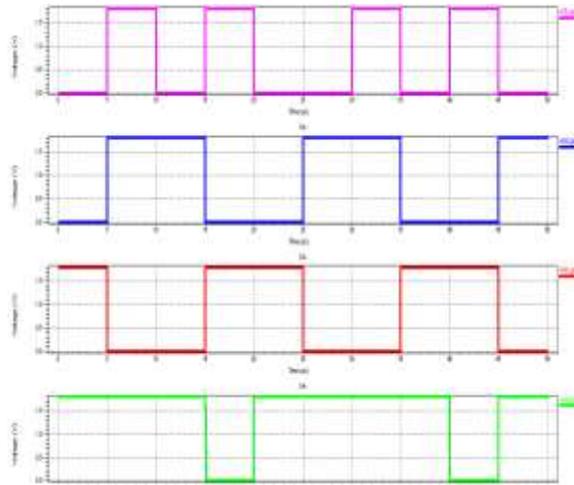


Figure 8. Input and output waveforms of sense amplifier circuit

C.COUPLED SENSE AMPLIFIER

We can employ coupling technique in sense amplifier to achieve power reduction. The normal sense amplifier consumes a power of 0.422 micro watts. Coupled sense amplifier requires only 0.01628 micro watts. So we can achieve approximately 5% power reduction by this technique. Figure 9 shows coupled sense amplifier. Figure 10 shows its output and input waveforms. Sense amplifier is connected to column decoder. So there is a chance to occur coupling fault in the transistors. This modified sense amplifier will reduce the effect of coupling fault.

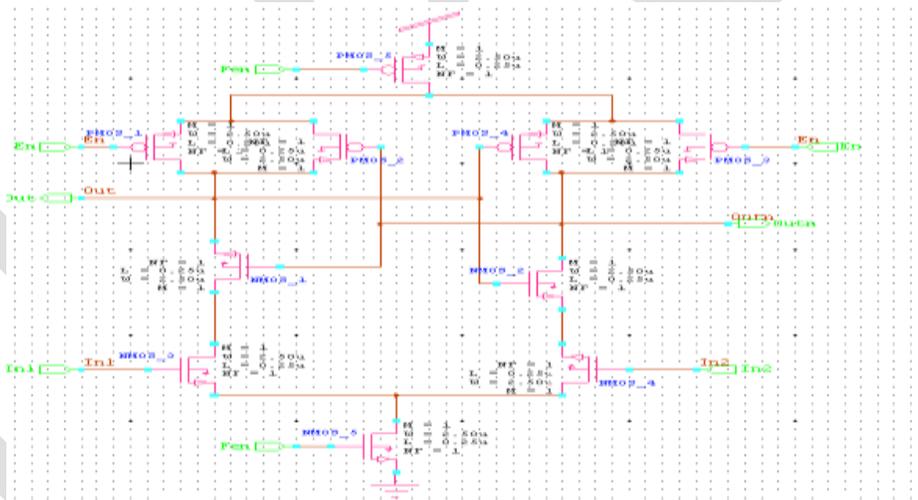


Figure 9. Coupled sense amplifier

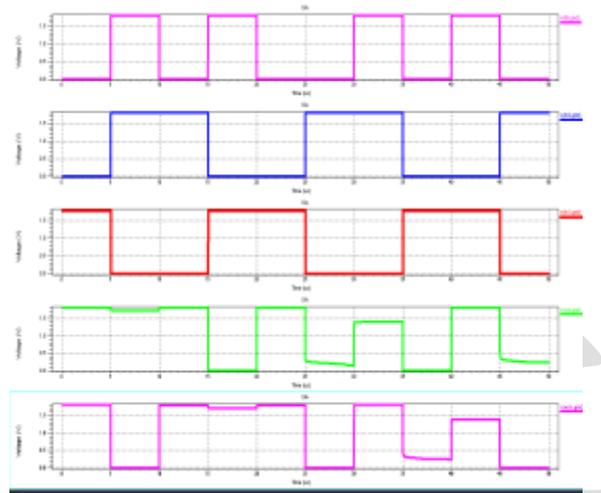


Figure 10. Input and output waveforms of coupled sense amplifier

D.DRAM CIRCUIT

Using the row decoder circuit and sense amplifier we can design the final DRAM circuit along with column decoder. For the proper working of DRAM circuit enable line of sense amplifier must be high. DRAM circuit with coupled sense amplifier and waveforms are shown below.

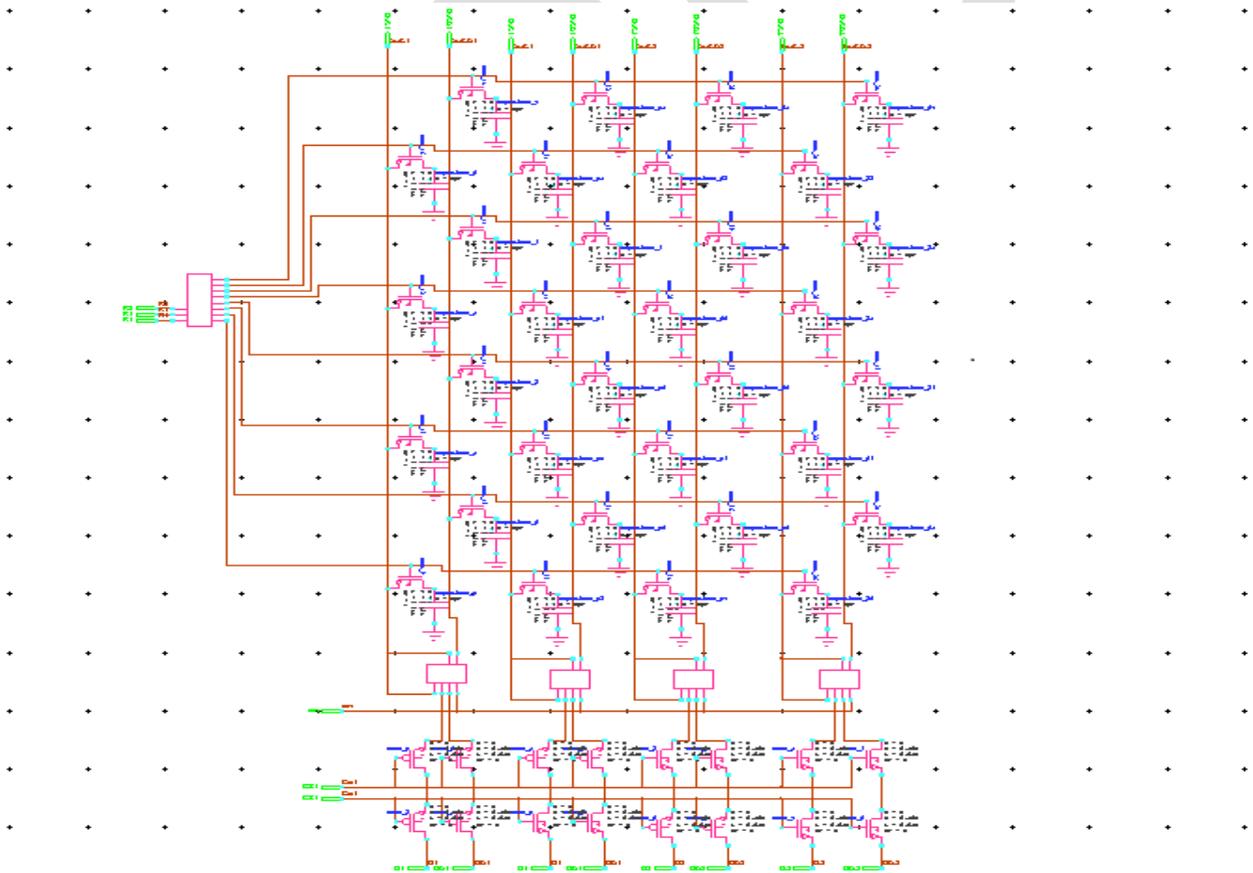


Figure 11. DRAM circuit with coupled sense amplifier

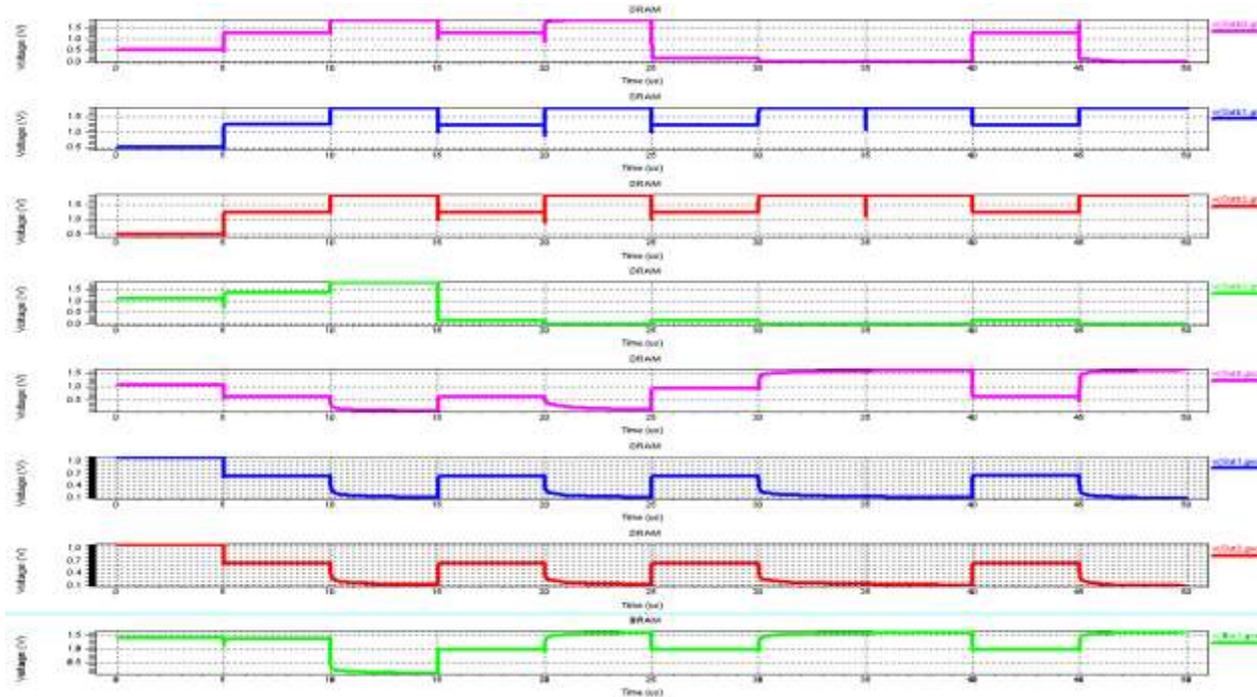


Figure 12. Output waveforms of DRAM circuit with coupled sense amplifier

E.COMPARISON OF PARAMETERS

For normal sense amplifier and coupled sense amplifier parameters such as power, static current, power delay product and energy delay product are calculated and shown in table 1.

Table 1. Comparison of parameters for normal and coupled sense amplifiers

PARAMETERS	NORMAL SENSE AMPLIFIER	COUPLED SENSE AMPLIFIER
Average power	0.422 μw	0.01628 μw
Static power	431 μw	333 μw
Static current	239.4 μA	185 μA
Power delay product	6.465 nws	4.995 nws
Energy delay product	0.0969 pws ²	0.0749 pws ²

For DRAM circuit with normal sense amplifier and DRAM circuit with coupled sense amplifier parameters such as static power, static current, power delay product and energy delay product are calculated and listed in table 2.

Table 2. Comparison of parameters for DRAM with normal sense amplifier and DRAM with coupled sense amplifier

PARAMETERS	DRAM with normal sense amplifier	DRAM with coupled sense amplifier
Static power	14.53 mw	12.1 mw
Static current	8.072 mA	6.72 mA
Power delay product	0.5812 mws	0.484 mws
Energy delay product	23.25 pws ²	19.36 pws ²

IV. CONCLUSION

DRAM circuit consists of row decoder, column decoder, memory array, input and output buffers and sense amplifier. In a DRAM circuit more than 80% of power is consumed by sense amplifier. DRAM circuit designed in s-edit consumes a static power of 14.53 milli watts. Circuit level modification in sense amplifier circuitry will help to achieve a power reduction of 5-10%. This modified sense amplifier also help to reduce coupling faults occurring in DRAM circuits.

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REVIEW ON AUTONOMIC COMPUTING: THE BRIEF INTRODUCTION

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Abstract— Computing coordination is constantly growing in complexity. With that development, the challenge of operating and keep up them improved. In some situations, these schemes may occur in lenient and detached environments creating such operations even more challenging. To address the previous problems, the idea of autonomic computing invented. In the year of 2001, IBM introduced a new computing system i.e. an Autonomic Computing (AC) system. It will constantly check and elevate its status, and automatically regulate itself to altering surroundings. The AC system is a self-managing system. Self-management is attained through key aspects such as self-optimization, self-configuration, and self-protection and self-healing. This paper presents autonomic computing that emphasizes on the architecture of an AC system and the framework elements needed for constructing the AC system.

Keywords— Autonomic Computing, self-management, features, architecture of AC, framework element, building blocks, growing complexities, IT professionals.

I. INTRODUCTION

The advances in computing and communication technologies and software have resulted in a tremendous growth in computing systems and applications that impact all aspects of our life. As the scale and difficulty of these systems and applications raise, their development, configuration and management challenge are start to break current paradigms, completely covers the capabilities of existing tools and methodologies, and rapidly concentrate the systems and applications hard, uncontrollable and insecure.

Autonomic computing is emerging as a significant new strategic and fundamental approach to the design of complex distributed computer systems. IBM introduced a new term Autonomic Computing (AC) in the year of 2001. It depicts the systems that are self-managing. The term Autonomy was inspired by the term autonomic nervous system that that controls vital body functions without an individual's knowledge. The Autonomic Computing systems involve of four key characteristics: Self-configuring, Self-optimization, Self-protection and Self-healing [1], [2], [3]. At 2005, IBM merged around 475 autonomic features into more than 75 products.

NASA is one of the leading organizations that build complex mission critical systems with autonomous behavior. To them, Autonomy provides great benefit; it helps developing spacecraft systems that can explore regions of space where traditional crafts cannot explore. Some of the successful systems with autonomic features developed by NASA are Deep Space 1, Earth Observing 1 and Mars Exploration Rovers [1].

1. Need of Autonomic Computing

In the developments of human and society automation has always been the base of progress. If human can handle one of his needs automatically, then he has free mind and resources to focus on another task. So step by step he can get ability to focus on more composite problem.

But the computing system verified that evolution via automation also produces complexity as a compulsory side effect. Follow the evolution of computers from single machines to modular system to personal computer networked with larger machines and an unmistakable pattern appears. Relate with previous machines unbelievable progress in almost every aspect if computing. Along with that growth has become increasingly refined architectures governed by software whose complexity now demands tens of millions of lines of code. In fact, the increasing difficulty of IT infrastructure threatens to challenge the very benefits IT goals to provide. Until now the computer systems trusted mainly on human interventions and administration to manage this difficulty. When considering about the current rates of growths, there will not be adequate skilled IT people to keep the world's computing systems running. Even in tentative financial times, still have great demand for trained IT workers.

Even if people could in some way come up with enough skilled people, the difficulty is growing beyond human ability to be able to it. As computing grows the overlapping connections, reliance and work together applications call for administrative decision making and retorts quicker than any human can deliver[2]. Recognizing root causes of failure becomes more problematic, while searching ways of growing system efficiency creates problem with more flexible than any human can hope to solve. Without new tactics, things will get worse. To solve problem people need computer systems with autonomic behavior.

2. Related Work

The author Mona A. Yahya, Manal A. Yahya, Dr. Ajantha Dahanayake Proposed a framework that explains to software analysts the main aspects to consider for accommodating software autonomy in the requirements engineering phase [1]. The paper proposed by the author Jeffrey O. Kephart, David M. Chess highlighted the architectural considerations of AC and different engineering and scientific challenges to the autonomic computing system [2]. The paper stressed three basic approaches to make a system Autonomic [6], the author Vitor E. Silva Souza Proposed a design for adaptive system using goals requirements. The author D. B. Abeywickrama, N. Biccocchi, F. Zambonelli proposed the goal modelling helps in identifying the functional and non-functional requirements of an adaptive system [7].

II. Features of Autonomic Computing

Autonomic computing systems combine four main features:

- Self-Configuration
- Self-Healing
- Self-Optimization
- Self-Protection

Fig 1 shows the features of autonomic computing



Fig: Features of Autonomic Computing

1. Self-configuration

The author Jeffrey O. Kephart, David M. Chess says that connecting, organizing, and integrating large, compound systems is challenging, time consuming, and mistake susceptible to even for experts[2]. With the capability to dynamically configure itself, an IT environment can adapt. Immediately with minimal intervention to the deployment of new components or changes in the IT environment.

2. Self-healing

Self-healing IT environments can detect problematic operations and then initiate corrective action without troublesome system applications. The Autonomic Computing systems will detect, diagnose, and repair localized problems resulting from bugs or failures in software and hardware, maybe through a regression tester [2]. Using information about the system configuration, a problem diagnosis component would analyze information from log files, possibly supplemented with data from additional monitors that it has requested. The system would then match the analysis against known software patches, install the appropriate patch, and retest.

3. Self-optimizing

Self-optimization refers to the ability of the IT environment to efficiently maximize resource provision and utilization to meet end users' needs with minimal intervention. In the near term, self-optimization mainly addresses the difficulties of managing system performance. In the extended span, self-optimizing components may learn from experience and automatically and proactively adjust themselves in the background of an overall business objective [2].

4. Self-protecting

A self-protecting environment allows authorized people to access the right data at the right time and can take proper actions automatically to make itself less susceptible to attacks on its run-time organization and business data. A self-protecting IT environment can detect hostile or invasive behavior as it occurs and take autonomous actions to make itself less vulnerable to unauthorized access and usage, computer program viruses, denial-of-service attacks, and common disappointments.

III. THE CONCEPTUAL ARCHITECTURE OF AUTONOMIC COMPUTING SYSTEMS

The building block of autonomic computing system is called an autonomic element. An autonomic element is a distinct system component that contains resources and delivers services to human and other autonomic elements. The general structure of an autonomic element is depicted in Figure [4]. The five structural blocks for an autonomic system are:

- Autonomic manager
- Knowledge source
- Touchpoint
- Manual manager
- Enterprise service bus



Fig: Architecture of Autonomic Computing

1. Autonomic Manager

An autonomic manager is an application that automates some management function and externalizes this function according to the behavior defined by management crossing point. The autonomic manager is a constituent that implements the control loop. For a system element to be self-managing, it must have an automated method to bring together the details it necessities from the system; to study those details to define if something needs to change; to create a plan, or order of actions, that states the vital changes; and to perform those actions. When these functions can be automated, a smart control loop is formed [4]. As shown in Figure, the architecture separates the loop into four parts that share knowledge. These four parts work together to provide the control loop functionality. The four parts communicate and work together with one another and exchange appropriate knowledge and data. Autonomic managers, in a manner related to touchpoints, provide sensor and effector manageability interfaces for other autonomic managers and manual managers to use.

Autonomic manager internal structure

a. Monitor

The monitor function gathers the details from the managed resources, via touchpoints, and associates them into indicators that can be analyzed. The details can consist of topology data, metrics, and arrangement property settings and so on. This data includes information around managed resource arrangement, rank, accessible capacity and throughput. Some of the data is stationary or

variations gradually, whereas further data is dynamic, varying constantly over and done with time. The monitor function aggregates, compares and filters these details up to it governs an indicator that needs to be analyzed [4].

Autonomic managers must gather and process large quantities of data from the touchpoints sensor interface of a managed resource. An autonomic manager's skill to promptly organize and make sense of this data is vital to its successful operation.

b. Analyze

The analyze function provides the mechanisms to observe and analyze conditions to determine if some change needs to be made. The analyze function is responsible for determining if the autonomic manager can tolerate by the recognized policy, now and in the future. In many cases, the analyze function models complex performance so it can hire predictions techniques such as time series forecasting and queuing models. These mechanisms permit the autonomic manager to learn about the IT environment and help forecast future behavior.

Autonomic managers must be able to perform complex data analysis and reasoning on the symptoms provided by the monitor function. If changes are required, the analyze function creates a change request and logically passes that change request to the plan function.

c. Plan

The plan function creates or selects a procedure to pass a desired modification in the managed resource. The plan functions can receipts on various forms, extending from a single command to a compound workflow. The plan function produces the suitable change plan, which signifies a desired set of changes for the succeeded resource, and understandably permits that change plan to the execute function [4].

d. Execute

The execute function offers the mechanism to plan and perform the necessary changes to the system. Once an autonomic manager has produced a change plan that agrees to a change request, some actions may need to be taken to change the state of one or more accomplished resources. The execute function of an autonomic manager is responsible for carrying out the procedure that was formed by the plan function of the autonomic manager through a sequence of actions. These actions are implemented using the touchpoint effector interface of a managed resource. Amount of the execution of the alteration plan could contain updating the knowledge that is used by the autonomic manager.

2. Knowledge Source

A knowledge source is an implementation of a record, vocabulary, database or other source that make available access to knowledge according to the interfaces arranged by the architecture. In an autonomic system, knowledge contains of certain types of data with architected syntax and semantics, such as signs, policies, change requests and change plans. This knowledge can be kept in a knowledge source so that it can be shared between autonomic managers. The knowledge kept in knowledge sources can be used to spread out the knowledge capabilities of an autonomic manager.

Data used by the autonomic manager's 4 functions (monitor, analyze, plan and execute) are kept as shared knowledge. The shared knowledge contains data such as topology information, old logs, metrics, signs and policies.

3. Touchpoints

A touchpoint is the part in a system that exposes the state and management operations for a resource in the system. An autonomic manager interconnects with a touchpoint through the manageability interface. A touchpoint is the application of the manageability interface for an exact manageable resource or a set of connected manageable resources.

Manageability Interface

The manageability interface for governing a manageable resource is organized into its sensor and effector interfaces. The manageability interface reduces the complexity by offering a standard interface to autonomic managers, rather than the different manageability interface mechanisms related with several kinds of manageable resources. A touchpoint equipment the sensor and effector behavior for definite manageable resource types by plotting the standard sensor and effector interfaces to one or more of the manageable resource's manageability interface mechanisms. The sensor and effector in the architecture are connected together.

A manageability capability refers to a logical collection of manageable resource state information and operations. Some examples of manageability capabilities are: identification, metrics, and configuration. For each manageability capability, the user of the manageability interface must be able to acquire and regulate state data through the manageability interface.

4. Manual Manager

A manual manager is an application of the user interface that allows an IT expert to execute some management function manually. The manual manager can work together with other autonomic managers at the similar level or organize autonomic managers and other IT professionals working at "lower" levels.

The manual manager building block is the architectural illustration of the human action and typically includes a human using an organization support. A manual manager can allow an IT professional to give management functions to autonomic managers.

5. Enterprise Service Bus

An enterprise service bus is an operation that supports in integrating other building blocks (for example, autonomic managers and touchpoints) by leading the connections among these building blocks. The enterprise service bus can be used to "connect" several autonomic computing building blocks.

IV. FRAMEWORK ELEMENTS

Following is a disintegration of the proposed framework by the author Mona A. Yahya et.al. Inputs to the framework are the Requirements Specification and System Goals as distinct by the stakeholders.

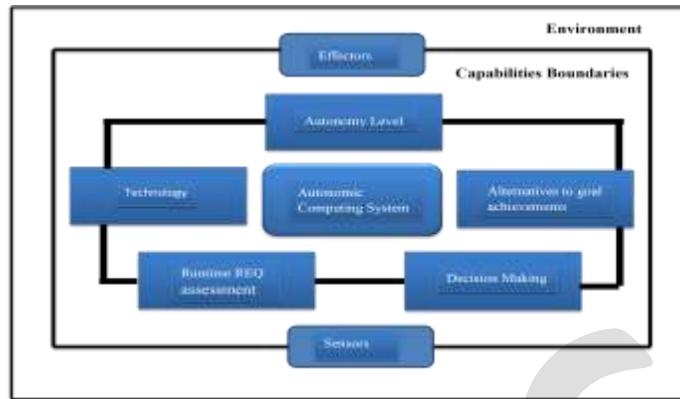


Fig: Elements Needed to Design Framework for Autonomic Computing

- 1. System Environment:** It is important to examine the environment in which the system will live. This will support in forecasting the probable changes and essential replies to be attained by the system.
- 2. System Capability:** Capabilities mean what the system can do to relate with the environment in terms of physical connections and data interaction.
- 3. Level of Autonomy:** autonomic computing is deliberated progressive in nature. There are five levels of autonomy: Basic, Managed, Predictive, Adaptive, and Autonomic. With the basic being the level in which most IT systems are in currently; and the Autonomic level being the uppermost level. Determining the level of autonomy shall allow the engineers make precise choices on how the system in hand will be developed.
- 4. Choice of Technology:** A development technology might be verbalized by the system requestors, or the area in which the software will function. However, developing for autonomy needs a dissimilar development environment that allows runtime adaptation. The XML-Based Autonomic Computing Expression Language (ACEL) and Software Component Ensemble Language (SCEL) operating on a Java Runtime Environment are two examples of technology supporting autonomic computing.
- 5. Runtime Requirement Assessment:** Autonomic computing necessitates a mechanism to monitor and evaluate the achievement or failure of completing the system goals at runtime. This mechanism could be based on the selected technology or developed separately. Earlier research has recommended a number of ways to this such as the definition of Awareness Requirements, and the idea of requirements reflection.
- 6. Decision-Making:** Understanding the runtime performance of requirements supports in determining about the action to be taken by the system.
- 7. Goal Achievement Alternatives:** Clarifying another way to accomplish goals is a vital part for developing autonomic requirements. The uncertainty related with the environment in which autonomic systems occur, may delay certain actions. However, that should not prevent the system from accomplishing the main goal [1].

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express my sincere gratitude towards my family for always being there when I needed them the most. With all respect and gratitude, I would like to thank all the people, who helped me directly or indirectly, I owe my all success to them.

CONCLUSION

For decades, the change of technology and science has reflected the growth of difficulty in several computer environments. In the year of 2001, IBM introduced a new advanced computing 'The Autonomic Computing' system which is self-managed. Any autonomic computing system has to be consists of four key characteristics of self-managing properties that is self-protection, self-healing, self-configuration and self-optimization. The architecture of an Autonomic Computing system includes four building blocks i.e. autonomic manager, knowledge source, touchpoint, manual manager and enterprise service bus. The offered framework is based on previous research in this field; however with forthcoming research other aspects may appear and need the development of the framework.

There are several advantages of autonomic computing systems. As well as addressing complexity, autonomic computing suggests the promise of a lesser cost of ownership and a reduced maintenance problem as systems become self-managing. Simplified user knowledge through a more approachable, here and now system. One more advantage is that Autonomic Computing saves the cost scale to use. AC scales the power, packing and costs that enhance usage through both hardware and software. AC realizes the idea of enablement by shifting existing properties to higher-order business.

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PERFORMANCE COMPARISON OF FEEDING TECHNIQUES OF MICROSTRIP ANTENNA

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Abstract- In this paper we are comparing the performance of direct coupled feed antenna and parasitically coupled antenna. In direct feed antenna a four element microstrip antenna is directly fed through a collective feed network using T-junctions and quarter wave transformers while in a parasitic feed antenna the size of the feeding network constricts which results in a smaller size for the array. This paper also includes the radiation characteristics of the two different feeding techniques simulated using Ansoft HFSS 13.0 software. Both the feeding techniques radiate in broadside with same bandwidth characteristics and same gain. The return loss of parasitic feed antenna also decreases by the use simple feed network.

Keywords- Direct feed array, Microstrip antenna, Mutual coupling, Parasitic feed array, Return loss, Quarter wave transformers

INTRODUCTION

Microstrip antennas have a conducting patch printed on a microwave substrate, and have the features of low profile, light weight, easy fabrication. However, microstrip antennas naturally have a narrow bandwidth and bandwidth enhancement necessary for practical applications. These antennas have wide range of applications in wireless communications. To distribute the power from the transmitter a power network must be used. In this study, the direct feed approach uses multi-layer structure of feeding the antenna array. The use of quarter wave transformers and T-junctions delivers complexity to direct feed network which in turn increases the fabrication cost. Also the performance of the antenna may be affected by the air gap between the layers. So we go for the study of single-layer structure which is parasitically fed.

DESIGN AND OPTIMIZATION OF DIRECT FEED ANTENNA

In this study the direct feed antenna radiating in broadside direction measures 72.9mm× 93.4mm designed using Teflon substrate which is 1.57mm thick with a dielectric constant of 2.2. In direct feed array the elements at the top of the array are fed in opposite direction to the elements at the bottom with a phase delay at the center to compensate the difference. The l_0 should be extremely small so that the coupling between the lines is eliminated. The antenna is optimized to operate between 5.2GHz to 5.5GHz. This antenna's feed network occupies more space compared with the size of radiating elements. The ohmic losses corresponding to the feed network can be minimized if the feed network is eliminated.

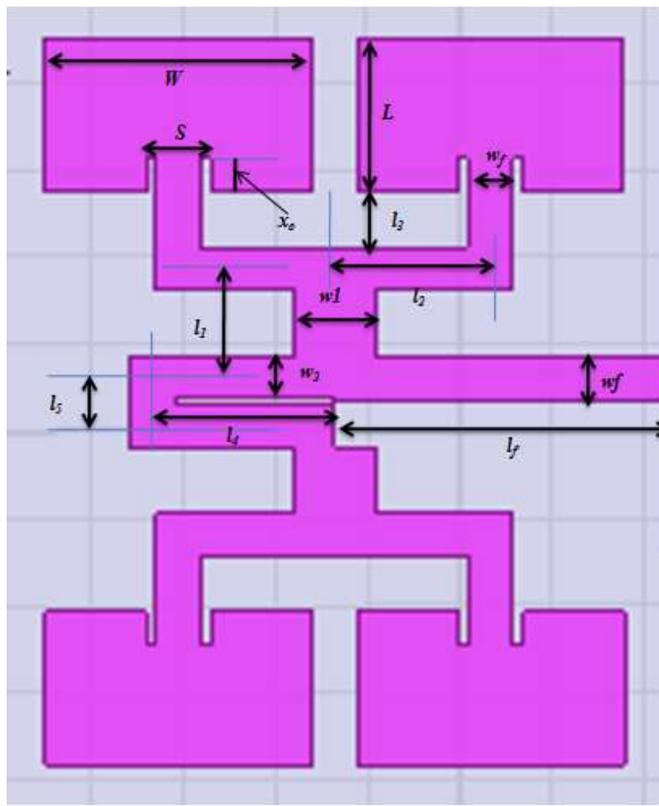


Fig.1 A four element direct feed array radiating in broadside direction.

Parameter	Value
w_f	4.87mm
l_f	25.0mm
x_o	3.86mm
S	7.01mm
W	29.02mm
L	17.60mm
l_1	12.39mm
l_2	17.06mm
l_3	6.47mm
l_4	9.84mm
l_5	20.86mm
l_6	10.00mm
w_1	8.7mm
w_2	7.39mm

Table1: Dimensions of four element direct feed array.

To avoid this complex feed network and to simplify the design and fabrication we go for parasitically coupled antenna. The patch elements in this design are not attached to the microstrip feed but are excited through a capacitive gap. Here, for the parasitically

coupled array we indicatively consider radiation in the broadside direction. The former goal is to inspect if this new design has any potential to compare its performance with that of direct feed antenna.

PERFORMANCE OF THE PARASITICALLY FED ANTENNA

A technique for improving the performance of the antenna using a single layer parasitic feed is shown. With respect to the mentioned antenna in fig.2, a parasitically fed array is optimized for the design frequency band of 3 to 7GHz. The dimensional parameters of parasitically feed antenna are given in Table2 which measures about 71.0mm X 55.3 mm.

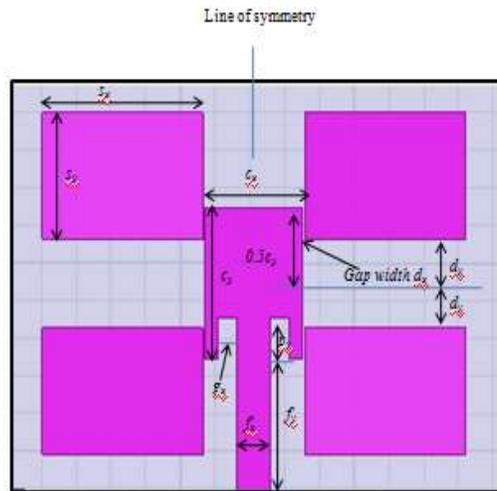


Fig.2. Parasitically fed array configuration.

Parameter	Value	Parameter	Value
c_x	14.14mm	s_x	23.11mm
c_y	20.01mm	s_y	16.93mm
f_x	4.89mm	d_x	0.25mm
p_y	17.50mm	d_y	5.86mm
p_y	5.50mm	d_z	2.64mm

Table2: Dimensions of parasitic feed array

COMPARISON OF DIRECT FEED AND PARASITIC FEED ARRAY ANTENNA

In this section, the performance of the parasitically fed array is compared with that of direct feed antenna array. The antenna is characterized by antenna gain, impedance matching, radiation pattern and efficiency. The return losses, VSWR, radiation patterns, are shown in Figs. 3.1(b), 3.2(b), 3.3(b), respectively. In majority of the bandwidths the efficiency of parasitically fed antenna slightly better than that of direct feed antenna.

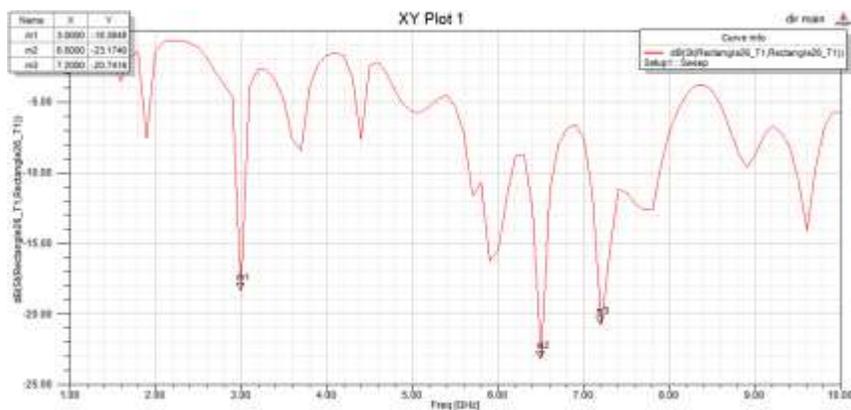


Fig. 3.1(a) reflection coefficient versus frequency of direct feed antenna

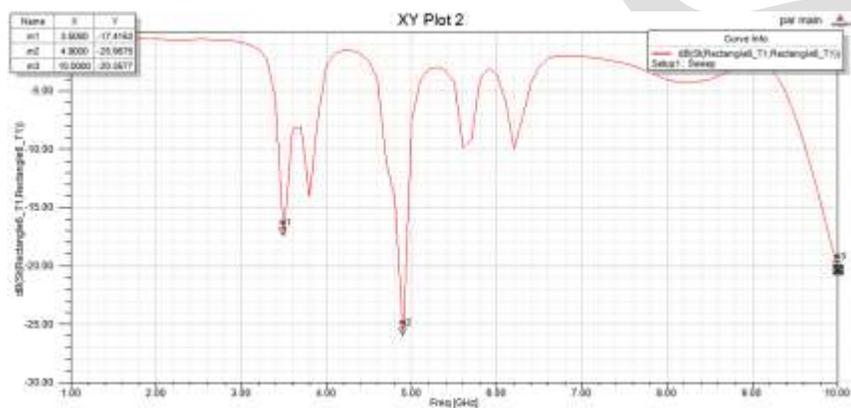


Fig. 3.1(b) reflection coefficient versus frequency of parasitic feed antenna

In parasitic feed antenna the amount of waves reflecting back to the source decreases which in turn increases the overall gain of the antenna

$$\text{Return loss} = -20 \log \frac{Z_a - Z_0}{Z_a + Z_0}$$

Where Z_a is the antenna input impedance and Z_0 is the measurement characteristic impedance.

The VSWR, which can derive from the level of reflected and incident waves, is also an indication of how closely or efficiently an antenna terminal input impedance is matched to the characteristic impedance of the transmission line. Most wireless system operates at 50 Ohm impedance. A VSWR of 1 indicates an antenna impedance of exactly 50 ohms.

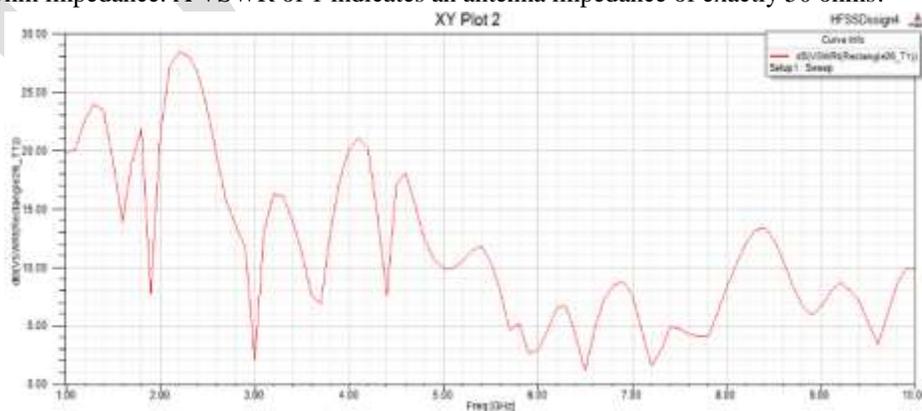


Fig. 3.2(a) VSWR of direct feed antenna

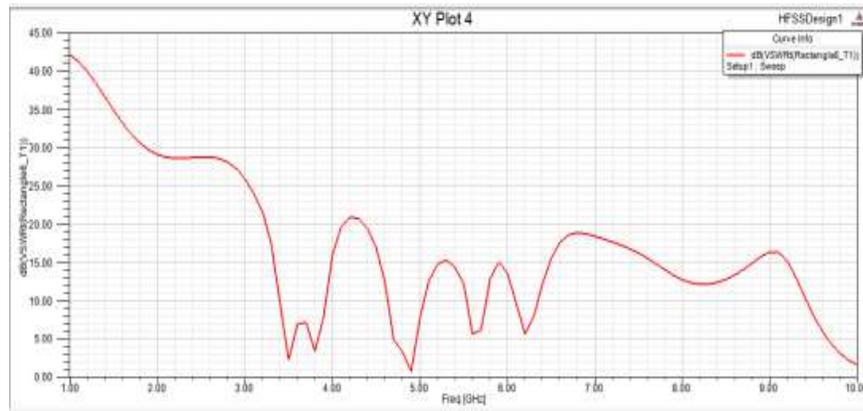


Fig. 3.2(b) VSWR of parasitic feed antenna

The radiation pattern of both the antennas that are compared is shown below. That is, the antenna's pattern describes how the antenna radiates energy out into space (or how it receives energy).

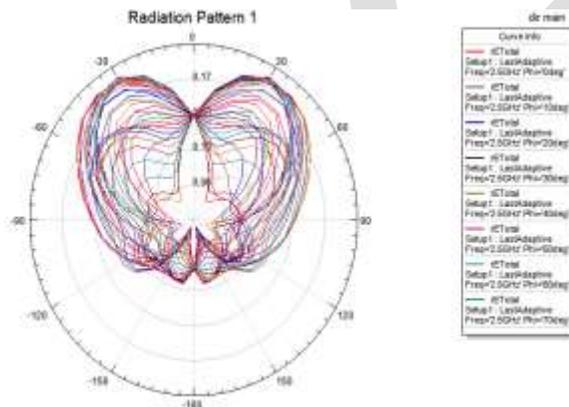


Fig. 3.3(a) radiation pattern of direct feed antenna

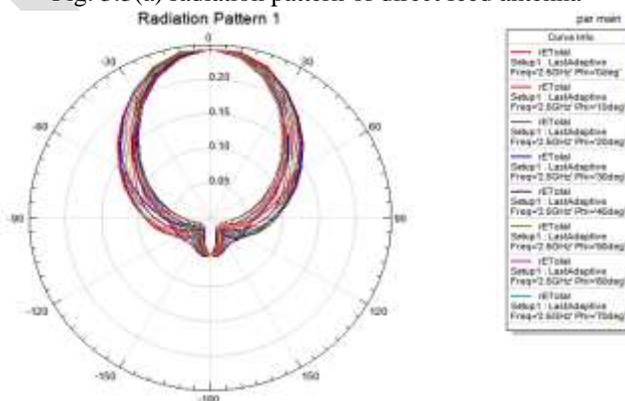


Fig. 3.3(b) radiation pattern of parasitic feed antenna

An antenna radiates energy in all directions, at least to some extent, so the antenna pattern is actually three-dimensional. The antenna patterns (azimuth and elevation plane patterns) are frequently shown as plots in polar coordinates. This gives the viewer the ability to easily visualize how the antenna radiates in all directions

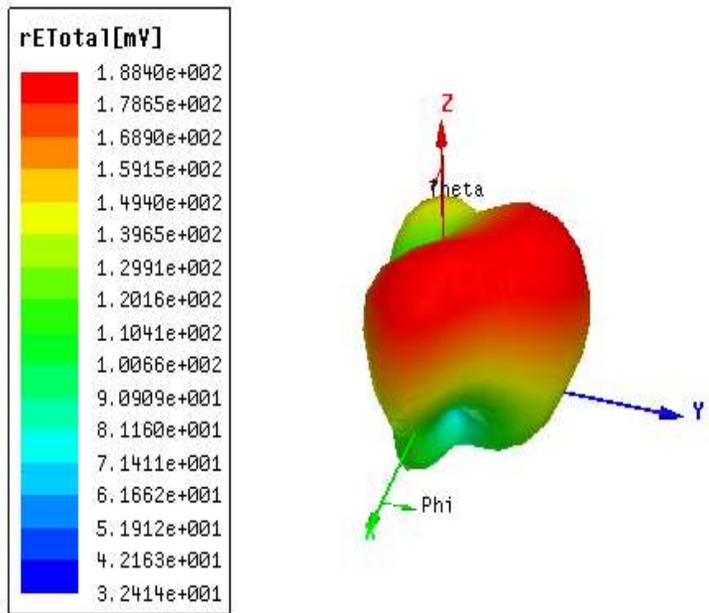


Fig.3.4(a). 3D Gain of direct feed antenna

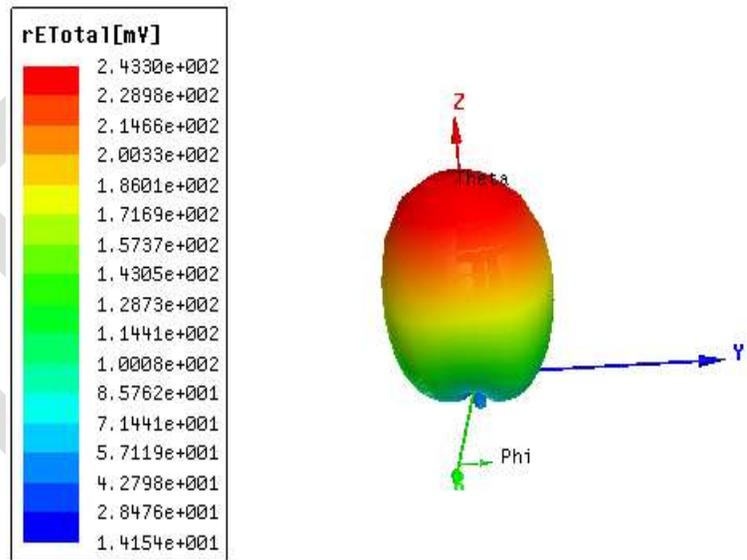


Fig.3.4(b) 3D Gain of parasitic feed antenna

The bandwidth, efficiency and broadside gain of parasitic feed antenna in general are similar to those of the direct fed antenna array. The performance of the antenna is summarized in Table3. The efficiency of parasitic feed antenna is slightly better than that of the direct fed array.

Parameter	Frequency (GHz)	Return loss (dB)	VSWR
Direct feed	3	-16.5	1.352
	6.5	-23.1	1.151
	7.2	-21	1.196
Parasitic feed	3.5	-17.5	1.308
	4.9	-26	1.106
	10	-20	1.222

Table3: Comparison of feeding techniques

OTHER COMPARISONS

As the feeding techniques are different further comparisons should be performed to justify the parasitic feeding approach.

COMPARISON BASED ON PATCH SIZE AND SEPERATION

In this subsection, the radiation pattern of parasitic feeding antenna is compared with that of the direct feeding approach using the same element size and spacing. The feeding network feeds the elements in the same phase for broadside radiation, as well as for impedance matching. The patch size and element spacing of direct feed antenna is the same as those of parasitic feed.

A LIST OF COMPARISONS

In this subsection comparison of bandwidth, gain, efficiency of single layer and multi layered structure antennas are compared. A list of comparisons is given in Table.3. The bandwidth, efficiency and broadside gain of parasitic antenna are similar to those of the direct feed antenna array. However the size and substrate of both the antennas is different. Recent research [2]–[4] has used multi-layer structures in constructing broadside arrays that result in a smaller size or higher gain, but the approach causes an increase in complexity in terms of both production and in the integration of other circuit components on the same printed circuit board. On Teflon substrate the gain of the multi-layer array (11.1 dBi) [3] is similar to that of single layer arrays, but the efficiency of the multilayer is (>91%) is higher than that of the single layer. Whereas, the multi-layer array on the LTCC substrate [4] has a smaller gain (7.17dBi) with a total of eight elements as this array is made for 10mm² MMIC chip. In this illustration, the parasitic feeding techniques can be used to simplify the feeding network, resulting in smaller size and similar performance while the structure is maintained as a single layer.

CONCLUSION

The comparison of two feeding techniques to a four element microstrip single layer patch array is done in this study. The first approach was a directly fed array with T-junctions and quarter waveforms and the second was a parasitically fed array. As a result of simple feeding system, the size of parasitically fed array decreases and the maximum obtained efficiency is higher. The other characteristics of the parasitically fed array such as impedance, bandwidth and maximum broadside gain, are similar to those of the direct fed array.

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FOG COMPUTING: REVIEW OF PRIVACY AND SECURITY ISSUES

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Abstract— Fog computing extends cloud computing, cloud computing provide data, compute, storage, and application services to end-user, also the fog computing also provide the services like data, compute ,storage and application to end user. Security and privacy issues are mention in paper. The security solution are available for cloud computing, but they are not useful to fog computing because fog devices working at the edge of the network.

Keywords— cloud computing, fog computing, Man-in-the-Middle Attack, PKI, HAN, WLAN, hijacked.

1. INTRODUCTION

Fog computing is a new standard that exploits the profits of virtualized IT infrastructures closer to end users. In a shell, Fog computing offers an attractive mixture of computational power, storage capability, and networking facilities at the edge of the networks, in Fog computing, facilities can be presented at end devices such as set-top-boxes or access points. The infrastructure of this new scattered computing allows applications to run as close as possible to detected actionable and considerable data, approaching people, methods and thing. Such Fog computing concept, truly a Cloud computing near to the 'ground', creates automated reply that drives the value.

2. SECURITY AND PRIVACY IN FOG COMPUTING

Security Issues

The security issue are authentication at various level of gateways or at the smart meters installed in the customer's home, the ip address has assign to every smart meters or smart appliances, A malicious user can either tamper with its private smart meter, report false readings, or spoof IP addresses. There are some solution should be present for the authentication problem such as public key infrastructure (PKI), another is Diffie-Hellman key exchange [1].

The smart meter encrypt the data and send to the Fog device like a home-area network (HAN) gateway. HAN decrypt data and aggregate the result and pass this decrypt data forward. Intrusion in smart grid can be can be detected using either a signature-based method in this method patterns of behaviour are checked or observed against an already existing database of possible misconducts [7]. Intrusion can also be captured by using an anomaly-based method in which an observed behaviour is compared with expected behavior to check if there is a deviation.

A. An Example: Man-in-the-Middle Attack

Man-in-the-middle attack has potential to become a typical attack in Fog computing. In this part take a Man-in-the-Middle Attack as example to expose security problem in Fog Computing. In this attack the, gateways serving as Fog devices may be compromised or replaced by fake ones. Cases are KFC or Star Bar customers connecting to malicious access points which provide deceptive SSID as public legitimate ones [7]. Attackers take the control of gateways when Private communication of victims will be hijacked.

1) **Environment Settings of Stealth Test:** Man-in-the-Middle Attack can be very stealthy in Fog computing. Small amount of resources in Fog devices, such as negligible CPU consumption and memory consumption are consumed by this type of attack. Therefore, traditional anomaly detection methods can hardly expose man-in-the-middle attack without noticeable features of this attack collected from the Fog. In order to observe how stealthy the man-in-the-middle attack can be, implement an attack environment displayed in Figure 1[7]. In this section, a 3G user sends a video call to a WLAN user. Since the man-in-the-middle attack needs to control the communication between the 3G user and the WLAN user, the key of this attack is to cooperation the gateway which serves as the Fog device. There are two step to determine the man-in-the-middle attack for the stealth test. First, we need to cooperation the gateway, and second, we insert malicious code into the cooperated system.

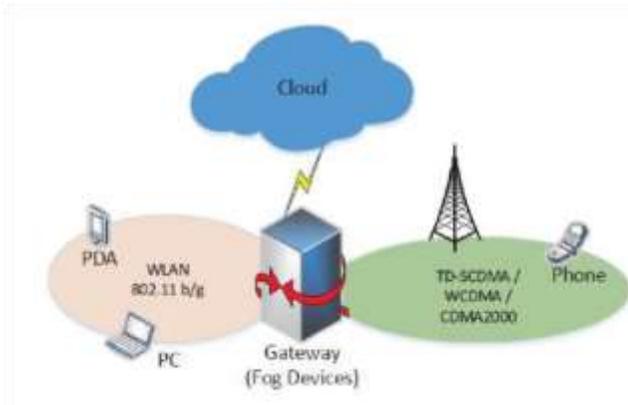


Fig. 1 A scenario for a man-in-the-middle attack towards Fog

2) **Work Flow of Man-in-the-Middle Attack:** Gateway need to translate the data of different protocols into the suitable formats when the 3G and WLAN communicate. Therefore, all the communication data will firstly arrive at the gateway and then be forwarded to other receivers. The man-in-the-middle attack is separated into four steps. The exemplify hijacked communication from 3G to WLAN in Figure 2, the embedded hook process of the gateway redirects the data received from the 3G user to the attacker present in first two process. The attacker replays or modifies the data of the communication at his or her individual computer, and then send the data back to the gateway, and fourth process the gateway forwards the data from the attacker to the WLAN user. In detail, the communication from the WLAN user will also be redirected to the enemy at first, and then be promoted by the hook in the gateway to the 3G user. We can understand noticeably from Figure 2 that the attacker can monitor and modify the data sent from the 3G user to the WLAN user in the ‘middle’ of the communication.

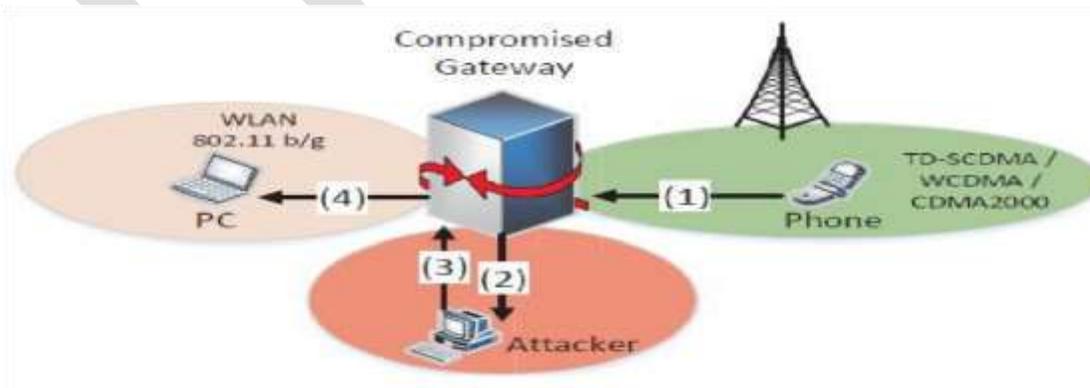


Fig. 2 The hijacked communication in Fog (e.g. from phone to PC)

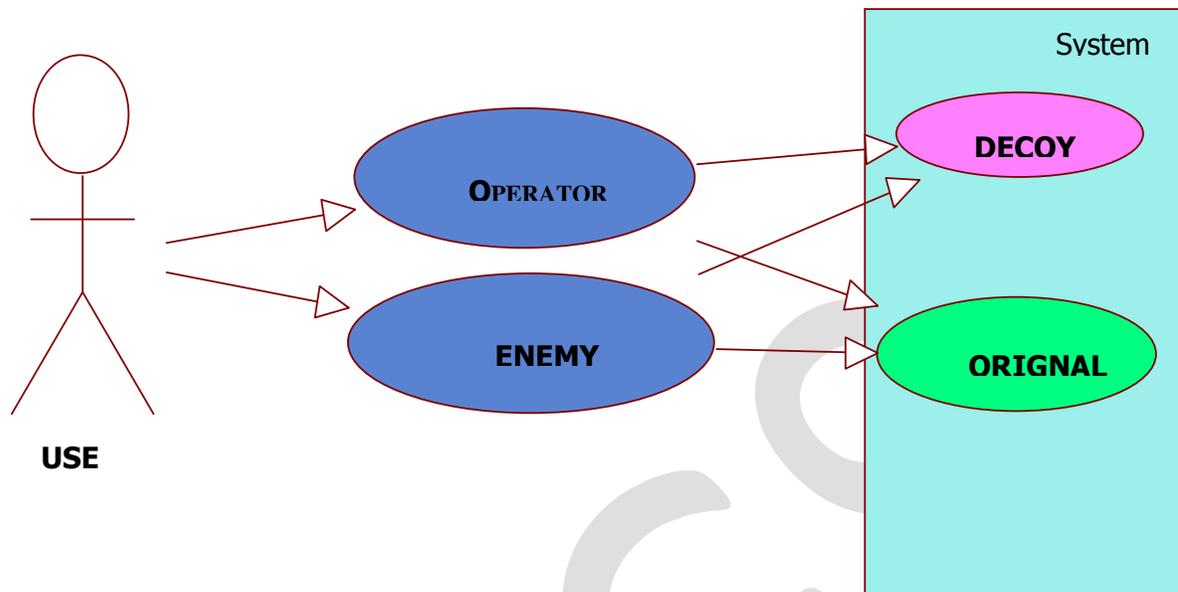


Fig. 3 Decoy System

B. Privacy Issue

In smart grids, privacy issues deal with hiding particulars, such as what appliance was used at what time, while permitting accurate summary information for accurate charging. Described an efficient and privacy-preserving aggregation scheme for smart grid communications [1]. The homomorphic technique used in the privacy issue, a homomorphic function takes as input the encrypted data from the smart meters and produces an encryption [1]. *Ivan Stojmenovic and Sheng Wen* mention their paper that the Fog device cannot decrypt the readings from the smart meter and interfere with them. This ensures the privacy of the data collected by smart meters, but does not promise that the Fog device transmits the correct report to the other gateways.

For data communications from user to smart grid operation center, data aggregation is performed straight on cipher-text at local gateways without decryption, and the aggregation outcome of the original data can be obtained at the operation center [7]. Authentication cost is reduced by a batch verification technique

C. Securing Cloud Computing Using Fog Computing

Salvatore J. Stolfo and Malek Ben Salem proposed extra security propose a different approach for securing data in the cloud using offensive decoy technology. By monitoring data access in the cloud detect abnormal data access patterns, and launch a disinformation attack by returning large amounts of decoy information to the attacker. This defends against the misuse of the user's real data.

- 1) Decoy System-Decoy data, such as decoy documents, honeypots and other fake information can be generated on demand and used for detecting unauthorized access to information and to 'poison' the thief's ex-filtrated information. The Decoy will confuse an attacker into believing they have ex-filtrated valuable information, when they have not. When unauthorized and abnormal access to a cloud facility is noticed, decoy information may be returned by the Cloud and delivered in such a way that it appear completely normal and legitimate. The owner of the information called legitimate user they would readily. We use this technology to launch disinformation attacks against malicious insiders, preventing them from distinctive the real sensitive customer data from fake worthless data the decoys, then, help two purposes:

- (1) Validating whether data access is authorized when abnormal information access is detected.
- (2) Confusing the attacker with fake information.

Applied above concepts to detect unconstitutional data access to data stored on a local file system by attackers who view of legitimate users after stealing their credentials [8].

- 2) **User Behavior Profiling**-It is expected that access to a user’s information in the Cloud will exhibit a usual resources of access. User profiling is a familiar technique that can be applied here to model in what way, at what time, and how considerable a user accesses their information in the Cloud. Such ‘normal user’ behaviour can be continuously checked to determine whether abnormal access to a user’s information is arising. This method of behaviour-based security is commonly used in fraud detection applications. According to *Salvatore J. Stolfo and Malek Ben Salem*, this is possible pretenses attack. Based on these assumptions they developed the model with the help of one class modelling technique named as one class provision vector machine. Advantage of one class support vector over two class is it has ability of building classifier without sharing data from other users. The privacy of user data is persistent. Investigates done by them indicate that we could reliably detect masquerade attacks using this approach with a very low false positive rate of 1.12% [2]

3. CLOUD Computing VS FOG Computing

Sr.no	1	2	3	4	5	6
Condition	Latency	Delay Jitter	No. of server nodes	Security	Location awareness	Support for Mobility
Cloud Computing	High	High	Few	Undefined	No	Limited
Fog Computing	Low	Very low	Very large	Can be defined	Yes	Supported

ACKNOWLEDGMENT

I would like to thank my honourable Principal Dr. R. P. Singh, my Head of Department, Prof. D. D. Patil, & my special thanks to my class teacher ,prof. R.P. Chaudhari & sincere thanks to prof .L. D. Panjwani and all the respected teaching faculties of department of computer science & engineering. Also I would like to thank my parents, friend for motivating me in this paper work activity. My special thanks to all the writers of reference paper that are referred by me.

CONCLUSION

The author Salvatore J. Stolfo, Malek Ben Salem and Angelos D. Keromytis investigate Fog computing advantages for services in several domains, and provide the analysis security issues in current paradigm. Some innovations in compute and storage may be inspired in the future to handle data intensive services based on the interplay between Fog and Cloud.

Future work will expand on the Fog computing paradigm in Smart Grid in this concept two models for Fog devices can be developed. Self-regulating Fog devices consult directly with the Cloud for periodic updates on charge and demands, while connected Fog devices may check each other, and create coalitions for further enhancements.

Fog devices are geographically distributed over diverse platforms. Service mobility across platforms needs to be optimized [1].

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Adequacy Evaluation of Electrical Distribution System with DG using MCS

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Abstract— In the last few decades, due to the growth of load demand, the operation, maintenance and control of power system have become a challenging task. To meet the load requirements, many noticeable research activities are going on in the field of deregulation, restructuring of power system, utilization of renewable energy sources and installing small generators at the load centre referred to as Distributed Generation (DG) etc. Furthermore, among many different types of DG units, renewable DG units are widely accepted.

In this paper, adequacy evaluation of the electrical distribution system with DG has been proposed. This concept deals with installation of additional capacity with the existing capacity for supplying load, which is provided by renewable DG units. Reliability index such as average unsupplied load (AUL) is calculated using Monte Carlo technique, and it is tested by considering IEEE RTS system as a base case for analysis.

Keywords— Adequacy Assessment, Renewable wind energy, Monte Carlo simulation, Distribution system, Distributed generation, IEEE RTS, Reliability index.

INTRODUCTION

The main objective of power system is to supply electrical energy as economically as possible with an acceptable degree of reliability and quality.

For conducting reliability assessment of power system, the system is divided into three hierarchical levels. 1st level (HL1) consists of evaluation of generation system, 2nd level (HL2) consists of combined evaluation of generation and transmission systems, 3rd level (HL3) consists of combined evaluation of all the main sectors of power system, i.e. generation, transmission and distribution system. Due to the complexities in HL3, only distribution system is taken into account for analysis of reliability evaluation of power system. Fig 1 represents hierarchical levels of reliability assessment.

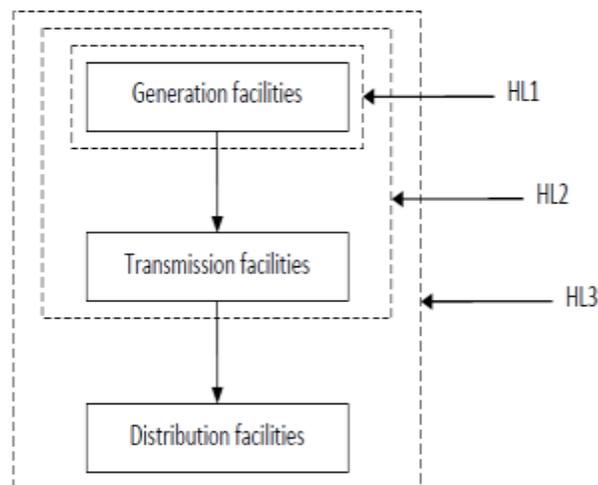


Figure 1: Hierarchical levels for reliability assessment.

The reliability assessment of a distribution system can be evaluated by two attributes: adequacy and security. Adequacy evaluation specifies the ability of the system to supply the accumulated electrical energy requirements of customers within component

ratings and voltage limits, even when expected and unexpected component outages occur. Security evaluation specifies to the ability of power system to withstand the disturbances arising from faults or equipment outages. Most of the research work is carried out considering security as an aspect of reliability evaluation with DG and only a few are conducted considering adequacy requirement. In [5] adequacy of a distribution system is assessed with consideration of distributed generation. Present work concentrates on adequacy of a distribution system with renewable wind energy based DG; natural variation of wind speed assessed by sequential time series and amount of power generation calculated using probabilistic method.

Distributed generation (DG) is commonly used in small-scale (1 KW–50 MW) electric power generators that produce electricity at a site close to customers or that are connected to an electric distribution system. It includes combustion gas turbines, fuel cells, solar, wind turbine and electric vehicles etc. Due to the improvements in distributed generation technology, some amount of spare capacity is also added at the customer sites. DG assures sufficient and acceptable continuity of supply, in the event of failure in the generation, distribution, and transmission systems. The degree of redundancy has to be proportionate with the requirement, that the supply should be as profitable as possible. It is necessary that maximum reliability is achieved within a given set of economic constraints. DG units are closer to customers so that transmission and distribution costs are avoided or reduced. It is straight forward to find sites for small generators than for large ones.

Probabilistic methods are used throughout this paper to provide new substantial information to be used in design and are innovative in planning and allocation. There are two fundamental approaches for probabilistic interpretation of reliability of power systems namely a method followed by Roy Billiton (analytical method) and Monte Carlo Simulation. Analytical method performs the system by mathematical models and uses straight forward analytical solutions to perform theory based reliability indices from the model. Monte Carlo Simulation estimates an experimental reliability index by simulating the actual random behavior to the system. Whatever approach is used, the predicted indices are valuable as the derived models. In this paper, MCS approach is used for calculating distribution adequacy indices.

PROBLEM DESCRIPTION

In this section, adequacy evaluation of an electrical distribution system with DG is described. The assumptions considered are,

1. Renewable DG used is wind power generation.
2. Hourly load characteristic of Distribution system is known a priori.
3. Due to future load growth, distribution systems may not be able to supply required load and hence additional energy is required. To avoid expansion of substation, DG installed close to them.

The interpretation of ability of a distribution system for satisfying the total system load is done as a part of adequacy assessment. Certainly the average amount of energy not supplied is given as adequacy index. MCS is used for distribution system adequacy assessment to endure the randomness of power generation in wind turbines. The subsequent control strategies are applied throughout the study.

- Unit power factor is maintained for all wind based DG.
- The data needed for MCS is naturally varying wind speed. The average hourly values are considered and the variation within the hour is not considered.
- Wind-based DG output power is regulated and used for satisfying load. Extra energy will be stepped up to grid.
- All DG ratings are considered in MW.

TIME SEQUENTIAL WIND SPEED SIMULATION

The necessary condition in time sequential simulation is to generate artificial operating histories of the wind speed (WS). The energy generated by DG depends mainly on values available at generation substation. The values such as wind speed and solar density radiation are different in various locations and are not predictable. Modeling of renewable DG plays a vital role in distribution system planning in presence of these resources. Thus, the proposed model should be able to tolerate power generation uncertainty. In this paper, wind turbines are utilized as renewable distributed generations. Research has been done by using solar energy [8], but using wind turbines does not cause any limitation for adequacy assessment. This proposed method is also applicable for other renewable based DG.

In this approach, wind speed data from various years in wind turbine location is gathered and corresponding time sequential wind speed variation is predicted. The effect of uncertain and time varying nature of wind speed profile should be modeled in distribution system adequacy assessment procedures. In this paper sequential time varying nature of wind speed with its uncertainty is considered. According to the wind speed probability density function, probabilities of each state of DG and transition rates to up and down states are calculated. After obtaining results, it is possible to calculate the sequential variation of wind speed using Monte Carlo simulation.

The following assumptions have been made,

- 1) The WS model is statistically stationary, i.e. random behavior of the WS is same at all points of time regardless of the point of time being considered.
- 2) The transition probability from a given WS state to another state is directly proportional to the average probability of the new state.
- 3) Transitions between WS states and Wind turbine states are independent of each other.

The sequential time series of wind speed is calculated for each simulation year as explained in fig 2.

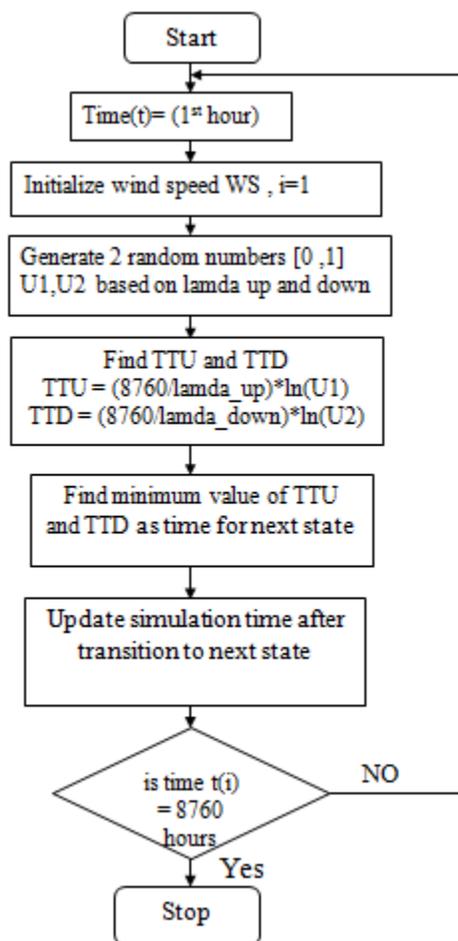


Figure 2. Flow chart to generate sequential time series wind speed

In fig 2, Lamda up and lamda down are up transition and down transition rates respectively. TTU and TTD are time to up and time to down respectively. The smallest of two values calculated defines the present WS movement and duration in a present state (example, if $TTU < TTD$, indicates that the current WS goes to upper state after TTU seconds).

A WS time series is thus obtained used in the Monte Carlo technique. The advantage of this approach is that it considers the natural variation of WS, and allows for a more realistic simulation. The disadvantage is the long computation time to calculate the time series based wind speed at every sampled year, but that can be overcome by defining and storing a set of artificial WS time series

before simulation, and calling them during computation. Since WS series is not calculated yearly computation time would be sensibly reduced.

WIND POWER GENERATION

By using time varying wind speed depending on cut out and cut in speed, wind power generation is calculated for each turbine using (1)

$$W_p = \begin{cases} 0 & S \leq S_{ci} \\ S_{rated} * \frac{(s_i - s_{ci})}{(s_r - s_{ci})} & S_{ci} \leq S \leq S_r \\ S_{rated} & S_r \leq S \leq S_{co} \\ 0 & S_{co} \leq S \end{cases} \quad (1)$$

Where, S_{ci} , S_{co} and S_r are the cut-in, cut-out and rated wind speed respectively, W_p is the output power of wind turbine.

After generating hourly wind speed time series and converting it into power generation using (1) for each wind turbine and summation of all wind turbines power generation is calculated using (2). Total power generation by each wind turbine is given by

$$P_{WT} = \sum_{m=1}^N (1 - FOR_m) * W_{P_m} \quad (2)$$

Where, P_{WT} is the power generated by wind turbine in m^{th} node in MW, FOR_m is the forced outage rate of m^{th} wind turbine. Simultaneous outages of two or more wind turbines are eliminated.

ADEQUACY ASSESSMENT USING MCS

In order to calculate adequacy of distribution system Total available capacity is calculated by

$$P_{Total} = P_T + P_{WT} \quad (3)$$

Where, P_T is Transmission capacity of substation, P_{DG} is total power generated by DG. After getting total available capacity, unsupplied load is calculated by superimposing weekly load and the available system capacity.

Accordingly, the system available margin is calculated. If this margin is positive, system capacity is adequate to supply load. If margin is negative then the system is not adequate. The distribution adequacy indices calculated by

$$AUL = \left| \frac{\sum \text{Negative Margin in MW}}{8760 * M} \right| \quad (4)$$

M is the number of Monte Carlo experiments.

Advantage of using Monte Carlo method for simulation is that it grants to model systems that are too complex for an analytic solution and it also grants to simulate uncertainty. Even when a design has a few uncertain parameters, it will operate in almost any uncertainty condition. While designing a system that will perform over a long period, simulating how it will operate over its entire lifetime comprises all kinds of uncertainty. Monte Carlo method is used to predict the tendency of failure after a certain time.

One drawback of Monte Carlo method is that they can involve running thousands of iterations of a single model. Literally, the more composite the system being simulated or the more uncertainty it contains, the more simulations had to be run. It can sometimes take days to run a complex model hundreds or thousands of times.

IEEE reliability test system.

The adequacy assessment of the distribution system is implemented in MATLAB Software and tested for 66/11 KV distribution substation.

The 66/11 KV distribution substation has capacity of 3400 MW to serve loads, with respect to operational limitations; the single line diagram of the system is shown in Fig. 3. This system supplies different combinations of loads. All loads are fed from 11-kV buses and weekly peak load value is considered for calculations of indices. Distribution substation peak load is 2850 MW. If the detailed value of hourly load variation is available, the proposed method can also be used for satisfying hourly load conditions. The annual peak load curve per hour is given in Fig. 4. The data required for load model is obtained from IEEE reliability test system given in reference [1].

Adequacy assessment done in two steps: 1. Determination of AUL without DG, 2. Determination of AUL with DG.

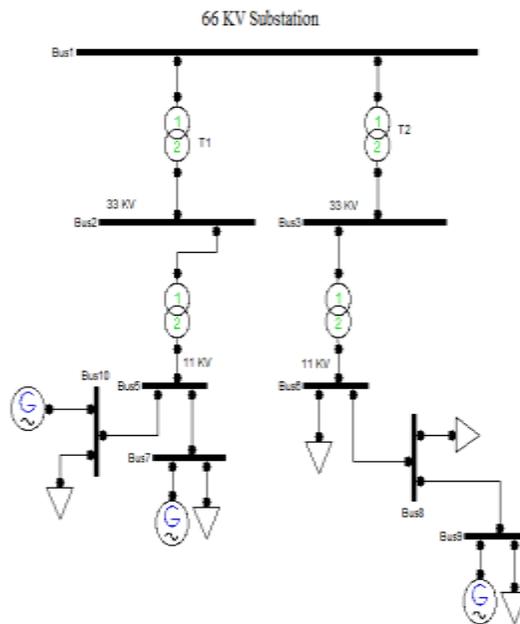


Figure 3. Single line diagram of distribution system.

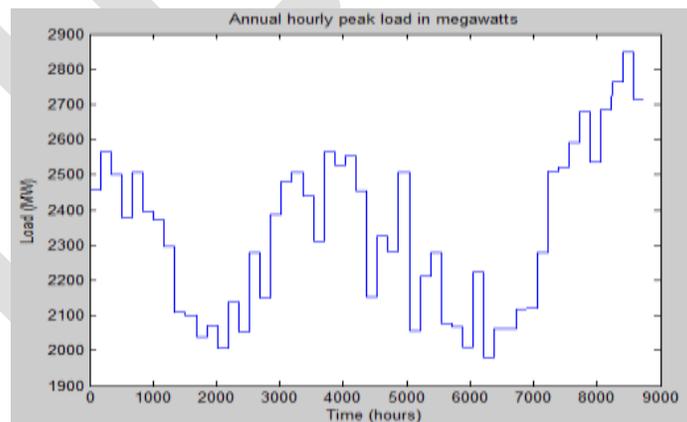


Figure 4. Peak load curve of one year.

A. Determination of the AUL Without DG

In this section, the available system margin is obtained by deducting the peak load from the transmission power P_T per hour. The estimated system margin for a sample year is shown in Fig. 5. From this figure it is noticed that substation transmission capacity is not capable of satisfying the required demand and therefore it is necessary to increase the overall system capacity. To estimate the required energy to meet the demand, hourly based negative margin at each hour during the sample year is recorded. Fig. 6 shows the distribution of the recorded negative margins per sample year. The maximum requirement of energy between the transmission capacity and peak load obtained is 380MW.

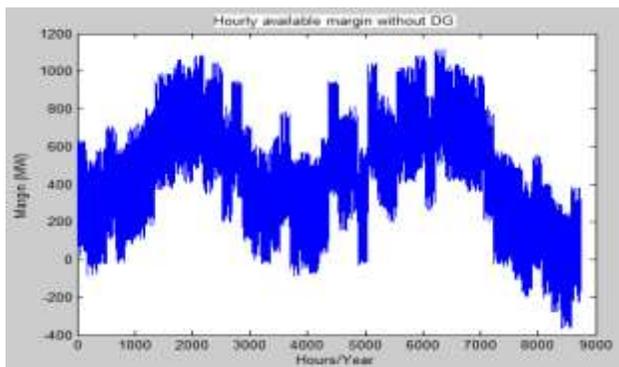


Figure 5. Hourly available system margin for one year

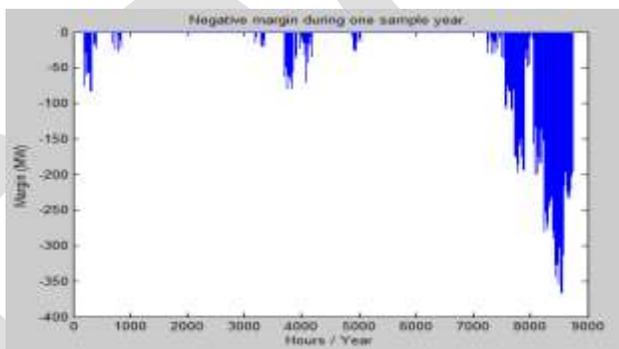


Figure 6. Negative margin without DG.

This result shows a high deficiency of the system. In order to estimate the AUL for any year, Monte Carlo Technique was performed for many sample years. The average amount of unsupplied load for each hour was calculated using (4). Fig. 7 shows calculated AUL using MCS. The AUL found to be 6.157 MW for each hour of the year. This figure shows the great need of substation capacity in order to meet the system load demand.

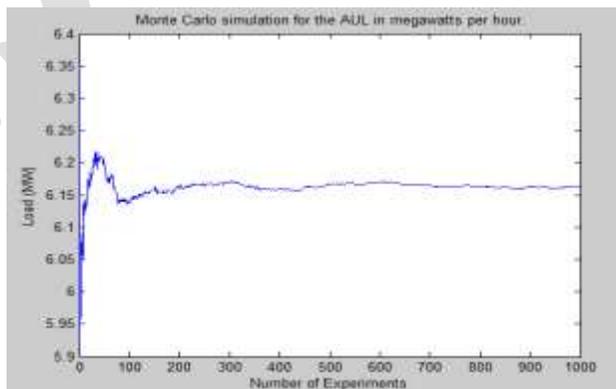


Figure 7. MCS for Average Unsupplied Load in MW

B. Determination of the AUL With DG

In this section, wind turbines are assumed to run in parallel with the existing system. In order to calculate wind power, Wind speeds are predicted for one year using fig 2, and it's shown in fig 8.

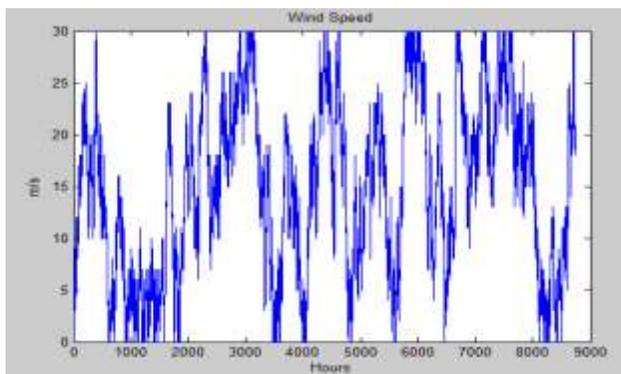


Figure 8 sequential time based series wind speed

Later, Wind speed is transformed to power generation as explained in section IV. DG location in distribution system and their failure rate, repair rate, capacities (MW) are provided in Table 1. Total available capacity P_{Total} is calculated using (3). Then the available capacity is superimposed with load curve and same procedure is followed as without DG. The results shown in Fig. 10 and those obtained from the system without DG (Fig. 7) shows that, the negative margin during the sampled year has reduced by DG running in parallel with the substation. However, the adequacy of the system calculated using indices, average amount of unsupplied load in each hour of the year.

Number	Capacity (MW)	Failure rate	Repair rate	Location
G1	20	0.001	0.003	Bus 7
G2	10	0.0024	0.005	Bus 9
G3	15	0.003	0.006	Bus 10

Table 1

The simulation for number of sample years is shown in Fig. 10. The AUL in each hour is 2.1 MW. Therefore, by implementation of wind turbines, adequacy index of distribution system has been improved by 65.89%. If DG is well managed it gives good support to the substation.

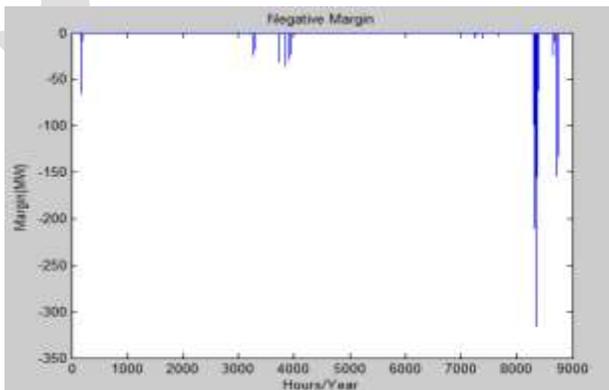


Figure 9. Negative margin with DG

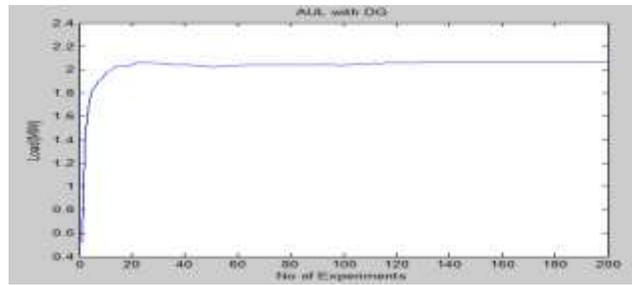


Figure 10. MCS of AUL with DG

CONCLUSION

In this work adequacy evaluation of the distribution system has been performed by considering wind energy based DG. Monte Carlo simulation technique is used for calculation of adequacy index using natural variation of wind speed. Application of the proposed approach for the test system notifies that wind energy based distributed generation can provide positive margin and could be a very good value addition to minimize the curtailment of unsupplied load value as distribution system adequacy index.

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Kinetics study of Cr(III) Adsorption onto low cost Fly Ash Adsorbent

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Abstract- Chromium removal from wastewater is becoming increasingly important both to meet discharge consents and prevent eutrophication of water resources. A series of simple batch tests were conducted to investigate the influence of fly ash dosage on chromium adsorption from synthetic wastewater containing Chromium trioxide. Chromium removal of up to 84.5% was obtained. Different adsorption and kinetic models were studied namely; Langmuir, Freundlich, First order, Second order, Factorial power and Elovich and their constants were calculated. Using K_L values, it is known that adsorption fits well in Langmuir isotherm. Second order kinetics is observed for the adsorption process carried out. Activated Fly ash is used in the treatment process. The effect of various parameters such as initial pH, contact time, adsorbent amount and initial Cr (III) concentration are studied. Adsorption capacity and adsorption intensity were calculated. Rate constants and order of the reaction were determined and final rate equation was developed.

Keywords:

Chromium removal, Chromium trioxide, Adsorption, Activated Fly ash, Adsorption capacity, Adsorption intensity.

INTRODUCTION

Advances in science and technology have brought tremendous progress in many spheres of development, but in the process, also contributed to degradation of environment all over the globe due to very little attention paid to the treatment of industrial effluents^[1]. The discharge of non-biodegradable heavy metals like Cu, Zn, Ni, Pb, Cd, and Cr into water stream is hazardous because the consumption of polluted water causes various health problems. Among these heavy metals, pollution by chromium is of major concern as chromium and its compounds are widely used in many industries such as metal finishing, dyes, pigments, inks, glass, ceramics, chromium tanning, textile, dyeing and wood preserving industries and certain glues^[2].

Leather is a material that has a reasonable mechanical resistance, good chemical stability and acceptable thermal behavior. This material is obtained by means of specific reactions among carboxylic groups of the protein fiber network of animal skin (collagen) and tanning reagents. The basic chromium (III) sulfate $[\text{Cr}(\text{OH})(\text{H}_2\text{O})_5\text{SO}_4]$ is a primary tanning agent widely used at the present time^[3]. Chromium exists in +3 and +6 oxidation states, as all other oxidation states are not stable in aqueous solutions. Both valences of chromium are potentially harmful^[4]. When chromium enters the gastric system, epigastric pain, nausea, vomiting, severe diarrhea, corrosion of skin, respiratory tract and lung carcinoma are noticed. The discharge limit from industry is less than 1 mg/l. Chromium is hazardous to health when its limit in potable water exceeds 0.5 mg/l. Several methods such as chemical precipitation, ions exchange, electrochemical precipitation, solvent extraction, reverse osmosis are being practiced for chromium removal in waste waters^[5].

These methods are cost intensive and are unaffordable for large scale treatment of wastewater that is rich in chromium. Adsorption using the activated carbon is an effective method for the treatment of industrial effluents contaminated with chromium and quite popular as compared to other methods^[6]. The cost associated with the commercial activated carbon is very high which make the adsorption process expensive^[7]. This indicates that the cost effective alternate adsorbents for treatment of chrome contaminated waste streams are needed.

MATERIALS AND METHODS

PREPARATION OF ADSORBENT:

The fly ash was collected from ACC cements, Madukarai. The composition of the fly ash was also collected from the Madukarai cement plant. The fly ash was washed with distilled water and dried at room temperature for 24 h. The activation of fly ash was carried out by treating it with concentrated sulfuric acid (98% w/w) and maintaining at the temperature range of 150°C for 24 h. Again it was washed with distilled water to remove the free acid.

CHARACTERIZATION OF FLY ASH AS ADSORBENT:

The scanning electron microscope (SEM) is a type of electron microscope that images the sample surface by scanning it with a high-energy beam of electrons in a raster scan pattern. The electrons interact with the atoms that make up the sample producing signals that contain information about the sample's surface topography, composition and other properties including electrical conductivity.

The particle size of the fly ashes was measured using a laser based particle size analyzer, a Mastersizer 2000 of Malvern Instruments Ltd. It utilizes Fraunhofer diffraction of light formed by particles with a diameter larger than the incident laser beam wavelength. A combination of an optical filter, lens and photo detector coupled with a computer loaded with Mastersizer software enables one to compute the particle size distribution from the diffraction data and store it as volume percentage against the particle size.

BATCH EXPERIMENTS:

A stock solution of Cr(III) was prepared by dissolving 1.52 g of 99.9% chrome green in distilled water and solution made up to 1000 ml. This solution is diluted as required to obtain the standard solutions containing 50-500 mg/l of Cr(III). The solution pH is adjusted in the range of 1 - 13 by adding 0.5 N HCl and 0.5 N NaOH solutions and measured by a pH meter. The batch experiments were carried out in 250 ml conical flasks by shaking a pre-weighed amount of the fly ash with 50 ml of the aqueous Cr(III) solutions for a predetermined period.

Adsorption isotherm study is carried out with different initial Cr(III) concentrations ranging from 50 to 500 mg/l while maintaining the adsorbent amount of 10 g/l. The effect of the contact time and the initial pH of solution are studied at 30°C with an initial Cr(III) concentration of 100 mg/l and an adsorbent amount of 10 g/l. The effect of the adsorbent amount is studied by varying it in the range of 2 to 16 g/l with the initial Cr(III) concentration of 100 mg/l at 30°C. The concentration of free Cr(III) ions in the effluent is determined spectrophotometrically (Elico® Double Beam UV-Vis Spectrophotometer SL 244) by developing a standard curve with different concentration of chrome green. The absorbance of the chrome green solution is read at 520 nm.

Desorption studies are conducted by batch experiments. The 15 g of saturated fly ash obtained from adsorption studies is first treated with 150 ml of 1 N NaOH solution for 1 day. After the NaOH treatment, fly ash are separated from the solution and washed with distilled water. Washed adsorbent is further regenerated with 150 ml of 1 N HCl. The fly ash washed with distilled water and dried at room temperature (~30 °C) for 6 h. Desorption experiments are carried out with different initial concentrations of Cr(III) ranging 50 to 500 mg/l.



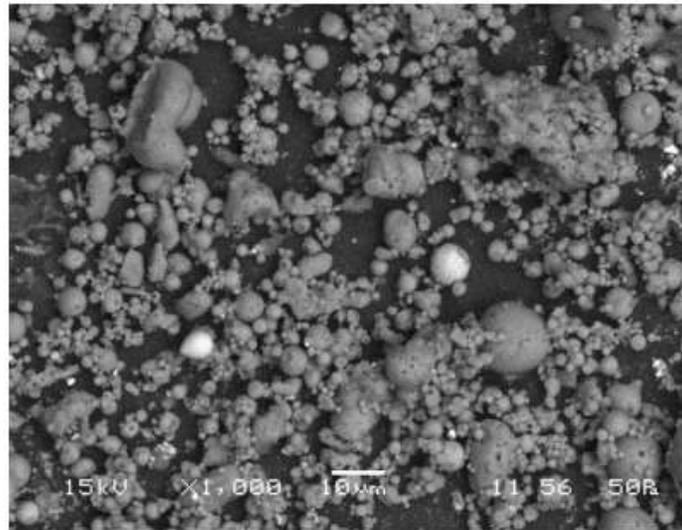
Figure 1: Chrome Green Powder and Solution

RESULTS AND DISCUSSION

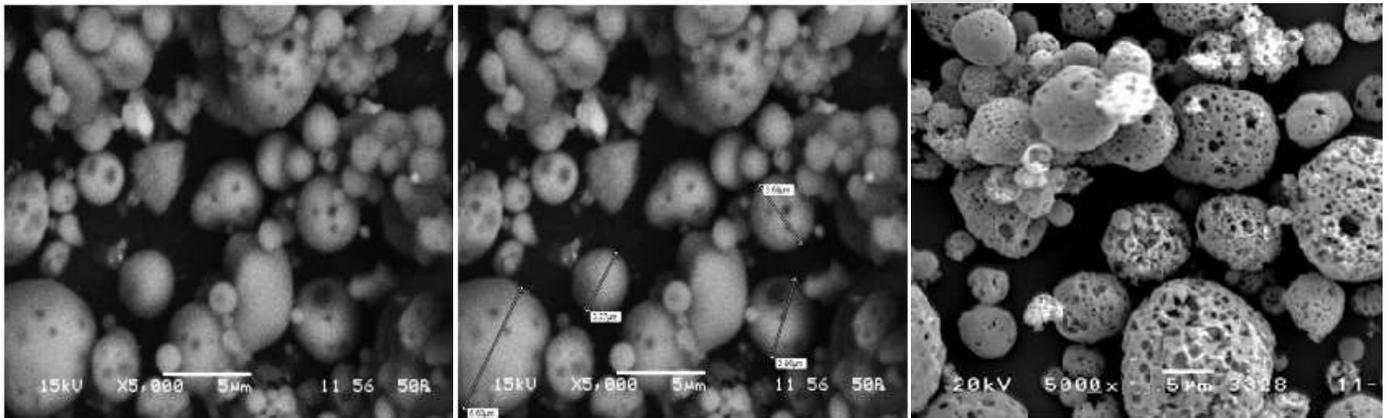
1. CHARACTERIZATION OF FLY ASH AS ADSORBENT:

The SEM analysis also shows that after activation of fly ash there are many numerous pores developed on their surface, which indicates larger surface area is available for adsorption. Thus there is a significant increase in adsorption capacity of fly ash.

SEM MICROPHOTOGRAPHS OF FLY ASH UNDER DIFFERENT MAGNIFICATION



Magnification at 1000x



Before activation

Before activation
Magnification at 5000x

After activation

Figure 2: SEM Analysis for Normal and Activated Fly ash with 1000x and 5000x Magnification

The particle size of fly ash collected from ACC cements plant was found to be Minimum-3.44 µm Mean-8.080 µm Max-18.585 µm from Figure 3. The size, density, type of reinforcing particles and its distribution have a pronounced effect on the properties of particulate composite.

PARTICLE SIZE DISTRIBUTION

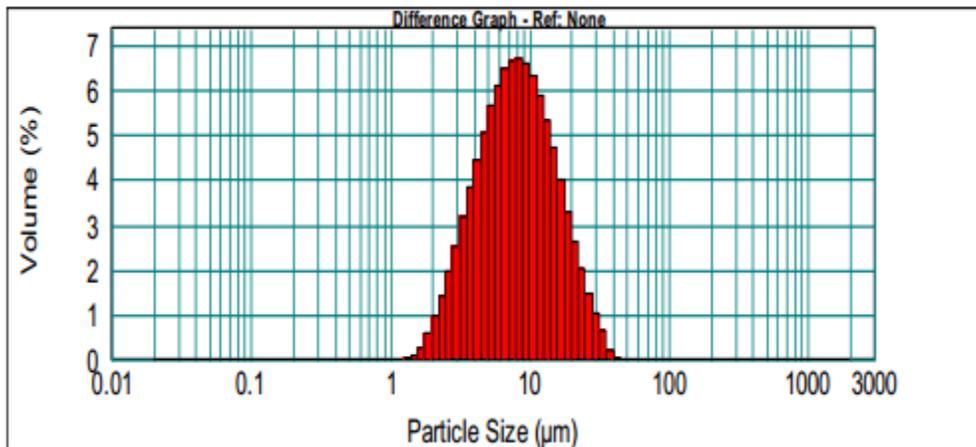


Figure 3: Particle Distribution Analysis using Mastersizer 2000

BATCH EXPERIMENTS:

In the present study, fly ash is used as an adsorbent for Cr(III) removal from aqueous solutions. Fly ash is activated by giving heat treatment and with the use of concentrated sulfuric acid (98% w/w). The effect of the activation of adsorbent was studied at 30°C with an initial Cr(III) concentration of 100 mg/l and an adsorbent amount of 10 g/l for 6 hours. There is a significant increase of 12% in the percentage removal of Cr(III) with activated fly ash as shown in Fig 4. Hence, for further batch adsorption studies fly ash with activation is used. The effect of various parameters such as initial pH, contact time, adsorbent amount and initial Cr(III) concentration are studied and discussed in detail in the following sections.

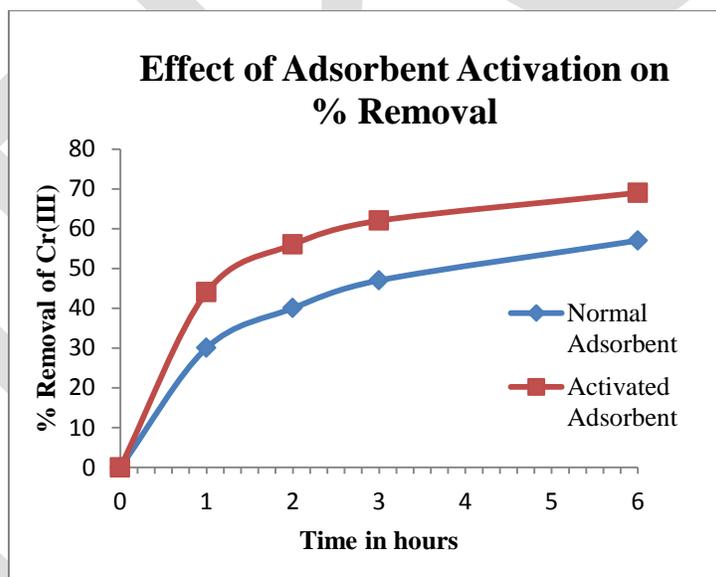


Figure 4: Effect of Adsorbent Activation on Cr(III) removal ($C_0=100\text{mg/l}$, $M=10\text{g/l}$, $t_T=6\text{ h}$)

EFFECT OF INITIAL pH

The effect of the initial pH of solution on Cr(III) removal is shown in Fig. 5. The effect of pH was studied at 30°C with an initial Cr(III) concentration of 50 mg/l and an adsorbent amount of 10 g/l for 20 hours. Removal efficiency is found increasing with increase in the initial pH and reached 84% at initial pH value of 13. Although insoluble in water, it dissolves in acid to produce hydrated chromium ions, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ while the surface of adsorbent is positively charged^[8]. Chrome green dissolves in concentrated alkali to yield chromite ions CrO^{2-} . The poly-nuclear species at a high Cr(III) concentration and hence the high pH value of 13 results in a higher percentage removal of Cr(III) using fly ash. Since there is no significant increase in the % removal of Cr(III) ions pH=9.0 is chosen to be the optimum value and the experiment is proceeded with it.

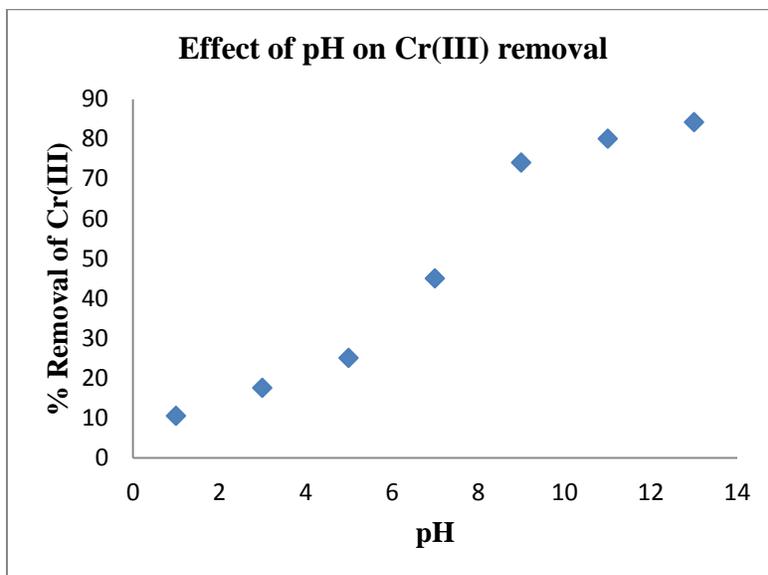


Figure 5: Effect of pH on Cr(III) removal ($C_0=50\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

EFFECT OF CONTACT TIME

Fig. 6 shows the percentage removal of Cr(III) for different values of the initial Cr(III) concentration ranging from 50 to 500 mg/l at pH value of 1. It is apparent from Fig. 6 that till 6 h, the percentage removal of Cr(III) from aqueous solution increases rapidly and reaches up to 72% to 31% of the Cr(III) removal for 50 to 500 mg/l of the initial Cr(III) concentration respectively. After that, the percentage removal of chromium (III) increases slowly till 22 h and becomes constant. A further increase in the contact time has a negligible effect on the rate of adsorption of Cr(III). Therefore, the contact time of 20 h could be considered for the adsorption of Cr(III) on fly ash for entire batch studies. The rate of adsorption of Cr(III) is faster in the initial periods and has a less effect on the rate of adsorption in later half of the process. The rate of adsorption decreases in the later stages of the Cr(III) adsorption as intra particle diffusion becomes predominant and may be due to the slow pore diffusion of the Cr(III) into the bulk of the adsorbent.

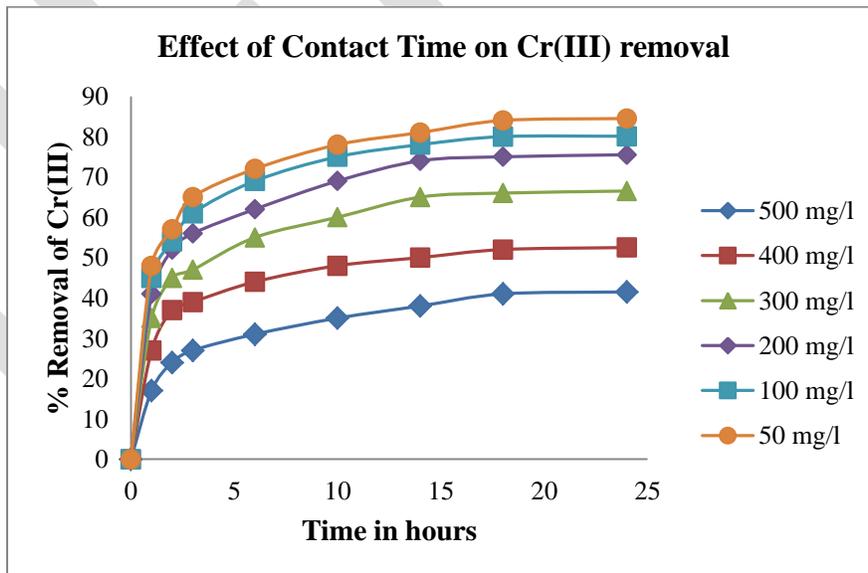


Figure 6: Effect of contact time on Cr(III) removal (pH=9.0, M=10g/l)

EFFECT OF ADSORBENT AMOUNT:

The effect of the fly ash amount on the adsorption of Cr(III) is shown in Fig. 7. The percentage removal increases from 76.4% to 83% by increasing the adsorbent amount from 2 to 16 g/l respectively and the adsorption capacity also dropped from 18.8 to 3.5 mg/g. The increase in Cr(III) removal with an increase in the fly ash amount is due to the increase in surface area and adsorption sites available for adsorption of Cr(III). However, the decrease in adsorption capacity by increasing the adsorbent amount is basically due to the sites remaining unsaturated during the adsorption process.

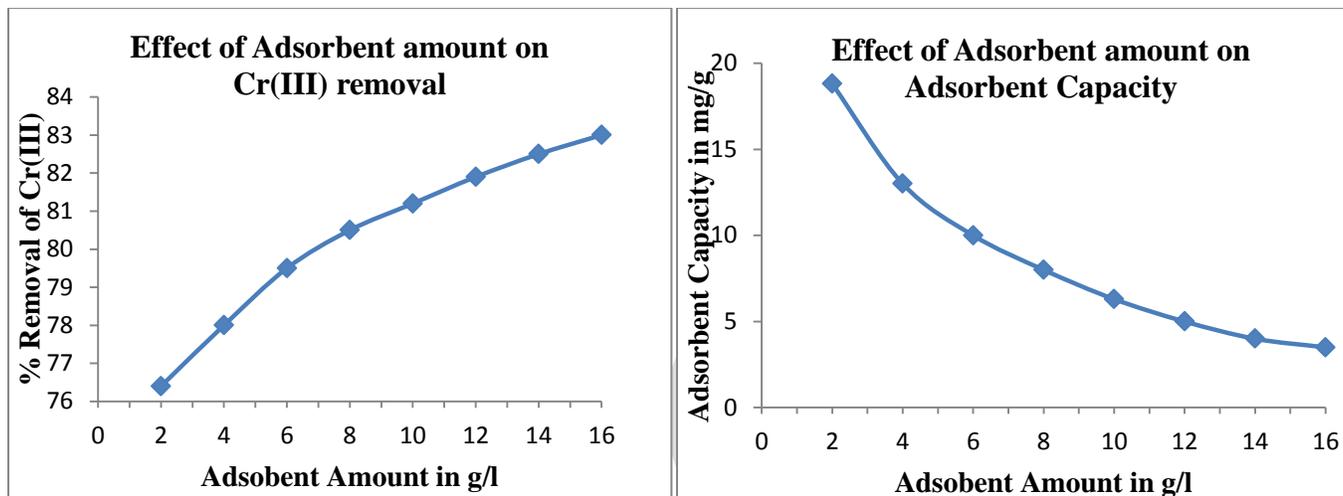


Figure 7: Effect of Adsorbent amount on Cr(III) removal and Adsorbent activity ($C_0=100\text{mg/l}$, $\text{pH}=9.0$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

EFFECT OF INITIAL CHROMIUM(III) CONCENTRATION:

Fig. 8 predicts the effect of initial Cr(III) concentration on the percentage removal of Cr(III) and the adsorption capacity of fly ash. The percentage removal decreases from 84.5% to 41.5% and the adsorption capacity increases from 4.3 to 41.8 mg/g with increase in the initial Cr(III) concentration from 50 to 500 mg/l, respectively. The decrease in the percentage removal of Cr(III) can be explained with the fact that all the adsorbents had a limited number of active sites, which would have become saturated above a certain Cr(III) concentration. The increase in the adsorption capacity with increase in the initial Cr(III) concentration may be due to the higher adsorption rate and the utilization of all the active sites available for the adsorption at higher concentration.

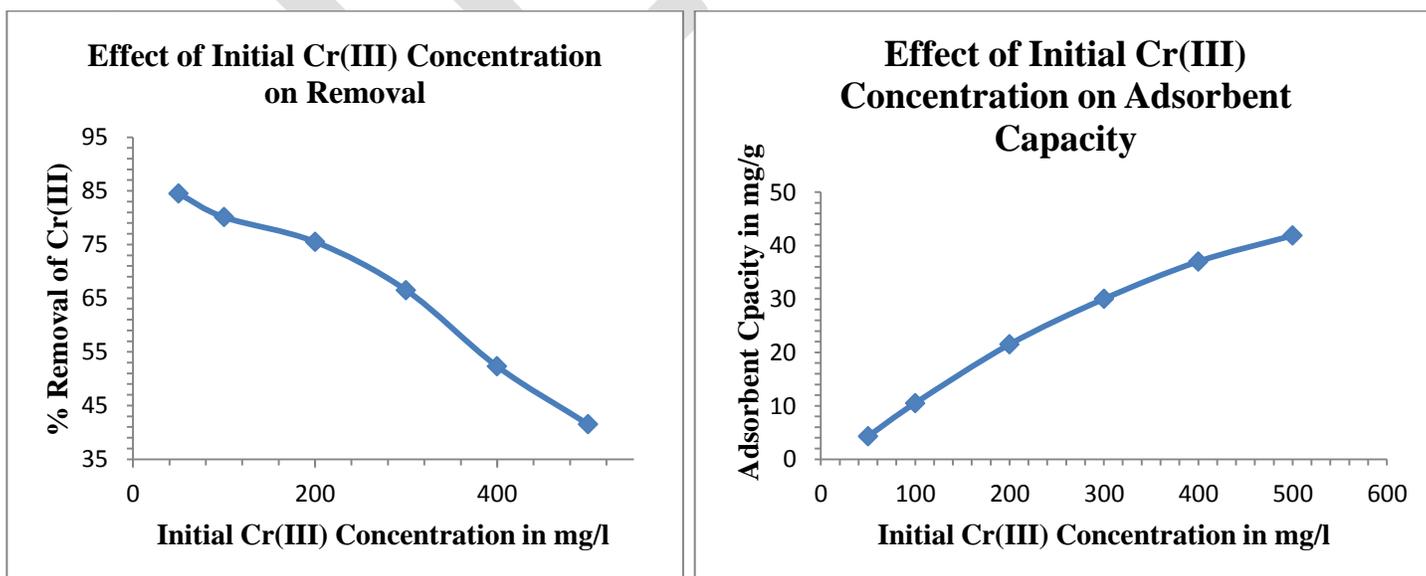


Figure 8: Effect of Initial Cr(III) concentration on Cr(III) removal and Adsorbent capacity ($C_0=100\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

ADSORPTION ISOTHERMS

The analysis and design of adsorption process requires equilibrium data for better understanding of the process. In the present investigation, the equilibrium data has been analyzed for various adsorbents using Freundlich and Langmuir isotherms.

1. FREUNDLICH ADSORPTION ISOTHERM

The expression for the Freundlich adsorption isotherm^[9] is given below

$$q_e = k_f C_e^{1/n}$$

Where, k_f and n are Freundlich constants. The above equation can be linearized in to a logarithmic form to determine the Freundlich constants.

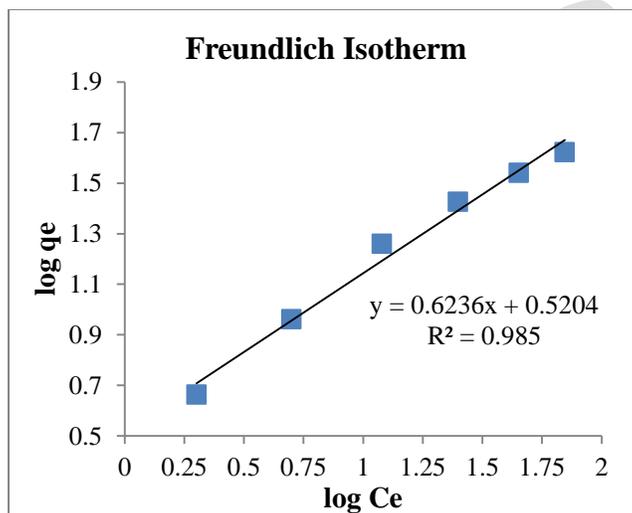


Figure 9 : Freundlich isotherm plot for adsorption of Cr(III) ($C_0=50-500\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

From the values of k_f and $1/n$, it is found that the isotherm is linear. The k_f parameter is a measure of adsorption capacity, which gets increased with increase in the efficiency of the adsorbent.

2. LANGMUIR ADSORPTION ISOTHERM

The expression for the Langmuir adsorption isotherm^[10] is given below

$$\frac{C_e}{q_e} = \frac{1}{bq_{max}} + \frac{C_e}{q_{max}}$$

Where, q_e is the adsorption capacity (mg/g) at equilibrium, C_e is the concentration of the solution at equilibrium, q_{max} represents the maximum adsorption capacity and b is the Langmuir constant.

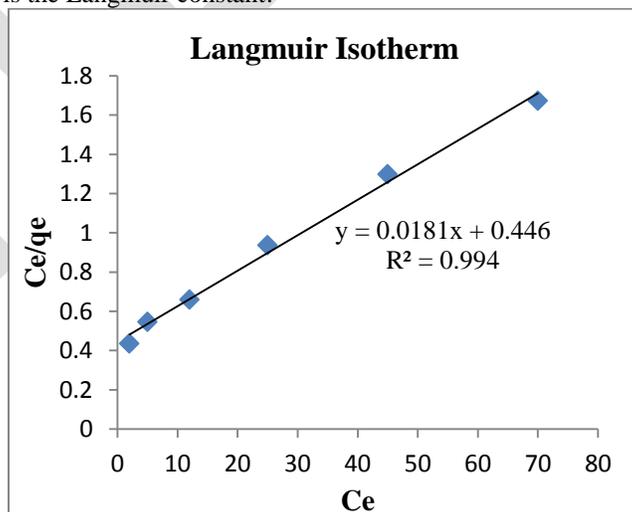


Figure 10: Langmuir isotherm plot for adsorption of Cr(III) ($C_0=50-500\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

The essential features of the Langmuir isotherm can be expressed in terms of a dimensionless constant or separation factor or equilibrium parameter K_L which is defined as

$$K_L = \frac{1}{1 + bC_0}$$

Where, b is the Langmuir constant and C_0 is the initial concentration of the salt solution. The value K_L indicates the type of isotherm. To be reversible ($K_L=0$), favorable ($0 < K_L < 1$), linear ($K_L=1$) or unfavorable ($K_L > 1$). In our kinetic studies, the value of K_L was found to be less than 1 and greater than 0, indicating favorable adsorption. The constants and R^2 value are listed in the Table 1 below.

Table 1
Isotherm constants for absorption of Cr(III) on activated fly ash

Langmuir Isotherm			Freundlich Isotherm		
Constants		Correlation Coefficient (R^2)	Constants		Correlation Coefficient (R^2)
q_{max} (mg/g)	b (l/mg)		k_f (mg/g)	n	
55.24	0.0405	0.994	3.11	1.562	0.9815

ADSORPTION KINETICS

In order to understand the kinetics of removal of Cr(III) using fly ash as an adsorbent, pseudo first-order and second-order kinetics are tested with the experimental data.

1. FIRST-ORDER KINETICS

The non-linear form of the pseudo first-order equation is given by

$$\frac{dq_t}{dt} = k_{ad}(q_e - q_t)$$

$$\log(q_e - q_t) = \log q_e - \frac{k_{ad}t}{2.303}$$

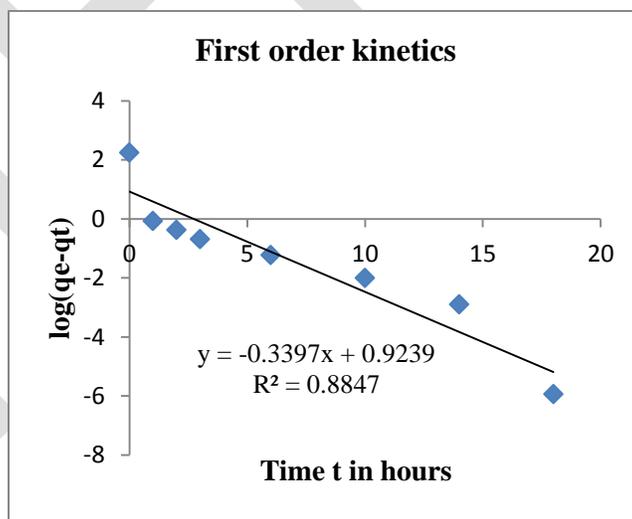


Figure 11: First order kinetics plot for adsorption of Cr(III) ($C_0=100\text{mg/l}$, $M=10\text{g/l}$, $t_f=20\text{ h}$)

where, q_e and q_t are the amounts of Cr(III) adsorbed (mg/g) at equilibrium time and at any instant of time, t , respectively, and k_{ad} (l/min) is the rate constant of the pseudo first-order adsorption process. The values of first-order rate constants, k_{ad} and q_e for the initial Cr(III) concentration ranges of 50-500 mg/l are calculated.

2. SECOND-ORDER KINETICS

The second-order kinetic rate equation is given by

$$\frac{dq_t}{dt} = k_{ad}(q_e - q_t)^2$$

$$\frac{t}{qt} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e}$$

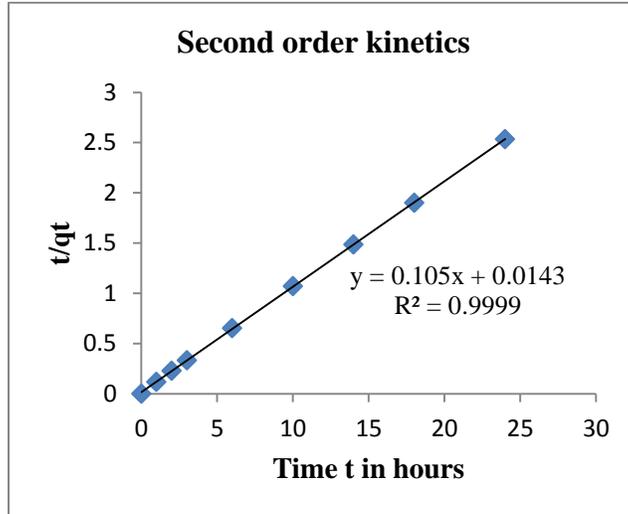


Figure 12: Second order kinetics plot for adsorption of Cr(III) ($C_0=100\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

k_2 is the second order rate constant, $\text{g}/(\text{mg})(\text{min})$. The application of the second-order kinetics by plotting t/qt vs. t , yielded the second-order rate constant, k_2 , estimated equilibrium capacity q_e , and the coefficient of determination (R^2) for the initial Cr(III) concentration ranging from 50 - 500 mg/l.

3. FRACTIONAL POWER MODEL

The adsorption kinetics can also be described by the power fraction equation. The linear fractional power equation is given as

$$\ln qt = \ln K + \gamma \ln t$$

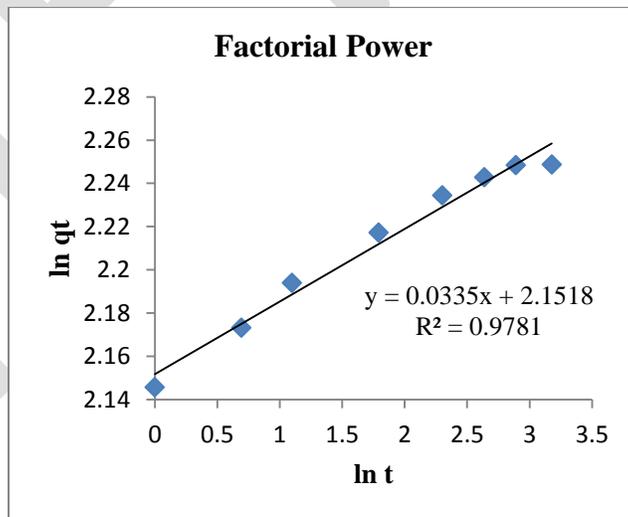


Figure 13: Factorial Power Model plot for adsorption of Cr(III) ($C_0=100\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

The plot $\ln qt$ vs $\ln t$ should give linear relationship from which γ and K can be calculated from the slope and intercept of the plot respectively.

4. THE ELOVICH EQUATION

The linear Elovich equation is given as follows

$$qt = \frac{1}{\beta} \ln \alpha \beta + \frac{1}{\beta} \ln t$$

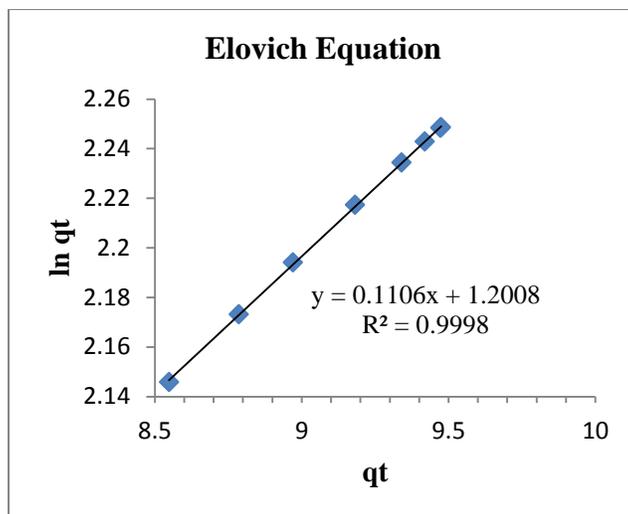


Figure 14: Elovich Equation plot for adsorption of Cr(III) ($C_0=100\text{mg/l}$, $M=10\text{g/l}$, $t_T=20\text{ h}$)

Where α is the initial adsorption rate (mg/g). Parameter β is related to the extent of surface coverage and the activation energy for chemical adsorption (g/mg). The constants and R^2 value are listed in the Table 2 below.

Table 2

Kinetic constants for absorption of Cr(III) on activated fly ash

First order kinetics			Second order kinetics			Factorial Power		Elovich Equation			
Constants		Correlation Coefficient R^2	Constants		Correlation Coefficient R^2	Constants		Correlation Coefficient R^2	Constants		Correlation Coefficient R^2
q_e mg/g	k_{ad} 1/min		q_e mg/g	k_2 1/min		K mg/g	γ		α mg/g	β (g/mg)	
8.39	0.7823	0.8847	9.514	0.7726	0.9999	8.6	0.0335	0.9781	9.041	0.1263	0.9998

CONCLUSION

The following conclusions could be drawn from present study.

1. The maximum adsorption of Cr(III) took place in the initial pH value of 9.0.
2. The equilibrium time for the adsorption of Cr(III) on the activated fly ash was found to be 20 h.
3. The percentage removal of Cr(III) increases with increase in the adsorbent amount.
4. Adsorption of Cr(III) on the fly ash yielded maximum adsorption capacity of 55.24 mg/g.
5. Adsorption of Cr(III) obeys second order rate equation.

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Strategic Transport Planning for infrastructural development in roads and transport for strengthening different socio-economic indicators in Odisha

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Abstract: The author's destination in present paper is to study the effectiveness of infrastructural development in roads and transport sector over different socio-economic indicators by using correlation and factor analysis models

Key words: – Strategic Transport Planning (STP), Principal component model, Mean, Standard deviation, correlation, Kayacr Normalization. Socio-economic indicators.

Introduction:

Transport is the nerve center of total economic activity. The nature and characteristics of transport depends on the level of economic development. Transportation department is a premier global foundation which leads to socio-economic peace, progress and prosperity. Strategic transport planning (STP) is the basis of Odisha and has got international flavor. STP is the soul of society as it passes from one generation to another. Key to better STP is culturing consciousness. Emergence of creative potential in the supreme form is the backbone for framing suitable STP models. Atkinson (1997) develops an integrated model of performance measurement which intends to capture STP issues.

Industrial welfare can be ascertained only when infrastructural development in roads and transport will be properly made of and rightly utilized in the changing current industrial and economic policy by applying suitable mathematical models for sustaining international standard progress. To be specific, transport sector in connection to logistic system can sustain perpetual growth in economy as well as rapid industrialization within the State.

Main Focus:

For Odishanization, STP for infrastructural development in roads and transport is essential as well as inevitable. STP is unified, comprehensive and integrated plan designed to assure that the basic objectives of the enterprise are achieved. It is the determination of the basic long term goals and objectives of an enterprise and the adoption of the courses of action and allocation of resources necessary for carrying out these goals. The objective of STP is to make the best use of resources in a changing environment. The basic objective is how STP can be executed more successfully to improve the probability of success. STP models boost up moral courage, intelligence integrity and burning commitment within the spirit of both employees and management.

The 21st century demands the wellbeing of human beings by building progressive STP, which is the stepping stone for social stability. The growing gap between STP and its implementation is dangerous to economic growth of Odisha. STP should be effective by dogged determination, rugged common sense and razor sharp intelligence of planner and not by hollow concept, tea-cup debate and impotent ideas.

To be meaningful and purposeful, to be of futuristic relevance and creative importance, it must be view objectivity and fearlessly changes in the forces of STP induced by constitutional calculus and explain how the mutation in the materialistic equation within society has altered the human condition. STP is dependent upon several environmental changes like economic change, political change, social change, ecological change, changes in law, changes in size of population and technological changes. Corporate STP is

the determination of basic long-term goals of transport sector and the adoption of course of action and allocation of resources necessary for carrying out these goals.

Basically, strategy is a formula for achieving success. STP involves understanding the environment and to guide the transport department by making it adopt to the environment. It relates to the activities of transport sector and also requires matching of the transport sector's activities to its resource capacity and also to decide about the allocation and reallocation of resources. It's is a process of analyzing, planning and evaluating transport business strategies by achieving its goals and projections. STP can reduce risks faced by the transport sector.

Results and Interpretation:

Table -1: Mean and Standard Deviation of transportation and allied aspects with some social parameters during the period from 2003-04 to 2012-13.

Social Parameters	Mean	Std. Deviation
Transportation (Rs. In Lakh)	1141511.20	598623.78
Road Length (in Kms.)	2440.26	1341.80
Amount spent in Road (Rs. In Crore)	917.47	673.57
No. of Vehicles (In 000)	2314.81	688.09
Agriculture & Animal Husbandry (Rs. In Lakh)	2513458.40	961149.29
Forestry (Rs. In Lakh)	341347.00	83787.00
Fisheries (Rs. In Lakh)	172483.60	63959.46
Mining & Quarrying (Rs. In Lakh)	1399819.40	759168.63
Manufacturing units (Rs. In Lakh)	1879955.50	897408.71
Electricity, Gas & Water Supply (Rs. In Lakh)	377646.50	97613.81
Construction (Rs. In Lakh)	1368434.00	529561.15
Hotel & Restaurant Trade (Rs. In Lakh)	1760100.20	898683.65
Storage (Rs. In Lakh)	15302.00	8551.02
Communication (Rs. In Lakh)	149768.10	61709.34
Banking & Insurance (Rs. In Lakh)	490424.70	260188.39
Real Estate (Rs. In Lakh)	856150.50	378146.79
Public Administration (Rs. In Lakh)	620812.90	296440.90
Other Services (Rs. In Lakh)	1441740.40	693536.10
Total GSDP (Rs. In Lakh)	14405854.40	6427863.16
Population (In Lakh)	403.47	16.19
Consumer Price Index	400.38	83.57

Sources: Collected and compiled from Economic Survey (2012-13).

On application of reliability analysis to the considered data, the Cronbach's Alpha has been calculated as 0.748 which signifies the adoptability of the data for further analysis [8].

Table -2 : Correlation Between Transportation and Allied aspects with some Social Parameters

Social Parameters	Total Transport	Road Length	Amount spent in Roads	No. of vehicles
Agriculture & Animal Husbandry	0.696	0.872*	0.897*	0.903*
Forestry	0.689	0.883*	0.840*	0.952*
Fisheries	0.735*	0.851*	0.822*	0.913*
Mining & Quarrying	0.735*	0.877*	0.861*	0.908*
Manufacturing units	0.745*	0.808*	0.822*	0.902*
Electricity, Gas & Water Supply	0.718*	0.380	0.294	0.545
Construction	0.778*	0.849*	0.856*	0.916*
Hotel & Restaurant Trade	0.790*	0.861*	0.845*	0.919*
Storage	0.764*	0.831*	0.812*	0.915*
Communication	0.761*	0.859*	0.836*	0.914*
Banking & Insurance	0.747*	0.838*	0.804*	0.901*
Real Estate	0.752*	0.851*	0.824*	0.921*
Public Administration	0.726*	0.851*	0.845*	0.915*
Other Services	0.734*	0.890*	0.879*	0.910*
Total GSDP	0.758*	0.869*	0.863*	0.922*
Population	0.779*	0.877*	0.878*	0.919*
Consumer Price	0.549	0.917*	0.925*	0.916*

*N.B.:- GSDP – Gross State Domestic Product, * - Significant at 5% level (P<0.05)*

The correlation coefficients more than 0.71 are significant and have been marked with “*” [7].

FACTOR ANALYSIS.

Factor analysis is a method of data reduction. Factor analysis is used to find factors among observed variables. Factor analysis groups variables with similar characteristics together. With factor analysis you can produce a small number of factors from a large number of variables which is capable of explaining the observed variance in the larger number of variables. The reduced factors can also be used for further analysis. Here, Agriculture & Animal Husbandry, Forestry, Fisheries, Mining & Quarrying, Manufacturing units, Electricity; Gas & Water Supply, Construction, Hotel & Restaurant Trade, Transport, Storage, Communication, Banking & Insurance, Real Estate, Public Administration, Other Services, Total GSDP, Population, Consumer Price, Road Length, Amount spent in Road and No of Vehicles on Road [1] will be subjected to Factor Analysis by following Principal Component Analysis for extraction supplemented with varimax rotation method and Kaiser normalisation [2][3]. The results obtained in the process with interpretations have been presented in the following:

Table-3: The loadings of the 21 variables on the extracted factors after application of rotation.

	Component	
	1	2
Agriculture & Animal Husbandry	0.900	
Forestry	0.910	
Fisheries	0.972	
Mining & Quarrying	0.939	
Manufacturing units	0.895	
Electricity, Gas & Water Supply		0.949
Construction	0.939	
Hotel & Restaurant Trade	0.954	
Transport		0.577
Storage	0.977	
Communication	0.979	
Banking & Insurance	0.960	
Real Estate	0.971	
Public Administration	0.989	
Other Services	0.991	
Total GSDP	0.957	
Population	0.953	
Consumer Price	0.980	
Road Length	0.960	
Amount spent in Road	0.990	
No of Vehicles on Road	0.966	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization [9].		

It may be noted here that, the extracted two factors may not be of much importance for further analysis. This is because maximum variables report for Factor-1 where as a very few report for Factor-2. As almost all variables report for Factor -1, it may be concluded that there may not be much discrimination among them [4][5] . Hence they may not be treated as independent among themselves. Obviously, further analysis pertaining to these extracted factors may not bear much importance [6].

CONCLUSION

It is concluded from the correlation coefficient table 2 cited above that transport is significantly correlated with fisheries, mining, manufacture units, electricity, construction, hotel, storage, communications, banking, real estate, public administration, other services, total GSDP and population. Hence development of all above indicators will lead to development of transport sector and vice versa.

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PLC BASED INDUCTION MOTOR STARTING AND PROTECTION

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Abstract— The intent of the paper is starting, speed control and protection of induction motor. There by limiting the starting current and increase the starting torque and so as to protect the induction motor. There are different methods for starting of the Slip Ring induction Motor. But we have opted the Rotor Resistance Control method for Starting the Induction Motor. Programming is done by using Programmable Logic Controller; control panel is designed and programmed according to requirements. The motor will start with high rotor resistance and the rotor resistance is cut off with respective time delay and the motor will run at rated speed. The contactor is used for the switching of three phase supply to the stator winding. This is how the starting, speed control and protection of induction motor is achieved and the operation is very reliable, sufficiently high efficient. Induction motors are widely used in many operating areas and industrial applications as they are simple, robust, reliable and have low production costs. The reliability of an induction motor is of great importance in applications such as commercial, aerospace and military and many industrial applications. In this paper different problems of IM are dealt with as over current, overvoltage, over temperature, over speed, inrush current, vibration monitoring during its time of operation. There are various proposed methods for fault diagnosis and protection of IM. Some of them are Stator fault monitoring techniques, protection system using On-line fault detection, Programmable Logic Controller (PLC) based protection system. In this study, the method which is applied is PLC based protection system of an IM.

Keywords— Induction Motor, Rotor resistance, Protection, Speed control, PLC, Ladder logic, Fault diagnosis

INTRODUCTION

The starting, speed control and protection of Induction motor can be achieved easily by using PLC. Three-phase induction motors are widely used in industrial drives because they are rugged, reliable and economical. High Starting torque is a desired feature in some special industrial applications which use 3-Ph Slip Ring Induction motor. An induction motor or asynchronous motor is a 3 phase 4 pole induction motor. This is a type of alternating current motor where power is supplied to the rotor by means of electromagnetic induction. The 3 phase 4 pole induction motor electric motor turns because of magnetic force is exert between the stationary electromagnet called the stator and a rotating. The three-phase induction motors are the most widely used electric motors in industry. They run at essentially constant speed from no-load to full-load. However, the speed is frequency dependent and consequently these motors are not easily adapted to speed control. We usually prefer d.c. motors when large speed variations are required. Nevertheless, the 3-phase induction motors are simple, rugged, low-priced, easy to maintain and can be manufactured with characteristics to suit most industrial requirements. This 3 phase 4 pole induction electric motor turns because of magnetic force exert between the stationary electromagnet called the stator and a rotating electromagnet called the rotor. If the slip ring induction motor is started with all the slip rings or the rotor terminals shorted, like a normal induction motor, then it suffers extremely high locked rotor current, ranging up to 1400%, accompanied with very low locked rotor torque as low as 60%. So, it is not advised to start a slip ring induction motor with its

OVERVIEW OF BLOCK DIAGRAM

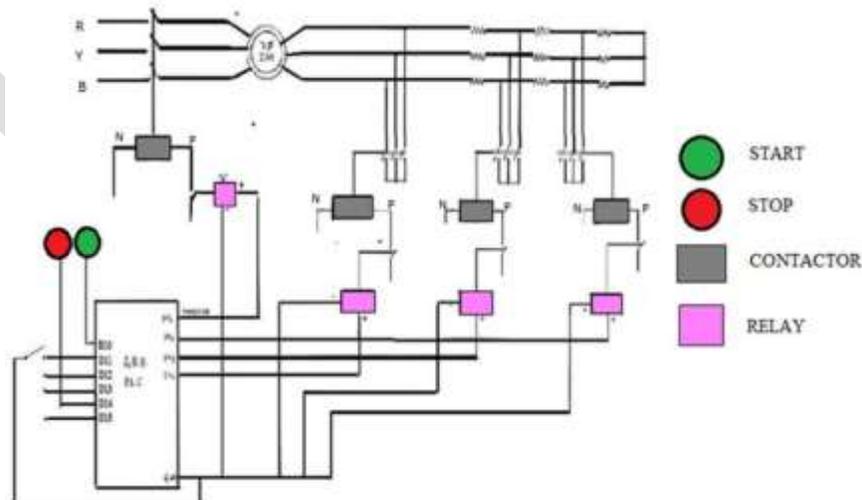


FIG.1 BLOCK DIAGRAM

PROGRAMMABLE LOGIC CONTROLLER

A PLC or a programmable controller is a small computer used for automation of real-world processes, such as control of machinery on factory assembly lines. A PLC can be programmed to sense, activate, and control industrial equipment. Therefore, a PLC incorporates a number of I/O points, which allow electrical signals to be interfaced. Input and output components of the processes are connected to the PLC; and the control program is loaded on the PLC memory. The basic structure of the PLC is illustrated in Fig. 2.

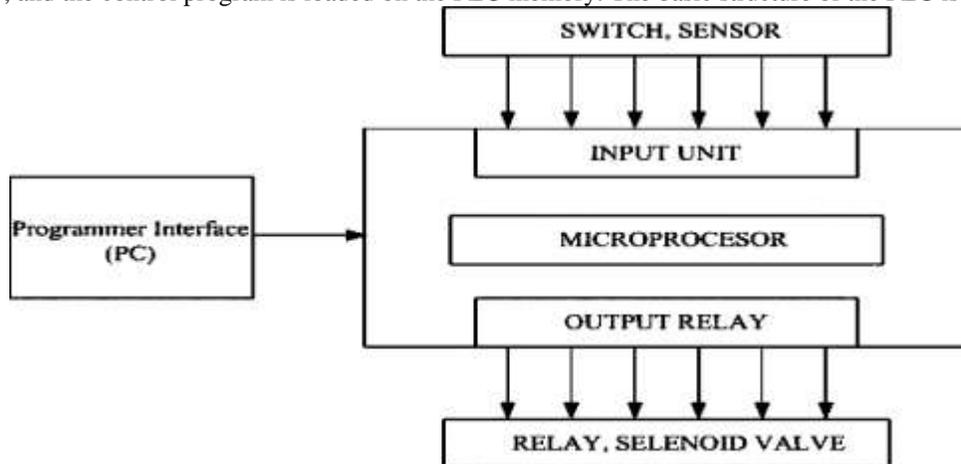


FIG 2 PROGRAMMABLE LOGIC CONTROLLER

In this study, the PLC measures the current, the voltage, the temperature, and the speed of an induction motor through analog inputs. In addition, it continuously monitors the inputs and activates the outputs according to the program. Siemens PLC S7-200 module with 14 digital input/10 digital output addresses with CPU 224 sample (14*DI 24 V dc/10*DO 24 V dc) is preferred due to its easy usefulness in experimental application. The PLC programming memory used is composed of 4096 words.

STEP 7—Micro/Win 32 programmer was used as the software. Statement list editor (STL) and ladder diagram (LAD) were used as programming languages. Software of the PLC was prepared on the computer and loaded on the PLC by RS 232-RS 485 PC/planposition

indicator (PPI) cable. While the program prepared is being loaded on the PLC from the computer, the most important point is the baud rate between the PLC and the computer. The baud rate must be appropriate to switch setup on the bound cable in manual.

II) PROTECTION SYSTEM

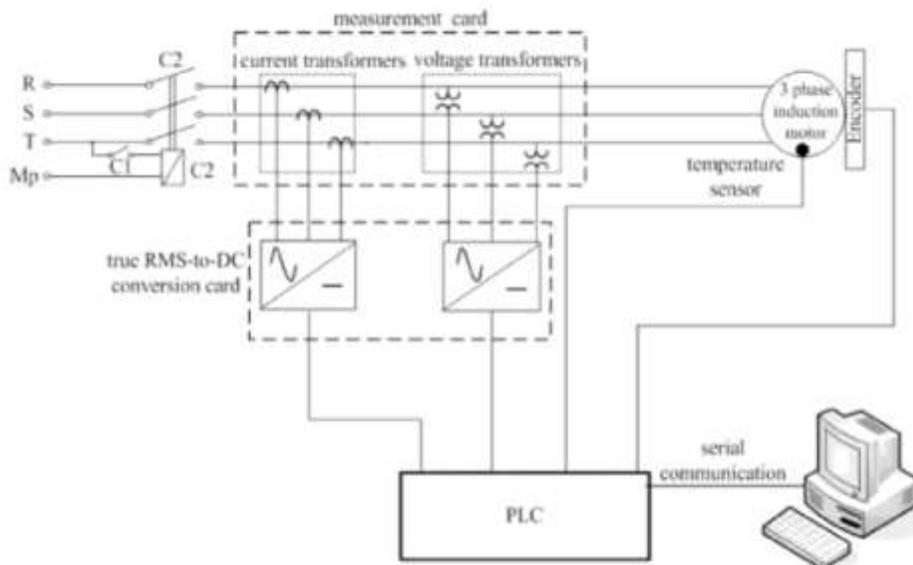


FIG.3.SCHEMATIC DIAGRAM OF THE PROTECTION SYSTEM.

Motor Electrical Protection

- Thermal Overload
- Process Caused (Excessive load)
- High Ambient Conditions (Hot, Blocked Ventilation)
- Power Supply Issues (Voltage/Current Unbalance, Harmonics)
- Phase Fault

- Ground Fault
- Abnormal Operating Conditions
- Over & Under Voltage
- Underfrequency
- Voltage and Current Unbalance
- Load Loss
- Jamming
- Jogging

Overvoltage Protection

The overall result of an overvoltage condition is a decrease in load current and poor power factor. Although old motors had robust design, new motors are designed close to saturation point for better utilization of core materials and increasing the V/Hz ratio cause saturation of air gap flux leading to motor heating.

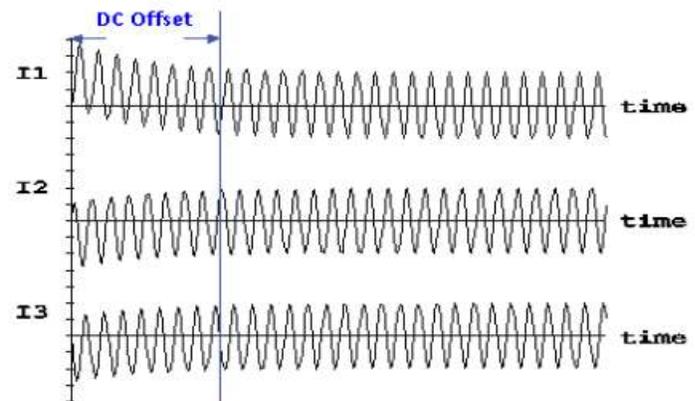
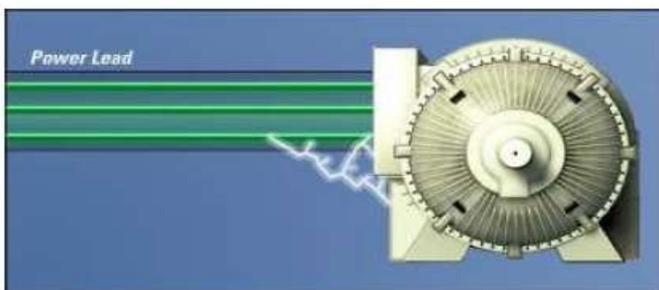
The overvoltage element should be set to 110% of the motors nameplate unless otherwise stated in the data sheets.

Undervoltage Protection

The overall result of an undervoltage condition is an increase in current and motor heating and a reduction in overall motor performance. The undervoltage protection element can be thought of as backup protection for the thermal overload element. In some cases, if an undervoltage condition exists it may be desirable to trip the motor faster than thermal overload element. The undervoltage trip should be set to 80-90% of nameplate unless otherwise stated on the motor data sheets. Motors that are connected to the same source/bus may experience a temporary undervoltage, when one of motors starts. To override this temporary voltage sags, a time delay set point should be set greater than the motor starting time.

Short Circuit Protection

The short circuit element provides protection for excessively high overcurrent faults Phase-to-phase and phase-to-ground faults are common types of short circuits. When a motor starts, the starting current (which is typically 6 times the Full Load Current) has asymmetrical components. These asymmetrical currents may cause one phase to see as much as 1.7 times the RMS starting current. To avoid nuisance tripping during starting, set the short circuit protection pick up to a value at least 1.7 times the maximum expected symmetrical starting current of motor. The breaker or contactor must have an interrupting capacity equal to or greater than the maximum available fault current or let an upstream protective device interrupt fault current.



LADDER LOGIC FOR STARTING OF MOTOR DIFFERENT PROGRAMMING LANGUAGES

1. LADDER DIAGRAM
2. FUNCTIONAL BLOCK DIAGRAM LANGUAGE
3. SEQUENTIAL FUNCTION CHART LANGUAGE
4. INSTRUCTION LIST LANGUAGE

HERE WE ARE USED LADDER LOGIC FOR STARTING AND PROTECTION PURPOSE

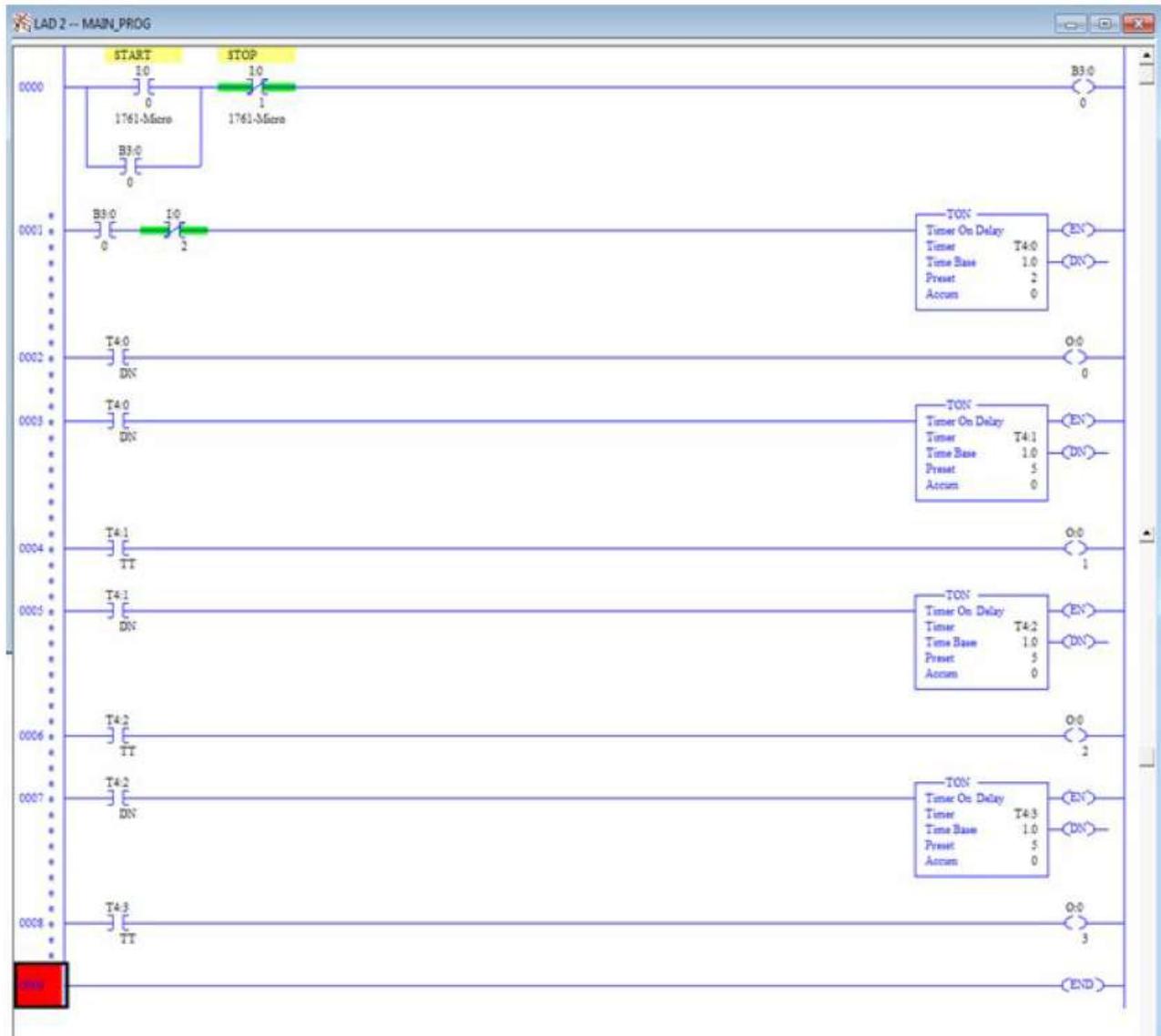


fig.4.ladder logic for starting of motor

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CONCLUSION

Speed control and protection of induction motor is achieved and the operation is very reliable, sufficiently high efficient. Without changing in any hardware connection just by simply changing the program in the PLC; the motor can be made to run in for any duration of time. This system also used for one of the starting method of three phase slip ring Induction motor this system not only reduces the starting current to a limit, but also develops High starting torque which is required in many of the induction motor applications. This can be applicable to run the lift, by changing the logic in a program and it can also be used for any industrial applications. This PLC based system requires less hardware compared to any microcontroller or microprocessor based system. Programmable Logic Controllers (PLC) are widely used in industrial control because they are inexpensive, easy to install and very flexible in applications. A PLC interacts with the external world through its inputs and outputs.

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Gender based Affection Recognition of Speech Signals using Spectral & Prosodic Feature Extraction

Mrs. Jibi Raj, Mr. Sujith Kumar

Abstract— Speech is one of the most fundamental and natural means of communication between human beings. Human beings use emotions extensively for expressing their intentions through speech. Affection Recognition through speech signals is a current research topic in the field of human-computer interaction with wide range of applications. The proposed system recognizes the emotional state of a person based on gender. The system compose of two subsystems: Gender Recognition and Emotion Recognition. Here, a speech emotion recognition system using both the spectral & prosodic features is proposed. Since both the spectral & prosodic features contain emotion information, the combination of these features improves the performance of the system. The gender recognized speech and the features extracted are given to the emotion recognition subsystem, where the emotions are recognized based on two classifiers (i.e., two support vector machines): the one trained on the basis of signals recorded by male speakers and the other one trained by that of female speakers.

Keywords— Affection, Energy, Formants, Mel Frequency Cepstral Coefficients, Pitch, Principal Component Analysis, Support Vector Machines.

INTRODUCTION

Speech is the most natural form of human communication. Emotion is an individual mental state that arises spontaneously rather than through conscious effort. Human beings use emotions extensively for conveying their intentions through speech. In some situations, it is even more important than the logical information contained in the speech. Emotional states are correlated with particular physiological states, which in turn make predictable effects on speech features, especially on pitch, timing, and voice quality.

When a person is in a state of anger, joy or fear, the sympathetic nervous system gets aroused. Then the heart rate and blood pressure increases, the mouth becomes dry and there will be occasional muscle tremors. The speech is then fast, loud and with strong high frequency energy. When someone is sad or bored, the parasympathetic nervous system gets arouse. Then the heart rate and blood pressure decreases and salivation increases, which results in slow, low-pitched speech with a weak high frequency energy.

Speech emotion recognition is particularly useful for applications which require natural man-machine interaction such as web and computer tutorial applications where the response of those systems to the user depends on the detected emotion. It is applicable in cases such as telemedicine, call centers and E-learning, where the key step is to identify the speaker and his emotions and take appropriate action based on the emotions.

The gender based speech emotion recognition system has the gender recognized emotional speech as an input and the classified emotion as an output. The first step is to extract the main features of the input speech that will differentiate between the different emotions and the gender is recognized based on the features. The most popular features used in speech emotion recognition are prosody and spectral. However the performance of the system degrades substantially, when these acoustic features are employed individually, i.e either prosody or spectral. Then the feature selection, removal and standardization algorithms are applied to get the optimum feature vectors. The vector is then given to the classifier in training and testing scheme. The final output is the classified emotion according to the input speech.

METHODOLOGY

Emotion from the speech is represented by the large number of parameters that is contained in the speech. Due to change in these parameters, there will be corresponding change in emotions. This method presents a gender-driven emotion recognition system whose

aim, starting from speech signals, is to determine the gender of speakers and then, on the basis of this information, to classify the emotion characterizing the speech signals. The proposed system composed of two functional blocks: Gender Recognition (GR) and Emotion Recognition (ER). The former can be implemented by a Pitch Estimation method, and the latter by two Support Vector Machine (SVM) classifiers, which exploits the GR subsystem output. The system recognizes the emotions such as anger, happy, boredom and sadness.

The basic block diagram for the gender based speech emotion recognition system is as shown in the Figure 1. Proposed system is based on prosodic and spectral features of speech. It consists of the emotional speech as input. Prosodic and spectral features were extracted from the speech signal. Gender recognition, based on pitch extraction, provides information about the gender of the speaker. Reduced feature sets, obtained by feature selection, performed through Principal Component Analysis were provided to the Support Vector Machine for training of the classifiers. The classifier classifies the test sample into one of the emotions and gives output. The recognized emotions are then grouped as positive and negative emotions by means of a classifier such as Support Vector Machines to make the system more reliable for specific applications like call centers, E-learning etc.

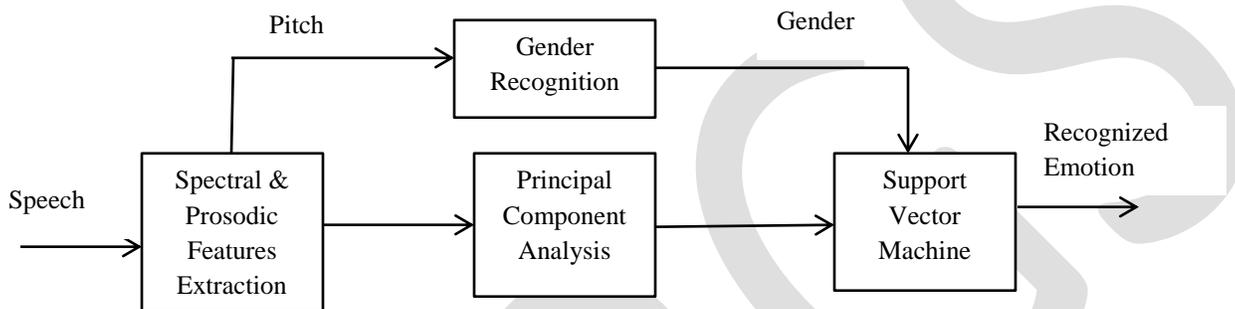


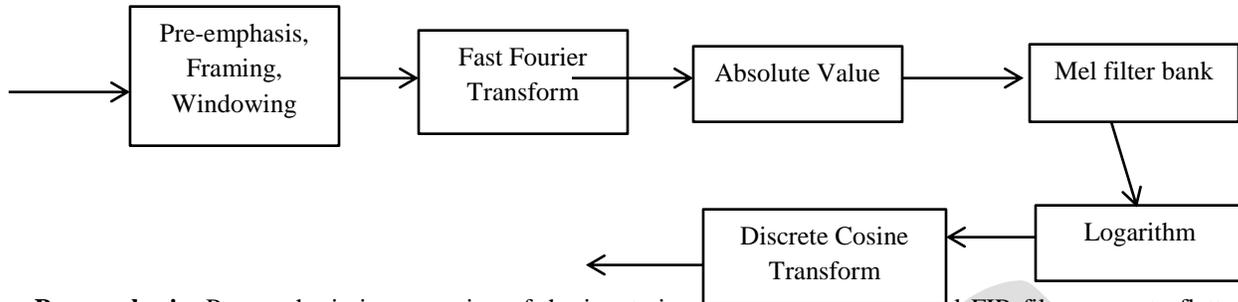
Fig.1. Block Diagram of Gender based Speech Emotion Recognition

Spectral & Prosodic Feature Extraction

The first step in speech emotion recognition system is to select a significant feature which carries large emotional information about the speech signal. Several researches have shown that effective parameters to distinguish a particular emotional states with potentially high efficiency are spectral features such as Mel Frequency Cepstrum Coefficients (MFCC) and prosodic features such as pitch, speech energy and formants. Prosodic features are related to the excitation of the vocal tract and speaking style of a person. Variation in vocal tract shapes/sizes and dynamic changes in articulator movements mainly cause the change in speaking rate. Spectral features characterize signal properties in the frequency domain, thus providing useful additions to prosodic features. For the purpose of feature extraction, spectral analysis algorithm such as Mel-frequency Cepstral Coefficients, MFCCs can be used.

❖ Mel Frequency Cepstral Coefficients

MFCC is based on the human peripheral auditory system. The human perception of the frequency contents of sounds for speech signals does not follow a linear scale. Thus for each tone with an actual frequency t measured in Hz, a subjective pitch is measured on a scale called the Mel Scale. The Mel frequency scale is linear frequency spacing below 1000 Hz and logarithmic spacing above 1kHz. As a reference point, the pitch of a 1 kHz tone, 40 dB above the perceptual hearing threshold, is defined as 1000 Mels. A compact representation would be provided by a set of mel frequency cepstrum coefficients (MFCC), which are the results of a cosine transform of the real logarithm of the short-term energy spectrum expressed on a Mel frequency scale. The calculation of the MFCC includes the following steps.



Pre-emphasis: Pre-emphasis is processing of the input signal by a low order digital FIR filter so as to flatten spectrally the input signal in favor of vocal tract parameters. It makes the signal less susceptible to later finite precision effects.

$$s_p(n) = s(n) - as(n - 1) \quad (1)$$

where a is a pre-emphasis coefficient lying usually in an interval of $(0.9,1)$, $s(n)$ is the original signal and $s_p(n)$ is a pre-emphasized signal.

Framing: The input speech signal $s(n)$ has always a finite length N_{total} but is usually not processed whole due to its quasi-stationary nature. Since speech signal is not stationary, the signal is divided into short segments called frames, within which speech signal can be considered as stationary. The signal is framed into pieces of length $N \ll N_{total}$ samples. Overlapping is performed because after framing of the signal, windowing is applied which causes the loss of information at the beginning and end of each frame. Overlapping reincorporates this information back into our extracted features.

Windowing: Windowing is done for minimizing the disruptions at the starting and at the end of each frame. The concept is to minimize the spectral distortion by using the window to taper the signal to zero at the beginning and end of each frame. Hamming window is widely used.

$$w(n) = 0.54 - 0.46 \cos\left(\frac{2\pi n}{N - 1}\right), \quad 0 \leq n \leq N - 1 \quad (2)$$

Where N is the total number of samples.

Fast Fourier Transform (FFT): FFT is performed to convert each frame of N samples from time domain into frequency domain. FFT gets log magnitude spectrum to determine MFCC.

Mel Filter Bank and Frequency Warping: The frequency range in FFT spectrum is very wide and voice signal does not follow the linear scale. Set of triangular filters are used to compute a weighted sum of filter spectral components so that the output of process approximates to a Mel scale. Each filter's magnitude frequency response is triangular in shape and equal to unity at the center frequency and decrease linearly to zero at center frequency of two adjacent filters. Then, each filter output is the sum of its filtered spectral components. The frequencies f in Hz are converted to Mel scale using the following conversion formula.

$$F(mel) = 2595 * \log_{10} \left[1 + \frac{f}{700} \right] \quad (3)$$

Logarithm: The logarithm has the effect of changing multiplication into addition. Therefore, this step simply converts the multiplication of the magnitude in the Fourier transform into addition.

Discrete Cosine Transform: It is used to orthogonalise the filter energy vectors. Because of this orthogonalisation step, the information of the filter energy vector is compacted into the first number of components and shortens the vector into number of components.

❖ Speech Energy

The energy is the basic and most important feature in speech signal. The energy of the speech signal provides a convenient representation that reflects the amplitude variation. In order to obtain the energy feature, we use short-term energy function to extract the value of energy in each speech frame. The energy of each frame is calculated by

$$E = \sum_{n=0}^{N-1} |s_i(n)|^2 \quad (4)$$

where $s_i(n)$ denotes the i^{th} frame of the speech signal $s(n)$.

❖ Formants

Formants are a distinguishing or meaningful frequency components of human speech. They are the resonance frequencies of the vocal tract. Formant frequencies are the dominant frequency components of human speech, so the slight variation in their properties may cause a major difference. The formants are physically defined as poles in a system function expressing the characteristics of a vocal tract. A simple method to estimate formant frequency relies on linear prediction analysis. They are obtained by finding the roots of the prediction polynomial obtained by Linear Prediction Coefficient (LPC) analysis. LPC determines the coefficients of a forward linear predictor by minimizing the prediction error in the least squares sense. Being $Z_i = r_i e^{\pm j\theta_i}$, the i^{th} complex root pair of the prediction polynomial, the frequency, called γ_i , of the i^{th} formant related to the i^{th} complex root pair of the LPC polynomial, can be estimated by applying the following formula

$$\gamma_i = \frac{F_s}{2\pi} \theta_i \quad (5)$$

❖ Pitch

Pitch period is defined as the time interval between two consecutive voiced excitation cycles i.e. the distance in time from one peak to the next peak. It is the fundamental frequency of the excitation source. The pitch signal is produced due to the vibration of the vocal folds, tension of the vocal folds and sub glottal air pressure, so the pitch is different for each emotion. Pitch of the speech signal can be estimated using the autocorrelation method. The autocorrelation gives a measure of the correlation of a speech signal with a delayed copy of itself. For a discrete time speech signal $s(n)$, the autocorrelation function is given by

$$R(\tau) = \sum_{n=0}^{N-1} s(n) s(n + \tau) \quad \tau \in [0, 1, \dots, N - 1] \quad (6)$$

$R(\tau)$ is the autocorrelation of lag τ . The pitch period is defined as

$$\tau_{pitch} = \arg_{\tau} \max R(\tau) \quad (7)$$

The frequency of pitch is computed as

$$\rho_{pitch} = \frac{F_s}{\tau_{pitch}} \quad (8)$$

where F_s is the sampling frequency of the speech signal.

Pitch based Gender Recognition

Gender identification is an important step in speaker and speech recognition systems. Due to physiological differences such as vocal fold thickness or vocal tract length, and differences in speaking style, there are gender based differences in human speech. For speech signal based gender identification, the most commonly used feature is pitch period. The main reason for using the pitch period comes from the fact that the pitch values of male speakers are on an average lower than pitch values of female speakers because male vocal folds are longer and thicker compared to female ones. For every speaker, a set of pitch period estimations are obtained from his/her speech signal. Pitch is the most distinctive feature between male and female. Pitch depends on the relative highness or lowness of a tone as perceived by the human ear. The commonly used method to estimate the pitch is based on detecting the highest value of the autocorrelation. The correlation between two waveforms is the measure of their similarity. The waveforms are compared at different time intervals, and their similarity is calculated at each interval. The result of a correlation is a measure of similarity as a function of time shift between the beginnings of the two waveforms. The autocorrelation function is the correlation of a waveform with itself. One would expect exact similarity at a time shift of zero, with increasing dissimilarity as the time shift increases. In the case of voiced speech, the main peak in short-time autocorrelation function normally occurs at a lag equal to the pitch-period.

Principal Component Analysis

The performance of a pattern recognition system highly depends on the discriminative ability of the features. Selecting the most relevant subset from the original feature set, we can increase the performance of the classifier and on the other hand decrease the computational complexity. Principle Component Analysis (PCA) is a mathematical method that uses transformations to identify

patterns in data. The components are arranged in a particular pattern with the component having highest variance occurring at the topmost level, followed by other components with high variance but totally uncorrelated with the previous components. The algorithm for feature reduction for N-dimensional vectors $\{s(t)\}$ $t = (1, 2, \dots, N)$ using PCA is as follows:

Step 1: By making use of transformation of coordinate translation, we set average vector s_m as the origin of new coordinate system in the form $s * t = s_t - s_m$

$$s_m = \frac{1}{N} \sum_{t=1}^N s_t \tag{9}$$

Step 2: Find out overall covariance matrix R

$$R = \frac{1}{N} \sum_{t=1}^N s_t s_t^T \tag{10}$$

Step 3: Find out eigenvalues $(\lambda_1, \lambda_2, \dots, \lambda_N)$ and related eigenvectors (q_1, q_2, \dots, q_N) .

Step 4: The sort order for each eigenvalue is descending order. We get a transformation matrix $A = (q_1, q_2, \dots, q_M)$ $(M < N)$.

Step 5: Transform N-dimensional original vector to M dimensional new vector in the form $y_t = A^T s_t$.

SVM Classification

SVMs are supervised learning methods that transforms input data from the initial dimensionality onto a higher dimension by using a kernel function to find an optimal separating hyperplane. SVM achieves optimum classification in the new feature space, where a clear distinction among features obtained by the optimum placement of a separation hyperplane under the precondition of linear separability. The hyperplane is obtained using Sequential Minimal Optimization (SMO) algorithm with no data points allowed to violate the Karush-Kuhn-Tucker (KKT) conditions.

Two kernel based Support Vector Machines are employed in this work. The first SVM is used if a male speaker is recognized by the Gender Recognition block. The other SVM in the case of a female speaker. The two SVMs are trained by using the speech signals of the emotional database of male and female speaker's. The two SVMs are trained by the traditional Quadratic Programming (QP) problem. i.e., the following problem has been solved for each gender g:

$$\begin{aligned} \min_{\lambda_g} \Gamma_g(\lambda_g) &= \frac{1}{2} \sum_{u=1}^{l_g} \sum_{v=1}^{l_g} y_g^u y_g^v \phi(x_g^u x_g^v) \lambda_g^u \lambda_g^v - \sum_{u=1}^{l_g} \lambda_g^u, \\ \sum_{u=1}^{l_g} \lambda_g^u \lambda_g^v &= 0, \quad 0 < \lambda_g^u < C, \quad \forall u, \end{aligned} \tag{12}$$

where $\lambda_g = \{\lambda_g^1, \lambda_g^2 \dots \lambda_g^{l_g}\}$ represents the well-known Lagrangian Multipliers vectors of the Quadratic Programming problem. Vectors $x_g^1, \dots, x_g^u, \dots, x_g^{l_g}$ are feature vectors while scalars $y_g^1 \dots y_g^u \dots y_g^{l_g}$ are the related labels (emotions). They represent vectors of the gender g. $(x_g^u, y_g^u), \forall u \in [1, l_g]$ is the related observation between the u-th input feature vector x_g^u and its label y_g^u . The quantity l_g is the total amount of related observations composing the training set. The quantity C is the complexity constant. It determines the trade off between the flatness and the tolerance level of the misclassified samples.

Equation 4.11 represents a non-linear SVM and $\phi(x_g^u x_g^v)$ is the kernel function. Here, $\phi(x_g^u x_g^v) = (x_g^u)^T (x_g^v) + 1$. The QP problems are solved by the Sequential Minimal Optimization approach that provides an optimal point if and only if Karush-Kuhn-Tucker conditions are verified and the matrices $y_g^u y_g^v \phi(x_g^u x_g^v)$ are positive semi-definite.

EXPERIMENTAL RESULTS AND DISCUSSION

Emotional speech samples from the Berlin Emotional Speech database was taken as input. The database covers six emotions (anger, boredom, disgust, fear, happiness, sadness) and neutral state. On the basis of this database, analysis of distinguishable features of the specific emotion is done for the system. The simulation is performed in MATLAB platform.

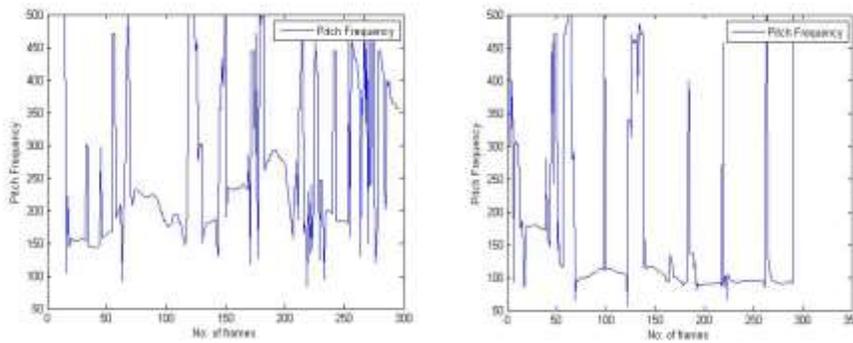
In the feature extraction stage, MFCC is used as the spectral feature. Twelve MFCC features are extracted from the speech signal per frame and it is observed that the energy of the mel cepstral coefficients are concentrated on the low coefficients. The twelve coefficients for the first five frames of boredom and anger emotional speech samples is shown. From the values, it can be inferred that MFCC values are higher for emotions such as boredom.

Table.1. MFCC values for boredom emotion

-8.37723	-7.68792	-7.12035	-6.67017	-6.33219
7.4545	7.554883	7.65206	7.748418	7.844383
0.133857	0.025286	-0.07813	-0.17683	-0.27085
3.023304	3.066898	3.111834	3.160341	3.211321
0.855775	0.787344	0.717601	0.647857	0.578762
-0.73739	-0.75556	-0.77106	-0.78358	-0.79347
-1.05734	-1.05867	-1.06036	-1.06224	-1.06388
-0.43238	-0.45502	-0.48328	-0.51693	-0.55504
-0.27731	-0.24259	-0.21089	-0.18111	-0.15318
0.136801	0.076234	0.008143	-0.06599	-0.14539
0.968227	0.991324	1.009311	1.024247	1.036314
-1.04307	-1.04349	-1.05024	-1.06283	-1.08092

Table.2. MFCC values for anger emotion

-4.57554	-3.30112	-2.12181	-1.0205	0.137838
7.081219	7.171192	7.205796	7.154948	6.954543
0.475364	0.464574	0.46827	0.511032	0.468277
3.211215	3.271585	3.323582	3.371205	3.586068
0.577336	0.59909	0.616361	0.613685	0.561465
1.240631	1.233302	1.220487	1.226955	1.130098
0.461068	0.526293	0.572269	0.596179	0.711834
-0.46154	-0.51125	-0.55754	-0.58136	-0.56341
-1.06869	-1.03066	-0.99802	-0.99924	-1.14086
-0.95181	-1.08595	-1.17808	-1.21024	-1.12262
-0.30872	-0.30046	-0.30279	-0.33583	-0.34234
0.693816	0.733691	0.761882	0.793632	0.74331



To analyse the performance of the classifier, confusion matrix showing emotion classification is obtained.

Table.3. Confusion matrix for male speakers

EMOTIONS	AN	BO	HA	SA
AN	4	1	0	0
BO	0	4	0	1
HA	0	0	5	0
SA	0	0	0	5

Table.4. Confusion matrix for male speakers

EMOTIONS	AN	BO	HA	SA
AN	5	0	0	0
BO	0	5	0	0
HA	0	0	4	1
SA	0	1	2	2

CONCLUSION

Emotions from the speech is represented by large number of parameters in the speech signal. Due to the change in these parameters, there will be corresponding change in emotions. The system is successfully implemented in real time. The system is language and text independent. Based on gender, there are corresponding changes in speech parameters and emotions. Emotions can be recognized from the spectral feature itself. For more accuracy of the system prosodic features are added to the system. Simulation results are presented to demonstrate the effectiveness of the proposed scheme.

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Personalization of Web Search With Protected Privacy

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ABSTRACT

Personalized web search (PWS) has demonstrated its effectiveness in improving the quality of various search services on the Internet. However, evidences show that users' reluctance to disclose their private information during search has become a major barrier for the wide proliferation of PWS. We study privacy protection in PWS applications that model user preferences as hierarchical user profiles. We propose a PWS framework called UPS that can adaptively generalize profiles by queries while respecting userspecified privacy requirements. Our runtime generalization aims at striking a balance between two predictive metrics that evaluate the utility of personalization and the privacy risk of exposing the generalized profile. We present two greedy algorithms, namely GreedyDP and GreedyIL, for runtime generalization. We also provide an online prediction mechanism for deciding whether personalizing a query is beneficial. Extensive experiments demonstrate the effectiveness of our framework. The experimental results also reveal that GreedyIL significantly outperforms GreedyDP in terms of efficiency.

Keywords—Privacy protection, personalized web search, utility, risk, profile,UPS,GreedyDP,GreedyIL.

1.INTRODUCTION

THE web search engine has long become the most important portal for ordinary people looking for useful information on the web. However, users might experience failure when search engines return irrelevant results that do not meet their real intentions. Such irrelevance is largely due to the enormous variety of users' contexts and backgrounds, as well as the ambiguity of texts. Personalized web search (PWS) is a general category of search techniques aiming at providing better search results, which are tailored for individual user needs. As the expense, user information has to be collected and analyzed to figure out the user intention behind the issued query. The solutions to PWS can generally be categorized into two types, namely click-log-based methods and profile-based ones. The click-log based methods are straightforward—they simply impose bias to clicked pages in the user's query history. Although this strategy has been demonstrated to perform consistently and considerably well [1], it can only work on repeated queries from the same user, which is a strong limitation confining its applicability. In contrast, profile-based methods improve the search experience with complicated user-interest models generated from user profiling techniques. Profile-based methods can be potentially effective for almost all sorts of queries, but are reported to be unstable under some circumstances

2.RELATED WORKS

Z. Dou, R. Song, and J.-R. Wen [1]We present a large- scale evaluation framework for personalized searchbased on query logs and then evaluate five personalized search algorithms (including two click-based ones and three topical-interest-based ones) using 12-day query logs of Windows Live search. By analyzing the results, we reveal that personalized Web search does not work equally well under various situations.

Teevan, S.T. Dumais, and E. Horvitz [2]We formulate and study search algorithms that consider a user's prior interactions with a wide variety of content to personalize that user's current Web search. Rather than relying on the unrealistic assumption that people will precisely specify their intent when searching, we pursue techniques that leverage implicit information about the user's interests. This information is used to re-rank Web search results within a relevance feedback framework. We explore rich models of user interests,

built from both search-related information, such as previously issued queries and previously visited Web pages, and other information about the user such as documents and email the user has read and created.

M. Spertta and S. Gach [3]Explore the use of a less-invasive means of gathering user information for personalized search. In particular, we build user profiles based on activity at the search site itself and study the use of these profiles to provide personalized search results. By implementing a wrapper around the Google search engine, we were able to collect information about individual user search activities.

A. Pretschner and S. Gauch [4]The user profiles are structured as a concept hierarchy of 4,400 nodes. These are populated by 'watching over a user's shoulder' while he is surfing. No explicit feedback is necessary. The profiles are shown to converge and to reflect the actual interests quite well. One possible deployment of the profiles is investigated: re-ranking and filtering search results. Increases in performance are moderate but noticeable and show that fully automatic creation of large hierarchical user profiles is possible[X. Shen, B. Tan, and C. Zhai 5]we systematically examine the issue of privacy preservation in personalized search. We distinguish and define four levels of privacy protection, and analyze various software architectures for personalized search. We show that client-side personalization has advantages over the existing server-side personalized search services in preserving privacy, and envision possible future strategies to fully protect user privacy.

The existing profile-based PWS do not support runtime profiling. A user profile is typically generalized for only once offline, and used to personalize all queries from a same user indiscriminately. Such "one profile fits all" strategy certainly has drawbacks given the variety of queries. A better approach is to make an online decision on whether to personalize the query (by exposing the profile) and what to expose in the user profile at runtime. Previous works on profile-based PWS mainly focus on improving the search utility and do not take into account the customization of privacy requirements. This probably makes some user privacy to be overprotected while others insufficiently protected. Many personalization techniques require iterative user interactions when creating personalized search results.

4. PROPOSED SYSTEM

We propose a privacy-preserving personalized web search framework UPS, which can generalize profiles for each query according to user-specified privacy requirements.

Relying on the definition of two conflicting metrics, namely personalization utility and privacy risk, for hierarchical user profile, we formulate the problem of privacy-preserving personalized search as Risk Profile Generalization, with its NP-hardness proved. We design two simple but effective generalization algorithms, GreedyDP and GreedyIL, to support runtime profiling. While the former tries to maximize the discriminating power (DP), the latter attempts to minimize the information loss (IL). We provide an inexpensive mechanism for the client to decide whether to personalize a query in UPS. This decision can be made before each runtime profiling to enhance the stability of the search results while avoid the unnecessary exposure of the profile.

MODULES

4.1 User Profile and Semantic Data Building

4.2 Rdf For User Uploaded Data.

4.3 Search over Indexed Data and Offline Profiling.

4.4 PSWS with UPS Framework.

4.1 User Profile and Semantic Data Building:

Consistent with many previous works in personalized web services, each user profile in UPS adopts a hierarchical structure. Moreover, our profile is constructed based on the availability of a public accessible taxonomy, denoted as R, which satisfies the following assumption. User profile is constructed based on the sample taxonomy repository.

The Resource Description Framework (RDF) is constructed for semantic data on a Relational Database containing Structured as well as unstructured data. A Schema is identified for the relational database and a RDF representing the schema of the database is constructed through model provided by the jena api. The Model contains all the information's about the data linkages in the schema. In this process the schema can also be altered based on admin requirement so that the search process can be effective.

4.2 Rdf for User Uploaded Data.

The RDF is also generated by mining the text contents uploaded by the users in blogs and the contents of the file are analyzed and the meta contents are manipulated. The meta contents are the key for search process so that the file can be rendered on demand. The Text mining process analyses the text word by word and also picks up the literal meaning behind the group of words that constitute the sentence. The Words are analyzed in WordNet api so that the related terms can be found for use in the meta content in generation of RDF. Generally RDF runs in the web services of Servers in all over the world to provide the schematic datas that the server holds in db to the distribution in the web to access it. So the user uploaded content will also be analyzed in realtime servers in their own natural language processing strategies and the results are obtained in a RDF format so that it can be understood by other Servers.

4.3 Search over Indexed Data and Offline Profiling

Similar data's are grouped together that relate to the same resource. The data level process is subjected to structure level processing by indexing the semantic data elements. Multiple RDFs are grouped and structured together to form a master RDF data that holds all the semantic information's of a Server that support reasoning in any formats of query processing. The Different resources are interlinked with high degree of relational factors by the predicates in the triples. The Query processing is handled directly in the RDF file by iterating the triples forming a discrete relation with the Service query and the URI representing the location of the resource is returned. As this process is handled in webservices in real time servers. Hence the structure-oriented approach to RDF data management where data partitioning and query processing make use of structure patterns generated by the RDF. The framework works in two phases, namely the offline and online phase, for each user. During the offline phase, a hierarchical user profile is constructed and customized with the user-specified privacy requirements. UPS consists of a nontrusty search engine server and a number of clients. Each client (user) accessing the search service trusts no one but himself/ herself. The key component for privacy protection is an online profiler implemented as a search proxy running on the client machine itself. The proxy maintains both the complete user profile, in a hierarchy of nodes with semantics, and the user-specified (customized) privacy requirements represented as a set of sensitive-nodes. In this section, we present the procedures carried out for each user during two different execution phases, namely the offline and online phases. Generally, the offline phase constructs the original user profile and then performs privacy requirement customization according to user-specified topic sensitivity. The subsequent online phase finds the optimal _-Risk Generalization solution in the search space determined by the customized user profile. Specifically, each user has to undertake the following procedures in our solution:

4.3.1. Offline profile construction,

4.3.2. Privacy requirement customization,

4.3.1. Offline-Profile Construction. The first step of the offline processing is to build the original user profile in a topic hierarchy H that reveals user interests.

4.3.2. Privacy Requirement Customization. This procedure first requests the user to specify a sensitive-node set, and the respective sensitivity value for each topic.

4.4. PSWS with UPS Framework.

The online phase handles queries as follows:

When a user issues a query on the client, the proxy generates a user profile in runtime in the light of query terms. The output of this step is a generalized user profile satisfying the privacy requirements. Subsequently, the query and the generalized user profile are sent together to the PWS server for personalized search. The search results are personalized with the profile and delivered back to the query proxy. Finally, the proxy either presents the raw results to the user, or reranks them with the complete user profile. As the sensitivity values explicitly indicate the user's privacy concerns, the most straightforward privacy preserving method is to remove subtrees rooted at all sensitive-nodes whose sensitivity values are greater than a threshold. Such method is referred to as forbidding.

4.4.1 Online query-topic mapping

4.4.2 Online generalization.

4.4.1. Query-topic Mapping:

The purposes of query-topic mapping are

- 1) To compute a rooted subtree of H , which is called a seed profile, so that all topics relevant to q are contained in it; and
- 2) To obtain the preference values between q and all topics in H

4.4.2. Profile Generalization:

This procedure generalizes the seed profile G_0 in a cost-based iterative manner relying on the privacy and utility metrics. In addition, this procedure computes the discriminating power for online decision on whether personalization should be employed.

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Image Compression Techniques: Lossy and Lossless

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Abstract— Digital image compression technology has emerged from the need for fast communication and ‘live’ processing of digital image information over the internet. Time has been passed and a lot of techniques now are available that reduce the compression ratio, and increase usability of fast computation, but as we are bound to certain limits, there are lots of innovative ways that are yet to overcome these limits. Today’s world is very dependent on digital media storage, that’s why it requires more efficient algorithms for image or data compression. Due to reserved bandwidth and capacity, images need be compressed and soft-encoded before further using it in transmission process. This paper points out Lossy as well as Lossless compression techniques as they are used in fields of image processing.

Keywords— DCT, DFT, Data Compression, Encryption, Decryption, Lossless Compression, Lossy Compression

INTRODUCTION

Digital Image Processing having some useful technologies and concepts which are famous for its commercial use also. The digital multimedia is so popular nowadays that each second nearly 26,396 Giga Bytes of data is transferred over the world, in which nearly 1,873 Giga Bytes are only Images. Needless to say, it requires a large amount of space to store the contents. Besides, the requirement of resolution is much higher than before. The art of representing the information in a compact form rather than its original or uncompressed form is compression [1]. The digital cameras, as compared to conventional film cameras produce instant images, which can be viewed without the delay of a second. The compression helps to reduce the cost of storage and to transmit images more efficiently. The compression techniques are mainly lossy compression techniques and lossless compression techniques. In the first one, 2D transforms that can be inverted are used. Lossy methods are especially suited for natural photographs where minor loss is acceptable. On the other hand, Lossless compression is preferred medical imaging, technical drawings, clip arts where every pixel information is important.

An image is essentially a 2-D signal processed by our brain. At the most times, the information in an image is analog in nature. But, they are converted from analog to digital form for purposes. A digital image is a 2-D array of pixels. If $f(x, y)$ represents an image, x and y represents spatial co-ordinates of each pixel. This image array is converted as matrix form to manipulate in digital processor.

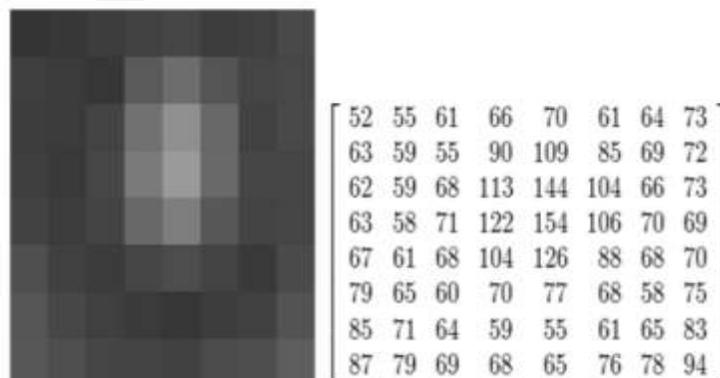


Figure 1: Image as a 2D Matrix

IMAGE COMPRESSION

Image compression is a process which on implementation gives output which is often smaller in size but looks similar to the original. The block diagram of image coding system is shown in below:

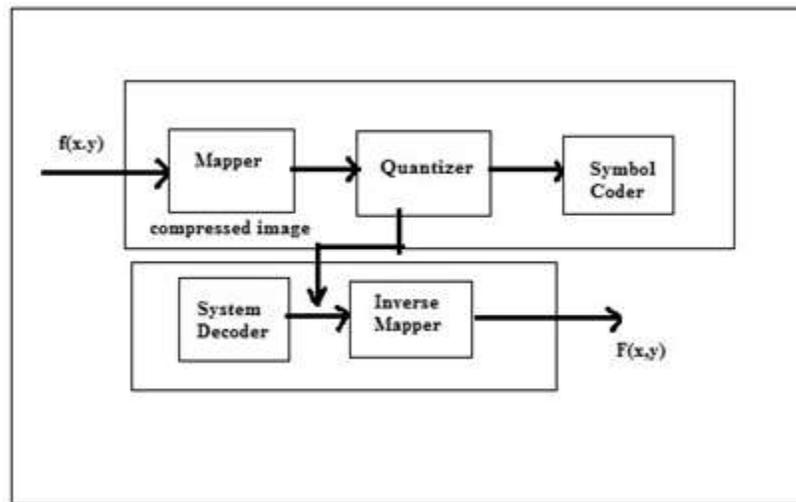


Figure 2: Image Compression Technique

The camera catches the reflected light from the surface of the objects placed at specific distance, and the received light illumination will be converted into 3 primary color components R, G and B. By coding algorithms, these three primary color components are processed.

Image compression involves a process to give out a compact representation of an image, in turn reducing the image storage and transmission requirements. Compression is achieved by the removing one of the following redundancy:

1. Coding
2. Inter-pixel
3. Perceptual

Coding redundancy emerges when the codes assigned to a set of events such as the pixel values like position, intensity of illumination, of an image have not been selected to take full advantage of the probabilities of the events [2].

It is only possible to represent an image having compressed resolution by taking these redundancies in consideration. Here, decoding is done to get the original image. The soul objective of compression is to reduce the number of bits to much possible extent, while keeping the resolution and the quality of the reconstructed image as close to the original image as possible.

Image compression systems are consists of two blocks: an encoder and a decoder. Image in the form of 2-D matrix denoted as $f(x, y)$ is fed into the encoder. If we let p and q denote the number of units that carry information (both actual) in the original and pre-processed images respectively, the compression that we get is calculated through the compression ratio, $C_R = p/q$ [3]. As shown in **Fig.2**, the encoder reduces all three redundancies of input image. Firstly, the Image mapper translates the input image into a format suitable to reduce inter-pixel loop-holes. The second stage, quantizer reduces the mapper's output accuracy in accordance with a predefined values. In final stage, a symbol decoder generates a random code for quantizer output and maps the output in accordance with the given code. These blocks when operates in reverse order, the inverse operations of the encoder's symbol coder and mapper block are performed. This does not apply to the quantization process, and is not included in the process.

ADVANTAGES OF IMAGE COMPRESSION

The benefits of image compression can be listed as follows:

1. Cost for transmitting an image as data reduces at much extent as cost depends upon duration for which data is being transmitted.
2. It saves computing power as execution of image transmission takes very less time if the size is lesser.
3. It reduces the transmission errors since fewer bits are transferred.
4. Secure level of transmission is possible due to encoding and compressing the image.

TYPES OF IMAGE COMPRESSION

The image compression techniques are broadly classified into two categories [4]. These are:

1. Lossy techniques
2. Lossless techniques

Lossy Compression Techniques:

Lossy compression methods have larger compression ratios as compared to the lossless compression techniques. Lossy methods are used for most applications. By this the output image that is reconstructed image is not exact copy but somehow resembles it at larger portion.

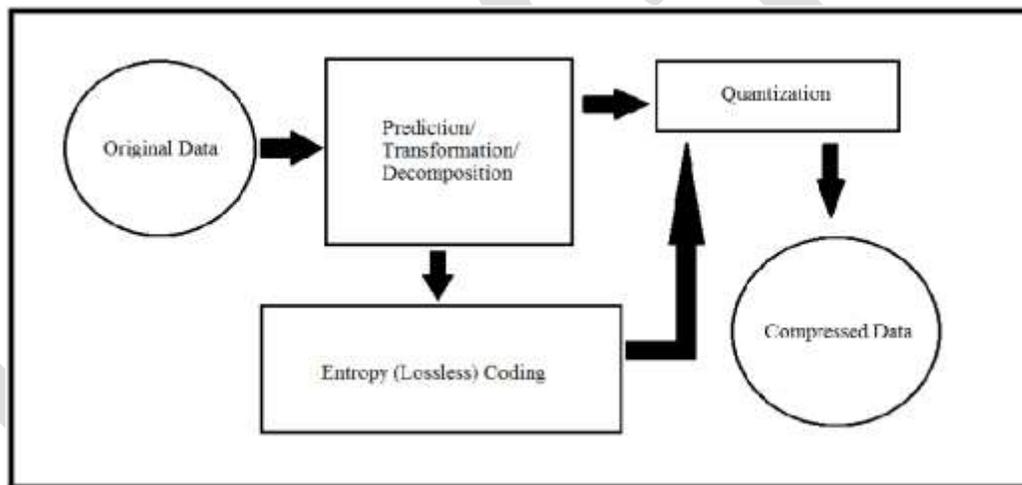


Figure 3: Lossy Image Compression

As shown in Fig.3, this prediction – transformation – decomposition process is completely reversible. There is loss of information due to process of quantization. The entropy coding after the quantizing, is lossless. When decoder has input data, entropy decoding is applied to compressed signal values to get the quantized signal values. Then, de-quantization is used on it and the image is recovered which resembles to the original [5].

Lossy compression methods include some basic consideration (performance wise):

1. Speed of encoding and decoding
2. Compression ratio
3. SNR ratio.

Lossy compression includes following methods:

1. Block truncation coding
2. Code Vector quantization
3. Fractal coding
4. Transform coding
5. Sub-band coding

Techniques

Block Truncation Coding

In this, image is divided into blocks like we have in fractals. The window of N by N of an image is considered as a block. The mean value of all values of that window consisting a certain number of pixel. The threshold is normally the mean value of the pixel values in the vector. Then a bitmap of that vector is generated by replacing all pixels having values are greater than or equal to the threshold by a 1. Then for each segment in the bitmap, a value is determined which is the average of the values of the corresponding pixels in the original code vector.

Code Vector Quantization

The basic idea in Vector Quantization is to create a dictionary of vectors of constant size, called code vectors. Values of pixels composed the blocks called as code vector. A given image is then parted into non-recurring vectors called image vectors. Dictionary is made out this information and it is indexed. Further, it is used for encoding the original image. Thus, every image is then entropy coded with the help of these indices.

Fractal Compression

The basic thing behind this coding is to divide image into segments by using standard points like color difference, edges, frequency and texture. It is obvious that parts of an image and other parts of the same image are usually resembling. Here, there is a dictionary which is used as a look up table called as fractal segments. The library contains codes which are compact sets of numbers. Doing an algorithm operation, fractals are operated and image is encoded. This scheme is far more effective for compressing images that are natural and textured.

Transform Coding

In this coding, transforms like Discrete Fourier Transform (DFT) and Discrete Cosine Transform (DCT), Discrete Sine Transform are used to alter the pixel specifications from spatial domain into frequency domain. One is the energy compaction property, some few coefficients only have the energy of original image signal that can be used to reproduce itself. Only those few significant coefficients are considered and the remaining is discarded. These coefficients are given for quantization and encoding. DCT coding has been the most commonly used in transformation of image data.

Subband Coding

In this scheme, quantization and coding is applied to each of the analyzed sub-bands from the frequency components bands. This coding is very useful because quantization and coding is more accurately applied to the sub-bands.

Lossless Compression Techniques

It is also known as entropy coding as it uses decomposition techniques to minimize loopholes. The original image can be perfectly recovered from the compressed image, in lossless compression techniques. These do not add noise to the signal. It is also known as entropy coding as it uses decomposition techniques to minimize redundancy.

Following techniques are included in lossless compression [6]:

1. Huffman encoding
2. Run length encoding
3. LZW coding
4. Area coding

Techniques

Huffman Coding

As shown in Fig. 4, this is a general technique for coding symbols using their statistical occurrence frequencies.

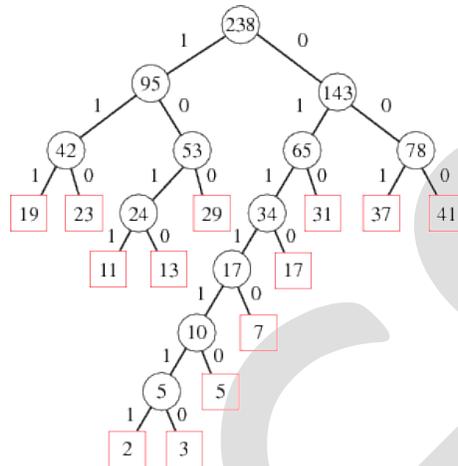


Figure 4: Huffman Coding

The pixels in the given image are assigned some specific numbers. The pixel having lesser occurrences will be given higher number of bits and the pixel with higher frequency occurrences will get relatively lesser number of bits. It is a prefix code. No two symbols in an image can have exactly same binary set of numbers. [7] In the commercial arena, most standards uses lossy or noisy methods of compression in early stages and in the final stage, the Huffman's code.

Run Length Encoding

If the data is sequential and repetitive Run Length Coding comes in as a simple method.

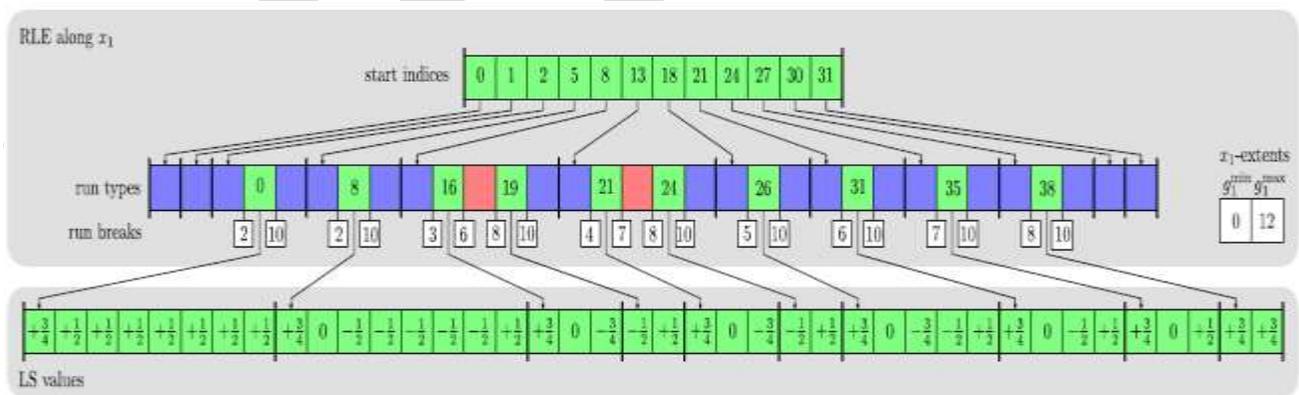


Figure 5: Run-Length Coding

In this, sequential symbols are replaced by what is called 'runs by shorter symbols'. [8] A sequence $\{V_i, R_i\}$ where V_i is the intensity of pixel and R_i refers to the number of consecutive pixels with the intensity V_i . If both V_i and R_i are represented by one byte, this total 12 pixels which are generated using only 8 bytes constitutes compression ratio of 1:5.

Area Coding

This is advanced form of earlier coding technique. It is nothing but a array that build up when it is easy to get 2D object of itself. [9] Here, same characteristics has to be chosen for the 2D blocks of pixels. These blocks or windows are coded in a form stating

their spatial coordinates and a structure. The only drawback of this technique is that it uses non-linear method which is unapplicable in hardware.

LZW Coding

LZW (Lempel-Ziv-Welch) is also a dictionary based coding. As it uses dictionary based coding, LZW has been greatly affecting digital world. Sequence used in here can be fixed or updated as soon as it is needed.

CONCLUSION

This paper points out different basic image compression techniques. As there are two types of compression methods namely Lossy and Lossless techniques, the usability and efficiency of respective techniques are different. Lossy methods of compression produce loss of information at the cost of reduction in size, whereas lossless methods do not produce any loss in information. But they have certain limitations so their commercial importance is less. Lossy compression is used where losing some information is tolerable such as audio, still images. But lossless compression is must for text files of bank records, text articles. Losing a slight information from an image in some fields like medical is not at all tolerable. Thus, it is necessary to enhance lossless compression techniques over lossy compression methods.

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Simulation and Performance Analysis of Optical Wavelength Converters based on Cross Gain Modulation (XGM) in SOA

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Abstract— In Fiber optic communication when signals are transmitted over fibers, there exist various kinds of non-linear effects. These non-linearities are serious issues in optical system, but on the other hand it can be useful for many applications. Wavelength converters are one of the applications of these non-linearities. It can be realized by fiber non-linearities or Semiconductor Optical Amplifier (SOA) non-linearities. The analysis of the Cross Gain Modulation (XGM) based Wavelength Converters done at 10Gb/s in terms of SOA current, converted signal power and quality factor. The simulations are done using a commercial optical system simulator named OptiSystem 12.0 by Optiwave.

Keywords — Semiconductor optical amplifier, Cross gain modulation, OptiSystem 12.0.

INTRODUCTION

Optical wavelength conversion is anticipated to be an essential function for the emerging bandwidth-intensive applications (video conferencing, video-on-demand services etc.) of high-speed wavelength division multiplexing (WDM) optical networks by enabling rapid resolution of output-port contention and wavelength reuse. The field of nonlinear optics has proven to be an inexhaustible source of this optical technique. This wavelength converter can be realized by using fiber nonlinearities or nonlinearities in semiconductor devices. Nonlinearity effects arose as optical fiber data rates, transmission lengths, number of wavelengths, and optical power levels increases. The only worries that troubled optical fiber in the early day were fiber attenuation and, sometimes, fiber dispersion, however, these issues are easily dealt with using a variety of dispersion avoidance and cancellation techniques. Fiber nonlinearities previously appeared in specialized applications such as undersea installations. However, the new nonlinearities that need special attention when designing state-of-the-art fiber optic systems include stimulated Brillouin scattering (SBS), stimulated Raman scattering (SRS), four wave mixing (FWM), self-phase modulation (SPM), cross-phase modulation (XPM), and intermodulation.

WAVELENGTH CONVERTERS

Wavelength converter changes the input wavelength to a new wavelength without modifying the data contents of the signal. Their most important use will be for avoidance of wavelength blocking in optical cross connects in wavelength division multiplexed (WDM) networks. Thereby the converters increase the flexibility and the capacity of the network for a fixed set of wavelengths. The converters features are [2], [11]:

- Bit-rate transparency (up to at least “10Gb/s”).
- No extinction ratio degradation.
- High signal-to-noise ratio at the output (to ensure cascability).
- Moderate input power levels (~ “0 dBm”).
- Large wavelength span for both input and output signals.
- Possibility for same input and output wavelengths (no conversion).
- Low chirp.
- Fast setup time of output wavelength.
- Insensitivity to input signal polarization.
- Simple implementation.

These wavelength converters can be realized by using fibre nonlinearities or nonlinearities in semiconductor devices. Out of the different wavelength conversion schemes, the most straight forward way is the opto-electronic conversion using either a direct

detection or a heterodyne receiver and a transmitter. However, this method does not provide efficient conversion of wavelength due to energy conversion from optical to electrical and vice-versa. As a consequence, all-optical wavelength conversion is very much attractive due to higher efficiency and fast response. Several methods, such as a self-phase modulation (SPM), a cross-gain modulation (XGM), cross phase modulation(XPM) and four-wave mixing (FWM) based on nonlinear media, such as optical fiber and semiconductor optical amplifier (SOA) can be used to realize all optical wavelength conversion.

WAVELENGTH CONVERTERS BASED ON CROSS-GAIN MODULATION (XGM) IN SOA

A simple technique for the realization of wavelength conversion is the use of cross gain modulation in semiconductor optical amplifiers. The XGM effect consists on the variation of the SOA gain in function of the input power. The increase of the power of the input signal causes a depletion of the carrier density, and therefore the amplification gain is reduced. Gain saturation can be simply used for XGM by transmitting two different optical signals together through the semiconductor optical amplifier [1]. The Figure 2.5 shows the Wavelength conversion through XGM in SOA.

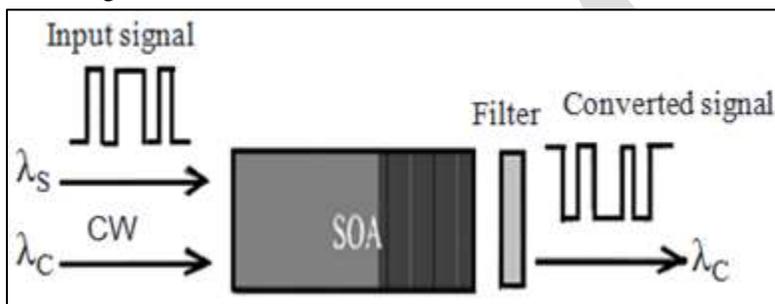


Fig.1 Wavelength Converter based on XGM in SOA

Two input data signals are coupled to the SOA: a low power continuous wave signal and a pulsed signal, both at different wavelengths. If an optical pulse is present on the pulsed signal the gain of the SOA decreases, and therefore the continuous signal experiences low amplification. If no light is present on the pulsed signal, the gain of the SOA increases, and consequently the continuous wave signal experiences high amplification. The first signal is the information signal on λ_s wavelength. The other is a continuous wave on λ_c wavelength. In this case the intensity modulation of the first signal will change the gain value of the SOA according to the gain saturation, so that the device will function as an external modulator for the second signal. Here the converted output is the inverted input. The attractions of XGM wavelength conversion devices lie in their simplicity, high conversion efficiency, polarization independence, and their insensitivity to the wavelength of the input data. One disadvantage of devices using XGM for wavelength conversion is extinction ratio degradation. This can be a serious limitation in cascading such devices in an optical network. Another important drawback of XGM wavelength converters is the wavelength chirp induced on the target waveform. This wavelength chirp can severely limit the transmission distance [7].

SIMULATION SETUP

The XGM wavelength converter is simulated using Optisystem 12.0 by Optiwave. The simulation is done at a data rate of 10Gbps. Here pump signal at wavelength 1550nm with 10dBm power and probe signal of 5dBm power at 1540nm are applied to the WDM mux and the multiplexed signal applied to the SOA. From the SOA output, the converted signal can be filtered out by using an optical filter, here Bessel filter is used [1]. The converted signal power is also analysed here. This simulation uses three visualizers namely optical power meter, optical spectrum analyser and BER analyser. Optical spectrum analysers provide the facility to analyse the optical spectrum. Optical power meters give the power received in both dBm and Watts. Eye diagram analyzer automatically calculates the Q factor and displays eye diagram. Also in order to find the effect of SOA current, the current is varied from 200mA to 500mA. The corresponding converted signal power and Q factor is noted.

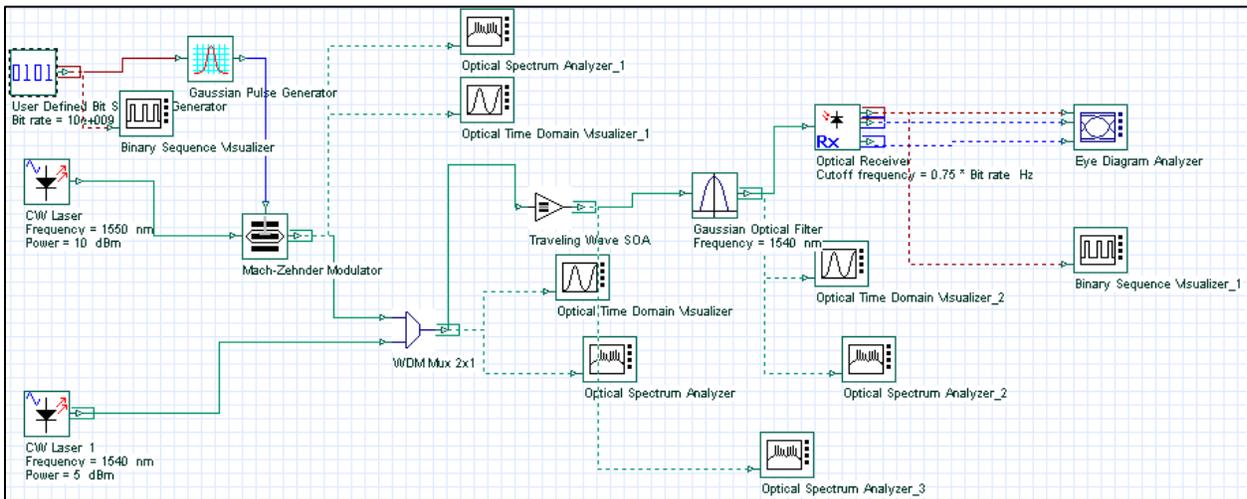
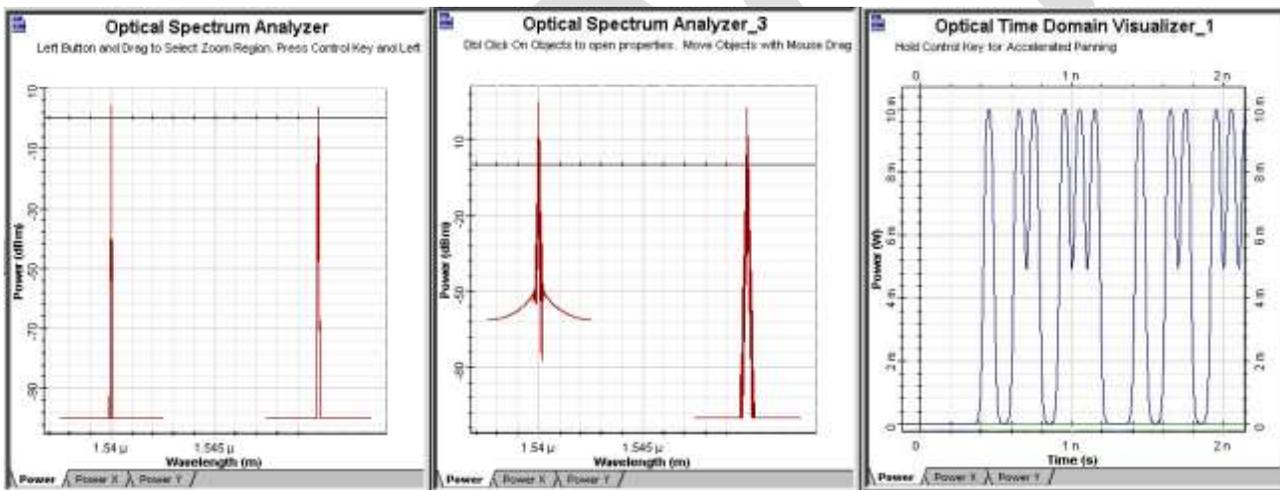


Fig.2 Simulation layout of XGM based Wavelength converter

RESULTS AND DISCUSSIONS



(a)

(b)

(c)

Fig.3 (a) Multiplexed signal (b) SOA output (c) Signal at 1550nm, pump signal

In the above figure, multiplexed output of pump signal (1550nm) and probe signal (1540nm) is shown in fig.3 (a). This multiplexed signal is applied into the SOA. Fig.3 (b) shows the SOA output. From that it is clear that the input signals are get amplified. The fig3 (c) shows the OTDM output of pump signal at 1550nm. The pump signal has a power of 10dBm. From the SOA, the converted signal which is the 1540nm signal can be filtered out by using gaussian optical filter. A binary sequence visualizer is used at the output in order to view the converted signal. The Quality factor and the BER of the conversion can be find by Eye diagram analyzer. The input from the binary sequence visualizer is shown in figure.4 (a). A bit sequence of 01011 is used in the input. The converted signal is shown in the below figures.

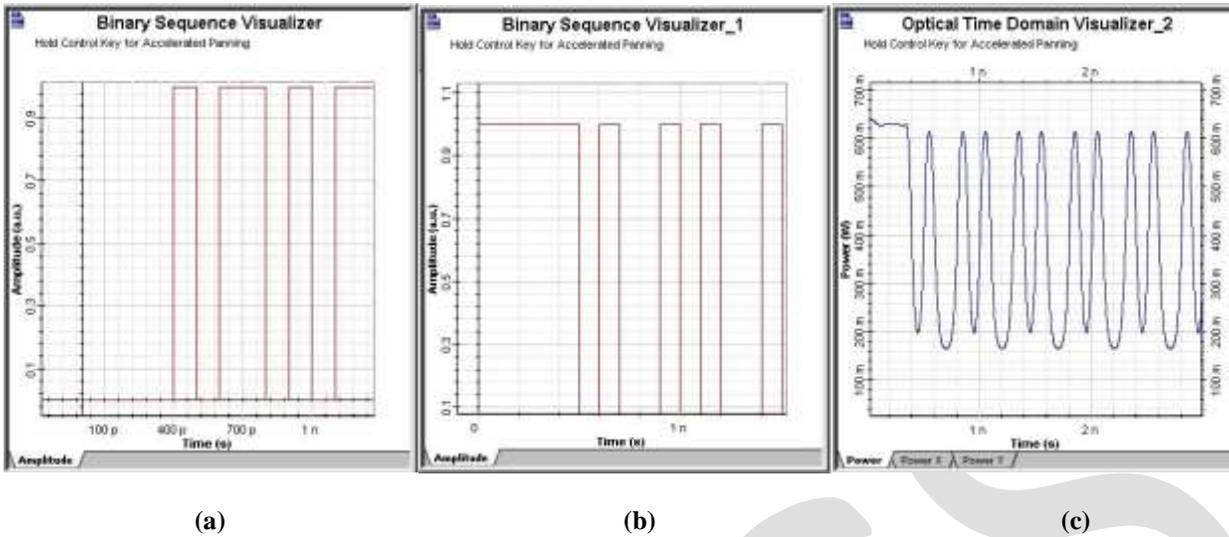


Fig.4 (a) Input data (b) Converted data at 1540nm (c) OTDM out of Converted signal at 1540nm

By comparing the figures 4 (a) and (b), it is clear that the converted signal is the inverted input. An output data of 10100 is obtained. That is, the XGM results the inverted gain modulation. Also the OTDM output shows that the power is increased to 27.78dBm.

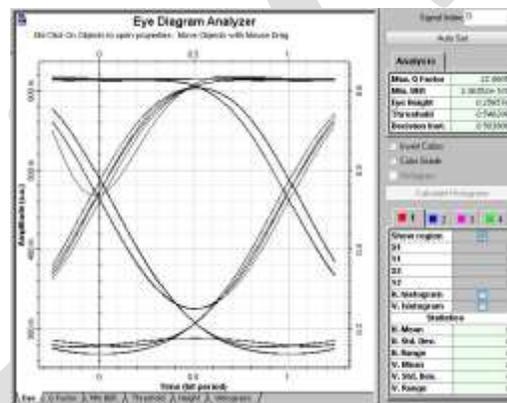


Fig.5 Eye diagram for 500mA SOA current

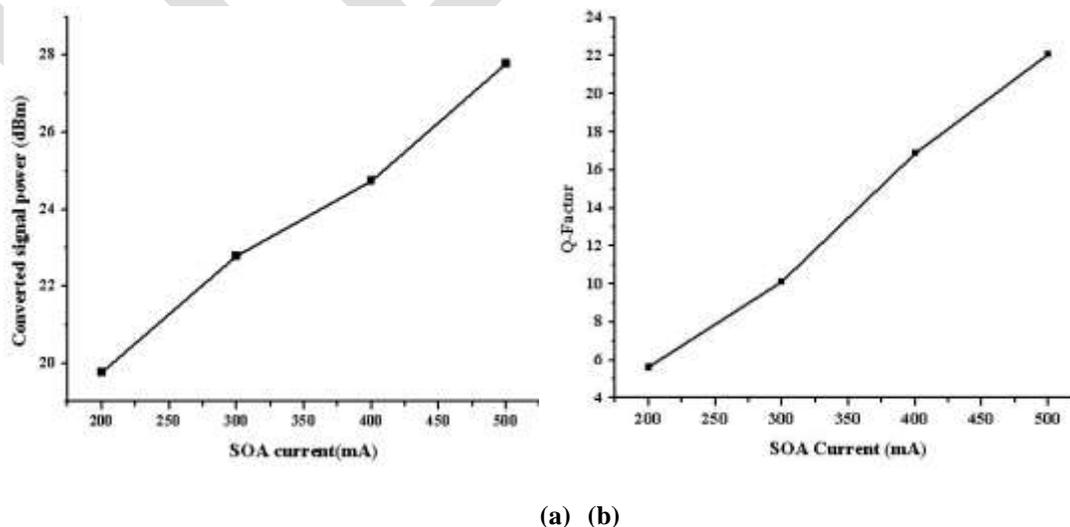


Fig.6 Relation between SOA current and (a) Converted signal power (b) Q-Factor

The eye diagram obtained at 500mA SOA current is shown in figure5. When varying the SOA current from 200mA to 500mA, the converted signal power increases also, Q-Factor increases. The maximum converted signal power and Q-Factor are obtained at 500mA SOA current. Figure 6 shows these results.

CONCLUSION

Wavelength Converter based on XGM in SOA is simulated. It can be concluded that the wavelength converted output signal is the inverted and the power is increased from 10dBm to 27.78dBm. That is, the SOA provides amplification. Also the converted signal power and Q-Factor increase with increase in SOA current.

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Performance Analysis of 8-Channel DWDM With 0.4nm Spacing Using Duobinary Modulation Format

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Abstract— The growing data and internet traffic in telecommunication has lead to an increase in demand for high transmission capacity. Although Non Return to Zero (NRZ) modulation is suitable for long haul systems due to its simplicity, one way of achieving a more efficient use of channel bandwidth is to use duobinary coding. It is a three level code of -1, 0 and 1. Data generator and duobinary encoder make up the electrical section of duobinary transmitter. Duobinary encoder at the transmitter section provides three level electrical signal. It can be either a duobinary filter or a delay and add circuit. Optical section of duobinary transmitter includes a laser diode and Mach Zehnder Modulator. Duobinary Modulation is a better choice for uncompensated single mode fiber, since it is more resilient to dispersion. It can be suggested for long distance communication systems at high bit rates. Duobinary signal can offer many advantages to various Wavelength Division Multiplexing techniques (WDM), since it eliminates the non linear effects due to low channel spacing.

Keywords— Non Return to Zero (NRZ), duobinary, duobinary encoder, delay and add circuit, duobinary filter, Mach Zehnder Modulator, WDM

INTRODUCTION

In recent years, the demand for faster communication due to the explosive growth in internet activities has lead to the better usage of channel bandwidth. Thus, Optical fiber communication technology which has higher bandwidth than copper cable is preferred to transmit higher data rates at longer distances. In optical fiber communication binary NRZ and RZ is widely used due to its simplicity of implementation. At higher data rates, chromatic dispersion in optical fiber causes waveform distortion and becomes a limiting factor in the Standard Single Mode Fiber (SSMF). Correlative coding, also known as Partial Response Signaling (PRS), can enhance the chromatic dispersion tolerance of a SSMF. Duobinary coding, which was first introduced by A Lender in 1960s, is a type of PRS. It is a three level signal with spectral width one half that of the binary.

Duobinary transmitter section has both optical and electrical part. Electrical section of duobinary transmitter consists of data source, electrical generator and duobinary encoder. Duobinary encoder produce three level electrical signal. It can be either a delay and add circuit or a duobinary filter (5 pole Bessel Thomson low pass filter). Duobinary filter is better than delay and add circuit for generating duobinary signal. The optical section of duobinary transmitter consists of a laser diode and Mach Zehnder Modulator (MZM). MZMs can be of two types - dual arm MZM and single arm MZM. A continuous wave or pulsed light wave generated by a laser diode is modulated by an external MZM and is transmitted through fiber. At the receiver, the square law detector neglects the phase of a received pulse. Therefore the received data sequence is absolute value of transmitted sequence [1,10,11].

Duobinary offers several advantages to Wavelength Division Multiplexing (WDM) techniques. In WDM, each communication channel is allocated to a different frequency and multiplexed onto a single fiber. At the destination wavelengths are spatially separated to different receiver locations. In this configuration the high carrier bandwidth is utilized to a greater extent to transmit multiple optical signals through a single optical fiber. WDM systems are divided into different wavelength patterns, Conventional/Coarse (CWDM) and Dense (DWDM). Conventional WDM systems provide up to 8 channels in the 3rd transmission window (C band) of silica fibers around 1,550 nm. Dense wavelength division multiplexing (DWDM) uses the same transmission window but with denser channel spacing. A typical system would use 40 channels at 100 GHz spacing or 80 channels with 50 GHz spacing. The two major non-linear effects such as FWM and Stimulated Raman Scattering (SRS) in transmission fiber limit the performance of DWDM. In order to eliminate these effects, Duobinary modulation can be used [3,6,7,8].

SIMULATION SETUP

Simulation setup for 8-channel DWDM using duobinary modulation format is shown in Fig.1. The data source feeds two drivers, one directly and other through NOT gate, that generates the NRZ signal. These two signals are passed to electrical filters of Bessel type. The Bessel filters have 5 poles. It acts as duobinary encoder that produces a three level signal. Here, dual arm MZM which is driven in push-pull fashion is used as the modulator to avoid chirping of the output signal. Push-pull means that each arm of MZM are driven by opposite voltages to avoid chirping of the output signal [2,9].

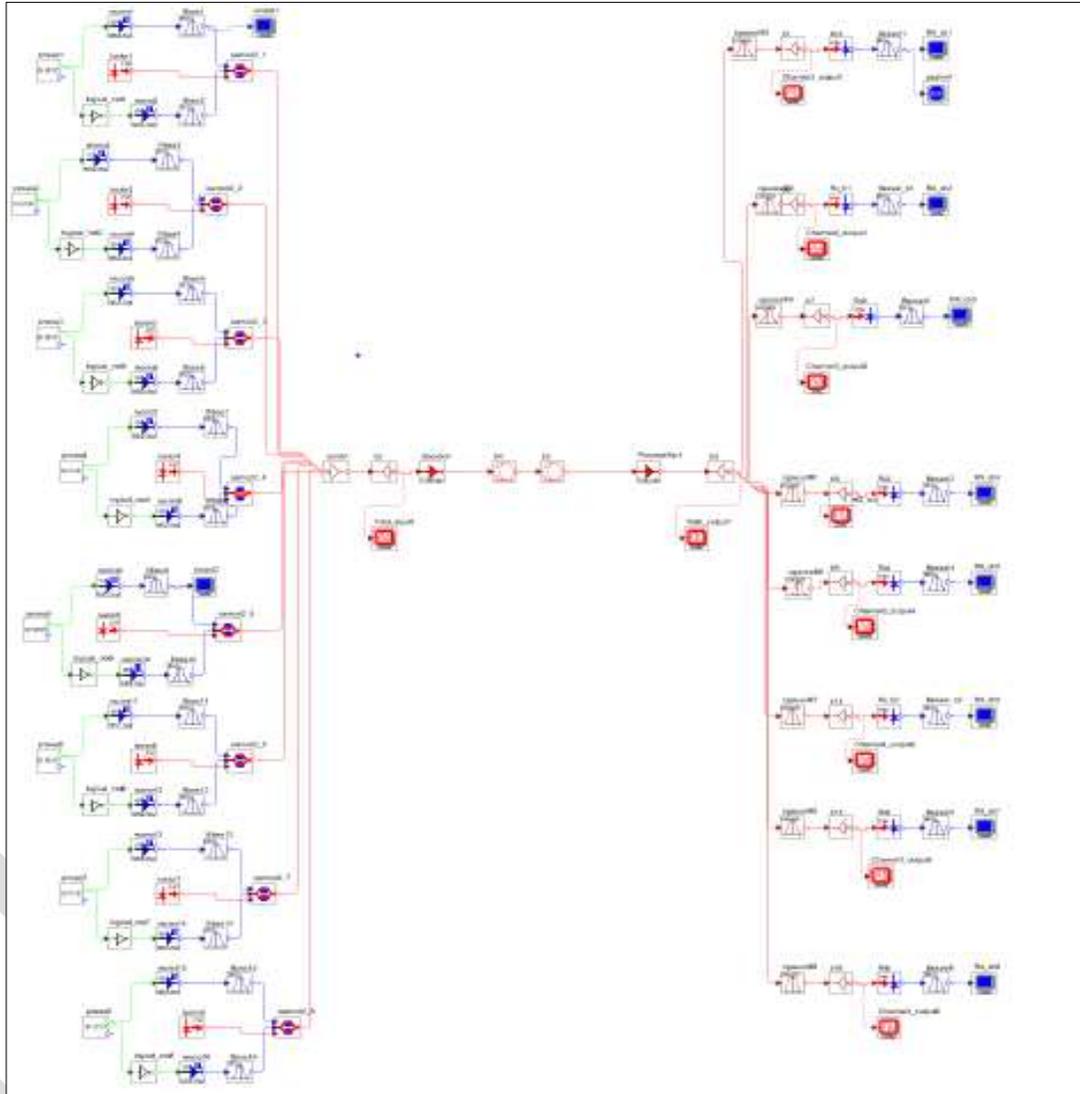


Fig.1. Simulation set up for 8 channel DWDM

As shown in Fig.1, the combiner combines 8 channels, each emitting different wavelengths to a single Standard Single Mode Fiber (SSMF). The channel spacing is chosen as 0.4 nm. In order to provide dispersion compensation, Reverse Dispersion Fiber (RDF) is placed after the SSMF. The RDF simulated had an attenuation of 0.24 dB/km and a negative dispersion of -16 ps/nm/km. Fiber PMD is 0.03ps/km^{0.5}. Non linear refractive index is taken as 2.8 E-18 m² / W.

At the receiving side, the wavelengths are separated, filtered using an optical filter (Gaussian filter) and detected using a PIN photodiode. Finally this electrical signal is filtered using a Bessel filter whose bandwidth depends on bit rate. SSMF and RDF are simulated at the ratio 1:1 [4,5,12].

RESULTS AND DISCUSSION

The optical spectrum obtained for 10 Gbps DWDM is shown in Fig.2.

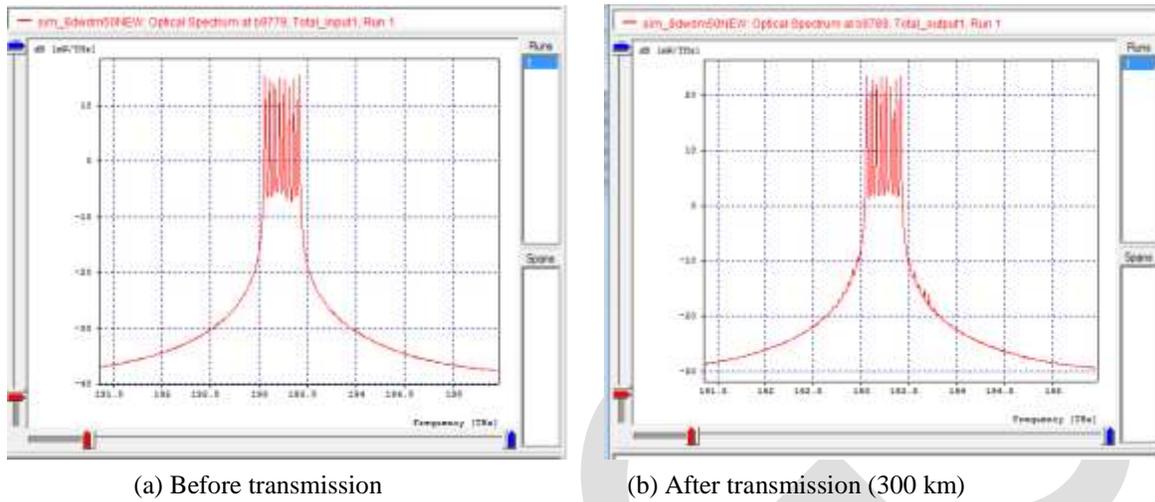


Fig.2.Optical spectrum

From the optical spectrum, it can be seen that duobinary reduces nonlinear effects such as Four Wave Mixing and Stimulated Raman Scattering (power tilt ≈ 0) for longer distances.

Fig. 3. shows the eye diagram for channel-1 and channel- 8 for 8-channel DWDM system after 300 km. It gives a Q Factor 17.480 for channel-1 and 18.309 for channel- 8. Corresponding BERs are $4.1712e-14$ and $4.0813e-16$ respectively.

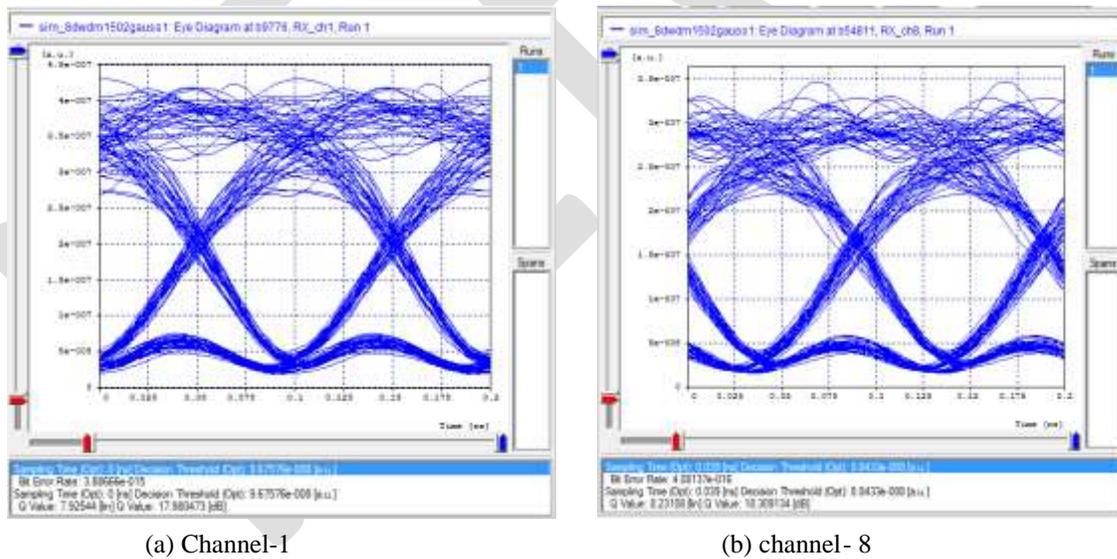
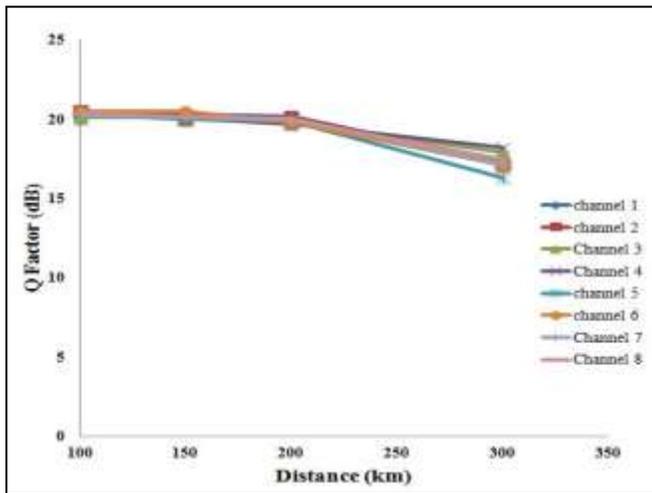
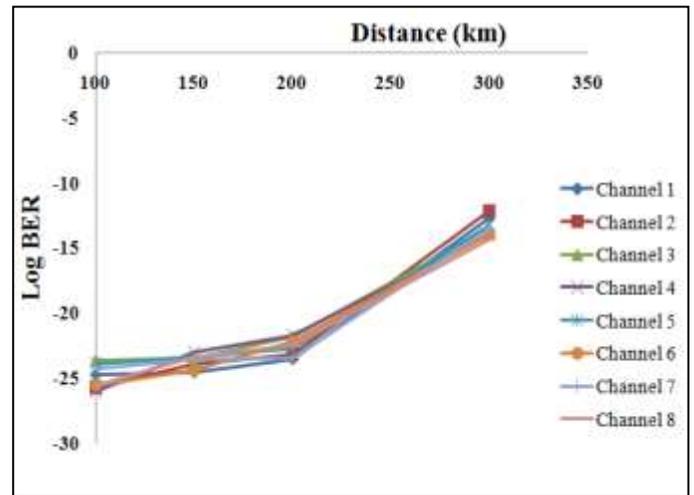


Fig.3.Eye diagram

Variation of Q Factor and BER with distance for 8 channel DWDM at 10 Gbps is shown in Fig.4.



(a) Distance vs Q Factor



(b) Distance vs BER

Fig.4.Variation of Q Factor and BER with distance

From the graphs , it is observed that duobinary modulation based DWDM provides better Q Factor and lower BER for large distances.

CONCLUSION

In this work , analysis of 8-channel DWDM using duobinary modulation format has been done. The channel spacing is chosen as 0.4 nm . From the analysis it is found that duobinary modulation reduces nonlinear effects such as FWM and SRS thereby providing better Q Factor and lower BER for longer distances .

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Timed Automation Scripts for Software Testing

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Abstract— Automation of test plans for testing software is a frequently used technology these days. The theory behind automation is that it makes the entire testing process much more efficient and requires less manual work. TouchStone is the software under consideration for creating automated scripts. But the drawback still remains that an individual must be present to execute the automated test script and provide necessary variable values. After the termination of the test script, the execution of the next test script must also be manually started. Hence this paper proposes the use of timed runs, where a series of test scripts and their associated variable values will be provided at one go. The start time of the execution can also be provided, if the execution is to be done at a later time. Once the entire batch has run, the test analyst can then review the results, thus saving time and effort.

Keywords— automation; testing; TouchStone; Test Execute; timed automation; efficient; software;

INTRODUCTION

Every software development group must test its end products, because it may contain flaws. Testing is performed to note the errors before the release of the product and also later for maintenance of the product. Manual testing processes are the most common, but they are less efficient in comparison to automated testing. Automated tests scripts can be created and easily repeated to perform the monotonous tasks which are difficult when performed with manual testing. Automated software testing improves the accuracy of the test plans, as the chance of human errors is removed. It also involves higher test coverage within smaller interval of time, and that too at a low cost. Furthermore if these scripts are run at once, without outside interference, the efficiency increases all the more.

AUTOMATION

Basic Overview

‘Automating’ means development of automation scripts which can be used for running the manual workflows of the application in an efficient way. In simpler terms it refers to the transfer of human functions to machines.

Test design is one of the foundation phases for software testing. This involves analyzing the requirements and the specifications and synthesizing test cases against which the software will be validated. It helps determine if the software complies with the requirements and specifications. This involves tremendous human effort.

Test development involves developing the test procedures (manual or automated) that will be repeated on the software being tested [2]. Mostly the tests are run manually and hence they involve human effort. Automating software testing involves development of test scripts using scripting languages so that computers can execute these tests with little human intervention. Creation of both manual and automated procedures involves different amounts of effort. However the extra effort required in coding automated test plans is an initial investment that has to be made for the future savings.

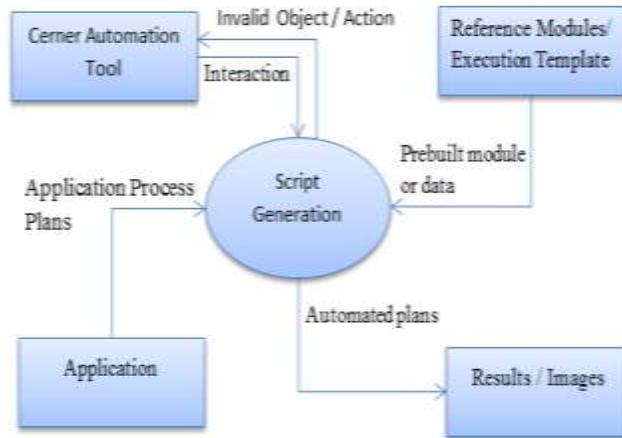


Figure 13 – Block Diagram of Automation

Figure 1 shows the basic components in automated testing. Pre-built modules and data is used along with new modules, and new test scripts are created. The requirements of the test script are obtained from the application to be tested. Automation tools are used to create these test scripts. Once a test script is executed the results can be obtained in the form of an html file or an image.

Advantages

Automation has the following advantages over manual testing :

- Lower cost
- Less human error involved
- More efficient
- Faster than manual testing
- Same modules can be repeated multiple times in the form of a loop
- Reference modules are available providing ease of reuse

Tool Used

The tool used for Automation is an internal tool called TouchStone. It has three basic components:

- Objects –Each component of the software which is to be interacted with is called an Object. It forms a hierarchy, with the root being the application itself.
- Modules – They are units composed of interactions, decisions or validations which can be executed as a whole. Each step in a test plan is represented by a module.
- Interactions –They are nothing but the code for performing a task on the objects

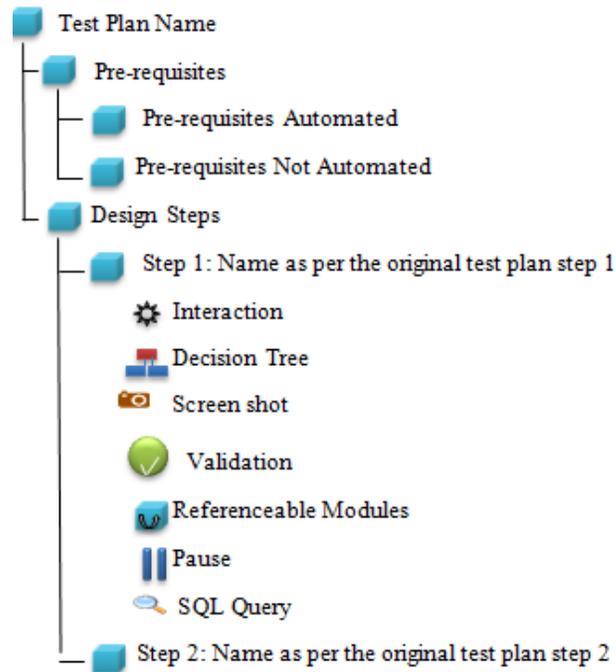


Figure 14 – Parts of a script in TouchStone

The following are other integral parts of scripting an automated test plan :

- Reference Modules – They are reusable codes which are stored in a repository. Using reference modules does away with the need of building code from scratch.
- Execution Templates – Since the test plan is to be run on different domains, with various different settings, execution templates must be used to maintain variable values for one generic automated script.
- Decision Making – When branch paths arrive, decision modules are used.
- Validations – Validations are used to verify whether certain values are being displayed the way they are supposed to be.
- Manual Steps – There are certain steps which cannot be automated, in such situations manual steps are used, where the tester is prompted to perform some action.
- Screenshots – They are used for verification.

Figure 2 shows these basic parts of a test script created using TouchStone and how they are present in a script.

Once a script is created in TouchStone, it can be run as many times as required, but the values for variables must be provided before the script is run. This means that every time a new test plan is to be executed, a Test Analyst must provide the variables and run it. This brings about a waste of resources. That's why timed execution of multiple scripts serially will increase efficiency.

LITERATURE SURVEY

In the paper entitled "Evaluating Automated Functional Testing Tools" [9] Schwaber et. al. showed how testing is a major cost factor in software development. To reduce these costs test automation can be taken as a solution. It has been mentioned that test automation tools can inevitably increase the number of tests being run. The frequency at which these tests are run can also be increased. There is a trade-off between automated and manual testing, and in certain situations manual is better, whereas in other cases automated test plans are much more cost-effective. The paper showed several cost models commonly used to make decisions about automating test plans. What was seen in the paper was that many points must be taken into consideration for automation.

In "Evolutionary testing of classes" [8] Tonella mentions the two common ways of testing software, either manually or automatically. It is shown how the two approaches are complementary in nature. Automated testing performs a greater number of tests in very little time, on the other hand manual testing makes best use of the knowledge of the testing engineer to mainly concentrate on those parts of the system that are known to be prone to errors and faults. The paper proposes a tool called AutoTest that integrates developers test cases into an automated. This combines the advantages of both approaches while keeping a simple interface.

CASE STUDY

There are several regression test plans related to various aspects of the Cerner Millennium application. Let us take an example test plan, EMR-R-Health Maintenance, to see what kind of steps are to be converted from manual to automated. The following test plan will give a general idea of the test plans to be automated.

Description

EMR-R-Health Maintenance deals with testing a specific part of the Cerner Millennium application which deals with providing information related to a patient's general health. Once a patient is registered at a healthcare location his/her basic details and problems are charted using the Millennium application. In the health maintenance tab of the application, recommendations are provided for various tests, screens and immunizations that a patient should undergo for better healthcare. These recommendations are made based on the patient's available information which was previously charted. The recommendations are termed as 'Expectations'. Once an Expectation is fulfilled, its details can be charted and it automatically moves to the 'Satisfied Expectations' pane. In this test plan the following functionalities are tested:

- Satisfying an Expectation using a PowerForm – Certain Expectations can be fulfilled by filling in information through a form known as a PowerForm. An example of this form of an Expectation is an 'Alcohol Misuse Screen' which requires the completion of a form having details related to alcohol consumption.
- Satisfying an Expectation using a Procedure – Certain Expectations can be fulfilled by assigning a procedure, such as a 'Blood Test' to be performed on the patient.
- Satisfying an Expectation manually – Some Expectations have an option termed as 'Done' available. These Expectations can be satisfied by simply clicking on the 'Done' option.
- Manually Add Existing Expectations – Not all recommendations are shown at once. New groups of Expectations can be displayed by manually adding existing groups of Expectations.
- Manually Add/Create Custom Free-Text Expectations – Custom Expectations can also be created.
- Change Frequency and /or Due Date – Certain Expectations must be repeated, for example "PET Scan". The frequency of these Expectations can be modified. Some Expectations, like immunizations have fixed due dates. If the user has permission, then he/she can change the due date.

Prerequisites

- The following test user with access to Cerner Millennium application and associated to the testing location must be identified:
 - Registered Nurse – A registered nurse is a clinician having privileges to access the Cerner Millennium application and to chart details for a patient of a specific testing location.
- A testing location must be identified – It is a healthcare organization where the test is to be performed. The registered nurse and patient must be associated with this testing location.
- A new female test patient must be registered (between 50-90 years old) with the following attributes:
 - Active outpatient encounter – An encounter number is associated with a patient every time he/she visits the healthcare center. The patient must be an outpatient, i.e. he/she must not be admitted to the healthcare center overnight.
 - Has an active diagnosis – Any diagnosis such as "diabetes" must be charted for the patient, before the test plan is executed.

Automation Process

The automation process involves conversion of the manual steps of the test plan into a systematic set of modules which automatically interact with the application being tested. The following procedures are to be followed when automating a test plan:

- A root module must be created.
- Each step of the test plan should be taken as a module. These modules must be present as sub-modules under the root module.
- The instructions of each step must be taken as interactions under each module.
- Variables must be created for values which may change, for example username and password
- Decision interactions must be added in situations where branching occurs
- Validation interactions must be used for verification of test steps
- Screenshot interactions must be added where automated verifications are not possible
- After a script is created for the entire test plan, a .xml file is generated which can be used to run the test plan.
- Before the test script is executed, the values for the variables used in the test script must be provided.

TIMED AUTOMATION

Timed automation is nothing but the execution of a set of automated test plans one after the other, without user interference, at a given time. The variable values can be provided beforehand as default values, without manual entry. To understand how this enhances the efficiency we must take into account the time involved in executing scripts. If we have a script with 60 modules, each module having 5 interactions on an average, we will see the following :

- Time for Manual Execution : 50 minutes (taking 10 seconds per interaction approximately)
- Time for Automated Execution :25 minutes (taking 5 seconds per interaction approximately)
- Time for opening a Project and starting execution: 1 minute
- Time for providing variable values: 10 seconds per variable.

From the above data we see that if we want to run 5 test plans with 20 variables and 60 modules each we will get approximate running times as shown in Table1.

TABLE I

Method for Testing	Duration (in minutes)
Manual	272
Automation	147
Timed Automation	130

This shows that timed execution of automated scripts is much more efficient than straightforward automation. With the increase in the size of test plans, and number of test plans being executed, the advantage of timed automation scripts will be more significant.

CONCLUSION

We can see that even though automation of test plans can speed up manual testing, they are still not exhausting all the possible advantages of automation. When automation is timed as opposed to executed manually one test plan at a time, the entire process of testing becomes more efficient. In software companies with multiple products, where a huge number of test plans have to be run on a regular basis, this approach will be very advantageous. Furthermore timed execution of scripts will enhance Overnight testing scenarios

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A Data Aggregation Method for Balancing Load under Probabilistic Network Model (PNM)

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Abstract— Data aggregation is a very crucial technique in WSNs. Data aggregation helps in reducing the energy consumption by eliminating redundancy. Data Gathering is a fundamental task in Wireless Sensor Networks (WSNs). Data gathering trees capable of performing aggregation operations are also referred to as Data Aggregation Trees (DATs). Most of the existing DAT construction works are based on the ideal Deterministic Network Model (DNM), where any pair of nodes in a WSN is either connected or disconnected. Under this model, any specific pair of nodes are neighbors if their physical distance is less than the transmission range, while the rest of the pairs are always disconnected. However, in most real applications, the DNM cannot fully characterize the behaviors of wireless links due to the existence of the transitional region phenomenon. The load-balance factor is also neglected when constructing DATs in current systems. And most of the current literatures investigate the DAT construction problem under the DNM. In this paper we are discussing on load balancing factor and also on construction of DAT using Probabilistic Network Model (PNM). Therefore, it is focused on constructing a Load-Balanced Data Aggregation Tree (LBDAT) under the PNM. More specifically, three problems are investigated, namely, the Load-Balanced Maximal Independent Set (LBMIS) problem, the Connected Maximal Independent Set (CMIS) problem, and the LBDAT construction problem. LBMIS and CMIS are well-known NP-hard problems and LBDAT is an NP-complete problem.

Keywords— Data aggregation, WSN, Network load balancing, Data Aggregation Trees (DATs), Load-Balanced Data Aggregation Tree (LBDAT), Deterministic Network Model (DNM), Probabilistic Network Model (PNM)

INTRODUCTION

Wireless sensor networks (WSNs) consist of sensor nodes. These networks have huge application in habitat monitoring, disaster management, security and military, etc. Wireless sensor nodes are very small in size and have limited processing capability and very low battery power. This restriction of low battery power makes the sensor network prone to failure. Data aggregation is a very crucial technique in WSNs. Data aggregation helps in reducing the energy consumption by eliminating redundancy. Data Gathering is a fundamental task in Wireless Sensor Networks (WSNs). Data gathering trees capable of performing aggregation operations are also referred to as Data Aggregation Trees (DATs).

Data aggregation is the process of collecting and aggregating the useful data. Data aggregation is considered as one of the fundamental processing procedures for saving the energy. In WSN, data aggregation is an effective way to save the limited resources. The main goal of data aggregation algorithm is to gather and aggregate data in an energy efficient manner so that network lifetime is enhanced. Wireless sensor networks have limited computational power, limited memory and battery power, hence increased complexity for application developers which results in applications that are closely coupled with network protocols. In Wireless Sensor Networks (WSNs), sensor nodes periodically sense the monitored environment and send the information to the sink (or base station), at which the gathered/collected information can be further processed for end-user queries. In this data gathering process, data aggregation can be used to fuse data from different sensors to eliminate redundant transmissions, since the data sensed by different sensors have spatial and temporal correlations. Hence, through this in-network data aggregation technique, the amount of data that needs to be transmitted by a sensor is reduced, which in turn decreases each sensor's energy consumption so that the whole network lifetime is extended.

Many practical applications like environmental monitoring, military applications, scientific research etc., are exploring the use of WSNs. Such applications require transferring a huge amount of relevance, sensed data from one point of the network to another. Since WSNs are mostly equipped with low power batteries, battery life is a major constraint in any real-time application. This necessitates the use of energy efficient data dissemination protocols for aggregation of the sensed data. Nodes of a WSN in close proximity usually hold similar data due to a property called spatial correlation. A data aggregation scheme is energy efficient if it maximizes the functionality of the network. If we assume that all sensors are equally important, we should minimize the energy consumption of each sensor.

For clarification [1], data gathering trees capable of performing aggregation operations are also referred to as Data Aggregation Trees (DATs), which are directed trees rooted at the sink and have a unique directed path from each node to the sink. Additionally, in a DAT, sensing data from different sensors are combined at intermediate sensors according to certain aggregation functions including COUNT, MIN, MAX, SUM, and AVERAGE. Due to the dense sensor deployment, many different DATs can be constructed to relay data from the monitored area to the sink. According to the diverse requirements of different applications, the DAT related works can be roughly classified into three categories: Energy-Efficient Aggregation Scheduling [3], [4], [5], Minimum-Latency Aggregation Scheduling [6], [7],[8], and Maximum-Lifetime Aggregation Scheduling[9],[10], [11], [12]. It is worth mentioning that aggregation scheduling attracts a lot of interests in the current literatures. However, unlike most of the existing works which spend lots of efforts on aggregation scheduling, we mainly focus on the DAT construction problem.

Key Points in data aggregation are as follows:

- i. Nodes sense attributes over the entire network and route to nearby nodes.
- ii. Node can receive different versions of same message from several neighboring nodes.
- iii. Communication is usually performed in the aggregate.
- iv. Neighboring nodes report similar data.
- v. Combine data coming from different sources and routes to remove redundancy.

Most of the existing DAT construction works are based on the ideal Deterministic Network Model (DNM), where any pair of nodes in a WSN is either connected or disconnected. Under this model, any specific pair of nodes are neighbors if their physical distance is less than the transmission range, while the rest of the pairs are always disconnected. However, in most real applications, the DNM cannot fully characterize the behaviors of wireless links due to the existence of the transitional region phenomenon. The load-balance factor is also neglected when constructing DATs in current systems. And most of the current literatures investigate the DAT construction problem under the DNM.

In this paper we are discussing on load balancing factor and also on construction of DAT using Probabilistic Network Model (PNM). Therefore, it is focused on constructing a Load-Balanced Data Aggregation Tree (LBDAT) under the PNM. More specifically, three problems are investigated, namely, the Load-Balanced Maximal Independent Set (LBMIS) problem, the Connected Maximal Independent Set (CMIS) problem, and the LBDAT construction problem. LBMIS and CMIS are well-known NP-hard problems and LBDAT is an NP-complete problem.

The main contributions of this paper are summarized as follows:

- i. Analysis of Data aggregation technique
- ii. Constructing a Load-Balanced Data Aggregation Tree (LBDAT) under the PNM
- iii. Investigation of three problems namely, the Load-Balanced Maximal Independent Set (LBMIS) problem, the Connected Maximal Independent Set (CMIS) problem, and the LBDAT construction problem
- iv. Simulation using NS-2.34 under Fedora Linux environment

METHODOLOGY

A. Data Aggregation overview

Data aggregation is the process of collecting and aggregating the useful data. Data aggregation is considered as one of the fundamental processing procedures for saving the energy. A data aggregation scheme is energy efficient if it maximizes the functionality of the network. If we assume that all sensors are equally important, we should minimize the energy consumption of each sensor. As soon as a query is sent by the BS to a sensor, the first step followed is to handle the query. This is followed by data collection from sources and aggregation of that data.

Network Data aggregation is of two types:

- a. Address-centric (AC) and
- b. Data-centric (DC)

a) Address-centric (AC)

In AC routing protocol [2], query is routed to a specific address or a given sensor based on the address specified in the query. Each source independently Address Centric Routing sends data along the shortest path to sink (“end to-end routing”). Data is then sent from this specific location to the BS(Base Station). The source with the address specified in the query, sends its data directly to the BS.

b) Data-centric (DC)

However, in DC routing [2], based on the condition specified in the query, all sensors satisfying that condition, need to respond and therefore, the query is broadcast to all the nodes (within range) in the network.

B.Proposed Method

We solve the LBDAT construction problem in three phases in this paper. First, we construct a Load-Balanced Maximal Independent Set (LBMIS), and then we select additional nodes to connect the nodes in LBMIS, denoted by the Connected MIS (CMIS) problem. Finally, we acquire a Load-Balanced Parent Node Assignment (LBPNA). After LBPNA is determined, by assigning a direction of each link in the constructed tree structure, we obtain an LBDAT. In this subsection, we formally define the LBMIS, CMIS, LBPNA, and LBDAT construction problems sequentially. The proposed method can be implemented using following flow(Fig.1).The simulation parameters are shown in table 1.And data aggregation for different network based schemes[1] are shown on Fig.2.

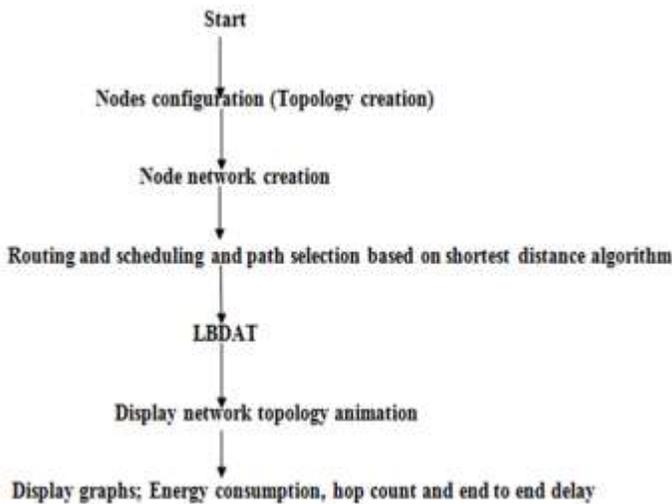


Fig.1.Proposed Flow

TABLE1
Simulation Parameters

Parameter/Specification	Details
No. of Nodes	50
Topology (Area)	500x500
NS2 version	NS2.34
Simulation Time	100 sec
Maximum Packet sent per second	1000
Energy threshold	0.3dbm

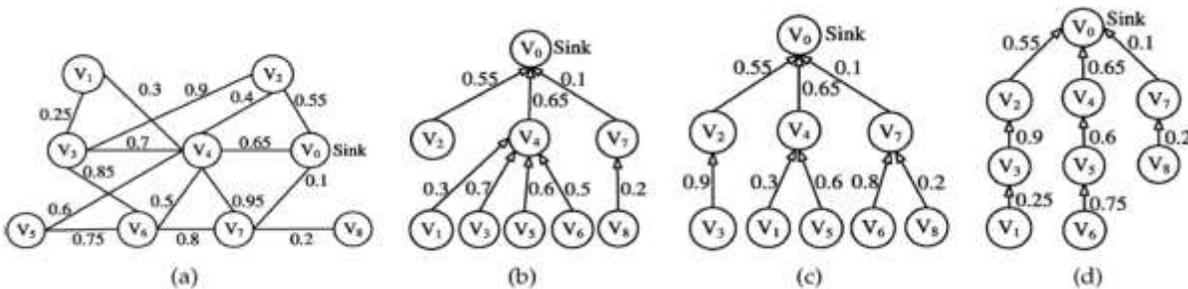


Fig.2.Data aggregation: Probabilistic WSN(a), DATs(b and c), and an LBDAT(d)

In this paper, we address the fundamental problems of constructing a load-balanced DAT in probabilistic WSNs. We first solve the CMIS problem, which is NP-hard, in two phases. In the first phase, we aim to find the optimal MIS such that the minimum potential load of all the independent nodes is maximized. To this end, a near optimal approximation algorithm is proposed. In the second phase, the minimum-sized set of LBMIS connectors are found to make the LBMIS connected. The theoretical lower and upper bounds of the number of non-leaf nodes are analyzed as well. Subsequently, we study the LBDAT construction problem and propose an approximation algorithm by using the linear relaxing and random rounding techniques. After an LBPNA is decided, by assigning a direction to each link, we obtain an LBDAT.

SIMULATION RESULTS

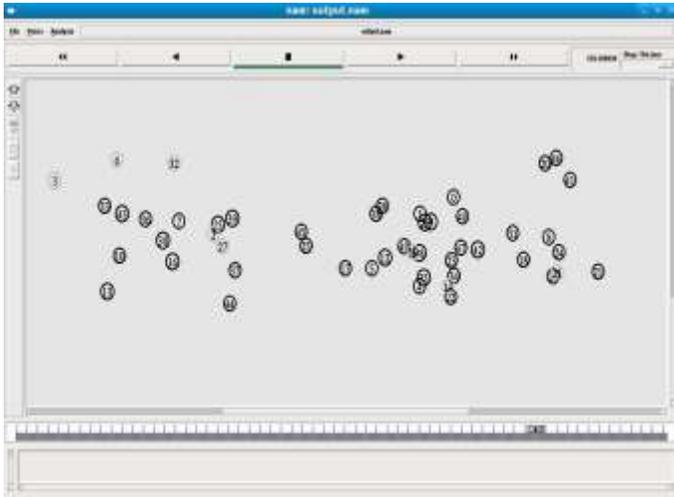


Fig.3.NS2 animation scenario

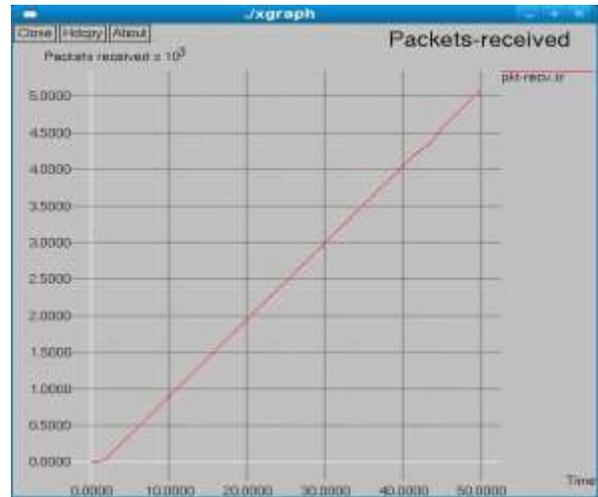


Fig.4.Packet received graph



Fig.5.PDR graph

TABLE 2
 PDR Values

SNO	NODES	PDR	PACKET SENT	PACKET RECEIVED
1)	10	0.8091	4725	3823
2)	20	0.9011	4725	3928
3)	30	0.7885	4725	4258
4)	40	0.6048	4725	3726
5)	50	0.6048	4725	2858

CONCLUSION

We are studying the WSN and data aggregation in WSN. In this paper we concentrated on load balancing factor and also on construction of DAT using Probabilistic Network Model (PNM). Therefore, it is focused on constructing a Load-Balanced Data Aggregation Tree (LBDAT) under the PNM. More specifically, three problems are investigated, namely, the Load-Balanced Maximal Independent Set (LBMIS) problem, the Connected Maximal Independent Set (CMIS) problem, and the LBDAT construction problem. LBMIS and CMIS are well-known NP-hard problems and LBDAT is an NP-complete problem. LBDAT will be NP-Complete and will be constructed in three steps: Load-Balanced Maximal Independent Set (MDMIS), Connected Maximal Independent Set (CMIS) and Load-Balanced Parent Node Allocation (LBPNA). Approximation algorithms and performance ratio analysis will also be covered.

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Edge Preserving Image Filtering Using Linear SURE and Wavelet Approach of SURE

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Abstract— This paper concentrates on developing a noise reduction method using a local linear model using the principle of Steins Unbiased Risk Estimator (SURE) along with the help of haar wavelet transform. Here, SURE is used as an estimate to reduce Mean Square Error. Control of images for performing various operations is an essential factor in this context. Hence there is an increased need to transform the image space into arithmetical domain. For the purpose of denoising, local approximation is to be developed over global approximations. The SURE filter and Joint SURE filter can be executed with the help of guidance image in denoising purpose while preserving the edges. The execution of wavelet based SURE denoising increase the efficiency of filtering. This can be applied for various real time applications, including noise reduction, enhancement and HDR compression.

Keywords— Edge Preserving Image Filtering, Local linear model, Wavelet decomposition, Denoising, Stein's Unbiased Risk Estimate (SURE), High Dynamic Range (HDR) Compression, Enhancement.

INTRODUCTION

Optical information transmitted in the form of digital images is a significant method of communication in the modern era, but the information at the receiver is often corrupted with noise. So the image needs processing before it can be used. Image denoising requires the manipulation of the image data to produce a visually arete image.

Enormous portion of digital image processing is dedicated to image restoration. This includes analysis in algorithm development and established resourceful image processing. Image restoration is the expulsion of degradation that are indulged with the image obtained at the receiver. Degradation arrives from blurring and noise due to electronic and photometric sources.

Consider the depiction of a digital image. Digital image in 2-dimension can be represented as a 2-dimensional array of data $s(x,y)$, where (x,y) shows the pixel location.[6] The pixel value resemble the brightness of the image at location (x,y) . Some of the most commonly used image types are binary, grayscale and color images. For evaluating the performance of the denoising algorithm, a high quality image is taken and some known noise is added to it. This would then be given as input to the denoising algorithm, which develops an image close to the original high quality image. The Linear operation [6] is the addition or multiplication of the noise $n(x,y)$ to the signal $s(x,y)$. Once the noisy image $w(x,y)$ is obtained, it is subjected to the denoising technique to get the denoised image $z(x,y)$.

RELATED WORKS

Recently, many novel edge-preserving smoothing filters have been proposed,consisting weighted least squares filter (WLS) [15], edge avoiding wavelets (EAW)[7], and domain transform (DT) approach [8] to approximate geodesic distance by iterating 1D-filtering operations. In particular, based on a local linear model, He et al.[9] proposed a new filtering method - guided filter that can perform effective edge preserving smoothing by the help of a guidance image. To have a better solution, He et al. introduced a regularization parameter which determines the amount of smoothing. Although edge-preserving smoothing filters are wildly used as useful tools for a variety of image editing and examining tasks, most of them are really proposed to denoise while preserving edges and geometrical structures in the original image.

Ce liu et al[3] proposed A unified framework for two tasks: automatic estimation and removal of color noise from a single image using piece wise smooth image models is estimated. Based on a simple piece wise-smooth image prior, a segmentation-based approach to automatically estimate and remove noise from color images is done. The Non Linear Filter is obtained by estimating the lower envelope of the standard deviations of image variance per segment .This automatically estimates and removes noise from color images and can be applied to computer vision applications to make them independent of noise level but it is mainly reliable for synthetic noises.

Byong Mok Oh et al [4] proposed two distinct editing methods. The first, which is a clone brushing tool, which allows the distortion-free copying of portions of an image, by using a parameterization optimization technique.. The second, which is a texture-illuminance decoupling filter, reduces the effect of illumination on uniformly textured areas. Here editing of image can be employed from different perspective, extracting and grouping of image-based objects can be done, but geometrical shapes are given more priority than real time objects.

Fredo Durand and Julie Dorsey [5] recommended Bilateral filter as a non-linear filter, where the pixel value is computed using an impact function in the intensity domain multiplied to the Gaussian in the spatial domain that decreases the weight of pixels with large intensity differences. This is based on a non iterative process in which Satisfying result is obtained in single pass. But the scheme may have Bilateral filtering may have the gradient reversal artifacts in detail decomposition and high dynamic range (HDR) compression.

Dimitri Van De Ville and Michel Kocher [10] Non-local means provides a powerful framework for denoising. SURE technique is used in the algorithm for restoration of an image corrupted by additive white Gaussian noise. The SURE concept allows assessing the MSE without knowledge of the noise-free signal. The paper depicts a satisfying result with less computational cost.

PROBLEM FORMULATION

The need for effective image restoration methods has developed with the enormous production of digital images and videos of all types, often taken in condemned situations. No matter how beneficial the cameras are, an image improvement is always sensible to improve their scope of action. The two main limitations in image accuracy are categorized as blur and noise. Blur is inherent to image acquisition systems, as digital images have fixed samples. The second main image perturbation is noise.

PROBLEM SETTING

Consider the measurement model[12] $y_i = x_i + n_i$ $i = 1, \dots, N$

where x_i is the underlying latent signal of interest at a position i , y_i is the noisy measured signal (pixel value), and n_i is the corrupting zero-mean white Gaussian noise with σ^2 . The standard simplified denoising problem is to find a reasonably good estimate \hat{x} of x . To redefine the problem more incisively, the complete measurement model in vector notation is given by

$$y=x+n$$

SIGNAL TO NOISE RATIO

The higher the PSNR is, the better the performance of denoising algorithm.

$$PSNR=10\log_{10}\left(\frac{MAX(x^2)}{MSE(\hat{x})}\right)$$

Where,

$$MSE(\hat{x})=\frac{1}{N} \|x - \hat{x}\|^2 = \frac{1}{N} \sum_{i=1}^N (x_i - \hat{x}_i)^2$$

Since x is the noise-free signal which does not affect the value of PSNR in any algorithm, maximizing PSNR is equivalent to minimizing MSE. However, one cannot approximate MSE without the original signal x . Thanks to Steins unbiased risk estimate

(SURE) provides a means for unbiased estimation of the true MSE, it is possible to replace MSE by SURE without any assumptions on the original signal. SURE is specified by the following expression

$$\text{SURE}(\hat{x}) = \frac{1}{N} \|y - \hat{x}\|^2 + \frac{2\sigma^2}{N} \text{div}_y\{\hat{x}\} - \sigma^2$$

where $\text{div}_y\{\hat{x}\}$ is the divergence of the output estimate with respect to the measurements,

$$\text{div}_y\{\hat{x}\} = \sum_{i=1}^N \frac{\delta \hat{x}_i}{\delta y_i}$$

METHODOLOGY

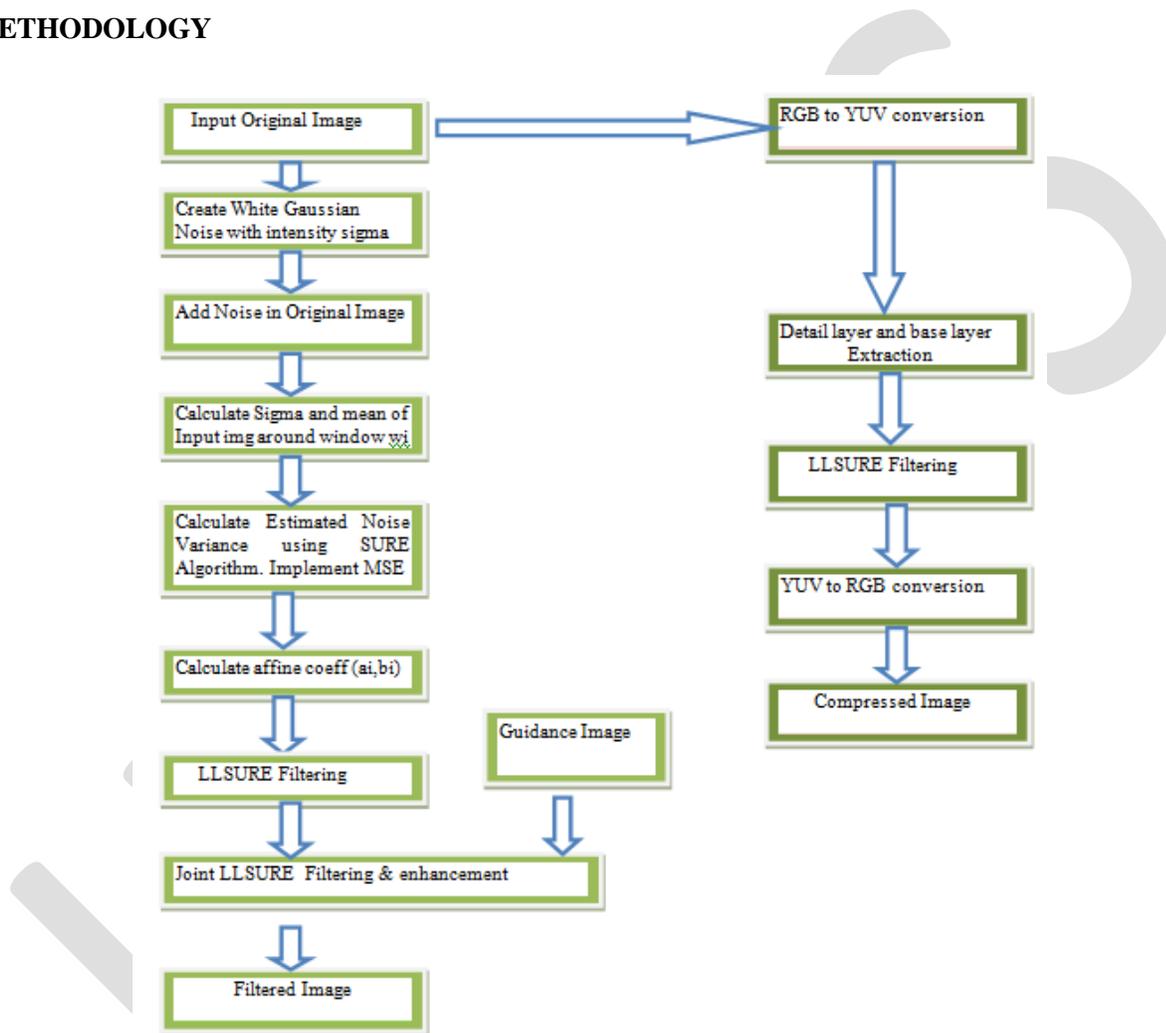


Figure 2: Block diagram of phase 1

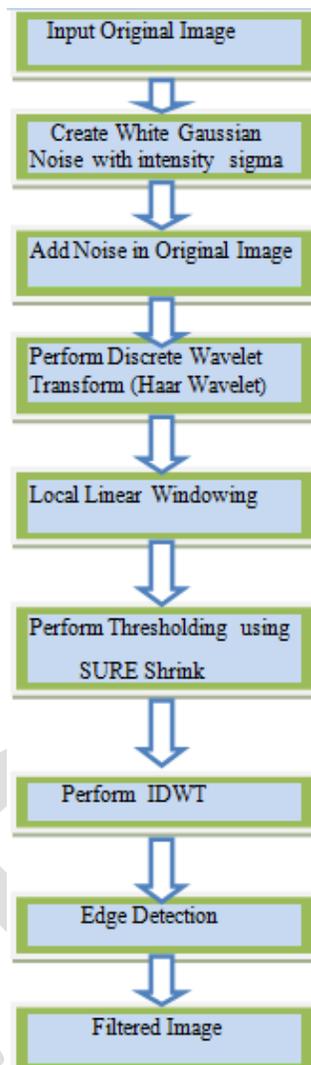


Figure 3: Block diagram of phase 2.

PHASE 1

Taking the biased estimator[12] given below,

$$\hat{x} = a * y + b$$

Where a and b are the affine coefficients, and now Considering a local window w_i , the basic SURE equation has been modified as shown below

$$SURE(a_i, b_i) = \frac{1}{N_w} \|y_{w_i} - (a_i y_{w_i} + b_i)\|^2 + 2\sigma^2 a_i + \sigma^2$$

Where a_i and b_i are affine transform coefficients obtained by[12] and σ^2 is the variance of measured data. Taking partial differential equation,

$$\frac{\delta}{\delta b_i} SURE(a_i, b_i) = 0$$

$$b_i^* = (1 - a_i^*) \bar{y}_i$$

And

$$\frac{\delta}{\delta a_i} \text{SURE}(a_i, b_i) = 0$$

$$a_i^* = \frac{\max(\sigma_i^2 - \sigma^2, 0)}{(\sigma_i^2 + \epsilon)}$$

Again to normalize the affine transform coefficients, consider the normalization procedure

$$\bar{a}_j = \frac{1}{w_j} \sum_{i \in w_j} a_i^* \sigma_i^2, \quad j \in w_i$$

$$\bar{b}_j = \frac{1}{w_j} \sum_{i \in w_j} b_i^* \sigma_i^2, \quad j \in w_i$$

Now the sure filter can be modelled as

$$\hat{x}_j^i = \bar{a}_j y_j + \bar{b}_j, \quad j \in w_i$$

For obtaining JSURE filter we consider the modified SURE equation:

$$\text{JSURE}(a_i, b_i) = \frac{1}{N_w} \|f_{w_i} - (a_i y_{w_i} + b_i)\|^2 + 2\sigma^2 a_i - \sigma^2$$

Where f_{w_i} is filter input image patch and y_{w_i} is guidance image patch. Now again by taking partial differential equation, with respect to a_i and b_i , it is obtained as [12]:

$$a_i^* = \frac{\text{cov}(f_{w_i}, y_{w_i})}{(\sigma_i^2 + \epsilon)}$$

$$b_i^* = \bar{f}_i - a_i^* \bar{y}_i$$

Where cov is the covariance function between f_{w_i} and y_{w_i} .

Now the sure filter can be modelled as

$$\hat{x}_j^i = a_j^* y_j + b_j^*, \quad j \in w_i$$

The key idea of a fine aggregation procedure is how to choose the weight for getting the best estimate. The simplest method of aggregating such multiple estimates is to average them using equal weight.

HDR COMPRESSION

HDRI is an image that has a greater dynamic range that can be shown on a display device or recorded with a camera with just a single exposure. Here, RGB image is converted to YUV. Then, Separation of base layer and detail layer is done [12]; preceding the application of LLSURE Filter. And finally YUV is converted back to RGB image.

PHASE 2

HAAR WAVELET

Wavelets are a set of non-linear bases. When approximating a function regarding wavelets, the wavelet basis functions are selected with respect to the function being approximated. The haar transform is the simplest kind of wavelet. The corresponding algorithm [13] transforms a 2-element vector $[x(1), x(2)]^T$ into $[y(1), y(2)]^T$ by relation:

$$\begin{bmatrix} x(1) \\ x(2) \end{bmatrix} = T \begin{bmatrix} y(1) \\ y(2) \end{bmatrix}$$

Where, $T = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ is an orthonormal matrix; which implies, $T^{-1} = T^T$. and it is possible [14] to recover x from y by relation:

$$\begin{bmatrix} x(1) \\ x(2) \end{bmatrix} = T^T \begin{bmatrix} y(1) \\ y(2) \end{bmatrix}$$

In 2-dimensions x and y become 2×2 matrices. We can transform the columns of x first, by pre-multiplying by T, and then the rows of the result by post-multiplying by T^T to find $y = T * x * T^T$. And then, $x = T^T * y * T$.

By doing so, we get image as shown below:

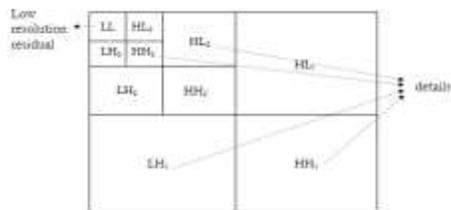


Figure 4: wavelet decomposition

THRESHOLD ESTIMATION

A dispute in the wavelet shrinkage process is to find a sufficient threshold value. A small threshold will bear the majority of the coefficients related with the noisy signal, then resulting a signal that may still be noisy. Moreover, a large threshold will shrink most coefficients, which leads to a smoothing of the signal that may subdue the important features of the image.

A separate threshold is estimated for each sub band based on Stein's unbiased risk estimator (SURE) known as SureShrink.

$$\lambda_s = \operatorname{argmin}_{t \geq 0} \operatorname{SURE}(t, G_s)$$

Where,
$$\operatorname{SURE}(t, G_s) = NS - 2[1 : NS] + \sum_{x,y=1}^{N_s} [\min G_{x,y}, t]^2$$

G_s is the detail coefficients from subband S and NS is the number of coefficients $G_{x,y}$ in $\{G_s\}$. As suggested by Donoho and Johnstone [15], when the coefficients are not very sparse, then Sure Shrink is applied, if not, universal threshold is applied. Universal threshold proposed by Donoho and Johnstone [15], defined as

$$\lambda_v = \hat{\sigma} \text{noise} \sqrt{2 \log L}$$

Where $(\hat{\sigma} \text{noise})^2$ is estimated noise deviation and L is the total number of pixels (M*N).

SIMULATION

The simulation is done on MATLAB. The test image include the image of Lena and a HDR image for compression. PSNR for the first phase(Lena) is obtained as 17 dB and for the second phase is 25.119dB. The Figure 5 shows the noisy image. Figure6 and Figure & shows output of phase 1 and phase 2 respectively. The compression for HDR image is also shown in Figure 9.



Figure 5: Noisy image with sigma 22



Figure 6: output of phase 1



Figure 7: output of phase 2

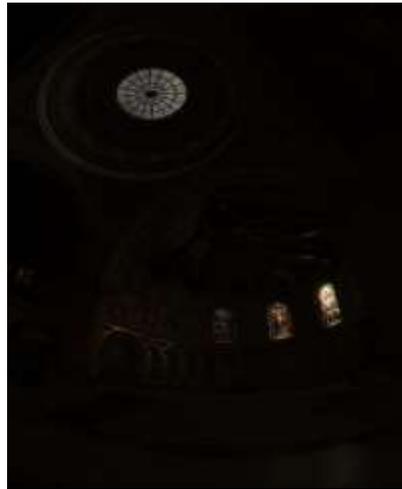


Figure 8: HDR input image



Figure 9: HDR compressed image.

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CONCLUSION

The most important task in image processing is denoising with preserving edges. A better quality image filtering method is present with several desirable features which include a flexible and versatile methodology. The geometrical structures are preserved while removing the noise and can be applied in image processing and computer vision applications.

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A REVIEW ON NATURAL CONVECTIVE HEAT TRANSFER FROM STAGGERED INTERRUPTED RECTANGULAR FINS

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Abstract— Heat sinks with fins are generally used to enhance the heat transfer rate in many industrial applications such as cooling of electronic, power electronic, telecommunication and automotive components. In many situations where heat transfer is by natural convection fins offer economical and trouble free solutions. The weight and volume of the equipment are the most important parameters of design. Now days the general trend is to use compact systems especially in electronic field which leads to higher packing density of systems causing higher heat generation. It affects the performance of system and may cause the system failure. The most preferred method for cooling electronic and telecommunications devices is passive cooling since it is cost effective and reliable solution. It doesn't require costly enhancing devices. This features leads to focus on development of efficient fin heat sink. The important element that defines the geometry of the heat sink is its fins. The fins generally used in industry are straight, circular and pin shaped. Here in this work the focus is on interrupted fins. The objective of this work is to enhance the heat transfer rate by providing proper interruptions. The staggered interruptions are provided on the heat sink. The proper selection of the interruption length increases the heat transfer rate and in addition providing fin interruptions results in considerable weight reduction that can lead to lower manufacturing cost.

Keywords— Fin geometry, Heat sinks, Interrupted fins, Natural convection, staggered interruptions, Thermal boundary layer, Thermal Performance.

INTRODUCTION

Heat sinks are commonly used for cooling of various electronic components in industries. Passive cooling heat sinks are widely used in CPU cooling, audio amplifiers and power LED cooling. Fins are used to increase the heat transfer rate between the heat sink and surrounding fluid. Now days there are a high demand for light weight, compact and economical heat sinks. Fins are the important aspect in geometry of heat sink. A fin is generally a flat surface extended from heat sink surface. It is used for increment in heat transfer to and from environment by increasing the convective heat transfer surface area. The common fin geometries that are used and studied in literature are straight, circular and pin shaped. The provision of interruptions on continuous rectangular fins increases the heat transfer rate from heat sink. It is due to fact that the interruptions provided on fins disrupt the thermal boundary layer growth and thus maintains thermally developing flow regime along the fins which leads to higher natural heat transfer coefficient. In addition provision of interruptions reduces the weight and can lead to lower manufacturing cost. On the other hand provision of interruptions leads to reduction in heat transfer area which decreases the heat transfer. Therefore it indicates that an optimum interruption exists that can provide the maximum heat transfer rate from heat sinks. It is found that the work has been done on in line interruption. Now here this work is extended to staggered interruptions.

Thermal boundary layer:

When a fluid flows over a hot or cold surface, a temperature field is setup within the fluid near the surface. This region where the temperature gradient exists is known as Thermal boundary layer. The thickness of thermal boundary layer is the distance y from the plate surface at which the temperature difference between the 99%.

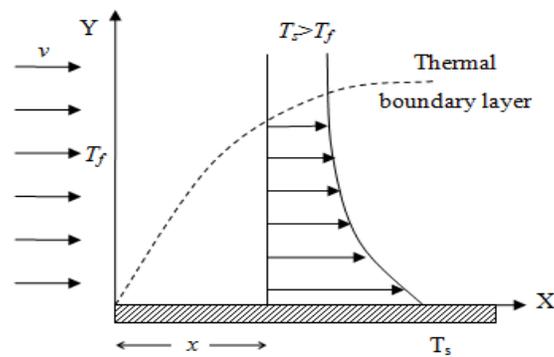


Figure 01 Thermal Boundary Layer.

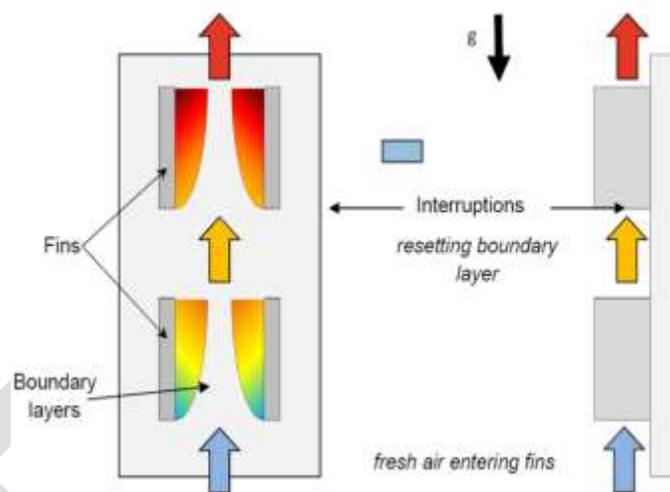


Figure 02 Effect of adding interruptions on the boundary layer growth in natural heat transfer from vertical fins [7].

LITERATURE SURVEY

[1] Mehran Ahandi et.al investigated numerically and experimentally steady state natural convection heat transfer from vertically mounted inline interrupted fins. They have done 2D numerical simulation to find fin interruption effects by using fluent software. They developed a custom design test bed to verify theoretical results. They performed comprehensive experimental and numerical parametric study to investigate the effects of fin spacing and fin interruptions. The results show that the interruptions increased the heat transfer rate by resetting the thermal and hydrodynamic boundary layer. They machined and tested 12 heat sink samples for validation the present numerical study. It is shown that the heat flux from heat sink increased when interruptions were added. They developed new compact co relation to calculate optimum fin interruption for targeted rectangular heat sink.

[2] A Ledezma et.al studied the geometric optimization of an assembly of staggered vertical plates that are installed in fixed volume they performed optimization for spacing, no of plates, plate dimension and stagger between columns. The range used is $Pr=0.72$ and $10^3 \leq Ra \leq 10^6$ where Ra is Rayleigh number based on the vertical dimension of assembly. They concluded that it is possible to optimize geometrically the internal architecture of a finite size volume by reducing the global thermal resistance.

[3] Shivdas S kharche et.al investigated experimentally and theoretically natural convection heat transfer from vertical rectangular fin arrays with and without notches at the center. They analyzed the notches of different geometrical shapes. After the experimental study they have concluded that the heat transfer rate in notch fins is more than the unnotched fins.

[4] Wadhah Hussein et.al conducted experimental study to investigate heat transfer by natural convection in rectangular fin plates with circular perforations as heat sinks. The pattern of the perforations included 24 circular perforations for the first fin, and the perforations were increased as 8 for each fin to 56 in fifth fin. They distributed the perforations in 6-14 rows and four columns. They observed that the temperature along the non-perforated fins was from 30 to 23.7^o at lower power 6 W. They observed that the drop in temperature between the fin base and the tip increased as the diameter of perforations increased. The temperature drop at the highest power of 220 W was from 250 to 49 ^oC for non-perforated fins. They concluded that the heat transfer rate and the coefficient of heat transfer increased with increased number of perforations.

[5] M J sable et.al studied that the tall vertical fins restrict the heat transfer enhancement because of boundary layer development. They investigated the heat transfer enhancement technique for natural convection adjacent to vertical heated plate with multiple V type partition plates in ambient air surrounding. They found that V shaped partition plates with not only act as extended surface but also as flow turbulator. For heat transfer enhancement they had attached v shaped partition plates with edges faced upstream to base plates. They observed that when the plate height exceeds certain critical values the heat transfer in downstream region of the partition plate is enhanced because of the inflows of lower temperature fluid in to the separation region. They observed that among the three different fin array configurations on vertical heated plate, V type fin array design performs better than rectangular vertical fin array and V fin array with bottom spacing design.

SYSTEM DEVELOPMENT

The interrupted fins are the more general form of fins. It includes continuous and pin fin which is obtained when the fin interruption reaches up to zero as shown in figure 3. It can be seen that the continuous fins and pin fins are the two extreme cases of targeted staggered interrupted fins. The analysis can be start based on proper fin spacing and interruption length leads to higher thermal performance. This is due to fact that interruptions provided disrupt the boundary layer growth, which leads to increase in heat transfer [1]. The objective of this study is to investigate the effects of providing interruptions to fins and to find out the optimum geometrical parameters of fin array. The focus is mainly on the fin length and interruption length in staggered interruptions. The aim is to developed compact easy to use thermal models that can provide the natural convective heat transfer from staggered interrupted vertical walls to the ambient. Experimental and numerical analysis will be performed to find maximum heat transfer rate from heat sink by obtaining the optimum geometry of staggered interruptions.

A schematic of the considered fin geometry with the salient geometric parameters is shown in Figure 3. When a heat sink is heated, Due to buoyancy force the surrounding fluid start moving and as a result thermal boundary layers start developing at the bottom edges of the fins. The boundary layers merge if the channels form by fins is sufficiently long and creates a fully developed channel flow. Interruptions provided disrupt this flow and improves the Thermal performance.

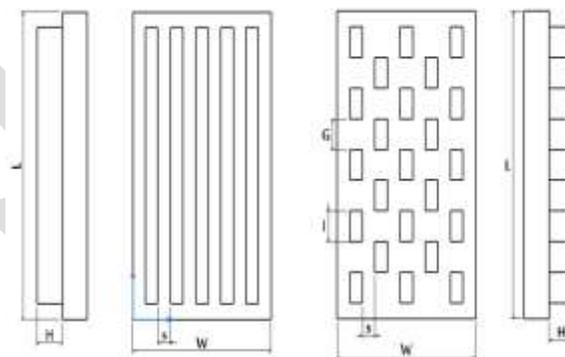


Figure 3 Schematic of the considered heat sink geometry, a) continuous rectangular fin heat sink; b) Staggered interrupted rectangular fin heat sink.

CONCLUSION

The earlier investigators have studied the problems concerned with various fin geometries, extensively both theoretically and experimentally. Out of which the interrupted fins with staggered fin arrays are intended to improve the convective heat transfer under natural convection. Based on the studies undertaken in literature review it can be said that a proper selection of interruption length leads to a higher thermal performance.

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Multilevel Inverters for High Power Applications with Improved Power Quality Using Lesser Number of Switches

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Abstract - In this paper a new three- phase multi-level inverter topology is proposed. With the increasing requirements for high power at high power quality, such a converter is inevitable. The major advantages of the proposed topology are improved power quality and lesser number of switches. This leads to lesser complexity of the control circuitry, reduction in switching harmonics and reduction in the cost. Also here the number of voltage sources required is very less compared to conventional methods. This method gives THD of output voltage about 3%. Output of the proposed three phase 31-level inverter has been verified by MATLAB simulation results.

Keywords-H-bridge, Multi-level inverter, cascading, pwm technique, power quality, Total Harmonic Distortion (THD).

I. INTRODUCTION

Power converters are spreading technology for handling high power applications [5] in different field of growth and development of electric power utilization. They are widely being used in manufacturing, automotive traction, industrial applications etc. These power converters should possess high output power quality, high efficiency and low cost.

The conventional converter topologies were two level voltage source inverters [7] and current source inverters [6] with new high rating semiconductor devices. These high rating new semiconductor devices are very costly as well as difficult in fabrication and development. With technical advancements new topologies with traditional low rating semiconductor devices [4] are introduced. These topologies are known as multi-level converters. Now multi-level converters are being used with higher and higher levels like – 3-levels, 4-levels etc. up to even 13-level have been reached. They are able to handle about 30 MW with high voltage output and cheaper semiconductor devices. The most noticeable drawbacks of such converters are complex circuits for controlling the switching devices and the losses due to larger number of switching devices. This leads to introduction of harmonics into the supply as well as load.

The proposed method is a three phase 31-level inverter with reduced number of switches. Hence the complex circuitry and switching losses are reduced. Also being of higher level, they possess advantages like high power quality, reduction in harmonics and lesser electromagnetic interference [14].

In this paper the next section will present the multilevel converter background and their features, characteristics and drawbacks. The third section will deal with the proposed topology of three phase 31-level inverter. The fourth and fifth sections will deal with simulation and simulation result analysis respectively. And finally with the future scope the paper is concluded.

II. MULTI-LEVEL INVERTER BACKGROUND

There are so many methods for combining semiconductor devices to form multilevel topologies. Some of them are cascaded H-bridge multilevel inverter [9], neutral clamped multilevel inverter [8], flying capacitor type inverter [11] and most recent cross switched multilevel inverter with reduced number of switches [10].

A simple 3-phase, 3-level cascaded inverter topology is discussed here. It consists of 36 switching devices and 9 dc sources. During switching of these switches there will be a high switching loss which may reduce the overall efficiency of the system as well as introduce harmonics into the supply system.

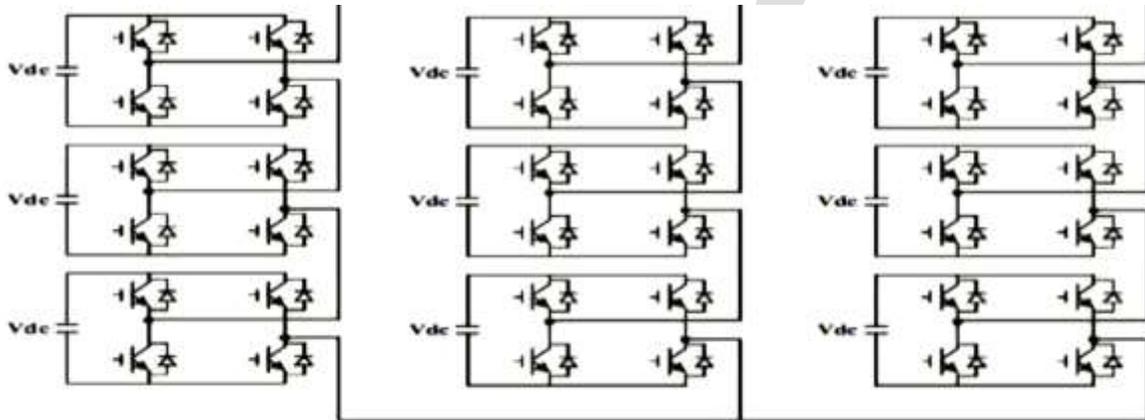


Fig.1 3-phase 3-level cascaded H-bridge inverter

Another advanced topology, cross switched multi-level inverter [10] is shown in the fig. 2 which consists of 12 switches and 5 dc source for one phase of the 3-phase 11-level inverter. In this method the power losses are lesser compared to the previous topologies, but not as low as in the proposed topology.

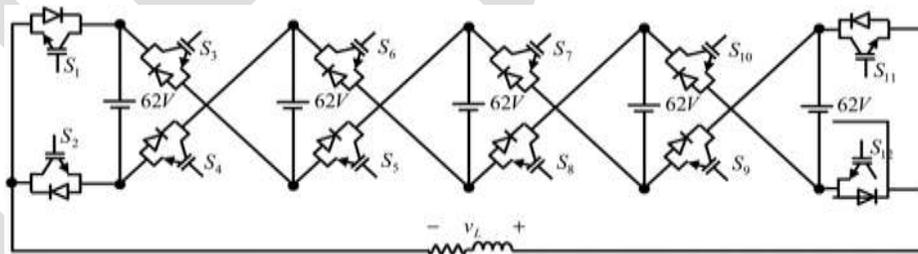


Fig. 2 One leg of 3-phase 11-level cross switched inverter

Figure 3 and figure 4 show two more multilevel inverter topologies. Here, even though the numbers of switches are less compared to the conventional methods, the number of switches is much greater in comparison with the proposed topology. The ladder type multi-level inverter [15] in figure 3 consists of “n”, number of switching devices for n-level output. In figure 4, an n-level staircase type inverter topology requires $2n-2$ number of switching devices

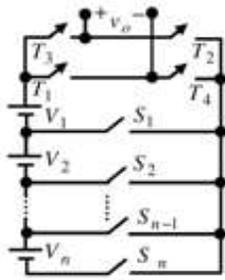


Fig. 3 Ladder Topology

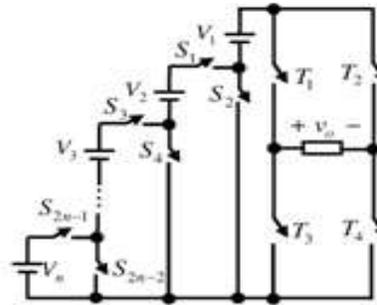


Fig. 4 Staircase topology

III. PROPOSED TOPOLOGY

The basic building block of the proposed topology is derived from H-bridge. The proposed method is a modified H-bridge topology [3]. Compared to the conventional H-bridge cascaded multi-level inverter topology [9], the modified H-bridge requires lesser number of switches. Hence the control circuitry becomes less complicated and cheaper. Here a 3-phase 31-level modified H-bridge, derived from a 7-level inverter is presented [1]. As the number of level increases the output wave form becomes more and more smooth. And hence the harmonics introduced in the supply systems and the loads are reduced [12]. This leads to improved power quality and power factor. One phase of the 3-phase proposed inverter is given in fig. 5. It consists of only 10 switches and 4 dc sources.

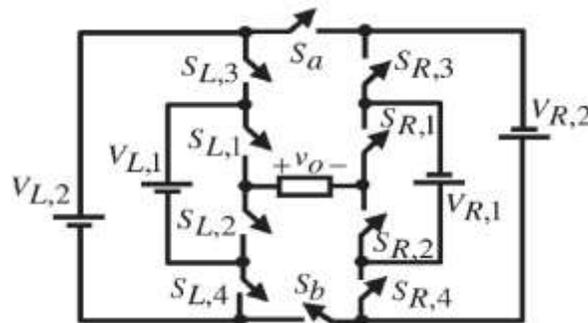


Fig.5. One phase of the 3-phase 31-level inverter

Here four switches and two dc sources are added to the conventional, two level H-bridge inverter to get the 31-level modified H-bridge inverter. In this method peak value of the output voltage waveform is obtained as $V_{L2} + V_{R2}$. Here V_{L2} and V_{R2} are source voltages. The total cost of the proposed method can be reduced because the magnitudes of the voltage sources required are low. As seen from figure 5 it is clear that simultaneous turn ON of S_{L1} and S_{L2} or S_{R1} and S_{R2} will lead to short circuiting of the dc sources. So this should be taken care of while selecting the switching sequence. Similarly simultaneous turn ON of S_a and S_b should be avoided. PWM scheme [2] is used for switching. Table 1 shows the excitation table of the switches and the corresponding output voltage levels. In table.1, the notation '1' stands for ON and '0' stands for OFF condition of the switch.

TABLE I

Switching sequences and corresponding output voltage levels of the proposed 31-level inverter phase-R

No	SL1	SL2	SL3	SL4	SR1	SR2	SR3	SR4	Sa	Sb	Vo
1	1	0	1	0	1	0	1	0	1	0	0
2	1	0	0	1	0	1	0	1	0	1	Vdc
3	0	1	0	1	1	0	0	1	0	1	2Vdc
4	1	0	0	1	1	0	0	1	0	1	3Vdc
5	0	1	1	0	0	1	0	1	0	1	4Vdc
6	1	0	1	0	0	1	0	1	0	1	5Vdc
7	0	1	1	0	1	0	0	1	0	1	6Vdc
8	1	0	1	0	1	0	0	1	0	1	7Vdc
9	0	1	0	1	0	1	1	0	0	1	8Vdc
10	1	0	0	1	0	1	1	0	0	1	9Vdc
11	0	1	0	1	1	0	1	0	0	1	10Vdc
12	1	0	0	1	1	0	1	0	0	1	11Vdc
13	0	1	1	0	0	1	1	0	0	1	12Vdc
14	1	0	1	0	0	1	1	0	0	1	13Vdc
15	0	1	1	0	1	0	1	0	0	1	14Vdc
16	1	0	1	0	1	0	1	0	0	1	15Vdc
17	0	1	1	0	1	0	1	0	1	0	-Vdc
18	1	0	1	0	0	1	1	0	1	0	-2Vdc
19	0	1	1	0	0	1	1	0	1	0	-3Vdc
20	1	0	0	1	1	0	1	0	1	0	-4Vdc
21	0	1	0	1	1	0	1	0	1	0	5Vdc
22	1	0	0	1	0	1	1	0	1	0	-6Vdc
23	0	1	0	1	0	1	1	0	1	0	-7Vdc
24	1	0	1	0	1	0	0	1	1	0	-8Vdc
25	0	1	1	0	1	0	0	1	1	0	-9Vdc
26	1	0	1	0	0	1	0	1	1	0	-10Vdc
27	0	1	1	0	0	1	0	1	1	0	-11Vdc
28	1	0	0	1	1	0	0	1	1	0	-12Vdc
29	0	1	0	1	1	0	0	1	1	0	-13Vdc
30	1	0	0	1	0	1	0	1	1	0	-14Vdc
31	0	1	0	1	0	1	0	1	1	0	-15Vdc

In the proposed method dc source VL1 is designed for Vdc, VL2 for 5Vdc, VR1 for 2Vdc and VR2 is designed for 10Vdc as per the general topology for N-level modified H-bridge [1]. According to the general topology for N-level modified H-bridge.

Number of sources = 2n (1)

Number of output voltage levels N = 2⁽²ⁿ⁺¹⁾ - 1 (2)

Number of switches = 4n + 2 (3)

Voltage source VL1 = Vdc (4)

Voltage source VL2 = 5Vdc (5)

Voltage source VR1 = 2Vdc (6)

Voltage source VR3 = 10Vdc (7)

Where ‘n’ is the number of sources in the left half of the circuit diagram and Vdc is the voltage level of first step from the zero level.

IV. SIMULATION DIAGRAM OF 3-PHASE 31-LEVEL INVERTER

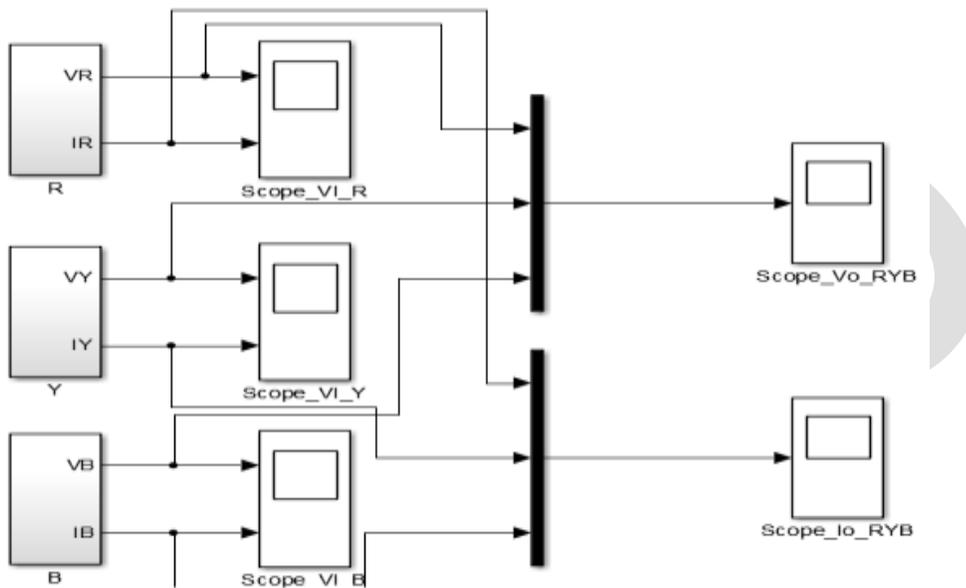


Fig.6. Simulation diagram of 3-phase 31-level inverter

In figure 6 there are three sub systems R,Y and B. All these subsystems are of the basic 31-level modified H-bridge. Here for simulation Vdc is selected as 15V, so that each step of the out put voltage will vary with 15V. During simulation, for each phase the PWM [13] reference sinusoidal waveform taken is 120° displaced with each other. So that the out put waveform of each phase will be displaced from each other by 120°. Through a multiplexer the three waveforms are brought out with respected to same axis.

V. SIMULATION RESULTS

Figure 7 shows the MATLAB simulation out put voltage waveforms with 15 positive voltage levels,15 negative voltage levels and 1 zero voltage level, which constitutes a total of 31 steps in each phase. Here we can see that the waveforms are having less distortion from ideal sine wave. And the current waveforms in Fig.8are more closer to a pure sine wave. This indicates least introduction of harmonics into the supply. THD for out put currents are shown in Fig.9.and that for voltages are shown in Fig.10.

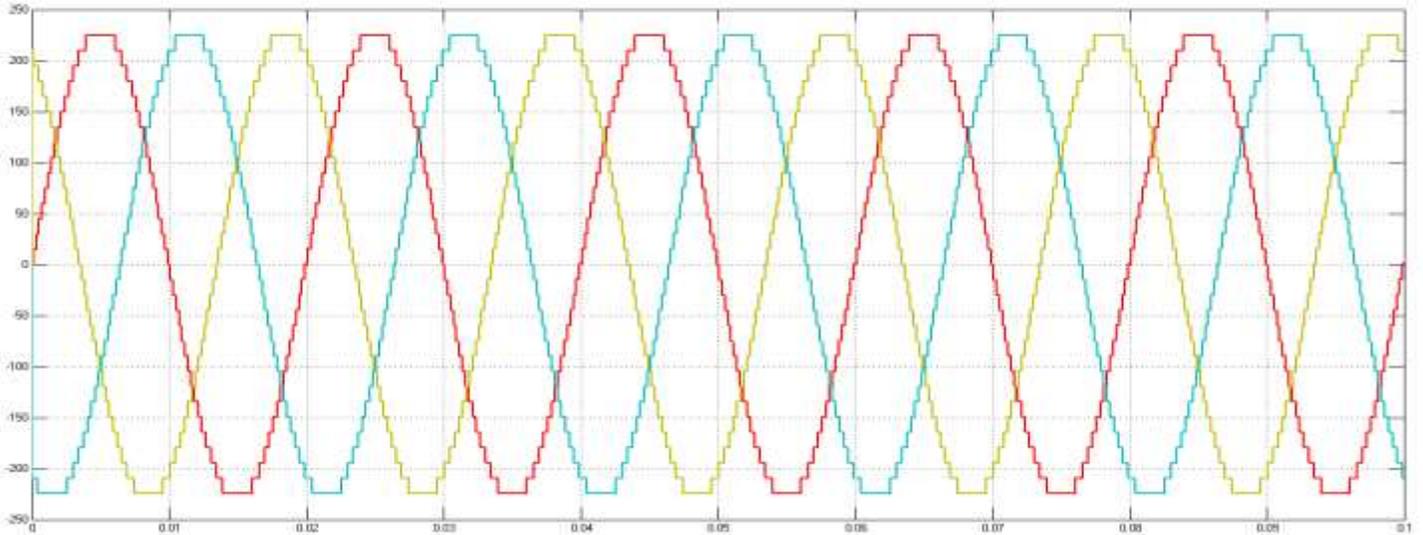


Fig.7. Output voltage waveforms

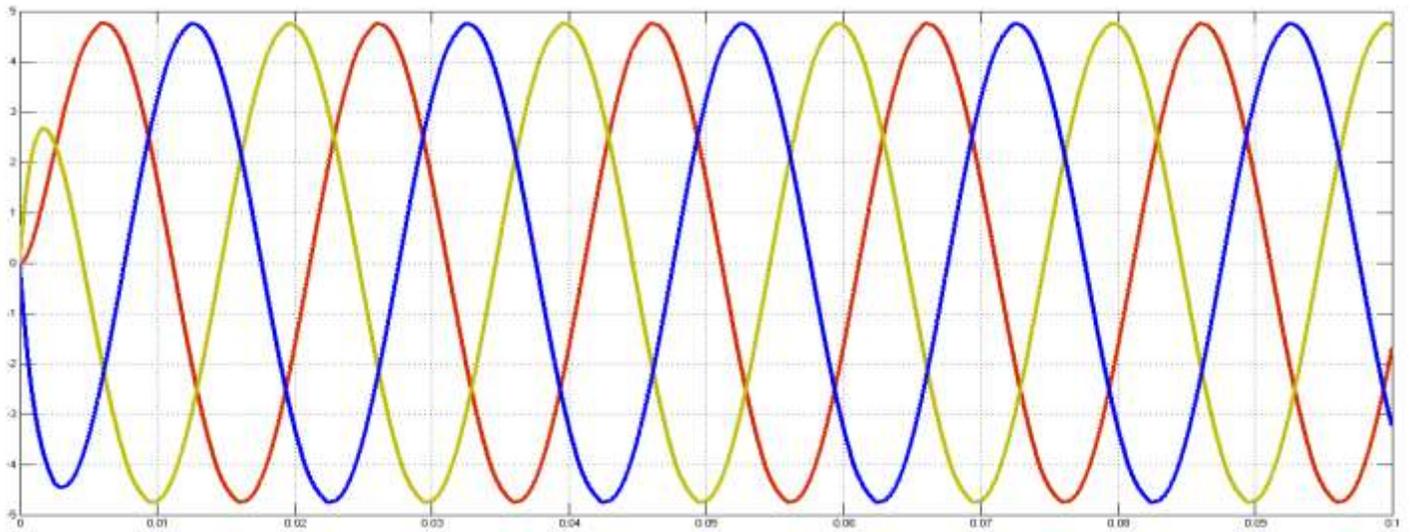


Fig.8. Output current waveforms

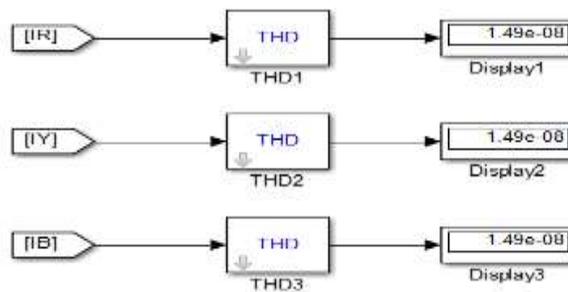


Fig.9. THD values for current waveforms.

THD values for current waveforms are very very small ,which indicates that the harmonics injected into the supply will be very less.Similarly the THD for voltages of different phases are nearly 3% only. This indicates that the harmonics introduced into the load

will be very low. From the harmonic spectrum of figure 10.a, it is clear that voltage magnitude for fundamental frequency is 229V, where as that for higher frequencies are very small of the order of 0.3V and below. Also it is observed that the even harmonics are almost absent, which indicates the symmetry of the sinusoidal out put waveform. This will give confirmation of the advantage of least THD value of the proposed method.

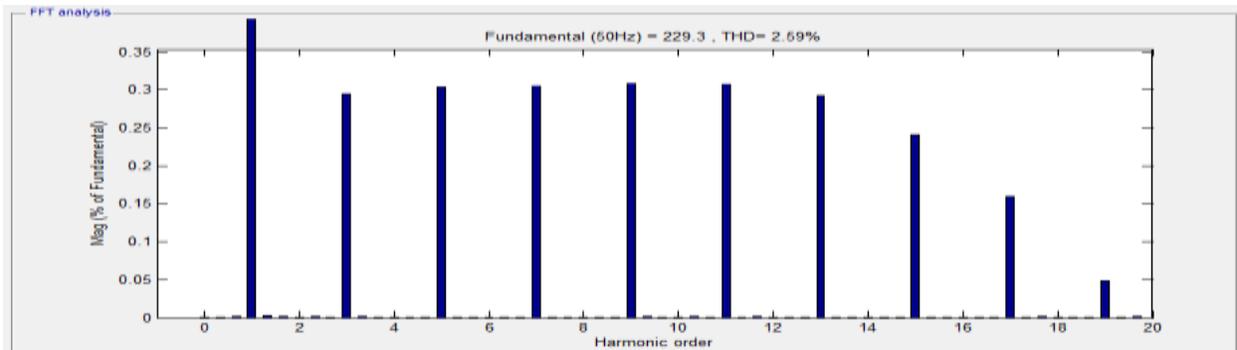


Fig.10a. Output voltage harmonic spectrum for R-phase.

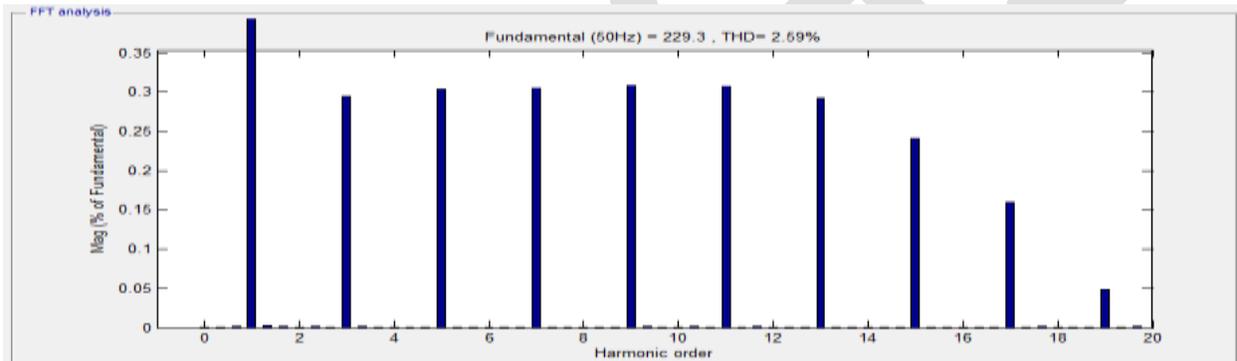


Fig.10b Output voltage harmonic spectrum for Y-phase.

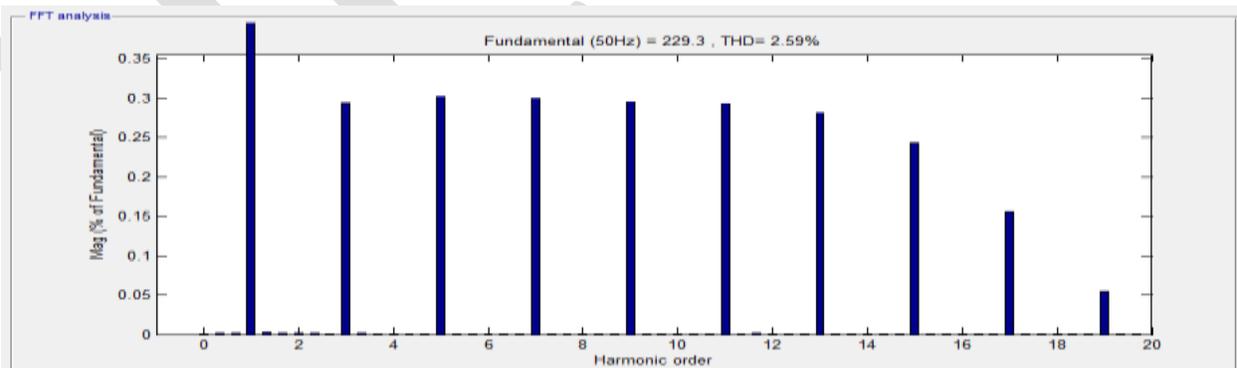


Fig.10c Output voltage harmonic spectrum for B-phase.

VI. CONCLUSION

In this paper the inverter topology for generating 31-level output voltage waveform has been proposed with the added advantage of lesser number of switches, which leads to reduced harmonics, improved efficiency and improved power factor. More over the control

circuitry became less complicated as the number of switches became lesser. Also the design steps are less complex, as there is a general topology for the proposed method. Based on the generalised method higher levels of multilevel inverters can be designed in future. In literature survey the proposed topology was compared with other topologies which had highlighted the advantages of proposed method over the conventional methods. The performance accuracy of the proposed three phase 31-level inverter circuit had been verified using MATLAB simulation.

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REMOTE HOST PROCESS CONTROL AND MONITORING OF INDUSTRY APPLIANCES

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Abstract— Industrial automation platforms are experiencing a paradigm shift. New technologies are making their way in the area, including embedded real-time systems, standard local area networks like Ethernet, Wi-Fi and ZigBee, IP-based communication protocols and Web Services. The aim of this work is to develop an embedded system directed at automating appliances in an industry via Ethernet. The system employs server/client architecture; switching commands for the appliances which are connected to the client can be received and displayed at either end. The remote host processes the commands received and translates them into actions of switching particular appliances ON, OFF and speed control of machines. The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV and uses a standard keyboard and mouse which acts a remote host in this system. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. A website is hosted which communicates with the Raspberry Pi server to alter the values of the machine. As the parameters are changed in the webpage, the result is reflected in the output of the machine. A live streaming feature is added to the system to ensure the safety and security of the machine. The machine parameter's can be monitored as well as controlled from the website itself. The site can be secured by using a login which prevents unnecessary intrusions.

Keywords— Ethernet, Wi-Fi, Raspberry Pi, Industrial appliances, Live streaming, Website, Host process, Arduino controller.

INTRODUCTION

Until more recently, induction motors (IMs) have performed the main part of many speed control systems and found usage in several industrial applications because they demonstrate trouble-free operation for long periods of time. The advances in microprocessors and power electronics have permitted the implementation of modern techniques for induction machines. The proposed model will have a website through which the control of the industrial appliances can be done. The control can be performed from any corner of the world with the help of a hosted website which is used in interchanging the values between the appliances and the site. The industry will have different apparatus which can also be controlled using this website. The speed and the operating voltage of the motor can be measured using this model. The measuring of the speed is done with the help of proximity sensor and measuring of the voltage is done with the help of voltage divider. Thus measured quantity will be given to a controller and the controller will convert it to digital and will send it to raspberry pi. The speed value set in the website will be set as the reference to the controller and it will give the PWM pulse as output to the driver circuit. Based on the generated pulse the speed of the motor can be controlled. The other appliances in the industry can also be switched on and off from the website. A live video streaming facility is added to monitor the operation of the Induction Motor from the website.

OVERVIEW OF PROJECT

In this paper, an experimental setup is implemented with real instruments. An arduino controller is used along with the raspberry pi to achieve the desired result. A Web-based system is developed using the Smart Access feature of the Raspberry pi. The equipment used in experimental setup is shown in Fig.1. The components of the experimental setup are:

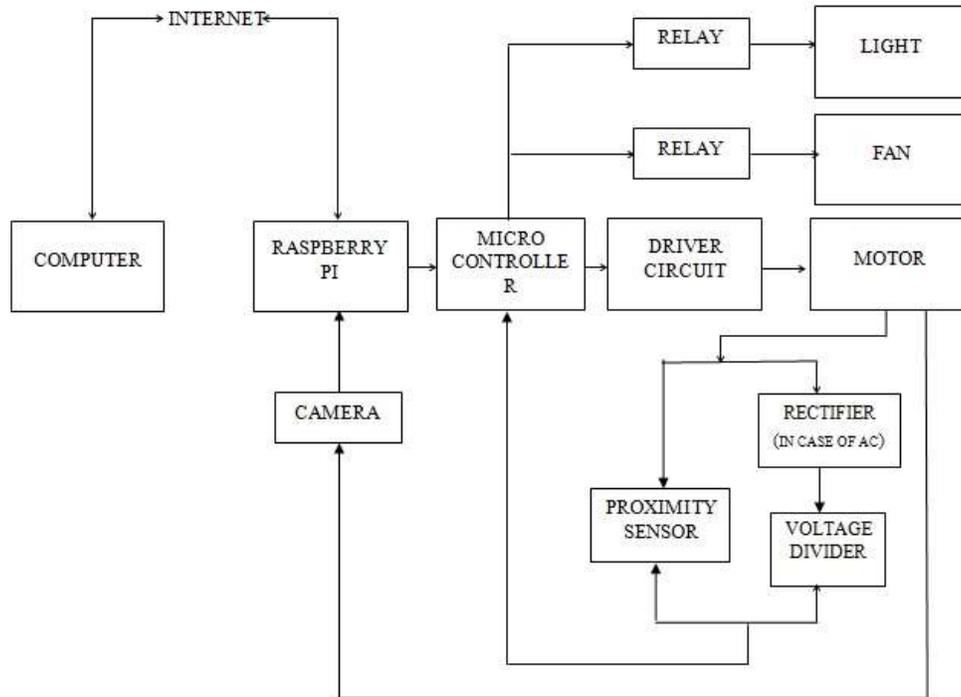


Fig 1. Block Diagram

1. A computer to access the website.
2. Raspberry pi acts as a server or an interface between the site and the appliances .
3. Micro controller help in ADC/DAC conversion and to generate pulse signals.
4. Relay acts as a switch in turning OFF and ON other appliances.
5. The input voltage of the motor is controlled using driver circuit.
6. Measurement of voltage is performed using a voltage divider.
7. The motor cab be both AC and DC. In case of an AC machine a rectifier is added to the voltage divider.
8. Proximity sensor along with a timer IC is used to measure the speed of the motor.
9. Camera is used for the purpose of streaming.

SIMULATION

The simulation was done using MATLAB

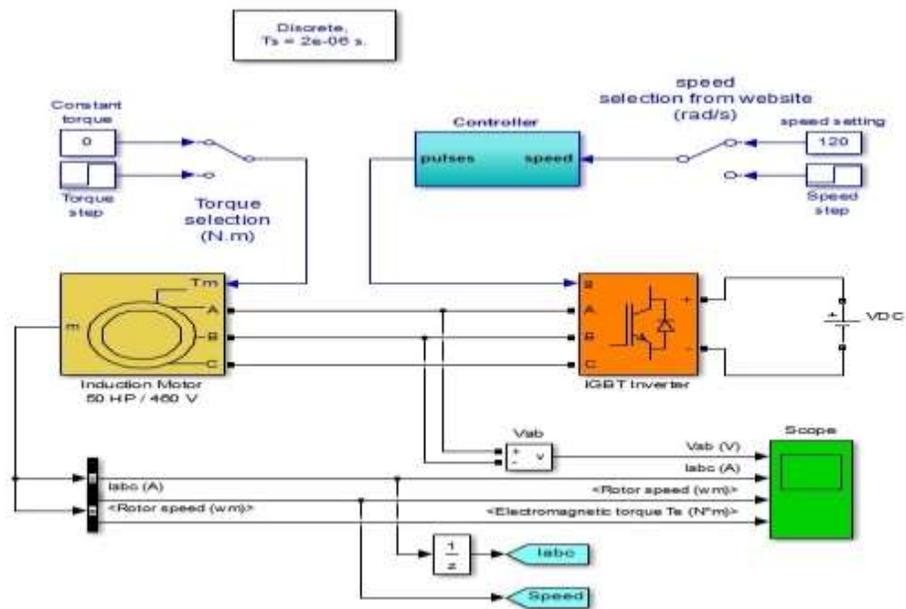


Fig 2. Simulation block

The descriptions of each block are:

1. Controller is used to generate the Gate signal to the IGBT inverter, based on the value set in the website.
2. IGBT inverter acts as a PWM generator and supplies the input voltage to the motor.
3. Induction motor runs with the voltage obtained from the inverter.
4. Torque selection is used to select the torque value to the induction motor.
5. Scope is used to display the input voltage, speed of the rotor and the current value along with the torque.

SIMULATION RESULT

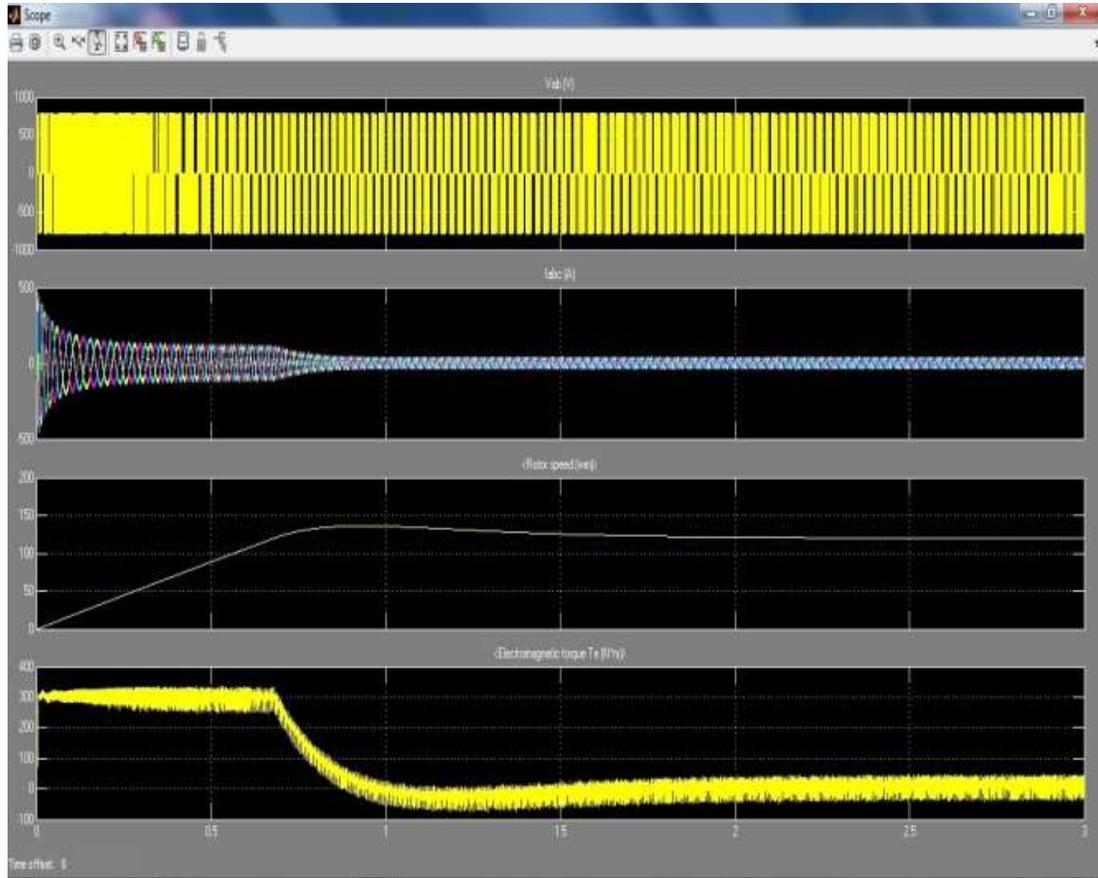


Fig 3. Simulated output

1. The first graph shows the input PWM pulse given to IGBT inverter.
2. Second graph shows the input current to the IM.
3. Third graph shows the speed change of the IM
4. Fourth graph shows the torque of the IM.

WEB BASED CONTROL

The design of the website was done using php Designer. The web page has a authentication page as the homepage. shown as in fig 4.

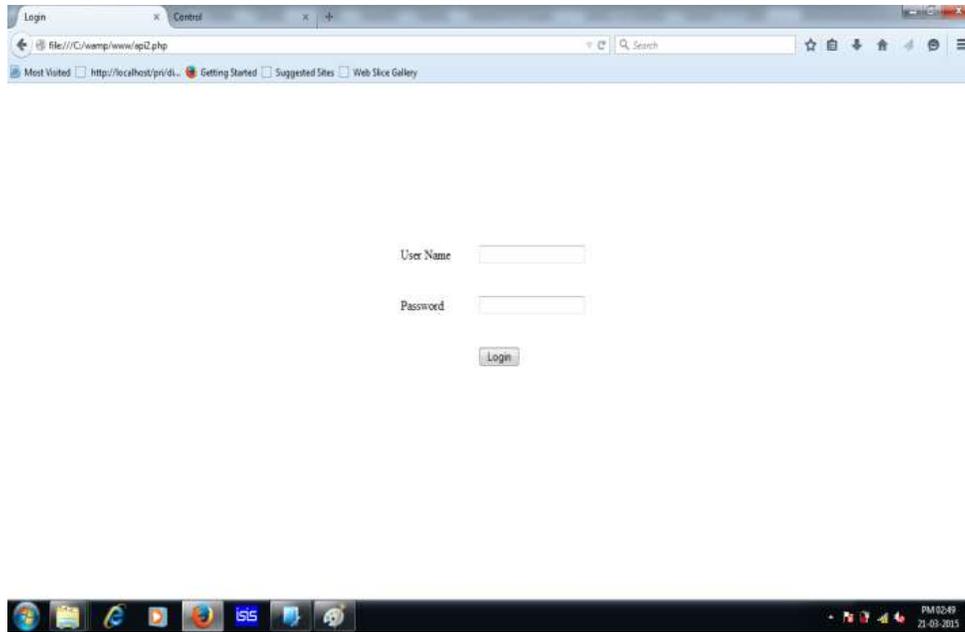


Fig 4. Login page

Authentication of the page is used in order to avoid unauthorised accessing of the website. After logging in it will be taken to the control page as shown in fig 5.



Fig 5 Control page

The control page is used in controlling the industry appliances and for viewing the video stream from the camera. The IP address along with date and time of the last visited system will be displayed on the site. When the required speed is entered and the set button is clicked the signal is sent to the controller and the speed of the motor changes.

CONCLUSION

In this paper, a Web-based remote access and monitoring of industrial appliances is presented. For this purpose, an embedded based structure was developed to control the system. For monitoring and supervising purpose a camera was installed in the system.

The main advantages are:

1. The industry can be controlled and monitor remotely from any part of the world.
2. Username and password protection was added to permit access to the web page for only authorized users. Every access is recorded and the IP address along with date and time is stored.

Because of the advantages mentioned above, the system is not only user-friendly it is also reliable, flexible and cost effective.

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Fault Analysis of Grid Connected Current Source Inverter Based PV System

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Abstract- Grid connected or utility interactive PV system are design to operate in parallel with and interconnected with the electric utility grid. The primary component in grid connected PV system is the inverter. The inverter convert DC power produced by the PV array into AC power consistent with voltage, current and power quality requirement of utility grid, and the automatically stops supplying power to the grid when the utility grid is not energized. In voltage source inverter, input voltage is maintained constant and amplitude of output voltage does not depend on the load. However the waveform of load current as well as it's magnitude depends upon the nature of load impedance. In the current source inverter (CSI), input current is constant but adjustable. The amplitude of output current from CSI is independent of load. To enlarge the use of grid-connected PV systems, the cost, performance, and life expectancy of the power electronic interface needs to be improved. The current-source inverter (CSI) offers advantages over VSI in terms of inherent boosting and short circuit protection capabilities, direct output current controllability, and ac-side simpler filter structure. Research on CSI-based DG is still in its infancy. This paper focuses on transient performances of a PV system based on CSI during the rigorous LL and TPG (Three- phase- to-ground) faults. It also performs a comparative analysis of CSI-based PV systems for severe LL and TPG (Three-phase- to- ground) faults under transient conditions. The control structure consists of two current control loops.

An MPPT provides the reference for the outer dc-side current control loop. The inner current control loop is designed to control the current that is injected into the grid. Using a case study of grid-side faults i.e., LL, TPG, the designed controller is able to fulfill all the requirements of a PV system grid interface besides limiting the dc-side current, irrespective of the severity of the fault, unlike a VSI-based PV system. The fault studies included line-to-line and three-phase-to-ground faults. The case study of this paper is presented by using a Mat lab Simulink environment, the respective results also shows the differences between the behavior of a system at the time of encountering faults. To illustrate the Dynamic stability of the CSI-based PV system during transients on the grid side, simulation studies are carried out for four kinds of faults. Results obtained from fault studies are highly in favour of CSI topology and provide illustrative evidence for short-circuit current protection capability of the CSI. On the other hand, the VSI-based PV system performs poorly when subjected to similar grid transients.

I. Introduction

Recently, the inverters are also playing an important role in various renewable energy applications as these are used for grid connection of Wind Energy System or Photovoltaic System. In addition to this, the control strategies used in the inverters are also similar to those in DC-DC converters. Both current-mode control and voltage-mode control are employed in practical applications. The interest in this paper is especially on current source inverters where the load is AC public utility network(through out this paper: the grid), and the source is a PV module. Total PV cell (crystalline silicon PV cell and thin-film PV cell) production in the IEA PVPS countries in 2012 is estimated to be 28,4 GW, about a 5% decrease from the previous year. As in 2011, China reported the largest production of PV cells. Total estimated production of PV cells in China is about 21 GW in 2012. While the growth rate from 2010 to 2011 was about 60%, figure 11 showed only a 5% growth from 2011. 5 companies among China's top 10 producers now have more than 2 GW of manufacturing capacity; Yingli Green Energy with 2,45 GW/year, JA Solar with 2,8 GW/year, Sun tech Power with 2,4 GW/year, and Trina Solar with 2,45 GW/year. Other major IEA PVPS countries producing PV cells are Japan, Malaysia, Germany, the US, and South Korea. In 2012, the IEA PVPS countries accounted for 84% of the global solar cell production. Major non-IEA PVPS countries manufacturing solar cells are Taiwan, Philip-pines, Singapore and India. Major PV module producers in China started to procure solar cells made in Taiwan to avoid the antidumping duties for Chinese solar products in the USA and this brought a growth of solar cell production in Taiwan. 5,4 GW of solar cells were produced in Taiwan in 2012, a 25,6% increase from the previous year.

India is densely populated and has high solar insolation, an ideal combination for using solar power in India. In the solar energy sector, some large projects have been proposed, and a 35,000 km² (14,000 sq mi) area of the Thar Desert has been set aside for solar power projects, sufficient to generate 700 to 2,100 GW. Also India's Ministry of New and Renewable Energy has released the JNNSM Phase 2 Draft Policy, by which the Government aims to install 10 GW of Solar Power and of this 10 GW target, 4 GW would fall under the central scheme and the remaining 6 GW under various State specific schemes.

In July 2009, India unveiled a US\$19 billion plan to produce 20 GW of solar power by 2020. Under the plan, the use of solar-powered equipment and applications would be made compulsory in all government buildings, as well as hospitals and hotels. On 18 November 2009, it was reported that India was ready to launch its National Solar Mission under the National Action Plan on Climate Change, with plans to generate 1,000 MW of power by 2013. From August 2011 to July 2012, India went from 2.5 MW of grid connected photovoltaic to over 1,000 MW.

Gujarat has been a leader in solar power generation and contributes 2/3rd of the 900 MW of photo voltaics in the country. The State has commissioned Asia's biggest solar park at Charanka village. The park is already generating 2 MW solar power out of its total planned capacity of 500 MW. The park has been functioning on a multi-developers and multi-beneficiaries paradigm and has been awarded for being the most innovative and environment-friendly project by the CII. With a view to make Gandhinagar a solar city, the State government has launched a roof-top solar power generation scheme. Under this scheme, the State plans to generate five megawatt of solar power by putting solar panels on about 50 state government buildings and on 500 private buildings. The State has also a plan to emulate this project in Rajkot, Surat, Bhavnagar and Vadodara in 2012-13.

II. Three-phase Grid-Connected Photovoltaic Module

This paper presents a mathematical modelling for the three-phase grid-connected Photovoltaic (PV) system based on Current Source Inverter (CSI). The paper also discusses designs of controllers for DC-side and AC-side currents. The DC-side current controller is responsible for making the current on the DC side of the inverter track a reference value that corresponds to the maximum power point at a particular insolation level. The AC-side current controller works in coordination with the Coupling (PCC). In this paper, to design current controllers, the phasor quantities are transformed from stationary frame of reference to a rotating frame of reference. Rotating frame of reference reduces number of phasor quantities, thus simplifying the controller design task. A detailed method for transforming the phasor quantities from stationary frame to rotating frame is provided. Model of the CSI developed in this paper is a detailed switched-model simulated in MATLAB simulation package. This paper introduces a simple, yet reliable method to tune the parameters of the controller for independent control of active and reactive components of the current on the AC-side. The single-line diagram of the three-phase, single-stage, grid-connected PV system with a CSI as the power-conditioning unit. The PV array is a parallel combination of np PV modules, while each PV module is a series combination of ns number of PV cells. The DC-side inductor L_{dc} filters out ripples in the DC-side current and allows its control Figure5.1 illustrates. The AC-side of the inverter is interfaced with the primary side of the transformer T_r through a capacitive filter composed of three Y-connected capacitors, C_f . Function of the capacitive filter, C_f , is to absorb switching harmonics and produce clean sinusoidal current at the grid interface. Breaker B_{pv} is an integral part of the PV system and is provided to protect the PV system by isolating it when there is a fault on the secondary side of the transformer, T_r .

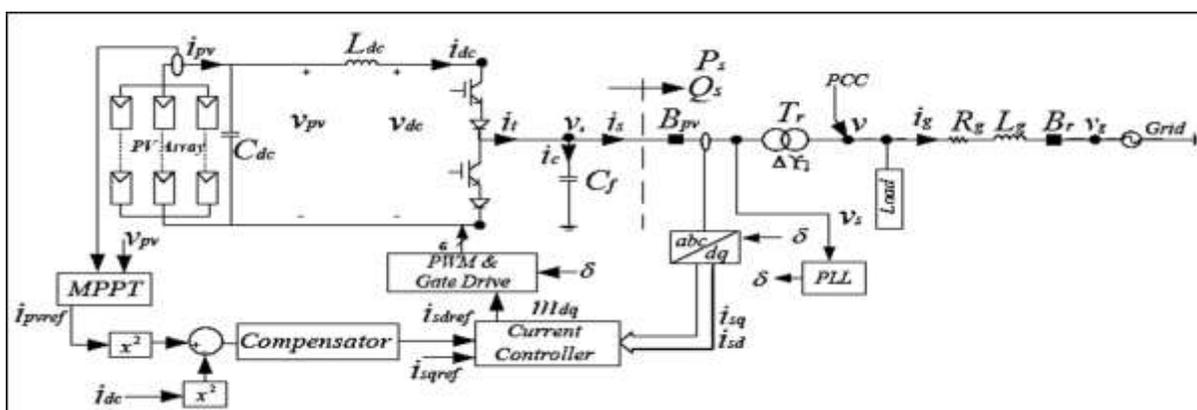


Fig.1: Schematic diagram of a three-phase, single-stage, grid-connected PV system based on CSI.[3]

arrangements for the CSI of Figure 2. Figure 3 illustrates the simulated tri-level terminal current, i_{ta} of the CSI. The capacitive filter, C_f suppresses the switching harmonic contents of the terminal current, resulting in the sinusoidal current i_{sa} , shown in Figure 3

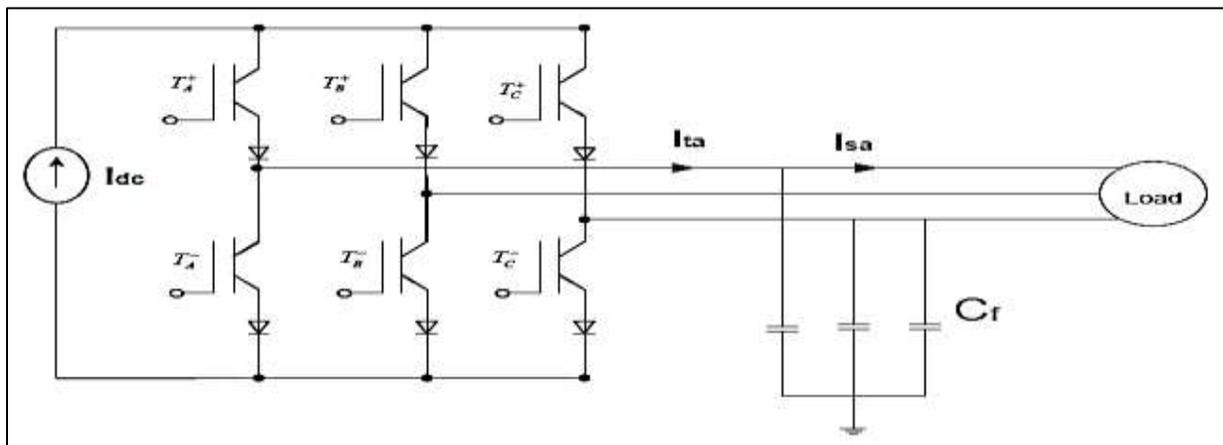


Fig.2 Schematic diagram of a Current Source Inverter.

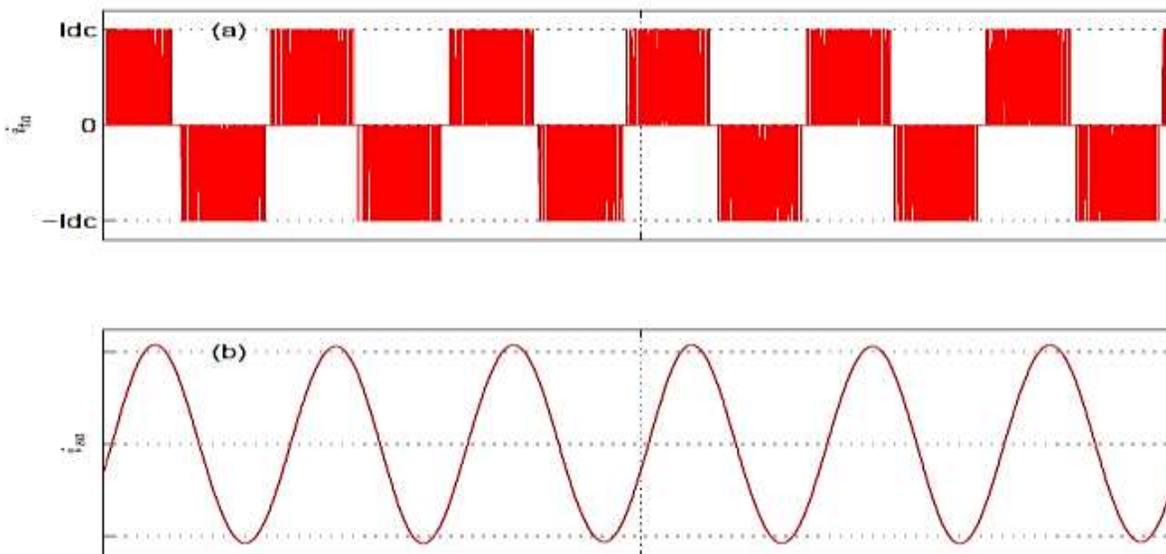


Fig.3: Simulated switching behaviour of the CSI (a) Terminal current of CSI (b) Filtered AC-side current

IV. Dynamics Models of CSI based PV system

A mathematical model is essential for the control design as well as analysis of the PV system. In this section the mathematical model of the uncontrolled PV system is formulated. The overall model consists of three sets of equations which describe the PV matrix, the DC-link voltage dynamics and the AC-side current dynamics of the PV system. The model of the uncontrolled PV system along with those of the controllers constitute a model for the closed-loop PV system.

A. Space-Phasor Representation of the PV System

The PV matrix is described by the following equations [1]:

$$i_{pv} = n_p^i ph - n_p^i rs \left[\exp\left(\frac{q u_{pv}}{k T_c n_x}\right) - 1 \right] \quad (1)$$

where q is the unit charge, k is Boltzmann's constant, A is the p-n junction ideality factor, and T_c is the cell temperature. I_{rs} is the cell reverse saturation current, which varies with temperature according to the following equation:

$$i_{rs} = i_{rr} \left[\frac{T_c}{T_r} \right]^3 \exp\left(\frac{q E_G}{k A} \left[\frac{1}{T_r} - \frac{1}{T_c} \right]\right) \quad (2)$$

where T_r is the cell reference temperature, I_{rr} is the reverse saturation current at T_r , and E_G is the band-gap energy of the cell. The photovoltaic current, I_{ph} , depends on the insolation level and the cell temperature as:

$$i_{ph} = [i_{scr} + K_e(T_c - T_r)] \frac{S}{S_{STC}} \tag{3}$$

In (2), i_{scr} is the cell short-circuit current in Amperes at the reference temperature and irradiation, K_e a temperature coefficient, S the insolation in kW/m² and S_{STC} the insolation level at standard temperature condition (STC) which is equal to 1 kW/m². Power delivered by the PV array is calculated by multiplying both sides of (3) by v_{pv} .

$$P_{pv} = n_p i_{ph} u_{pv} - n_p i_{rs} u_{pv} \left[\exp\left(\frac{q u_{pv}}{k T_c A n_s}\right) - 1 \right] \tag{4}$$

Substituting current i_{ph} from (3) in (4), power P_{pv} becomes

$$P_{pv} = n_p [i_{scr} + K_e(T_c - T_r)] \frac{S}{S_{STC}} u_{pv} - n_p i_{rs} u_{pv} \left[\exp\left(\frac{q u_{pv}}{k T_c A n_s}\right) - 1 \right] \tag{5}$$

Based on (5), [3] it is evident that the power delivered by the PV array is a function of insolation level, S , at any given temperature. Since the inverter employed in the PV system of this work is of current-source type. The power-versus-current characteristic of the PV array has to be examined (rather than the power-versus-voltage characteristic). Figure 4 illustrates the power-versus-current characteristic of the PV array based on the parameters listed in the Appendix A for insolation levels of 0.1, 0.5 and 1 kW/m². Figure 5.4 shows that P_{pv} can be maximized by control of current i_{pv} , based on a Maximum PowerPoint Tracking (MPPT) strategy [7].

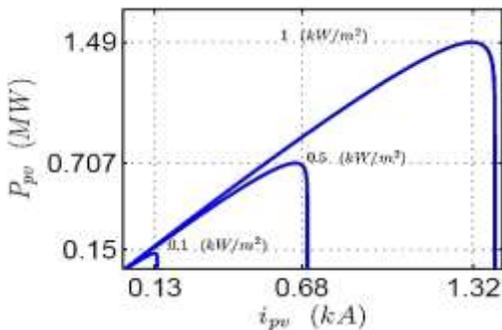


Fig.4: Current versus power characteristics of a PV matrix

The output current of the CSI, i_t is related to the DC-side current i_{dc} as follows [3]

$$\vec{i}_t = \vec{m} i_{dc} \tag{6}$$

Where i_t and \vec{m} are the space phasors corresponding to the CSI terminal currents and the PWM modulating signals. The CSI of Figure 2 is a 6-pulse converter employing IGBT switches, operated under Sinusoidal Pulse Width Modulation (SPWM) strategy [2]. Similarly, the DC-side voltage, v_{dc} , is related to the CSI AC-side voltage space phasor as [3]

$$u_{dc} = \vec{m} v_s \tag{7}$$

Voltage and current at the PCC can be expressed in space-phasor form as [1]:

$$\vec{u}_s = \frac{2}{3} (v_{sa} + e^{-j\frac{2\pi}{3}} u_{sb} + e^{j\frac{2\pi}{3}} u_{sc}) \tag{8}$$

And

$$\vec{i}_s = \frac{2}{3} (i_{sa} + e^{-j\frac{2\pi}{3}} i_{sb} + e^{j\frac{2\pi}{3}} i_{sc}) \tag{9}$$

$$\vec{i}_s = \frac{2}{3} (i_{sa} + e^{j\frac{2\pi}{3}} i_{sb} + e^{-j\frac{2\pi}{3}} i_{sc}) \tag{10}$$

Multiplying (8) and (9), and considering real parts of both sides one gets

$$Re \{ \vec{u}_s \vec{i}_s \} = \frac{4}{9} (u_{sa} i_{sa} + u_{sb} i_{sb} + u_{sc} i_{sc}) - \frac{u_{sa} i_{sb}}{2} - \frac{u_{sa} i_{sc}}{2} - \frac{u_{sb} i_{sa}}{2} - \frac{u_{sb} i_{sc}}{2} - \frac{u_{sc} i_{sa}}{2} - \frac{u_{sc} i_{sb}}{2} \tag{11}$$

Equation (11) can be further simplified to

$$Re \{ \vec{v}_s \vec{i}_s \} = \left[\frac{4}{9} (u_{sa} i_{sa} + u_{sb} i_{sb} + u_{sc} i_{sc}) - \frac{1}{2} (u_{sa} + u_{sb} + u_{sc})(i_{sa} + i_{sb} + i_{sc}) \right] \tag{12}$$

For a balanced three-phase system currents, i_{sa} , i_{sb} , i_{sc} are related as:

$$i_{sa} + i_{sb} + i_{sc} = 0 \tag{13}$$

Substituting (13) in (12) one gets

$$Re \{ \vec{u}_s \vec{i}_s \} = \frac{2}{3} (v_{sa}i_{sa} + v_{sb}i_{sb} + v_{sc}i_{sc})$$

For a three-phase systems the real power, P_s in time domain is expressed as [1]:

$$P_s = (u_{sa}i_{sa} + u_{sb}i_{sb} + u_{sc}i_{sc})$$

Substituting expression for P_s from (12) in (13) one gets

$$Re \{ \vec{v}_s \vec{i}_s \} = \frac{2}{3} P_s \tag{14}$$

Equation (14) can be rewritten as

$$P_{dc} \approx P_s = \frac{3}{2} Re \{ \vec{v}_s \vec{i}_s \}$$

Assuming the switching losses of the inverter negligible, the DC-side power of the inverter, P_{dc} , is equal to the power delivered on the AC-side. Therefore [3],

$$P_{dc} \approx P_s = \frac{3}{2} Re \{ \vec{v}_s \vec{i}_s \} \tag{15}$$

B. DQ-Frame Representation

For the purposes of analysis and control, the space-phasor variables of the PV system model are projected on a dq -frame. Transformation of the variables from the space-phasor form to the dq -frame form results in equivalent DC variables, which simplify the analysis and control design tasks. Moreover, a dq -frame based control can be implemented more conveniently compared to the case where the control signals are time-varying. The transformation is defined as:

$$\vec{f} = (f_d + jf_q)e^{j\theta} \tag{16}$$

Where \vec{f} represents a space-phasor, f_d and f_q are the space-phasor dq -frame components, and θ is the reference angle of the dq -frame. Another useful quantity is the derivative of a space-phasor, that is:

$$\begin{aligned} \frac{d\vec{f}}{dt} &= \frac{d}{dt} (f_d + jf_q)e^{j\theta} \\ &= \left(\frac{df_d}{dt} + j \frac{df_q}{dt} \right) e^{j\theta} + j \frac{d\theta}{dt} (f_d + jf_q)e^{j\theta} \\ &= \left(\frac{df_d}{dt} + j \frac{df_q}{dt} \right) e^{j\theta} + j\omega (f_d + jf_q)e^{j\theta} \end{aligned}$$

where ω is the dq -frame angular speed, as

$$\omega = \frac{d\theta}{dt}$$

Based on (16), P_s in (13) can be expressed as:

$$P_s = \frac{3}{2} Re \left\{ \frac{(v_{sd} + jv_{sq})e^{j\theta}}{\vec{v}_s} \frac{(i_d + ji_q)e^{-j\theta}}{r^2} \right\} \tag{17}$$

which can further be simplified to

$$P_s = \frac{3}{2} (v_{sd}i_d + v_{sq}i_q) \tag{18}$$

Similarly, the dq -frame equivalent of PR in (18) is deduced as:

$$P_R = \frac{3}{2} R (i_d^2 + i_q^2) \tag{19}$$

In addition, based on (18) and (19), PL in (19) is simplified to

$$P_L = \frac{3}{2} L \left(i_d \frac{di_d}{dt} + i_q \frac{di_q}{dt} \right) \tag{20}$$

Substituting in (20) for P_s , PR , and PL , respectively from (17), (18), and (19) one finds:

$$\frac{c}{2} \frac{dv_{dc}^2}{dt} = P_{pv} - \frac{3}{2} (v_{sd} i_d + v_{sq} i_q) - \frac{3}{2} R (i_d^2 + i_q^2) - \frac{3}{2} L \left(i_d \frac{di_d}{dt} + i_q \frac{di_q}{dt} \right) \tag{21}$$

Equation (21) is employed in designing a voltage regulator to maintain the DC link voltage, v_{dc} , at a desired level, such that the power out of the PV matrix can be maximized. A similar procedure as the one adopted to derive (22) yields the following dq -frame equivalents for (20):

$$L \frac{di_d}{dt} = L\omega i_q - R_{id} + m_d \frac{v_{dc}}{2} - v_{sd} \tag{22}$$

$$L \frac{di_q}{dt} = -L\omega i_d - R_{iq} + m_d \frac{v_{dc}}{2} - v_{sq} \tag{23}$$

Equations (21), (22), and (23) constitute a state-space model for the VSC, in which v_{dc} , i_d , i_q are the state variables, m_d and m_q are the control inputs, and v_{sd} , v_{sq} , and S are the exogenous inputs.

C. Phase-Locked Loop (PLL)

As discussed in previous Section, the AC variables of the PV system are projected on a dq frame the rotational speed of which is ω . In a steady state, the AC variables are sinusoidal functions of the grid frequency ω_0 . Thus, their dq -frame components become time-invariant (in the steady-state) if the dq frame angular speed ω becomes equal to ω_0 . This is achieved by means of a PLL mechanism [5]. A block diagram of the PLL adopted in this research is presented in Figure. 5. As Figure.5 shows, \widehat{v}_s is resolved into its d and q axis components, based on (20). Then, v_{sq} is processed by the compensator $H(s)$, and ω is determined. In a steady state, v_{sq} is forced to zero while ω becomes equal to ω_0 . Therefore, $H(s)$ must include at least one integrator.

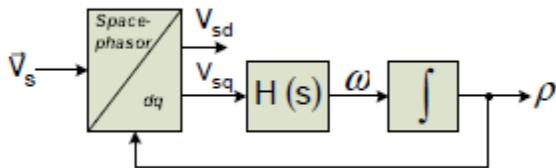


Fig.5: Block diagram of the Phase-Locked Loop (PLL)

Let $H(s)$ be a PI compensator cascaded with a first-order, low-pass, transfer function, as

$$\Omega = H(s) V_{sq}$$

$$= \frac{\beta_1 s + \beta_2}{s(s + \beta_3)} V_{sq}$$

where β_1 and β_2 are the proportional and integral gains of the PI part, respectively, whereas β_3 is the pole of the low-pass function of the compensator. Let the two state variables β_1 and β_2 are defined as

$$x_7 = \frac{v_{sq}}{s^2 + \beta_3 s}$$

$$x_6 = s X_2$$

then, the PLL is described by the state-space model

$$\frac{d}{dt}x_{pll} = A_{pll}X_{pll} + B_{pll} \begin{bmatrix} v_{sd} \\ v_{sq} \end{bmatrix}$$

$$\omega = E_{pll}X_{pll}$$

$$\rho = F_{pll}X_{pll}$$

Where

$$\text{Where } A_{pll} = \begin{bmatrix} -\beta_2 & 0 & 0 \\ 1 & 0 & 0 \\ \beta_1 & \beta_2 & 0 \end{bmatrix}$$

$$B_{pll} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$E_{pll} = [\beta_1 \beta_2 \ 0]$$

$$F_{pll} = [0 \ 0 \ 1]$$

$$X_{pll} = [x_6 \ x_7 \ \rho]^T$$

Equations introduce the PLL as a dynamic system whose inputs are v_{sd} and v_{sq} , the state variables are ε_1 , ε_2 , and ρ and the outputs are ρ and ω . Regulation of v_{sq} at zero also has the implication that the expression for the PV system real-power output, i.e. (5.24), is simplified to

$$P_s = \frac{3}{2} v_{sd} i_d \tag{24}$$

Hence, P_s is proportional to, and can be controlled by, i_d . Similarly, the dq -frame expression for the reactive power assumes the form:

$$\begin{aligned} Q_s &= \frac{3}{2} \text{Im}\{\overline{u_s} \overline{i_s}\} \\ &= \frac{3}{2} v_{sd} i_{sq} \left\{ \frac{[(u_{sd} + ju_{sq})e^{jb}]}{j_b} \frac{[(i_{sd} + ji_{sq})e^{jb}]}{j_b} \right\} \\ &= -\frac{3}{2} u_{sd} i_{sq} \end{aligned}$$

which can be further simplified to:

$$Q_s = -\frac{3}{2} v_{sd} i_q \tag{25}$$

Equation (25) indicates that Q_s can be controlled by i_q to adjust the power-factor that the PV system exhibits to the distribution network.

V. Inner Current Control Loop

Equations (24) and (25), respectively, show that active and reactive powers delivered by the CSI can be adjusted by controlling i_d and i_q , respectively. Figure 6 shows the

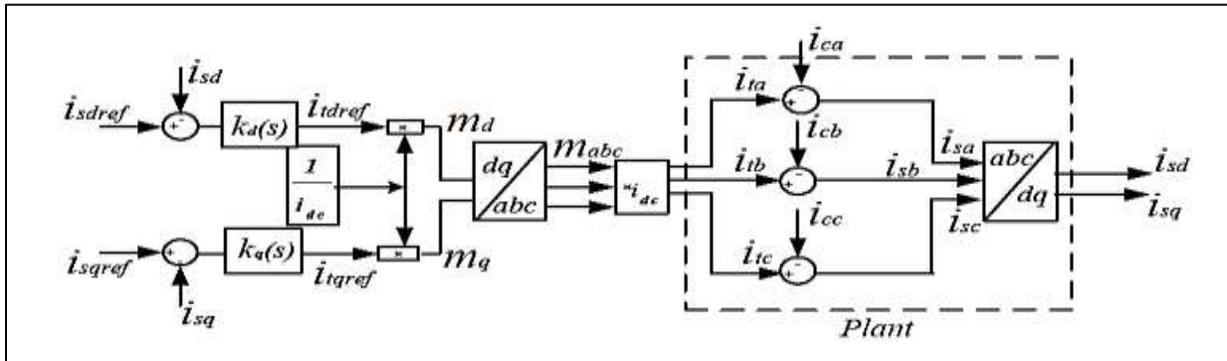


Fig.6: Block diagram of the CSI AC-side current control system [3]

block diagram of the CSI AC-side current controller. Controller structures $k_d(s)$ and $k_q(s)$ in Figure 5.6 are expressed as:

$$k_d(s) = k_q(s) = k_p + \frac{k_i}{s} \tag{26}$$

where k_p and k_i are the proportional and integral gains, respectively. Control signals m_d and m_q are obtained as

$$m_d = \frac{i_{tdref}}{i_{dc}} \text{ and } m_q = \frac{i_{tqref}}{i_{dc}} \tag{27}$$

where i_{tdref} and i_{tqref} are current references derived from the outputs of the compensators $k_d(s)$ and $k_q(s)$, respectively. The d-axis component of the inverter output current, i_{td} , is related to the current i_{sd} as:

$$i_{td} = i_{cd} \tag{28}$$

where i_{cd} is d-axis component of the filter capacitor current. It should be noted that with a proper filter design, the fundamental-frequency component of the capacitor current will be very small, i.e., i_{cd} is negligible as compared to i_{sd} . The same discussion can be made for the q-axis components. Therefore, one can write

$$i_{td} \approx i_{sd} \approx m_d i_{dc} \text{ and } i_{tq} \approx i_{sq} \approx m_q i_{dc} \tag{29}$$

Under the assumption that $i_{cd} = 0$, the following transfer function can be written for the closed-loop control system of i_{sd} illustrated in Figure 6.

$$T(s) = \frac{i_{sd}}{i_{sdreref}} = \frac{k_p + \frac{k_i}{s}}{s + \frac{1}{T_i}} = \frac{s \frac{k_p}{k_p+1} + \frac{k_i}{k_p+1}}{s + \frac{k_i}{k_p+1}} \tag{30}$$

As the value of k_p increases the pole of the transfer function $T(s)$ in (30) approaches the origin of s-plane, which is not desirable. Therefore, to imitate the transient behaviour of a first-order system, k_p should be chosen to be small. k_i , as the inverse of time-constant. Thus, k_p and k_i can be written as:

$$k_p \approx 0 \text{ and } k_i = \frac{1}{T_i} \tag{31}$$

Substituting the values of k_p and k_i in (31) the transfer function $T(s)$ becomes

$$T(s) = \frac{i_{sd}}{i_{sdreref}} = \frac{\frac{1}{T_i}}{s + \frac{1}{T_i}} = \frac{1}{T_i s + 1} \tag{32}$$

In the first order system represented by (32), T_i determines the controller response time. For fast response, the range of T_i varies between 0.5 ms to 5 ms.

VI. Outer Current Control Loop

Equation (26), after substituting $v_{sq} = 0$, represents a system with i_{sd} as the input, i_{sd} the output and v_{sd} the disturbance input. If time constant τ in the PI compensator of the inner current control loop is properly selected, i_{sd} can be approximated to $i_{sd}(ref)$. Therefore, (26) can be rewritten as:

$$\frac{1}{2}L_{dc} \frac{di_{dc}^2}{dt} \approx P_{pv} - \frac{3}{2}u_{sd}i_{sdref} \tag{33}$$

The DC-link current controller designed on the basis of (33) is illustrated in Figure7. The fact that Ppv is product of vpv and ipv makes the system nonlinear. To mitigate the impact of nonlinearity, isdref can be derived in the following way:

$$i_{sdref} = u_i + n \left(\frac{P_{pv}}{\frac{3}{2}u_{sd}} \right) \tag{34}$$

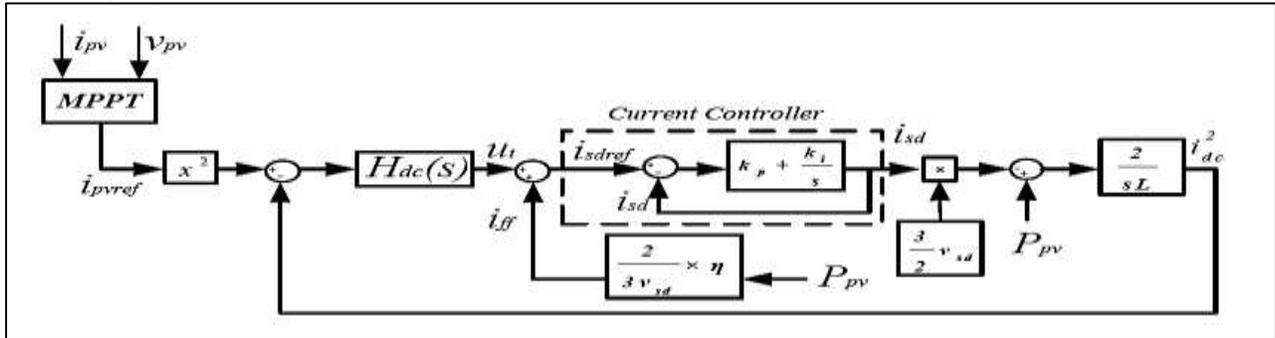


Fig.7: Closed-loop control structure of the DC-side current [3]

$$\frac{L_{dc}}{2} \frac{di_{dc}^2}{dt} \approx (1 - \eta) P_{pv} - \frac{3}{2}u_{sd}u_i \tag{35}$$

Equation (35) indicates that if $\eta = 1$, the impact of the PV array nonlinearity on the DC side current control is eliminated, and the effective control unit becomes an integrator.

VII. Comparative Performance of the CSI-based PV system with the VSI based PV system

Case study 1: On Different Insolation Level of PV Panels

In this case study, the behaviors of the VSI- and CSI-based PV systems in response to a change in insolation level are illustrated. Since VSI and CSI are dual topologies, the characteristic of voltage in CSI is analogous to that of current in VSI, and vice versa. Initially, the insolation level is set to 0.4 kW=m². At t = 1 s, the insolation level is step changed to 0.6 kW=m², as shown in Figure 8.1(a). With the change in insolation level, the CSI DC-side current reference changes from 0.7 kA to 1 kA by the maximum power point tracker. The new reference is tracked by the outer current control loop or the DC-side current controller, as shown in Figure 8.1(c). Since the terminal current of the CSI, it, is linearly related to the DC-side current, idc, it is also changed as shown in Figure 8.1(e). The AC-side current reference is derived from the DC-side current control loop. Since there is an increase in the DC-side current, the d-axis current reference, i_{tdref} , increases, and so does the current isa, as shown in Figure 8.1(g). With the increase in isa, the current on the secondary side of the transformer, iga, also increases. Presently, the utility mandates that the current injected by the inverter, iga, be in-phase with the voltage at the PCC. This is shown in Figure 8.1(b). Figures 8.1(b),(d),(f) show the performance of a VSI-based PV system in response to the same step change in insolation level. One can observe in Figure 8.1(d) a step change in the DC-side voltage level, vdc, of the VSI as a result of a change in insolation level, similar to that in DC-side current of CSI. The AC-side terminal voltage of VSI, shown in Figure 8.1(j), is a two-level quantity whereas the AC-side terminal current of CSI is a three-level quantity. Figure 8.1(h) illustrates the filtered output voltage of the VSI. The unity power factor maintained by the VSI-based PV system at the PCC is illustrated in Figure 8.1(i). From this case study, it can be inferred that the performance of the CSI-based PV system is quite satisfactory and even superior to that of VSI-based PV system due to three-level output current (as compared to two-level output voltage of (VSI), simpler AC-side filter design and direct control of injected current (as compared to indirect output current control in VSI).

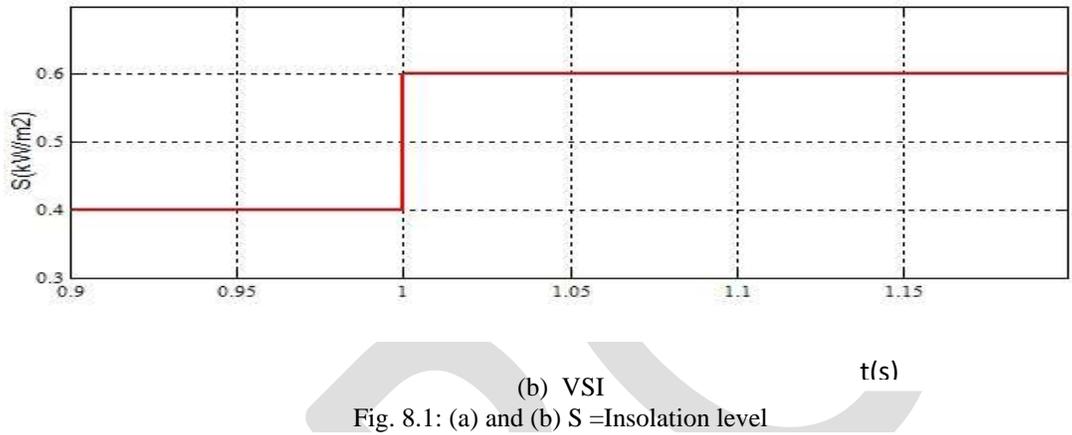
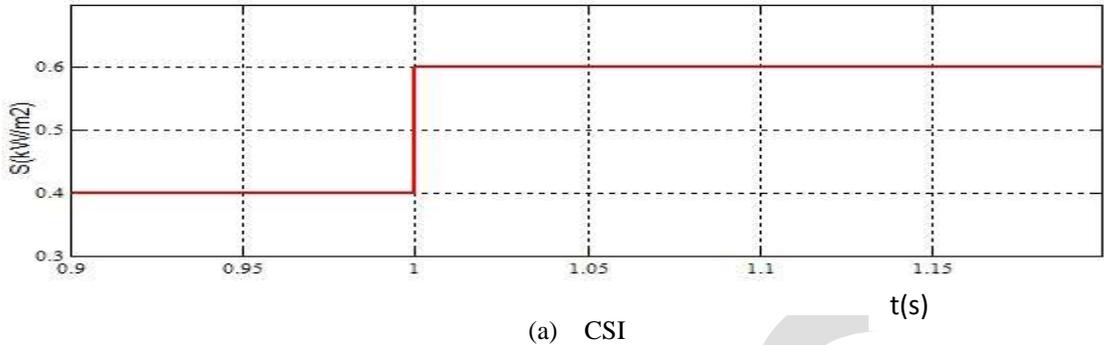


Fig. 8.1: (a) and (b) S =Insolation level

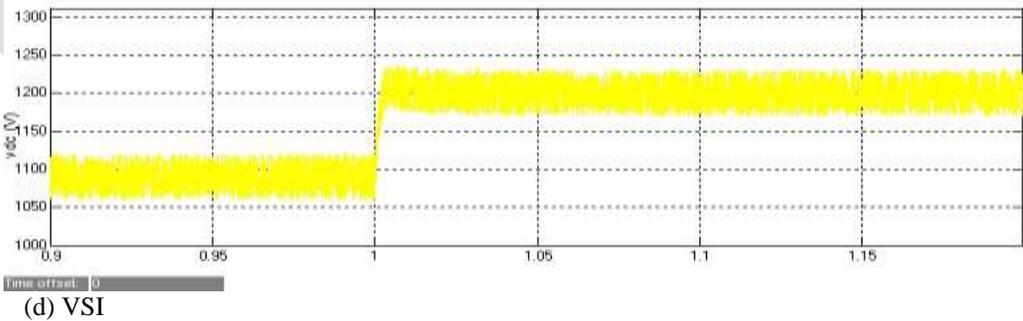
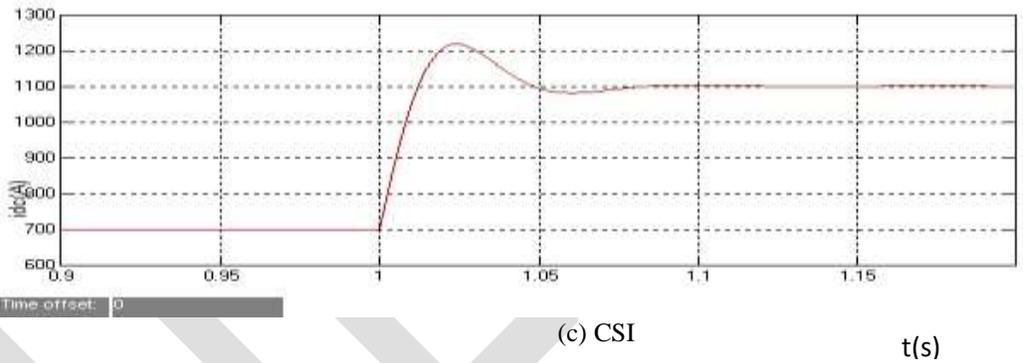


Fig.8.1: (c) and (d) idc = DC-side current of CSI; vdc = DC side voltage of VSI

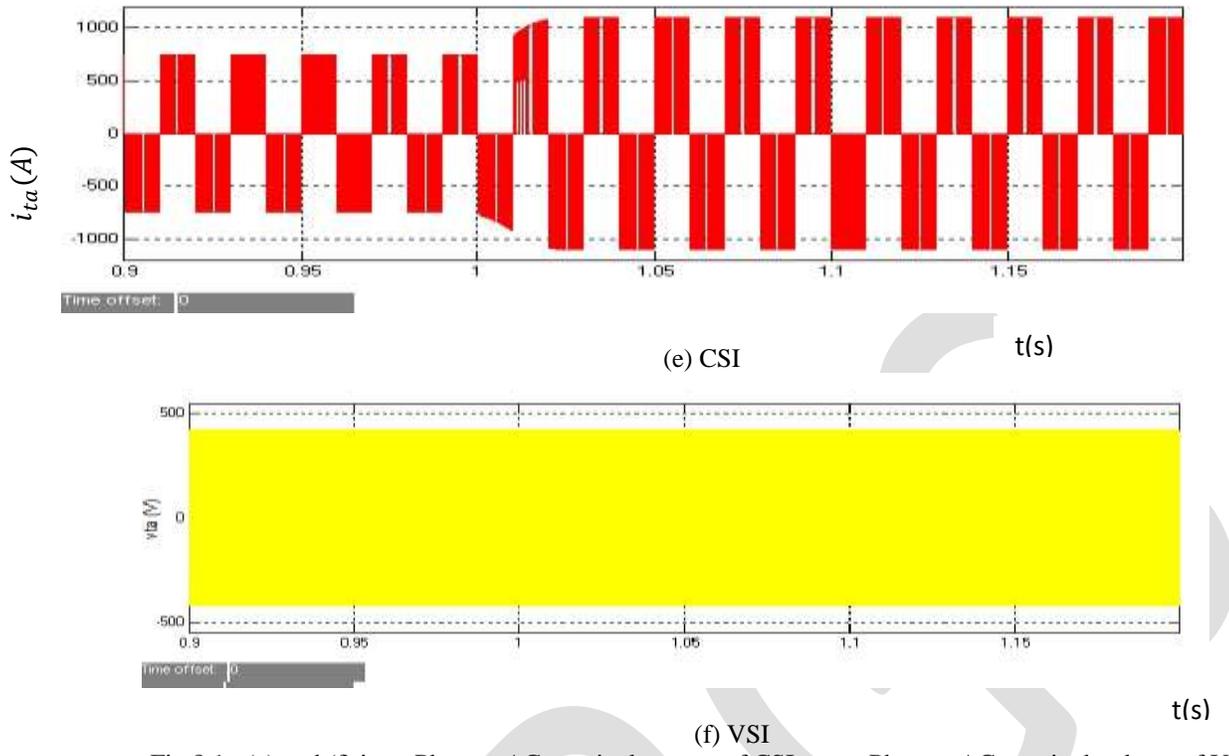


Fig.8.1: (e) and (f) i_{ta} = Phase-a AC terminal current of CSI; v_{ta} = Phase-a AC terminal voltage of VSI

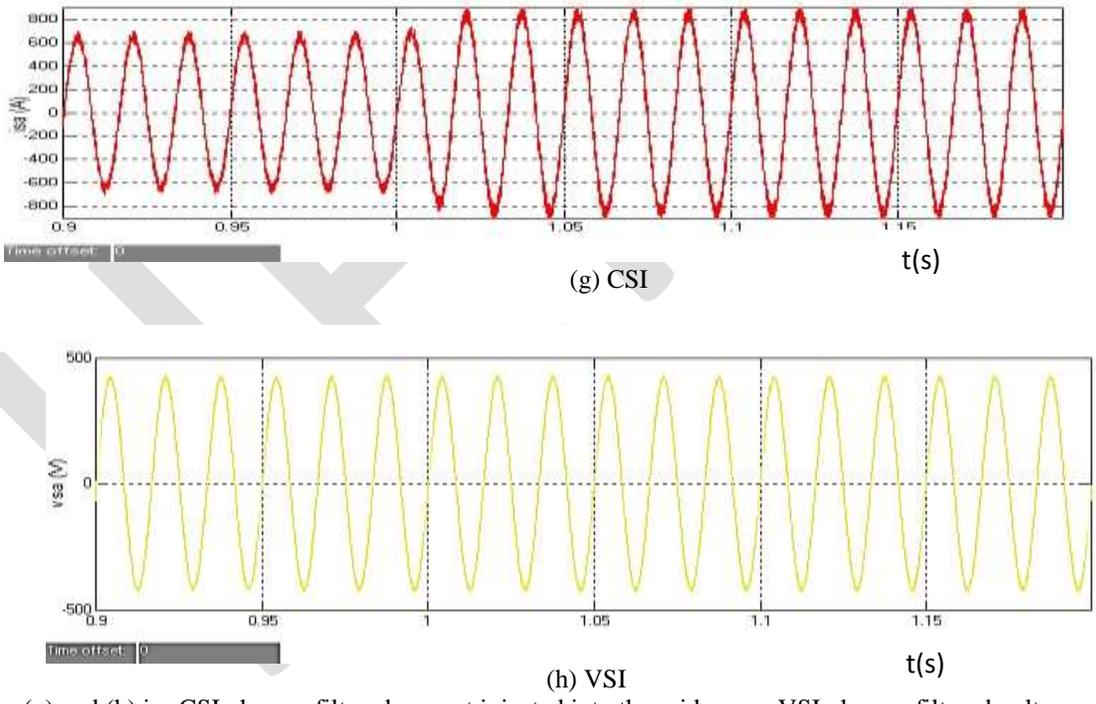
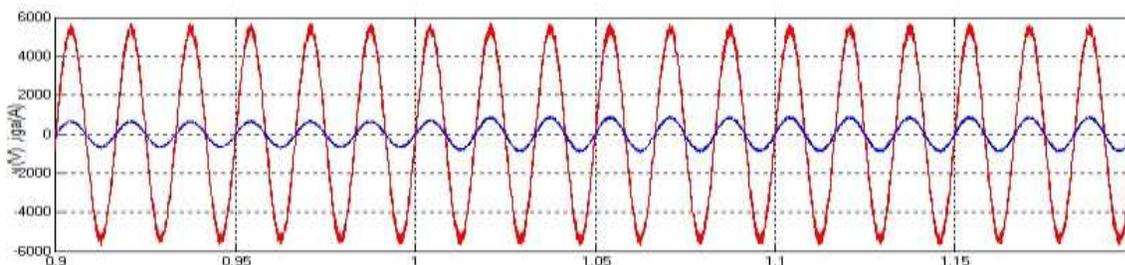
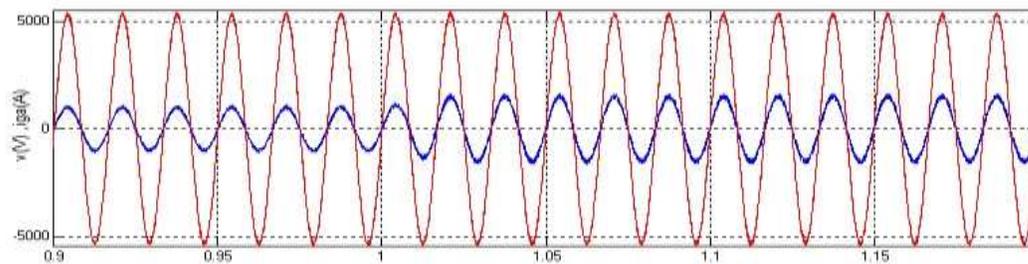


Fig.8.1: (g) and (h) i_{sa} CSI phase-a filtered current injected into the grid; v_{sa} = VSI phase-a filtered voltage at the grid interface



t(s) (i) CSI

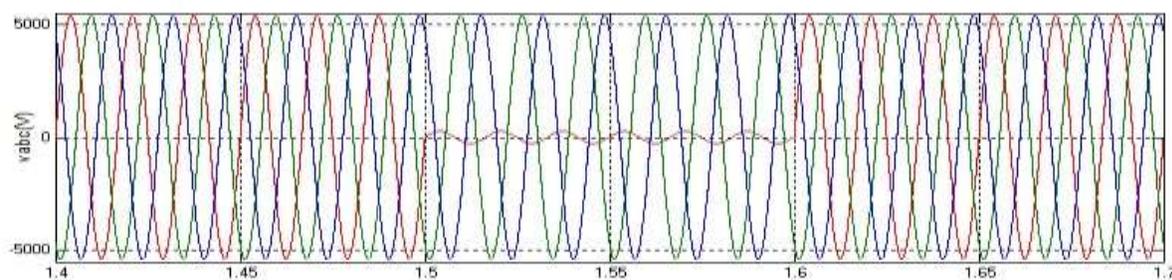


t(s) (j) VSI

Fig.8.1: (i) and (j) $v =$ Phase-a voltage at the PCC; $iga =$ Phase-a current at the PCC

Case study 2: When Fault Occurs

The objective of this case study is to show the impact of a change in the AC-side voltage level on the performance of the PV system, the anti-islanding protection is disabled. At time $t = 1.5$ s, a SLG fault is applied on phase-a of secondary side of the transformer Tr. Due to the fault, the voltage v_a drops to zero, as shown in Figure 8.2(a). Application of fault on the AC-side has resulted in oscillations in the DC-side current of the CSI, as shown in Fig. 8.2(b). However, oscillations are damped as soon as the fault is cleared, and the DC-side current controller tracks the reference current in less than 20 ms. Due to this disturbance, the AC terminal current of the CSI, i_{ta} , undergoes over modulation, as shown in Figure 8.2(c). The over modulation results in low order harmonics, and the current i_{sa} injected into the grid is no longer sinusoidal, as shown in Figure 8.2(d). This case study clearly shows the inherent over-current protection built in CSI that limits the currents on both DC and AC sides. Fault on the grid-side of the inverter results in oscillations of current and voltage on the DC-side of the inverter [4], [5] Oscillations in the DC-side current are not desirable as the inverter requires a smooth input DC-current. In case of VSI-based PV system, the controller regulates the DC-side voltage; therefore, there is no direct control on the DC side current. On the contrary, in CSI-based PV system, the DC-side current is regulated and limited. As a result, the current on the AC-side of the inverter may not show a sharp rise under fault. This case study is designed to present a comparative analysis of behaviors during fault for CSI- and VSI-based PV systems. For this study, the insolation level is maintained at 1 kW/m^2 . In real life, when the fault occurs on the grid-side, and the breaker Br opens, the anti-islanding scheme must act to protect the inverter and personnel.



t(s) (a)

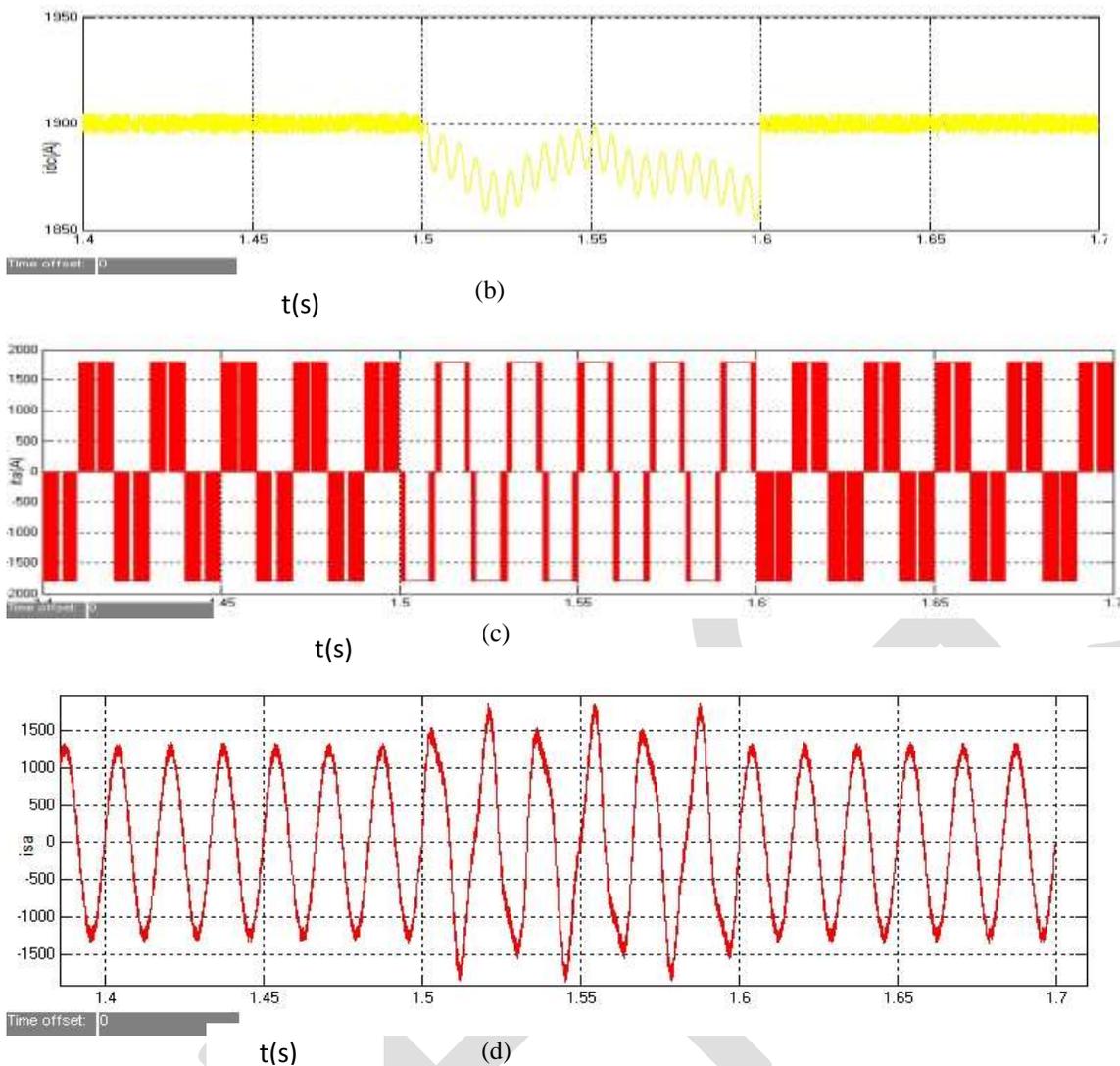
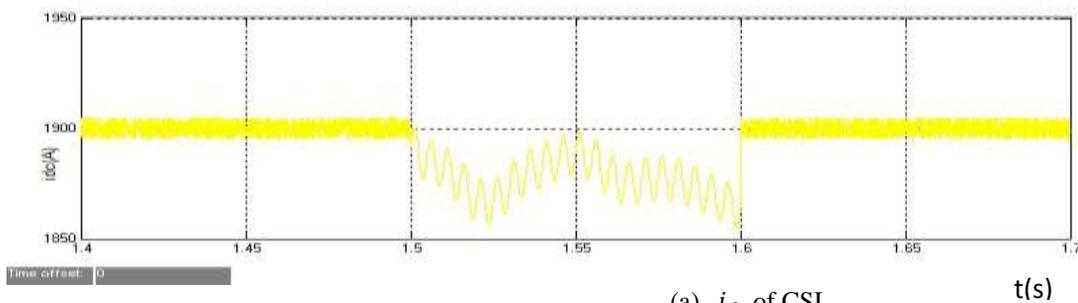


Fig. 8.2: CSI-based PV system performance during SLG (v_{abc} = three phase voltage on the secondary-side of T_r ; i_{dc} = DC-side current of the CSI; i_{ta} = phase-terminal current of CSI; i_{sa} = phase-a current injected to the grid).

VIII. CSI and VSI Relative Performances During Single line to Ground Fault

The performances of CSI- and VSI-based PV systems during a SLG fault. As mentioned earlier, in VSI-based PV system, the controller on the DC-side is employed to control the DC-side voltage (with AC-side currents limited during faults by limiters implemented in the control system), whereas in CSI-based PV system, the controller's task is to control the DC-side current. One can observe from Figure 9(a) that the range of variation in the DC-side current of CSI during fault is tightly limited due to the regulatory role of the DC-side current controller. On the contrary, Figure 9(c) shows that the DC-side current of VSI is allowed to vary in a wide range. Also, Figure 9(b) shows that the amplitude of CSI's AC-side current is limited during fault, whereas the AC-side current of VSI shows a sharp rise in the presence of a current limiter, as illustrated by Figure 9(d).



(a) i_{dc} of CSI
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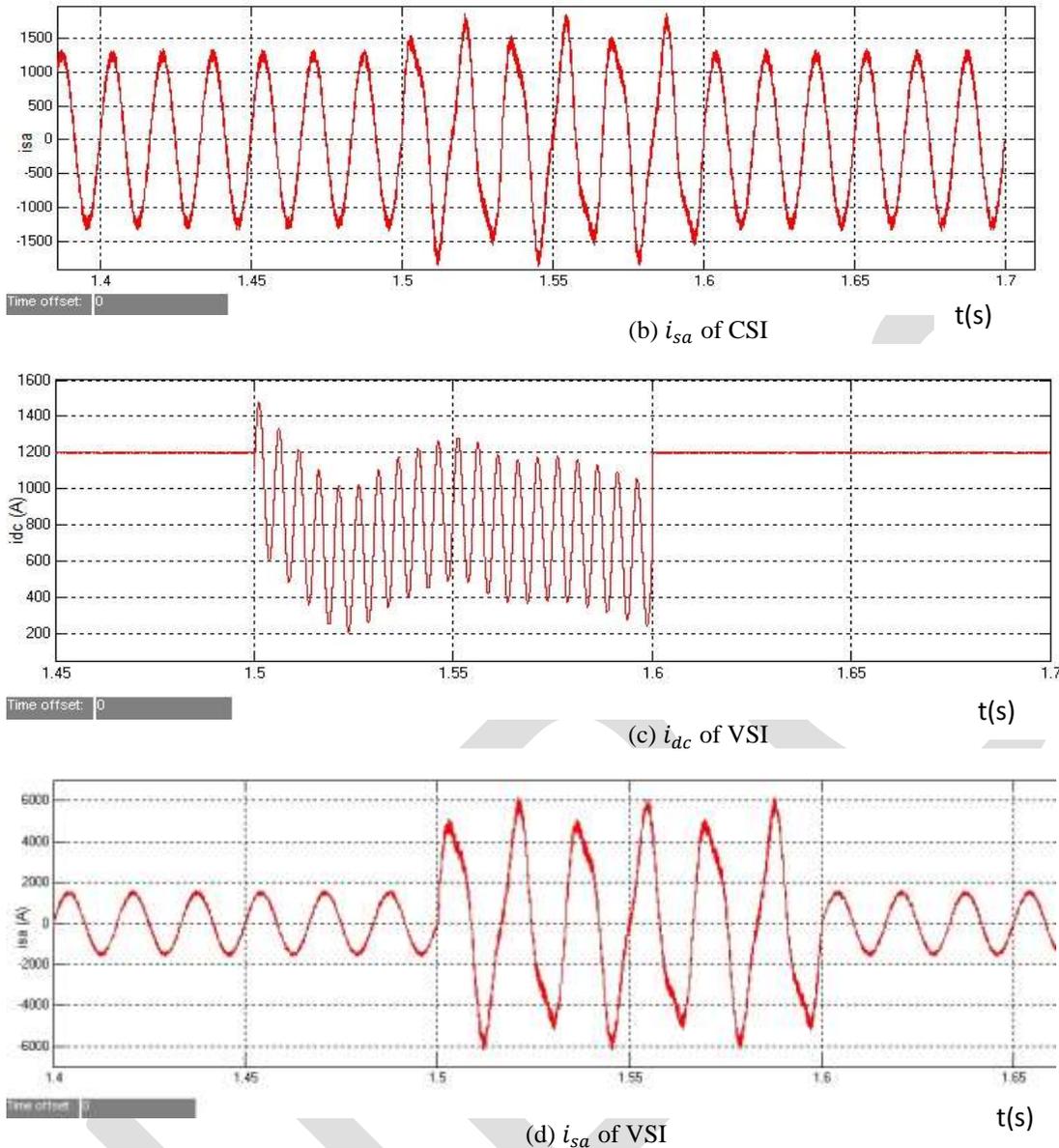


Fig.9: CSI- and VSI-based PV systems' performances during a SLG fault.

Conclusion

The main objective of this paper is to make quality contributions in the field of power electronic interface for grid-connected PV systems. For this purpose, the less-investigated topology for PV system grid interface, i.e., Current Source Inverter was chosen. To make sure about the originality of the work and to avoid repetition of the past work, an extensive literature survey was carried out first. The literature survey covers a range of topologies employed for interfacing PVs. A part of literature survey focusses on grid-connected PV systems that incorporate CSI as their power conditioning units. The survey was a useful way to determine the research gap in the field of CSIs for PV applications. In the initial stage of research, a single-stage CSI-based PV system was designed. The design involved developing a DC-link current controller, which allowed maximum power point tracking, and an AC-side current controller with the mandates of AC-side current wave shaping and reactive power control. The maximum power point tracker (MPPT) is based on the widely used Perturb & Observe (P&O) method and can track the maximum power point in the order of milliseconds. To efficiently track the current reference generated by the MPPT, DC-link current controller is equipped with a feed-forward compensation technique. The feed-forward control plays a major role in suppressing the nonlinearity caused by PV arrays.. The AC-side current controller is designed in a stationary frame of reference. For converting the 3-phase state variables to their corresponding dq-frame equivalents, the transformation angle is derived from the Phase-Locked Loop (PLL). The task of the AC-side current

controller is to track the reference for the d-axis component of AC-side current, generated by DC-link current controller, and inject a clean sinusoidal current into the grid that is in phase with the voltage at the PCC. The AC-side current controller has the ability of adjusting reactive power to a desired value. However, for this work, it is assumed that there is no reactive power demand from the PV system. Therefore, the reactive component is set to zero and there is only active power transfer between the PV system and the distribution system. To verify the performance of the developed CSI-based PV system, a number of simulation studies are carried out in Matlab environment. In the first case study, the performance of the CSI-based PV system is compared with that of a VSI-based PV system of similar rating for a step change in the insolation level. Through simulation results, it is shown that even though both topologies show similar performances, the quality of the sinusoidal current generated by a CSI-based PV system is superior to that of the current generated by a VSI-based PV system. To illustrate the performance of the CSI-based PV system during transients on the grid side, simulation studies are carried out for four kinds of faults. Results obtained from fault studies are highly in favor of CSI topology and provide illustrative evidence for short-circuit current protection capability of the CSI.

SYSTEM PARAMETERS

PV system parameter	Value	Comment
filter capacitance, Cf	300 μ F	
switching frequency	3060 Hz	51 \times 60 Hz
DC-link capacitance, C	1000 μ F	
DC-link inductance, Ldc	1 mH	
ns of PV cells per string, ns	800	
np of PV strings, np	200	
ideality factor, A	1.92	
cell reference temperature, Tref	300 K	
temperature coefficient, kV	0.0017 A/K	
cell short circuit current, Iscr	8.03 A	
reverse saturation current, Irs	1.2×10^{-7} A	
Grid inductance, Lg	1 mH	
Grid Resistance, Rg	1 m	
Grid voltage, vg	6.6 kV	
Tr nominal power	1.3 MV A	
Tr voltage ratio	6.6/0.48 kV	Delta/Y
Tr leakage inductance	0.1 pu	
Tr ohmic resistance	0.02 pu	
on-state resistance of valves, R	3 m	
kp (for i = 0.5 ms)	.0002	
ki (for i = 0.5 ms)	2 s-1	

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HAZE REFINEMENT STRATEGIES

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Abstract— Haze is mainly caused due to weather changes that affects the atmosphere resulting in unclear images mainly taken in open - air . This paper presents two methods for regaining the image clarity: - Single Image Haze Removal using Multi Level Fusion and Single Image Haze Removal using Dark Channel that improve the visual quality of images. In this paper, we implement and examine the effect of above mentioned techniques based on objective and subjective image quality parameters (like Peak Signal To Noise Ratio, Normalized Absolute Error And Maximum Difference etc) to measure the quality of enhanced color images. A comparative analysis between the two is also being carried out. The first method presents a new single image strategy for the improvement of the visibility of unclear images that are affected by atmospheric changes. Image fusion merges two images. The image retains useful regions using three maps: luminance, chromaticity, and saliency. Since using weight maps additional errors may occur, so to minimize those errors the maps then undergo Laplacian and Gaussian pyramid representations and shows effectiveness and the power of a fusion-based strategy of dehazing centered on single degraded image. In second method, a simple but powerful prior, color attenuation prior, for haze removal from a single input hazy image. By creating a linear model for modeling the scene depth of the hazy image under this novel prior and learning the parameters of the model by using a supervised learning method. Experimental results leads to highly effective algorithm. Both the methods compared are suitable for real – time applications but differs in execution time and other performance parameters used for comparison.

Keywords—Weight maps, Pyramidal refinement, Fusion, Dark channel, Transmission estimate, Peak Signal To Noise Ratio, Normalized Absolute Error And Maximum Difference.

INTRODUCTION

The goal of haze removal algorithms is to enhance and recover details of scene from haze image. The quality of photograph in our daily life is easily undermined by the aerosols suspended in the medium, such as dust, mist, or fumes. This has an effect on the image in which contrasts are reduced and color of the image gets low causing image less visible affecting the entire clarity of the scene. There are many circumstances that accurate haze removal algorithms are needed. In computer vision, most automatic systems for surveillance, intelligent vehicles, object recognition, etc., assume that the input images have clear visibility. However, this is not always true in bad weather. Therefore, these applications will fail in the conditions. In consumer photography, the presence of fog will be an annoyance to the images for it reduced the contrast significantly. In this paper, novel algorithms that is able to enhance hazy image based on a single image. **SIHRMLF(Single Image Haze Removal using Multi Level Fusion)** is built on the fusion principle that has shown utility in several applications such as multispectral video enhancement, underwater image enhancement and intelligent transport system. The image fusion combines different inputs and finally gives a enhanced image. **SIHRDC(Single Image Haze Removal using Dark Channel) is based on patches of pixels is also useful for day today real time applications.** In most of the algorithms , that was previously implemented usage of multiple images , polarized filters , etc were used to bring out the clarity of the images. Here the methods discussed uses only a single image which was captured in not so suitable weather conditions . **The** both methods uses only a image to clear fog , smoke , smog and other obscurities present in the captured image to enhance the visibility. This scene degrading factors are due atmospheric changes. The main advantage of the proposed algorithms compared with other is less intricate. The speeds of the algorithms are also comparatively faster than previous related works. This methods can be included in real-time applications such as vehicle detection in surveillance cameras, scene or object detection for providing support in enhancing the vision of scene. The main concentration of our paper mainly centered on a comparatative review on both the methods using PSNR, MSE, NAE (Peak Signal To Noise Ratio, Normalized Absolute Error And Maximum Difference) etc to measure the similarity, quality of the obtained image with the original one .

RELATED WORKS

H. S. Narasimhan, S. Nayar (1999) proposed a technique based on using multiple images[1]. The paper proposes a Narrow Spectral Band (Monochrome) Weather model, and is evaluated on the basis that with distance, contrast of a scene degrades. Multiple images are taken at different distance and weather conditions of the same scene and only standard contrast enhancement techniques can handle a scene at a fixed distance from the sensor. The entire analysis is computed for single narrow spectral band(monochrome) images. The main drawback was in restoring the contrast of degraded images due to atmospheric changes. Contrast restoration was same for all the different images of the same scene taken in different weather conditions which requires time and may become more complex in some cases. The method sometimes might get limited due to extreme bad weather conditions.

E. Robby T. Tan (2008) implemented polarized filter approach[2]. By using different degrees of polarization(DOP) of the same scene, two or more images are derived. A polarizing filter that can be adjusted to different degree is attached to the camera. The main limitation of the method is it cannot work effectively for dynamic scenes. For dynamic scenes the changes are more faster with respect to the filter rotation, therefore it will be difficult to find higher and lower level degree of polarization. This increases the complexity and reduces the application in which the method can be introduced. Also multiple scattering of light can affect the effective working of the polarizing filter.

D. Raanan. Fattal (2008) et al. conjoined a method of haze removal using RGB channels. For this a model based on Radiative Transport Equation is observed carefully and from that a model is formulated for images captured by the camera. Mathematically the color channels are put together using the coefficient of transmission. By light scattering principle of physics from the light source to the eye of the observer determines the coefficient of transmission without scattering. This is given by a graphical representation by showing that the signal to noise ratio is below the expected level and needs shading comparing to noise present in images. This is implemented without using multiple images, polarization filters etc. This also need not require much complex assumption but the method also depends heavily on the amount of haze present and the sensors used[3].

G. L. Kratz and K. Nishino(2009) put forward the method of factorizing scene albedo and depth of haze image[4]. Here the image is modeled using a probabilistic formulation called Factorial Markov Random Field with the single image, independent layers of clear day of the image and scene depth. These methods mostly give the true color of the hazed image and restore the image color through an algorithm i.e. canonical Expectation Maximization algorithm. Either the scene albedo or depth has to be known to compute the algorithm, this is also the main constraint for the proposed method. So it is important to make assumptions for adding additional constraints and is limited in that way.

Erik Matlin and Peyman Milanfar(2011) proposes dual procedures to recover scene radiance[5]. The procedure begins on the assumption that all images have noise or errors because of measurement errors. The first procedure acts as a pre-processing step which includes removing noise and hazy portions of the image separately. The second procedure is to remove noise and haze simultaneously until the said condition is achieved. This procedure confronts the problem of separating haze and noise simultaneously because noise level has to be accurately known to provide good results. Thus the effectiveness depends on the inexact levels of denoising.

Codruta Orniana Ancuti and Cosmin Ancuti (2013) introduced the concept of single image dehazing by multi-scale fusion. In this proposed method decomposition of image into different detailed levels is done by pyramidal decomposition and finally combined by fusion. This strategy merges the minute details from the inputs derived from the single input haze image using fusion technique. To derive the very small details of the inputs, at first, unavoidable features of the original image are extracted using weighted maps. The maps extract features of light, color and object structure. The extracted features may contain certain errors which are again filtered using pyramidal refinement strategy. For deriving inputs the method uses shades of grey color constancy algorithm for white balance which is quite complex. Even though this method using fusion is one among the first to be implemented for dehazing, the method varies in many ways than the previously mentioned methods and is much simpler concept and less complex for real-time applications[6].

BASIC WORKING PROCEDURE

SIHRMLF

The first method proposed i.e. the SIHRMLF comprises of an input deriving section in which two inputs from the original single degraded image are derived using contrast enhancement and white balancing procedures and separately decomposed to multiple levels using Laplacian pyramid. Both the derived images will undergo feature extraction separately using three weight maps for luminance, chrominance and saliency features[6]. These maps are normalized and are undergone multi-scale decomposition using Gaussian pyramid. Finally fusion of these pyramid levels of Laplacian and Gaussian takes place which will give the expected output. The working procedure is shown in figure 1 in a step by step manner.

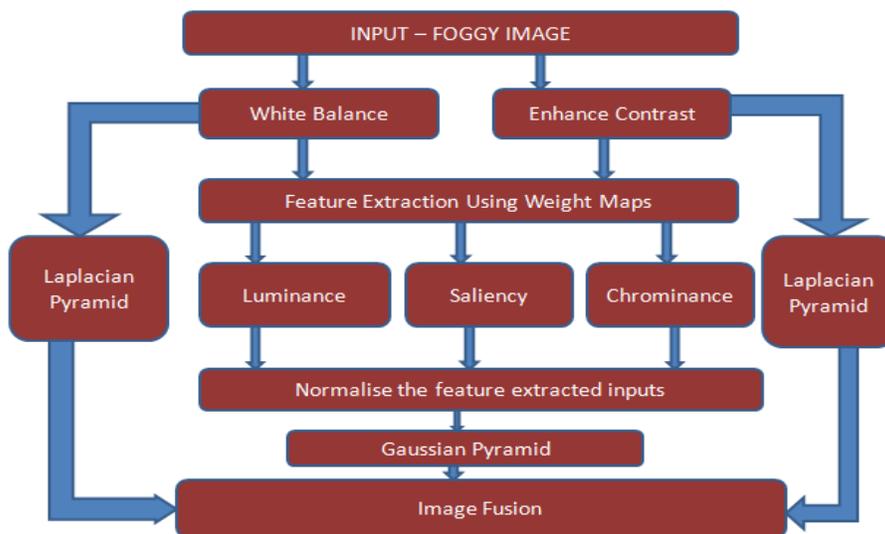


Figure 1: SIHRMSF Block Diagram

Single image haze removal using fusion method works completely by per-pixel strategy. Fusion aims in combining the most essential features which gives the information captured in the haze image and completely converts it to a haze free output image. But to completely extract the important features without any additional errors from the original haze image, certain feature extracting process and different levels of filtering process are required. For that, at first, two inputs has to be derived. The derived inputs are from the original haze image, one is by enhancing the color and other by white balancing. Here the input image which is affected by haze is given as H . The first step is to apply white balancing in the image. White balancing simply is to adjust colors to give image a more natural look. The light sources such as sun, light bulbs, flashlights and so on depends on different color temperatures. Indoor lighting and outdoor lighting have different color temperatures. Sometimes white things are not exactly white in nature light for example a white object or white car may not seem pure white in photos slightly yellowish or orange in certain photos since different light sources emit different color variations called color temperatures. Humans receive information directly from and immediately change the color temperature. So while capturing images certain errors in adjusting the color temperature, since it only approximate it from the ambient light during outdoor photography. Color temperature of light during day time in outdoors is about 5000K. Our method has taken the concept of conjoined by Ormania [6],[3]. So in the previous implementation the white balancing is done by shades of grey color constancy algorithm which is much more complex to formulate. It is based on modeling the image based on Lambertian surface for formulating the intensity of the image by using its radiance, wavelength and reflectance of the surface. We have introduced a much simpler process by calculating the simple mean of the pixels for different color channels i.e. for R,G,B. The mean of pixels of each color channels is computed separately and again the mean of the three means are taken and normalized. This normalized value is then multiplied to all the three channels separately and combined to extract the RGB input from H , $H_1(x)$ imply one of the calculated input.

Contrast Enhancement [6]enhances the dissimilarity in brightness consistently in overall images dynamic range between the scenery and the elements present in the scene. Here the course is to first determine the luminance value L , using the R,G,B channel, compute the mean of luminance value denoted as \tilde{H} , this then differenced from the whole input image. It raise visualness of image but certain areas get effected at the same time this is corrected in the next step. For gamma a default value given in [6],[7],[11] is set, since it so far gives a good approximate second input, which is given mathematically as,

$$H_2(x) = \alpha(H(x) - \tilde{H})$$

Luminance given by weighted sum of RGB components,

$$L = 0.299 * R + 0.587 * G + 0.114 * B$$

Weight maps harmonize the beneficence of both inputs in the feature extraction. It also assure the allocation of higher values to regions having appropriate and conservative features that is unavoidable in the final output. Mainly three features are ensured in this method which very vital to regain the image structure[8]. Of which the first to be ensured is luminance feature, by using effortless per-pixel techniques, here the mean value of the image is taken as the luminance L , and minuses from the RGB components and is multiplied by $1/3^{rd}$ fraction following its square root which is, i is the no: of inputs[6],[17],

$$M_L^i = \sqrt{1/3[(R^i - L^i)^2 + (G^i - L^i)^2 + (B^i - L^i)^2]}$$

Second map is the Chrominance map which wholly depends on the saturation value of the image. Here for computational smoothness and to set the ultimate saturation range to one HIS model is preferred. Since in HIS the R,G,B amount in RGB components is constraint to the [0,1] range called normalization. The difference of saturation S , and top saturation range S_{max} is calculated dividing by standard deviation, and exponentiated giving[6],

$$M_C^i(x) = \exp\left(-\frac{(S^i(x) - S_{max}^i)^2}{2\sigma^2}\right)$$

Thirdly salient map is advised to correctly estimate whether any objective elements of the image, which could be any object person, or building etc regarding to the adjacent regions [19]. The left hand side of the equation given below indicates the salient map and the right hand side gives the corresponding average pixel value of two inputs differenced from a out focused image of the input image. With cut off frequency as $\Pi/2.75$ as w_{hc} , the H_i^{whc} filters noise of that frequency from input image. Given by[6],[5],

$$M_S^i = \|H_i^{whc}(x) - H_k^\mu\|$$

Maps assure the features remain intact in the final output. More detailed information about the inputs and the normalized features are collected by pyramidal refinement. Here Laplacian and Gaussian Pyramid is utilized to fragmentize the descendant inputs from the initial input and finely draw out all the details available in each level and induce it in the final output by fusion without losing any of the input structure. Refinement makes better result by small changes. Pyramidal arrangement is done by convolution of a weighting function and an image. Here the two inputs undergo Laplacian formation and weight maps are normalized for Gaussian refinement. We use same type of pyramid formation for both i.e. the effect of convolution of image is same as low pass filtering, so the variant levels denote the filtered variations of the input image. Both spatial density and resolution of the image get reduced in a set of images which is in effect low pass filtered form series structure in pyramid arrangement. To attain Gaussian distribution the weighting function set as 0.4 (default) since it denotes the shape of the function. Laplacian Pyramid is formed from the Gaussian algorithm as a set of error images between two levels of Gaussian pyramids i.e [6].

$$L_i = G_i - G_{i+1}$$

Here i denotes the level of refinement. This will look as band pass filtered variations of input image[9]. This way all the image structure is regained and retained by fusion by simply applying summation of both the refined inputs at different levels. At the end of the procedure all the levels are summed up to reconstruct the output clear image for which fusion is formulated as[6],

$$F(x) = \sum_i(M^i(x) * H_i(x))$$

G and L denotes Gaussian and Laplacian formation and i denotes different levels, 5-7 levels of is set as preferred for different images[20], F denotes the fused output[6],

$$F_i(x) = \sum_i(G_i\{M^i(x)\} L_i\{H_i(x)\})$$

SIHRDC

The second method SIHRDC formulates an image model using Radiative Transport Equation[3],[18]. In SIHRDC uses dark channels that make use of dark pixels and by using atmospheric light assumption, the transmission map is computed[10] for the single input image. Finally the scene radiance is recovered from the image model which gives the dehazed image. The basic working algorithms of the method is formulated as a block diagram and is derived as shown:

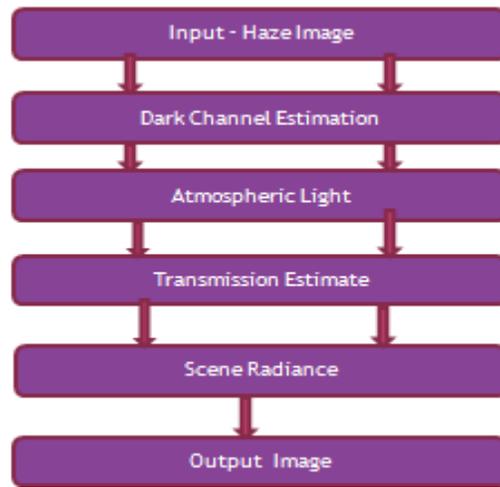


Figure 2: SIHRDC Block Diagram

Haze Removal Using Single Image Dark Channel is patch based procedure. This method is adaptation from [3]. Here radiative transport equation is modified to model an image to the mathematical form. Here H is the input image, D gives scene radiance, A denotes atmospheric light, and T denotes transmission. The past assumption of this model comes from physics[14] based on scattering of light. Atmospheric scattering occurs and increases as the distance between light source and object or eye of the observer [3],[2]. Image equation [3] is,

$$H(x) = D(x)T(x) + A(1 - T(x))$$

Transmission is given by the equation, where β is the scattering coefficient,

$$T(x) = e^{-\beta d(x)}$$

In certain regions except the sky regions a few pixels might be dark in intensity in any one of the color channels. Otherwise, there will be such a patch whose lower intensity is very low valued. Then algebraically for an image H , the dark channel D is given by [3],

$$D^{dark}(x) = \min_{c \in \{r,g,b\}} (\min_{y \in \phi(x)} (D^c(y)))$$

where D^c is a color channel of D and $\phi(x)$ is the local patch focussed at x . c denotes the RGB channel, and y belongs to local patch. Patch size of 15×15 is formulated to calculate the darkest pixel in the RGB channel, the images are also resized for calculation convenience. As mentioned above assuming that the regions excluding sky region have a very low valued intensities and limited to zero. Factors contributing very low value for dark channels are shadows of object or people, color deficiency of any color in the RGB channel can cause dark channel and also by objects which are dark. In outdoor photography all these elements are very common which will definitely give the opportunity to seek dark channels[3],[12]. In haze region the transmission is reduced, so the dark channels are a reflection of the amount of thickness in which the haze is present, applying reduction operation using min in both RHS and LHS of the image mode[3],

$$\min_{y \in \phi(x)} (H^c(y)) = \tilde{T}(x) \min_{y \in \phi(x)} (D^c(y) + (1 - \tilde{T}(x))A^c)$$

Assuming for regions other than sky,

$$D^{dark}(x) = \min_c (\min_{y \in \phi(x)} (D^c(y))) = 0$$

The atmospheric light A is computed from those haze pixels in which passing of light is almost incapable. For atmospheric light estimation, the highest 0.1 percentage pixels which are bright are considered and from this the maximum bright of the input image is put under assumption as atmospheric light. Note that, considering the image as a whole this may not be the brightest. Putting into account the image model equation of the smazed image, the local patch, H^c is the image in different color channels separately, from the above equations, it is concluded that the transmission estimate $\tilde{T}(x)$ is given by,

$$\tilde{T}(x) = 1 - \min_c \left(\min_{y \in \Omega(x)} \left(\frac{H^c(y)}{A^c} \right) \right)$$

Min operation[2],[3] is applied to both the equation for evaluating the color channels separately, but in certain conditions the image may seem very superficial or seem to be made too perfectly. So to avoid unwanted perfection, i.e. to give the output a natural feeling by retaining its natural colors a additional parameter ω is induced to the second term or the difference term of the derived formula and transmission is reformulated as,

$$\tilde{T}(x) = 1 - \omega \min_c \left(\min_{y \in \Omega(x)} \left(\frac{H^c(y)}{A^c} \right) \right)$$

The final step is to produce scene radiance from the image equation [16]. Since recouping the radiance directly might not be a good choice because it will be easily affected by noise. So a limited quantity of haze is allowed and transmission is constrained to the minimum bound given as T_0 ,

$$D(x) = \frac{H(x) - A}{\max(T(x), T_0)} + A$$

PERFORMANCE COMPARISON

PSNR, Peak Signal to Noise Ratio is computed by deriving the Mean Square Error i.e., where R and C denotes rows and columns [6],[3],

$$MSE = \frac{1}{RC} \sum_{X=1}^M \sum_{Y=1}^N (H_i(X, Y) - H_o(X, Y))^2$$

$$PSNR = 10 * \log_{10} \left(\frac{256^2}{mse} \right)$$

NAE, Normalized Absolute Error is given by,

$$NAE = \left(\frac{\sum(\sum(abs(error\ image)))}{\sum(\sum(orginal\ image))} \right)$$

Error image is obtained by subtracting output image from the original image. MD, maximum difference is said to be,

$$MD = \max(\max(error\ image))$$

RESULTS AND DISCUSSIONS

The method implemented in SIHRMLF is operated on each and every pixel of the inputs extracted from the original input. Thereby it is indicated as per-pixel strategy. The SIHRDC method uses strategy on patches of group of pixel from the single input. Both the methods are quite simple to put into practice and can be easily implemented in real time applications. The outdoor images are mainly used in implementing the so called methods. Both the methods give comparatively very good results than the results obtained by previously proposed methods [13],[15][16]. Here, comparison of the results using the outputs of two methods is obtained by certain

quality measurements. An example of a haze image will be any outdoor image that is covered with fog, smoke, mist, dust, smaze, etc, here such an image is under consideration as the input. The image is showing a bridge amidst of green trees. It is captured in an outdoor environment, so atmospheric color cast, shadows of objects such as trees etc would be present. So these small artifacts have to be filtered.



Figure 3.a: Input Image



Figure 3.b: SIHRMLF



Figure 3.c: SIHRDC

Figure:3. Results of both methods SIHRMLF and SIHRDC with bridge image and corresponding final outputs as a,b,c

The figure shows image taken as input and its corresponding outputs of the two methods. Here in the output image, comparing with the input image the upper portion of the bridge is very clearly visible though the downward portion is still has some of the fog to be removed. In white balance section, the regions having white colour gets more white avoiding the atmospheric color, here it is the mist region. The contrast enhancement increases clarity on the unclear regions covered by haze. But during this stage other regions may tend to get darker which can be rectified in feature extraction process. By different levels of pyramidal filtering the image information can be regained and thus in the output, more clear image obtained by retaining its structure. The results of second procedure includes only one input and no need of other derived inputs. It recovers the darkest channel, transmission estimate and scene radiance from the obtained image model as described earlier in this paper. The scene radiance is the one which recovers the image haze-free. This shows much better results as shown above. Similarly examples of two other images are also taken into account for performance measure of the two method.



Figure 4.a: Input Image



Figure 4.b: SIHRMLF



Figure 4.c: SIHRDC

Figure:4. Results of both methods SIHRMLF and SIHRDC with the another image and corresponding final outputs.

The performance of the two methods are done by using PSNR, NAE, MD which is Peak Signal To Noise Ratio, Normalized Absolute Error And Maximum Difference. The basic concept of all these parameters is to measure the difference between input image and the final output image. This gives the amount of similarity or error difference between the input and output image. The tabular column shown below gives the corresponding parameter values for three different images are shown of which first two images are figure 3 and figure 4.

INPUT	PSNR		NAE		MD	
	SIHRMLF	SIHRDC	SIHRMLF	SIHRDC	SIHRMLF	SIHRDC
FIGURE 3	54.88	54.84	0.4737	0.5495	0.8373	0.6237
FIGURE 4	63.10	59.73	0.2574	0.4345	0.6287	0.5212
IMAGE 3	58.74	56.26	0.4195	0.6918	0.9879	0.6409

Figure 5: Tabular Representation of PSNR ,NAE and MD values on RGB channels.

For all the three images, PSNR,NAE,MD values ranges very closely between both methods . The PSNR of first method has shown significant increase compared to the other method. SIHRMLF is comparatively very appropriate and yields good PSNR though the SIHRDC gives good output but has certain small disturbances and also loss in image naturalness is due to color variations compared to the actual image, first one is much better performance. Normalized Absolute Error should be minimum value, so as the tabular comparison shown the method that includes fusion give more similarity than the other method in terms of recollecting the image information without loss . Here the maximum difference should be greater comparing to the input image since the output image obtained will be better in terms of image clarity. So the fusion method is much more appropriate in terms of image structure similarity and image information regaining where as SIHRDC method also gives better performance in removing the fog or haze but has a few amount of noise which can have further scope of modification by undergoing any normal filtering methods.

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CONCLUSION

Haze refinement techniques have a significant amount of importance in day today real time applications. So for the increasing need of efficient refinement strategy, this paper study is very relevant since the paper basically compare the performance including PSNR, NAE, MD of Single Image Haze Removal using Multi Level Fusion and Single Image Haze Removal using Dark Channel which are highly applicable because of its less complex features used in every step. Each step included in either of the methods are simple image processing steps which can be easily understood.. Both the implementation has been made suitable for images of resolution 500×500 . First one is pixel based and second is patch based (having patch size of about 15×15).This is can be easily done in almost all versions of Matlab.

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Multimodal Biometric and Multi Attack Protection Using Image Features

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Abstract— Biometric system uses physiological, behavioral characteristics for automatic personal recognition. Multimodal biometrics is an integration of two or more biometric systems. It overcomes the limitations of other biometrics system like unimodal biometric system. Multimodal biometric for fake identity detection using image features uses three biometric patterns and they are iris, face, and fingerprint. In this system user chooses two biometric patterns as input, which will be fused. Gaussian filter is used to smooth this fused image. Smoothed version of input image and input image is compared using image quality assessment to extract image features. In this system different image quality measures are used for feature extraction. Extracted image features are used by artificial neural network to classify an image as real or fake. Depending on whether image is real or fake appropriate action is taken. Actions could be showing user identification on screen if image is classified as real or raising an alert if image is classified as fake. This system can be used in locker, ATM and other areas where personal identification is required.

Keywords— Biometrics, Multimodal, Image quality assessment, IQM, SSIM, Security, Feed Forward Neural Networks.

INTRODUCTION

Biometrics refers to the automatic identification of a person based on his or her physiological or behavioral characteristics. Biometric recognition offers a reliable solution to the problem of user authentication in identity management systems. Any human physiological or behavioral trait can serve as a biometric characteristic as long as it satisfies the requirements of universality, distinctiveness, permanence and collectibility. Different types of fraudulent access attempt are present in biometric systems. In these attacks, the intruder uses some type of synthetically produced artifact (e.g., gummy finger, printed iris image or face mask), or tries to mimic the behavior of the genuine user (e.g., gait, signature), to fraudulently access the biometric system. Image quality assessment is used to protect the biometric system from these attacks. Image quality assessment is following the quality difference hypothesis. In quality difference hypothesis assume that, it is expected that a fake image captured in an attack attempt will have different quality than a real sample acquired in the normal operation scenario for which the sensor was designed. Biometric systems are traditionally used for three different applications such as physical access control for the protection against unauthorized person to access to places or rooms, logical access control for the protection of networks and computers, and time and attendance control.

Traditional personal identification systems are based on something that you have (Key) or something that you know (Personal Identification Number [PIN]), but biometrics relies on something that you are. Biometric systems used in real world applications are unimodal. Unimodal biometrics has several problems such as noisy data, intra class variation; inter class similarities, nonuniversality and spoofing which cause this system less accurate and secure. To overcome these problems and to increase level of security multimodal biometrics is used. Multimodal biometrics refers to the use of a combination of two or more biometric modalities in a Verification or Identification system [1]. Three fusion levels in multimodal biometrics: feature level fusion, matching score level fusion and decision level fusion. Different methods such as PCA, ICA and image quality assessment are used for feature extraction. Image quality assessment must be accurate, easy to use, fast and reliable. Different classification methods are used to distinguish between legitimate and imposter samples. In biometric system mainly consist of enrollment, verification, identification.

Biometrics offers greater security and convenience than traditional methods of personal recognition. In some applications, bio-metrics can replace or supplement the existing technology. One emerging technology that is becoming more widespread in such organizations is bio-metrics, automatic personal recognition based on physiological or behavioral characteristics. The term comes from the Greek words bios (life) and metrikos (measure)[2]. Unimodal biometrics uses a single source of biometric system for personal identification. Unimodal biometrics has several problems such as noisy data, intra class variation, inter class similarities, nonuniversality and spoofing which cause this system less accurate and secure. Multibiometrics is a combination of one or more biometrics. In multibiometrics the noise in any one of the biometrics will lead to high false reject rate (FRR) while identification [3]. All these

problems are addressed by Multimodal biometrics. Multimodal biometrics is the integration of two or more types of biometrics system. Multimodal biometrics operates in two phases that is enrollment phase and authentication phase [4]. In enrollment phase, biometric traits of a user are captured and these are stored in the system database as a template for that user and which is further used for authentication phase. In authentication phase, once again traits of a user captured and system uses this to either identify or verify a person.

METHODOLOGY

Multimodal biometric increases the security of the biometric system and avoids spoofing attacks. Human physiological characteristics like Iris, fingerprint and face, which satisfies biometric characteristics such as universality, distinctiveness, permanence and collectability, are used as input to this system. Image quality assessment is used for feature extraction from these inputs as it is a low complexity process compared to other feature extraction methods. If the positioning or angle of user input (face, iris, finger-print) is incorrect then system identifies this user as fake even if he/she is a real user. This can be avoided by using ANN.

1. BASIC BLOCK DIAGRAM

General diagram of the biometric protection method based on Image Quality Assessment is shown Figure 1. For a multimodal biometric system, selecting the proper biometric traits is one of the main tasks. There is no single biometric trait that is the best. The appropriate biometric type for a given application depends on many factors including the type of biometric system operation (identification or verification), perceived risks, types of users, and various need for security. Each biometric trait has associated advantages and limitations. It is often the case that a single biometric trait is not capable of satisfying above mentioned requirements needed by different applications.

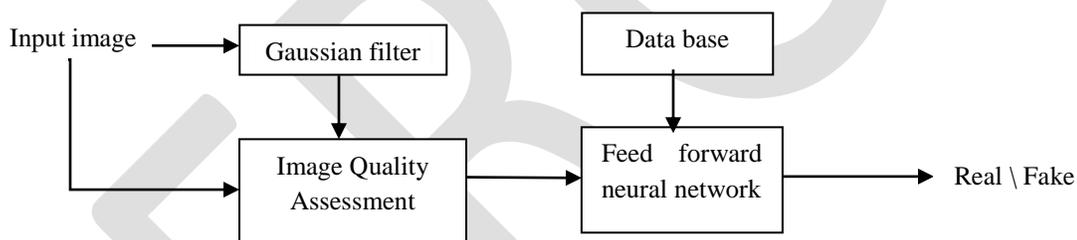


Fig. 1: Block diagram of Multimodal Biometric for Fake Identity Detection using image features

In this method use face, iris and fingerprint biometric traits for this purpose. All of these biometric traits are from the similar region of the human body. The human face plays an important role in our social interaction, conveying peoples identity. Using the human face as a key to security, biometric face recognition technology has received significant attention in the past several years due to its potential for a wide variety of applications in both law enforcement and non-law enforcement. Face recognition serves the crime deterrent purpose because face images that have been recorded and archived can later help identify a person. Iris is a unique characteristic of a person. The primary visible characteristic of iris is the trabecular mesh work that makes possible to divide the iris in a radial fashion. Considered to be one of the exact methods of biometrics. Iris is protected by eyelid, cornea and aqueous humour that makes the likelihood damage minimal makes the likelihood damage minimal.

Fingerprints vary from person to person (even identical twins have different prints) and don't change over time. Fingerprinting is an authentication technique that has helped law enforcement officials identifies potential criminals for decades, but recently it has started to gain wider usage. The technique is emerging as the most popular form of biometrics, and much of the budding interest is coming from government agencies looking to enhance physical security, such as access to buildings.

2. GAUSSIAN FILTER

The input image I is filtered with a low-pass Gaussian filter in order to generate a smoothed version \hat{I} . The Gaussian smoothing operator is a 2-D convolution operator that is used to 'blur' images and remove detail and noise. In this sense it is similar to the mean filter, but it uses a different kernel that represents the shape of a Gaussian ('bell-shaped') hump. For designing Gaussian filter is $h = f$ special ('Gaussian', hsize, sigma) which returns a rotationally symmetric Gaussian lowpass filter of size hsize with standard deviation

sigma.

3. IMAGE QUALITY ASSESSMENT

Image Quality is a characteristic of an image that measures the perceived image degradations that occurs within the imaging system. Image quality measurement is very important for various image processing applications such as recognition, retrieval, classification, compression, restoration and similar fields. The images may contain different types of distortions like blur, noise, contrast change etc. There are two ways for measuring image quality like Subjective and Objective. If the quality is judged by a group of observers then it comes under subjective quality assessment techniques. Subjective measures are usually inconvenient, time consuming and expensive. On the other hand objective quality measurements automatically predict the perceived image quality based on computational metrics. Objective quality measures can be classified as Full reference (FR), No reference (NR) and Reduced Reference (RR). Full reference image quality assessment demands that a complete reference image is to be known, while no reference image quality assessment means that the reference image is not available. Reference image is partially available and is in the form of a set of extracted features for reduced reference image quality assessment.

2.1 Full Reference (FR) Image Quality Assessment

Full-reference (FR) IQA methods rely on the availability of a clean undistorted reference image to estimate the quality of the test sample. Full reference image quality assessment (FR-IQA) is mainly classified into three; they are Error Sensitivity Measures, Structural Similarity Measures, and Information Theoretic Measures.

2.1.1 Error Sensitivity Measures: An image or video signal whose quality is being evaluated can be thought of as a sum of a perfect reference signal and an error signal. Assume that the loss of quality is directly related to the strength of the error signal. Therefore, a natural way to assess the quality of an image is to quantify the error between the distorted signal and the reference signal, which is fully available in FR quality assessment. Error sensitivity measures have been classified here into five different categories according to the image property measured. They are Pixel Difference measures, Correlation-based measures, Edge-based measures, Spectral distance measures, Gradient-based measures.

2.1.2 Structural Similarity Measures: The principle hypothesis of structural similarity based image quality assessment is that the HVS is highly adapted to extract structural information from the visual field, and therefore a measurement of structural similarity (or distortion) should provide a good approximation to perceived image quality. The luminance of the surface of an object being observed is the product of the illumination and the reflectance, but the structures of the objects in the scene are independent of the illumination. Consequently, to explore the structural information in an image, to separate the influence of the illumination. Define the structural information in an image as those attributes that represent the structure of objects in the scene, independent of the average luminance and contrast. Since luminance and contrast can vary across a scene, use the local luminance and contrast for definition.

First, the luminance of each signal is compared. Assuming discrete signals, this is estimated as the mean intensity:

$$\mu_x = \frac{1}{N} \sum_{i=1}^N x_i \quad (1)$$

The luminance comparison function $l(x, y)$ is then a function of μ_x and μ_y .

Second, remove the mean intensity from the signal. In discrete form, the resulting signal $X - \mu_x$ corresponds to the projection of vector X onto the hyper plane defined by

$$\sum_{i=1}^N x_i = 0 \quad (2)$$

Third, the signal is normalized (divided) by its own standard deviation; so that the two signals are being compared have unit standard deviation. The structure comparison $s(x, y)$ is conducted on these normalized signals $\frac{(X-\mu_x)}{\sigma_x}$ and $\frac{(Y-\mu_y)}{\sigma_y}$.

Finally, the three components are combined to yield an overall similarity measure:

$$S(x, y) = f(l(x, y), c(x, y), s(x, y)) \quad (3)$$

Information Theoretic Measures: The quality assessment problem is viewed as an information-fidelity problem rather than a signal-fidelity problem. An image source communicates to a receiver through a channel that limits the amount of information that could flow through it, thereby introducing distortions. The output of the image source is the reference image, the output of the channel is the test image, and the goal is to relate the visual quality of the test image to the amount of information shared between the test and the reference signals, or more precisely, the mutual information between them. Although mutual information is a statistical measure of information fidelity, and may only be loosely related with what humans regard as image information, it places fundamental limits on the amount of cognitive information that could be extracted from an image. For example, in cases where the channel is distorting images severely, corresponding to low mutual information between the test and the reference, the ability of human viewers to obtain semantic information by discriminating and identifying objects in images is also hampered. Thus, information fidelity methods exploit the relationship between statistical image information and visual quality.

2.2 No-reference (NR) Image Quality Assessment

Objective quality assessment is a very complicated task, and even full-reference QA methods have had only limited success in making accurate quality predictions. Therefore tend to break up the problem of NR QA into smaller, domain specific problems by targeting a limited class of artifacts distortion specific IQA. The most common being the blocking artifact, which is usually the result of block based compression algorithms running at low bit rates. NR QA for blocking distortion as well as pioneering research into NR measurement of distortion introduced by Wavelet based compression algorithms based on Natural Scene Statistics modeling.

4. FEED FORWARD NEURAL NETWORK

Artificial neural networks (ANNs) are networks of simple processing elements (called neurons) operating on their local data and communicating with other elements. The design of ANNs was motivated by the structure of a real brain, but the processing elements and the architectures used in ANN have gone far from their biological inspiration. There exist many types of neural networks, but the basic principles are very similar. Each neuron in the network is able to receive input signals, to process them and to send an output signal. Each neuron is connected at least with one neuron, and each connection is evaluated by a real number, called the weight coefficient, that reflects the degree of importance of the given connection in the neural network.

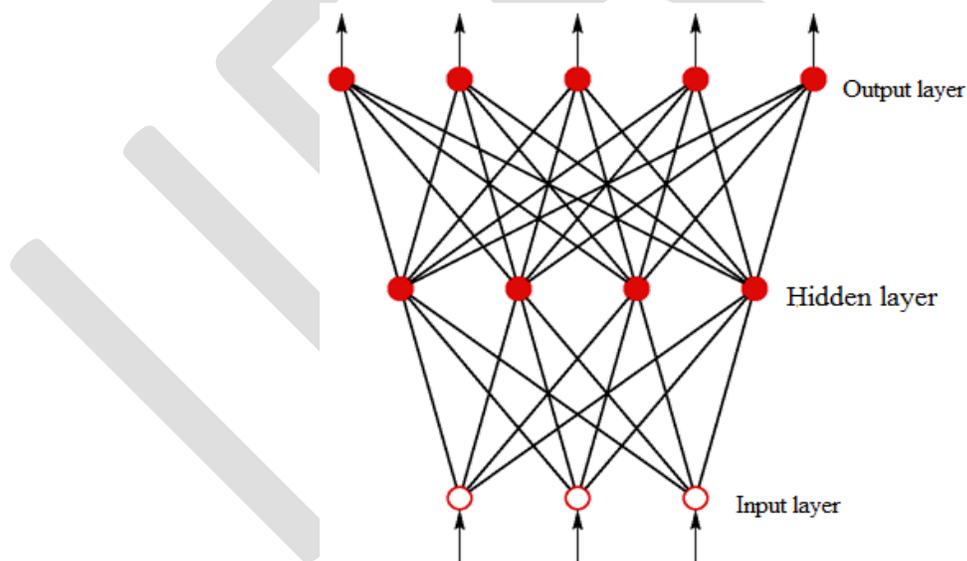


Fig. 2: An example of a 2-layered network

In principle, neural network has the power of a universal approximator, i.e. it can realize an arbitrary mapping of one vector space onto another vector space. The main advantage of neural networks is the fact, that they are able to use some a priori unknown information hidden in data (but they are not able to extract it). Process of capturing the unknown information is called learning of neural network or training of neural network. In mathematical formalism to learn means to adjust the weight coefficients in such a way that some conditions are fulfilled. There exist two main types of training process: supervised and unsupervised training. Supervised training (e.g. multi-layer feed-forward (MLF) neural network) means, that neural network knows the desired output and adjusting of

weight coefficients is done in such way, that the calculated and desired outputs are as close as possible. Unsupervised training means, that the desired output is not known, the system is provided with a group of facts (patterns) and then left to itself to settle down (or not) to a stable state in some number of iterations.

A feed forward neural network is a biologically inspired classification algorithm. It consists of a (possibly large) number of simple neuron like processing units, organized in layers. Every unit in a layer is connected with all the units in the previous layer. These connections are not all equal; each connection may have a different strength or weight. The weights on these connections encode the knowledge of a network. Often the units in a neural network are also called nodes. Data enters at the inputs and passes through the network, layer by layer, until it arrives at the outputs. During normal operation, that is when it acts as a classifier, there is no feedback between layers. This is why they are called feed forward neural networks. In the following Figure 4.3 is an example of a 2-layered network with, from top to bottom: an output layer with 5 units, a hidden layer with 4 units, respectively. The network has 3 input units.

RESULTS

Different biometric traits are the input image of this system. Input image is passed through a Gaussian filter and obtain a smoothed version of input image. Image quality assessment is used to extract features from input image and Gaussian filtered image. These image quality features are used to classify the input image as real or fake with the help of feed forward neural network. Simulation is performed using the MATLAB R2014a. The simulation results are as follows:

INPUT IMAGES

Input images were collected from various sites that found with the help of Google. Three biometric traits, face, finger print and iris, are used in this system. Input face image is collected from <https://www.idiap.ch/dataset/replayattack> . The input fingerprint image is collected from <http://prag.diee.unica.it/LivDet09/> . The input iris image is collected from <http://www.citer.wvu.edu/>.



Fig. 3: Input images Face, Fingerprint, Iris

IMAGE QUALITY MEASURES

Table 1: Image Quality Measures of Face, Fingerprint, Iris

IQM	FACE	FINGERPRINT	IRIS
MSE	11.77	187.55	6.21
PSNR	37.42	25.40	40.20
SNR	13.34	1.17	15.93
NK	1.00	0.97	1.00
AD	0.30	0.41	0.04
SC	1.00	1.06	1.00
MD	51.00	51.00	46.00
NAE	0.01	0.07	0.01
LMSE	0.24	0.07	0.11
RAMD	5.10	5.10	4.60
SSIM	0.98	0.97	0.99

An image quality subsystem computes quality scores for images that represent a measure of visual quality of the images. Initial quality scores and can be computed for the images based on image feature values for the images and a transformation factor that represents a measure of importance of image quality for computing relevance scores for images. Image Quality Measures of three input image are shown Table.1. General 11 image quality features extracted from one image to distinguish between legitimate and imposter samples. Smoothed version of input image and input image is compared using image quality assessment to extract image features.

CLASSIFICATION

The feature vector is generated and the image sample is classified as real or fake, using simple classifiers. The feed forward neural network is used to classify the input image is real or fake. The operation of this network can be divided into two phases: learning phase and classification phase. In the classification phase the weights of the network are fixed. A pattern, presented at the inputs, will be transformed from layer to layer until it reaches the output layer. Now classification can occur by selecting the category associated with the output unit that has the largest output value. Feed forward neural network based iris image classification is shown in Figure 4, Figure 5 and Figure 6. Feed forward networks consist of a series of layers. The first layer has a connection from the network input. Each subsequent layer has a connection from the previous layer. The final layer produces the network's output. Feed forward networks can be used for any kind of input to output mapping. A feed forward network with one hidden layer and enough neurons in the hidden layers, can fit any finite input-output mapping problem.



Fig. 4: Classified input face image

CONCLUSION

In real world, biometric systems face various forms of attacks. In these attacks, the intruder uses some type of synthetically produced artifacts, or tries to mimic the behavior of the genuine user, to fraudulently access the biometric system. This project uses Quality Difference Hypothesis, which uses the assumption that image quality properties of real access and fraudulent attacks are different. So image quality assessment is used as a protection tool against different biometric attacks. By the use of IQA this method is able to consistently perform at a high level for different biometric traits. This system uses three biometric traits as the input image, such as face, fingerprint and iris. From the input, image quality measures are extracted and feed forward neural network is used to classifies the input image is real or fake.

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STUDY AND ANALYSIS OF THE SCOPE OF VALUE STREAM MAPPING (VSM) TECHNIQUE APPLICATION IN A SELECTED GARMENTS FACTORY OF BANGLADESH

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Abstract

In Bangladesh a significant amount of foreign currency comes from the RMG sector. Garment industries in developing countries are more focused on sourcing of raw material and minimizing delivery cost than labor productivity because of the availability of cheap labor. Due to this, labor productivity is lower in developing countries than in the developed ones. So productivity improvement is one of the major concern in garments factories. This paper addresses the scope of value stream mapping (VSM) application in a selected garments factory of Bangladesh. The core idea behind the thesis work was to examine the existing condition of production system where there is no application of VSM technique and to analyze the scope of VSM technique application in the studied production line. The main objective of the research paper is to identify various wastes occurs in the production system. Additionally it tries to find out some areas for improvement and propose some improvement strategies. In this concern this case study has been conducted focusing cutting, finishing and on a particular production line of sewing section in a selected garments factory. During the investigation, attention has been concentrated how non- value adding activity hampers daily production rate and how to improve the productivity. Value adding, non-value adding (necessary and unnecessary) processes and different types of wastes have been identified by drawing the current state map for cutting, sewing and finishing sections. The study focuses on removing the big losses namely, breakdown losses, quality loss, small stops, startup rejects to improve the effectiveness of the production line. Some strategies are proposed for reducing these losses and improving the overall productivity. It is found that the non-value adding time has contributed significantly in total production lead time. Finally, a future state map has been proposed to the management that will be benefited for productivity improvement of the existing production system as well as to reduce the non-value adding time.

Keywords

VSM, Lean manufacturing, RMG, Cause effect diagram, Pareto Chart, 5S, 5 Why analysis.

1. Introduction

In Bangladesh, the Ready Made Garment (RMG) Industry has emerged as a major economic sector and has had its impact on the financial service sector, communication, transportation and on other related industries. 2 million workers in 4,000 factories, which is about one-fourth of the number of employees engaged in the manufacturing sector, constitute the real backbone of the country's economy [1].

Garment industries in developing countries are more focused on sourcing of raw material and minimizing delivery cost than labor productivity because of the availability of cheap labor. Due to this, labor productivity is lower in developing countries than in the developed ones. For example, labor is very cheap in Bangladesh but the productivity is low among other developing countries. Similarly, the cost of fabric is a major part of the garment so there seems to be great need for improvement in this sector. Even in developing countries the CAD and CAM system for fabric cutting has been implemented to save fabric. Now the worry is about labor productivity and making production flexible. The fashion industry is highly volatile and if the orders are not fulfilled on time, the fear for losing business is real. This means that time is very important driver for success. The Company that delivers goods with a shorter lead time is the market winner. This can be achieved greatly by adopting lean manufacturing system which is more than a cost reduction program. It aims at eliminating wastes which could be in the form of excess production and inventory, redundant movement of material, waiting and delays, over processing, excess worker motion, rework and corrections. Part of lean manufacturing is assessing operations and processes or products that add cost rather than value. Each step of the manufacturing process is examined to determine if it adds value to the product. If it does not add value, the process could be assigned to a subcontractor or outsourcing company in order to focus the workforce on value-added operations of its core business. This is known as value stream which is a set of processes required to transform raw materials into finished goods that customer's value. In this research work, the scope of one of the most important Lean Manufacturing tool called "Value Stream Mapping" will be evaluated in a selected garments factory of Bangladesh.

1.1 Objectives

The objective of this research is to investigate the scope and how Value Stream Mapping (VSM) technique can be adopted to the discrete manufacturing system and to evaluate their benefit on a specific application instance. In answering the research problem, the study sought to accomplish the following objectives.

1. To examine the existing scenario of production line where there is no application of VSM technique.
2. To Identify and eliminate waste and bottlenecks in the current manufacturing line.
3. To identify the potential avenues for improving present level of VSM.

2. Literature review

Value Stream Mapping (VSM) is a tool of lean manufacturing that helps to understand the flow of material and information as products make their way through the value stream. The value stream includes the value adding and non-value adding activities that are required to bring a product from raw material through delivery to the customer. In other words, Value Stream Mapping is an outline of a product's manufacturing life cycle that identifies each step throughout the production process. It represent a visual information of material flow for a particular product family [2].

2.1 Focus on waste

Waste is anything that does not contribute to transforming a part to the customer's needs. The aim of Lean Manufacturing is to incorporate less human effort, less inventory, less time to develop products, and less space to become highly responsive to customer demand while producing top quality products in the most efficient and economical manner possible [3 & 4]. Typically the types of waste considered in a lean manufacturing system includes,

1. Inventory: An excess of inventory ties up money that could be used for other things. It also slows down the speed of production, which matters most when custom products or perishables are involved. It is important to remember that inventory includes not only supplies of raw materials but also finished products awaiting sale [3 & 4].
2. Overproduction: Producing more material than is required by the next process, making earlier than is required by the next process, or making faster than is required by the next process. The corresponding Lean principle is to manufacture based upon a pull system, or producing products just as customers order them [3 & 4].
3. Producing defective products: Defective products impede flow and lead to wasteful handling, time, and effort. Production defects and service errors waste resources in four ways. First, materials are consumed. Second, the labor used to produce the part (or provide the service) the first time cannot be recovered. Third, labor is required to rework the product (or redo the service). Fourth, labor is required to address any forthcoming customer complaints [3 & 4].
4. Motion: Any motion that does not add value to the product is waste. Motion of the workers, machines, and transport (e.g. due to the inappropriate location of tools and parts) is waste. Unnecessary motion is caused by poor workflow, poor layout, housekeeping, and inconsistent or undocumented work methods [3 & 4].
5. Processing waste: Extra processing not essential to value-added from the customer point of view is waste. Some of the more common examples of this are reworking (the product or service should have been done correctly the first time), debarring (parts should have been produced without burrs, with properly designed and maintained tooling), and inspecting (parts should have been produced using statistical process control techniques to eliminate or minimize the amount of inspection required) [3 & 4].
6. Transportation: Moving material does not enhance the value of the product to the customer. Material should be delivered to its point of use. Instead of raw materials being shipped from the vendor to a receiving location, processed, moved into a warehouse, and then transported to the assembly line, Lean demands that the material be shipped directly from the vendor to the location in the assembly line where it will be used. The Lean term for this technique is called point-of-use-storage (POUS) [3].

Waiting: Material waiting is not material flowing through value-added operations. This includes waiting for material, information, equipment, tools, etc. Lean demands that all resources are provided on a just-in-time (JIT) basis – not too soon, not too late [3].

2.2 Lean tools

In this research work different types of Lean Tools, such as: Pareto analysis, Cause-effect analyses, Five S (5S) and 5 Why analysis; are used to find existing situation and to identify various types of wastes exists in the selected industry which does not add any value to the overall production process. These tools are described below,

1. Pareto analysis: In nineteenth-century Italy, the Italian economist Vilfredo Pareto observed that about 80 percent of the country's wealth was controlled by about 20 percent of the population. This observation led to what is now known as the Pareto Principle; it is also known as the "80-20" rule. In general, the Pareto principle, applied to quality, suggests that the majority of the quality losses are mal-distributed in such a way that a "vital few" quality defects or problems always constitute a high percent of the overall quality losses [5]. The intent of a Pareto analysis is to separate the vital few from the trivial many. Thus, the Pareto analysis can assist to identify the most important effects and causes to stratify the valuable data which can be used to prioritize the product-process improvement efforts [6].
2. Cause & Effect Analysis: A cause is a fundamental condition or stimulus of some sort that ultimately creates a result or effect. Most analysis are worked in both directions, from cause to effect or effect to cause in order to discover and document causes, effects, and cause-effect linkage [6]. Cause-effect analyses are usually summarized in a Cause effect (CE) Diagram. The CE diagram was developed by Ishikawa for the purpose of representing the relationship between an effect and the potential or possible causes influencing it. The CE diagram, sometimes referred to as a "fish-bone" diagram, is an organized or structured picture with lines and twigs (resembling fish bones) used to stratify and group causes. The effect is typically contained in a box on the right side, while the causes appear on the left side.
3. Five S (5S) or Work place Organization: 5S is a method to reduce waste and optimize productivity through maintaining an orderly workplace and using visual cues to achieve more consistent operational results. This tool is a systematic method for organizing and standardizing the workplace. It's one of the simplest Lean tools to implement, provides immediate return on investment, crosses all industry boundaries, and is applicable to every function within an organization [5]. The 5S pillars are, (1) Sort (2) Set in Order (Straighten) (3) Shine (4) Standardize (Systemize) (5) Sustain.
4. Five Why (5 Why) Analysis: Invented in the 1930's by Toyota Founder Kiichiro Toyoda's father Sakichi and made popular in the 1970s by the Toyota Production System, the 5 Whys strategy involves looking at any problem and asking: "Why?" and "What caused this problem?" [7]. The idea is simple. By asking the question "Why" one can separate the symptoms from the causes of a problem. This is critical as symptoms often mask the causes of problems. As with effective incident classification, basing actions on symptoms is worst possible practice. Using the technique effectively will define the root cause of any nonconformance and subsequently lead to defining effective long term corrective actions.

3. Research methodology

The methodology of this research work is a case study research. This case study is conducted in selected a garments industry located in Dhaka. The study gives an idea about the existing scenario of the different section of the garments industry. This study deals about various types of wastes of the industry, more specifically the waste of time. Several Lean Tools are used to investigate the existing situation of the selected garments industry that is discussed later. This section represents the necessary steps required to perform the case study. The overall steps involved in the study are presented below in Fig. 1 with the help of a flow diagram.

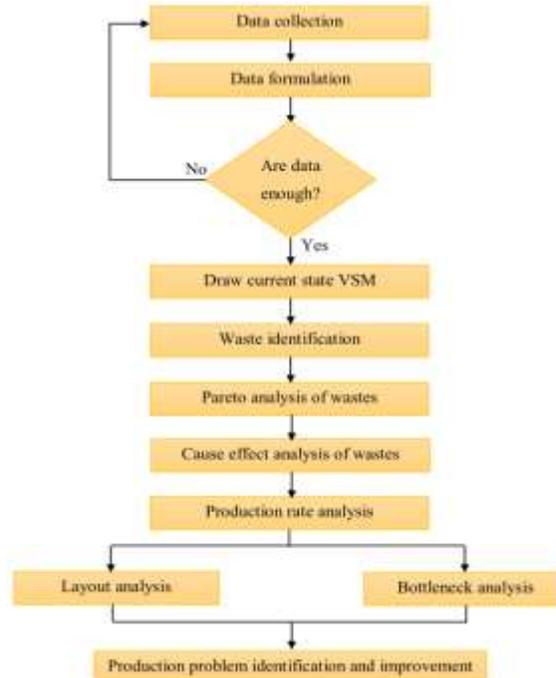


Figure 1: Steps involved in this case study

The information and data collected were sorted and arranged so that further study and analysis could be performed. Quantitative data were analyzed by using tables and graphs. Various types of information were given as a profile. Some analysis has been shown by Pareto Diagram and Cause Effect Diagram. After completion of the data processing, the analysis has been performed. The steps involved for the data collection and analysis are represented by the flow diagram, which is given in Fig.2

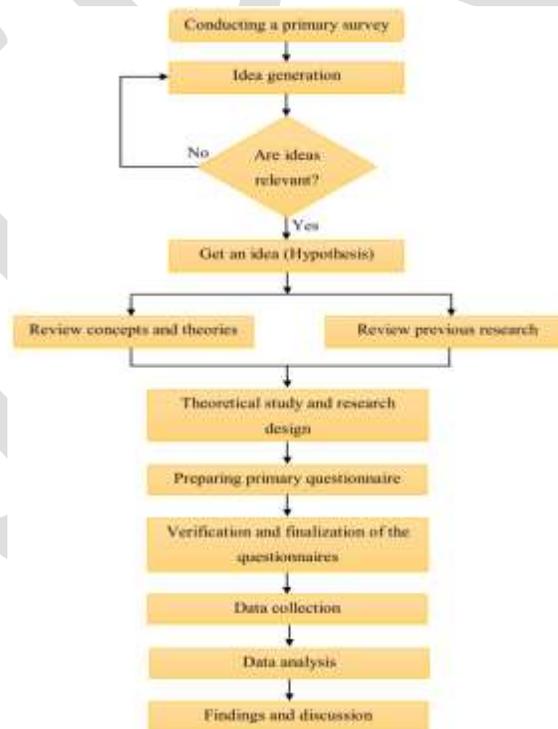


Figure 2: Steps involved in data analysis

Finally results from the overall analysis are given and necessary guidelines are provided for necessary improvement (productivity, quality, resource utilization, waste minimization) of the cutting, sewing, and finishing section.

4. Findings and analysis

This case study deals with various types of waste exists in sewing section more specifically time waste. The information as well as data has been gathered through the questionnaire, observation and interview. The data and information was collected through the observation of the production floor and some past record from the industrial engineering and planning department of the selected industry. Finally all data has been analyzed by using various types of tables, graphs and some tools such as cause effect diagram, Pareto analysis, 5 Why analysis and 5S.

4.1 Current state map

The current state VSM shows the process flow from the start to the end of the manufacturing line for cutting, sewing, and finishing sections. Figure 3 shows the current state map of the flow. The current state mapping shows that, this company is currently using a pure push production system; therefore, it requires mass effort to change from this traditional production system.

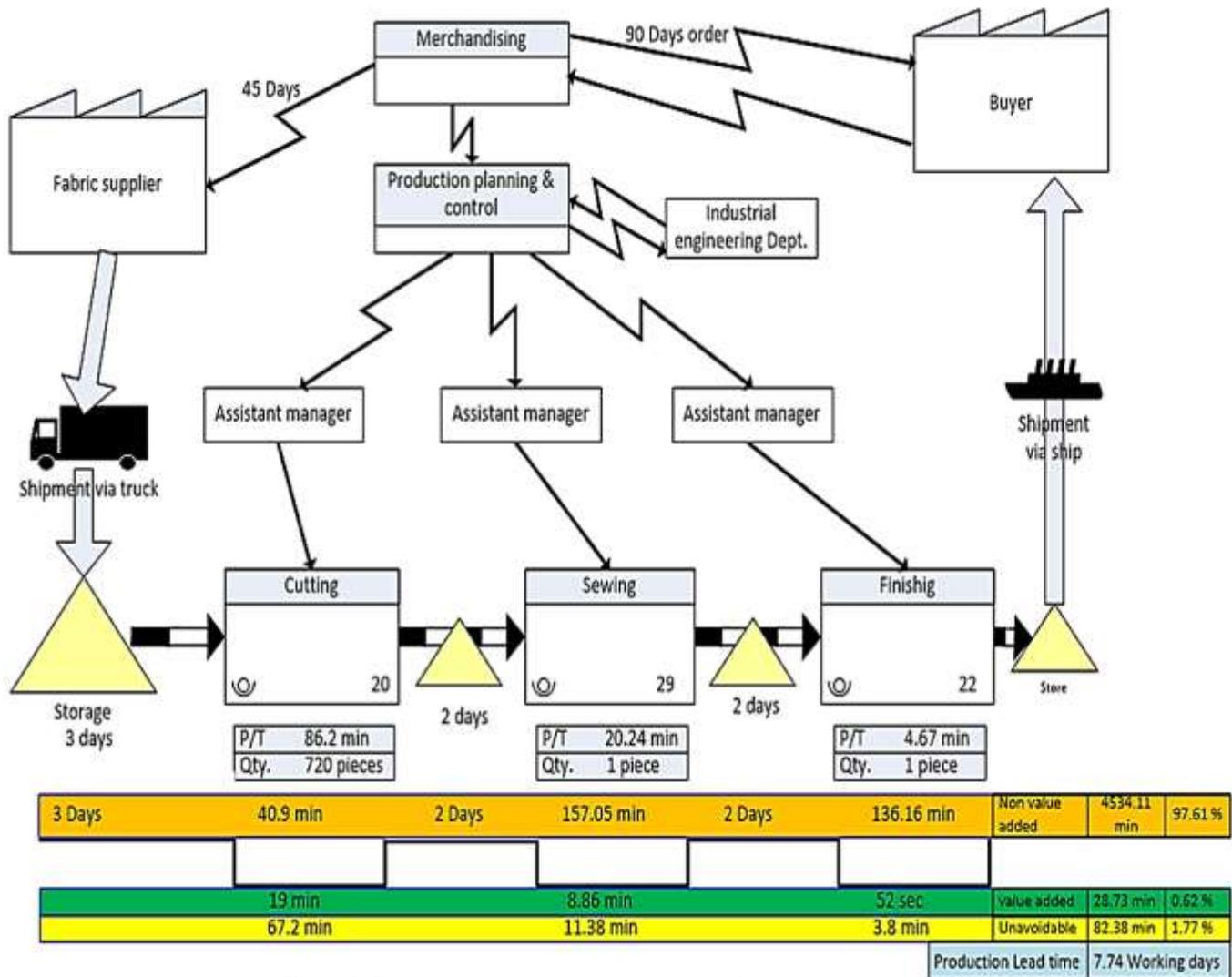


Figure 3: The current state map of the production

4.2 Findings of wastes in different section

The observed data and the current state map of the processes revealed some wastes in the flow. We assessed the company's current practice towards wastes analysed the percentage of the major wastes in sewing, cutting and finishing process.

Inventory: In cutting section, there are 3 days of inventory of fabrics and at the beginning of cutting process, there are almost 2 days of inventory before supplying the bundles to sewing section and there are about 2 days of inventory remain in the stock before supplying to the finishing section. Those three sections retain a large amount of inventory which is a waste of inventory which is about 90.44%

of total lead time.

1. **Waiting Time:** Most of the processes in cutting, sewing and finishing section have waiting time. The total waiting time is calculated as 283.58 minutes where 2.85 min (0.98%) waiting time in cutting section, 156.33 minutes (53.99%) waiting time in sewing section and 130.4 minutes (45.03%) waiting time in finishing section. The product waits at different processes, 6.10% of the total production lead time, which is a significant loss of valuable time.
2. **Defects:** There are considerable amount of defects in cutting, sewing and finishing section. Among those defects most of the defects occur in sewing section. Compared to sewing section there are a little amount of defects occurs in cutting and finishing.
3. **Transportation:** There is 11.03 minutes transportation in cutting section, 21.08 minutes transportation in sewing section and 2.8 minutes transportation in finishing section. Transportation takes 0.752% of the total lead time.
4. **Excessive Motion:** Excessive motion occurs in cutting section when the fabrics move from store to cutting table to quality check to store. There is little excessive motion in sewing and finishing section because of the positions of workstations. From the VSM data it's found that the total amount of excessive motion time is 15.62 minutes

4.3 Pareto analysis of wastes

The wastes that are found in current state mapping are ranked in terms of time to find out the leading waste.

$$\begin{aligned} \text{Total waste time} &= \text{Total non-value adding time} \\ &= 4534.11 \text{ min} \end{aligned}$$

The factors and their percentages contributing this non value adding time are given below,

Queuing by inventory: 4200 min (92.63%)

Waiting time: 283.58 min (6.25%)

Transportation time: 34.91 min (0.77%)

Excessive motion: 15.62 min (0.35%)

From the above information a Pareto chart has been drawn to visualise the significance level of those wastes

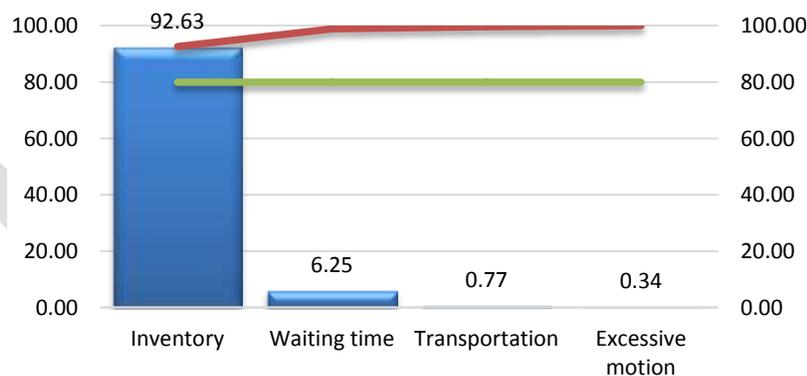


Figure 4: Pareto chart for Wastes

From the above analysis it's clear that the major cause of waste is product inventorying time.

4.4 Findings of Cause effect analysis of wastes

After performing Pareto analysis major wastes are identified then cause-effect analysis is done to find out the possible cause of those wastes. The following root causes have been found from the analysis.

Wastes	Reasons
Inventory	Raw materials, Safety stock, Finish goods, Delivery schedule, Min. Qty. requirement.
Waiting Time	Lack of skilled labor, Imbalanced layout, Transportation schedule.
Defects	Equipment problem, Lack of skilled worker, Material problem.
Transportation	Discontinuous process, Distance between work stations, Improper arrangement of machine.
Excessive Motion	Layout

4.5 Findings of 5 Why analysis

Waste	Root causes	Solution
Inventory	No formal set of procedures to handle inventory	Kanban
Waiting	No formal set of procedures to handle inventory, Lack of training & motivation	Kanban
Defects and rework	Lack of motivation & training	Training & motivation for workers
Excessive transportation	Poor layout	Training, motivation & instruction for workers properly
Excessive motion	Improper work sequence & layout	Proper layout

A solution to those wastes and root causes has been identified using 5 why analysis.

4.6 Bottleneck analysis

As the production rate data of the garments factory showed the production rate is only 56.79% so, it's clear that, the line's capacity exceed the demand. That's why the bottleneck analysis is done to find out the bottleneck point and eventually improve the condition. To find out if there is any bottleneck in the line Takt time is calculated and then compared with the cycle time. If the Takt time is less than the cycle time then it'll be clear that, the production line suffers with bottleneck problem [8].

4.6.1 Takt time calculation

After calculating operator availability, machine uptime & quality data Takt analysis is done. The Takt time calculation of the sewing process is shown below [8],

$$\text{Takt time} = \frac{\text{Effective working time}}{\text{Total demand for the products}}$$

$$\begin{aligned} &= \frac{\text{no. of shift} \times \text{avail. hrs. per shift} \times \text{op. avail.} \times \text{m/c uptime}}{\text{daily demand} \div \text{quality}} \\ &= \frac{1 \times 10 \times 94.25\% \times 87.42\%}{1000 \div 92.01\%} \\ &= 0.4549 \text{ min/piece} \end{aligned}$$

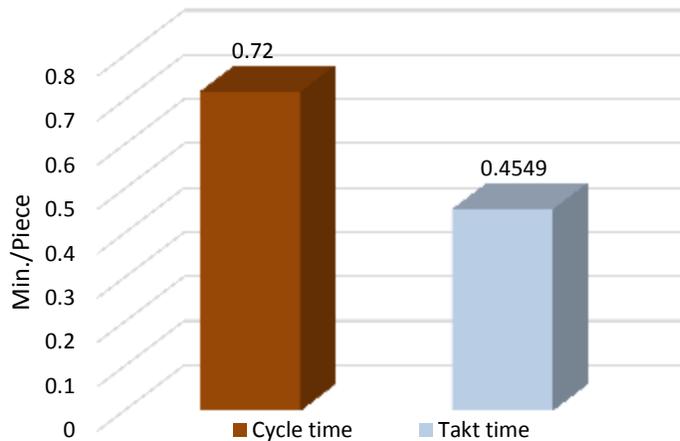
From the above calculation the Takt Time is found 0.4549 minute/piece.

4.6.2 Cycle time calculation

The cycle time for a line (time between completions of successive items on the line) is determined by the maximum time required at any work station. Highest cycle time is found as 0.72 minute. So it's the cycle time of the product for sewing section.

4.6.3 Takt time and cycle time comparison

After calculating product cycle time and the Takt time, a chart has been drawn to compare the cycle time and Takt time to find out if there is any bottleneck in the production line. Figure 5 illustrates the Takt time and cycle time comparison.



4.7 Future state value stream mapping

After improving various waste, removing bottleneck from the sewing process and improving current layout future state map is drawn. The future state VSM is shown in Figures 6. The improvement activities are shown in the VSM by the Kaizen burst icon. Kanban pull system are also proposed to replace the traditional push system.

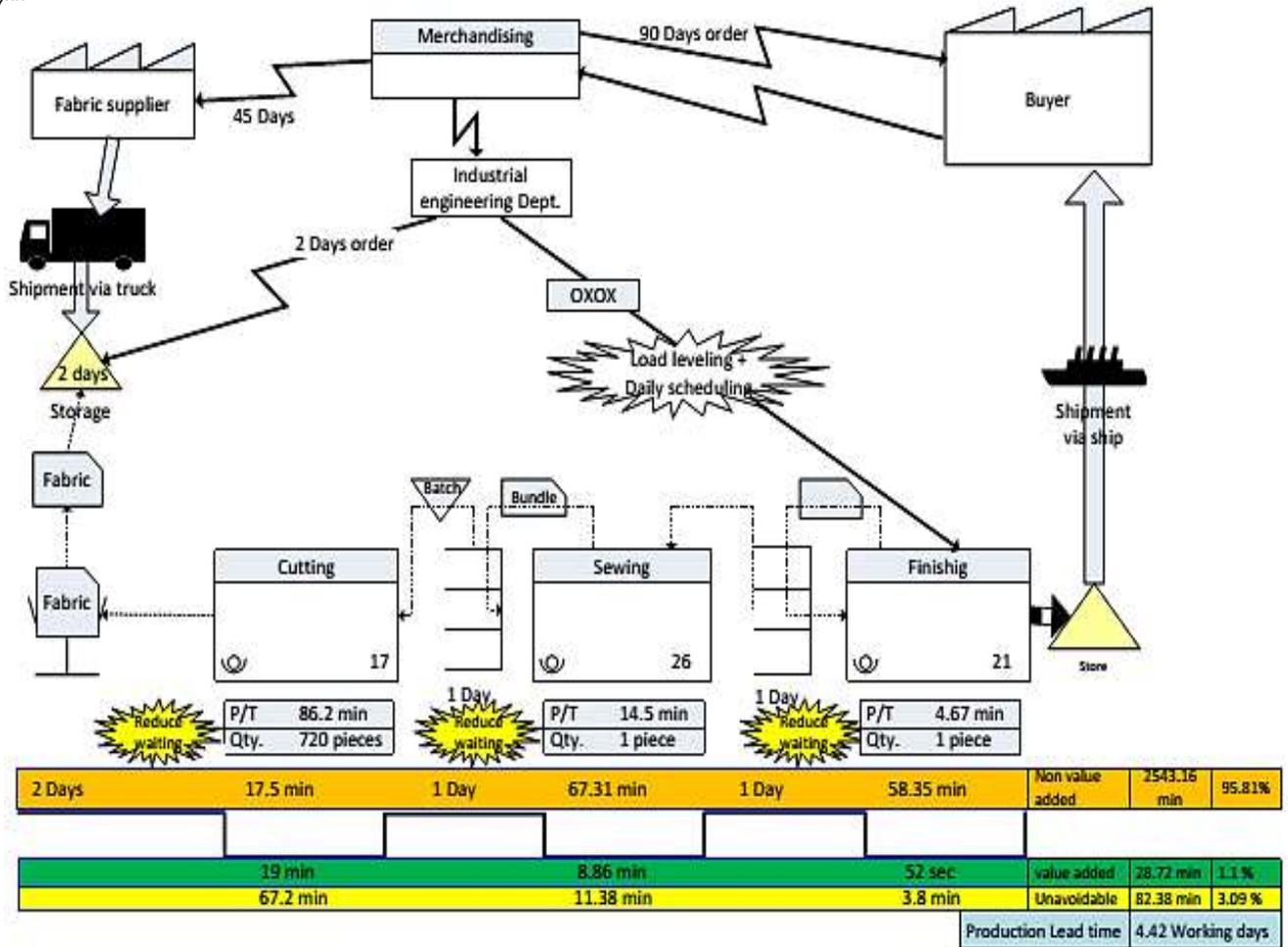


Figure 6: Future state VSM

4.8 Comparison of current state map and future state map

More detailed explanation about these improvement activities are provided in table below :

Factor	Current state map	Future state map
Inventory	7 Days	4 Days
Waiting time	283.58 Minutes	115.26 Minutes
Transportation	34.91 Minutes	17.64 Minutes
Non-value added time	7.56 Days	4.24 Days
Total lead time	7.74 Days	4.42 Days
Super market	None	2
Production information	Production planning & control	Industrial engineering dept.
Manpower	71	64

5. Conclusion and recommendations

The main goal of this thesis was to find out the scope of VSM technique application in garments factory. On a selected product of the studied garments factory VSM was implemented to find out the amount of wastes in cutting, sewing and finishing section; because the selected product had a long lead time and was unable to meet the expected production rate. Pareto analysis was done to identify the dominating waste. Cause effect and 5 why analysis was done to identify the reason of waste, after proposing different solution

strategies to reduce the identified waste and problems, a future state map was drawn to meet the expected production rate with reduced lead time and wastes. The result has significantly been improved over the current state map. As value stream map can be drawn in relatively short time with almost no expenditure of money and as it can identify wastes with good accuracy, thus it's very helpful for managers who are having difficulties with their low production rate, higher lead time and high production costs. A careful future state value stream mapping can put an ease to their problems.

Through this thesis work,

- Value added activity has been increased from 0.62% - 1.1%
- Waiting time has been reduced from 283.58 min. to 115.26 min.
- Productivity has been increased 31.94 %
- Lead time has been decreased 7.74 days to 4.42 days
- Bottleneck point has been reduced from 0.72 min. to 0.49 min.

Therefore organizations of similar type can use the research outcomes as a knowledge base to identify their wastes and come up with suitable remedies.

For improvement of production system of the selected garments industry, below some recommendations are proposed:

- ☆ Value stream mapping should be applied to determine the current scenario of production and to identify various types of wastes.
- ☆ Kanban supermarket pull system should be implemented to reduce unnecessary raw material inventory and waiting time.
- ☆ To reduce other waste various technique such as zero defects, setup time reduction, line balancing, SMED, 5S, and Poka-Yoke can be applied.
- ☆ Layout needs to be improved to reduce unnecessary transportation wastes.
- ☆ Bottleneck point should be identified and removed to get the maximum output from the production line.
- ☆ Proper and adequate training should be provided to employees and workers so that they can gather proper knowledge and consciousness about the operation of various machine to maintain desired quality.
- ☆ To reduce worker absenteeism and to build up moral and trust among the workers some measures should be taken such as job enrichment, implementation of proper incentive plan, relationship improvement between employee and management, total productive maintenance, worker motivation.
- ☆ Instead, minimize total cost in the long run (low bids do not always ensure quality). Reduce the number of suppliers for the same item by eliminating those that do not qualify with statistical evidence of quality. A single supplier for any one item should be chosen based on a long-term relationship of loyalty and trust.

It's necessary to involve Industrial and Production Engineers for optimum use of resource at best quality.

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A COMPARATIVE STUDY ON VARIOUS ROUTING TECHNIQUES IN MOBILE WIRELESS SENSOR NETWORKS: A REVIEW

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Abstract— WSN have diverse applications and difficulties in the era. This comprise of hundreds and thousands of small sensors. Cluster head election issue is one of the essential QoS requirement of WSNs, yet this issue has not been sufficiently investigated in the set of cluster based sensor systems. Mobility plays a key part in the execution of the application. Lately, portability has turned into an important area of research for the WSN group. The expanding capacities and the diminishing expenses of portable sensors make versatile sensor systems. In spite of the fact that WSN arrangements were never imagined to be completely static, mobility was first viewed as having a few difficulties that expected to be succeed, including connectivity, scope, and energy utilization, among others. In this paper we will clarify the fundamental focal points and weaknesses of every routing technique.

Keywords— Wireless sensor networks; routing protocols; sensor nodes; mobility; fault tolerance; heterogeneity; portability; remote sensor system; versatility; energy utilization; quality of service.

INTRODUCTION

WSN are homogeneous or heterogeneous framework containing little gadgets called sensors nodes. These sensors are little, with constrained processing and figuring assets and they are reasonable contrasted with customary sensors [1]. These sensor hubs can sense, measure, and assemble data from nature and, in light of some nearby choice methodology; they can transmit the sensed information to the client. Shrewd sensor hubs are low power gadgets furnished with one or more sensors, a processor, memory, a force supply, a radio, and an actuator. An assortment of mechanical, warm, organic, synthetic, optical, and attractive sensors may be joined to the sensor hub to gauge properties of the earth. Since the sensor hubs have restricted memory and are regularly conveyed in hard to get to areas, a radio is executed for remote correspondence to exchange the information to a base station (e.g., a portable computer, an individual handheld gadget, or an entrance point to an altered framework). Battery is the primary force source in a sensor hub. Auxiliary power supply that gathers power from the earth, for example, sun oriented boards may be included to the hub depending on the fittingness of nature where the sensor will be conveyed. Contingent upon the application and the sort of sensors utilized, actuators may be joined in the sensors [7].

Remote sensor system (WSN) applications regularly include the perception of some physical marvel through examining of the earth. Versatile remote sensor systems (MWSNs) are a specific class of WSN in which portability assumes a key part in the execution of the application. Lately, versatility has turned into a huge examination region for the WSN. Despite the fact that WSN arrangements were never imagined to be completely static, portability was at first viewed as having a few difficulties that expected to be succeed, including integration, scope, and vitality utilization, among others. Be that as it may, late studies have been demonstrating portability in a more positive light. As opposed to confounding these issues, it has been exhibited that the presentation of versatile substances can resolve some of these issues. Furthermore, versatility empowers sensor hubs to target and track moving phenomena, for example, substance mists, vehicles, and bundles [8].

A standout amongst the hugest difficulties for MWSNs is the requirement for localization. In request to comprehend sensor information in a spatial connection, or for proper navigation throughout a sensing region, sensor position must be known. Because sensor nodes may be deployed dynamically (i.e., dropped from an aircraft), or may change position during run-time (i.e., when attached to a shipping container), there may be no way of knowing the location of each node at any given time. For static WSNs, this is not as much of a problem because once node positions have been determined, they are unlikely to change. On the other hand, mobile sensors must frequently estimate their position, which takes time and energy, and consumes other resources needed by the sensing application. Furthermore, localization schemes that provide high-accuracy positioning information in WSNs cannot be employed by mobile sensors, because they typically require centralized processing, take too long to run, or make assumptions about the environment or network topology that do not apply to dynamic networks.

This paper makes us enable to identify the different dimensions of clustering techniques in WSNs and MWSN to solve the energy limitation problem in these networks [11].

VARIOUS ISSUES AND ROUTING CHALLENGES

Despite of various advantages these networks have various restrictions i.e. limited energy supply, limited computing power, limited bandwidth etc. We are summarizing routing challenges and design issues:

1. Heterogeneous Nodes: All the sensor nodes are considered to be of same type i.e., all the nodes have same capacity in terms of calculation, communication, and power. However, depending upon the work done all the nodes have different responsibilities. There exists many technical issues related to the data. For example, some may require collection of sensors for the calculation of temperature, pressure and humidity of the environment, detecting motion via acoustic signatures, and taking images and video of particular object [4].

2. Scalability: There may be large amount of nodes according detected by sensors[2].The quantity can be hundred and thousand. The routing technique which we are going to use should be able to cope up. Sensor system directing conventions ought to be sufficiently adaptable to react to environment. Until anything happens, the greater part of the sensors can stay in the slumber state, with information from the few remaining sensors giving a coarse quality.

3. Network Dynamics: The majority of the system architectures expect that sensor nodes are stable[2]. Versatility of both BS's or sensor node is now and again useful in various applications. Directing messages from or to moving nodes is additionally difficult since condition turns into a critical issue, with data transmission and so on.

4. Network connectivity: High node thickness in sensor systems blocks them from being totally attached to one another. In this way, sensor nodes are required to be exceptionally associated. This, then again, may not keep the system topology from being variable and the system size from being contracting because of sensor nodes disappointments. Furthermore, integration relies on upon and perhaps irregular distribution of nodes [2].

5. Quality of Service: In a few applications, information to be conveyed inside a certain span of time from the minute it is sensed, generally the information will be pointless[4]. Then again, in many applications, preservation of energy, which is straightforwardly identified with system lifetime, is considered moderately more critical than the nature of information sent. As the energy gets exhausted, the system may be required to decrease the nature of the result so as to diminish the energy dispersal in the nodes and consequently extend the aggregate system lifetime.

6. Fault Tolerance: Some sensor nodes may be hindered because of absence of energy, physical harm, or ecological impedance[4]. The disappointment of sensor nodes should not influence the general working of the sensor system. In the event that numerous nodes fail, MAC must suit development of new connections and courses to the information gathering base stations.

7. Data Reporting Model: Information sensing and reporting in WSNs is reliant on the application and the time criticality of the information reporting. Information reporting can be sorted as either time-driven(continuous), occasion driven, question driven . The time-driven model is suitable for applications that require occasional information observing. In that capacity, sensor nodes will occasionally switch on their sensors and transmitters, sense the environment and transmit the information at consistent occasional time intervals. In occasion driven and question driven models, sensor nodes respond promptly to sudden and radical changes in the estimation of a sensed credit because of the event of a certain occasion or an inquiry is created by the BS. Thusly, these are appropriate for time basic applications. A result of the past models is additionally conceivable [4].

VARIOUS CLUSTERING TECHNIQUES

1. Network structure based clustering

1.1 Flat routing

In flat routing systems, every node regularly assumes the same part and sensor node work together to perform the sensing. Because of the vast number of such nodes, it is not possible to allot a global identifier to every node. This thought has lead information to be centralized, where the BS sends questions to specific locales and sits strictly for information from the sensors placed in the chosen areas. Since information is being asked for through inquiries, quality based naming is important to indicate the properties of information.

- **SPIN(Sensor convention for data by means of arrangement):**

These protocols make utilization of the property that nodes that are close enough have comparative information, and consequently there is a need to just convey the information that different nodes don't work together. Nodes running SPIN allocate and abnormal state name to totally depict their gathered information (called meta-information) and perform meta-information arrangements before any information is transmitted. This guarantees that there is no repetitive information sent all through the system. The semantics of the meta-information configuration is application-dependent and is not tagged in SPIN. Sensors may use their remarkable IDs to report meta-information in the event that they cover a certain known area. For eg, SPIN has admittance to the current vitality level of the nodes and adjusts the convention it is running in view of the amount of vitality is remaining [3].

- **Rumor routing:**

Rumor routing is a type of diffusion and is essentially expected for applications where geographic routing is not applicable. When all is said in done, coordinated dispersion uses flooding to infuse the query to the whole system when there is no geographic basis to diffuse undertakings. Nonetheless, now and again there is just a little measure of information asked for from the nodes and therefore the utilization of flooding is pointless. An option methodology is to surge the occasions if the quantity of occasions is little and the quantity of inquiries is expansive. The key idea is to course the questions to the nodes that have observed a specific occasion as opposed to flooding the whole system to recover data about the specific occasions. At the point when a node identifies an occasion, it adds such occasion to its table, called 11events table, and creates an agent. Agent travels to every part of the system so as to engender data about nearby occasions to removed nodes. At the point when a node creates an inquiry for an occasion, the node that know the course, may react to the question by examining its occasion table. Subsequently, there is no need to surge the entire system, which lessens the correspondence cost [2].

- **Minimum Cost Forwarding Algorithm (MCFA):**

The MCFA algorithm exploits the way that the way of routing is constantly known, that is, towards the base-station. Subsequently, a sensor node does not require having an extraordinary ID nor keeping up a routing table. Rather, every node keeps up the least estimate from itself to the base-station. Every message to be sent by the sensor node is show to its neighbors. At the point when a node gets the message, it checks that it is on the minimum expense way between the sensor node and the base-station. In the event that this is the situation, it re-shows the message to its neighbors. This procedure repeats until the base-station is arrived at destination. In MCFA, every node should to know the way assess from itself to the base-station. This is acquired as follows. The base-station shows a message with the expense set to zero while each node at first set its minimum expense to the base-station to infinity (∞). Every node, after accepting the message began at the base-station, verifies whether the evaluation in the message in addition to the link on which it is received is not exactly the same. If yes, the current estimation and the estimation in the show message are updated. If the telecast message is upgraded, then it is re-sent; else, it is cleansed and nothing further is carried out. Nonetheless, the past technique may bring about a few nodes having numerous redesigns and those nodes far from the base-station will get more overhauls from those closer to the base-station[12].

2. Hierarchical Routing

Progressive directing is a productive approach to lower energy utilization inside a clustering and by performing information total and combination to reduce the quantity of transmitted messages to the BS. This process is mostly two-layer routing where one layer is utilized to choose cluster heads and the other layer is utilized for routing. Most systems in this class are not about routing, rather on "who and when to send or procedure/total" the data, channel portion and so forth, which can be orthogonal to the multihop steering capacity [11].

- **LEACH Protocol:**

Low Energy Adaptive Clustering Hierarchy ("LEACH") is a TDMA-based MAC convention which is incorporated with grouping and a straightforward directing convention in remote sensor systems (WSNs). The objective of LEACH is to bring down the vitality utilization needed to make and keep up bunches so as to enhance the life time of a remote sensor system. Drain is a progressive convention in which most hubs transmit to group heads, and the bunch heads total and pack the information and forward it to the base station (sink). Every hub utilizes a stochastic calculation at each round to figure out if it will turn into a bunch head in this round. Filter expect that every hub has a radio capable to such a degree as to specifically achieve the base station or the closest bunch head, however that utilizing this radio at full power all the time would squander vitality. Hubs that have been bunch heads can't get to be group sets out again toward P rounds, where P is the wanted rate of group heads[5].

- **Power-Efficient Gathering in Sensor Information Systems (PEGASIS):**

The convention, called Power-Efficient Gathering in Sensor Information Systems (PEGASIS) is a close ideal chain-based protocol. The essential idea of the convention is that so as to extend system lifetime, nodes require just to communicate with their closest neighbors and they alternate in corresponding with the base-station. At the point when the round of all nodes communicate with the base-station closes, another round will begin etc. This reduces the force needed to transmit information every round as the force depleting is spread consistently over all hubs. Thus, PEGASIS has two fundamental goals. In the first place, expand the lifetime of every node by utilizing procedures and accordingly the system lifetime will be expanded. Second, permit just nearby coordination between nodes that are near one another so that the data transfer capacity devoured in correspondence is decreased. Dissimilar to LEACH, PEGASIS avoids cluster arrangement and uses stand out node in a fasten to transmit to the BS as opposed to utilizing numerous nodes [6].

- **Threshold-sensitive Energy Efficient Protocols (TEEN and APTEEN):**

Two various leveled directing conventions called TEEN (Threshold-touchy Energy Efficient sensor Network convention), and APTEEN (Adaptive Periodic Threshold-delicate Energy Efficient sensor Network convention) are proposed for basic applications. In TEEN, sensor nodes sense the medium persistently, yet the information transmission is carried out less much of the time. A group head sensor sends its individuals a hard limit, which is the edge estimation of the sensed attribute and a delicate edge, which is a little change in the estimation of the sensed characteristic that triggers the node to switch on its transmitter and transmit. In this way the hard threshold tries to reduce the quantity of transmissions by permitting the nodes to transmit just when the sensed quality is in the scope of investment. A little estimation of the threshold gives a more exact picture of the system[7].

- **Sensor Aggregates Routing:**

In this, a set of algorithm for building and keeping up sensor totals were proposed. The target is to on the whole screen target action in a certain situation (target following applications). A sensor total contains those nodes in a system that fulfill a gathering predicate for a community preparing undertaking. The parameters of the predicate rely on upon the undertaking. Sensors in a sensor field is partitioned into cluster as indicated by their sensed sign quality, so that there is peak per cluster. At that point, local group leaders are chosen. To choose a cluster, data trades between neighboring sensors are variable. On the off chance that a sensor, in the wake of trading parcels with all its one-jump neighbors, observes that it is higher than all its one-bounce neighbors on the sign field scene, it announces itself a leader. This leader based following calculation expect the special leader knows the land area of the joint effort[4].

3. Routing Protocols based on Protocol Operation

- **Multipath routing Protocols:**

In this subsection, we think about the directing protocols that utilize various ways as opposed to a solitary way to improve the system execution. The adaptation to internal failure (flexibility) of a convention is measured by the probability that another way exists between a source and a destination when the essential way fails. This can be expanded by maintaining various ways between the source and the destination. These other ways are kept alive by sending messages [2].

The SPIN family conventions examined prior and the conventions are illustrations of arrangement based on routing conventions. The inspiration is that the utilization of flooding to scatter information will deliver implosion and cover between the sent information, subsequently nodes will get copy duplicates of the same information. This operation acquires more data additionally handling by sending the same information by different sensors. The SPIN conventions are intended to scatter the information of one sensor to all different sensors expecting these sensors are potential base-stations. Consequently, the fundamental thought of arrangement based routing in WSNs is to make copy data and keep repetitive information from being sent to the following sensor or the base-station by leading a progression of transaction messages [3].

- **QoS-based routing:**

In QoS-based routing protocols, the network needs to balance between energy utilization and information quality. Specifically, the system needs to fulfill certain QoS measurements, e.g., delay, vitality, data transfer capacity, and so forth when conveying information to the BS. Sequential Assignment Routing (SAR) proposed in is one of the first directing conventions for WSNs that presents the thought of QoS in the routing decision. Directing choice in SAR is reliant on three components: energy resources, QoS on every way, and the need level of every packet. To stay away from single path failure, a multi-way approach is utilized and restricted way rebuilding plans are utilized. To make various ways from a source node, a tree established at the source node to the destination node (i.e., the set of base-stations (BSs)) is assembled [2].

CONCLUSION

Generally, the directing methodologies are described considering the framework structure into three classes: Flat, Hierarchical and location based routing techniques. Besides, these traditions are divided into multipath-based, query based, location based, or QoS-build directing system depending regarding the protocol operation. We in like manner highlight the layout tradeoffs in middle of energy and correspondence. There are still numerous difficulties in the event of sensor systems that can be talked about in future headings.

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Distributed Personal Authentication System

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Abstract- It is known that currently India is facing big issues like terror attacks by terrorists. So our borders are protected by Iron Spike fences, and a watchtower containing soldiers. Those persons are fully responsible to prevent any intrusion. This project will not fully remove the responsibility of the soldiers, but manages to take the maximum responsibility and thus help soldiers at the border. The basic purpose of the project is to enhance the border security electronically with automation. By using GPS, system can track position of gun and also can be used for security purpose using password.

Keywords- Automatic gun control, Password authentication, GPS, Wireless Communication, ARM7, Keil, Embedded based.

INTRODUCTION

It is a common story that weapons of policemen or soldiers are stolen. This results into the use of these weapons for various crimes. Each year there are thousands of fatal gunshot victims in India. What makes these weapons preferable to another user is, no authentication is required for using the weapons. So to overcome these problems this system checks the identity of the person who holds the gun before user can fire it by using proper password for authentication.

The solution is a Wireless Link between two or more objects. There will be a wireless link between the gun and the module on the body of the policeman or soldier. This means that the gun will operate only if it gets the correct password from the soldier. At war-field soldier can use this automatic gun to distract enemies by using his password.

SYSTEM ARCHITECTURE

In this system there are three sections, defined as follows:

PERSON SECTION

In person section input is taken through the keypad from the user is in the form of 4 digit code and then this code is transmitted to the HT12 encoder. Encoder converts this code into digital form and then it is transmitted by using a STT 433Mhz transmitter. Radio frequency (RF) is a frequency or rate of oscillation within the range of about 3 Hz to 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves. Since most of this range is beyond the vibration rate that most mechanical systems can respond to, RF usually refers to oscillations in electrical circuits or electromagnetic radiation.

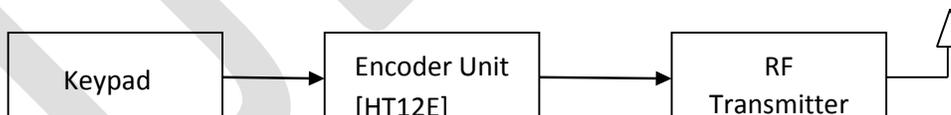


Fig.1 Person section

Device section

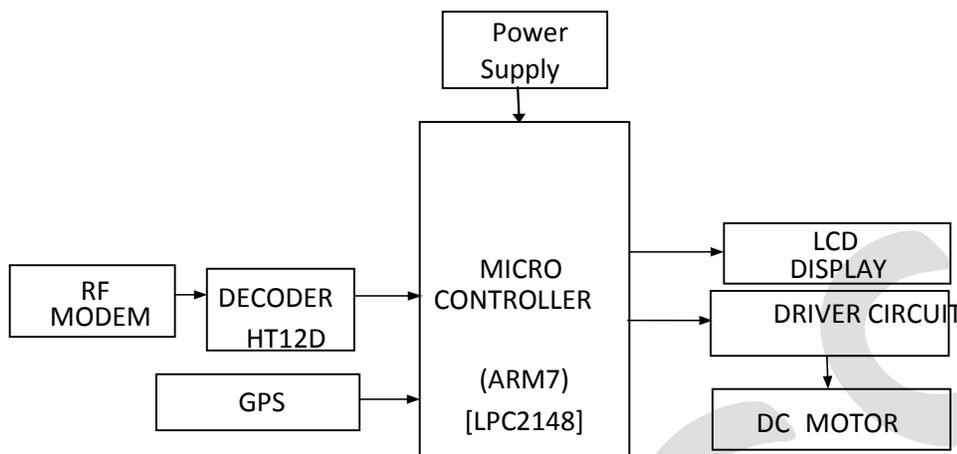


Fig.2 Device section

Device section is mounted on weapon. In device section there is a receiver which can receive the signal transmitted by the STT 433 MHz transmitter. The receiver used is STR 433Mhz which will receive only the 433 MHz frequency then this received signal is decoded using HT12D decoder.

Then the decoded output is given to ARM 7 microcontroller. If the output of the decoder matches the code given by the user then the DC motor is started. In the ARM microcontroller there is program present which can be written in embedded C. This program compares the output of decoder to the user code. The ARM microcontroller can be activated and deactivated by using external switch. Here relay is used to control the DC motor. If the gun operates successfully then on LCD display there will be a message displayed that is “DEVICE IS OPERATING”. And if device is not operating then it will display “DEVICE IS NOT OPERATING”.

Admin section

The admin section is mainly used for backup plan. In case of any accident, if the device where the authentication is done is misplaced or damaged then the user can use the admin section for further working. The admin section can be used for both the purposes as to permanently disable the weapon or permanently enable it. To make permanently enable or disable the weapon user need to request to admin section. The weapon can be controlled by the soldier and the administrator in control room by using personal section and admin section respectively.

In admin section user need to enter a code or password via keyboard which will be connected to the computer or mobile. And then by using RF transmitter that admin section will do as per requirements of the user. This admin section is also useful when soldier is died and further use of that weapon is carried through control room.

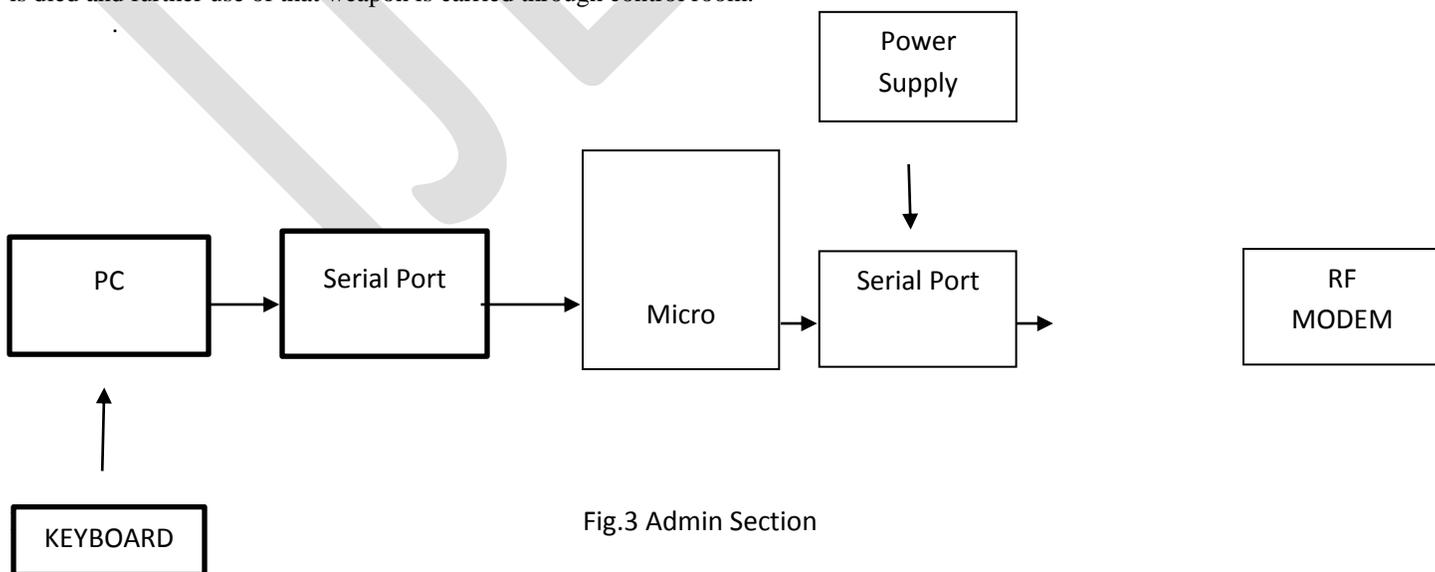


Fig.3 Admin Section

HARDWARE COMPONENTS

Following components are used in this system:

ARM 7 Microcontroller- The principle feature of the ARM 7 microcontroller is that it is a register based load-and store architecture with a number of operating modes. While the ARM7 is a 32 bit microcontroller, it is also capable of running a 16-bit instruction set, known as "THUMB". This helps to achieve a greater code density and enhanced power saving. While all of the register-to-register data processing instructions are single-cycle, other instructions such as data transfer instructions are multi-cycle. To increase the performance of these instructions the ARM 7 has a three stage pipeline.

In order to keep the ARM 7 both simple and cost-effective, the code and data regions are accessed via a single data bus. Thus while the ARM 7 is capable of single-cycle execution of all data processing instructions, data transfer instructions may take several cycles since they will require at least two accesses onto the bus (one for the instruction and one for the data). In order to improve performance, a three stage pipeline is used that allows multiple instructions to be processed simultaneously. The pipeline has three stages; FETCH, DECODE and EXECUTE.

Power supply- The main building block of any electronic system is the power supply to provide required power for their operation and is as shown in the Figure 5. For the microcontroller, keyboard, LCD, RTC, GSM, +5V, 3.3V and +12V is required.

RF Transmitter- the STT-433 is ideal for remote control applications where low cost and longer range is required. The transmitter operates from a 1.5-12V supply, making it ideal for battery-powered applications. The transmitter employs a SAW-stabilized oscillator, ensuring accurate frequency control for best range performance. The manufacturing-friendly SIP style package and low-cost make the STT-433 suitable for high volume applications.

RF Receiver- The data is received by the RF receiver from the antenna pin and this data is available on the data pins. Two Data pins are provided in the receiver module. Thus, this data can be used for further applications. Operating voltage: 2.4V~12V. Low power and high noise immunity CMOS technology.

HT-12E encoder- The 2^{12} encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12_N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E further enhances the application flexibility of the 2^{12} series of encoders.

HT-12D decoder- The decoders are a series of CMOS LSIs for remote control system applications. They are paired with Hole 2^{12} series of encoders. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 2^{12} series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 2^{12} series of decoders are capable of decoding information's that consist of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

GPS section- The Global Positioning System (GPS) is a satellite-based navigation system consists of a network of 24 satellites located into orbit. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world. Normally no subscription fees or system charges to utilize GPS.

A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like, speed, distance to destination, time and other. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible person through GSM technology.

CIRCUIT DISCRPTION

POWER SUPPLY

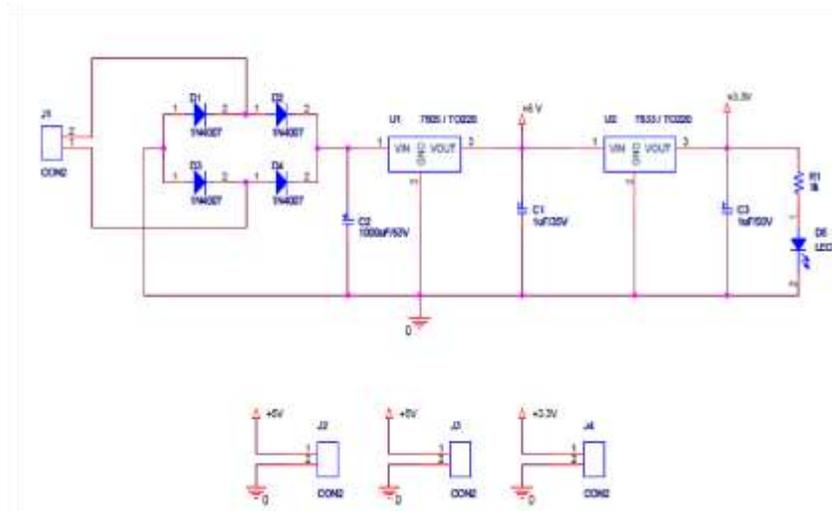


Fig.4 Power supply

Device section

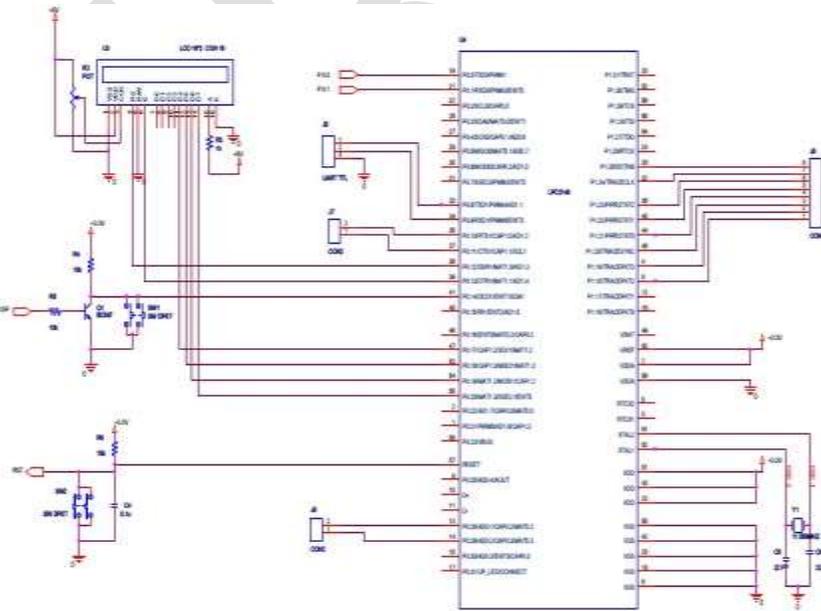


Fig.5 (a) Device section

RESULT

Three section with casing are as shown in figure

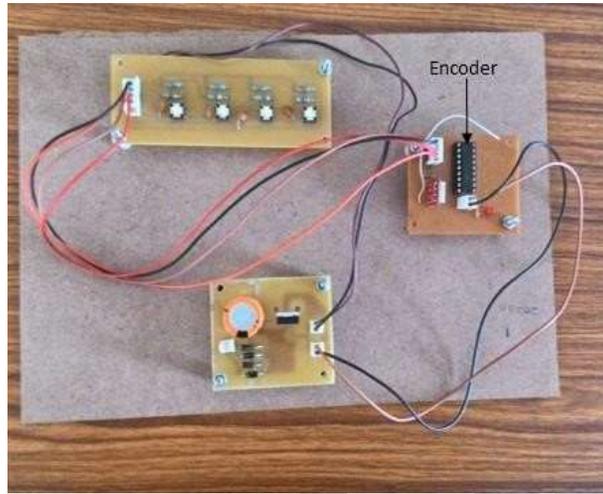


Fig.6 Person section

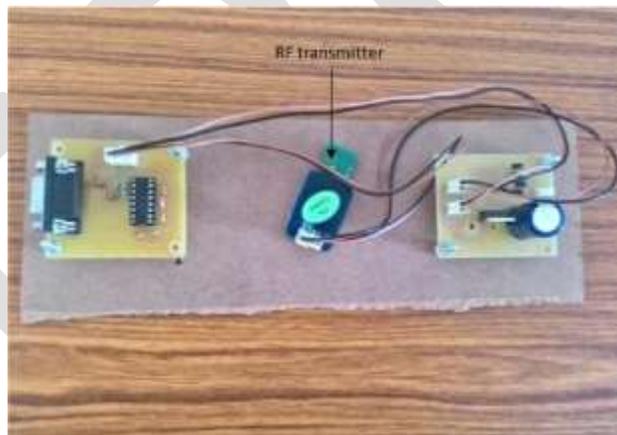


Fig.7 Admin section

Person section as shown in figure 6 is with soldier in warfield. Password is known to only soldier and control room admin. As soon as authentication is successful, then motor in device section rotates. Admin control room is for backup support when soldier is dead or injured. Then admin can access that gun with the password.

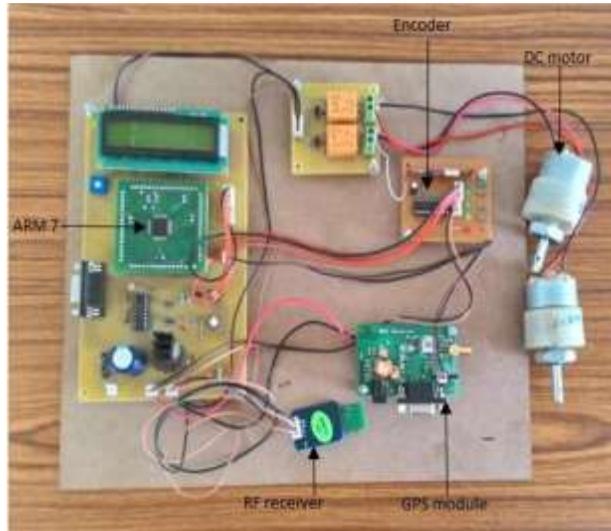


Fig.8 Device section

Truth table for person section:

Table no. 1

Switch position				Motor		SYSTEM
S1	S2	S3	S4	M1	M2	
1	1	1	1	-	-	ON
1	0	0	0	ON	-	-
0	1	0	0	OFF	-	-
0	0	1	0	-	ON	-
0	0	0	1	-	OFF	-
1	0	1	0	ON	ON	-
0	1	1	0	OFF	ON	-
1	0	0	1	ON	OFF	-
0	1	0	1	OFF	OFF	-

Truth table for admin section:

Code	Motor		System
123	-	-	ON
M1N	ON	-	-
M1F	OFF	-	-
M2N	-	ON	-
M2F	-	OFF	-
GPS	-	-	1846.4404,N 7383.2024,E

Table no. 2

ACKNOWLEDGEMENT

We are grateful to God Almighty, for making us able to do this work. We deeply thank to Prof. Mrs. S. S. Vasekar, Professor in Smt. Kashibai Navale College of Engineering, for all the help during the course of this work.

CONCLUSION

Now a days India is sick off massive terror attacks and bomb explosions. To avoid such disaster this DPAS system is useful as technical power. In today's world this system will be very useful for the security purpose in defence service. The hardware and software both can be further modified according to the requirement. Multiple weapons can be operated by a single soldier. Injured soldier also can battle using this system.

This paper can be used as a simple didactic reference which proposes introducing a complete top down system design flow, touching clearly all steps of a system design, hardware components selection, power supply section designing, microcontroller firmware programming, PCB board designing, GUI software programming, high level data elaboration and system testing.

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Designing an Earthing and Bonding System for High Voltage Substation

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Abstract - There are a number of factors that need to be considered when designing high voltage substations. Therefore, designing a high voltage substation is a challenging task. The first step in designing a high voltage substation is to design an earthing and bonding system. An earthing system connection is one to which transformer and generators neutrals or earthing impedances may be connected in order to pass the maximum fault current. In this paper designing an earthing and bonding system for high voltage substation using one and half circuit breaker layout has been briefly explained.

Keywords - Substation, earthing and bonding, step and touch voltages, mesh voltage, transformer and circuit breaker, layout

I. INTRODUCTION

The earthing system should be designed to ensure the lowest possible and most economical resistance to earth mass for the expected fault currents flowing to earth, and to ensure that the potential difference induced by these fault currents into the earth mat, is kept within internationally accepted safety margins. Normally the design engineer had to rely on experience or even worse, guess, in determining the dimensions of, and the total amount of material to be used in the design of an effective earthing system. Because of this, many earthing systems were overdesigned, while some designs might even be a safety hazard under fault conditions.

The worldwide global market requires electrical engineers to have a deep understanding of the bonding and earthing practices adopted in different countries around the world. This knowledge is essential to obtain effective designs and high safety standards and can promote the elimination of technical obstacles that can still create market barriers. Industrial and commercial low-voltage (i.e., not exceeding 1 kV) power systems, persons are exposed to the risk of electric shock. Thus, standard protective measures, properly installed and maintained, must be in place to prevent persons from being in contact with energized parts for a harmful length of time. We define direct contact as contact with parts that are normally live (e.g., a damaged wire) and indirect contact as contact with metal parts that are normally not energized but likely to become live upon faults (e.g., faulty equipment). Protections against direct and indirect contacts are also respectively referred to as basic and fault protections [1].

The bonding of electrical equipment plays a crucial role in maintaining the same potential between conductive parts likely to be energized and conductive parts liable to introduce a “zero” potential into the premises. Voltage rises between such parts are unsafe, as they may induce harmful currents through the human body, the magnitude of which may vary depending on a number of factors. If the conductive part is in good contact with the bonded enclosure, there is no need for a further bonding connection; on the other hand, if the conductive part is not in good contact with the bonded enclosure, its grounding connection is against safety, as it would unnecessarily energize the part under fault conditions [2].

II. EARTHING AND BONDING

The first step in designing a substation is to design an earthing and bonding system. The function of an earthing and bonding system is to provide an earthing system connection to which transformer neutrals or earthing impedances may be connected in order to pass the maximum fault current. The earthing system also ensures that no thermal or mechanical damage occurs on the equipment within the substation, thereby resulting in safety to operation and maintenance personnel. The earthing system also guarantees equipotential bonding such that there are no dangerous potential gradients developed in the substation. In designing the substation, three voltages have to be considered.

1)Touch Voltage:-The potential difference between the ground potential rise (GPR) and the surface potential at the point where a person is standing while at the same time having a hand in contact with a grounded structure [3].

2) Step Voltage:-The difference in surface potential experienced by a person bridging a distance of 1 m with the feet without contacting any grounded object [3].

3) Mesh Voltage:-This is the maximum touch voltage that is developed in the mesh of the earthing grid.

III. SUBSTATION EARTHING CALCULATION METHODOLOGY

Calculations for earth impedances and touch and step potentials are based on site measurements of ground resistivity and system fault levels. A grid layout with particular conductors is then analysed to determine the effective substation earthing resistance, from which the earthing voltage is calculated.

In practice, it is normal to take the highest fault level for substation earth grid calculation purposes. Additionally, it is necessary to ensure a sufficient margin such that expansion of the system is catered for.

To determine the earth resistivity, probe tests are carried out on the site. These tests are best performed in dry weather such that conservative resistivity readings are obtained.

One of the important steps in determining the size and basic layout of a earthing system for an ac substation is the estimation of ground resistance of the earthing grid. The simple formulas proposed by Laurent, Niemann and Sverak are based on the formula for the ground resistance of a circular plate. The shape of the grounding grid depends on the shape of the substation area. It may be square, rectangular, triangular, L-shaped, T-shaped or any other shape. The simple formulas give fairly accurate results for the grids which are nearly square. Schwarz proposed a formula which is also applicable to rectangular grids for a limited value of length to width ratio [4]. Earthing materials used in substation are:-

A. Conductors

Bare copper conductor is usually used for the substation earthing grid. The copper bars themselves usually have a cross-sectional area of 95mm^2 , and they are laid at a shallow depth of 0.25-0.5m, in $3-7\text{m}^2$. In addition to the buried potential earth grid, a separate above ground earthing ring is usually provided, to which all metallic substation plant is bonded.

B. Connections

Connections to the grid and other earthing joints should not be soldered because the heat generated during fault conditions could cause a soldered joint to fail. Joints are usually bolted, and in this case, the face of the joints should be tinned.

C. Earthing Rods

The earthing grid must be supplemented by earthing rods to assist in the dissipation of earth fault currents and further reduce the overall substation earthing resistance. These rods are usually made of solid copper, or copper clad steel.

D. Switchyard Fence Earthing

The switchyard fence earthing practices are possible and are used by different utilities. These are:

- 1). Extend the substation earth grid 0.5m-1.5m beyond the fence perimeter. The fence is then bonded to the grid at regular intervals.
- 2). Place the fence beyond the perimeter of the switchyard earthing grid and bond the fence to its own earthing rod system. This earthing rod system is not coupled to the main substation earthing grid.

E. Earth Mat Design

Earthing system in a sub station comprises of earth mat or grid, earth electrode, earthing conductor and earth connectors [5]. The factors which influence the earth mat design are:

- Magnitude of Fault Current
- Duration of Fault
- Soil Resistivity
- Resistivity of Surface Material
- Shock Duration
- Material of Earth Mat Conductor
- Earthing Mat Geometry

IV. LAYOUT OF SUBSTATION

The layout of the substation is very important since there should be a security of supply. In an ideal substation all circuits and equipment would be duplicated such that following a fault, or during maintenance, a connection remains available. Practically this is not feasible since the cost of implementing such a design is very high. Methods have been adopted to achieve a compromise between complete security of supply and capital investment. There are four categories of substation that give varying securities of supply:

- 1) Category 1: No outage is necessary within the substation for either maintenance or fault conditions.
- 2) Category 2: Short outage is necessary to transfer the load to an alternative circuit for maintenance or fault conditions.
- 3) Category 3: Loss of a circuit or section of the substation due to fault or maintenance.
- 4) Category 4: Loss of the entire substation due to fault or maintenance.

The different layouts for substations are following:-

A. Single Busbar

The general schematic for such a substation is shown in the Fig.1. With this design, there is an ease of operation of the substation.

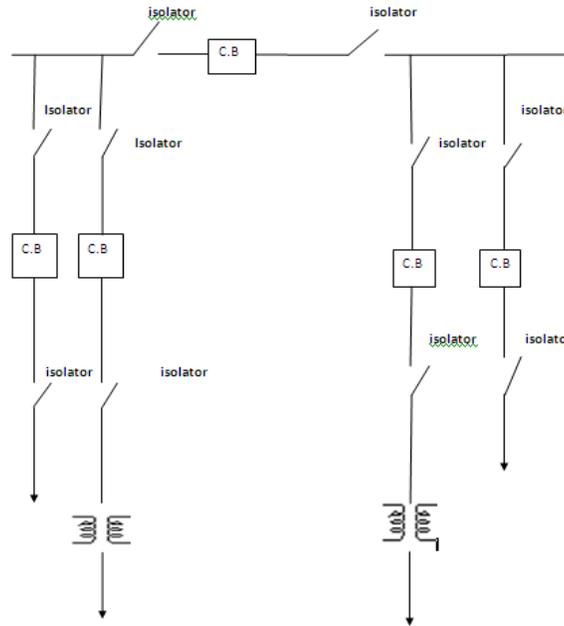


Fig.1. The layout for single bus bar substation

This design also places minimum reliance on signaling for satisfactory operation of protection. Additionally there is the facility to support the economical operation of future feeder bays. Such a substation has the following characteristics.

- Each circuit is protected by its own circuit breaker and hence plant outage does not necessarily result in loss of supply.
- A fault on the feeder or transformer circuit breaker causes loss of the transformer and feeder circuit, one of which may be restored after isolating the faulty circuit breaker.
- A fault on the bus section circuit breaker causes complete shutdown of the substation. All circuits may be restored after isolating the faulty circuit breaker.
- A busbar fault causes loss of one transformer and one feeder. Maintenance of one busbar section or isolator will cause the temporary outage of two circuits.
- Maintenance of a feeder or transformer circuit breaker involves loss of the circuit.
- Introduction of bypass isolators between bus bar and circuit isolator allows circuit breaker maintenance facilities without loss of that circuit.

B. Mesh Substation

The general layout for a full mesh substation is shown in the Fig. 2.

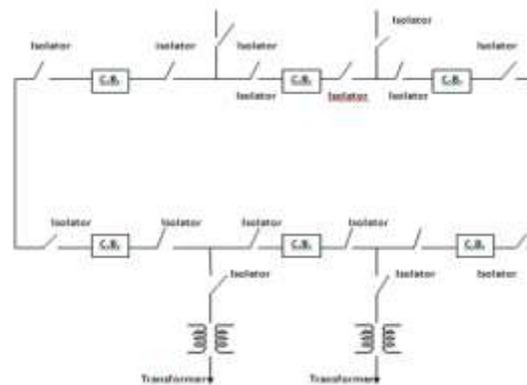


Fig. 2. The layout for mess substation

The characteristics of such a substation are as follows:

- Operation of two circuit breakers is required to connect or disconnect a circuit, and disconnection involves opening of a mesh.
- Circuit breakers may be maintained without loss of supply or protection, and no additional bypass facilities are required.

- Bus bar faults will only cause the loss of one circuit breaker. Breaker faults will involve the loss of a maximum of two circuits.
- Generally, not more than twice as many outgoing circuits as in feeds are used in order to rationalize circuit equipment load capabilities and ratings.

C. One and a Half Circuit Breaker layout

The layout of a 1 1/2 circuit breaker substation is shown in Fig.3.

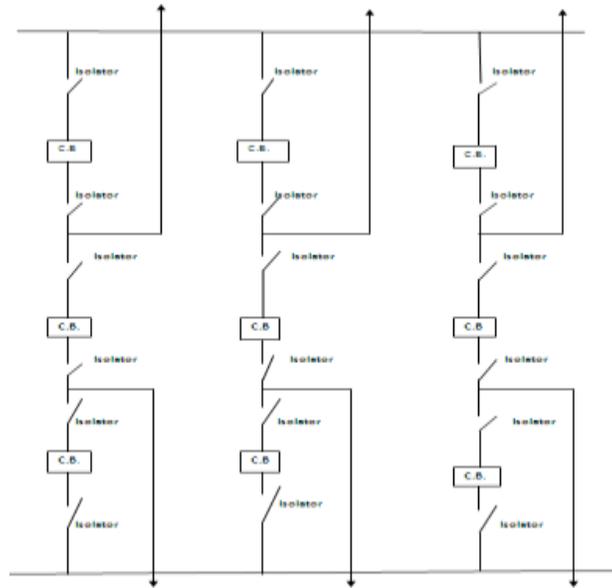


Fig.3. The layout of a one and half circuit breaker substation

The reason that such a layout is known as a 1 1/2 circuit breaker is due to the fact that in the design, there are 9 circuit breakers that are used to protect the 6 feeders. Thus, 1 1/2 circuit breakers protect 1 feeder. Some characteristics of this design are:

- There is the additional cost of the circuit breakers together with the complex arrangement.
- It is possible to operate any one pair of circuits, or groups of pairs of circuits.
- There is a very high security against the loss of supply.

V. PRINCIPLE OF SUBSTATION LAYOUTS

Substation layout consists essentially in arranging a number of switchgear components in an ordered pattern governed by their function and rules of spatial separation.

A. Spatial Separation

- Earth Clearance: - this is the clearance between live parts and earthed structures, walls, screens and ground.
- Phase Clearance: - this is the clearance between live parts of different phases.
- Isolating Distance: - this is the clearance between the terminals of an isolator and the connections thereto.
- Section Clearance: - this is the clearance between live parts and the terminals of a work section. The limits of this work section, or maintenance zone, may be the ground or a platform from which the man works.

B. Separation of Maintenance Zones

Two methods are available for separating equipment in a maintenance zone that has been isolated and made dead.

- 1). The provision of a section clearance.
- 2). Use of an intervening earthed barrier

The choice between the two methods depends on the voltage and whether horizontal or vertical clearances are involved.

- A section clearance is composed of the reach of a man, taken as 8 feet, plus an earth clearance.
- For the voltage at which the earth clearance is 8 feet, the space required will be the same whether a section clearance or an earthed barrier is used. Hence,
Separation by earthed barrier = Earth Clearance + 50mm for barrier + Earth Clearance
Separation by section clearance = 2.44m + Earth clearance
- For vertical clearances it is necessary to take into account the space occupied by the equipment and the need for an access platform at higher voltages.
- The height of the platform is taken as 1.37m below the highest point of work.

C. Establishing Maintenance Zones

Some maintenance zones are easily defined and the need for them is self evident as is the case of a circuit breaker. There should be a means of isolation on each side of the circuit breaker, and to separate it from adjacent live parts, when isolated, either by section clearances or earth barriers.

D. Electrical Separations

Together with maintenance zoning, the separation, by isolating distance and phase clearances, of the substation components and of the conductors interconnecting them constitute the main basis of substation layouts. There are at least three such electrical separations per phase that are needed in a circuit:

- 1). Between the terminals of the bus bar isolator and their connections.
- 2). Between the terminals of the circuit breaker and their connections.
- 3). Between the terminals of the feeder isolator and their connections.

VI. COMPONENTS OF A SUBSTATION

The substation components will only be considered to the extent where they influence substation layout.

A. Circuit Breakers

There are two forms of open circuit breakers:

- 1) Dead Tank: - circuit breaker compartment is at earth potential.
- 2) Live Tank: - circuit breaker compartment is at line potential.

The form of circuit breaker influences the way in which the circuit breaker is accommodated. This may be one of the following ways.

(a) Ground Mounting and Plinth Mounting

The main advantages of this type of mounting are its simplicity, ease of erection, ease of maintenance and elimination of support structures. An added advantage is that in indoor substations, there is the reduction in the height of the building. A disadvantage however is that to prevent danger to personnel, the circuit breaker has to be surrounded by an earthed barrier, which increases the area required.

(b) Retractable Circuit Breakers

These have the advantage of being space saving due to the fact that isolators can be accommodated in the same area of clearance that has to be allowed between the retractable circuit breaker and the live fixed contacts. Another advantage is that there is the ease and safety of maintenance. Additionally such a mounting is economical since at least two insulators per phase are still needed to support the fixed circuit breaker plug contacts.

(c) Suspended Circuit Breakers

At higher voltages tension insulators are cheaper than post or pedestal insulators. With this type of mounting the live tank circuit breaker is suspended by tension insulators from overhead structures, and held in a stable position by similar insulators tensioned to the ground. There is the claimed advantage of reduced costs and simplified foundations, and the structures used to suspend the circuit breakers may be used for other purposes.

B. Current Transformers

CT's may be accommodated in one of six manners:

- Over Circuit Breaker bushings or in pedestals.
- In separate post type housings.
- Over moving bushings of some types of insulators.
- Over power transformers or reactor bushings.
- Over wall or roof bushings.
- Over cables.

In all except the second of the list, the CT's occupy incidental space and do not affect the size of the layout. The CT's become more remote from the circuit breaker in the order listed above. Accommodation of CT's over isolator bushings, or bushings through walls or roofs, is usually confined to indoor substations.

C. Isolators

These are essentially off load devices although they are capable of dealing with small charging currents of busbars and connections. The design of isolators is closely related to the design of substations. Isolator design is considered in the following aspects:

- Space Factor
- Insulation Security
- Standardization
- Ease of Maintenance
- Cost Some types of isolators include:
- Horizontal Isolation types
- Vertical Isolation types
- Moving Bushing types

D. Conductor Systems

An ideal conductor should fulfill the following requirements:

- Should be capable of carrying the specified load currents and short time currents.
- Should be able to withstand forces on it due to its situation. These forces comprise self weight, and weight of other conductors and equipment, short circuit forces and atmospheric forces such as wind and ice loading.
- Should be corona free at rated voltage.
- Should have the minimum number of joints.
- Should need the minimum number of supporting insulators.
- Should be economical.

The most suitable material for the conductor system is copper or aluminium. Steel may be used but has limitations of poor conductivity and high susceptibility to corrosion. In an effort to make the conductor ideal, three different types have been utilized, and these include:

- Flat surfaced Conductors
- Stranded Conductors
- Tubular Conductors

E. Insulation

Insulation security has been rated very highly among the aims of good substation design. Extensive research is done on improving flashover characteristics as well as combating pollution. Increased creepage length, resistance glazing, insulation greasing and line washing have been used with varying degrees of success.

F. Power Transformers

EHV power transformers are usually oil immersed with all three phases in one tank. Auto transformers can offer advantage of smaller physical size and reduced losses. The different classes of power transformers are:

- O.N. : Oil Immersed, Natural Cooling
- O.B. : Oil Immersed, Air Blast Cooling
- O.F.N. : Oil Immersed, Oil Circulation Forced, Natural Cooling
- O.F.B. : Oil Immersed, Oil Circulation Forced, Air Blast Cooling

Power transformers are usually the largest single item in a substation. For economy of service roads, transformers are located on one side of a substation, and the connection to switchgear is by bare conductors. Because of the large quantity of oil, it is essential to take precaution against the spread of fire. Hence, the transformer is usually located around a sump used to collect the excess oil. Transformers that are located a cell should be enclosed in a blast proof room.

G. Overhead Line Terminations

Two methods are used to terminate overhead lines at a substation.

- 1) Tensioning conductors to substation structures or buildings
- 2) Tensioning conductors to ground winches.

The choice is influenced by the height of towers and the proximity to the substation. The following clearances should be observed as shown in Table I.

Table I. GROUND CLEARANCE

<i>Sl. No.</i>	<i>Voltage Level</i>	<i>Minimum Ground Clearance</i>
1.	less than 66kV	6.1m
2.	66kV - 110kV	6.4m
3.	110kV - 165kV	6.7m
4	Greater than 165kV	7.0m

VII. SIMULATION OF SUBSTATION EARTHING GRIDS WITH UNEQUAL-POTENTIAL

Substation earthing grids are made of interconnected conductor bars, buried under substations. The purpose of the grids is to reduce the earthing resistance of electric installations and smooth the potential gradient on the earth surface to ensure safety to the persons in the substation during short-circuit fault of the power system. The possibility of the hazard can be judged by computing the maximum step and touch voltages. The design of earthing systems must meet the requirement of the safety and the electrical properties. Meanwhile, the reduction of the earthing resistance is able to reduce the rise of the potential around the grid, caused by the fault current emanating to the earth, so that the electromagnetic interference with the communication system nearby can be decreased. In the simulation of earthing grids, most of the methods presented previously were based on equal-potential models, i.e., ignoring the resistance of the conductor and the potential drop caused by the interior resistance of the conductor. The assumption that the earthing grid is of equal-potential arises from that the resistivity or the resistance of the conductors is much smaller than that of the soil. For ordinary earthing grids, the equal-potential grid model is able to meet the requirement of general engineering design, i.e., calculation accuracy of the earthing resistance and the step as well as the touch voltage. However, if the radius of conductors supposing the conductor is in the shape of a cylinder) is very small, their resistance may cause an obvious potential difference on the grid. On the other hand, if the radius of conductors is great enough, further increasing of the radius influences the parameters of the grid very slightly, so that it is not necessary to adopt conductors of a very large radius to construct grids. Otherwise, only material consuming,

but nothing else can be achieved. Therefore, it is of great significance to investigate the proper radius of conductors for grids of certain sizes, buried in the earth of a certain value of conductivity [6-8].

Another use of the unequal-potential model is analyzing the electromagnetic interference between the communication or electronic instruments whose earthing terminals are connected to the earthing grid, but not to the same point. The potential difference of the grid may produce potential difference between the terminals, which will create electromagnetic interference between the instruments. Based on the analysis of the grid with unequal-potential model, the interference can be decreased by connecting the earthing terminals of associated instruments to the points located on or near an equal-potential line [9].

There are number of softwares which are very useful in designing high voltage substations like ESGSD (Economical Substation Grounding System Designer), GGS (Grounding Grid System) module. These softwares can be used in design of grounding system for high voltage substations for different grid shapes in two types of soil models. Software ESGSD is quite satisfactory for design of grounding system design in uniform as well as two layered soils and it also meets IEEE safety criteria [10, 11, 12, 13].

VIII. CONCLUSION

Earthing and bonding is extremely important and required for designing any substation layout. In designing the substation, three voltages (namely step, touch and mesh) have to be considered. The biggest advantage of one and half circuit breaker substation layout is that it is possible to operate any one pair of circuits, or groups of pairs of circuits. The form of circuit breaker influences the way in which the circuit breaker is accommodated. The various components of substation must be as per required standard. It is very important that metal parts required to be bonded for safety reasons are only a subset of the whole set of possible conductive parts present in electrical systems. Their identification is crucial to create an effective protection against indirect contact. The conditions that must be fulfilled to assure protection against indirect contact indeed provide the designer with effective, and safe, criteria to size the electrical installation. The simulation of earthing grids with unequal-potential is of great significance in the design of grids and the analysis of electromagnetic compatibility. The main work of simulating grids with unequal-potential is the same as that with equal-potential, which is the calculation of the resistance coefficients.

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Mild Brain Injury Detection Using Texture Features

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Abstract— Mild Brain Injury (MBI) is defined by any disruption of brain function. The long lasting MBI related symptoms have not resolved completely. It can be resolved by treated immediately. So the early detection of mild injuries is very essential. Magnetic Resonance Imaging (MRI) is used for the detection of brain abnormalities. MBI is difficult to detect because it appears as the low contrast regions of MR Images. This work presents an automated detection of mild brain injuries in MRI using texture analysis and a suitable classifier. MR Images of tissue contains a lot of microscopic information that may not be assessed visually and texture analysis provides the means for obtaining this information. It mainly consists of two stages. Texture feature extraction and feature classification. The extracted features are given as input to SVM classifier. The classifier classify image between lesion and normal.

Keywords Magnetic resonance imaging, Mild brain injury, Texture analysis, Support vector machine classifier.

INTRODUCTION

Brain imaging is a widely used medical application that is helpful in the detection of brain abnormalities. Magnetic Resonance Imaging (MRI) is a procedure used in hospitals to scan patients and determine the severity of certain injuries. An MRI uses a magnetic field and radio waves to create detailed image of the body. MRI is examined by radiologist based on visual interpretation of the film to identify the presence of abnormal tissue. Brain images have been selected for the image reference for this work because the injuries of the brain tend to affect large areas of the brain.

Mild Brain Injury (MBI) is a disease that is commonly caused by a significant blow to the head from a sports related injury, motor vehicle accident, an accidental fall, or an assault. It is evidenced by loss of consciousness, loss of memory of events before or during the trauma, or a change in emotional or mental state at the time of the accident [1]. To be classified as mild brain injury, the patient must not experience post-traumatic amnesia for more than 24 hours, and loss of consciousness, if any, may not be longer than 30 minutes. Long lasting outcome of mild brain injury related symptoms cannot be resolved completely. The best outcome occurs when the MBI is treated immediately. So this is the need for the detection mild brain injury. Recently manual studies are used to identify the location and size of lesion from MRI. But the manual detection of mild injury is often difficult and require a lot of time and it is affected by inter and intra operator variability. Operator fatigue also plays a large role since manual detection can take a long time to analyze. However manual detection is still considered as a reference and automated algorithms are compared to this standard.

Currently there is a lack of computational methods for the evaluation of mild brain injury from MRI. This is because of the subtle nature of its progression and also it appears in the low contrast regions of images. Here uses the texture analysis of the images. MR Images of tissue contain a lot of IJERGS staff will revise and reformat if required microscopic information that may not be assessed visually and texture analysis technique provides the means for obtaining the information and it is used to detect structural abnormality in each tissue. The goal is to find an accurate method for this purpose.

Mild Brain Injury is difficult to detect as it appears in the low contrast regions of MR Images[3]. It involves textural analysis of MR Images and a suitable classifier. In medical image analysis the determination of tissue type and classification of tissue abnormality are performed by using texture. Textural analysis is used to detect structural abnormality in each tissue. Textural features are used as input to classifiers in order to provide an information about lesion versus non lesion region[10]. Textural feature extraction methods are used for the extraction of features. A support vector machine classifier provides the locations of lesion.

METHODOLOGY

Mild Brain Injuries (MBI) are located at the low contrast regions of MR images. Detection of such abnormalities are difficult because of the subtle nature of its progression and low contrast appearance. Current abnormality detection approaches uses feature extraction and classification as the major steps. The accuracy of the detection depends on the type of classifier used. It combines the advantages of texture features and a suitable classifier. Databases of known injured images are taken as the reference for the accurate detection.

This method consists of two stages. Feature extraction and feature classification. All the images are MRI T2 weighted images with different views but the same resolution. The T2 weighted images shows clearer vision than other modalities. The images undergo a feature extraction process. Textural features are considered for the purpose of mild injury detection because texture features are able to identify micro structural changes that occur in the brain. The next step is the feature classification. Classifiers are used to estimate the locations of lesion and the normal appearing brain matter space. This approach performs well when there is a large amount of training data. It estimates the lesion using only visual features. The block diagram for mild injury detection is shown in Figure 1.

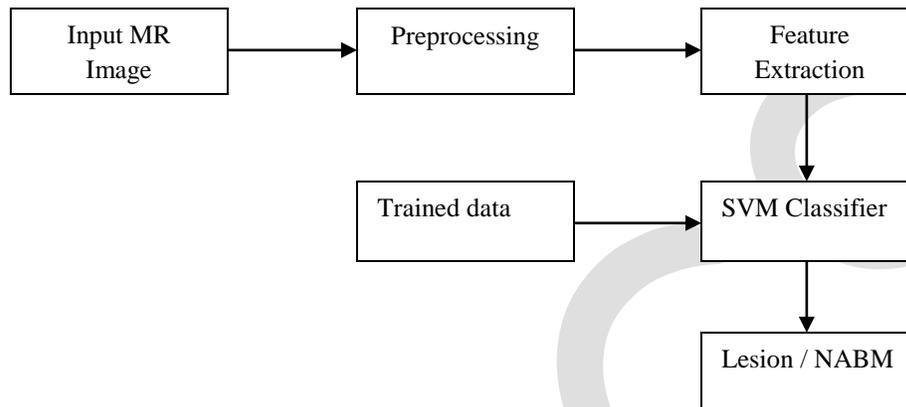


Figure 1: Block diagram of mild brain injury detection

1. PREPROCESSING

Image preprocessing is an essential procedure and the simplest categories of medical image processing. This stage is used for reducing image noise, highlighting edges, or displaying digital images. These are used to suppress noise and imaging of spectral parameters. After this stage the medical image is converted into standard image without noise[11]. Preprocessing techniques are used to improve the detection of the suspicious regions in MRI. Here the preprocessing method consists of three steps: First, the image is converted to gray scale image. Second, a median filter is used to reduce noise. Third, image equalization is applied to smooth the gray level image with an average value.

The median filter is the simpler technique and it removes the speckle noise from an image and also removes pulse or spike noise. The Median Filter is performed by taking the magnitude of all of the vectors within a mask and sorting the magnitudes. The pixel with the median magnitude is then used to replace the pixel studied.

Adaptive histogram equalization is used for enhancing the contrast of an image. It differs from ordinary histogram equalization in the respect that the adaptive method computes several histograms, each corresponding to a distinct section of the image and uses them to redistribute the lightness value of the image. It is therefore suitable for improving the local contrast of an image and bringing out more detail.

2. FEATURE EXTRACTION

Feature extraction is a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. Transforming the input image into a set of features is called feature extraction. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete the tasks[12]. If the features extracted are carefully chosen it is expected that the features set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input. Texture based feature extraction methods are used for this work. Image texture gives us information about the spatial arrangement of color or intensities in an image or selected region of an image. Texture can be defined as a descriptor of local brightness variation from pixel to pixel a local neighborhood of an image[13]. In general texture can be defined as the neighborhood property of an image. Mild injury causes texture changes in the brain with features based on region histogram statistics, co-occurrence matrix and gradient measures.

2.1 Histogram based features

The histogram-based features used in this work are first order statistics that include mean, variance, skewness and kurtosis. Let z be a random variable denoting image gray levels and $p(z_i)$, $i = 0, 1, 2, 3, \dots, L-1$, be the corresponding normalized histogram, where L is the number of distinct gray levels. The features are calculated using the above-mentioned histogram.

Mean: It gives the average gray level of each region and it is useful only as a rough idea of intensity not really texture.

$$m = \sum_{i=0}^{L-1} z_i p(z_i)$$

Variance: It gives the amount of gray level fluctuations from the mean gray level value.

$$\mu_2(z) = \sum_{i=0}^{L-1} (z_i - m)^2 p(z_i)$$

Skewness: It is a measure of the asymmetry of the gray levels around the sample mean. If skewness is negative the data are spread out more to the left of the mean than to the right. If skewness is positive, the data are spread out more to the right.

$$\mu_3(z) = \sum_{i=0}^{L-1} (z_i - m)^3 p(z_i)$$

Kurtosis: It is a measure of how outlier-prone a distribution is. It describes the shape of the tail of the histogram. That is it describes the measure of flatness of the histogram.

$$\mu_4(z) = \sum_{i=0}^{L-1} (z_i - m)^4 p(z_i)$$

2.2 Co-occurrence based features

Gray Level Co-Occurrence Matrix (GLCM) has proved to be a popular statistical method of extracting textural feature from images and it is a widely used texture analysis method. It enhances the details of image and gives the interpretation. The GLCM is a tabulation of how often different combinations of pixel brightness values (gray levels) occur in an image. The advantage of the co-occurrence matrix calculations is that the co-occurring pairs of pixels can be spatially related in various orientations with reference to distance and angular spatial relationships, as on considering the relationship between two pixels at a time. As a result the combination of gray levels and their positions are exhibited apparently.

An image of GLCM (i, j) extracts the features based on pixel and its next neighbor pixel in the image. GLCM (i, j) is a two dimensional function and it is composed of m pixels in the vertical direction and n pixels in the horizontal direction. i, j are horizontal and vertical co-ordinates of the image. The total number of pixels in the image is $m \times n = N$, where i varies from 0 to m and j varies from 0 to n . The features that are obtained by using the GLCM matrix are:

Contrast: It measures the intensity contrast between a pixel and its neighboring pixel over a whole image. It is zero for constant images.

$$contrast = \sum_{i=0}^m \sum_{j=0}^n (i - j)^2 GLCM(i, j)$$

Energy: It is a measure of uniformity through an image and it is the sum of squared elements in a GLCM. It is one for constant images.

$$energy = \sum_{i=0}^m \sum_{j=0}^n GLCM(i, j)$$

Homogeneity: The closeness of gray levels in the spatial distribution over image is inferred by homogeneity. Homogeneous textured image is comprised of limited range of gray levels and hence, the GLCM image exhibits a few values with relatively high probability.

$$homogeneity = \sum_{i=0}^m \sum_{j=0}^n \frac{GLCM(i, j)}{|1 + (i - j)|}$$

Correlation: Correlation that brings out how correlated a reference pixel to its neighbor over an image. It is uncorrelated to energy, contrast and homogeneity. It measures how a pixel is related to its neighbor pixel.

$$correlation = \frac{\sum_{i=0}^m \sum_{j=0}^n (i * j) GLCM(i, j) - (\mu_x \mu_y)}{\sigma_x \sigma_y}$$

2.3 Gradient based features

An image gradient is a directional change in the intensity or color in an image. Image gradients may be used to extract information from images. Gradient images are created from the original image by convolving with a filter. One of the simplest filter used for this purpose is the Sobel filter. Each pixel of a gradient image measures the change in intensity of that same point in the original image, in a given direction. To get the full range of direction, gradient images in the x and y directions are computed[10]. A gradient image in the x direction measuring horizontal change in intensity and a gradient image in the y direction measuring vertical change in intensity. Gray pixels have a small gradient and black or white pixels have a large gradient.

3. SUPPORT VECTOR MACHINE CLASSIFIER

Classification analyses the numerical properties of image features and organize the data into different categories. It mainly consist of two phases. Training phase and testing phase. Classification is the process where a given test sample is assigned a class on the basis of knowledge gained by the classifier during training. To make the classification results comparable and for exhaustive data analysis, we have used leave one out classification method for the SVM classifier.

The Support Vector Machine(SVM) classifier is trained by using the features obtained from the lesion and non-lesion region. Manual segmentation is taken as the ground truth for the finding lesion region. Here the lesion region is obtained by cropping or similar intensity grouping operation. Then trained the classifier by using the features obtained from the two region. After the training operation test the classifier performance by using a new input image.

Support Vector Machine is a discriminative classifier formally defined by a separating hyperplane. In other words, given labeled training data (supervised learning), the algorithm outputs an optimal hyperplane which categorizes new examples. The operation of the SVM algorithm is based on finding the hyperplane that gives the largest minimum distance to the training examples. Twice this minimum distance gives the maximum margin. Therefore, the optimal separating hyperplane maximizes the margin of the training data. This decision boundary optimally separates two classes of input data points. This decision boundary is shown in figure.2 where M is the maximum margin, that is the distance of the hyperplane to the nearest point of the two classes. The equation for the hyperplane is given by

$$y = w^T x + b$$

Where w is known as the weight vector and b is the bias. The optimal hyperplane can be represented in an infinite number of different ways by scaling of w and b. As a matter of convention, among all the possible representations of the hyperplane, the one chosen is

$$|w^T x + b| = 1$$

Where x symbolizes the training examples closest to the hyperplane. In general, the training examples that are closest to the hyperplane are called support vectors. This representation is known as the canonical hyperplane. The distance between a point x and a hyperplane is given as

$$distance = \frac{|w^T x + b|}{\|w\|}$$

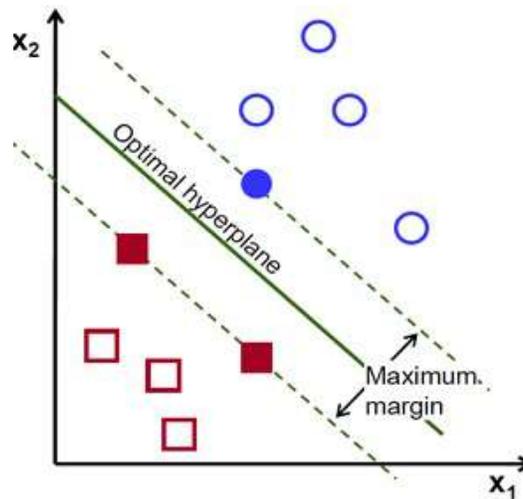


Figure2: SVM for classifying datapoints

In particular, for the canonical hyperplane, the numerator is equal to one and the distance to the support vectors is

$$distance = \frac{1}{\|w\|}$$

The distance of the hyperplane to the nearest point of the two classes is given by

$$M = \frac{2}{\|w\|}$$

Finally, the problem of maximizing M is equivalent to the problem of minimizing a function $L(w)$ subject to some constraints. The constraints model the requirement for the hyperplane to classify correctly all the training examples x_i . Formally

$$\min_{w,b} L(w) = \frac{1}{2} \|w\|^2 \text{ subject to } y_k(w \cdot x_k - b) \geq 1 \forall i$$

Where y_k represents each of the labels of the training examples. In nonlinear SVM the data points are not always be separated by drawing a straight line. In such situations the data points in input space are transformed to a higher dimensional space by using a kernel function. Many kernel functions are used for SVM such as linear, polynomial, radial basis function and sigmoid etc.

RESULTS

The dataset consist of T2 weighted MR Images having micro lesions. T2 images are of higher contrast and clearer vision as compared to other modalities. All the images are resized to 256×256 for further processing. First the image is converted to gray scale images. Figure 3 shows the re sized gray scale input image. Preprocessing stage includes noise removal and contrast enhancement. Median filter is a good choice for removing noise from MR Images. It is best suit for removing certain type of random noise from the images. Figure 4 shows the filtered image. Adaptive histogram equalization is used for improving the contrast of an image. Figure 5 shows the equalized image.

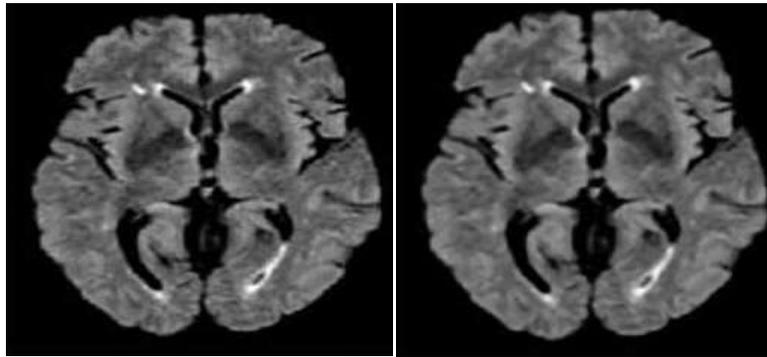


Figure 3 : Resized input image Figure 4: Filtered image

Feature is a property that represents the whole image. Here texture features are used. In the training stage features from the lesion and non-lesion regions are taken. According to these features further classification is done. Three methods are used for extracting features from the images. All the extracted features act as input to SVM classifier. It consists of two stages, a training stage and a testing stage. Classifier is trained according to the features obtained from the lesion and non-lesion regions. In the testing stage the classifier performance is analyzed by using a new image having mild injury. At the output of the classifier the correct region is detected.

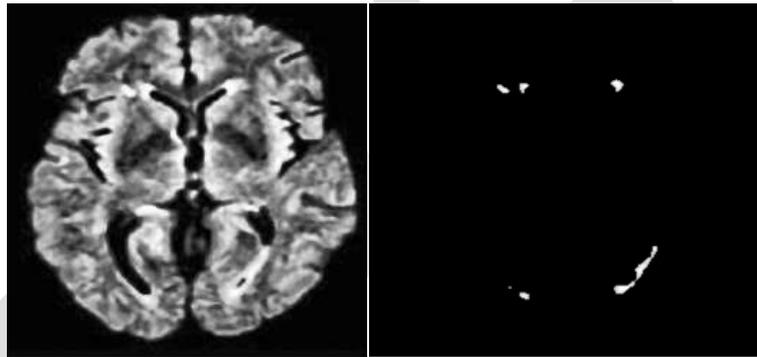


Figure 5: Contrast enhanced image Figure 6: Lesion detected image

CONCLUSION

Automatic brain abnormality detection mainly involves two steps. Feature extraction and feature classification. Selection of these two depends on the specific application. Mild brain injury is difficult to detect because it appears in the low-contrast regions in an image. It is a fully automated method for detecting mild brain injuries that uses texture analysis and classification. Texture analysis is used for obtaining the microscopic information from the images that may not be assessed visually. Here we are combining the texture features and a suitable classifier to produce a posterior probability of lesion. Detection accuracy can be with the help of large database and features.

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Emailing File through SMS

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Abstract— If mobile phones are the lifeline of communication then SMS is its heartbeat. SMS (Short Message Service) in very short time span became the most popular way of exchanging information. This project proposes a method that uses SMS as a medium to retrieve file residing on the remote client machine through email. The application is to be installed on the client machine with active internet connection. Intended user will send a SMS in specific format received by the mobile gateway connected to client machine which in turn activates the application and triggers the search process. Further parsing the received SMS, the file is searched on Remote machine and after locating it is mailed to the user..

Keywords -sms, email-file, gsm-modem

1.INTRODUCTION

The advent of mobile phones gave the world of communication a new meaning. Wireless communication forms the base of telephonic communication. New technologies related to mobile phones started surfacing in market. Development of PDA's was a boost given to this technology. Earlier PDA's like calendar, calculators, memos, etc. were parts of feature phones.[1] Integrating internet into mobile phones gave encouragement for the development of variety of PDAs. New OS's like Android, Symbian became popular and smart phones emerged. Sending and receiving emails, surfing net, downloading and uploading media was now possible to do through mobile phones. SMS though popular from early era of mobile phones, smart phones attached additional features to simple SMS. SMS was readily adopted by many sectors to provide facilities like mobile banking, e-ticketing, bill payments, railway PNR status, etc[2]. Mass acceptance of SMS to avail these services brought a revolution in above sectors and proved to be a major success factor.

2.Existing System

In today's dynamic work environment, functioning 24*7 and is largely dependent on data in its various forms like text, audio, video, images, etc. The availability of data is the key feature for smooth running of businesses which is one of the factor leading to pressures on employees to keep data intact. Files been scattered over multiple machines and in this constant run suppose if a person forgets a file on his home desktop and needs it urgently at his workplace and there is no computer educated person at his home to email this file. Going back home to take the file is also not a feasible option. Few Android apps allow you to receive remote files on mobile phones. But these apps are limited to smart phones and need internet connection on both sides. One of the most popular software used now a day to access files from remote machine is Team Viewer. Team Viewer: Team Viewer developed by Team Viewer GmbH, is a software package for remote control, desktop sharing, web conferencing and file transfer between computers. Popularly used to access the files on remote machine.

2.1 Disadvantages of existing system

- The software should be running on both local and remote sides in order to access the files.
- To establish connection between a local and remote client, TeamViewer generated ID and password of either clients are required.
- Active internet connection is required on both sides.
- Accessing the remote files and then mailing it to the other user is a time consuming process
- Teamviewer needs administrator permissions to startup. Therefore not feasible to be used in office where employees don't exercise such rights.

- In many offices it is prohibited to use such software applications.

3. Proposed System

The solution to the problem is our proposed application. EFS application facilitates user to obtain a file located on home desktop through email by sending SMS. The SMS format will include the name of the file to be search, the file location (optional), user mail address to where the file if found has to be mailed. The application on receiving this SMS will search the file on remote machine and on finding it will attach it to the email and mail it. This file search on remote machine will 1st be conducted in 'Recent Files' folder as it usually recently accessed files that we need. If the file is not found here, then the application will search rest of the pc for the file. The user can also specify a direct path of the file in the SMS. Apart from mailing the searched file the application can also upload and download files from the FTP server

3.1 Advantages compared to existing system:

- The application has to be installed only on the client side.
- No admin access required due to client side installation. User has to just send a SMS.
- Active internet connection is required only on the client side for the purpose of emailing file.
- The proposed system provides the facility of sending the searched file through Email automatically triggered only by SMS.
- The proposed system provides upload and download of files from/to FTP server.
- The entire search process and other feature of FTP are easily accessed by SMS with nominal charges from service provider.

4. System Architecture

Following two steps have to be performed by the user only one time after installing the EFS application:

4.1 Registration of mobile no.

- Start the EFS application.
- Go to Add mobile no. option and give the no. from which one desires to use EFS.
- Press Send Code button. A random code is send to your no.
- Put this code in the next verification screen and your mobile no. is successfully registered with the EFS.
- The user can also later edit or delete mobile no. details.

4.2 FTP details

- Start the EFS application.
- Go to FTP Details form.
- Fill the details of host name, user name, and password.
- Save the details.

User is now ready to use EFS application from anywhere in the world. Now the user has to only send the SMS in any of the following Formats to avail the services of EFS:

Send File - SF: SF#<FILE_NAME>#<FILE_LOCATION>#<EXACT_SEARCH(Y/N)>#<EMAIL_ID (Separated by Comma)>

File Information - FI: FI#<FILE_NAME>#<FILE_LOCATION>

File Upload - FU: FU#<FILE_NAME>#<FILE_LOCATION>#<EXACT_SEARCH (Y/N)>#<FTP_SERVER_NAME>

File Download - FD: FD#<FILE_NAME>#<EMAIL_ID(Separated by Comma)># <EXACT_SEARCH (Y/N)>#<FTP_SERVER_NAME>

File List - FL: FL#<FTP_SERVER_NAME>#<EMAIL_ID(Separated by Comma)>

The request in any of the above is processed by the EFS application and result is sent to the user.

4.3 Working

1. User sends SMS in a required format to GSM Modem
2. GSM Modem then forwards SMS to EFS Application
3. Application receives a SMS, parses it and splits the SMS into components
4. Depending on the request, application either communicates with Mail Server, FTP Server & respond back to user through SMS
 - 4.1. If request is related to File upload, Download or List then the application connect with FTP server and execute the request
 - 4.2. FTP Server gives the acknowledgement of the request
 - 4.3. If request is related to Email File then the appln connect with Mail server and execute the request
 - 4.4. Mail Server gives the acknowledgement of the request
5. Application sends a response back to user through SMS
6. GSM Modem then forwards SMS to User.

Figure 1 illustrates the System Architecture for EFS. It consists of following aspects:

A. SMS

- The user will send a SMS in specific format to EFS.
- After the request has been processed the acknowledgement is send back to user.
- File Info request results are also send to user using SMS.

B.GSM Modem

- The client PC is to be connected to the GSM modem which acts as a mobile gateway.
- This modem is responsible to receive the SMS send by the user.
- SMS is further forwarded to the EFS by this modem.

C.User Machine

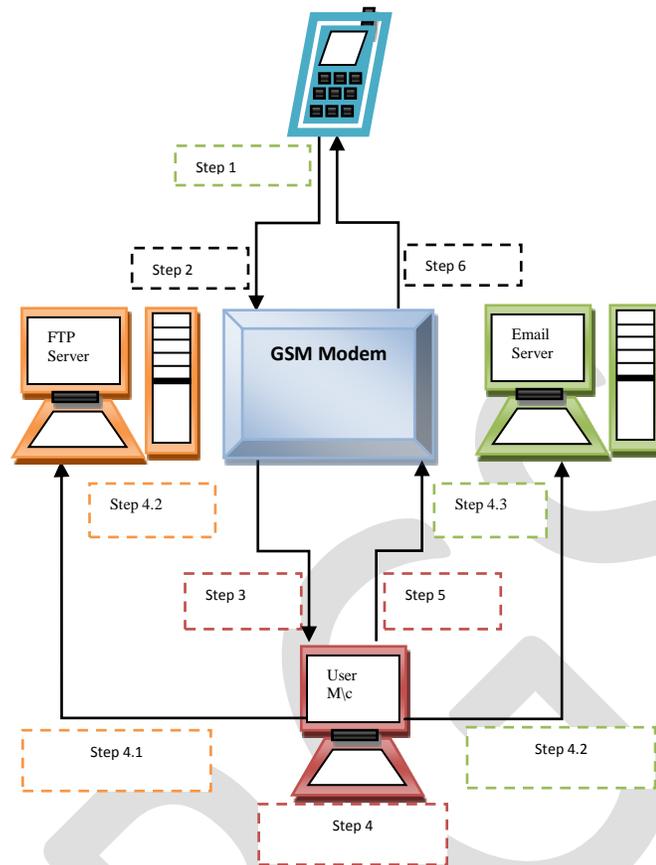
- The user machine is where the EFS application is installed.
- After receiving the SMS, it is read, parsed and processed accordingly.
- Processing depends upon the type of the request send by the user viz. FTP, File Search, File Info.
- File Info- This module will give the file related information like size, creation date, modified date and last accessed date.
- File Search- This module locates the file specified by the user in SMS in the Remote pc and forwards it to Email Server.
-

D. FTP Server

- **File Upload** - This module will actually search the file in the user remote machine and uploads the file to the FTP server mentioned in the SMS.
- **File Download** - This module will actually search the file on the FTP server and downloads the file to the user machine and mail the file.
- **File List** - Provides a list of files present on users FTP Server.

E. Mail Server:

- This Server attaches the file searched or downloaded by FTP server to mail and sends it to the email ID specified in the SMS.



5. Technology

AT Commands

- AT Commands are Attention Commands.
 - AT Commands are used for sending and receiving SMS through phones that supports them.
 - AT Commands are used for application that requires sending and receiving SMS.
 - The purpose of using AT Commands in Remote file search using SMS is to receive and send SMS from/to the mobile which is used to trigger the application.
 - AT Commands are basically used to operate the mobile phone which is acting as a modem between the remote PC and the Client phone.
 - This mobile phone /modem need to read and send SMS generated for or by the application.
- AT** - This command is used to check communication between the module and the computer.

+CMGF - This command is used to set the SMS mode.

+CMGW - This command is used to store message in the SIM.

+CMGS - This command is used to send a SMS message to a phone number.

+CMGL- This command is used to generate msg list.

+CNMI- This command gives new message indication.

+CPMS- This command is used to select preferred message storage.

5.1 .Net Framework

- Net Framework is a software framework developed by Microsoft that's runs primarily on Microsoft Windows.
- It contains built in libraries that facilitate programming in any language supported by it.

- C# language is used to develop the EFS application.

6. Conclusion

EFS Application will facilitate the user to obtain remote files anytime & anywhere through Email by using SMS which is the most effective medium of communication today.

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Factors Contributing to Students Poor Performance in Mathematics at West African Senior School Certification Examination (A Case Study: Kenema City, Eastern Province Sierra Leone)

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ABSTRACT: Performance in Mathematics by students has persistently been poor. This study sought to investigate the factors contributing to the poor performance and to establish the strategies that can be adopted to improve performance in Mathematics by students in secondary schools in Kenema City, Sierra Leone. The study to determine the school based factors that affect students' performance in Mathematics in secondary schools, socio-cultural factors that affect them and their personal factors that affect performance in Mathematics, and established the strategies that can be adopted to improve performance in Mathematics. Descriptive survey research design was adopted for the study. The target population was 100 respondents which comprised of WASSCE students in Kenema District, and 15 Mathematics teachers. The data for the research was collected by use of three questionnaires; student, and teacher questionnaires. Factors contributing to poor performance include under staffing, inadequate teaching/ learning materials, lack of motivation and poor attitudes by both teachers and students, retrogressive practices. Improving on these factors and sensitization of the local community to discard practices which prohibit student's effective participation in learning mathematics could improve performance in Mathematics. It is anticipated that the findings of this study will give curriculum developers new insights into emerging issues on performance and influence the Ministry of Education on policy formulation. Students are also expected to benefit from the findings; because improved mathematics performance will give them opportunities to pursue science related courses in higher institutions of learning and middle level colleges.

KEYWORDS: Poor Performance; Factors; Student and Teacher

ACKNOWLEDGMENT

I owe depth of gratitude to God Almighty through Jesus for giving me knowledge, wisdom and understanding throughout my academic pursuit.

My sincere thanks go to Miss Marian Johnson who works assiduously as a typist to ensure that this work comes to an end. I am particularly grateful to my wife for her architectural role in my academic activities. Thanks and appreciations go to my mother and late father, they nurtured me to the level I am today.

INTRODUCTION

As soon as children begin talking, parents begin teaching their children to recite the ABCs and count from 1 to 10. Even at an early age, parents realize the importance of teaching their children the beginning basics of reading and mathematics before they enter school (Sheldon & Epstein, 2009). Sheldon and Epstein stated, "In every school across the country, students are taught and expected to learn mathematics, beginning with number recognition in kindergarten" (p. 196). For Africa, many problems for students begin before they even enter school (Education Trust, 2008). Many children enter school with very little beginning knowledge. They come from homes in which the parents are uneducated, often cannot speak English, and possibly struggling economically. These students are entering school already at a disadvantage (Education Trust). While many young students begin mastering reading, mathematics often becomes a subject area that countless students will have difficulties and problems mastering.

Students need to be encouraged to acquire, and be provided with, the necessary academic skills to enter math and science related professions (Cavanagh, 2007b). Mastering mathematics has become more important than ever before in the world. Students with a strong background in mathematics have an advantage over those students who struggle when competing in the job market. In the job market, workers who have a strong mathematics and science background are more likely to be employed and earn more than those with lower achievement even if they have not gone to college (Department of Education, 1997). To compete in our 21st century global economy, it is critical that students leave high school knowledgeable and proficient in mathematics.

Today's graduates need to have solid mathematics skills regardless of whether they enter the workforce or continue into higher education (USDOE, 2008b). President Bush's National Mathematics Advisory Panel, convened in 2006, stated America's math education system is broken and must be fixed. This has been the same in Sierra Leone Mathematics instruction in our educational system is not preparing today's students with the skills necessary to become engineers and scientists (USDOE, 2008a). Schools must find ways to improve instruction and provide students with rich experiences in mathematics as they progress through the school system (Newton, 2007). To produce a generation of students who can compete globally will require schools to prioritize the effective teaching of mathematics (Brown. & Center for Comprehensive School Reform and Improvement, 2009). If not, then students are likely to repeat the cycle of poor learning experiences, inadequate foundational knowledge and skills, and weak educational outcomes in mathematics (Newton). One factor that may affect a student's ability to succeed academically has been associated with low self-efficacy and lack of motivation (Margolis & McCabe, 2006). Low self-efficacy causes motivational problems that hinder academic achievement. Margolis and McCabe stated, "It is not surprising that many struggling learners have low self-efficacy for academics. They believe that they lack the ability to succeed" (p. 218). Therefore, students will avoid academics and give up quickly when faced with difficulties. Other possible factors that may affect student achievement are socioeconomic status conditions and ineffective instructional strategies (Colvin, 2003). Colvin stated, "The link between socioeconomic status and academic achievement in the United States is among the strongest in the world" (p. 14). A statistical study done in Texas found that if economically disadvantaged students were lucky enough to have five consecutive above average teachers in term of effectiveness, the tight link between socioeconomics and academic achievement could be broken (Colvin). Too many students today are not learning the mathematics they will need to be successful outside the classroom. In many instances, students do not have the opportunity to learn significant mathematics.

In others, students lack the commitment or are not engaged in learning due to ineffective instruction or curriculum (National Council of Teachers of Mathematics [NCTM], 2000). Mathematical skills are a lifelong necessity. It is unclear what innovations, strategies or factors have the most impact on student achievement in mathematics on the TAKS test. Prevention and intervention programs are essential to support at-risk students. The overwhelming majority of school and district leaders do not know how to help teachers better prepare students to succeed in mathematics (Wagner, 2003). The implementation of NCLB has impacted how school districts are judged. The new law fundamentally redefines what it takes to be a successful school system, and district leaders would be wise to begin taking steps now to meet the new demands (Jerald & Haycock, 2002). Schools will no longer be judged as successful unless all students regardless of race or socioeconomic status can be taught successfully.

Statement of Problem

Long ago before the coming of Arabs and Europeans to Africa, the African people had developed their own systems of education; although the systems varied from one community to the other, their goals were often strikingly similar. At independence in 1961 education was viewed as the means to eradicating poverty, ignorance and diseases from Sierra Leone. Mathematics is seen by society as the foundation of scientific and technological knowledge that is vital in social economic development of the nation. Because of this, mathematics is a compulsory subject at both primary and secondary levels in Sierra Leone. Mathematics is also used as a basic entry requirement into any of the prestigious courses such as medicine, architecture and engineering among other degree courses. Despite the important role that mathematics plays in society, there has always been poor performance in the subject at public examinations.

Table 1. Shows the mean grades of student in WASSCE over 6 years in Kenema District.

Year	2007	2008	2009	2010	2011	2012
Mean Grade	E8	D7	D7	D7	C6	D7

Aim and Objectives of the Study

The main aim of this study was to investigate the factors that contribute to students poor performance in mathematics at the WASSCE in five (5) selected secondary schools in Kenema District. Specifically, the objectives of the study were to;

- Determine the school based/ institutional factors that affect student performance in Mathematics in secondary schools
- Establish demographic factors that affect student performance in Mathematics in secondary schools
- Establish student personal factors that affect student performance in Mathematics in secondary schools

- Devise strategies that can be adopted to improve performance in Mathematics by students in secondary schools

Significance of the Study

This study sought to identify factors contributing to student poor performance in mathematics at the WASSCE in selected secondary schools in Kenema District. Once a school is labeled by the West African Examination Council as academically unacceptable in terms of performance in WASSCE, the school must begin, almost immediately, seeking answers to why students are not successful at the WASSCE. The immediate goal is to raise exam scores and continuously search for ways to maintain exam scores. If schools can determine what factors may be hindering student achievement, then they can begin creating and implementing intervention measures that will assist in student achievement. Considering that most secondary schools in Kenema are currently rated as academically unacceptable, it is reasonable to think these schools could have lower exam scores the next school year falling victim to WAEC's lowest accountability label of academically unacceptable. The findings from this study may provide school authorities in secondary schools in Kenema with significant factors that are impacting student poor performance on the mathematics portion of the WASSCE. Therefore, school authorities may begin implementing educational innovations and interventions to directly address those factors within their own campuses to deter future hindrances.

Assumptions For the study

Several assumptions were made. The data collected from WAEC for this study were accurate. The data were uniformed and not bias. The WAEC math exam was an accurate and reliable estimate of student mathematics achievement. The data used in this study would identify factors impacting student poor performance in mathematics at the WASSCE.

1.5 Limitations of the Study

The following limitations were applicable to this study. The findings of the study were limited to Kenema District and are only applicable to large secondary schools. The validity and reliability of the data collected from WAEC were dependent on the information given at the WAEC website and regional office in Kenema. Finance was a major challenge in carrying out this study, gathering and compiling the findings.

RESEARCH METHODOLOGY

In this study, a qualitative, non-experimental, exploratory and descriptive (Babbie, 1998) approach was followed. This approach was seen as ideal, because the aim was to capture in depth views of both the mathematics teachers and their students. Such views would hopefully put into perspective, the context in which the teaching and learning of mathematics takes place. Also, the views would provide an empirical basis of what could be done to counter the contributory factors to poor performance in mathematics.

Data Sources

Both primary and secondary data were used in this research. Secondary data were obtained from books, articles, newspapers and internet sources to review literature. These were analyzed in chapter two. Secondary data were also obtained from WAEC regional office in Kenema.

Primary data were collected through questionnaire survey and face-to-face interviews.

Participants and study context

The targeted populations for the present study were students preparing for the 2014 WASSCE examination. Consent to conduct the present investigation was given by authorities in all the schools. A convenient sample of five (5) schools from Kenema was chosen. This sample was chosen in respect of poor average performance by all schools in this area. In fact, the five schools had produced low pass rates in WASSCE mathematics since 2004. Also, targeting the five schools allowed for coverage of different areas of Kenema

The participants for the study included 100 senior secondary school students randomly retrieved from five government supported schools. 40% of the student participants were females, and 60% were males. 15 mathematics teachers were also interviewed across the selected schools. The sample size was determined by financial limitations of the researcher.

Procedure

The data collection instrument was organized and pilot-tested to obtain reliability. Course calendar was reviewed to identify the most appropriate date and time of participants for the subjects' retrieve. Prospective participants were reached through randomly visits to classes at a mathematics department of a government secondary school. The purpose of the study was explained to mathematics department students, and their voluntary participation was requested. All students in these mathematics classes volunteered to participate in the study. Printed survey instruments were distributed to the students. All students completed and returned survey on the same day.

Sampling Techniques Used

The following sampling techniques were employed to select the participants for the study. These were: cluster and simple random sampling.

Cluster Sampling

Firstly, the study subjects were zoned into five clusters according to the school they attend. The sample size of 100(for students) and 15 (for math teachers) were divided equally among the five selected schools. This give a sample size of twenty (for students) and three (for math teachers) for each school, which means that 20 students and 3 math teachers were interviewed in each school.

Simple random sampling

This was used to select participants for interview. That is the first student to be contacted in each school was interviewed. If the first student was not ready, the next available student was interviewed.

Table 2. The distribution of samples from the various targeted secondary schools

School	Number of Students	Number of Teachers
Luke's Commercial Secondary School.	20	3
Holy Rosary Secondary School	20	3
Islamic Secondary School	20	3
Government Secondary School Kenema	20	3
Ansaru Secondary School	20	3
Total	100	15

Administered questionnaires were examined to check completeness, accuracy and consistency of responses in order to detect and eliminate errors. The Statistical Package for Social Science (SPSS) was used to process the quantitative data. The data were processed into statistical tables for interpretation and discussion. Processed data were analyzed both quantitatively and qualitatively. Collected instruments were reviewed for any missing data entry or errors. No missing data or error was detected. Then collected data were imported to the statistical analysis package (SPSS 13) for later analysis. Descriptive analysis, ANOVA and Post Hoc Multiple Comparison LSD test were used to answer the research questions. All statistical analyses were conducted with a significant level of 0.05.

Location and Size

Kenema is located in the Eastern Province of Sierra Leone and surrounded by the Kamboi Hills. Its coordinates in Sierra Leone are 7° 55" north and 11° 11" west. Kenema is the third largest city in Sierra Leone (after Freetown and Bo) and the Headquarter of the Eastern Province. The city lies approximately 200 miles east of Freetown and about 500 miles south of Bo. The municipality of Kenema had a population of 128,402 in the 2004 census (Sesay et al, 2006) and a more recent estimate of 188,463.

Socio-Economic Background

The city is a major trade centre and is one of Sierra Leone's six municipalities that is governed by a directly elected city council form of government, headed by a mayor. Like the rest of Sierra Leone, football is by far the most popular sport in the city.

The Sierra Leone professional football club called Kamboi Eagles, which is based in Kenema, represents the city in the Sierra Leone Premier League. Kenema is an intense commercial centre. The city has nightclubs, bars restaurants, big markets like the Kamboi Shopping Plaza that caters for different household needs. The city is characterized by deplorable road network and intermittent power supply.

Education

As in the rest of Sierra Leone, Kenema has an educational system with six years of primary school (Class 1-6), and three years of junior secondary school (JSS 1-3); four years of senior secondary school (SSS 1-4).Primary school usually starts from ages 6 to 12 and secondary school usually starts from ages 13 to 18. Primary Education is free and compulsory in government-sponsored schools. Prominent schools in Kenema include: Government Secondary Schools (GSSK), Holy Trinity Secondary School, Ahmadiyya Secondary School, Holy Rosary Secondary School, and Islamic Secondary School.

The Eastern Polytechnic, situated at the main Combema Road is the highest learning institution in the city, offering certificates and degree courses

Health

Kenema and Bo are endemic areas of a highly contagious tropical hemorrhagic fever known as Lassa fever and recently Ebola. Kenema hospital is a centre of an international effort to combat the diseases with support from The World Health Organization (WHO) and UNAMSIL. New laboratories to improve rapid diagnosis are being installed at the hospital, which admits between 250 and 500 suspected cases per year.

The District has 16 Chiefdoms and 121 functioning PHUs (which include 24 CHCs, 3 clinics located at the Kenema Government Hospital (Under 5 and School Health Clinics), 31CHPs and 62 MCHPs, and 1 mission hospital).

RESULT AND DISCUSSION

The research questions investigated students' perceptions whether or not demographic factors including gender, parents' educational level, and socio-economic status have an effect on mathematics achievement. Participants' responses were reviewed to identify the most frequently answered responses for demographic factors:

Demographic Characteristics of respondents:

Data on table 3 indicate gender of the participants of the study where male were in majority in all categories.

Table 3: Gender of Participation

Respondents	Male (%)	Female (%)
Students	55	45
Math Teachers	73.3	26.7
Total	57.4	42.6

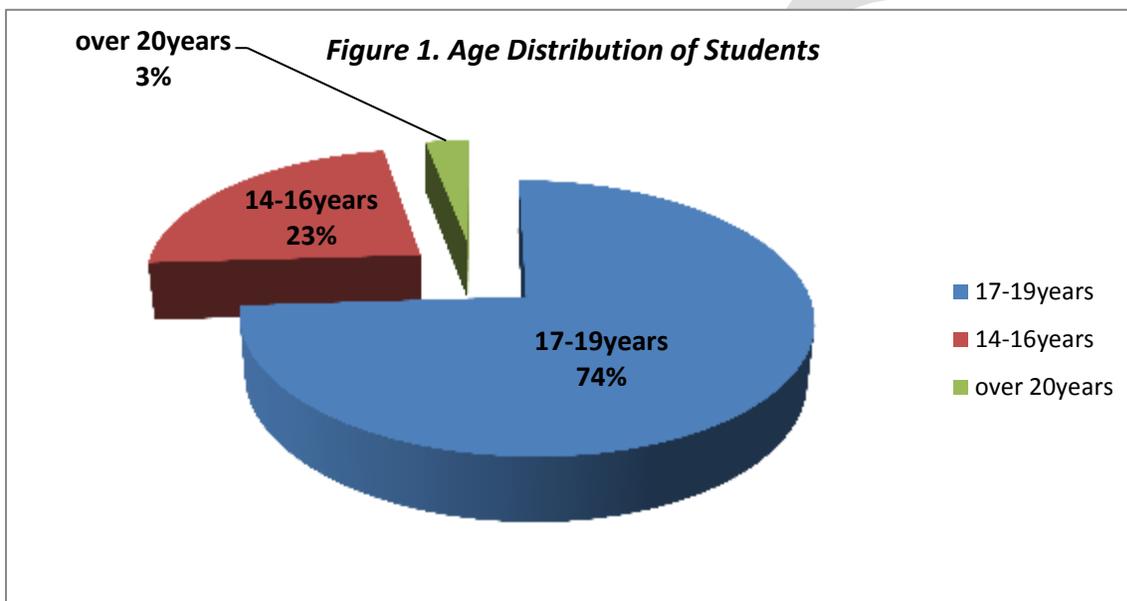
Field Survey, 2014

Performance at Basic Education Certificate Examination (BECE):

The Basic Education Certificate Examination (BECE) is entrance examination to the senior secondary school in the country. Data obtained indicate that students had a mean aggregate of five (5) in mathematics. This partly explains why there is poor performance on mathematics at the West African Senior School Examination (WASSCE).

Age of Students:

Information obtained indicate that most of students (74%) were between 17 and 19 years of age, 23% were between 14 and 16 years, 3% were over 20 years, and none were below 13 years, as shown in figure 1 below.



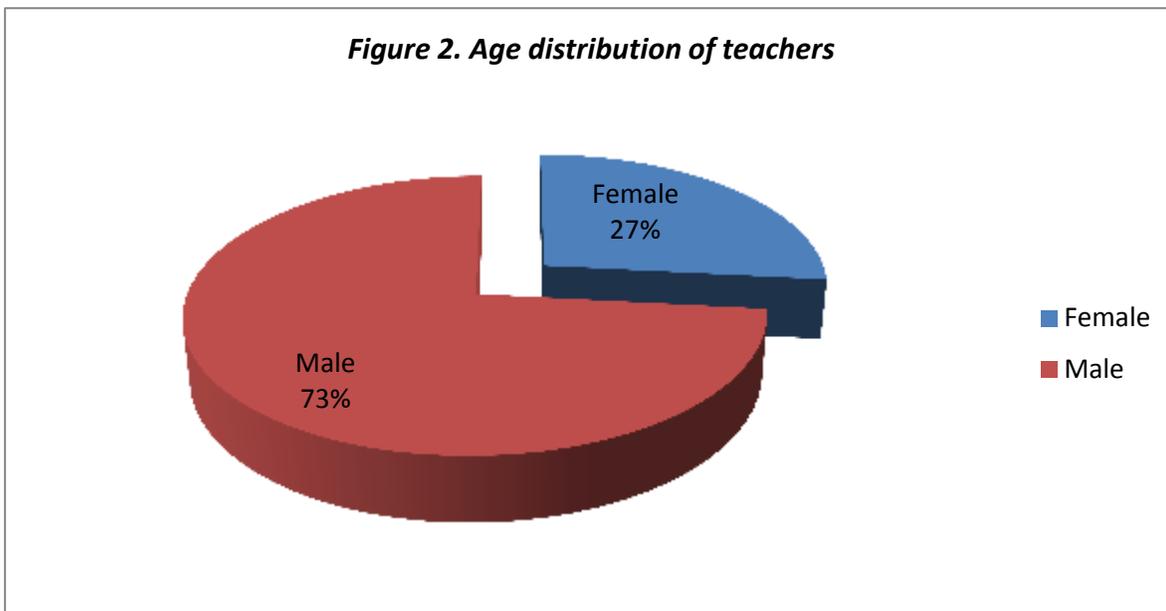
These results are normal since the Sierra Leone system of education is that pupils join class one at age six, primary education is six years and secondary six years.

Mathematics Teachers Demographic Characteristics:

The following information was obtained about mathematics teachers;

- i) The mathematics teachers who participated in the study were 26.7% female and 73.3% males. Thus there are more male teachers in secondary schools than female teachers. The same pattern was with students.

More girls need to be encouraged to take mathematics so as to have more female mathematics teachers. This data is shown in figure 2 below.



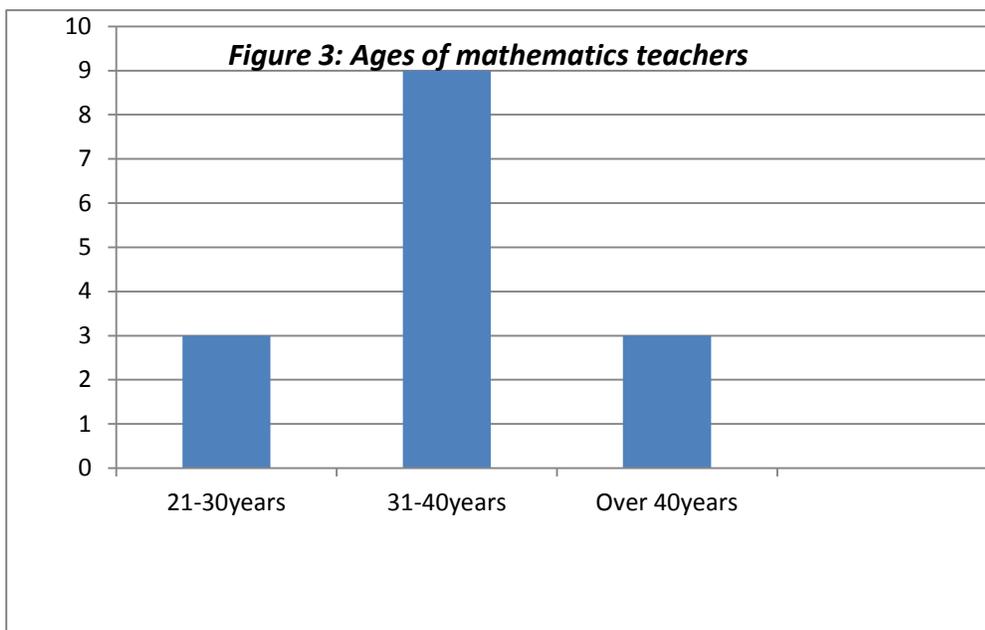
ii) Information obtained shows that 60% of the teachers are professionally trained with Bachelor of Education degrees, 40% are untrained and unqualified. Therefore, their output is expected to be average. Secondary school students appear to learn more Mathematics from teachers with degrees or significant coursework in Mathematics (Wayne & Young, 2000). Table 4 represents this information below.

Table 4: Qualification of teachers

Respondents (Teachers)	Frequency (%)
Professionally Trained	9(60)
Untrained & Unqualified	6(40)
Total	15(100)

Field Survey, 2014

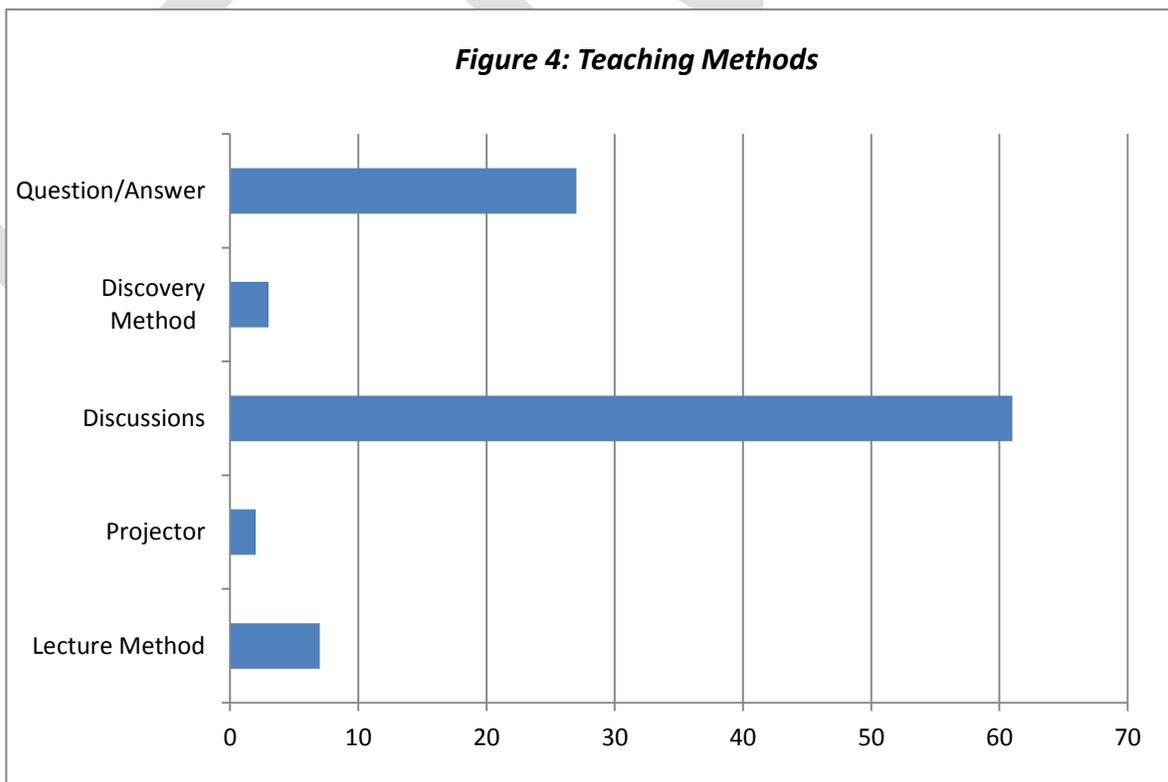
iii) Ages of mathematics teachers; between 21 to 30 years of age (20%), between 31 and 40 years (60%) and over 40 years of age (20%). These shows mathematics teachers are fairly young and are expected to be energetic in teaching the subject. The bar chart below represents the data.



School Based Factors that Contribute to Poor Performance in Mathematics:

The data was collected and analyzed;

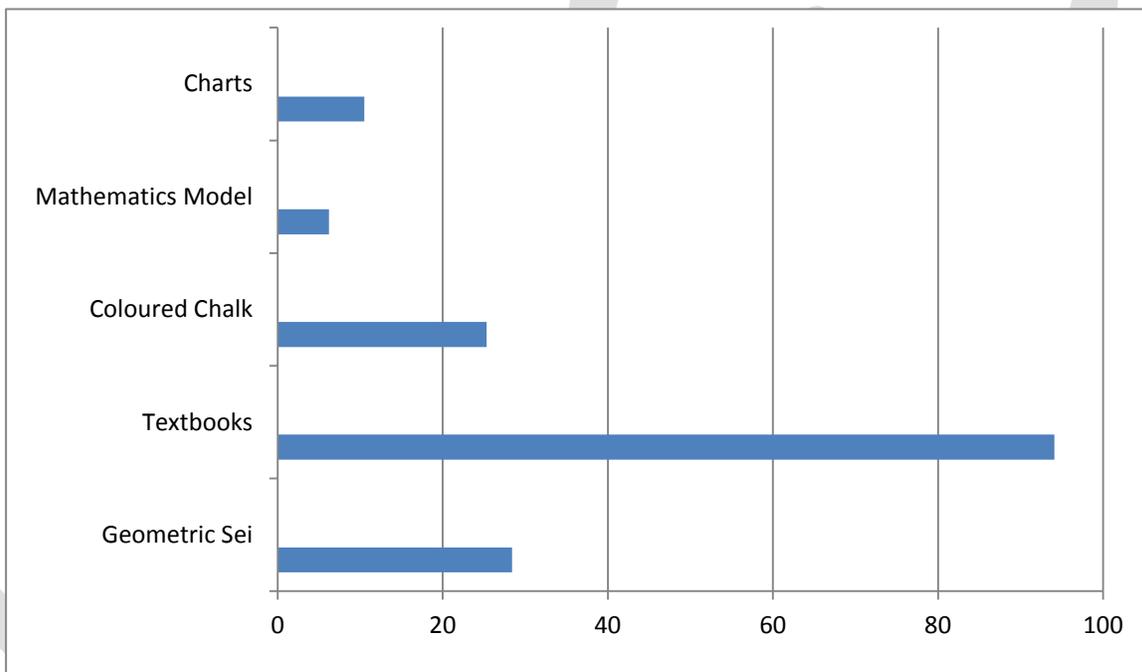
- i) **Methods of Teaching Mathematics:** Data obtained indicate that 7% of the teachers use lecture method, 2% use project, 61% use discussions, discovery method is used by 3% while 27% of the teachers use the question/ Answer method. According to (Costello, 1991) lecture method is ineffective in that it turns the learners into passive participants in the learning process. However despite the disadvantage, lecture method is useful in covering large content (SMASSE, 2007). Discussions, project and discovery methods creates an enabling environment for the learners and ensures that individual



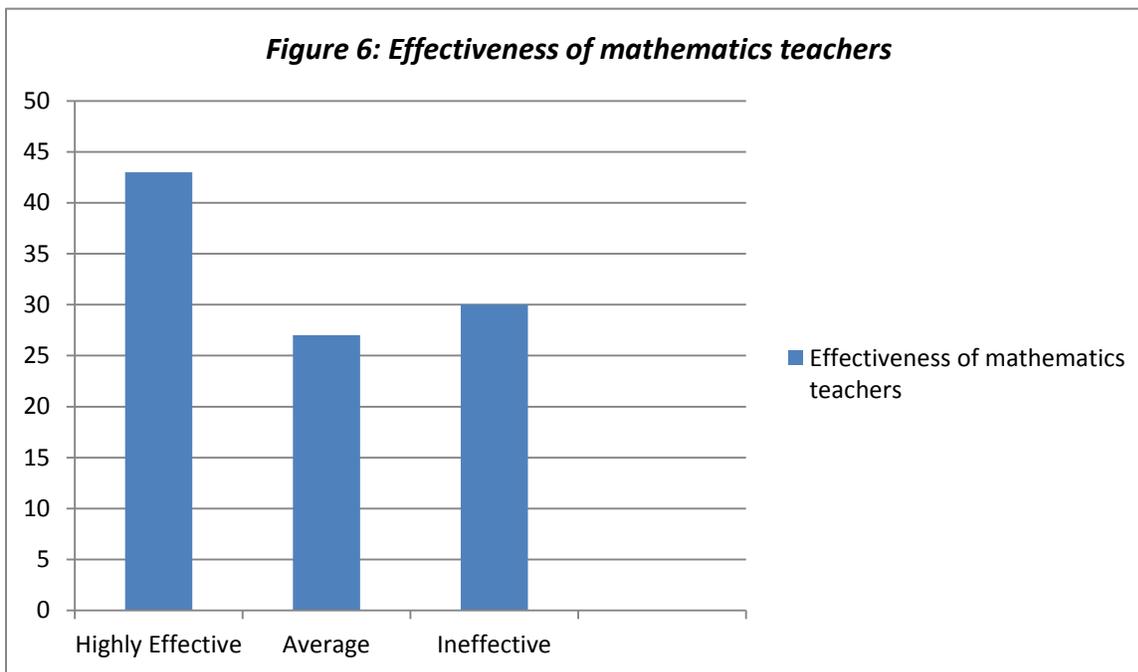
differences are taken care of.

- ii) **Teaching/Learning Materials for Mathematics:** Information obtained on availability of teaching/learning materials for mathematics in secondary schools indicate that text books are leading with 94.1%, followed by mathematics geometrical sets (28.4%) and colored chalk (25.3%). Whereas, charts and mathematics models take 10.5% and 6.2% respectively. According to Psacharopolous and Woodhall (1985) textbooks are a major input for performance in examinations. This view is shared by Chepchieng (1995) who observes that availability of and quality of textbooks in a secondary school is strongly related to achievement among children from lower income families especially those in rural boarding schools. that physical facilities contribute positively to students academic performance (Munda, Tanui & Kaberia, 2000). Also 43.5% of all students indicated that schools lacked physical facilities and the ones existing were poorly used. According to Munda, Tanui and Kaberia, (2000) physical facilities contribute positively to students' academic performance. This result is illustrated in the figure below.

Figure 5: Learning materials for mathematics



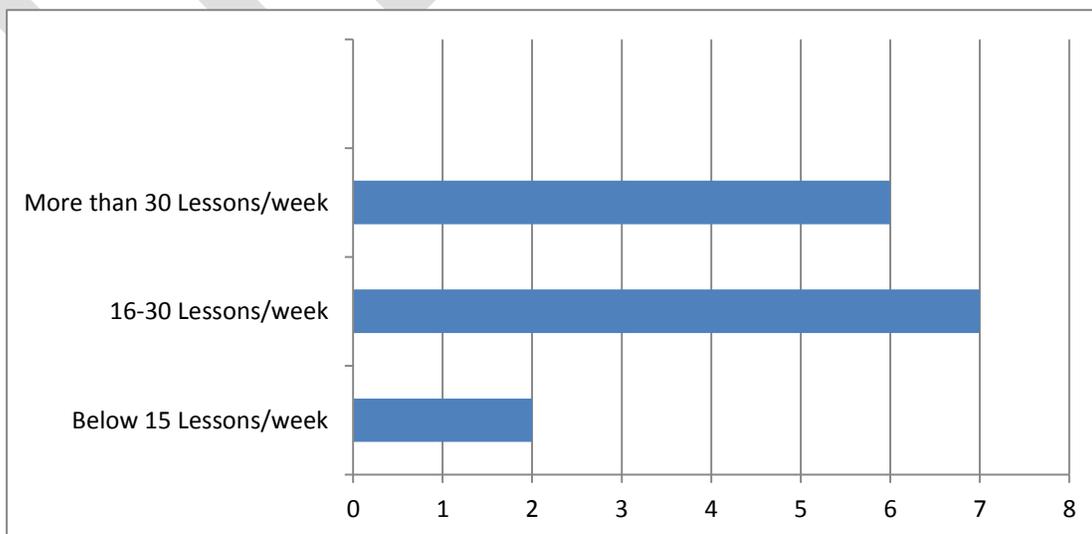
- iii) **Effectiveness of Mathematics Teachers in Teaching:** Student's opinion on the effectiveness of their Mathematics teachers in teaching the subject shows that 43% indicated that they are highly effective, 27% indicated that they are average and 30% indicated that they are not effective.



- iv) **Teachers’ Attitude towards Mathematics:** Data obtained after analyzing teachers’ responses on items soliciting their attitude towards mathematics indicate that they have a positive attitude towards the subject. The overall mean perception of Mathematics by the Mathematics teachers was 4.18 out of maximum possible score of 5.00. This implies that Mathematics teachers have a positive attitude towards Mathematics ($4.18 > 2.50$).

- v) **Mathematics Teachers’ Workload:** Data obtained shows that 13% of Mathematics teachers teach below 15 lessons per week, 47% teach between 16 to 30 lessons, while 40% teach more than 30 lessons in a week. According to the Ministry of Education (2008) a teacher in a secondary school is supposed to teach at most 30 lessons in a week. This indicates that 40% of mathematics teachers are overloaded. This percentage is high and may contribute to poor performance in mathematics.

Figure 7: Mathematics Teachers Workload



- vi) **Mathematics Remedial Lessons:** Information obtained shows that 55.6% indicate that remedial lessons are required in order to have mathematics syllabus completed. This means that the mathematics syllabus is overloaded, teachers do not plan well or learners are slow in learning mathematics.

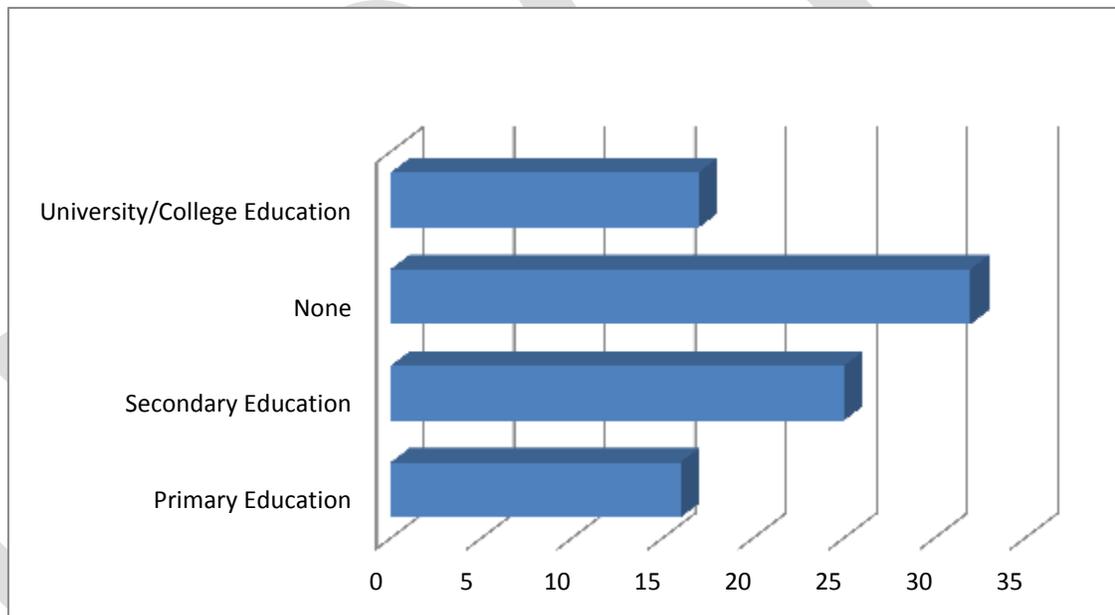
Socio economic Factors affecting Performance in Mathematics at WASSCE:

The following information was obtained on social economic factors affecting secondary school students' performance in Mathematics at KCSE;

i) **Students' Parents/Guardians Education background:**

Results in figure 7 below indicated that most parents/guardians (73%) do not have education beyond secondary school education, and only 17% have college/university education. This result reflects the high illiteracy rate in study area. Thus, they may not be good role models for their children in academic matters. Desarrollo (2007) indicated that the extent to which parents or other family members are actively engaged in a student's education had appositive influence on the student's achievement

Figure 8: Students' Parents/Guardians Educational background



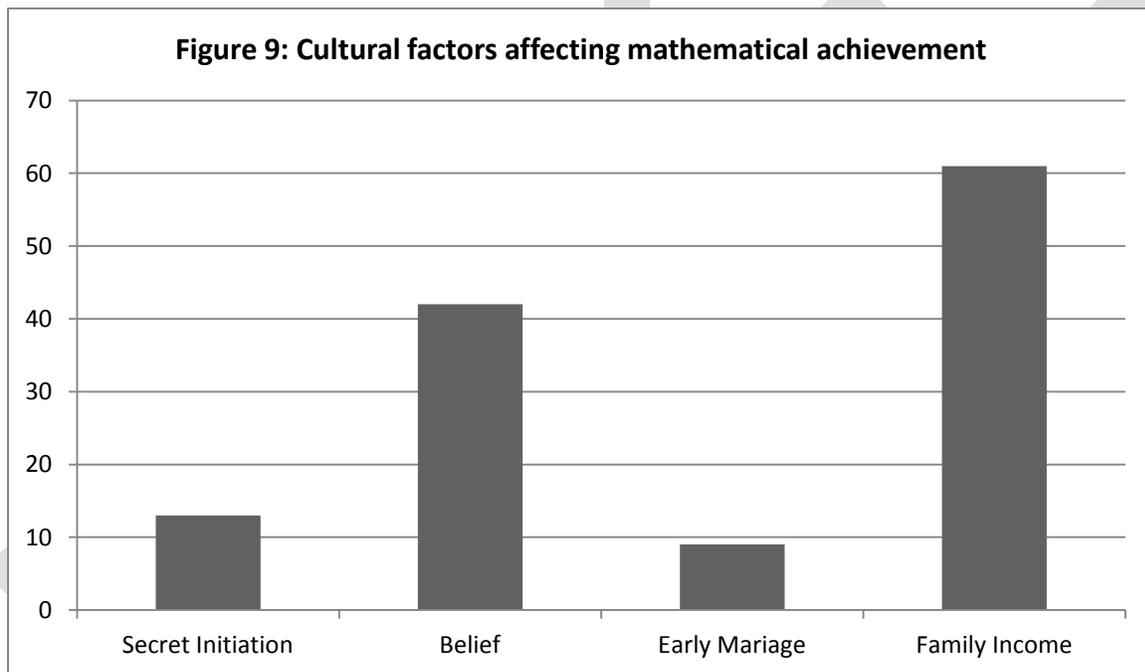
- ii) **Source of Income for Students' Parents/Guardians:** Student's parents/Guardians sources of income are farming (40%), salary (37%), Business (17%) and casual labour (6%). However, it was clearly indicated that the income is not consisted; therefore students whose parents rely on them are likely to get inadequate learning resources, and other essential requirements.

Performance from such student will always be poor. According to Conger et al 1992, 1993, 1999 low parental socio-economic status is associated with diminished resources hence contributing to lower academic achievement. Table 5 below represents Students' Parents/Guardians Education background.

Table 5: Students' Parents/Guardians Education background

Occupation	Percentage (%)
Farming	40
Salary	37
Business	17
Casual Labour	6
Total	100

i) **Cultural Factors** Mathematics teacher’s responses on socio-economic factors contributing to poor performance in Mathematics as shown in figure 8 cited secret initiation (13%), beliefs (42%), early marriage (9%) and family income (61%). Also, cultural constraints negatively impacts on achievement level among students. Children who come from insecure environments caused by socio-cultural practices such as cattle rustling, early marriages and female genital mutilation (FGM) show emotional problems at school. They lack concentration in class and confidence in whatever task they are given to do (Durojaiye, 1976).



Students Personal Factors Contributing to Poor Performance in Mathematics at WASSCE:

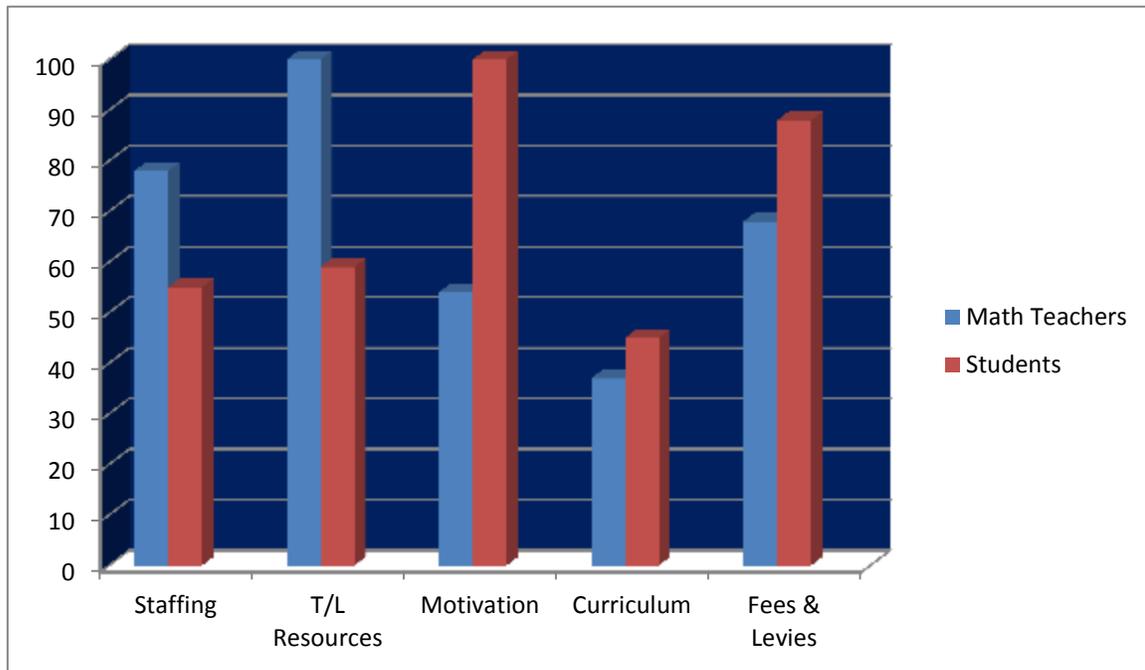
Students’ personal factors contributing to poor performance in Mathematics at WASSCE were found to be gender, economic factors and attitude towards mathematics. Students’ attitude towards mathematics was measured using likert scale and the results obtained indicated that they have a positive attitude towards mathematics. Mwamwenda (1995) argued that the achievement of students in a subject is determined by their attitudes rather than inability to study

Haimowitz (1989) indicated the cause of most failures in schools might not be due to insufficient or inadequate instruction but by active resistance by the learners. This argument suggests that favourable attitudes towards Mathematics should be developed for achievement in the subject to improve.

Strategies to Improve Achievement in Mathematics:

The strategies suggested by the students on how to improve achievement in mathematics were grouped into five areas, which comprised of staffing, teaching and learning materials, curriculum, motivation and attitudes, and fees and levies. The same strategies were identified by mathematics teachers as shown in figure 9. All mathematics teachers (100%) and all students (100%) suggest improvement in teaching/learning materials and motivation respectively, may improve achievement in the subject.

Figure 10: Strategies to improve achievement in mathematics



SUMMARY OF KEY FINDINGS, RECOMMENDATIONS AND CONCLUSION

Through the analyses, the following are the key findings of the study. These are discussed below:

Key Findings:

- Poor mathematical foundation: Most students in senior secondary school do not get a grade better than 5 in their BECE mathematics. This affects their understanding of the subject in the senior school level.
- Male domination: 73.3% of mathematics teachers in the study area are male while the remaining 26.7% are female. This gap need to be bridged if girls are to stop believing that mathematics is for boys mainly. This will brings the need for more girls to be encouraged to take mathematics seriously so as to have more female mathematics teachers.
- More mathematics teachers are needed in schools: Although a good number (60%) of mathematics teachers are trained and qualified with a Bachelors of Education in the subject, a considerable 40% who teach mathematics are still untrained.
- Teaching method: 7% of mathematics teachers are still using an ineffective lecture method in teaching the subject. This method turns the learners into passive participants. Discussion method make up for the most percentage in teaching methodology with 61% of teachers using it.
- Availability of teaching/learning materials: Textbooks are the leading available learning/teaching materials in senior secondary schools with a percentage of 94.1%. Mathematics model and charts make a combined percentage of 16.7%. Also, 43.5% of students indicated that schools lack the physical facilities and existing ones are poorly used.
- Effectiveness of mathematics teachers: A good number (57%) of mathematics teachers are not effective in their teaching. They are either average or completely ineffective in their performance.
- Mathematics teachers' workload: Mathematics teachers are overloaded with too many teaching lessons. 40% of teachers teach more than 30 lessons per week and only 15% of them teach less than 15 lessons per week.
- Mathematics Syllabus: The mathematics syllabus is overloaded and teachers do not plan well or learners are slow in learning mathematics. Therefore 56% of students indicated that remedial lessons be organized to have mathematics syllabus completed on time.

- Students' parents'/guardians' educational background: A good number (73%) of students' parents/guardians do not have education beyond secondary school. This reflects the high illiteracy rate in the study area. Parents' education level was found to be an effective factor in achievement of students in math courses similar to the results of Coleman, (1966) and Campbell, Hombo, & Mazzeo, (2000). Parents with higher level of education could be a role model for their children to accomplish high levels of achievement in math courses.
- Low parental socio-economic status: Majority of students' parent/guardians are not sustained income earners. Low parental socio-economic status is associated with diminished resources hence contributing to lower academic achievement. Socio-economic status in this study was reported as an important factor affecting the math achievement of students in math courses. Parents with high income seem to provide richer instructional resources to their children which may eventually help to improve the math scores of students. As the grade level increases, math students' opinion about the effects of socio-economic status on the math achievement increases. This finding illustrates that math students need more financial resources as they get close to graduate in math department. Deficiency of financial resources is reported as a factor that has an effect on their math achievement
- Cultural factors: Cultural practices such as secret initiation during school days, belief, early marriage, and family income are still affecting academic achievement in Kenema.
- Students' personal factors: Factors such as gender, economic factors and careless attitude towards mathematics are affecting performance at WASSCE.

Recommendation

Based on the findings of the study, the following measures are recommended for an improved performance in mathematics at WASSCE.

- i) To mitigate on the inadequacy of teaching/learning materials and equipments the government needs to enhance their provisions to schools. It should extend loan facilities and bursaries to secondary school students from poor families.
- ii) The government and other stakeholders such as Non Governmental Organizations need to sensitize the local community to discard beliefs and practices such as FGM and *moranism* that prohibit effective participation which result to poor performance in mathematics.
- iii) The Ministry of Education and schools managements should motivate teachers especially after the release of examination results. This includes recommendation for promotion, subsidizing of house rents. The provision of incentives towards mathematics courses in universities and teacher training colleges through grant-in-aids and scholarships should be considered. This will help in training more mathematics teachers.
- iv) The Ministry of Education should review the curriculum to make it relevant and flexible to the diverse needs of different regions and background of the students.
- v) Allocation of more time to the teaching of mathematics on school time tables so that mathematics syllabus can be completed on time.

Conclusion

In the study, the following objectives were set to be achieved. The first objective was to determine the school based factor that affects mathematics performance in WASSCE. Therefore, the survey established that teaching method was not wholly effective, learning/teaching are inadequate, and there is a heavy workload on teachers in teaching the subject.

The second objective was to establish demographic factors that affect students' mathematics performance in WASSCE. The survey revealed that cultural factors (secret society initiation, early marriage, belief and family income), parents' educational level and socio-economic status are having negative bearing on the students' mathematical achievement in WASSCE.

Furthermore, the study intended to establish students' personal factor. Therefore, gender, economic factor, and the careless attitude towards mathematics are affecting performance in the subject. Therefore, all the objectives set were achieved.

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Large data computing using Clustering algorithms based on Hadoop

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Abstract— The Hadoop Distributed File System (HDFS) is designed to store large data sets reliably and to stream those data sets at high bandwidth to user applications. In a large cluster, thousands of servers and host are directly attached and execute user application tasks. By distributing storage and computation across many servers, the resource can grow with demand while remaining economical at every size. Hadoop is a popular opensource implementation of MapReduce for the analysis of large datasets. To manage storage resources across the cluster, Hadoop uses a distributed user-level file system. This paper analyzes the performance of two major clustering algorithms K-means and DBSCAN on Hadoop platform and uncovers several performance issues. The experimental result demonstrates that K-means clustering algorithm is more efficient than DBSCAN algorithm based on MapReduce. Experimental results also show that DBSCAN algorithm based on MapReduce alleviates the problem of time delay caused by large data sets.

Keywords— MapReduce, Hadoop, Clustering, K-means, DBSCAN, HDFS

INTRODUCTION

Apache Hadoop is an open-source software framework that supports data-intensive distributed applications, licensed under the Apache v2 license. It supports the running of applications on large clusters of commodity hardware. Hadoop was derived from Google's MapReduce and Google File System (GFS) papers. The Hadoop framework transparently provides both reliability and data motion to applications. Hadoop implements a computational paradigm named MapReduce, where the application is divided into many small fragments of work, each of which may be executed or re-executed on any node in the cluster. In addition, it provides a distributed file system that stores data on the compute nodes, providing very high aggregate bandwidth across the cluster. Both map/reduce and the distributed file system are designed so that node failures are automatically handled by the framework.

In a larger cluster[1] the HDFS is managed through a dedicated NameNode server that hosts the filesystem index, and a secondary NameNode that can generate snapshots of the namenode's memory structures, so preventing filesystem corruption and reducing loss of data. Similarly, job scheduling can be managed by a standalone JobTracker server. In clusters where the Hadoop MapReduce engine is deployed against an alternate filesystem, the NameNode, secondary NameNode and DataNode architecture of HDFS is replaced by the filesystem-specific equivalent. In a Hadoop cluster, data is distributed to all the nodes of the cluster as it is being loaded in. The Hadoop Distributed File System (HDFS) will split large data files into chunks which are managed by different nodes in the cluster. In addition to this each chunk is replicated across several machines, so that a single machine failure does not result in any data being unavailable. An active monitoring system then re-replicates the data in response to system failures which can result in partial storage. Even though the file chunks are replicated and distributed across several machines, they form a single namespace, so their contents are universally accessible. Data is conceptually record-oriented in the Hadoop programming framework. Individual input files are broken into lines or into other formats specific to the application logic. Each process running on a node in the cluster then processes a subset of these records. The Hadoop framework then schedules these processes in proximity to the location of data/records using knowledge from the distributed file system. Since files are spread across the distributed file system as chunks, each compute process running on a node operates on a subset of the data. Which data operated on by a node is chosen based on its locality to the node: most data is read from the local disk straight into the CPU, alleviating strain on network bandwidth and preventing unnecessary network transfers. This strategy of moving computation to the data, instead of moving the data to the computation allows Hadoop to achieve high data locality which in turn results in high performance.

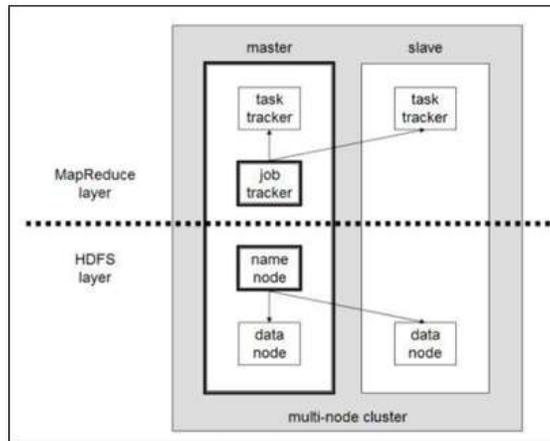


Fig. 1 HDFS setup

MAPREDUCE PROGRAMMING MODEL

MapReduce Programming Model MapReduce is a software framework proposed by Google, which is a basis computational model of current cloud computing platform. Its main function is to handle massive amounts of data. Because of its simplicity, MapReduce can effectively deal with machine failures and easily expand the number of system nodes. MapReduce provides a distributed approach to process massive data distributed on a large -scale computer clusters. The input data is stored in the distributed file system (HDFS), MapReduce adopts a divide and conquer method to evenly divide the inputted large data sets into small data sets, and then process on different node, which has achieved parallelism. In the MapReduce programming model[2] data is seen as a series of key value pairs like, the workflow of MapReduce consists of three phases: Map, Shuffle, and Reduce. Users simply write map and reduce functions. In the Map phase, a map task corresponds to a node in the cluster, as the other word, multiple map tasks are running in parallel at the same time in a cluster. Each map call is given a key-value pair (k_1, v_1) and produces a list of (k_2, v_2) pairs. The output of the map calls is transferred to the reduce nodes (shuffle phase). All the intermediate records with the same intermediate key (k_2) are sent to the same reducer node. At each reduce node, the received intermediate records are sorted and grouped (all the intermediate records with the same key form a single group). Each group is processed in a single reduce call. The data processing can be summarized as follows:

Map $(k_1, v_1) \rightarrow \text{list}(k_2, v_2)$
 Reduce $(k_2, \text{list}(v_2)) \rightarrow \text{list}(k_3, v_3)$

K-MEANS CLUSTERING ALGORITHM

K-Means is a simple learning algorithm for clustering analysis. The goal of K-Means algorithm is to find the best division of n entities in k groups, so that the total distance between the group's members and its corresponding centroid, representative of the group, is minimized the k-means algorithm is used for partitioning where each cluster's Centre is represented by the mean value of the objects in the cluster [3] K-means Pseudo code:

1. Begin with n clusters, each containing one object and we will number the clusters 1 through n .
2. Compute the between-cluster distance $D(r, s)$ between-object distance of the two objects in r and s respectively, $r, s = 1, 2, \dots, n$. Let the square matrix $D = (D(r, s))$. If the objects are represented by vectors, we can use the Euclidean distance.
3. Next, find the most similar pair of clusters r and s , such that the distance, $D(r, s)$, is minimum among all the pairwise distances.
4. Merge r and s to a new cluster t and compute the between-cluster distance $D(t, k)$ for any existing cluster $k \neq r, s$. Once the distances are obtained, delete the rows and columns corresponding to the old cluster r and s in the D matrix, since r and s do not exist anymore. Then add a new row and column in D corresponding to cluster t .
5. Repeat Step 3 a total of $n - 1$ times until there is only one cluster left.

K-MEANS ALGORITHM BASED ON MAPREDUCE

As the analysis above, PKMeans algorithm needs one kind of MapReduce job. The map function performs the procedure of assigning each sample to the closest center while the reduce function performs the procedure of updating the new centers. In order to decrease the cost of network communication, a combiner function is developed to deal with partial combination of the intermediate values with the same key within the same map task. In Map-function the input dataset is stored on HDFS [16] as a sequence file of <key, value> pairs, each of which represents a record in the dataset. The key is the offset in bytes of this record to the start point of the data file, and the value is a string of the content of this record. The dataset is split and globally broadcast to all mappers. Consequently, the distance computations are parallel executed. For each map task, PKMeans construct a global variant centers which is an array containing the information about centers of the clusters. Given the information, a mapper can compute the closest center point for each sample. The intermediate values are then composed of two parts: the index of the closest center point and the sample information. The pseudo code of map function is shown in Algorithm

DBSCAN CLUSTERING ALGORITHM

DBSCAN Clustering Algorithm The purpose of clustering algorithm is to convert large amounts of raw data into separate clusters in order to better and faster access. DBSCAN and Kmeans are two major algorithm for processing clustering problem. DBSCAN is a density-based clustering algorithm, which can generate any number of clusters, and also for the distribution of spatial data. KMeans algorithm is based on the prototype, which can find the approximate class for the given value. Compared to K-means algorithm, DBSCAN does not need to know the number of classes to be formed in advance. It can not only find freeform class, but also to identify the noise points. Class is defined as a collection contains the maximum number of data objects which density connectivity in DBSCAN algorithm. The idea of the algorithm is for all of the unmarked objects in data set D , select object P and marked P as visited. Region query for P to determine whether it is a core object. If P is not a core object, then mark it as noise and reselect another object that is not marked. If P is a core object, then establish class C for the core object P and general the objects within P as seed objects to region query to expanding the class C until no new object join class C , clustering process over. That is when the number of objects in the given radius (ϵ) region not less than the density threshold ($MinPts$), then clustering. Because of taking the density distribution of data object into account, so it can mining for freeform datasets. The following are related terms, definitions [4] of DBSCAN algorithm:

- The area in ϵ of the specified object P is called ϵ region of P .
- If the number of objects in the ϵ region of object P is not less than the given density Threshold $MinPts$, say P is a core object.
- The given dataset D , if object P is included in the ϵ region of object Q , and Q is a core Object, say P starting from Q is directly density-reachable.
- Object list $\{P_1, P_2, \dots, P_n\}$, $P_1 = Q$, $P_n = P$, for $P_i \in D$ ($1 \leq i \leq n$), if P_{i+1} starting from P_i is directly density-reachable on ϵ and $MinPts$, then P starting from Q is density-reachable on ϵ and $MinPts$.
- For the object O in the dataset D , if object P starting from O is density-reachable on ϵ and $MinPts$ and object Q starting from O is also density-reachable on ϵ and $MinPts$, then call P to Q is density-linked on ϵ and $MinPts$.
- If object P does not belong to any class, P is said to noise. DBSCAN discover classes by querying the ϵ region of unmarked objects in the dataset. If the ϵ region of an object P has the number of objects is more than $MinPts$, then create a new class based on the core object P , all of the objects in the ϵ region of P and P are belong to the same class. Objects in the ϵ region of P are treated as seeds and region query for these seeds to expanding the class until there is no new object join class.

Algorithm pseudo-code is as follows:

Input: dataset D , radius Eps , density threshold $MinPts$

Output: class C

1. DBSCAN ($D, Eps, MinPts$)
2. Begin
3. Init $C=0$; // the number of classes is initialized to 0

4. for each unvisited point p in D
5. Mark p as visited; //marked P as accessed
6. N = getNeighbours (p, Eps);
7. If sizeOf (N) < MinPts then
8. Mark p as Noise; //if sizeOf (N) < MinPts then mark P as noise
9. Else
10. C= next cluster; //create a new class C
11. Expand Cluster (p, N, C, Eps, MinPts); //expand class C
12. End if
13. End for
14. End

DBSCAN algorithm has two parameters: the radius ϵ and density threshold MinPts, Determination of parameters determine the final clustering result. On the computational complexity, if using spatial index, it can be analyzed the time complexity of DBSCAN is $O(n \log n)$, n is the number of objects in the database. Otherwise, the time complexity rises to $O(n^2)$ [5]. As we know, DBSCAN algorithm firstly determine whether an object is the core object, if it is, then continue to expand the class with the object as the center. In this process, with the increasing of core objects, the objects which are not marked are stored in memory, if there is a very large clustering in database, it will require a lot of memory space to store the core object information, and will lead to high I/O overhead, as a result, the clustering speed will be seriously affected. So this paper proposes a parallel DBSCAN clustering algorithm based on MapReduce to reduce I/O overhead and improve the clustering speed.

DBSCAN ALGORITHM BASED ON MAPREDUCE

In DBSCAN algorithm extending class is by verifies whether the given object in the dataset D is a core at the specified radius ϵ . The Algorithm takes a large part of the time spending on the region query of object. When the dataset is very large, the inputted data objects are many, serial DBSCAN algorithm to determine whether each of object is core object will consume a high I/O overhead. Researchers found that the determination of core object can be parallelized, and we can get a conclusion by analyzing the algorithm that if an object exists in two different classes, and it is a core object, then these two classes can be merged into a new class. Otherwise the object belongs to one of classes, there is no relationship between the two classes. This paper introduces a new concept - sharing object sharing object Core objects P and Q belong to different classes, if the object O starting from P, Q are directly densityreacheable, then called object O is a sharing object. And if O is a core object, called O is a sharing core object. If there exist a sharing core object in different classes, these classes can be combined into a new class. As shown in Figure 3, object O is a sharing core object: Figure 3. Clustering of Overlapping Objects in Region Obviously we can take advantage of the MapReduce programming model to parallelize the whole process to save clustering time and resources. The basic idea of DBSCAN algorithm based on MapReduce is divided into four steps [6]:

- 1) Step one: The data in the dataset cut into small blocks which are equal size.
- 2) Step two: the blocks are distributed to the nodes in the cluster, so that all of nodes in the cluster can run the Map function of themselves in parallel to calculate and process those blocks.
- 3) Initial Cluster. For any unlabeled object p in the dataset, using Map-Reduce parallel programming model to calculate the number of objects in its region to determine if it is a core object. If is, P and all the objects in the region of P constitute an initial class (C), and marked those objects with the same cluster identifier (Cid). Conversely, if p is not a core object, and there is no other object in its region, marked P as noise. Otherwise, detect whether there has a core object q in the region of non-core object p. If has, given the object p and the objects in the region of q with the same cluster identifier. Repeat until all of the objects in the dataset are identified. After the process is completed, get an initial class clusters and a noise set.
- 4) Merge Result. Class merging is to consider these objects which exist in more than two classes. If there is a sharing core object, merging the two classes. Else classify the object as the proximity side. It will be given a new class name if there have different classes are combined. When there is no object exist in different classes, mergering initialize class completed. 3. Step three: merge the result of each processor. 4. Step four: Output clustering results. Figure 3 shows the ideas of DBSCAN algorithm based on MapReduce, the data

exchange format of each stage is, and the object identifier Oid as the key, value is filled with (core_tag, used_tag, Cid, x, y, and z). Core_tag indicates whether it is a core object, used_tag identify whether there had been clustering, Cid means class logo .Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

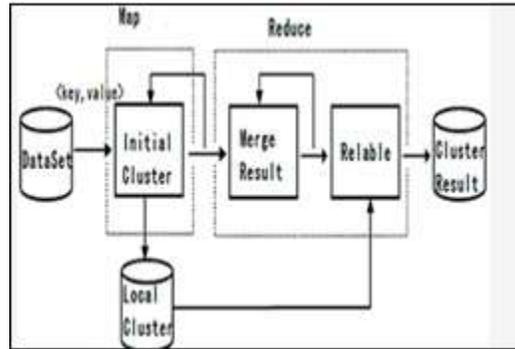


Fig.3 DBSCAN with MapReduce

EXPERIMENTAL RESULTS

For the test, we have taken a data set and selected a key value pair. After implementing DBSCAN algorithm based on MapReduce we get the following result. The output in fig 4. Displays the execution time taken by DBSCAN algorithm on Hadoop MapReduce Framework. Similarly, after implementing k-means clustering algorithm on Hadoop for same data set and same key value pair we get the execution time as shown in fig.5. Table I summarizes the execution time taken by both the algorithms on Hadoop

Experiment 1: Execution time taken by K-Means algorithm and DBSCAN clustering algorithm based on Hadoop for the same documents.

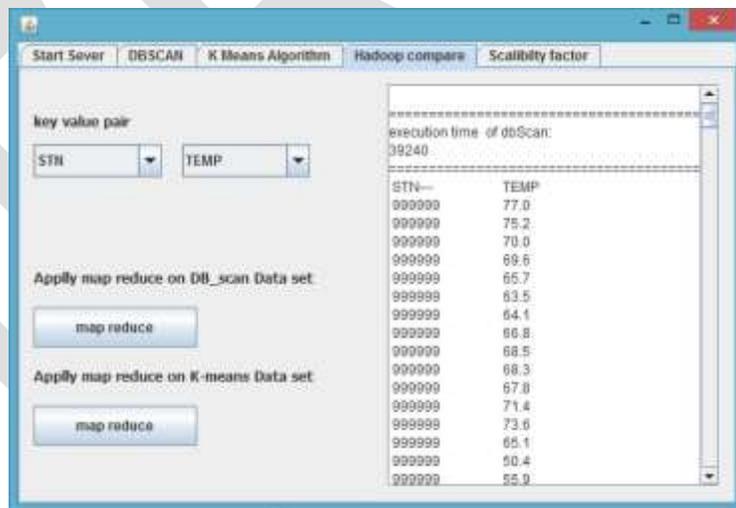


Fig. 4 Execution time taken by DBSCAN

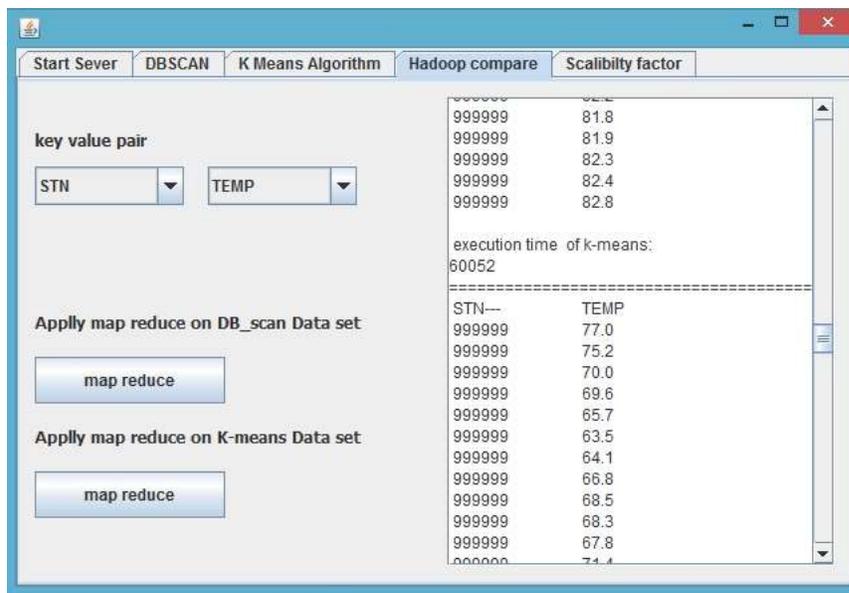


Fig.5 Execution time taken by K-means

Table 1 Execution time table

Clustering Algorithm	DBSCAN algorithm	K-means algorithm
Execution time in seconds(s)	39.240	60.052

Experiment 2: As the number of nodes increases the time taken by each algorithm is as follows

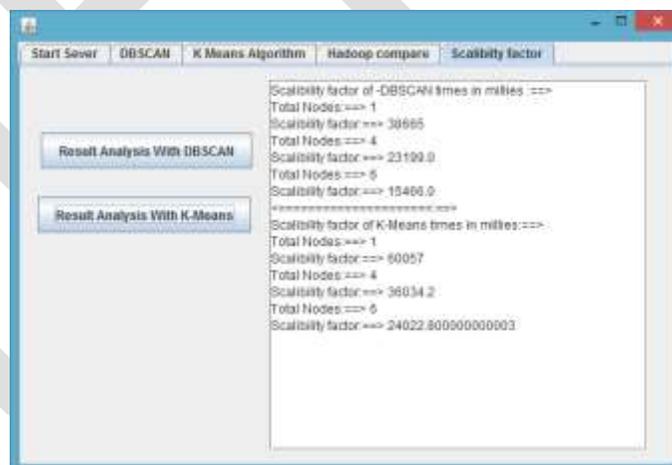


Fig. 6 Scalability Factor based on number of nodes

Table 2 Time taken by both algorithm as number of nodes are increased

Number of nodes	2	4	6
Time taken by DBSCAN algorithm in seconds(s)	38.665	23.199	15.466
Time taken by K-means algorithm in seconds(s)	60.057	36.034	24.022

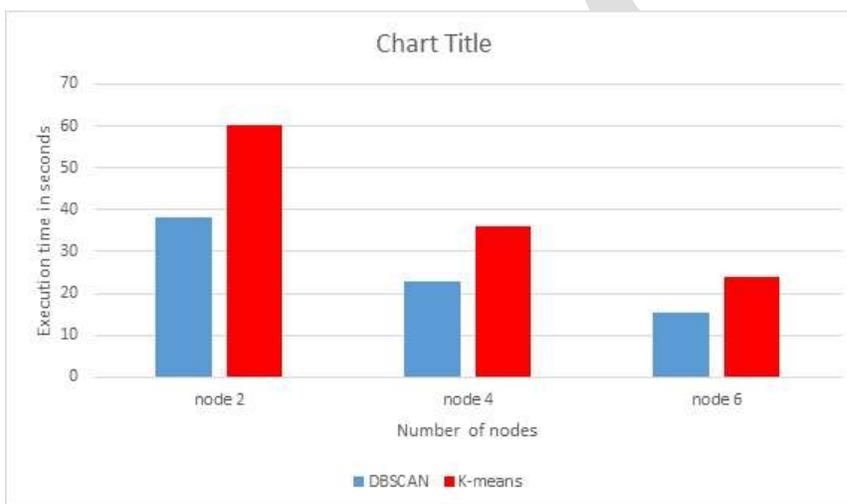


Fig. 7 Execution time taken by both algorithms as number of nodes are increased

CONCLUSION

DBSCAN and K-means are two major algorithm for processing clustering problem. These algorithms can automatically cluster the data making full sense of the Hadoop cluster performance.

The main deficiency with K-means clustering algorithm is we have to set the number of clusters to be generated in advance and it is also sensitive to noise and outlier data. Compared to K-means algorithm, DBSCAN does not need to know the number of classes to be formed in advance, it can not only find freeform classes but also identify noise points.

As per the results obtained K-means clustering algorithm performed on Hadoop alleviates the problem of time delay caused by increasing the number of nodes.

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Characteristic Evaluation of Blended Cement Concrete

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Abstract— This paper summarized the research work on evaluation of ternary blended cement containing Metakaolin & Fly ash .compaction factor test, slump cone test, flow table test was carried out on fresh concrete to check the workability while compressive strength, flexural strength, split tensile strength, impact strength was carried out on hardened concrete. A concrete mix of grade M40 was investigated by keeping water-binder ratio as 0.4. Initially workability and strength characteristics of binary blend was carried out by replacement intervals of 5%, 10%, 15%, 20%. Similarly workability and strength characteristics of Ternary bend was found out by replacement intervals of 5%, 10%, 15%, 20%^[1]. Result states that by increasing percentage of fly ash, workability goes on increasing while by increasing percentage of metakaolin workability goes on decreasing^[1]. It was observed that, percentage change in strength of concrete when fly ash is used is varying for various duration. But when Metakaolin was used, the percentage change in strength for various durations is almost constant^[2]. Thus from above conclusions we get an idea about using both the materials i.e. fly ash and metakaolin, as a replacement in concrete together. It was evident from the tests of workability as well as on strength, that combination of 5% FA and 20% MK increase strength as well as makes the concrete more workable^[3].

Keywords— Metakaolin, Fly-Ash, Binary, Ternary Blend, workability, Compressive strength, split tensile strength, impact value.

INTRODUCTION

Concrete is mostly used material worldwide because of its certain advantages such as general availability of ingredients, mouldability of fresh concrete and durability of hardened concrete^[3]. But this popularity of concrete causing the adverse effect on environment. The main constituent of concrete is cement which causes about 7% of global warming And CO₂ emission and which require huge amount of energy for its production. Also problem of disposal of waste generated due to combustion of coal. Flyash is major waste product of thermal power plant. So there is need to replace the cement by any other cementitious material which overcomes above disadvantages. There are various types of supplementary cementitious material like silica flume, fly ash , GGBFS, Metakaolin, In this work, an extensive study using metakaolin and fly as binary mix its combinations as ternary mix has been carried out. Use of Portland cement construction is one of the major reasons for Co₂ emissions. Metakaolin is obtained by thermal activation of kaolin clay which reduces Co₂ emissions & reduce heat of hydration caused due to Portland cement, while fly ash is waste generated by thermal power plant used as partial replacement of cement as well as additive to provide environmental consistent way of its disposal & reuse^[12].

1. To find the optimum proportion of metakaolin that can be used as a replacement/ substitute material for cement in concrete.
2. To find the optimum proportion of Fly Ash that can be used as a replacement/ substitute material for cement in concrete.
3. To evaluate compressive and tensile strength of metakaolin and fly ash replaced concrete specimens.

II. MATERIALS AND METHODOLOGY

A. Metakaolin

Metakaolin is classified as a new generation of supplementary cementitious material^[5]. Supplementary cementitious materials (SCMs) are finely ground solid materials that are used to replace part of the clinker in a cement or cement in a concrete mixture. Use of metakaolin in cement-based systems, provides technical as well as environmental benefits. Metakaolin is unique in that it is not the by-product of an industrial process nor is it entirely natural; it is derived from a naturally occurring mineral, and is manufactured specifically for cementing applications^[2]. Metakaolin is usually produced by thermal treatment, i.e., calcination of kaolin clays within a definite temperature range. The main process important for production high reactivity pozzolana from kaolin clay is calcination. The heating process drives off water from the mineral kaolinite (Al₂O₃+2SiO₂+2H₂O), the main constituent of kaolin clay, and collapses the material structure, resulting in an amorphous alumino-silicate (Al₂O₃.2SiO₂), meta-kaolinite.

TABLE.I. PHYSICAL PROPERTIES OF METAKAOLIN

PHYSICAL PROPERTIES	METAKAOLIN
Physical form	Powder
appearance	Dark grey
Specific Gravity	2.5
Mean grain size (µm)	2.54

Specific area cm ² /gm	150000-180000
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TABLE.II. CHEMICAL PROPERTIES OF METAKAOLIN

CHEMICAL COMPONENT	PERCENTAGE %
SiO ₂	60-65
Fe ₂ O ₃	1.00
Al ₂ O ₃	30-34
CaO	0.2-0.8
Na ₂ O	0.5-1.2
K ₂ O	0.5-1.2
Mn ₂ O ₃	0.22

B. Fly Ash

Fly ash, also known as flue-ash, is one of the residues generated in combustion, and comprises the fine particles that rise with the flue gases^[15]. Ash which does not rise is termed bottom ash. In an industrial context, fly ash usually refers to ash produced during combustion of coal. Fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys of coal-fired power plants, and together with bottom ash removed from the bottom of the furnace is in this case jointly known as coal ash^[16]. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide (SiO₂) and calcium oxide (CaO). There are basically two classes of fly ash as defined by ASTM C618 as:-

1. Class F Fly ash
2. Class C Fly ash.

Differences between these two classes are based on the amount of Calcium, Silicon, Aluminum, & Iron content in ash. Chemical property is largely influenced by the chemical content of fly ash.

Physical properties help in classifying the coal ashes for engineering purposes and other engineering properties. Some of the properties are specific gravity, grain size distribution, index properties, free swell index and specific surface.

TABLE.III. CHEMICAL COMPOSITION OF FLY ASH

CHEMICAL COMPOSITION	PERCENTAGE (%)
Silica (SiO ₂)	49-67
Alumina (Al ₂ O ₃)	16-29
Iron Oxide (Fe ₂ O ₃)	4-10
Calcium Oxide (CaO)	1-4
Magnesium Oxide (MgO)	0.2-2
Sulphur (SO ₃)	0.1-2
Loss of Ignition	0.5-3.0

Other than the above substitute materials; Cement, fine and coarse aggregates were used and tested for various properties.

C. Concrete Mixes

In this study, the early age properties of fresh concrete and mechanical performance and tensile strength of hardened concrete were examined^[10]. All tests were conducted using the following sample groups:

1. Conventional concrete,
2. Cement is replace with 5%, 10%, 15%, 20% FA.
3. Cement is replace with 5%, 10%, 15%, 20% MK
4. Cement is replace with combination of fly ash and MK by 5% ,10%,15%,20%
5. Each of the above samples was tested for compressive strength, split tensile strength and workability tests.

D. Workability

The workability of various mixes was assessed by determining the compacting factor, Slump value and flow percentage as per the IS-1199:1959 specifications.

III. RESULTS & DISCUSSION

A. Workability:

Freshly mixed concrete for various proportions were tested for workability by three methods, viz. compacting factor, flow percentage and slump value^[9]. It was observed that, the workability increases with increase in fly-ash content in the mix. The mix with cement as the only binder, the workability was medium. An attempt has been made to correlate the increase in workability as a function of fly-

ash content in the fly ash concrete. The variation of each workability measure with fly-ash content is presented in Table IV. From table, the values of compaction factor, flow percentage and slump value has shown increase with increase in fly-ash addition. But with increase in Metakaolin content the workability reduces to make concrete poor in workability and handling.

TABLE.IV. WORKABILITY OF CONCRETE MIXES:

SR NO	MIX	SLUMP OF CONCRETE (mm)	COMPACTION FACTOR	FLOW (%)	WORKABILITY
1.	PCC	89	0.887	70	Medium
2	5 % FA	90	0.86	70	Medium
3	10 % FA	95	0.89	77	Good
4	15 % FA	107	0.92	90	High
5	20 % FA	121	0.97	92	High
6	5 % MK	78	0.85	75	Medium
7	10 % MK	75	0.8	68	Low
8	15 % MK	67	0.76	65	Low
9	20 % MK	58	0.75	59	Poor

TABLE.V. WORKABILITY OF TERNARY BLENDED CEMENT CONCRETE

SR. NO.	MIX COMBINATION	SLUMP (mm)	C.F.	FLOW TEST (%)	WORKABILITY
1.	Conv. Concrete	89	0.887	70%	Medium
2	5%FA+5%MK	66	0.87	79%	Medium
3	5%FA+10%MK	58	0.85	73%	Medium
4	5%FA+15%MK	50	0.77	65%	Low
5	5%FA+20%MK	42	0.75	58%	Poor
6	10%FA+5%MK	79	0.89	69%	Medium
7	10%FA+10%MK	68	0.83	74%	Medium
8	10%FA+15%MK	61	0.80	74%	Medium
9	10%FA+20%MK	45	0.76	62%	Low
10	15%FA+5%MK	113	0.92	89%	High
11	15%FA+10%MK	104	0.95	92%	High
12	15%FA+15%MK	89	0.86	73%	Medium
13	15%FA+20%MK	81	0.84	70%	Medium
14	20%FA+5%MK	120	0.97	94%	High
15	20%FA+10%MK	109	0.97	95%	High
16	20%FA+15%MK	93	0.90	76%	Medium
17	20%FA+20%MK	87	0.85	75%	Medium

Fig.1. reveals that the value of slump decreases with increase in % of MK in blend and slump increases with increase in the % of FA in the blend.

This may be because the pozzolonic activity of MK is higher than that of FA, hence on addition of water MK uses it faster than the FA.

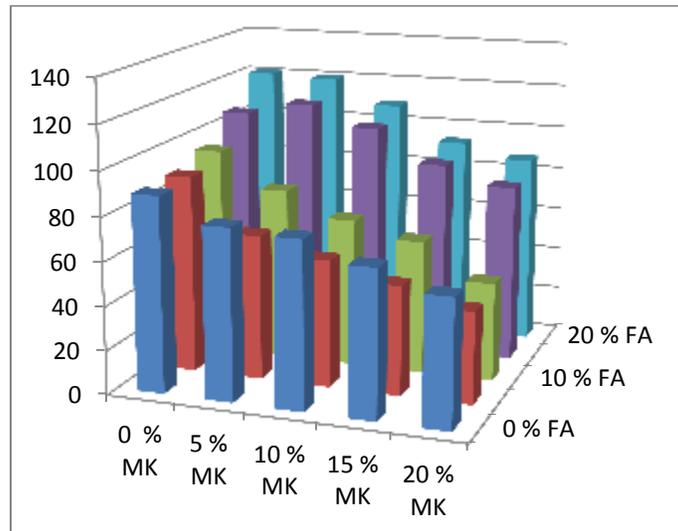


Fig.1. Graph of slump showing ternary blend cement replacement

It is evident that from fig. 2 that the value of compaction factor decreases with increase in % of MK in blend and compaction factor increases with increase in the % of FA in the blend.

This may be because the particle size distribution of the substitution materials used are finer than that of cement, hence they are denser and occupies more surface area, also due to workability there is good response in compaction of concrete

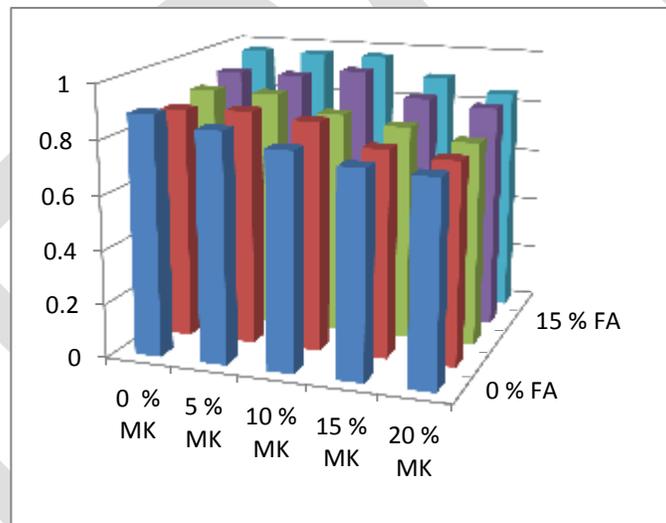


Fig.2. Graph of compaction factor showing ternary blend replacement

It is evident that from fig.3 that the flow value initially shows trend of increment upto 5% and then decreases with increase in % of MK in blend and flow value increases with increase in the % of FA in the blend.

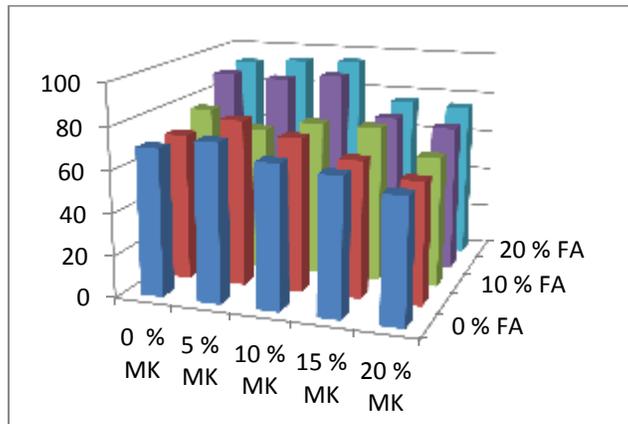


Fig.3. Graph of flow value showing ternary blend cement replacement

B. Compressive Strength behaviour of blended cement concrete.

TABLE.VI. COMPRESSIVE STRENGTH TEST RESULTS

REPLACEMENT LEVELS (%)	COMPRESSIVE STRENGTH (MPA)		
	3 DAYS	7 DAYS	28 DAYS
PCC	25.78	32.44	41.78
5 % FA	23.56	35.56	41.33
10 % FA	22.89	34.22	40.44
15 % FA	21.78	32.22	38.67
20 % FA	20.89	30.67	37.78
5 % MK	25.56	33.33	42.22
10 % MK	27.11	35.11	44.89
15 % MK	28.22	36.44	47.11
20 % MK	27.33	35.56	43.46

The table shows results of compressive strength for various replacements in cement.

Fig.4 reveals that when cement is replaced the compressive strength has reduced this might be because the FA is good in workability and might have hampered the water cement ratio to reduce the strength. When MK is used there has been a substantial rise in the strength upto 20%.

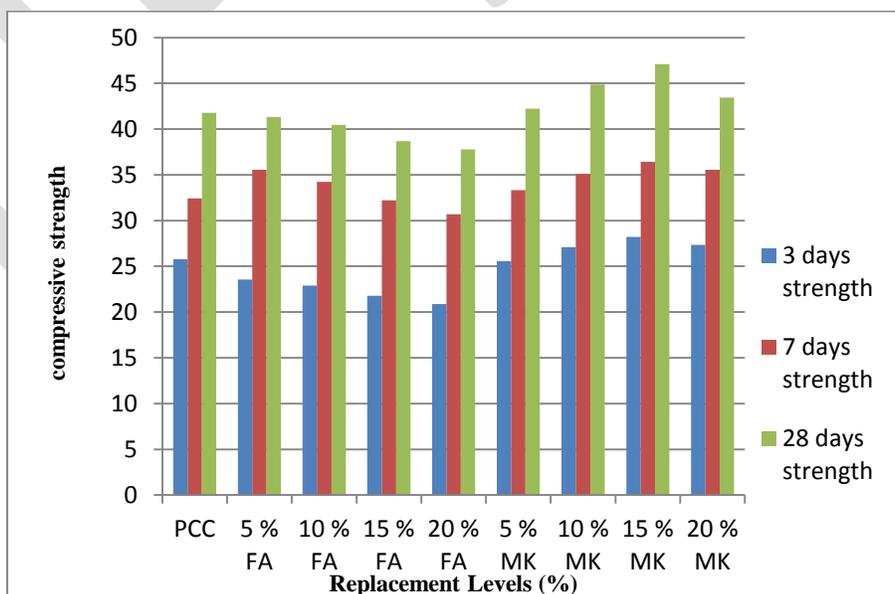


Fig.4. Graph of compressive strength for individual replacement

C. Split-tensile strength behaviour of blended cement

TABLE.VII. SPLIT-TENSILE TEST RESULTS

SR. NO.	REPLACEMENT LEVELS		SPLIT TENSILE STRENGTH
	FA FOR CEMENT	MK FOR AGGREGATE	28 DAYS
1	0	0	4.53
2	5	0	4.84
3	10	0	4.73
4	15	0	4.56
5	20	0	4.10
6	0	5	3.75
7	0	10	4.74
8	0	15	4.46
9	0	20	3.96

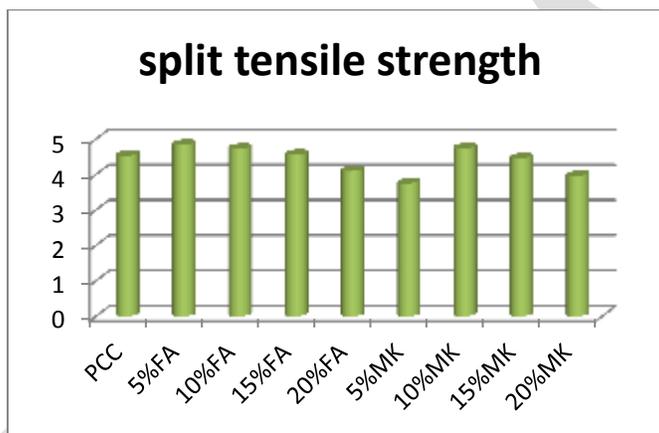


Fig.5. Graph of Split tensile strength for individual blend replacement

As shown in the fig.5, PCC strength is better than FA replacement but lesser than MK replacement.

As FA is only an admixture which improves the workability, it helps in increasing and maintaining the tension upto 15% replacement and again drops moderately in comparison of PCC. Whereas MK addition shows reduction in tension capacity of concrete. Only at 10% MK addition split tensile capacity has increased.

TABLE IX. 28 DAYS FLEXURAL STRENGTH FOR VARIOUS REPLACEMENTS

SR. NO.	MIX COMBINATION	AVERAGE FLEXURAL STRENGTH
1.	Conv. Concrete	6.39
2	5 % FA	5.49
3	10 % FA	5.46
4	15 % FA	5.44
5	20 % FA	4.7
6	5 % MK	6.59
7	10 % MK	6.93
8	15 % MK	7.20
9	20 % MK	6.39



Fig.6. Graph of flexural strength for various replacement

TABLE NO. VIII. COMPRESSIVE STRENGTH & SPLIT TENSILE STRENGTH VALUES FOR TERNARY MIX REPLACEMENTS

SR. No.	REPLACEMENT LEVELS		COMPRESSIVE STRENGTH 28 DAYS	SPLIT TENSILE STRENGTH
	FA FOR CEMENT	MK FOR CEMENT		
1	0	0	41.78	4.53
2	5	5	41.78	3.89
3	5	10	43.11	4.13
4	5	15	49.78	4.67
5	5	20	45.89	5.77
6	10	5	41.33	5.45
7	10	10	42.67	4.97
8	10	15	46.34	6.23
9	10	20	43.56	5.67
10	15	5	41.45	4.89
11	15	10	41.67	5.13
12	15	15	45.12	4.45
13	15	20	42.56	4.05
14	20	5	40.67	3.97
15	20	10	41.34	3.78
16	20	15	44.67	4.35
17	20	20	43.11	3.77

Fig. 7 shows that for ternary blend the compressive strength increases to certain limit and finally decreases beyond that limit. This might be for the addition of MK which is a good pozzolonic additive and to certain extent FA improves the workability hence it also adds to the concrete strength.

Fig.8 shows the graph of flexural strength. The variation in reading is observed as trend showing increase in flexural strength upto 15 % of combinations and then decrease in values of strength.

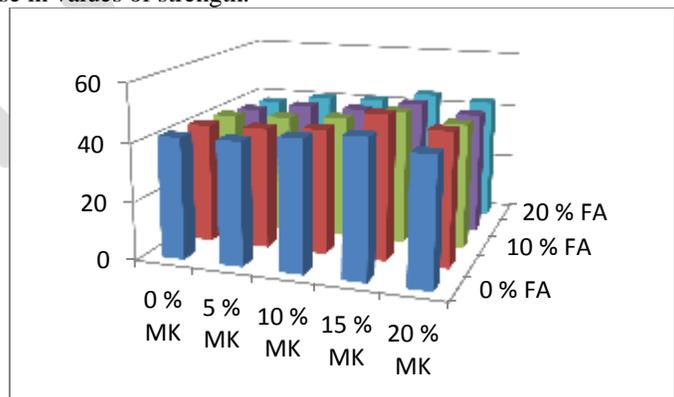


Fig.7. 28 Days compressive strength of ternary blended cement concrete

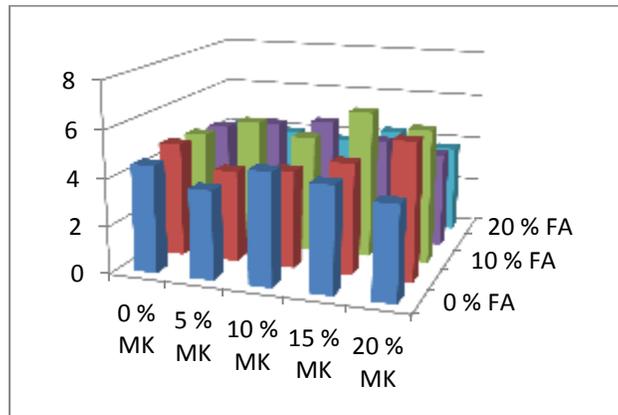


Fig.8. 28 Days flexural strength of ternary blended cement concrete

TABLE NO .X. 28 DAYS IMPACT STRENGTH FOR VARIOUS REPLACEMENTS

SR. NO.	MIX COMBINATION	FIRST CRACK STRENGTH (BLOWS)	FAILURE STRENGTH (BLOWS)
1.	Conv. Concrete	22	31
2	5 % FA	24	35
3	10 % FA	28	41
4	15 % FA	32	47
5	20 % FA	31	47
6	5 % MK	38	56
7	10 % MK	47	76
8	15 % MK	63	82
9	20 % MK	63	84

From the water absorption test values in table below it can be concluded that conventional concrete weighs heavier than others as it absorbs much water than the others. The minimum water is absorbed by the MK blend as it fills up the pores within the concrete making it denser and harder for absorption.

TABLE NO. XI. WATER ABSORPTION TEST RESULTS FOR VARIOUS REPLACEMENTS

MIX DESIGNATION	INCREASE IN MASS OF CONCRETE (%)
Conv. Concrete	7.085
5%FA	3.931
10%FA	4.439
15%FA	4.126
20%FA	4.223
5%MK	4.439
10%MK	4.302
15%MK	4.152
20%MK	3.529

V. CONCLUSION

- From the above results it is very clear that, as the fly ash percentage by weight goes on increasing, the strength of the concrete goes on decreasing. And as the Metakaolin percentage by weight goes on increasing, the strength of concrete also increases.
- It is also been observed that, percentage change in strength of concrete when fly ash is used is not constant for various durations.
- But when Metakaolin is used, the percentage change in strength for various durations is almost constant.
- Thus from above conclusions we get an idea about using both the materials i.e. fly ash and metakaolin, as a replacement in concrete together.
- From the results of individual replacement, it is also clear that strength of cubes can be further improved by using a fair combination of two materials to get blended concrete.

- It is evident from the workability as well as strength graphs that combination of 5% FA and 20% MK may prove to increase strength as well as makes concrete more workable.

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Simulation and Analysis of Optical WDM System using FBG as Dispersion Compensator

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Abstract—In order to enhance the capacity of optical networks and for increasing the demand of higher bandwidths Wavelength Division Multiplexing (WDM) is used. WDM networks are developed to support multiple signals with different frequencies or wavelengths through a single fiber. The dispersion mechanism within the fiber cause broadening of the transmitted light pulses as they travel along the channel. Inter symbol interference can be compensated by using Optical Fiber Bragg Gratings (FBG). FBG is a type of distributed Bragg reflector constructed in a small segment of an optical fiber that reflects particular wavelengths of light and transmits all other. This work discusses the application of a demultiplexer (DEMUX) based FBG in WDM systems which reduces the bit error rate and enhances the quality of the received optical signal in a network. The performance analysis of the system is done using Optisystem software. The performances of different electrical filters are analyzed by varying chirp functions and data rates. And also the performances of FBG as dispersion compensator are analyzed for long haul optical communication.

Keywords—Wavelength Division Multiplexing, FBG, Filter, Q Factor, bitrates, Dispersion Compensator.

INTRODUCTION

Broadband based communication services can provide the technological advancement in telecommunication system. Increasing number of users and bandwidth demands has brought rapid evolution of high speed access networks, which leads to the enhancement of Quality of Service (QoS) and reduces the delays. For better functionality and cost effective implementation a new architecture is required. The requirements such as high data rate and large number of transmission channels have lead to fiber optic data systems. Optical network can provide higher bandwidth than copper based networks.

One of the most promising concepts for high capacity communication system is Wavelength Division Multiplexing (WDM). Wavelength Division Multiplexed optical networks are developed to support multiple signals with different frequencies or wavelengths in a single fiber. WDM is similar to Frequency Division Multiplexing (FDM). But instead of Radio Frequencies (RF), WDM is done in the IR portion of the electromagnetic spectrum. Each IR channel carries several RF signals combined by means of FDM or Time-Division Multiplexing (TDM). Using FDM or TDM in combination with WDM or several IR channels data of different formats and different speeds can be transmitted through a single fiber.

Each multiplexed IR channel is separated, or demultiplexed, into the original signals at the destination. WDM is used for achieving high system capacity and effective usage of bandwidth. In optical fiber, chromatic dispersion cause significant distortion in optical pulses during transmission. For enhancing the quality of transmission, dispersion compensators are required. Optical Fiber Bragg Gratings (FBG) are used to compensate dispersion. Grating reflects different wavelengths (or frequencies) at different points along its length. The rejected spectrum broadens as the reflected wavelength changes with the grating period. Effectively, a chirped Bragg grating introduces different delays at different frequencies. Chirped gratings are ideally suited to compensate the dispersion for individual wavelengths than multiple wavelengths. Fiber geometry, low insertion loss, high return loss or extinction, and potentially low cost are the advantages of FBG over other technologies.

OVERVIEW OF WDM SYSTEM

In fiber-optic communications, Wavelength Division Multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals into a single optical fiber by using different wavelengths of laser light. This technique enables bidirectional communications over one strand of fiber, as well as multiplication of capacity. Since wavelength and frequency are tied together by a simple relationship, in which the product of frequency and wavelength equals the speed of light, the two terms actually describe the same concept.

A WDM system uses a multiplexer at the transmitter to join the signals together and a demultiplexer at the receiver to split them apart. The first WDM systems combined only two signals. Modern systems can handle up to 160 signals. In an optical fiber, different spectral components propagate at different speed, this is the primary reason for chromatic dispersion. As the consequence of different speeds the light impulse spectral components have different time of arrival to the end of fiber, impulse width increases and interbit

spaces narrow. The receiver cannot correctly recognize whether a transmitter in a specific bit interval sent a value of logical one or zero. The distortion of the transmitted information will then increase the bit error rate.

The dispersion can be compensated by Fiber Bragg grating. Fiber Bragg Grating (FBG) is a type of distributed Bragg reflector constructed in a short segment of optical fiber that reflects a particular wavelengths of light and transmits all others. This is achieved by creating a periodic variation in the refractive index of the fiber core. A fiber Bragg grating can therefore be used as an inline optical filter to block certain wavelengths, or as a wavelength-specific reflector.

The fundamental principle behind the operation of FBG is Fresnel reflection, where light traveling between media of different refractive indices may reflect and refract at the interface. The refractive index will typically alternate over a defined length. At each periodic refraction a small amount of light is reflected. All the reflected light signals combine coherently to one large reflection at a particular wavelength when the grating period is approximately half the input light's wavelength. This is referred as the Bragg condition, and the wavelength at which reflection occurs is called the Bragg wavelength. Light signals at wavelengths other than the Bragg wavelength, which are not phase matched, are essentially transparent.

A Bessel filter is a type of analog linear filter with a maximum flat group/phase delay (maximum linear phase response), which preserves the wave shape of filtered signals in the passband. Bessel filters are often used in audio crossover systems. This filter is also called as Bessel–Thomson filters. The Bessel filter is very similar to the Gaussian filter, and tends towards the same shape as filter order increases. The Bessel filter has better shaping factor, flatter phase delay and flatter group delay than a Gaussian of the same order, though the Gaussian has lower time delay.

Chebyshev filters are analog or digital having a steeper roll-off and more passband ripple (type I) or stopband ripple (type II) than Butterworth filters. Chebyshev filters have the property that they minimize the error between the idealized and the actual filter characteristic over the range of the filter, but with ripples in the passband.

The Butterworth filter is a type of signal processing filter designed to flat the frequency response as possible in the passband. It is also referred as a maximally flat magnitude filter. The frequency response of the Butterworth filter is maximum flat (i.e. has no ripples) in the passband and rolls off towards zero in the stopband.

A filter whose impulse response is a Gaussian function. It have the properties of having minimal possible delay. Gaussian filter does not overshoot to a step function input while minimizing the rise time and fall time. It is considered the ideal time domain filter. A Gaussian filter is non-causal.

Roll-off is the steepness of a transmission function with frequency in electrical network analysis and most especially in connection with filter circuits in the transition between passband and stopband. It is most typically applied to the insertion loss of network. It is used to measure roll-off as a function of frequency. Filters with high roll-off were first developed to prevent crosstalk between adjacent channels on telephone FDM systems.

To improve overall system performance and to reduce the dispersion, several dispersion compensation technologies were proposed. Among the various techniques the ones that appear to hold immediate promise for dispersion compensation and management could be broadly classified as: Dispersion Compensating Fiber (DCF) and Fiber Bragg Gratings (FBG). The idea of using DCF for dispersion compensation was proposed as early as in 1980 but, until after the invention of optical amplifiers, DCF began to be widespread attention and study. DCF has become a most useful method of dispersion compensation. There is positive second-order and third-order dispersion value in SMF while the DCF dispersion value is negative. So by inserting a DCF, the average dispersion is close to zero. Fiber Bragg gratings (FBGs) are very attractive components because being passive, linear, and compact, they possess strong dispersion in both reflection and transmission. In reflection, the dispersion arises when the edge of the band gap varies with axial position along the grating such as in linearly chirped grating. Different wavelengths in a dispersed pulse are reflected at different positions in the grating, leading to different optical path lengths and thus providing the possibility of compensating for dispersion in long-haul fiber links.

Pre-Compensation Technique This scheme achieves dispersion compensation by placing the FBG before a certain conventional single mode fiber, or after the optical transmitter. **Post-Compensation Technique** This scheme achieves dispersion compensation by placing the DCF after a certain conventional single mode fiber, or before the optical transmitter. **Symmetrical Compensation Technique** This scheme mainly consist of both post compensation and precompensation. Two FBGs are placed before and after fiber sections.

SYSTEM DESIGN

A seven port continuous wave laser source is used to give the input. The transmission frequency of CW laser array starts from 193.1 THz with channel spacing of 25 GHz for the simulation of WDM optical network. The power of the input optical source is -14 dBm.

All seven unique subsystems act as WDM transmitters. Multiplexer circuit consists of four subsystems (Tr1 to Tr4). Every subsystem includes NRZ pulse generator, Mach-Zehnder Modulator, Continuous Wave laser and pseudo random bit sequence generator. The multiplexed signal is then launched into a single mode optical fiber of length 10 km, having an attenuation factor of 0.2 dB/km and a differential group delay of 0.2 ps/km.

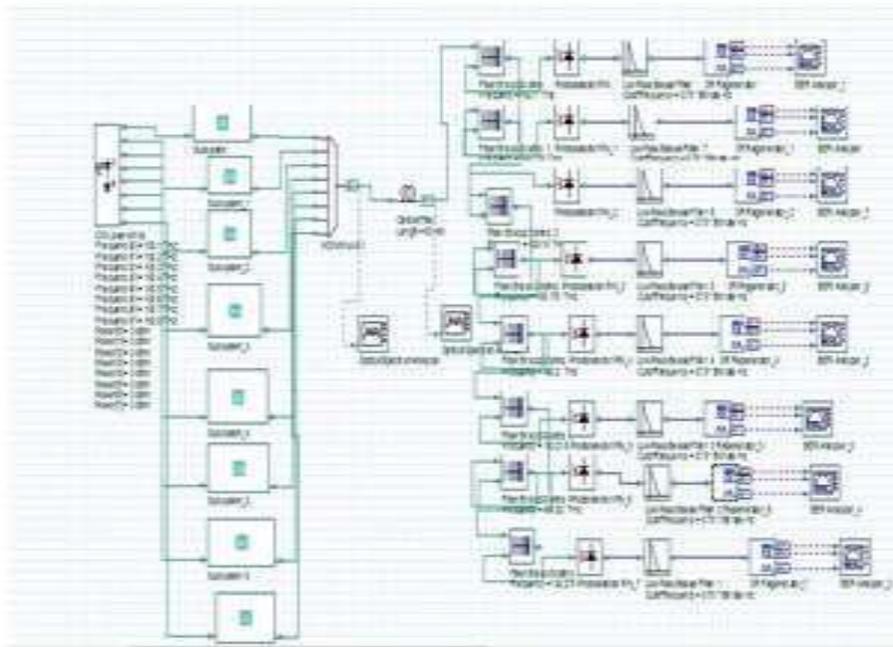


Fig. 1. Circuit diagram of FBG based demux of Bessel filter

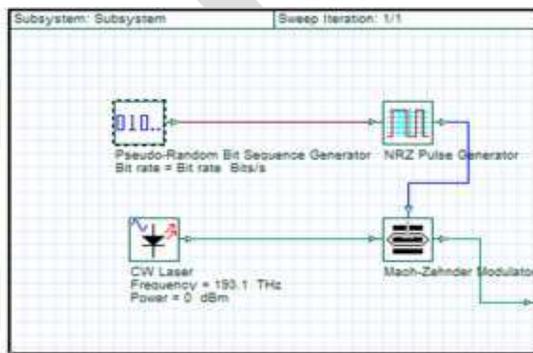


Fig. 2. Internal structure of transmitter subsystem

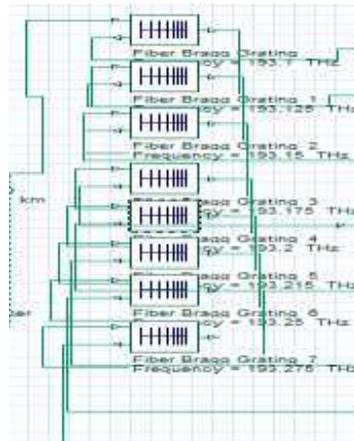


Fig. 3. Internal structure of Demux subsystem

The NRZ pulse generator creates a sequence of non-return to zero pulses coded by an input digital signal from the PRBS generator. The optical source used is CW laser. Then the modulated signal is transmitted to the fiber. Output of fiber is sent to fiber Bragg grating which is used to compensate the distortion. The optical signals from the Demux are detected by PIN Photodiode which converts the optical signals to electrical signals. Each incoming signal is then processed by different electrical low pass filters to remove any redundant noise and improve the Bit Error Rate (BER) and the Quality Factor (Q-Factor) of the signal.

The optical signal from fiber is then passed to a FBG based WDM demultiplexer which filters each wavelength. Different low pass electrical filters are used at the end of receiver. The filter in the demultiplexer removes noise from the demultiplexed signals. The optical signals from the demultiplexer are detected by PIN Photodiode which converts the optical signals to electrical signals. Each incoming signal is then processed by low pass Bessel filter to remove any redundant noise and there by improve Quality Factor (QFactor) of the signal. The same simulation process is repeated by replacing Bessel filter with Butterworth, Chebyshev, Gaussian, Cosine roll, Raised Cosine and Rectangular filters.

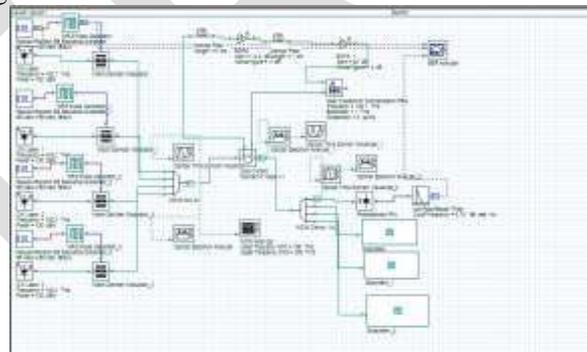


Fig. 4. Simulation layout of Post-Compensation Technique in WDM System

To support a high-capacity WDM transmission, the embedded standard single mode fiber (SMF) should be up graded to overcome the dispersion limit. Here dispersion compensation is analyzed with the help of fiber Bragg compensator. According to relative position of FBG and single mode fiber, post-compensation, pre-compensation and symmetrical/mix compensation are proposed. Precompensation scheme achieve dispersion compensation by placing the FBG before a certain conventional single-mode fiber, or after the optical transmitter.

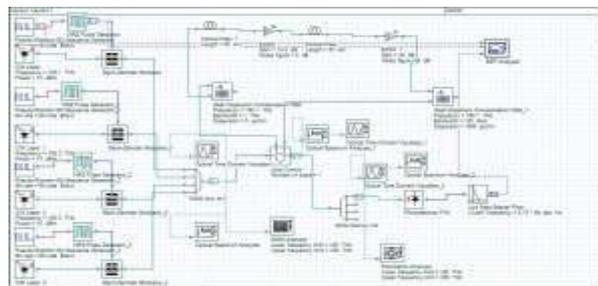


Fig. 5. Simulation layout of symmetrical-Compensation Technique in WDM System

Multiplexer circuit consists of four subsystems. The relative position of FBG will result in different compensation technique. In post compensation the FBG is placed after the fiber whereas in Symmetrical/mix compensation scheme consist of both post compensation and pre compensation. Then the reflected signal is fed to the receiver section. Then the dispersion compensated signal is fed to the PIN detector for electrical conversion of the signal, the non linearities in the signal is removed by filters. The output is displayed by BER analyzer.

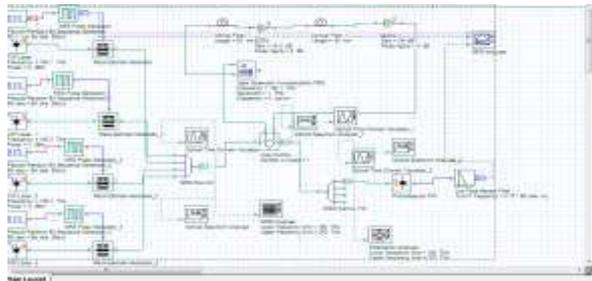


Fig. 6.Simulation layout of Pre-Compensation Technique in WDM System

RESULTS AND DISCUSSION

The Q-Factor and the BER at the receiver end vary depending upon the electrical filter used. The input spectrum at 1.25Gbps is shown in the figure 7. The values of Q-factor and BER for quadratic, linear and square root chirp functions at data rates of 1.25 Gbps and 2.5Gbps are given in Table I, Table II and Table III.

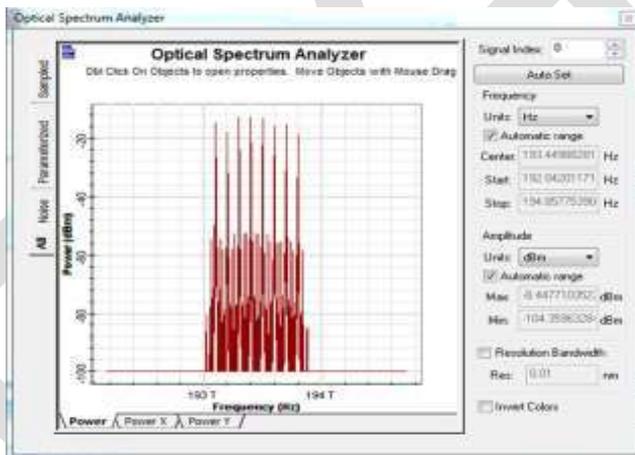


Fig. 7. Input spectrum

TABLE 1 Linear Chirp

FILTER	BIT RATE			
	1.25 Gbps		2.5Gbps	
	Q-Factor	BER	Q-Factor	BER
Bessel	11.428	1.11e ⁻⁰³⁰	11.235	5.67e ⁻⁰³⁰
Butterworth	10.187	1.89e ⁻⁰²⁰	10.987	2.75e ⁻⁰¹⁵
Chebyshev	7.284	1.39e ⁻⁰¹³	7.184	3.067e ⁻⁰¹⁰
Gaussian	9.804	3.67e ⁻⁰²³	10.227	7.284e ⁻⁰²⁵
Cosine Roll Off	9.723	3.62e ⁻⁰²⁷	11.164	2.635e ⁻⁰²⁹
Raised Cosine	8.782	1.11e ⁻⁰¹⁹	9.509	8.179
Rectangular	10.256	4.49e ⁻⁰²⁵	9.668	1.65e ⁻⁰²²

TABLE 2 Square Root Chirp

FILTER	BIT RATE			
	1.25 Gbps		2.5Gbps	
	Q-Factor	BER	Q-Factor	BER
Bessel	13.58	3.19e ⁻⁰²⁶	10.49	4.65e ⁻⁰²⁶
Butterworth	11.871	1.39e ⁻⁰²⁶	9.291	7.39e ⁻⁰²¹
Chebyshev	10.284	8.90e ⁻⁰¹⁴	6.89	2.95e ⁻⁰¹²
Gaussian	9.804	1.5e ⁻⁰²⁴	9.272	8.306e ⁻⁰²¹
Cosine Roll Off	9.723	1.95e ⁻⁰³¹	9.32	4.76e ⁻⁰²¹
Raised Cosine	8.782	2.90e ⁻⁰⁴¹	10.05	4.02e ⁻⁰²⁴
Rectangular	10.256	1.12e ⁻⁰²⁹	9.78	6.38e ⁻⁰²³

TABLE 3 Quadratic Chirp

FILTER	BIT RATE			
	1.25 Gbps		2.5Gbps	
	Q-Factor	BER	Q-Factor	BER
Bessel	12.01	1.99e ⁻⁰²⁴	10.38	1.977e ⁻⁰²⁵
Butterworth	10.33	2.34e ⁻⁰²⁵	8.92	2.100e ⁻⁰¹⁹
Chebyshev	6.95	1.49e ⁻⁰¹²	6.804	4.06e ⁻⁰¹²
Gaussian	9.607	3.18e ⁻⁰²²	8.74	1.134e ⁻⁰¹⁸
Cosine Roll Off	10.25	5.21e ⁻⁰²⁵	8.86	2.79e ⁻⁰¹⁹
Raised Cosine	10.16	9.59e ⁻⁰³⁴	9.96	9.73e ⁻⁰²⁴
Rectangular	10.93	3.53e ⁻⁰²⁸	10.36	3.134e ⁻⁰²⁵

It was observed that at the bit rate of 1.25Gbps, Bessel and Chebyshev filters have highest Q-factor for all the chirp functions. All other electrical filters like Gaussian, Butterworth, and RC are tolerable but possess high BER value. At the bit rate of 2.5Gbps, the electrical filters like Bessel, Gaussian and Cosine Roll-off are having highest value of Q-factor. For linear Chirp function, the Q-factor is found to decrease with the increase in bit rate for most of the filters. The value of BER increases with the increase in bit rate except Rectangular filter. For Quadratic Chirp, the Q-factor increases with increase in bit rate except for Bessel, Butterworth and Chebyshev filters. The value of BER increases with the increase in bit rate except for Rectangular and RC filter. For Square root chirp function, the Q-factor decreases with increase in bit rate except for Cosine Roll off, RC and Rectangular filters. Q-factor gradually increases from Quadratic to linear and then from linear to Square- root Chirp function.

When the input power increases from 0-5 dBm all the compensation technique shows linear response. When the input power is greater than 5dBm, the Q-Factor gradually decreases in the case of pre-compensation and post compensation technique whereas in symmetrical compensation the Q-Factor increase along with the input power. At 10 dBm the pre-compensation and symmetrical compensation technique rapidly decreases whereas post compensation shows a gradual decrease in Q-Factor. This is because as the optical power increases the nonlinear effect also increases. So from Fig. 8.it is clear that the performanceof post compensation is best for high speed WDM system.

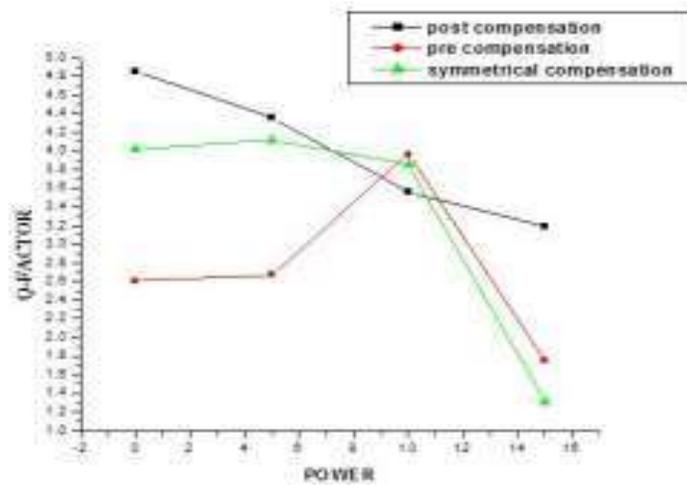


Fig. 8. Represents the Relationship Between Power and Q-factor

The Fig. 9. represents the relationship between power and Bit Error Rate. When the input power increases the bit error rate also increases. There is rapid increase in BER for pre-compensation and symmetrical compensation technique. The post compensation technique shows gradual increase in BER.

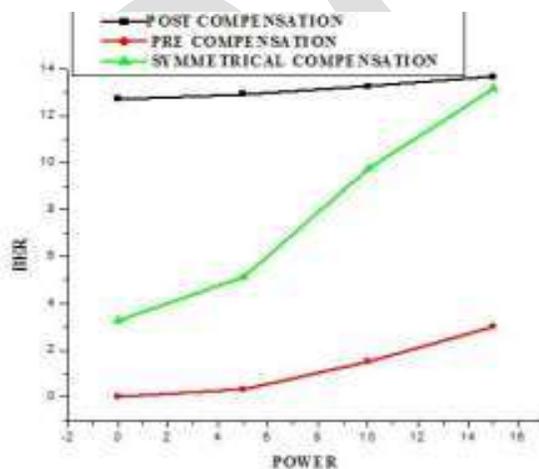


Fig. 9. Represents the Relationship Between Power and BER

CONCLUSION

The performance analysis of various low pass electrical filters like Bessel, Butterworth, Chebyshev, RC, Cosine Roll Off, Gaussian, IIR and Rectangular at different bit rates of 1.25Gbps and 2.5Gbps was done. The Q-factors and BER values of all the filters were tabularized and compared. The performance of Bessel, Butterworth and Chebyshev filters were best among all of the other filters. It was observed that the Bessel filter had the best Q-factor and lowest BER among all the filters for all bit rates. Hence, Bessel filter is the best electrical filter for WDM systems at these bit rates. It was also found that the Quality factor improves with change in Chirp Functions. The best Q factor was attained with square root Chirp Function. The behaviours of different compensation techniques are analyzed. The compensation schemes reduced the dispersion appropriately. The post compensation scheme reduces the accumulated chromatic dispersion to the maximum possible extent at high input power rather than precompensation and symmetrical compensation schemes.

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DESIGN AND FABRICATION OF HYDRAULIC SPRING STIFFNESS TESTING MACHINE

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Abstract- Springs isolate the driver from road imperfections by allowing the tyre to move over a bump without drastically disturbing the chassis. If the chassis remains fairly steady then the tyres are better able to follow road contours automatically. While springs do an excellent job of smoothing over bumps, they will keep bouncing once started. In other words, the chassis continues swaying and the tyres keep hopping long after the vehicle strikes a bump. Left uncontrolled, springs give an uncomfortable ride with very poor tyre to road contact. To control this undesirable behavior, a shock absorber keeps the spring from over reacting to every bump or dips and not only prevents but also balances excess movement of the tyre and chassis. Springs are durable items and are easily inspected. If the ride height of a vehicle has decreased excessively or a coil/leaf has broken it is advisable to replace the springs in axle sets. Consumers also often change springs to alter their vehicle's ride and handling characteristics. Spring problems are generally easy to identify.

Keywords – Spring , Tyre , CAD model , Stiffness , Shock absorber , Chassis , Vehicle

INTRODUCTION-

The most common method for checking the performance of shock absorbers is for the owner or mechanic to jump up and down on the car bumper and observe whether or not the car motion appears to be adequately damped. When the shocks are completely worn out, it is clear that the damping is inadequate, however by the time the wear is readily observable, the car owner has been driving for an extended period of time with bad shocks. By then the owner has learned to hate his vehicle, the tyres have been abnormally worn, and the road ability has deteriorated to the point that he or she has been driving dangerously all over the road.

Main reason for replacement of shock absorber(spring) is physical damage. Spring stiffness must be checked before replacement. This test rig will give the force applied on spring. With the help of force and deflection produced , we can calculate stiffness of spring. By varying the force , we can obtain corresponding deflections . We are going to study the suspension characteristics of spring by graphical method.

WORKING PRINCIPLE

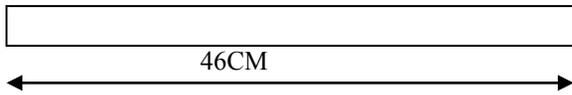
The working of hydraulic stiffness testing machine is based on Pascal's law which states that **“PRESSURE APPLIED AT ANY POINT ON ANY CONFINED LIQUID IS TRANSMITTED EQUALLY TO ALL OTHER POINTS”** This principle is same as that used in hydraulic press.

The pressure is transmitted from hydraulic cylinder to load cell by application of a lever. The smaller cylinder is having plunger and hydraulic cylinder is having ram (piston and piston rod). Hydraulic cylinder is having a lever mounted over it. When force is applied by lever, it gets multiplied to many times and that multiplied force acts on the plunger. Due to this force the plunger compresses the liquid. The liquid will be pressurized as it is confined between plunger and piston. This pressure in liquid is transmitted by liquid to piston. As the piston is having larger area than plunger, the force delivered by piston and piston rod is much larger than force acting on the plunger. The piston rod moves outwards and presses the spring placed between the hydraulic cylinder and load cell. When the release knob is opened the pressurized liquid gets escaped into the reservoir and due to the spring action of retracting spring the piston is brought backward.

DESIGN-

First of all we have to calculate maximum output required to lift the load

DESIGN OF LEVER -



by law of moments

$$F \times l = f \times L$$

$F = f \times L/l$ where f = force or effort applied and F = force obtained by leverage.

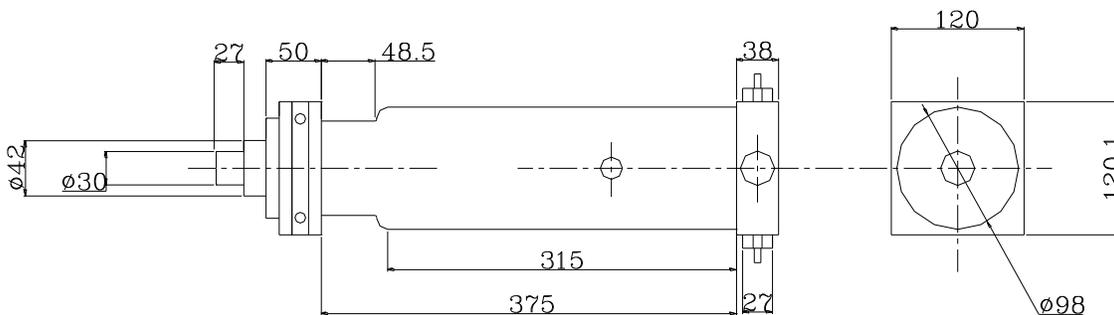
Now normally a person can apply a 20kg force. So we take $f = 20\text{kgf}$

Now $L = 46\text{cm}$. And $l = 4\text{cm}$. Considered.

$$\therefore F = 20 \times 46/4 = 230\text{kgf.}$$

Force applied by leverage = 230kgf.

DESIGN OF BIGGER CYLINDER -



CYLINDER (QTY. 1 OFF)

FROM HYDRAULIC PRESS FORMULA,

$$W = \frac{A}{a} \times F$$

$$W = \frac{\frac{\pi}{4} D^2}{\frac{\pi}{4} d^2} \times F = \frac{D^2}{d^2} \times F$$

Now, d = diameter of smaller cylinder = 1.5 cm.

We have , $W = 1500\text{kg}$ & $F = 230\text{kgf}$.

$$\therefore 1500 = \frac{D^2}{15^2} \times 230$$

$$D = 3.8\text{cm} \text{ , } D \text{ actual} \approx 4 \text{ cm}$$

Therefore diameter of bigger cylinder = 40 mm.

Now for thickness of cylinder wall of bigger cylinder,

We have, $t = \frac{pd}{2f_t}$ where p = internal pressure, & d = diameter of cylinder,

f_t = permissible stress.

$$\begin{aligned} \text{We have } p &= F/A = \frac{230}{\frac{\pi d^2}{4}} \\ &= \frac{230}{\frac{\pi 4^2}{4}} \end{aligned}$$

$$\text{Internal Pressure (p)} = 18.32 \text{ kg/cm}^2$$

Now ultimate stress for cylinder material = 800 kg/cm²

Considering factor of safety as 5.

$$\text{We get permissible stress} = \frac{\text{Ultimate stress}}{\text{factor of safety}}$$

$$\therefore f_t = \frac{800}{5}$$

$$f_t = 160 \text{ kg/cm}^2$$

Inputting these value in the thickness formula,

We get,

$$t = 18.32 \times \frac{9.8}{2} \times 160$$

$$= 0.753 \text{ cm.}$$

$$t \approx 0.8 \text{ cm.} = 8 \text{ mm.}$$

$$\text{Outer dia. of cylinder} = 40 + (2 \times 8) = 56 \text{ mm}$$

DESIGN OF PISTON ROD -

The piston rod is subjected to compressive load.

$$\text{We known (stress)} = \frac{\text{Force}}{\text{Area}}$$

$$= 300 \text{ kg/cm}^2 \text{ in compression for mild steel.}$$

Taking factor of safety = 2

$$= \frac{300}{2}$$

$$= 150 \text{ kg/cm}^2$$

& $p = 1500 \text{ kg. (compressive)}$

$\therefore \text{Area (A)} = \text{Force}/\text{Stress}$

$$= \frac{1500}{150}$$

$$= 10 \text{ cm}^2$$

$$\frac{\pi}{4} d^2 = 10$$

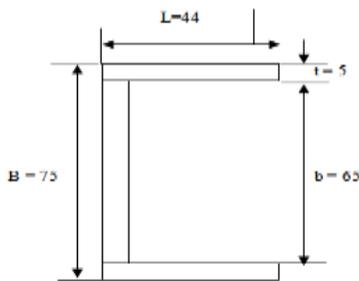
$\therefore d = 3.5 \text{ cm}$

$\therefore d = 3.5 \text{ cm.}$

Therefore diameter of piston rod = 35 mm.

Length of piston rod is taken 20cm as per the requirement.

Design of C frame -



The c frame is subjected to pure tensile failure

ISLC 75 x 40 x 5 size

Area of cross section = $2 (50 \times 5) + (90 \times 5)$

$$A = 950 \text{ mm}^2$$

Design force = 1500 kg

$$= 1500 \times 9.81$$

$$= 14715 \text{ N}$$

$$\text{Induced tensile stress} = \frac{F}{A} = \frac{14715}{1000} = 14.715 \text{ N/mm}^2$$

Allowable tensile stress = 320 N/mm^2

As induced stress is much more **less** than allowable stress design of C section is safe.

METHODOLOGY –

1. Close the pressure relief valve and adjust the spring in between load cell and hydraulic cylinder.
2. The machine contains hydraulic piston and cylinder arrangement to press spring under testing. By manual pumping hydraulic piston move forward and compress spring.
3. Due to compression in spring, force is applied on load cell and deflection occurred in spring.
4. Load cell is connected to microprocessor circuit. Potentiometer and load cell are connected to microprocessor. It calculates deflection from potentiometer and force from load cell.
5. With the help of program , spring stiffness is displayed on screen.

$$\text{Stiffness (K)} = \frac{\text{Force (L)}}{\text{Deflection(D)}}$$

TESTING RESULTS –

SR. NO.	LOAD (N)	DEFLECTION (mm)	SPRING STIFFNESS (N/mm)	AVG. STIFFNESS
1.	60	60	1	
2.	60	60	1	1
3.	60	59	1.016	

Advantages-

1. Spring of different diameters can be checked without damaging it.
2. The testing process is carried out in very less time, so production rate is very high.
3. One man effort is enough and no skill is required.
4. The system is self lubricating, noiseless and portable.

Disadvantages-

1. Spring wire dia. cannot be checked below 40mm and above 60mm. (If we check the diameter of spring below 40mm there are chances for spring to buckle)
2. As system is hydraulic, leakage may occur and hence refilling of oil is necessary.

Applications-

1. The machine is used for measuring spring stiffness for different spiral and helical springs in the range of 40mm to 60mm.
2. Can be used in garages where frequent inspection of the suspensions of various automobiles is carried out.
3. With the help of this machine it is possible to analyze when to replace the suspension by comparing the stiffness of the testing suspension with that of the standard stiffness.

DIAGRAM-

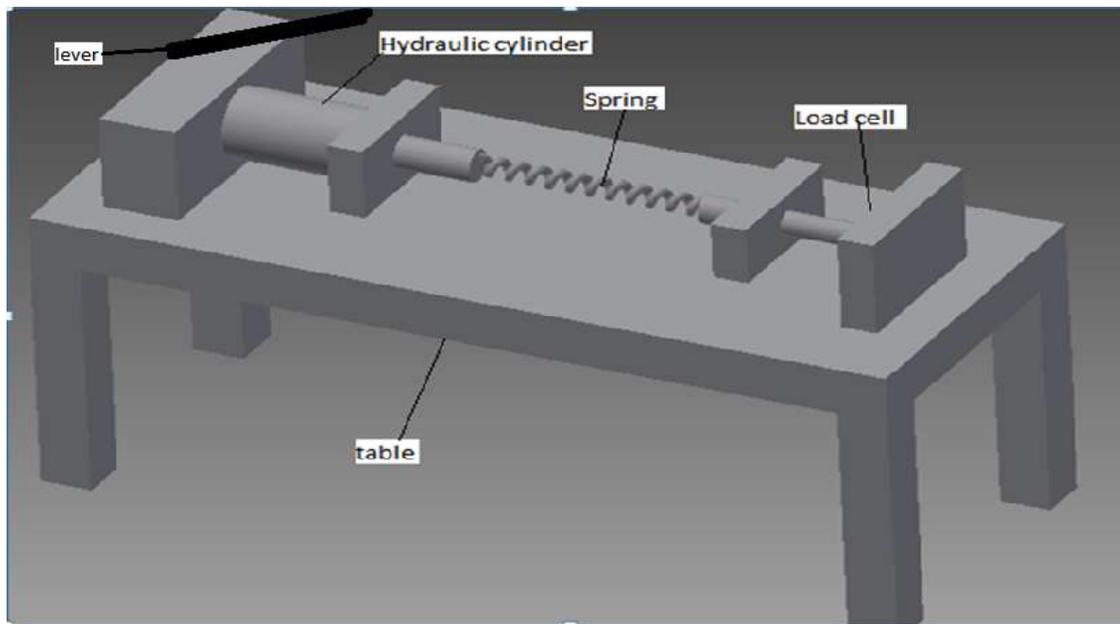


Fig., CAD model of project set up

CONCLUSION-

By this project, pressure is applied on spring with the help of hydraulic system. Applied load and deflection produced in spring is measured by microprocessor and value of spring stiffness is displayed.

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A REVIEW ON MULTIFUNCTIONAL ROBOTIC VEHICLE FOR INDUSTRIAL AND SECURITY APPLICATIONS

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Abstract— In any industry or household work, the picking and placing are very basic operations and have been required to do it again and again .One way is the use of a small vehicle capable of doing pick and place type of work. The system proposed will include the robust assembly for these types of functions with the wireless operation and control using RF module. The system will have a wireless camera that will be used for continuous monitoring of the surrounding environment where the vehicle will be placed.

Another important aspect is the security of workplace for some natural hazards and also from thefts. The model will also include fire sensor and theft detection system with direct transmission of the signals to fire brigade and control and security office by using GSM module. It will also buzz the alarm at the same time of detection .Hence it will provide total security in the night time or when the workplace is off. The total functions will be built around AVR microcontroller with obstacle and metal detection also. Hence the vehicle will have total of five applications right from mechanical work, monitoring to the security and alarming.

keywords—RF module, GSM module, AVR microcontroller.

INTRODUCTION

Life is the most priceless gift of the universe, which cannot be substituted or replaced. As generations have passed by, complexity of life has increased to such an extent that populaces are certainly not as concerned about the safety processes. In the present day scenario, fire accidents are on the rise due to sheer negligence and hence resulting in the loss of countless lives to which no effective procedures are being undertaken [1].

Robot is defined as a mechanical design that is capable of performing human tasks or behaving in a human-like manner. To built robot requires expert and complex programming [2]. Now a day's Robotics is part of today's communication & communication is part of advancement of technology, so we have decided to work on ROBOTICS to design something which will take human life to next era. ROBOT has sufficient intelligence to cover the maximum area within provided space. It is having an infrared sensor which are used to sense the obstacles coming in between the path of ROBOT [3].

Recent developments in the field of robotics and wireless communication have resulted in many widely adopted wireless standards, with each of the catering for different needs depending upon the utility of the user. We have also described here one of the applications of wireless communication by incorporating the wireless technology with a robotic vehicle which will be of optimum use in the workplace. This designing of a robotic system using RF technology with wireless camera, sensor and with an additional GSM feature. GSM based control systems implements the emerging applications of the GSM technology. GSM technology is also used to make the project more user friendly. The project helps to generate interests as well as innovations in the fields of robotics while working towards a practical and obtainable solution to save lives and mitigate the risk of property damage.

Technology makes use and knowledge of different tools, machines, along with techniques, systems and methods of organization for solving a problem as well as perform a specific function. It also refers for the collection of tools, machinery as well as procedures. Technology has affected society along with surroundings in a different ways. In society, technology is helping for development of more advanced economies and has allowed the rise of a leisure class. The implementation of this project is to resolve the problem of replacing a human work with wireless controlled omnidirectional monitoring robot with video support that completely controlled with wireless network. The recent developments in technology which permit the use technology such as wireless, using wireless it have capabilities of communicating with each other. Wireless is a new technology, which has at its center the goal of eliminating wired connections between computers [4].

OVERALL DESIGN OF THE SYSTEM

In this project the first type of robot we are going to see is a robot based on RF module for pick and place. A pick and place robot is the one which is used to pick up an object and place it in the desired location. We have shown that how we can control the movement of the robot with the help of an RF Module. RF Modules are used for wireless transfer data. It is suitable for remote controlling applications, where you need for controlling some machines or some robots without getting in touch with them. Here we are controlling all the movement of the robot by using transmitter which is equipped with encoder circuit, radio frequency transmitter. On the other hand at the receiver end we receive the data also control the motors used for the required movement.

The second we are going to see is obstacle detection using sensor. The sensor provides high immunity from ambient light and can be used in all light conditions quite effectively. Obstacle detection systems typically compute the position of obstacles relative to a mobile agent by using range information.

The next robot we are going to see is the robot used for fire sensing. Loss due to fire damage has always been a major area of concern for both industrial and residential areas. Fire detection is done by circuit containing LM35 and AVR microcontroller. This paper covers the design and construction of a robot that is able to sense fire and inform to fire bridge. It was determined that the use of robot equipped with advanced fire detection technology can minimize cost, reduce false alarms, and be highly extensible to other industries. With the rapid development of technology and innovation, there has been increased focus on the area of fire detection throughout the past few decades.

A wireless RF Camera is attached to the head of the robot to provide surveillance. However, the robot consists of RF Camera and at the workstation, the receiver is connected to the computer by using the TV Tuner Card. The different live images can be viewed and adequate measures or emergency operations can be carried out saving lives. The robot is built using steel and aluminium alloy which can resist high temperatures, and protecting the circuit.

One more function of these project is for theft detection during night time. The theft detection consist of two circuitary first consist of IR sensor place on window and doors of workplace and second one placed on robot which consist of LDR sensor and GSM Module. GSM Module will helps to indicate control and security room there is theft in workplace. It provide more security to the workplace.

TECHNICAL REQUIREMENTS

The technical requirements which are chosen as a basis. They are for the efficient functioning of the system which are as follows:

RF Module

RF Modules is used wireless data transfer. An RF module which is also called as (radio frequency module) is a small electronic device which is used for transmission and/or receiving radio signals between two communicating devices. In an embedded system it is often desirable for communication with another device. This wireless communication can be accomplished through optical communication or it may be through Radio Frequency communication. RF communications includes a transmitter and/or receiver.

An RF transmitter module is a nothing but small PCB sub-assembly which is capable of transmitting a radio wave along with modulating that wave for carrying data. Transmitter modules are mostly implemented alongside a micro controller which also provides data for the module which can be transmitted. RF Transmitters are mostly subjected to regulatory requirements which are used for dictation of maximum allowable transmitter power output along with harmonics, and band edge requirements.

An RF Receiver module is used to receive the modulated RF signal, and also demodulates it. There are mainly two types of RF receiver modules. they are as follows: superheterodyne receivers and super-regenerative receivers. Super-regenerative modules are generally low cost and low power designs made up of using a series of amplifiers for extracting modulated data from a carrier wave. Super-regenerative modules are usually imprecise because of their frequency of operation varies considerably along with temperature and also with power supply voltage.

- Range in open space(Standard Conditions) : 100 Meters
- RX Receiver Frequency : 433 MHz
- RX Supply Current : 3.5 mA
- RX IF Frequency : 1MHz
- RX Operating Voltage : 5V
- TX Frequency Range : 433.92 MHz
- TX Supply Voltage : 3V ~ 6V

- This has single channel for data transfer, so serial data communication is used

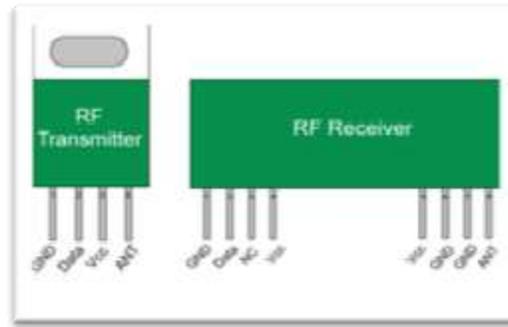


Figure 1. RF Module

Serial Encoder/Decoder

The most popular serial encoder/decoder which used is the HT12D-HT12E pair. The HT12E Encoder ICs are nothing but series of CMOS LSIs used for Remote Control system applications. They are having capability to encode 12 bit of information which consists of N address bits and also 12-N data bits. Each of the addresses along with data input is externally trinary programmable if it is bonded out.

The HT12D Decoder ICs are series of CMOS LSIs which are used for remote control system applications. This ICs are paired with one other. For performing proper operation a pair of encoder/decoder along with the same number of address and data format must be selected. The Decoder is used to receive the serial address and also data from its corresponding encoder, which is transmitted by a carrier using an RF transmission medium .It gives output to the output pins when processing the data is over.

Voltage regulator

We used LM7805 voltage regulator. The output current of 1.5A can be delivered by each of these stated regulators. The immunity for overloading is provided by means of the internal current-limiting as well as thermal shutdown features of the regulators. Generally, number "78" denotes positive voltage output and the given last two digits represent the output voltage which it will produce. Also with these devices can be cascaded arranged in parallel with the peripheral components for attaining adjustable output voltages and currents too. Figure 2 depicting the pin out of LM7805.

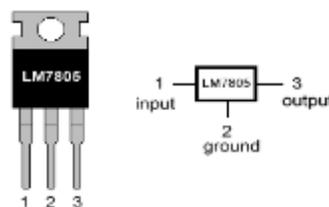


Figure 2. LM7805 Pinout diagram

LDR

A Light Dependent Resistor (aka LDR, photoconductor, photocell, or photo resistor.) which is a device, has a resistance which always varies in accordance to the amount of light falling on the surface, when light falls upon it then value of resistance changes. Light dependent resistors are often used in the circuits where it is necessary for detection of the presence of light and the ambient level of light often for creation of a light triggered switch.

It is different for the values of resistances of an LDR to be in meg ohms in darkness and then used to fall to a few hundred ohms in the bright light. With such a wide variation found in resistance, LDRs are easily usable and there are many LDR circuits available in the market. LDRs are made from various semiconductor materials for enabling them so as to have their light sensitive properties with a very high resistance. Many materials are be used, but one most popular material used for these LDR's is a cadmium sulphide (CdS).

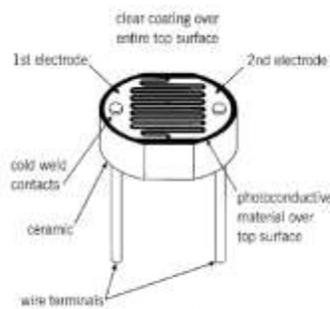


Figure 3. Typical construction of LDR

LM35

The LM35 series are nothing but a precision integrated-circuit temperature sensors. It has an output voltage which linearly proportional to the Centigrade temperature and has Linear + 10 mV/°C Scale Factor. Thus we can say LM35 has an advantage over linear temperature sensors which are calibrated in ° Kelvin, because user is not required to subtract a large constant voltage from the output for obtaining convenient Centigrade scaling too. LM35 have 0.5°C ensured Accuracy provided at +25°C. The LM35 doesn't require any external calibration and trimming for providing a typical accuracies of ±¼°C at room temperature and the accuracy of ±¾°C over a range of -55°C to +150°C temperature. Low cost is guaranteed by trimming and calibrating at the water level. The low output impedance and linear output and precise inherent calibration of the LM35 used for making interfacing for readout or control circuitry. The device is used with just a single power supplies, or also with plus and minus supplies. LM35 draws only 60 µA from the provided supply, has very low self-heating of less than 0.1°C in the still air. The LM35 is rated for operation of over a -55°C to +150°C temperature range. It has 4 to 30V voltage range. It has low impedance output, of 0.1 Ω for 1 mA Load.

LM324

The LM324 series are having low-cost, quad operational amplifiers having true differential inputs. The LM324 is compensated internally and short circuited as well as protected outputs IC. It has low input bias currents of values 100 nA maximum. They are having several advantages over standard operational amplifier which are types in single supply applications. The quad amplifier can be operated at supply voltages as low as 3.0 V or it may be as high as 32 V with a quiescent currents of about one-fifth of these associated with the MC1741. The common mode input range which also includes the negative supply and thereby eliminating the necessity to external biasing components in much more applications. The output voltage range includes the negative power supply voltage.

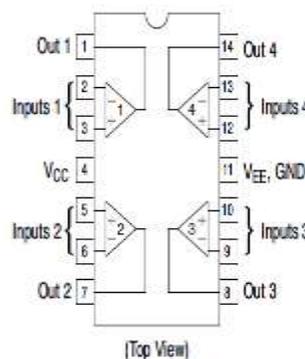


Figure 4. Pin connection of LM324

Motor Driver

Any motor needs to be provided with certain voltage. When a motor is interfaced with a microcontroller or processor, it need extra current as compared to the microcontroller pin which can typically generate for running. A basic approach for this is for providing a switch which accepts a small current. It amplifies generates a larger current which is required to drive a motor. Thus entire process is done by a motor drive also.

L293D is a typical Motor driver which also allows DC motor used to drive in both of the clockwise and also anticlockwise direction. L293D is a 16-pin IC .It can control a set of two DC motors simultaneously in any of the direction. It is a dual H-bridge Motor Driver integrated circuit (IC) .Its operation is given by in the Table 1. L293D which has an output current capability limited only upto 600mA per channel with a peak of output current limited to 1.2A, sufficient enough for driving a 100rpm motor. An internal sensor senses its internal temperature and also stops driving the motors if the temperature crosses a set point which are used to implies that the over temperature protection is also for built into the IC. Zener diodes are also used for protecting the driver IC from the voltage spikes which occur when the motor is turned on or off.

TABLE I. Operation of L293

Input1	Input2	Operation
0	0	Stop
1	0	Clockwise
0	1	Anticlockwise
1	1	stop

AVR Microcontroller

Microcontroller is the main part of an embedded system. The Atmega16 is a low-power CMOS 8-bit Microcontroller which is based on the AVR enhanced RISC architecture. After execution of powerful instructions in a single clock cycle, then ATmega16 achieves throughputs approaching 1 MIPS per MHz which allows the system which are designed for optimizing power consumption verses processing speed. The AVR core combines with a rich instruction set with 32 general purpose working registers. Total 32 registers are directly connected to the Arithmetic Logic Unit (ALU), which allows two independent registers which are accessed in one single instruction executed in one clock cycle. The architecture found after result is more code efficient and achieving throughputs up to ten times faster than that of the conventional CISC

microcontrollers.

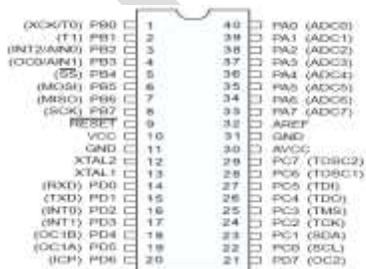


Figure 5. Pin diagram of AVR microcontroller

The ATmega16 features a 10-bit successive approximation ADC. ADC is connected to the 8-channel Analog Multiplexer which allows the 8 single-ended voltage inputs which constructed from the pins of Port A. The single-ended voltage inputs is referred to 0V (GND). The ADC consists of a Sample and Hold circuit which ensures that the input voltage given to the ADC is held at a constant level during the process of conversion. The ADC has a separate analog supply voltage pin and also AVCC. AVCC must not differ more than ±0.3 V from that of VCC. See the paragraph of “ADC Noise Canceler” which is mentioned on page 206 on how to connect this pin. Internal reference voltages of nominally 2.56V or AVCC are always provided On-chip. The voltage reference is externally decoupled at pin AREF by a capacitor for used for better noise performance.

Global System for mobiles

The GSM Modem can be used to accept any GSM network operator SIM card and act like as a mobile phone with its own unique phone number. The RS232 port is used for communication and development of embedded applications which is an extra advantage of this modem. Applications like as data transfer, SMS Control, remote control and also logging can be developed in an easy way. The modem is directly connected to a PC serial port or any microcontroller. Sending and receiving of SMS can be done by using this modem. GSM SIM 300 Modem GSM/GPRS Modem TTL are built with dual band GSM/GPRS engine SIM 300 which works on frequencies 900/1800 MHZ. The Baud rate is configurable from the value of 2400-115200 through AT command. The GSM /GPRS modem is having an internal TCP/IP stack which enables to connect with internet via GPRS. It can be used for SMS also Voice as well as Data transfer application in M2M interfaces. The commercially available GSM is SIM 300 dual-band GSM/GPRS 900/1800 MHZ. It has features like

- It has Configurable baud rate
- It can be controlled through standard AT commands
- A SIM card holder
- An Inbuilt powerful TCP/IP Protocol stack internet data transfer over GPRS
- A Normal operation temperature: -20 C to +55 C
- An Input Voltage: 3.6V -4.5V DC

IMPLEMENTATION

The proposed robot is wheel base robot which has arm on the front side and which can rotate through 180 degree. The robot has the mechanical structure which is composed of set of four wheels and two arms which are attached to the front. For the movement of the robot in forward, left, right, clockwise and anticlockwise direction 12V DC motors of 120 rpm are used. Movement of the arms close or open is carried out by 12V DC motors of 10rpm .

We have a transmitter for controlling the robot with a RF MODULE for forward, backward, left, right movements and arms movement. A block diagram of transmitter section is shown in figure 6.

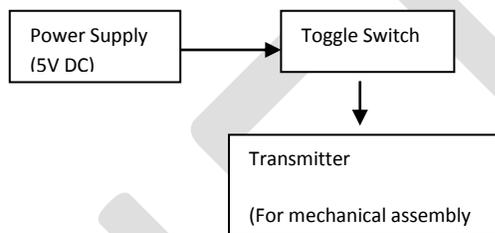


Figure 6. Transmitter Section

At the receiver end we receive the data and then this data is decoded by a decoder, then through microcontroller the signals goes to the motor driver and we get the desired movements. A block diagram of receiver section is as shown in figure 7. Here we use 433MHz of radio frequency. In this project we use one encoder IC HT 12 E to encode data. The transmitter converts the data from decimal to binary into 12 bit code. The parallel signals as the output of the encoder are then fed to the RF module. RF module here is capable of transmitting the signals wirelessly. So the RF module transmits the signals wirelessly into the free space via the transmitting antenna. The ASK modulation is done by the RF itself. In the receiver circuit we use one decoder IC. This IC is HT 12 D. First of all data is to be received by the RF module and then connected to the decoder IC.

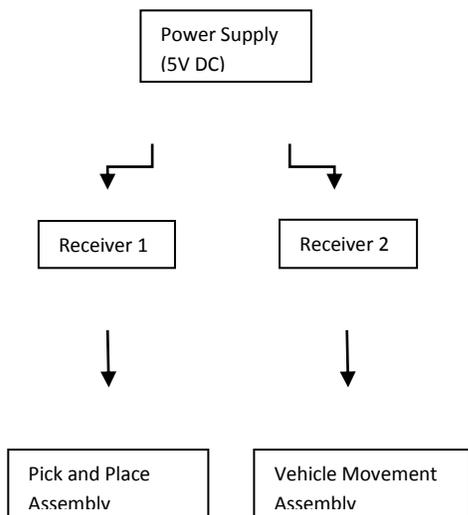


Figure 7. Receiver section

In this robot as LM35 is connected to the AVR microcontroller. LM35 senses the fire or increase in temperature after certain limit microcontroller will receives the signal a buzzer sounds, the buzzer sound is to intimate the occurrence of fire accident. After the sounding of the buzzer microcontroller actuates the driver circuit and it connect to the GSM module which will send message to the fire bridge.

Some IR sensors are connected across door and window of the workplace. When door or window is close, there will be continuous transmission of the Infrared signal. But when door or window opens then transmission of Infrared signal stops then through receiver circuit one relay is connected which will turns ON bulb in the workplace. LDR is used to detect the light. When light is detected buzzer sounds, buzzer and light is to intimate the occurrence of theft in the workplace. It also connected to the GSM module which will send message to the control and security office. A block diagram of sensing and detection system shown in figure 8.

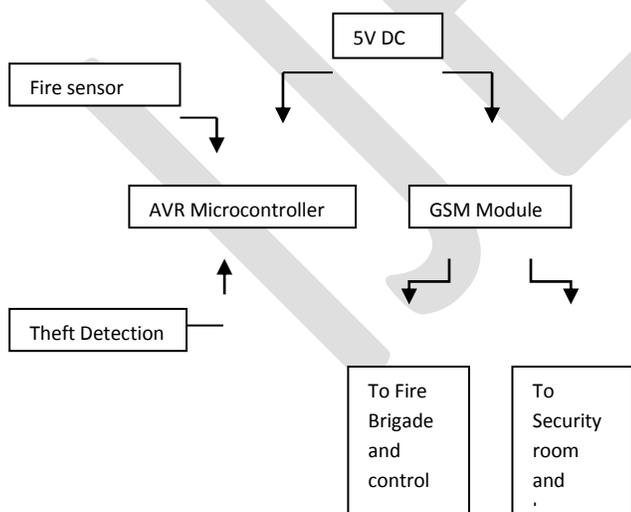


Figure 8. Sensing and detection system

This robot uses infrared sensor for detection of the obstacle in between the path and then avoid them to complete its objective. The IR transmitter continuously generate an Infrared signal, when an obstacle comes in the path the infrared signal reflected back from the object and is received by the IR sensor and then generating a positive high signal with the help of the receiver circuit which indicates that there is an obstacle in the path. In such a way the robot is able to detect obstacles of provided space and able to avoid obstacles coming in between the path of ROBOT.

CONCLUSION

This robot is able to produce the basic walking movements using four dc motors and arm movement for pick and place using 2 dc motors. A robot is developed with a very good intelligence which is easily capable to sense the obstacle and by processing the signal coming from the sensor it is perfectly avoiding the obstacle coming in between the path. In future, the sensing range can be increased by increasing the sensor quality with the help of ultrasonic sensor or the IR signal spread all over the provide area. It is capable of sensing fire in the workplace which provide protection of workplace from natural hazards. In future we can also add the system which will extinguish fire and can be extended to a real fire extinguisher by replacing the water carrier by a carbon-di-oxide carrier and by making it to extinguish fires of all the room using microcontroller programming. Robotic vehicle is capable for theft detection. It provide safety to the workplace. It also provide continuous monitoring system through which user can observe condition in the workplace in the control room.

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ALTERING WIND BELT DESIGN FOR BETTER EFFICIENCY

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Abstract— Harnessing energy from high and low wind with present wind belt is not so efficient. This paper deals with increasing the efficiency of the wind belt by the change of present wind belt by adjust the tension and length of the belt. Abstract must be of

Keywords— aerodynamic fluttering, wind-based generator, electromagnetic generator, energy harvesting Introduction.

INTRODUCTION

This design is low cost and a small device which harness energy by the belt vibration due to wind and is used to oscillate magnets in between copper wire coils in order to create an EMF. This phenomenon is used to produce electrical energy from the wind. The amount of energy produced from the wind is proportional to the Length, Tension and Magnet size

Energy Produced

Amount of EMF produced from the wind belt is given by

$$E=2\pi NfAB$$

Where

E= EMF produced

N=Number of turns in the coil

f= Frequency with which flutter vibrates

A= Area of the magnetic core

B=Magnetic field strength

Also

f= v/d

Where

v= velocity of the wind

d= maximum flutter distance

DESIGN PROCEDURE

The 'Stiffness of the belt' and 'Length of the belt' are the important factor for the amount of energy produced. The tension required. Smaller belt produced more fluttering in high speed wind so longer belt is best suitable for harvesting power from low wind speeds and for high wind length of the belt should be less. Therefore, belt length can be maintained from 50cm to 100cm according to wind speed.

DESIGN.

Designing done by keeping Efficiency in mind. Length of the belt are adjusted by rollers which can move in the frame. Coil are fixed to the rollers i.e. if the rollers are moved coils will move along with it. Rubber bush is added behind the coil so that the vibration of the belt is arrested between the coils. For adjusting belt tension screw is given at the other end of the frame to increase or decrease the tension in belt.

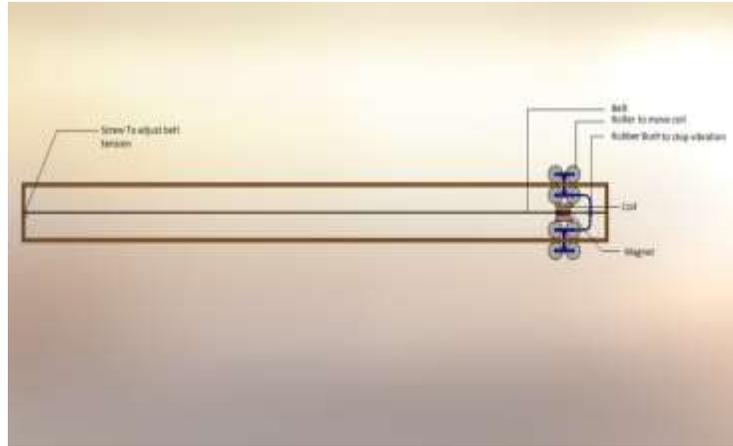


Fig. 15 Wind belt design

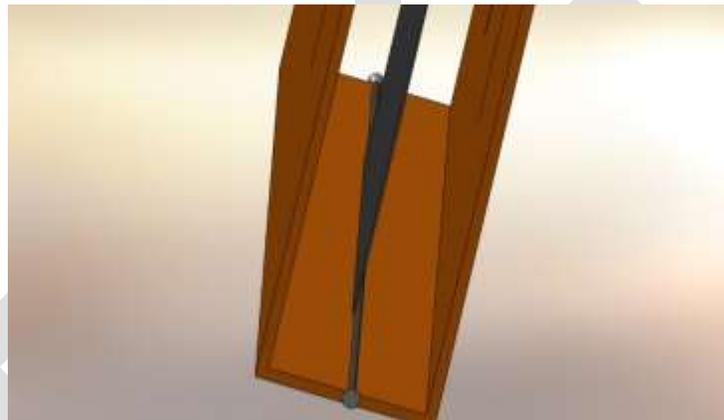


Fig. 2 Screw to adjust Tension

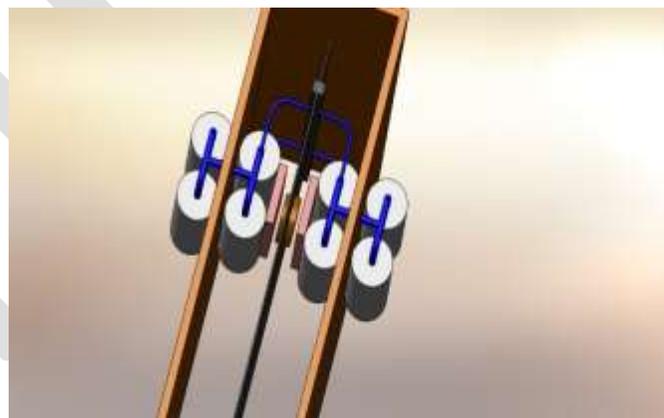


Fig. 3 Roller, Coil, Bush Arrangement

Assumption

Wind velocity varies from 5 m/s to 10 m/s.

With this velocity radius of the magnet is fixed as $r = 2.5$ cm,

$d=1\text{M}$, $N= 50$ turns, and $B= 0.02$ Tesla,

With reference to formula value of EMF generated varies as shown:

Table 1 EMF for Various wind speed

Velocity	f/d	EMF
5	5	0.123
5.25	5.25	0.129
5.5	5.5	0.136
5.75	5.75	0.142
6	6	0.148
6.25	6.25	0.154
6.5	6.5	0.160
6.75	6.75	0.166
7	7	0.173
7.25	7.25	0.179
7.5	7.5	0.185
7.75	7.75	0.191
8	8	0.197
8.25	8.25	0.203
8.5	8.5	0.210
8.75	8.75	0.216
9	9	0.222
9.25	9.25	0.228
9.5	9.5	0.234
9.75	9.75	0.240
10	10	0.246

By the above table it's clear that EMF produced will increase with the increase in the wind velocity.

The vibration of the strip increases with decrease in the length of the strip.

Below table shows the EMF produced by various length of the flutter at constant wind speed of 5m/s.

Table 2 EMF for Various length

Length	f/d	EMF
1	5	0.12325
0.95	5.26316	0.12973
0.9	5.55556	0.13694
0.85	5.88235	0.14499
0.8	6.25	0.15406
0.75	6.66667	0.16433
0.7	7.14286	0.17606

0.65	7.69231	0.18961
0.6	8.33333	0.20541
0.5	10	0.24649

CONCLUSION

The design described here can efficiently produce more EMF, This is a small scale design, and the material which are used are cheap and easily available. This can even be used in the places where the wind potential is low or high, this design can be fixed in the coastal area where continues wind supply is available.

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ANALYSIS OF BIDIRECTIONAL LONG REACH WDM PON

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Abstract— Passive Optical Network (PON) implementing WDM plays a vital role in telecommunication system, due to its characteristics such as low energy consumption and higher bandwidth. In a bidirectional PON both upstream and downstream transmission can be done through the same fiber. This work demonstrates an architecture of PON system based on Fabry-Perot laser Diode (FP-LD) with two cascaded Array Waveguide grating (AWG). The architecture is expected to be effective and low cost compared to standard WDM bidirectional PON. AWG is used to multiplex or demultiplex different wavelengths in WDM PON. FP-LD is used at the Optical Network Unit (ONU) as transmitter, which re-modulate the downstream signal with upstream data and re-send upstream towards the central office. It can reduce cost of ONU. Further more, performance analysis of various architectures of WDM PON and the effects of nonlinearities in them and the bidirectional traffic in WDM PON have been done by using OptiSystem software. Various performance characteristics such as, BER, Q Factor are investigated.

Keywords— *PON, FP-LD, AWG, ONU, BER, Q Factor*

INTRODUCTION

According to CISCO forecast Project during the year of 2011-2016 the explosive growth in global internet traffic will reach up to petabytes per minutes including video signal in the range of millions per minutes. This key driving force shifted the technology in trends towards Next generation (NGA) Access network. PONs are the most promising candidate of NGA network because of its high bandwidth provision, low cost and low maintenance. There are several TDM-PON standards are introduced for accessing. But WDM-PONs are most advantageous because of its high bandwidth demand and security.

In a bidirectional WDM PON both upstream and downstream signals are send through the same fiber. PON consist of a Central Office (CO), a bidirectional channel, and an Optical Network Unit (ONU) at user side. ONUs use a unique upstream wavelength, different wavelength transmitters must be used at the end users but the simplest solution is to use fixed wavelength transmitters so long transmission distances and high speed transmission can be achieved with this solution. So, a network deployment would be expensive with increased complexity in network operation, administration, and management.

TO avoid this wavelength re-use scheme is used. By this the ONU make WDM PON is cost effective. While using wavelength Reuse scheme the ONU doesn't need any source. In which the downstream wavelength is remodulated with the upstream data. This can be achieved by using the components like AWG, RSOA, and FP-LD.

OVERVIEW OF WDM SYSTEM

The architecture of WDM-PON employs a separate wavelength channel from the OLT to each ONU, for each of the upstream and downstream directions. This approach creates a point-to-point link between the CO and each ONU, In the WDM-PON, each ONU can operate at a rate up to the full bit rate of a wavelength channel. Moreover, different wavelengths may be operated at different bit rates, if necessary; hence, different varieties of services may be supported over the same network. In other words, different sets of wavelengths may be used to support different independent PON sub networks, all operating over the same fiber infrastructure. The wavelength channels are routed from the OLT to the ONUs by a passive arrayed waveguide grating (AWG) router,[1] which is deployed at a remote node (RN), by which multiple spectral orders are routed to the same output port from an input port. This allows for spatial reuse of the wavelength channels. A multi wavelength source at the OLT is used for transmitting multiple

wavelengths to the various ONUs. For the upstream direction; the OLT employs a WDM demultiplexer along with a receiver array for receiving the upstream signals. Each ONU is equipped with a transmitter and receiver for receiving and transmitting on its respective wavelengths.

Since ONU deals with different wavelength it required multi wave length sources it make ONU costlier. To avoid this wavelength reuse scheme is used. Wavelength reuse scheme is obtained by the aid of elements like FP-LD, RSOA which is used at ONU. The downstream wavelength also is used to wavelength seed RSOA located at the ONU. Each RSOA is operated in the gain saturation region such that the amplitude squeezing effect can be used to remove the downstream modulation on the seeding wavelength[4]. The resulting amplified RSOA output has a wavelength identical to that of the downstream wavelength and can be directly modulated with upstream data. The downstream and upstream wavelengths specified to and from an ONU are identical.

The AWG router is an important element in many WDM-PON architectures. Figure 1 shows a conventional AWG. These devices are capable of multiplexing a large number of wavelengths into a single optical fiber, thereby increasing the transmission capacity of optical networks. The AWGs consist of a number of input (1) / output (5) couplers, a free space propagation region (2) and (4) and the grating wave guides (3). The grating consists of a large number of wave guides with a constant length increment (L). Light is coupled into the device via an optical fiber (1) connected to the input port. Light diffracting out of the input wave guide at the coupler/slab interface propagates through the free-space region (2) and illuminates the grating with a Gaussian distribution. Each wavelength of light coupled to the grating wave guides (3) undergoes a constant change of phase attributed to the constant length increment in grating wave guides. Light diffracted from each waveguide of the grating interferes constructively and gets refocused at the output wave guides (5), with the spatial position, the output channels, being wavelength dependent on the array phase shift. It has a property of cyclic wavelength routing which makes the devices for wavelength reuse scheme[7]

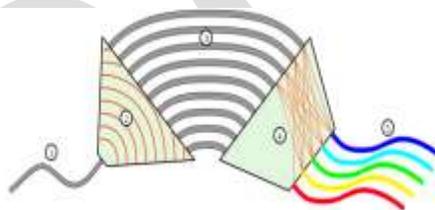


Figure 1: Conventional WDM coupler versus AWG

The FP-LD is considered a light emitting diode (LED) with a pair of end mirrors. The mirrors are needed to create the right conditions for lasing to occur. The input light will enter the cavity through the mirror on the left and will leave it through the mirror on the right. Some wavelengths will resonate within the cavity and it can pass through the mirror on the right but the other wavelengths will strongly attenuate[9]

If a random wave travels from the left-hand mirror to the right-hand mirror. At the right-hand mirror, this wave is reflected; hence, the wave experiences a 180 degree phase shift so this resonator does not support this. The lateral modes will be formed in this situation. If a random wave travels inside a resonator wave. At the right hand mirror, the wave experiences a 180 phase shift and continues to propagate. At the left hand mirror, this wave again has the same phase shift and continues to travel. Thus, the second wave produces a stable pattern called a standing wave. The only difference between the two waves is their wavelengths. Thus, a resonator can support only a wave with a certain wavelength, the wave that forms a standing-wave pattern. This resonator supports many wavelengths that can form a standing wave.[11] Wavelengths selected by a resonator are called longitudinal modes. A resonator can support an infinite number of waves as long as they form a standing wave. However, the active medium provides gain within only a better shaping factor, flatter phase delay and flatter group delay than a Gaussian of the same order, though the Gaussian has lower time delay. Small range of wavelengths since a laser radiation is the result of the interaction of a resonator and an active medium.

SYSTEM DESIGN

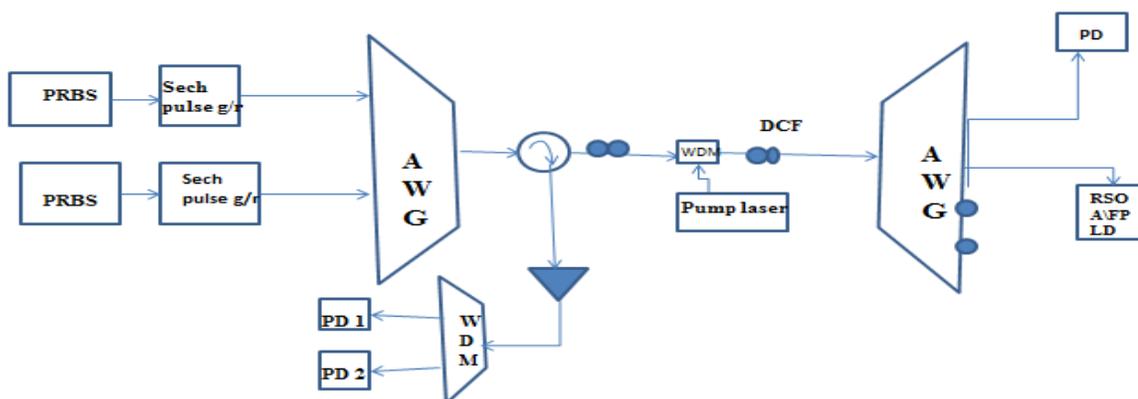


Fig 2: Architecture with sech pulse generator

Soliton pulses of wavelength 1550 and 1551 from sech pulse generator is directly modulated at downstream data 10 Gbps. We have kept channel spacing 1 nm to reduce effect of non linear and linear effect like FWM and chromatic dispersion. All those two wavelengths signals are multiplexed by using WDM MUX .After multiplexing; those entire two signals are transmitted via single mode optical fiber which is mostly used for practical application. After travelling through SMF of length 35 km, 10 km dispersion compensating fiber (DCF). The feeder fiber is compensated dispersion by a length of dispersion compensating fiber. The dispersion parameters for SMF at 1550nm are 16.75 ps/nm/km and 0.075ps/nm²/km, respectively, while those for DCF at 1550nm are -95ps/nm/km and -0.62ps/nm²/km. In the hybrid amplifier, the DCF is not only used to compensate fiber dispersion, but also used as part of Raman amplifier .Here, the dispersion compensating Raman amplifier (DCRA) is made of a Raman

Amplifier with 160mw pump power at 1480-nm and 10-km DCF. In order to boost up the signal power before the ONUs, the optical signal transmitted through feeder fiber with the help of hybrid amplifier. The analysis of backscattered signal for downstream data signal is done at circulator 1 by calculating optical power of backscattered signal. Bidirectional circulator which has insertion loss equal to 3dB. Further, all those two difference wavelengths signal are demultiplexed by AWG and which are given to 50:50 splitter. The optical power received at the ONU was divided into 50% to the RSOA and 50% to the downstream detector. The eye diagrams and Bidirectional traffic of the network is analyzed. The simulation block is shown in Fig 3

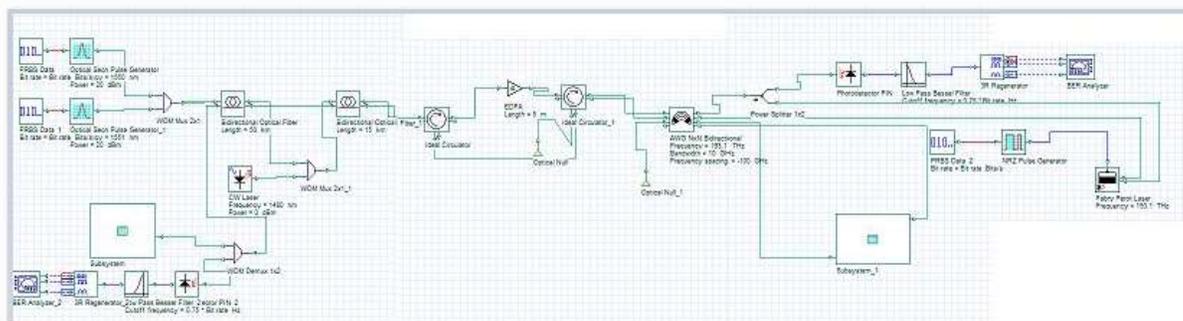


Fig 3 : Simulation Block of architecture with sech pulse generator

RESULTS AND DISCUSSION

Length (m)	Wavelength (nm)	Power (dB)	BER	Q factor
560	1582	-1.58	1×10^{-40}	43
1227	1594	-1.83	1×10^{-40}	42
2775	1575	-2.08	1×10^{-40}	33
3000	1584.5	-6	1.37×10^{-19}	32
9000	1593	-7	1.3×10^{-19}	28
25000	1560	-6	4.80×10^{-19}	28
50000	1572	-9.5	4.80×10^{-19}	25
65000	1550	-10	5×10^{-19}	23

Table 1 : Downstream Traffic

Length (m)	Wavelength (nm)	Power (dB)	BER	Q factor
560	1582	- 0.58	1×10^{-40}	43
1227	1594	- 0.83	1×10^{-40}	42
2775	1575	-1.08	1×10^{-40}	33
3000	1584.5	-1.20	1.37×10^{-19}	32
9000	1593	-3	1.3×10^{-19}	28
25000	1560	-5	4.80×10^{-19}	28
50000	1572	-8	4.80×10^{-19}	25
65000	1550	-9.5	5×10^{-19}	23

Table 2 : Upstream Traffic

Table 1 and Table 2 gives the results of Downstream and Upstream traffic analysis .From the tables it is note that the power level is verymuch changable.This is due to the Fiber set parameters such as wavelength and nonlinearities.The power level doesn't falls below -9 dB.For the smaller transmission distance obtained much better Q factor and BER.From the analysis and comparison with other architecture (without any compensation and amplification) the network can safely operate in 65 Km transmission length, the BER is at the range of 10^{-19} .The eye diagram of Up stream and down stream signal is shown in Fig :4

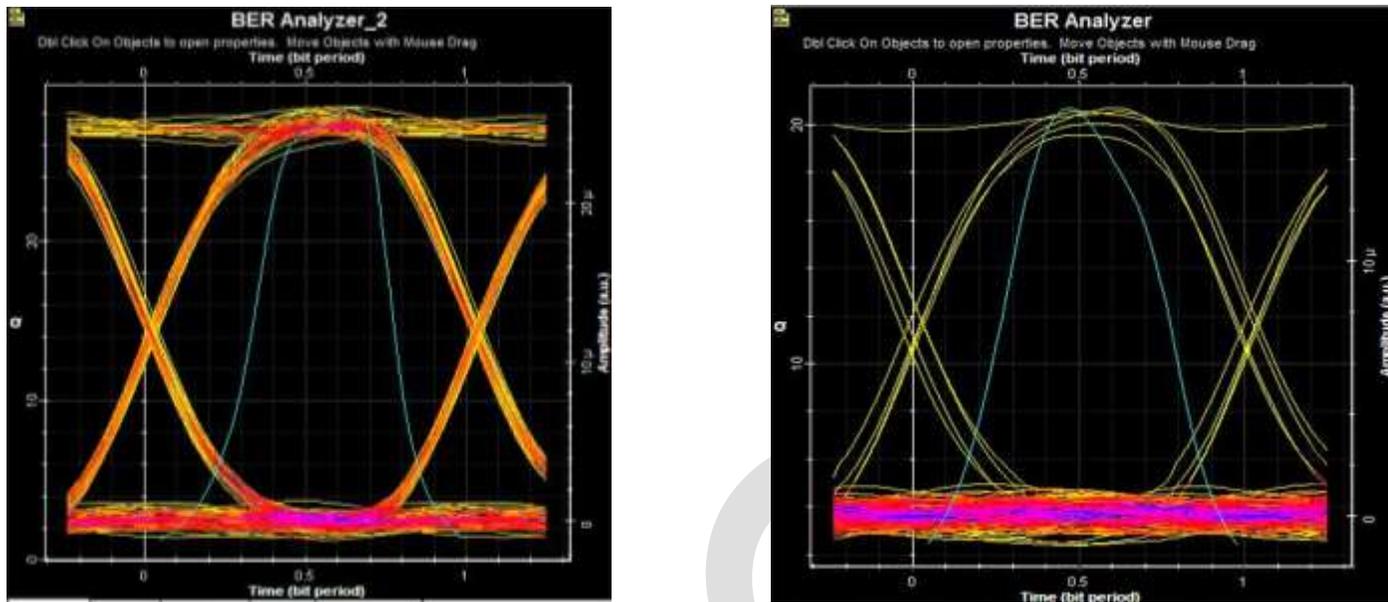


FIG. 4. EYE DIAGRAM FOR (A).DOWNSTREAM AND (B) UPSTREAM SIGNAL

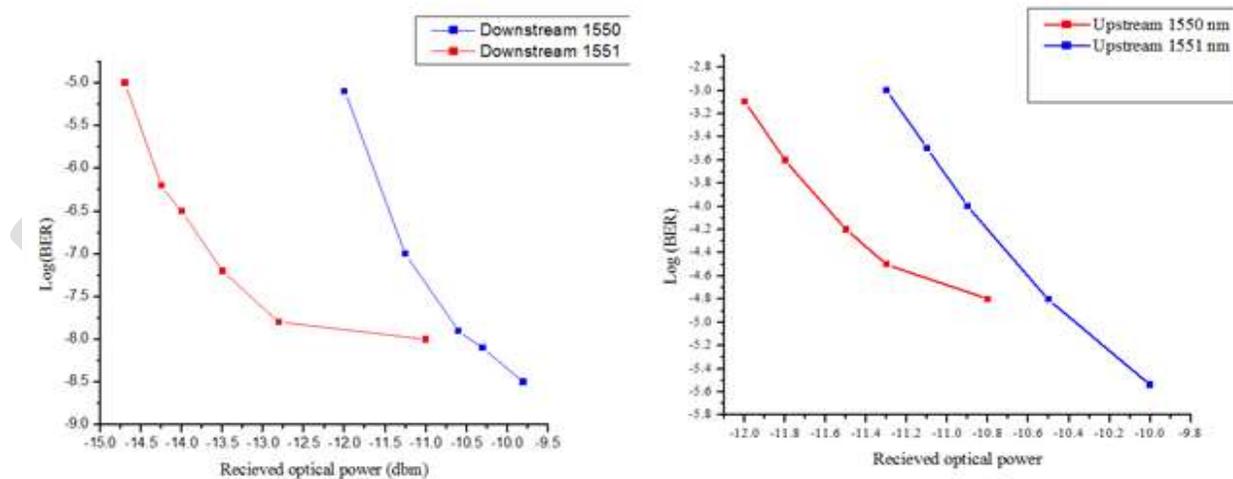


Fig. 5. Transmission performance of downstream and Upstream data

The graph above shows the variation of Received power with BER. At minimum BER the detected power will be high. As the BER is increasing the received power is decreasing.

CONCLUSION

It is successfully demonstrated that wavelength division multiplexing passive optical network (WDM-PON) system can be successfully implemented for 65Km. It delivers downstream 20-Gbps data and upstream 10-Gbps data on a single wavelength. To perform this function it uses pulse source- mode locked laser that generates a single pulse of “sech” shape with specified power and

width i.e. soliton pulse. The transmission distance of the proposed WDM-PON system can be expanded while the performance is maintained.

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Early Alert System in VANET

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Abstract— Global positioning system can be used to get the position of the vehicle and which can be shared with other nodes in the network. For VANET application this positioning information is the central requirement. In case of emergency not all the vehicle get affected in network so it has to be multicast as broadcasting of alert packet is not feasible, but listing the node to be considered for multicast is challenging task as every vehicle cannot hold the location information of the entire vehicle in the network. Calculating the list of relative vehicles position is depending on the traveling direction, bearing angle and the distance by the great circle algorithm. Hence the proposed system is designed and developed to find out the relative position between multiple vehicles where the road side unit will manage all the vehicle information and detect the failure vehicle and calculate the detail of the vehicles get affected by the failure vehicle using the geo positioning and multicast alert packet to identified vehicles. This will narrow down the broadcasting scenario and prevent the traffic conjunction due to traffic density. Thus multicasting will reduce the problems caused by broadcasting. The proposed system consists of two modules that is early alert system and traffic density calculation for retiming of the green signal at the intersection of the road or at the square where according to the number of vehicles the green timing will vary and will be directly proportional which will also allow on demand routing.

Keywords— GPS, VANET, Multicasting, Traffic density, RSU, TCU.

INTRODUCTION

The proposed system is designed and developed to find out the relative position between multiple vehicles for the early alert system. The great circle algorithm is used for calculating the traveling direction, bearing angle and the distance between the multiple vehicles to find out the relative position between them. GPS device provides vehicle location even these locations can be shared with other vehicle. Using GPS device protocol data system can get the direction for which system need to parse & process GPS data Bearing angle: Degree on earth co-ordinate system with respect to vertical center of earth is called as bearing angle. As the accident occurs the information goes to the roadside unit then the RSU communicates with the other vehicles and then multicasts the alert message to the vehicles at the back of the vehicle whose accident has been taken place. The second module is retiming of green signal. Congestion in road traffic is a serious issue and timing of traffic light is pre-defined or fixed in the traffic light and it is independent on traffic density. It is the Priority Based Signal Management in traffic system, which deals with traffic load in each side of lane during high-density traffic on road at specific time. The Improved Priority Based Signal Management in Traffic System is used in heavy traffic roads and the junction, which is based on the time as well as the density, and the time delay will be controlled and density will also be controlled. If the traffic density is high on particular side more priority is given for that side. The Road Side Unit (RSU) continuously keeps watching density on all sides and the green signal is given to the side on priority basis, where the camera detects high density. Priority based signaling is followed here. By using this system traffic can be cleared without irregularities[1]. Maximum density of traffic will allow traffic with maximum timing assigned Minimum density of traffic will allow traffic with minimum timing assigned.



Fig.1: Proposed Model

METHODOLOGY

Based on previous studies reports it is seen that design of early alert message advertising model with reliable routing protocol for multicast messaging has to be done to reduce the traffic congestion. RSUs assists the traffic safety messaging, which delivers early alert safety messages to dedicate vehicles using relative positions by multicasting the alert message to only those vehicle which is going to get affected by accident. Main motive is to improve the VANET connectivity for safety message delivery between the vehicles and the RSUs. Multicasting of Alert Messages is done here. Topology is highly dynamic and rapidly changing in vanet. VANETs provides raveler information, develop comfort application and traffic flow is improved by Popularity of multicast routing protocols has increased the cause is, the VANET routing protocol provides many to many and one to many communication for different application of VANET [8]. Most of the existing multicast routing protocols are designed to satisfy safety applications[1] however there are some non-safety applications that also need multicast routing protocol. Since human spend plenty of time driving their cars daily and along the highways requires a precise management to improve traffic flow and decrease the number of deaths and injuries in vehicular collisions, and eventually make travels more pleasant due to number of increasing cars.

The main goal is detecting relative position and multicasting the critical messages. The additional scenarios implemented are density based green light retiming and priority based green time control for Emergency vehicle.

THE GREAT CIRCLE ALGORITHM

The great-circle algorithm is used in early alert system. Due to lack of real time implementation one can't understand the real problems and the real time scenario issues. In VANET V-2-V is most demanded scenarios for communication but with whom to communicate is the issue. As in VANET information sharing is the most important point but it's a still problem to define a exact message receiver. Human can decide to send message to particular person after looking toward its position, but machine can't do this. GPS device provides vehicle location even these locations can be shared with other vehicle. But vehicle can't get relative position of each other in this way. Proposed system is designed and developed to find out the relative position between multiple vehicles. Here road side unit will manage all the vehicle information and detect the failure vehicle and calculate the detail of the vehicles get affected by the failure vehicle using the geo positioning and multicast alert packet to identified vehicles. This will narrow down the broadcasting scenario and prevent the traffic conjunction due to wrong message delivery to unwanted vehicles.

We can demonstrate everything in simulation by implementing the algorithms on imaginary locations. It is not feasible to setup test bed, as we need real A-GPS and proper environmental set up. In real world vehicle are at desired distance so that changes in every geo-point can be gathered and also RSU can be implemented. So RF based node for intercommunication between vehicles to RSU to vehicle with GUI based scenario Simulation of all modules is justified and also tracing of desired location using GPS. Using Vb.net the simulation is performed for early alert system and retiming of green signal.

Firstly we have to design and develop vehicle node having traveling direction and the location information. Then develop a node, which will work as a roadside unit and manage all vehicle location information and also manage detection of failure node in the network. Once the failure node detected it will calculate the relative position of other vehicle and multicast the messages to particular vehicle.

Many time roads are traffic free still the timer will take its default time. We need a system to calculate the density of traffic and control the signal timer. Maximum density of traffic will allow traffic with maximum default timing assigned. Minimum density of traffic will allow traffic with minimum defined timing assigned. For this calculation of number of communication nodes is to be done first then RSU and TCU communication with TCU increase or decrease the signaling time. Sensors are to be used to sense the number of vehicles.

The main objective of the proposed system is to design and develop to find out the relative position between multiple vehicles. Here road side unit will manage all the vehicle information and detect the failure vehicle and calculate the detail of the vehicles get affected by the failure vehicle using the geo positioning and multicast alert packet to identified vehicles. This will narrow down the broadcasting scenario and prevent the traffic conjunction due to wrong message delivery to unwanted vehicles.

The other objective is traffic density calculation retiming of green signaling so the system is designed and developed to reduce traffic Congestion in road traffic is a serious issue and timing of traffic light is pre-defined or fixed in the traffic light and it is independent on traffic density. Designing a framework for a dynamic and automatic traffic light control system and developed a simulation based model with codes in to help build the system. The system will examine the possibility of deploying an intelligent real-time traffic signal controller, which will receives information transmitted from vehicles. Utilizing this information to optimize the traffic signal scheduling at the intersection.

The system describes to overcome the problem of traffic jam on intersection at the Traffic Signal system. System also proposes the Priority Based traffic light signaling which help to assign the priority to the emergency vehicles. The Roadside Unit (RSUs) will receive information transmitted from vehicles then utilizes this information to optimize the traffic signal scheduling at the intersection. To monitor the density of the traffic, we will keep the Road Side Unit (RSU) besides the road and depends upon the images from the Road Side Unit (RSU), the delay of the traffic signals will be increase or decrease.

The roadside Unit (RSU) installed on every intersection will communicate with vehicle on road at either side, hence calculate number of communication nodes in order to calculate density. Roadside Unit (RSU) will transfer the collected data to the Traffic Control Unit (TCU) and then TCU increase or decrease the signaling time as per the calculated density. The Emergency vehicles having transmitter will send the signal to the receiver on intersection from long distance so that the particular lane's traffic light will be green and allow vehicle to bypass. After passing the emergency vehicle, the traffic system will functioning as per the normal operations as it is. This will gives authority to the permitted vehicles only e.g. Ambulance, Police or Fire department vehicles.

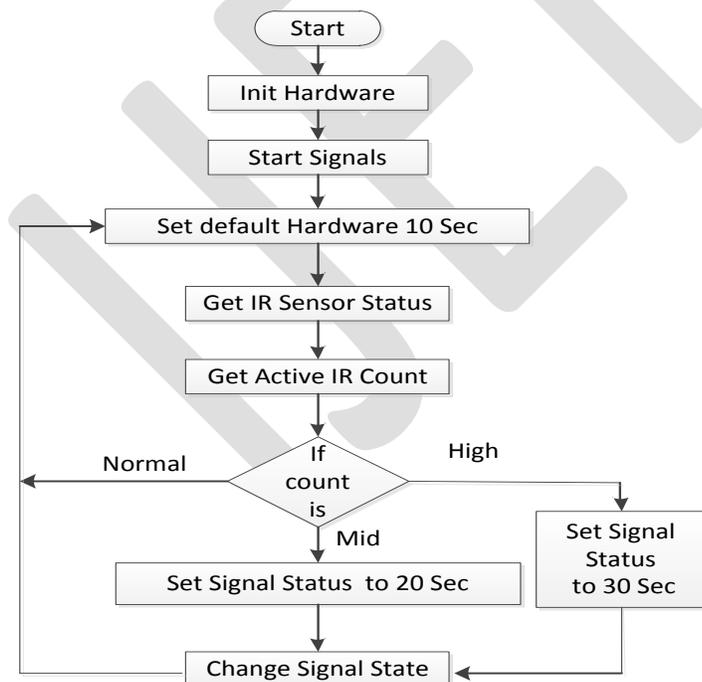


Fig.2: Flow Chart of Retiming of Green Signal

RESULT

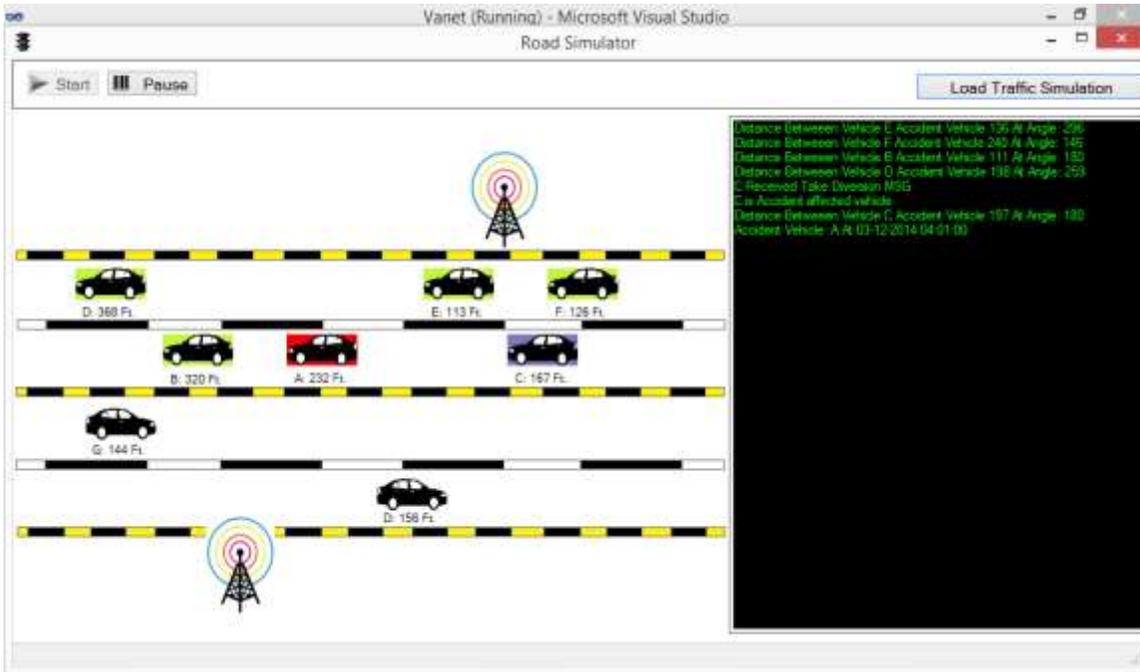


Fig.3: Early Alert System



Fig.4: Traffic Density Calculation

CONCLUSION

The early alert system reduces the traffic accidents and reduces the traffic congestion by multi casting the alert message instead of broadcasting. The multicasting scenario warns the drivers and thus reduces the accidents. The main task is with whom to communicate Priority Based Signal Management in Traffic System shown how the Traffic Light Signal control, including with the implement of Traffic Scheduling Algorithm which is used to gain information from the vehicle position and the speed. The acquired data from Road Side Units reschedule the traffic light timing according to the traffic condition for low or high-density road traffic. If the density of the road traffic is high then Maximum density of traffic will allow maximum default timing for traffic lights. Minimum density of traffic will allow traffic with minimum timing for traffic lights. If the traffic rate on both side is Equal or gap within traffic then according to arrival time traffic light signal set to minimized. The simulated result under high as well as low-density road traffic load.

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An Implementation of Secure Online Voting System

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Abstract –In view of traditional voting environment, voting process is quite troublesome because of disinclination of voters to visit booth. Huge transformation in computer technology has implored us to propagate an online voting system which is much more accessible, favorable and adequate. In this paper, a new way of voting cracks the limitation of traditional voting and focuses on the security and performability of the voting, so that it can reach to “Each and Every” voter of “Each and Every Class”, which will be a leading stride towards heading India a developed country from developing country. It is a twofold system containing SMS voting system and website voting system.

Keywords – CAPTCHA, Encryption and Decryption, iris verification, One Time password, t-pin, IVR system, Short Message Service (SMS), Web services

INTRODUCTION

Voting system is the pillar of every democracy in which voters choose their leaders to show their presence for the way that they will be supervised. Voting scheme have grown from counting hands in previous days to system that include papers, punch card, optical scan machine and mechanical lever i.e. to the electronic voting system. This traditional voting system is the time consuming process therefore maximum of urban population is not able to vote because of their busy schedule.

The fundamental idea behind secure online voting system to conquer inability of the conventional voting system as it suffers from various drawbacks such as it consumes huge volume of paper work, time, there is no personal role of higher officers, damage of electronic machines due to lack of attention. Secure online voting system is the system through which any voter can vote from anywhere in country.

Our main goal is to implement a system which will animate maximum number of voters to cast their vote remotely which will reduce time consumption and hence there will be increase in voting. This system is twofold system incorporating website voting system which ensures much more transparency and security.

Scope of Study

The ambit of the project is that it will use the user ID and tpin generated as password to register him/her in the online voting system, from this all the details of voter and candidate will be saved in database. For the main security purpose email address of voter and candidate will be cross verified with already existing database as the registration details will be sent to that email address.

Online voting system can also send any error messages or any fraud to registered email.

LITERATURE SURVEY

BACKGROUND:

It has always been a backbreaking task for election commission to conduct secure and transparent polls in India. Corers of rupees have been spent by election commission on voting to make sure that the elections are violence free. The traditional voting system which is also knows as electronic voting system using 'EVM (Electronic Voting Machine)' requires huge investment of time because of which people neglect voting.

Author of [1] has proposed an architecture in which voting is done by making use of cards, these cards are designed similar to smart cards which have entire details related to the voter embedded in them. Hence, the proposed architecture in [1] ensures assurability, security, verifiability and transparency in the voting system.

Author of [2] Ralf Kusters has proposed main idea behind clash attacks i.e. voting machine sometimes provide same receipt to the different voters because of this election get manipulated without being detected.

Implementation of e-voting on an Android System has been explained by Kirti Autade in [4], the proposed architecture in the paper cannot be used over large scale especially in a country like India which is one of the developing country and whose major percentage of voters comes out from a rural background. But still the system is very much beneficial for small scale setup such as for College elections or confidential recruitment.

As explained by Ankit Anand [7], in order to overcome the drawback of electronic voting system websites can be introduced which will help voters to remotely cast their votes. This system has capability of reducing human errors and will provide better scalability for large elections. But this system was not capable of reducing the conflicts due to fake identity and was even not feasible for rural people who do not have access to internet.

To overcome this Aree Ali Mohammed [3] proposed two way systems which came out as much enhanced and efficient alternative system. Twofold system comprises of SMS voting system and Website voting system. The undesirable characteristic of above mentioned system is lack of verifiability of voter identity, accuracy and transparency.

As per Gina Gallegos-Garcia [5] encryption, decryption and cryptography can be used as one of security measure while data transmission. Even Author [6] Jagdish B.chakole and P.R.Pardhi has propounded a design of secure online voting system by making use of asymmetric and symmetric keys for encryption and decryption of messages that are used for casting votes. It was designed to ensure accuracy, democracy simplicity, verifiability, consistency, privacy, security.

Author of [10] Niranjan Malwade has propounded the idea of smart voting system with face recognition where user can vote by using android application which can be downloaded over internet. The authentication will be done using SMS confirmation and face recognition.

The implementation of highly secured online voting system over network by R. Udayakumar [11], proposed architecture of the internet voting where user can participate using their information stored in database while creating the voter ID and all the information need to be updated at a period of less than 6-months. The major drawback of this system is that it need high speed internet connection.

Author of [12] has proposed an online voting system with secure user authentication by providing biometric and password security to voter account, basically merging secret key with the cover image on the basis of core image.

PROPOSED SYSTEM

Our proposed system is the two-fold system one is voting through website and other is through mobile phones. The voter can use either of the two ways as per his convenience. For first fold the software is being developed for the use of everyone with a simple and self-descriptive GUI which needs strong internet connection. On the other fold interactive voice response (IVR) is used to let voters vote from normal mobile phones.

All the voters and candidates must register first and then they can vote to choose their leader after login to online voting system using user ID, system generated password and by scanning and verifying their iris. This online voting system is a system by which any Voter can use his/her voting rights from anywhere in country. The online voting system contains:

- 1) Voter's details in database.
- 2) Candidate's details in database.
- 3) Voters and candidate's ID and password.
- 4) Collection of total number of votes.

The intended online voting system can be defined using four phases:

- 1) Registration phase.
- 2) Authentication phase.
- 3) Voting phase.

Counting phase

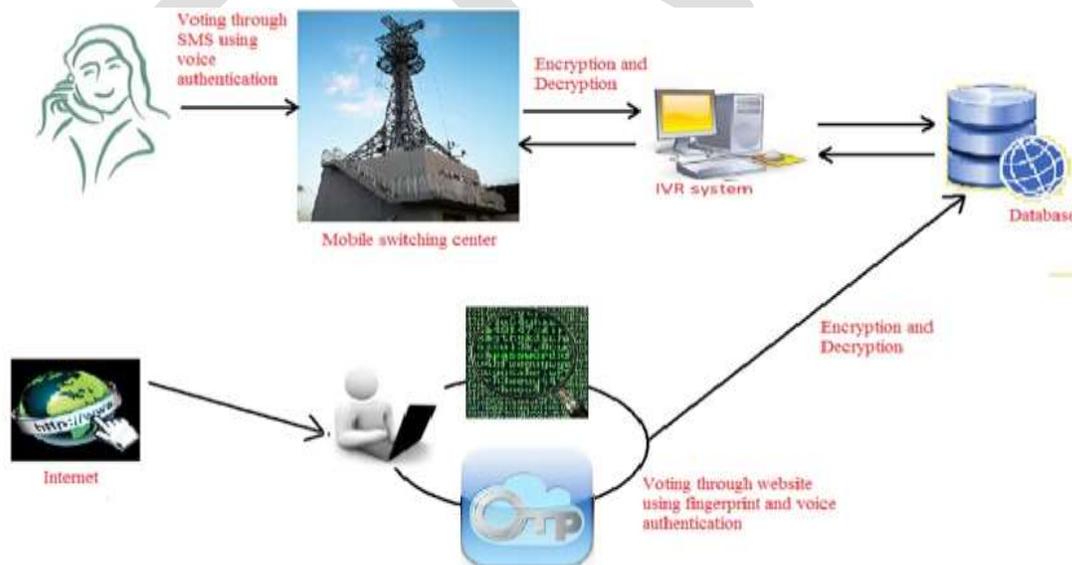
EXPERIMENTAL RESULT

The online voting system software is developed to be used by everyone with very simple and self-explanatory GUI (graphical user interface). All the information which user will enter will get stored in database.

At the time of registration voter has to enter all the information like name, voter id and adhaar card number etc. to verify himself. If the adhaar card number and voter Id is matching then only voter can proceed further and can enter register. Some of the experimental results of online voting system is as shown in below.

HOME

This is the first page i.e. welcome page of the system. User can login or can view some voting tips and even register to the system just by one click in home page.



DESIGN AND IMPLEMENTATION

The secured online voting system is the two way voting system. The first way is internet voting which include OTP generation for user identity, 10 digit system generated password which will be sent to user or voter on their email address, etc. Two step verification increase assurability and transparency in the user login to the system where user get OTP (one time password) message to his/her registered phone number. To increase the security of online voting system to another extent which is quite important thus we have implemented iris scanning and verification of human eye. The second way is voting through IVR(interactive voice response) system

where user have to call to the online voting system then system ask him/her for voter ID, password and verify them and let them vote to the party of their choice.

The focus of this design is to elaborate an interchangeable and collective online voting system with which user can register and get user ID and password and can vote for the candidate of their choice after login to the system. The total implementation overview of secured online voting system is as shown in figure 1. And first fold of system i.e. internet voting workflow is as shown in figure 2.

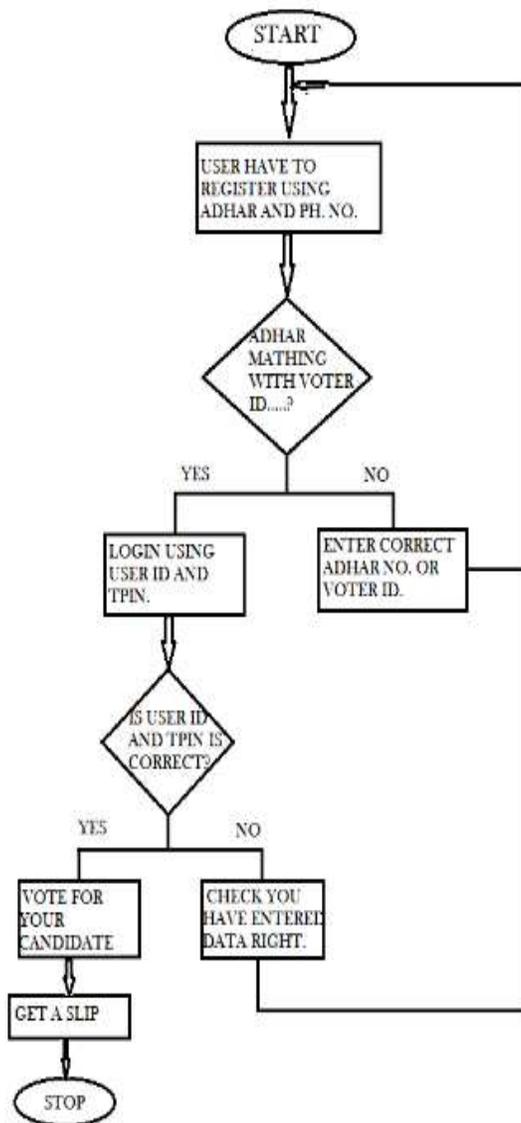


Fig2. Internet Voting

The second fold of system i.e. voting through normal mobile phones for which we have implemented IVR (interactive voice response) system. The normal workflow of voting through IVR is as shown in figure 3.

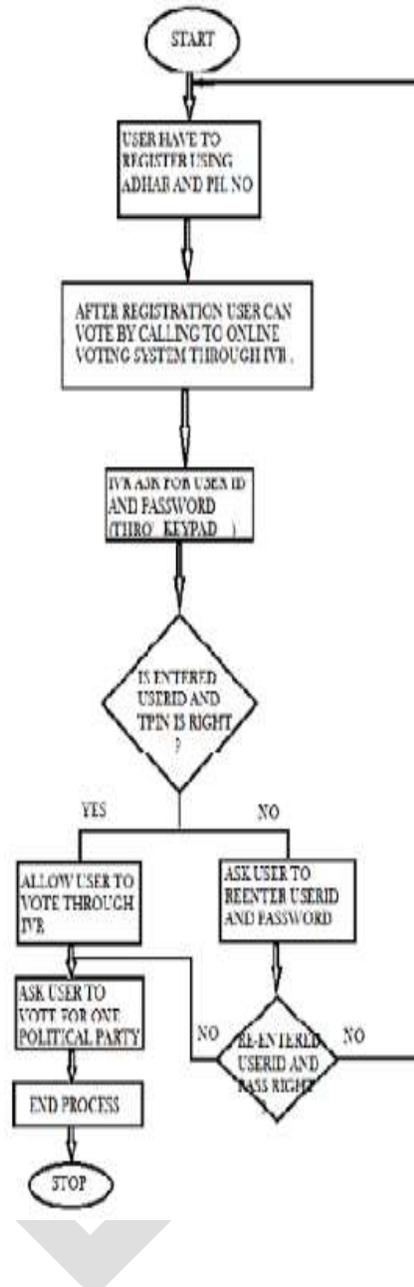


Fig3. IVR votin

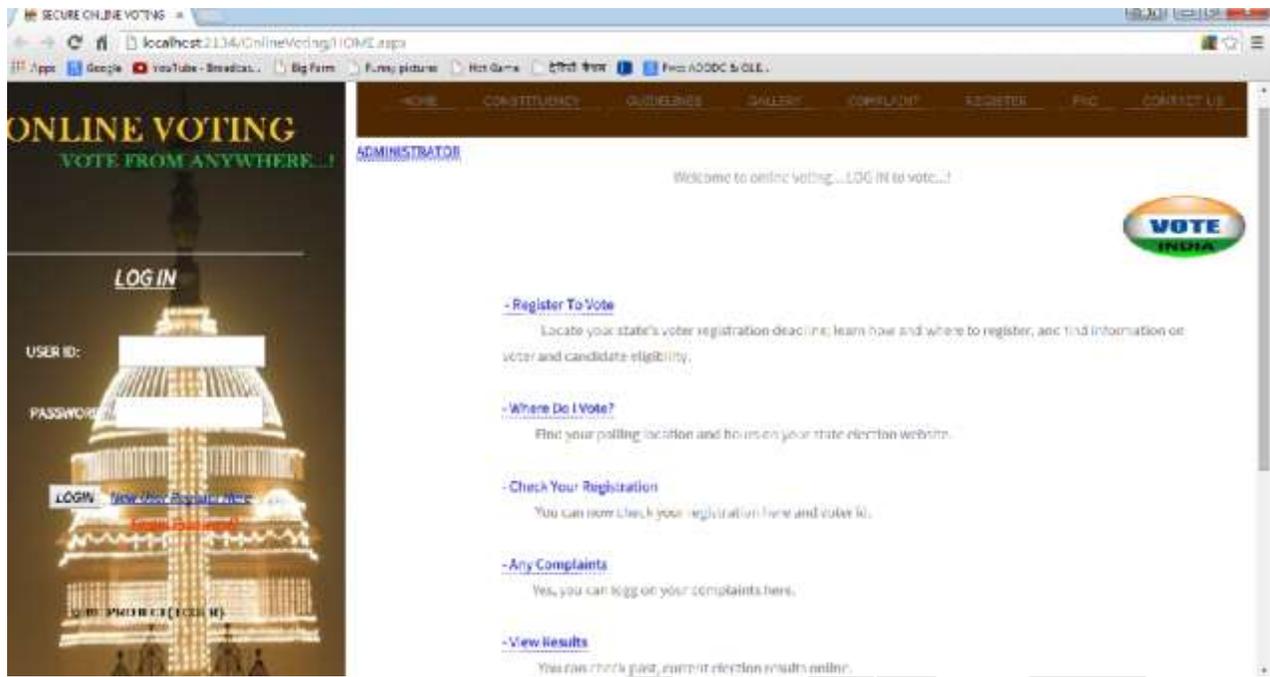


Fig4. Home page

CHECK YOUR REGISTRATION

This is the page where user can check his/her registration details just by entering birth date and voter ID. If person is not registered then system tells them to register first.

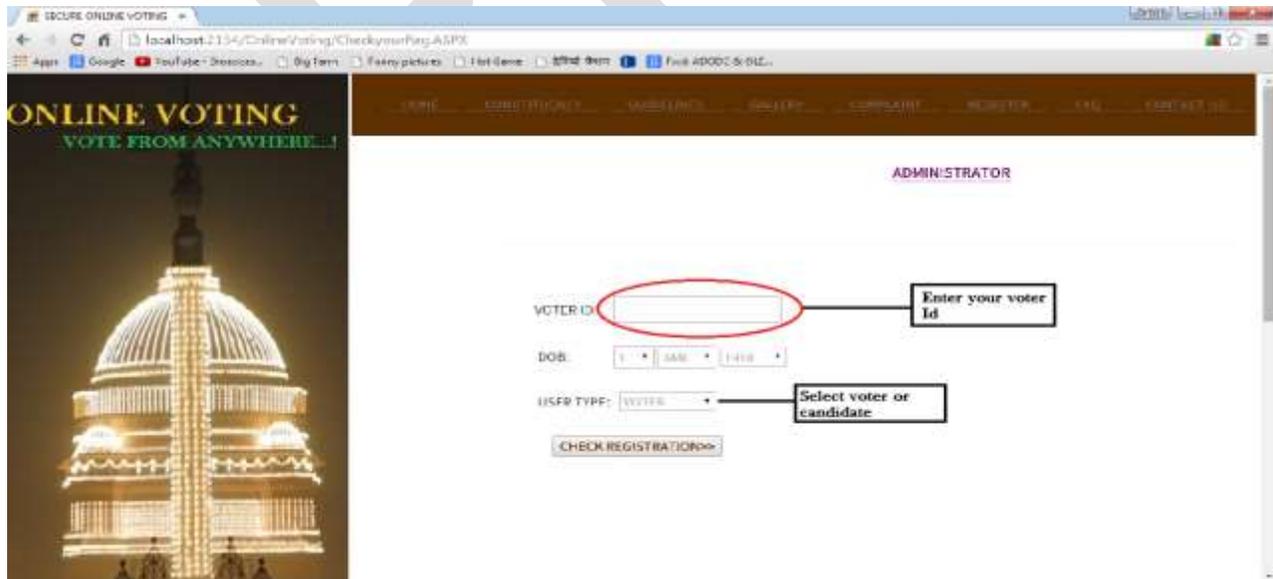


Fig5. Check Registration

TWO STEP VERIFICATION

This page appears after user login into system to vote. In this, system sends OTP message to user's phone number which had given at the time of registration. This increase the security level of system.



Fig6. 2-step verification

REGISTER VOTER

This is voter registration page where voter have submit all there details to get registered in system and to vote in coming elections.

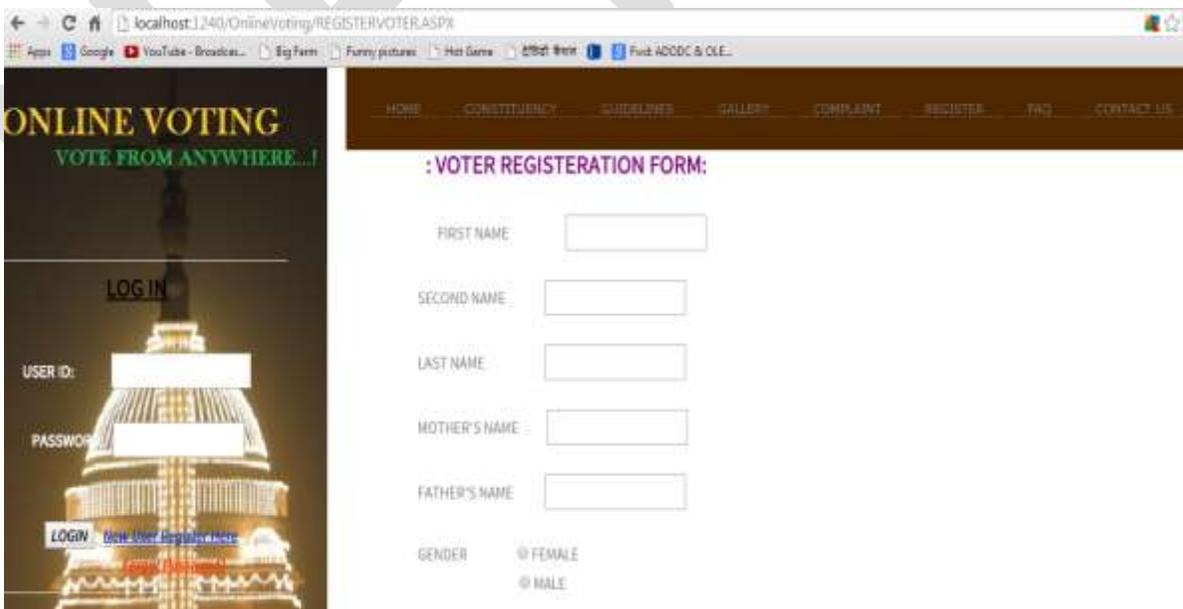


Fig7. Registration page

IVR SYSTEM

This is the second phase of online voting system where user can vote using normal handsets. This is mainly implemented for the people who live in rural area. The working IVR system is as shown in figure 8.

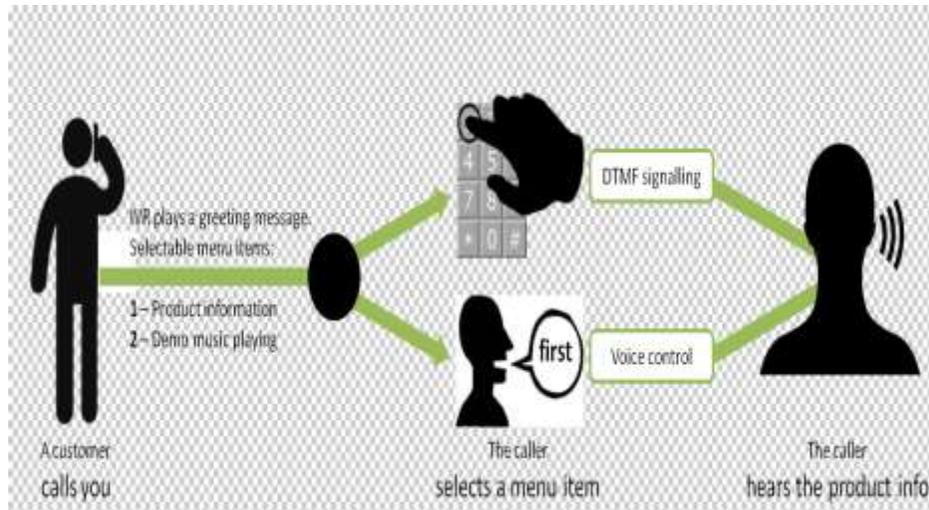


Fig8. IVR system working

FUTURE SCOPE:

The practicable future scope of the project includes the improvement in the security level of the system. In annexation to that it would be interesting to meet some other confidential primitives to improve the security level of online voting system.

The future improvement can also be done for voice verification in IVR, system crash and power failure so that the voters can vote with more assurance.

CONCLUSION:

Our proposal allow a voter to cast his/her voter through internet and also through normal handsets, therefore voter does not have to go to voting booths to vote they can vote from anywhere in India. To make our system highly secured we also have enforced the method for iris scanning and verification.

Our system also provides high transparency of voter's details at the time of registration only i.e. when voter is registering to the system then his voter Id and Aadhar number should match. The user validation process of our system is enhanced by adding iris matching, security key and one time password. This system will exclude the customary action like rigging. Consequently, the member of state or country can believe that they alone can choose their leaders and this system allows them to vote from anywhere.

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IJERGS

Low Power-Delay-Product CMOS Full Adder

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Abstract— This paper shows an effective and improved circuit design for 1-bit full adder circuit with lesser energy required. The circuit is designed using total number of 9 transistors. The proposed circuit performance better in terms of power, delay, power delay product which is very easily shown by the simulation results. There is comparison of performance among proposed circuit with other pre-exist circuits in various literatures and this comparison shows higher reduction in Power-Delay-Product (pJ) of our proposed design. It has remarkably improved power consumption and temperature sustainability when compared with existing design. BSIM standard models are used for simulations. The proposed design gives faster response for the carry output and can be used to reduce more at higher temperature.

Keywords— nMOS; pMOS; Adder; PDP, Delay.

INTRODUCTION

Addition is one of the fundamental arithmetic operations. It is used extensively in many VLSI systems such as microprocessors and applications specify DSP architecture. In addition to its main task which is adding two numbers, it is the nucleus of many other useful operations such as, subtraction, multiplication etc. In most of these systems the adder lies in the critical path that determines the overall performance of the system. The XOR gate is the basic building block of the full adder circuit. The performance of the full adder can be improved by enhancing the performance of the XOR gate. The main intention of reducing this transistor count is to reduce the size of XOR gate so that large number of devices can be configured on a single silicon chip thereby reducing the area and delay.[1]. Most of the time increasing the threshold voltage could limit performance loss but results get increased leakages [2]. There are some other techniques as well which are used for design of low power which includes clock gating along with dynamic voltage or frequency scaling [3] and [4]. Energy-efficiency is one of the most required features for modern electronic systems designed for portable applications. 1bit Full Adder (FA) cell is the building block for most implementations of subtraction, addition operations. Full adder circuit is functional building block and most critical component of complex arithmetic circuits like microprocessors, digital signal processors or any ALUs. Almost every complex computational circuit requires full adder circuitry. The entire computational block power consumption can be reduced by implementing low power techniques on full adder circuitry To meet the rising demand, we advise a new energy efficient power adder by reducing the number of the MOS Transistor which reduces loss problem, considerably diminishing the power consumption compared to its peer design. So a new improved 9T 1-bit full adder cell is presented in this paper. We have conducted simulation runs in different input patterns, varying voltages and temperatures. The reason to do these many simulations is to give a better confidence to how this new adder would perform under all possible practical applications. Results demonstrate improvement in threshold loss, power consumption and temperature sustainability.

THEORETICAL BACKGROUND

Full Adder circuit adds a pair of matching bits of the two different numbers which are expressed in binary form and carry from the earlier stage producing a sum with a new carry. Hence, it is also called a two input adder. Basically adder topologies are based on two XOR circuits (Module I and Module II) generating the sum and Module 3 made up of different topologies to generate the carry out as shown in fig.1. The Carry signal can be obtained by using one MUX and one XOR output.

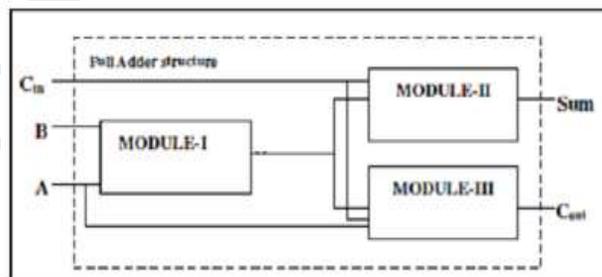


Fig.1: Structure of Full Adder

PREVIOUS WORKS

Full adder circuit is designed for addition binary logics. Sum signal (SUM) and carry out signal (COUT) are the output of I-bit full adder. Both of them are generated by input A, B and C_{IN} following Boolean equation as:

$$SUM = A \oplus B \oplus C_{IN} \tag{1}$$

$$C_{OUT} = AB + BC_{IN} + AC_{IN} \tag{2}$$

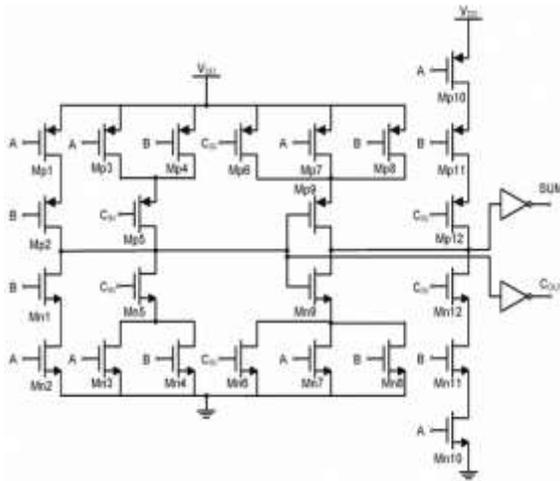


Figure 2. Conventional CMOS full adder [1][5][6][7]

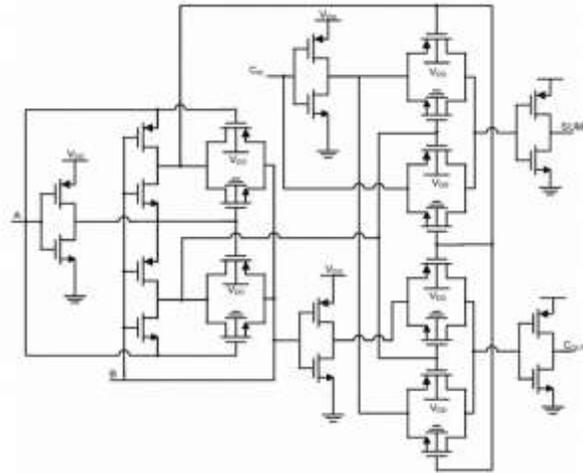


Figure 3. Transmission gate full adder [8]

Conventional CMOS full adder [1] [5] [6] [7], as shown in Fig. 2, is the complementary CMOS structure, which combines transistor PMOS pull-up and transistor NMOS pull-down network to produce output. The complementary CMOS logic circuit has the advantage of layout regularity and stability at low voltage. It has a high transistor count which consumes area and power. The problem of this adder is delay imbalance. Because SUM signal relies on the generation of COUT signal; there is a delay between two signals. The transmission gate full adder is illustrated in Fig. 3, which based on transmission gate [8]. It has lower-transistor count and lower loading of the input. After generated, SUM and COUT signal are balanced than the Conventional CMOS full adder. It provides transistor buffer output of SUM and COUT for a high driving capability. In Fig 4 shows Hybrid transmission gate/pass transistor logic full adder [7]. It is developed from transmission gate, pass transistor logic and enhance the driving capability by insert inverters at output. Its drawback is high power consumption.

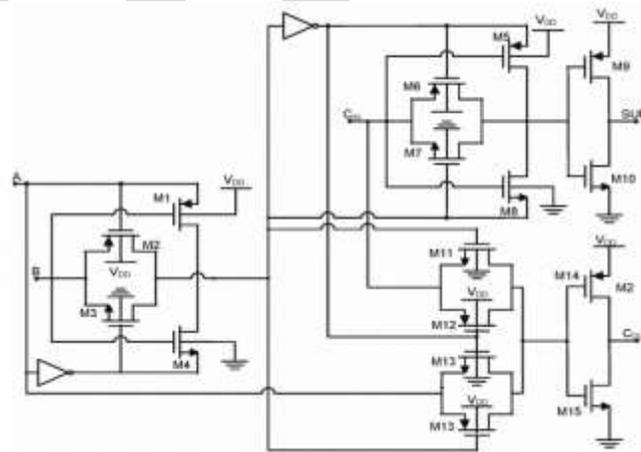


Figure 4. Hybrid transmission gate/pass transistor logic full adder [7]

PROPOSED WORK

The Full adder design in static CMOS with complementary PMOS and NMOS [13]. This adder is based on regular CMOS structure (pull-up and pull-down network), which uses both NMOS and PMOS transistors. These transistors are arranged in a structure formed by two complementary networks. In static CMOS, the NMOS transistors only need to pass 0's and the PMOS only pass 1's, so the output is always strongly driven and the levels are never degraded. This is called a fully restored logic gate. Pull-up network is complement of pull-down. Below schematic, fig 5, is a Full adder cell of 9 transistors which is implemented by using CMOS technique (used sum and carryout equations).

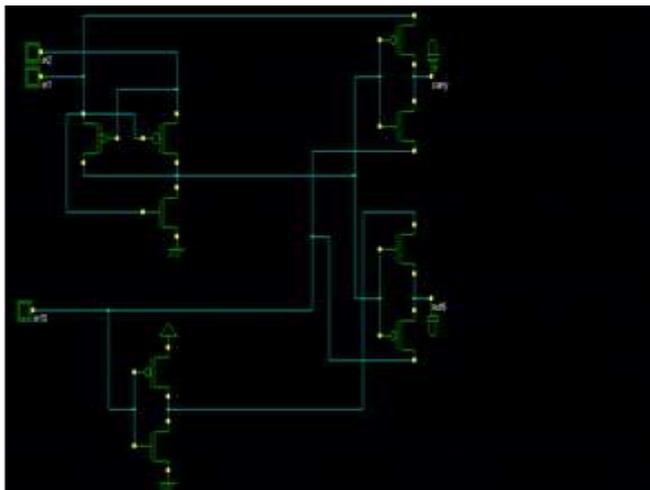
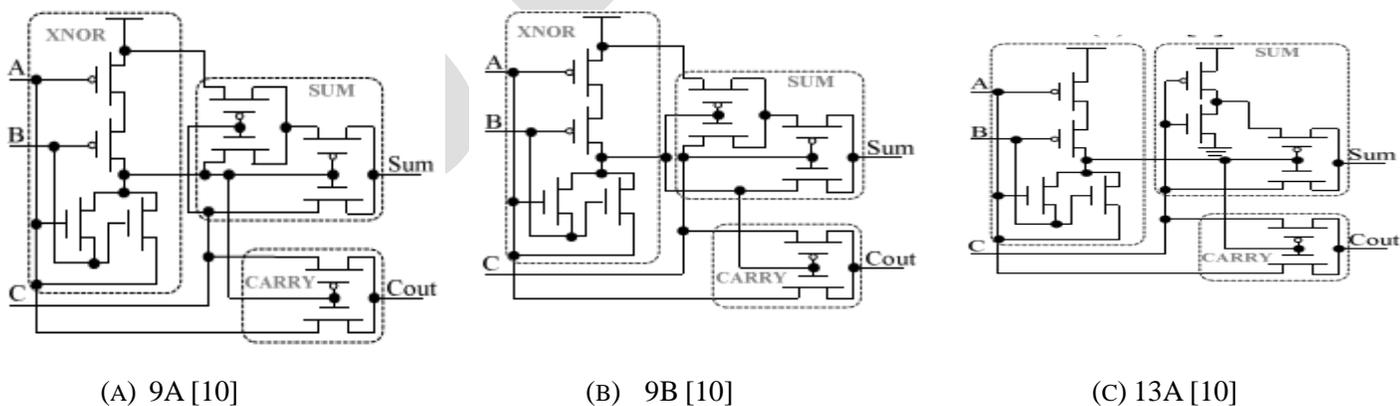


FIG 5: PROPOSED 9 TRANSISTOR FULL ADDER

SIMULATION AND RESULTS

The proposed full adder circuit as well as other reported circuits is simulated by using Microwind2 and Dsch2 tools for power consumption, area, and delay at 120nm and 70nm technologies with appropriate supply voltages and the results are given in Table 1. The proposed 1 bit adder cell consumes lower power compared to other reported circuits and also gives faster response for carry out and degrades sum output response compared to 9A [10], 9B [10], 13A [10], CLRCL [11] and CP-FA, respectively. CLRCL (Complementary and Level Restoring Carry Logic) is previous version of 10-T full adder [12] design featuring low power operations and fast carry signal propagation. Typical transistor sizes, i.e. (pMOS/nMOS)=1.0 μ m/0.5 μ m in width and 0.18 μ m (minimum feature size) in length are applied to all.



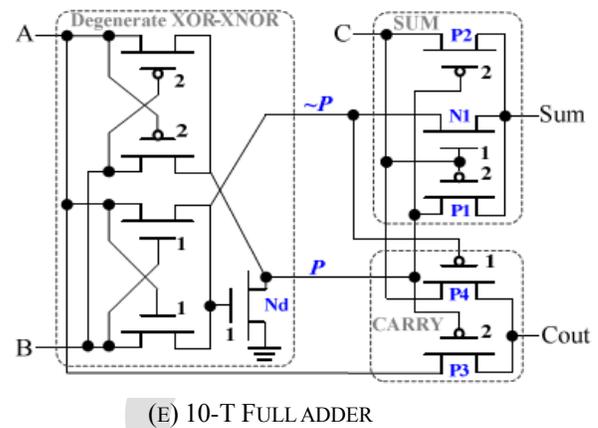
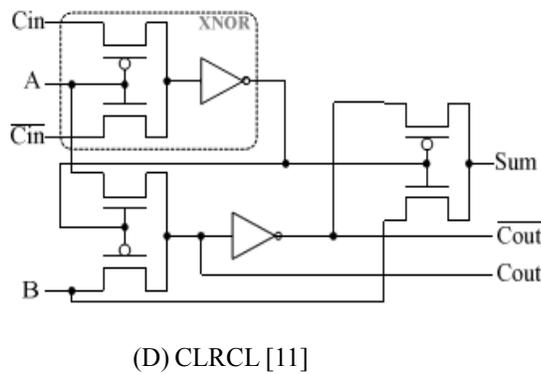
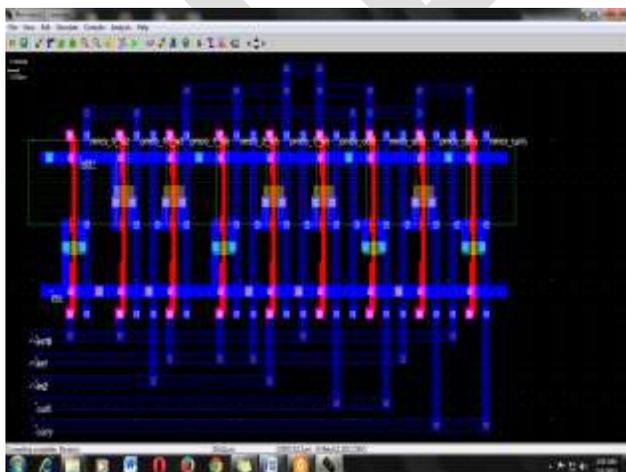


Fig 6: Various Full Adder Design

TABLE I. 6 FULL ADDERS SIMULATION RESULTS

Full Adder Designs	9A	9B	13A	CLRCL	10-T	PROPOSED
$C_{out}/CARRY$ DELAY (nS)	4.11	3.92	3.84	1.52	0.85	.0023
Power Consumption (uW)	36.68	43.07	39.01	39.82	33.25	1.34
Power-Delay-Product (pJ)	150.75	168.83	149.8	60.53	28.26	0.003082



Simulation waveforms of proposed 9-Transistor full adder design

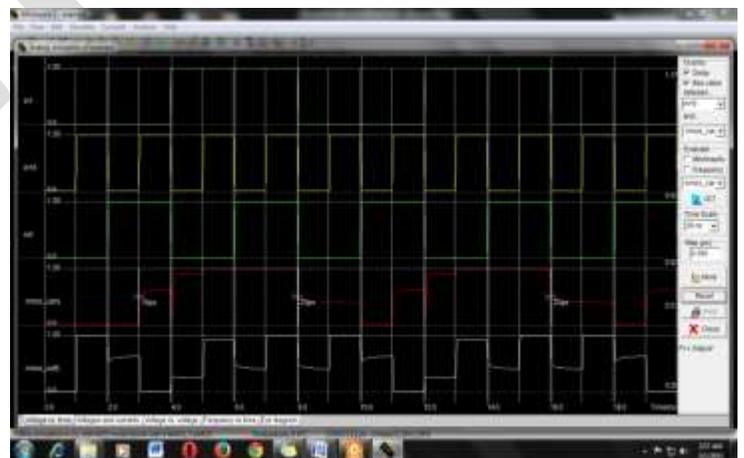


Fig 7: Layout of proposed full adder circuit

Fig 8

The PDP (Power-Delay-Product) was calculated and simulated plotted. We constructed full adder cells with the basic techniques and our proposed technique. Table I, Figure. 6 and Figure 7 show the comparison of delay of all the reference circuits, the basic circuits and the proposed circuit. Table I compares the power consumption of the circuits. At the same time, Table I in association with figure 7 compared the power delay product (PDP) of the proposed adder with the conventional adders. When compared to the other circuits it can be seen that the power-delay-product (PDP) can be reduced many-many times in the proposed adder circuit.

ACKNOWLEDGMENT

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CONCLUSIONS

In this paper, the current work simulated the design of 9 transistors full adder, which is used low transistor count. With the help of 9 CMOS transistors, we have realized the circuit and compared proposed work with the previous, conventional adder circuits. The simulation results shows that this proposed adder has better performance than the previous proposed conventional circuits. This improvement is lots more time the available existing designs of various full addresses. XOR gate which is implemented by PMOS pass transistors has a less delay .The main aim of this paper is to design a high performance and low Power-Delay-Product.

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INTELLIGENT CONTROL OF ELEVEN LEVEL CASCADED INVERTER WITH REDUCED NUMBER OF SWITCHES USING STEP MODULATION

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Abstract— Multilevel inverter is widely used in high power industrial application. This paper presents a new modified cascaded H bridge multilevel inverter with reduced switching component. In conventional CHB inverter more number of components is used, it seem to more complex control circuit and bulky. In proposed MLI, output voltage level increased by using less no of switches works by the step modulation technique. The CHB 11 level inverter governed by the Fuzzy logic controller and it is powered by separate Dc sources, in order to improve the power quality by reducing the harmonic distortion at the output voltage. Hence the efficiency of the system will be improved. The results are validated using MATLAB/SIMULINK.

Keywords— FLC, Cascaded Multilevel Inverter, SPWM, PI controller.

INTRODUCTION

In recent years multi level inverters are used high power and high voltage applications. Multilevel inverter produces a staircase output waveform, this waveform look like a pure sine wave. The multilevel inverter output voltage has less number of harmonics compare to the conventional bipolar inverter output voltage.

Multilevel Inverter make it possible to achieve medium voltage generation using low to medium voltage switches, preventing high dv/dt stress and the need for series connection of switches while allowing higher converter power rating.[1] Multilevel converters have less filter requirements, generate a staircase waveform, have better harmonic profile (lower total harmonic distortion), and have less switching losses. Cascaded H-bridge (CHB), diode-clamped and capacitor-clamped are among the most common topologies, More emphasis will be given here to the features related to the CHB, since it is the topology to be used here for harmonic control. The cascade multilevel topology and its universal module have several advantages over the traditional customized converter architecture. The cascaded H-bridge multilevel inverter is composed by the series connection of power cells, each one containing an H-bridge inverter and isolated dc-sources.[2] Each H-bridge cells can provide the three different voltages like zero, positive DC and negative DC voltages. One of the advantages of this type of multilevel inverter is that it needs less number of components compared with diode clamped and flying capacitor inverters. Fig (1) shows the eleven level cascaded inverter. In [4], a new approach for modulation of an 11-level cascade multilevel inverter with step modulation using fuzzy logic controller with reduced number of switches is presented.

CASCADED MULTILEVEL INVERTER

One more alternative for a multilevel inverter is the cascaded multilevel inverter or series H-bridge inverter. The CMLI has been utilized in a wide range of applications. With its modularity and flexibility, the CMLI shows superiority in high-power applications, especially shunt and series connected FACTS controllers. The CMLI synthesizes its output nearly sinusoidal voltage waveforms by combining many isolated voltage levels. By adding more H-bridge converters, the amount of Var can simply increased without redesign the power stage, and build-in redundancy against individual H-bridge converter failure can be realized. A series of single-phase full bridges makes up a phase for the inverter. A three-phase CMLI topology is essentially composed of three identical phase legs of the series-chain of H-bridge converters, which can possibly generate different output voltage waveforms and offers the potential for AC system phase-balancing. This feature is impossible in other VSC topologies utilizing a common DC link. Since this topology consists of series power conversion cells, the voltage and power level may be easily scaled.[5] The dc link supply for each full bridge converter is provided separately, and this is typically achieved using diode rectifiers fed from isolated secondary windings of a three-phase transformer.

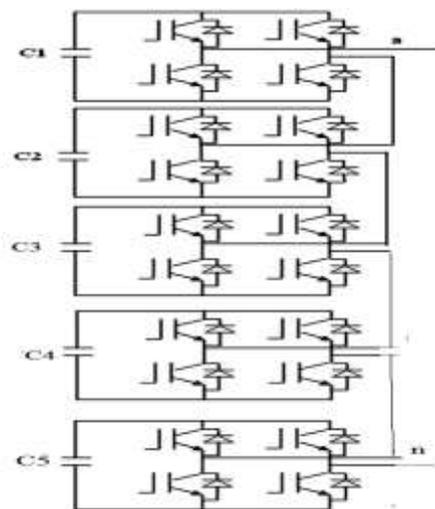


Fig.1,Single phase structures of Cascaded inverter 11-level

FUZZY CONTROL

Fuzzy control is a control method based on fuzzy logic. Just as fuzzy logic can be described simply as “computing with words rather than numbers”, fuzzy control can be described simply as “control with sentences rather than equations” [6]. A fuzzy controller can include empirical rules, and that is especially useful in operator controlled plants.

Fuzzy Logic Control System

In contrast to conventional control techniques, Fuzzy Logic Control (FLC) is best utilized in complex ill-defined processes that can be controlled by a skilled human operator without much knowledge of their underlying dynamics. The basic idea behind FLC is to incorporate the "expert experience" of a human operator in the design of the controller in controlling a process whose input – output relationship is described by collection of fuzzy control rules (e.g., IF-THEN rules) involving linguistic variables rather than a complicated dynamic model. [7] The utilization of linguistic variables, fuzzy control rules, and approximate reasoning provides a means to incorporate human expert experience in designing the controller.

In this project I have used an FLC of the Mamdani model with 25 rules based on the 5 segments of the error and error rates. The centroid type of defuzzification is adopted. The rule matrix used is of the sliding rule method.

PROPOSED MULTILEVEL INVERTER TOPOLOGY

The performance of Multilevel inverter is highly superior to that of conventional two-level inverters due to reduced harmonic distortion, lower electromagnetic interference, and higher dc link voltages. However, it has some disadvantages such as increased number of components, complex pulsewidth modulation control method, and voltage-balancing problem. In this project, a new topology with a reversing-voltage component is proposed to improve the multilevel performance by compensating the disadvantages mentioned. This topology requires fewer components compared to existing inverters (particularly in higher levels) and requires fewer carrier signals and gate drives. [8] Hence this new topology is named as Reversing Voltage (RV) topology. This topology is a hybrid multilevel topology which separates the output voltage into two parts. One part is named level generation part and is responsible for level generating in positive polarity. This part requires high frequency switches to generate the required levels. The switches in this part should have high-switching-frequency capability. The other part is called polarity generation and is responsible for generating the polarity of the output voltage, which is the low-frequency part operating at line frequency.

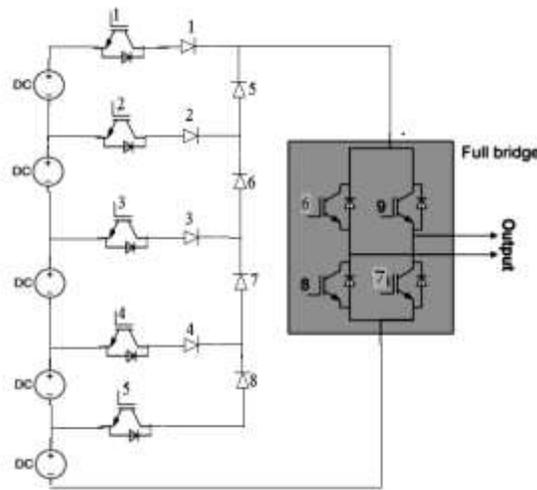


Fig.2, Circuit Diagram of Eleven level Inverter With Reduced number of switches

The proposed circuit diagram is shown in fig.2. which consists of 9 switches and 5 dc sources instead of using conventional Eleven level cascaded H-bridge inverter with 20 switches and 5 dc sources.

Table.1. Switching states for eleven level inverter using RV Topology with fuzzy logic controller

Output Voltage	S1	S2	S3	S4	S5	S6	S7	S8	S9
5V _{dc}	1	1	1	1	1	1	1	0	0
4V _{dc}	1	1	1	1	0	1	1	0	0
3V _{dc}	1	1	1	0	0	1	1	0	0
2V _{dc}	1	1	0	0	0	1	1	0	0
1V _{dc}	1	0	0	0	0	1	1	0	0
0V _{dc}	0	0	0	0	0	1	0	1	0
-1V _{dc}	1	0	0	0	0	0	0	1	1
-2V _{dc}	1	1	0	0	0	0	0	1	1
-3V _{dc}	1	1	1	0	0	0	0	1	1
-4V _{dc}	1	1	1	1	0	0	0	1	1
-5V _{dc}	1	1	1	1	1	0	0	1	1

In table 1, switches S1 to S5 indicates level generation part which are high frequency switches and S6 to S9 indicate polarity generation part which are low frequency switches. According to the switching state the required levels and output voltages are generated at the inverter output. Also the inverter output is controlled by fuzzy logic control with the help of PIC microcontroller.

The function of the fuzzy logic controller in this context is that it monitors the actual value of the output voltage and compares it with the set point. Based on the error and error rate a decision is made by the Fuzzy Logic Controller in association with a decision making tool that consists of the rule base.

Depending upon the output of the FLC the duty cycle of each level is adjusted automatically in the making of the eleven level inverter and thus the average output voltage is made equal to the required voltage. The Mamdani type of fuzzy logic is used in this project. The error and the error rates have been segmented into five and the total number of rules was 25. The method of defuzzification used in this project is of the centroid method.

SIMULATION RESULTS

A Eleven level inverter using RV topology model was implemented in MATLAB / SIMULINK software with PD-SPWM technique. Figure.3 presents the output voltage and current waveform of eleven level inverter using RV topology. The simulation results are obtained for the output voltage and output current of the single phase eleven level RV Topology inverter for PD-SPWM Technique. FFT spectrum of the output voltage and current waveform of 11-level inverter using RV topology is shown in fig.4, and fig.5, respectively.

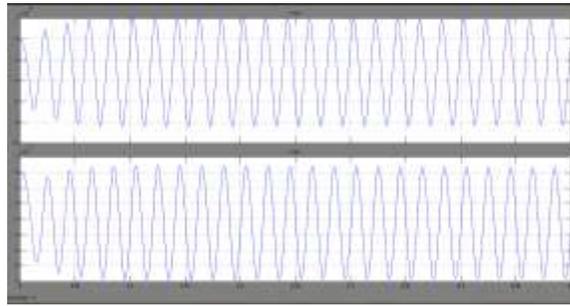


Fig.3, Output voltage and current waveform of the eleven level inverter using RV Topology

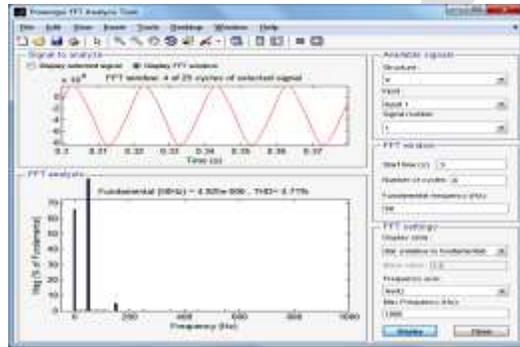


Fig.4, FFT spectrum for the output voltage waveform of eleven level RV topology inverter

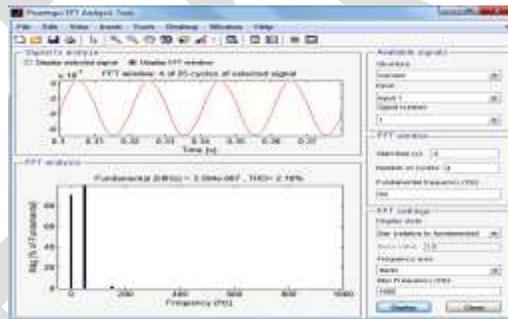


Fig.5, FFT spectrum for the output current waveform of eleven level RV topology inverter

A Eleven level inverter using RV topology with PI controller model was implemented in MATLAB / SIMULINK software with PD-SPWM technique. Figure.6. presents the simulation model of eleven level inverter using RV topology with PI Controller and is developed using MATLAB/ SIMULINK. The simulation results are obtained for the output voltage and output current of the single phase eleven level RV Topology inverter with PI Controller for PD-SPWM Technique. FFT spectrum of the output voltage and current waveform of 11-level inverter using RV topology with PI controller is shown in fig.7, and fig.8, respectively.

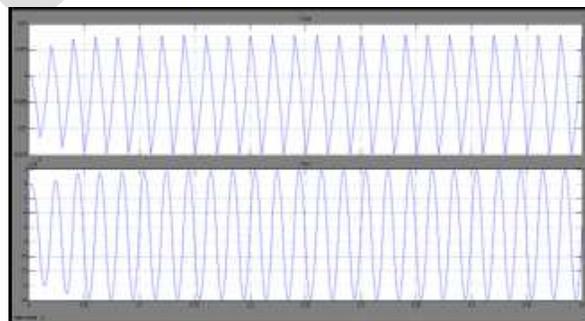


Fig.6, Output voltage and current waveform of the Eleven level inverter using RV Topology with PI controller

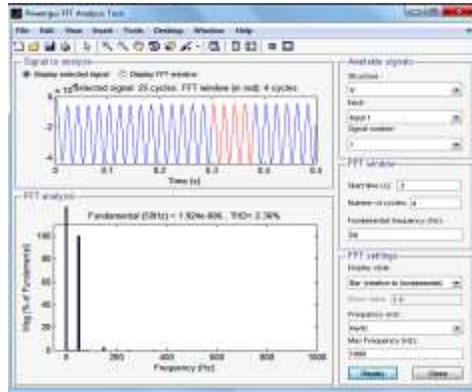


Fig.7, FFT spectrum for the output voltage waveform of eleven level RV topology inverter with PI Controller

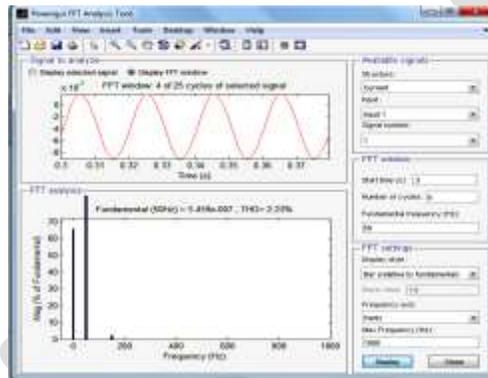


Fig.8, FFT spectrum for the output voltage waveform of eleven level RV topology inverter with PI Controller

A Eleven level inverter using RV topology with fuzzy logic controller model was implemented in MATLAB / SIMULINK software with PD-SPWM technique. Figure.9 presents the output voltage and current waveform of eleven level inverter using RV topology with fuzzy logic Controller and is developed using MATLAB/ SIMULINK. The simulation results are obtained for the output voltage and output current of the single phase eleven level RV Topology inverter with fuzzy logic Controller for PD-SPWM Technique. FFT spectrum of the output voltage and current waveform of 11-level inverter using RV topology with fuzzy logic controller is shown in fig.10, and fig.11, respectively.

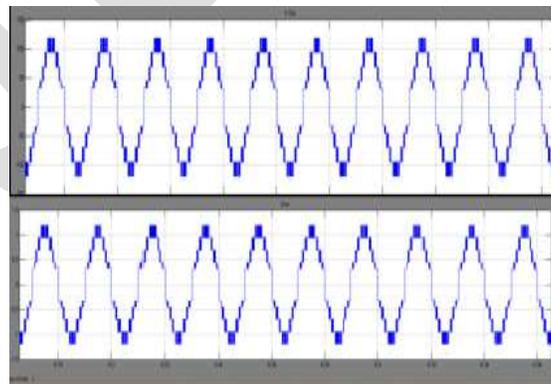


Fig.9, Output voltage and current waveform of the eleven level inverter using RV Topology with fuzzy logic controller

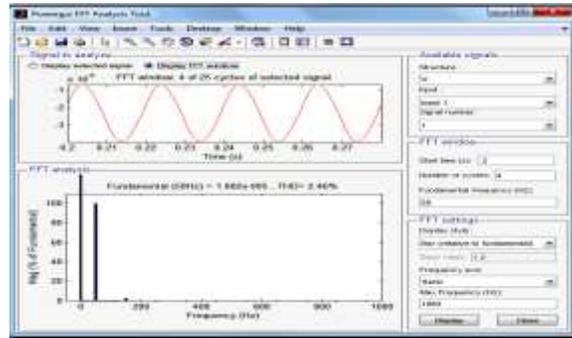


Fig.10, FFT spectrum for the output voltage waveform of eleven level RV topology inverter with fuzzy logic Controller

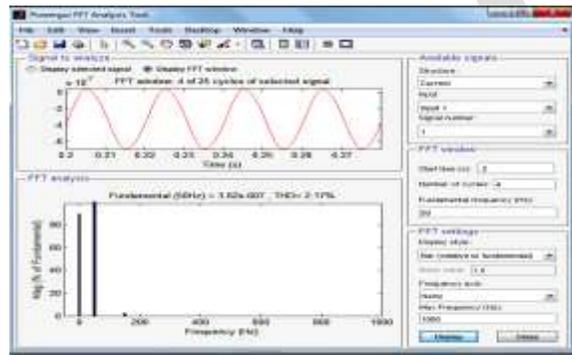


Fig.11, FFT spectrum for the output current waveform of seven levels RV topology inverter with fuzzy logic Controller

From the above FFT spectrum analysis, the percentage THD values for each scheme are noted in the table.2. The percentage THD values for output voltage and output current for eleven level RV Topology inverter without control scheme and also with PI and FLC schemes are analyzed. From the table 2, it is observed that the output current percentage THD value is minimum for Fuzzy Logic Control scheme over the other schemes.

Table 2. Percentage THD analysis of eleven level inverter using RV Topology

Description	Output Voltage % THD	Output Current %THD
Without Controller	4.71	2.16
With PI Controller	2.36	2.23
With Fuzzy Logic Controller	2.46	2.17

CONCLUSION

A new inverter topology has been proposed which has superior features over conventional topologies in terms of the required power switches and isolated dc supplies, control requirements, cost, and reliability. It is shown that this topology can be a good candidate for converters used in power applications such as FACTS, HVDC, PV systems, UPS, etc. In the mentioned topology, the switching operation is separated into high- and low-frequency parts. This will add up to the efficiency of the converter as well as reducing the size and cost of the final prototype. The PD-SPWM control method is used to drive the inverter. The experimental results of the developed prototype for a eleven-level inverter of the proposed topology are demonstrated. The results clearly show that the proposed topology can effectively work as a multilevel inverter with a reduced number of carriers for PWM. In order to regulate the output voltage of the inverter a PI and an FLC controller were designed and tested. The results reveal that the FLC out performs the PI controller in terms of THD of the output voltage.

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Finite Element Analysis of Residual Stresses on Ferritic Stainless Steel using Shield Metal Arc Welding

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Abstract- This work deals with the finite element analysis of Ferritic Stainless Steel using single pass Shielded Metal Arc Welding (SMAW). The analysis of stresses in heat affected zone (HAZ) and welded zone is carried out. The model uses FEA (ANSYS 14). Main purpose of this paper is to present both the methodologies of simulation by the ANSYS using coding carried out by mechanical APDL (ANSYS Parametric Design Language). The transient thermo-mechanical (coupled) analysis shows temperature and residual stress distributions on welded plates.

Keywords- Finite element analysis, Temperature distribution, Residual stress, ANSYS, SMAW

INTRODUCTION

Welding is most popular joining process utilized in various industries such as petrochemical, aero-space, automotive, marine etc. Welding is a versatile and relative low-cost process. However welding causes a non-uniform temperature distribution and produces residual stresses. This paper pertains to the evaluation of residual stress in 409M stainless steel (FSS) welding.

In the present analysis, the temperature distribution and the weld-induced residual stress fields and deformation of steel plates are investigated by numerical simulations based on FEM modeling using ANSYS14. The temperature dependent thermo-physical properties such as thermal conductivity, specific heat and density are provided and temperature dependent thermal-structural properties including Young's modulus, Poisson's ratio and thermal expansion coefficient are used for thermal analysis and mechanical analysis, respectively. The heat flux provided in thermal analysis was calculated using Goldak's heat source model. Finite element analysis to simulate the transient thermal conditions of the weld is considered to be the most accurate and flexible method of modeling.

LITERATURE REVIEW

S. Murugan et al [1], studied the Temperature distribution and residual stresses due to multipass welding in type 304 stainless steel and low carbon steel weld pads. In a multipass welding operation, the residual stresses are developed. This change stresses with every weld pass. Among various welding operation they carried out MMAW i.e., Manual Metal Arc Welding. This tensile residual stresses increases susceptibility of weld to fatigue damage, stress corrosion cracking as well as fracture. M. Jeyakumar et al [2] did the evaluation of residual stress in butt-welded steel plates. The residual stresses and distortions are dominated by deformation of metals in the heat affected zone of weld joints as well as by external and internal restraints. The residual stress effects may be either beneficial or detrimental which depends upon magnitude and distribution of stresses. Since the load steps are more mechanical APDL is adopted over here. The analysis results found in this research is in good agreement with existing complex 3D finite element analysis and experiments. K Punitharani, et al [3] discussed the Finite element method for residual stresses and distortion in hard faced gate valve. The process of depositing a filler material on the surface of carbon and low alloy steel base metal is called hard facing. In this

work residual stresses are predicted in hard face gate valve using FEA and with the help of X-ray diffraction technique stresses measured are being validated. Here the load steps fairly are very high, therefore programming language called ANSYS parametric design language is used and the coding was employed to perform both thermal and structural analysis.

C.M. Chen and R. Kovacevic [4] explained the finite element modeling of friction stir welding thermal and thermo-mechanical analysis. Friction stir welding is nowadays is emerged as solid state joining. Here it is expected that the residual stresses and distortions generated are less as compared with fusion welding. G.A.Moraitis and G.N.Labeas [5] made the prediction of residual stresses and distortions due to laser beam welding of butt joints in pressure vessels. A 3 dimensional model has been developed for the simulation of laser welding process and later predicting the distortions and residual stresses of laser beam welding steel and aluminum butt joints. Simulation model helps us to control residual stresses and distortion within the welded structures. Ali Moarrefzadeh [6] investigated Finite Element simulation for thermal profile in shielded metal arc welding (SMAW) process. FEM simulation can provide detail information of stress distribution, deformations and temperatures. In finite element simulations two numerical formations were there viz., Lagrangian formulation and Eulerian formulation. For meshing of solid field PLANE55 type is used which has 4 nodes with one degree of freedom. This element has mesh moving property as well. For fluid field FLUID141 element is used.

J.J. del et al [7] made the Comparative analysis of TIG welding distortions between austenitic and duplex stainless steels by FEM. The aim of this paper was to establish a set of approximations and simplification in numerical modelling of stainless steel welding for reducing huge computation time due to coupled and nonlinear formulations. N. Akkus, G. Genc, and S. Sen [8] showed experiments and Finite Element Analysis of Arc Welding Residual Stresses. In sheet metal after welding residual stresses occurs so in this paper FEA and experimentation is carried out. Thermocouples are used for temperature measurement. Residual stresses are investigated with the help of hole drilling method. In residual stress measurement experiment as the welding speed increases less strain and less residual stresses were observed. Li Chaowen and Wang Yong [9] explained three-dimensional FEA of temperature and stress distributions for in-service welding process. Welding onto a pipeline in active operation, called in-service welding. It is the advanced technique utilized in repair of pipelines. These in-service welding repair methods are widely used through the natural gas, petroleum and petrochemical industries. Shielded metal arc welding was carried out here as a heat source model and the doubled ellipsoid model was selected. For verifying the FE model, the temperature obtained by the thermocouples was compared to the EF calculated. Dragi Stamenkovic and Ivana Vasovic [10] studied about Finite Element Analysis of Residual Stresses in Butt Welding Two Similar Plates. The joining of dissimilar metals are more challenging than that in similar metals due to difference in properties of base metals welded. Therefore welded structures first meet the strength requirements and probability of defect formation. There are two different methods in couple-field analysis viz., sequential and direct. Fanrong Kong and Radovan Kovacevic [11] worked on 3D finite element modelling of the thermally induced residual stresses in the hybrid laser/arc welding of lap joint. In this study, four cases of hybrid laser-GTAW experiment with different welding speeds of 20 mm/s, 25 mm/s, 30 mm/s, and 40mm/s are performed to validate the thermo-mechanical finite element model. The finer mesh is placed near and along the weld bead in order to assure enough accuracy in simulation, and the courser mesh is chosen for the areas far from the weld bead in order to reduce the computation cost. All the procedure was carried out using ANSYS program designed language (APDL).

FINITE ELEMENT ANALYSIS

The finite element method is a numerical procedure that can be used to obtain solutions to a large class of engineering problems involving stress analysis, heat transfer, electromagnetism, and fluid flow. ANSYS is a comprehensive general-purpose finite element computer program that contains over 100,000 lines of code. ANSYS is capable of performing static, dynamic, heat transfer, fluid flow, and electromagnetism analyses. In order to accurately capture the temperature fields and the residual stresses in the welded pipe, a 3-D

finite element model is developed. The thermo-mechanical behavior of the weldment during welding is simulated using coupled formulation.

Thermal Analysis

Heat conduction is assumed governed by the Fourier law. Together with the source term from the process, the (transient) governing equation for temperatures becomes

$$\rho c_p \frac{\partial T}{\partial t} = \frac{\partial}{\partial x} \left(k \frac{\partial T}{\partial x} \right) + \frac{\partial}{\partial y} \left(k \frac{\partial T}{\partial y} \right) + \frac{\partial}{\partial z} \left(k \frac{\partial T}{\partial z} \right) + \dot{Q}_v \quad 1$$

To analyse the transient energy distribution in a material, conductivity and heat capacity of the material must be specified.

Material Model

In the present thermal analysis, two work-pieces of dimension 150*75*4 were developed in APDL and were glued. The material is meshed using a brick element called SOLID70 which is 8 noded three dimensional element. Meshing was carried out was mapped meshing which was fine at welded zone and coarse at heat affected zone. The element is defined by eight nodes with temperature as single degree of freedom at each node and by the orthotropic material properties. The Goldak moving heat source was modeled in ansys.

Boundary conditions for thermal model were specified as surface loads through ANSYS® codes. Assumptions were made for various boundary conditions based on data collected from various published research papers. Convective and radiative heat losses to the ambient occurs across all free surfaces of the workpiece and conduction losses occur from the workpiece bottom surface to the backing plate. According to Stefan-Boltzmann's law the radiative heat loss is given by

$$q_{rad} = \epsilon \sigma ((T - T_z)^4 - (T_0 - T_z)^4) \quad 2$$

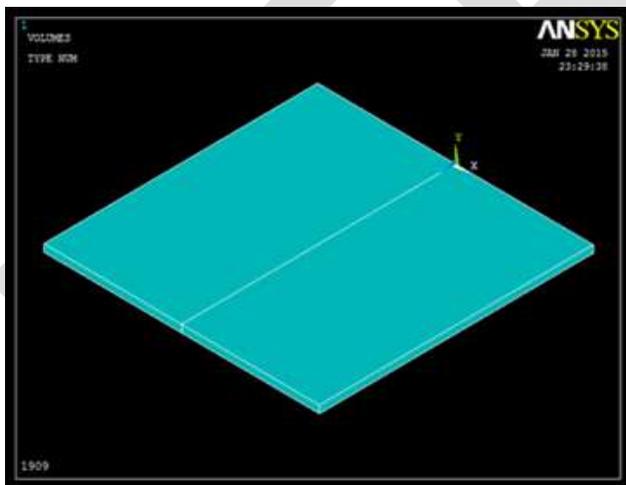


Fig. 1. Model developed in APDL

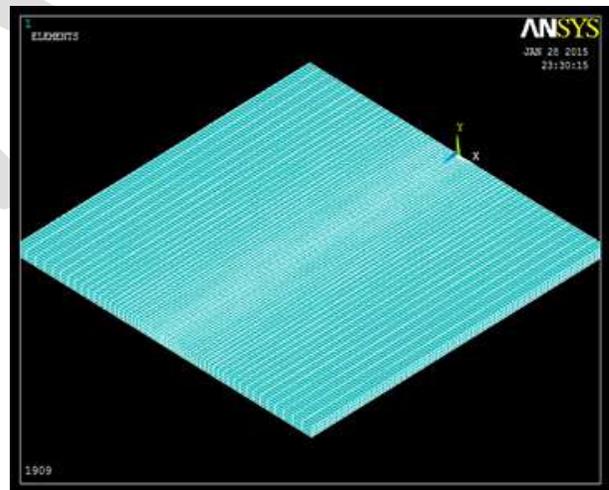


Fig. 2. Meshed model

Structural Analysis

The same finite element model used in the thermal analysis was employed here, except for the element type and the boundary conditions. The mechanical analysis is conducted using the temperature histories computed by the thermal analysis as the input data. During the welding process, solid-state phase transformation does not occur in the stainless base metal and the weld metal. The elastic strain is modeled using the isotropic Hook's law with temperature-dependent Young's modulus and Poisson's ratio.

Here the coupled thermo-mechanical analysis was carried out. The results from thermal analysis were added as the input to structural and hence no boundary conditions were provided to it. Only the material properties like Modulus of elasticity, Poisson's ratio and thermal expansion coefficient were provided to it. The element Solid 70 is replaced automatically by the equivalent structural element Solid 185, which is also an eight-noded, three-dimensional element but has plasticity, hyper-elasticity, stress stiffening, creep, large deflection, and large strain capabilities.

RESULTS AND DISCUSSIONS

Thermal profile of welding using ANSYS

Using thermal analysis movement of heat source at various times and temperature distribution are shown below in figure 3 and 4. Heat source starts at 0 and continues upto to 66 seconds, since the welding time from start to end was 66 seconds. Below are the heat sources shown in figure 3 are after (a) 11seconds, (b) 22seconds, (c) 44seconds and (d) 65.56seconds. With the help of Goldak's heat source model heat flux are estimated and were applied at the welded zone. (where fine mesh were provided.)

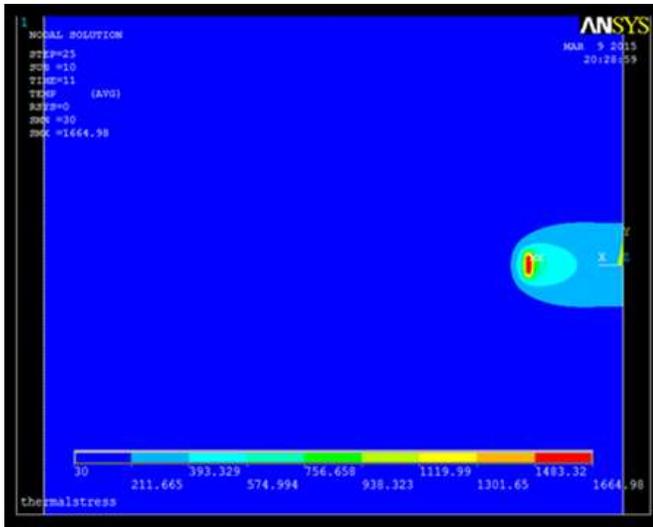


Fig. 3(a). At 11 seconds

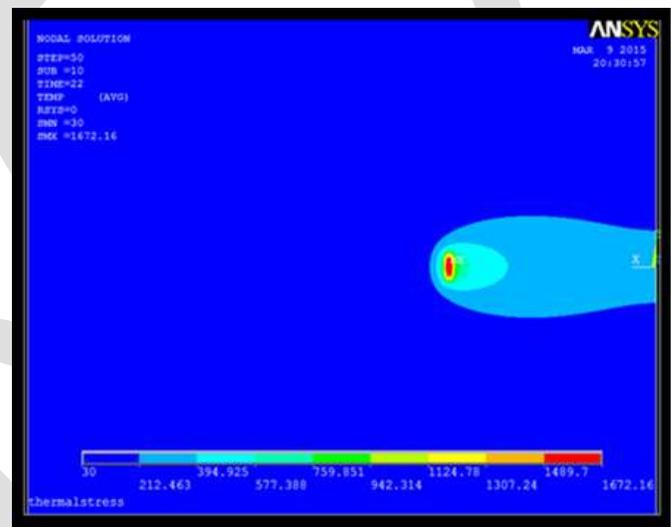


Fig. 3(b). At 22 seconds

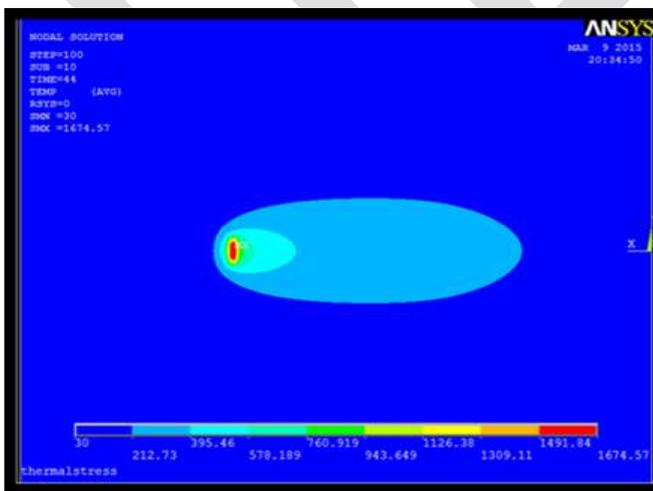


Fig. 3(c). At 44 seconds

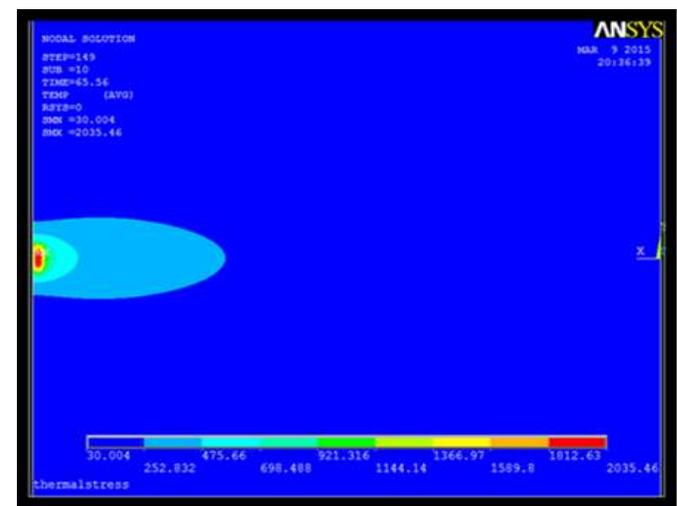


Fig. 3(d). At 65.56 seconds

Fig. 3. Movement of heat source at various times

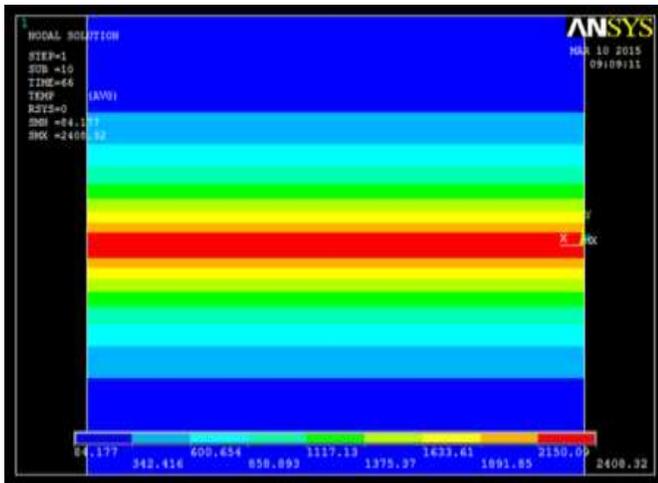


Fig. 4. Temperature distribution

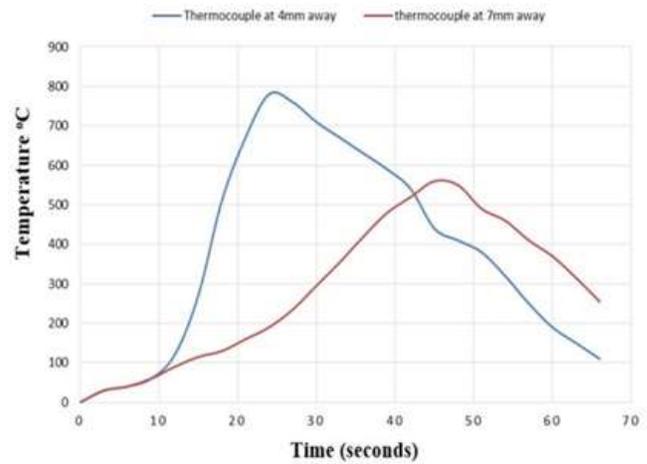


Fig. 5. Thermal profile using ANSYS

Two thermocouples were inserted in plates at mm and 7mm away from welding in order to find out the temperature profile at heat affected zone from starting point of welding. The thermocouples were inserted at a distance of 50mm and 100mm. Following figure 5. shows the temperature distribution at heat affected zone as the welding torch moves.

Structural Analysis

As the structural analysis is coupled with thermal analysis, hence carried out after the thermal analysis. It does not require boundary conditions. Outputs from thermal results are treated as input to structural analysis. As no boundary conditions are provided therefore displacement is considered to be zero. Below shown are the stresses which are developed in the work-piece after welding. Figures 6(a,b,c) shows the stresses in x, y and z directions, Figures 7(a,b,c) shows the shear stresses in x, y and z directions. Figure 8 shows the equivalent stress.

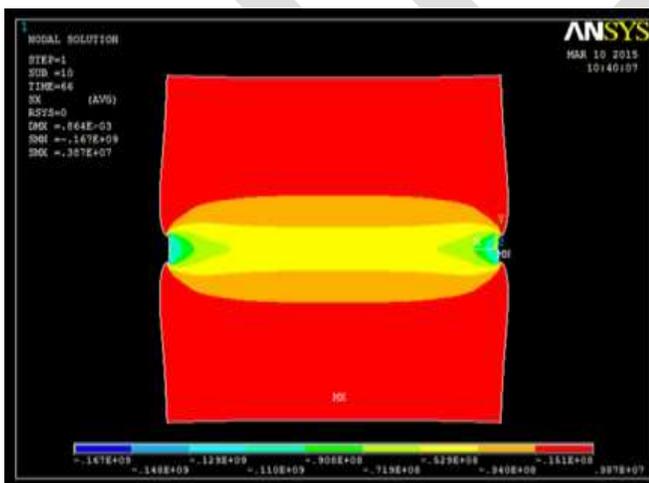


Fig. 6(a). Stress in x-direction

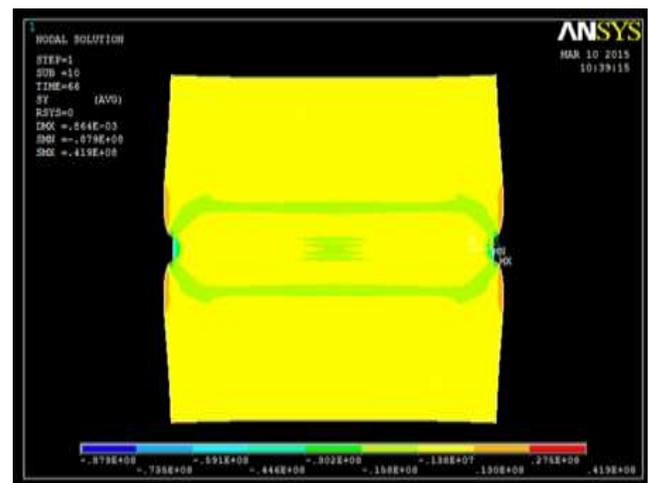


Fig. 6(b). Stress in y-direction

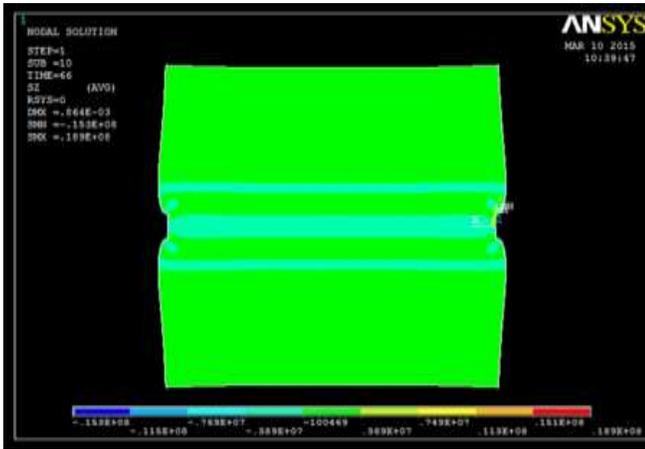


Fig. 6(c). Stress in z-direction

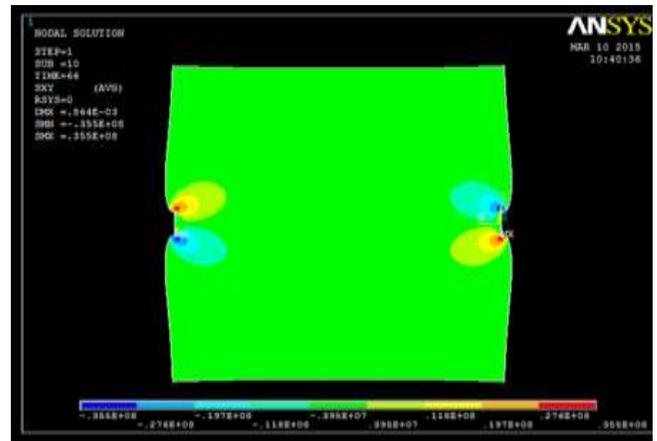


Fig. 7(a). Shear stress in x-direction

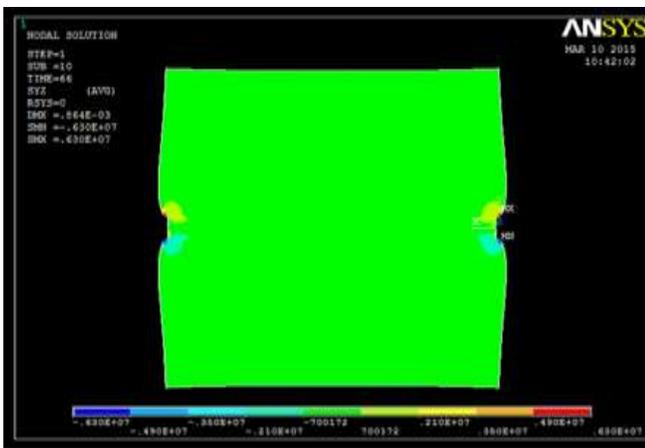


Fig. 7(b). Shear stress in y-direction

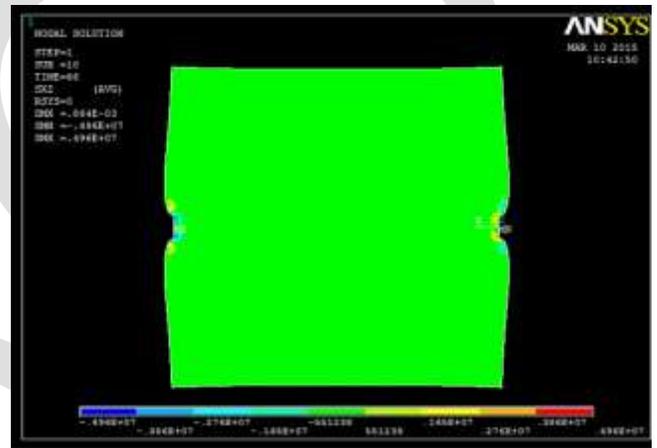


Fig. 7(c). Shear stress in z-direction

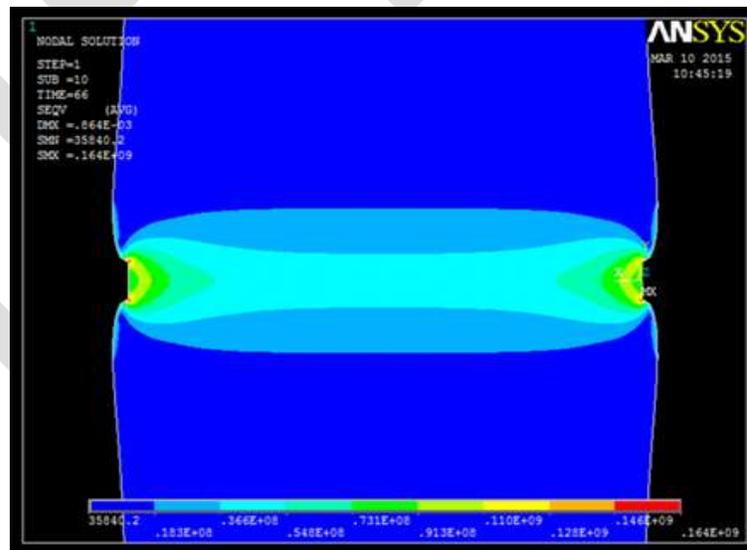


Fig. 8. Von-mises stress

CONCLUSION

Finite Element Analysis of stresses has been carried out ANSYS 14. In this study 3-D FE model is developed to analyze the temperature fields and stress distribution for FSS409M. The 3-D Finite Element model which was developed have predicted temperature cycles and welding residual stress fields satisfactorily.

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Review on Comparative Analysis of Different Video Watermarking Techniques with DWT-SVD-DCT

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ABSTRACT: Rapid growth in last few years in the image watermarking among various techniques like DWT, DCT, and SVD found to be significant regarding robustness, imperceptibility, data payload etc. Hybrid technology like DWT-SVD, DCT-SVD, DWT-DCT-SVD techniques for image watermarking used to give better tradeoff between performance, robustness and data payload. In this paper survey on available video watermarking techniques is performed, also feasibility study on watermarking techniques meeting application specific criteria for various types of attacks and perform survey on comparative analysis of DWT-SVD-DCT watermarking algorithm based on robustness and computational complexity.

Keywords: DWT-DCT, DCT-SVD, DWT-DCT, SVD.

I. INTRODUCTION

The usage of High speed computer networks, the Internet and the World Wide Web for communication and information sharing leads to increase in size of internet. Due to this the volume of multimedia data (images, text, video/audio) also increasing Extensive and easy accesses to multimedia contents and possibility to make unlimited copy without loss of considerable fidelity have motivated the need for digital rights management [1]. Digital watermarking is a technology that can serve copyright protection to multimedia information or multimedia data. Various digital watermarking schemes have been proposed in digital images video, audio and other multimedia objects. Digital watermarking means embedding the secret information in the form of watermark into the digital multimedia objects such that it can be detected or extracted later in order to make an assertion about the object. The purpose of watermarking is to embed information imperceptibly, robustly with having high data payload. In the host data parameters in digital watermarking are: data payload, fidelity and robustness [2]. Digital watermarking has been widely used for still images but now they are also used for other multimedia objects such as audio and videos Digital video watermarking is the process of embedding and extracting watermark from the videos. There are many algorithms of video watermarking some based on the group of continuous still images and some are based on temporal dimension.

II. Video Watermarking

Watermarking techniques can be applied in two domains: Spatial domain and transform domain. Spatial values which changes the intensity values (Luminance, Chrominance and color space) on overall video frames.[3]Previously watermarking techniques were based on spatial domain example least significant bits (LSBs). This method is easy and simple however they are not robust against common digital signal processing operations such as video compression. Frequency domain technology embeds watermark in the transform of the signal. The main strength of frequency domain techniques is addressing the restrictions of spatial methods, moreover special features to represent an alternative view of a signal. The main drawback with frequency domain refers to high computational requirement. Three techniques in frequency domain are namely Discrete Cosine Transform, Discrete Wavelet Transform, Discrete Fourier Transform, Singular value decomposition

III. Techniques of Video Watermarking

A. *Singular Value Decomposition:* The SVD is popular linear numerical technique used to solve mathematical problem that provides tool for analysis of matrices. [2] It is an effective way for extracting algebraic features from an image. It was first introduced by Beltrami and Jordan in 1870 for square matrices and then Eckart and Young in 1936 extended to rectangular matrices provided its application in image processing and watermarking.[3][4]

The SVD of an image has good stability even when there is a small disruption. In order to get high imperceptibility, robustness and payload, two algorithms of SVD are used which are based on algebraic transform of singular value decomposition.

1. In first algorithm watermark bit information are embedded in the SVD-transform video in a diagonal wise fashion.[5]The diagonal wise algorithm achieved better robustness result.
2. In second algorithm bits are embedded in a block-wise fashion, block-wise algorithm gave higher data payload rate The SVD belongs to orthogonal transform which decompose the given matrix into three matrices of same size. To decompose the matrix using SVD technique it need not be a square matrix. Let us denote the image as matrix A. The SVD decomposition of matrix A is given using

$$A = USV^T$$

U and V are matrices such that $UU^T = I, VV^T = I$, where I is $U = V$, U matrix Scaled left singular values and V matrix is called right singular values. Each of s specifies the luminance of an image layer while the corresponding pair of singular vector specifies the geometry of the image layer The decomposition of matrix A is obtained using $SVD(A) = USV^T = S$ such that all the elements in main diagonal are in decreasing order like $S_1 = S_2 = S_n$ where S is the diagonal matrix having all positive singular values in its main diagonal of A. Number of nonzero values the rank of the matrix These positive singular values can be used to embed watermark. The order of singular matrix is same as A, and hence the resultant matrix is also square. Hence images of equal size can be taken as cover object.

B. Discrete Cosine Transform: The most popular and classic domain for image processing is that of the Discrete Cosine Transfer. In block-based DCT transform image is segmented in three frequency sub-bands: Low frequency sub-band, mid-frequency sub-band and high frequency sub-band. It is much easier to embed watermarking information into the middle frequency bands of an image. DCT transformation is based on two facts:

1. In first fact the most of the signal energy lies at the low frequency sub band which contains the most significant visual part of the image.
2. In second fact the high frequency component of the image are usually removed through compression and noise attacks.

In DCT domain we can have a 2-D watermark signal W, which is embedded in the middle band frequency of 8×8 DCT block. The 8×8 DCT coefficients $F(u, v)$ are modulated according to the following equation denotes the middle band frequency coefficients, the gain factor, and the spatial domain location of an 8×8 pixel block in image coefficients in the corresponding 8×8 DCT block.

$$I_{W_{x,y}} = \begin{cases} I_{x,y}(u, v) + k * W_{x,y}(u, v) & \text{if } (u, v) \in F_M \\ I_{x,y}(u, v) & \text{if else} \end{cases}$$

Here F_M denotes the middle band frequency coefficients, k the gain factor, (x, y) the spatial domain location of an 8×8 pixel block in image I and (u, v) the DCT coefficients in the corresponding 8×8 DCT block. Imperceptibility, data payload and robustness are the important requirements of and efficient watermarking scheme.

Compare to DCT, SVD based watermarking scheme has high imperceptibility and also withstands certain attacks, but not resistant to attacks like rotation, sharpening etc. Disadvantage of SVD is that it has only limited capacity. The limitation of SVD led to the development of new scheme that club the properties of DCT and SVD. This hybrid algorithm proves to be better than ordinary DCT based watermarking and ordinary SVD based watermarking scheme

C. Discrete Wavelet Transform: DWT is Multiscale approximation (MSA) mathematical tool for decomposing an image. [12].DWT is a time domain localized analysis method.[15] It differentiate time in high frequency and frequency in low frequency part of DWT transformed signal. An image is considered as two dimensional signals which are passed through various orthogonal filters like daubechies, QMFs etc which are high and low pass filters decompose into various sub bands having different resolutions.

These sub-bands are LL, LH, HL, HH which are horizontal, vertical and diagonal details as shown in fig a. This is known as first level wavelet decomposition of an image. It can be further decompose in to second level of decomposition. It is carried out on first

level LL sub band of the image which results in another level of decomposition. Watermark is embedded in high frequency sub bands because the details like sharpness, edges etc of an image are present in high frequency sub bands (LH, HL and HH) to avoid degradation of host video and make it invisible.

Cons of embedding watermark in high frequency sub band may reduce robustness. In order to get best tradeoff between performance and robustness, watermark is embedded into LH and HL sub bands. It improves the robustness and increases the capacity of embedding data. Several algorithms has been proposed on using DWT-SVD. First time SVD based algorithm using DWT was presented by Genic and Ahmet Eskicioglu(2004).[16]

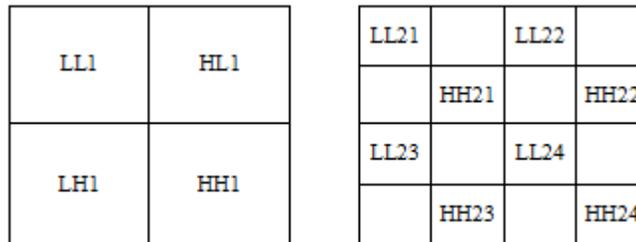


Fig a. Decomposition of image into various sub bands using DWT.

As compare to DWT-SVD, SVD-DCT scheme has enormous capacity because embedding can be perform in all the sub bands.[17]It was found that watermark to be resisted to all types of attacks except achieve good imperceptibility and rotation. Disadvantage is that the embedding and recovery are time consuming process because the zigzag scanning to map the coefficient into four quadrants based on the frequency. Alternatively if we apply DWT we get four frequency sub bands directly. So the time consumption will be greatly reduced. [18] Also, SVD is a very convenient tool for watermarking in the DWT domain.

IV. Hybrid Technique

DWT-DCT-SVD: This method satisfies all the requirements of watermarking scheme such as imperceptibility or fidelity, robustness and good capacity. Also, this method is robust against different kind attacks likes rotation and sharpening. In this algorithm the properties of SVD and DWT are clubbed. In this method the wavelet coefficients of the host image are utilizes to embed the watermark. Any of the three high frequency sub bands of wavelet coefficients can be used to watermark the image. The DCT coefficients of the wavelet coefficients are calculated and singular values decomposed. The singular values of the host image and watermark are added to form the modified singular values of the watermarked image. Then the inverse DCT transform is applied followed by the inverse DWT [22]. Fig b. shows the embedding and extraction technique for DWT-DCT-SVD based video watermarking.

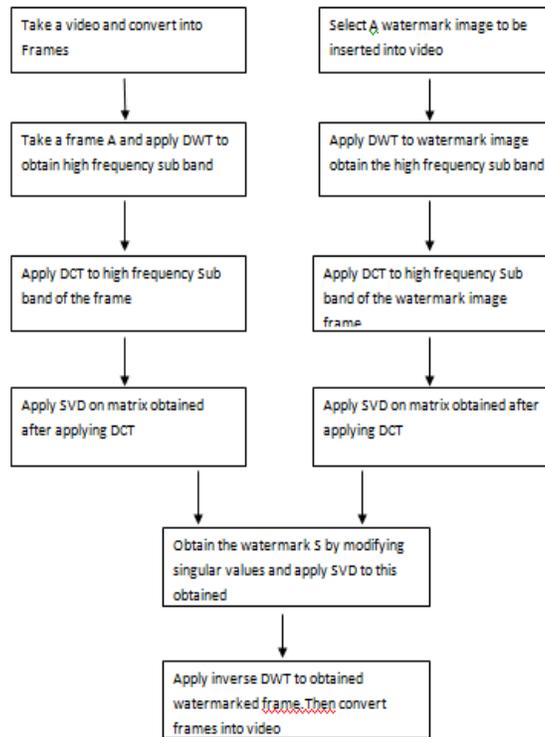


Fig b. Video watermarking using Hybrid technique DWT-DCT-SVD.

Conclusion

The technique based on DCT-SVD is very time consuming but it offers better capacity and imperceptibility. Technique DWT-SVD is found to be similar to the DCT-SVD scheme except that the process was fast. The DWT-SVD-DCT found to satisfy all the necessary requirements of an best watermarking scheme such as imperceptibility, fidelity, robustness and high data payload. Also, this method is robust against different kinds of mentioned attacks. DWT-DCT-SVD method can be used for authentication and data hiding purposes. The future work includes the extension of this technique to other various attacks and formats of videos.

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TRANSIENT STABILITY ANALYSIS AND ITS INTENSIFICATION-IN MICROGRID

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Abstract—Technology evaluation, environmental concerns are often vast and messy in electrical power system. Hence, the study of transient stability plays a vital role for secured and planning operation in the power system. Today's challenge is the implementation of renewable energy into existing power system. Thus, microgrid an effective means of integrating distributed energy source. However, low inertia power electronics interface make microgrids sensitive to disturbance. It is therefore essential to investigate the transient stability characteristic of microgrid in detail. This paper presents the transient stability analysis of microgrid under different loading conditions and system voltage and critical clearing time is observed. The test system is simulated and stability analysis is carried out using MATLAB/Simulink Library.

Index Terms—Transient stability, Microgrid, Distribution generation (DG), WECS

INTRODUCTION

Electricity demand is continuously increasing. With the traditional technologies, fossil fuel like coal and natural gas is burnt to convert, to produce electrical energy in large scale power plants, polluting environment. This situation needs an urgent solution for the near future. There are many alternative promising solutions for the above problem, and one such solution is the concept of microgrid. It has become more important for modern power systems in terms of a possible means of achieving clean energy generation with updated and proven generation technologies. Microgrid is a technological innovation and business model response to fundamental technical flaws, economic constraints, environmental costs, and brittleness in the electrical grid. Microgrid is a sustainable technology for achieving energy security and more energy independence through energy efficiency, on-site generation and energy management.

The concept of microgrid scheme is based on distributed generation (DG) and the use of power electronics devices [1].The micro grid can work in grid connected mode as well as in islanded mode with the help of power electronic converter. The state-space modeling for such inverters based micro-grid [2] is available. The typical issues like transient stability, over voltage, under voltage, oscillations, offset voltage which are present in central grid are also observed in microgrid. Microgrid could be an answer to our energy crisis. Most of the microsources are interfaced through power electronic converters. Thus, microgrid has the characteristic of low inertia and extensive use of power electronic converters. Low inertia reduces the spinning kinetic energy of a system and the possibility of transient instability when the microgrid oscillates between the grid connected and islanded mode. The power electronics of the microsources generally has fast response but they may be susceptible to transient overloads. An extensive literature survey reveals that the concerted efforts have been on by researchers in the field of renewable energy and allied areas. Quite a good number of papers have been discussed about the concept design, implementation and operation of standalone grids and microgrids.

Thus, the transient stability of microgrid should be investigated. In this paper an attempt is made to study the power system issues under the transient condition in microgrid.

MICROGRID

The main objective behind the development of microgrid concept is to integrate as much as renewable energy sources, e.g. PV, wind turbine, fuel cell etc, which if directly integrated in the bulk grid system, would have increased the chances of system instability. The microgrid system acts like a plug and play power unit that can easily isolate itself during any grid disturbance or outage and continue supplying its loads in an islanded state. Also, microgrids provide a platform for effective utilization of sustainable energy sources and test their potential to replace the conventional power system. The microgrid controllers play a vital role in maintaining the microgrid in its islanded state.

A microgrid that is an integral part of a bulk grid system can only have the following modes of operation:

(A) *Grid connected mode*: The microgrid is connected to the utility grid via a switch at the point of common coupling (PCC). At this stage, the DGs of the microgrid share its local loads with the grid supply. In this mode the grid determines the voltage amplitude and frequency of the entire microgrid. This mode encourages the possibility of a bidirectional power flow, where excess generation by the DGs is returned to the utility grid system.

(B) *Transition mode*: The microgrid, on sensing a grid outage can disconnect itself from the grid by opening the switch at the PCC. This sudden absence of a power supply can trigger cascaded tripping inside the microgrid unless any proper control action is taken. Therefore, advanced controllers are designed to handle the transition from the grid connected to islanded mode. Similarly, controller action should also ensure a synchronized transition from islanded to grid connected mode.

(C) *Islanded mode*: In this mode the microgrid behaves as an autonomous power system, supplying its own load demands (both local and common), with the help of proper control actions. In absence of the utility grid, the DGs now determine the frequency and the voltage of the microgrid. Controllers play a key role in sharing loads among DGs, handling DG trips and non-linearity of loads. Success in this mode can make microgrid an effective solution to the centralized problem of the conventional grid system.

TRANSIENT STABILITY CONDITIONS

The transient stability of power systems is a nonlinear problem, the system stage is changing where if the transition is considered from one equilibrium to the other then due the large disturbances occur. So improving the transient stability is the main requirement. The transient stability studies are important both in operational planning as well as real-time operation.

Generator behaviour under transient conditions:

Transient stability is influenced by the non linear characteristic of an Electric power system. The equations describing phenomena cannot be linearized, thus assumptions are made in transient stability. For the purpose of studying electromechanical phenomena the generator can be represented by a driven rotating mass (equivalent to all turbines, shafts and generator rotors) which is broken by an electromagnetic field [3].

In steady state operation the mechanical power delivered to the rotating mass equals the electric power produced by the rotor electromagnetic field. In this equilibrium point the mechanical turbine torque τ_m is equal to the electric torque τ_e + mechanical damping synchronous speed torque τ_d (rotational losses) and no relative rotor motion appears.

As soon as mechanical and electric torque are no more in equilibrium the rotating masses are accelerated or decelerated following Newton's law

$$J \frac{d\omega_r}{dt} + D\Delta\omega_r = \tau_m - \tau_d - \tau_e \quad (1)$$

where

$$\omega_r = \omega_0 + \Delta\omega_r \quad (2)$$

J represents the total moment of inertia of rotating masses ($\text{kg}\cdot\text{m}^2$), ω_r is the rotor angular velocity (rad/s), ω_0 is synchronous speed (rad/s), $\Delta\omega_r$ is the rotor angular speed deviation (rad/s), D is damping torque coefficient (Nms) and τ_m , τ_e , τ_d (Nm) are the torques as explained in above paragraph. The mechanical damping torque τ_d is small and can be neglected for all practical purposes [4]. The main source of damping in equation (1) ($D\Delta\omega_r$) is a generator damping winding. In synchronous operation there is no damping thus $\Delta\omega_r$ equals 0. In transient conditions which are interesting for phenomena related to transient stability the generator air gap flux penetrates the damper winding and induces voltage (emf) whenever $\omega_r \neq \omega_0$

As a consequence of this voltage, current flows in the damper winding which further causes a torque opposite to the change of rotor's relative angle (according to Lenz's law). This torque can be small speed deviations be assumed to be proportional to $\Delta\omega_r$ and can be referred to as asynchronous torque. For convenience and clarity of explanation, considerations let this damping be neglected.

Considering the assumptions, equation (2) and the fact ω_0 is a constant, equation (1) can be written as

$$J \frac{d\omega_r}{dt} = \tau_m - \tau_e \quad (3)$$

Let δ_r , be defined as a rotor angle with respect to the synchronous rotating reference axis. Then:

$$\Delta\omega_r = \frac{d\delta_r}{dt} \quad (4)$$

And according to equation 3

$$J \frac{d^2\delta_r}{dt^2} = \tau_m - \tau_e \quad (5)$$

Multiplying equation 5 by the synchronous velocity ω_0 and taking into considerations that power is the product between torque and angular velocity equation (5) can be rewritten as follows

$$J\omega_0 \frac{d^2\delta_r}{dt^2} = \frac{\omega_0}{\omega_r} P_m - \frac{\omega_0}{\omega_r} P_e \quad (6)$$

Where P_m is shaft power provide to the generator and P_e is the electrical air gap power. In all practical cases it can be assumed that the rotor speed of a synchronous machine is so close to the synchronous speed that

$$\frac{\omega_0}{\omega_r} \approx 1 \quad (7)$$

Considering also that the product equals the angular momentum finally the basic equation is obtained that describes rotor dynamics-is called swing equation.

$$M_r \frac{d^2\delta_r}{dt^2} = P_m - P_e \quad (8)$$

Often rotor angular momentum M_r is expressed either with,

i) Normalized inertia constant $H(s)$, defined as a stored kinetic energy of rotating masses in mega joules at synchronous speed, normalized with the machine rating S_N

$$H = \frac{1J\omega_0^2}{2S_N} \Rightarrow M_r = \frac{2HS_N}{\omega_0} \quad (9)$$

ii) Mechanical time constant $T_a(s)$, defined as the time in which a generator rotating mass would reach the synchronous speed if the nominal mechanical torque (S_N/ω_0) was suddenly applied to the turbine shaft of the generator at rest.

$$T_a = 2H \Rightarrow M_r = \frac{T_a S_N}{\omega_0} \quad (10)$$

The changes in mechanical power P_m are dependent upon the turbine power (frequency) controller. The time constants of mechanical power control are high compared to the rotor initial-swing time interval, therefore during the transients, characteristic for transient stability, P_m can in our theoretical considerations be assumed constant (pre-disturbance steady-state value).

Methods of improving transient stability:

By using UPFC

This method mainly gives the answer to the following question: How to unified power flow controller (UPFC) parameters and how it should be controlled in order to achieve the maximal desired effect for solving first swing stability problem. These types of problems mainly appear for bulky power systems with long transmission lines. There are various methods of reference identification of the series part, in order to improve the transient stability of the system based on: optimal parameters, state variables and also injection models were studied [5]. Finally, a method based on state variables and using the local measurement was proposed.

By using multiple models and switching

Most common problem in adaptive control is the poor transient response which is observed when adaptation is initiated. Here a stable strategy is developed for improving the transient response by using multiple models of the plant for controlling and switching between them. These models are identical except for initial estimates of the unknown plant parameters and control is applied to determine at every instant by the model which best approximates the plant. Result which we get after simulation indicates the improvement in performance that can be achieved.

Transient Stability Simulation by the Waveform Relaxation Methods

In this a new methodology for power system dynamic response calculations is presented. This technique is known as the waveform relaxation which is extensively being used in transient analysis [6] of VLSI circuits and it can take the advantage of new architectures in computer systems such as parallel processors and gives the computational results.

Renewable Energy Integration:

Effect of renewable energy integration on transient stability must be assessed on a case-by-case basis and depends more on distribution of asynchronous generator and controller types [7]. Depending on grid characteristic, it is necessary to limit penetration of renewable energy sources.

SCHEMATIC DESCRIPTION AND WORKING

The wind farm consists of 1.0 MW wind turbines connected to a 25 kV distribution system exporting power to a 120 kV grid through a 30 km 25 kV feeder. A 50 kW load is also connected on the 575 V bus of the wind farm. The wind turbine and the induction generator (WTIG) are as shown in Figure (1).

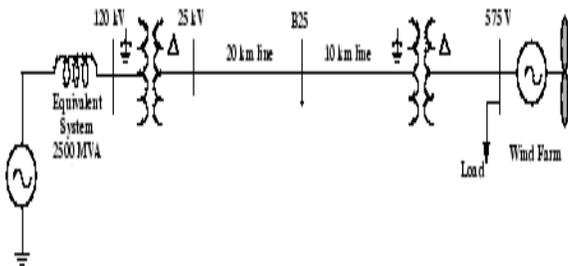


Figure 1. Single line diagram of Microgrid

The stator winding is connected directly to the grid and the rotor is driven by the wind turbine. The power captured by the wind turbine is converted into electrical power by the induction generator and is transmitted to the grid by the stator winding. The pitch angle is controlled in order to limit the generator output power to its nominal value for high wind speeds. In order to generate power the induction generator speed must be slightly above the synchronous speed. The reactive power absorbed by the induction generator is provided by the grid.

Both the wind turbine and the motor load have a protection system monitoring voltage, current and machine speed. The stator winding is connected directly to the 60 Hz grid while the rotor is fed at variable frequency through the converter.

Thus, the technology allows extracting maximum energy from the wind for low wind speeds by optimizing the turbine speed, while minimizing mechanical stresses on the turbine during gusts of wind. The optimum turbine speed producing maximum mechanical energy for a given wind speed is proportional to the wind speed.

Rotor speed varies approximately between 1p.u at no load and 1.005 p.u at full load. Wind speed varies from 8-14m/s, pitch angle varies from -2° to 12° , maximum rate change of pitch angle is 5° .

MATLAB AND SIMULINK MODEL

Figure (2). shows the Simulink model of Microgrid in which micro source is connected in parallel with the resistive/reactive load at PCC. The proposed system is modeled using phasor simulation in Simpower system Library with ode 23tb solver.

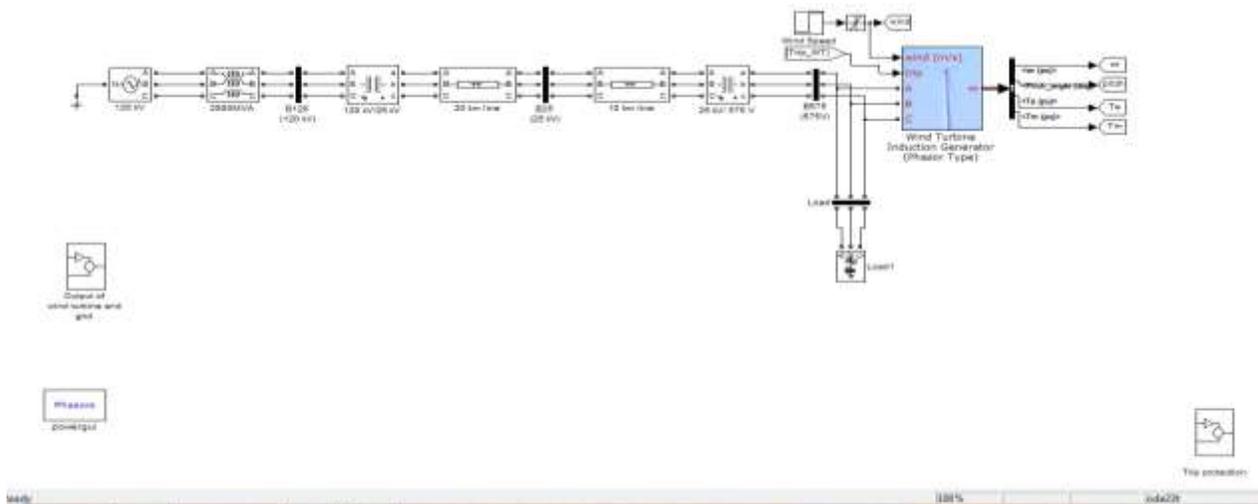


Figure 2. Simulink model of the proposed system

RESULTS AND DISCUSSIONS

Performance of Microgrid under different operating condition.

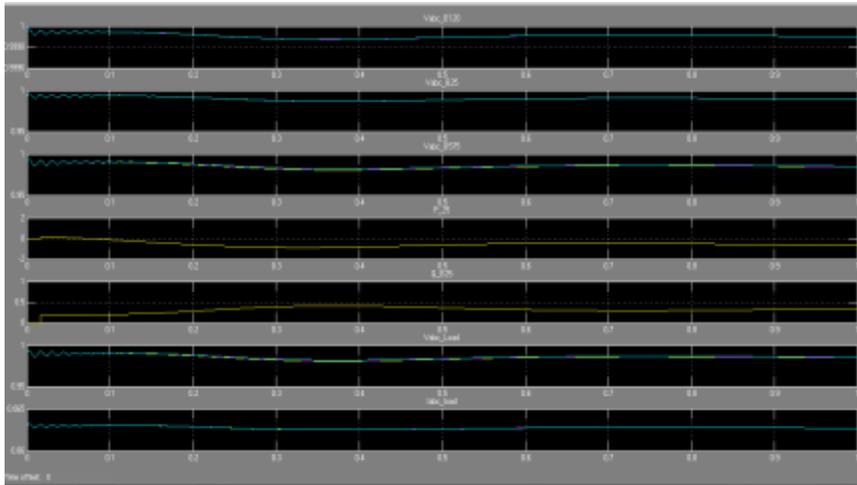
Case1: Under Normal load condition

The performance of the system with WECS as microsources under normal load condition with RL load is as shown in simulation results below.

	Vabc_ B120	Vabc - B25	Vabc_ B575	Vabc_ Load	Iabc_ Load	V1_575
	p.u	p.u	p.u	p.u	p.u	p.u
Magnitude	0.9999	0.9996	0.99	0.99	0.063	1
Time(s)	0.1	0.1	0.1	0.1	0.1	0.05

Table 1.

Thus, the table 1. briefly explains about the transient operation taken to reach the steady state with magnitude of voltage at grid side, voltage at PCC (point of coupling), voltage and current at consumer side, mean voltage of the wind turbine w.r.t to time in seconds.

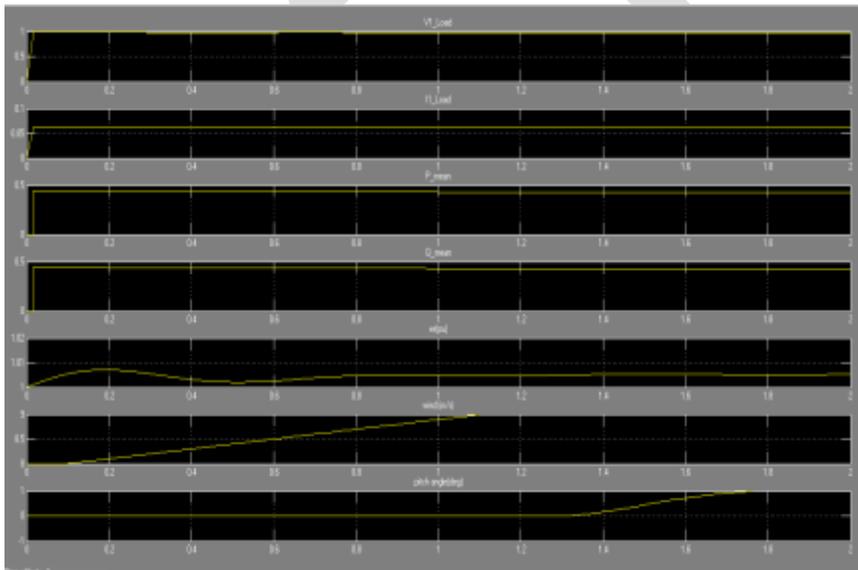


V1_Load	I1_Load	Pmean	Qmean
p.u	p.u	p.u	p.u
1	0.6	0.44	0.44
0.05	0.05	0.05	0.05

Table 2.

Mean voltage, mean current, mean active power and mean reactive power of the wind turbine as shown in table 2.

The simulation results of wind speed (m/s), rotor speed and pitch angle are also shown.



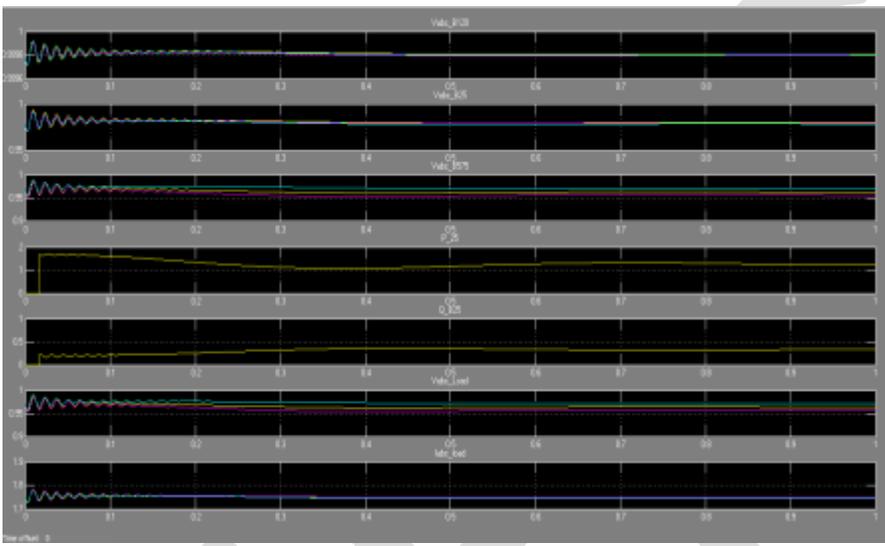
Case2: Under Over load condition

The performance of the system with WECS as micro sources under overload condition with RL load (2MW, 50kvar) is as shown in simulation results.

	Vabc_ B120	Vabc_ B25	Vabc_ B575	Vabc_ Load	Iabc_ Load	V1_575
	p.u	p.u	p.u	p.u	p.u	p.u
Magnitude	0.9998	0.997	0.98	0.975	1.75	0.99
Time(s)	0.2	0.2	0.2	0.2	0.2	0.055

Table 3.

The above table 3. shows the transient operation taken to reach the steady state with magnitude of voltage at grid side, voltage at PCC (point of coupling), voltage and current at consumer side, mean voltage of the wind turbine w.r.t to time in seconds.



V1_Load	I1_Load	Pmean	Qmean
p.u	p.u	p.u	p.u
1	1.8	1.7	0.45
0.055	0.055	0.2	0.2

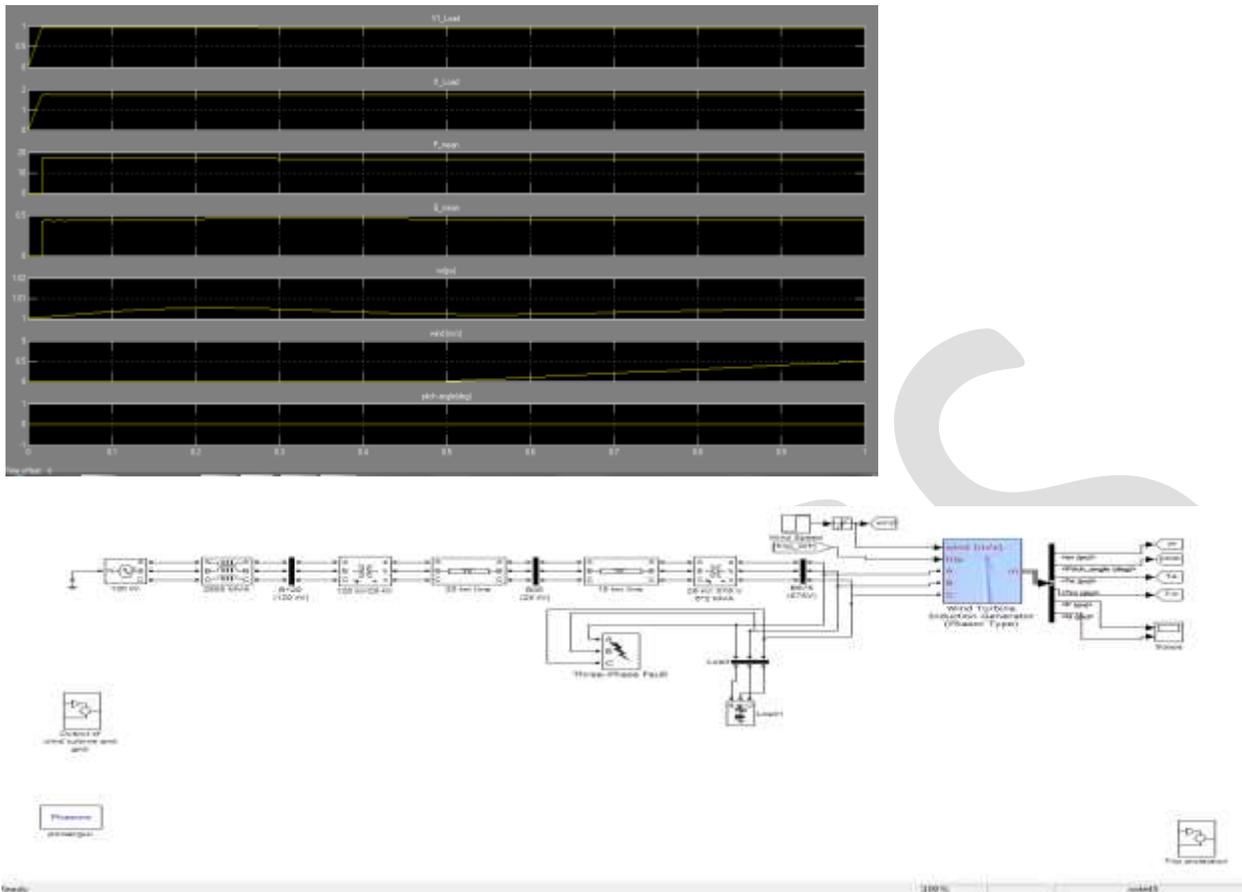


Figure 3. Simulink model of the proposed microgrid system with faulty section

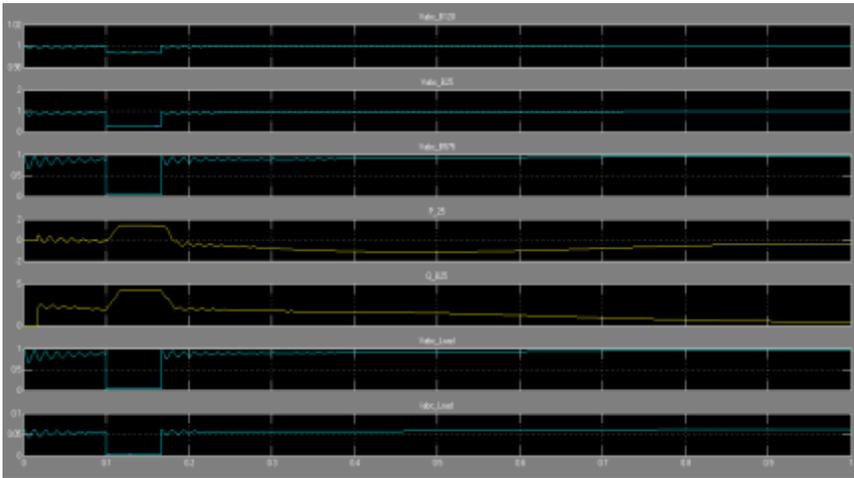
Case 3_1: Fault Condition (LLG Fault at bus 575,60Hz RL,50kw,50kvar)

The performance of the system during fault condition at initial period at t=0.5 to 0.8 seconds, the time taken by the system to reach to steady state value is given in table 4. shown below

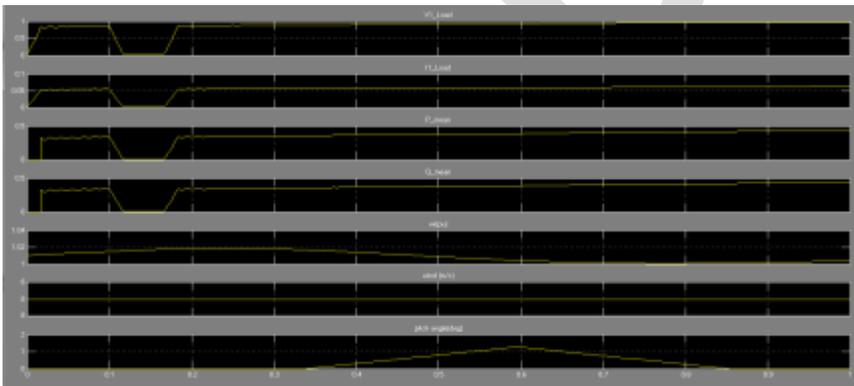
	Vabc_ B120	Vabc_ B25	Vabc_ B575	Vabc_ Load	Iabc_ Load	V1_575
	p.u	p.u	p.u	p.u	p.u	p.u
Magnitude	0.9996	0.92	0.89	0.91	0.06	0.91
Time(s)	0.3	0.3	0.3	0.3	0.3	0.065

Table 4.

The above table 4.state with magnitude of voltage at grid side, voltage at PCC (point of coupling), voltage and current at consumer side, mean voltage of the wind turbine w.r.t to time in seconds



V1_Load	I1_Load	Pmean	Qmean
p.u	p.u	p.u	p.u
0.9	0.056	0.34	0.34
0.06	0.06	0.25	0.25



CONCLUSION

This paper has addressed the enhancement and relevant study of transient stability analysis for microgrid. A Simulink model is developed with DG unit to design the microgrid. Using this model, transient stability analysis is carried out under different operating conditions. Thus, it was observed that under different loading condition the critical clearing time is increased as the load increases at consumer point. Thus, transient stability analysis becomes a major role for optimal design of microgrid.

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A Detail Review of Routing Attacks in Mobile Ad Hoc Networks

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Abstract— A MANET is an infrastructure-less type of ad-hoc network that consist of number of mobile nodes to make communication among nodes mobile establish dynamic path among one node to another via wireless network interfaces. In a MANET routing is a particularly challenging task as compared to other conventional network. Due to unique characteristics such as limited power, dynamic network topology and limited bandwidth. In the availability of malicious nodes, one of the main problems in MANET is to design the robust security to mitigating various type of routing attack difficult mechanism have been proposed using various cryptographic Techniques. In this paper we describe various ad hoc network security mechanism required to mitigate several type of attacks in routing protocols. To accomplish our goals we have done detail literature survey for collecting relevant information related to various security attacks with their mechanism. In our survey we focus on the results and related works from which provide secure protocol for MANET.

Keywords— MANET, Black-Hole Attack, Gray-Hole Attack, Jellyfish Attack, Rushing Attack, Worm Hole Attack

I. INTRODUCTION

A MANET is rapidly growing technology which is based on rapidly deployed network and self-organized. Due to its important features, MANET attracts various real world application areas where the networks topology changes very fast [2]. Nodes are interconnected through wireless interface. There is no fixed set of infrastructure and centralized administration in this type of networks. MANET is used different of applications such as search and rescue, emergency relief scenarios, public meeting, device network, disaster recovery, automatic battlefields and virtual classroom etc. The counter measures can be considered as function or features that reduce security vulnerabilities and attacks [14].

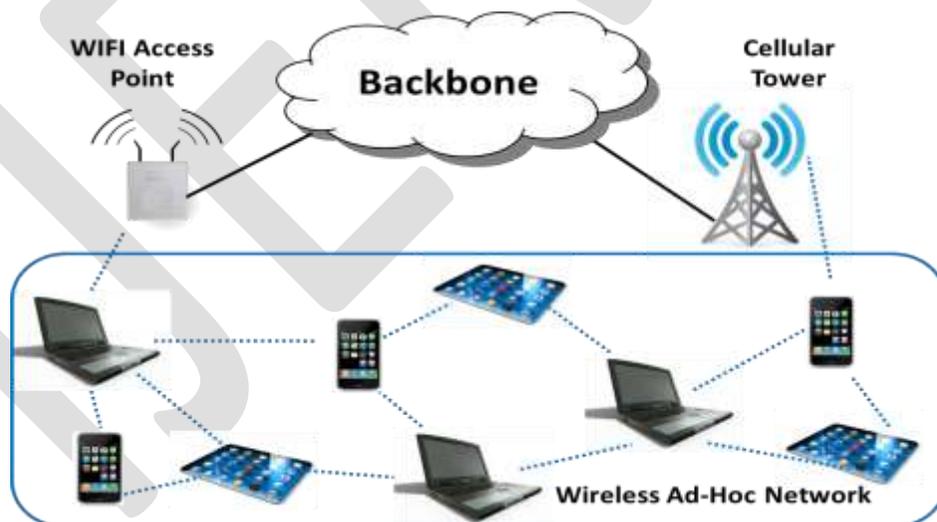


Figure: 1 Mobile Ad hoc Network

Malicious routing attacks can target the routing discovery or maintenance parts by not following the specification of routing protocols. Most of these routing protocols rely on cooperation between nodes due to the lack of a centralized administration and suppose that all nodes are well-behaved and trustworthy [6]. However in a hostile environment, a malicious node can launch Routing attacks to disrupt denial-of-service (DoS) attacks or routing operations to deny services to legitimate nodes [11].

Table: 1 Different types of Attacks

Layer	Type of Attack
Application Layer	1. Repudiation attack, 2. Attacks by virus & worms
Transport Layer	1. TCP SYN attack (DOS in nature), 2. TCP session hijacking, 3. Jelly Fish attack
Network Layer	1. Flooding attack, 2. Route tracking, 3 Message Fabricate, modification, 4.Blackhole attack, 5.Wormhole attack, 6. Link spoofing attack
MAC Layer	1. Mac DOS (Denial of service) attack, 2. Traffic monitoring & analysis, 3. Bandwidth stealth, 4. MAC targeted attack, 5. WEP targeted attack
Physical Layer	1. Jamming attack (DOS in nature), 2. Stolen or compromised attack, 3. Malicious message injecting, 4. Eavesdropping attack

II. Categories of Attacks: Attacks in MANET be divided into types are active attack and passive attack [12].

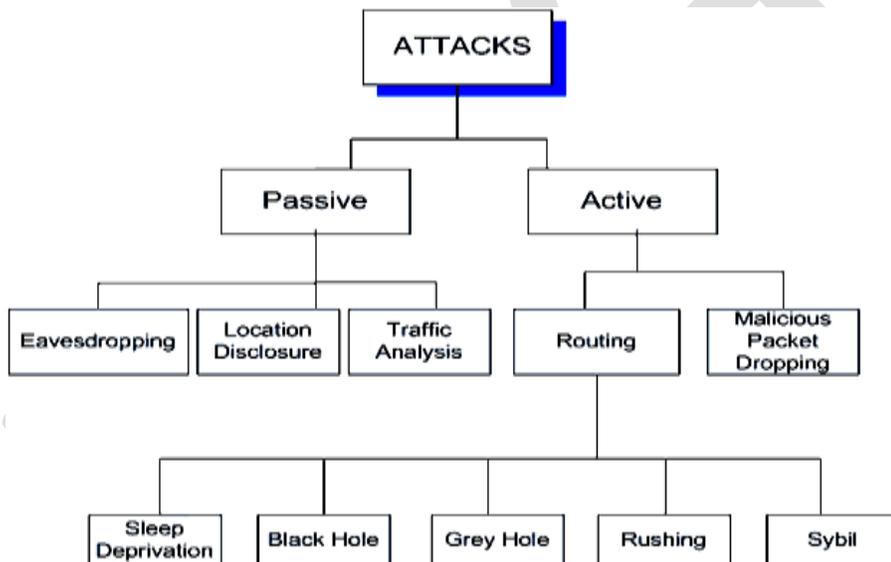


Figure: 2 Categories of Mobile Ad hoc Network Attacks

2.1 Active attack

The information which is routing through the nodes in MANET is altered by an attacker node. Attacker node also streams some false information in the network. Attacker node also do the task of RREQ (re request) though it is not an authenticated node so the other node rejecting its request due these RREQs the bandwidth is consumed and network is jammed [12].

Black hole attack: In black hole attack, a malicious node sends false routing information and claiming that it has an original route and causes other good nodes to route data packets through the malicious one [16]. All traffic will be routed through the attacker, and the attacker can misuse or discard the traffic.

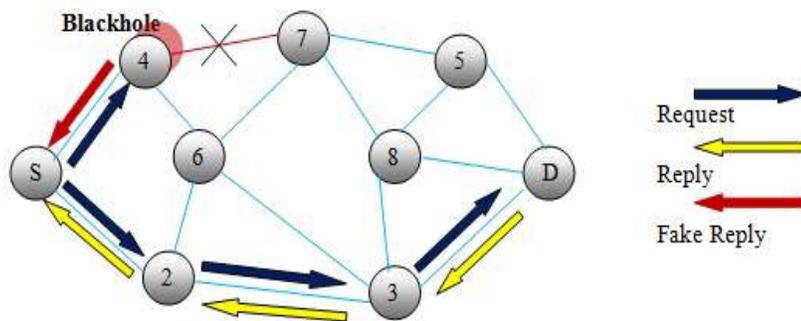


Figure: 3 Black Hole Attack

Worm hole attack: In Worm hole attack two malicious nodes make a tunnel b/w them. This tunnel is called worm hole. Wormhole attack is additionally known as the tunneling attack. An attacker receives a packet at one point and tunnels it to another malicious node in the network. This way beginner assumes that he found the shortest path in the network. This tunnel between two colluding attackers is called the wormhole [1, 2, and 3]. The seriousness of this attack is that it can be launched against all communication that provide confidentiality and authenticate .

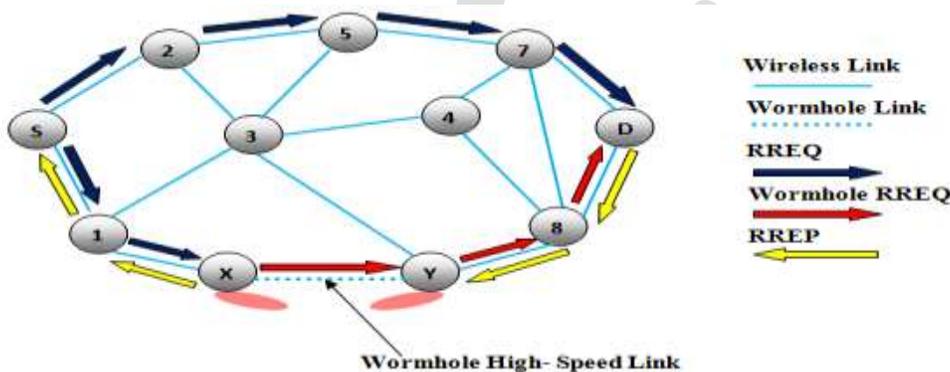


Figure: 4 Worm hole attack:

Spoofing: When a malicious node miss-present his identity, thus this manner it will alter the vision of sender and sender change the topology [1].

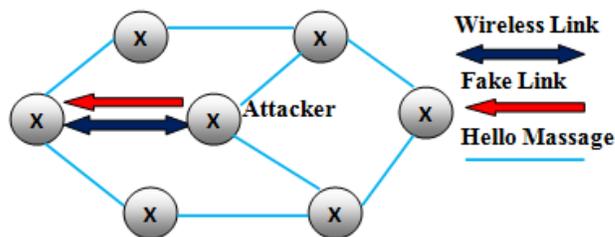


Figure: 5 Spoofing Attack

Rushing attack: In rushing attack, an attacker comes between the route of sender and receiver. When sender send packet to the receiver, then attacker intercept the packet and forward to receiver. Attacker performs duplicate suppression mechanism and then sends the duplicate to the receiver again and again. Receiver assumes that packets come from sender so that receiver will be busy continuously. This way, it reduces the efficiency of receiver [7].

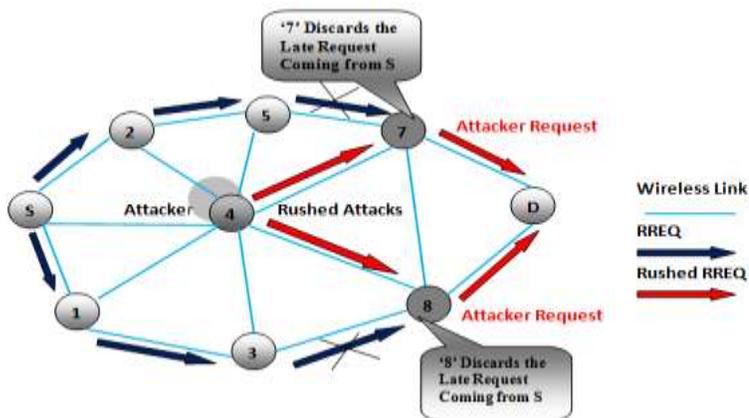


Figure: 6 Rushing Attack

Fabrication: When a malicious node generates the false routing message. This means malicious node generate the incorrect information about the route between devices [12].

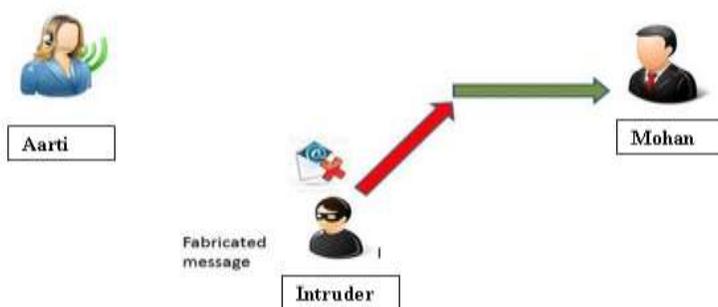


Figure: 7 Fabrication Attack

Modification: Malicious node performs some modification within the routing, in order that sender sends the message through the long route. This cause time delay and communication delay is occurred between sender and receiver [13].

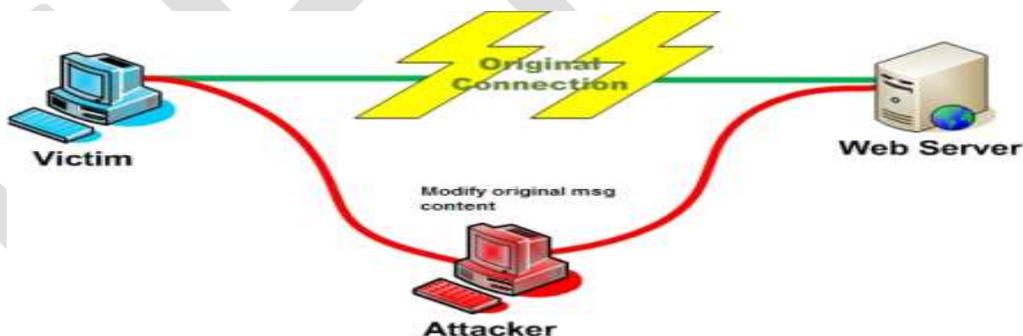


Figure: 8 Modification Attack

Denial of services: In this form of attack, malicious node causing the message to the node and consume the bandwidth of the network. The aim of malicious node is to be busy to the network node. This way, if a message from the authorized node will come, then receiver will not receive the message because he is busy and beginner should wait for the receiver response [14].

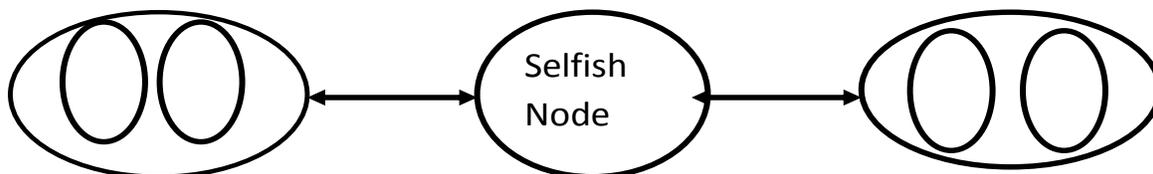


Figure: 9 Denial of Services Attack

Sinkhole Attack: It is a service attack that prevents the base station from obtaining complete and correct information [9]. In sinkhole attack, a compromised node tries to attract the data to it from his all neighboring node. Selective forwarding, modification or even dropping of data can be done by the sinkhole attack [11]

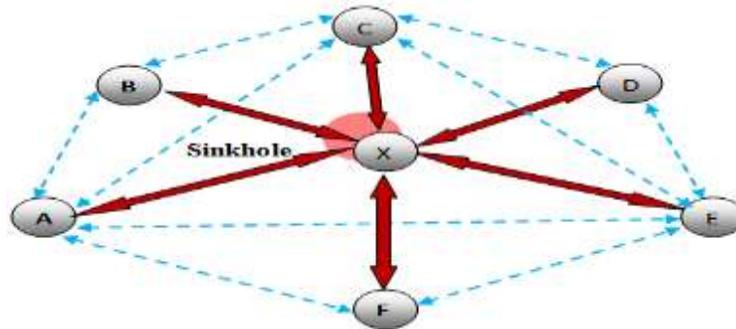


Figure: 10 Sinkhole Attack

Sybil Attacks: Sybil attack refers to the multiple copies of malicious nodes. It may be happen, if the malicious node shares its secret key with different malicious nodes. This manner the amount of inflated within the network and therefore the chance of the attack is additionally inflated.. If we have a tendency to use the multipath routing, then the possibility of choosing a path within the network, those contain the malicious node will be inflated [1, 2, 3].

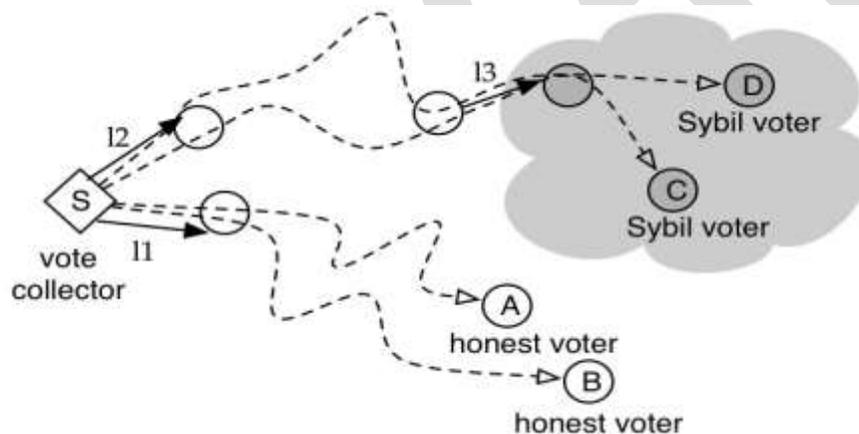


Figure: 11 Sybil Attack

Gray Hole Attack: A grey hole attack (GH) [24] is a special case of the BH attack, in which an intruder first captures the routes, i.e. becomes part of the routes in the network (as with the BH attack), and then drops packets selectively. For example, the intruder may drop packets from specific source nodes, or it may drop packets probabilistically or drop packets in some other specific pattern. As we noted above, BH and GH attacks are different in nature from packet dropping attacks, where the attacker simply fails to forward packets for some reason. BH and GH attacks on the other hand comprise two tasks: the attacker first captures routes and then either drops all packets (BH attack) or some packets (GH attack).

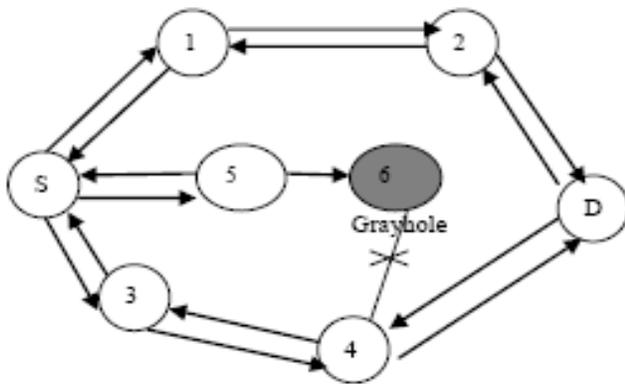


Figure: 12 Gray Hole Attack

Table: 2 Different Approaches for attacks

S. No.	Approaches	Type of Detection	Problems
1.	Packet Forwarding Misbehavior	Single Black Hole	Falsely Accusing
2	Dynamic Anomaly Detection	Single Black hole	High False Alarm Rate
3	Core Maintenance of Allocation Table Approach	Collaborative black hole	Time delay
4	Neighborhood-Based Approach	Single Black Hole	High False Positive
5	Bluff- Based Approach	Single Black Hole	More Time Delay
6	Authentication & Sequence No Based	Single Black Hole	Limited sequence No
7	REACT(Hash Based Defending)	Single Black Hole	Resource consumption & Identification delay
8	Random two-hop ACK	Single Black Hole	Less Efficient
9	DPRAODV	Single Black Hole	Time delay & Normalized Overhead

Table: 3 Related Work

Author	Attack	Solution	Remarks
Cerri. D Politec di Milan, Ghioni A	Blackhole Attack	SAODV	Requires heavyweight asymmetric cryptographic algorithm

Seung Yi, Prasad Naldurg, Robin Kravets [20]	Replay Attacks	SAR	Require excessive encrypting and decrypting at each hop. Discovered route may not be shortest path
Davide Cerri and Alessandro Ghioni	DOS, Man in the Middle Attack	Adoptive SAODV	Routing Overhead and High Processing Power, Time delay in establishing routes
Bridget, Brain Neil, Elizabeth Royer, Clay Shields	Active Attacks	ARAN	Cannot defend against authenticated Selfish nodes
Chu-Hsing Lin, Tunghai Univ, Taipei, Wei-Shen Lai, Yen-Lin Huang; Mei- Chun Chou [21]	Wormhole attack	SEAD	It doesn't provide a way to prevent an attacker from tampering with "next hop" columns. Instead, it relies on doing neighbor authentication, which is bad.

III. Passive Attack: In passive attack there is not any alteration within the message that is transmitted. There is an attacker (intermediated node) between sender & receiver that reads the message. This intermediate attacker node is additionally doing the task of network observance to analyze which kind of communication is goes on. The name of some passive attacks is Eavesdropping, traffic analysis, and Monitoring [11].

a. Eavesdropping: Eavesdropping is a passive attack, that occurred within the mobile ad-hoc network. The aim of eavesdropping is to find some secret or confidential information that should be kept secret during the communication. This confidential information may be privet or public key of sender or receiver or any password [17].

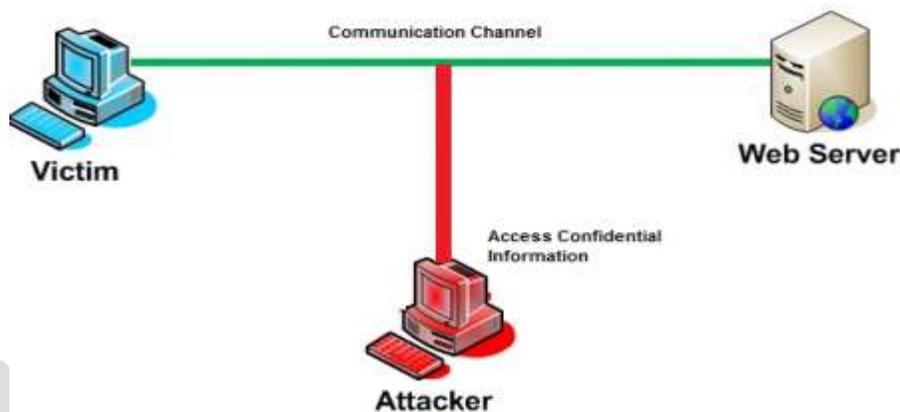


Figure: Eavesdropping

b. Traffic analysis: In this type of attack, an attacker tries to sense the communication path between the sender and receiver. This way attacker found the amount of data which is travel between the route of sender and receiver. There is no alteration in data by the traffic analysis [17].

c. Monitoring: Monitoring is a passive attack in which attacker can see the confidential data, but he cannot change the data or cannot modify the data [23].

IV. Mitigation technique

Mitigation technique in ad hoc network guarantees to protect from the attacks, security threats and vulnerabilities, like The Multipath Routing can be effective way to mitigate selective forwarding. Different mitigation techniques for attacks are:

1. Black-Hole Attack: [28] (I) Collecting multiple RREP messages (from more than two nodes) and thus hoping multiple redundant paths to the destination node and then buffering the packets until a safe route is found. (ii) Maintaining a table in each node with previous sequence number in increasing order. Each node before forwarding packets increases the sequence number. The sender node broadcasts RREQ to its neighbors and once this RREQ reaches the destination, it replies with a RREP with last packet sequence number. If the intermediate node finds that RREP contains a wrong sequence number, it understands that somewhere something went wrong.

2. Gray-Hole Attack: Mitigated by priority protocols schemes [32]. Whenever a node enters in a Mobile Ad Hoc network IP allocation is the first step in which the node will get its IP along with initial priority and we have adopted the technique of Prime

DHCP [25]. Neighbor Discovery is the second step of the proposed scheme. New node will send the HELLO packets to its neighbors and discover the identity of the neighbors along with their priority. Authentication is the next step of the scheme in which it will broadcast information about its existence and exchange keys with the neighbors according to the scheme HEAP [26] which is a hop-by-hop authentication protocol. HEAP authenticates packets at every hop by using a modified HMAC based algorithm along with two keys and drops any packets that originate from outsiders.

3. Jellyfish Attack: (i) 2ACK [23]: The basic idea of the 2ACK scheme is that, when a node forwards a data packet successfully over the next hop, the destination node of the next-hop link will send back a special two-hop acknowledgment called 2ACK to indicate that the data packet has been received successfully. Such a 2ACK transmission takes place for only a fraction of data packets, but not for all. (ii) Credit based systems [28]: This approach provides incentives for successful transmission of some kind of token or credit which the node might use when it starts sending its own packet.

4. Worm Hole Attack [13]: Geographical leashes & temporal leashes: A leash is added to each packet in order to restrict the distance the packets are allowed to travel. A leash is associated with each hop. Thus, each transmission of a packet requires a new leash. A geographical leash is intended to limit the distance between the transmitter and the receiver of a packet. A temporal leash provides an upper bound on the lifetime of a packet.

5. Rushing Attack: (i) SEDYMO [15]: Secured Dynamic MANET On-Demand is similar to DYMO but it dictates intermediate node must add routing information while broadcasting the routing messages and no intermediate node should delete any routing information from previous sender while broadcasting. It also incorporates hash chains and digital signature to protect the identity. (ii) SRDP [34]: Secure Route Discovery Protocol is security enhanced Dynamic Source routing (DSR) protocol. (iii) SND [31]: Secure Neighbor Detection is another method of verifying each neighbor's identity within a maximum transmission range.

6. Cache Poisoning Attack: (i) SAODV [16]: Secure AODV is an extension to AODV protocol that adds each node to exchange signed routing messages. Each node has its own public key which it uses to sign routing messages. Also SAODV uses hop count as a metric for shortest-route as AODV and uses hash chains to secure hop count information in route messages. (ii) SNRP [16]: Secure Neighbor Routing protocol uses security enhanced Neighbor Lookup Protocol (NLP) to secure MANET routing. Newly added node uses public key to participate in MANET.

7. Sybil Attack: One way of mitigating this attack is maintaining a chain of trust, so single identity is generated by a hierarchical structure which may be hard to fake. Another approach would be based on signal strength.

V. CONCLUSION

We have tried to categorize the various varieties of unintentional security attacks only supported on their characteristics to significantly cut back the mitigation amount. By transportation the attacks under these two broad categories the complicity of naming additionally reduces. We have also kept a close look on the prevailing algorithms required to mitigate the attacks and have tried to bind the attacks into categories according to that. Some attacks have characteristics which makes them unsuitable to be categorized into these categories, so they have been kept away from this topic of discussion for the time being. Further study is in progress to find out more common characteristics of the attacks a lot of powerfully bind them into these categories and to ably design more powerful algorithm in mitigating information.

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IMPENDING KNOW-HOW TECHNOLOGY FOR INFORMATION MANAGEMENT WILL BE: OPEN TO CLOUD COMPUTING, IT'S CRAM AND SAFETY MEASURES

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Abstract— Research in virtualization, utility computing, distributed computing, and more recently networking, web and software services has provided chance to build a moderately latest term CLOUD COMPUTING. Cloud Computing implies a service on demand, service oriented architecture, complete information technology transparency for the end-user, vast flexibility, with less total cost of ownership, on-demand services and much more.

The next leading edge in cloud computing security and conformity will be to generate transparency at the bottom-most layers of the cloud by mounting the standards, tools and linkages. If safety of organizations computing infrastructure cannot be trusted, the security of important data, software and services operation on zenith of that infrastructure falls into uncertainty. We believe clouds can extend the organization infrastructure-level policy controls and the security of end-to-end user, to handle even the most demanding safety measures of necessities for data and applications. Finally, this will facilitate organizations to take gain advantage of the cloud's benefits in supporting a vast range of business processes. This paper discusses upcoming technology for information management that is the concept of "cloud" computing, several of security issues it tries to address[1].

Keywords— "cloud" computing, virtual computing lab, virtualization, utility computing, end-to-end quality of Service.

I. INTRODUCTION

According to Google Proposal Cloud computing means the endless intelligence of the crowds.

Exact Meaning of Cloud computing:

It is a latest Computing paradigm, that involve computation and data outsourcing, having

- (i) On exact "just-in-time" provisioning
- (ii) No upfront charge ... pay-as-you-go
- (iii) Flexible and vast resource scalability



Figure 1.0: Google search image

Cloud Computing is with the aim of, use only when you want, use as much or as less you need, and pay only what you use.

Cloud computing is Internet-based computing, whereby shared servers provide resources, software, and data to computers and other devices on demand, as with the electricity grid. Cloud computing is a natural evolution of the widespread adoption of virtualization, service-oriented architecture and utility computing[1].

Cloud computing means selling "X as a service"

IaaS: Infrastructure as a Service

– Selling virtualized hardware

PaaS: Platform as a service

- Access to a configurable platform/API
- SaaS: Software as a service
- Software that runs on top of a cloud

II. CLOUD COMPUTING ARCHITECTURAL LAYERS

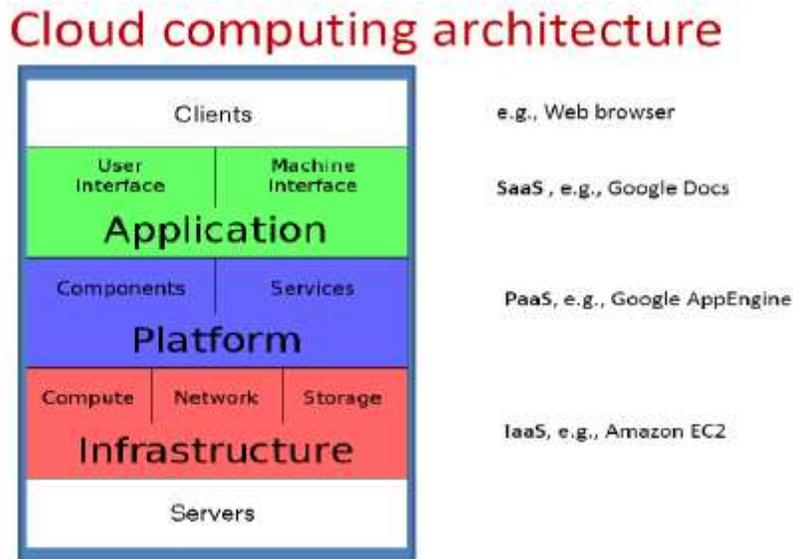


FIGURE 2.1: ARCHITECTURE

FIGURE 2.1: ARCHITECTURE

The Internet functions through a series of network protocols that form a stack of layers, as shown in the figure (or as described in more detail in the OSI model). Once an Internet connection is established among several computers, it is possible to share services within any one of the following layers[2].

Client

A cloud client consists of computer hardware and/or computer software that relies on cloud computing for application delivery, or that is specifically designed for delivery of cloud services and that, in either case, is essentially useless without it. Examples include some computers, phones and other devices, operating systems and browsers.

Application

Cloud application services or "Software as a Service (SaaS)" deliver software as a service over the Internet, eliminating the need to install and run the application on the customer's own computers and simplifying maintenance and support. People tend to use the terms „SaaS“ and „cloud“ interchangeably, when in fact they are two different things.

Key characteristics include:

- Network-based access to, and management of, commercially available (i.e., not custom) software
- Activities that are managed from central locations rather than at each customer's site, enabling customers to access applications remotely via the Web
- Application delivery that typically is closer to a one-to-many model (single instance, multi-tenant architecture) than to a one-to-one model, including architecture, pricing, partnering, and management characteristics
- Centralized feature updating, which obviates the need for downloadable patches and upgrades.

Platform

Cloud platform services or "Platform as a Service (PaaS)" deliver a computing platform and/or solution stack as a service, often consuming cloud infrastructure and sustaining cloud applications. It facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

Infrastructure

Cloud infrastructure services, also known as "Infrastructure as a Service (IaaS)", delivers computer infrastructure - typically a platform virtualization environment - as a service. Rather than purchasing servers, software, data-center space or network equipment, clients instead buy those resources as a fully outsourced service. Suppliers typically bill such services on a utility computing basis and amount of resources consumed (and therefore the cost) will typically reflect the level of activity. IaaS evolved from virtual private server offerings.

Server

The server's layer consists of computer hardware and/or computer software products that are specifically designed for the delivery of cloud services, including multi-core processors, cloud-specific operating systems and combined offerings.

2.1. Cyber Infrastructure

“Cyber infrastructure makes applications dramatically easier to develop and deploy, thus expanding the feasible scope of applications possible within budget and organizational constraints, and shifting the scientist’s and engineer’s effort away from information technology development and concentrating it on scientific and engineering research. Cyber infrastructure also increases efficiency, quality, and reliability by capturing commonalities among application needs, and facilitates the efficient sharing of equipment and services.” Today, almost any business or major activity uses, or relies in some form, on IT and IT services. These services need to be enabling and appliance-like, and there must be an economy of-scale for the total-cost-of-ownership to be better than it would be without cyber infrastructure[3].

Technology needs to improve end-user productivity and reduce technology-driven overhead. For example, unless IT is the primary business of an organization, less than 20% of its efforts not directly connected to its primary business should have to do with IT overhead, even though 80% of its business might be conducted using electronic means.

2.2. Concepts

A powerful underlying and enabling concept is computing through service-oriented architectures

(SOA) – Delivery of an integrated and orchestrated suite of functions to an end-user through composition of both loosely and tightly coupled functions, and services – often network based. Related concepts are component-based system engineering, orchestration of different services through workflows, and virtualization.

2.2.1. Service-oriented Architecture

SOA is not a new concept, although it again has been receiving considerable attention in recent years [9, 25, 38].

Examples of some of the first network-based service-oriented architectures are remote procedure calls (RPC), DCOM and Object Request Brokers (ORBs) based on the CORBA specifications [32, 33]. A more recent example are the so called “Grid Computing” architectures and solutions [15, 17, 18]. In an SOA environment, end-users request an IT service (or an integrated collection of such services) at the desired functional, quality and capacity level, and receive it either at the time requested or at a specified later time. Service discovery, brokering, and reliability are important, and services are usually designed to interoperate, as are the composites made of these services. It is expected that in the next 10 years, service-based solutions will be a major vehicle for delivery of information and other IT-assisted functions at both individual and organizational levels, e.g., software applications, web-based services, personal and business “desktop” computing, high-performance computing[4].

2.2.2. Components

The key to a SOA framework that supports workflows is componentization of its services, an ability to support a range of couplings among workflow building blocks, fault-tolerance in its data- and process-aware service-based delivery, and an ability to audit processes, data and results, i.e., collect and use provenance information. Component-based approach is characterized by [13, 28] reusability (elements can be re-used in other workflows), substitutability (alternative implementations are easy to insert, very precisely specified interfaces are available, runtime component replacement mechanisms exist, there is ability to verify and validate substitutions, etc.), extensibility and scalability (ability to readily extend system component pool and to scale it, increase capabilities of individual components, have an extensible and scalable architecture that can automatically discover new functionalities and resources, etc.), customizability (ability to customize generic features to the needs of a particular scientific domain and problem), and composability (easy construction of more complex functional solutions using basic components, reasoning about such compositions, etc.). There are other characteristics that also are very important. Those include reliability and availability of the components and services, the cost of the services, security, total cost of ownership, economy of scale, and so on. In the context of cloud computing we distinguish many categories of components: from differentiated and undifferentiated hardware, to general purpose and specialized software and applications, to real and virtual “images”, to environments, to no-root differentiated resources, to workflow-based environments and collections of services, and so on. They are discussed later in the paper.

2.2.3. Workflows

An integrated view of service-based activities is provided by the concept of a workflow. An IT-assisted workflow represents a series of structured activities and computations that arise in information-assisted problem solving. Workflows have been drawing enormous attention in the database and information systems research and development communities [16, 20]. Similarly, the scientific community has developed a number of problem solving environments, most of them as integrated solutions [19]. Scientific workflows merge advances in these two areas to automate support for sophisticated scientific problem solving [28, 42]. A workflow can be represented by a directed graph of data flows that connect loosely and tightly coupled (and often asynchronous) processing components. One such graph is shown in Figure 1. It illustrates a Kepler-based implementation of a part of a fusion simulation workflow [2, 8]. In the context of “cloud computing”, the key questions should be whether the underlying infrastructure is supportive of the workflow oriented view of the world. This includes on demand and advance-reservation-based access to individual and aggregated computational and other resources, autonomies, ability to group resources from potentially different “clouds” to deliver workflow results, appropriate level of security and privacy, etc.

2.2.4. Virtualization

Virtualization is another very useful concept. It allows abstraction and isolation of lower level functionalities and underlying hardware. This enables portability of higher level functions and sharing and/or aggregation of the physical resources. The virtualization concept has been around in some form since 1960s (e.g., in IBM mainframe systems). Since then, the concept has matured considerably and it has been applied to all aspects of computing – memory, storage, processors, software, networks, as well as services that IT offers. It is the combination of the growing needs and the recent advances in the IT architectures and solutions that

is now bringing the virtualization to the true commodity level. Virtualization, through its economy of scale, and its ability to offer very advanced and complex IT services at a reasonable cost, is poised to become, along with wireless and highly distributed and pervasive computing devices, such as sensors and personal cell-based access devices, the driving technology behind the next wave in IT growth[5].

III. CLOUD COMPUTING SECURITY ISSUES

Cloud Computing Challenges and Related Security Issues. A Survey Paper identified seven issues that need to be addressed before enterprises consider switching to the cloud computing model. They are as follows:

- . Privileged user access - information transmitted from the client through the Internet poses a certain degree of risk, because of issues of data ownership; enterprises should spend time getting to know their providers and their regulations as much as possible before assigning some trivial applications first to test the water
 - . Regulatory compliance - clients are accountable for the security of their solution, as they can choose between providers that allow to be audited by 3rd party organizations that check levels of security and providers that don't
 - . Data location - depending on contracts, some clients might never know what country or what jurisdiction their data is located
 - . Data segregation - encrypted information from multiple companies may be stored on the same hard disk, so a mechanism to separate data should be deployed by the provider.
 - . Recovery - every provider should have a disaster recovery protocol to protect user data
 - . Investigative support - if a client suspects faulty activity from the provider, it may not have many legal ways pursue an investigation
 - . Long-term viability - refers to the ability to retract a contract and all data if the current provider is bought out by another firm
- Given that not all of the above need to be improved depending on the application at hand, it is still paramount that consensus is reached on the issues regarding standardization. Third party secure data publication applied to cloud.

Cloud Security and Compliance – What the future holds

The next frontier in cloud security and compliance will be to create transparency at the bottom-most layers of the cloud by developing the standards, tools and linkages to monitor and prove that the cloud's physical and virtual machines are actually performing as they should. Verifying what's happening at the foundational levels of the cloud is important for the simple reason that if organizations can't trust the safety of their computing infrastructure, the security of all the data, software and services running on top of that infrastructure falls into doubt[6].

There's currently no easy way for organizations to monitor actual conditions and operating states within the hardware, hypervisors and virtual machines comprising their clouds. However, cloud providers and members of the IT Industry are collaborating on a conceptual IT framework to integrate the secure measurements provided by a hardware root of trust into adjoining hypervisors and virtualization management software. The resulting infrastructure stack would be tied into data analysis tools and a governance, risk & compliance (GRC) console, which would contextualize conditions in the cloud's hardware and virtualization layers to present a reliable assessment of an organization's overall security and compliance posture. This type of integrated hardware-software framework would make the lowest levels of the cloud's infrastructure as inspect able, analyzable and reportable for compliance as the cloud's top-most application services layer.

With this unprecedented level of visibility, we believe clouds can develop the infrastructure-level policy controls and the end-to-end security attestations to handle even the most demanding security requirements for applications and data. Ultimately, this will enable organizations to take advantage of the cloud's benefits in supporting a much broader range of business processes. Maintaining the Integrity of the Specifications

IV. EXPANSION OF CLOUD COMPUTING OFFERS SECURITY FOR VIRTUALIZATION, CLOUD COMPUTING

Virtualization and cloud computing allow computer users access to powerful computers and software applications hosted by remote groups of servers, but security concerns related to data privacy are limiting public confidence -- and slowing adoption of the new technology. Now researchers from North Carolina State University have developed new techniques and software that may be the key to resolving those security concerns and boosting confidence in the sector.

Virtualization allows the pooling of the computational power and storage of multiple computers, which can then be shared by multiple users. For example, under the cloud computing paradigm, businesses can lease computer resources from a data center to operate Web sites and interact with customers -- without having to pay for the overhead of buying and maintaining their own IT infrastructures. The virtualization manager, commonly referred to as a "hypervisor," is a type of software that creates "virtual machines" that operate in isolation from one another on a common computer. In other words, the hypervisor allows different operating systems to run in isolation from one another -- even though each of these systems is using computing power and storage capability on the same computer. This is the technique that enables concepts like cloud computing to function.

One of the major threats to virtualization -- and cloud computing -- is malicious software that enables computer viruses or other malware that have compromised one customer's system to spread to the underlying hypervisor and, ultimately, to the systems of other customers. In short, a key concern is that one cloud computing customer could download a virus -- such as one that steals user data -- and then spread that virus to the systems of all the other customers.

"If this sort of attack is feasible, it undermines consumer confidence in cloud computing," Jiang says, "since consumers couldn't trust that their information would remain confidential."

But Jiang and his Ph.D. student Zhi Wang have now developed software, called HyperSafe, that leverages existing hardware features to secure hypervisors against such attacks. "We can guarantee the integrity of the underlying hypervisor by protecting it from being compromised by any malware downloaded by an individual user," Jiang says. "By doing so, we can ensure the hypervisor's isolation." For malware to affect a hypervisor, it typically needs to run its own code in the hypervisor. HyperSafe utilizes two components to prevent that from happening. First, the HyperSafe program "has a technique called non-bypassable memory lockdown, which explicitly and reliably bars the introduction of new code by anyone other than the hypervisor administrator," Jiang says. "This also prevents attempts to modify existing hypervisor code by external users."

Second, HyperSafe uses a technique called restricted pointer indexing. This technique "initially characterizes a hypervisor's normal behavior, and then prevents any deviation from that profile," Jiang says. "Only the hypervisor administrators themselves can introduce changes to the hypervisor code."

The research was funded by the U.S. Army Research Office and the National Science Foundation. The research, "HyperSafe: A Lightweight Approach to Provide Lifetime Hypervisor Control-Flow Integrity," will be presented May 18 at the 31st IEEE Symposium On Security And Privacy in Oakland, Calif[7].

V. CONCLUSION

"Cloud" computing builds on decades of research in virtualization, distributed computing, utility computing, and, more recently, networking, web and software services. It implies a service-oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. This paper discusses the concept of "cloud" computing, the issues it tries to address, related research topics, and a "cloud" implementation based on which we can manage information and can make better use of technology.

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Refinder Web Search

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Abstract— Personalized Web Search provide better search result as per user queries. In the existing system the search engine will retrieve the irrelevant results for the user query. In the proposed model the query will be processed based on Personalized Web Search. The query will be retrieved based on Click Log based and Profile based. The Profile based retrieval will be done through browsing history, click through data and bookmarks. We are purposing an addition method to Track the Lead Time of the Resultant Website & Obtaining the Feedback of the user for any URL. Based on Lead time, Feedback and above said Proposed Methods we would Rank the best Resultant for any Users.

Keywords: Refinder, Lead Time, Click Log, Personalized Web Search, greedyDP, greedyIL, prune-leaf

1. INTRODUCTION

There are lots of search engines available on web to get any type of information. But not all of them provides good results, instead it returns some irrelevant result that does not matches the user queries. To solve this type of problem Personalized web search is helpful. Personalized Web Search (PWS)[1] is a general search engine technique which aimed to provide better search results as per individual user queries. PWS can generally be categorized into two types, first is click-log-based methods and second is profile-based[1].

Click-log based methods simply impose bias to clicked pages in the user's query history. It can only work on repeated queries from the same user. However profile-based method used to improve search experience and it also generates complicated user interest models from user profiling techniques. Although both of them has some limitation in click-log based as well as profile based. Click-log based strategy can only work on repeated queries from the same user[2], which is a strong limitation confining its applicability and profile based method is unstable under some circumstances.

So, we are purposing an addition method to rank the best resultant for any user. In this method we are going to track the Lead Time of the Resultant Website & will obtain the Feedback of the user for any URL and then according to the lead time and feedback of the user it will re-rank the previous results and provide best results as per user queries.

The rest of this paper is organized as follows: Section 2 reviews the related work, focusing on PWS and its privacy preservation. Section 3 presents the architecture diagram of the project. Section 4. Gives a description about modules used in this paper. Section 5. Presents the generalisation algorithms for the project. Section 6 demo of the project (screen shot) Section 7. Concludes the paper.

2. PREVIOUS WORS

2.1 Supporting Privacy Protection in Personalized Web Search

Personalized web search provide effective search queries for user. But research says that user doesn't want to disclose or share his/her personal information. To solve this problem author purposes a PWS framework called UPS. UPS (User Customizable Privacy-Preserving Search) can generalize profiles by queries and it's also protect user's specified privacy requirements. UPS contains of a search engine server and a number of clients. Each client (user) approaching the search service trusts no one but himself/herself. The major component for privacy protection is an online profiler implemented as a search proxy running on the client side machine itself. The proxy observes both the complete user profile, in a picking order of nodes with semantics, and the user-specified (customized) privacy requirements represented as a set of sensitive-nodes.

UPS is differentiated from conventional Personalised Web Search in such a way that it Provides runtime profiling, which is effective to optimizes the personalization utility with user's privacy Requirements and it allows for customization of privacy needs and even it does not require any iterative user interaction.

UPS is used for runtime generalization. Runtime generalization help to make balanced between two prognostic metrics that evaluate of personalization and the privacy risk to bring out the generalized profile.

For runtime generalization they presented two greedy algorithms first one is GreedyDP and second one GreedyIL and both algorithm is efficient to produce best results for personalized user query.

In our purposed system we are adding lead time techniques and feedback of the user to enhance the personalized web search by re-ranking the result on the basis of lead time and feedback of the user.

2.2 Profile-Based Personalization

In the Previous works on profile-based PWS they mainly focus on improving the search utility. The principle idea of these works is to adapt the search results by referring to, often implicitly, a user profile that bring out a particular information goal.

There are many profile representations that available in the literature to alleviate different personalization strategies. Earlier techniques apply term lists/vectors or bag of words to represent their profile. However, the recent works create profiles in hierarchical structures because of their stronger descriptive ability, higher access efficiency, and better scalability. The majority of the hierarchical representations are made with existing weighted topic hierarchy/graph, such as ODP¹, Wikipedia² and so on. In our purposed system we do not aim on the implementation of the user profiles. Actually we are enhancing the supporting PWS by using re-ranking methods and make it user friendly by providing feedback option.

In the literature the performance measures of PWS, Normalized Discounted Cumulative Gain (nDCG) is a common measure of the effectiveness of an information retrieval system. It is works on an ungraded relevance scale of item-positions in the result list.

Meanwhile our work is to enhance the PWS so we are using click-log and profile based technique to produce relevant search while lead time technique and feedback are used to enhance the PWS.

2.3 Privacy Protection in PWS System

There are two classes of privacy protection problems for PWS.

- First one class includes those treat privacy as the identification of an individual.
- The other hold those consider the sensitivity of the data, related to the user profiles, exposed to the PWS server.

1. Open Directory Project (ODP), <http://dmoz.org/>.

2. Wikipedia, the Free Encyclopaedia, <http://www.wikipedia.org/>

The key works in the literature of protecting user identifications (class one) try to solve the privacy problem on different levels, including the group identity, the pseudo identity, no personal information, and no identity. The first level solution is proved to fragile. The third and fourth levels are visionary because of their high cost in cryptography and communication. So, the existing efforts focus on the second level. [8] and [9] generating a group profile of k users to provide online anonymity on user profiles. Using this approach, the linkage between the query and a single user is broken, the useless user profile (UUP) protocol is implemented to shuffle queries among a group of users who issue them that result any queries cannot profile a certain individual. In this scheme, every user acts as a search agency of his or her neighbours. users can decide to submit the query on behalf of who issued it, or forward it to other neighbours. The shortcomings of current solutions in class one is the high cost introduced due to the collaboration and communication.

The solutions in class two do not require third-party assistance or collaborations between social network entries. In this solution, users only trust themselves and cannot tolerate the exposure of their complete profiles an anonymity server. Horvitz and Krause employ statistical techniques to learn a probabilistic model, and then this model is used to generate the near-optimal partial profile. The main limitation in this work is that probabilistic model is trained through predefined frequent queries and it builds the user profile as a finite set of attributes. The literature proposed a privacy protection solution for PWS based on hierarchical profiles. User-specified threshold

is used to generalize profile to obtain in effect as a rooted sub tree of the complete profile. But this work does not address the utility of query, which is most important for the service quality of PWS.

3. ARCHITECTURE DIAGRAM



4. MODULES

4.1 USER QUERY

Query deployment module is used to create the Search Bar by which the User will enter the query. We are going to implement this project as web project. We will load our project into the web server and then we will execute this project. To create user query interface page, we'll develop this page using web based coding like Java Server Pages and Servlets. This User interface page will be connected to the backend database in which we will have the dataset. So that the result will be retrieved back to the user for their enter query.

4.2 SERVER

The server will maintain the database which consists of the large amount of data from which the exact result will be retrieved for the user surfed query. The server will also retrieve the data based on the search option the user is wanted to search of the information. The server will also implement some techniques while retrieving the data from the database.

4.3 CLUSTERING THE DOCUMENTS

In this module we are clustering the named documents. The Clustering will be processed as per name or keyword or tag values in the documents. So that we can cluster the documents named documents effectively. Since we are applying the clustering mechanism we can extract the best match result with maximum probability.

4.4 STEMMING ALGORITHM

Stemming algorithm is used to filter the stopping words from the query and search for the exact result that the user is surfing for. So that we can retrieve best matched results from the server's database. We will use word stemmer algorithm to filter the stopping words from the query.

4.5 SCORING ALGORITHM

In this module we are going to apply the Ranking algorithm to rank the result as documents weights. For an example if the user enter the query as “Cloud Computing” then the server will retrieve the data and order them according to the document weights. Document will be ranks using the below mentioned formulae.

Document weight= Total of query word query present in the document / Total number words in the document.

4.6 TOP K QUERY AND DATA RETRIVAL

In this module we can retrieve the documents using Top K query algorithm. By using this algorithm we can retrieve the Top K best matched results for the user entered query. SO that we retrieve most matched documents for the entered query.

5. THE GENERALIZATION ALGORITHM

At first we introducing a brute-force optimal algorithm, then we implement two Greedy algorithms, namely the GreedyDP and GreedyIL.

5.1 THE BRUTE-FORCE ALGORITHM

The brute-force algorithm exhausts all possible rooted sub trees of a given seed profile to find the optimal generalization. The requirements are respected during the exhaustion. The sub tree with the optimal utility is chosen as the result. Although the seed profile H_0 is significantly smaller than G , the exponential computational complexity of brute-force algorithm is still not acceptable. Formally, we have the following theorem whose proof is given in the link <http://doi.ieeecomputersociety.org/10.1109/TKDE.2012.201>.

5.2 THE GREEDYDP ALGORITHM

Given the complexity of our problem, a better practical solution would be a near-optimal greedy algorithm. As preliminary, we use an operator $-t$ known as prune-leaf, which denotes the removal of a leaf topic t from a profile. Formally, we denote by $G_i \xrightarrow{-t} G_{i+1}$ the process of pruning leaf t from G_i to obtain G_{i+1} . Obviously, the optimal profile G^* can be generated with a finite-length transitive closure $\xrightarrow{\text{prune-leaf}}$.

The first greedy algorithm GreedyDP works in a bottom up direction. Starting from G_0 , in every I^{th} iteration, GreedyDP chooses a leaf topic $t \in T_{g, (q)}$ for pruning, trying to maximize the utility of the output of the current iteration, namely G_{i+1} . During the iterations, we maintain a best profile-so-far, which indicates the G_{i+1} . having the highest discriminating power while satisfying the risk constraint. The process terminates when the profile is generalized to a root-topic. Which is the best-profile-so-far will be the final result (G_0) of the algorithm.

The main problem of GreedyDP is that it needs re-computation of all candidate profiles (together with their discriminating power and privacy risk) generated from attempts of prune-leaf on all $t \in T_{g, (q)}$ This causes significant memory requirements and computational cost.

5.3 THE GREEDYIL ALGORITHM

The GreedyIL algorithm implement to improve the efficiency of the generalization using heuristics based on several findings. The important finding is that any prune-leaf operation reduces the discriminating power of the profile. i.e, the DP displays monotonicity by prune-leaf. We have the following theorem:

Theorem 1. If G_0 is a profile obtained by applying a prune-leaf operation on G , then $DP(q,G) \geq DP(q,G')$.

Considering operation $G_i \xrightarrow{-t} G_{i+1}$. in the i th iteration, maximizing $DP(q, G_{i+1})$ is equivalent to minimizing the incurred information loss, which is defined as $DP(q, G_i) - DP(q, G_{i+1})$

The above finding motivates us to maintain a priority queue of candidate prune-leaf operators in descending order of the information loss caused by the operator. Each candidate operator in the queue is a tuple like $OP = \langle t, IL(t, G_i) \rangle$, where $IL(t, G_i)$ indicates the IL incurred by pruning t from G_i and t is the leaf to be pruned by op . This queue, denoted by Q , enables fast retrieval of the best so-far candidate operator.

This Theorem also leads to the following heuristic, which helps to reduce the total computational cost significantly

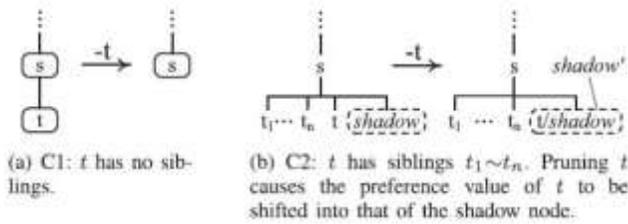


Fig. Two Cases of prune-leaf on a leaf t .

Heuristic 1. The iterative process can terminate whenever $\bar{\alpha}$ -risk is satisfied.

Next finding is that the computation of IL can be simplified to the evaluation of $\Delta PG(q, G) = PG(q, g_i) - PG(q, G_{i+1})$. The reason is that, referring to (12), the another term $TS(q, G)$ remains unchanged for any pruning operations until a single leaf is left (in such case the only choice for pruning is the single leaf itself). Now we consider two possible cases as being showed in Fig. (C1) t is a node with no siblings, and (C2) t is a node with siblings. The case C1 is easy to handle. while, the evaluation of IL in case C2 requires introducing a shadow sibling of t . Each time if we try to prune t , we actually merge t into shadow to get a new shadow leaf $shadow'$, together with the preference of t , i.e

$$Pr(shadow' | q, \mathcal{G}) = Pr(shadow | q, \mathcal{G}) + Pr(t | q, \mathcal{G}).$$

Finally, we have the heuristic, which significantly eases the computation of $IL(t)$. It can be seen that all terms in (16) can be computed efficiently.

Heuristic 2

$$IL(t) = \begin{cases} Pr(t | q, \mathcal{G})(IC(t) - IC(par(t, \mathcal{G}))), & \text{case C1} \\ dp(t) + dp(shadow) - dp(shadow'), & \text{case C2,} \end{cases}$$

where $dp(t) = Pr(t | q, \mathcal{G}) \log \frac{Pr(t | q, \mathcal{G})}{Pr(t)}$.

The third finding is that, in case C1 already described above, prune-leaf only works on a single topic t . Thus, it does not affect the IL of other candidate operators in Q . In case C2, pruning t incurs re-computation of the preference values of its sibling nodes. Thus, we have

Heuristic 3. Once a leaf topic t is pruned, only the candidate operators pruning t 's sibling topics need to be updated in Q . In other words, we only need to re-compute the IL values for operators attempting to prune t 's sibling topics.

Algorithm 1 shows the pseudo code of the GreedyIL algorithm. Generally, GreedyIL traces the information loss of the discriminating power. This help to saves a lot of computational cost. In the Heuristic 1(line 5) avoids unimportant iterations. Heuristics 2 (line 4, 10, 14) further simplifies the computation of IL. Finally, Heuristics 3 (line 16) reduces the need for IL-re-computation significantly. All topics in the seed profile have sibling nodes In the worst case condition, then GreedyIL has computational complexity of $O(|G_0| * T|G_0(q)|)$. However, this is extremely extinct in practice. Therefore, GreedyIL is expected to significantly outperform GreedyDP.

ALGORITHM 1: GreedyIL

Input : Seed Profile \mathcal{G}_0 ; Query q ; Privacy threshold δ

Output: Generalized profile \mathcal{G}^* satisfying δ -Risk

```

1 let  $Q$  be the IL-priority queue of prune-leaf decisions;
   $i$  be the iteration index, initialized to 0;
  // Online decision whether personalize  $q$  or not
2 if  $DP(q, \mathcal{R}) < \mu$  then
3   Obtain the seed profile  $\mathcal{G}_0$  from Online-1;
4   Insert  $\langle t, IL(t) \rangle$  into  $Q$  for all  $t \in T_{\mathcal{H}}(q)$ ;
5   while  $risk(q, \mathcal{G}_i) > \delta$  do
6     Pop a prune-leaf operation on  $t$  from  $Q$ ;
7     Set  $s \leftarrow par(t, \mathcal{G}_i)$ ;
8     Process prune-leaf  $\mathcal{G}_i \xrightarrow{-t} \mathcal{G}_{i+1}$ ;
9     if  $t$  has no siblings then // Case C1
10      Insert  $\langle s, IL(s) \rangle$  to  $Q$ ;
11    else if  $t$  has siblings then // Case C2
12      Merge  $t$  into shadow-sibling;
13      if No operations on  $t$ 's siblings in  $Q$  then
14        Insert  $\langle s, IL(s) \rangle$  to  $Q$ ;
15      else
16        Update the IL-values for all operations on
17         $t$ 's siblings in  $Q$ ;
18    Update  $i \leftarrow i + 1$ ;
19 return  $\mathcal{G}_i$  as  $\mathcal{G}^*$ ;
20 return  $root(\mathcal{R})$  as  $\mathcal{G}^*$ ;
    
```

6. SCREEN SHOTS

Image 1: Admin Page only access by admin

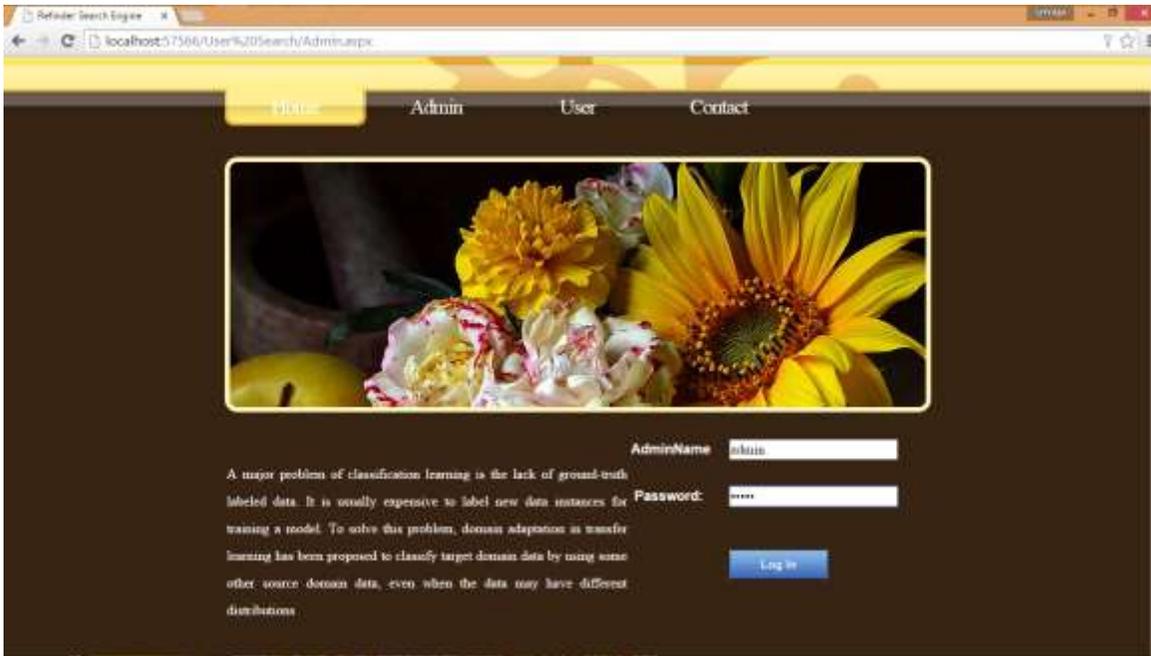


Image 2: web page after log in by admin



From this page admin control the search engine and from this page we can add new user, add web information, uploads files.

Image 3: sign up page for new user

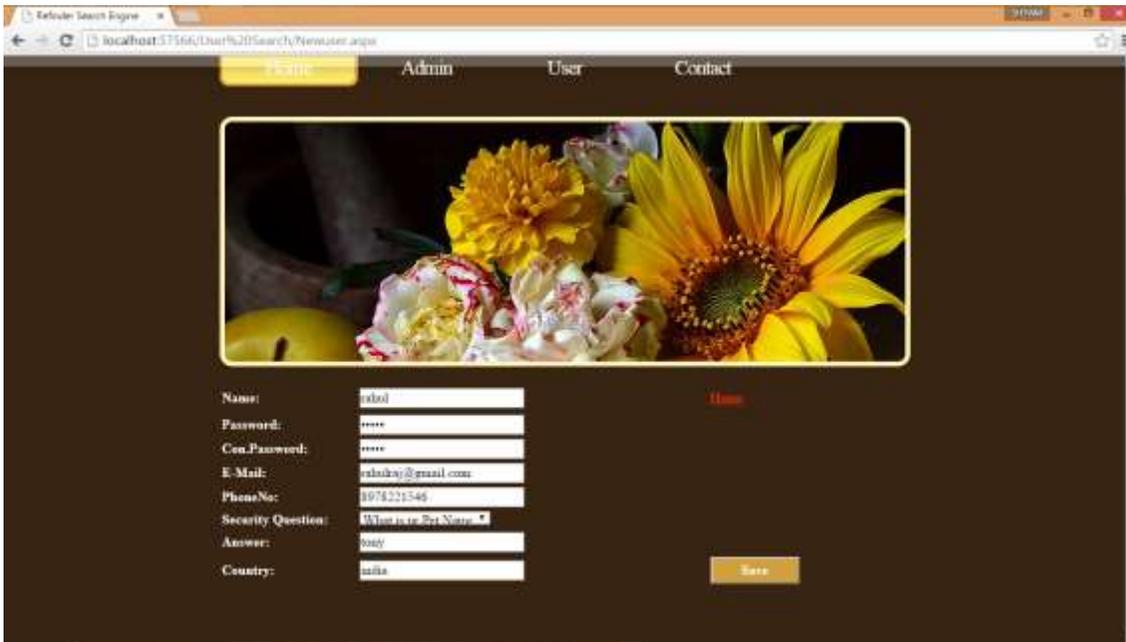


Image 4: log in page for user



Image 5: personalised web search page for user

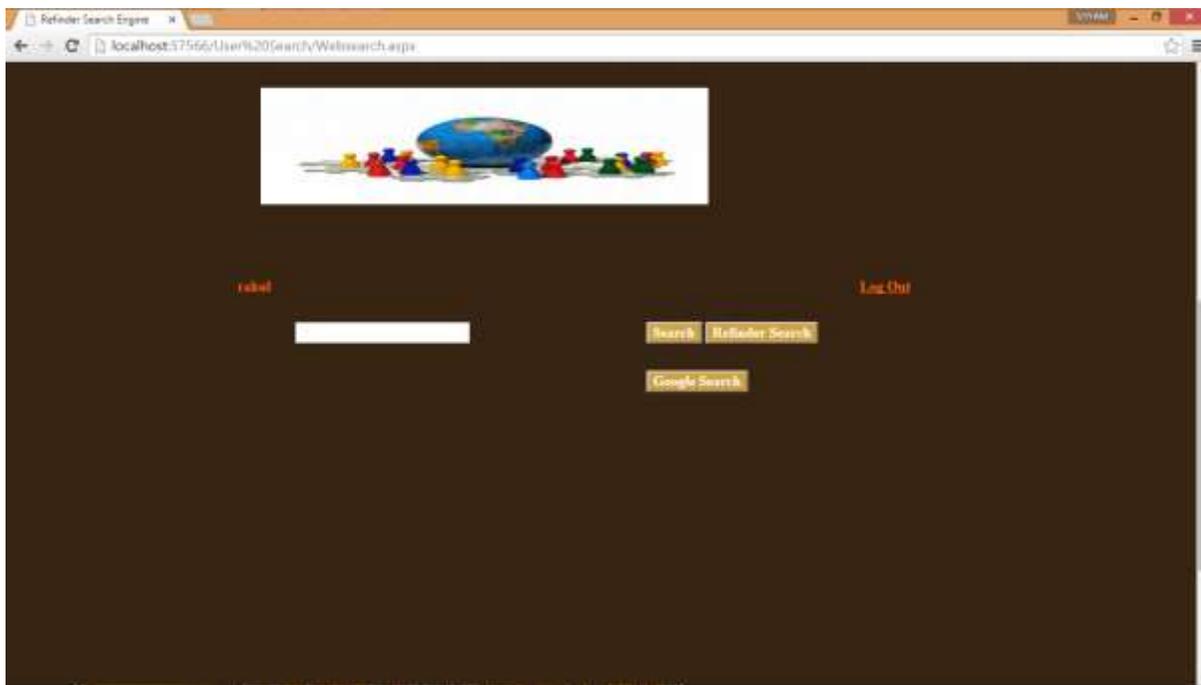


Image 6: query result page for user

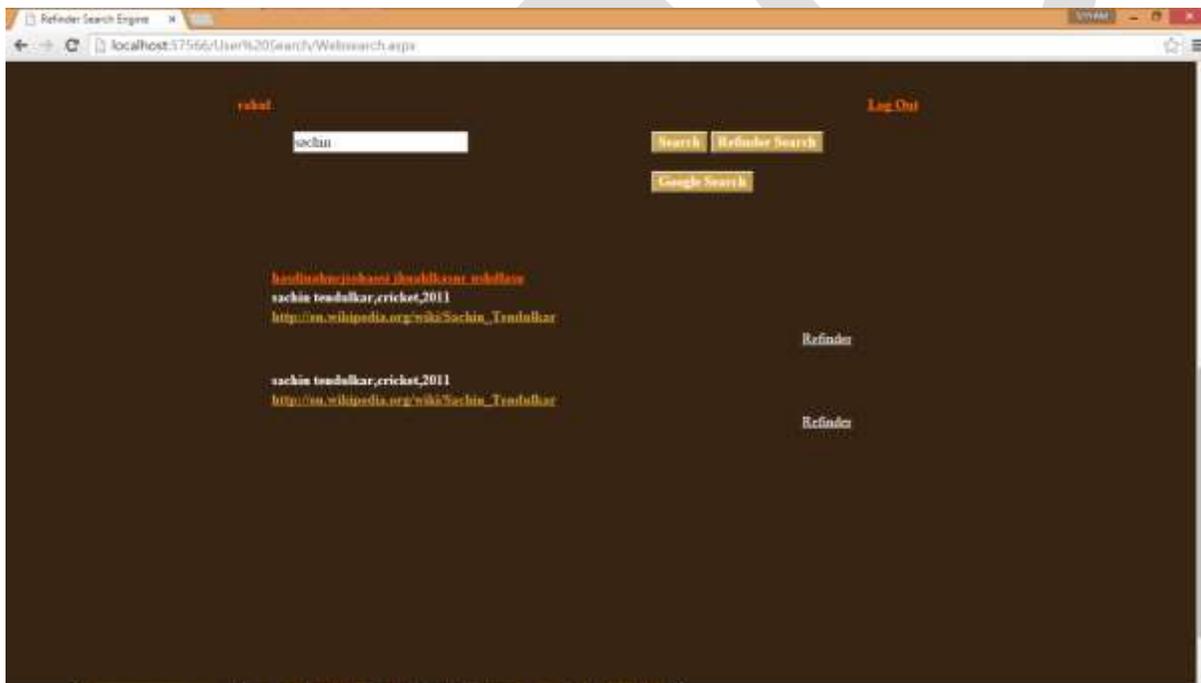


Image 7: refinder option to view this result in future. It have three catagory date,location and activity

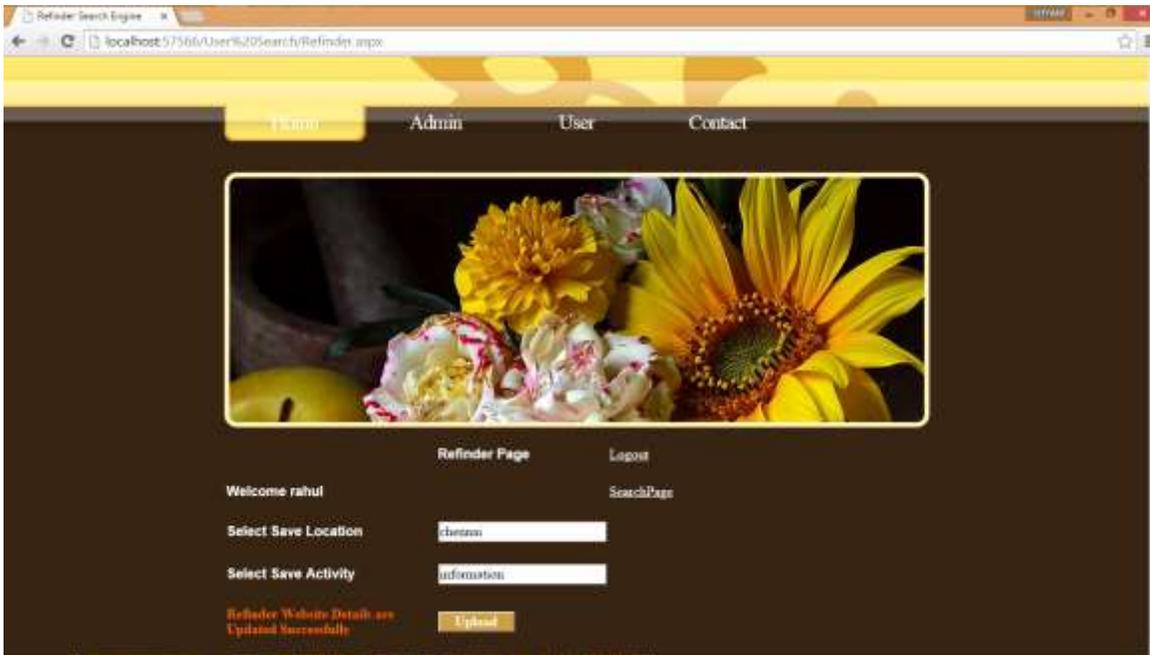
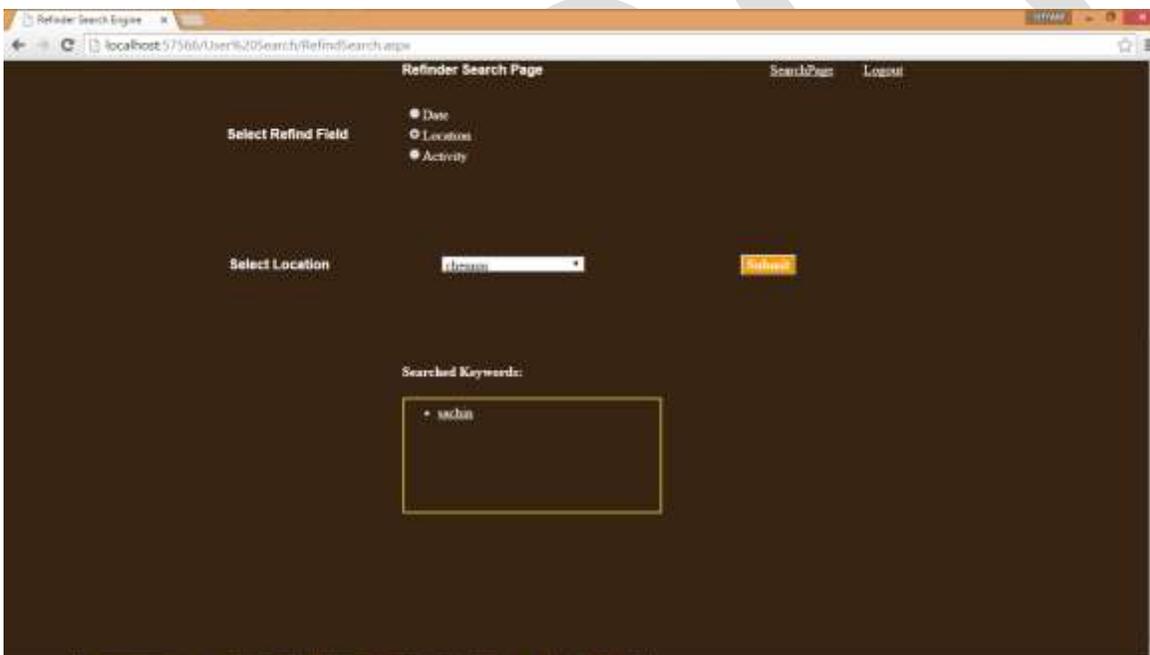


Image 8: with help of refinder search previous works can easily access by user anytime and anywhere.



7. ACKNOWLEDGMENT

The author would like to thank the Vice Chancellor, Dean-Engineering, Director, Secretary, Correspondent, and HOD of Computer Science & Engineering, Dr. K.P. Kaliyamurthie, Bharath University, and Chennai for their motivation and constant encouragement. The author would like to specially thank **Dr. A. Kumaravel, Dean , School of Computing**, for his guidance and for critical review of this manuscript and for his valuable input and fruitful discussions in completing the work and the Faculty Members of Department of Computer Science & Engineering. Also, he takes privilege in extending gratitude to his parents and family members who rendered their support throughout this Research work.

8. CONCLUSION

This paper presented an enhancement of privacy protection framework for personalized web search. The framework allowed users to specify customized privacy requirements via the hierarchical profiles. In addition, we add refinder option for user. When user search

queries, refinder option available in all result queries. If user get some useful information according to the query he can easily use refinder option to view these result again. Refinder sorted in three option 1.date 2.location 3.activity.

In date it short the result by date user use the refinder option for significant result. While in the location category it sort the result by location the user search the query. In activity category, refinder sot the result in the basis of what user take the action with that result.

For future work, we will try to make it more protected with one time password and it resist the adversaries with broader background knowledge or capability to capture a series of queries from the victim.

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REVIEW ON DEVELOPMENT AND ANALYSIS OF HELICAL SPRING WITH COMBINATION OF CONVENTIONAL AND COMPOSITE MATERIALS

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ABSTRACT- Aim of this paper is to analyze feasibility of adopting composite material for design of helical coil spring. Combination of springs with steel and composite material i.e Glass fiber epoxy resin is to be used in place of conventional spring steel. The cause of implementing combination of steel and composite material is the low stiffness of single composite spring, which limits its application to light vehicles. Fuel efficiency of automobiles can be maximized by lowering the weight of the vehicle. The spring of the suspension system plays an important role for a smooth and jerk free ride. So it is required to design the springs very precisely. The use of conventional steel as spring increases the weight and manufacturing process energy required is more so manufacturers are willing to use composite materials light in weight and also have corrosion resistance, it can also withstand high temperature. Manufacturing composite material is quite costlier than the steel spring. The use of composite material is beneficial if manufacturing process is standardized it can increase the efficiency of the vehicle adherence overcome the material cost.

Keywords: Helical spring, composite material, Glass fibre, epoxy resin, stiffness, Fuel efficiency

INTRODUCTION

Spring is an elastic body whose function is to store energy when deflected by force and return equivalent amount of energy on being released. Helical compression springs are widely used for suspension in light vehicle and locomotives worldwide.

Generally springs made of hardened steel are used. Small springs can be wound from pre-hardened stock while larger ones are made from annealed steel and hardened after fabrication. Non-ferrous metals are also used such phosphor bronze and titanium for parts requiring corrosion resistance and beryllium copper for springs carrying electrical current because of its low electrical resistance.

The rate of spring is called the change in the force it exerts, to the change in deflection of the spring. On the basis of design and required operating environment, any material can be used to construct a spring, so long as the material has the required combination of rigidity and elasticity: technically, a wooden bow is a form of spring. In the present scenario the automobile industry is regularly trying to reduce the fuel consumption of the automobile vehicles. Fuel efficiency of automobiles can be maximized by lowering the weight of the vehicle. The suspension system of an automobile is one of the important segments of the automobile vehicle. The use of

steel helical coil spring in suspension system is generally used by the automobile manufacturers. We know that, the spring of the suspension system plays an important role for a smooth and easy ride. So it required to design the springs very exactly. The use of conventional steel in spring increases the weight and with the current scenario the automobile manufacturers are interested in replacing steel springs with light weight composite materials.



Figure1: Helical compression springs in pallel.

The following paragraph show the relevant result and the studies conducted on the performance and analysis done by them are describe in below paragraph of the literature

[1] **Abdul Budan, T.S.Manjunathathe** checked feasibility of replacing the metal coil spring with the composite coil spring. Three different types of springs were made using glass fibre, carbon fibre and combination of glass fiber and carbon fibre. The objective of the study was to reduce the weight of the spring. According to the experimental results the spring rate of the carbon fiber spring is 34% more than the glass fiber spring and 45% more than the glass fibre/carbon fiber spring. The weight of the carbon fiber spring is 18% less than the glass fiber spring, 15% less than the Glass fibre/carbon fibre spring and 80% less than the steel spring. Three types of composite coil springs have been developed in this study; they are lighter than steel spring and the stiffness achieved in these springs are less than the steel springs. (Spring rate of the same dimension steel spring is approximately 14 N /mm and weight of the steel spring is 1.078 kg). The following conclusions can be drawn from the analysis of experimental results of these springs. The weight of the springs manufactured from carbon fiber roving is less than the glass fiber and glass fiber/carbon fiber roving springs. The stiffness of the carbon fiber springs is greater than the other two types of composite coil springs. The springs developed from the glass fiber/carbon fiber roving does not exhibit a favourable results compare to other two types of springs.

The cost of the glass fiber springs are 25% more than the steel springs and the cost of the carbon fiber springs is 200% more than the steel springs. The selection of the glass fiber or a carbon fiber springs depends upon the cost and application of the spring which can be compensated by saving the fuel from weight reduction. As compared to steel springs of the same dimensions, the stiffness of composite coil springs is less. In order to increase the stiffness of the spring the dimensions of the composite spring is to be increased

which in turn increases the weight of the spring. Hence the application of the composite coil springs can be limited to light vehicles, which requires less spring stiffness, e.g. electric vehicles and hybrid vehicles.

[2]Mehdi Bakhshesh and Majid Bakhshesh studied replacement of a helical steel spring by three different composite helical springs. Numerical results have been compared with theoretical results and found to be in good agreement. Compared to steel spring, the composite helical spring has been found to have lesser stress and has the most value when fiber position has been considered to be in direction of loading. Weight of spring has been reduced and has been shown that changing percentage of fiber, especially at Carbon/Epoxy composite, does not affect spring weight. Longitudinal displacement in composite helical spring is more than that of steel helical spring and has the least value when fiber position has been considered to be in direction of loading. The most safety factor is related to case that fiber position has been considered to be perpendicular to loading and it is for Carbon/Epoxy composite helical spring. Resin transfer moulding process is used for manufacturing spring.

Steel helical spring has been replaced by three different composite helical springs including E-glass/Epoxy, Carbon/Epoxy and Kevlar/Epoxy. The loading conditions are assumed to be static. Spring Shear stress has been obtained using FEM and has been compared with steel helical spring. Composite spring properties have been studied with changing fiber angle relative to spring axial. The element is SOLID 46, which is a layered version of the 8-nodes structural solid element to model layered thick shell or solids. The element has three degree of freedom at each node and allows up to 250 different material layers. From results it is concluded that Spring has the most Shear stress when fiber position has been considered to be in direction of loading. With changing fiber angle, Shear stress reduces so that it reaches the least value when fiber position has been considered to be perpendicular to loading.

[3]Suresh.G, Vignesh.R, Aravinth.B, Padmanabhan.K, A.Thiagararajan done design and experimental analysis of composite helical spring made of fiber reinforced polymer of Woven Roving Fiber (WRF), and Thermo set polymer (Epoxy

Resin) with Nano clay. The addition of nanoclay provides unique mechanical and tribological properties combined with low specific weight and a high resistance to degradation in order to ensure safety and economic efficiency. A

Comprehensive study was carried out a series of Nano composites containing varying amount of nano particles (Nano clay). The objective was to compare the load carrying capacity, stiffness and weight savings of composite helical spring with that of steel helical spring. The design constraints are stresses and deflections. The dimensions of an existing conventional steel helical spring of a light commercial vehicle are taken. Same dimensions of conventional helical spring are used to fabricate a composite spring.

The types of composite coil springs had been developed in this study; they are lighter than steel spring and the stiffness achieved in these springs are less than the steel spring. As compared to steel springs of the same dimensions, the stiffness of composite coil springs is less. In order to increase the stiffness of the spring the dimensions of the composite spring is to be increased which in turn increases the weight of the spring. Hence the application of the composite coil springs can be limited to light vehicles, which requires less spring stiffness, e.g. electric vehicles and hybrid vehicles. The manufacturing of the composite coil springs is also difficult and time consuming compare to steel spring, however with the use of CNC winding machine and automated process which can be made easy and also the manufacturing cost can be reduced if produced in mass.

[4]AHANA DWEEPAN studied material selection for conventional coil springs and found that use of composite material is beneficial if it can increase the efficiency of the vehicle and hence overcome the material cost. Other spring materials can be suggested for enhancements of fatigue life prediction. Modified design needs to be manufactured and tested for deformation and stress results. Model created in ProE is exported to ANSYS by converting it to IGES format. The imported model is meshed in ANSYS and boundary constrains are defined. With the Boundary constrains, the stresses and strain of the bone can be determined and the values are tabulated. And again by changing the material of the model the analyzing of the optimized model is done. Thus the investigation of stress and strain is carried out using ANSYS and better design is achieved.

[5]Saurabh Singh designed springs with composite and conventional materials. from thee result we can state that the stiffness can be increased in expense of manufacturing cost and material volume. However the ever demanding need of weight reduction of vehicles will be satisfied by employing this method. The weight reduction int his combination is about 21%.

Manufacturing cost of composite material increases due to the difficulty in manufacturing, and also it is a time consuming process. But however use of automated system can reduce the difficulty and time consumption. Production in mass can also reduce the manufacturing cost.

[6] Md Musthak and M. Madhavi developed high strength carbon epoxy spring with tape winding. Composite spring is manufactured using Carbon fiber in 45 degree orientation. Tests were conducted to study mechanical behaviour. Spring is tested on UTM machine to determine deflections for various loads.

A helical compression spring was developed for 1400N Payload and 30mm deflection. Three different types of spring were selected; glass fibre, carbon fibre and combination of both. The deflection and axial stresses are the design constraints for selection of fibre orientation in carbon pre-peg epoxy based spring. The results indicate that carbon pre-peg springs are superior in structural parameters. Load deflection results shows large variations in deformations reduced as there is lesser gap between coils. It is concluded that due to high strain energy capacity and corrosive resistance composite helical springs may be used for high strength engg application

CONCLUSION

Feasibility of composite materials is checked, composite helical springs can be easily replaced in light weight vehicles with slight sacrifice of the size. In regular vehicles, combination of springs with composite and conventional material can be used to overcome low stiffness of composite materials and weight of spring can be optimized.

OTHER RECOMMENDATIONS

We can also investigate on behavior of composite spring with different materials, different angles of fibres with matrix, .

We can further study on combination of spring in parallel two wheeler, three wheeler suspension and analyze efficiency & minimizing weight.

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Classification of Leaf Using Geometric Features

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Abstract— Every leaf has its own identity and possess some information that will help humans to identify and classify the plant by analyzing its leaves. The shape of leaf is a significant feature that most people use to recognise and classify a plant. It uses different parameters like diameter, physiological length, physiological width, leaf area and perimeter are basic geometry information can be extract from the leaf shape. The leaf identification is essential for scientists working in the agricultural and environmental fields. This work is a study of leaf identification and recognition system. The steps include the capturing the leaf image followed by a preprocessing. Later discussing about different classifiers and their accuracies

Keywords— General Regression Neural Network, Geometric, k-nearest neighbor algorithm, Morphological, Probabilistic Neural Network, Radial Basis Probabilistic Neural Network, recognition, Wavelet Transform.

1. INTRODUCTION

Plants have important functions in various areas, such as food, medical science, industry, and the environment. The classification of plants based on leaf identification become a latest research trend now. Each leaf carries substantial information that can be used to identify and classify the origin or the type of plant. In order for a computer to recognize the two objects as being similar, algorithms need to be developed that can successfully provide for object identification regardless of where they are located in the image or whether they are scaled or rotated. In a surgeon's view, images like x-ray and ultrasound scanning play an important role to diagnose diseases and this method has been proven reliable for years. The researchers are also using the same method as doctors to simulate the same principle to recognize a plant using high quality leaf images and complex mathematical formula for a processor to decide the category and type of plants. In particular, it is understood that the proper way to extract plant features involves plant recognition based on leaf images. There are two methods widely used for plant recognition based on leaf image, are leaf color based recognition and leaf shape based recognition. In the color based conventional study, a simple color similarity between two images can be measured by comparing their color histogram. And in the shape based conventional study, use region and contour-based simple features and features could be considered time domain data. The main advantage of our proposed method is that only contour features are used in the matching process, the method is scale invariant and computationally efficient.

2. PROPOSED SYSTEM

The following section illustrates the fundamental of recognition and classification process by computer using a leaf image in order to recognize and classify a plant. Many of the proposed approaches are based on recognizing and classifying method. Recognition process normally occurs during preprocessing stage, followed by the extraction process as shown in the figure. Classification is the process which look up into a database for the comparison of the leaf features. The major steps are discussed in the consecutive sub-sections.

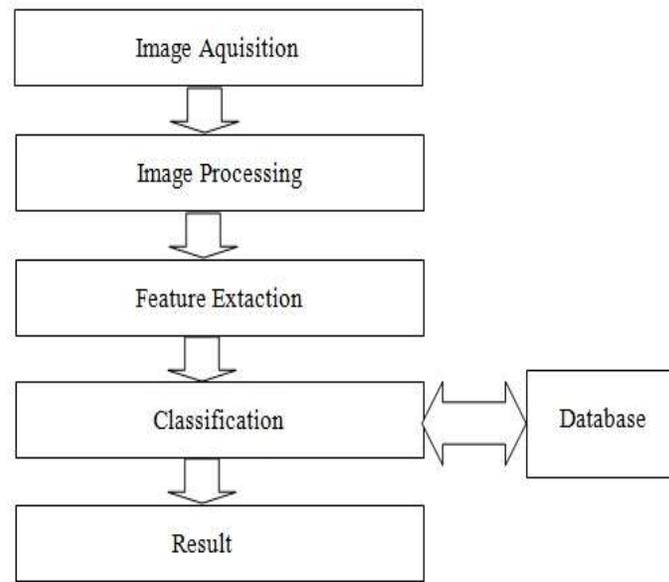


Figure 1. System description of plant recognition and classification

2.1 IMAGE AQUISITION

The images can be acquired using an image scanner or digital camera, even one captured using your mobile phone. There is no restriction on resolution and image format; The image can be an RGB image or a gray scale image. However, the image background needs to be clean preferably white or any single colored with reasonable contrast with the leaf color and the leafstalk should be removed prior to image acquisition.

The preprocessing is done to identify the leaf in an image and discarding all other information other than the leaf shape. This step includes Leaf contour extraction. The leaf contour extraction can be explained as follows. Most leaves have generally green color, while the color of leaves is changed by season or environmental factors. The color change of leaf image can cause decline of recognition performance or non-recognized problem. The color converting process on input image is the first step for leaf contour extraction, and it can set foundation to improve recognition performance irrelevant to the leaf color change. We can convert the input color leaf image to gray scale image by using the following expression

$$\text{Gray} = 0.299 * R + 0.587 * G + 0.114 * B$$

The converted gray scale leaf image is converted to a binary image once again. The threshold conversion is performed as follows

$$B(x,y) = \begin{cases} 0 & \text{if } f(x,y) \leq T \\ 255 & \text{if } f(x,y) > T \end{cases}$$

Where $B(x,y)$ and $f(x,y)$ are the intensity values of the gray scale image and the binary image, respectively, at position (x,y) , and T is the threshold value. Figure 2 shows an example of leaf contour extraction.

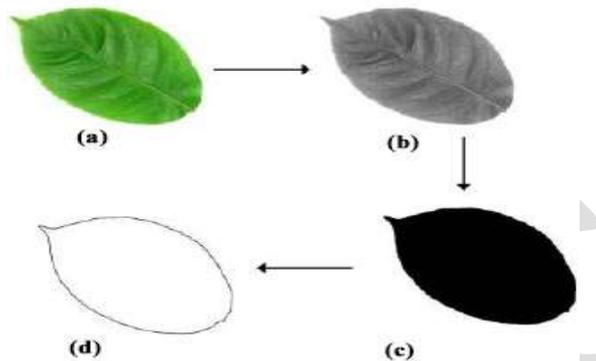


Figure 2. leaf contour extraction

2.2 IMAGE PREPROCESSING

The preprocessing is done to identify the leaf in an image and discarding all other information other than the leaf shape. This can be done with a little help from the user. The user can help identify the base-point and some reference points of the leaf. The leaf is extracted from the background and a binary image is produced where the background pixels are set to 0 or black and the pixels within the leaf is set to 1 or white. The remaining black pixels within the leaf blade are removed to produce an enhanced binary image. Then the tip of the leaf is located by finding out the furthest point (which is, in most cases, the tip of the leaf) from the base-point (selected by the user).

2.3 FEATURE EXTRACTION

After the pre-processing is done, feature extraction is easy. Our method takes into account only the shape of the leaf and the geometric features of the leaf.

Leaf feature using Geometric and digital morphological features

We describe geometric and digital morphological features in order to leaf feature extraction. We extract four basic geometric features as leaf length, leaf width, leaf area, leaf perimeter. The leaf length is defined as the longest distance between the centroid and the two ends on the margin of the leaf on opposite sides of the centroid. It is denoted by LL . The leaf width is defined as the distance between the intersection point with LL at the centroid and its opposite side on the margin of the leaf. It is denoted by LW . Figure 5 shows the procedure for obtaining LL and LW . The leaf area is the number of pixels in the leaf region. It is denoted by LA . The leaf perimeter is the number of pixels in the leaf contour. It is denoted by LP . We extract ten features based on digital morphological features using four basic geometric features and the study conducted as aspect ratio, form factor, rectangularity, perimeter ratio of the leaf length, perimeter ratio of the leaf length and leaf width, and five vein features. The aspect ratio is calculated using the leaf length LL and leaf width LW . It is defined as LL/LW . The form factor is used to describe the difference between a leaf and a circle. It is defined as $4\pi LA/ LP^2$, where LA is the leaf area and LP is the perimeter of the leaf margin. The rectangularity describes the similarity between a leaf and a rectangle. It is defined as $LL*LW/ LA$, where LL is the leaf length, LW is the leaf width and LA is the leaf area. The ratio of perimeter to leaf length, representing the ratio of the leaf perimeter LP and leaf length LL , is calculated by LL/ LP . The perimeter ratio of the leaf length and leaf width is defined as the ratio of the leaf perimeter LP and the sum of the leaf length LL and leaf width LW , thus $LP/(LL+ LW)$. The Vein features have been extracted using the methods and the morphological openings on the gray scale images. The five features are as follows: $Lv\ 1/A$, $Lv\ 2/A$, $Lv\ 3/A$, $Lv\ 4/A$, $Lv4/Lv1$.

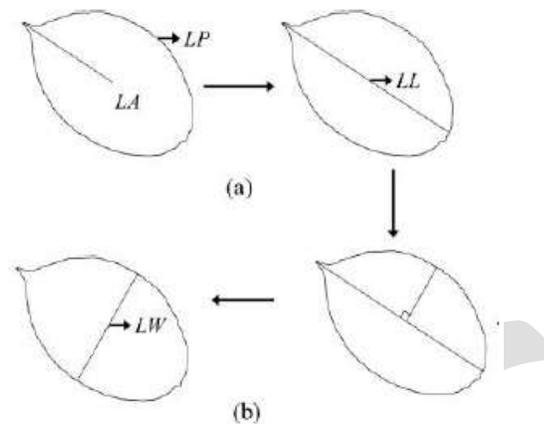


Figure 3. Procedure for Obtaining Leaf Length and Leaf Width: (a) leaf length, (b) leaf width

2.4 Classification

A classification based on different classifiers are implemented and compared. In the NN (Nearest Neighbour) classifier new sample is classified by calculating the distance to the nearest training case; the sign of that point then determines the classification of the sample. The k-nearest neighbor algorithm (K-NN) is a method for classifying objects based on closest training examples in the feature space. The k-NN classifier extends this idea by taking the k nearest points and assigning the sign of the majority. Larger k values help reduce the effects of noisy points within the training data set, and the choice of k is often performed through cross-validation. In the distance measurement based classification feature values of one class is added together then the average is found and thus form a core vector for one class. Similarly core vectors are finding for each class. Now this core vectors will represent the classes. For the testing purpose we will compare the features of each sample with these core vectors and the sample will go to the class which is having higher similarity with the values of testing data. Probabilistic Neural Network (PNN) to train the extracted values of 1800 leaves that was used and classified into 32 species of plant. The result is on average 90.312% accuracy. The testing to the proposed approach was conducted also with other general-purpose classification algorithms and it was found out that the algorithms only focused on leaf shape information. In other words, the proposed approach has an advantage because the approach is not only concentrating on leaf shape information in order to classify the plants. PNN method consists of several layers and the input layer will retrieve the vector values from the extraction process for training the method. However, colour and texture features become additional input to train the method. Consequently it is shown that there is an improvement of 3.44% in accuracy of the plant classification compared to 90.312% previously using algorithms. One of the neural network methods are known as feed-forward back-propagation neural network In this the number of nodes of input layer is the same as the number of extracted features and similarly with the output layer is same, as the number of plant categories, become the main reason why the method has been used for recognition purpose. Furthermore, the method that has been structured consists of three layers, which are 16 nodes of input layer, 32 nodes of hidden layer and 6 nodes of the output layer. The method has been trained based on 1200 samples which consist of 6 species of plant and 30 leaf images from each species. The result of the training was recorded based on the species. Still neural network algorithm has been chosen for recognition purpose. This time many were used Nearest Neighbour classifier (1-NN), k-Nearest Neighbour classifier (k-NN) and Radial Basis Probabilistic Neural Network (RBPNN) methods to train the samples. The vector values were retrieved from the previous segmentation process, where the algorithm was proposed to integrate with Wavelet Transform (WT) and Gaussian interpolation methods. As a result, it was 93.17% for (1-NN), 85.47% for (k-NN where k = 5) and 91.18% for (RBPNN). The finding is increasing the value of k will improve the stability of the proposed method in order to recognise the plant. General Regression Neural Network (GRNN) was also used for recognition purposes. Similarly with other methods, the vector values from the extraction process are input into the classifier to be trained. 10 species and 10 samples from each species have been used for training. The result from the testing is 100% accuracy rate of plant recognition and classification. Not only that any changes in the spread parameters of the GRNN will not affect the process of leaf recognition.

TABLE 1
LIST OF CLASSIFIER AND THE SUCCESSFULNESS RATE OF CLASSIFYING AND RECOGNIZING

Classifier	Accuracy
Probabilistic Neural Network (PNN)	90.312%
Nearest Neighbour (1-NN)	93.170 %
k -Nearest Neighbour (k-NN)	85.470 %
Radial Basis Probabilistic Neural Network (RBPNN)	91.180 %
General Regression Neural Network (GRNN)	100.000%

The extraction process and the extracted features also affect the classification rate. The reason is a different extraction methods will extract different features. Besides, more features are extracted and considered for recognition process, hence, more accurate the classification output. In fact, the same classifier has been used for recognition and classification, but because of different extraction methods were used earlier, therefore the accuracy rates are not the same as what has been produced.

3. CONCLUSION

The findings of our study are the types of leaf features that should be extracted, external factors that must be considered before the extraction process, types of extraction and classification methods that can be used for plant recognition and classification. In other words, the results of this study can be used as a specification of leaf features that must be considered for plant recognition and classification purposes as shown in **Table 1**. Finally, we can select some classifiers for testing and future development. The selection will be based on type of leaf features that can be extracted and recognised and ability of the pre-processing method to handle the noise or other external factors in the image.

In the future work, the selected classifiers will be tested based on the dataset and the results will be recorded. Only the better classifier will be used in future research work. However, we may have to consider images that contain many leaves in order to test the ability of the classifiers.

4. ACKNOWLEDGMENT

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A Novel Coated Graphite Electrode for Potentiometric Determination of Pyrilamine Maleate in Pharmaceutical Compounds and Biological Fluids

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Abstract- A new pyrilamine coated graphite electrode (CGE) based on pyrilamine-tetraphenylborate ion-pair (Pyra-TPB) as electroactive material has been described. The sensor exhibited a linear response with a good Nernstian slope over a relatively wide range of concentration. The membrane film of the electrode made of 3% (w/w) ion-pair, 48.5% DBP (w/w) and 48.5% PVC (w/w). The sensor displays Nernstian response of 58.4 ± 0.4 mV/decade over the concentration range of 7.7×10^{-5} to 1.0×10^{-2} mol L⁻¹ with limit of detection of 5.3×10^{-5} mol L⁻¹. The coated wire electrode has short response time ~ 10 s and it can be used in pH range of 4.0–7.0. The selectivity coefficients were determined in relation to several inorganic and organic species. The proposed sensor displayed useful analytical characteristics for the determination of pyrilamine in pharmaceutical preparation and biological fluids such as plasma and urine samples.

Keywords: Pyrilamine maleate; Potentiometry; Coated graphite electrode; Biological fluids.

1 Introduction

The development of efficient ion-selective electrodes (ISEs) has always been a big challenge for the scientists as these sensors can be involved nowadays in many fields. Ion-selective electrodes (ISEs) have found wide spread use for the direct determination of ionic species [1-11]. They were also found to be effective in the analysis of pharmaceutical formulations for their attractive properties of simple design, ease of construction, reasonable selectivity, fast response time, applicability to colored and turbid solutions and possible interfacing with automated and computerized systems.

In conventional polymeric membrane ion-selective electrodes (ISEs), the sensing membrane is interposed between two aqueous phases, the sample and the inner solution. These electrodes, however, still have certain inherent limitations.

They are mechanically complicated, and thus difficult to fabricate in small size. In a solid-contact or “coated wire” ISE, the polymer membrane is directly cast on the solid surface, with no internal reference solution being interposed. An exciting advance was made in ISEs by Cattrall and Freiser [12] when they developed coated wire ISEs. CWEs may suffer from reproducibility and long-term stability (drifting potential) problems, resulting from the poorly defined contact and mechanism of charge transfer between the membrane coating and the conducting transducer. Coated electrodes in which an electroactive species is incorporated into a thin polymeric film coated directly on a metallic or graphite conductor has been shown to be very effective for a wide variety of inorganic and organic ions [13-18].

Electrodes of this sort has unique advantages including simplicity, low cost, durability, capability of reliable response in a wide concentration range for a wide variety of both organic and inorganic ions and suitable for measurements in small volumes of sample or for the desired in vivo applications of ISEs that biomedical researchers have long awaited.

Pyrilamine {1,2-Ethanediamine N-[(4-methoxyphenyl)methyl]-N¹, N¹-dimethyl-N-2-pyridinyl-(Z)-2 butenedioate (1:1) (or) 2-[(2-Dimethyl amino) ethyl] (p-methoxybenzyl) amino pyridine maleate (1:1)} (Fig. 1) is an antihistamine with a low incidence of side effects. It is effective for use in perennial and seasonal allergic rhinitis, vasomotor rhinitis, allergic conjunctivitis due to inherent allergens and foods, mild uncomplicated allergic skin manifestations of urticaria and angiodesma, angioedema, demo graphism and aneceoratum of reactions of blood or plasma. It is an antagonizing agent that competes for receptor sites with natural histamine, a biogenic amine present in most body cells and tissues. It is a common ingredient of cold and menstrual symptoms [19]. It has been found to cause liver cancer in rats when administered in large amounts [20]. It has been linked to cardio toxicity, meaning prolonged use can lead to excessive stress on the heart [21].

Several methods have been reported for the determination of pyrilamine in pharmaceutical formulations and biological fluids: high performance liquid chromatography [22-24], gas chromatography with nitrogen-phosphorous [25], ultraviolet-visible [26-29], high performance liquid chromatography/thermospray mass spectrometry and tandem mass spectrometry [30], thermospray /mass spectrometry and tandem mass spectrometry [31], gas liquid chromatography [32], partition chromatographic method [33], column liquid chromatography [34] and high-pressure liquid chromatography [35].

This work describes construction and investigation of performance characteristics of novel ISEs based on coated wire electrodes for the determination of pyrilamine maleat in bulk powder, pharmaceutical formulations and biological fluids.

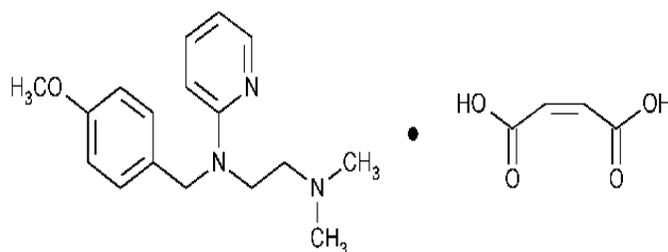


Fig. 1. Chemical structure of pyrilamine maleate.

2 Experimental

2.1 Reagents and materials

All chemicals were of analytical grade. Double distilled water was used throughout all experiments. Pure-grade pyrilamine maleate ($M_w = 401.46 \text{ g mol}^{-1}$) was supplied by Egyptian International Center for Import, Cairo, Egypt. Sodium tetraphenylborate (NaTPB), poly (vinyl chloride) of high molecular weight (PVC), tetrahydrofuran (THF) and dibutyl phthalate (DBP) were purchased from Merck (Germany). The metal salts were provided by BDH company (UK) as nitrates or chlorides. Stock solutions of the metal salts were prepared in bidistilled water and standardized when-ever necessary. In the analysis of biological fluids, human urine and plasma were used; plasma was obtained from Regional Blood Transfusion Services, Beni-Suef, Egypt.

2.2 Apparatus

Laboratory potential measurements were performed using 702 titroprocessor equipped with a 665 dosimat (Switzerland) made by Metrohm. Silver-silver chloride double-junction reference electrode (Metrohm 6.0222.100) in conjugation with different drug ion-selective electrode was used. A mLW W20 circulator thermostat was used to control the temperature of the test solutions.

2.3 Preparation of the ion-pair

The ion-pair compound, Pyra-TPB was prepared by slow addition of 100 mL of 1.0×10^{-2} mol L⁻¹ sodium tetraphenylborate solution to 100 mL of 1.0×10^{-2} mol L⁻¹ pyrilamine maleate under stirring for 15 min. The resulting precipitate was filtered off through a Whatman filter paper No. 42, washed with cold distilled water several times and dried at room temperature. The composition of the ion-pair was confirmed by elemental analysis to be 1:1 (Pyra:TPB).

2.4 Conductometric measurements

Conductometric titrations were followed with a Jenway conductivity meter. 50 mL of 1.0×10^{-2} mol L⁻¹ pyrilamine maleate solution was transferred to the 100 mL cell and the solution titrated against a 1.0×10^{-2} mol L⁻¹ NaTPB solution using a microburette. The conductance of the solution was measured after thorough stirring of each addition (2 min, intervals). Conductance values were corrected by multiplying by the dilution coefficient and plotted versus molar ratio. The titration plot showed a break which corresponds to the stoichiometry of the ion-pair.

2.5 Preparation of the coated wire sensors

CWEs were constructed using silver, copper and aluminum metal wires (1 mm diameter) and graphite rod (4 mm diameter) following the procedures described in details elsewhere [36]. The polished and cleaned electrodes were dipped in the coating solution and allowed to dry in air. The process was repeated several times till a layer of the proper thickness was formed covering the terminal of the rod. The prepared electrode was preconditioned by soaking for 30 min in 1.0×10^{-3} mol L⁻¹ pyrilamine maleate. When not in use, the electrode was stored in air.

2.6 Construction of calibration curves

The conditioned electrodes were immersed in conjunction with the double-junction Ag/AgCl reference electrode in solutions of pyrilamine maleate in the range of 1.0×10^{-6} – 1.0×10^{-2} mol L⁻¹. They were allowed to equilibrate whilst stirring and recording the e.m.f. readings within ± 1 mV. The mV-concentration profiles were plotted. The regression equations for the linear part of the curves were computed and used for subsequent determination of unknown concentrations of pyrilamine maleate.

2.7 Selectivity coefficient determination

The separate solution method and the matched potential method (MPM) [37-39] are employed to determine the selectivity coefficients, $\log K_{\text{Pyra}, J^{z_2}}^{\text{pot}}$, of the potentiometric sensor towards different species. In the separate solution method, the potential of a cell comprising a working electrode and a reference electrode is measured in two separate solutions, where E_1 is the potential measured in 1.0×10^{-3} mol L⁻¹ pyrilamine maleate, E_2 the potential measured in 1.0×10^{-3} mol L⁻¹ of the interfering compound, z_1 and z_2 are the charges of pyrilamine and interfering species, respectively and S is slope of the electrode calibration plot. The selectivity coefficients were determined by the separate solution method using the rearranged Nicolsky equation:

$$\log K_{\text{PyraJ}^{z_2}}^{\text{pot}} = ((E_1 - E_2)/S) + (1 + (z_1/z_2)) \log a$$

In the matched potential method, the selectivity coefficient was determined by measuring the change in potential upon increasing the primary ion activity from an initial value of a_A to \hat{a}_A and a_B represents the activity of interfering ion added to the reference solution of primary ion of activity a_A which also brings the same potential change. It is given by expression:

$$K_{A,B}^{MPM} = (\hat{a}_A - a_A) / a_B$$

In the present studies a_A and \hat{a}_A were kept at 1.0×10^{-4} and 1.2×10^{-4} mol L⁻¹ pyrilamine maleate and a_B was experimentally determined.

2.8 Potentiometric determination of pyrilamine maleate

The standard addition method was applied [40], in which small increments of the standard solution 1.0×10^{-2} mol L⁻¹ of pyrilamine maleate were added to 50 mL aliquot samples of various concentrations from pure drug or pharmaceutical preparations. The change in millivolt reading was recorded for each increment and used to calculate the concentration of pyrilamine maleate sample solution using the following equation:

$$C_x = C_s V_s (V_x + V_s)^{-1} (10^{n(\Delta E/S)} - V_x (V_x + V_s)^{-1})$$

Where: C_x and V_x are the concentration and the volume of the unknown, respectively, C_s and V_s the concentration and the volume of the standard solution, respectively, S the slope of the calibration graph and ΔE is the change in mV due to the addition of the standard solution.

2.9 Potentiometric titration of pyrilamine maleate

An aliquots of 1.0×10^{-2} mol L⁻¹ drug solution (pure or caplet) were transferred into 50 mL volumetric flasks and made up to the mark with bidistilled water. Different concentrations of pyrilamine maleate were prepared, then titrated potentiometrically with a standard solution of 1.0×10^{-2} mol L⁻¹ NaTPB. The volume of the titrant at equivalence point was obtained using the conventional S-shaped curves. The differential graphs of the titration curves have also been constructed to obtain well defined and accurate end points using the computer program Origin lab.

2.10 Determination of pyrilamine maleate in pharmaceutical preparations

An accurate weight of pyrilamine caplets ground and finely powdered in a small Petri dish and dissolved in bidistilled water up to 30 mL by stirring for 1 h. The solution was filtrated in a 50 mL measuring flask. The residue was washed three times with bidistilled water; the volume was completed to the mark by water. The potentials of drug solutions were directly measured using CGE electrode.

2.11 Determination of pyrilamine maleate in biological fluids

Different amounts of pyrilamine maleate, and 5 mL of plasma or urine of a healthy person were transferred to 50 mL measuring flask and completed to the mark using bidistilled water. The contents of the measuring flask were transferred to a 100 mL beaker, and subjected to potentiometric determination of pyrilamine maleate by standard addition method.

Results and discussion

Pyrilaminium cation was found to form 1:1 water insoluble ion-pair with tetraphenylborate anion as indicated by elemental analysis [calculated %C=81.37, %H=7.11 and %N=6.95, and found %C=81.53, % H=7.12 and %N=7.05] and ascertained using conductometric titration (Fig. 2). The prepared ion-pair was identified and examined in CGE sensor responsive for Pyra cation.

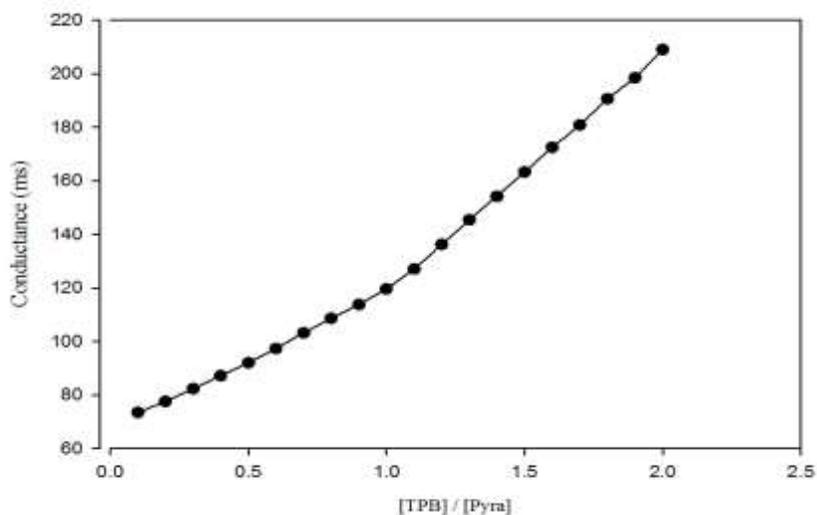


Fig. 2. Conductometric titration curve of $1.0 \times 10^{-2} \text{ mol L}^{-1}$ pyrilamine maleate against $1.0 \times 10^{-2} \text{ mol L}^{-1}$ of NaTPB.

3.1 Effect of sensor bed

To investigate the effect of the bed nature on the efficiency of coated wire electrodes, the optimized coating mixture was used in the preparation of electrodes with different conductive beds, namely silver, copper, graphite and aluminum. After conditioning, each electrode was examined in the concentration range 1.0×10^{-6} to $1.0 \times 10^{-2} \text{ mol L}^{-1}$ of pyrilamine solution. The dynamic range of concentration and the limit of detection for the electrodes were evaluated according to the IUPAC recommendations [41]. Examining the results compiled in Table 1, one can notice that all wires give inferior response towards pyrilamine as compared to that of graphite rod-coated electrode (CGE). Coated graphite electrode (Fig. 3) has a slope of $58.4 \pm 0.4 \text{ mV/decade}$ over the concentration range of 7.7×10^{-5} - $1.0 \times 10^{-2} \text{ mol L}^{-1}$ and a detection limit of $5.3 \times 10^{-5} \text{ mol L}^{-1}$. This is attributed to high conductivity of graphite rod. Therefore, graphite rod was used as the inner solid contact for the electrodes in this study.

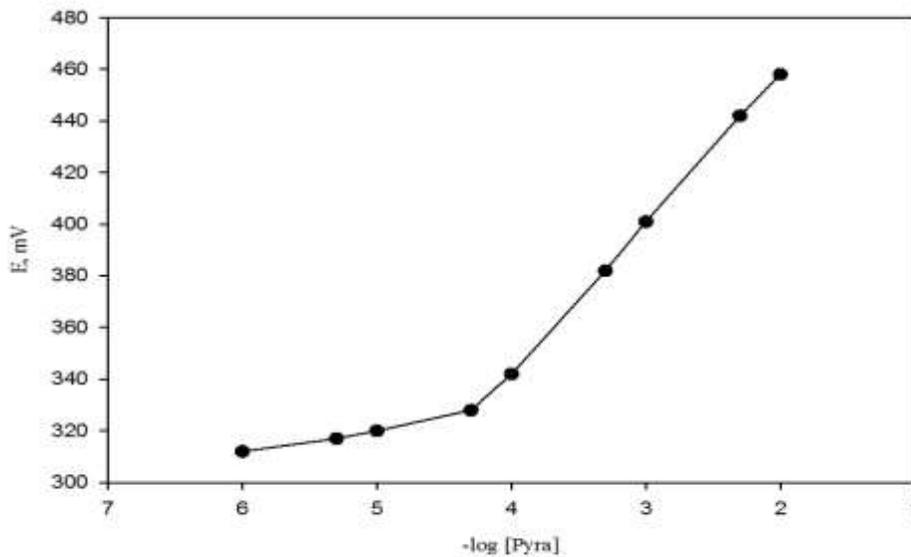


Fig. 3. Calibration curve of CGE electrode

Table 1. Optimization of membrane compositions and their potentiometric response for coated wire pyrilamine selective electrodes

Composition of membrane% (w/w; mg)				Slope mV/de cade	Linear concentration range (mol L ⁻¹)	LOD (mol L ⁻¹)	LOQ (mol L ⁻¹)	RSD %
Pyra- TPB	PVC	DBP	Electrode bed					
3	48.5	48.5	Graphite	58.4	$7.7 \times 10^{-5} - 1.0 \times 10^{-2}$	5.3×10^{-5}	1.8×10^{-4}	0.49
3	48.5	48.5	Silver	57.5	$4.5 \times 10^{-5} - 1.0 \times 10^{-2}$	2.0×10^{-5}	6.7×10^{-5}	0.61
3	48.5	48.5	Copper	56.0	$9.8 \times 10^{-5} - 1.0 \times 10^{-3}$	6.0×10^{-5}	2.0×10^{-4}	0.63
3	48.5	48.5	Aluminium	42.5	$9.6 \times 10^{-5} - 1.0 \times 10^{-3}$	1.1×10^{-5}	3.7×10^{-5}	0.84

LOD: limit of detection.

LOQ: limit of quantitation.

RSD: relative standard deviation (four determinations).

3.2 Life time

The life time of the electrode was determined by soaking the electrode (CGE) in $1.0 \times 10^{-3} \text{ mol L}^{-1}$ pyrilamine maleate solution for different intervals till the electrode lost the Nernstian behaviour. This behavior can be attributed to the decomposition of the ion-pair and loss of other components in the membrane phase that were in contact with aqueous test solution containing pyrilamine cation. The response of the electrode has been measured by recording the calibration graph at 25°C at different intervals. The results showed that the life time measured in this way was found to be 8 days. It was established that continuous soaking had a negative impact on the response of the sensor due, probably, to the leaching of the active ingredients (ion-exchanger and plasticizer) to the bathing solution [42]. The life span of the coated wire electrodes, in general, are less than those of the corresponding liquid contact electrodes. This may be attributed to the poor mechanical adhesion of the PVC-based sensitive layer to the conductive bed [43].

3.3 Response time, reversibility and reproducibility

Dynamic response time is an important factor, for the evaluation of any sensor. To measure the dynamic response time of the proposed electrode, the concentration of the test solution was successively changed from 1.0×10^{-5} to $1.0 \times 10^{-2} \text{ mol L}^{-1}$. The resulting data show that the time needed to reach a constant potential within $\pm 1 \text{ mV}$ of the final equilibrium value after successive immersion of a series of pyrilamine maleate solution, each having a 10-fold difference in concentration is 10 s for CGE electrode as shown in Fig. 4. To evaluate the reversibility of the electrode, the practical potential response of the electrode was recorded by changing solutions with different pyrilamine maleate concentrations from 1.0×10^{-2} to $1.0 \times 10^{-5} \text{ mol L}^{-1}$. The measurements were performed from the highest concentration to the lowest. The potentiometric response of the electrode was reversible and had no memory effect (Fig. 4).

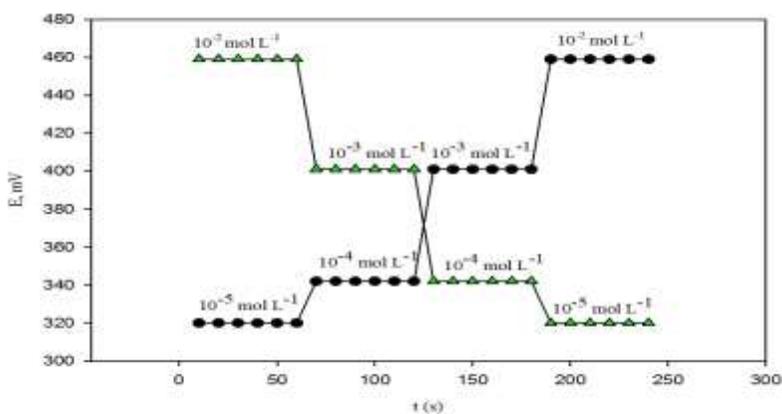


Fig. 4. Potential-time plot for the response of CGE sensor.

3.4 The effect of pH on the response of the electrode

Since pK_a of pyrilamine is 8.9, therefore at $pH 7.9$ pyrilamine is nearly completely ionized, i.e. pyrilamine will be in the cationic form. The concentration distribution diagram for pyrilamine maleate species is constructed using SPECIES program [44] (Fig. 5).

The influence of pH on the response of the CGE was examined for the 1.0×10^{-3} and $1.0 \times 10^{-4} \text{ mol L}^{-1}$ pyrilamine solutions. The pH was adjusted by adding small volumes of $(0.1-1.0) \text{ mol L}^{-1}$ HCl or NaOH to the test solutions and the variation in potential was

followed. It can be seen from Fig. 6 that the variation in potential due to pH change is considered acceptable in the pH range 4.0–7.0. However, there is an observed drift at pH values lower than 4.0 which may be due to H^+ interference. On the other hand, the potential decreases gradually at pH values higher than 7.0. The decrease may be attributed to the formation of the free drug base in the test solution.

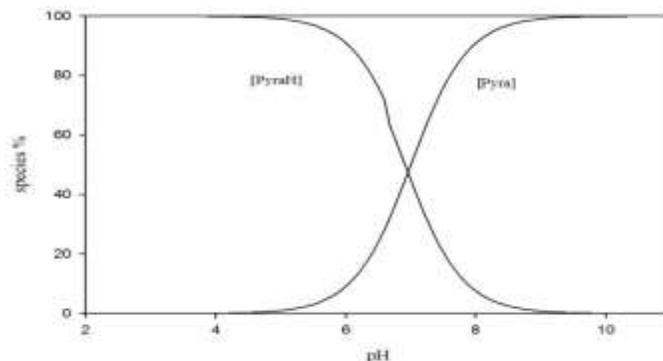


Fig. 5. Representative concentration distribution diagram for pyrilamine maleate species.

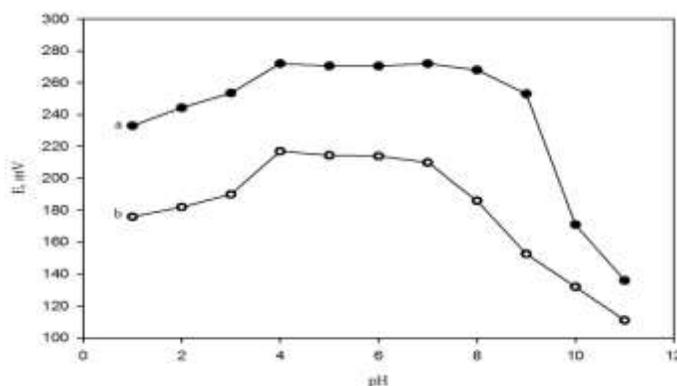


Fig. 6. Effect of pH of the test solutions on the potential response of CGE electrode: (a) 1.0×10^{-3} , (b) 1.0×10^{-4} mol L^{-1} Pyra solution.

3.5 Selectivity of the electrode

The influence of some inorganic cations, sugars and amino acids on the pyrilamine electrode was investigated graphically by plotting the potential response of the electrode for different interferents against their varying concentration. As shown from the calibration curves (Fig. 7), except for pyrilamine cation there is no significant response of the electrode for all interferents tested. The selectivity coefficients (Table 2) were determined by the separate solution and matched potential methods. The results reflect a very high selectivity of the investigated electrode for the pyrilamine cation. The inorganic cations do not interfere owing to the differences in ionic size and consequently their mobilities and permeabilities as compared with pyrilaminium ion. The selectivity sequence significantly differs from the so called Hofmeister selectivity sequence [45] (i.e. selectivity solely based on lipophilicity of cation). In case of non-ionic species, the high selectivity is mainly attributed to the difference in polarity and to the lipophilic nature of their molecules relative to pyrilaminium ion. The mechanism of selectivity is mainly based on the stereospecificity and electrostatic environment, and is dependent on how much matching is present between the location of the lipophilic sites in the two competing

species in the bathing solution side and those present in the receptor of the ion-exchanger [46]. In the case of sugars and amino acids, the high selectivity is mainly attributed to the difference in polarity and lipophilic character of their molecules relative to pyrilamine maleate.

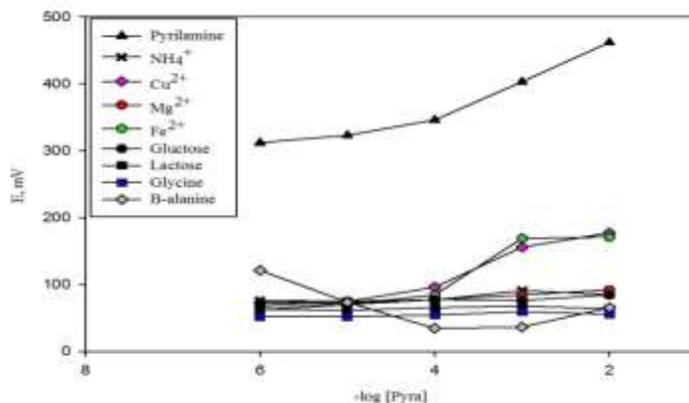


Fig. 7. Calibration graphs of some inorganic cations, sugars and amino acids using CGE electrode.

Table 2. Selectivity coefficient values of the CGE electrode.

Interferent	$K_{P_{in}A_{J^{Z+}}}^{pot}$	
	SSM	MPM
K^+	8.5×10^{-3}	----
NH_4^+	8.8×10^{-4}	----
Li^+	9.6×10^{-3}	----
Fe^{2+}	5.7×10^{-4}	----
Ca^{2+}	1.5×10^{-6}	----
Mg^{2+}	6.7×10^{-4}	----
Mn^{2+}	8.9×10^{-7}	----
Cu^{2+}	2.9×10^{-3}	----
Co^{2+}	4.3×10^{-4}	----
Vitamine C	----	----
Glucose	----	8.2×10^{-3}
Fructose	----	1.1×10^{-2}
Lactose	----	1.4×10^{-3}
Maltose	----	8.6×10^{-3}
Urea	----	7.5×10^{-3}
Glycine	----	8.6×10^{-3}
β -alanine	----	7.8×10^{-3}

3.6 Analytical applications

The proposed electrode was found to work well under laboratory conditions. It can be seen that the amount of pyrilamine can be accurately determined using the proposed electrode. To assess the applicability of the proposed electrode, pyrilamine maleate was determined in pure solution, pharmaceutical preparations, spiked urine and plasma samples, by applying the standard addition method. The obtained average recovery and relative standard deviation values are summarized in Tables 3 and 4, which reflect the high accuracy and precision of the electrode. The optimized pyrilamine maleate selective electrode was successfully applied as indicator

electrode in the potentiometric titration of pyrilamine maleate solution with NaTPB solution (Table 3). The well-defined potential jumps of the titration curves (Fig. 8) correspond to formation of a Pyra-TPB ion-pair of 1:1 stoichiometry indicating the high sensitivity of the electrode. Obviously, the two methods, standard addition and potentiometric titration, can be applied to the determination of pyrilamine maleate in bulk powder and in pharmaceutical formulations or in biological fluids without interference by the excipients expected to be present in tablets or the constituents of body fluids.

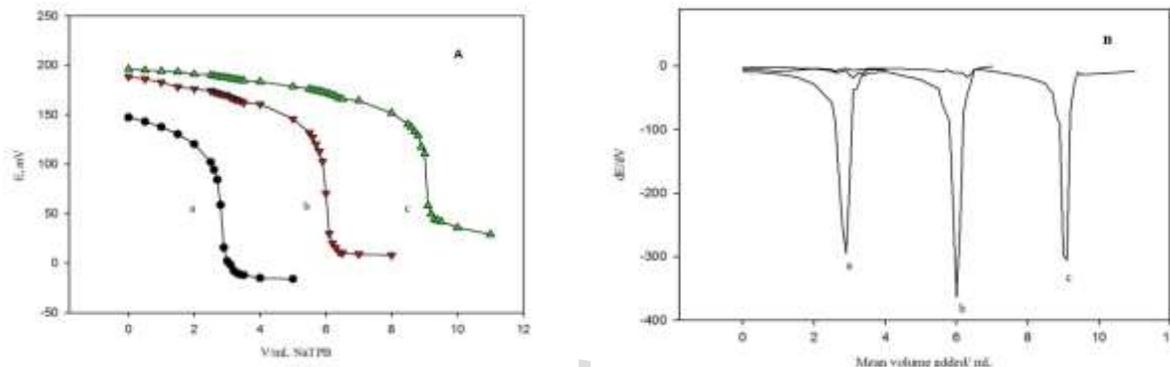


Fig. 8. Potentiometric titration curves (A) and its first derivative (B) of (a) 3, (b) 6 and (c) 9 mL of $1.0 \times 10^{-2} \text{ mol L}^{-1}$ pyrilamine maleate using CGE electrode and $1.0 \times 10^{-2} \text{ mol L}^{-1}$ NaTPB as titrant.

3.7 Statistical analysis and validity of the proposed method

The linearity, limit of detection, precision, accuracy, and ruggedness/robustness were the parameters which were used for the method validation. As mentioned before, the measuring range of the pyrilamine electrode is between 7.7×10^{-5} and $1.0 \times 10^{-2} \text{ mol L}^{-1}$ pyrilamine maleate.

3.7.1. Ruggedness

For ruggedness of the method, a comparison was performed between the intra- and inter-day assay results for pyrilamine obtained by two M. Sc. students. The RSD values for the intra- and inter-day assays of pyrilamine in the cited formulations performed in the same laboratory by the two analysts did not exceed 1.42% which indicates that the method is capable of producing results with high precision.

3.7.2. Robustness

The robustness was examined while the parameter values (pH of the medium and the laboratory temperature) were being deliberately slightly changed. Pylamine recovery percentages were good under most conditions, not showing any significant change when the critical parameters were modified.

The results obtained from the standard addition method of the drug were compared with those obtained from the potentiometric titration method by applying F- and t-tests [47]. The results (Table 3) show that the calculated F- and t-values did not exceed the theoretical values, reflecting the accuracy and precision of the applied method.

4. Conclusion

The proposed pyrilamine coated wire electrode based on Pyra-TPB as electroactive material might be a useful analytical tool and interesting alternative for the determination of pyrilamine ions in pure, pharmaceutical formulations and biological fluids. The sensor shows favorable performance characteristics with short response times (~ 10 s), low limit of detection $5.3 \times 10^{-5} \text{ mol L}^{-1}$ over the concentration range from 7.7×10^{-5} to $1.0 \times 10^{-2} \text{ mol L}^{-1}$.

This study was compared with the other reported methods. The results of this study showed wider linear range, 7.7×10^{-5} - $1.0 \times 10^{-2} \text{ mol L}^{-1}$ than the other methods. It is characterized by reasonable selectivity, low cost and fast response. The data are given in Table 5, thus proving that it is a good pyrilamine-ion selective electrode for the pure, pharmaceutical preparations and biological fluids with high accuracy and precision.

Table 3. Determination of pyrilamine maleate in pure solutions and pharmaceutical preparations applying the standard addition and the potentiometric titration methods.

Sample	Standard addition			Potentiometric titration		
	Taken (mg)	Recovery (%)	RSD (%)	Taken (mg)	Recovery (%)	RSD (%)
Pure solution	1.00	101.61	0.96	12.04	98.44	1.37
	1.61	101.01	0.97	24.09	99.22	0.68
	2.01	99.29	1.42	36.13	100.00	1.00
	4.02	98.65	0.35			
Mean ± SD		100.14±1.39			99.22±0.79	
F-ratio		3.09 (19.20) [a]				
t-ratio		1.01 (2.571) [b]				
Midol [®] complete	1.00	97.58	0.77	12.04	99.22	0.01
	1.61	99.55	0.78	24.09	99.44	0.97
	2.01	100.41	0.95	36.13	100.74	0.64
	4.02	99.83	0.69			
Mean ± SD		99.34±1.24			99.80±0.82	
F-ratio		1.01 (9.55) [a]				
t-ratio		0.56 (2.571) [b]				

SD: standard deviation.

F-ratio: Tabulated F-value at 95% confidence level.

t-ratio: Tabulated t-value at 95% confidence level and five degrees of freedom.

Table 4. Determination of pyrilamine maleate in spiked plasma and urine samples applying the standard addition method.

Electrode	Taken (mg)	Spiked plasma		Spiked urine	
		Recovery (%)	RSD (%)	Recovery (%)	RSD (%)
CGE	1.00	101.29	1.43	97.49	0.55
	1.61	97.70	1.23	99.87	0.41
	2.01	100.69	1.24	100.41	0.95
	4.02	100.00	1.83	99.00	1.09

Table 5. Comparison between the suggested and some of the other published methods for determination of pyrilamine maleate.

Reagent/method	Linear range mol L ⁻¹	LOD mol L ⁻¹	r ²	RSD %	Ref
Column liquid chromatography	$3.5 \times 10^{-4} - 2.5 \times 10^{-3}$	2.5×10^{-7}	0.9990	173.7	[34]
Uv-visible spectrometry	$2.5 \times 10^{-3} - 6.9 \times 10^{-3}$	7.0×10^{-6}	0.9999	1.626	[26]
High performance liquid chromatography	$1.5 \times 10^{-3} - 1.3 \times 10^{-4}$	7.5×10^{-6}	0.9990	1.45	[23]
CGE	$7.7 \times 10^{-3} - 1.0 \times 10^{-2}$	5.3×10^{-3}	0.9999	0.49	[P.S]

Ion Selective Electrode

r²: Correlation coefficient.

P.S: Present study.

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Cyber Crime: A Changing Threat Scenario in the State Of Art

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The global cyber crime landscape has changed dramatically with criminals utilizing more sophisticated technology and greater knowledge of cyber security. Illegal profits have reached to amazing figures and it has become a business opportunity open to everybody driven by profit and personal gains. The alertness level towards cybercrime threats has increased and law enforcement acts globally to battle with them but Growing danger from crimes committed against electronic information on computers is alerting us to claim attention and developments towards cyber crime in the changing threat scenario has become demand of the state of art. In this research paper an analytical approach has been introduced to various trends used for cyber crime in the changing threat scenario. This paper also sheds light on different methods by which cyber crime is committed, who and why commits cyber crime?

Keywords: Cyber Attacks, Cyber Crimes, Cyber Law, I.T. Act 2000, I.T. Act 2008, National Security.

1. Introduction

In the present scenario advent of technological revolution has given broader opportunities and scope to internet users but at the same time this has led to the global high-tech cyber crime. Information technology (IT) has exposed the user to a huge data bank of information regarding everything and anything. However, it has also added a new dimension to terrorism. Recent reports suggest that the terrorist is also getting equipped to utilize cyber space to carryout terrorist attacks. The possibility of such attacks in future cannot be denied. Terrorism related to cyber is popularly known as 'cyber terrorism' [6]. Cybercrime deals with the crimes related to computer world. Since couple of decades India has imparted information technology in almost all the areas, mainly in Indian banking industry and financial institutions with its full optimization. India is rated in the top 5 countries affected with cyber crimes and gaining momentum from simple email type of crime to serious crime like hacking, phishing, Vishing, source code theft, cyber staking, internet time theft, Web Jacking and cross site scripting etc[1]. Thus cybercriminals have become more organized and adaptive, and continue to develop fraud-as-a-service models which make some of the most innovative and advanced threat and fraud technologies available to a much wider user base [16]. Etter in 2001 defines, "Offences where a computer is used as a tool in the commission of an offence, or as a target of an offence, or used as a storage device in the commission of an offence". According to Graham in 2001 Cyber fraud can be defined as: "A fraudulent behaviour connected with computerization by which someone intends to gain dishonest advantage". Smith in 2001 defines e-fraud as "any dishonest activity that involves the Internet as the target or means of obtaining some financial reward". Using the Graham's definition as a basis, e-fraud can be defined as the intersection of Cyber crime and Fraud as shown below [17]:

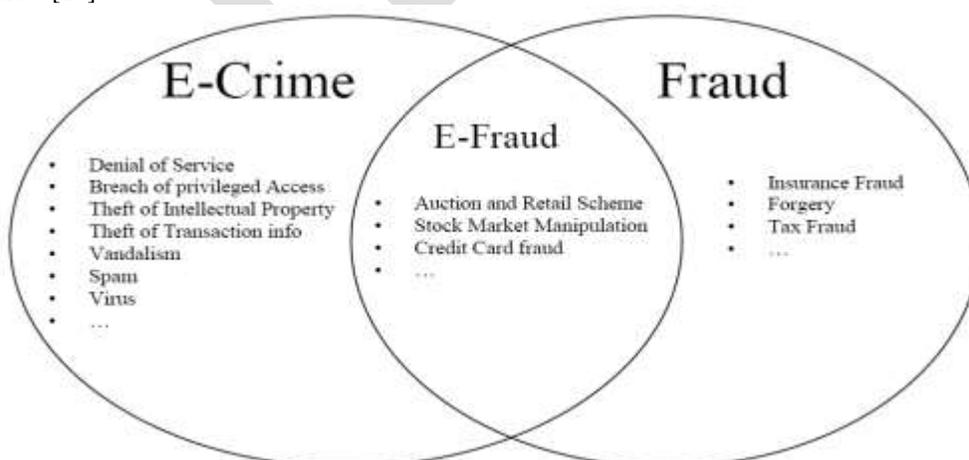


Fig 1: E-Fraud As an intersection of E-crime and fraud

Top modes of attack are Phishing attacks of online banking accounts, Cloning debit cards, e-mail frauds and Obscene publication etc. following figure shows status of global internet attacks in the year 2014 [11].

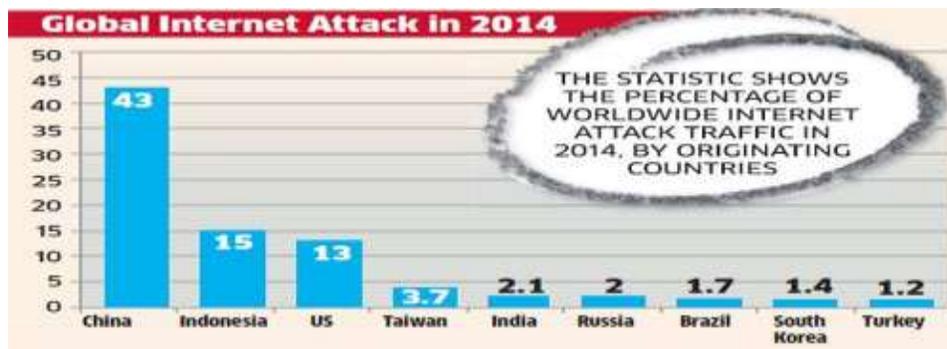


Fig 2: Status of Global Internet Attacks In the Year 2014

The following map demonstrates the top five countries ranked by the number of victim complaints reported to the IC3 during 2013

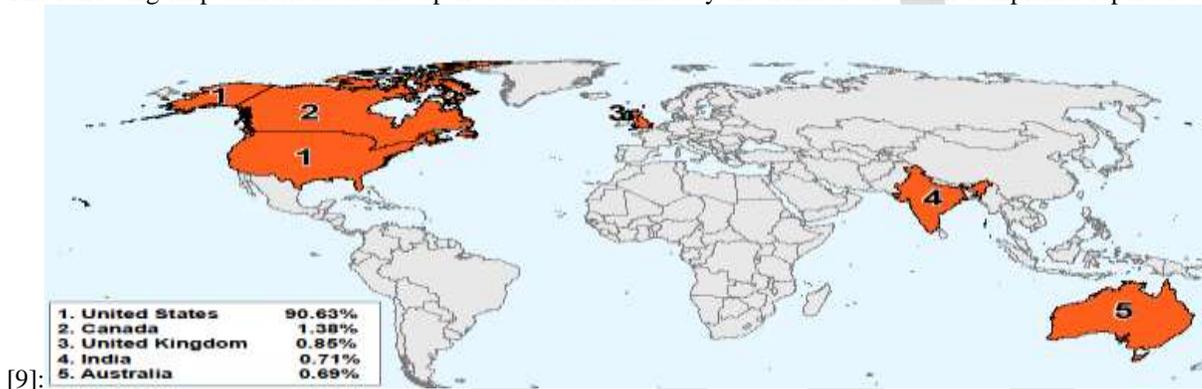


Fig 3: Rank of Top Five Countries According to the Number of Victim Complaints In 2013

2. Literature Review

Cybercrime is an activity performed by criminal by using an element of a computer or network of computers. In Cybercrime most radical changes can be seen in criminal behavior and it had a reflective impact on our lives in such a short space of time. Reports suggest that cyber attacks are understandably directed toward economic and financial institutions. Given the increasing dependency of the Indian economic and financial institutions on IT, a cyber attack against them might lead to an irreparable collapse of our economic structures. And the most frightening thought is the ineffectiveness of reciprocal arrangements or the absence of alternatives [6].

Methods of attack are becoming even more sophisticated with the passage of time. Online banking has existed since the 1980s [4]. In pre 2000 cybercrime was considered as immature or childish behavior of criminal as a practical joke or game by those who committed it. Earlier it was centered on or around one-man operated crime with the intension to exploit the limitations in the computer operating system or computer network. In most cases these crimes were committed by those people who felt challenged to prove that they could beat the system without any intension of gaining financial benefit where a great deal of financial damage could actually result. At this time Criminal defense policies was also largely based on the fact that no real intentional damage was done and, in a large number of cases, the penalty for the crime was showing how the computer system had been hacked by the hacker. In post 2000 cyber criminal gangs had introduced a professional element into the world of cybercrime. They had organized and focused their attention towards profit gain and had developed tactics to making use of computer networks to infiltrate and take advantage of the trust of other users of that computer network for huge financial gain. They had worked out hardened and they had realized that the Internet was a safe domain, with much less risk, with which to operate and generate large profits [3]. Few cases of fraud have been reported until 2004. That means that the escalation of attacks is relatively recent, and was concentrated in the last decade [4]. Fig 4 is showing various stages of cyber attack evolution from year 1980 to the year 2000+ [2]:

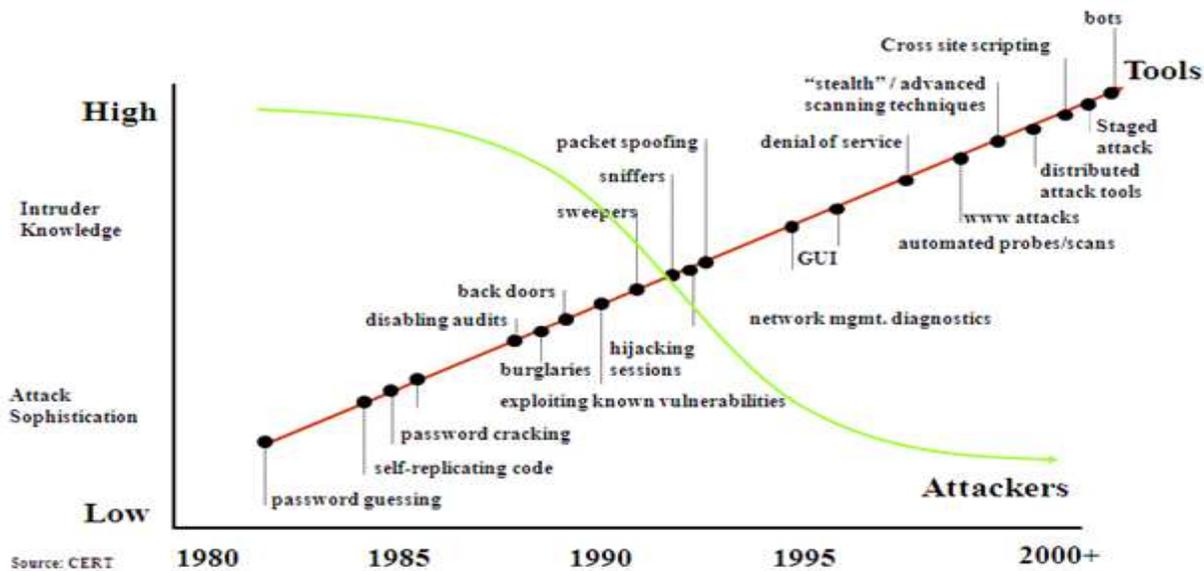


Fig 4: Various stages of cyber attack evolution

3. Objectives of the Study

1. To identify different methods by which cyber is committed? Who commits and reason behind why do people commit cyber crime?
2. How many cyber crimes are committed and what are the trends in the changing threat scenario.
3. To find out different methods by different point of view like legal, technical and strategic perspective to reduce cyber crime.

4. Methodology

This study is descriptive in nature. An attempt has been made to analyze cyber crime report given by different media resources from theoretical and investigative points of views with sentencing research. The material has been referred from Online as well as desk based book reviews, articles, reports, research and conference papers. Thus a combination of existing literature studies and in-depth secondary database material is used to fulfill the objective.

5. Methods and Taxonomy of Cyber Attacks

The most popular weapon in cyber terrorism is the use of computer viruses and worms. That is why in some cases of cyber terrorism is also called 'computer terrorism'. The attacks or methods on the computer infrastructure can be classified into three different methods that is **physical attack** in which the computer infrastructure is damaged by using conventional methods like bombs, fire etc., then **Syntactic Attacks** in which the computer infrastructure is damaged by modifying the logic of the system in order to introduce delay or make the system unpredictable. Computer viruses and Trojans are used in this type of attack and third method is **Semantic Attacks** which is more treacherous as it exploits the confidence of the user in the system. During the attack the information keyed in the system during entering and exiting the system is modified without the user's knowledge in order to induce errors [6]. In the following table taxonomy of cyber attacks has been shown [1] [7] [8]:

S. No.	Categories with Examples
1	User based / against a Persons <ol style="list-style-type: none"> i. Defamation/ Insult ii. SMS spoofing / Email spoofing/ Harassment Via Emails iii. Hacking/Unauthorized access iv. Offensive content exposure & harassment v. Cyber stalking / physical threat using computer technology vi. Broadcasting of prohibited materials / child Pornography vii. Trafficking in drug or human beings etc

	viii. Cheating & fraud like stealing password & data, ATM like credit/debit card fraud.
2	Property based cyber crimes <ol style="list-style-type: none"> i. EFT crime ii. Online theft iii. Computer vandalism. iv. Unauthorized access v. Virus Transmitting vi. Intellectual property vii. Offensive material Propagation viii. Electronic Money laundering and Tax avoidance ix. Hacking in terms of reputation loss of particular person or a company x. Cyber squatting in terms of registering, selling or using a domain name with the intent of profiting from the goodwill of someone else's trademark like www.yahoo.com and www.yaahoo.com.
3	Society based cyber crime <ol style="list-style-type: none"> i. Sale of illegal articles. ii. Forgery crimes like by fake threatening mails to mislead large number of people iii. Financial Crimes like use of debit/credit card by obtaining illegal password. iv. Child pornography like indecent exposure and obscenity. v. Trafficking in drugs/arms weapons/human beings etc vi. Online gambling like offering jobs, contractual crimes etc.
4.	Private Organizations based <ol style="list-style-type: none"> i. Theft of telecommunications services. ii. Telecommunications Piracy iii. Unauthorized control/access over computer system iv. Ownership of non-permitted information. v. Distribution of pirated software etc.
5	Government based cyber crime <ol style="list-style-type: none"> i. Distribution of pirated software ii. Ownership of Unauthorized Information iii. Cyber welfare refers to politically motivated hacking. iv. Cyber Terrorism like DDoS, sensitive computer network, denial of services, v. Defacement of websites etc.

Table 1: Cyber Crime Taxonomy

6. Advantages on online criminality/Fraud against traditional crime (why criminal commits cyber crime)

Cyber crimes are reasonably easy with low risk and hard to trace because:

1. Low amount of time, effort and money is required.
2. Secrecy is maintained without Physical presence.
3. Encryption is much better than a good concealing outfit.
4. Evidence of a crime can be easily wiped out.
5. Ethical limitations are very few.
6. No eyewitnesses.
7. Massive audience target with unlimited geographical coverage
8. Easy to mislead victims online cover their tracks by using aliases and unknown re-mailers.
9. Majority of victims don't file complaints and as a result fraudster motivates towards another fraud.

7. Role playing factors responsible for cyber crime

The integrity, authenticity, confidentiality and availability of data in cyberspace have become vital questions of the 21st century. The trends of Information Systems such as Internet and cloud computing has created challenges in maintaining security of information. Data interception, data modification, data theft, network crime, access crime etc are the fundamental categories of cyber crimes. Accountable factors which are responsible for cyber crime are-

1. Data access and sharing policies between private and public sectors.
2. Data leakage through mobile and wireless frauds and cloud computing also plays important role to augmentation of cyber crime.
3. Criminals Justice sanctions like internet restrictions and electronic monitoring.

4. Sentencing of cyber criminals etc.

8. Cyber Crime Trends in Current Scenario

India has emerged as a favourite among cybercriminals, mostly hackers and other malicious users who use the internet to commit crimes. According to an Assoc ham-Mahindra SSG study “The number of cyber crimes in the country may double to 3 lakh in 2015 and could pose serious economic and national security challenges”. The increasing use of smart phones and tablets for online banking and other financial transactions have increased risks. Phishing attacks of online banking accounts or cloning of ATM/debit cards are common occurrences. The attacks have mostly originated from the cyber space of countries including the US, Europe, Brazil, Turkey, China, Pakistan, Bangladesh, Algeria and the UAE, the study revealed. Smartphone users rarely check for security certificates while downloading apps (games, music and other software) from third party or unsecured sites, the study said, adding that mobile banking apps store data such as PIN and account number, on the phone. It further stated that mobile frauds are an area of concern for companies as 35-40 per cent of financial transactions are done via mobile devices and this number is expected to grow to 55-60 per cent by 2015 [10]. According to Computer Emergency Response Team-India (CERT-In) report till may 2014 total 9,9,174 Indian websites were hacked by hacker groups spread across the world [13].

The true volume and scope of cyber crime is indefinite and criminals continue to use a variety of scams to defraud Internet users. FBI IC3 (Federal Bureau of Investigation International Crime Complaint Center) receives wide variety of complaints on a different crime schemes from simple frauds to complex hacking and malicious software or malware scams. In 2013, the IC3 received 262,813 consumer complaints with an adjusted dollar loss of \$781,841,6111, which is a 48.8 percent increase in reported losses since 2012 (\$581,441,110). Of the 262,813 complaints received in 2013, 45.5 percent (119,457) reported financial loss. Year wise complaints registered in IC3 has been shown below [9]-

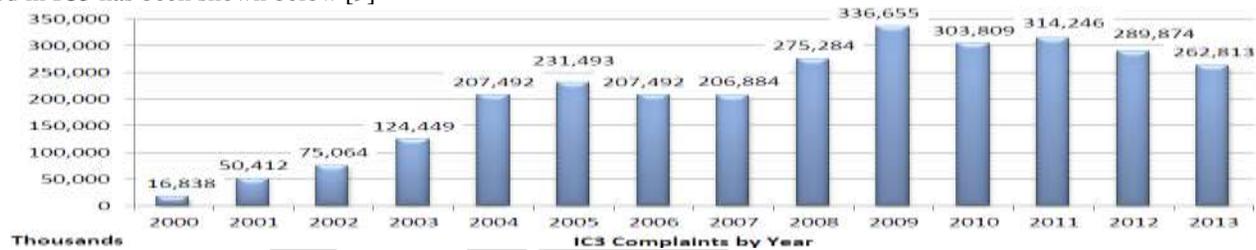


Fig 5: Year wise Status of IC3 complaints against cyber crime

Indian cyber law is still ineffective in delivering cyber crime convictions, even as cyber fraud continues to increase. The year 2013 has seen a lot of events as far as cyber law jurisprudence in India are concerned. It has been an eventful year that demonstrated how cyber legal challenges are increasingly becoming relevant. According to the information reported to and tracked by Indian Computer Response Team (CERT-In), a total number of 308,371 websites of which 78 belonged to government were hacked between 2011 and 2013 (up to June). Hackers of the Pakistan Cyber Army (PCA) breached and defaced seven websites owned by the Indian government. The year 2013 has also seen the increase in the use of power of blocking for the purposes of blocking various websites. Internet Service Providers blocked torrent websites, like The PirateBay and some others like, Vimeo. Some sites were blocked on judicial orders. Government of India has been quietly working in the year 2013 on a new legislation on privacy that can provide India a substantial basis for protection and preservation of privacy, both personal and data privacy [12].

In the following table Cyber Crimes/Cases registered and Persons Arrested under IT Act during 2010-2013 has been given in decreasing order [14]:

SL. No.	Crime heads	Cases Registered				% Variation in 2013 over 2012	Persons Arrested				% Variation in 2013 over 2012
		2010	2011	2012	2013		2010	2011	2012	2013	
1	Tampering computer source documents	64	94	161	137	-14.9	79	66	104	59	-43.3
2	Hacking with computer system										
	i) Loss/damage to computer resource/utility	346	826	1,440	1,966	36.5	233	487	612	818	33.7
	ii) Hacking	164	157	435	550	26.4	61	65	137	193	40.9
3	Obscene publication/transmission in electronic form	328	496	589	1203	104.2	361	443	497	737	48.3
4	Failure										
	i) Of compliance/orders of certifying authority	2	6	6	13	116.7	5	4	4	3	-25.0
	ii) To assist in decrypting the information intercepted by govt. agency	0	3	3	6	100.0	0	0	3	7	133.3
5	Un-authorized access/attempt to access to protected computer system	3	6	3	27	800.0	6	15	1	17	1600.0
6	Obtaining licence or digital signature certificate by misrepresentation/suppression of fact	9	6	6	12	100.0	4	0	5	14	180.0
7	Publishing false digital signature certificate	2	3	1	4	300.0	2	1	0	8	@
8	Fraud digital signature certificate	3	12	10	71	610.0	4	8	3	51	1600.0
9	Breach of confidentiality/privacy	15	26	46	93	102.2	27	27	22	30	36.4
10	Other	30	157	176	274	55.7	17	68	134	161	20.1
	Total	966	1,791	2,876	4,356	51.5	799	1,184	1,522	2,098	37.8

Note- @ indicates infinite percentage variation because of division by zero

Table 2: Cyber Crimes/Cases registered and Persons Arrested Under IT Act During 2012 & 2013 with Percentage of Variation.

In the following table Incidence of Cases Registered under Cyber Crimes in various States During 2012 & 2013 and Percentage of Variation has been given in decreasing order [14]:

S. No.	Name of the State	IT Act			IPC Section		
		2012	2013	% variation of	2012	2013	% variation of
1	MAHARASHTRA	471	681	44.6	90	226	151.1
2	ANDHRA PRADESH	429	635	48.0	25	16	-36.0
3	KARNATAKA	412	513	24.5	25	20	-20.0
4	UTTAR PRADESH	205	372	81.5	44	310	604.5
5	KERALA	269	349	29.7	43	34	-20.9
6	MADHYA PRADESH	142	282	98.6	55	60	9.1
7	RAJASTHAN	147	239	62.6	7	58	728.6
8	WEST BENGAL	196	210	7.1	113	132	16.8
9	PUNJAB	72	146	102.8	6	10	66.7
10	HARYANA	66	112	69.7	116	211	81.9

Table 3: Incidence of Cases Registered under Cyber Crimes in various States during 2012 & 2013

Cyber crimes – cases of various categories under IT Act, 2000- As it is clear from table 2 that total 4,356 cases were registered under IT Act during the year 2013 and 2,876 cases were registered in the previous year (2012), thus showing an increase of 51.5% in 2013 as compare to 2012. As it is clear from table 3 that 15.6% of total such cases (681 out of 4,356 cases) were reported from Maharashtra followed by Andhra Pradesh (635 cases), Karnataka (513 cases), Uttar Pradesh (372 cases), Kerala (349 cases), Madhya Pradesh (282 cases), Rajasthan (239 cases), West Bengal (210 cases), Punjab (146 cases) and Haryana (112 cases).

In the Following table Incidence of Cases Registered and Number of Persons Arrested under Cyber Crimes (IT Act) during 2013 at All-India level has been shown:

Sl. No (1)	Crime Head (2)	Cases Registered (3)	Persons Arrested (4)
A. Offences under IT Act			
1	Tampering computer source documents	137	59
2	Hacking with Computer Systems		
	i) Loss/damage to computer resource/utility	1966	816
	ii) Hacking	550	193
3	Obscene publication/transmission in electronic form	1203	737
4	Failure		
	i) Of compliance/orders of certifying Authority	13	3
	ii) To assist in decrypting the information intercepted by Govt. Agency	6	7
5	Un-authorized access/attempt to access of protected Computer system	27	17
6	Obtaining License or Digital Signature Certificate by misrepresentation/suppression of fact	12	14
7	Publishing false digital Signature Certificate	4	2
8	Fraud Digital Signature Certificate	71	51
9	Breach of confidentiality/privacy	93	30
10	Other	274	161
12	Total (A)	4356	2098

Table 4: Cases Registered and Number of Persons Arrested Under IT Act In 2013

In the Following table Incidence of Cases Registered and Number of Persons Arrested under Cyber Crimes (IPC section) during 2013 at All-India level has been shown:

Sl. No (1)	Crime Head (2)	Cases Registered (3)	Persons Arrested (4)
B. Offences under IPC			
1	Offences by/Against Public Servant	1	2
2	False electronic evidence	6	7
3	Destruction of electronic evidence	6	4
4	Forgery	747	626
5	Criminal Breach of Trust/Fraud	518	471
6	Counterfeiting		
	i) Property/mark	10	34
	ii) Tampering	8	10
	iii) Currency/Stamps	41	49
7	Total (B)	1337	1203

Table 5: Cases Registered and Number of Persons Arrested Under IPC section in 2013

As it is clear from the table 4 that under cyber crime IT Act out of 4356 registered cases only 2098 persons were arrested, i. e. only 48.16% persons were arrested and 51.84% persons were not arrested and in the table 5 under IPC Section out of 1337 registered cases only 1203 persons were arrested, i. e. total 89.97% persons were arrested and only 10.03% persons were not arrested. Thus under IT Act more cases were registered as compare to IPC Section but the percentage of persons arrested in IPC section is more than the persons arrested in IT Act. **Overall** 5693 (4356+1337) cases were registered under IT Act and IPC Sections and only 3301 (2098+1203) persons were arrested under IT Act and IPC Section i. e. total 57.98% persons were arrested under both the categories and 42.02% were left as it is. These figures show unawareness and needs strong standards and regulations at strategic and legal perspectives.

In the Following table Persons Arrested under Cyber Crimes (IT Act) By Age Group During 2013 at All-India level has been shown:

Sl. No (1)	Crime Head (2)	Below 18 Years (3)	Between 18 – 30 Years (4)	Between 30 – 45 Years (5)	Between 45 – 60 Years (6)	Above 60 Years (7)	Total (All Age Groups) (8)
A. Offences under IT Act							
1	Tampering computer source documents	1	23	24	11	0	89
2	Hacking with Computer Systems						
	i) Loss/damage to computer resource/utility	10	454	307	44	3	818
	ii) Hacking	2	92	91	6	2	193
3	Obscene publication/transmission in electronic form	20	457	203	53	4	737
4	Failure						
	i) Of compliance/orders of certifying Authority	0	1	2	0	0	3
	ii) To assist in decrypting the information intercepted by Govt. Agency	3	4	0	0	0	7
5	Un-authorized access/attempt to access of protected Computer system	0	9	8	0	0	17
6	Obtaining License or Digital Signature Certificate by misrepresentation/suppression of fact	0	10	4	0	0	14
7	Publishing false digital Signature Certificate	0	4	3	1	0	8
8	Fraud Digital Signature Certificate	0	27	19	5	0	61
9	Breach of confidentiality/privacy	0	19	8	3	0	30
10	Other	9	90	53	8	1	161
11	Total (A)	48	1190	722	131	10	2098

In the Following table Persons Arrested under Cyber Crimes (IPC Sections) By Age Group During 2013 at All-India level has been shown:

Sl. No (1)	Crime Head (2)	Below 18 Years (3)	Between 18 – 30 Years (4)	Between 30 – 45 Years (5)	Between 45 – 60 Years (6)	Above 60 Years (7)	Total (All Age Groups) (8)
B. Offences under IPC							
1	Offences by/Against Public Servant	0	2	0	0	0	2
2	False electronic evidence	0	6	0	1	0	7
3	Destruction of electronic evidence	0	3	1	0	0	4
4	Forgery	0	263	305	54	4	626
5	Criminal Breach of Trust/Fraud	0	145	260	66	0	471
6	Counterfeiting						
	i) Property/mark	0	8	15	9	2	34
	ii) Tampering	0	2	3	5	0	10
	iii) Currency/Stamps	0	19	19	9	2	49
7	Total (B)	0	448	603	144	8	1203

Table 7: Persons Arrested Under Cyber Crimes (IPC Sections) By Age Group In 2013

As shown in table 6 Under IT Act total 2098 persons were arrested from all age groups wherein 1190 persons were between age group 18-30 years and 722 persons were from the age group 30-45 years. Similarly in the table 7 under IPC Section total 1203 persons were arrested from all age groups wherein 603 from age group 30-45 and 448 from age group 18-30. **Thus** under IT Act cyber crime percentage of age group 18-30 is more whereas Under IPC Section Cyber crime percentage of age group 30-45 is more.

It can be concluded that under IT Act for the cyber crime like hacking, obscene publications, unauthorized access, digital signature certificate fraud and violation of confidentiality, persons of age group 18-30 are more involved **whereas** under IPC Section offences like forgery, criminal violation of trust and counterfeiting, persons of age group 30-45 are more involved.

Federal Investigative Law Enforcement and Regulatory Agencies

For the determination of some of the federal investigative law enforcement agencies that may be appropriate for reporting certain kinds of crime, following table can be referred [15].

Type of Crime	Appropriate federal investigative law enforcement agencies
Computer intrusion (i.e. hacking)	<ul style="list-style-type: none"> • FBI local office • U.S. Secret Service • Internet Crime Complaint Center
Password trafficking	<ul style="list-style-type: none"> • FBI local office • U.S. Secret Service • Internet Crime Complaint Center
Counterfeiting of currency	<ul style="list-style-type: none"> • U.S. Secret Service
Child Pornography or Exploitation	<ul style="list-style-type: none"> • FBI local office • if imported, U.S. Immigration and Customs Enforcement • Internet Crime Complaint Center
Internet fraud and SPAM	<ul style="list-style-type: none"> • FBI local office • U.S. Secret Service • Federal Trade Commission (online complaint) • if securities fraud or investment-related SPAM e-mails, Securities and Exchange Commission (online complaint) • Internet Crime Complaint Center
Internet harassment	<ul style="list-style-type: none"> • FBI local office
Internet bomb threats	<ul style="list-style-type: none"> • FBI local office • ATF local office

Table 8: Federal Investigative Law Enforcement Agencies

9. Conclusion and Suggestions

Rising Internet penetration and online banking have made India a favourite among cybercriminals, who target online financial transactions using malicious software (malware). According to the studies done in 2014 after Japan and US, India has ranked third in the list of countries most affected by online banking. In case of revenue generation Andhra Pradesh, Karnataka and Maharashtra together contribute more than 70 per cent to India's revenue from IT and IT related industries [10]. The pace at which cybercrime is emerging is one of the most alarming trends. In recent years, cyber crime has grown by leaps and bounds. Cyber crime revenue grew to levels comparable to that of a state, and major security analysts agree that it will experience sustained growth in the coming years. The improvement of online banking system and its increased use by consumers worldwide has made this service a privileged target for cyber criminals [4]. Phil Williams, a visiting scientist at CERT, summarize the issue concisely. "The Internet provides both channels and targets for crime and enables them to be exploited for considerable gain with a very low level of risk For organized crime it is difficult to ask for more" [5].

Cyber attacks have come not only from terrorists but also from neighboring countries unfavorable to our National interests. Small business generally faces online fraud risks as well as unaware people who responds to consumer scam invitations. Threat of cybercrime is coming out on intense level towards the economy, peace and security of our nation hence a holistic approach is required to fight with present scenario to provide ensured security in all consequences. There is no one measure that will cure the danger of cybercrime and ensure cyber security and due to complex nature of cybercrime it has become difficult to battle with it. It is necessary for individuals, organizations and government to take initiatives like to educate and create awareness on security practices by addressing people, process and technology issues as well as regarding to the collection of digital forensics evidences; and how to report cybercrime. In the following table suggestions from various perspectives has been discussed:

S. No.	Categories of Perceptions	Suggestions
1.	Technical perspective	<ol style="list-style-type: none"> 1. Net security should be increased. 2. DTS (Digital Time Stamping System) should be used. 3. Encryption technology should be used for processing, storage and transfer of data. 4. Mails or applications sent from unknown sources or not signed should be ignored. 5. Status of device visibility should be hidden for Bluetooth mobile services. 6. Software's downloaded from internet should not be executed without scanning. 7. Compromised computers should be isolated from further threats spreading. 8. Filter software and voice recognizer should be used against unauthorized access. 9. Email server should be blocked or email should be removed for the files attachment with the extension .vbs, .bat, .exe, .pif and .scr to protect from threat spreading.

		<p>10. Many Operating systems, by default install auxiliary services that are not critical. These services increase possibilities of attack. Installation of these services should be avoided.</p> <p>11. Access control should be limited and password protection should be provided in case of file sharing.</p> <p>12. Complex password protection should be given by user and updated anti-hijacking software's like anti-spyware, firewalls, IDS and IPS should be used.</p> <p>13. High biometric/ forensic techniques should be involved as cyber security mechanism.</p>
2.	Legal Perspective	<p>1. False Email id registration should be treated as an offense.</p> <p>2. Licenses of ISP should be reviewed periodically.</p> <p>3. Appropriate changes according to recent threat scenario should be done to make the laws more effective well as enactment of new laws is required.</p> <p>4. Cyber law should be universalized and universal legal regulatory mechanism should be adopted.</p> <p>5. Establishment of special cyber court and investigation cell for high technology based crimes.</p> <p>6. Standard regulations should be implemented towards uses of social networking sides.</p> <p>7. Implementation of E-Judiciary and video-conferencing concept for speedy justice.</p> <p>8. High penalties should be enforced for the committed cybercrime and for those who do not report the incident of cybercrime.</p>
3.	Strategic Perspective	<p>1. More investment in this field in terms of finance and manpower is required.</p> <p>2. Organizations who are dealing with Cyber security should be given all support.</p> <p>3. Joint efforts are required by all Government agencies including defence forces to attract qualified skilled personnel for implementation of counter measures.</p> <p>4. There should be a cryptogrammic relationship between the Internet Service Providers, government and civil society so that legal framework towards cyber-security can become stronger.</p> <p>5. Agreements relating to cyber security should be given the same importance as other conventional agreements.</p> <p>6. A national cyber security technology frame-work should be developed to specify cyber security requirement controls and baseline for individual network user.</p> <p>7. Current scenario needs to sensitize the common citizens about the dangers of cyber terrorism. National culture of security standards should be introduced and promoted.</p> <p>8. Multifactor authentication with unique personal id like biometric identification, smart card etc can be included.</p> <p>9. Cyber Crime awareness and education programs should be introduced and education system curriculum should be reviewed and proper training should be incorporated related with information and cyber security at all levels of education i. e. at primary and secondary level also.</p>

Table 10: Recommendation to ensure cyber security

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Design of High Gain Wideband Low Noise Amplifier based on Matching technique for Multiple Applications

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Abstract— Increasing demands of portable wireless devices have motivated the development of CMOS radio frequency integrated circuits (RFIC). In wireless system Low Noise Amplifier is the first stage of any RF Receiver design. Performance of RF receiver mainly depends on the effectiveness of LNA. The main objective of the LNA design is to get good gain with minimum noise generation for the entire operating frequency range. With proper matching, Wideband LNA would be one with approximately or exactly the same operating characteristics over a very wide passband and would be used for multiple applications. An efficient LNA design has to manage trade-off between Gain, Noise Figure, Input-Output Losses, power consumption and device's stability. The LNA would be designed and will be simulated on Agilent's ADS.

Keywords— Gain, Impedance Matching, Noise Figure, Power Consumption, Wideband, Reflection Coefficient, Stability

INTRODUCTION

With rapidly increasing technology, wireless communication is evidencing introduction of various communication standards. Despite the fact that digital circuits currently offer an impressive performance, pure digital signal processing of radio signals remains limited for relatively low frequencies below a few hundred MHz. On the other hand, frequency bands used in current mobile applications span from around 800MHz up to 6 GHz and hence demand the use of analog circuits to down-convert the radio signals to lower frequencies that are suitable for digital processing. The group of circuits that form this part of the receiver is known as the radio receiver front-end. The rapidly increasing applications for wireless communication systems demands for wideband multiple standard wireless system. It is therefore, desirable to develop a single mobile terminal compatible with several standards. To cope up the growth of technology need's a Multiband/wideband Receiver that would support multiple standard applications. In Wireless communication systems, Low noise amplifier is the chief component of any RF receiver design. Low Noise Amplifier (LNA) is an electronic amplifier used to amplify possibly very weak signals and is placed at the front end of a receiver. LNA's performance has direct impact on the overall receiver performance.

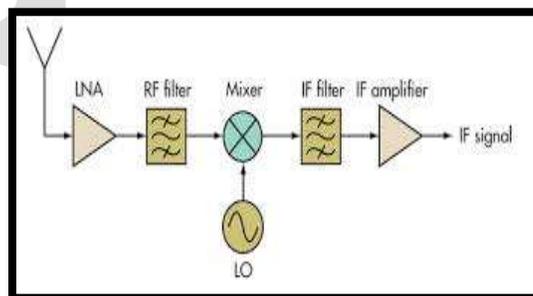


Fig 1. RF Receiver with LNA

When the signal couples from antenna into a LNA circuit, signal is amplified and transmitted to a mixer system including the reduction of the noise coming from outside or circuit inside. LNA is usually located very close to the detection device to reduce losses

in the feed line. As LNA is the Key component of RF Receiver it's prime requirements are high gain, lowest possible noise figure (NF), minimum power consumption and system's stability.

The LNA placed at the front-end of a radio receiver circuit determines the performance of sensitivity, linearity and power consumption. A wideband LNA basically is one with approximately or exactly the same operating characteristics over a very wide passband. For Wideband LNA a single, wide-band, RF front-end can satisfy the requirements of any standard in a wide frequency range and thereby support multiple applications. In RF receiver an antenna in combination with wideband LNA is an ideal solution for supporting multiple applications.

DESIGN PARAMETERS

A. Noise Figure

Noise figure (NF) is a measures of degradation of the signal-to-noise ratio (SNR), caused by components in a radio frequency (RF) signal chain. The overall noise figure is mainly determined by the first amplification stage, provided that it has sufficient gain. It is the ratio between SNR at input to the SNR at output, and is expressed in decibels (dB). NF specifies the noise performance of a circuit or device.

$$NF = 10 \log (SNR_{in} / SNR_{out}) \text{ dB}$$

B. Stability

It is the chief parameter of LNA design. Stability requires to design an LNA circuit that is unconditionally stable for the complete range of frequencies. Achieving stability over entire range of frequency requires to manage trade-off between LNA's gain and noise figure. Stability of the device depends on it's stability factor K and Δ ;

$$K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2|S_{21}||S_{12}|}$$

$$\Delta = S_{11}S_{22} - S_{12}S_{21}$$

C. S-Parameter

These are also known as Scattering Parameter. S-Parameters are derived from the port parameter analysis of two port network as it describe the electrical behaviour of linear electrical networks when undergoing various steady state stimuli by electrical signals.

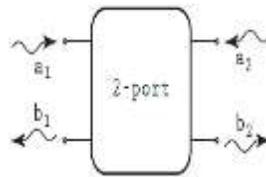


Fig. 2-Port Network

S-Parameter analysis determines the Gain S21 (forward voltage gain), Input Matching S11(input return loss), Output Matching S22(output return loss), Reverse Isolation S12(reverse isolation). While Gain is defined as the ratio between the signal outputs of a system to signal input of a system. Gain basically is the measure of how well the signal from input of any system is routed to the output of the same system.

D. Input-output Matching

Impedance matching is the practice of designing the input impedance of an electrical load or the output impedance of its corresponding signal source to maximize the power transfer or minimize signal reflection from the load. Also the input and output matching of low noise amplifier determines the frequency response. Wideband LNA requires matching for supporting operation over wideband frequencies.

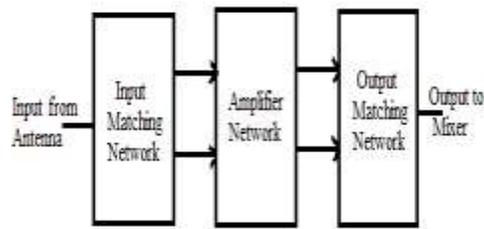


Fig 3. Concept of Matching

LITERATURE SURVEY

Few papers presents a high gain, low power, high linearity wideband low noise amplifier (LNA) targeting multiple (multiple standard) applications. These few papers have used different techniques to achieve optimum characteristics for LNA. Xusheng Tang et. Al. in [4] presents the design of a low noise amplifier in 0.13 μ m CMOS technology. The conventional inductive degeneration is applied to reduce the noise figure and the amplifying stage uses the cascode structure to increase the gain and achieve a better isolation. Chang-Tsung Fu et.Al. in [7] have analysed simultaneous noise and impedance matching (SNIM) condition for a common-source amplifier. A dual reactive feedback circuit along with an LC-ladder matching network is proposed to achieve the broadband simultaneous noise and impedance matching. Hira Shumail et.Al. [8] have mentioned the design of a highly linear, fully integrated, wideband low noise amplifier. The transistors have been biased in weak/moderate inversion to achieve better linearity and employs a three stage distributed topology along with input and output matching networks. Chun-Chieh Huang et. Al. in [9] stated the designing of LNA using the gate-inductive gain-peaking technique to boost the gain; the proposed LNA achieves a good figure of merit (FOM) with less power consumption. gives one option to use a wideband resistive load cab be used to load inductor for bandwidth extension.

Work done by Jigisha Sureja et.Al. [12] Proposed a technique to attain the wide bandwidth LNA using 0.18 μ m CMOS technology for a single stage 0.1-3GHz wideband LNA. The paper analyzes cascode common source structure of LNA where a T-coil network can be implemented as a high order filter for bandwidth extension. Vu Kien Dao et. Al. in [14] proposed a multi-band low noise amplifier (LNA) which can operate at frequencies supported by multiple standards. Input matching, noise matching and gain are achieved by adopting a switched output load and a resistive shunt-feedback circuit.

TABLE 1
 COMPARISON OF VARIOUS LNA TOPOLOGIES

Topology	Gain	Noise Figure	Power Consumption
Common gate (CG)	Low	High	moderate
Common Source (CS)	High	Low	High
Cascode CS	High	Moderate	Moderate
Resistive feedback	Moderate	Low	High
Current reuse	High	High	Low

PROPOSED LOW NOISE AMPLIFIER DESIGN

An LNA is a key component which is placed at the front-end of a radio receiver circuit which determine the performance of sensitivity, linearity and power consumption. As the received signals are processed first through LNA and then to other blocks of receiver. The main function of LNA is to amplify the signal without adding extra noise to the received signal. The LNA schematic shown below is simulated in TSMC RF CMOS 0.13 μ m technology. Voltage supply of 1.3V is given to transistor (NMOS). The design consists of lumped dc components (R, L, C) with different value at input and output side of circuit. The design below uses common source topology of LNA which either grounded or common to both input and output side. LNA designing includes managing it's parameters like high gain, stability, good input and output matching, low noise figure and linearity. These Design parameters are interdependent, therefore managing trade-off between them is essential. The LNA is designed in Agilent's ADS as it's provides an integrated design environment for the circuit design at RF frequency.

The amplifier is designed using 0.18 μ m CMOS (Complementary Metal-oxide Semiconductor) based technology. This technology gives low power consumption, strong reliability and also support Multi-dimensional and Multi-standard applications. The Common source topology is used in the design of LNA as it requires low bandwidth of operation. Common source topology also provides high gain and corresponding low noise figure with moderate power consumption. It also has good impedance matching and linearity to lower the distortions.

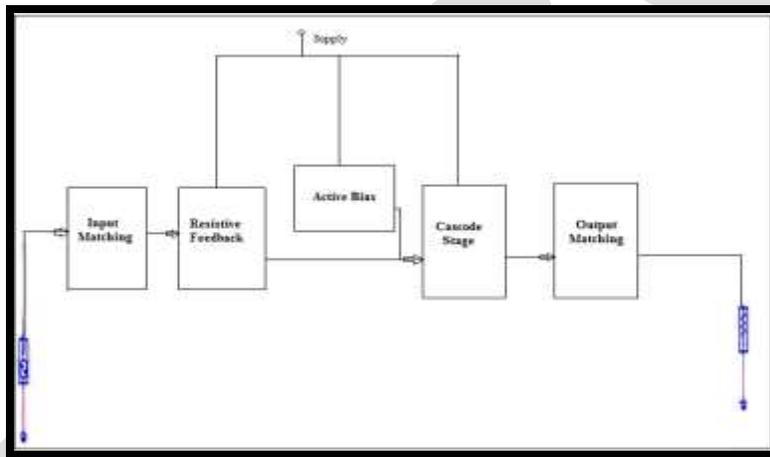


Fig.4. Low Noise Amplifier Circuit

SIMULATION RESULT

The designed circuit is simulated under **Advanced Design System (ADS)**. It is a leading electronic design automation software for RF, and also microwave and signal integrity applications. Scattering parameter, harmonics, stability and noise figure of the circuit over the frequency range of 0.5GHz to 6GHz have been simulated with 1.3V of voltage supply.

The forward gain S_{21} is measured to be in the range of 21.37-19.64 db at the frequency range of 0.5-6GHz. The input reflection coefficient (S_{11}) is in the range of -11.19 - -15.12 db, the output reflection coefficient (S_{22}) is in the range of -7.44 - -7 and the noise figure is in the range of 1.97 - 2.01 db for the same frequency range.

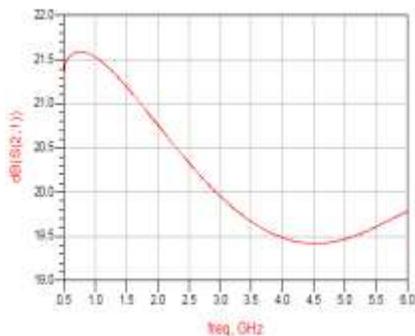


Figure 5: Gain (S_{21})

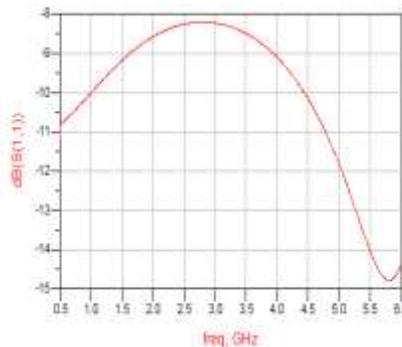


Figure 6: Input reflection coefficient (S_{11})

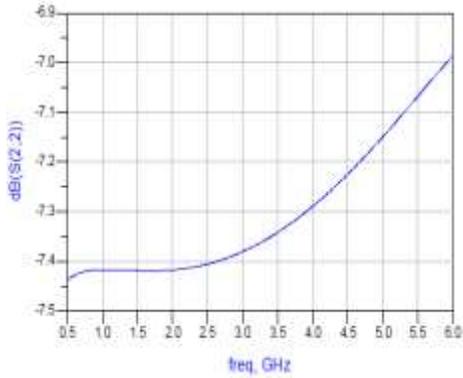


Figure 7: Output reflection coefficients (S_{22})

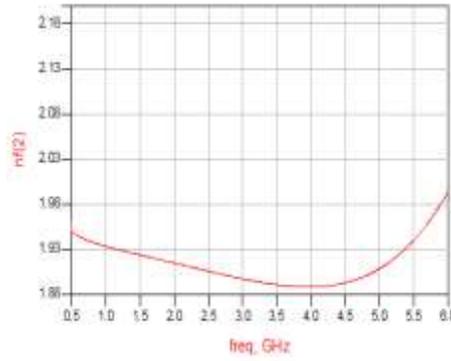


Figure 8: Noise Figure of LNA



Figure 9: Stability of LNA

TABLE 2
 COMPARISON OF SIMULATION RESULTS

Paper	Frequency (GHz)	Gain (dB)	Noise Figure (dB)	S11 (dB)	S22 (dB)
Ref 15	1	19.5	3.81	<-5.0	NA
Ref 16	3.1-10.6	12.25	<3.8	<-10	<-8.2
Ref 17	0.8-2.5	15.1	1.63	<-10	<-5.0
This Work	0.5-6	21.37-19.64	1.97 - 2.01	-11.19 - -15.12	-7.44 - -7

CONCLUSION

The paper describes the concept and designed circuit of Low Noise Amplifier. This paper gives the details information about LNA design parameter and the comparison between different LNA design topologies. The Complete LNA schematic is simulated in Agilent's ADS through 0.13 μ m CMOS technology. The simulations results obtained has high gain and optimal noise characteristics with good stability. This LNA would be used in RF receiver for good quality reception.

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An Improved Switching Median Filter Based on Local Outlier Factor

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Abstract— In this paper an improved switching median filter based on local outlier factor for the restoration of gray scale and color images that are highly corrupted by impulse noise is proposed. In first stage the proposed algorithm detects noisy pixels by local outlier factor incorporating with Boundary Discriminative Noise Detection (LOFBDND). Since this detection stage using LOF detects edge as noise and miss detect some noisy pixels which will result in high miss detection and false alarm rate so before going into filtering stage, next step will take out edge information. Then the directional weighted median filter is applied to remove the detected noise by replacing each noisy with the weighted mean of its neighbors in the filtering window of 5×5 , while taking four different directions in that window. The proposed algorithm shows better results than Switching Median Filter Based on Local Outlier Factor and also directed towards edge preservation. Experimental results show improvements both individually and quantitatively (in terms of peak signal to noise ratio, mean absolute error, miss detection rate and false alarm rate).

Keywords— Impulse noise, local outlier factor, switching median filter, directional weighted median filter.

INTRODUCTION

Digital images are often contaminated by impulse noise due to a number of non-idealities caused by malfunctioning of camera's sensor cells, transmission errors, faulty memory locations or timing errors in analog to digital conversion in the imaging process. Salt and pepper noise is a kind of impulse noise that usually corrupts images by replacing some of the pixels of the original image with new pixels having luminance values near or equal to the minimum or maximum of the allowable dynamic luminance range. Since the performances of sub-sequent image processing tasks are dependent on the success of image noise removal operation, it is important to remove impulse noise from image in most of the applications. Linear filtering techniques [1] are not effective in removing impulse noise, because it distorts the useful information in the image and fails to preserve image details and texture while removing the noise, therefore non-linear filtering techniques are widely used in the restoration process.

Median filters are usually implemented uniformly across the images causing both noise and noise-free pixels to be modified and some desirable and important details to be removed. Additionally, the filter is effective only for low noise densities and exhibits blurring if the window size is large and leads to insufficient noise removal if the window size is small [2]. The edge details of the original image will not be preserved by MF when the noise level is over 50%. To overcome this problem, "Switching Median Filtering" [3] has been proposed for enhancing the filtering effect and preserving the details. In switching median filter there are two phases: noise detection and filtering noisy image. Noise detection is done using a priori threshold value to decide if pixel is corrupted or not and accordingly median filter is to be applied or not. By doing this, the filtering step will not modify those uncorrupted pixels. Various new switching filters with an impulse detector are proposed to enhance the effect of median filter.

The improved switching median (ISM) filter [4] has impulse detector based on four one-dimensional Laplacian operators and to separate them from edges. Directional weighted median filter (DWM) filter [5] is another filter with good detail features preserving ability in which impulse detector is based on the differences between the current pixel and its neighbors aligned with four main directions and then uses weighted median filter to restore image. In boundary discriminative noise detection (BDND) [6] algorithm the local histogram is used to determine the decision boundaries between noise-free and noisy pixels. Adaptive Switching Median (ASWM) [7] with high noise detection ability for random-valued impulse noise uses a threshold calculated locally from image pixels intensity values in a sliding window. But with noise density above 60%, the precision of noise detection decreases.

Local Outlier Factor (LOF) is an outlier detection strategy in data mining [8]. This approach uses local outlier factor to indicate outlier-ness degree of object i.e. how much outlying an object is. Since gray level value of corrupted pixel is different from noise-free pixels. LOF is used to quantify this distinction. In the first stage, LOF coupled with Boundary Discriminative Noise Detection is given [9]. Then in next stage directional weighted median filter is adopted to filter noisy pixels. This approach considers edge pixels as noise and miss-detect some noisy pixels because local outlier factor of edge pixels are different. So miss-detection rate and false alarm rate is high and edges are not preserved. The proposed algorithm will remove this problem and further enhance image.

The rest of the paper is structured as follows: A brief Literature Survey is presented in Section II. Section III describes the proposed algorithm. Section IV presents the simulation results and a comparative performance of algorithm for various images. Section V draws the conclusion of the proposed work.

LITERATURE SURVEY

Impulse Noise in Image

Impulse noise corruption is often found in digital images. Impulse noise is independent and uncorrelated to the image pixels and is distributed over the image in random manner. Hence comparing with Gaussian noise, for an image corrupted with impulse noise, only certain percentage of image pixel is contaminated and the rest of pixels will be noise-free. Intensity of damaged pixel is significantly different when compared to intensity of the pixels in neighborhood. Impulse noise is further classified as salt and pepper noise and random valued noise.

In salt and pepper noise the noisy pixel takes either maximum gray level-255 or minimum gray level-0 and it looks like white and black spots on the images, thus they are called as salt and pepper noise.

$$Y_{i,j} = \begin{cases} 0 \text{ or } 255 \text{ with probability } p \\ x_{i,j} \text{ with probability } 1 - p \end{cases}$$

Here $Y_{i,j}$ represents the corrupted image pixel, p is the noise probability of impulse noise and $X_{i,j}$ is the uncorrupted image pixel.

In case of random valued impulse noise, noise can take any gray level value within the interval $[0,255]$. In this case noise is randomly distributed over the entire image and probability of occurrence of any gray level value as noise will be same. We can mathematically represent random valued impulse noise as below.

$$Y_{i,j} = \begin{cases} n_{i,j} \text{ with probability } p \\ x_{i,j} \text{ with probability } 1 - p \end{cases}$$

Where $n_{i,j}$ is the gray level value of the noisy pixel.

Linear Filters

Filtering is a neighborhood operation, in which the value of any given pixel in the output image is determined by applying some algorithm to the values of the pixels in the neighborhood of the corresponding input pixel [1]. A pixel's neighborhood is some set of pixels, defined by their locations relative to that pixel. Mathematically, a filter may be defined as a function which maps an image x into image y :

$$F(x) = y$$

The filter is said to be linear when the function F satisfies both the superposition and proportionality principles. Linear filtering is filtering in which the value of an output pixel is a linear combination of the values of the pixels in the input pixel's neighborhood. For example, an algorithm that computes a weighted average of the neighborhood pixels is one type of linear filtering operation. Two dimensional and m -dimensional linear filtering are also performed with the extension of one-dimensional linear filtering techniques to two or more dimensions. If the filter evaluates the output image only with the input image, the filter is called non-recursive. On the other hand, if the evaluation process requires input image samples together with output image samples, it is called recursive filter.

Non-Linear Filters

Median Filters

Median Filters [1] are very efficient in impulse noise removal at low density levels. The median filter follows the moving window approach for filtering. A 3×3 , 5×5 or 7×7 kernel of pixels is taken and scanned over pixel matrix of the entire image. In median filtering, first sorting of the entire pixel values from the surrounding neighborhood is done into numerical order and median value is calculated. Then the centre pixel of kernel is replaced by this median value. The median value should be written into a separate array or buffer so that the results are not corrupted as the process is continued.

Max-Min Filter

Min and Max filter works on ranked set of pixels. Contrary to median filter which replaces the reference pixel with the median value, the Min filter replaces it with the lowest value instead. Mathematically, it can be defined as:

$$F(x,y) = \min \{g(r,c), (r,c) \in W\}$$

Similarly, the max filter replaces the reference pixel with the highest value within the window, i.e.

$$F(x,y) = \max \{g(r,c), (r,c) \in W\}$$

The min filter is useful for reduction of salt noise, whereas max filter can help remove pepper noise.

' α ' Trimmed Mean Filter

This filter uses another combination of order statistics and averaging [1]. In this case an average of pixels values closest to median filter excluding the D lowest and D highest values in an ordered set is taken. For D=0, the filter behaves like a regular arithmetic mean filter; for D= (mn-1)/2 it is equivalent to median filter. It is used in cases where image is corrupted by more than one type of noise.

Mathematically

$$\hat{f}(x,y) = \frac{1}{mn-d} \sum_{(s,t) \in S} g_r(s,t)$$

The disadvantage is that, when the image is corrupted by SPN more than 50% the algorithm fails because of trimming even uncorrupted pixels and blurring of the edges takes place and hence fine details are lost [10].

Unsymmetric Trimmed Median Filter

An Unsymmetric Trimmed Median Filter (UTMF) was proposed in order to overcome problems with ATMF. In UTMF, the elements in selected 3x3 window are arranged in increasing or decreasing order. Then it removes the pixel values 0's and 255's in the image (i.e. the pixel values causing SPN) are removed from the image. Then the median value of the remaining pixels is corrupted. The noisy pixel is replaced with this median value. It is called trimmed median filter because the pixel values 0's and 255's are trimmed from the selected window.

Switching Median Filters

In the earlier decades, median-based filters have gained much attention because of they are simple for implementation. Nevertheless, because the median filters are implemented in a uniform manner across the image, they modify both noise pixels and uncorrupted good pixels. To avoid the distortion of good pixels, a new scheme is introduced which consists of two stages: firstly impulse detection algorithm is applied before filtering and then in next stage detection outcomes are used to control whether a pixel should be modified or not while applying filter. This approach is called Switching Median Filtering. Fig. 1 shows a general framework for this kind of filtering which proved to be more effective than previous methods that are uniformly applied when the noisy pixels are sparsely distributed in the image.

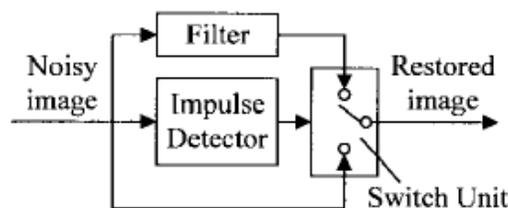


Fig.1 A general framework of switching based image filters

An Efficient Switching Median Filter Based on Local Outlier Factor

Wei Wang and Peizhong Lu [9] proposed a new technique of image filtering using the switching median filter which is based on Local Outlier Factor where the LOF of each pixel is computed. In detection phase noisy pixels are identified by local outlier factor incorporating with boundary discriminative noise detection (LOFBDND). Then in filtering phase, it uses directional weighted median filter to eliminate the detected impulses by replacing each noisy pixel with the weighted mean of its neighbors in the filtering window.

Local Outlier Factor

Local Outlier Factor is used for identifying density-based local outliers [8]. The local outlier factor is computed on the basis of local density, where locality can be found by k -nearest neighbors, whose distance is used to calculate the density. By comparison of the local density of an object and the local densities of its neighbors, one can identify areas of similar densities, and also points that have a substantially lower density than their neighbors which are considered as outliers. The local density is computed by the distance at which a point can be reached from its neighbors.

k -distance(A): the distance of the object A to the k -nearest neighbour.

$N_k(A)$: set of k -nearest neighbours

$$\text{reachability-distance}_k(A, B) = \max\{k\text{-distance}(B), d(A,B)\}$$

The local reachability density of an object A is:

$$\text{Lrd}(A) = 1 / \left(\frac{\sum_{B \in N_k(A)} \text{reachability-distance}_k(A,B)}{|N_k(A)|} \right)$$

Now, the local reachability densities are then compared with those of the neighbors using

$$\text{LOF}_k(A) = \frac{\sum_{B \in N_k(A)} \frac{\text{Lrd}(B)}{\text{Lrd}(A)}}{|N_k(A)|}$$

which is the average local reachability density of the neighbors divided by the object's own local reachability density. If the value is 1 then it indicates that the object is comparable to its neighbors (and not an outlier). If the value is less than 1 then it indicates a denser region, while values significantly larger than 1 indicate outliers.

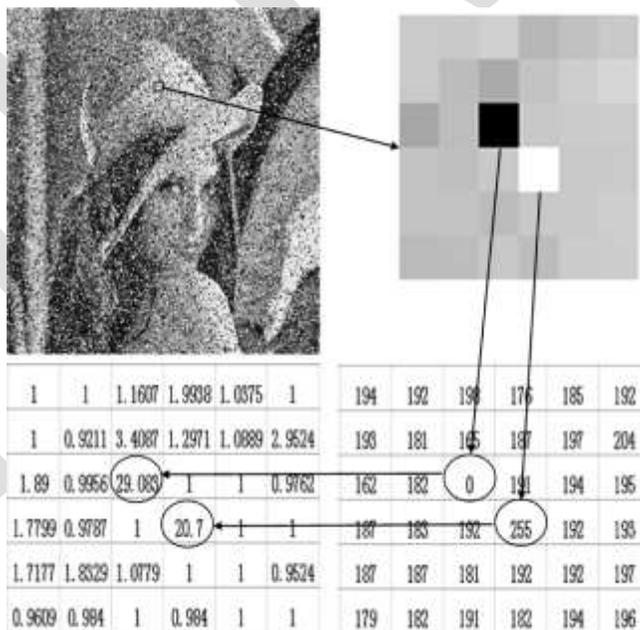


Fig.2 LOF calculation example: The left top shows Lena image corrupted with 20% SPN noise; the right top shows 6x6 pixels portion; the right bottom shows gray level values of pixel and left bottom shows corresponding LOF.

Here we consider image as a dataset, every pixel in the image is treated as an object in the dataset, and the intensity difference of two pixels is taken as the distance of two objects, so we can calculate the LOF values of pixels. If a pixel is corrupted by

impulse noise, it would be likely different from surrounding pixels in gray level value, i.e. it may belong to another cluster. Thus, we can use LOF to express this characteristic. We define dataset as window (in our experiment, $k=3$, $L=4$) centered on pixel.

We gave a case of LOF calculation as shown in fig.2. In this example "Lena" image is contaminated with 20% salt and pepper noise. Only the 6×6 pixels area is displayed due to lack of space. There are two noises, one is salt noise and the other is pepper noise. The gray values of these two noisy pixels are 0 and 255 respectively, and the corresponding LOF values are 29.083 and 20.7, but the LOF values of other pixels in this area are relatively small, this shows that noisy pixels have different LOF values. So we can conclude that noise detection using LOF is possible. In addition, the median and mean of the LOF of all image pixels are approximately equal to 1 if there is no noise in an image.

Since local outlier factor of pixels at edge are different. Thus, it considers edge pixels as noise and miss-detect some noise pixels also. So false alarm rate and miss detection rate are high. To reduce the false alarm rate and miss-detection rate and to further improve image we have proposed a method in this paper.

PROPOSED SCHEME

Basic rule: If the LOF of an image pixel is greater than a threshold T_a then it may be corrupted, the larger the LOF of p is, and the more likely it is corrupted.

$$\text{Class}(p) = \begin{cases} \text{noise candidate} & \text{if } \text{LOF}(g(i,j)) > T_a \\ \text{noise} & \text{if } \text{LOF}(g(i,j)) > T_b \end{cases}$$

where T_a and T_b are given threshold, $g_{i,j}$ is the gray value of pixels at coordinate (i, j) of a digital image. Because of the diversity of the LOF values of the image pixels we find that fixed T_a and T_b are not universal. A simple but effective adaptive method according to local small neighborhood relativity principle of natural image is to use the mean of LOF values of all pixels in p 's neighborhood. That is

$$T_a = \alpha M \quad \text{and} \quad T_b = \beta M$$

α and β : given parameters (in our experiments $\alpha=2$, $\beta=6.5$),
 M : mean of the LOF value of all pixels in a 9×9 window.

A. Detection Stage

Noise detection strategy utilizes local outlier factor. If pixel is a noise candidate, then it will be validated by BDND method proposed by Ng [4]. The algorithm steps are given below:

- 1) Calculate the Local Outlier Factor of every pixel p in an image.
- 2) Classify p by LOF ($g_{i,j}$) and boundary discriminative method:
 - a) If $\text{LOF}(g_{i,j}) > T_a$, then p is classified as noise candidate, else, impose a 21×21 window centered on pixel p .
 - b) Sort the pixels lie in the given window to an ordered vector V_o and find the median value med .
 - c) Compute the difference vector of V_o , and then find the pixels which correspond to the maximum differences in the intervals of $[0, \text{med}]$ and $(\text{med}, 255]$, and set these two pixel's intensities as the decision boundaries b_1 and b_2 respectively.
 - d) If $b_1 < g_{i,j} \leq b_2$, then p is noise-free, else, p is classified as noise candidate.
- 3) Validate the noisy candidates:
If $\text{LOF}(g_{i,j}) > T_b$, then p is noise, else, validate the noisy candidates by imposing a 3×3 window, and repeat steps (b)–(d).

B. Filtering Stage

- 1.) To reduce false alarming at the edges of image the following steps are performed:
 - a) Get the edges of image using sobel operator
 - b) Divide edge image into blocks of 3×3 .
 - c) For each 3×3 block if the block has more than two edge pixels then declare it genuine and remove edge information at that point.
- 2.) To filter the corrupted image, we use a weighted median filter with 5×5 window as in [5] with four different directions. The weight of a pixel is computed on the basis of standard deviation in four directions.

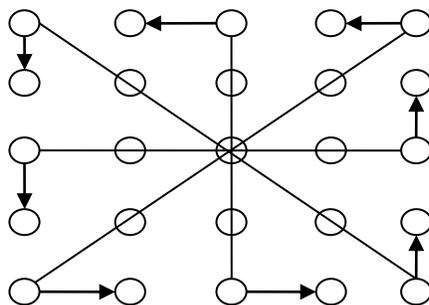


Fig. 3 5x5 mask for filtering

S is the set of pixels in the direction with minimum standard deviation.

$$w_{i,j} = \begin{cases} 2, & \text{if } g(x+i, y+j) \in S \\ 1, & \text{otherwise} \end{cases}$$

3.) The noisy pixel is restored by computing median as:

$$m(x, y) = \text{median}\{ w_{i,j} \diamond g_{x+i, y+j} \}; -1 \leq i, j \leq +1$$

where operator \diamond denotes repetition operation. The output of the filter is:

$$\hat{g}(x, y) = a_{x,y} g + (1 - a_{x,y}) m(x, y)$$

$$a_{x,y} = \begin{cases} 0, & \text{if } g(x,y) \text{ is corrupted} \\ 1, & \text{otherwise} \end{cases}$$

SIMULATION RESULTS

The existing and proposed algorithms are simulated in MATLAB 7.11 R2010b (32 bit). Experiments are performed with various images including both colored and gray scale images. To compare the performance, the images are corrupted with additive SPN. The density is varied from 45% to 75% in different images. The corrupted images are restored using both LOFBDND and the proposed algorithm.

A. Comparison of detection and filtering stage

Performance of the algorithms at detection stage is quantitatively measured in terms of FA and MD. In our testing, Miss-detection number (MD) represents the number of noise being miss-detected and false alarm number (FA) represents the number of noise free pixels that are misclassified as noise. At filtering stage the existing and proposed algorithms are compared in terms of PSNR and MAE.

$$\text{PSNR in db} = 10 \log_{10} \left(\frac{255}{\text{MSE}} \right)$$

$$\text{MSE} = \frac{\sum_i \sum_j \{Y(i,j) - \hat{Y}(i,j)\}^2}{M \times N}$$

$$\text{MAE} = \frac{\sum_i \sum_j \{Y(i,j) - \hat{Y}(i,j)\}}{M \times N}$$

Where PSNR stands for Peak Signal to Noise Ratio, MSE stands for Mean Squared Error, MAE stands for Mean Absolute Error, FA and MD for false alarm and miss-detection rate respectively. Y denotes the original image; \hat{Y} denotes the denoised image. In this text we have presented the comparative performance of 5 different images (Table 1). Figure numbers in first column of the table refers to the experimental outcomes displayed on the next page. From Table 1 we can see that our proposed detection algorithm is better on all parameters. At detection stage it maintains rather low miss-detection rate and false alarm rate than existing algorithm.

There is also increase in PSNR (peak signal to noise ratio) in each case and the proposed algorithm has lower MAE (mean absolute error) as well.

B. Comparison of Visual Performance

The images used in the tabulation are shown in figure 4 to figure 8 below. In all figures, top left is the original image, top right is the noisy image with additive SPN, bottom left is the denoised image generated by LOFBDND and bottom right is the denoised image generated by the proposed algorithm.

TABLE I: RESULT COMPARISON FOR TEST IMAGES

Image	Parameter	LOFBDND	Proposed Algorithm
Image 1 (figure 3)	PSNR	46.33	48.25
	MAE	0.145	0.127
	FA	83	28
	MD	96	19
Image 2 (figure 4)	PSNR	41.31	42.71
	MAE	0.268	0.238
	FA	48	11
	MD	70	17
Image 3 (figure 5)	PSNR	31.85	33.53
	MAE	0.759	0.642
	FA	206	72
	MD	172	55
Image 4 (figure 6)	PSNR	35.93	37.88
	MAE	1.09	0.86
	FA	77	29
	MD	64	13
Image 5 (figure 7)	PSNR	31.65	33.08
	MAE	1.938	1.683
	FA	89	26
	MD	64	21

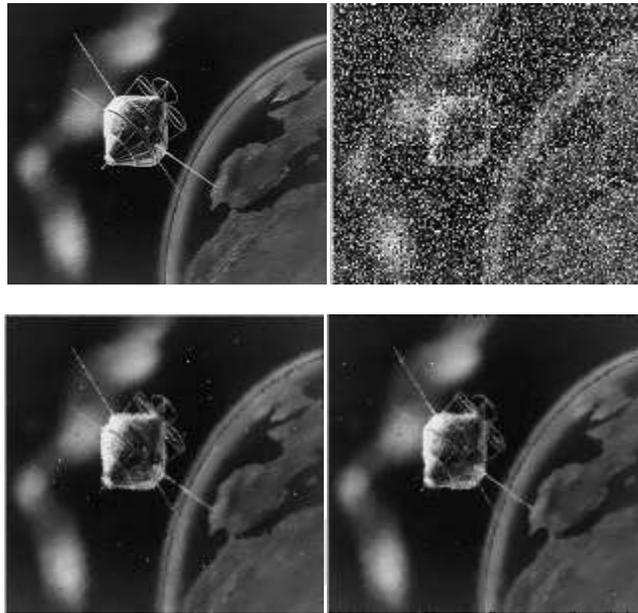


Fig.4 Test Image 1

Visual analysis of the images also reveals that the issue reported earlier is corrected to a great extent by the proposed algorithm i.e. by using proposed algorithm we get less noise along edges and there is also improvement in quality of image. As we can see in test image 1 that noise along the edges and also in other parts get reduced. We have used satellite images in our experiments because edges are clearer in these images.

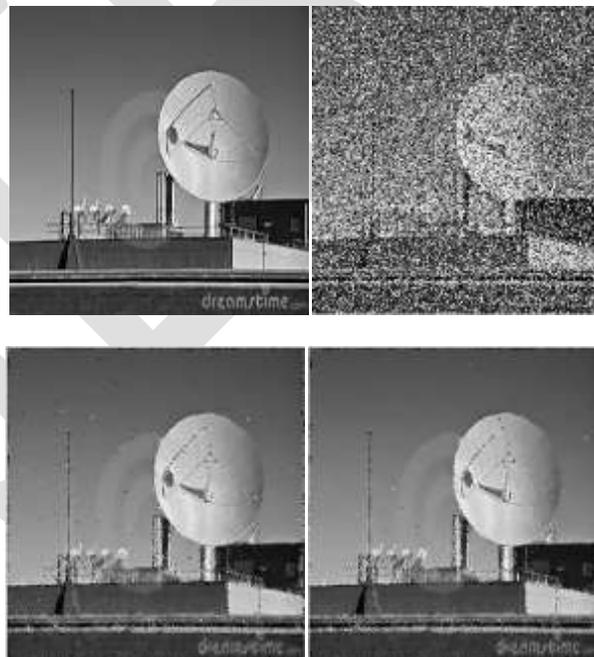


Fig. 5 Test Image 2

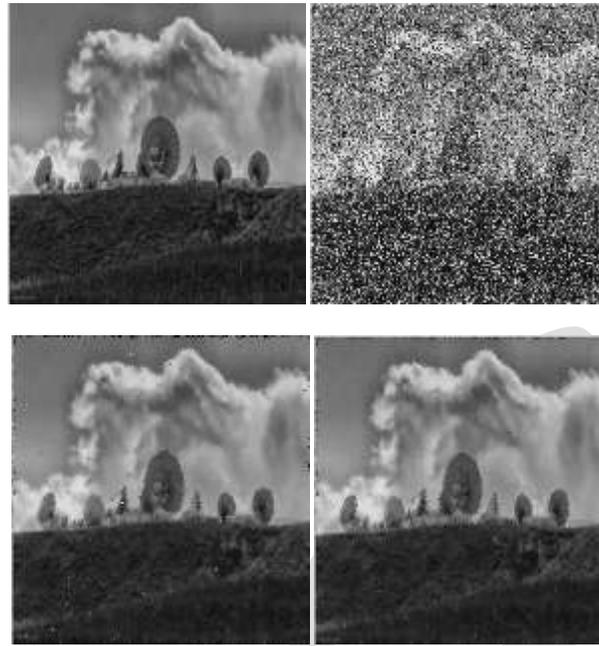


Fig.6 Test Image 3

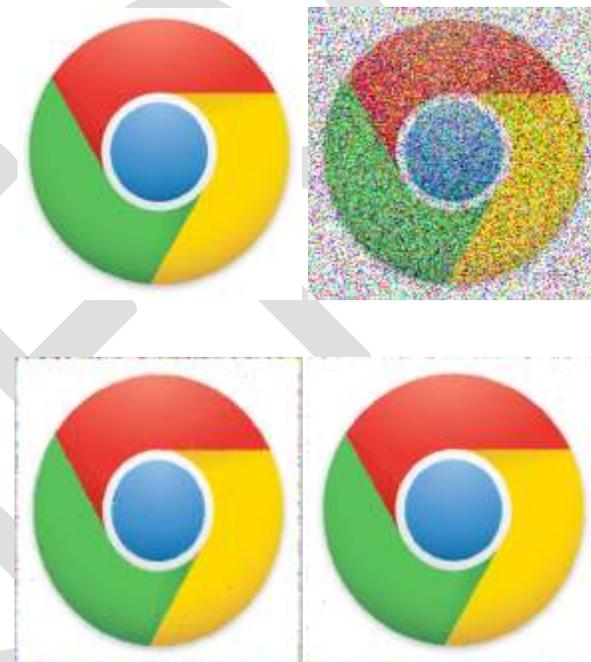


Fig. 7 Test Image 4

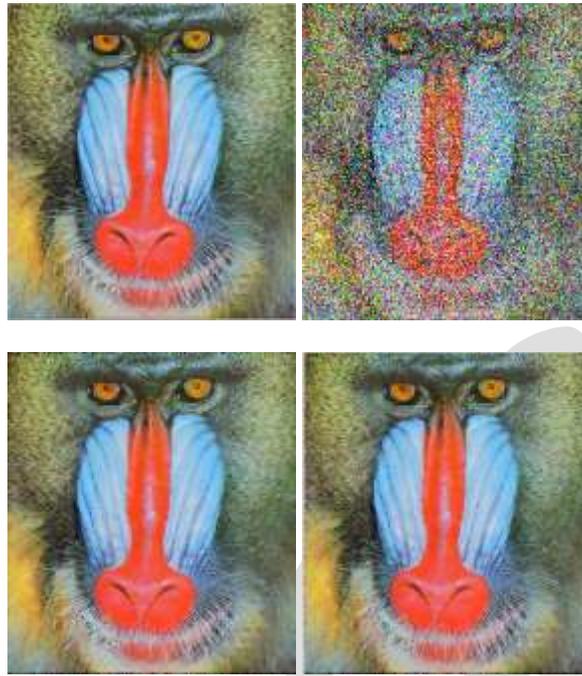


Fig. 8 Test Image 5

CONCLUSION AND FUTURE WORK

In this paper, an improved LOFBDND method is proposed to restore the images which are corrupted with high density SPN. The proposed algorithm tries to identify noisy pixels and restore them properly and do not give false alarms at pixels those are present on edges. A quantitative comparison of proposed algorithm is also done with the existing noise removal algorithms in terms of PSNR, MAE, FA, and MD. Simulation of the proposed algorithm is done in MATLAB 7.11 R2010b (32 bit). The Operating System is Windows XP Professional (Service Pack 3). The performance of the algorithm has been tested on both color and gray-scale images at varying noise densities. It is evident from the experimental results that proposed algorithm gives better performance both visibly and quantitatively.

This work can be carried further for improvement of the quality of the output image. Filtering stage can be improved by using cascading windows or by using open close sequence filter.

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IJERGS

A Survey: A Flexible Approach to Instant-Fuzzy Search Using Effective Phrase Indexing and Segmentation with Proximity Rankin

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Abstract—Instant search is basically important task for the user to get effective responses to the query when user typing a query in search engine. Fuzzy search used to improve user search experiences by finding relevant answers with keywords similar to query keywords. We are using phrase threshold value which is used to limit the answer set generated by instant fuzzy search. For that main challenge is that to improve the speed of performance as well as minimize answer set to retrieval of desired documents for the user query. At the same time, we also need better ranking functions that consider the proximity of keywords to compute relevance scores. In this paper, we study how to compute proximity information into ranking in instant-fuzzy search while achieving efficient time and space complexities. A phrase base indexing technique is used to overcome the space and time limitations of these solutions, we propose an approach that focuses on common phrases in the database. We study how to index these phrase threshold value and compare user threshold for effective answer set and develop an computational algorithm for efficiently segmenting a query into phrases and computing these phrases using algorithm to find relevant answers to the user query.

Keywords—instant search, fuzzy search, phrase threshold

INTRODUCTION

Generally, instant search is an important in Information Retrieval(IR) for user to get fast response from search engine when user typing an query.[1] Instant search is said to be effective when it gives faster retrieval of answer set with minimum computational time. It is known that to achieve an instant speed for humans, from the time a user types in a character to the time the results are shown in answer set, the total time should be less than 100 milliseconds [7]. It is needed to consider time goes in network delay, time on the search server to find relevant documents to the query, and the time of running code on the device of the user such as web browser. Thus the amount of time the server can spend is even less. At the same time, compared to traditional search systems, instant search can result in more queries on the server since each keystroke can invoke a query, thus it requires a higher speed of the search process to meet the requirement of a high query throughput. What makes the computation even more challenging is that the server also needs to retrieve high-quality answers to a query given a limited amount of time to meet the information need of the user.[8]

Basically, text related interfaces have been undergoing a sea change in the last few years. An autocompletion mechanism unobtrusively prompts the user with a set of suggestions, each of which is a suffix, or completion, of the user's current input. This allows the user to avoid unnecessary typing, hence saving not just time but also user cognitive burden.[2]

Especially, management of string data in databases and information systems increased huge importance in current time. If suppose, given a collection of strings, efficiently identify the ones similar to a given query string. Such a query is called an "approximate string search." This problem is of great interest for a variety of applications, as illustrated by the following examples.

Generally, information from multiple data sources often have numerous inconsistencies as data may be present in different formats. For example, the same real-world entity can be represented in slightly different formats, such as "PO Box 13, Main St." and "P.O. Box 13, Main St". Errors can also be introduced due to irregularities in the data collection process, from human mistakes, and many other causes. For these reasons, one of the main goals of data cleaning is to find similar entities within a collection, or all similar pairs of entities across a number of collections.

Users may pose SQL queries to a DBMS that contain selection predicates that do not match all of the relevant data within the database exactly. The reasons are possible errors in the query, may be inconsistencies in the data, limited knowledge about the data, and more. By supporting query relaxation, the DBMS can return data of potential interest to the user, based on query predicate similarity (e.g., returning “Steve Smith” as an answer to the query “Steven Smith”).

It is needed to retrieve the relevant answer set to user query while user is typing in a search engine (e.g., Google or Yahoo search box with a drop-down suggestion menu that updates as users type). These interactive search boxes are ubiquitous and have shown to be very important in practice, because they limit the number of errors made by users and also reduce the number of query reformulations submitted in order to find the one that will yield satisfying results to the user. The drawback of almost all existing, interactive techniques is that they support only prefix or substring matches, without regard for fuzzy, approximate searching; if users make a spelling mistake, they are presented with an empty suggestion box. One reason is that interactive approximate string search has attracted little attention and is not a trivial problem to solve, given the expensive nature of string similarity functions and ranking techniques.[3]

Problem statement :

In this paper, we study how to integrate proximity information into ranking in instant-fuzzy search to compute relevant answers to the query[8]. The proximity of matching keywords in answers is an important function to determine the relevance of the answers. User queries typically contain correlated keywords, as well as some pattern based phrases and to answers to these keywords or phrases together are more likely what the user is looking for. [15]

For example, if the user types in a search engine as a search query “Sachin Tendulkar”, the user is most likely looking for the records containing information about the cricketer Sachin Tendulkar, while documents containing “Sachin Pilgaonkar”. Existing system have limitation to respond to user query, as it requires mostly three phrases to enter for proximity instant search and it is time consuming. To achieve exact matches needed to user, we adapt instant fuzzy search. There is a need to minimize time and space tradeoff for retrieval of user query while user typing a query.

LITERATURE SURVEY

Significant works have been done in instant search in which system finds answer to query while user types in keyword character-by-character. Some researches defined the techniques to integrate proximity information into ranking in instant fuzzy search.

In [1], a Proximity Probabilistic Model (PPM) that uses and advances a bag-of-words probabilistic retrieval model. In this paper, a document is transformed to a pseudo document form, in which a term count is propagated to other nearby terms. Then they consider three heuristics, i.e., the distance of two query term occurrences, their order, and assigned term weights, which can be viewed as a pseudo term frequency. Finally, integrate term proximity into the probabilistic model BM25 by using the pseudo term frequency to replace term frequency.

In [2], author studied the problem of autocompletion at the level of a multi-word “phrase” which is appeared in a query. There are two main challenges: one is that the number of phrases (both the number possible as well as the number actually observed in a corpus) is combinatorially larger than the number of words; the second is that a “phrase”, unlike a “word”, does not have a well-defined boundary, so that the autocompletion system has to decide not just what to predict, but also how far away these phrases indeed. For that implementation they introduced a FussyTree structure to address the first challenge and the concept of a significant phrase to address the second challenge. They developed a probabilistically driven multiple completion choice model, and exploit features such as frequency distributions to improve the quality of our suffix completions. They experimentally demonstrate the practicability and value of our technique for an email composition application and show that we can save approximately a fifth of the keystrokes typed.

In [3], author studied how to provide a comprehensive overview of recent research progress on the important problem of approximate search in string collections. We identify existing indexes, search algorithms, filtering strategies, selectivity estimation techniques and other work, and comment on their respective merits and limitations.

In [4], author present the first large-scale study of user in- teractions with auto-completion based on query logs of Bing, a commercial search engine. Their results confirm that lower-ranked auto-completion suggestions receive substantially lower engagement than those ranked higher. They also observe that users are most likely to engage with auto-completion after typing about half of the query, and in particular at word boundaries. Author noticed that the likelihood of using auto-completion varies with the distance of query characters on the keyboard. Finally, the results reported in their study provide valuable insights for understanding user engagement with autocompletion, and are likely to inform the design of more effective QAC systems.

In [5], author implemented a novel and probabilistic approach to string transformation, which is both accurate and efficient for the retrieval of answer set. This approach includes the use of a log linear model, a method for training the model, and an algorithm for generating the top k candidates, whether there is or is not a predefined dictionary. The log linear model is defined as a conditional probability distribution of an output string and a rule set for the transformation conditioned on an input string. The learning method employs maximum likelihood estimation for parameter estimation. The string generation algorithm based on pruning is guaranteed to generate the optimal top-k candidates. This method is applied to correction of spelling errors in queries as well as reformulation of queries in web search. Experimental results on large scale data show that the proposed approach is very accurate and efficient improving upon existing methods in terms of accuracy and efficiency in different settings.

In our work, we are using effective phrase indexing to improve speed of performance to instant query search.

IMPLEMENTATION DETAILS

Limitations of Existing System

A main disadvantage of existing approach is that its perfor- mance can be low if there are many results matching the query keywords, which may take a lot of time to compute, rank, and sort. Thus it may not meet the high-performance requirement in an instant-search system.

To solve this problem, we propose a technique that can find the most relevant answers without generating all the candidate answers. In this approach, the inverted list of a keyword is ordered based on the relevancy of the keyword to the records on the list. This order guarantees that more relevant records for a keyword are processed earlier.

In order to support term proximity ranking in top-k query processing, introduces an additional term-pair index, which contains all the term pairs within a window size w in a document along with their proximity information.

Given a query $q = ht_1, t_2i$, if the index contains the pairs (t_1, t_2) or (t_2, t_1) , their inverted lists are processed, their relevancy scores are computed based on the linear combination of content-based score and the proximity score, and the temporary top-k answer list is maintained. Then the top- k answer computation continues with the inverted lists of single keywords t_1 and t_2 . Since the answers computed in the first step have high proximity scores, the early termination condition can be quickly satisfied in the second step.

Finally, a phrase is a sequence of keywords that has high probability to appear in the records and queries. We study how to utilize phrase matching efficiently to improve ranking in this top-k computation framework.

Proposed System Architectue

Fig. 1 shows proposed architecture of system indicating computation of valid phrases to the user query continuously when user interacts. These collected phrases are will be stored in dataset for further use of comparison when user enters keywords as a query.

We are preparing valid phrase based indexing and making tree based structure to store these phrases to fast retrieval when user enters a query. Next step is to develop effective query plan that helps to generate valid segmentation and ranking only top-k answers to the query.

Proposed system will overcome limitation of existing system as we are dealing with minimizing top-k answers by effective phrase indexing and segmenting those phrases in proper order. We are preparing an threshold value for the top-k answer that will help to ignore unwanted search of documents.

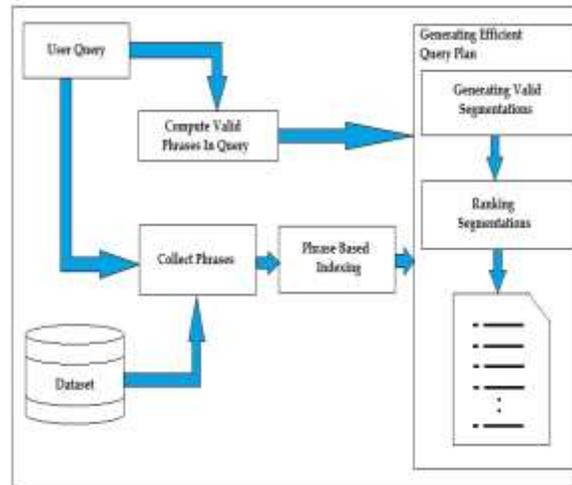


Fig.1 Proposed System Architecture

Fig.2 Mathematical Model for Proposed System

- **Ranking Segmentations with proper allocation:**

When we collect all generated segmentation for desired phrases, a way of accessing the indexes to compute its answer set. Then Query Plan Builder will rank these segmentations to decide the final query plan, which is supposed to be an order of segmentations to be executed. We can run these segmentations one by one until we find enough answers the query. Thus, the ranking needs to guarantee that the answers to a high-rank segmentation are more relevant than the answers to a low-rank segmentation. There are different methods to rank a segmentation. Segmentation comparator used to decide the final order of the segmentations. This comparator compares two segmentations at a time based on the following features and decides which segmentation has a higher ranking: Firstly, it will points summation between phrases and compares these phrases; Also, checks number of phrases available in the segmentation. The comparator ranks the segmentation that has the smaller minimum edit distance

summation higher. If two segmentations have the same total minimum edit distance, then it ranks the segmentation with higher value. As an example, for the query $q = \langle \text{hart}, \text{surgery} \rangle$, consider the segmentation “hart | surgery” with two valid phrases. Each of them has an exact match in the dictionary D , so its summation of minimum edit distances is 0. Consider another segmentation “hart surgery” with one valid phrase. This phrase has an edit distance 1 to the term “heart surgery”, which is minimum. Using this method, we would rank the first segmentation higher due to its small total edit distance. If two segmentations have the same total minimum edit distance, then we can rank the segmentation with fewer segments higher. When there are fewer phrases in a segmentation, the number of keywords in a phrase increases. Having more keywords in a phrase can result in better answers because more keywords appear next to each other in the answers. If two segmentations have both the same total minimum distance and the number of phrases, then we assume they have the same rank.

It is noticed that the answers to the segmentation where each keyword is a separate phrase include the answers to all the other segmentations. Therefore, once this segmentation is executed, there is no need to execute the rest of the segmentations in the plan. In the $q = \langle \text{hart}, \text{surgery} \rangle$ example, the segmentation “hart surgery” is discarded from the query plan since the segmentation “hart | surgery” is ranked higher due to its smaller edit distance.

Basically, our approach to reducing time to rank answer documents using effective phrase indexing and proper segmentation.

- **Query Time for Proposed System:**

We can compare existing systems query time is much larger. Our proposed system works on indexing valid phrases and retrieving these valid phrases from the database which is already stored. We are proposing segmentation of query using effective query plan. Proposed system is designed in a such a way that it take only specified threshold answer sets.

Fig.3 shows the relation between the number keywords and computational time in milliseconds. The time required to retrieve ranked documents using instant fuzzy search by applying effective phrase indexing and segmenting those phrases with proximity ranking is minimum than existing system.

CONCLUSION

In this paper we study how to improve instant-fuzzy search by effective phrase index identification and segmenting those phrases with proper indexing by considering proximity information when we need to compute top-k answers. We studied how to adapt existing solutions to solve this problem, including computing valid phrases, computing all answers, doing early termination, and indexing term pairs. We proposed a technique to index important phrases to avoid the large space overhead of indexing all word grams by effective phrase identification and segmenting. We compared our techniques to the instant fuzzy adaptations of basic approaches. We conducted a very thorough analysis by considering space, time, and relevancy tradeoffs of these approaches. In particular, our experiments on real data will show the efficiency of the proposed technique for maximum of

2-keyword and for 3-keywords for some queries that are common in search applications. We concluded that minimizing top-k answer to the user query.

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BUS RAPID TRANSIT SYSTEM

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Abstract: The bus systems in India are not as efficient as the railways. In order to bring out the same efficiency in bus systems, the BRTS (Bus Rapid Transit System) is designed. The BRTS involves use of two technologies, the RFID (Radio Frequency Identification) and GPRS (General Packet Radio Service). The whereabouts of each bus passing through a particular bus station is given to all the other bus stations present in the route. The time of departure and arrival is stated. Visual Basic is used as the front end and SQL is used as the back end in the project.

Keywords: BRTS, GUI, GPRS, RFID, SQL, VB.Net, Webpage

1. Introduction

BRTS [1] has been recorded in the literature with the variations made with the buses used for transport. There have been buses with radio and television, an automatic ticket collector and air conditioned buses. None of the above stated changes have made the Bus transport system efficient for the users.

The main disadvantage of using public transportation [2] is irregularity in scheduling. In some regions, the mass transit is limited and hence is available only after specific durations. Travelers with disabilities need to make a pre-trip investigation. Furthermore, some of the transit systems do not work on public holidays or weekends.

All these reasons have led to the design of BRTS [1][3]. This system will basically increase the speed of the transport system in India. The passengers will be well aware of the bus timing which would make it convenient for their travel. The system would become very efficient after the use of the system. It would make the system faster and simpler.

2. Proposed System

BRT system uses two technologies, RFID and GPRS. Radio Frequency Identification (RFID) tags have emerged as a key technology for real-time asset tracking [4]. It is an automated identification technology that allows for reading of data without contact making it attractive in vehicles. RFID readers can read tags even when they are hidden.

In this system, there is a RFID tag located on the bus and a RFID reader is present at a particular height at the bus station. As soon as the bus arrives at the first station the RFID reader will read the unique address from the RFID tag. The RFID reader is connected to the processor via RS232. The data is then sent to the processor. The processor is programmed using Visual Basic. The time of arrival of the bus and the name of the bus is stored in the database. The processor already contains a look-up table that contains the unique address of each bus against its registration number. This enables us to know which bus has arrived at the station. The information is then loaded into the server. The server updates the information in the database and forwards it to the other stations using GPRS. Every station has a web page that is interconnected and will be refreshed automatically so that every latest entry of the bus can be entered.

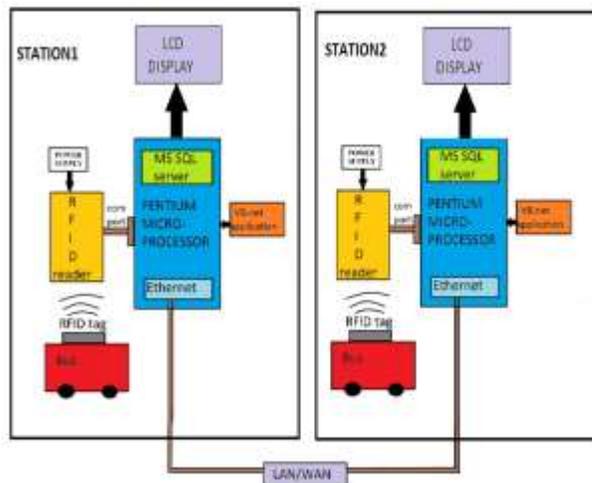


Fig1: Block Diagram

As the bus arrives at a particular station, the other stations will be informed about the time that will be required to reach their stations. This enables the passengers to know where the bus is currently present, and in how much time the bus is expected at the desired stop [5]. All this information will be displayed on a LCD display present at the stations.

RFID (Radio Frequency Identification):

RFID devices can be classified mainly as Active and Passive devices.

Active tags require a power source—they are either connected to a powered infrastructure or use energy stored in an integrated battery. In case of active tags, a tag’s lifetime is limited by the stored energy, balanced against the number of read operations the device must undergo. However, batteries make the cost, size, and lifetime of active tags impractical for the retail trade. The lifetime, size and cost depend on the battery which makes it impractical for retail use.

Passive RFID tags do not require batteries or maintenance. The tags have an indefinite operational life and are small enough to fit into a practical adhesive label. A passive tag consists of three parts: an antenna, a semi conductor chip attached to the antenna, and some form of encapsulation. The tag reader provides power and communicates with the tag. The tag antenna captures energy and transfers the tag’s ID which is co-ordinated by the tag chip. The encapsulation protects the antenna and chip from being damaged by environmental reagents. Encapsulation also provides the tag integrity. The encapsulation is a small glass or a laminar plastic substrate with adhesive on one side to enable easy attachment.

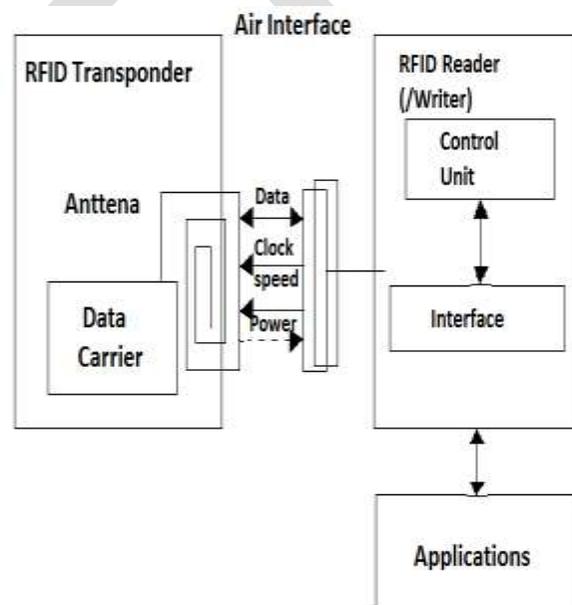


Fig2: RFID working principle

RFID technology consists of a tag, reader and middleware.

RFID Reader:

RFID uses radio frequency electromagnetic waves to transfer the data from a tag that may be attached to any object for the purpose of identification. The RFID Reader is as shown in Fig 3. and reads any tag that is within its range.



Fig3: RFID Reader

The data is transmitted over serial line which can be read easily. The reader has an LED for power indication and also a buzzer that indicates presence of a card. The reader shown in Fig3 can detect cards in the range of 8-10cm.

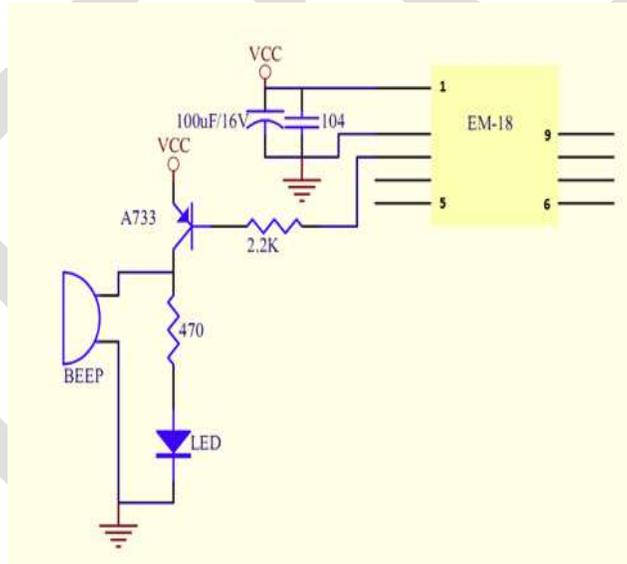


Fig4: EM-18 Application Circuit

Table1: EM-18 PINOUT

1	VCC	5V
2	GND	GND
3	BEEP	BEEP AND LED
4	ANT	NO USE
5	ANT	NO USE
6	SEL	HIGH IS RS232, LOW IS WEIGAND
7	RS232	RS232

8	D1	WEIGAND DATA 1
9	D0	WEIGAND DATA 0

RFID Tag:

The tag contains electronically stored information which can be read from up to several meters away. A barcode needs to be in line of sight of the reader. This is not the case with RFID tags and may be embedded in the tracked object. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response.



Fig4: RFID reader

The tag's information is stored electronically in a non-volatile memory. The RFID tag includes a small RF transmitter and receiver. An RFID reader transmits an encoded radio signal to interrogate the tag. The tag receives the message and responds with its identification information. This may be only a unique tag serial number, or may be product-related information such as a stock number, lot or batch number, production date, or other specific information.

RFID tags contain at least two parts:

1. An integrated circuit for storing and processing information, modulating and demodulating a radio frequency (RF) signal, collecting DC power from the incident reader signal, and other specialized functions
2. An antenna for receiving and transmitting the signal.

Signaling between the reader and the tag is done in several different incompatible ways, depending on the frequency band used by the tag. An Electronic Product Code (EPC) is one common type of data stored in a tag. When written into the tag by an RFID printer, the tag contains a 96-bit string of data. The first eight bits are a header which identifies the version of the protocol. The next 28 bits identify the organization that manages the data for this tag; the organization number is assigned by the EPC Global consortium. The next 24 bits are an object class, identifying the kind of product, the last 36 bits are a unique serial number for a particular tag.

GPRS (General Packet Radio Service):

GPRS is a wireless mode of communication that has a wide range of applications. It provides uninterrupted data transfer at the rate of 56-114kbps to all the users. It is integrated into GSM.

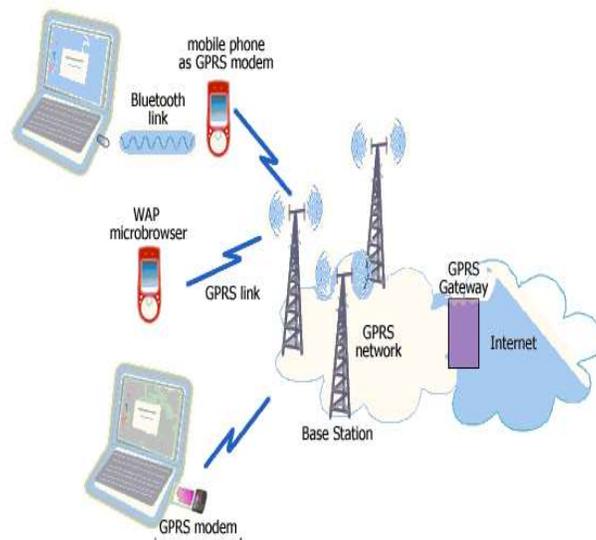


Fig5: GPRS Structure

Currently being maintained by the 3GPP (3rd Generation Partnership Project), It provides a certain quality of service.

SOFTWARE FUNCTIONING:

1. Data is monitored using COM port

When the bus arrives at a station, the reader reads the unique identification number and sends the data serially to the central control unit. The Software functioning is shown in fig 6.

2. Bus ID is identified by the database

There is a database created at the central unit that contains the ID of a tag attached to a bus against its registration number. The database is created in SQL (Sequential Query Language). As the data from a station is received, it is looked up in the existing database.

3. Bus is identified using look up table

After the reception of the ID, it is compared with the data present in the look up table, from where the route of the bus is identified.

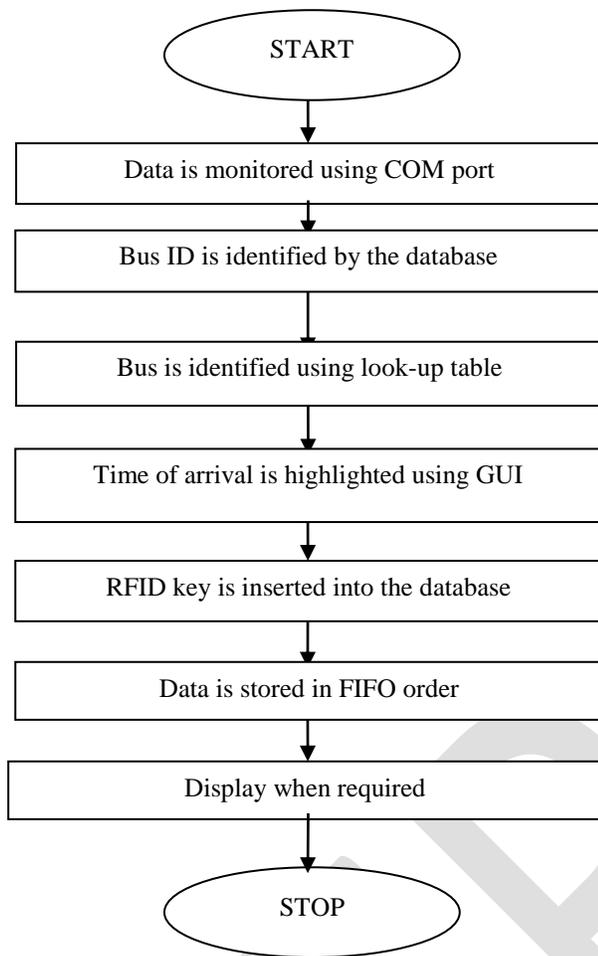


Fig6: Software Functioning

4. Time of arrival is highlighted using GUI

Every station including the central unit has a login page created using Visual Studio. This acts as the frontend of the system. The time of arrival of the bus is stored and is sent to all others stations in the route via GPRS. All the information is transferred to and read from a private webpage that is created especially for the system. It is integrated using the IIS (Internet Information Service). This ensures speed and less congestion in the network path.

5. RFID key is inserted into the database

The RFID key i.e. the identification number is inserted in the database which indicates the bus name and number.

6. Data is stored in FIFO order

The data that is received is stored in as first in first out order. The data is stored in another temporary database that has limited number of entries. As the database gets full, the oldest data in the database is deleted.

7. Display when required

Every station has a LCD display connected to the processor. As the database is updated, the information is displayed in the LCD and the travelers can get the whereabouts of a required bus and other additional information.

3. Result

Using this technique every module were tested the following results were obtained. Fig7 shows the Login page created in Visual Studio using VB.Net. This login page is present at control unit. Fig8 shows the webpage after the authority logs into his system and connection is established with the system. Fig9 is the temporary database created for the entries of the bus. Fig 10 shows the webpage for the local host, which would be present for every station other than the central control unit. Fig11 shows the connection of the local host with the system. Fig12 shows the webpage linked with the local host. Fig13 shows the data that is received and can be displayed on the LCD. Fig 14 represents IIS debugging.



Fig7 : Login page



Fig8: Connection established

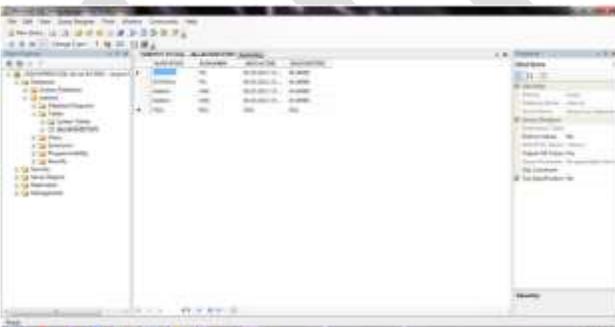


Fig9: Entries recorded into SQL Server

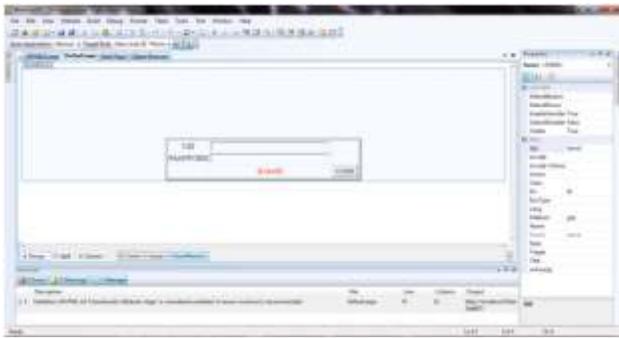


Fig10: Webpage created



Fig11: Local host created

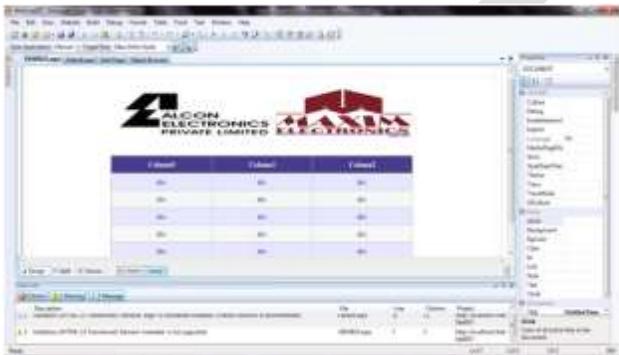


Fig12: Webpage created



Fig13: Webpage on each station



Fig14: IIS debugging\

4. Conclusion

The BRTS has been implemented using RFID and GPRS. The system increased passenger convenience and thus made it more reliable. The use of passive RFID makes the system cost efficient. The webpage created is used exclusively by the authorities and hence reduces congestion in the network. This increases the speed and makes it more efficient than the existing system.

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MITIGATION OF SUBSYNCHRONOUS RESONANCE IN SERIES COMPENSATED WIND FARM USING UPFC AND ANN WITH BACK PROPAGATION ALGORITHM

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Abstract— FACTS devices have shown effective functionalities in promoting the system operation security and service reliability. UPFC Versatile of FACTS controllers, yield simultaneous control of all basic power system parameters. Subsynchronous Resonance has been identified as a serious problem for conventional turbine Generators due to the application of series capacitors. Moreover Wind turbine generators are also susceptible to Subsynchronous oscillations and other resonant interactions. Artificial Neural Network(ANN) using Back propagation Algorithm can be used with promising results as it has good ability of Non-linear mapping with self organization and self learning capability, it also requires less computational time and ANN is trained to store solution without excessive memory storage requirements. UPFC joined with artificial neural network could respond and damp both Subsynchronous resonance and Subsynchronous oscillations respectively. It has been demonstrated in MATLAB/Simulink and shown with better damping of oscillations.

I INTRODUCTION

Series compensated long transmission lines in order to improve power transmission networks are in the power of great importance [1]. Series compensation of transmission lines, decreasing the normal load impedance by increasing the electrical length of the line, had a notable impact in promoting stable and improves voltage [2]. Compensated in such networks, electrical networks and modes of interaction between states leads to a phenomenon harmful to the mechanical shaft of the turbine generator under synchronous oscillations (SSR) is [3]. Sub-synchronous resonance phenomenon often occurs in series with the capacitor compensated systems. SSR oscillation phenomenon is that it occurs in the range of electrical and mechanical oscillations gradually increases, and the turbine rotor - Generator simultaneously is that the fluctuations it is not controlled and proper protection, these fluctuations can lead to fatigue or even broken rotor axis [2]. WIND power based generation has been rapidly growing world wide during past decade [4]. In order to transmit large amounts of wind power over long distances, system planners may often add series compensation to existing transmission systems for enhanced power transfer capability. Subsynchronous Resonance (SSR) has been identified as a problem for conventional turbine generators due to the application of series capacitors [5], [6]. Wind turbine generators may also susceptible to subsynchronous oscillations or other resonant interactions [7],[8].

Series capacitors have been extensively used as a very effective means of increasing power transfer capability of transmission system [1]. This is due to partially compensating the reactance of the transmission lines. However, the use of series capacitors may lead to the phenomenon of subsynchronous resonance. Under a disturbance, series capacitors may excite subsynchronous oscillations, when electrical resonant frequency of the network is close to natural torsional mode frequency of turbine-generator shaft [2]. Under such circumstance the shaft will oscillate at this natural frequency. This oscillation might grow to uncertain limit in seconds resulting in shaft fatigue and possibly damage and failure [2]. Therefore, there is a need to investigate and analyse Subsynchronous resonance when planning inclusion of series capacitors for new or existing power system. Subsynchronous resonance is categorized in three categories, induction generator effect, torsional interaction and torque amplification. In all aspects, subsynchronous resonance is due to the interaction of a series capacitor with turbine-generator.

II SUBSYNCHRONOUS RESONANCE AND SUBSYNCHRONOUS OSCILLATIONS

WIND power based generation has been rapidly growing world-wide during the recent past. In order to transmit large amounts of wind power over long distances, system planners may often add series compensation to existing transmission systems for enhanced

power transfer capability. Subsynchronous Resonance (SSR) has been identified as a problem for conventional turbine generators due to the application of series capacitors [2], [3]. Wind turbine generators may also be susceptible to subsynchronous oscillations or other resonant interactions [4],[5]. However, not much information is available in literature about such interaction possibilities. Subsynchronous resonance is a phenomenon in which the resonant frequency of the turbine generator shaft coincides with a natural resonant frequency of the electrical system such that there is a sustained, cyclic exchange of energy between the mechanical shaft and the electrical system. This exchange of energy results in torsional stress on the turbine generator shaft that can lead to severe damage. In extreme cases, the shaft can actually fracture. Subsynchronous resonance (SSR) is a dynamic phenomenon of interest in power systems that have certain special characteristics. Subsynchronous resonance is an electric power system condition where the electric network exchanges energy with a turbine generator at one or more of the natural frequencies of the combined system below the synchronous frequency of the system.[2]

The definition includes any system condition that provides the opportunity for an exchange of energy at a given subsynchronous frequency.

III. UNIFIED POWER FLOW CONTROLLER (UPFC)

The Unified Power Flow Controller (UPFC) is a typical FACTS (Flexible AC Transmission Systems) device that is the most sophisticated and complex power electronic equipment and has emerged for the control and optimization of power flow and also to regulate the voltage in electrical power transmission system. This project propose the mitigation SSR and oscillations by placing UPFC in the transmission line with suitable controllers[10].

A Unified Power Flow Controller (or UPFC) is an electrical device for providing fast-acting reactive power compensation on high-voltage electricity transmission networks. The controller can control active and reactive power flows in a transmission line. The UPFC uses solid state devices, which provide functional flexibility, generally not attainable by conventional thyristor controlled systems. The UPFC is a combination of a static synchronous compensator (STATCOM) and a static synchronous series compensator (SSSC) coupled via a common DC voltage link[10].

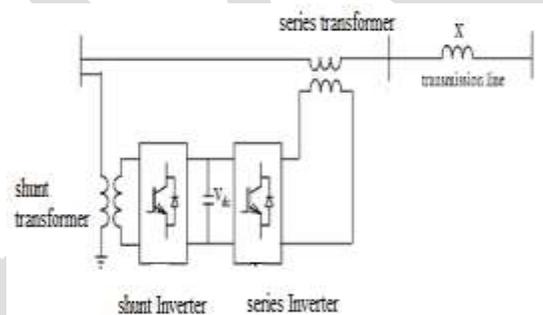


Fig:1 Schematic Diagram of UPFC

The UPFC allows a secondary but important function such as stability control to suppress power system oscillations improving the transient stability of power system. The UPFC can provide simultaneous control of all basic power system parameters (transmission voltage, impedance and phase angle). The controller can fulfill functions of reactive shunt compensation, series compensation and phase shifting meeting multiple control objectives[7].

UPFC consists of two inverters connected back to back with DC link capacitor as shown in. One inverter is connected in shunt and the other in series with the transmission line. Such an arrangement allows for all the three functions namely series, shunt and phase angle compensation to be unified in one unit[8].

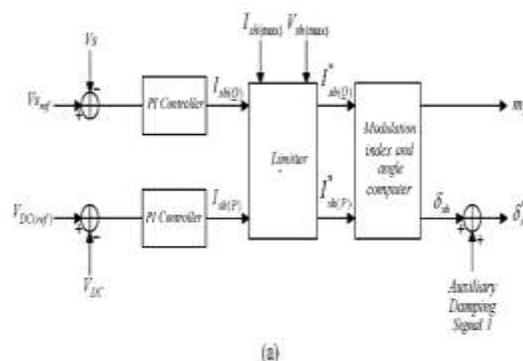
Shunt Inverter is connected to a shunt transformer and the series inverter is connected to a series transformer. It is readily seen that the inverter connected to the shunt transformer can perform the function of a variable reactive power source similar to that of shunt compensator. In addition, the shunt inverter can charge the DC link capacitor.

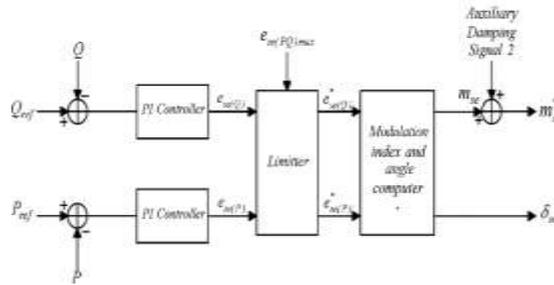
Series inverter can provide series or phase angle compensation by injecting a series voltage of proper phase relationship. In the case of series compensation, series inverter can function independent of the shunt inverter, as series inverter supplies consumes only reactive power and does not have any real power exchange with shunt inverter. In such case the DC link capacitor voltage will ideally be constant.

IV. EXISTING SYSTEM

UPFC with SSD(Subsynchronous Resonance damping controller)

The UPFC control system, does not provide, by itself, the essential damping of oscillations since its primary mission is to regulate the bus voltage and to control the power flow in corresponding transmission line. However, the UPFC controllable signals including $m_{sh}, \delta_{sh}, m_{se}$ and δ_{se} , can be modulated in a desired way to provide some other ancillary duties such as SSD, power oscillation damping, etc. In order to achieve an effective damping of SSR, from the reference[14] it is understood that it is indispensable to apply synchronized tuning of UPFC with auxiliary SSD controllers. Fig. 3 presents two controllers which are respectively granted to shunt and series branch control systems. Two controllers depicted by Fig. 3 generate auxiliary signals for the main control circuits shown in Fig. 2. Referring to Fig. 2, with the aim of achieving effective damping of oscillations, the output of SSD controller is utilized to modulate δ_{sh} in shunt converter. In contrast, the output of SSD controller in conjunction with the series branch is devised to regulate m_{se} with the aim of providing the proper damping. As illustrated in Fig. 3 a gain block, a washout filter, and a lead-lag compensator comprise the building blocks of a SSD controller. Δ_w signifies the angular frequency difference and is speculated as the feedback input signal [14]. The design process for each SSD controller is such that an additional electrical torque, which is in phase with the speed deviation, it would be produced to improve the damping of oscillations [15]. The gain settings for SSDs are determined such that a desired damping ratio for the subsynchronous oscillations is generated. Also a washout filter is included suitably to eliminate the effect of SSDs in steady-state power conditions. Herein, a trial-and-error approach has been applied for tuning the different parameters of SSDs through the simulation studies to achieve the best damping performance. However, intelligent and heuristic algorithms might be employed as well. The generated output signals by auxiliary SSD controllers are utilized to adjust the reference settings of UPFC in order to realize the SSD objective. For the sake of comprehensive studies, three different control strategies are considered. In the first attempt, only the SSD controller is added to the shunt inverter control system. In the second trial, a single SSD controller is designed and added to the series inverter control system. Finally, it is deemed that two SSD controllers for both shunt and series inverter control systems are operating simultaneously. In this case, the total capability of UPFC could be realized.





(b)Fig 2: Block Diagram of the UPFC control system (a)shunt inverter controller(b)series inverter controller

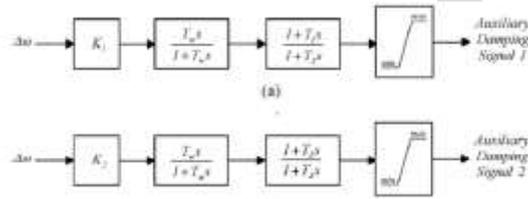


Fig 3:SSD controller (a) for shunt branch (b) for series branch.

V.PROPOSED SYSTEM

UPFC WITH ARTIFICIAL NEURAL NETWORK

A neural network is a machine that is designed to model the way in which the brain performs a particular task. The network is implemented by using electronic components or is simulated in software on a digital computer. A neural network is a massively parallel distributed processor made up of simple processing units, which has a natural propensity for storing experimental knowledge and making it available for use. Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques[16]. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse.

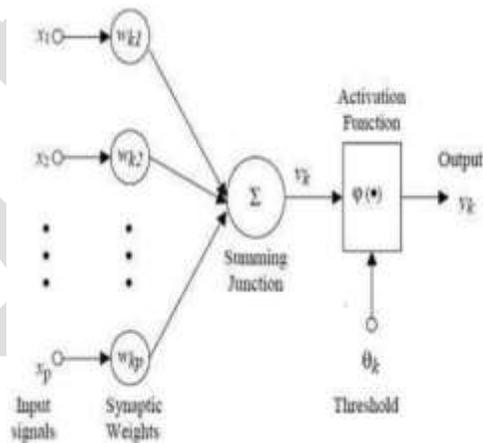
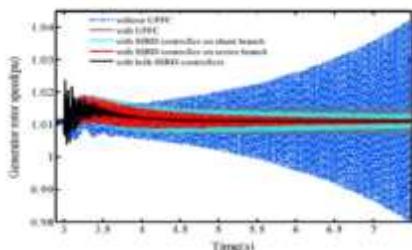


Fig 4: Model of an ANN

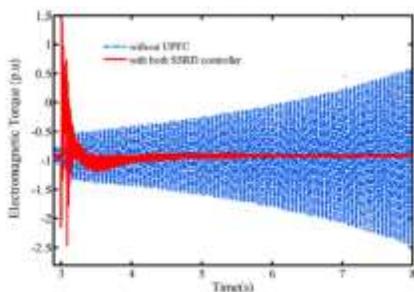
This expert can then be used to provide projections given new situations of interest and answer "what if" questions. Before the ANN can be used to adapt the controller gains in real time, it is necessary to determine a proper set of values for the connection weights. The process of reaching the connection weights is normally carried out off-line and is usually referred to as the training process. In the training process, we first compile a set of training patterns and store these training patterns in the training set. Each training pattern

comprises a set of input data and the corresponding output data. A training pattern set of training patterns, which cover a wide range of operating conditions, is finally used to train the desired ANN. It should be noted that we use two hidden layers. Main purpose of ANN is used for the reducing the error in the system, for that we are going to use training data method. In this method, we have to give both input values and desired output value for estimating the weight values, in that initial value taken as a random value[17]. UPFC is the most widely used FACTS device to control the power flow and to optimize the system stability in the transmission line. The ANN is usually made up of sigmoidal activation function neurons and back propagation is normally used to train the network either on-line or off-line. In order to train a neural network to determine the network weights and most important of all is learning to talk. Training a neural network depends on the network type. Another smart way to reduce oscillations about the synchronous oscillations can be reduced by using a neural network[18]. Usefulness of artificial neural networks are able to solve problems of power systems. They are able to input and output of a power system using constant learning process and no need to do the programming of complex.

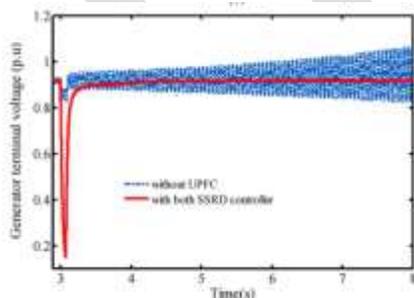
VI. SIMULATION RESULT



(a)

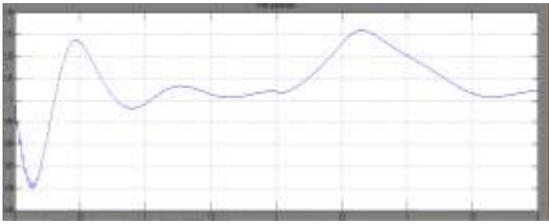


(b)

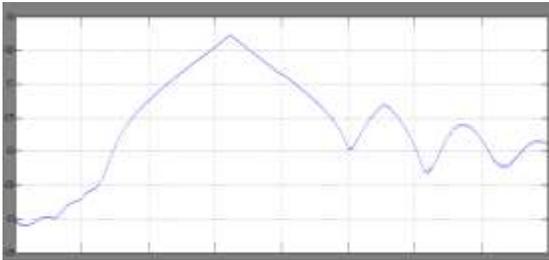


(c)

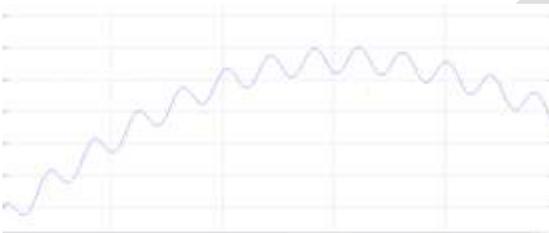
Fig 5: SSR mitigation using UPFC and SSD controller (a) generator rotor speed (b) electromagnetic torque (c) generator terminal voltage



(a)



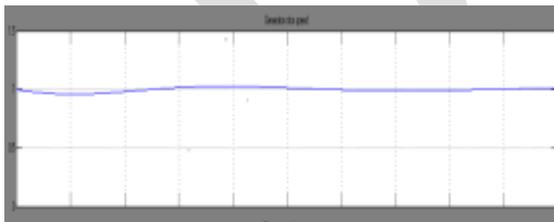
(b)



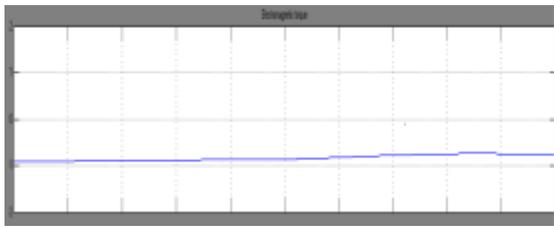
(c)

Fig 6 : Oscillations in (a)Generator rotor speed (b)Electromagnetic torque (c) Generator voltage without using UPFC

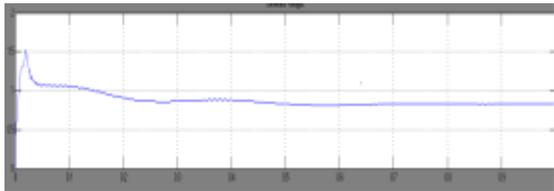
Fig 6(a),(b) displays oscillations in generator rotor speed, electromagnetic torque. Referring to Fig 6(a),(b) it is observable that, in contrast to the instability for the case without UPFC, the UPFC even with no specific controller prevents divergent SSR oscillations but the damping performance is, however, very poor.



(a)



(b)



(c)

Fig 7: SSR mitigation using UPFC and Artificial Neural Network (a) Generator rotor speed (b) Electromagnetic torque (c) Generator terminal voltage

VII. CONCLUSION

The proposed work presented a comprehensive approach for mitigating SSR and damping subsynchronous oscillations. The main cause of the Production of SSR is the Series Compensation. The study served a rather comprehensive exploration on the SSR mitigating effect yielded by the UPFC utilization in the transmission system with suitable intelligent controller. Artificial neural network should not only improve the performance of the UPFC but also it should not cause any instability in the system. The study demonstrated that UPFC with artificial neural network can simultaneously achieve SSR mitigation and subsynchronous oscillation damping.

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SUCCESSFUL LEAN IMPLEMENTATION: THE SYSTEMATIC AND SIMULTANEOUS CONSIDERATION OF SOFT AND HARD LEAN PRACTICES

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Keywords: Survey, Lean Manufacturing, success factors, Multinational, Morocco.

Abstract: Lean Manufacturing (LM) is a collective term for production practices aimed at increasing value creation and reducing waste in all forms. Although manufacturing facilities worldwide use hard lean practices, negligence of soft lean practices may widely moderate the expected results from the LM implementation. Thus, LM's success comes from both practices that they must be applied simultaneously and systematically. Using LM background, this paper aims to contribute to evaluate the maturity of both soft and hard lean manufacturing practices based on the feedback of LM projects implementation in various multinationals based in Morocco. The results revealed that the fundamentals hard lean practices are more extensively used than soft lean practices. Examining the soft lean practices implementation investigated through five logical clusters of relevant LM fundamentals, the study results depict that employee development and communication systems are less embraced and considered. Investigating what makes LM successful in a Moroccan context, top management engagement, allocation of time and resources for improvement projects, strong management's leadership, and employees' development program are voted to be the top four success factors. Through the critical lean practices and factors of success, the results of this study are used to identify directions for proposing solutions for LM implementation in the Moroccan SMEs.

Introduction

LM is an integrated and interdependent system involving many elements: the tools, the philosophy and management [48]. LM is underlined by a philosophy of continual productivity and quality improvement in the pursuit of excellence in all phases of the industrial cycle [74]. Referring to the Toyota Production System (TPS), manufacturing firms have been trying to duplicate this manufacturing system for over two decades, often under different names, e.g. total enterprise manufacturing, and world-class manufacturing. However, LM deployment, like every other organizational strategies and managerial actions, can lead to failure than to success. In fact, despite the acute awareness of LM and its purported benefits, its implementation has been relatively slow and in an ad hoc fashion [31] and several companies failed to achieve a superior performance through LM [48]. Likewise, only few manufactures have managed to imitate Toyota successfully, even though the company has been extraordinarily open about its practices. Given that largest multinationals as large organizations are generally considered to be leaders and with more success chances in LM implementation, an investigation of the status of lean practices implementation, success factors and pitfalls on the lean pathway in these companies proves very important. Thus, the main objective of this study is to explore the status of lean practices in multinational facilities based in Morocco. The status aims to discover is the implementation success, problems/barriers, and the assumption of specifics success factors role.

The remainder of this article is organized as follows: First, we present an overview of the literature and related theory of LM. Next, we describe the data, sample, and measures in Section 3. Results are analyzed in the same Section. We conclude in Section 4 and highlight future work.

Literature review

Lean Manufacturing

LM is interpreted as a managerial system that integrates specific practices and techniques to reduce internal and external process variability, also called “Muda”, recognized as the principal source of production problems [11]. Especially, LM practices are internal tools for creating a streamlined, high quality system that produces finished products at the pace of customer demand with little or no waste [68]. LM is expected to reduce manufacturing costs continuously through better quality, lower inventory, and shorter lead times. Achieving these results requires an even production flow of small lot size incorporating schedule stability, product quality, short setup times, preventive maintenance, and efficient process layout [38].

Unfortunately, there is no major consensus about a set of LM techniques in the literature reviews. [64] state that there are over 100 lean tools available in the literature reviews and there is no way systematically to link manufacturing organization problems and the possible tools to eradicate these problems. This is not very surprising because these literature reviews are based mainly on case studies, mathematical models and conceptual studies in LM [43]. For example, [68] identify twenty two LM practices and categorized them into four clusters that are: 1) Just-in-Time, 2) Total Quality Management, 3) Total Preventive Management, and 4) Human resource. For [53], there are twenty LM practices that are frequently mentioned in literatures and categorized them into six bundles associated with: 1) Just-in-time, 2) Continuous improvement, 3) Quality, 4) Eliminating of waste, 5) People management, 6) and Visual management. Some other researches also categorized the lean tools and techniques according to the area of implementation such as internally and externally oriented lean practices. For example, [63] divided the lean practices into six areas which are: 1) Process and equipment, 2) Manufacturing, 3) Planning and control human resources, 4) product Design, 5) Supplier relationship, 6) and Customer relationship. For [56], companies should lead to LM implementation in five dimensions that are: 1) Elimination of waste, 2) Continuous improvement, 3) Continuous flow and Pull-driven systems, 4) Multifunctional teams, 5) Information systems. More, in their research about implementation of LM in small sized enterprises, [58], elaborate a list of thirty seven suitable and recommendable methods and instruments to implement LM and divided them into 5 major clusters: 1) Machinery and equipment, 2) Material flow and layout, 3) Organization and staff, 4) Production planning and control, and 5) Quality. Thus, there is a wide range of LM practices available to companies for quality and efficiency improvement. Even so, the selection of appropriate lean tools for manufacturing improvement, together with their applicability, incorporation and acceptance within operations remains the major problem for any company [37].

Nevertheless, among the interesting approaches in the study of LM implementation, are those who classify the LM as a multidimensional concept that classify practices as hard or soft. Soft practices emphasize the organizational and human side in operations, quality, and performance management. On the other hand, the hard practices concern more the methodological and technical side of the LM as preventive maintenance, cellular manufacturing, continuous flow, reduced lot sizes, quick changeover times, and kanban [76]. According to [11], and in line with previous studies, technical and analytical tools introduced to a firm to improve production systems represent hard practices while practices related to principles, managerial concepts, people, and relations are soft.

Unfortunately, despite authors empirically showed that the hard part of the LM implementation is a strong predictor of manufacturing performance improvements, soft practices are crucial for achieving superior performance through LM [11]. More, the efficacy of hard practices is especially magnified when they are coherently accompanied by intangible and soft practices linked to human resource management (HRM), performance management, management leadership and support, and customer and supplier involvement. Thus, the successful use of LM practices requires more than use of hard practices (hard side), and to be able to transform the entire organization into a lean organization, the soft practices (soft side) must be implemented at all company levels [50]. In other words, as LM is an integrated socio-technical system, success comes from these two sides being applied simultaneously and systematically.

Lean manufacturing, risks and success factors

If lean practices have been shown to improve performance and drive efficiency [5], existence of specific factors in all plants successfully implemented LM has been shown too. Unfortunately, although certain success factors are suggested by different authors and many scholars have attempted to formalize the critical factors for successful LM implementation, there is actually no consensus on what the main success factors are in the literature reviews [57]. For example, according to [32], the success of LM implementation

depends on seven critical factors that are: 1) personalized demarche, 2) top management commitment, 3) allocation of resources, 4) strong communication, 5) structural methodology, 6) multifunctional teams, and 7) continuous performance measurement. For [50], the success of LM implementation depends on four critical factors: 1) leadership and management, 2) finance, 3) skills and expertise, and 4) supportive organizational culture. Too, [53] depicts that LM implementation success depends on four critical factors: 1) personalized demarche, 2) top management commitment, 3) problem solving culture, and 4) the team work. Also, [26] argument that there are four key factors for success in the implementation of a lean effort: 1) Preparation and motivation of people, 2) roles in the change process, 3) methodologies for change, and 4) environment for change. Likewise, in his research on the relationships between firm's practices and performance, [11] confirms that plants successfully implement LM are characterized by a specific organizational profile and extensively adopt soft LM practices. Consequently, it is the integration of soft practices and development of a lean culture, which in a positive case facilitates the achievement of LM promises regarding organizational benefits and customer satisfaction.

Research design and data analysis

Research design, sample selection, and analysis approach

The empirical research took place beginning of 2015. The data was captured through a survey covering various multinationals based in Morocco whose production processes related to automotive and aeronautic manufacturing. In absence of an official database related to multinationals based in morocco, the sample selection is completely random. Even so, we have selected the largest multinationals as large organizations are generally considered to be leaders and with more success chances in LM implementation [68], [10], [25], [58]. A questionnaire was developed and sent via electronic and regular mails. Emails, phone and direct contact were utilized in effort of collecting information. The survey questionnaire items were developed based on LM background. The survey questionnaire was split into the following categories with several or more questions in each category to determine:

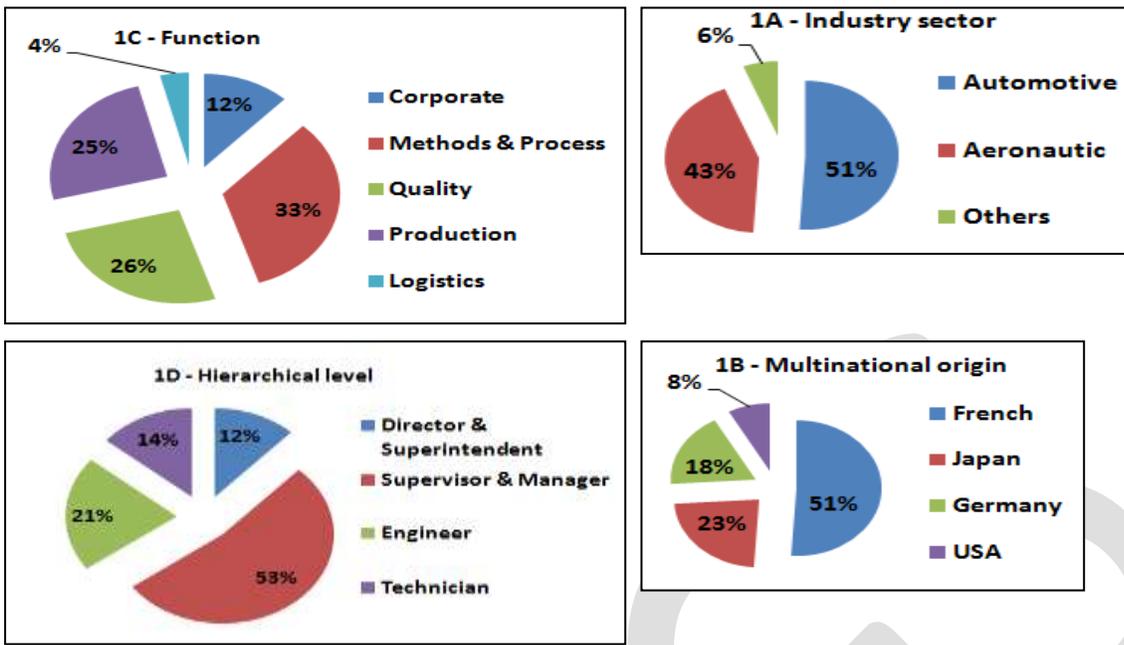
Adoption of lean hard practices,

Integration of lean soft practices,

Critical success factors for sustainable lean implementation in a Moroccan context.

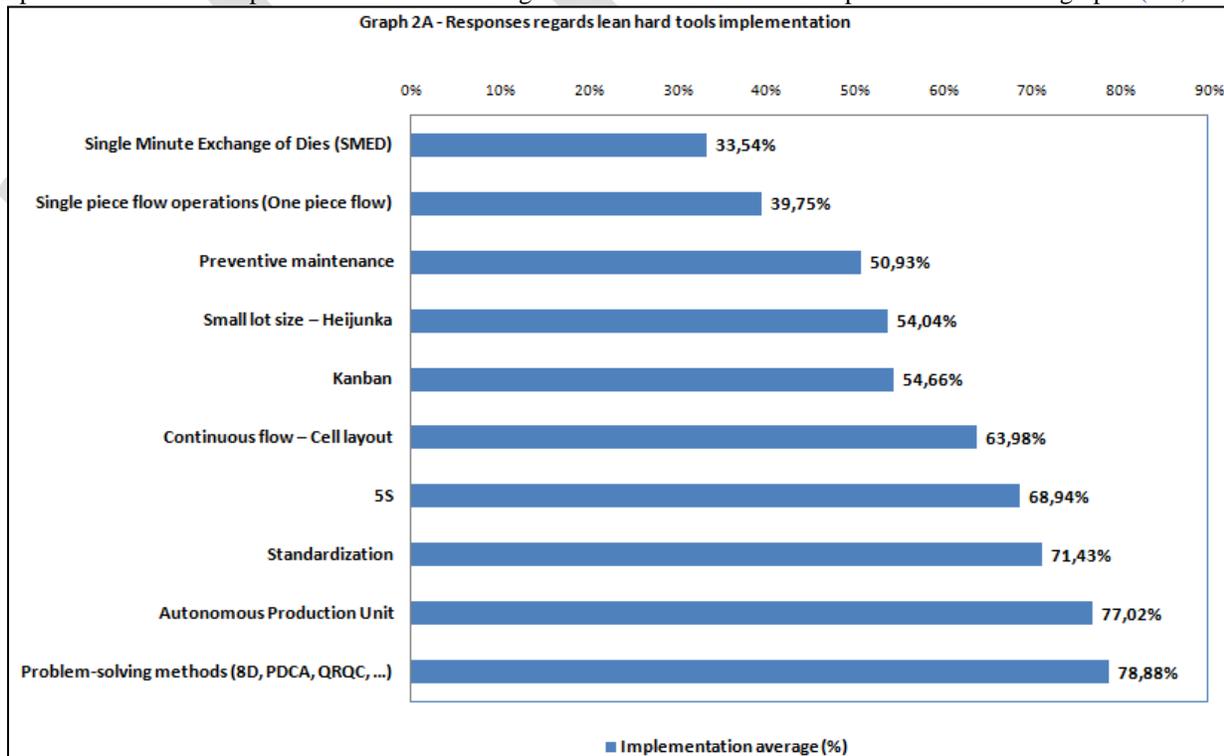
Data analysis & results

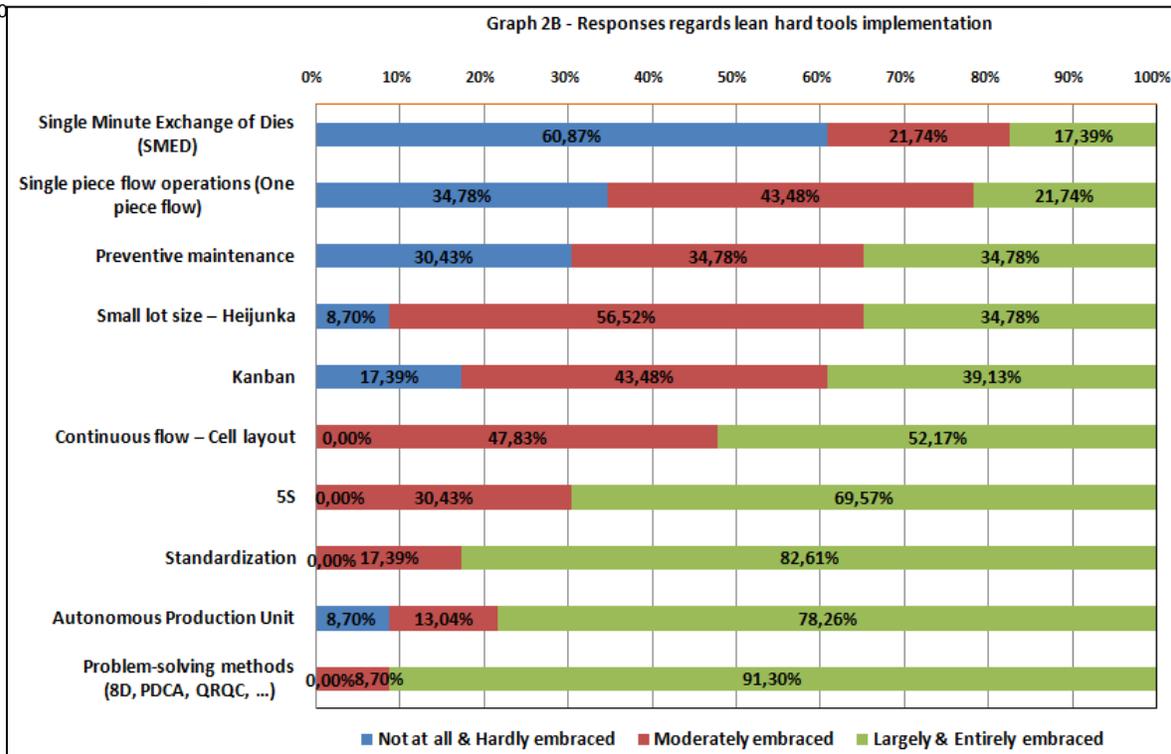
In total, 52 questionnaires have been returned, of which none had to be discarded because of insufficient data, with 32% as response rate. Graphs (1A, 1B, 1C, 1D) provide an overview of the responses by sector, by multinational origin, by function, and by hierarchical level of respondents



The responses are fairly evenly divided over the targeted sectors, the automotive sector make up exactly half of the responses (51%). The majority of the respondents to the survey were upper or middle management who were likely to have a good overview of LM practices maturity because of their daily involvement in production and planning processes. Regarding functions and hierarchical level, manager level make up half of the responses (53%), and 21% are engineer. Finally, 51% of factories are French, 23% Japanese, 18% German, and 8% American.

First we analyzed the usage of lean hard practices. The questions were created on the basis of the literature review [68], [45], [24], [11], [10], [72], [53], [66], [40], [75], [48]. A comparison of number of empirical studies on LM leads to the identification of 10 practices that are frequently cited as hard lean practices. Unsurprisingly, the entire organizations were investigated, the fundamentals hard lean practices had been implemented within their organizations and the results are presented in the bar graphs (2A, 2B).

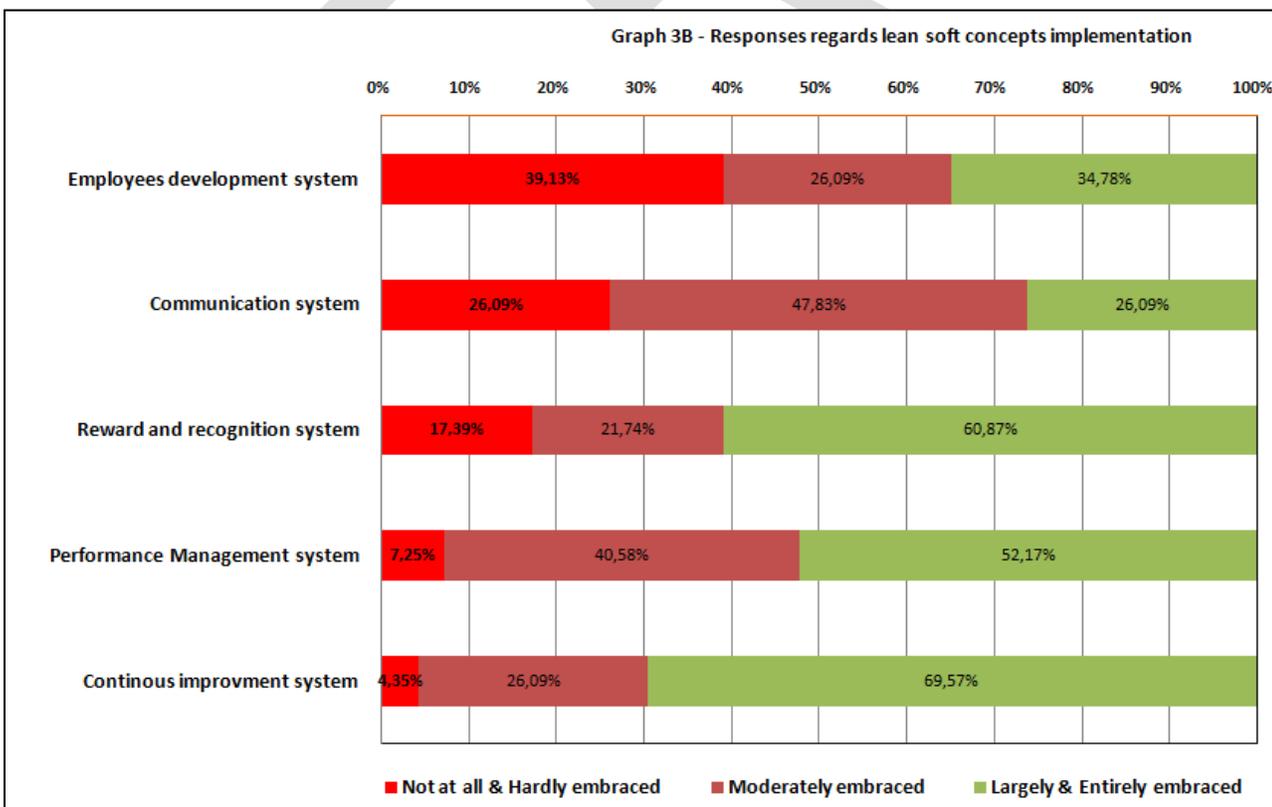
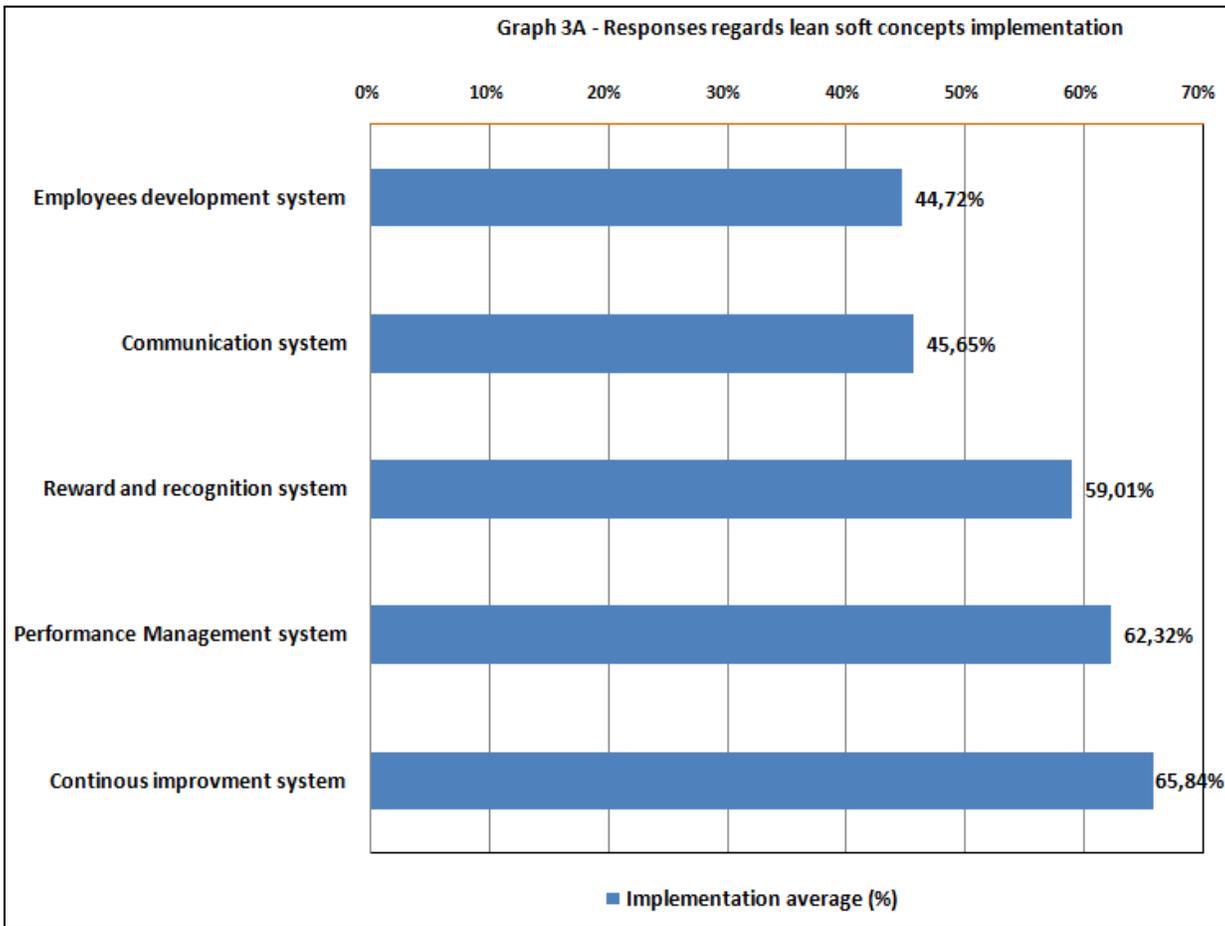




The top tools which are slightly used are the SMED (33.54%), and the one piece flow (39.75%). SMED is one of the most initiatives for set-up reduction time have been associated with Shigeo Shingo’s “Single Minute Exchange of Die” methodology [30]. The application of Shingo’s methodology usually results into two main benefits: increasing manufacturing capacity and improving the equipment flexibility [13]. Improvement projects based on SMED involve the process identification and changeover analysis as well as the training of the improvement team. Training and motivation can be considered as the major drivers in successfully SMED projects [34]. Such training can facilitate success when it is provided to both the SMED team and the shop floor staff involved with the implementation. This training can reduce staff hesitation and fears arising from misunderstanding.

One piece flow refers to the concept of moving one workpiece at a time between operations within a workcell. One piece flow has many benefits. It encourages work balance, better quality and a host of internal improvements. Unfortunately, the explanation for the finding of low respect of one piece flow in our study is that LM and quality approaches require a fundamentally different philosophy of thinking than the traditional mass production approach. This result can be considered a consequence of difficulty for managers to discern the lean philosophy and to assimilate the benefits of one piece flow implementation. If the leaders don't understand and believe in one piece flow enough to take the time to remove resistance in shop floor through training and strong communication, just-in-time is less likely to be embraced and the miraculous gains in performance through LM are less likely to be reached.

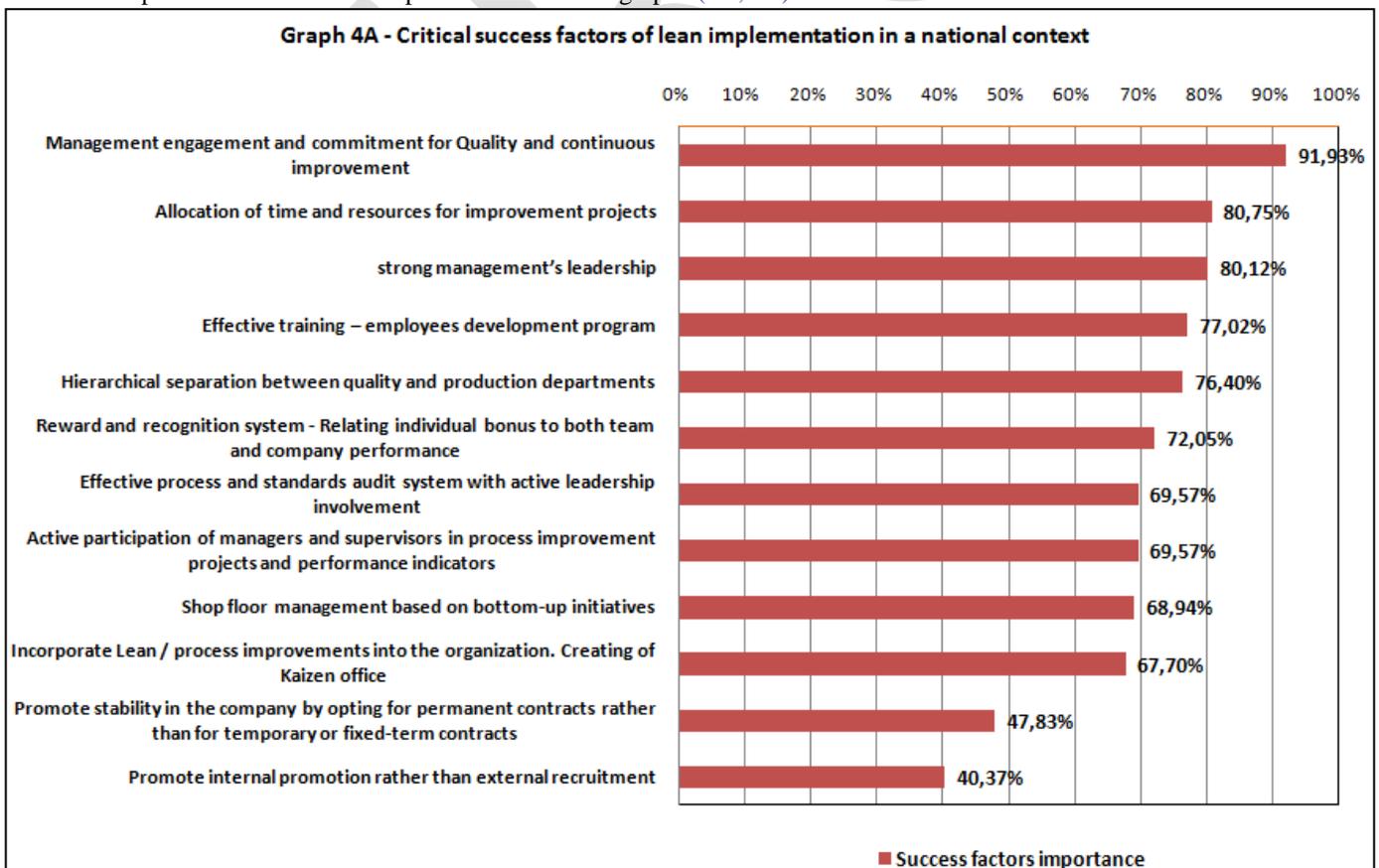
Next, usually using descriptive statistics, we analyzed the lean soft elements integrated in the management processes within the various companies investigated. Twelve specific questions were formulated on the basis of the literature review to investigate about lean soft elements status [68], [27], [20], [7], [72], [58], [18], [52], [32], [75], [48], [49], [61], [24], [22], [23], [57]. These elements were grouped into five logical clusters of significant lean soft fundamentals that are “Communication”, “Employee development system”, “Continuous improvement system”, “Valorization & rewards system”, and “Performance management system”.

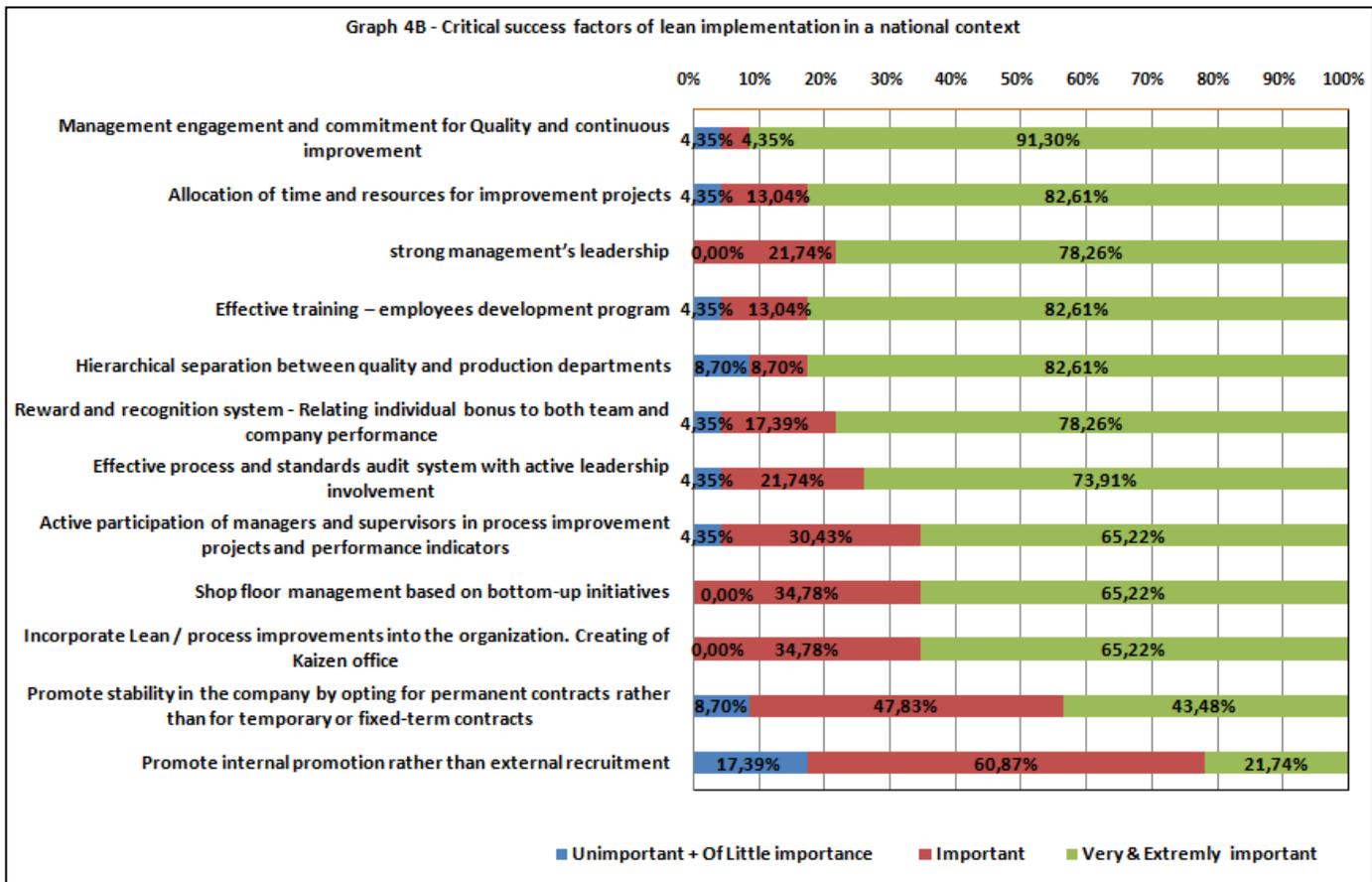


Pleasantly, the various organizations surveyed revealed interesting information regarding the lean soft practices implementation. Graphs (3A, 3B) depict the existence both of a continuous improvement system (66.84%) and performance management system (62.32%). Equally significant, was the presence of a reward system (59.01%) which linked exclusively with management considering and implementing workers' proposals. This finding sheds light on prior research into the role of rewards and economic incentives as facilitating and inhibiting factors in the success process of LM [57]. Conversely, the study depicts a poor implementation of employee development system (44.72%). Unfortunately, the qualification of employees is a fundamental task in LM. It enables workers to participate in the continuous improvement and the continuous development of processes must go along with a continuous development of people [22], [50]. Skill of workforce and in-house expertise for instance, soft skills and technical skills plays an important role in the successful adoption of lean manufacturing [25]. Unlike to [51], specific solutions to inspire organizational innovation and also continuous improvement is not to hire people with diverse skills, talents, and scientific background, sometimes outside of the company's industry, to help the company challenge the status quo and bring different frames of reference toward a problem, but is to make effort on improving worker's competence and skill levels in order to increase their versatility and, in the final instance, to achieve a greater level of flexibility and adaptability in the organization [49]. The previous finding of low utilization of SMED (33.54%) in our case study, since it requires specific training, support what is stated in the prior literature and our finding about how important training is for people to better assimilate and learn the first lean tools.

Furthermore, our results show a significant negative strength of communication (45.65%). Unfortunately, a structured communication procedure can improve worker involvement, provide the workers with greater accountability and give them a greater feeling of ownership of performance achievement. Continuous information feedback can also give a rapid response to any departure from objectives set and the bases for continuous improvement [71]. According to [52], communication seems to be the key to successful lean changes and to increase the possibility of the lean implementation success. Furthermore, it is important for employees to be exposed to greater communication and the role of communication can be seen as a "qualifier" criterion.

The last important result was regarding the critical success factors – what makes LM successful in a Moroccan context? The respondents gave scores based on the five point Likert scale on twelve critical success factors for the success and, or failure of LM based on their experience. The results are presented in the bar graphs (4A, 4B).





One factor that scored very high overall was the top management engagement and commitment (91.93%). Allocation of time and resources for improvement projects was found to be the following critical success factor (80.75%). Likewise, a strong management's leadership was founded to be a critical success factor (80.12%). This result is aligned with previous empirical lean success factors research, which has consistently reported a positive relationship between management attitudes and LM outcomes [26], [8], [19], [37], [75], [25], [48], [49], [33], [29], [61], [22], [23], [57], [18], [35], [32], [52]. Yet, one of the more interesting set of success factors was continuous training (77.02%) and hierarchical separation between quality and production departments. However, the study results remain that internal promotion (40.37%) and job security (47.83%) were not rated as among the most vital factors for the success of LM. Areas in which the author happen to disagree with majority of the participants. In fact, an effective internal mobility policy develops employees' willingness to change, reduces adaptation costs and allows for corporate uncertainty in a rapidly changing environment [59]. It can be seen as a genuine strategy of flexibility relying on internal resources as opposed to depending on the external job market. Also, involving employees in making decisions related to their professional career will be favorable and lead to enforcing the feeling of confidence both in the business and its manager [54]. Even, in lean implementations it is important to provide job security [26], [49], [75] and privilege internal promotion rather than external recruitment [49]. As a basic of LM philosophy, there is no doubt that internal promotion and stability dimension are the single most important elements for success and the benefits of internal mobility are obvious for both organization and employees.

Conclusions, recommendations and future research

This study provided insight into the maturity of LM practices by exploring their status in various multinationals located in Morocco. Again, our main objective was threefold: (1) to identify the usage of lean hard tools and techniques; (2) to evaluate the integration of lean soft fundamentals in facilities management systems; (3) to determine challenges and success factors for implementation of LM in a national context.

To summarize it can be concluded that the survey findings fit with existing theory. The relevant lean hard tools are practically used like problem-solving methods, production flow, 5S, and standardization. Examining the lean soft practices implementation investigated through five logical clusters of relevant lean management fundamentals, our study results depict that employee development and communication systems are less embraced and considered. Pleasantly performance management, reward and continuous improvement systems are largely implemented and considered.

Finally, we have investigated what makes LM successful in a Moroccan context. The study results support all critical aspects taken from the literature and on average have at least been voted by the respondents to be important for successful lean implementation. Seeing that the top four success factors are top management engagement and commitment, allocation of time and resources for improvement projects, strong management's leadership, and employees' development program it becomes very clear that the research supports recent literature. Surprisingly, if job security and internal promotion are critical for successful lean implementation, the respondents however have rated this aspect on the last rank of the importance scale. Looking at this aspect the survey data don't supports the reading findings.

An avenue for further investigation is to expand the study to include additional industrial sectors. Finally, it is believed that more future studies are needed in order to develop and provide methodology and tools to ensure LM deployment success in a national context.

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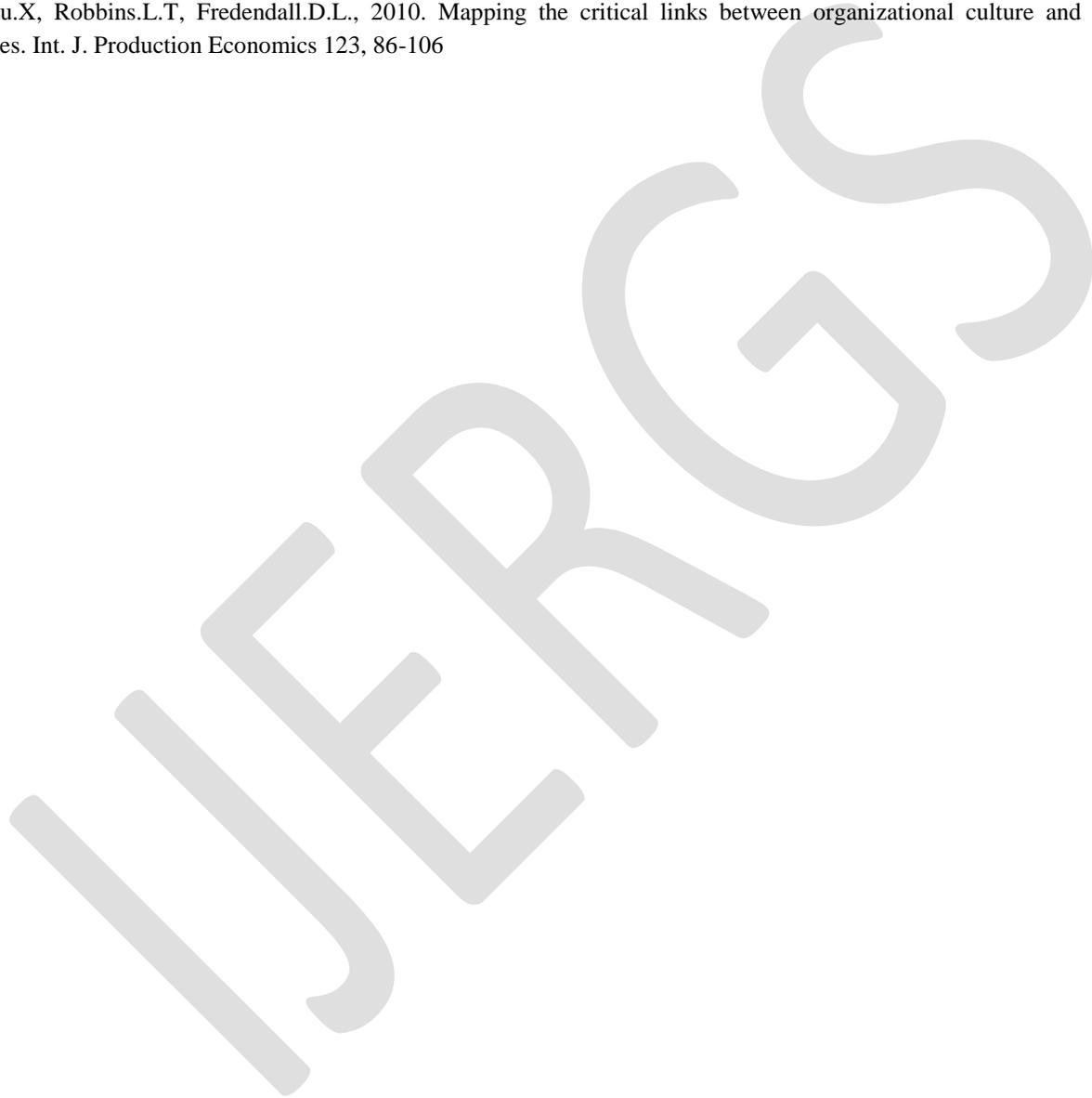
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SVD BASED IMAGE COMPRESSION

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Abstract- Image compression techniques are the most concerned topics in today's technological developments. Singular Value Decomposition (SVD) is one such image compression technique. This SVD performs its operations on matrices. In this paper, we will discuss how SVD is applied on images, the methodology of image compression using SVD and also the algorithm to compress an image using MATLAB.

Keywords-Image compression, Singular Value Decomposition, Image processing, image as a matrix, image processing, face recognition

INTRODUCTION

Now a day, everyone is fond of selfies. Not only selfies, man wishes to capture all his memorable events. This results in the increase of number of images and videos. It is obvious that a more amount of memory is needed to store all these images and videos. If these images are needed to be transmitted, it even requires large bandwidth. So, there comes the need of image compression techniques. These image compression techniques reduce the storage space occupied by the image without any loss to image quality. Thus the image size can be reduced by selecting proper compression technique depending on the requirement of user or application.

IMAGE COMPRESSION TECHNIQUES

Image compression is a technique in which the storage space of image is reduced without degrading the image quality. This is classified into two types.

Lossy image compression:

In this, the image is compressed such that there is loss in image data, that is, image cannot be reconstructed if once compressed. This technique is best suited for normal photographs where a small loss of fidelity is acceptable. Most of the regular image compression techniques used today are lossy techniques.

SVD is also a lossy image compression technique.

Lossless image compression:

In this, the compressed image is same as that of the original input image. Here, image once compressed can be reconstructed. It is reversible process. This technique is best suited for medical applications etc.,

REPRESENTING IMAGE AS A MATRIX

Every image is represented by pixels. Pixels represent the intensity of image. These pixel values are arranged as a matrix. The matrix representation of an image can be easily obtained using MATLAB.

Syntax for displaying matrix representation of an image is

```
I=imread('1.jpeg'); % reads input image.
Disp(I);           % displays pixel values of image (as a matrix, arranged in rows and columns)
```

SVD TECHNIQUE

Let A be an $m \times n$ matrix. Performing SVD to A factorizes it into a product of orthogonal matrix, diagonal matrix and another orthogonal matrix.

$$A = USV^T$$

Where,

A is image matrix

U is $m \times m$ matrix

S is $m \times n$ matrix

V is $n \times n$ matrix

Singular Value Decomposition technique splits given matrix into a product of orthonormal matrices and a diagonal matrix. The procedure to perform SVD theoretically is as follows

Find eigen values of the image matrix. Obtain singular values (square root of eigen values).

Place singular values in decreasing order as a diagonal matrix, S matrix

Using image matrix, say A, obtain AA^T and $A^T A$.

Find the eigen vector of above matrices. These vectors become columns of U and V matrices.

Now, using S, U and V matrices, represent A matrix.

IMAGE COMPRESSION USING SVD

After obtaining U, S and V values using above steps,

Eliminate the unnecessary singular values in S matrix.

Obtain compressed image A with the new diagonal matrix obtained after removing some singular values.

MATHEMATICAL ANALYSIS

Let image matrix be $A_{m \times n}$.

Using SVD, A can be represented as

$$A = USV^T$$

$$A = \begin{bmatrix} u_1 & u_2 & \dots & u_m \end{bmatrix} \begin{bmatrix} s_1 & 0 & \dots & 0 \\ 0 & s_2 & \dots & \vdots \\ \vdots & 0 & \ddots & 0 \\ 0 & \dots & 0 & s_n \end{bmatrix} \begin{bmatrix} v_1^T \\ v_2^T \\ \vdots \\ v_n^T \end{bmatrix}$$

The values $s_1 > s_2 > \dots > s_n > 0$ and as the last values of S are approximately equal to zero, they can be removed. After removing those values resultant A matrix can be represented as

$$A = US^1V^T$$

$$A = \begin{bmatrix} u_1 & u_2 & \dots & u_m \end{bmatrix} \begin{bmatrix} s_1 & 0 & \dots & \dots & \dots & 0 \\ 0 & \ddots & & & & \\ \vdots & & s_r & & & \\ \vdots & & & 0 & & \\ \vdots & & & & \ddots & \\ 0 & \dots & \dots & \dots & \dots & 0 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ \vdots \\ \vdots \\ v_n \end{bmatrix}$$

In the above matrix, S values after r terms are approximated to zero. So multiplication of the terms greater than r will be zero.

If m=n, the above matrix can be represented as

$$A = \begin{bmatrix} s_1u_1 & s_2u_2 & \dots & s_ru_r & 0 & \dots & 0 \end{bmatrix} \begin{bmatrix} v_1^T \\ v_2^T \\ \vdots \\ \vdots \\ v_n^T \end{bmatrix}$$

$$= s_1u_1v_1^T + s_2u_2v_2^T + \dots + s_ru_rv_r^T$$

$$= \sum_{i=1}^r s_iu_iv_i^T$$

We know that, rank of a singular matrix is equal to the number of non zero singular values. The rank of above matrix will now be obviously reduced as the number of S values is approximated to 'r' terms.

Therefore, size of the matrix is reduced, which in turn reduces the memory occupied by the image.

Thus,

- From the above analysis, the matrix A can be approximated by adding only the first few terms (r terms) of the series. As r increases, the image quality increases, but at the same time, the amount of memory needed to store the image also increases.
- Optimum r value should be selected such that there is no damage to image quality and at the same time storage space occupied by image is reduced. Thus, selection of r value plays an important role in performance of Singular Value Decomposition (SVD) technique.

IMPLEMENTING SVD BASED IMAGE COMPRESSION USING MATLAB

METHODOLOGY USED

Initially the JPEG image which has to be compressed is given as an input. This input image is stored as an array of integers. Required 'r' value should be specified. Compression is then achieved by performing Singular value decomposition (SVD) on RGB components of the input JPEG image. The resultant decomposed matrix is regenerated after approximating S matrix.

SVD FUNCTIONS

Singular value decomposition of symbolic matrix can be easily done using MATLAB build in function 'svd'. This function decomposes the given matrix into three matrices.

Syntax

```
sigma = svd(X)
[U,S,V] = svd(X)
[U,S,V] = svd(X,0)
[U,S,V] = svd(X,'econ')
```

ALGORITHM

Step-1:

Read the image (input image).

syntax:

```
img=imread('filename.jpg');
```

Step-2:

Split the input image (colour image) into R, G, B channels.

Syntax:

```
red = img(:,:,1); % Red channel
green = img(:,:,2); % Green channel
blue = img(:,:,3); % Blue channel
```

Step-3:

Decompose each component using Singular Value Decomposition

Syntax:

```
[u,s,v]=svd(I);
```

Step-4:

Select r value and discard the diagonal value of S matrix not required.

Construct the image using the selected singular values.

Syntax:

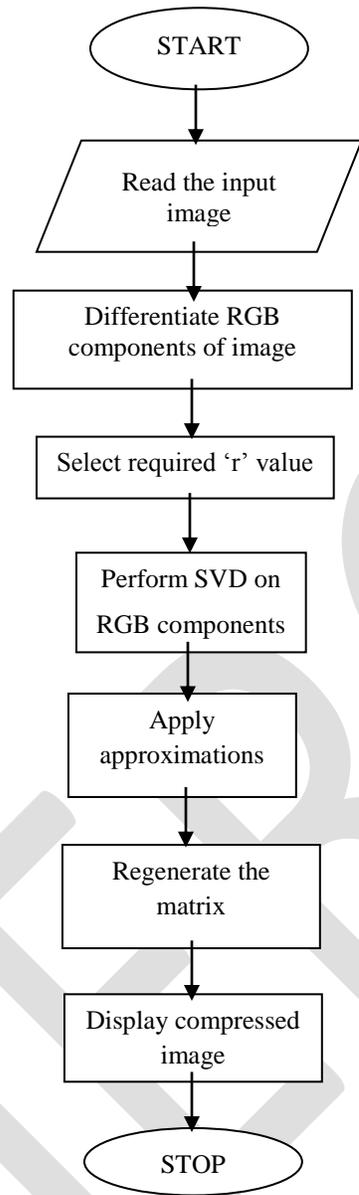
```
for j=1:r
    c=c+s(j,j)*u(:,j)*v(:,j).';
end
```

- The r-value in the m-file represents the number of iterations taken on each layer used in the resulting decomposition. This is actually the rank of the SVD matrix. By increasing the rank we can increase clarity until an optimal image is reached.

Step-5:

Display the compressed image.

FLOW DIAGRAM



MEMORY UTILIZATION

Let $A_{m \times n}$ be an image matrix. This image matrix will contain a total of $m \times n$ pixels. Assume, each pixel will occupy a memory location. So, the input image occupies mn memory locations. This can be mathematically shown as,

$$A_M = mn$$

After performing SVD,

U matrix is of size $m \times m$

V matrix is of size $n \times n$

With r approximations,

U matrix is of size $m \times r$

V matrix is of size $n \times r$

According to definition of SVD,

The image matrix can be represented as a product of orthogonal matrix times a diagonal matrix times another orthogonal matrix.

Thus,

$$A = USV^T$$

So, total memory locations occupied by this decomposed matrix with r approximations is

$$A_M = U_M + V_M + S_M$$

$$A_M = mr + nr + r$$

$$A_M = r(m + n + 1)$$

For high resolution images,

$$mn \gg r(m + n + 1)$$

Hence, memory occupied is reduced ie., image is compressed.

APPLICATIONS

SVD approach can be used in image processing, image compression, face recognition, water marking, data retrieval etc., SVD is most widely used in face recognition, noise reduction in images, image de-blurring, signal processing etc., Research is still going on different applications of SVD on digital image processing.

RESULTS

Outputs for r=70 for given image

The size of input image is 768×1024 . It occupies 6291456 bytes.

After compression, the resultant image occupies 2359296 bytes.

Clearly, image is compressed without any loss to image quality.



Input image



Output for r=70

Outputs for different r values



Input image



with r=5 values



with r=10 values

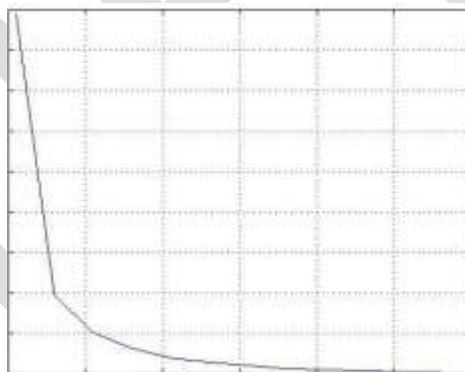


with r=30 values



with r=50 values

Error between
compressed
image and
original image



r values

graph between r values and error between
compressed image and original image

CONCLUSION

Singular Value Decomposition (SVD) is a simple, robust and reliable technique. This SVD technique provides stable and effective method to split the image matrix into a set of linearly independent matrices. SVD provides good compression ratio and also a practical solution to image compression problem. The results shown above clearly displays the compressed outputs for different r values. Thus, selection of r value plays a crucial role in this SVD based image compression technique.

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Weather forecast prediction: a Data Mining application

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Abstract— Weather forecasting is an important application in meteorology and has been one of the most scientifically and technologically challenging problems around the world. In this paper, we analyse the use of data mining techniques in forecasting weather. This can be carried out using Artificial Neural Network and Decision tree Algorithms and meteorological data collected in specific time. The performance of these algorithms was compared using standard performance metrics, and the algorithm which gave the best results used to generate classification rules for the mean weather variables. The results show that given enough case data mining techniques can be used for weather forecasting.

Keywords—ANN, CART algorithm, Data mining, Decision Tree, KDD, LAD, Weather prediction

INTRODUCTION

Weather prediction [9] has been one of the most interesting and fascinating domain. The scientists have been trying to forecast the meteorological characteristics using a large set of methods, some of them more accurate than others. Lately, there has been discovered that data mining, a method developed recently, can be successfully applied in this domain. Data mining is a process that uses a variety of data analysis tools to discover patterns and relationships in data that may be used to make valid prediction.

Contents-

Data means collection of information. Database means organized collection of data. Data warehouse means which provides enterprise with memory. Data Mining- It is extraction of interesting (non-trivial, implicit, previously unknown and potentially useful) information or patterns from huge amount of data .It is an interesting technique that can be implemented in various areas to generate useful information from the existing large volumes of data. Data mining has thus far been successfully implemented to bring success in commercial applications. Some of the applications of data mining include discovery of interesting patterns, clustering of data based on parameters and prediction of results by using the existing data. There are diverse techniques and algorithms available in data mining that can be implemented for various applications. This paper proposes an efficient data mining technique for weather forecast. Knowledge Discovery in Databases (KDD) is the whole process of finding useful information and patterns in data. Typical data mining architecture is as shown in Fig 1.

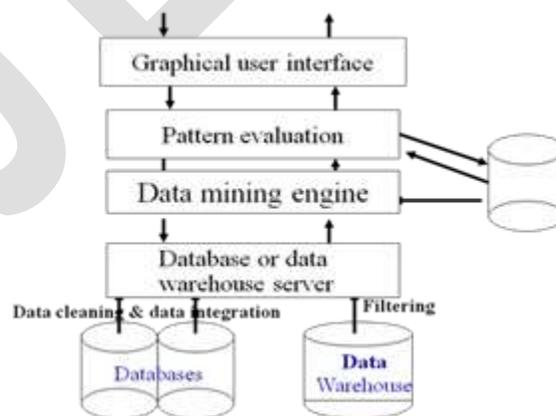


Fig 1. Typical data mining architecture

Data Mining Techniques- Data mining techniques search for interesting information without demanding a priori hypotheses, the kind of patterns that can be discovered depend upon the data mining tasks employed. By and large, there are two types of data mining tasks: descriptive data mining tasks that describe the general properties of the existing data and predictive data mining tasks that attempt to do predictions based on inference on available data. This techniques are often more powerful, flexible, and efficient for exploratory analysis than the statistical techniques. The most commonly used techniques in data mining are: artificial neural networks, genetic algorithms, rule induction, nearestneighbour method and memory-based reasoning, logistic regression, discriminant analysis and decision trees.

Weather Forecasting –

Weather forecasting plays a significant role in meteorology. Weather forecasting remains a formidable challenge because of its data intensive and frenzied nature. Generally two methods are used to forecast weather: a) the empirical approach and b) the dynamical approach. The first approach is based on the occurrence of analogues and it is often referred to as analogue forecasting. This approach is useful in predicting local scale weather if recorded cases are plentiful. The second case is based upon equations and forward simulations of the atmosphere and is often referred to as computer modeling. The dynamical approach is useful to predict large scale weather phenomena and may not predict short term weather efficiently. Most weather prediction systems use a combination of both the techniques.

In this paper there are two techniques described for weather prediction:-

a) algorithm using both Artificial Neural Networks (ANN) and Decision Trees (DT) were used to analyze meteorological data gathered in-order to develop classification rules for the Application of Data Mining Techniques in Weather Prediction. Weather parameters over the study period and for the prediction of future weather conditions using available historical data. The targets for the prediction are those weather changes that affect us daily like changes in minimum and maximum temperature, rainfall, evaporation and wind speed. An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. It is composed of a huge number of highly interconnected processing elements (neurons) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a particular application, such as pattern recognition or data classification, through a learning process. The artificial neuron is an information processing unit that is fundamental to the operation of a neural network. There are three basic elements of a neuron model. Fig.2 shows the basic elements of neuron model with the help of a perceptron model, which are, (i) a set of synapses connecting links, each of which is characterized by a weight or strength of its own, (ii) an adder for summing the input signals weighted by the respective synapses of the neuron and (iii) an activation function for limiting the amplitude of the output of a neuron. A typical input-output relation can be expressed as shown in Equation 1.

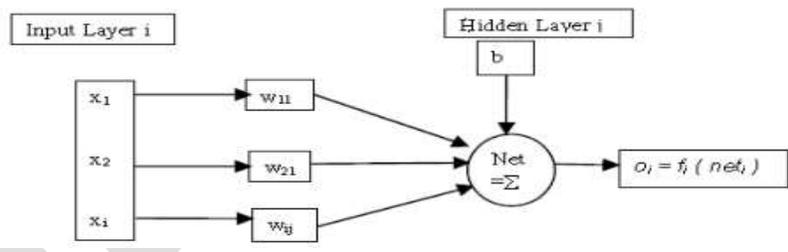


Fig 2: Model of a perceptron

$$net_j = \sum_{i=1}^n w_{ij} x_i + b_j$$

$$o_i = f_i (net_i) \dots\dots\dots (1)$$

Where \$X_i\$ = inputs to \$i\$th node in input, \$W_{ij}\$ = weight between \$i\$th input node and \$j\$th hidden node, \$b\$ – bias at \$j\$th node, \$net\$ = adder, \$f\$ = activation function.

The type of transfer or activation function affects size of steps taken in weight space. ANN’s architecture requires determination of the number of connection weights and the way information flows through the network, this is carried out by choosing the number of

layers, number of nodes in each layer and their connectivity. The numbers of output nodes are fixed by the quantities to be estimated. The number of input nodes is dependent on the problem under consideration and the modeler's discretion to utilize domain knowledge. The number of neurons in the hidden layer is increased gradually and the performance of the network in the form of an error is monitored. A Decision Tree is a flow-chart-like tree structure. Each internal node denotes a test on an attribute. Each branch represents an outcome of the test. Leaf nodes represent class distribution. The decision tree structure provides an explicit set of "if-then" rules (rather than abstract mathematical equations), making the results easy to interpret. Depending on the algorithm, each node may have two or more branches. For example, CART [11] generates trees with only two branches at each node. Such a tree is called a binary tree. When more than two branches are allowed this is called a multiway tree [10]. In the tree structures, leaves represent classifications and branches represent conjunctions of features that lead to those classifications.

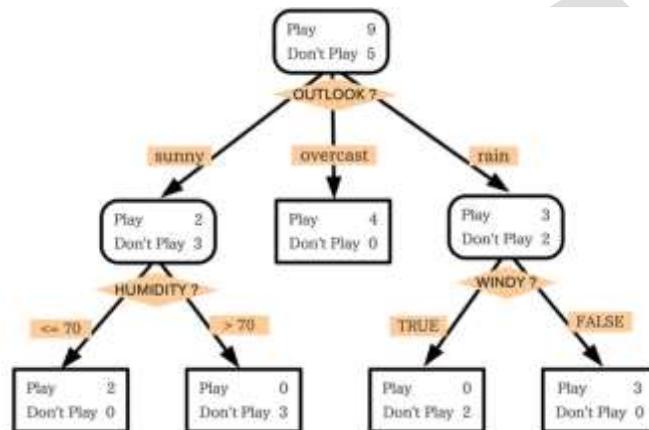


Fig 3:Decision tree

As shown in fig.3 provided here is a canonical example in data mining, involving the decision to play or not play based on climate conditions. In this case, outlook is in the position of the root node. The degrees of the node are attribute values. In this example, the child nodes are tests of humidity and windy, leading to the leaf nodes which are the actual classifications. This example also includes the corresponding data, also referred to as instances. In our example, there are 9 "play" days and 5 "no play" days.

In decision analysis, a decision tree can be used visually and explicitly to represent decisions and decision making. The concept of information gain is used to decide the splitting value at an internal node. The splitting value that would provide the most information gain is chosen. Formally, information gain is defined by entropy. In other to improve the accuracy and generalization of classification and regression trees, various techniques were introduced like boosting and pruning. Boosting is a technique for improving the accuracy of a predictive function by applying the function repeatedly in a series and combining the output of each function with weighting so that the total error of the prediction is minimized or growing a number of independent trees in parallel and combine them after all the trees have been developed. Pruning is carried out on the tree to optimize the size of trees and thus reduce overfitting which is a problem in large, single-tree models where the model begins to fit noise in the data. When such a model is applied to data that was not used to build the model, the model will not be able to generalize. Many decision tree algorithms exist and these include: Alternating Decision Tree, Logitboost Alternating Decision Tree (LAD), C4.5 and Classification and Regression Tree (CART).

Materials and Methods-

Data Collection -The data used for this work was collected from specific region. Following stages of the research applied on collected data: Data Cleaning, Data Selection, Data Transformation and Data Mining.

Data Cleaning- In this stage, a consistent format for the data model was developed which took care of missing data, finding duplicated data, and weeding out of bad data. Finally, the cleaned data were transformed into a format suitable for data mining. A very low-quality information is available in various data sources and on the Web; many organizations are interested in how to transform the

data into cleaned forms which can be used for high-profit purposes. This goal generates an urgent need for data analysis aimed at cleaning the raw data.

Data Selection - At this stage, data relevant to the analysis was decided on and retrieved from the dataset. The meteorological dataset had ten (10) attributes, their type and description is presented in Table 1. Due to the nature of the Cloud Form data where all the values are the same and the high percentage of missing values in the sunshine data both were not used in the analysis.

Table 1: Attributes of Meteorological Dataset

Attribute	Type	Description
Year	Numerical	Year considered
Month	Numerical	Month considered
Wind speed	Numerical	Wind run in km
Evaporation	Numerical	Evaporation
CloudForm	Numerical	The mean cloud amount
Radiation	Numerical	The amount of radiation
Sunshine	Numerical	The amount of sunshine
MinTemp	Numerical	The monthly Minimum Temperature
Rainfall	Numerical	Total monthly rainfall
MaxTemp	Numerical	Maximum Temperature

Data Transformation-This is also known as data consolidation. It is the stage in which the selected data is transformed into forms appropriate for data mining. The data file was saved in Comma Separated Value (CSV) file format and the datasets were normalized to reduce the effect of scaling on the data.

Data Mining Stage -The data mining stage was divided into three phases. At each phase all the algorithms were used to analyze the meteorological datasets. The testing method adopted for this research was percentage split that train on a percentage of the dataset, cross validate on it and test on the remaining percentage. Thereafter interesting patterns representing knowledge were identified.

Evaluation Metrics

In selecting the appropriate algorithms and parameters that best model the weather forecasting variable, the following performance metrics were used

- 1. Correlation Coefficient:** This measures the statistical correlation between the predicted and actual values. This method is unique in that it does not change with a scale in values for the test cases. A higher number means a better model, with a 1 meaning a perfect statistical correlation and a 0 meaning there is no correlation at all.
- 2. Mean Squared Error:** Mean-squared error is one of the most commonly used measures of success for numeric prediction. This value is computed by taking the average of the squared differences between each computed value and its corresponding correct value.
- 3. The Mean-squared Error:** is simply the square root of the mean-squared-error. The mean-squared error gives the error value the same dimensionality as the actual and predicted values.

% Error: The percent error is defined by the following formula.

$$\%Error = \frac{100}{NP} \sum_{j=0}^p \sum_{i=0}^N \frac{|dy_{ij} - dd_{ij}|}{dd_{ij}} \dots\dots\dots (2)$$

Where P = number of output processing elements

N = number of exemplars in the data set

dy_{ij} = denormalised network output for exemplar i at processing element j .

dd_{ij} = denormalised desired output for exemplar I at processing element j .

Experimental Design

C5 Decision Tree classifier algorithm which is implemented in See5 is used to analyze the meteorological data. The C5 algorithm is selected application of Data Mining Techniques in Weather Prediction, after comparison of results of tests carried out using CART and C4.5 algorithms [12]. The ANN algorithms used were those capable of carrying out time series analysis namely: the Time Lagged Feedforward Network (TLFN) and Recurrent networks implemented in NeuroSolutions 6 ANN development and simulation software). The ANN networks were used to predict future values of Wind speed, Evaporation, Radiation, Minimum Temperature, Maximum Temperature and Rainfall given the Month and Year.

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CONCLUSION

In this the C5 decision tree classification algorithm was used to generate decision trees and rules for classifying weather parameters such as maximum temperature, minimum temperature, rainfall, evaporation and wind speed in terms of the month and years. Given enough data the observed trend over time could be studied and important deviations which show changes in climatic patterns can be identified. Artificial Neural Networks can detect the relationships between the input variables and generate outputs based on the observed patterns inherent in the data without any need for programming or developing complex equations to model these relationships. Hence given enough data ANN's can detect the relationships between weather parameter and use these to predict future weather conditions. This is important to climatic change studies because the variation in weather conditions in term of temperature, rainfall and wind speed can be studied using these data mining techniques.

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INDUSTRIAL SEWAGE WATER QUALITY MONITORING SYSTEM

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Abstract— The objective of this project is to develop an automatic wireless system to intimate the message to concerned authority when the waste water from industries are mixed with river illegally. Water pollution is a serious problem for the entire world. It threatens the health and well-being of humans, plants, and animals. The main factor of the water pollution is industries which disposes waste water to the river illegally. In early project, the water pollution was detected by chemical test or laboratory test by using this system the testing equipment will be in stationary and samples will be given to testing equipment. In our project the testing equipment can be placed in the river. The parameters involved in the water quality determination such as the pH level, turbidity, dissolved oxygen and Temperature.

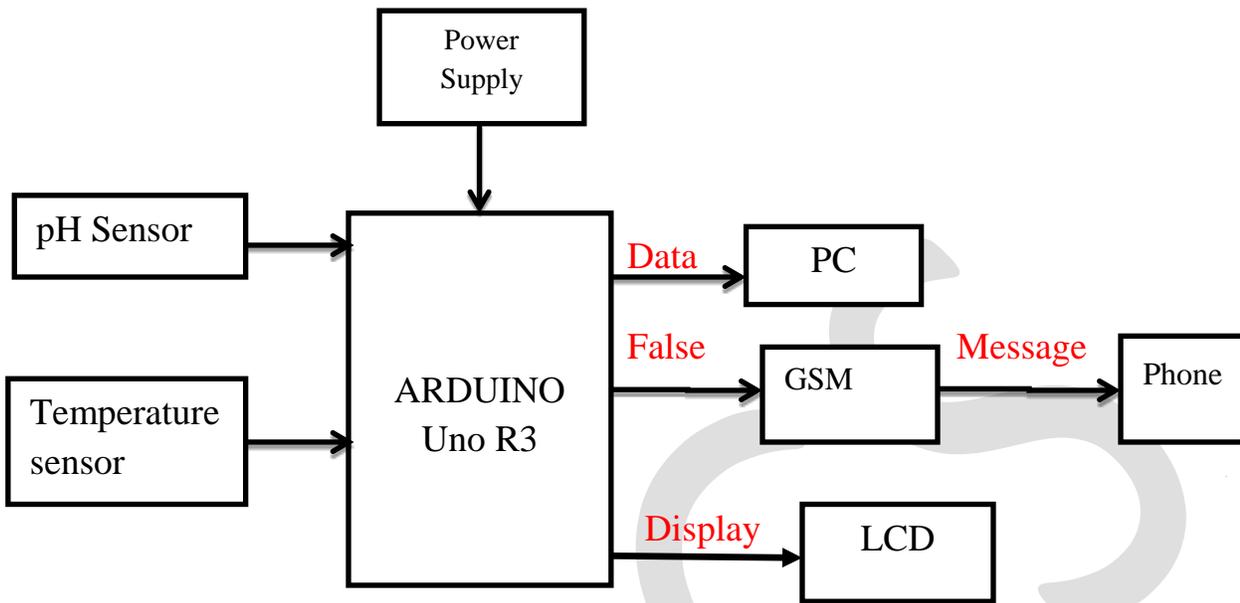
In the Proposed water quality monitoring system the pH and Temperature sensors will be kept in the river. The output of all the sensors are in analog. It is important to convert into digital value. So all the sensed value from the sensor will be given to the ARDUINO board. After converting, the values are compared to the threshold value. In case inference value above threshold value, the automated warning SMS alert will be sent to the Pollution Control Board via GSM.

Keywords— ARDUINO UNO R3, TEMPERATURE SENSOR, pH SENSOR, GSM SIM 300, LCD,MOBILE PHONE.

INTRODUCTION

Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds. Water pollution affects plants and organisms living in these bodies of water. In almost all cases the effect is damaging not only to individual species and populations, but also to the natural communities. Water covers over 70% of the earth's surface and is a very important resource for people and the environment. Water pollution affects drinking water, rivers, lakes and oceans all over the world. Mainly industry sewage water mixed with river. This consequently harms human health and the natural environment. An estimated 1,000 Indian children die of diarrheal sickness every day. Our water resources are prone to a threat of pollution especially from the industrial activities. It is a challenge in the enforcement aspect as it is impossible for the authorities to continuously monitor the location of water resources due to limitation especially in man power, facilities and cost of equipment. The automatic monitoring system will reduce the reliance on man power at the monitoring site thus reducing the cost. This project automatically measure various water pollution parameter using sensor. The output from these sensors is fed to ARDUINO microcontroller. The microcontroller reads the data and then displays in LCD. If the water is polluted the message will be sent to the pollution control board via GSM.

Block Diagram



Block diagram of the entire system

The block diagram of our entire system consists of two modules.

The modules are,

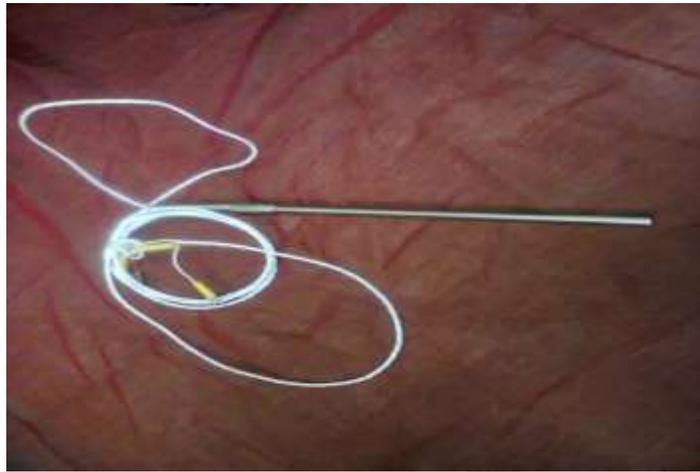
- Sensing module
- Receiving module

Sensing Module

Sensing module consists of pH sensor and Temperature sensor. Each sensor sense the data and the data is given to the ARDUINO board.



pH SENSOR



TEMPERATURE SENSOR

Receiving module

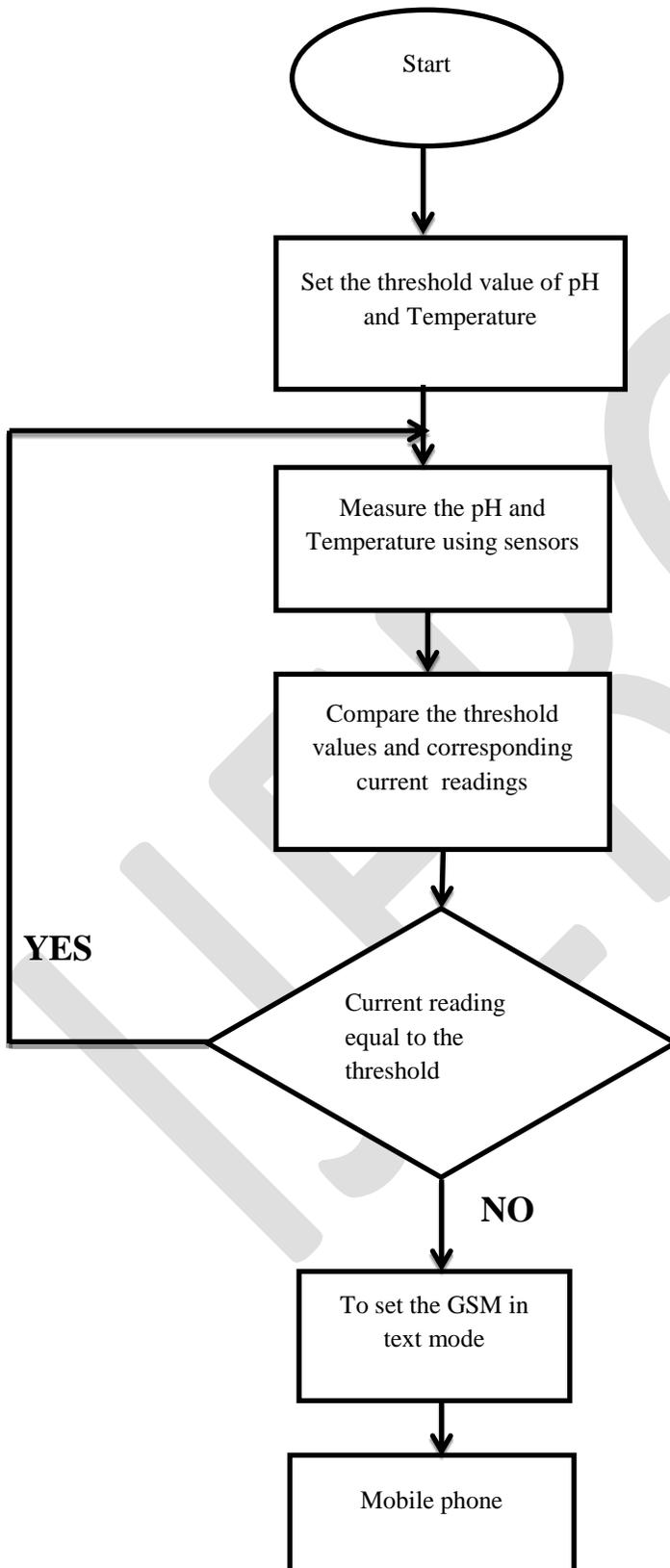
Receiving module consists of GSM and Mobile phone.

The data from the ARDUINO board is given to the GSM. If the system detects the water is polluted the message will send to the Pollution Control Board. We use cool term software to store database for Temperature and pH sensor values.



GSM SIM300

Proposed methodology



pH sensor

pH measurement reveals the hydrogen ion concentration in water. It is used to determine both the pH value of a water. The most widely used type of pH measurement is the electrode method. pH sensor is used for measuring the pH value. In the process world, pH is an important parameter to be measured and controlled. The pH of a solution indicates how acidic or basic (alkaline) it is. The pH term translates the values of the hydrogen ion concentration- which ordinarily ranges between about 1 and 10×10^{-14} gram-equivalents per litre - into numbers between 0 and 14. The output of the pH sensor can be amplified using instrumentation amplifier.

Temperature sensor

Resistance Temperature detectors (RTD) accurately sense Temperature with an excellent degree of repeatability and interchangeability of elements. The RTD is composed of certain metallic elements, whose change in resistance is a function of Temperature. In operation, a small excitation current is passed across the element and the voltage which is proportional to resistance is then measured and converted to units of Temperature calibration. The RTD element is manufactured by winding a wire or plating a film on a ceramic or glass core and sealing the element within a ceramic or glass capsule. Since most RTDs have a low initial resistance often 100 ohms and have a small change in resistance per unit of Temperature range the resistance of the lead wire is often compensated for with a three or four wire bridge configuration built into the measuring devices. By selecting the proper elements and protective sheathing, RTDs can operate in a Temperature range of $(-200 \text{ to } 650)^\circ\text{C}$. RTD output is not directly given to the ARDUINO because it accepts only 5V. For enabling the RTD we using voltage divider circuit.

GSM

GSM Modem is simple to interface. Use it to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro controllers and computers. It uses the highly popular SIM300 module for all its operations. It comes with a standard RS232 interface which can be used to easily interface the modem to micro controllers and computers. The modem consists of all the required external circuitry required to start experimenting with the SIM300 module like the power regulation, external antenna, SIM Holder, etc.

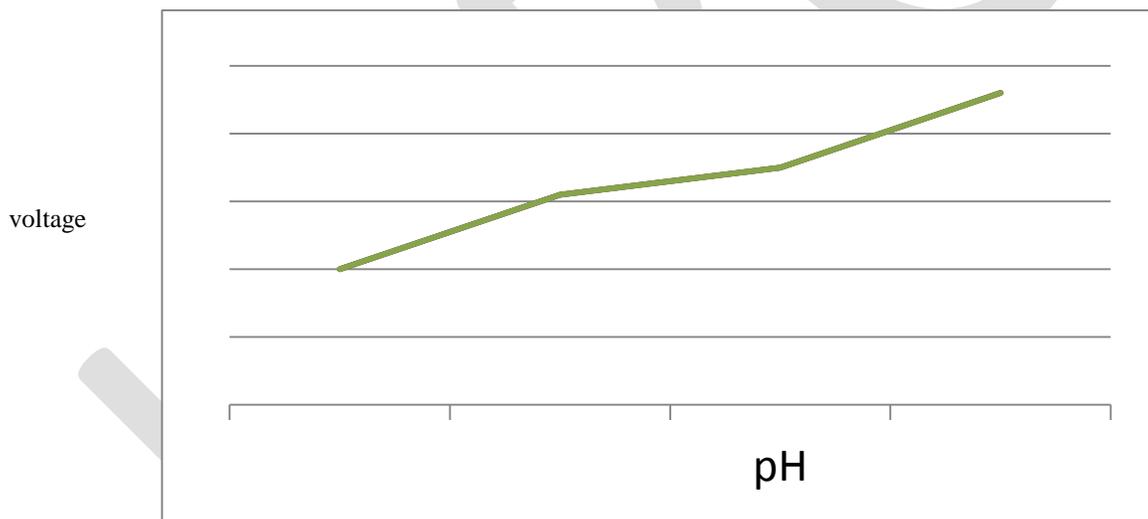


INTEFACING WITH ARDUINO

In this experiment, we deployed samples to monitor the pH value and voltage by digital pH monitor. During this experiment, the temperature was between 24⁰Cand 27⁰C.then the graph is plotted between voltage and pH value for further calibration. It is compared with the plot of our ph probe's graph is plotted between pH value and voltage are calculated by multi meter.

SAMPLES AND pH VALUE

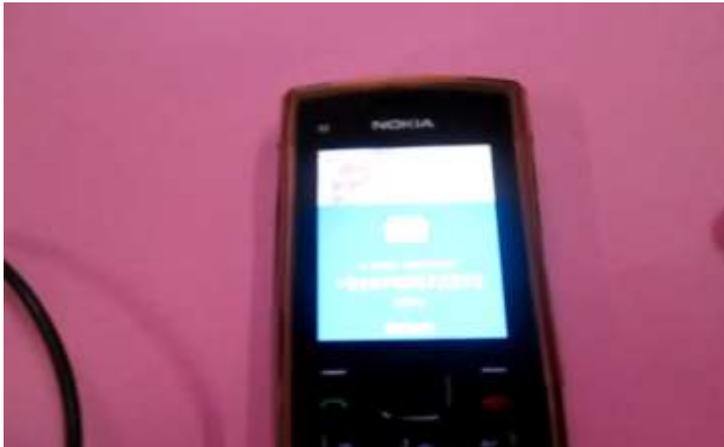
SOLUTION	pH VALUE PER 100ml	VOLTAGE (V)
Sample 1	4	3.52
Sample 2	6.2	3.94
Sample 3	7	4.16
Sample 4	9.2	4.52



GRAPH BETWEEN pH AND VOLTAGE

In our project we use RTD (RESISTANCE TEMPERATURE DETECTOR) temperature sensor which has resistor that changes resistance value as its temperature changes. By using this resistance value, convert it into voltage for getting original temperature. but the out put of RTD is very high so we use voltage divider circuit for reducing it in to needed value.

The GSM is operated through ARDUINO software for sending message about the quality of water to the concerned authority whose mobile number is specified in the program. In program the threshold value is assigned for pH and temperature sensor (i.e.) 7 for pH and 36⁰C for temperature. The pH value equal to 7 and the temperature less than 36⁰C is considered as pure water. If any one of the conditions is false is assumed to be polluted water then the message is sent to concerned authority via GSM.



MESSAGE DISPLAY ON SCREEN

ACKNOWLEDGMENT

We wish to express our deep sense of gratitude to our Project Guide, **Mrs.T.Prathiba,M.E.,[PhD]**, Assistant Professor, Department of Electronics and Communication Engineering, Kamaraj College of Engineering and technology, Virudhunagar for her guidance and constant supervision as well as for providing necessary information regarding the project and also for her support in completing the project.

CONCLUSION

In this paper, a water quality monitoring system based on wireless sensor network is presented. The system is constituted by a base station and several sensor nodes. In the node side, water quality data is collected by different sensors such as pH and Temperature. If the water is polluted then the data is sent to the concerned authority via GSM.

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A Novel Approach for Compression Using Optimized Colourisation Method

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Abstract- Colorization is a process of adding a color to a gray scale image. In this paper formulating a colourisation based compression into an optimisation method, ie, L1- Minimization method. That means instead of performing frequency transformation we can store grayscale version of image along with some color information of a very few pixels. The encoder selects pixels required for colourisation which is user defined and sends its position vectors and color labels to decoder along with compressed luminance component of image. These pixels are known as Representative Pixels (RP). Then, the decoder restores the color information for the remaining pixels using suitable colorization methods. The main function of this coding is the extraction of RP. By formulating RP selection into L1 minimization problem we can reconstruct image with high PSNR value. Also to improve visual quality separate encoding for geometry and texture can be performed. Thus it avoids the loss of local oscillation between original and reconstructed image. Geometry and texture separation is done by total variation regularisation. The texture components are compressed into coefficients that represent correlation between luminance and chrominance values and geometry components are compressed by formulating RP selection problem into L1 minimization problem.

Keywords— Colourization, L1-minimization, Texture, Geometry, Compression, Representative pixels, Total Variation Regularisation, Encoder, Decoder, PSNR, SSIM.

INTRODUCTION

The basic objective of image compression is to find an image representation in which pixels are less correlated. Recently, machine learning based approach has been proposed for image compression instead of frequency transformation. From a machine learning perspective, two fundamental problems are there. One is how to select the most representative pixels, which is essentially an active learning problem. The selected pixels, together with the gray scale image are stored as the encoding process. Another is how to combine color and gray scale information of the pixels to learn a model, which is essentially a semi-supervised learning problem. The learned model is used to recover the color image as the decoding process. It is observed that, in many images, there is a great deal of color coherence. In particular, most images consist mainly of regions of smoothly varying color. This suggests that colors at a subset of locations can be stored and the necessary gradients can be subsequently generated through a process of optimization. Since the information amount for representing positions and color values of these locations is small, a novel approach to image compression by using colorization (called colorization-based coding) has been proposed. The main task in semi-supervised learning based compression is to automatically extract these few representative pixels in the encoder. In other words, the encoder selects the pixels required for the colorization process, which are called representative pixels (RP) and maintains the color information only for these RP. The position vectors and the chrominance values are sent to the decoder only for the RP set together with the luminance channel, which is compressed by conventional compression techniques. Then, the decoder restores the color information for the remaining pixels using colorization methods.

Colorization based coding utilizes the fact that the required number of pixels having color information is small. The main issue in colorization based coding is how to extract the RP set so that the compression rate and the quality of the restored color image become good. Another issue is how to restore the chrominance components without losing the local oscillation that the original images had. Due to these a novel method is needed for image compression which gives better quality and good compression ratio.

RELATED WORK

Cheng et al: Cheng *et al*'s colorization-based coding uses an active machine learning approach to extract RP automatically. It is better than JPEG std for color components. The steps of this method are given below.

1. Divide original image into clusters by image segmentation algorithm.
2. Extract RP randomly from each cluster.
3. Conduct colorization by using temporary RP.
4. Search for clusters that have high error between original and colorized images.
5. Extract more RP from high-error clusters.
6. Repeat 4–5.

Additionally, Cheng *et al* apply some extension to Levin's colorization to suit their approach. However, their colorization-based coding cannot reduce the redundant RP if the initial RP (extracted at step 2) already have redundancy.

Colorization-Based Compression Techniques: The function of colorization based coding is the extraction of the RP. Existing methods use an iterative approach to extract the RP. In those approaches, first, an a priori temporary set of RP is usually selected. This a priori selection is manual and causes a redundant or insufficient set of RP. Therefore, redundant RP have to be eliminated, and required RP have to be additionally extracted by additional RP elimination/extraction methods.

Levin's Colorization: The concept of Levin *et al*'s colorization algorithm is neighboring pixels that have similar intensities should have similar colors. Consider the YCbCr color space. Y is the luminance component corresponding to y , and Cb or Cr is the color component corresponding to u . Let n be the number of pixels in the original image and r be an identifier of the pixels in raster-scan order ($1 \leq r \leq n$). u is assumed to be a one-dimensional vector that contains a color component restored by colorization (denoted as the restoration color component) and is arranged in column in raster-scan order. x is assumed to be a one-dimensional vector that contains RP values, and x has non-zero values only for RP. $u(r)$ and $x(r)$ are the r -th elements of u and x respectively. $\Omega = \{r/x(r) \neq 0\}$ is a set of positions of RP. Obviously, $|\Omega|$ is the number of RP that have a specific color value, and it corresponds to the amount of information in-colorization based coding. Let $y(r)$ be a luminance component at the r -th pixel. $s \in N(r)$ denotes that the s -th pixel is belonging to the neighbour (defined as 8 surrounding pixels) of the r -th pixel. Levin *et al* defined a cost function as

$$J(u) = \sum_{r \in \Omega} (u(r) - \sum_{s \in N(r)} u(s))^2 + (\sum_{r \in \Omega} u(r) - x(r))^2$$

PROPOSED METHOD

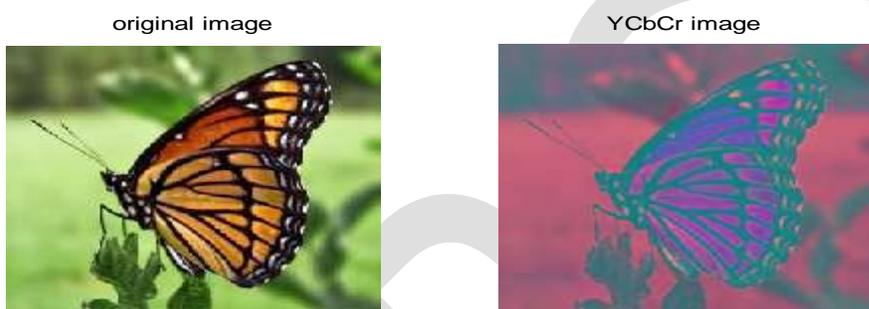
The overall system diagram is shown below. In encoder, the original color image is first decomposed into its luminance channel and its chrominance channels. The luminance channel is compressed using JPEG std. and its discrete Fourier or Wavelet coefficients are sent to the decoder. Then for each component Y, Cb and Cr, geometry and texture are separated using total variation regularization to get geometry components Y_g, C_{bg} and C_{rg} and texture components Y_t, C_{bt}, C_{rt} . Also, in the encoder, a colorization matrix C is constructed by performing multi-scale mean shift segmentation on the geometry component. Using this matrix C and the original chrominance values obtained from the original color image, the RP set is extracted by solving an optimization problem, i.e., an L1 minimization problem. Here the algorithm used is Orthogonal Matching pursuit algorithm (OMP).

reconstructed. For color coding of texture part, correlation coefficients a_{cb} and a_{cr} are extracted. Using texture part of luminance (Y_t) and correlation coefficients (a_{cb} and a_{cr}), texture part of chrominance (C_{bt} , C_{rt}) are reconstruct-ed. All components of geometry and texture are combined to restore the image.

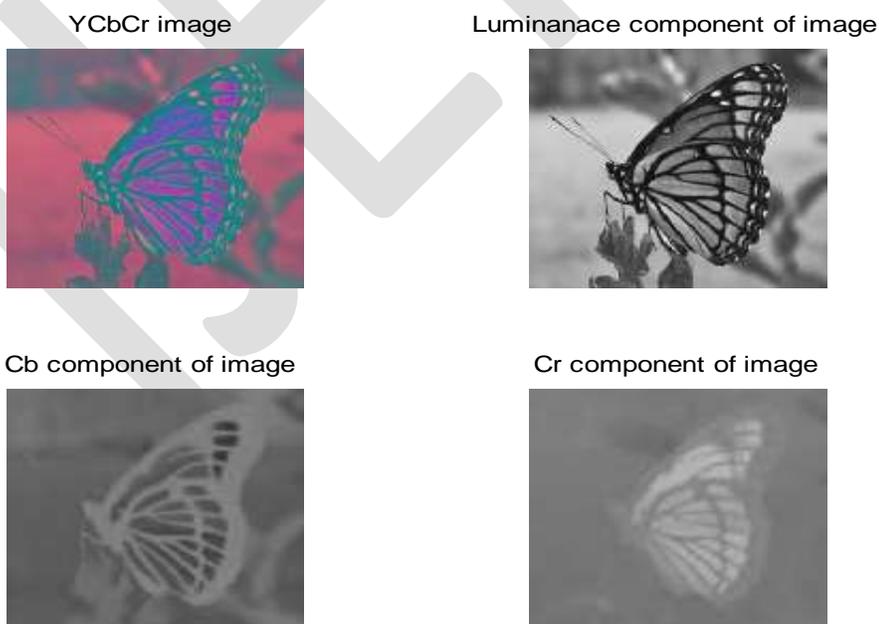
RESULT

To make the visual comparison easy, we constructed the colors with a very small number of coefficients (or RP) for all the methods. In the comparison with conventional colorization based coding methods, we used an uncompressed luminance channel in the reconstruction of the color image for all methods. The proposed method surpasses other colorization based coding methods by a large amount, and using a compressed luminance channel makes no difference in the comparative result.

Figures show the results of the implementation in MATLABR2013a:



Step 1: Original image is converted into YCbCr. (Figure 2)



Step 2: Decompose I into its luminance channel and original chrominance images. (Figure 3)

Luminance component of original image



JPEG compressed Luminance component of image



Step 3: Perform JPEG compression on the luminance component of original image. (Figure 4)

Y component of image



Geometry component



Cb component of image



Geometry component



Cr component of image



Geometry component



Step 4: Geometry component of Y,Cb,Cr channels. (Figure 5)

Decompressed image



meanshifted output into binary for scale=1



meanshifted output into binary for scale=2



meanshifted output into binary for scale=3



meanshifted output into binary for scale=4



Step 5: The colourization matrix is constructed by performing multiscale mean shift segmentation on the luminance component.
(Figure 6)

Centroid points of the image in Y-plane



Centroid points of the image in Cb-plane



Centroid points of the image in Cr-plane



Centroid points of the image combined



Step 6: Using this matrix and chrominance values perform Orthogonal Matching Pursuit (OMP) algorithm to get Representative Pixels (RP) and these pixels are sent to the decoder. (Figure 7)

Y component of image



Texture component of image



Cb component of image



Texture component of image



Cr component of image



Texture component of image



Step 7: Find Correlation Between luminance and chrominance components of the texture part. (Figure 8)

Original image



Reconstructed image



Step 8: In decoder, using these RP set and the same colourization matrix, constructed in encoder and the correlation coefficient reconstruct original image. (Figure 9)

PSNR and SSIM

The peak signal-to-noise ratio (PSNR) and structural similarity (SSIM Structural Similarity Index Matric) value as an objective evaluation of image quality for comparison. PSNR is defined as

$$\text{PSNR} = 10 * \log_{10}\left(\frac{256^2}{\text{mse}}\right)$$

where MSE is Mean Square Error.

SSIM is the image quality assessment based on the degradation of structural information, better for the human visual estimation than traditional image quality assessments such as PSNR. SSIM between images X and Y is defined as

$$\text{SSIM} = \frac{(2\mu_x\mu_y + C_1) + (2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2 + \sigma_y^2 + C_2)}$$

Where μ_x is the average of X and μ_y is the average of Y. σ_{xy} is the covariance of X and Y. σ_x is the variance of X and σ_y is the variance of Y. C1 and C2 are constants. Result numbers are averages of PSNR and SSIM of the three RGB components. Using a compressed luminance channel deteriorates the PSNR a little compared with that using an uncompressed luminance channel.

Results obtained in command window

- Size of colourization matrix = [10000 9606]
- The PSNR Value = 25.7824
- SSIM = 0.9026
- Elapsed time is 54.788464 seconds.

CONCLUSION

Compression Using Optimized Colourisation Method was implemented and analysed. In this method, the geometry and texture of an image are separated using total variation regularization. The texture components are compressed into coefficients that represent the correlation between luminance and chrominance, and the geometry components are compressed by formulating the RP selection problem into an L1 minimization problem. The compression performance and visual quality was evaluated using SSIM and PSNR values. Using this method, the compression gain becomes high and the reconstructed image has good visual quality. The speed of execution of proposed system is slow. The method can be improved further by increasing the speed of algorithm. Also the proposed method can be extended from still images to video too.

ACKNOWLEDGMENT

I would like to express my deepest gratitude to God Almighty in completing this thesis and also express my heartfelt thanks to parents, professors and friends who extended their sincere support for the fulfillment of both theoretical and practical work of my paper.

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APPLICATION OF LEAN KAIZEN IN PRODUCTIVITY IMPROVEMENT AND SAFETY MEASURES IN A MANUFACTURING INDUSTRY

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Abstract :- Productivity is very essential factor in any manufacturing industry. Productivity of production system is analogous to the efficiency of machine. Productivity is an average measure of efficiency of production. Highest efficiency in production is obtained by manufacturing required quantity of product, of required quality, at required time, by the best and cheapest method. The basic requirement of any industry is to maintain the quality and productivity of product in continuous improvement. The way to increase this, is to apply proper manufacturing strategy and use of tools to achieve business objective in order to stay competitive and to increase profit. Kaizen is the best method to improve manufacturing in continuous manner, as Kaizen means Continuous improvement. Kaizen results for greater improvement in labour productivity. The Kaizen philosophy has been implemented in organizations around the world as way to improve production values while also improving employee moral and safety. Kaizen is a team process so that the interaction between the labours and management get increases. It concludes that the application of Kaizen, transformation at workplace can be establish to leading productivity improvement.

Keywords : Productivity, Kaizen, Continuous Improvement, Low cost, Worker efficiency, Safety precautions, Better solution.

INTRODUCTION

Lean manufacturing is the systematic elimination of waste from all aspects of an organization's operations, where waste is viewed as any use or loss of resources that does not lead directly to creating the product or service a customer wants when they want it. Lean production is an approach to improve manufacturing efficiency and product quality. As productivity is most important factor for overall growth of organization and lead to stay competitive in the world. The LEAN kaizen is established as a best technique to improve the productivity in production system.

Kai-Zen = Continuous-Improvement

What is Kaizen? Kaizen (Ky 'zen) is a Japanese term that means continuous improvement taken from words 'Kai', which means continuous and 'zen' which means improvement. Some translate 'Kai' to mean change and 'zen' to mean good, or for the better. The creator of the concept of kaizen, or continuous improvement, was the late Dr. W. Edwards Deming, an American statistician. The Kaizen philosophy is to "do it better, make it better, and improve it even if it isn't broken, because if we don't, we can't compete with those who do." Kaizen encompasses many of the components of Japanese businesses that have been seen as a part of their success. Quality circles, automation, suggestion systems, just-in-time delivery, Kanban and 5S are all included within the Kaizen system of running a business as it is shown in figure. Kaizen involves setting standards and then continually improving those standards. To support the higher standards Kaizen also involves providing the training, materials and supervision that is needed for employees to achieve the higher standards and maintain their ability to meet those standards on an on-going basis.



Fig 1: KAIZEN Umbrella

CONCEPT

This paper refers to apply the KAIZEN technique for productivity improvement in BAJAJ INDUSTRIES LIMITED, IMMAMWADA, NAGPUR. Their main products are Cotton Ginning Machinery and its parts. The concept is to study problems encountered in industry and provide proper solution due to which the company can run with high performance. The reason of this is that the industries acquire the high economic growth only by eliminating non value added activities, reducing waste like longer waiting times, interruptions, travel time and keeping standardisation in industry. The concept of work is to-

1. Observe the process
2. Find out problems in industry
3. Generating ideas and design action plan to overcome the problems
4. Implementing
5. Analysing all aspects of conclusion
6. Refining the solution and set for final result with respect to quality and quantity.

METHODOLOGY

We are applying kaizen methodology to solve the problem identified in industry. Kaizen is defined as ongoing improvement involving everyone in the organization. Kaizen management has two main components. These include improvement and maintenance of standard operating procedures. Maintaining standards involves training and discipline. Kaizen represents small improvements in the current system. Everyone in the organization is involved in Kaizen from top managers who introduce, support, and build systems conducive to Kaizen, to workers who engage in Kaizen activities through suggestion systems and small group activities. Kaizen involves quality circles, small group activities, as well as permanent and continuous use of the PDCA cycle. Team members in the quality circles identify problems, identify their causes, analyze the causes, implement and test countermeasures, and establish new standards and procedures.

PRINCIPLE OF KAIZEN

- Its rules may vary in detail from company to company.
- Use all of the team's knowledge.

- It is almost entirely action based.
- It involves every employee in making change in most cases .

It focus on identifying problems at their source.

STEPS OF KAIZEN

1. Identify Present Losses
2. Theme And Goal Setting
3. Scheduling
4. Analysis And Counter-Measure
5. Implementation
6. Common Effectiveness
7. Taking Measure To Prevent Recurrence
8. Horizontal Replication

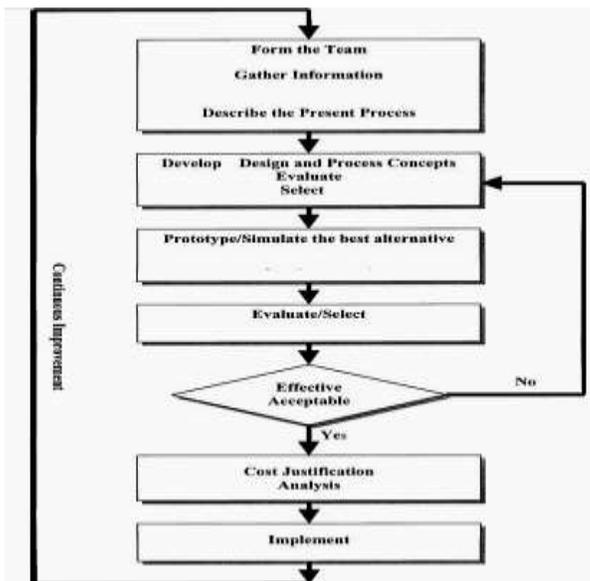


Fig 2 : Process Of Kaizen

IDENTIFICATION OF PROBLEMS

In many manufacturing industry there are so many problems related to productivity. It is major problem in industry because it affects industrial growth. In this industry there are so many problems which affects there productivity and production. The following are the problems found in that industry:-

1. **No Painting shop**:- There is no separate paint shop. Thus painting is done in free space. The paint particles get spread in all over the shop.
2. **Improper handling of material**:- In this industry improper material handling by workers take place, due to which chances of accident increases.
3. **Improper inventory of materials**:- There is no specific space for raw materials and finished products. Due to this workers face much problem to find proper material. It increases production time.
4. **Less safety measures**:- In this industry, the proper safety equipments are not available. So that it increases accidents to them.
5. **Environmental hazardous**:- In the industry some machining operation is done in open space like grinding, painting etc. Due to this particles get spread in environment because of it environment get hazard.

IMPLEMENTATION OF KAIZEN

CURRENT SITUATION (CAUSE ANALYSIS)

As the actual production of industry is completed at shop floor and majority of defects in product and services are generated at a stage of shop floor, we focus on shop floor processes. Shop floor processes include machining, grinding, welding, painting, etc. We have observed most of the problems and defects related with painting, machining and grinding processes.

Currently in Bajaj Steel Ltd., the spray painting is done on auto feeder and subassembly before final assembly and after the final assembly. The separate painting shop has not been provided for spray painting so the spray painting is done in open free space. Thus paint particles get spread in all over the shops including machining department, assembly department and quality inspection department. There is vast problem of spray painting in all three shops. The spread paint particles occupy all the area in all three shops of industry which converts good into bad environment. The suspended paint particles disturbs the workers from their jobs by polluting the area. So that the workers are not giving full efforts in machining products and other processes. Thus the less products or work are processed by the workers in same time and at same payment which result in less working efficiency. Also there is problem of health of persons working in industry including managers, engineers and mostly the workers. This problems was creating panic to the industry. To solve this problems, company decided that the painting will done when machining operations are not performing and vice versa that is the painting and other operation can not performed on same time. So that there is loss of work during painting as well as machining. And loss in work means loss in production, loss in productivity and increase in production lead time. Again in spray painting, they are completing less products. If they improve the painting method they could complete more products. Present data is given for 1 employee. 1 worker is painting 14-15 ginning machine in 1 shift of 8 hours which could be painted 20-21 ginning machines in same time.

For cleaning and grinding, the workers use hand grinders. We have got information that there accident in grinding. The problem is that the grind particles get flow into the eyes of worker though he was wearing all safety measures. This may happen due to less safety measures and traditional grinding method.

The industry has not decided the standardised time for production line because there is stoppage of work constantly. Again there is no specific space for raw materials and finished products. Due to this workers face much problem to find proper material. It increases production time.

CORRECTIVE ACTIONS

PROBLEMS	CAUSE	ACTION
Labour inefficiency	Bad working Condition	Provide good working condition
Stoppage of work	Spread paint particles all over the shop	Restriction to flow the particles
Incomplete target in painting	Waste of time in refilling paint gun	Use advanced method
Health Problem	Bad working condition	Provide good working condition
Loss in Production	Breakdown in work	Remove breakdown in work
Loss in working time	Breakdown in work	Remove breakdown in work
Increase in Production lead time	Breakdown in work	Remove breakdown in work

Accidents in Grinding	Less safety measures	Provide full safety measures
Improper inventory	Improper use of area/space	Proper use of space
Improper handling material	Less handling equipment	Provide full handling equipment
Environmental hazardous	Spread paint particles	Restriction to paint particles
No standardisation	Stoppage Of work	Remove stoppage in work

The kaizen actions include the above actions with following actions-

- 1) Making of separate paint shop or allow partition to the spray painting area with exhaust blower.
- 2) Use advanced method for refilling the painting gun.
- 3) Provide full safety measures
- 4) Provide full handling Equipment
- 5) Use proper method for grinding

EVALUATION

PROBLEM	BEFORE KAIZEN	AFTER KAIZEN
Labour inefficiency	Less	More
Stoppage Of work	More	Less
Loss in Production	More	Less
Loss in Working time	More	Less
Health and accident problems	More	Very Less
Improper Inventory	More	Very Less
Improper Handling material	More	Very Less

CONCLUSION

The positive approach with kaizen is implemented in Bajaj Steel ltd. The problems observed during kaizen implementation are solved with better working efficiency, better working environment, continuous work production. Under these circumstances, the

implementation of lean tool kaizen, improves the production environment with moderate investment. This case study carries evidence of genuine advantages when applying KAIZEN to the manufacturing shop floor.

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Low-Complexity Wallace Multiplier Using Energy-Efficient Full Adder Based On Carbon Nanotube Technology

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Abstract— In high speed applications, multipliers and their associated circuits like accumulators, half adders, and full adders consume a significant portion. Therefore, it is necessary to increase their performance as well as size efficiency. In order to reduce the hardware complexity which ultimately reduces an area and power, energy efficient full adders plays crucial role in Wallace tree multiplier. Reduced Complexity Wallace multiplier (RCWM) will have fewer adders than Standard Wallace multiplier (SWM). The Reduced complexity reduction method greatly reduces the number of half adders with 75-80% reduction in an area of half adders than standard Wallace multipliers. In RCWM and SWM, at the last stage Carry Propagating Adder (CPA) is used. This paper proposes use of high speed, low power full adder based on Carbon Nanotube technology in reduced complexity Wallace Multiplier at the place of Conventional Full adder in order to reduce power, area and improvement in speed.

Keywords— Wallace Multiplier, energy efficient CNTfull adders, High speed multiplier, CMOS full adder, Carbon Nanotube Field Effect Transistor, High Speed, Low Power

INTRODUCTION

In digital electronic world, power consumption and delay improvement are the most important parameters of a circuit. Digital signal processing (DSP) and image processing, multiplier play a crucial role. In image processing fast Fourier transform (FFT) is one of the most important transform often used. In Fast Fourier transform, computational process requires large number of multiplication and addition operation. The execution of these algorithms requires dedicated MAC and Arithmetic and Logic Unit (ALU) architectures. Multipliers and adders are the key element of these arithmetic units [9] as they lie in the critical path. Many researchers have tried to implement increasingly efficient multiplier. They aim at offering low complexity, low power consumption and high speed. One such multiplier is Standard Wallace Multiplier (SWM) [3]. SWM is fully parallel version of the multiplier, the carry save adders (CSA) used in SWM are conventional full adders whose carries are not connected. SWM also uses half adders in reduction phase. Reduced complexity Wallace multiplier (RCWM) [1] reduced number of half adders used in SWM with a slight increase in full adders to reduce the number of gates. Both the multipliers SWM and RCWM have same number of stages and delay is also same. The complementary CMOS and CPL designs are two conventional Adders based on CMOS structure. Based on transmission function and transmission gate, TFA and TGA designs were implemented. The other designs are classified as Hybrid designs. This paper proposes use of high speed, low power full adder based on Carbon Nanotube technology (CNT)[4] in reduced complexity Wallace multiplier at the place of carry propagating adder in order to reduce power, area and improvement in speed.

CARBON NANOTUBE FIELD EFFECT TRANSISTORS (CNFETS)

Carbon nanotube field effect transistor (CNTFET) uses CNT as their semiconducting channels. A single-wall CNT (SWCNT) consists of one cylinder only, and the simple manufacturing process of this device makes it very promising for alternative to MOSFET. The gate-to-source voltage that generates the same reference current is taken as the threshold voltage for the transistor that has different chirality. CNTFETs provide a unique opportunity to control threshold voltage by changing the diameter of the CNT or the chirality vector.

Fig. 1 shows the threshold voltage of both P-CNTFET and N-CNTFET obtained from simulation for various chirality vectors (various n for $m = 0$) [11]. The CNTFETs are particularly attractive due to possibility of near ballistic channel transport, easy application of high- k gate insulator and novel device physics. Although most of the work on CNTFETs has concentrated so far on their d.c. properties, the a.c. properties are technologically most relevant. Theoretically, it is predicted that a short nanotube operating in the ballistic regime, and the quantum capacitance limit should be able to provide gain in the THz range [12].

Comparison of CNTFET-based logic circuits to CMOS logic circuits is necessary to establish means of evaluation for performance metrics such as current density, device switching speed, propagation delay through the gates, switching energy, operating temperature, and cost. However, the technology is not sufficiently mature to enable meaningful comparisons as the positioning techniques must still evolve to enable high-yield volume manufacturing and contact technology must be improved to reduce the impact of contacts on circuit performance.

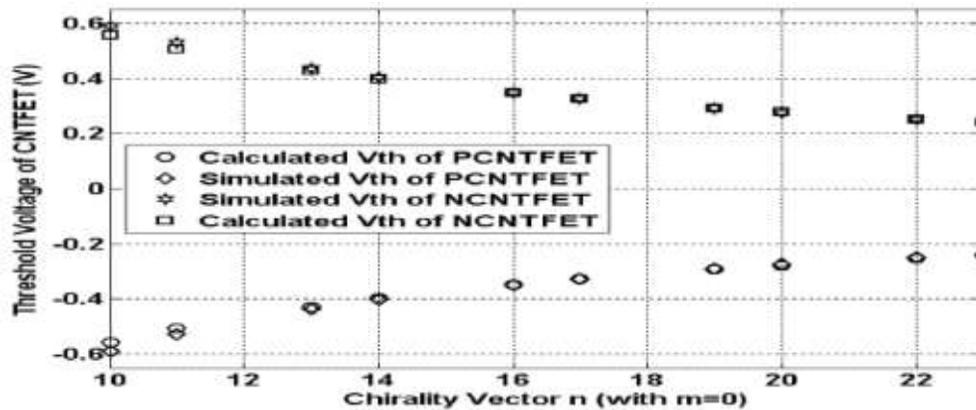


Fig1: Threshold voltage of CNTFETs versus n (for m = 0) [11]

TRADITIONAL METHOD

A. Wallace Multiplier

A Wallace Multiplier is an efficient methodology, easily hardware implementable that multiplies two integers, devised by an Australian Computer Scientist Chris Wallace. For unsigned multiplication, up to n shifted copies of the multiplicand are added to form the result. The entire procedure is carried out into three steps: partial product (PP) generation, partial product grouping & reduction, and final addition. The principle of Wallace tree multiplication [3] is shown in Fig. 2. It is clear from the figure that for an $n \times n$ multiplication there are n^2 partial products that have to be summed. The 1st step in the algorithm involves grouping the partial products into sets of 3. For example, if there are n rows of partial products, $3 \cdot \lfloor n/3 \rfloor$ rows are grouped and the remaining $n \bmod 3$ rows are passed to the next stage. Therefore in the Fig. 1, three rows of partial products are grouped together in stage 1. These 3 rows are summed using full adders and if there are 2 dots in a particular column half adders are used. The resulting sum and carry signals from the half and full adders are passed to the next stage. The process is repeated till the entire n partial products are summed. The resulting sum and carry out of the last stage is added using a fast carry propagation adder at the final stage.

B. Reduced Complexity Wallace Multiplier

Reduced complexity Wallace Multiplier (RCWM) is the modified version of Standard Wallace Multiplier (SWM). In SWM they use full adder and half adder in their reduction phase, but half adder do not reduced the number of partial bit, therefore RCWM reduced the number of half adder used in the SWM with slightly increase in full adder.

The partial products are formed by N^2 AND gates. The partial products are arranged in a Tree structure format. The modified Wallace reduction method divides the matrix into three row groups. Full adders are use for each group of three bits in a column like the Standard Wallace reduction. A group of two bits in a column is not processed, that is, it is passed on to the next stage (in contrast to Standard Wallace method). Single bits are passed on to the next stage as in the Standard Wallace reduction. The only time half adders are used is to ensure that the number of stages does not exceed that of a Standard Wallace multiplier. For some cases, half adders are only used in the final stage of reduction. In RCWM they uses carry propagating adder (CPA). One possible carry propagating adder for RCWM is a hybrid adder consisting of S+1 ripple carry half adder

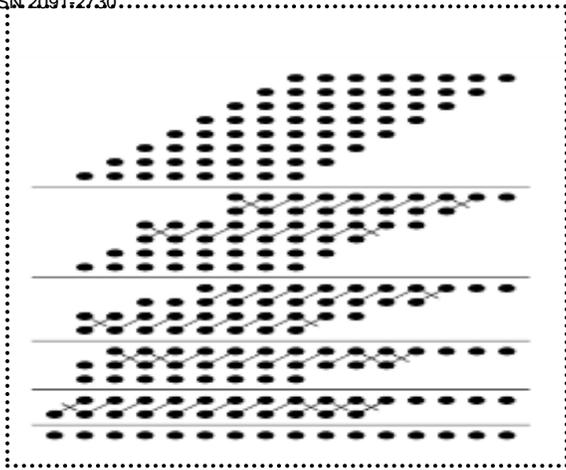


Fig 2. Dot notation for SWM (8 bit) [6]

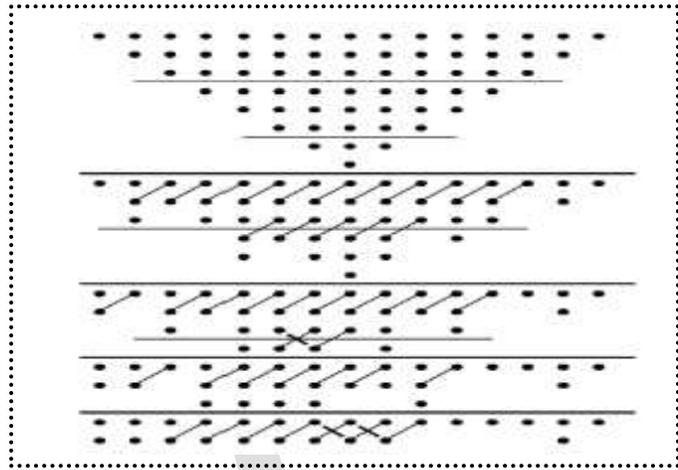


Fig 3. Dot notation for RCWM (8 bit) [6]

ENERGY EFFICIENT CNT FULL ADDER

Adders are the heart of multiplier. Hence, efficiency of Adders affects performance of multiplier. The conventional adder design depending on input values can have threshold losing in output voltages and are not full swing. For solving this problem, some method such as using transmission gate instead of pass transistor or using output buffers, but these methods cause to increase transistor using and critical path and in result increasing power consumption and delay. CNFETs have a special property that can be used for this case[4]. The threshold voltage is inversely proportional to the diameter of its CNT. So by increasing the diameter of CNT, V_{th} can be reduced. Decreasing of V_{th} leads to better driving capability and higher speed and the full swing problem can be solved

Design of a Energy Efficient CNT Full Adder

The logic formula for a one-bit full adder is shown in Equation (3). The inputs are A, B, C (C is carry input) and outputs are Sum and Cout.

$$\begin{aligned} SUM &= XOR(A, B, C) = A \oplus B \oplus C \quad (1) \\ &= (A \oplus B) \oplus C \end{aligned}$$

The Sum is generated by using XOR twice. First, A and B become XOR and then the result of previous stage become XOR with C. A XOR module is illustrated in Figure 4. This module uses two pass transistors and two pull down transistors. Pass transistors can cover the 3 states of inputs that are 00, 01, 10 and one more remained state (11) is handled by pull down network.

In this design to implement Cout Equation NCFET and a PCNFET pass transistor are used

$$\begin{aligned} Cout &= C(A \oplus B) + AB \\ &= C(A \oplus B) + A\overline{A}B + AAB \quad (2) \\ &= C(A \oplus B) + A(\overline{A}B + AB) \\ &= C(A \oplus B) + A(\overline{A \oplus B}) \end{aligned}$$

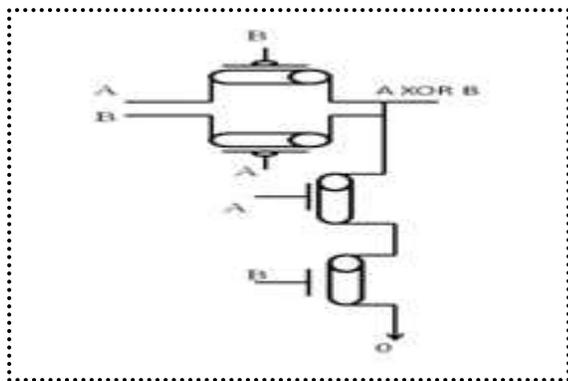


Fig 4. .Design of XOR [4].

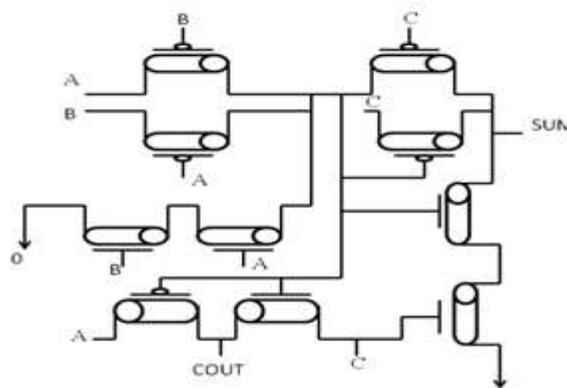


Fig 5. .Design of Full Adder [4].

PROPOSED ARCHITECTURE

Proposed architecture has same stages as RCW Multiplier. At the stage where conventional full adder is present, Energy Efficient Full Adder is used as shown in Fig 7. Our proposed architecture aims to reduced overall power consumption and leads to increase speed. The design makes use of Energy Efficient CNT Full Adder in Place of conventional full adder. Let two numbers multiply using RCW Multiplier as shown below. The RCW Multiplier has three steps. Multiply (that is - AND) each bit of one of the arguments, by each bit of the other, giving n^2 results. Depending on position of the multiplied bits, the wires carry different weights, for example wire of bit carrying result of $a_2 b_3$ is 32. Fig 6 shows the multiplication of two 4-bit numbers. The numbers are denoted by A and B where a_0, a_1, a_2, a_3 represents the bits of multiplicand A with a_0 as its least significant bit and a_3 as its most significant bit and b_0, b_1, b_2, b_3 represents the bits of multiplier B with b_0 as its least significant bit and b_3 as its most significant bit. The Multiplication of the two 4-bit numbers giving partial product which, arrange these partial product bit in tree format and reduced the group two bit using Half adder shown in first stage, and reduced the group of three bit using full adder shown in second stage as of Fig 7. Then final adder adds all the result of second stage and gives final product, which is of 8-bit.

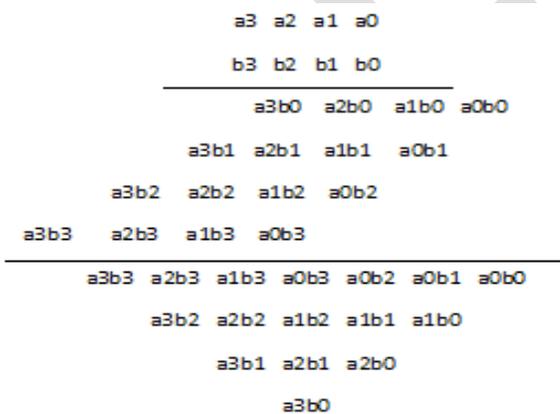


Fig 6. Multiplication of two 4 bit numbers

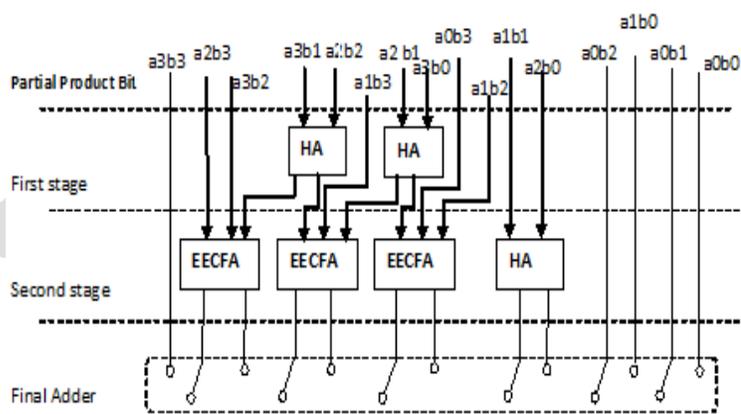


Fig7. Proposed Architecture Of 4x4 Wallace Multiplier

AREA OPTIMIZED WALLACE TREE MULTIPLIER

TABLE I. Complexity of Reduction

Proposed Wallace Tree Multiplier using EECNTFA						
Number of bits	4	8	16	24	32	64
Number of stages	2	4	6	7	8	10
Full Adders	12	39	201	490	907	3853
Half Adders	-	3	9	16	23	53
Total Gates	120	405	2055	4980	9185	38795

TABLE II. Comparison table for Full Adder

ADDER	GATE COUNT
Conventional CMOS Full Adder	40
Carry Propagate Adder	32
Energy Efficient Full Adder [4]	10

SIMULATION RESULTS AND ANALYSIS

The simulation was done using 0.18 μ m technology with length and width specification as given NMOS: L=180nm And W =360nm; PMOS: L=180nm and W=720nm. The convention of the W/L ratio of PMOS being thrice that of NMOS has been adhered to for better results.

A. Schematic of inverter

Fig. below shows a CMOS inverter using one nMOS transistor and one pMOS. When the input A is 0, the nMOS transistor is OFF and the pMOS transistor is ON.

B. Result of CMOS inverter

This section analyzes the static and dynamic power of an inverter Design with 0.25 μ m technology. Static power comes to be 2 m and dynamic power comes to 18 mw as shown in Fig 8.

Fig 8. Wave form for Inverter

CONCLUSION

This paper proposed an improvement of reduced complexity Wallace Multiplier with reduced power consumption and area by using Energy Efficient CNTfull adder at the place of conventional Full adder. From the literature view it can be inferred that proposed multiplier reduced power and total gate count i.e. reduced area.

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Optimization of die-casting process parameters using DOE

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Abstract— This paper reports on an optimization of die-casting process parameters to identify optimized level for improving the cycle time using Taguchi method for DOE. AISic132 up to 20tonn machine capacity is used to calculate cycle time. There are four machining parameters i.e. melting temperature, Injection pressure, Plunger speed, cooling phase. Different experiments are done based on this parameters. Taguchi orthogonal array is designed with three levels and four process Parameters with the help of software Minitab 15. In the first run nine experiments are performed and Cycle time is calculated. Taguchi method stresses the importance of studying the response variation using the signal-to-noise (S/N) ratio, resulting in minimization of cycle time variation due to uncontrollable parameter. The Cycle time was considered as the quality characteristic with the concept of "the larger-the-better". The S/N ratio for the larger-the-better Where n is the number of measurements in a trial/row, in this case, n=1 and y is the measured value in a run/row. The S/N ratio values are calculated by taking into consideration with the help of software Minitab 15. The Cycle time values measured from the experiments and their optimum value for maximum cycle time. Every day scientists are developing new materials and for each new material, we need economical and efficient die-casting process. It is also predicted that Taguchi method is a good method for optimization of various Diecasing process parameters as it reduces the number of experiments. From the literature survey, it can be seen that there is no work done on AISic 132 die-casting process. So in this project the Pressure die casting parameter of AISic 132 is done in order to optimize the pressure die-casting process parameters for minimizing the Cycle time.

Keywords— Taguchi Method, Die-casting Parameters, Pressure die-casting Process, AISic 132, Software Minitab15

INTRODUCTION

There are two main types of die casting machines - hot chamber machines (used for alloys with low melting temperatures, such as zinc) and cold chamber machines (used for alloys with high melting temperatures, such as aluminum). The differences between these machines will be detailed in the sections on equipment and tooling. However, in both machines, after the molten metal is injected into the dies, it rapidly cools and solidifies into the final part, called the casting. Die casting equipment was invented in 1838 for the purpose of producing movable type for the printing industry. The first die casting-related patent was granted in 1849 for a small hand operated machine for the purpose of mechanized printing type production. In 1885, Otto Mergenthaler invented the linotype machine, an automated type casting device which became the prominent type of equipment in the publishing industry. Other applications grew rapidly, with die casting facilitating the growth of consumer goods and appliances by making affordable the production of intricate parts in high volumes. Die casting is a metal casting process that is characterized by forcing molten metal under high pressure into a mold cavity. The mold cavity is created using two hardened tool steel dies which have been machined into shape and work similarly to an injection mold during the process. Most die castings are from nonferrous metals, specifically zinc, copper, aluminum, magnesium, lead, alloys. Depending on the type of metal being cast, a hot- or cold-chamber machine is used. The Taguchi method is a well-known technique that provides a systematic and efficient methodology for process optimization and this is a powerful tool for the design of high quality systems. Taguchi approach to design of experiments is easy to adopt and apply for users with limited knowledge of statistics, hence gained wide popularity in the engineering and scientific community. This is an engineering methodology for obtaining product and process condition, which are minimally sensitive to the various causes of variation, and which produce high-quality products with low development and manufacturing costs. Signal to noise ratio and orthogonal array are two major tools used in robust design. The S/N ratio characteristics can be divided into three categories when the characteristic is continuous

a) Nominal is the best

b) Smaller the better

c) Larger is better characteristics

For the maximum material removal rate, the solution is “Larger is better” and S/N ratio is determined according to the following equation.

Where, S/N = Signal to Noise Ratio,

n = No. of Measurements,

y = Measured Value

The influence of each control factor can be more clearly presented with response graphs. Optimal cutting conditions of control factors can be very easily determined from S/N response graphs, too. Parameters design is the key step in Taguchi method to achieve reliable results without increasing the experimental costs.

AlSi132 is most suitable for the manufacture of parts such as Electrical enclosures, gear box, bolts and studs. AlSi132 withstand the highest operating temperatures of all the die cast alloys. Its strength, rigidity, and corrosive resistance offer significant heat dissipating. Aluminum is used in a broad range of networking and infrastructure equipment in the telecom and computing industries.

➤ Hot-chamber die casting

Hot Chamber Die Casting is the process where the injection system is immersed in pool of molten metal hence the name. The furnace is attached to the machine via a feeding system called a gooseneck. As the cycle begins the piston will retract, which allows the molten metal to fill the “gooseneck” from a port in the injection cylinder. As the plunger move downwards, it seals the port and forces the molten metal through the gooseneck and nozzle into the die. Once the metal solidifies, the plunger will pull upwards. Afterwards, the die will open and the part is ejected. The advantage this process its short cycle time as it does not require metal to be transported from a separate furnace. Unfortunately, this die casting process is only suitable for alloys that do not attack the injection cylinder.

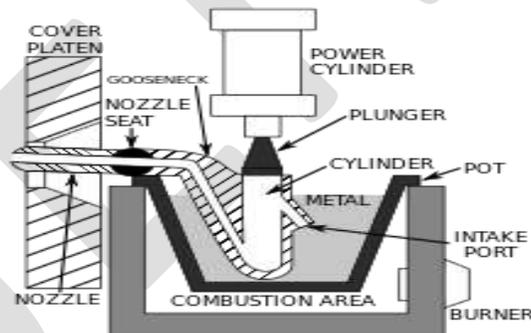


Figure:Hot-chamber die casting

➤ Cold-chamber die casting

Cold Chamber Die Casting is the process of using a ladle to transport the molten metal from the holding furnace into the unheated shot chamber or injection cylinder. This metal is then shot into the die by using a hydraulic piston. However, this process is primarily used for manufacturing aluminum parts as molten aluminum alloys have a tendency to attack and erode the metal cylinders, plungers and dies greatly shortening their tool life.

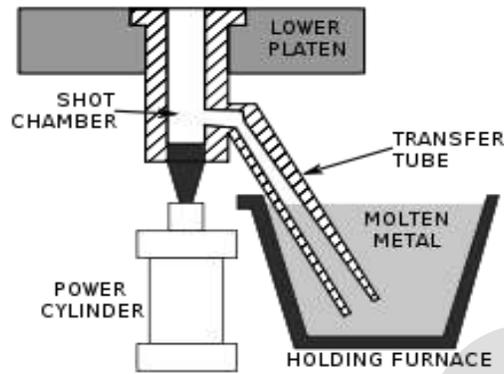


Figure: Cold-chamber die casting

OBJECTIVE

- Select the component/s for study
- Identify the critical parameters for Processing the Cast components
- Capture the historical data for process parameters with its levels
- Perform DOE considering response factor as the cycle time or the quality of the component .
- Trial and testing upon development for experimentation
- Validate the thesis by comparing with the experimental results

Problem Definition

The sponsoring Company whose associate concern is primarily engaged in production of Die Casting is keen to investigate the levels for the factors responsible for arriving at the best quality for the cast components. Pressure die casting is primarily affected by the process parameters such as solidification time, molten temperature, Filling time, injection pressure and plunger velocity. It is therefore essential that the optimum casting technique with minimum defects be adopted to reduce the manufacturing cost of die casting component during mass production. The optimization of the process parameters pose a challenge for defects since the interplay among the parameters needs to be captured for setting the process for each component. In manufacturing processes, there are various parameters with different adjustment levels, which may influence the final characteristics of the product. To optimize a manufacturing process, the trial and error method is used to identify the best parameters to manufacture a quality product. However, this method demands extensive experimental work and results in a great waste of time and money. Thus, design of experiments appears to be an important tool for continuous and rapid improvements in quality (Coleman and Montgomery, 1993). These experimental methods may be employed to solve problems related to a manufacturing process, to substitute a process for another one, to develop different products and to understand the influence of various factors on the final quality of a given product. The design of experiments (DOEs) is an experimental technique that helps to investigate the best combinations of Process parameters, changing quantities, levels and combinations in order to obtain results statically reliable. It is a systematic route that may be followed so as to find solutions to industrial process problems with greater objectivity by means of experimental and statistical techniques. The die casting process is controlled by several parameters. When properly determined and adjusted, they result in an improvement in quality of the die casting parts. Usually, the main controlled variables are mold temperature, dosage volume, slow and fast shots, commutation spots, injection pressure, upset pressure as well as chemical composition and liquid metal temperature.

DESIGN OF EXPERIMENT

Outline of experimental design procedure

The Experiments are carried out by researchers or engineers in all fields of study to compare the effects of several conditions or to discover something new. If an experiment is to be performed most efficiently, then a scientific approach to planning it must be considered. The statistical design of experiments is the process of planning experiments so that appropriate data will be collected, the minimum number of experiments will be performed to acquire the necessary technical information, and suitable statistical methods will be used to analyze the collected data. The statistical approach to experimental design is necessary if we wish to draw meaningful conclusions from the data. Thus, there are two aspects to any experimental design: the design of the experiment and the statistical analysis of the collected data. They are closely related, since the method of statistical analysis depends on the design employed. An outline of the recommended procedure for an experimental design is shown in Figure and briefly explained below.

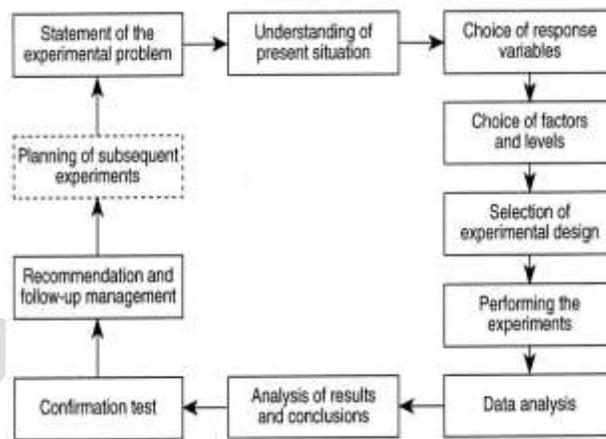


Figure: Outline of experimental design procedure

Taguchi system of quality engineering

Dr. Genichi Taguchi has introduced more cost effective engineering methodology namely robust design to deliver high quality products at low cost through research and development. It can greatly improve an organization's ability to meet market windows, keep development and manufacturing costs as low as possible. Robust design uses any ideas from statistical experiment design and adds a new dimension to it by explicitly addressing two major concerns faced by all products and process designers:

How to reduce economically the variation of a product's function in the customer's environment?

How to ensure that decisions found optimum during laboratory experiments will prove to be valid and reliable in manufacturing and customer environments?

Signal to noise ratio

In the field of communication engineering a quantity called the signal-to-noise (SN) ratio has been used as the quality characteristic of choice. Taguchi, whose background is communication and electronic engineering, introduced this same concept into the design of experiments. Two of the applications in which the concept of SN ratio is useful are the improvement of quality via variability reduction and the improvement of measurement. The control factors that may contribute to reduced variation and improved quality can be identified by the amount of variation present and by the shift of mean response when there are repetitive data. The SN ratio transforms several repetitions into one value which reflects the amount of variation present and the mean response. There are several

SN ratios available depending on the type of characteristic: continuous or discrete; nominal-is-best, smaller-the-better or larger-the-better. In this section we will only discuss the case when the characteristic is continuous. The discrete case will be explained later.

1) Nominal is Best Characteristics

2) Smaller the Better Characteristics

3) Larger the Better Characteristics

There are cases where The-Larger-The-Better is applicable to characteristics such as the strength of materials and fuel efficiency. In these cases, there are no predetermined target values, and the larger the value of the characteristic, the better it is. The corresponding SN ratio of Larger-the-Better is; Note that the target value of $1/y$ is 0 in the larger-the-better characteristic. The SN equations are based on the loss function when there is a set of n characteristics. If we employ the loss-function approach for the nominal-is-best case, we can derive the following SN equation: This form of equation may be more desirable for three reasons. First, where y_i can take a negative or positive value, it is possible for S_m to be less than V , so that equation cannot be used. Second, as y increases, SN increases. However, if y is greater than the target value m , the bigger y becomes the worse. Hence, where y is bigger than m , SN does not reflect desirable situations. Third, the SN values are not based on the concept of the loss function, and are not consistent with the loss function.

Orthogonal array

Many designed experiments use matrices called orthogonal arrays for determining which combinations of factor levels to use for each experimental run and for analyzing the data. In the past, orthogonal arrays were known as 'magic squares' Perhaps the effectiveness of orthogonal arrays in experimental design is magic. What is an orthogonal array?

An orthogonal array is a fractional factorial matrix which assures a balanced comparison of levels of any factor or interaction of factors. It is a matrix of numbers arranged in rows and columns where each row represents the level of the factors in each run, and each column represents a specific factor that can be changed from each run. The array is called orthogonal because all columns all columns can be evaluated independently of one another.

There are 18 orthogonal array tables in the catalogue of Taguchi, these being denoted by $LN(sk)$ or just by LN . Here, $LN(sk)$ is a matrix with dimension $N \times k$, s distinct elements and the property that every pair of columns contains all possible s^2 ordered pairs of elements with the same frequency. In particular, N is the number of rows and k the number of columns in the orthogonal array. Elements of an orthogonal array can be numbers, symbols or letters.

SALIENT FEATURES OF TAGUCHI METHOD

1. A popular off-line quality control method aiming to reduce variability in a process and the number of experimental runs required to gather necessary data.
2. A simple, efficient and systematic method to optimize product or process to improve the performance or reduce the cost.
3. It helps to arrive at the best parameters for the optimal conditions with the least number of analytical investigations.
4. It is a scientifically disciplined mechanism for evaluating and implementing improvements in products, processes, materials, equipments and facilities. Therefore, the Taguchi method has great potential in the area of low cost experimentation. Thus it becomes an attractive and widely accepted tool to engineers and scientists

Steps in Taguchi based Experiment

➤ Definition of the problem

The statement of the problem is “Optimization of Die Casting Process parameters to identify the optimized levels for improving cycle time using Taguchi Methods for DOE.”

➤ Selection of response variables

The recovery rate of Cycle time is the “Smaller the better” type of quality characteristic

Selection of process parameters and their levels

1. Injection Pressure
2. Plunger Speed
3. Melting temperature
4. Cooling time

➤ Various process parameters and their identified levels table.

Level	Melt temp, deg c	Inj Press, bar	Plunger speed, m/s	Cooling phase, sec
1	690	800	2	8
2	694	840	3	9
3	700	900	4	11

➤ Selection of an orthogonal array

The number of levels for each control parameter defines the experimental region. We have four parameters at three different levels, from the table we has selected L9 orthogonal array for the experimentation.

ANALYSIS AND EXPERIMENTATION

Experimental Machine setup & Product

Figure show experimental setup of machine that is R38 hot chamber die-casting machine having Tank Capacity: 200L, Weight of machine: 3000kg, Overall dimension: 3000X1050x1550 on which different die-casting process is carried out.



Figure: Hot chamber die-casting machine

Figure Shows ALSI 132 handle cover that is die-casting product on which L9 experiments are performed for four different process parameters value to calculate cycle time value which is response factor.



Figure: ALSI 132 Handle cover

Taguchi Analysis on MINITAB 15

- Create Taguchi Design on MINITAB 15

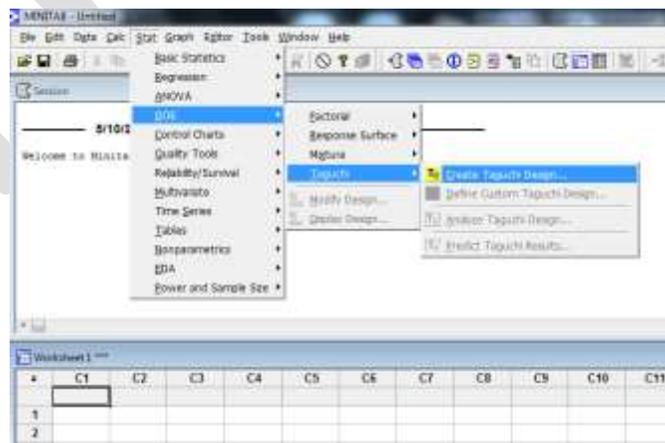


Figure: Taguchi Design

➤ Selection of Available Design

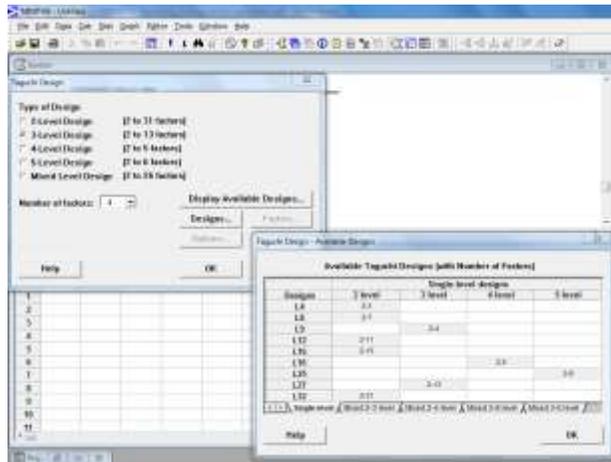


Figure: Three level type design

➤ Selection of Taguchi Design

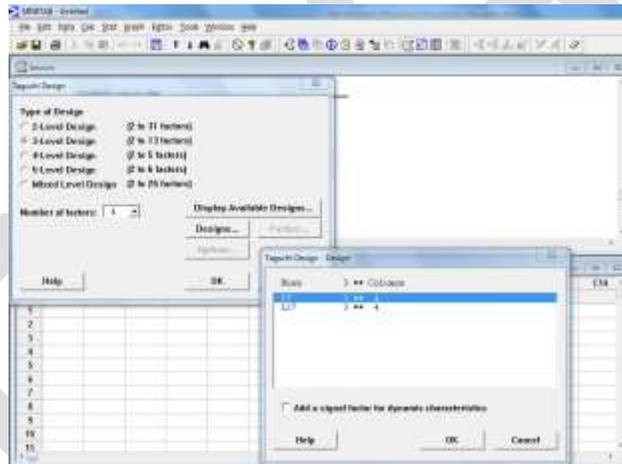


Figure: L9 orthogonal array

➤ Click on Factors and write name of factors and levels of factors at desired place. Then press ok as Shown in given below figure

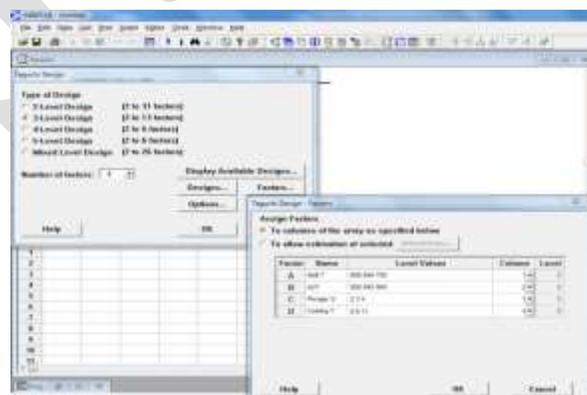


Figure: Factors & level chart

- Experiments are performed according to the Selected Design of experiment. When experiment is Performed cycle time is calculated as given in table below.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
1	490	800	2	8	36									
2	490	840	3	9	48									
3	490	880	4	11	62									
4	494	800	3	9	36									
5	494	840	4	9	36									
6	494	880	3	9	36									
7	500	800	4	9	36									
8	500	840	2	11	62									
9	500	880	3	8	36									

Figure: L9 Process parameters 9 level chart

- Finally press ok in window analyses Taguchi design. Graphs and SN ratio is generated

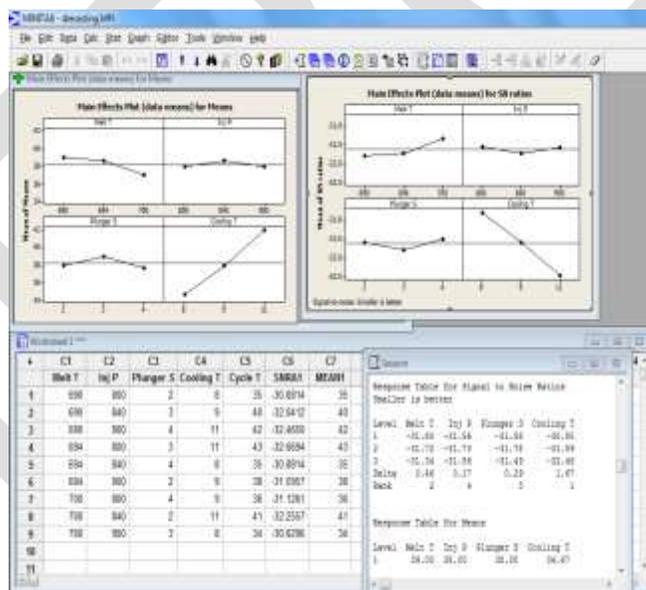


Figure: Result table

➤ Experimental Response table for SN ratio & Means

Taguchi Analysis: Cycle time, versus Melt temp,de, Inj Press, b, ...

Response Table for Signal to Noise Ratios
Smaller is better

Level	Melt temp, deg c	Inj Press, bar	Plunger speed, m/s	Cooling phase, sec
1	-31.80	-31.56	-31.58	-30.80
2	-31.72	-31.73	-31.78	-31.59
3	-31.34	-31.56	-31.49	-32.46
Delta	0.46	0.17	0.29	1.67
Rank	2	4	3	1

Response Table for Means

Level	Melt temp, deg c	Inj Press, bar	Plunger speed, m/s	Cooling phase, sec
1	35.00	38.00	38.00	34.67
2	38.67	38.67	39.00	38.00
3	37.00	38.00	37.67	42.00
Delta	2.00	0.67	1.33	7.33
Rank	2	4	3	1

Figure: Response table for SN ratio & Means

From the values of delta Melting temp, Injection Pressure, Plunger Speed, cooling phase we can conclude that cooling phase is most affected parameter as compared to Melting temp, Injection pressure, Plunger speed.

➤ Chart shows the optimum solution of the given set of parameters is given by the value having SN ratio is largest i.e. -30.6296

Worksheet1***

#	C1	C2	C3	C4	C5	C6	C7	C8
	Melt T	Inj P	Plunger S	Cooling T	Cycle T	SNRA1	MEAN1	
1	690	800	2	8	35	-30.8814	35	
2	690	840	3	9	40	-32.0412	40	
3	690	900	4	11	42	-32.4650	42	
4	694	800	3	11	43	-32.6694	43	
5	694	840	4	8	35	-30.8814	35	
6	694	900	2	9	38	-31.5967	38	
7	700	800	4	9	36	-31.1261	36	
8	700	840	2	11	41	-32.2557	41	
9	700	900	3	8	34	-30.6296	34	
10								
11								

Figure: Optimum solution

Applying DOE using Taguchi optimized level has been found out with particular combinations for cycle time.

Table: DOE result table

Melt. Temp	Inj Pre	Plung Speed	Cool Time	Cycle Time	SNR	Mean
700	900	3	8	34	-30.629	34

Experimentation Result

Table: Experimental result table

Melt. Temp	Inj Pre	Plung Speed	Cool Time	Cycle Time	SNR	Mean

700	900	3	8	34	-30.629	34
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Experiment has been administrated on Part name-Housing handle-Bar(2W/motor cycle) Part name BAL 15324 using the above reference chart trial are found to be satisfactory for the given range value of parameters with significant reduction in initial setting time complimentary to reasonable quality of product.



Figure: L9 Test report

CONCLUSIONS

The Taguchi's approach has been carried out for optimizing the parameters of die-casting process. Four input parameters have been optimized using SNR. The smaller-the-better quality characteristic has been used for minimizing the Cycle time. An L9 orthogonal array with four parameters and three levels has been used for predict set of parameter which gives value of predicated Cycle time. 9 numbers of experiments were done for those sets of parameters. Experimental values of performance were put in the Minitab software¹⁴ and software predicated Cycle time is 34 for set of Melting Temp 700 deg C, Inj Pres 900 bar, Plunger speed 3m/s & Cooling time 8 sec. This suggested set of parameter which gives optimum performance of porosity. Validation experiment was done for that set of parameter and compared with predicated value. This experimental value of % of porosity is very closer to the predicated values. Result obtained from validation experiments using optimum parameter combination gives excellent agreement with predicated results. The performance of the optimized model is better than the original model and also prove that taguchi parameter design concept is more powerful and efficient tool for minimize the cycle time.

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Model of Control and Visualization of Work of Belt Conveyors

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Abstract – Systems of continuous transport and material handling perform well, where key role plays high productivity. Belt conveyors, thanks to simple structure, high reliability, relatively small energy consumption, are basic means of material transport. Model of control and visualization of work of belt conveyors is presented in this article. Significant for the structure of model was to program GE Fanuc's devices, that is, PLC driver and operator's control panel and depiction of work process of conveyors, using visualization software In Touch.

Keywords – conveyor belts, visualization.

INTRODUCTION

The issue of transport in the industry is a key element of productivity of almost each factory or mine. It is also important in the agriculture and food industry. [18,12] Nowadays, conveyor belts are from a few meters to a few kilometres in length, and their productivity is about 4000 tons of transported materials within one hour. [4,2,11] Chain conveyor (where the function of tension member fulfils a chain) and linear conveyor (where this function fulfils system of steel lines) are types of tension memberless conveyors, often additionally equipped with fasteners, scrapers or closed containers. [3, 5]. Sometimes chain plays a role of tension member for the trucks moving on the track attached the ceiling of a building. [16] The so-called overhead conveyor allows to get to each place of a factory hall, what considerably speeds up the cycle of production. [10].

1. Structure of model of control and visualization of work of belt conveyors

Model of a group of belt conveyors consists of two parts: (Fig1.):

1. Four conveyor belts and elevator, which operates one of conveyor belts.
2. Control cabinet and doors, where we can find control buttons and operator's control panel.



Fig.1. Model of control and visualization of work of belt conveyors.[17]

- *Sensors, actuators*

The inductive sensors XS1N30PA349 (detection of cubes) (Table 1.) and Ni10U-M12-AP6X-H1141 (presence of an elevator) were used to build a model (Table 2). They detect the presence of metal elements. [14,15] Transported details were made of wood and steel sheets, therefore, the sensors detect them in a moment when cube is within their reach. [7,9,8]

Table 1. Parameters XS1N30PA349

Parameters	Value
Nominal range– S_n	20mm
The range of useful	0mm - 16mm
Dimensions	M30 X 40,5 mm
Type	PNP, NO
Supply Voltage V (V)	10...38 VDC
Maximum switching frequency (Hz)	5000 Hz

Table 2. Parameters Ni10U-M12-AP6X-H114□□

Parameters	Value
Nominal range– S_n	10mm
The range of useful	0mm - 8mm
Dimensions	M12 X 52 mm
Type	PNP, NC
Supply Voltage V (V)	10...30 VDC
Maximum switching frequency (Hz)	5000 Hz

In order to drive a model, engines with reducers SG-545124500-60K were applied, supplied with the voltage 12VDC. Angular speed of the engines is 50 rpm. The drives take a current $I = 500$ mA.

The model uses the GE Fanuc PLC VersaMax Micro IC200UDR164 (Fig. 2.). The PLC must be matched to a particular control by introducing into its memory algorithm desired operation of the plant. The algorithm is written in a programming language dedicated controller. You can change the algorithm by changing the contents of program memory. The controller is provided with a corresponding number of input systems collect information about the state of the object and the service requests with the appropriate number and type of output devices connected to the actuators, signaling, or data.



Fig. 2. Appearance GE Fanuc PLC VersaMax Micro IC200UDR164 used in the model

Table 3. Parametry PLC GE Fanuc VersaMax Micro IC200UDR164 [6]

Parameters	Value
Supply Voltage	120/240 VAC
Range	100 (-15%) ÷ 240 (+10%) VAC
Inrush current	2.5 A at a voltage 30 VDC
Current consumption	0.2 A at a voltage 30 VDC
Input Power	26 VA

The model uses the GE Fanuc PLC VersaMax Micro IC200UDR164 (Table 3) and written programs:

- Program MAIN to the PLC in language LAD

- Program TASM_1 to the PLC in language LAD
- Program TASM_2 to the PLC in language LAD
- Program TASM_3 to the PLC in language LAD
- Program LIFT to the PLC in language LAD (Fig.3)

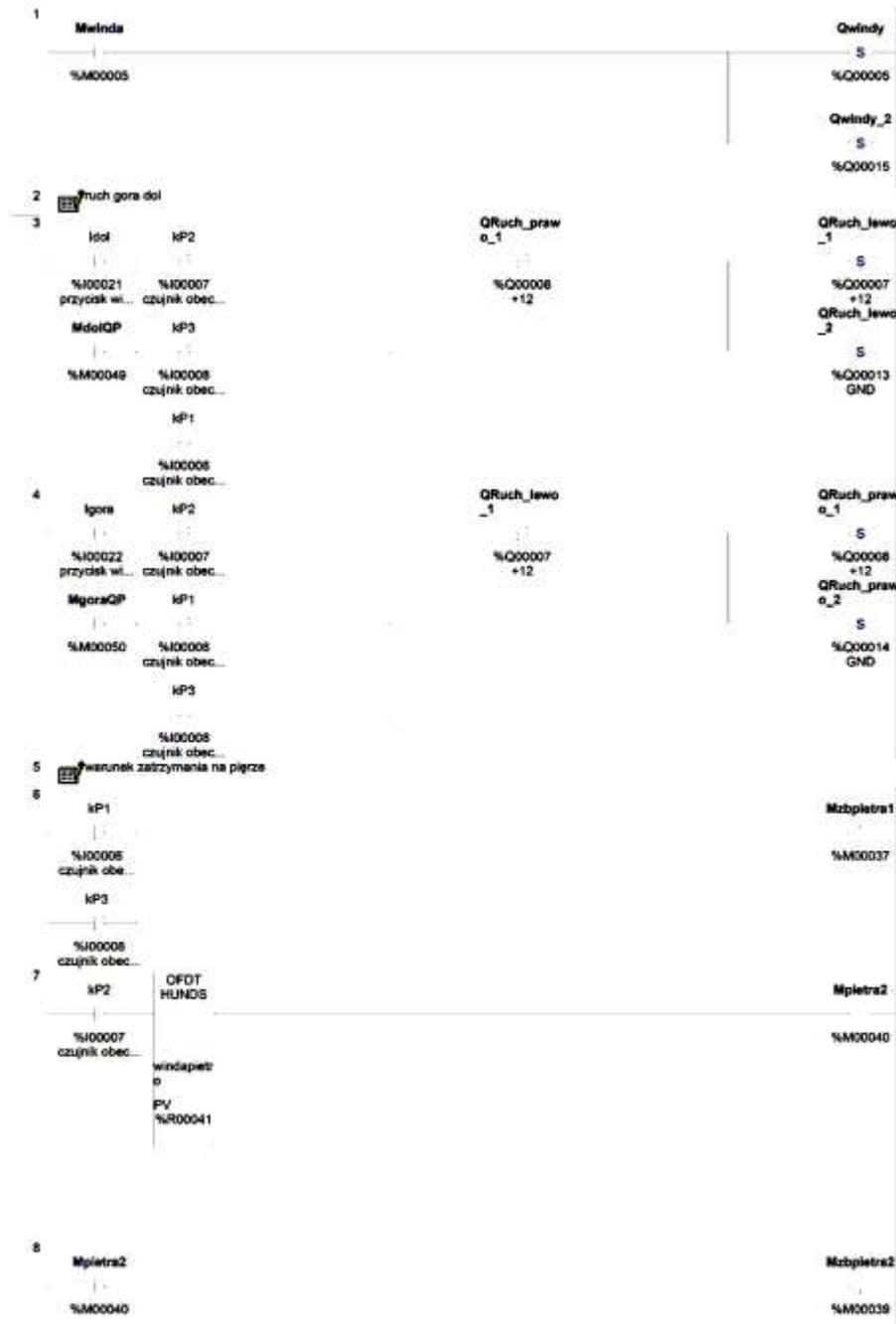


Fig. 3. Program LIFT to the PLC in language LAD

2. Control and visualization

The buttons on the doors, operator's control panel and Application InTouch – Window Viewer are used to control the work of conveyor belts.[1,19] To start work, you must log on in QuickPanel View, choose the floor which you transport

the cubes, press the button *ELEVATOR*. The buttons *DOWN*, *UP* are used to control the elevator. The elevator will automatically move to different floor. When elevator is between the levels, you can use the button *ELEVATOR* to stop it, and then choose direction (*DOWN* or *UP*) (Fig.4.).

In order to transport a cube from the floor of a conveyor belt to elevator's conveyor, we choose one of the buttons: *CONVEYOR BELT 1*, *CONVEYOR BELT 2*, *CONVEYOR BELT 3* (you can choose a conveyor standing next to the elevator). Then, a lamp *ELEVATOR* turns off and chosen button turns on. If there is one cube in the elevator, it can be transported with the use button *LEFT*. In order to transport a cube from a conveyor to an elevator, we choose *RIGHT*.

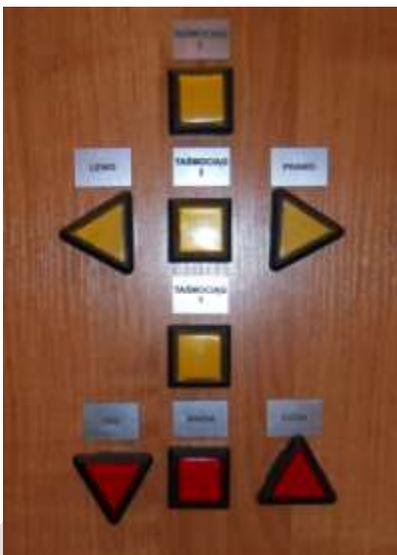


Fig. 4. Conveyor belt control panel

- *Control - operator's control panel*

Operator's control panel starts automatically during activation of a control cabinet. [6, 8] The user starts his/her QuickPanel View from logging on. Then, we go to *Main Menu*.

Screen is divided into two parts. In the first one, there is a view of model of a conveyor belt. In the second one, there are buttons to move from one window to another (Fig. 5.)

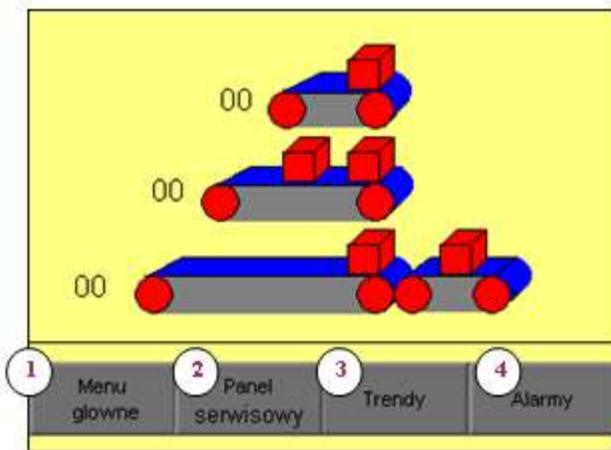


Fig. 5. QuickPanel View – Main menu (1-Main menu, 2- Service panel, 3- Trends, 4-Alarms)

Firstly, we should choose the floor, by touching the object showing an elevator. The panel, which replaces bottom belt, opens up (Fig.6) Choice is confirmed by pressing the button *Elevator control*.

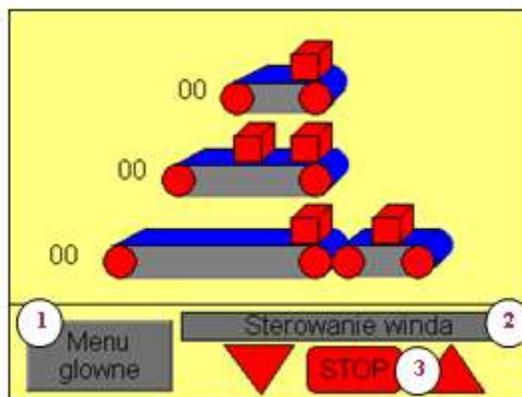


Fig.6. QuickPanel View – elevator control (1-Main menu, 2- Control lift, 3- Stop)

Touching conveyor belt on the Panel, we activate belt to control of conveyor belt (Fig. 7). Choice of a conveyor belt is confirmed by pressing the button *Conveyor belt control 1*.

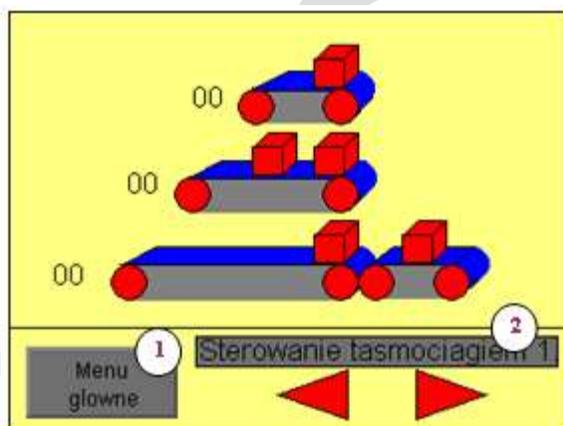


Fig.7. QuickPanel View – conveyor belt control (1- Main menu, 2- Control Conveyors 1)

User has a possibility to work in a manual mode (Fig 8.). Service panel can be activated by an *administrator*.

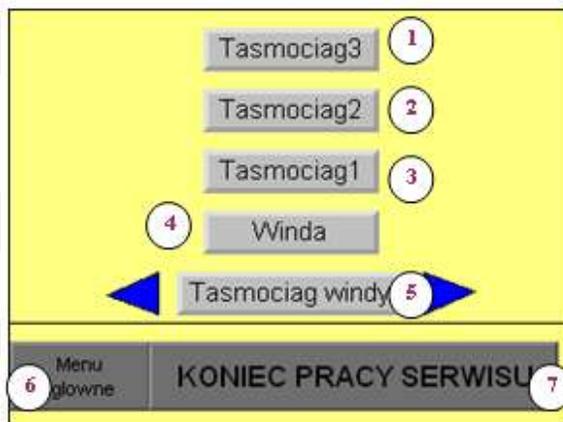


Fig.8. QuickPanel View – Service panel (1- Control Conveyors 3, 2- Control Conveyors, 2- Control Conveyors 1, 4- Lift, 5- Conveyors lift , 6- Main Menu, 7 – End of the service Work)

In a manual mode, operator can move each drive. To do this, we must choose drive of the object, that we want to have control on, for example, conveyor belt of an elevator. Then, we can choose direction of a movement. Next to active drive, there are triangular buttons used to choose direction. In order to return to service of a position in a semiautomatic mode on the operator’s control panel, we go to *END OF SERVICE WORK*.

Visualization of conveyor belts were also made in the software In Touch. (Fig 9)

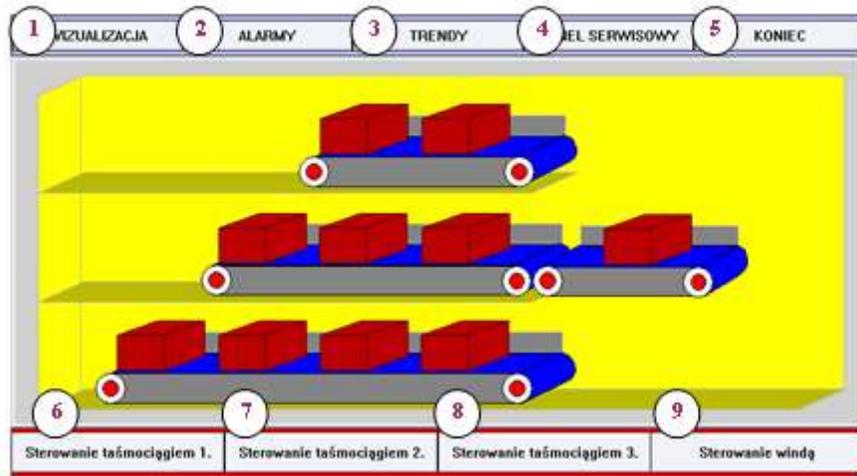


Fig.9. In Touch Application Manager (1-Visualization, 2-Alarms, 3- Trends, 4- service panel, 5-End, 6- Control Conveyors 1, 7- Control Conveyors 2, 8- Control Conveyors 3, 9- Control Lift

The application uses the following types of scripts:

- Application - covering the whole of the application. (Fig. 10.)
- Windows - referring to the window.
- Conditional - combined with the discrete or discrete expression.
- Data Change - associated only with variable and / or field variable.

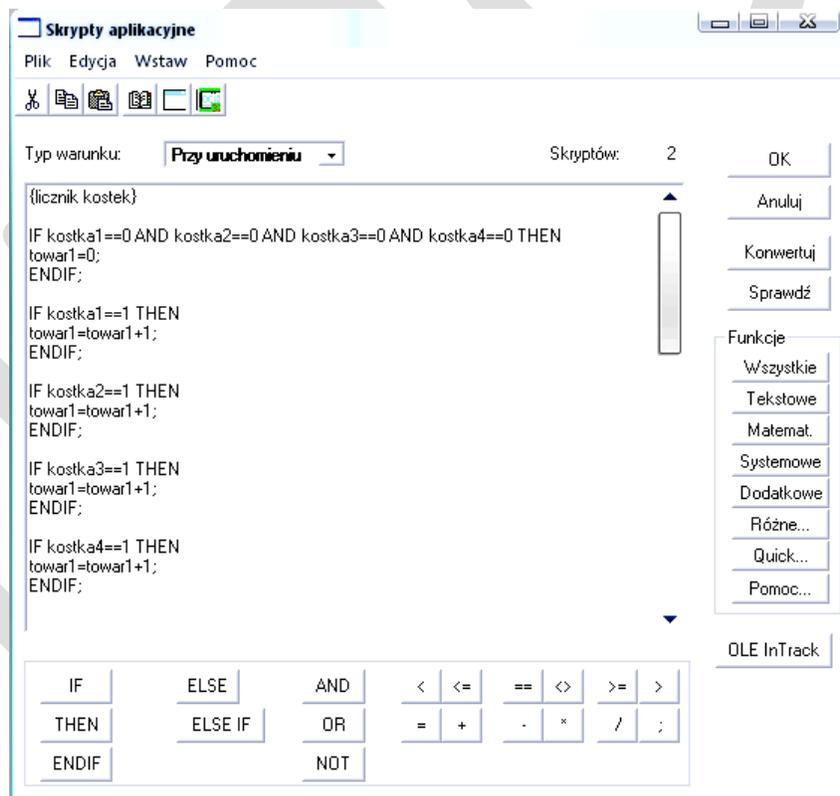


Fig.10. Scripts Application- meter cube

CONCLUSION

Building of presented work model of belt conveyors included: mechanics, electrics, automation, visualization, as well as ability to design mechanical construction. Significant for the structure of model was to program GE Fanuc's devices, that is, PLC driver (VersaMax IC200UDR010) and operator's control panel (QuickPanel View). In order to do this, it was

necessary to learn how to use Proficy Machine Edition. The next stage of work was, drive software, as well as structure of visualization application, with the use of operator's control panel and visualization software, In Touch. Note the use of two HMI (Human Machine Interface), which is the operator and In Touch. These solutions reproduce their function. The combination of Wonderware applications and the operator is not often used in reality, so this post will give you the opportunity to compare the two applications.

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M-Banking using Steganography and Persuasive Cued Click Points (PCCP) based Authentication

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Abstract — Graphical password using cued click points is one of the alternative and better solutions to alphanumeric passwords. As it is very tedious and lengthy process to remember alphanumeric password in any application. When any application is provided with user friendly authentication it becomes easy to access and use that application. One of the major reasons behind this method is according to psychological studies human mind can easily remember images than alphabets or digits and one can easily break the passwords by several simple means such as dictionary attacks, social engineering attacks & shoulder surfing attacks. In this paper we are representing the authentication given to mobile banking application by using graphical password. Authentication is a process by which the identity of the user is verified by the system. Thus we have proposed mobile banking application with graphical security by means of Steganography and Persuasive Cued Click Points. We are providing one of the algorithms which are based on selection of username and alphanumeric password for logging in into the application and series of images as a password for Fund Transfer. Implicitly the Persuasive Cued Click Point based authentication system provides more immunity to the common attacks suffered by other authentication schemes.

Keywords— Persuasive Cued Click Points, Grid, Graphical Password, Steganography, Image Processing, Authentication, Security, Cloud Security.

INTRODUCTION

When someone wants to access the network, every web engine provides user authentication for security purpose. For hiding information secret code is being used from ancient time. Previous survey concludes that text passwords can be detected. Easily by intruders by various simple means such as attacks due to shoulder surfing, social engineering attack, dictionary attacks. Hence to deal with such traditional problems with traditional methods, advancement in methods have been proposed using graphical/images as passwords, such as Persuasive Cued Click-Points (PCCP). This paper basically provides cloud security by using graphical password. Alphanumeric password can also be done by using cloud security but the problem is that this method is not much secure as well as easy to remember. The important thing is that each and every time the user has to recall the password. Priority has to be given by user for security purpose in order to satisfy their work. The aim of this work is to provide 2 levels in terms of security for transaction in banking applications. First we are making use of Steganography for sending user id and password on server using Steganography encoded image from the user's mobile phone. Once the user is authenticated he will be shown with a graphical password screen. A sequence of images will be provided to the CCP User with 4x4 blocks and user will have to select one block for each image. Secondly, if incorrect image is selected by the user during login, the successive image displayed will also be incorrect. Authenticated users who know the correct sequence of the images would know that they clicked on a wrong point and would go for the right image. So this feedback is not at all helpful to the attacker who is unaware of the expected sequence of images. This way security level is improved by using "Steganography" technique and graphical authentication in mobile banking applications.

LITERATURE SURVEY

Many attempts were made to improvise the means of securing. Various researches have been done and many methods for the graphical password authentication have been proposed till date. Some of the methods are as follows:

A. Image based scheme

Image-based schemes use images including photo graphics, artificial pictures, or other kind of images as background.

Advantages:

User can easily remember the password as it given in images.

Disadvantages:

Image based password is very long process user have to pass through selection of number of images. It consumes user's time also.

B. Graph based scheme:

In this scheme graphical passwords are at grid background.

Advantages:

There is no need of storing graphical database at server- side. Grid is simple object so no extra displays are needed.

Disadvantages:

During authentication the sequence can be changed or grids may be different as it is a drawing.

C. Hybrid authentication:

In hybrid scheme user needs to rate the number and thus finds a particular sequence of colours and remembers it.

Advantages:

Since the colours are already provided to the user so user has to remember only the sequence.

Disadvantages:

It becomes quite difficult to remember the sequence of colour as well as sequence.

D. Signature based scheme:

In signature based passwords user has to set a signature kind of password and every time he authenticates he needs to draw the same signature for the password authentication.

Advantages:

Signature as password is very difficult to be get cracked. A small mistake in drawing the signature will deny the access to the password authentication.

Disadvantages:

Remembering the grid signature is not easy to remember. So the authenticate user may fail many times to access it properly.

PROPOSED SYSTEM

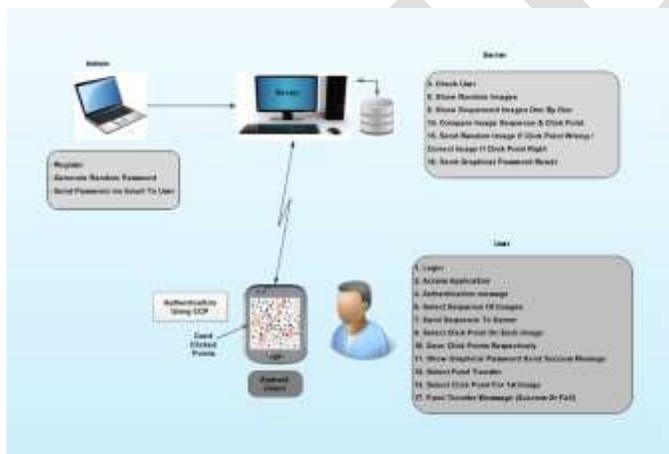


Fig.1 Block diagram

1. How to start

When one starts the cloud service they will be provided with options to select. For registration user have to pass through authentication process. In that on the basis of username, process will be started at the server-side. Set of images which will be provided to user are based on result of calculation.

Username: ABCD

2. Flow of proposed system

When the user tries to access the application they will be provided with two options sign in and sign up. If it is new user, user will have to first sign up. After sign up process user will be allowed the access to the application. And if the user has already signed up, he simply has to sign in with the username and password with which he had signed up, and the user can now access the application according to his need. At server side calculation in sign up registration is made for user. For accessing the application further like fund transfer, User have to enter the username based on that particular image set which will be provided to them on the basis of algorithm. In this algorithm first username is checked. After calculation set of images will be provide to user. User has to select five images as client side and it will be saved on server side as server side selection. So the complete password will be stored in database of server. In sign in the user have to give username which he or she has given during sign in and select the password from given set of images. Validation of user is done then cloud access is given to particular user. They access their account with uploading and downloading facility.

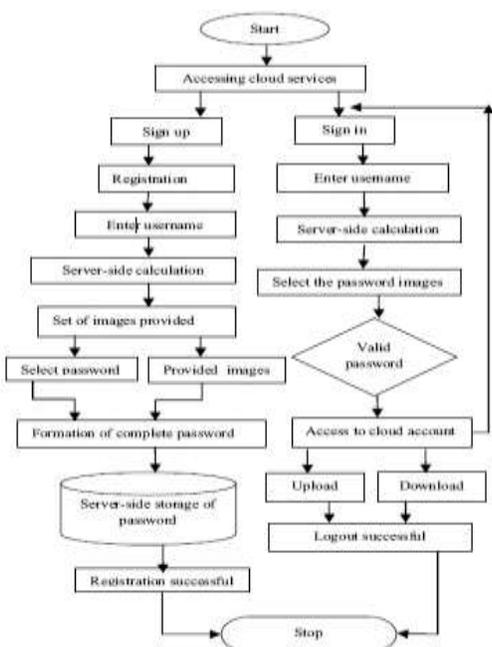


Fig. 2 Flow of proposed system

SYSTEM ARCHITECTURE

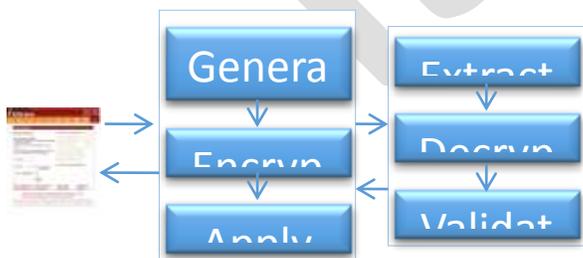


Fig. 3 System Architecture

EXPERIMENTAL SETUP AND RESULTS

The setup includes three sections of experiments in research. First of which is used to create server side which provides the cloud service and also used for authentication of the user. Second is to create client side where the login form is created for applying to the application. And the third is the admin where user authentication is done. Basically, the setup includes server, client and database. Server checks the user, shows random images to client in order to select images for password, server shows the images in sequential order and compares the sequence as well as the click point, and it checks whether the sequence is correct or not, according to the result it shows the graphical password. At the admin side registration of the client is done, it helps to create random images for the user, the password which is created by the admin for user to access the application is send via email. At the client side, user has to login via the login page present at this side, user can access the application through the username and password set, authentication message is send to the admin, the sequence of images which is provided by the server user has to select click point on every image, when fund transfer function is appeared on the application graphical password is being used, user has to click the point respectively according to the images to gain access of fund transfer, according to the password message is generated whether the login is successful or failed.

Software requirements:

Android sdk 2.3

Eclipse 3.3

Hardware requirements:

Intel p4 with 256 Mb ram

Software interfaces:

XML

Servlets

Object Serialization

Hardware interfaces:

RS232/ Ethernet/ Wi-Fi

Communication interface:

TCP / IP

Tools to be used:

Netbeans 7.1

Eclipse 3.3

Android application:



Fig. 4 Menu



Fig. 4 Text password

This android application consists of various bank functions. For logging in to the application text password is provided to the client via email by the admin. Once we enter the application we can access the functions. Graphical password is provided for the fund transfer, as fund transfer nowadays is crucial process to follow. The graphical password is set by the images generated randomly by the server. Minimum five images should be selected by the user for generating graphical password. The above procedure is shown in the figure below.



Fig. 5 Fund Transfer



Fig 6 Graphical password

APPLICATIONS AND FUTURE SCOPE

Applications

1. Internet banking application Login.
2. Fund transfer and balance enquiry.
3. Graphical Authentication Using Cued Click- Points (CCP).
4. Secure E-banking applications for all banks.

Future Scope

Instead of direct sending of the information, it is encrypted and hidden in a picture using random bit Steganography Technique. Then the picture is sent to the server. After receiving the picture on server, the sample http download socket program downloads the image, decrypts it and decodes to receive the message. The message is then processed on the server to verify user Credentials such as user name and password. Once the user passes credential test, camera is switched ON, On the client side and image is captured. This image is then compared with the server face database images, on Successful match – is taken to the menu screen.

EMAINING CONTENTS

You can add the remaining content as it is but the heading must be Time New Roman Front of size 11 with bold and the content must be as of introduction i.e time new roman of size 10 and must be justified alignment

ACKNOWLEDGMENT

We consider it is our privilege to express our gratitude and Respect to all those who guided us in the completion of Technical paper. The research presented in this paper is supported by management of K.J's College of Engg. & Mgmt Research. It's a great privilege to place on record our deep Sense of gratitude to our HOD Mr. D.C. Mehetre, of Computer Dept. I am grateful to thank Dr.Sanjeev Wagh, Principal, KJCOEMR. We are grateful to our guide Mrs. Aparna Hambarde, for her invaluable support and guidance. We would like to thank the reviewers for their time and expertise, constructive comments and valuable insights

CONCLUSION

Thus graphical password authentication can be given by taking cloud as a platform. The new scheme provides solves the many problems of existing system. It can also be useful for user in security point of view. These results demonstrate that graphical password schemes can suffer from drawbacks similar to those of textual password schemes, notably biases in human tendencies to select memorable passwords. The proposed Graphical Password Authentication System in an Implicit Manner provides authentication information to be implicitly conferred to the user. If the user clicks the same points of interest compared with the server, the user is implicitly authenticated. No password information is exchanged or changed between the client and the server. Since the authentication information is conveyed, it can secure shoulder surfing and screen dump attack, which none of the existing schemes can tolerate. The strength lies in creating a good authentication and authorization space with a sufficiently large collection of images to avoid repeating cycles. Compared to other methods reviewed in this paper, it requires a lot of human-interaction and careful selection of images and Click points. It may also need user training. Our preliminary analysis suggests that it is more difficult to break graphical passwords using the traditional attack methods such as brute force search, dictionary attack, or spyware.

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Some Breakthroughs in Nanoelectronics in the Last Decade

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Abstract- Various research groups have contributed in taking electronics from the present micro level to a new nano level, which is needed for reducing the size of electronic devices and making them perform at a faster speed with an improved efficiency. The research groups have succeeded in making molecular level transistors, junction-less transistors, memory transistor (eliminating need for capacitor), trigate transistors (at Intel), faster graphene transistors (at IBM) and organic transistors (NOMFET). There are also attempts to invent technologies for fabrication of nanobased integrated circuits using concept of magnetic dots (at UCLA), nanowires (at Weizmann Institute), carbon nanotubes (at Stanford University). Researchers are working to print nanolevel circuits with inkjet printers using silver ink (at Pennsylvania) and on flexible plastics (at North Carolina State University) which may lead to flexible motherboards, mobiles and laptops. Attempts are also being made for designing nanolevel circuits with less power consumption and faster heat dissipation. Then research groups at West Lafayette and Motorola are working for better displays and monitors with sharper and intense output imaging using Nanowire and Carbon Nanotube technologies. Research groups have also succeeded in improving Random Access Memories MRAM (at University of Illinois, Chicago), MeRAM (at UCLA), NRAM (at Imec and Nantero) and hard disks (Race Track Memory with thousand times more storage capacity) at IBM. Researchers are also working on silicon nanophotonics and on spectrally purer laser for bringing speed in data transmission. These all research innovations and ideas are a leap forward by science and are worth being discussed for any future research in electronics.

Keywords: 3D nanotube circuits, C60, flexible circuits, Graphene, magnetic quantum dots, MeRAM, NOMFET, NRAM, nanoglue, silicon nanophotonics, single molecular transistor, S-DFB laser, OLEDs, race track memory

INTRODUCTION

Researchers are using nanoelectronics to increase the capabilities of electronics devices, reduce their weight and power consumption. Some of the nano electronics areas, which are being explored in detail, can be introduced as follows.

A. REDUCTION IN SIZE: Smaller circuit means faster execution and data transmission. Various research groups are working to build nano level circuits. The researchers, for example, at university of Alberta [1] have constructed a single molecule transistor. A team of researchers led by Prof. Jean-Pierre Colinge at the Tyndall National Institute have reported the design and fabrication of the world's first junction less transistor in Nature [2]. Researchers at Center for Nanoscience and Nanotechnology, Tel Aviv University have reported [3] building a sophisticated memory transistor, with carbon C60 molecules, which is capable to both transfer and store energy, eliminating the need for a capacitor. Intel has developed [4] a fundamentally different technology to construct Tri-Gate transistor 3D transistors of size ~ 22 nm. IBM reported [5] the world's Fastest Graphene Transistor, which can be utilized to produce high performance devices and integrated circuits. Researchers at Georgia Institute of Technology have created graphene p-n junctions [6] by transferring films of the promising electronic material to substrates that have been patterned by compounds that are either strong electron donors or electron acceptors. CNRS and CEA researchers have developed a transistor [7] that can mimic the main functionalities of a synapse. This organic transistor, based on pentacene and gold nanoparticles and is known as a NOMFET (Nanoparticle Organic Memory Field-Effect Transistor), has opened the way to new generations of neuro-inspired computers. The researchers in Munich laboratories of Infineon Technologies AG (FSE/NYSE: IFX), in an efforts to create smaller and more powerful structures for integrated circuits, have constructed the world's smallest nanotube transistor, with a channel length of only 18 nm [8].

B. IMPROVEMENT IN FABRICATION OF CIRCUITS: There are attempts to improve the technology used in the fabrication of circuits for the electronic devices. Researchers at University of California, Los Angeles (UCLA) and Intel Corporation have created advanced 'magnetic quantum dots', a futuristic semiconductor technology that will pave the way for the next generation of electrical and information technology systems [9]. A team led by Prof. Ernesto Joselevich of the Weizmann Institute's Materials and Interfaces Department [10] have successfully created self-integrating nanowires whose position, length and direction can be fully controlled. They then succeeded in creating a transistor from each nanowire on the surface, producing hundreds of such transistors simultaneously. The nanowires were also used to create a more complex electronic component – a functioning logic circuit called an Address Decoder, an essential constituent of computers. A team of Stanford engineers have built [11] a basic computer using carbon nanotubes that runs faster and uses lesser energy than those made from silicon chips. The researchers, at Stanford [12] designed a chip with the most advanced computing and storage elements, made of carbon nanotubes to date, by devising a way to root out the stubborn complication of nanotubes that cause short circuits. Five members of the team (Wei, Patil, Lin, Wong and Mitra) immediately followed up the VMR paper at IEDM with another presentation [13] describing the first multilayer carbon nanotube three-dimensional integrated circuit. Like multilevel parking garages, three-dimensional circuits allow for packing of more units – in this case, transistors – into a confined area. A team of researchers, led by Professor Cherie Kagan, from the University of Pennsylvania, showed [14] that nanoscale particles, or nanocrystals, of the semiconductor cadmium selenide can be "printed" or "coated" on flexible plastics high-performance electronics. Researchers from Georgia Tech, the University of Tokyo and Microsoft Research have developed a novel method to rapidly and cheaply make electrical circuits by printing them with commodity inkjet printers and off-the-shelf materials [15]. Dr. Yong Zhu and his coworkers in North Carolina State University have developed highly conductive and elastic conductors made from silver nanowires, which can be used to develop stretchable electronic devices [16]. Scientists at the Lockheed Martin Space System Advanced Technology Center (ATC) in Palo Alto developed a revolutionary nanotechnology copper-based electrical interconnect material, or solder that can be processed around 200 °C. Once fully optimized, the QuantumFuse™ solder material is expected to produce joints with up to 10 times the electrical and thermal conductivity compared to tin-based materials currently in use [17].

C. INCREASING THE SPEED OF DATA TRANSMISSION: Researchers are integrating silicon nanophotonics components into CMOS integrated circuits and are producing new lasers that help produce the light with much tighter frequency control than previously achieved. This may allow much higher data rates for information transmission over fiber optics. IBM (NYSE: IBM) announced a major advance [18] in the ability to use light instead of electrical signals to transmit information for future computing. The breakthrough technology – called "silicon nanophotonics" – allows the integration of different optical components side-by-side with electrical circuits on a single silicon chip using, for the first time, sub-100nm semiconductor technology. The researchers [19] recently achieved unprecedented spectral purity as a direct consequence of the incorporation of a nano scale corrugation within the multilayered structure of the laser. The purer the tone, the more information it can carry.

D. REDUCTION IN POWER CONSUMPTION: UC Berkeley researchers reported [20] to have exploited the special properties of the rare, heavy metal tantalum magnets, as an alternative to transistors because they require far less energy for switching. A team of interdisciplinary researchers at Rensselaer Polytechnic Institute [21] has developed a new method of boosting the heat transfer rate across two different materials with a "nanoglue", which is useful for cooling computer chips and lighting-emitting diode (LED) devices, collecting solar power, harvesting waste heat, and other applications.

E. BUILDING BETTER DISPLAYS: We can improve the display screens on electronic devices in terms of their reduced power consumption, decreased weight and thickness. West Lafayette ind. – Engineers created the first "active matrix" display [22] using a new class of transparent transistors made of "nanowires" and circuits - a step toward realizing applications such as e-paper, flexible color monitors and "heads-up" displays in car windshields. The applied research arm of Motorola Inc. developed [23] a working 5-inch color video display prototype based on proprietary Carbon Nanotube (CNT) technology – a breakthrough technique that will create large, flat panel displays with superior quality, longer lifetimes and lower costs than current offerings.

F. BETTER MEMORY UNITS - RAM AND HARD DISKS: Researchers are developing a type of memory chip with a projected density of one terabyte of memory per square inch or greater. A team of researchers at University of Illinois at Chicago [24] has demonstrated that nanometer-sized permalloy rings, shaped into tiny rectangles, can store and access data almost instantly. The finding brings closer by one step the commercial reality of a promising form of memory called MRAM. The team of researchers at UCLA's Henry Samueli School of Engineering and Applied Science has also developed an improved memory [25], which they call MeRAM for magneto electric random access memory, which uses electric voltage instead of a flowing electric current. MeRAM is an ultra-fast, high-capacity class of computer memory and has a great potential to be used in future memory chips for almost all electronic applications. Team of researchers at IBM [26] developed what they dubbed as "racetrack" memory, which combines the high performance and reliability of flash drives with the low cost and high capacity of the hard disk drive. Imec, a world-leading research institution in nanoelectronics and Nantero, Inc., a nanotechnology company [27] will develop the carbon-nanotube-based memory, which can be a high-density next-generation memory NRAM with a size under 20nm. The detailed review of these remarkable research works is as follows.

DISCUSSION

REDUCTION IN SIZE: Smaller circuit means faster execution and data transmission. Various research groups are working to build nano level circuits. There are research groups which are working for the miniaturization of transistors. It is possible to "put the power of all

of today's present computers in the palm of hand" and it is all due to nanoelectronics. The efforts of these groups can be summarized as below:

Building a Single molecule transistor Researchers at the University of Alberta [1] constructed an electronic circuitry on a molecular scale, a breakthrough that will remove the limitations of conventional transistor technology and will pave the way for smaller, faster, cheaper microelectronic devices. The team shows that a single molecule can be controllably charged, with all the surrounding molecules remaining neutral, causing it to act as a basic transistor. Transistors control the flow of current in most electronic devices and are combined to form integrated circuits used to make the microprocessors and memory chips that drive everything from computers and cell phones to household appliances. But where conventional transistors might use a million electrons to switch a current, the team was able to control the current through a hydrocarbon molecule using a single atom. The transistor, has three terminals - an 'in,' and 'out,' and a control outlet. Although, the transistor developed by the team has a control, but it's very sluggish and slow right now. It takes the order of a minutes to change conditions that make current go or not. Therefore, so for any computer technology, this thing is today impractical. But it is not hopeless. There are many hurdles, but there are not any we see as insurmountable.

In fact, the research team has already cleared what appeared to be insurmountable obstacle in manipulating molecules measuring one one-billionth of a metre in size. It is very hard to connect wires to a molecule. This is trying to bring three watermelons together all to touch something the size of a poppy seed. You could not do it - you could make two watermelons touch a poppy seed, and even that would be kind of difficult, holding that poppy seed in place. But then to bring in the third watermelon is impossible - you cannot have all three touching such a small object. To solve this problem, the "transistor" molecule was placed on a silicon surface that has been exposed to hydrogen gas, so that each silicon atom was capped with a hydrogen atom. By removing the hydrogen cap from single silicon atom, that silicon atom can be made to conduct a charge while the surrounding atoms remaining neutral. The tip of a powerful scanning tunneling microscope serves as the on/off switch.

Practical nanoscale transistors may be decades away but the potential to create smaller, faster, more efficient electronic devices with minimal energy and material requirements is a powerful incentive to pursue this line of research. The group is studying switching, routing, and signal processing using nanostructure devices that operate on principles different from scaled conventional transistors, including devices incorporating layers of organic molecules and reduced metal oxides.

Tyndall breakthrough to revolutionize microchip manufacturing; the world's first junction less nanowire transistor

A team of researchers led Prof. Jean-Pierre Colinge at the Tyndall National Institute have reported [2] in Nature Nanotechnology the design and fabrication of the world's first junction-less transistor, that can revolutionize microchip manufacturing. It significantly reduces power and greatly simplifies the fabrication process of silicon chips.

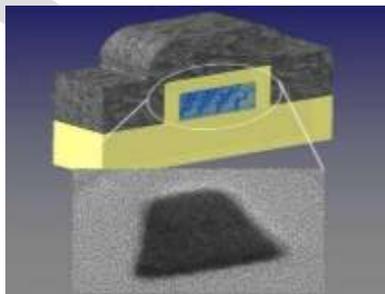


Fig.1. Junction less nanowire transistor successfully fabricated and tested at Tyndall National

The transistor is the fundamental building block in all electronic devices. Since the early seventies the number of transistors in a silicon chip has grown from a few hundred to over two billion transistors on a single chip today. The exponential increase in demand for feature packed electronic semiconductor devices is driving the industry to produce chips that need to be smaller, more energy efficient and more cost effective than ever before. As a consequence transistors are becoming so small that conventional transistor architectures, used since the seventies, can no longer be used. Current technologies require fabrication processes that are both complex and costly. All existing transistors are based on junctions. A junction is formed when two pieces of silicon with different polarities are placed side by side. Controlling the junction allows the current in the device to be turned on and off and it is the precise fabrication of this junction that determines the characteristics and quality of the transistor and is a major factor in the cost of production. Tyndall National Institutes ground breaking junction-less transistor does not require a junction. The current flows in a very thin Junction-less silicon nanowire and the flow of current is perfectly controlled by a `wedding ring` structure that electrically squeezes the silicon wire in the same way that you might stop the flow of water in a hose by squeezing it. These structures are easy to fabricate even on a miniature scale which leads to the major breakthrough in potential cost reduction. The Tyndall junction-less devices have near ideal electrical properties and behave like the most perfect transistors. Moreover, they have the potential of operating faster and using less energy than the conventional transistors used in today's microprocessors. The credit for fabricating the junction-less transistor, which resembles in a way the first ideal transistor structure, proposed in 1925, goes to the skill and expertise of researchers who were able to fabricate silicon nanowire with a diameter of a few dozen atoms using electron-beam writing techniques.

Carbon-Based Transistors Ramp Up Speed and Memory for Mobile Devices

Mobile devices like smart phones and tablets are the computing devices of the post-personal-computer (Post-PC) era, and are hailed as the hardware of the future. However, their present-day incarnations have some flaws. These devices, which are small and

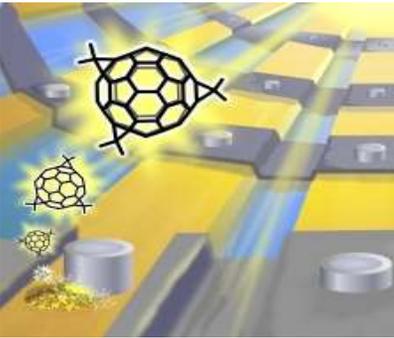


Fig.2. Carbon C60 molecules used to successfully fabricate sophisticated memory transistor

battery operated, are quickly closing the gap with their laptop or desktop ancestors in terms of computing power and storage capacity — but they are lacking in RAM, the run-time memory reserves that computers need to operate various programs. Because current RAM technology is power-hungry and physically large, it doesn't function well in mobile devices. That's where laptops and PC's retain the edge. Low RAM memory limits the number of applications that can be run at one time and quickly consumes battery power. The idea of a sophisticated transistor, which can do the job of both the transistor and the capacitor, was a technological dream — until now. Elad Mentovich and his supervisor Dr. Shachar Richter of Department of Chemistry and Center for Nanoscience and Nanotechnology, Tel Aviv University have reported [3] a creative solution to these well-known problems. As silicon technology gets smaller, creating a large and powerful memory grows harder. They have successfully built a sophisticated memory transistor with carbon molecules called C60, that can both transfer and store energy, eliminating the need for a capacitor. This molecular memory transistor, which is as small as one nanometer, stores and disseminates information at high speed — and it is ready to be produced at existing high-tech fabrication facilities. The basis of the technology has been published in the journal *Advanced Materials and Applied Physics Letters*. Year 2012 was the first in which big technology companies sold more tablets and smartphones than laptops and notebooks combined. The memory of smartphones and tablets will approach the level of a laptop with this new technology. It will be possible to run applications simultaneously, and because it is low voltage, power consumption will fall and battery life will be longer. The next step is to find a fabrication facility with the necessary materials to manufacture the transistors. The benefit of this product is that with the right equipment, which is standard in high-tech facilities and breakthroughs on how to put the transistors together, these molecular memories can be manufactured anywhere. Therefore, the distance to implementation is not far.

3D, 22 nm: New Technology Delivers an Unprecedented Combination of Performance and Power Efficiency

It is better to have smaller and more power efficient transistor. Intel reports [4] a fundamentally different technology to construct Tri-Gate transistor 3D transistors of size ~ 22 nm. Intel continues to predictably shrink its manufacturing technology in a series of "world firsts": 45 nm with high-k/metal gate in 2007; 32 nm in 2009; and now 22 nm with the world's first 3D transistor in a high volume logic process beginning in 2011. This technology will help to relentlessly pursue Moore's Law and to ensure the pace of the technological advancement. Transistor size and structure are at the very center of delivering the benefits of Moore's Law to the end user. With a smaller, 3D transistor, Intel will design even more powerful processors with incredible power efficiency. The new technology will enable innovative micro architectures, System on Chip (SoC) designs, and new products – from servers and PCs to smart phones, and innovative consumer products. Intel's 3D Tri-Gate transistor uses three gates wrapped around the silicon channel in a 3D structure, enabling an unprecedented combination of performance and energy efficiency. Intel designed the new transistor to provide unique ultra-low power benefits for use in handheld devices, like smart phones and tablets, while also delivering improved performance normally expected for high-end processors. The new transistors are so impressively efficient at low voltages that they allow the Intel® Atom™ processor design team to innovate new architectural approaches for 22 nm Intel® Atom™ micro architecture. Intel's future SoC products based on the 22 nm 3D Tri-Gate transistors will hit sub 1 mW idle power—for incredibly low-power SoCs.

IBM Scientists Demonstrate World's Fastest Graphene Transistor

Graphene is a single atom-thick layer of carbon atoms bonded in a hexagonal honeycomb-like arrangement. This two-dimensional form of carbon has unique electrical, optical, mechanical and thermal properties and its technological applications are being explored intensely. A key advantage of graphene lies in the very high speed, with which electrons propagate, which is required in high-speed and high-performance next generation transistors. IBM showed [5] that graphene can be utilized to produce high performance devices and integrated circuits. The high frequency operation was achieved using wafer-scale, epitaxially grown graphene, using processing technology compatible to that which is used in advanced silicon device fabrication.

Uniform and high-quality graphene wafers were synthesized by thermal decomposition of a silicon carbide (SiC) substrate. The graphene transistor itself utilized a metal top-gate architecture and a novel gate-insulator stack involving a polymer and a high dielectric constant oxide. The gate length was modest, 240 nanometers, leaving plenty of space for further optimization of its performance by scaling down the gate length. It is noteworthy that the frequency performance of the graphene device already exceeds the cut-off frequency of state-of-the-art silicon transistors of the same gate length (~ 40 GigaHertz). This performance was obtained from devices based on graphene obtained from natural graphite, and suggests that that still better performance can be obtained from graphene of different origins.

Field-Effect Transistors: Self-Assembled Monolayers Create P-N Junctions in Graphene Films

The electronic properties of graphene films are directly affected by the characteristics of the substrates on which they are grown or to which they are transferred. Researchers are taking advantage of this to create graphene p-n junctions— which is essential to fabricate devices – by transferring films of the promising electronic material to substrates that have been patterned by compounds that are either strong electron donors or electron acceptors. A low temperature, controllable and stable method has been developed to dope graphene films using self-assembled monolayers (SAM) that modify the interface of graphene and its support substrate. The team of researchers at the Georgia Institute of Technology [6] uses this concept to create graphene p-n junctions without damaging the lattice structure of the material or significantly reducing electron/hole mobility. The graphene was grown on a copper film using chemical vapor deposition (CVD), a process that allows synthesis of large-scale films and their transfer to desired substrates for device applications. The graphene films were transferred to silicon dioxide substrates that were functionalized with the self-assembled monolayers. Putting graphene on top of self-assembled monolayers uses the effect of electron donation or electron withdrawal from underneath the graphene to modify the material's electronic properties.

Creating n-type and p-type doping in graphene – which has no natural bandgap – has led to development of several approaches. Earlier scientists substituted nitrogen atoms for some of the carbon atoms in the graphene lattice, compounds were applied to the surface of the graphene, and the edges of graphene nano-ribbons were modified. However, most of these techniques have disadvantages, including disruption of the lattice – which reduces electron mobility – and long-term stability issues. Any time graphene is put into contact with a substrate of any kind, the material has an inherent tendency to change its electrical properties. However in this study, this was done in a controlled way and was used to make the material predominately n-type or p-type. This could create a doping effect without introducing defects that disrupt the material's attractive electron mobility. Using conventional lithography techniques, the researchers created patterns from different silane materials on a dielectric substrate, usually silicon oxide. The materials are chosen because they are either strong electron donors or electron acceptors. When a thin film of graphene is placed over the patterns, the underlying materials create charged sections in the graphene that correspond to the patterning. The researchers were able to dope the graphene into both n-type and p-type materials through an electron donation or withdrawal effect from the monolayer which does not lead to the substitutional defects observed in many of the other doping processes. The graphene structure itself is still pristine as it comes to us in the transfer process. The monolayers are bonded to the dielectric substrate and are thermally stable up to 200 degrees Celsius with the graphene film over them. The team used 3-Aminopropyltriethoxysilane (APTES) and perfluorooctyltriethoxysilane (PFES) for patterning. In principle, however, there are many other commercially-available materials that can also create the patterns. The researchers used their technique to fabricate graphene p-n junctions, which was verified by the creation of field-effect transistors (FET). Characteristic I-V curves indicated the presence of two separate Dirac points, which indicated an energy separation of neutrality points between the p and n regions in the graphene. The real goal is to find ways to make graphene at lower temperatures and in ways that allow us to integrate it with other devices, either silicon CMOS or other materials that do not tolerate the high temperatures required for the initial growth. Therefore, this study shows us that graphene can be used as a useful electronic or opto-electronic material at low temperatures and in patterned forms.

An organic transistor paves the way for new generations of neuro-inspired computers

CNRS and CEA researchers have developed a transistor [7] that can mimic the main functionalities of a synapse. This organic transistor, based on pentacene and gold nanoparticles and known as a NOMFET (Nanoparticle Organic Memory Field-Effect Transistor), has opened the way to new generations of neuro-inspired computers, capable of responding in a manner similar to the nervous system. The development of new information processing strategies consists in mimicking the way biological systems such as neuron networks operate, to produce electronic circuits with new features. In the nervous system, a synapse is the junction between two neurons, enabling the transmission of electric messages from one neuron to another and the adaptation of the message as a function of the nature of the incoming signal (plasticity). For example, if the synapse receives very closely packed pulses of incoming

signals, it will transmit a more intense action potential. Conversely, if the pulses are spaced farther apart, the action potential will be weaker. It is this plasticity that the researchers have succeeded in mimicking with the NOMFET. A transistor, the basic building block of an electronic circuit, can be used as a simple switch - it can then transmit, or not, a signal - or instead offer numerous functionalities (amplification, modulation, encoding, etc.). The innovation of the NOMFET resides in the original combination of an organic transistor and gold nanoparticles. These encapsulated nanoparticles, fixed in the channel of the transistor and coated with pentacene, have a memory effect that allows them to mimic the way a synapse works during the transmission of action potentials between two neurons. This property therefore makes the electronic component capable of evolving as a function of the system in which it is placed. Its performance is comparable to the seven CMOS transistors (at least) that have been needed until now to mimic this plasticity. The devices produced have been optimized to nanometric sizes in order to be able to integrate them on a large scale. Neuro-inspired computers produced using this technology, are capable of functions comparable to those of the human brain. Unlike silicon computers, widely used in high performance computing, neuro-inspired computers can resolve much more complex problems, such as visual recognition.

Infineon develops 18nm Channel Length Nanotube Transistor

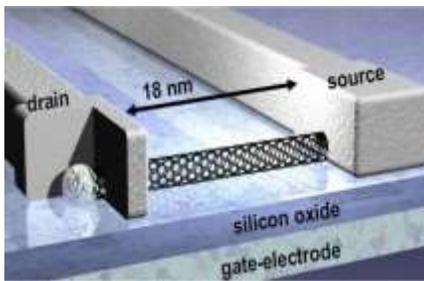


Fig.3. 18nm channel length smallest nanotube transistor developed at Infineon

The researchers in Munich laboratories of Infineon Technologies AG (FSE/NYSE: IFX), in an efforts to create smaller and more powerful structures for integrated circuits, have constructed the world's smallest nanotube transistor, with a channel length of only 18 nm [8]. The most advanced transistors currently in production are almost four times this size. The researchers build nano transistor by growing carbon nanotubes, each one measuring only 0.7 to 1.1 nm in diameter, in a controlled process. A single human hair is around 100,000 times thicker by comparison. The carbon nanotubes can carry electrical current virtually without friction on their surface as a result of "ballistic" electron transport and can therefore handle conduction 1000 times more than copper wire. This characteristic properties of carbon nanotubes make them the ideal material for many applications in microelectronic. Also they can be both conducting and semiconducting. Infineon is one of the pioneers in developing carbon nanotubes and was the first semiconductor company to demonstrate

how the tubes can be grown at precisely defined locations and how transistors for switching larger currents can be constructed. The nanotube transistor just unveiled can deliver currents in excess of 15 μA at a supply voltage of only 0.4 V (0.7 V is currently the norm). A current density of some 10 times above that of silicon, today's standard material, has been observed. On the basis of the test results, Infineon researchers are confident that they can go on miniaturizing transistors at the same rate as previously. Even supply voltages as low as 0.35 V, which are according to the ITRS currently not expected before the year 2018, will be realized with carbon nanotubes used as the material.

IMPROVEMENT IN FABRICATION OF CIRCUITS: There are also attempts to improve the technology used in the fabrication of circuits for the electronic devices. Research works in this direction, worth mentioning are as follows;

Novel material paves the way for next-generation information technology

Professor Jin Zou and Dr Yong Wang from the Faculty of Engineering, Architecture and Information Technology have collaborated with the University of California, Los Angeles (UCLA) and Intel Corporation to create advanced 'magnetic quantum dots', a futuristic semiconductor technology that paves the way for the next generation of electrical and information technology systems. The breakthrough research was published in prestigious scientific journal Nature Materials [9]. The magnetic quantum dots simultaneously utilise both 'charge' and 'spin' – two types of outputs generated by electrons. Magnetic quantum dot technology is expected to underpin future communications and resolve power consumption and variability issues in today's microelectronics industry by providing computers and other devices with extraordinary electrical and magnetic properties. Developing quantum dots which are able to harness both outputs will help to significantly reduce the size of electrical devices and reduce power dissipation inherent in electrical systems, because the collective spins in spintronics devices are expected to consume less energy than current charge-based technology. The novel technology was proven even in experiments at relatively high temperature, which was not previously thought possible. This research is expected to lead to greater efficiency and stability for electrical systems and information technology, which provide essential infrastructure for every sector.

Guided Growth of Nanowires Leads to Self-Integrated Circuits

Researchers working with tiny components in nanoelectronics face a challenge similar to that of parents of small children: teaching them to manage on their own. The nano-components are so small that arranging them with external tools is impossible. The only solution is to create conditions in which they can be “trusted” to assemble themselves. Much effort has gone into facilitating the self-assembly of semiconductors, the basic building blocks of electronics, but until recently, success has been limited. Scientists had developed methods for growing semiconductor nanowires vertically on a surface, but the resultant structures were short and disorganized. After growing, such nanowires need to be “harvested” and aligned horizontally. Since such placement is random, scientists need to determine their location and only then integrate them into electric circuits. A team led by Prof. Ernesto Joselevich of the Weizmann Institute’s Materials and Interfaces Department has managed to overcome these limitations and have, for the first time, successfully created self-integrating nanowires whose position, length and direction can be fully controlled. The achievement, reported in the Proceedings of the National Academy of Sciences (PNAS), USA, [10] is based on a method developed by Prof. Joselevich two years ago for growing nanowires horizontally in an orderly manner. First, the scientists prepared a surface with tiny, atom-sized grooves and then added to the middle of the grooves catalyst particles that served as nuclei for the growth of nanowires. This setup defined the position, length and direction of the nanowires. They then succeeded in creating a transistor from each nanowire on the surface, producing hundreds of such transistors simultaneously. The nanowires were also used to create a more complex electronic component – a functioning logic circuit called an Address Decoder, an essential constituent of computers. The method makes it possible, for the first time, to determine the arrangement of the nanowires in advance to suit the desired electronic circuit. The ability to efficiently produce circuits from self-integrating semiconductors opens the door to a variety of technological applications, including the development of improved LED devices, lasers and solar cells.

Stanford engineers build basic computer using carbon nanotubes

A team of Stanford engineers have, a semiconductor material reported in an article [11] published on the cover of the journal Nature, to have built a basic computer using carbon nanotubes (CNTs) which are long chains of carbon atoms extremely efficient at conducting and controlling electricity. CNTs has the potential for a new generation of electronic devices that run faster, while using lesser energy, than those made from silicon chips.. They are so thin – thousands of CNTs could fit side by side in a human hair – and it takes very little energy to switch them off. In theory, this combination of efficient conductivity and low-power switching make carbon nanotubes excellent candidates to serve as electronic transistors. Firstly, the challenge was to grow CNTs in straight lines, as with billions of nanotubes on a chip, even a tiny degree of misaligned tubes causes errors. Secondly, depending on how the CNTs grow, a fraction of these carbon nanotubes end up behaving like metallic wires that always conduct electricity, instead of acting like semiconductors that can be switched off. Since mass production is the eventual goal, researchers had to find ways to deal with misaligned and/or metallic CNTs without having to hunt for them like needles in a haystack. There has to be some way to design circuits without having to look for imperfections or even know where they were.

The authors describe a two-pronged approach called "imperfection-immune design." The researchers switched off all the good CNTs and pumped the semiconductor circuit full of electricity. Therefore the electricity got concentrated in the metallic nanotubes, which grew so hot that they burned up and literally vaporized into tiny puffs of carbon dioxide. This sophisticated technique eliminated the metallic CNTs in the circuit. However, bypassing the misaligned nanotubes requires even greater subtlety. The Stanford researchers created a powerful algorithm that maps out a circuit layout that is guaranteed to work no matter whether or where CNTs might be askew. This 'imperfections-immune design' [technique] makes this discovery truly exemplary. The Stanford team used this imperfection-immune design to assemble a basic computer with 178 transistors, a limit imposed by the fact that they used the university's chip-making facilities rather than an industrial fabrication process. Their CNT computer performed tasks such as counting and number sorting. It runs a basic operating system that allows it to swap between these processes. In a demonstration of its potential, the researchers also showed that the CNT computer runs MIPS, a commercial instruction set developed in the early 1980s by then Stanford engineering professor and now university President John Hennessy.

New Stanford techniques make carbon-based integrated circuits more practical: 3-D nanotube circuits

The researchers, at Stanford built a small chip with the most advanced computing and storage elements, made of carbon nanotubes [12], by devising a way to root out the stubborn complication of nanotubes that cause short circuits. This new technique, which the researchers believe to be VLSI (very large scale integration) -compatible Metallic Nanotube Removal (VMR), is based

upon an idea first proposed by Paul Collins and colleagues at IBM in 2001, to break up the nanotubes by exposing them to high current. The Stanford team has now made the idea practical on a VLSI scale by creating a grid of electrodes that zap away the unwanted nanotubes. The same electrode grid can then be etched to produce any circuit design, including ones that make use of the Stanford-developed techniques mentioned above. Five members of the same team (Wei, Patil, Lin, Wong and Mitra) immediately followed up the VMR paper at IEDM with another presentation [13] describing the first multilayer carbon nanotube three-dimensionally integrated circuit. Like multilevel parking garages, three-dimensional circuits allow for packing of more units – in this case, transistors – into a confined area. On chips, the third dimension can also reduce the lengths of some interconnecting wires, reducing energy required for data transmission. While engineers have recently begun making progress in building three-dimensional circuits by stacking and connecting layers made with conventional materials, the Stanford work shows it can be done with nanotubes in a way that is integrated from the start as a 3-D design, yielding a higher density of connections among layers. Indicating that progress is possible with nanotubes, a prototype three-layer chip functioning as logic gates was constructed with dozens of nanotube transistors connected through nanotube and metal wiring. This used a relatively low-temperature process in which nanotubes were transferred from a quartz wafer onto a silicon chip. A remaining challenge is to increase the number of nanotubes that can be properly patterned on a given area of a chip, to allow for making the millions of transistors that modern designs require.

Penn Researchers Make Flexible, Low-voltage Circuits Using Nanocrystals

Electronic circuits are typically integrated in rigid silicon wafers, but flexibility opens up a wide range of applications. In a world, where electronics is becoming more pervasive, flexibility is a highly desirable trait, but finding materials with the right mix of performance and manufacturing cost remains a challenge.

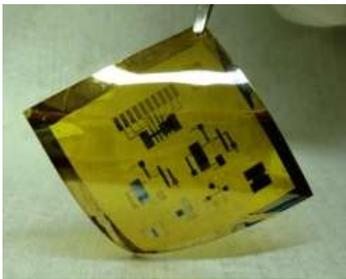


Fig.4. Flexible circuit fabricated at University of Pennsylvania

Researchers at University of Pennsylvania [14], showed that nanoscale particles, or nanocrystals of the semiconductor cadmium selenide can be "printed" or "coated" on flexible plastics to form high-performance electronics. They made a performance benchmark in amorphous silicon, which is the material that runs the display in our laptops, among other devices and showed that cadmium selenide nanocrystals devices can move electrons 22 times faster than in amorphous silicon. Besides speed, another advantage cadmium selenide nanocrystals have over amorphous silicon is the temperature at which they are deposited. Whereas amorphous silicon uses a process that operates at several hundred degrees, cadmium selenide nanocrystals can be deposited at room temperature and annealed at mild temperatures, opening up the possibility of using more flexible plastic foundations. The new aspect of their research was to use ligands that can translate very easily onto the flexible plastic; other ligands are so caustic that the plastic actually melts. Because the nanocrystals are dispersed in an ink-like liquid, multiple types of deposition techniques can be used to make circuits. The researchers, in this study, used spin-coating, in which centrifugal force pulls a thin layer of the solution over a surface and the nanocrystals can be applied through various techniques such as dipping, spraying or ink-jet printing as well.

On a flexible plastic sheet a bottom layer of electrodes was patterned using a shadow mask — essentially a stencil — to mark off one level of the circuit. The researchers then used the stencil to define small regions of conducting gold to make the electrical connections to upper levels that would form the circuit. An insulating aluminum oxide layer was introduced and a 30-nanometer layer of nanocrystals was coated from solution. Finally, electrodes on the top level were deposited through shadow masks to ultimately form the circuits. In words of Prof. Kagen, "The more complex circuits are like buildings with multiple floors. The gold acts like staircases that the electrons can use to travel between those floors". Using this process, the researchers built three kinds of circuits to test the nanocrystals performance for circuit applications: an inverter, an amplifier and a ring oscillator. With the combination of flexibility, relatively simple fabrication processes and low power requirements, these cadmium selenide nanocrystal circuits paves the way for new kinds of devices and pervasive sensors, which could have biomedical or security applications.

Georgia Tech Develops Inkjet-Based Circuits at Fraction of Time and Cost

Researchers from Georgia Tech, the University of Tokyo and Microsoft Research developed a novel method to rapidly and cheaply make electrical circuits by printing them with commodity inkjet printers and off-the-shelf materials [15]. For about \$300 in equipment costs, anyone can produce working electrical circuits in the 60 seconds the time it takes to print the circuit. The technique, called instant inkjet circuits, allows the printing of arbitrary-shaped conductors onto rigid or flexible materials and can advance the prototyping skills of non-technical enthusiasts and novice hackers. This introduces a new approach to the rapid prototyping of

fully custom-printed circuits and unlike existing methods for printing conductive patterns, the conductivity in this technique emerges within a few seconds and without the need for special equipment. The researchers used silver nanoparticle ink based on recent advances in chemically bonding metal particles, to print the circuits and avoided techniques like thermal bonding, or sintering which are time-consuming and potentially heat damaging techniques. The circuits were printed on resin-coated paper, PET film and glossy photo paper works best. Researchers also made a list of materials to avoid, such as canvas cloths and magnet sheets. The method can be used to print circuit boards, sensors and antennas with little cost, and it opens up many new opportunities.

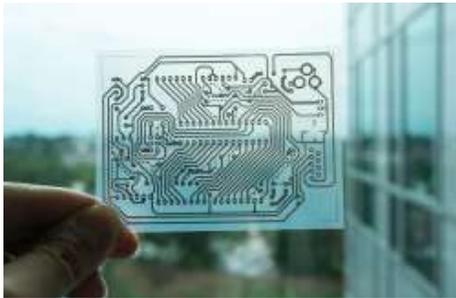


Fig.5. A single-sided wiring pattern for an arduino micro controller was printed on a transparent sheet of coated PET film

To make the technique possible, researchers optimized commercially available tools and materials including printers, adhesive tape and the silver ink. Designing the circuit itself was accomplished with ordinary desktop drawing software, and even a photocopy of a drawing can produce a working circuit. Once printed, the circuits can be attached to electronic components using conductive double-sided tape or silver epoxy adhesive, allowing full-scale prototyping in mere hours. The homemade circuits might allow thinkers to quickly prototype crude calculators, thermostat controls, battery chargers or

any number of electronic devices. A single-sided wiring pattern for an Arduino micro controller was printed on a transparent sheet of coated PET film. This technology can be used in the classroom, to introduce students to basic electronics principles very cheaply, and they can use a range of electronic components to augment the experience. The researchers demonstrated the capabilities of the new technique for capacitive touch sensing - the interaction prominent in Smartphone interfaces - and the flexibility of the printed circuits at ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2013) in Zurich, Switzerland, Sept. 8-12. They attached a capacitive ribbon with embedded inkjet-printed circuits into a drinking glass. The capacitive ribbon sensor, when connected to a micro controller, was able to measure the level of the liquid left in the glass.

Researchers Create Highly Conductive and Elastic Conductors Using Silver Nanowires

Dr. Yong Zhu and his coworkers in North Carolina State University developed [16] highly conductive and elastic conductors made from silver Nanowires, which can be used to develop stretchable electronic devices. Stretchable circuitry can do many things that its rigid counterpart cannot. For example, an electronic “skin” could help robots pick up delicate objects without breaking them, and stretchable displays and antennas could make cell phones and other electronic devices stretch and compress without affecting their performance.

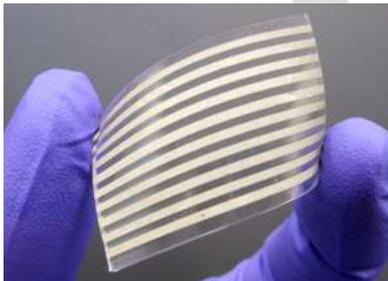


Fig.6. Silver nanowires printed to fabricate patterned stretchable conductors

However, it requires producing conductors which are elastic and able to effectively and reliably transmit electric signals regardless of whether they are deformed. Silver has very high electric conductivity, meaning that it can transfer electricity efficiently. The new technique embeds highly conductive silver nanowires in a polymer that can withstand significant stretching without adversely affecting the material’s conductivity. This makes it attractive as a component for use with broad range of applications in stretchable electronic devices. The study focuses on high and stable conductivity under a large degree of deformation, complementary to most other works using silver nanowires that are more concerned with

flexibility and transparency. The fabrication approach is very simple. The silver nanowires are placed on a silicon plate and the liquid polymer is poured over the silicon substrate. The polymer is then exposed to high heat, which turns the polymer from a liquid into an elastic solid. Because the polymer flows around the silver nanowires when it is in liquid form, the nanowires are trapped in the polymer when it becomes solid. The polymer can then be peeled off the silicon plate. The fact that it is easy to make patterns using the silver nanowire conductors facilitates the use of the technique in the electronics manufacturing. When the nanowires-embedded polymer is stretched and relaxed, the surface of the polymer containing nanowires buckles. The end result is that the composite is flat on the side that contains no nanowires, but wavy on the side that contains silver nanowires. After the nanowire-embedded surface has buckled, the material can be stretched up to 50 percent of its elongation, or tensile strain, without affecting the conductivity of the silver nanowires. This is because the buckled shape of the material allows the nanowires to stay in a fixed position relative to each other, even as the polymer is being stretched. In addition to having high conductivity and a large stable strain range, the new stretchable conductors show excellent robustness under repeated mechanical loading. Other reported stretchable conductive materials are typically deposited on top of substrates and can delaminate under repeated mechanical stretching or surface rubbing.

Lockheed Martin Advanced Technology Center Develops Revolutionary Nanotechnology Copper Solder

Presently, nearly all solders used commercially contain lead, but there is now an urgent need for a lead-free solder because of a worldwide effort to phase out hazardous materials in electronics. The European Union implemented lead-free solder in 2006. Alternative lead-free replacement was a combination of tin, silver and copper (Sn/Ag/Cu) and was acceptable to the consumer electronics industry, which deals mostly with short product life cycles and relatively benign operating environments. However, multiple issues have arisen: high processing temperatures drive higher cost, the high tin content can lead to tin whiskers that can cause short circuits, and the fractures are common in challenging environments, making it difficult to quantify reliability. These reliability concerns become significant particularly in systems for the military, aerospace, medical, oil and gas, and automotive industries. In such applications, long service life and robustness of components are critical, where vibration, shock, thermal cycling, humidity, and extreme temperature use are common. Scientists at the Lockheed Martin Space System Advanced Technology Center (ATC) in Palo Alto [17] developed a revolutionary nanotechnology copper-based electrical interconnect material, or QuantumFuse™ solder that can be processed around 200 °C. The solder is based on the well-known melting point depression of materials in nanoparticle form. Given this nanoscale phenomenon, they produced a solder paste based on pure copper. Once fully optimized, the QuantumFuse™ solder material is expected to produce joints with up to 10 times the electrical and thermal conductivity compared to tin-based materials currently in use. Applications in military and commercial systems are currently under consideration. A number of requirements were addressed in the development of the QuantumFuse™ solder paste including, but not limited to: 1) sufficiently small nanoparticle size, 2) a reasonable size distribution, 3) reaction scalability, 4) low cost synthesis, 5) oxidation and growth resistance at ambient conditions, and 6) robust particle fusion when subjected to elevated temperature. Copper was chosen because it is already used throughout the electronics industry as a trace, interconnect, and pad material, minimizing compatibility issues. It is cheap (1/4th the cost of tin; 1/100th the cost of silver, and 1/10,000th that of gold), abundant, and has 10 times the electrical and thermal conductivity compared to commercial tin-based solder. The ATC demonstrated QuantumFuse™ with the assembly of a small test camera board. These accomplishments are extremely exciting and promising and require more research for a routine use in military and commercial applications.

INCREASING THE SPEED OF DATA TRANSMISSION: Researchers are integrating the technique of “silicon nanophotonics” into CMOS integrated circuits. This optical technique is intended to provide higher speed data transmission between integrated circuits than which is possible with electrical signals. Researchers are also striving to develop lasers with much tighter frequency control than previously achieved. This will allow much higher data rates for information transmission over fiber optics. The research works, being carried out are being discussed as under:

IBM Lights Up Silicon Chips to Tackle Big Data

IBM (NYSE: IBM) announced a major advance [18] in the ability to use light instead of electrical signals to transmit information for future computing. The breakthrough technology – called “silicon nanophotonics” – allows the integration of different optical components side-by-side with electrical circuits on a single silicon chip using, for the first time, sub-100nm semiconductor technology. Silicon nanophotonics takes advantage of pulses of light for communication and provides a super highway for large volumes of data to move at rapid speeds between computer chips in servers, large datacenters, and supercomputers, thus alleviating the limitations of congested data traffic and high-cost traditional interconnects. It provides answers to Big Data challenges by seamlessly connecting various parts of large systems, whether few centimeters or few kilometers apart from each other, and move terabytes of data via pulses of light through optical fibers. The processing module components of silicon nanophotonics such as wavelength division multiplexers (WDM), modulators, and detectors were integrated side-by-side with a CMOS electrical circuitry into a high-performance 90nm CMOS fabrication line. The single-chip optical communication transceivers can be manufactured in a conventional semiconductor foundry, providing significant cost reduction over traditional approaches. These CMOS nanophotonics technology transceivers exceed the data rate of 25Gbps per channel. In addition, the technology is capable of feeding a number of parallel optical data streams into a single fiber by utilizing compact on-chip wavelength-division multiplexing devices. The ability to multiplex large data streams at high data rates will allow future scaling of optical communications to be capable of delivering terabytes of data between distant parts of computer systems.

A New Laser for a Faster Internet

Light is capable of carrying vast amounts of information with approximately 10,000 times more bandwidth than microwaves which are the earlier carrier of long-distance communications. But to utilize this potential, the laser light needs to be as spectrally pure—as close to a single frequency—as possible. The purer the tone, the more information it can carry, and for decades researchers

are trying to develop a laser that comes as close as possible to emitting just one frequency. Present day worldwide optical-fiber network is still powered by a laser known as the distributed-feedback semiconductor (S-DFB) laser, developed in the mid 1970s by Yariv's research group. The S-DFB laser's unusual longevity in optical communications stemmed from its, at the time, unparalleled spectral purity—the degree to which the emitted light matched a single frequency. The laser's increased spectral purity directly translates into a larger information bandwidth of the laser beam and longer possible transmission distances in the optical fiber—with the result that more information can be carried farther and faster than ever before. The old S-DFB laser had a successful 40-year run in optical communications—and was cited as the main reason for Yariv receiving the 2010 National Medal of Science. However, the spectral purity, or coherence, of the laser no longer satisfies the ever-increasing demand for bandwidth. The present-day laser designs—even S-DFB laser—have an internal architecture which is unfavorable for high spectral-purity operation. This is because they allow a large and theoretically unavoidable optical noise to co-mingle with the coherent laser and thus degrade its spectral purity. The researchers recently achieved unprecedented spectral purity [19] as a direct consequence of the incorporation of a nano scale corrugation within the multilayered structure of the laser. The washboard-like surface acts as a sort of internal filter, discriminating against spurious "noisy" waves contaminating the ideal wave frequency. The old S-DFB laser consists of continuous crystalline layers of materials called III-V semiconductors—typically gallium arsenide and indium phosphide—that convert into light the applied electrical current flowing through the structure. Once generated, the light is stored within the same material. Since III-V semiconductors are also strong light absorbers—and this absorption leads to a degradation of spectral purity—the researchers sought a different solution for the new laser. The highly coherent new laser still converts current to light using the III-V material, but in a fundamental departure from the S-DFB laser. It stores the light in a layer of silicon, which does not absorb light. Spatial patterning of this silicon layer—a variant of the corrugated surface of the S-DFB laser—causes the silicon to act as a light concentrator, pulling the newly generated light away from the light-absorbing III-V material and into the near absorption-free silicon.

This newly achieved high spectral purity—a 20 times narrower range of frequencies than which is possible with the S-DFB laser—is especially important for the future of fiber-optic communications. The laser beams in optic fibers carry information in pulses



Fig.7. Highly coherent Semi-Conductor Lasers based on integral high-Q resonators in hybrid Si/III-V platforms.

of light; data signals are impressed on the beam by rapidly turning the laser on and off, and the resulting light pulses are carried through the optic fibers. However, to meet the increasing demand for bandwidth, communications system engineers are now adopting a new method of impressing the data on laser beams that no longer requires this "on-off" technique. This method, called as coherent phase communication, the data resides in small delays in the arrival time of the waves; the delays—a tiny fraction (10^{-16}) of a second in duration—can then accurately relay the information even over thousands of miles. The digital electronic bits carrying video, data, or other information are converted at the laser into these small delays in the

otherwise rock-steady light wave. But the number of possible delays, and thus the data-carrying capacity of the channel, is fundamentally limited by the degree of spectral purity of the laser beam. This purity can never be absolute—a limitation of the laws of physics—but with the new laser, we have come closer to the absolute purity.

REDUCTION IN POWER CONSUMPTION: Lesser power consumption in electronic devices decreases the production of heat in the circuit and reduces its operating temperature. It undoubtedly leads to an increased battery life. Following research groups working in this area needs being mentioned:

New milestone could help magnets end era of computer transistors

Semiconductor-based transistors, the on-off switches that direct the flow of electricity and form a computer's nervous system, consume greater chunks of power at increasingly hotter temperatures as processing speeds grow. For more than a decade, researchers are pursuing magnets as an alternative to transistors because they require far less energy while switching. However, until now, the power needed to generate the magnetic field to orient the magnets for clocking them on and off was more than the power gained by moving away from transistors. UC Berkeley researchers discussed [20] overcoming this limitation by exploiting the special properties of the rare, heavy metal tantalum. They created a so-called Spin Hall effect by using nanomagnets placed on top of tantalum wire and then sending a current through it. Electrons in the current will randomly spin in either a clockwise or counterclockwise direction. When the current passes through the tantalum atomic core, its physical properties naturally sort the electrons to opposing sides based

on their direction of spin. This creates the polarization which can switch magnets in a logic circuit without the need for a magnetic field. The power consumption is up to 10,000 times lower than state-of-the-art schemes for nanomagnetic computing and provides for a realistic replacement for transistors.

Nature Materials Study: Boosting Heat Transfer with Nanoglue

A team of interdisciplinary researchers at Rensselaer Polytechnic Institute [21] has developed a new method which significantly increases the heat transfer rate across two different materials. The study, published in the journal *Nature Materials*, is useful for new advances in cooling computer chips, lighting-emitting diode (LED) devices, in collecting solar power, harvesting waste heat, and in other applications. This was achieved by sandwiching a layer of ultrathin “nanoglue” between copper and silica. The research team demonstrated a four-fold increase in thermal conductance at the interface between the two materials. Less than a nanometer—or one billionth of a meter—thick, the nanoglue is a layer of molecules that form strong links with the copper (a metal) and the silica (a ceramic), which otherwise do not stick together well. This kind of nano-molecular locking improves adhesion, and also helps to sync up the vibrations of atoms that make up the two materials which, in turn, facilitates more efficient transport of heat particles called phonons. Beyond copper and silica, the research team has demonstrated their approach works with other metal-ceramic interfaces.

Heat transfer is a critical aspect of many different technologies. As computer chips grow smaller and more complex, manufacturers are constantly in search of new and better means for removing excess heat from semiconductor devices to boost reliability and performance. With photovoltaic devices, for example, better heat transfer leads to more efficient conversion of sunlight to electrical power. LED makers are also looking for ways to increase efficiency by reducing the percentage of input power lost as heat. The ability to enhance and optimize interfacial thermal conductance should lead to new innovations in these and other applications. Interfaces between different materials are often heat-flow bottlenecks due to stifled phonon transport. Inserting a third material usually only makes things worse because of an additional interface created. However, introducing an ultrathin nanolayer of organic molecules that strongly bond with both the materials at the interface gives rise to multi-fold increases in interfacial thermal conductance, contrary to poor heat conduction seen at inorganic-organic interfaces. This method to tune thermal conductance by controlling adhesion using an organic nanolayer works for multiple materials systems, and



Fig.8. Boosting Heat Transfer with Nanoglue offers a new means for atomic- and molecular-level manipulation of multiple properties at different types of materials interfaces. Also, it was done rather unobtrusively by the simple method of self-assembly of a single layer of molecules.

This study establishes the correlation between interfacial bond strength and thermal conductance, which serves to underpin new theoretical descriptions and opens up new ways to control interfacial heat transfer. It is truly remarkable that a single molecular layer can bring about such a large improvement in the thermal properties of interfaces by forming strong interfacial bonds. This is also a fascinating example of the interplay between the physical, chemical, and mechanical properties working in unison at the nanoscale to determine the heat transport characteristics at dissimilar metal-ceramic interfaces.

BUILDING BETTER DISPLAYS

The “quantum dots” can replace the fluorescent dots used in current displays and these displays will be simpler to make, will use reduced power consumption and will have decreased weight and thickness. The "active matrix" display using a new class of transparent transistors and circuits made of "nanowires" is a step toward realizing applications such as e-paper, flexible color monitors and "heads-up" displays in car windshields. Carbon Nanotube (CNT) technology – a breakthrough technique, can be used to develop large, flat panel displays with superior quality, longer lifetimes and lower costs than current offerings.

Engineers make first 'active matrix' display using nanowires

Electronic displays like television screens contain millions of pixels located at the intersections of rows and columns that crisscross each other. The OLEDs are devices that rival the brightness of conventional pixels in flat-panel television sets, computer monitors and displays in consumer electronics. OLEDs are used in cell phones, MP3 displays and prototype television sets, but their production requires a complex process, and it is difficult to manufacture OLEDs which are small enough for high-resolution displays.

Nanowire-transistor electronics can solve this problem. The nanowires are tiny cylindrical structures that are assembled on glass or thin films of flexible plastic. The researchers [22] used nanowires as small as 20 nanometers - a thousand times thinner than a human hair - to create a display containing organic light emitting diodes, or OLEDs. Nanowire electronics was fabricated at room temperature in a simple process that is practical for commercial manufacturing. The fabrication method is scalable and provides a low-cost way to produce high-resolution displays. Unlike conventional computer chips - called CMOS, for complementary metal oxide semiconductor chips - the nanowire thin-film transistors can be produced less expensively under low temperatures, making them ideal to incorporate into flexible plastics which melt under high-temperature processing. The nanowire transistors were made of a transparent semiconductor called indium oxide, a potential replacement for silicon in future transparent circuits. The OLEDs used in the display consisted of nanowire transistors, electrodes made of a material called indium tin oxide and plastic capacitors that store electricity. All of the materials are transparent until activated to emit light. The researchers successfully selectively illuminated a specific row of active-matrix OLEDs in a display about the size of a fingernail. Conventional liquid crystal displays in flat-panel televisions and monitors are backlit by a white light, and each pixel acts as a filter that turns on and off to create images. OLEDs, however, emit light directly, eliminating the need to backlight the screen and making it possible to create more vivid displays that are thin and flexible. This first "active matrix" display using a new class of transparent transistors and circuits is undoubtedly a step toward realizing applications such as e-paper, flexible color monitors and "heads-up" GPS navigational displays right on the windshield of your car. Imagine having a local map displayed on your windshield so that you need not to take your eyes off the road. Future research is expected to include work to design displays that can control individual OLEDs to generate images. A unique aspect of these displays is that they are transparent. Until the pixels are activated, the display area looks like lightly tinted glass. The technology can also be used to create antennas that aim microwave and radio signals more precisely than current antennas. Such antennas can improve cell phone reception and will make it more difficult to eavesdrop on military transmissions on the battlefield.

The new OLEDs have brightness nearly comparable to that of the pixels in commercial flat-panel television sets. The OLEDs have an average brightness of more than 300 candelas per square meter, compared with 400-500 candelas per square meter for commercially available liquid-crystal display televisions. The researchers successfully created OLEDs of the proper size for commercial displays, about 176 by 54 microns, the size which will be ideal for small displays in cell phones, personal digital assistants and other portable electronics.

Motorola Labs Debuts First Ever Nano Emissive Flat Screen Display Prototype

Motorola Labs developed [23] a working 5-inch color video display prototype based on proprietary Carbon Nanotube (CNT) technology – a breakthrough technique for creating large, flat panel displays with superior quality, longer lifetimes and lower costs than current offerings. This can be optimized for a large screen High Definition Television (HDTV) which is less than 1-inch thick. The development of such a flat panel 5-inch prototype display is possible due to Motorola Labs Nano Emissive Display (NED) technology, a scalable method of growing CNTs directly on glass to enable an energy efficient design that excels at emitting electrons. Through this cost-effective process and design, Motorola showcases the potential to create longer-lasting NED flat panel displays with high brightness, excellent uniformity and color purity. This NED technology is demonstrating full color video with good response time and a low manufacturing cost which is expected to be less than \$400 for a 40-inch NED panel. Motorola prototype is low cost display driven electronics (similar to LCD, much lower than Plasma) with color 5" video section of a 1280 x 720, 16:9, 42-inch HDTV with a small panel thickness of 3.3 millimeters (about 1/8th of an inch), high quality brightness and vivid colors produced using standard Cathode Ray Tube (CRT) and showing display characteristics which meet or exceed CRTs, such as fast response time, wide viewing angle and wide operation temperature.

BETTER MEMORY UNITS - RAM AND HARD DISKS

Magnetic Random Access Memory developed at University of Illinois

Magnetic Random Access Memory (MRAM) is a contemporary spin on decades-old core memory technology that uses magnetic fields rather than electrical charges to reliably store and randomly access data. A team of researchers at University of Illinois at Chicago [24] has demonstrated that nanometer-sized permalloy rings, shaped into tiny rectangles, can store and access data almost instantly. The MRAM developed at UIC does not need refreshing the memory. That means we can store data, recall it and it remains there. It is non-volatile. The conventional DRAM (dynamic random access memory) stores information as electrical charges.

Therefore it needs to be constantly refreshed. This means, as at present, as battery dies, we lose information. But with MRAM, even if the battery dies, magnetized layer of memory stays magnetized and the data stays there, hopefully, forever.

Square-shape of the magnetized memory rings is the key to make MRAM work. The researchers initially investigated the memory properties of circular rings, but found that square and rectangular-shaped rings sitting on nano-scale memory cells are more reliable design for storing data, keeping data stable, switching the magnetic field and making it possible to retrieve information. However, the technology remains largely in the development phase with improvements needed in patterning the magnetic material. The square rings are uniform down at sizes below 50 nanometers. Square and rectangular rings exhibit two stable states of opposite polarity at remanence that can be used for data storage. It has also been shown that unlike circular rings that switch only through the vortex state, the square and rectangular rings also exhibit a unique inter-mediate horseshoe state depending on the direction of magnetization. The choice of the stable intermediate state and thus the switching mechanism, in the square and rectangular rings, can be controlled. This offers a good platform for the development of the magnetic storage technology. Presently MRAM square ring cells that work well as a circuit are comparatively large -- often as big as 500 nanometers. Everything is determined by shape, and small variations in the shape of magnetic material leads to drastic changes in switching properties. All these MRAM cells should switch exactly together, and this needs to be controlled precisely. Unlike with everyday DRAM memory chips used in personal computers and other consumer electronic devices, MRAM holds the promise of providing instant access memory without the boot-up delays which is now common after turning on the device power. Also, MRAM is not prone to memory loss caused by radiation particles, so it may prove to be the memory storage device of choice in future spacecraft electronics, such as space probes, launch vehicles, laboratories and earth-orbiting satellites.

UCLA engineers develop new energy-efficient computer memory using magnetic materials

The researchers at UCLA have developed an improved memory [25], which they call Magnetolectric Random Access Memory or MeRAM, which uses electric voltage instead of a flowing electric current for creating magnetic field. It uses nanoscale structures called voltage-controlled magnet-insulator junctions, which have several layers stacked on top of each other, including the

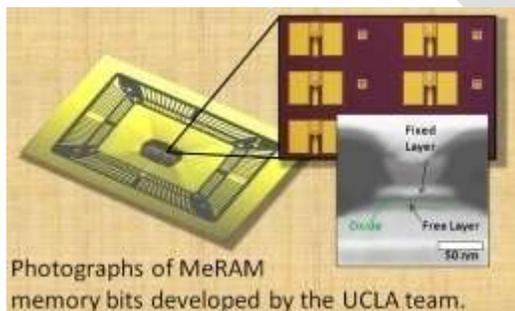


Fig.9. MeRAM memory bits developed by UCLA team

two composed of magnetic materials. However, while magnetic direction of one layer is fixed, that of the other is manipulated via an electric field. The devices are specially designed to be sensitive to electric fields. When the electric field is applied, it results in voltage — a difference in electric potential between the two magnetic layers. This voltage accumulates or depletes the electrons at the surface of these layers, writing bits of information into the memory. MeRAM is an ultra-fast, high-capacity class of computer memory and has a great potential to be used in future memory chips for almost all electronic applications, including smartphones, tablets, computers and microprocessors, as well as for data storage, like the solid-state disks used in computers and large data centers. MeRAM is up to 1,000 times more energy-efficient than current technologies. Its key advantage over existing technologies is that it combines extraordinary low energy with very

high density, high-speed reading and writing and non-volatility — the ability to retain data when no power is applied, similar to hard disk drives and flash memory sticks. But MeRAM is much faster. Currently, magnetic memory is based on a technology called spin-transfer torque (STT), which uses the magnetic property of electrons — referred to as spin — in addition to their charge. STT utilizes an electric current to move electrons to write data into the memory and therefore requires a certain amount of power, which means that it generates heat when data is written into it. Further, its memory capacity is limited by how close to each other bits of data can be physically placed, a process which itself is limited by the currents required to write information. The low bit capacity, in turn, translates into a relatively large cost per bit, limiting STT's range of applications. The technology used in MeRAM replaces STT's electric current with voltage to write data. This eliminates the need to move large numbers of electrons through wires and instead uses voltage — the difference in electrical potential — to switch the magnetic bits and write information into the memory. This results in computer memory that generates much less heat, making it 10 to 1,000 times more energy-efficient. Further the memory is more than five-times as dense, with more bits of information stored in the same physical area, which substantially brings down the cost per bit.

Race Track Memory based on Nanowires

Team of researchers at IBM [26] describes the fundamentals of a computer memory technology known as "racetrack" memory which combines the high performance and reliability of flash with the low cost and high capacity of the hard disk drive.

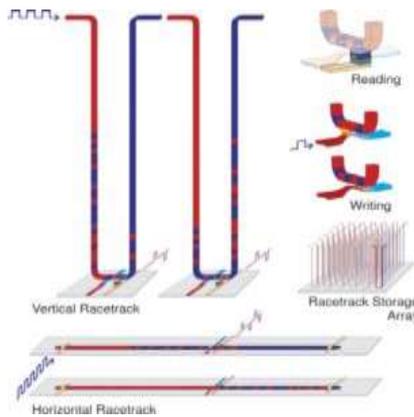


Fig.10. Computer memory technology named as "Race Track Memory" developed at IBM.

cheaper than in flash memory. But hard disk drive is intrinsically slower and, with many moving parts, has mechanical reliability issues which are not present in flash technology. Flash memory, however, has its own drawbacks – while it is fast to read data, it is slow to write data, and it, too, has a finite lifespan. Flash, can be reused only a few thousands of times because it eventually breaks as it is slightly damaged by each use or "rewrite." However, the racetrack memory has no moving parts, and, rather than storing data as ensemble of electronic charge, uses the "spin" of the electron to store data, it has no wear-out mechanism and so can be rewritten endlessly without any wear and tear.

The domain walls are the boundaries between magnetic regions or "domains" in magnetic materials. The manipulation of magnetic domain walls for storing information, however, was always expensive, complex, and used significant power to generate the fields necessary to do so. The researchers, however, showed that the domain wall can be moved by interacting the spin polarized current with magnetization in the walls which results in a spin transfer torque on these walls. The use of spin momentum transfer considerably simplifies the memory device since the current is passed directly across the domain wall without the need for any additional field generators. The magnetic domains, thus, can be used to store information in columns of magnetic material (the "racetracks") arranged perpendicularly or horizontally on the surface of a silicon wafer. Magnetic domain walls are then formed, within the columns delineating regions magnetized in opposite directions (e.g. up or down) along a racetrack. Each domain has a "head" (positive or north pole) and a "tail" (negative or south pole). Successive domain walls along the racetrack alternate between "head to head" and "tail to tail" configurations. The spacing between consecutive domain walls (that is, the bit length) is controlled by pinning sites fabricated along the racetrack. The researchers, in this study, described the use of horizontal permalloy nanowires to demonstrate the successive creation, motion and detection of domain walls by using sequences of properly timed nanosecond long spin-polarized current pulses. The cycle time for the writing and shifting of the domain walls was a few tens of nanoseconds. These results illustrated the basic concept of a magnetic shift register relying on the phenomenon of spin momentum transfer to move series of closely spaced domain walls – an entirely new take on the decades-old concept of storing information in movable domain walls. Furthermore, the racetrack can also move into the third dimension (3D) leading to the construction of a novel 3D racetrack memory device. This is a paradigm shift from traditional two-dimensional arrays of transistors and magnetic bits found in silicon-based microelectronic devices and hard disk drives. By moving into the third dimension, racetrack memory stands to open new possibilities for developing less expensive, faster devices because it is also not dependant on miniaturization as dictated by Moore's Law.

Imec and Nantero launch joint carbon nanotube memory program for high-density next-generation memory below 20nm

Imec, a world-leading research institution in nanoelectronics and Nantero Inc., a nanotechnology company have decided to develop the carbon-nanotube-based memory developed by Nantero [27] known as NRAM, and its application in high-density next-generation memories with a size under 20nm. Carbon nanotube memory NRAM is based on the carbon nanotubes (CNTs) which are cylindrical carbon molecules about a nanometer across and up to a millimeter long. CNTs exhibit extraordinary strength, unique electrical properties and efficient heat conduction, is highly promising material for future memories. Researchers at Nantero Inc. has

already fabricated high-yielding 4Mb arrays of NRAM in CMOS production environments, with several important performance advantages such as the write speed is as fast as 3 nanoseconds, the endurance is unlimited which was over a trillion cycles, a low operating power requirement and superior high temperature retention. Nantero and imec will develop and demonstrate this form of memory for future applications below 20nm such as terabit-scale memory arrays and ultra-fast gigabit-scale nonvolatile cache memories. NRAM, with suitable endurance and speed specifications, is useful in Non-Volatile Memory applications and is a good alternative to DRAM which is presently everyday memory chip used in personal computers and other consumer electronic devices and is currently facing scaling limitations beyond 18nm.

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CONCLUSION

The researchers all over the world are exploring possibilities to use nanotechnology in improving working and fabrication of electronic devices. They have succeeded in reducing size of these devices by making molecular level, junction-less, memory (eliminating need for capacitor), Trigate, faster graphene and Organic (NOMFET) transistors. Improvement in fabrication methods such as successfully printing Nano-level circuits with Inkjet printers using silver ink and printing circuits on flexible plastics which will lead to flexible motherboards, mobiles and laptops are remarkable developments. There are sincere efforts in designing nanolevel circuits with less power consumption and faster heat dissipation. Research work on Silicon Nanophotonics and spectrally purer laser will improve the rate of data transmission. Research groups have designed better displays and monitors with sharper and intense output imaging using Nanowire and Carbon Nanotube technologies. Improved Random Access Memories MRAM, MeRAM, NRAM and hard disks such as Race Track Memory with thousand times more storage capacity are going to be the promising part of future electronic gadgets.

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Mining High Utility Itemsets using UP Growth with Genetic Algorithm from Data Mart

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Abstract: In data mining in order to analyse vast amount of data, Frequent itemset mining play an important role. In practice, Frequent pattern mining cannot meet the tasks of real world problems due to itemsets vary in numerous measures. Hence an evolving technique called Utility-based data mining is used in data mining processes. The utility mining not only considers the frequency but also see the utility associated with the itemsets. The basic idea of utility mining is to extract the itemsets with high utilities, by considering user preferences such as profit, quantity and cost from OLTP systems. In our proposed approach, we are using UP growth with Genetic Algorithm. The approach is that UP growth algorithm would generate Potentially High Utility Itemsets and Genetic Algorithm would optimize and provide the High Utility Item set from it. On comparing with existing algorithm, the proposed approach is performing better in terms of memory utilization.

Keywords—Utility mining, High utility itemsets, UP Growth, Genetic Algorithm, genotype, Frequent itemset mining, Memory utilization

I. INTRODUCTION

A. Data Mining

Data Mining refers to extracting or mining knowledge from large databases. Data mining and knowledge discovery in the databases is a new interdisciplinary field, merging ideas from statistics, machine learning, databases and parallel computing. Hence Data mining can be defined as: a) non trivial extraction of implicit, previously unknown and potentially useful information from the large databases, b) the search for the relationships and global patterns that exists in large databases but are hidden among vast amounts of data, c) refers to using a variety of techniques to identify nuggets of information or decision –making knowledge in the database and extracting these in such a way that they can be put to use in areas such as decision support, prediction, forecasting and estimation, d) it is the system self learns from the previous history of investigated system, formulating and testing hypothesis about rules which system works properly, e) the process of discovering meaningful, new correlation pattern and trends by shifting through large amount of data stored in repositories, using pattern recognition techniques as well as statistical and mathematical techniques.[1]

For the past two decades data mining has emerged as an important research area. This is mainly due to the inter-disciplinary nature of the subject and the diverse range of application domains in which data mining based products and techniques are being employed. This includes bioinformatics, genetics, medicine, clinical research, education, retail and marketing research.

Data mining has been considerably used in the analysis of customer transactions in retail research where it is termed as market basket analysis. Market Basket Analysis is the process of exploring customer buying habits by finding associates between the different items that customers place in their “Shopping Baskets”. The discovery of such associations can help retailers develop marketing strategies by gaining insight into which items are frequently purchased together by customer.

B. Frequent Itemset Mining

Frequent itemset mining is the mining of frequent itemsets (set of items) from transactional or relational data sets. An itemset can be defined as a non-empty set of items. An itemset with k different items is termed as a k -itemset. For e.g. {bread, butter, milk } may denote a 3-itemset in a supermarket transaction .The notion of frequent itemsets was introduced by Agrawal et al [2].Frequent itemsets are the itemsets that appear frequently in the transactions. The goal of frequent itemset mining is to identify all the itemsets in a transaction dataset [3]. Frequent itemset mining plays an essential role in the theory and practice of many important data mining tasks, such as mining association rules [2,4,5], long patterns ,emerging patterns, and dependency rules. It has been applied in the field of telecommunications, census analysis and text analysis [6].

The criterion of being frequent is expressed in terms of support value of the itemsets. The Support value of an itemset is the percentage of transactions that contain the itemset.

C. Utility Mining

The restrictions of frequent or rare itemset mining inspired researchers to conceive a utility based mining approach, which allows a user to conveniently express his or her perspectives concerning the usefulness of itemsets as utility values and then find itemsets with high utility values higher than a threshold [8] .In utility based mining the term utility refers to the quantitative representation of user preference i.e. the utility value of an itemset is the measurement of the importance of that itemset in the users perspective. For e.g. if a sales analyst involved in some retail research needs to find out which itemsets in the stores earn the maximum sales revenue for the stores he or she will define the utility of any itemset as the monetary profit that the store earns by selling each unit of that itemset.

Here note that the sales analyst is not interested in the number of transactions that contain the itemset but he or she is only concerned about the revenue generated collectively by all the transactions containing the itemset. In practice the utility value of an itemset can be profit, popularity, page-rank, measure of some aesthetic aspect such as beauty or design or some other measures of user's preference.

Genetic Algorithm:

The basic steps involved in the Genetic Algorithm are:

- i) Encoding
- ii) Population Initialization
- iii) Fitness Function
- iv) Genetic Operators
- v) Evaluation and
- vi) Termination Criteria

Encoding:

Encoding is the starting point of Genetic Algorithm. Here several types are available like Binary Encoding, Permutation Encoding, Value Encoding and Tree Encoding. In our problem, Binary Encoding has been used, in which Binary value '1' represent presence of an item and '0' represent absence of an item in an itemset. Chromosome length is fixed and it is equal to number of distinct items (n) which is obtained from the transaction database.

Population Initialization:

Given an itemset length ' k ', all the genes (item) in a chromosome are encoded as '0'. The initial population is produced using random number generator. If the generated random number is ' r ', then the chromosome is encoded as '1' at r_{th} position. This represent i_r item presents in a chromosome (itemset). Upon randomly generating an item in a chromosome, it is checked against other items already generated in the same chromosome and if the item is present a new number is randomly generated until it is unique. This is repeated until generating ' k ' unique random numbers. This process should hold the condition $k \leq n$.

Fitness Function:

The main goal this work is to generate the high utility itemsets from the transaction database. Hence, the fitness function is essential for determining the chromosome (itemset) which satisfy minUtil threshold. The following fitness function [15] has been used

$$f(X)=u(X)=\sum_{T_q \in D \wedge X \subseteq T_q} u(X, T_q)$$

where $u(X)$ – utility measure, T- Transaction, D- Database, X-item set.

II. LITERATURE REVIEW

In this section we present a brief overview of the various algorithms, concepts and approaches that have been defined in various research publications. Wide range of studies have been done for mining frequent patterns. Among the issues of frequent pattern mining, the most famous are association rule mining and sequential pattern mining.

Agarwal et al in [2] studied the mining of association rules for finding the relationships between data items in large databases. Association rule mining techniques use a two-step process. The first step uses algorithms like the Apriori to identify all the frequent itemsets based on the support value of the itemsets. Apriori uses the downward closure property of itemsets to prune off itemsets which cannot qualify as frequent itemsets by detecting them early. The second step in association rule mining is the generation of association rules from frequent itemsets using the support – confidence model.

Han et al [14] proposed a novel frequent pattern tree (FP-tree) structure, which is an extended prefix-tree structure for storing compressed, crucial information about frequent patterns, and develop an efficient FP-tree based mining method, FP-growth, for mining the complete set of frequent patterns by pattern fragment growth. Efficiency of mining is achieved with three techniques: (i) a large database is compressed into a highly condensed, much smaller data structure, which avoids costly, repeated database scans, (ii) FP-tree-based mining adopts a pattern fragment growth method to avoid the costly generation of a large number of candidate sets, and (iii) a partitioning-based, divide-and-conquer method is used to decompose the mining task into a set of smaller tasks for mining confined patterns in conditional databases, which dramatically reduces the search space. The main limitation is expensive to build and mine from FP-tree.

Liu et al [7] proposed Fast high utility item set mining algorithm, which is mainly composed of two mining phases. In phase I, it employs an Apriori-based level-wise method to enumerate HTWUIs. Candidate itemsets with length k are generated from length $k-1$ HTWUIs, and their TWUs are computed by scanning the database once in each pass. After the above steps, the complete set of HTWUIs is collected in phase I. In phase II, HTWUIs that are high utility itemsets are identified with an additional database scan. Although two-phase algorithm reduces search space by using TWDC property, it still generates too many candidates to obtain HTWUIs and requires multiple database scans.

In this paper [13], two efficient sliding window-based algorithms, MHUI-BIT (Mining High-Utility Itemsets based on BITvector) and MHUI-TID (Mining High-Utility Itemsets based on TIDlist), are proposed for mining high-utility itemsets from data streams. The advantage is mining high-utility itemsets with negative item profits over stream transaction-sensitive sliding windows but memory issue cannot be overcome as expected. In the paper [16] Tseng et al proposed to discover temporal high utility itemsets which are the itemsets with support larger than a pre-specified threshold in current time window of data stream. A novel approach THUI (Temporal High Utility Itemsets)-Mine has been used for mining temporal high utility itemsets from data streams.

III. PROPOSED WORK

The proposed method can be broadly classified into two stages as mentioned in Fig.1

1. Construct UP tree and identify potentially high utility itemsets (PHUI) using UP growth algorithm[19].
2. Identify the actual high utility item set from PHUI using genetic algorithm.

In Stage I, the global UP (utility pattern) tree has been constructed with two strategies – DGU (Discarding Global Unpromising Items) and DNU (Decreasing Global Node Utilities). After that, Reorganised Transaction table has been formed with RTUs (Reorganized Transaction Utility).

Construction of Global UP Tree:

In an UP-Tree, each node consists of item name, count, node utility (overestimated utility of node), parent node of N and child node details. A table named header table is employed to facilitate the traversal of UP-Tree. In header table, each entry records an item name, an overestimated utility, and a link. The link points to the last occurrence of the node which has the same item as the entry in the UP-Tree. By following the links in header table and the nodes in UP-Tree, the nodes having the same name can be traversed efficiently.

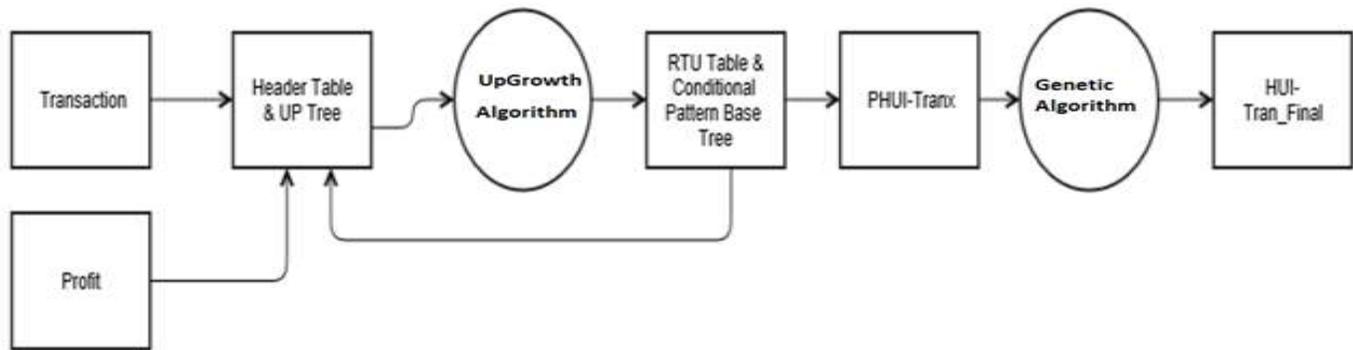


Figure 1: High Utility Itemset mining using UP growth with Genetic Algorithm – Data Flow Diagram

DGU (Discarding Global Unpromising Itemsets):

This involves two scan of database and during the first scan, Transaction Utility (TU) of each transaction is computed as well as TWU of each single item accumulated. In the second scan, transaction are inserted into UP tree and also unpromising items are removed.

DNU (Decreasing Global Node utilities):

This is a Divide and Conquer process that would be useful for large database having lots of transactions. It divide the search space into smaller spaces in such a way that conditional tree has been constructed.

Then UP Growth algorithm started (Figure 2) and it involves 2 strategies – DLU (Discarding Local Unpromising items) and DLN (Decreasing Local Node) Utilities. This algorithm is called recursively and generate Potentially High Utility Itemsets (PHUI). The DLU (Discarding Local Unpromising items) and DLN (Discarding Local Node Utilities) is similar to DGU and DNU discussed earlier and has been used to effectively generate PHUI (Potentially High Utility Itemset).

In Stage II, the Genetic algorithm [18] is invoked (Figure 3) to mine the actual high utility item sets from the PHUI and optimally generate the required items. The genetic algorithm is chosen because it is a promising solution for global search and it is capable of discovering high utility itemsets with corresponding parameters quantity and profit. Here the basic steps involved are Encoding, Population Intialization, Fitness Function, Genetic Operators, Evaluation and Termination Criteria. To the best of our knowledge, this is the first time with this combination of UP growth and Genetic algorithm is used. Tournament replacement strategy for selection of candidate from the population has been used. Based on the Minimum threshold value, the fitness function has been evaluated and candidate item set is selected for next iteration till the termination criteria reached.

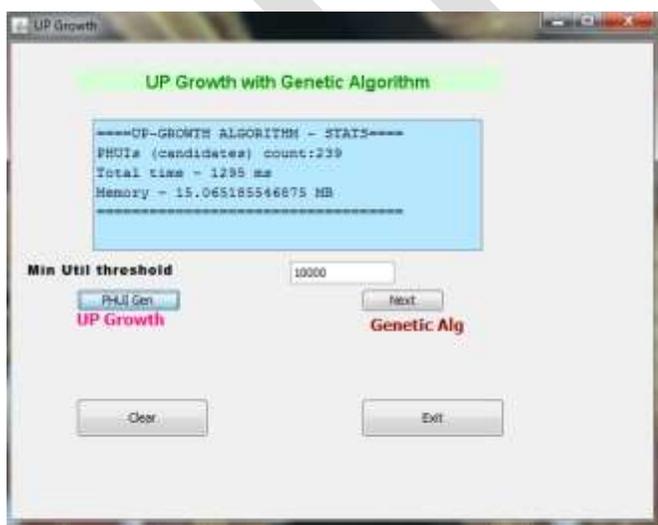


Figure 2: Generate PHUI – UP Growth Algorithm

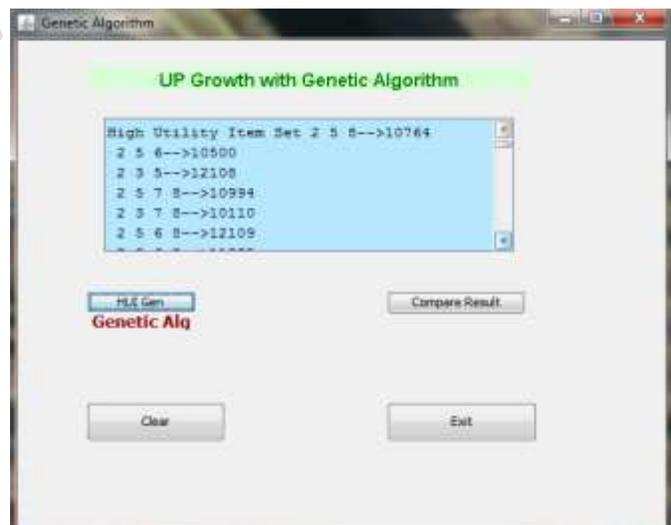


Figure 3: Generate HUI – Genetic Algorithm

IV. PERFORMANCE COMPARISON

Here we compare the performance of our proposed approach with other algorithm in terms of memory consumed with sample dataset and the approach is better when the threshold value is increasing.

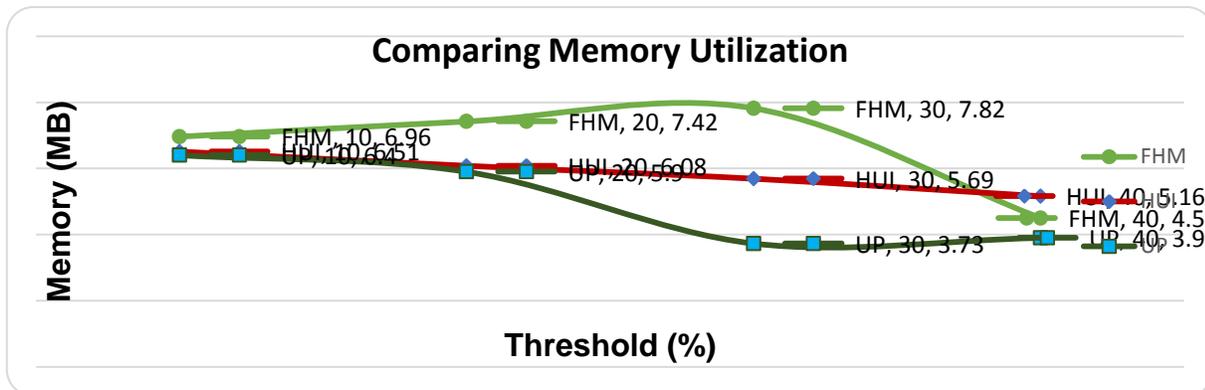


Figure 4: High Utility Itemset mining using UP growth with Genetic Algorithm – Performance Comparison

V. CONCLUSION

Frequent itemset mining is evolved on the platform that the itemsets which appear more frequently in the transaction databases are of significant to the user. However the effectiveness of mining the frequent itemset by considering only the frequency of appearance of the itemsets is challenged in many application domains such as Medical research, retail research. On many occasions, in real applications that the itemsets that contribute the most in terms of some user defined utility function (for e.g. profit) are not necessarily frequent itemsets as observed in various studies.[17] Hence new concept called Utility mining evolved which attempts to bridge this gap by using item utilities as an suggestive measurement of the importance of that item in the user’s perspective. Here most of the existing work is dedicated towards reducing the search space while searching for the high utility itemsets.

A novel approach to use UP growth algorithm with Genetic algorithm has been explored in this paper. When comparing the performance with existing algorithms, the proposed approach shown better results in terms of memory utilization.

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Review on Image Recognition

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Abstract— Face recognition presents a challenging problem in the field of image analysis and computer vision, and as such has received a great deal of attention over the last few years because of its many applications in various domains. This article surveys forensic face-recognition approaches and the challenges face in improving matching and retrieval results as well as processing low-quality images. Here we propose the novel method to recognize the heterogeneous face recognition. it gives a new way to explore with an image Initially we remove the noise from the image. To remove the noise present in the image we use median filter. The system involves using a relational feature representation for face images by using kernel similarities between a novel face pattern and a set of prototypes. Finally the identified image will be retrieved from the database.

Keywords— Face Recognition, Heterogeneous Face Recognition, Kernel LDA, Kernel PCA, prototype image.

INTRODUCTION

Facial recognition technologies are used in a wide array of contexts, reflecting a spectrum of increasing technological sophistication in today's world. At the simplest level, the technology can be used for facial detection; that is, merely to detect and locate a face in a photo. Current uses of facial detection include refining search engine results to include only those results that contain a face; locating faces in images in order to blur them. A more refined version of facial recognition technology allows assessing characteristics of facial images.

Face recognition has always been a very challenging task for the researches. On the other hand, it has always been very difficult to implement due to all different situation that a human face can be found. Due to the difficulty of the face recognition task, the number of techniques is large and diverse. It is not think that images are always capture in ideal conditions, there may be illumination, pose, and expression variation. Such challenges are more prominent in heterogeneous face recognition. In last decades there were many method developed to tackle such problem.

From face recognition surveys it implies that they have face recognition of face images which are of same type. This restricts the face recognition for specific datatype. Such situation can be tackle by using face images of different modality, it refer as heterogeneous faces.

When designing a face detection and face recognition system, in addition to considering the aspects from psychophysics and neuroscience and the factors of human appearance variations, there are still some design issues to be taken into account.

First, the execution speed of the system reveals the possibility of on-line service and the ability to handle large amounts of data. Heterogeneous face recognition using kernel methods concentrate their works on how to speed-up the existing algorithms and how to handle large amounts of data simultaneously.

Second, the training data size is another important issue in algorithm design. It is trivial that more data are included, more information we can exploit and better performance we can achieve. While in practical cases, the database size is usually limited due to the difficulty in data acquisition and the human privacy. In propose technique we can have high dimensional data with increased data size also include some prior knowledge or try to predict and interpolate the missing and unseen data.

In previous technique had problem that how to bring the algorithms into uncontrolled conditions technique. In this research we'll try to combine the existing algorithms and modify the weights and relationship among them to see if face detection and recognition could be extended into uncontrolled conditions.

So, the propose technique refer as heterogeneous face recognition, in which we are matching the two face images from alternate imaging modalities, such as an infrared image to a photograph or a sketch to a photograph. While heterogeneous face

recognition can involve matching between any two imaging modalities, the majority of scenarios involve a gallery dataset consisting of visible light photographs. Probe images can be of any other modality, though the practical scenarios of interest to us are infrared images (NIR and thermal) and hand-drawn facial sketches. The core of the proposed approach involves using a relational feature representation for face images. The fig 1. shows the face images capture by different equipment under different illumination.



Fig 1: Examples of Images for Heterogeneous Face Scenario

Face recognition is mainly use for two primary tasks:

- Verification(one-to-one matching)
- Identification(one-to-many matching)

There are numerous areas in which face recognition can be exploited for these two purposes; some of them are given as follows

- Security (access control to buildings, airports/seaports, ATM machines and border checkpoints; computer/ network security; email authentication on multimedia workstations).
- Surveillance (a large number of CCTVs can be monitored to look for known criminals, drug offenders, etc).
- General identity verification (electoral registration, banking, electronic commerce, identifying newborns, national IDs, passports, drivers' licenses, employee IDs).
- Criminal justice systems (mug-shot/booking systems, post-event analysis, forensics).
- Image database investigations (searching image databases of licensed drivers, benefit recipients, missing children, immigrants and police bookings).

A. Kernel similarity

By using kernel similarities between a novel face pattern and a set of prototypes, we are able to exploit the kernel trick, which allows us to generate a high dimensional, nonlinear representation of a face image using compact feature vectors. The use of a nonlinear similarities representation is found to best suited for the HFR problem because the set of training image from each modality can be used as the prototype, depending on modality of new image, the image from the each prototype is selected from the corresponding modality. In earlier method they needed a two feature descriptor for two HFR, But the propose method need descriptors that are effective in each domain. Therefore matching process of face recognition for heterogeneous face images will minimum with high accuracy. [9] This book provides evidence of practical applications that have made a kernel method a fundamental part of the toolbox for machine learning, statistics, and signal processing practitioners. There had a major revolution taken place in pattern recognition technology with introduction of rigorous and powerful mathematical approaches in problem domain. Kernel method is combination of convex optimization and statistical learning theory with ideas from functional analysis and classical statistics to produce class of algorithms.

FACE RECOGNITION TECHNIQUES

A. Face Recognition from Intensity Images

a. Featured-based-

Feature-based approaches first process the input image to identify and extract (and measure) distinctive facial features such as the eyes, mouth, nose, etc., as well as other fiducial marks, and then compute the geometric relationships among those facial points, thus reducing the input facial image to a vector of geometric features[4]. Then employed standard statistical pattern recognition techniques to match faces using these measurements .

b. Advantages and Disadvantages

- The main advantage offered by the featured-based techniques is that such methods are relatively robust to position variations in the input image.
- The major disadvantage of these approaches is the difficulty of automatic feature detection and any of these techniques has to make arbitrary decisions about which features are important.

B. Holistic

Holistic approaches attempt to identify faces using global representations, i.e., descriptions based on the entire image rather than on local features of the face. These schemes can be subdivided into two groups: statistical and AI approaches.

The simple version of Holistic it represents image as 2D array of intensity value recognition is performed by direct correlation comparisons between the input face and all the other faces in the database. But it is computationally very expensive and sensitivity to face orientation, size, variable lighting conditions, background clutter, and noise. The major part of direct matching methods' recognition performance is that they attempt to perform classification in a space of very high dimensionality. Several other schemes have been proposed to counter this curse of dimensionality, that employ statistical dimensionality reduction methods to obtain and retain the most meaningful feature dimensions before performing recognition. Ex. PCA, LDA.

AI approaches utilize tools such as neural networks and machine learning techniques to recognize faces. In 50 principal components were extracted and an auto-associative neural network was used to reduce those components to five dimensions. In both PCA and Wavelet Transform face extraction scheme, SVM (Support Vector Machine) is used. SVM employed as binary classifiers and the SVM outputs were mapped to probabilities.

These schemes have reportedly yielded promising results for various difficult face recognition scenarios.

C. Multiple Classifier Systems

Since the performance of any classifier is more sensitive to some factors and relatively invariant to others, a recent trend has been to combine individual classifiers in order to integrate their complementary information and thereby create a system that is more robust than any individual classifier to variables that complicate the recognition task. Such systems have been termed as multiple classifier systems (MCSs)[4].

The main advantage of the holistic approaches is that they do not destroy any of the information in the images by concentrating on only limited regions or points of interest. Consequently, these techniques are not only computationally expensive but require a high degree of correlation between the test and training images, and do not perform effectively under large variations in pose, scale and illumination, etc. result of which these approaches appear to produce better recognition results than the feature-based ones in general.

D. Face Recognition from Video Sequences

Face recognition system based on video typically consists of three modules: one for detecting the face; a second one for tracking it; and a third one for recognizing it. Most of these systems choose a few good frames and then apply one of the recognition techniques for intensity images to those frames in order to identify the individual. Ex. Howell and Buxton employed a two-layer RBF network for learning/training and used Difference of Gaussian (DoG) filtering and Gabor wavelet analysis for the feature representation, while the scheme from was utilized for face detection and tracking[4].

The advantage of this scheme is, it provides temporal continuity, so classification information from several frames can be combined to improve recognition performance. Moreover, video allows the tracking of face images such that variations in facial expressions and poses can be compensated for, resulting in improved recognition.

Dynamic face recognition scheme appears to be disadvantages due to low quality image, clutter background, the presence of more than one face in the picture; and a large amount of data to process.

E. Face Recognition from Other Sensory Inputs

The research on face recognition has been focused on identifying individuals from 2D intensity images, in recent years some attention has nevertheless been directed towards exploiting other sensing modalities, such as 3D or range data and infra-red imagery[4].

a. 3D Model-based-

3D Model based recognition system allows us to exploit features based on the shape and the curvature of the face (such as the shape of the forehead, jaw line, and cheeks) without being plagued by the variances caused by lighting, orientation and background clutter that affect 2D systems.

b. Infra-red-

For detecting and recognizing faces thermal infra-red imagery of faces is use because it is insensitive to variations in lighting. Since infra-red facial images reveal the vein and tissue structure of the face which is unique to each individual (like a fingerprint), some of the face recognition techniques for the visible spectrum should therefore yield favorable results when applied to these images.

FACE IMAGE REPRESENTATION

Many methods use vector space structure to represent images. Appearance- based approaches are used to represent an object in terms of several raw intensity images. Feature space is used to project similarity between test view and stored prototypes. Image is represented by using vectors. In some methods of face recognition each face images represents as weighted sum (feature vector) of the eigenfaces, which store in 1D array. In the propose work will replace this feature vector representation by kernel similarities.

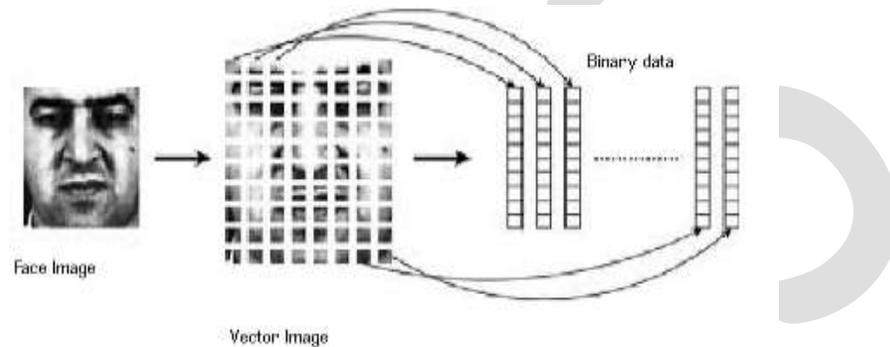


Fig.2. Image Representation

RELATED WORK

Tang et al. spearheaded the work in heterogeneous face recognition with several approaches to synthesize a photograph from a sketch (or vice versa)[1]. Wang initially proposed an eigen-transformation method. Later, Liu et al. performed the transformation using local linear embedding to estimate the corresponding photo patch from a sketch patch. Wang and Tang proposed a Markov random field model for converting a sketch into a photograph. Other synthesis methods have been proposed as well[1][7][9]. In discriminative feature based approach is that once the sketch has been converted into photograph, matching can be performed using exiting face recognition algorithm. So we present the prototype in which no direct comparison between face images in probe and gallery image modality is needed. [1], have been proposed different approaches to HFR. In the prior works used only a single prototype is used per training subject. By contrast, we will presenting the designed for heterogeneous face recognition, which uses two prototype images per subject (one per modality). In earlier work utilized a similar approach that did not exploit the benefit of nonlinear kernels, but did use a separate pattern from each image modality (sketch and photo) for each prototype. The kernel coupled spectral regression by Lei and Li used a similar approach of representing heterogeneous face images as nonlinear similarities to a set of prototypes.

Brendan F. KlareZhifeng Li, and Anil K. Jain, addressed the problem of matching a forensic sketch to a gallery of mug shot images [2]. Previous research in sketch matching only offered solutions to matching highly accurate sketches that were drawn while looking at the subject (viewed sketches). A new framework called local feature-based discriminant analysis (LFDA) had been given for identifying forensic sketch. These approaches first represent face images using local feature descriptors, such as variants of local binary patterns (LBPs) [2] and SIFTS descriptors [2]. This approach is first used by the Liao et al on NIR to VIS face recognition by processing face images with a difference of Gaussian (DoG) filter, and encoding them using multiblock local binary patterns (MB-LBPs). DoG is use for filtering the large different variable facial features to obtained normalized appearance for all heterogeneous faces.

One of the HFR scenario is matching of forensic to mug shot photos[2]. This paper propped feature based approach, which will be successfully give good result for other heterogeneous face recognition scenario.

A. Kernel LDA

One of the traditional method were use for feature extraction is LDA (Linear Discriminant Analysis).

It aims to maximize between class variance and minimize within class variance. On other hand it has problem of sample size with high dimensional face data. So,[6]had been proposed kernel based approach to solve face recognition problem under complex distribution by mapping the input space to high-dimensional feature space.

Jieping Ye, Qi Li, were describes, the most well known technique for feature extraction i.e. LDA (Linear discriminator analysis)[7]. They had been review four important extensions of classical discriminate analysis, including pseudo inverse LDA ,Regularized LDA , PCA+LDA , and LDA/GSVD, which are Preferred for high-dimensional approach.

B. Kernel Principal Component Analysis (PCA)

The second well known method for feature extraction is principal component analysis. In this probe and gallery image must be of same size and must first normalized to line up the eyes and mouth of subjects. The advantage is that, it can reduce the data needed to identify the individuals to 1/100th of the data presented. Although it has disadvantage, that it requires full frontal face to be presented each time.[8]proposed kernel PCA as extension of a PCA. The basic idea of this is to map the input spaces into feature space via nonlinear mapping .Kernel PCA based on principle that since PCA in feature space can be formulated in terms of dot products in same space.

C. SIFT(Scale Invariant Feature Transform)

Scale-Invariant Feature Transform (SIFT) descriptor to form a rejection classifier, which quickly eliminates a large number of illegible candidate faces from the gallery at an early stage. SIFTs are 2D local descriptors [5] and have been successfully used for object recognition under occlusions. [5], the utility of SIFT for face recognition under illumination and expression variations has been explored. In SIFT feature descriptors, the interpersonal variations between the sketch and photos modality were dimension will still maintaining sufficient information for interclass discrimination.

CONCLUSION

Heterogeneous Face Recognition (HFR) refers recognition of face images captured in different modalities, e.g. Visual (VIS), near infrared (NIR) and thermal infrared (TIR) the concept of prototype images and kernel similarities makes the process effective and efficient to explore a probe image in high dimensional data.

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High Gain Printed Monopole Antenna for Wireless Applications

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Abstract— It has been observed that printed monopole antennas are simple in design and fabrication because of high operating frequency, yielding very large bandwidths but the gain and directivity associated with these planar monopole antennas is still a topic of major research. This paper focuses on designing and simulating a high gain printed monopole antenna using the idea of increasing the antenna elements in a linear antenna array and studying the radiation patterns for the array of 5 elements, 9 elements and 16 elements to improve its directive gain. For many applications a high gain and directive antenna is required. We are using the rectangular shaped elements in our array as its performance is very good for applications in ISM band and multiband wireless applications.

Keywords— ISM Band, Impedance bandwidth, Microstrip patch antenna, Printed monopole, antenna array, directivity.

INTRODUCTION

Monopole is single-end fed ground plane dependent antenna. The antenna must have a ground plane to be efficient. Ideally the ground plane should spread out at least a quarter wavelength, or more, around the feed-point of the antenna. The directive gain or directivity of the antenna is influenced by number of elements in the antenna array.

Modern and future wireless systems are placing greater demands on antenna designs and shapes. Many systems now operate in two or more frequency bands, requiring dual or triple band operation of fundamentally narrow band antennas[3][4][5][10]. The monopole antennas are convenient to match to 50 ohms, and are unbalanced. The simplest member of the family is the quarter wave monopole above a perfect ground plane. An antenna array is a set of N spatially separated antennas. In general the performance of antenna array increases with number of antennas in the array. Antenna arrays are becoming an increasingly important in wireless communications. The advantages of using antenna arrays:

1. They can provide the capability of a steerable beam (radiation direction change) as in smart antennas.
2. They can provide high gain (array gain) by using simple antenna elements.
3. They provide a diversity gain in multipath signal reception.
4. They enable array signal processing.
5. Maximize the signal to interference plus noise ratio(SINR)

Design Specifications:

The three essential parameters for the design of a square printed monopole antenna array are as follow:

Frequency of operation (fo): The resonant frequency of the antenna must be selected appropriately. The ISM Band frequency ranges from 2.4 - 2.4835 GHz. Hence the antenna designed must be able to operate in this frequency range. The resonant frequency selected for my design is 2.45 GHz.

Dielectric constant of the substrate (εr): The dielectric material selected for my design is glass epoxy FR4 substrate which has a dielectric constant of 4.3. A substrate with a high dielectric constant has been selected since it reduces the dimensions of the antenna.

Height of dielectric substrate (h): For the microstrip patch antenna to be used in ISM Band Application, it is essential that the antenna is not bulky. Hence, the height of the dielectric substrate is selected as 1.59 mm.

METHODOLOGY

1. **Estimate patch dimension:** Patch dimension of monopole antenna is calculated by using equation of lower edge frequency according to the resonant frequency and required bandwidth and gain.
2. **Design of Antenna:** According to the dimensions and parameters calculated in above step monopole antenna is designed by using IE3D software.
3. **Simulation:** Simulate the above designed antenna by using the IE3D simulator and obtain parameters such as current distribution, radiation pattern, gain v/s frequency plot, VSWR etc.
4. **Hardware Implementation:** If the desired parameters and results are satisfied then implement the structure on hardware, design monopole printed antenna using double sided copper clad.

5. **Observation of hardware result:** After implementing the structure on hardware analyze the result and observe whether the desired parameters are achieved as in software design.

DESIGN STEPS

Rectangular monopole antenna array having patch dimension of 40x120 mm, ground dimension 400x20 mm for 5 elements antenna array, $p=3$ mm and substrate of dimension 400x200 mm for 5 elements is to be design as shown in fig. 1. To design printed monopole antenna steps are mentioned below:

- Step 1: Define Basic Parameters.
- Step 2: Build the rectangular patch.
- Step 3: Build the feed line.
- Step 4: Define Port to the antenna for excitation.
- Step 5: Preview Meshing and Automatic Edge Cells.
- Step 6: EM Simulation.
- Step 7: EM Simulation with Current Distribution Data and Pattern Calculation.

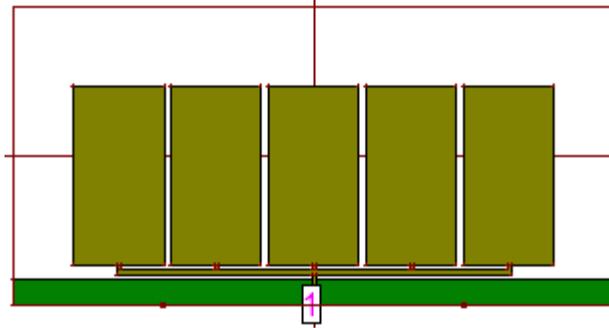


Fig. 1: Geometry of Rectangular Monopole Antenna Array of 5 Elements

Rectangular monopole antenna array having 9 elements each having patch dimension of 40x120 mm, ground dimension of 500x20 mm, $p=3$ mm and substrate of dimension 500x200 mm is to be design as shown in fig. 2.

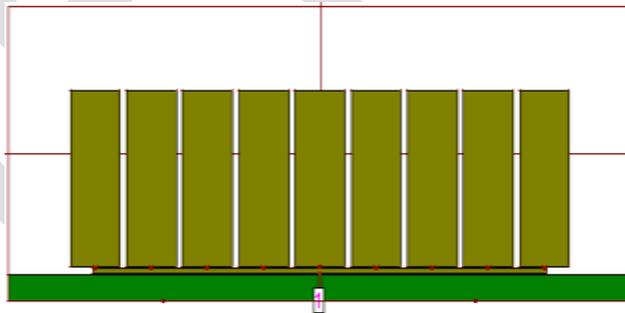


Fig. 2: Geometry of Rectangular Monopole Antenna Array of 9 Elements

Rectangular monopole antenna array having 16 elements each having patch dimension of 40x120 mm, ground dimension of 700x20 mm, $p=3$ mm and substrate of dimension 700x200 mm is to be design as shown in fig. 2.

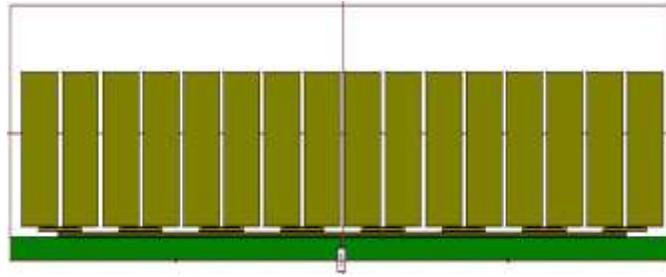


Fig. 3: Geometry of Rectangular Monopole Antenna Array of 16 Elements

RESULTS

1. In design of Fig. 1 rectangular monopole antenna array for 5 elements having patch dimension of 40x120 mm, ground dimension of 400x200 mm, $p=3$ mm and substrate of dimension 400x200 mm was designed. After designing and simulating the antenna frequency range of 780-990 MHz is achieved. The directivity of this antenna can be inspected by studying the radiation pattern in Fig. 5
2. In design of Fig. 2 rectangular monopole antenna array for 9 elements having patch dimension of 40x120 mm, ground dimension of 500x200 mm, $p=3$ mm and substrate of dimension 500x200 mm was designed. After designing and simulating the antenna frequency range of 1.5-1.7 GHz is achieved. The directivity of this antenna can be inspected by studying the radiation pattern in Fig. 6
3. In design of Fig. 3 rectangular monopole antenna array for 16 elements having patch dimension of 40x120 mm, ground dimension of 700x200 mm, $p=3$ mm and substrate of dimension 700x200 mm was designed. After designing and simulating the antenna frequency range of 2-2.7 GHz is achieved. The directivity of this antenna can be inspected by studying the radiation pattern in Fig. 6

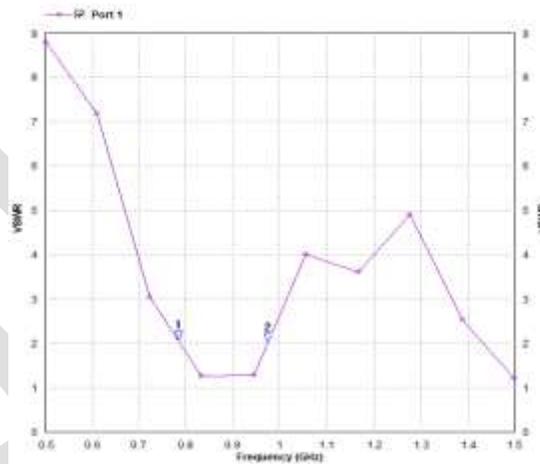


Fig. 4: Frequency v/s VSWR plot for five element antenna array

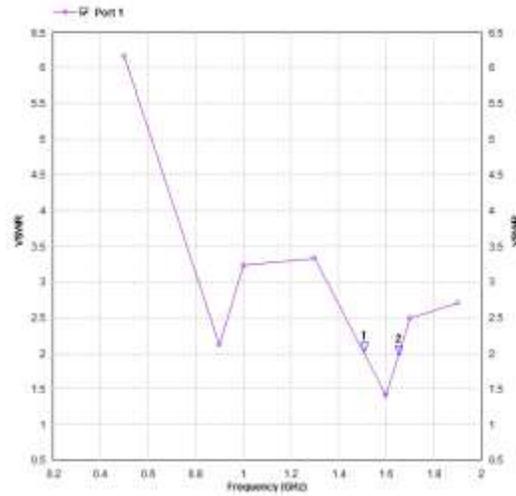


Fig. 5: Frequency v/s VSWR plot for nine element antenna array

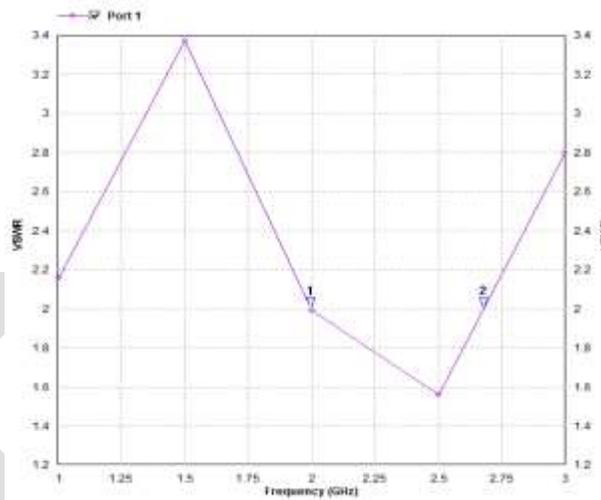


Fig. 6: Frequency v/s VSWR plot for sixteen element antenna array

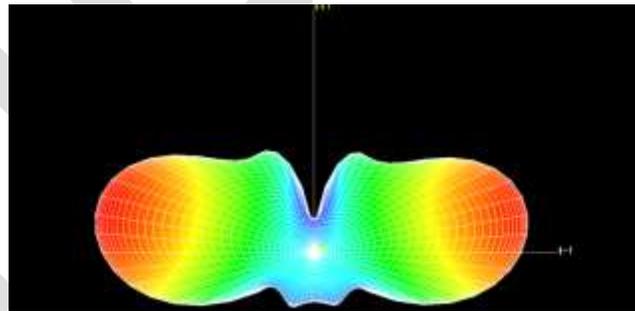


Fig. 6: 3D Radiation pattern cut into 2D polar pattern for five element patch

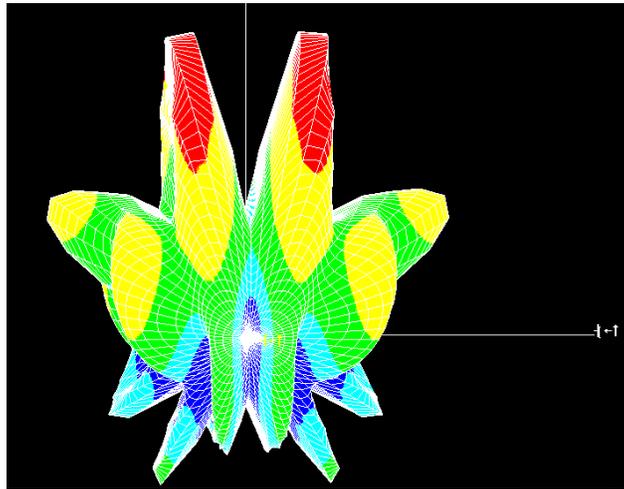


Fig. 7: 3D Radiation pattern cut into 2D polar pattern for nine element patch

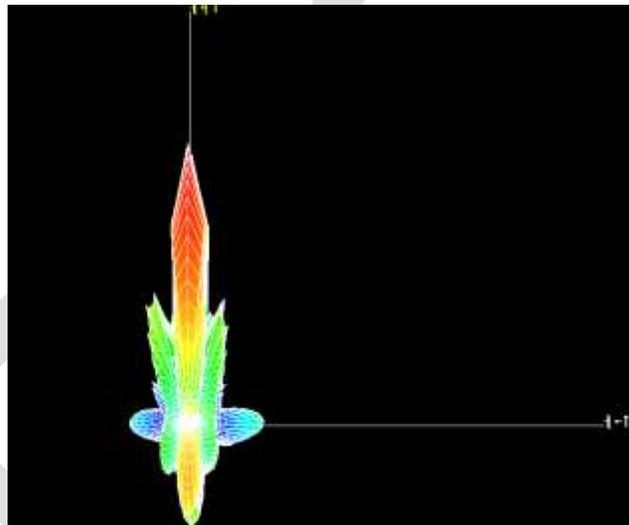


Fig. 7: 3D Radiation pattern cut into 2D polar pattern for sixteen element patch

After designing and simulating proposed printed monopole antenna patch for five, nine and sixteen elements, next part is to implement these printed monopole antennas on hardware, so that it can be analyzed whether these antennas can be used practically or not. Printed Monopole antennas can be designed by using double side copper clad PCB. For this purpose PCB fabrication method to be followed so that printed monopole antenna with finite ground plane is made

CONCLUSIONS

Depending upon the observations of these three antenna designs we make the conclusion of our work. The overall working of antennas was understood. The major parameter (such as VSWR Plot, Radiation Patterns, Directivity and Beamwidth) that affect design and applications were studied and their implications understood. The constructed Printed Monopole antennas operated at expected frequency and power levels. When we observed the comparison of radiation pattern for 5 elements patch antenna, 9 elements patch antenna and 16 elements. We could observe that the radiation pattern appears more directive in 16 elements antenna array. This shows that when the number elements in the array are increased from 5 to 16 the radiation pattern becomes highly directive. This shows that certainly increasing the number of elements in array increases the directivity of the antenna thereby increasing gain. In further observations we would understand this conclusion further by increasing elements in array.

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Microstepping Of Stepper Motor And Sources Of Errors In Microstepping System

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Abstract— This application note discusses microstepping and the increased system performance that it offers. Some of the most important factors that limit microstepping performance, as well as methods of overcoming these limitations, are discussed. It is assumed that the reader is somewhat familiar with stepper motor driving and the torque generation principles of a stepper motor. If not, chapter 1 and 2 of this book can be read to get the background information necessary.

Keywords— Microstepping, Stepper Motor, Half Stepping, Full Stepping, Wave Stepping, Sources Of Error In Microstepping System, Sources Of Failure In Microstepping System, Quantization Error, Detent Error, Motor Pole Placement Error, Lead Screw Pitch Error, Sticktion And Backlash Error.

INTRODUCTION

Microstepping is a way of moving the stator flux of a stepper more smoothly than in full-step or half-step drive modes. This results in less vibration, and makes noiseless stepping possible down to 0 Hz. It also makes smaller step angles and better positioning possible.

There are a lot of different microstepping modes, with step lengths from 1/3-full-step down to 1/32-fullstep or even less. Theoretically it is possible to use non-integer fractions of a full-step, but this is often impractical.

A stepper motor is a synchronous electrical motor. This means that the rotor's stable stop position is in synchronization with the stator flux. The rotor is made to rotate by rotating the stator flux, thus making the rotor move towards the new stable stop position. The torque (T) developed by the motor is a function of the holding torque (T_H) and the distance between the stator flux (f_s) and the rotor position (f_r).

$$T = T_H \times \sin(f_r - f_s)$$

where f_r and f_s are given in electrical degrees

The relationship between electrical and mechanical angles is given by the formula:

$$F_{el} = (n \div 4) \times f_{mech}$$

where n is the number of full-steps per revolution.

When a stepper is driven in full-step and half-step modes the stator flux is rotated 90 and 45 electrical degrees, respectively every step of the motor. From the formula above we see that a pulsing torque is developed by the motor (see figure 1a, which also shows the speed ripple caused by the torque ripple). The reason for this is that $f_s - f_r$ is not constant in time due to the discontinuous motion of f_s .

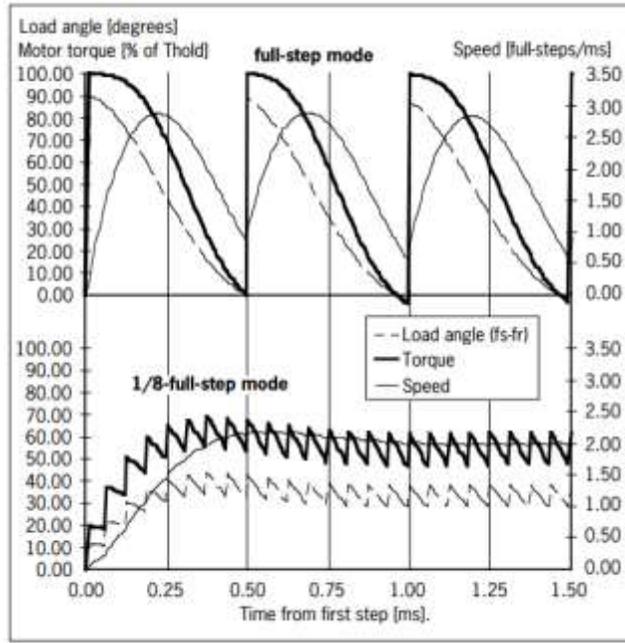


Figure 1. (A)—torque and speed ripple as function of load angle, full-step mode. (B)—torque and speed ripple as function of load angle, microstepping 1/8-full-step mode.

Generating a stator flux that rotates 90 or 45 degrees at a time is simple, just two current levels are required I_{on} and 0. This can be done easily with all type of drivers. For a given direction of the stator flux, the current levels corresponding to that direction are calculated from the formulas:

$$I_A = I_{peak} \times \sin(f_s)$$

$$I_B = I_{peak} \times \cos(f_s)$$

By combining the I_{on} and 0 values in the two windings we can achieve 8 different combinations of winding currents. This gives us the 8 normal 1- and 2-phase-on stop positions corresponding to the flux directions 0, 45, ..., 315 electrical degrees (see figure 2a). If we have a driver which can generate any current level from 0 to 141% of the nominal 2-phase-on current for the motor, it is possible to create a rotating flux which can stop at any desired electrical position (see figure 2b). It is therefore also possible to select any electrical stepping angle— 1/4-full-step (15 electrical degrees), 1/8- full-step or 1/32-full-step (2.8 electrical degrees) for instance. Not only can the direction of flux be varied, but also the amplitude.

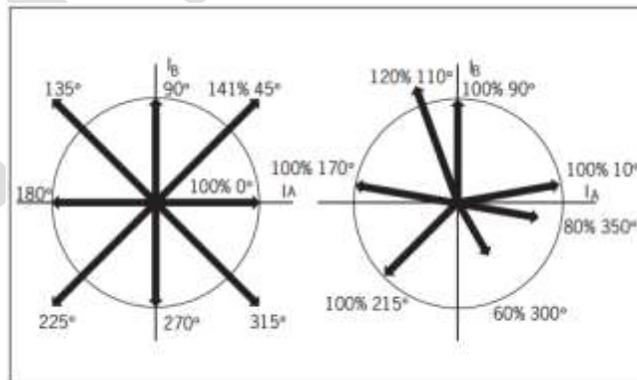


Figure 2. (A)—flux directions for normal half and full-step stop positions. Length is proportional to holding torque. (B)—microstepping flux directions. Direction and length are variable.

From the torque development formula, we can now see that the effect of microstepping is that the rotor will have a much smoother movement on low frequencies because the stator flux, which controls the stable rotor stop position, is moved in a more-continuous way, compared to full and half-step modes, (see figure 1b).

With frequencies above 2 to 3 times the system's natural frequency, microstepping has only a small effect on the rotor movement compared to full-stepping. The reason for this is the filtering effect of the rotor and load inertia. A stepper motor system acts as a low pass filter.

REMAINING CONTENTS

I. WHY MICROSTEPPING

In many applications microstepping can increase system performance, and lower system complexity and cost, compared to full- and half-step driving techniques. Microstepping can be used to solve noise and resonance problems, and to increase step accuracy and resolution.

- **Running at resonance frequencies**

The natural frequency, F_0 (Hz), of a stepper motor system is determined by the rotor and load inertia,

$J_T = J_R + J_L$ (Kgm^2), holding torque, T_H (Nm), (with the selected driving mode and current levels) and number of full-steps per revolution (n).

$$F_0 = (n \times T_H \div J_T)^{0.5} \div 4\pi$$

If the system damping is low there is an obvious risk of losing steps or generating noise when the motor is operated at or around the resonance frequency. Depending on motor type, total inertia, and damping; this problems can also appear at or close to integer multiples and fractions of F_0 , that is: ..., $F_0/4$, $F_0/3$, $F_0/2$, $2F_0$, $3F_0$, $4F_0$, Normally the frequencies closest to F_0 gives the most problems.

When a non-microstepping driver is used, the main cause of these resonances is that the stator flux is moved in a discontinuous way, 90 or 45 (fullstep and half-step mode) electrical degrees at a time. This causes a pulsing energy flow to the rotor. The pulsations excite the resonance. The energy transferred to the rotor, when a single step is taken, is in the worst case (no load friction) equal to:

$$(4T_H \div n) \times [1 - \cos(f_e)]$$

T_H and n are as above and f_e = electrical step angle, 90 degrees for fullstep, 45 degrees for half-step. This shows that using half-steps instead of full-steps reduce the excitation energy to approximately 29% of the full-step energy. If we move to microstepping 1/32-full-step mode only 0.1% of the full-step energy remains (see figure 3).

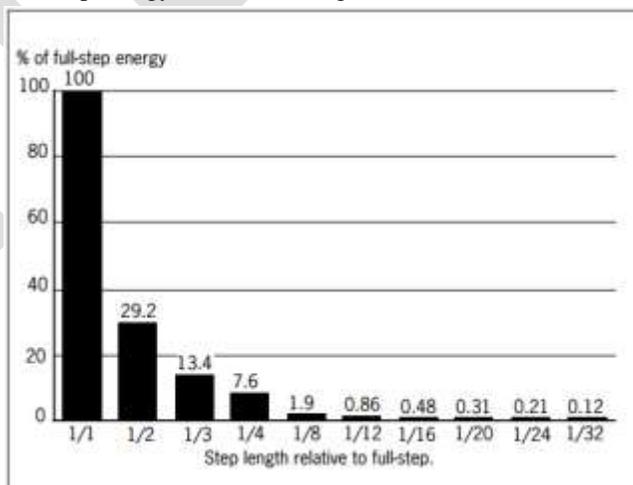


Figure 3. Relative excitation energy as function of electrical step length.

It appears that, by using microstepping techniques, this excitation energy can be lowered to such a low level that all resonances are fully eliminated.

Unfortunately this is only true for an ideal stepper motor. In reality there are also other sources that excite the system resonances. Never the less, using microstepping will improve the movement in almost all applications—and in many cases microstepping will alone give a sufficient reduction of the noise and vibrations to satisfy the application.

- **Extending the dynamic range towards lower frequencies**

When running a stepper motor at low frequencies. in half- or full-step mode. the movement becomes discontinuous, shows a great deal of ringing, and generates noise and vibrations. The stepping frequencies where this happens are below the system's natural frequency. Here microstepping offers a easy and safe way to extend noiseless stepping frequencies down towards 0Hz. Normally it is not necessary to use smaller steps than 1/32-full-step. With this small electrical step angle the energy transferred to the rotor/ electrical step is only 0.1% of the fullstep energy, as described above, and is so small that it is easily absorbed by the internal motor friction—so no ringing or overshoot is generated by the stepping (see figure 4). The deviation of the microstepping positions from a straight line is due to the use of uncompensated sine/cosine profiles.

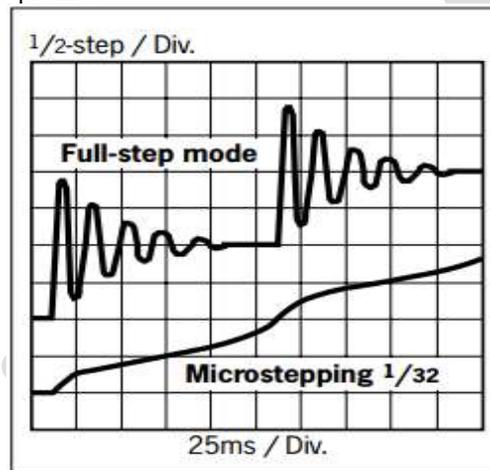


Figure 4. Rotor position as function of stepping mode.

- **Electronic “gearbox”**

In some applications, where small relative movements or higher step resolution are required, microstepping can replace a mechanical gearbox. In many applications, this is often a better and less-complex solution—even if a larger motor has to be used. To get the best results in this type of application careful motor selection and development of customized sine/cosine profiles are recommended.

- **Improved step accuracy**

Microstepping can also be used to increase stepper motor position accuracy beyond the manufacturer's specification. One way to do this is as follows. Design a microprocessor based microstepping system. Use the motor at 2- phase-on stop positions, $|I_a| = |I_b|$ (these are normally the most accurate rotor stop positions). Use a factory calibration process (manual or automatic) to store a correction value for each stop position on every motor used. The correction value is used to output “adjusted” full-step positions to the motor (see figure 5b). The adjusted positions have slightly changed current levels in the windings to compensate for the position deviations at the original stop positions (see figure 5a). This technique can be used when optimum step accuracy is the most important design criteria.

If this technique is used, the system has to use a rotor home position indicator to synchronize the rotor with the compensation profile.

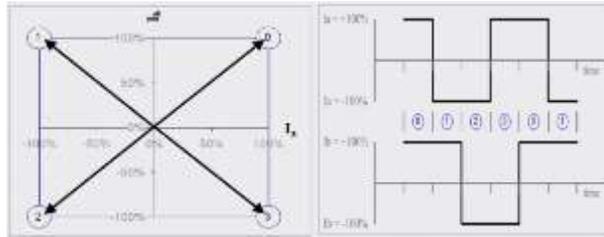
- **System complexity**

Even though the electronics for generating microstepping is more complex than electronics for full- and half-step ping, the total system complexity including motor, gearbox and transmission is less complex and costs less in many applications. Microstepping can replace or simplify gearboxes and mechanics for damping of noise and vibrations. Also motor selection becomes easier and more flexible. In a microprocessor, based microstepping application it is possible to use software and PWM-timers or D/A-converters

internal to the microprocessor to replace an external microstepping controller to achieve lowest possible microstepping hardware cost. It is then possible to achieve the same hardware cost as in full- and half-step systems for similar motor sizes.

II. FULL STEPPING

In full stepping operation, the current required in each winding is either $-I_{max}$ or $+I_{max}$. A step sequence of 4 full steps makes up one complete step cycle. Note that these full step positions are the same as the odd numbered positions from the half stepping sequence.

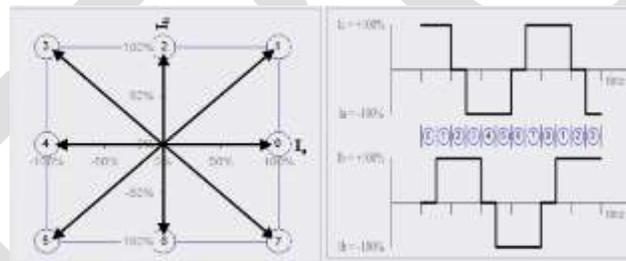


Phase Diagram

Timing Diagram

III. HALF STEPPING

In a half stepping operation, the current required in each winding is either $-I_{max}$, 0, or $+I_{max}$. A step sequence of 8 half steps makes up one complete step cycle.

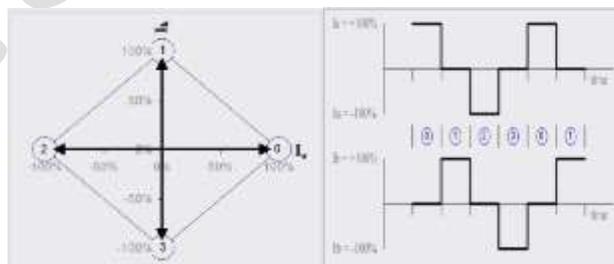


Phase Diagram

Timing Diagram

IV. WAVE STEPPING

Wave stepping is another method of full stepping, but with reduced power requirements (and corresponding torque output) since only one winding is powered at a time. The current required in each winding is either $-I_{max}$, 0 or $+I_{max}$. A step sequence of 4 full steps makes up one complete step cycle. Note that these full step positions are the same as the even numbered positions from the half stepping sequence.



Phase Diagram

Timing Diagram

V. TYPES OF MICROSTEPPING

- **Square Path**

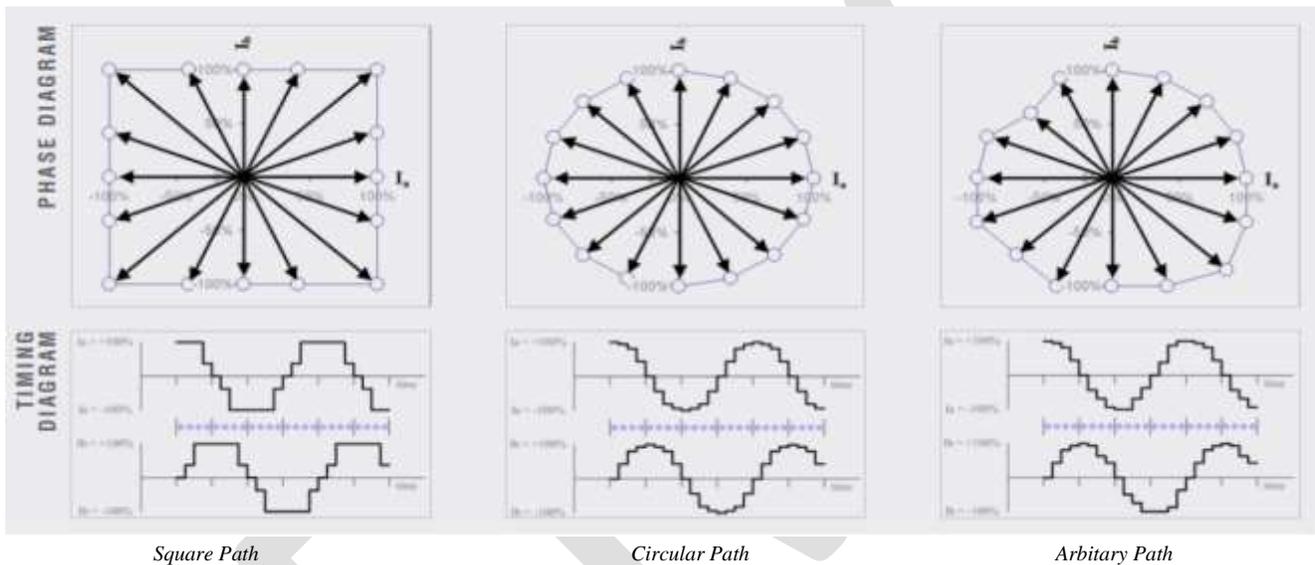
This method of microstepping provides the highest peak torque if you are limited by available supply voltage.

- **Circular Path**

This method is also referred to as sine cosine microstepping and is usually what people are referring to when they talk about microstepping, though in fact it is only one method.

- **Arbitrary Path**

There would be little reason to use a method such as this. It is presented only to illustrate the possibilities. Although it looks very strange compared to the other two methods, in theory it will produce the same angular rotation of an ideal motor. Only the available thrust would differ.



VI. SOURCES OF ERROR IN MICROSTEPPING SYSTEM

Stepper motor control systems are usually open loop. That is, the controller does not have position feedback and position being different from the calculated position.

Therefore is not aware of the “actual” position of the motor. Therefore, it is important to be aware of possible sources of error that will result in the actual

- **QUANTIZATION ERROR**

In any digital controller, it is impossible to achieve infinitely variable I_a and/or I_b . Only discrete or “quantized” values are possible. The number of discrete values depends on the resolution achievable by the controller. For example, if the maximum current output of the controller is 1 A, and the controller has a resolution of 0.1 A, then there are 10 possible current values for I_a and/or I_b , not including 0. The number of discrete values possible determines how close mathematically the phasor can be set to a particular length and microstep angle. The error between the desired phasor angle and the actual phasor angle achieved is the quantization error. A maximum quantization error equivalent to 0.5 microsteps is a typical design requirement in any microstepping control algorithm. Note that by adjusting the phasor end point to a nearby I_a , I_b point rather than sticking to a strictly circular or square profile can often reduce the quantization error, but may add some torque ripple. Thus, the current resolution you require for I_a and I_b will be determined by the number of microsteps per step you want to achieve, the quantization error you can tolerate, and the torque ripple you can tolerate.

- **DETENT ERROR**

Detent torque is the maximum torque that can be applied to an unenergized stepper motor without causing continuous rotation. If you plotted torque versus shaft angle as you slowly rotate the stepper motor with no current in either winding, then you would find that the torque is approximately sinusoidal with shaft angle. The detent torque is just the amplitude of the sine curve. In an ideal

motor, the torque curve would be perfectly sinusoidal. What is commonly referred to as “detent error” isn’t due to the existence of the detent torque per se but due to the non-sinusoidal component of the detent torque. The shape of the torque curve is affected by motor pole geometry. In that sense, detent error is really pole geometry error. Because different motor manufacturers use different pole geometries, this error can vary from one manufacturer to another as well as from one motor to another.

- **MOTOR POLE PLACEMENT ERROR**

Motor pole placement error results in a varying step size. There is typically an error that repeats every 4 steps (one complete step cycle), as well as an error that repeats every full revolution. This has an obvious effect on microstepping. The microstep size within large steps will be proportionally larger than the microstep size in small steps. Pole placement error in a typical motor is less than 0.5 steps of cumulative error over half a revolution of the motor. Given that a typical motor has 200 steps per revolution, that translates to an error in step size of roughly +/- 0.5%. It is possible to eliminate pole placement error in any application simply by moving in increments of one full revolution of the motor. If that is not possible, then some error can be eliminated by moving in increments of 4 steps. However, moving in increments of 4 steps or full revolutions is clearly not microstepping. Therefore, all microstepping applications invariably suffer from some pole placement error.

- **LEAD SCREW PITCH ERROR**

Many motorized systems convert rotary motion to linear motion via lead screw. Stepper motor applications are no exception. In these types of systems, any error in the lead screw pitch will contribute to the total system error.

- **STICKTION AND BACKLASH ERROR**

In microstepping systems, mechanical sticktion and backlash are frequently much larger than the microstep resolution. There are many systems on the market capable of microstepping at 256 microsteps per step, but there is little point to this if mechanical sticktion in the system will be on the order of 5 to 10 microsteps at that microstep resolution.

VII. SOURCES OF FAILURE IN MICROSTEPPING SYSTEM

This discussion has centred on the challenges of designing a microstepping system, but there are also challenges when implementing a system. If the load on a stepper motor exceeds its maximum torque, then the motor poles will not follow the changing magnetic field and the motor stalls. To avoid this type of failure, microstepping systems must either keep the load below the maximum torque, or include position sensors to detect and compensate for stalls.

CONCLUSION

There are still compelling reasons other than high resolution for microstepping.

They include:

1. Reduced Mechanical Noise.
2. Gentler Actuation Mechanically.
3. Reduces Resonances Problems.

In summary, although Microstepping gives the designer more resolution, improved accuracy is not realized. Reduction in mechanical and electromagnetically induced noise is, however, a real benefit. The mechanical transmission of torque will also be much gentler as will a reduction in resonance problems. This gives better confidence in maintaining synchronization of the open loop system and less wear and tear on the mechanical transmission system.

In fact, taking an infinite number of microsteps per full step results in two-phase synchronous permanent magnet ac motor operation, with speed a function of the frequency of the ac power supply. The rotor will lag behind the rotating magnetic field until sufficient torque is generated to accommodate the load.

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Brain Tumor Detection using Image Fusion and Neural Network

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Abstract— The main objective of the method is to automatically segment and detect brain tumor using Image Fusion and Artificial Neural Network. An automatic segmentation of brain images is needed to correctly segment tumor from other brain tissues. Accurate detection of size and location of brain tumor plays a vital role in the diagnosis of tumor. This method propose an efficient wavelet based fusion algorithm for tumor detection which utilizes the complementary and redundant information from the Computed Tomography (CT) image and Magnetic Resonance Imaging (MRI) images. The reason for going onto image fusion is that, in the medical image processing, different sources of images produce complementary information and so one has to fuse all the sources of images to get more details required for the diagnosis of the patients. Hence this algorithm effectively uses the information provided by the CT image and MRI images there by providing a resultant fused image which increases the efficiency of tumor detection. Segmentation of the fused image is performed using thresholding. Feed Forward Neural Network is used to automatically detect brain tumor from segmented brain image.

Keywords: Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Discrete Wavelet Transform (DWT), Feed Forward Neural Network (FFNN), Skull Stripping, Thresholding, Segmentation

INTRODUCTION

A brain tumor is a mass of abnormally growing cells in the brain or skull. It can be benign (noncancerous) or malignant (cancerous). Unlike other cancers, a cancer arising from brain tissue (a primary brain cancer) rarely spreads. All brain tumors whether benign or malignant are serious[1]. A growing tumor eventually will compress and damage other structures in the brain. There are two types of brain tumors: primary and secondary. Primary tumors begin in brain tissue, while secondary tumors spread to the brain from another part of the body. Accurate detection of size and location of brain tumor plays a vital role in the diagnosis of tumor. In the last two decades medical science has seen a revolutionary development in the field of biomedical diagnostic imaging. The current technologies in the field of artificial intelligence and computer vision technologies have been very effectively put into practice in applications such as diagnosis of diseases like cancer through medical imaging. The main emphasis of the latest developments in medical imaging is to develop more reliable and capable algorithms which can be used in real time diagnosis of tumors.[2]

The detection of brain tissue and tumor in MR images and CT scan images has been an active research area. Segmenting and detection of specific regions of brain containing the tumor cells is considered to be the fundamental problem in image analysis related to tumor detection[3]. This method seeks to bring out the advantages of segmentation of CT scan images and MR images through image fusion. Image fusion is one of the most commonly used methods in medical diagnosis. It merges the multimodal images to provide additional information. Medical imaging image fusion, usually involves combining information of multi modalities such as magnetic resonance image (MRI), computed tomography (CT), positron emission tomography (PET), and single photon emission computed tomography (SPECT).[4] Image fusion is more general solution to a number of applications in image processing where high spatial and spectral information are required in a single image. Image fusion is used to overcome the observational constraints, which account for the disability to build such instruments to provide such information.[5]

Wavelet transforms is a new area of technology, replacing the Fourier transform in different fields of application like image processing, heart-rate and ECG analysis, DNA analysis[6], protein analysis, climatology, speech recognition, computer graphics and Multi fractal analysis. The proposed method utilizes wavelet analysis based image fusion to enhance the efficiency of brain tumor detection. Wavelet transform allows the components of a non-stationary signal to be analyzed whereas Fourier Transform fails to analyze a non-stationary signal. Wavelets allow complex information such as speech signals, images and patterns to be decomposed into elementary forms at different positions and scales and subsequently reconstructed with high precision. In this method, the MRI and CT image are processed using wavelet analyses.

Image segmentation is the process of partitioning different regions of the image based on different criteria. Surgical planning, post-surgical assessment, abnormality detection, and much other medical application require medical image segmentation.

Medical images contain complicated anatomical structures that require precise and most accurate segmentation for clinical diagnosis. The proposed method perform automatic segmentation of brain image by using standard deviation of the image[7]. Artificial Neural Network is used to automatically detect the tumor from the segmented brain image.[8]

LITERATURE REVIEW

Image fusion

The main objective of the algorithm is to highlight the importance of wavelet based image fusion in the proposed method. Image Fusion has specific role in medical diagnosis. This theme deals with combining different sources of information for intelligent systems. The information are images from various modalities and signals delivered by different sensors. Image fusion produce a single image from a set of input images. The fused image should have much more complete information which is more useful for human or machine perception[5]. Different types of multisensor fusion include Signal-level, Image-level, Feature-level and Symbol-level.

Advantages of Image Fusion

- Improve reliability
(by redundant information)
- Improve capability
(by complementary information)

Objectives of Image Fusion Schemes

- Extract all the relevant information from the source images.
- Do not introduce any artifacts or inconsistencies which will distract human observers or the following processing.
- Reliable and robust to imperfections such as mis-registration.

Image fusion methods can be broadly classified as Spatial domain and Transform domain. The primitive fusion schemes perform the fusion right on the source images, which often have serious disadvantage such as spatial distortion in the fused images. Spatial distortion can be very well handled by frequency domain approaches on image fusion. Most commonly used image fusion methods are:

- High pass filtering technique
- IHS transform based image fusion
- PCA based image fusion
- Pair-wise spatial frequency matching

With the introduction of pyramid transform in mid-80's, some sophisticated approaches began to emerge. Major advantages of pyramid transform are

1. extract image features such as edges at multiple scales
2. redundancy reduction and image modeling for
 - efficient coding
 - image enhancement/restoration
 - image analysis/synthesis
3. It can provide both spatial and frequency domain localization

Several types of pyramid decomposition are used or developed for image fusion and are,

- Laplacian Pyramid
- Ratio-of-low-pass Pyramid
- Gradient Pyramid

With the development of wavelet theory, wavelet multiscale decomposition became popular instead of pyramid decomposition for image fusion because it retains most of the advantages for image fusion but has much more complete theoretical support. Wavelet transform can be taken as one special type of pyramid decompositions.

PROPOSED METHOD

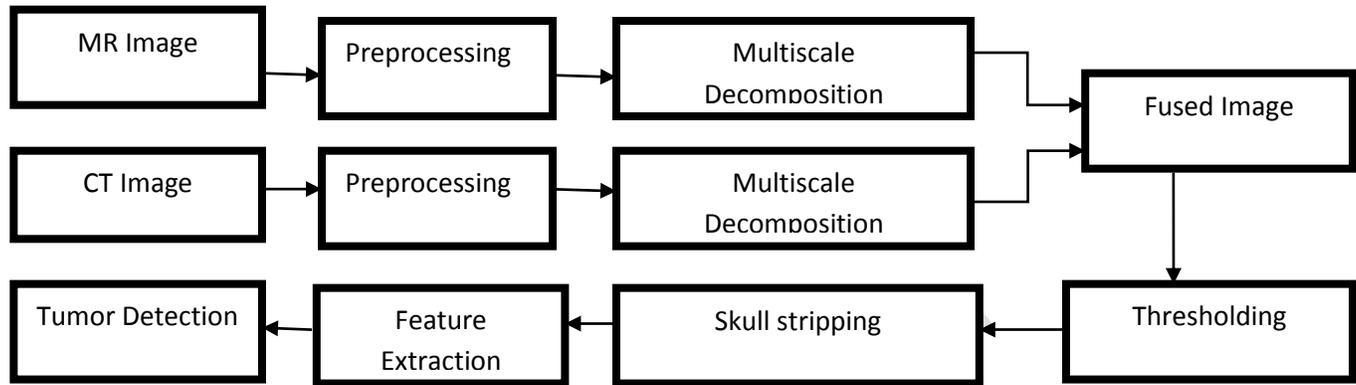


Figure 1. Block diagram of the proposed method

Image acquisition is the first stage of the proposed method. The term image acquisition refers to the process of capturing real world images and storing them into a computer. There are several types of imaging systems available for Brain analysis like Computed Tomography (CT) and Magnetic resonance imaging (MRI). Both types of images play specific important roles in medical image processing. CT images are used more often to ascertain differences in tissue density depending upon their ability to block X-rays while MRI provides good contrast between the different soft tissues of the body, which make it especially useful in detecting brain tissues and cancers

Preprocessing stage include Image Resampling and Enhancement. Resampling is the method of changing number of pixel in the image. By resampling a new version of the original image with a different width and height in pixels are created. Increasing the size is called upsampling, decreasing the size is called downsampling. Spatial resolution should not change after the resampling procedure. The noise in the input image can reduce the performance of the algorithm. Image processing techniques are applied on the source images to increase the contrast, brightness, reduce the artifacts due to noise and other factors. The input image is given to enhancement stage for the removing high intensity component, which helps to enhance the smoothness towards piecewise-homogeneous region and reduces the edge blurring effects. Contrast enhancement and noise removal are the two methods applied for enhancement

Contrast Enhancement is used to make the image brighter, visual and detail worth full. One of the most popular global contrast enhancement techniques is histogram equalization (HE). Histogram equalization is a technique that allows us to improve the contrast of images with such narrow histograms and it has been found to be a powerful technique in image enhancement. This technique does not change the values contained in the matrix that represents the image instead, it modifies the color mapping associated with the values of the matrix so that this tends to use to evenly every color in the full dynamic range. [9] Noise Removal is an operation to remove unwanted details from an image. This detail gets attached to an image while capturing or acquisition process. Noise may be due to environment particles, capturing device inability, lack of experience of machine/computer operator or some other reason. Noise removal helps an image processing system to extract necessary information only.

In next stage decomposition of the image using discrete wavelet transform is performed. Wavelet transform is applied on the preprocessed images by passing the processed images through the respective wavelet filters. To obtain optimum results wavelet transform is applied on the source images with different wavelets such as Daubechies, Symlets, Haar, Coiflets and at different level of decomposition.

Decomposed images are the inputs to the next stage. Fusion of two images are performed by taking the coefficients of decomposed image. Different coefficient fusion methods yield different performances. After decomposition using DWT, the low frequency coefficients reflect the gross approximations of the source images. For better performance maximum value of the low frequency coefficients from the two decomposed image are chosen to form low frequency coefficients of the fused image.

High frequency coefficients correspond to sharper brightness in the image. The commonly used selection principle is the local energy scheme to pick out the salient features of an image, e.g. edges and boundaries. This fusion scheme is the weighted average scheme suggested by Burt and Kolesynski (1993). The salient features are first identified in each decomposed image. Local energy in the neighborhood of a coefficient is computed as salience of a feature. [10]

$$E(A, p) = \sum_{q=p} w(q) C_j^2(A, q) \tag{1}$$

Where, $w(q)$ is a weight and $\sum_{q \in Q} w(q) = 1$. The neighborhood Q is small window typically 5×5 or 3×3 centered at the current coefficient position. $E(B, p)$ can also be obtained by this rule. The selection mode is implemented as:

$$C_j(\mathbf{F}, \mathbf{p}) = \begin{cases} C_j(\mathbf{A}, \mathbf{p}), & E(\mathbf{A}, \mathbf{p}) \geq E(\mathbf{B}, \mathbf{p}) \\ C_j(\mathbf{B}, \mathbf{p}), & E(\mathbf{B}, \mathbf{p}) \geq E(\mathbf{A}, \mathbf{p}) \end{cases} \quad (2)$$

This selection scheme helps to ensure that most of the dominant features are incorporated into the fused Image.

Once the coefficients are merged using appropriate fusion rule Inverse Discrete Wavelet Transform is applied on the fused coefficients to obtain resultant fused image. Inverse Discrete Wavelet Transform is performed by passing the processed images through the respective reconstruction filters

Final fused image is given to the segmentation stage. Basic purpose of segmentation is the extraction of affected regions from the image, from which information can easily be perceived[11]. Thresholding often provides an easy and convenient way to perform the segmentation on the basis of the different intensities or colors in the foreground and background regions of an image. In the proposed method thresholding is performed by calculating standard deviation of the image using the equation(4)

$$I_{mean} = \frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x, y) \quad (3)$$

$$Sd = \sqrt{\frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} (f(x, y) - I_{mean})^2} \quad (4)$$

Using this standard deviation an intensity map is created. The standard deviation of the image obtained from the intensity map is recomputed. Average intensity of the pixels those are above the new standard deviation is computed. Average intensity is set as the threshold to find tumor region.

Intensity map is defined as,

$$L(x, y) = \begin{cases} 255 & \text{if } f(x, y) \geq Sd \\ 0 & \text{if } f(x, y) < Sd \end{cases} \quad (5)$$

The segmented image is used for tumor detection by using Artificial Neural Network. Neural network has been widely used for classification of different tissue regions in medical images. In this work, we use multi-layer Feed Forward neural network as the classifier to automatically extract the tumor regions from non-tumor regions. To improve efficiency of algorithm skull stripping is performed on segmented image. Skull stripping methods are designed to eliminate the non-brain tissue in segmented image and is performed by the help of Mathematical Morphology.

RESULTS

For the the proposed method two image ,one is MR image and another is CT scan image is used as the input image. For the method we are considering only registered images. The two input images are given to the preprocessing stage and thereafter to the decomposition stage. Thus obtaining fused resultant image. The fusion algorithm is repeated for different wavelets and for different level of decomposition. After obtaining the resultant fused image the performance evaluation of the images was carried out using peak signal to noise ratio and mean square error

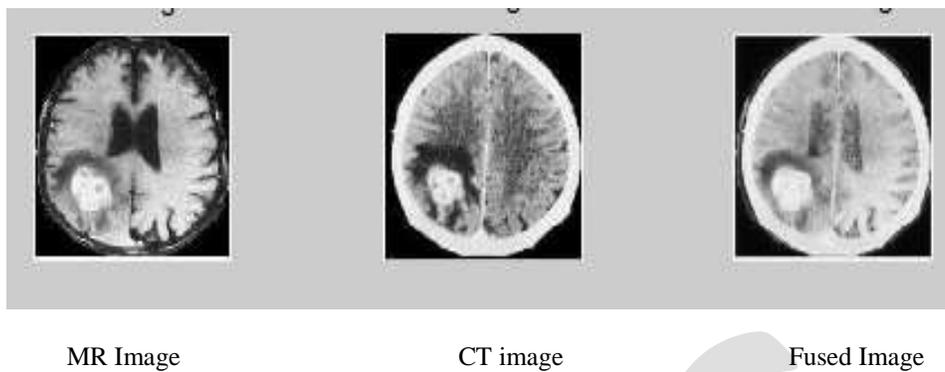


Figure 2: Input Images and Fusion Result

Final Fused image is used to extract tumor region after segmentation using artificial neural network. Skull stripping is performed on the segmented image.



Figure 4: Skull Stripped Image

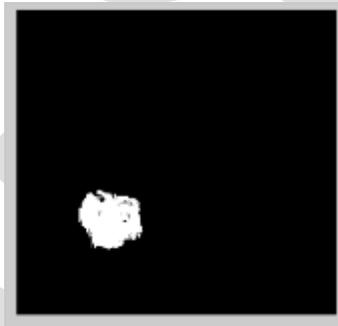


Figure 5: Tumor

Boundary and area of the tumor region is calculated and plotted in the fused image.



Figure 6: Area detected in fused image

The algorithm is evaluated on the basis of PSNR and MSE by using different wavelets. Symlet and Biorthogonal wavelet perform better on the basis of PSNR compared to other wavelet.

WAVELETS	Haar	Db2	Bior . 2. 2	Dmey	Rbio 2. 2	Coif2	Sym4
MSE	0.0763	0.0660	0.0475	0.0568	0.0935	0.0527	0.0471
PSNR	11.1719	11.8070	13.2296	12.4594	10.2935	12.7793	13.2707

Table 1. Performance Analysis Different Wavelets

CONCLUSION

A new method for brain tumor detection using the complementary and redundant information from the Computed Tomography (CT) image and Magnetic Resonance Imaging (MRI) images are proposed. Proposed method uses Wavelet based image fusion to produce a high quality fused image with spatial and spectral information. The method also detects brain tumor automatically using ANN and also determines the position of the tumor and the area of the tumor. The results from the image fusion using different wavelets are compared on the basis of the PSNR and MSE in detection of the tumor as compared to the original MR image and CT scan image.

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An Ensample for Proficient Insight of Data Visualization

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Abstract— Recent advancements in the technology have reconnoitered, thus leading to enormous generation and utilization of data. Data acts as a fundamental part for all the domains including the data warehouse domain. Data can be explored in various ways; one such way to explore and conceptualize the data is termed as “Data Visualization”. This insight of data proffers an ease for the users to understand the scenario more precisely. But this visualization faces a lot of challenges as a correct visualization picture is of utmost importance. Along with visualizing data, the processing part should also be equally efficient. To deal with multidimensional data OLAP (Online Analytical Processing) appears to be a more feasible option but OLAP does not provide an efficient processing when pattern or sequential data is considered. Another issue that upraises over here is that there is no accurate processing of traditional and pattern data in the same OLAP. To deal with issues specified, a system is designed that deals with both traditional as well as sequential data and provides suitable visualization. The system incorporates a sequential OLAP and complexity design modeling technique to achieve the objective.

Keywords— Data warehouse, report, OLAP, datasets, multidimensional, Sequential, Visualization, complexity design modeling.

INTRODUCTION

As the technology is heading towards a wider array of knowledge, so there arises a need to improve the efficiency of the work performed. A data centric domain is always the substratum of all the technology. Data plays a pivotal role in the rapid emerging techsavvy globe and is used, provided and generated. In an effort to acquiesce decision makers the ease to analyze complex data for quick, efficient, interactive and meaningful exploration, a technology called Online Analytical Processing (OLAP) [3] has emerged. Due to its distinctive features OLAP has owned a remarkable demand in the business world as well as in the fields of academics and research, as it is competent enough to deal with huge datasets [1][5]. OLAP technology works on multi-dimensional databases or more pronouncedly referred to as MDB [2]. The use of these MDB's helps the firm to have a global view of the data as well assists the decision-makers or knowledge engineers to acquire an apprehensive perception of the scenario thus leading to collaborative access and surge in the enactment speed. The data in any industry is broadly classified into two categories, one is the transactional (operational) data and another is the historical data.

Data warehouse and the OLAP technology emphasizes on the historical data and the OLTP (Online Transaction Processing) deals with the transactional or operational part of the data [5]. The data warehouse assimilates data from diverse sources storing its history so as to increase the proficiency of the decision support system [4]. Due to the voluminous data escalation rapid advancement of OLAP is required. Till now OLAP's performance and visualization have not been amalgamated in a way so that it can deal with the subject. The concern with the proficient visualization of MDB's generated by various domains including academics, scientific research, healthcare industries, stock market-commerce and statistics still subsists [2][7]. There is as such no measure taken to efficiently envision them. On the contrary there are certain commercially acknowledged tools for visualization, but the assimilation of OLAP with visualization goes missing. Another issue of concern is that the OLAP does not provide the most efficient solution for pattern or sequential datasets [6] such the RFID logs, biometric logs or server access logs. There is a need of emergence of a technique that deals with both traditional as well as sequential data and also visualizes the data effectively.

RELATED WORK

The domains that majorly deal with data have undergone remarkable shift since the era of its emergence. This is because of the constant updating in the technologies used. To deal with the rising need many researches have been commenced. Apart from researches many commercial tools have emerged. To enlist a few famous ones, such as Tableau [11] that is very much recognized globally, Spagobi [12], Actuate [13] etc. Majority of these commercial softwares work on the relational databases rather than on multidimensional database. The prime focus of these tools is only on the visualization part and the analysis and the processing part has a wide spectrum of improvement. Also there is a huge amount of literature that covers the functionality of OLAP in the data warehouse and various types of OLAP's proposed that may deal with varied customized situations. But none of the OLAP's focused on the issues of dealing with the massive datasets generated including the traditional and sequential ones. One such OLAP approach is the Visual OLAP [14] approach that outwits the drawback imposed by the conventional interfaces. The approach focuses on the exposure of the collaboration between the consummation-oriented techniques used foe BI (Business Intelligence) and the

accomplishments in the extents of Information Visualization. The authors in [15] [16] [17] and [18] also discussed regarding the various alternatives available that can provide an optimal solution. The issue of efficient visualization of both traditional and sequential data using a single system still exists.

SYSTEM MODEL

To deal with the problem of effective analysis and visualization an approach is designed. This system design or the model uses the combination of two influential techniques:

1. Sequential Analytical Processing [8][9]
2. Complexity Design Modeling [10]

The system model is described below in figure 1. The system is aimed towards providing an efficient visualization through an OLAP that is sequential in nature and manages to process the data that is sequential as well as the data that is non-sequential (traditional) in nature. The user here can be a manager or admin respective to the domain whose data is provided as the input to the system. The system is tested on various datasets such as academic dataset, toll-tax data, and biometric logs etc.

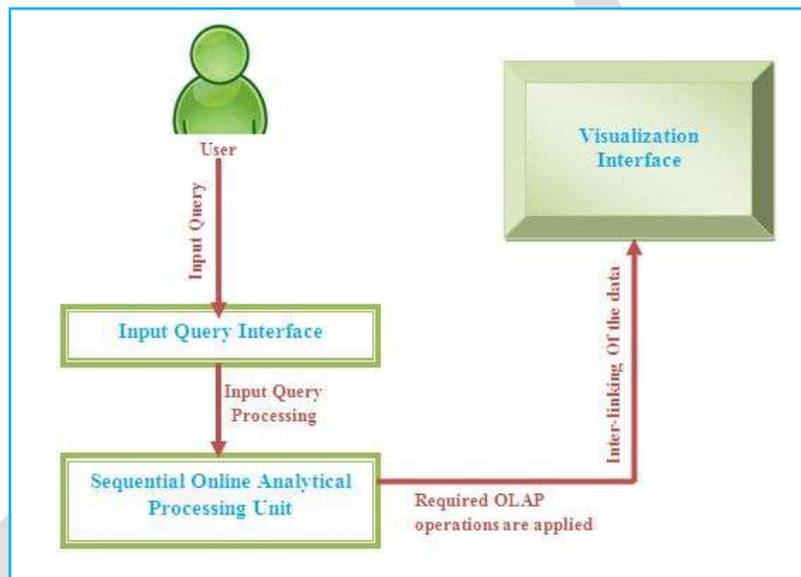


Figure 1: The workflow of the system model

As per the model the user interacts with the system by providing an input query to the system as shown in the figure 1. The input query is then processed using the sequential online analytical processing unit. This unit performs internal OLAP operations as per the query. After efficient query processing, the data is interlinked and then the final output is visualized in the visualization interface. The plan of work is shown in the below figure 2.

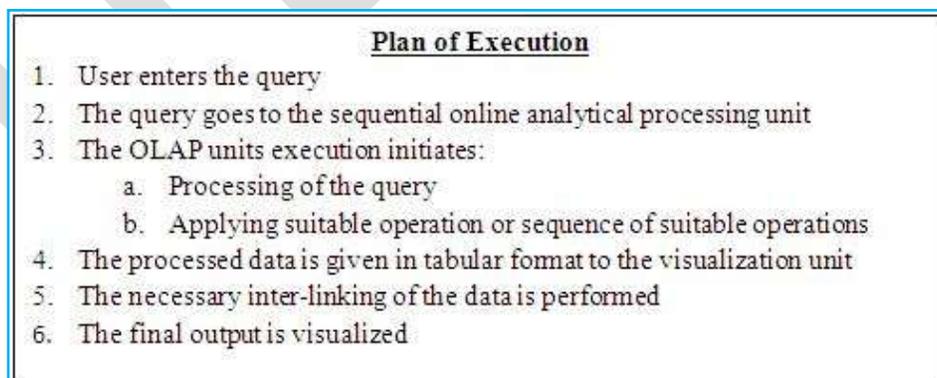


Figure 2: Plan of Execution

The Sequential Online Analytical processing unit is an addition to the OLAP so as to make it capable of effectively dealing with sequential as well as traditional data. More precisely Sequential OLAP [9] is a neoteric on-line analytical processing system created

for warehousing and analysing the sequential or pattern data. There are various conducive attributes in the sequential OLAP. The traditional OLAP systems groups the data in rows based on their attribute values but the sequential OLAP systems treats patterns as dimensions and it groups sequences based on the patterns they possess. The sequential OLAP consists of seven fundamental operations that are enlisted in below figure 3.

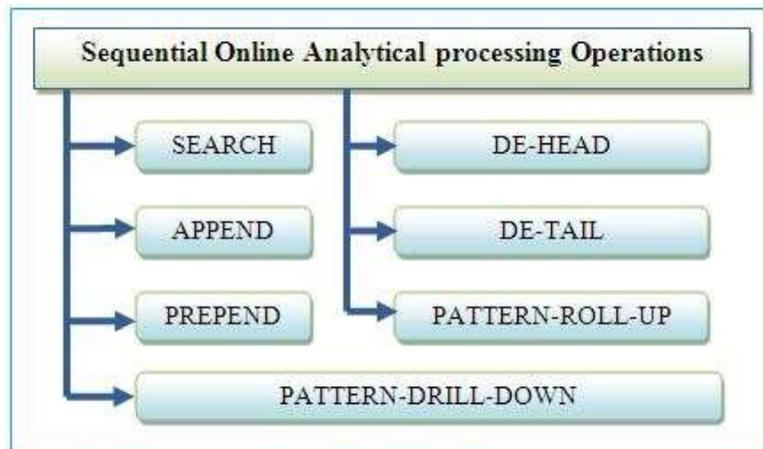


Figure 3: Sequential OLAP operations

The first operation i.e. SEARCH operation performs the basic task of finding or discovery of certain entry in the dataset and if a match exist it returns it as an output. For an instance when the academic dataset was considered that had the entries of students admitted in an institute in the year 2004 that contained details such as enrollment number, department, contact details, address and percentage of each semester etc. The snippet of the dataset is shown in below figure 4.

Admission	Name	Gender	Departme	enroll no	roll no	contact no	Address I	Address L	1st Year	3rd Sem	4th Sem	5th Sem	6th Sem	7th Sem	8th Sem	Graduatio	Graduate	drop outs
2004	SNEHAL K F	CSE	NU/A9/15	1	7.36E+09	Chhaoni	Nagpur	58	62	63.2	66	65	54	58	2008	Yes	No	
2004	NISHIGAN F	CSE	NU/A9/15	2	7.36E+09	Hingna	Nagpur	70	70	70	70	70	70	70	2008	Yes	No	
2004	TANUSHRI M	CSE	NU/A9/15	3	7.36E+09	Dharamot	Nagpur	70	70	70	70						Yes	
2004	TEJAL NAF M	CSE	NU/A9/15	4	7.36E+09	Gandhi Ch	Nagpur	58	62	63.2	66						Yes	
2004	PRIYA VIN F	CSE	NU/A9/16	5	7.36E+09	Itwara	Nagpur	70	70	70	70	70	70	70	2008	Yes	No	
2004	AADITYA VM	CSE	NU/A9/16	6	7.36E+09	Birdey	Nagpur	70	70	70	70	70	70	70	2008	Yes	No	
2004	ABHISHEK F	CSE	NU/A9/16	7	7.36E+09	Mahesh N	Nagpur	70	70	70							Yes	
2004	AKSHAY V F	CSE	NU/A9/16	8	7.37E+09	Jafar Nagr	Nagpur	58	62	63.2	66	65	54	58	2008	Yes	No	
2004	ASHOK RAM	CSE	NU/A9/16	9	7.37E+09	kadbi Cno	Nagpur	70	70	70	70	70	70	70	2008	Yes	No	
2004	BRAMHAN M	CSE	NU/A9/16	10	7.37E+09	New Colo	Nagpur	58	62	63.2	66	65	54	58	2008	Yes	No	
2004	PAWAN JM	CSE	NU/A9/16	11	7.37E+09	Ahbab Col	Nagpur	70	70	70	70	70	70	70	2008	Yes	No	
2004	DEVAL SAI M	CSE	NU/A9/16	12	7.37E+09	Friends Cc	Nagpur	58	62	63.2	66	65	54	58	2008	Yes	No	

Figure 4: View of academic dataset

The second operation is APPEND operation that performs the task of affixing the data to the end of the pattern or the template. The next operation i.e. PREPEND does the opposite of the second operation it prefixes at the beginning of pattern or template. DE-HEAD and DE-TAIL removes the first entry and the last at the template respectively. The last two operations works same as Roll-Up and Drill-Down in regular OLAP with an extension that they are adept to process the pattern data. The PATTERN-ROLL-UP operation rolls up the dimension to the upper hierarchy. On the contrary the PATTERN-DRILL-DOWN operation drills the data to the most detailed level in the hierarchy so that all the possible details can be understood. These operations in the processing unit are the most important measure because their efficient processing only guarantees that the output obtained after visualizing will be accurate.

EXPERIMENTAL RESULTS

The system is tested on academic dataset to explain the working of the model. The internal computation deals with the auto execution of the Sequential OLAP operations as in step 3a and 3b in the above fig 2. The query processing unit in the system model effectuates at the backend. Whenever a user inputs a query according to the requirement OLAP is executed at back end. To understand the functionality the internal computation is shown in figure 5. According to the demand an operation is performed or a combination of operations is executed.

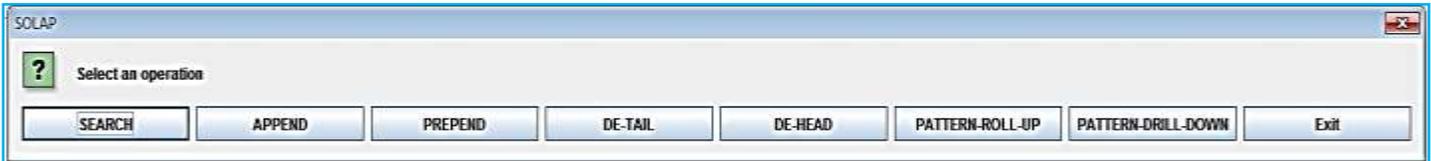


Figure 5: Sequential OLAP operations processing

To test that whether the system works efficiently it has been tested for visualization as well. A test code is generated that works on the mappings of the technique described in [10]. The below figure 6 shows a static interface generated only for the academic dataset. The user first reads the dataset given as input to the system. The snippet of the dataset fetched is shown in the figure 7. As per the requirement the below steps are performed like visualize dropouts, visualize percentage, visualize locations, visualize graduates.

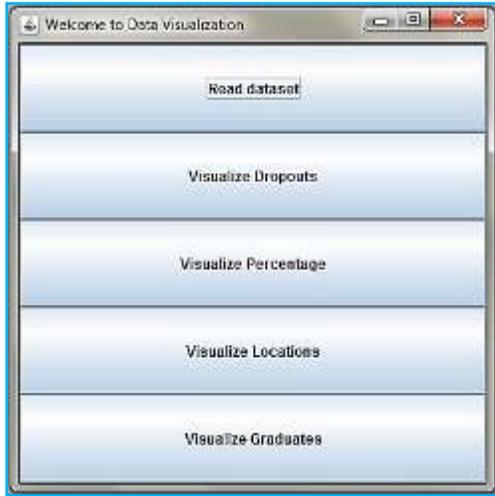


Figure 6: Visualization Test Code

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2013,RAJNI BABUSINGH TETWAR ,M,MECH,NU/A9/5122,32,8154751623,Mahesh Nagar,Na
2013,ROHINI ARUN GHATE ,F,MECH,NU/A9/5123,33,8154762734,Jafar Nagar,Nagpur,5
2013,RUNALI MOTIRAM DONGARE ,F,MECH,NU/A9/5124,34,8154773845,kadbi Chowk,Nag
2013,RUTUJA LILADHAR NAWGHARE ,F,MECH,NU/A9/5125,35,8154784956,New Colony,Na
2013,SAYALI MAHENDRA SALVI ,M,MECH,NU/A9/5126,36,8154796067,Sadar,Nagpur,70,
2013,SAYALI SANJAY THAKRE ,M,MECH,NU/A9/5127,37,8154807178,Kamde Chowk,Nagpu
2013,SHARVARI SUNIL DARBHE ,M,MECH,NU/A9/5128,38,8154818289,Seminar Hills,Na
2013,SHIVANI SANJAY REBHE ,M,MECH,NU/A9/5129,39,8154829400,Ghat Road,Nagpur,
2013,SHRUTI GAJANAN KAWALE ,M,MECH,NU/A9/5130,40,8154840511,Ring Road,Nagpur
2013,SIMRAN ABDUL RAJJAK SAIDE ,F,MECH,NU/A9/5131,41,8154851622,Mandvi,Nagpu
2013,SNEHAL MILIND PANDE ,F,MECH,NU/A9/5132,42,8154862733,Birdey,Nagpur,70,7
2013,SNEHAL SHYAMSUNDER HIRANI ,M,MECH,NU/A9/5133,43,8154873844,Mahesh Nagar
2013,SUJATA PRAKASHRAO DATIR ,F,MECH,NU/A9/5134,44,8154884955,Jafar Nagar,Na
2013,VAISHNAVI PRAKASH SOWANY ,M,MECH,NU/A9/5135,45,8154896066,kadbi Chowk,M
2013,YAMINEE SUBHASH LILARE ,F,MECH,NU/A9/5136,46,8154907177,New Colony,Amra
2013,ABHIJIT MILIND CHAUDHARY ,F,MECH,NU/A9/5137,47,8154918288,Sadar,Nanded,
2013,ADITYA AVINASH KARMARKAR ,F,MECH,NU/A9/5138,48,8154929399,Kamde Chowk,B
2013,AKSHAY ARUN ADMANE ,M,MECH,NU/A9/5139,49,8154940510,Seminar Hills,Chand
2013,ANKIT RAMU POHANE ,M,MECH,NU/A9/5140,50,8154951621,Ghat Road,Gujrat,70,
2013,ASHISH DILIP ZADE ,M,MECH,NU/A9/5141,51,8154962732,Ring Road,Nagpur,56,
2013,CHETAN CHANDU NANDESHWAR ,M,MECH,NU/A9/5142,52,8154973843,Chhaoni,Nagpu
2013,DEVENDRA SURESH RAMTEKKAR ,M,MECH,NU/A9/5143,53,8154984954,Hingna,Nagpu
    
```

Figure 7 : Snippet of dataset fetched

If the user requires to visualize the dropouts the output generated is as shown in figure 7.

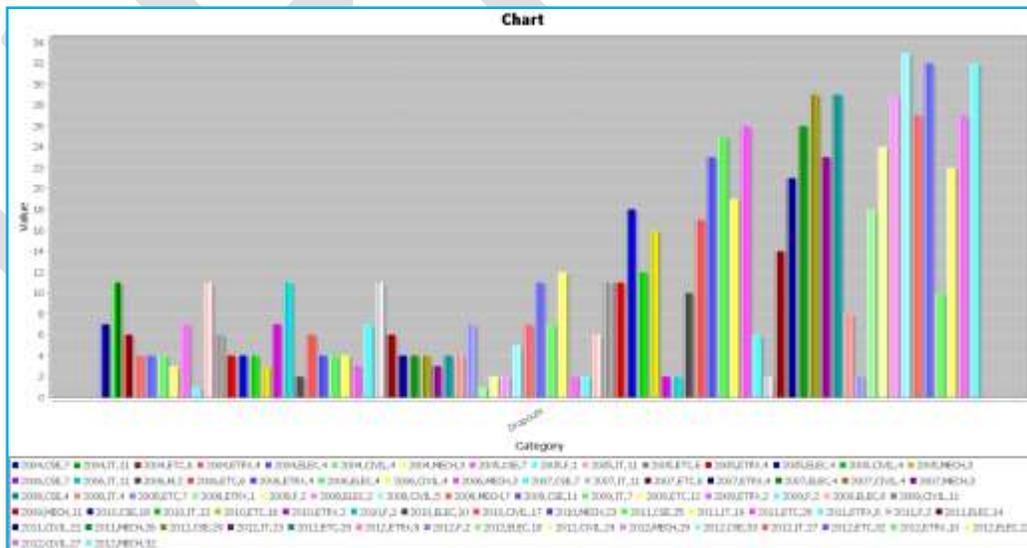


Figure 8: Output generated for dropouts visualization

The same can be generated for the rest of the options in figure 6 such as Visualize percentage, Visualize Locations and Visualize graduates. The working of the system involves the above described internal computations. The complete system will solve the problem of efficient visualization.

CONCLUSION AND FUTURE WORK

The system was created with a motivation so that the user can view the desired data in a single perception of an image. The system included two most important features including the sequential OLAP unit and the visualization done by using the complexity design approach. The work focused on the concept to accomplish the massive datasets so that it can match up to the pace of advancement and as well to present the data in a more human understandable form. The system's sequential OLAP was tested on various datasets such as academic dataset ranging from the year 2004 to 2014 including around 5500 records, biometric logs for around 50 employees for 14 months and toll tax data to check the performance of the system. After the successful accomplishment of the sequential online analytical processing, the system was tested to check for the visualization which also worked proficiently. The system can be used in academic institutes to manage their data and for the various visualizations generated for the documentation purpose. The complete visualization interface is yet to be achieved. Till now the system works for separate visualization, interlinking of data will be the next objective to be achieved.

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Design of helical antenna using 4NEC2

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Abstract— an antenna is a system of elevated conductors, which matches the receiver or transmitter to free space. Antennas are metallic structure designed for radiating and receiving electromagnetic energy. There are many types of antennas used for communication. A helical antenna is an antenna in which a conductor connected to ground plane, is wound into a helical shape. The helix is the simplest antenna which generates circular polarized waves. This paper shows using the design and simulation of helical antenna using 4NEC2 software. Gain, Efficiency, Impedance, Standing Wave Ratio (SWR) and other parameters are analyzed. Thus, a suitable helical antenna is designed and simulated which provides better radiation pattern for effective communication and for use into satellite communication.

Keywords— Helical antenna, 4NEC2, Satellite communication, Gain, Efficiency, Impedance, SWR.

INTRODUCTION

An antenna acts as an interface between a guided wave and a free-space wave. The wire antennas are made of thin, conducting, straight or curved wire segments or hollow tubes and are very easy to construct. It is suspended above the ground and the radius of the wire is very small compared to the operating wavelength of the radio waves used. The dipole and monopole are examples of straight wire antennas. The loop antenna is an example of curved wire antenna. The loop antenna is a radiating coil of any convenient cross section of one or more turns carrying radio frequency current. It may assume any shape like rectangular, square, circular, etc. The circular loop antenna is one of the easiest to construct as well as to analyze. Helical antenna is designed from the loop antenna and many small loop antennas joined together forms the helical antenna. It consists of thick copper wire or tubing wound in the shape of helix or screw thread and used as an antenna in conjunction with flat metal plate called a ground plate. The ground plane is made of sheet or screen of radial and concentric conductors. It exhibits circular polarization. The helical antenna operates in axial and normal modes with respect to the helix diameter. The helical antenna has high directivity (i.e.), its ability to concentrate radiated power in a certain direction. It is used in radio astronomy, satellite and space probe communication. [10]

SIMULATION TOOL

4NEC2 (Numerical Electric Code) is a simulation method for wire antennas, developed by the Lawrence Livermore Laboratory in 1981 for the Navy. To realize this, an antenna is divided into “short segments” with linear variation of current and voltage. The results are very convenient and the standard for this simulation technique is NEC2. The demerit of NEC2 is that the simulation errors occur when wires are crossing in a very short distance or when using buried wires were overcome with 4NEC2. 4NEC2 offers a huge amount of possibilities and options and it was programmed by Arie Voors. Its main advantages are the optimizing tools and the parameter sweeps. It can be found and downloaded free of charge from the Internet. It is open source software. In 4NEC2, the frequency, wavelength, length, radius can be changed and the radiation pattern, smith chart is generated accordingly. Also the efficiency is calculated for the obtained radiation pattern. [13]

The helical antenna should be designed by considering various parameters. Some of the important parameters which describe the geometry of helical antenna are:

Diameter of the helix= D

Spacing between turns= S

Circumference of helix = C

Pitch angle $\infty = \tan^{-1}(s/D)$

Length of one turn $L_0 = (S^2 + C^2)^{1/2}$

Total length of the antenna $L = NS$

When the pitch angle, ∞ is $0^\circ < \infty < 90^\circ$ a helix geometry is formed. There are two modes of operation of helical antenna – normal and axial mode. The parameters on which the mode of radiation depends are the diameter of helix and turn spacing. When the helix diameter is very small as compared to the wavelength, then the helical antenna operates in the normal mode and exhibits broadside radiation. When the helix diameter is large compared to the wavelength, then the helical antenna operates in the axial mode and exhibits end fire radiation. The normalized field pattern is given by:

$$E = \sin\left(\frac{\lambda}{2N}\right) \cos\theta \cdot \frac{\sin\left(\frac{N\phi}{2}\right)}{\sin\left(\frac{\phi}{2}\right)}$$

Here, we design a helical antenna of frequency 150MHZ with a wavelength of 1.999m. The diameter is small compared to the wavelength (diameter of the helical antenna is 63.6cm), so we get a helical antenna with normal mode of radiation.

$$D = \lambda/\pi = 1.999/3.14 = 63.6\text{cm}$$

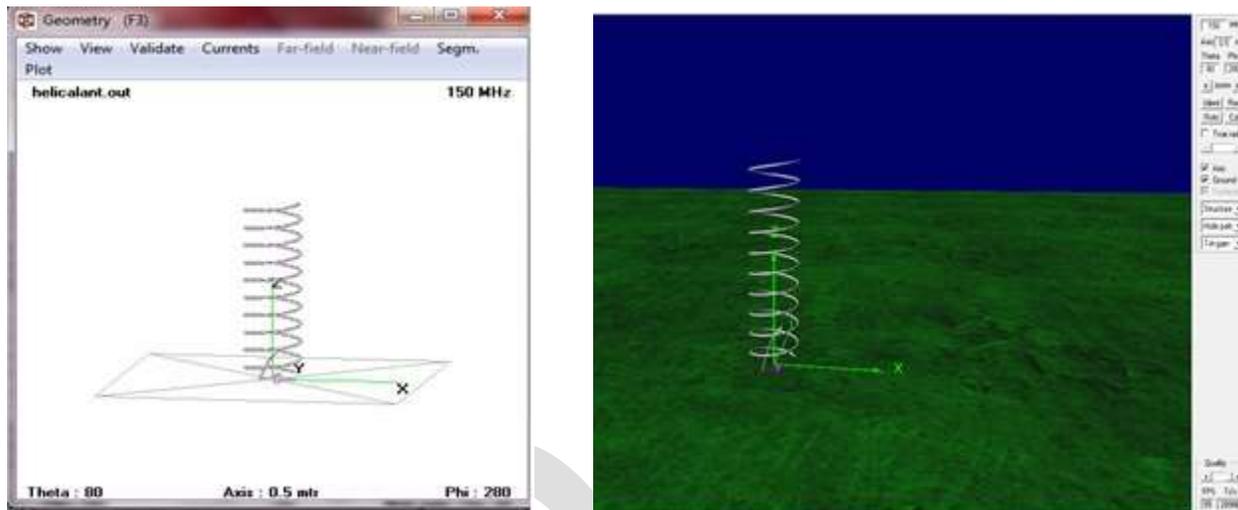


Fig 1: 2D and 3D radiation pattern

APPROXIMATION OF ANTENNA CALCULATION

The various parameters of the helical antenna are calculated using wavelength, frequency, no. of. Turns and spacing between the turns. The input power given to the helical antenna is 100W and the output power or radiated power is also 100W. Therefore, the efficiency is 100% without any loss. Also the radiation efficiency (power loss) is minimum (i.e.) 17.24%. Thus, the calculated parameters match with the simulation results and the newly designed helical antenna is best approximated. It provides good radiation pattern and efficiency for efficient communication.

INPUT:

Wavelength	1.999m
Frequency	150Mhz
No. of. Turns	3
Spacing between the turns	2.25m

Using the above input parameters, other metrics like antenna gain, characteristic impedance, diameter, Half Power bandwidth and effective aperture are calculated using the following relations.

Gain = 10.8 + 10*log10 ((C/lambda)²*N*(S/lambda))
 Impedance = 150/sqrt(C/lambda) Ohm
 Diameter = lambda /Pi
 Half Power Bandwidth = 52/ ((C/lambda)*sqrt(N*(S/lambda)))
 Effective aperture = D*lambda²/ (4*PI)

THEORETICAL OUTPUT:

Gain	19.1 dB
Impedance	150 Ohms
Diameter	63.6 cm
Half Power Bandwidth	20 ⁰
Effective aperture	25.8 m ²
Efficiency of the helical antenna	100%

SIMULATION RESULTS

The 4NEC2 software generates the Far field, Near field pattern of the helical antenna designed in it. These patterns can be viewed in 2D and 3D plots. The helical antenna is designed at 150MHZ frequency because the range of frequency used for satellite communication broadcast is (109-173) MHZ frequency. The radiation pattern, smith chart, plot of impedance of helical antenna designed at 150MHZ frequency is given below:

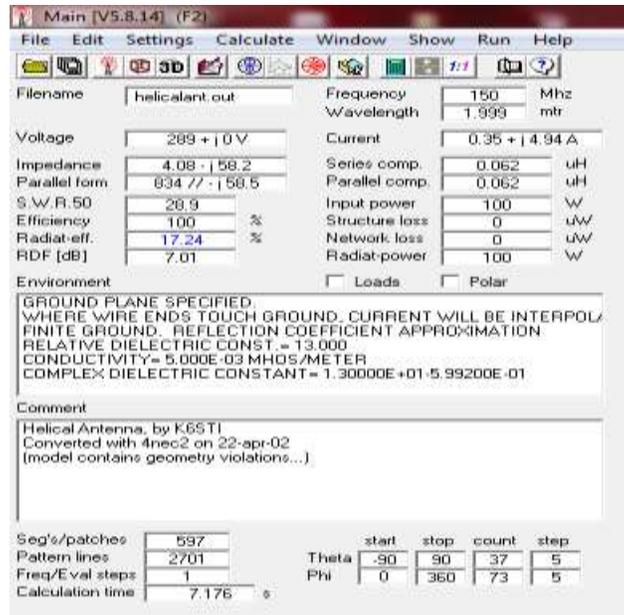


Fig 2: Main window showing various parameters

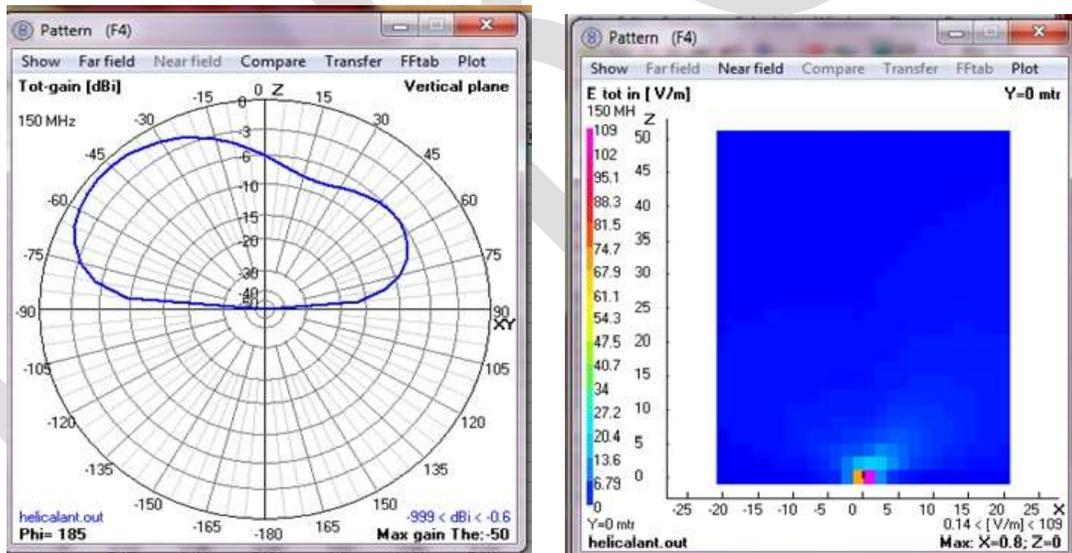


Fig 3: Far Field and Near Field Pattern

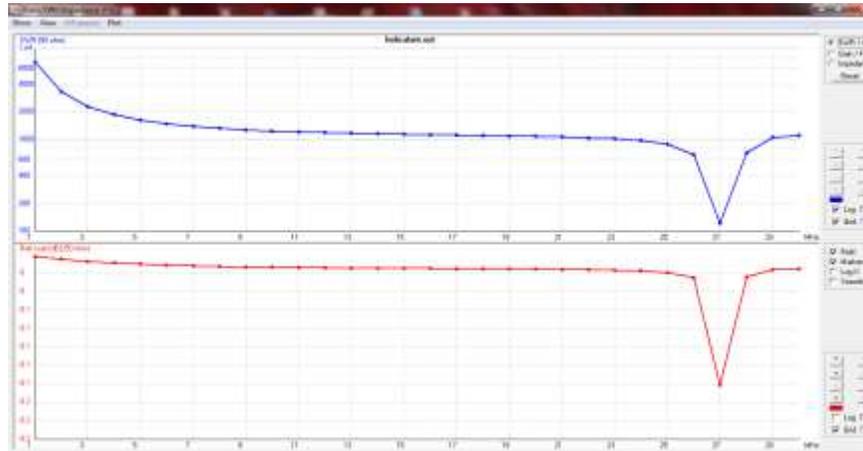


Fig 4: Impedance Plot

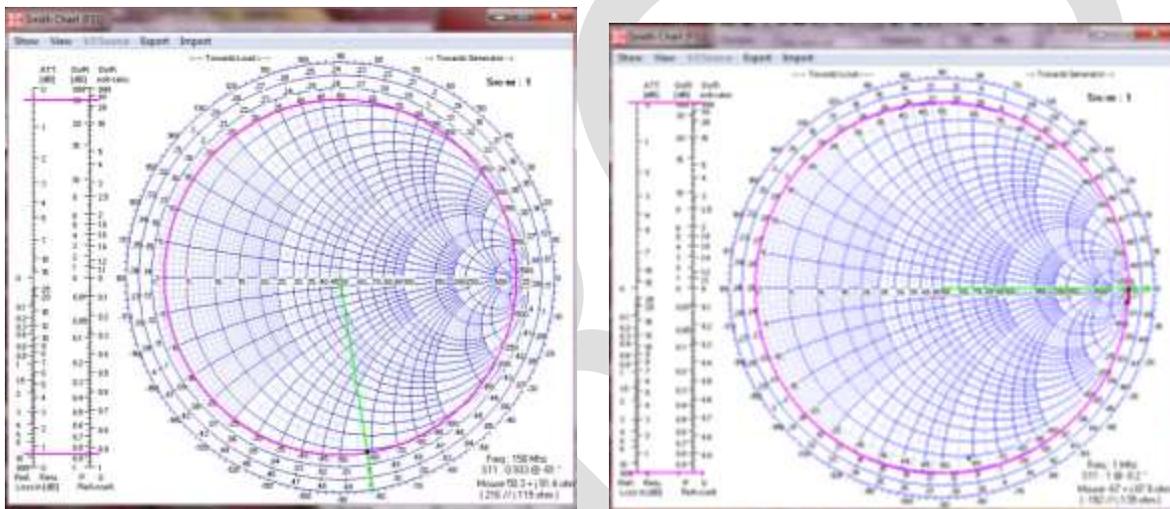


Fig 5: Smith Chart for Far field and Near Field Pattern

CONCLUSIONS

Thus the helical antenna is successfully simulated using 4NEC2 software. It has achieved a maximum efficiency of 100% for efficient and flawless communication at a frequency of 150MHz without any loss. The main goal of this work is to design a suitable helical antenna and analyze its parameters for better gain. The simulated antenna at 150MHz frequency can be fabricated and used in satellite communication.

SUMMARY

Lakshmi Kumar, Nilay Reddy. K [nilay.forall@gmail.com] and Suprabath. K [suprabath.kristam@gmail.com], Undergraduate students from Department of Electronics and Communication Engineering working in this paper will be carrying out the design and fabrication of antenna as future work. They work under the guidance of Ms. Puthanial. M [Puthanial@gmail.com] who is pursuing her PhD in Wireless communication related work in the area of smart antennas under the guidance of Dr. P. C. Kishore Raja, Professor and head, Department of Electronics and Communication Engineering, Saveetha School of Engineering, Saveetha University, Chennai.

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Dynamic Xml Dataset Based On Multi-Channel Bus Architecture for Multimedia Cloud

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Abstract-A number of client server internet video streaming for live streaming has been an emerging technique in recent years. The behaviour of these popular systems has been extensively studied in several measurement projects. Due to the proprietary nature of these commercial systems, however, these studies have to rely on a “black-box” approach, where packet traces are collected from a single or a limited number of measurement points, to infer various properties of traffic on the control and data planes. Although such studies are useful to compare different systems from the end-user’s perspective, it is difficult to intuitively understand the observed properties without fully reverse-engineering the underlying systems. This project describes the network architecture of “dynamic xml dataset based on multi-channel bus architecture for multimedia cloud”, one of the largest production live streaming providers and presents a large scale measurement using data collected by the provider. Alternatively, efficient techniques based on randomizing visual feature and search indexes have been proposed recently to enable similarity comparison between encrypted images.

Keywords: Communication Bus, Distributed Mobile Multimedia, Cloud Computing

I. INTRODUCTION

In cloud computing platform the communication bus plays a crucial role in delivering multimedia services to the clients in the distributed computing. The multimedia applications differ from traditional applications in various ways. They generate large amounts of data and often involve groups of users requiring point-to-multipoint and multipoint-to-multipoint connections. They also require high quality performance. Many multimedia services can be provided in the distributed computing environments. Service-specific transmission should be provided. For example, according as a media type to be transferred is whether video type or audio type, it is so reasonable to use different transport mechanism or different Quality of Service (QoS). The Distributed Multimedia System is aiming to improve future networks and middleware for advanced multimedia applications.

Multimedia does not only mean audio and video, but also sensor data of any kind. The system investigates context-aware and self-adapting solutions for transmission, distribution and management of multimedia data. Pervasive networking and modern Internet: Wifi, WiMax, Bluetooth, the third-generation of mobile phone networks. The result is that networking has become a pervasive resource and devices can be connected at any time and in any place. Mobile and ubiquitous computing: small and portable computing devices are integrated into the distributed system such as laptop, handheld devices (PDA, cell phone, camera etc). Distributed multimedia systems: it support a range of media types such as audio, video in a distributed system. So desktop can access live television, file libraries, music libraries, telephone IP phone (Skype) in distributed system. Most video-on-demand systems are examples of delay-sensitive progressive-download application. The third case, real-time live streaming has the most stringent delay requirement. While progressive download may tolerate initial buffering of tens of seconds or even minutes, live streaming generally cannot tolerate more than a few seconds of buffering. Taking into account the delay introduced by signal ingest and encoding, and network transmission and propagation, the live streaming system can introduce only a few seconds of buffering time end-to-end and still be considered “live”.

Multimedia systems play a central part in many human activities. Due to the significant advances in the VLSI technology, there is an increasing demand for portable multimedia appliances capable of handling advanced algorithms required in all forms of communication. Over the years, a steady move from standalone multimedia to deeply distributed multimedia systems. Whereas desktop-based systems are mainly optimized based on the performance constraints, power consumption is the key design constraint for multimedia devices that draw their energy from batteries. The overall goal of successful design is then to find the best mapping of the target multimedia application onto the architectural resources, while satisfying an imposed set of design constraints (e.g. minimum power dissipation, maximum performance) and specified QoS metrics (e.g. end-to-end latency, jitter, loss rate) which directly impact the media quality. This system addresses a few fundamental issues that make the design process particularly challenging and offers a holistic perspective towards a coherent design methodology.

Other design concerns are generated by the large number of multimedia systems that need to provide services relying on the energy provided by a battery of limited weight and size, the limitation on computational capability of multimedia systems because of heat dissipation issues, and the dependability of multimedia systems operating at high temperatures because of excessive power dissipation. Last but not least, the designing and manufacturing costs are increasingly important since many of the multimedia devices have to be affordable in order to fulfill their prospective area of deployment as an example, think of a sensor network where hundreds or even thousands of computation nodes are needed; plus, the entire sensor network may have a limited live span of only a few days. The design time also needs to be kept very low in order to keep pace with market trends.

II. RELATED WORK

Basic issues in multimedia systems design: Massoud Pedram Department of EE-Systems University of Southern California

Multimedia systems represent a very special class complex computing systems. As such, their design process should start by taking into consideration their unique characteristics which are dominated by the huge amount of data that needs to be processed and transmitted in a continuous manner, and the timing constraints that need to be satisfied in order to have an informational message meaningful to the end-user. Another important characteristic is the Quality of Service (QoS) which embraces all the non-functional properties of a system (e.g. power consumption, latency, jitter, cost, etc.). In multimedia systems, QoS requirements vary considerably from one media type to another. For example, due to the large amount of data that needs to be processed, the video streams require consistently high throughput, but can tolerate reasonable levels of jitter and packet errors. In contrast, the audio applications manipulate a much smaller volume of data (therefore do not require such a high bandwidth), but place tighter constraints on jitter and error rates.

Modeling issues: Joerg Henkel C&C Research Labs NEC USA

As in most practical cases, the design of multimedia systems starts with the modeling step of the multimedia *application*. In its most abstract form, a multimedia application can be reduced to a set of different media streams (audio, video, etc. coming from the same or different sources of information) that satisfy a particular temporal relationship. For instance, in order to enforce lip-synchronization, the audio and video streams need to be synchronized at precise time instances. With respect to this temporal relationship, multimedia applications are characterized by 'soft' rather than hard real-time constraints and then they may tolerate a small percentage of missed deadlines. In other words, the behavior of multimedia applications is not necessarily characterized by a single hard real-time constraint, as is the case for safety critical applications, but by a probability which captures some variability in the performance metrics. To model the application of interest, system need to think about representing streams of information. A natural choice is to use process graphs where each node corresponds to a *process* in the multimedia application, while each edge represents a communication *channel* (link) which allows data to be exchanged (usually asynchronously) between different communicating processes. This communication process happens through dedicated buffers that behave like finite-length queues.

The Design of the Borealis Stream Processing Engine: Daniel J. Abadi, MIT Cambridge

Borealis is a second-generation distributed stream processing engine that is being developed at Brandeis University, Brown University, and MIT. Borealis inherits core stream processing functionality from Aurora and distribution functionality from Medusa. Borealis modifies and extends both systems in non-trivial and critical ways to provide advanced capabilities that are commonly required by newly-emerging stream processing applications. In this project, system outline the basic design and functionality of Borealis. Through sample real-world applications, system motivate the need for dynamically revising query results and modifying query specifications. System then describe how Borealis addresses these challenges through an innovative set of features, including revision records, time travel, and control lines. Finally, system present a highly flexible and scalable QoS-based optimization model that operates across server and sensor networks and a new fault-tolerance model with flexible consistency-availability trade-offs.

A survey and comparison of peer – to – peer overlay network schemes: Eng Keong Lua, Jon Crowcrof

Over an internet today, Computing and communications environments are significantly more complex and chaotic than classical distributed system and lacking any centralized organisation or hierarchical control. There has been much interest in emerging Peer-to-Peer (P2P) network overlays because they provide a good substrate. These P2P overlay networks attempt to provide a long list of features. P2P networks potentially offer an efficient routing architecture that is self-organizing, massively scalable, and robust in the wide-area, combining fault tolerance, load balancing. They present a survey and comparison of various structured and unstructured P2P overlay network. The technical meaning of structured is the overlay network topology is tightly controlled and content is placed not at random peers but specified location that will make subsequent queries more efficient. An unstructured P2P system is composed of peers joining the network with some loose rules, without any prior knowledge of the topology. The network uses flooding as the mechanism to send queries across the overlay with a limited scope. When a peer receives the flood query, it sends a list of all content matching the query to the originating peer. Thus, unstructured P2P networks face one basic problem: peers readily become overloaded, and thus the system does not scale when handling a high rate of aggregate queries and sudden increases in system size. P2P overlay networks is best suited depends on the application and its required functionalities and performance metrics, e.g. scalability, network routing performance, location service, file sharing, content distribution, and so on. Several of these schemes are being applied to the sharing of music, replication of electronic address books, multi-player games, provisioning of mobile, location, or adhoc services, and the distribution of workloads of mirrored Web sites.

Multimedia security in cloud computing environment: Sonal Guleria, Dr. Sonia Vatta, Research Scholar, Guide School of Computer Science & Engineering, Bahra University

Cloud computing multimedia database is based on the current of database development, object-oriented technology and object-oriented fields in the database, which increasing display its vitality. Cloud computing provides a computer user access to Information Technology (IT) services which contains applications, servers, data storage, without requiring an understanding of the technology. An analogy to an electricity computing grid is to be useful for cloud computing. To enabling convenient and on-demand network access to a shared pool of configurable computing resources are used for as a model of cloud computing. Cloud computing can be expressed as a

combination of Software-as-a-Service which refers to a service delivery model to enabling used for business services of software interface and can be combined creating new business services delivered via flexible networks and Platform as a Service in which Cloud systems offering an additional abstraction level which supplying a virtualized infrastructure that can provide the software platform where systems should be run on and Infrastructure as a Service which Providers manage a large set of computing resources which is used for storing and processing capacity. Through Virtualization, they are able to split, assign and dynamically re-size these resources to build ad-hoc systems as demanded by customers.

Enhancing dynamic cloud-based services using network virtualization: Fang Hao, T.V. Lakshman, Sarit Mukherjee, Haoyu Song Bell Labs, Alcatel-Lucent

Services and applications will migrate to a cloud-computing paradigm where thin-clients on user devices access, over the network, applications hosted in data centers by application service providers. For example, “thin client” applications such as allow users to run a VM in the network cloud, and access the VM from various devices at different locations. A flexible service delivery system would allow these VMs to migrate to different locations in the cloud depending on user locations so as to permit faster access and more efficient data delivery to users. For good performance and efficiency, it is critical that these services are delivered from locations that are the best for the current set of users. Services will be hosted on virtual machines in interconnected data centre and that these virtual machines will migrate dynamically to locations best suited for the current user population. A basic network infrastructure need then is the ability to migrate virtual machines across multiple networks without losing service continuity. Enabling wide-area VM mobility in an efficient manner can be of significant value to many cloud-computing applications. Since VMs used for cloud-computing applications will be hosted in data centre, the focus of this system has been on VM migration within and between data centre. Several open issues remain for future research particularly the use of this architecture in enabling new applications and in simplifying implementation of current features.

Media cloud - a new paradigm of multimedia computing: Snehal .Warhekar,.V.T.Gaikwad Sipna COET

Multimedia computing has attracted considerable attention with the rapid growth in the development and application of multimedia technology. It has attempted to support the increasing resource consumption and computational overhead caused by multimedia computing. Media Cloud, a new multimedia computing paradigm that integrates the concept of cloud computing in handling multimedia applications and services effectively and efficiently. Media Cloud faces the following key challenges: heterogeneity, scalability, and multimedia Quality of Service (QoS) provisioning. Challenges are: a layered architecture of Media Cloud, which can provide scalable multimedia services, is presented. Then, Media Cloud technologies by which users can access multimedia services from different terminals anytime and anywhere with QoS provisioning are introduced. Finally, Media Cloud implementation and applications are presented, and media retrieval and delivery are adopted as case studies to demonstrate the feasibility of the proposed Media Cloud design. Multimedia computing is a technology that can generate, edit, process, and search for media content, such as images, videos, audios, and graphics, among others. Multimedia computing technology has the potential to enable a large number of applications, ranging from multimedia e-mail and video players to sophisticated real-time conferencing and virtual/augmented reality. Media Cloud is to process complex services with efficient resource allocation, scalability, and QoS provisioning. A layered view of Media Cloud, which is logically, divided into three layers, namely, the Media Service Layer (MSL), the Media Overlay Layer (MOL), and the Resource Management Layer (RML).

III. PROPOSED DESIGN

Application and transmission bindings that hierarchically cooperate together and with **DBMA** the advanced **64-bit streaming** of multimedia data files are transmitted by using the multi-channel bus transmission process. It will be decoded in the client place, by providing the search options to the client to select the better resources from the cloud data server using the cloud service provider. The feedback from the clients is taken into account for the dynamic service providing options during the next transactions. Service-specific transmission should be provided. The media type to be transferred is whether video types or audio type, this mechanism will provide the Quality of Service (QoS). The client server connection should be able to dynamically change itself as network environment changes. For example, as the computing user moves, it could suffer from fluctuations in throughput and delay because the level of connectivity varies. To cope with such requirements, efficient adaptations should take place at a variety of levels by this proposed technique. Delay over the data channel fault tolerance is enhanced over by the video encoding scheme for enhancing data buffer size regardless of the rate of transmission with data loss.

A. CLIENT REQUEST METRIC

It's smarter to rent than to buy such kind of service is provided by cloud computing. It is a model that is used for delivering resources that can be either Software or Hardware. Its means getting resources through network and more over that charges based only on the amount of computing resources used. Cloud service such as infrastructure as a service is caught for a security issue because by nature it is dynamic and multi tenancy. The common threats to the data in cloud are access to the data by any unauthorized user or cloud provider himself may not be trustworthy. Traditional cryptography techniques are adopted by the client to achieve the user's control over the entire data. Security aspects such as integrity, confidentiality and authentication are considered to have secure data storage. Through advanced encryption scheme and hashing for user's data to preserve it from the security breach in data storage where it is stored in a large data centre.

B. XML METASPACE VERIFICATION

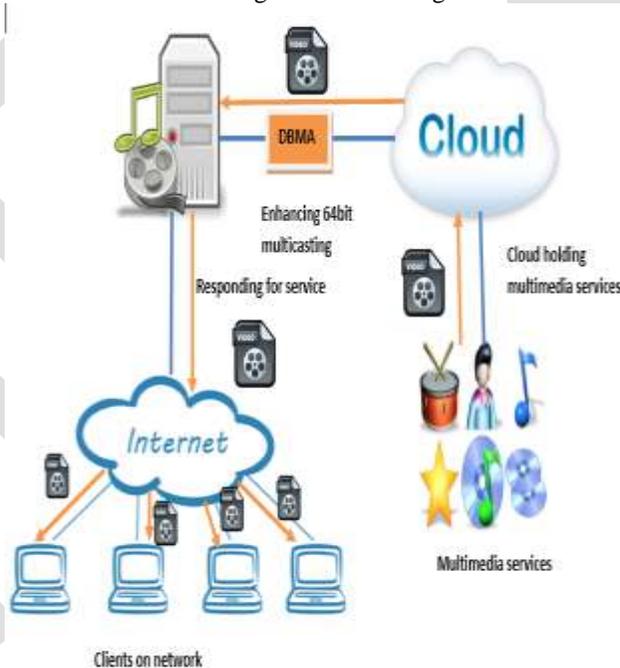
This module is designed to load the file and then it converting it into an xml file. Why xml format? The purpose is to stream the file in a web browser. The xml format file can be easily loaded in a web browser and the xml format file can be easily played without any buffering. This module takes it role as converting the file of any format into an xml file. Playing xml frames as the video is an inventive technique. Regular metadata refresh protects users against spoofing and phishing, and is a necessary precaution in the event of key compromise. Failure to refresh metadata exposes users, and other Federation participants to unnecessary risk. It will verify that the XML Meta space exists in the correct location. If it can't find the tag, it'll give you information about the error that encountered. Once this problem is resolved, try to verify your site again. Unauthorized the tag from the page can cause your site to become unverified, and will need to go through the verification process again.

C. 64-BIT MULTICASTINGS

At server side there should be a tool to stream the multimedia services. In this case, it is **64-bit multicasting**. It is multimedia streaming management service, which have the capability to stream the multimedia services to the clients. Unlike normal streaming it has the effective method of streaming the xml contents to the clients. When the clients are authenticated and verified for xml it starts to stream the respective xml files to the respective clients. A multicast address is also used by multiple hosts, which acquire the multicast address destination by participating in the multicast distribution protocol among the network routers. A packet that is sent to a multicast address is delivered to all interfaces that have joined the corresponding multicast group. In particular, it permits hierarchical address allocation methods that facilitate route aggregation across the Internet, and thus limit the expansion of routing tables. The use of multicast addressing is expanded and simplified, and provides additional optimization for the delivery of services. Device mobility, security, and configuration aspects have been considered in the design of the protocol.

D. CLIENT FEEDBACK REPORT

This enables the admin to monitor the processing of the streaming mechanism the process monitoring shows the number of process going on. That is the total number of streaming services at present. Then it shows the amount of traffic occurring in the system. It is helpful to find out if any problem occurs in the system, which may allow the admin to solve the problem immediately. Server provides as variety of different mechanisms for logging everything that happens on your server, from the initial request, through the URL mapping process, to the final resolution of the connection, including any errors that may have occurred in the process. In addition to this, third party modules may provide logging capabilities, or inject entries into the existing log files, and applications such as Multimedia programs, access scripts, or other handlers, may send messages to the server feedback log shown in the figure 1.



IV. RESULT AND DISCUSSION

Cloud media with DBMA computing offers cost effective services to its service providers through efficient multiplexing of media contents like audio, video, image by providing a common infrastructure, utilizing the server, optimization, virtualization, Mobility and automatic processing. There is no need for physically acquiring an infrastructure or resource in our local system and thus reduces the cost. Cloud media with DBMA is an always connected to the cloud service provider and therefore it is upgraded and maintained without any manual interference. Software and security will be up to date always. Cloud media with DBMA allows the media content to be accessed anywhere through any smart device and it is compatible with all kinds of client service enabled computers, Smartphone, cars tablets etc. Cloud media with DBMA provides consistency in distributing the specific media contents to the users of other cloud within a cloud

community using the streaming protocols like TCP/IP, UDP, RTP etc. Cloud media with DBMA computation uses optimized data centers for processing, distributing or sharing the media content to the users. But the traditional computation requires more energy consumption. Cloud media with DBMA offers the users to purchase a media content once and it can be accessed anywhere in multi-screen by providing customization ability depending upon the accessing device. Cloud media with DBMA technology has many bases for storing the media content in the cloud using the resources. Also it is more secure since the stored media content will be duplicated without manual interference.

V. CONCLUSION

Cloud computing using mobile devices has many advantages over traditional cloud computing for applications that use mobile data. DBMA provides an infrastructure for cloud computing, providing an abstract interface for using data and executing computing jobs on a mobile device cloud. CSP provides most of the essential features for a mobile-cloud computing infrastructure, making it suitable to use as a basis for DBMA. Furthermore, there are several solutions provided by DBMA that can be directly applied to challenges in a multimedia cloud computing environment, such as using fault-tolerance for tolerating node departure. This overhead cost is exacerbated by artificial limitations. Nevertheless, DBMA easily scales to all of the nodes in our network, and would likely scale to many more nodes. It also works reasonably well for local peer-to-peer data sharing and is generally successful in tolerating node-departure. Our experiences in implementing the distributed multimedia search and sharing application suggest that DBMA provides a convenient, sufficiently abstract interface for developing applications that use mobile data.

As, future enhancement, though it is analyzed the concepts about the Cloud computing for Multimedia i.e. Multimedia Cloud computing, which is used to access, store and process the media contents like audio, video, image etc. of any format and any size. Also the system has addressed some of the emerging cloud media services to choose with DBMA. Cloud media with DBMA is an area of greater innovation and more competitive so it will offer more benefits to its users in the future. Similarly there are several challenges also in the case of QOS, security, reliable network usage etc. This system will also help in the further research on security issues of multimedia contents in cloud media.

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Detecting Optimized Nodes Map Community Structure In Bigdata

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Abstract-The recent evolution of social networking services (SNSs) such as Facebook and Twitter are getting more popular, analyzing social network data has become one of the most important issues in various areas. Among those analysis jobs, community detection from social network data gains much attention from academia and industry since it has many real-world applications such as friend recommendation and target marketing. This proposed technique DONMT (Detecting Optimized Nodes Map Technique) to detect the better community structure in big data mining. Community detection is to partition the set of network nodes into multiple groups such that the nodes within a group are connected densely, but connections between groups that are presented in the vertex. It first probe the path between every pair of nodes with trivial and non trivial to predecessor nodes then calculate each pair of nodes in "weight betweenness" then every pair are interlinked. The minimized path length of interlink node verified by time and data weight. This propose techniques delete the edges with maximum nodes count by which node more information they allocate by rank. The experiment results show the shortest map than the existing ones.

Keywords: Clustering, Filter, Graph Based Clustering, Trivial, weight betweenness, Hadoop, Bigdata

1. INTRODUCTION

The feature subset selection is an effective way for reducing dimensionality, removing irrelevant data, increasing learning accuracy, and improving result comprehensibility. Many feature subset selection methods have been proposed and studied for machine learning applications. They can be divided into four broad categories: the Embedded, Wrapper, Filter, and Hybrid approaches. The embedded methods incorporate feature selection as a part of the training process and are usually specific to given learning algorithms, and therefore may be more efficient than the other three categories.

Traditional machine learning algorithms like decision trees or artificial neural networks are examples of embedded approaches. The wrapper methods use the predictive accuracy of a predetermined learning algorithm to determine the goodness of the selected subsets, the accuracy of the learning algorithms is usually high. However, the generality of the selected features is limited and the computational complexity is large. The filter methods are independent of learning algorithms, with good generality. Their computational complexity is low, but the accuracy of the learning algorithms is not guaranteed. The hybrid methods are a combination of filter and wrapper methods by using a filter method to reduce search space that will be considered by the subsequent wrapper.

It mainly focuses on combining filter and wrapper methods to achieve the best possible performance with a particular learning algorithm with similar time complexity of the filter methods. The wrapper methods are computationally expensive and tend to over fit on small training sets. The filter methods, in addition to their generality, are usually a good choice when the number of features is very large. Thus, we will focus on the filter method in this paper. With respect to the filter feature selection methods, the application of cluster analysis has been demonstrated to be more effective than traditional feature selection algorithms are applied in the distributional clustering of words to reduce the dimensionality of text data. In cluster analysis, graph theoretic methods have been well studied and used in many applications. The results have, sometimes, the best agreement with human performance. The general graph theoretic clustering is simple: Compute a neighborhood graph of instances, then delete any edge in the graph that is much longer/shorter (according to some criterion) than its neighbors. The result is a forest and each tree in the forest represents a cluster. In this study, apply graph theoretic clustering methods to features.

In particular, it adopts the minimum spanning tree (MST) based clustering algorithms, because it do not assume that data points are grouped around centers or separated by a regular geometric curve and have been widely used in practice. Based on the MST method, this propose a attribute based Fast clustering based feature Selection algorithm (DONMT). The DONMT algorithm works in two steps. In the first step, features are divided into clusters by using feedback verification clustering methods. In the second step, the most representative feature that is strongly related to target classes is selected from each cluster to form the final subset of features.

Features in different clusters are relatively independent, the clustering based strategy of FAST has a high probability of producing a subset of useful and independent features. The proposed feature subset selection algorithm DONMT was tested upon 35 publicly available image, microarray, and text data sets. The experimental results show that, compared with other five different types of feature subset selection algorithms, the proposed algorithm not only reduces the number of features, but also improves the performances of the four well known different types of classifiers.

2. RELATED WORKS

This chapter explores closely related literature and the placement of this dissertation research in the areas of the selection of scholarly materials, data mining techniques and software agents.

2.1 Data Collection

Finding scholarly information on the World Wide Web can be very frustrating. There is no way to search through a large selection of only scholarly sites with the current Web search tools. The existing search tools provide search algorithms that sift through millions of Web pages with no way to limit the search to a category of Web sites. Nobody seems to know how to do any automatic filtering for quality of Web sites. However, librarians have been doing quality filtering of materials for many years, but “no one seems conscious of the standards carefully developed by information professionals over the past century” (Collins 1996, 122).

In the print world, the academic library performs this filtering function by providing patrons with a subset of print works pertaining to academia. This selection role is filled by library staff members using either explicit or tacit criteria to select individual works. Some sites, such as the Internet Public Library (<http://www.ipl.org>), attempt to select scholarly sites. However, because of the rapid introduction of new documents on the World Wide Web, a human cannot keep up and the resource is quickly outdated.

In order to handle the vast number of documents on the Web, an automated selection system is needed. First, the criteria used by academic librarians to select print works will be examined. These criteria can be translated into equivalent criteria for Web pages. A Web robot can then be designed to determine these criteria for a page. After creating a training set of examined Web pages with their selection decisions, data mining techniques can be used to create a classification model that will be a quality filter for Web pages.

Most of the existing works are motivated by a commonly performed task in the biomedical domain[6][7], that of constructing a systematic review. Authors of systematic reviews seek to identify as much as possible of the relevant literature in connection with some aspect of medical practice, typically a highly specific clinical question. The review’s authors assess, select, and synthesize the evidence contained in a set of identified documents, to provide a “best currently known” summary of knowledge and practice in that field.

A variety of organizations provide central points of call for systematic reviews, including the Cochrane Collaboration,² the largest of these efforts, and the Agency for Healthcare Research and Quality, AHRQ.³ The collections used as the source material are already large, and continue to grow. For example, as at end of 2009, MEDLINE, the largest of the available collections, contained more than 19 million entries, with more than 700,000 citations having been added during the year. To construct each systematic review, a complex Boolean search query[2][3] is used to retrieve a set of possibly relevant documents (typically in the order of one to three thousand), which are then comprehensively triaged by multiple assessors.

Recently, hierarchical clustering[4] has been adopted in word selection in the context of text classification. Distributional clustering has been used to cluster words into groups based either on their participation in particular grammatical relations with other words by Pereira or on the distribution of class labels associated with each word by Baker and McCallum.

As distributional clustering of words is agglomerative in nature, and result in sub-optimal word clusters and high computational cost, it shows a new information-theoretic divisive algorithm for word clustering and applied it to text classification. It proposed to cluster features using a special metric of Barthelemy distance, and then makes use of the dendrogram of the resulting cluster hierarchy to choose the most relevant attributes. Unfortunately, the cluster evaluation measure based on Barthelemy distance does not identify a feature subset that allows the classifiers to improve their original performance accuracy. Furthermore, even compared with other feature selection methods, the obtained accuracy is lower.

2.2 CFD Method

CONDITIONAL functional dependencies (CFDs) were recently introduced for data cleaning. They extend standard functional dependencies (FDs) by enforcing patterns of semantically related constants. CFDs have been proven more effective than FDs in detecting and repairing inconsistencies (dirtiness) of data and are expected to be adopted by data cleaning tools that currently employ standard FDs for surveys on data cleaning tools.

However, for CFD-based cleaning methods to be effective in practice, it is necessary to have techniques in place that can automatically discover or learn CFDs from sample data, to be used as data cleaning rules. Indeed, it is often unrealistic to rely solely on human experts to design CFDs via an expensive and long manual process. As indicated in [1], cleaning-rule discovery is critical to commercial data quality tools.

This practical concern highlights the need for studying the discovery problem for CFDs; given a sample instance r of a relation schema R , it is to find a canonical cover of all CFDs that hold on r , i.e., a set of CFDs that is logically equivalent to the set of all CFDs that hold on r . To reduce redundancy, each CFD in the canonical cover should be minimal, i.e., nontrivial and left-reduced (for nontrivial and CFDs).

The discovery problem is, however, highly nontrivial. It is already hard for traditional FDs since, among other things, a canonical cover of FDs discovered from a relation r is inherently exponential in the arity of the schema of r , i.e., the number of attributes in R . Since CFD discovery subsumes FD discovery, the exponential complexity carries over to CFD discovery. Moreover, CFD discovery requires mining of semantic patterns with constants, a challenge that was not encountered when discovering FDs, as illustrated by the example below.

2.3 Data Archive using OLAP

The discovery problem has been studied for FDs for two decades in the previous research papers for database design, data archiving, OLAP, and data mining. It was first investigated in miner papers, which shows that the problem is inherently exponential in the arity of the schema R of sample data r . One of the best-known methods for FD discovery is TANE, a level wise algorithm that searches an attribute-set containment lattice and derives FDs with $k \leq 1$ attributes from sets of k attributes, with pruning based on FDs generated in previous levels. TANE takes linear time in the size of input sample r , and works well when the arity $|R|$ is not very large. The algorithms of cfd's follow a similar level wise approach.

However, the level wise algorithms may take exponential time in $|R|$ even if the output is not exponential in $|R|$. In light of this, another algorithm, referred to as FastFD [2], explores the connection between FD discovery and the problem of finding minimal covers of hyper graphs, and employs the depth-first strategy to search minimal covers. It takes (almost) linear time in the size of the output, i.e., in the size of the FD cover.

2.4 Pruning Data Using Pre Computation Technique

To reduce similarity computation effort, the notion of *pruning* was introduced by Buckley and Lewit [1985] for term-at-a-time processing, and by Turtle and Flood [1995] for document-at-a-time processing. These authors reasoned that a system that correctly identifies the top r documents is no less useful than one that completely scores the whole collection. In the case of the term-at-a time approach of Buckley and Lewit, whole query terms might be dropped as a result of pruning, and when they are, both processing time and disk transfer time can be saved.

On the other hand, in the case of the document-at-a-time approach of Turtle and Flood, some pointers might be dispensed with after just a cursory amount of processing, saving overall processing costs; but all inverted lists must be fetched. Moffat and Zobel [1996] describe a mechanism for inserting additional information called "skips" into document-sorted compressed

inverted lists in order to support a term-at-a-time processing strategy that they called CONTINUE. Skips are forward pointers within a compressed inverted list, and allow unnecessary sections to be passed over with minimal effort, and then decoding resumed. The other key aspect of the CONTINUE approach is the notion of OR-mode and AND-mode processing of index pointers.

If a pointer to some document is processed in OR-mode, then it has the authority to nominate this document as being a potential answer, and have it considered by subsequent processing steps, even if no other query terms appear in it. Every document that is eventually scored and ranked must have been nominated by a pointer processed in OR-mode. On the other hand, pointers processed in AND-mode are permitted to boost the scores of previously nominated documents, but are not allowed of themselves to nominate documents. If all of the index pointers corresponding to some document are processed in AND-mode, then that document will not be scored, and will not be considered as a candidate answer.

2.5 Fuzzy Set Based Top Clustering

Fuzzy systems are designed to provide customer support through a range of different technologies and Information Retrieval (IR) tools play a fundamental role in this activity. Efficiency and effectiveness in data retrieval are crucial for the overall problem solution process but they depend on the infrastructure data are stored into and the correspondent abstraction model.

The abstraction associated with an object should capture all its peculiarities into an easily manageable representation but deciding which the “relevant” features of an object are is complex and uncertainty makes this task even harder. Focusing on Information Retrieval system, implementation issues are critical both for the overall performance of the system and the accuracy of the retrieved information. Customers usually provide data with different degrees of confidence depending on how that information has been collected.

Current Information Retrieval tools do not explicitly model the uncertainty associated to information but they “mix” the measure of relevance associated to information with the relative measure of confidence. They don’t even manage the feedback provided by users about the accuracy and usefulness of the retrieved solutions. The explicit management of relevance and confidence on information, integrated with an adaptively process is the key factor to improve the retrieval precision of a help desk system.

3. PROPOSED MODEL

Feature selection process is the vital one in the architecture of data retrieval process in web mining. It involves identifying a subset of the most useful features that produces compatible results as the original entire set of features. This proposed algorithm **DONMT** is evaluating from both the efficiency and effectiveness points of view. While the efficiency concerns the time required to find the multiple attribute based feature selection, the effectiveness is related to the quality of the mechanism designed to perform the feature selection.

Based on the proposed idea, attribute based fast clustering-based feature selection algorithm (**DONMT**) is proposed and going to experiments with different parameter set. The **DONMT** algorithm works in three steps. It exploits the concept of edge betweenness to divide a network into multiple communities. Though it is being widely used, it has limitations in supporting large-scale networks since it needs to calculate the shortest path between every pair of nodes in a network. In this technique develop a parallel version of the GN algorithm to support large-scale networks. This proposed technique, which we call Shortest Path Betweenness of MapReduce Algorithm **DONMT** that utilizes the MapReduce model. This algorithm consists of four major stages, and all operations are executed in parallel. it also suggest an approximation technique to further speed up community detection processes.

The **DONMT** algorithm works in three steps. In the first step, features are divided into clusters by using graph-theoretic clustering methods. In the second step, the most representative feature that is strongly related to target cluster classes is selected from each cluster to form an attribute based classes. Features in different clusters are relatively either dependent or independent, the clustering based strategy of **DONMT** has a high probability of producing a subset of useful and independent features. To ensure the efficiency of **FAST**, we adopt the efficient minimum-spanning tree (MST) clustering method. The efficiency and effectiveness of the **DONMT** algorithm are evaluated through an empirical study. The third step is feature selected data are verified with the true database server that are driven from the attribute based cluster of classes. So this system shows the better performance than the existing **FAST**, **FCBF** and **Btree** based systems. . It also tested in the most popular open-source platform for MapReduce, and then conducted performance tests for **SPB-MRA** on Amazon EC2 instances. The results showed that elapsed time decreases almost linearly as the number of reducers increases and the approximation technique introduces negligible errors.

3.1 Similarity Cluster Formation In Mining Servers

In this module we extract the similar document from the data set based on the given Boolean query. The similar document is extracted using TF-IDF values. Compute the similarity score for the given query and the data set. Get the highest similarity score document.

3.2 Weight Computation Using Gn

In this module shows compute the score (weightage) for each nodes in a data set from various database servers. The recursive nature of DONMT queries makes it necessary to calculate the scores on lower levels in the query tree first. One obvious possibility would be to try and add processing logic to each query node as it acts on its clauses. But optimizations such as max-score could only be employed at the query root node, as a threshold is only available for the overall query score. Instead, It follow a holistic approach and prefer to be able to calculate the document score given a set of query terms $S \subseteq T$ present in a document, no matter where they appear in the query tree.

3.3 Shortest Distance Edge Detection

To provide early termination of each node weight scoring, It also propose the use of term independent score bounds that represent the maximum attainable score for a given number of terms. A lookup table of score bounds M_r is created, indexed by r that is consulted to check if it is possible for a candidate document containing r of the terms to achieve a score greater than the current entry threshold. That is, for each $r = 1 \dots n$, we seek to determine

$$M_r = \max\{\text{CalcScore}(S, B) \mid S \subseteq T \text{ and } |S| = r\}$$

The number of possible term combinations that could occur in nodes is $O(\binom{n}{r})$ for each r , which is $O(2^n)$ in total, and a demanding computation. However, the scoring functions only depend on the clause scores, that is, the overall score of each sub-tree, meaning that the problem can be broken down into subparts, solved for each sub-tree separately, and then aggregated. The simplest (sub) tree consists of one term, for which the solution is trivial. For a particular operator node with clauses C , let n_c denote the number of terms in the sub-tree of clause $c \in C$. A table with $r = 0, \dots, \sum_{c \in C} n_c$ possible terms present is then computed; and to compute each M_r , all possibilities to decompose r into a sum over the clauses $r = \sum_{c \in C} r_c$ have to be considered.

3.4 Optimized Map Reducing Using Donmt

In this module it gets the top k nodes for the give correlated clustering query. Our objective is to construct a query sequence $q_1, q_2 \dots q_v$ of DONMT return data queries that can be submitted to the database, retrieve as few data as possible, and still contain all the documents that would be in the top-k results.

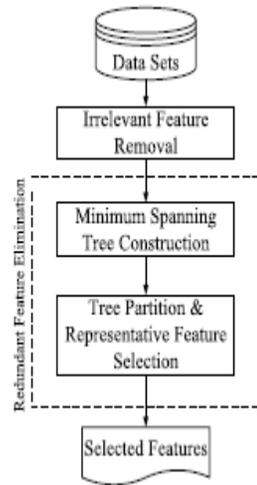


Fig. 1 shows architecture of DONMT

3.5 Proposed Algorithm – Donmt

Inputs: $D (F_1, F_2, \dots, F_m, C)$ - the given data set

θ the T - Relevance threshold.

Output: S - selected feature subset.

// === **part 1: Irrelevant Feature Removal** ===

1. **For** $i=1$ to m **do**
2. T - Relevance = $SU (F_i, C)$
3. if T - Relevance $> \theta$ then
4. $S = S \cup \{ F_i \}$;

// === **part 2: minimum spanning tree construction** ===

5. $G = \text{NULL}$; // G is a complete graph
6. **For each pair of features** $\{ F^i, F^j \} \subset S$ **do**
7. F - Correlation = $SU (F^i, F^j)$
8. Add F^i and / or F^j to G with F - Correlation as the weight of
 The corresponding edge;
9. $\text{Min Span Tree} = \text{prime} (G)$; // Using prime algorithm to generate the
 Minimum spanning tree

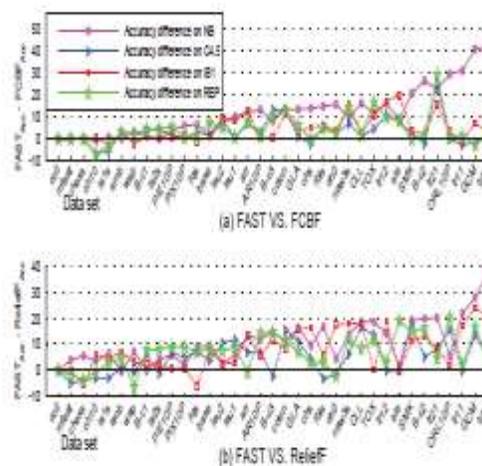
// === **part 3: Tree partition and Representative feature selection** ===

10. $\text{Forest} = \text{min Span Tree}$
11. **For each edge** $E_{ij} \in \text{Forest}$ **do**
12. **if** $SU (F^i, F^j) < SU (F^i, C) \wedge SU (F^i, F^j) < SU (F^i, C)$ **then**
13. $\text{Forest} = \text{Forest} - E_{ij}$
14. $S = \emptyset$
15. **For each tree** $T_i \in \text{Forest}$ **do**
16. $F^j_R = \text{argmax } F^k \in T_i \text{ } SU (F^k, C)$
17. $S = S \cup \{ F^j_R \}$;
18. **Returns** S

4. RESULTS AND DISCUSSIONS

In this section presents the experimental results in terms of the proportion of selected features, the time to obtain the feature subset, the classification accuracy, and the Win/Draw/Loss record. In the experiment, for each feature subset selection algorithm, we obtain $M \times N$ feature subsets Subset and the corresponding runtime Time with each data set. Average Subset and Time, obtain the number of selected features further the proportion of selected features and the corresponding runtime for each feature selection algorithm on each data set.

For each classification algorithm, this system DONMT obtain $M \times N$ classification Accuracy for each feature selection algorithm and each data set. Average this Accuracy, it obtains mean accuracy of each classification algorithm under each feature selection algorithm and each data set. The procedure experimental Process comparative results show the graph.



Graph 1 shows the accuracy differences between ABFAST and comparative algorithms.

For each of the four classification algorithms, although the θ values where the best classification accuracies are obtained are different for different data sets, the value of 0.2 is commonly accepted because the corresponding classification accuracies are among the best or nearly the best ones.

When determining the value of θ , besides classification accuracy, the proportion of the selected features should be taken into account as well. This is because improper proportion of the selected features results in a large number of features is retained, and further affects the classification efficiency.

CONCLUSION

This technique DONMT had been done successful implementation in high dimensional database servers. The algorithm involves (i) removing irrelevant features, (ii) constructing a minimum spanning tree from relative ones, and (iii) partitioning the MST and selecting representative features by verify it with the true data verification. Based on the proposed idea, attribute based fast clustering-based feature selection algorithm (DONMT) is proposed and going to experiments with different parameter set. The DONMT algorithm works in three steps. It exploits the concept of edge betweenness to divide a network into multiple communities. Though it is being widely used, it has limitations in supporting large-scale networks since it needs to calculate the shortest path between every pair of nodes in a network. In this technique develop a parallel version of the GN algorithm to support large-scale networks. This proposed technique, which we call Shortest Path Betweenness of MapReduce Algorithm DONMT that utilizes the MapReduce model.

FUTURE ENHANCMENT

In future this model for feature selection from the high dimensional database systems will have been implemented and tested with the different set of parameters. From the analysis above technique performs very well on the microarray database servers. The reason lies in both the characteristics of the data set itself and the property of the proposed algorithm. For the purpose of exploring the relationship between feature selection algorithms with high intensity of data volume, in which algorithms are more suitable for which

types of data, it ranks the six feature selection algorithms according to the classification accuracy of a given classifier on a specific type of data after the feature selection algorithms are performed.

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BASIC COMPONENT DESIGN CONSIDERATION OF OVERHEAD CRANE

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ABSTRACT- Design is an essential task of engineering it consists of scientific principal and technical information and imagination for the development of new or improved machine or mechanical system to perform specification with maximum efficiency and economy. Overhead cranes are gaining more and more importance due to their ease of carrying heavy loads and easy coordination with the space this paper tries the best to incorporate maximum details of overhead crane.

KEY WORDS-Overhead Crane, Hook, Motor, Power Consumed, Capacity, Pulley, Drum.

INTRODUCTION

A crane is a complex machine whose height and reach along with the movement allow it to perform a variety of load handling tasks. They are commonly seen in construction zone, shipyards and factories.

Overhead travelling cranes are widely used in manufacturing plants & metal extraction industries.

Such cranes vary in lifting capacity from about 2 tons to 400 tons span from 6 m to 50 m or more. For capacities of 10 tons and upwards have independent auxiliary hoist rated at 1/5 to 1/3 that of the main hoist.

Depending upon the purpose for which it is designed the crane can be operated from ground or from the cabin. Of many types of overhead traveling cranes in use the most often used is of moveable bridge type.

The design provided here is for 50 tone lifting capacity to approximate 15m hoist height with a speed of 15m/min. Design of overhead crane including designing of hoisting, traversing and travelling mechanism. This includes designing of various parts such as hook, pulley arrangement, drums, selection of motor, etc. Overhead cranes are widely used in warehouses, metal extraction industries and machine shops.

The purpose of this design is to design the various main components of overhead crane widely used in warehouses, metal extraction industries and machine shops.

The main objective of this work are

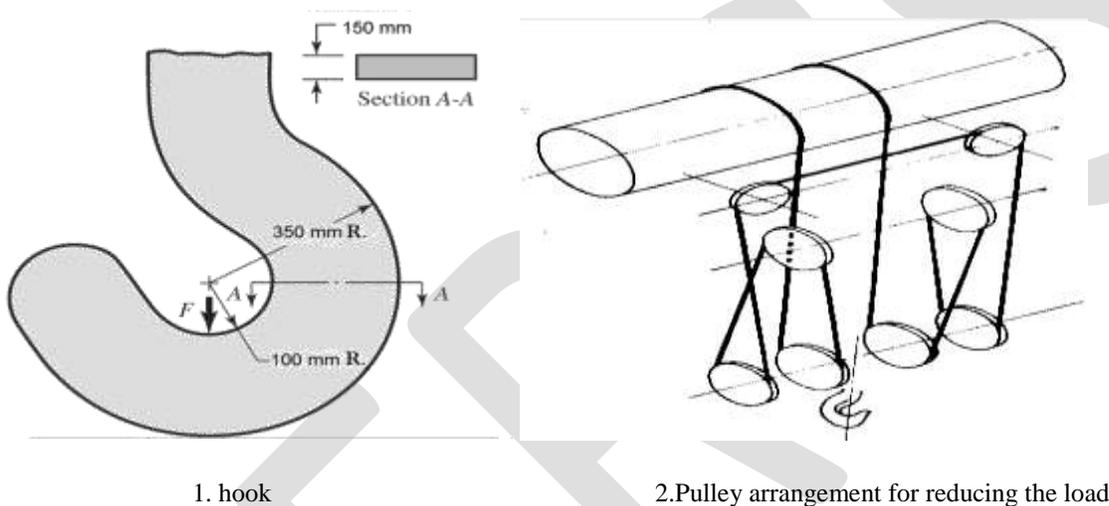
1. Power requirement (approx).
2. Select the type of motor used.
3. Design the hook for carrying load.
4. Selection and design of pulley system.
5. Design of drum for carrying rope.

With D.C. equipment it is good practice to rely on the overload capacity of the motor to take care of peace occasional overload variation of lines voltage has marked effect on A.C.

Induction motors has been taken into consideration to ensure that sufficient torque, well within the value is available for starting.

The lifting hooks for crane load are generally made of trapezoidal cross section for load up to 50 tons. These can be designed from the standard proportions in terms of internal diameter. But cross sectional area of hook is assumed to be rectangular in our calculations. But in general trapezoidal is considered to be best optimized. The rectangular cross section is subjected to direct stress and bending stresses. In the analysis done below hook is subjected to bending moment which is calculated about the centroidal axis not the neutral axis.

For hook we have considered dimensions : Breadth, $b=150\text{mm}$, height, $h=250\text{mm}$, Internal radius of curved section, $r_o=350\text{mm}$, External radius of curved section, $r_i=100\text{mm}$, factor of safety considered as 5.3 and material for hook as High strength alloy steel.



1. hook

2. Pulley arrangement for reducing the load

For designing a pulley system the principle of tackle block is employed. Here the drum pull is multiplied by reeving to obtain the hook pull and divided by the reeving to obtain the hook speed. Doubling the number of parts of rope, for example would double the lifting capacity of the block and reduce the hoisting speed by one half.

CONTENT

1. Power Requirement for motor

$$P = T \cdot \omega$$

$$T = F \cdot r$$

T = Torque which the drum is supposed to lift (N-m)

r = radius of drum.

ω = Angular velocity in radians.

P = Power required for lifting load (Capacity of Motor of Hoisting Motion)

2. For a pulley system

Reduced load

$$P=C*F,$$

P – Effort

C – Factor of resistance

F – Load which is to be lifted

$$P = F * \{C^n (C - 1)\} / \{C^n - 1\}^{[2]}$$

N – Number of pulleys used

If C = 1.08 (for well lubricated bronze bearing)

3. $P * \text{drum radius} * \omega = F * \text{hoisting velocity}$

4. b & h = dimensions of cross - section of hook

r_i = radius of internal fibre

r_o = radius of external fibre

R_n = radius of neutral axis

R = mean radius

σ = Bending stresses

F = load carrying capacity

$$R_n = A / \int dA/r = bh \int_{r_i}^{r_o} b/r dr = h / \ln (r_o/r_i)^{[1]}$$

The moment is positive and

$$M = F * R$$

Finding the bending stresses on the extreme fibers

$$\sigma = F/A + My/A * e (R_n - y)^{[1]}$$

if stress are found safe, dimensions are safe.

5. Drum diameter ranges from $26d - 34d$ (d, diameter of rope) if rope is 6X37 type

The minimum diameter of the drum is usually expressed in terms of the rope diameter and the D/d ratio depends upon the construction of the rope material of which the rope is made. It is also influenced by the rope speed and may be operating condition. Large lifting height may necessitate increasing the diameter of the drum in order to limit the overall length. Intensive operation necessitates large drum, and the A.I.S.S.E. call for a minimum drum pitch diameter of 30 d for 6X37 rope.

Due to restriction on size of crane trolley, therefore a drum diameter of 28d is chosen.

Drum diameter, $D = 28d$

The material for drum can be taken as cast iron.

ACKNOWLEDGE

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We are also thankful to our friends and our colleagues, who gave us, required confidence and support that always helped us in boosting our morale and motivated us in our endeavor of making this project.

CONCLUSION

The following table provides the result of design

1. MOTOR

Type of Motor	Capacity (kW)	Speed (RPM)
AC Induction	25.78	1000

2. HOOK

Material Used	Internal Radius (mm)	External Radius (mm)
High Strength Alloy Steel	100	150

Assuming Factor of safety as 5.3

3. PULLEY SYSTEM

No. of Pulleys Used	Reduced Load (tonnes)	Speed (RPM)
2	12.6	1000

4. DRUM

Material Used	Diameter (mm)	Length (mm)
Cast Iron	400	1000

5. POWER REQUIREMENT

$$P=125.78KW$$

$$\text{Hoisting speed} = 15 \text{ m/min}$$

It design requires application of design principles into practical situation of industry. The basic parameter which was considered in problem was the load to be lifted. Accordingly speed of hoisting, was considered.

The parts design here is the main parts and forms the basis of any overhead crane. This design is for general purpose overhead crane generally used in warehouses, metal extraction industries and machine shops. Have capacity of about 50 tons, lifting capacity to approximate 15m hoist height with a speed of 15m/min.

Different components were designed using the basic principles of machine design. Material was considered for various components and subsequently each component's strength was calculated. Appropriate factor of safety has been taken into account. Space limitation has also been taken into consideration. All machine elements were then integrated to give final shape to assembly.

The design of crane provides scope to find further compacted design with better safety limit. Also, it gives an idea to study other engineering equipment.

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Influence of Market Orientation on Ethical Responsibility Special Reference to the Licensed Commercial Banks in Batticaloa

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ABSTRACT- Concerns and awareness of ethical issues have increased among the society and customers in the past few decades. Therefore society and customers expect marketers to be involved their business in ethically responsible manner. Thus it becomes necessary for the market orientated businesses to adopt ethical responsibility to fulfill the social expectations of their customers and society. Hence marketers are expected to develop a ethical responsible business behavior. This study examined the research problem of whether market orientation influences ethical responsibility in the Sri Lankan banking sector. This research was carried out with the objectives of evaluating market orientation and to analyze the influence of market orientation on ethical responsibility in the banking sector. Furthermore conceptual model has been developed to link market orientation and ethical responsibility. Customer orientation, competitor orientation and inter functional coordination are considered as the measurement variables of market orientation and it was derived from Narver and Slater (1990). Quantitative methodology has been applied for this research and questionnaires were used to collect data. 27 managers and 154 staff from whole licensed commercial banks in Batticaloa district have been selected for this study. Mean, standard deviation, correlation and multiple regressions have been used for the analysis. Findings have shown that market orientations of licensed commercial banks are at higher level. Furthermore it was also found that there is a positive relationship between market orientation and ethical responsibility; and market orientation significantly influences ethical responsibility of the licensed commercial banking entities. These findings would be useful to foster ethical responsible business behavior among the entities and industries which will satisfy customers that are socially conscious and also will meet the expectations of various stakeholders.

Key Words: Market orientation, customer orientation, competitor orientation, inter functional coordination, Ethical responsibility

INTRODUCTION

Background of the study

Market orientation has become a prominent concept in marketing literature and in practice to ensure sustainable and superior customer value. Narver and Slater (1990) defined market orientation as “the organizational culture that most effectively and efficiently creates the necessary behaviors for the creation of superior value for buyers and, thus, continuous superior performance for the business” (p. 21). Market oriented businesses are committed to understand both the expressed and latent needs of their customers, to share this understanding broadly throughout the organization, and to coordinate all activities of the business to create superior customer value (Day, 1994; Kohli&Jaworski, 1990; Slater &Narver, 1995). Thus market oriented businesses seek to understand customers' expressed and latent needs, and develop superior solutions to those needs in order to add value to their customers.

Ethics are, at their essence, moral judgments about what is right and what is wrong. In a business sense, these ethics are decided upon and formed by each company and underpin the decisions that anyone in the business makes. The decision to behave ethically as one

individual to another is easy for any decent moral human being, but it is easy to forget the impact a large, faceless business can have on the world.

Meanwhile social responsibility and ethical issues have become the expectation to the society and customers. The awareness level on social issues has increased among the society and customers in the past few decades. It has resulted in a phenomenon where customers have become socially conscious (McAlister & Ferrell, 2002; Mohr, Webb, & Harris, 2001). Therefore society and customers expect the businesses to operate in an ethical responsible way. According to Moir (2001) there are societal expectations over the businesses. Similarly Mohr et al. (2001); Sen and Bhattacharya (2001) highlighted that customers expect the marketers to be ethically responsible. Therefore it has become the expectation of customers and society that the marketers have to be ethically responsible. Since there are customer expectations over marketers to be ethically responsible, market oriented businesses have to undertake ethical activities thereby addressing customers' expectations.

Research Problem

It is necessary for the marketers to determine as to whether market orientation influences Ethical responsibility in their business. As far as the researcher knows no research has been conducted so far in Sri Lanka to examine whether market orientation leads to Ethical responsibility with special reference to Banking Sector. Thus there exists a clear knowledge gap. This knowledge gap becomes a problem to marketers in fostering ethical responsible business behavior. Absence of such knowledge makes marketers in the Sri Lankan banking industry unclear and difficult to satisfy expectations of the customers who are responsive to ethical responsible issues. Researcher examines this problem in this study and attempts to fill this knowledge gap. Therefore the following research problem is advanced in this study

Does market orientation influence the ethical responsibility with special reference to Banking sector?

Research questions

The following research questions are advanced in this study.

1. To what extent License commercial banking organizations are market oriented?
2. To what degree the influence of market orientation on ethical responsibility in License commercial banks?

1.4 Objective of the Study

The specific objectives of this study are given below. These objectives have been derived from the research questions and purpose of the study.

1. To examine the market orientation of the license commercial banking organizations.
2. To evaluate the degree to which market orientation influences ethical responsibility practices in the License commercial banks

LITERATURE REVIEW

The Concept of Market Orientation

Identifying customers' needs and expectations and satisfying such needs became the primary task for marketers (Barksdale & Darden, 1971). This is known as "Marketing Concept". Marketing concept became popular and widely acceptable among the marketers since 1950s. Marketing concept makes the marketers to be more responsive to customers' wants and needs.

Marketers realized that implementing marketing concept is not the duty and responsibility of the marketing department alone. It required the support of the whole organization. It is necessary that entire organization has to move towards satisfying customer needs. Whole organization has to be involved in the process of identifying needs, wants and expectations of their customers and satisfying such expectations thereby adding value to their customers. This process is known as "Market Orientation".

According to Kohli and Jaworski (1990) market orientation is the implementation of the marketing concept. Hence, a market-oriented organization is one whose actions are consistent with the marketing concept. Marketing concept is the base for the market orientation. Therefore market orientation is the operational manifestation of the marketing concept.

Kohli and Jaworski (1993) have proposed their definitions on market orientation is "The culture that most effectively and efficiently creates the behaviors for the creation of superior value for buyers" (p. 21), and stated that market orientation consists of three behavioral components – customer orientation, competitor orientation, and inter functional coordination.

Components of Market Orientation

According to Narver and Slater (1990) market orientation is the organizational culture that creates superior value for customers. Thus customer orientation, competitor orientation, and inter functional coordination are three behavioral components of market orientation.

Customer orientation

A marketer must be customer oriented to add value to their customers. Kohli and Jaworski (1990) and Narver and Slater (1990) indicated that market oriented business require a company wide customer orientation. Narver and Slater (1990) described about customer orientation as: seller has to understand who its potential customers are at present as well as who they may be in the future, what they want now as well as what they may want in the future, and what they perceive now as well as what they may perceive in the future as relevant satisfiers of their want. Thus customer oriented marketer has to understand needs, wants, preferences, expectations, behavior, and perception etc of their customers. Based on this knowledge, marketers have to take actions to satisfy their customers there by adding value to them.

Competitor Orientation

According to Narver and Slater (1990) marketers have to be competitor oriented to create value to their customers. Market oriented businesses have to generate knowledge on their competitors to give comparatively better value to their customers (Day & Wensley, 1988; Kohli & Jaworski, 1990). Sørensen (2009) also argued for including competitor-oriented activities in market orientation. Thus there is a clear idea that a market oriented businesses have to be competitor oriented. Hence competitor orientation means understanding competitors' strengths, capabilities and weakness in order to create superior value to their customers than their competitors.

Inter-functional Coordination

Inter- functional coordination also is an important element of market orientation. In marketing concept it was identified as the integrated effort (Barksdale & Darden, 1971; Bell & Emory, 1971; Hise, 1965; McNamara, 1972). Bell and Emory (1971) described integrated effort as “the entire firm must be in tune with the market by placing emphasis on the integration of the marketing function with research, product management, sales, and advertising to enhance the firm's total effectiveness” (p. 39). Narver and Slater (1990) have accepted the thoughts of the previous researchers and therefore they indicated that creating value for buyers is much more than a marketing function; and it requires the synergetic effect in which the contribution of each subgroup is tailored and integrated.

Concept of Ethical Responsibility

In the past several decades Concept of “Ethical Responsibility” has been evolving as an important concept among the managers. Since 1930 business people and business magazines have been stressing various issues related to the ethical responsibility of businesses. Even though varying views and definitions were advanced to the Concept of ethical responsibility.

Ethical responsibilities require the business to abide its activities, practices and policies, to the expected norms defined by the members of society such as consumers, employees, shareholders, community, and other stakeholders (Schwartz & Carroll, 2003). These norms, standards and expectations are not coded in laws but abiding to these will ensure concerns, rights and interests of various stakeholders. Moreover in recent past there is a growing attention paid on the ethical aspects of business. Therefore it is vital for businesses to adopt ethical considerations in to business. It is vital for the organizations to be interacted with its various stakeholders. Stakeholder group is known as any group or individual who can affect or is affected by the achievement of the organization's objectives (Moir, 2001). Since organization has many stakeholders, present day organizations have to be responsible to all such stakeholders. It becomes necessary for organizations to consider the issues concerning all of their stakeholders under their ethical domain. In recent literature, ethical responsibility is viewed from the stakeholders’ point of view.

A company which sets out to work within its own ethical guidelines is also less at risk of being fined for poor behaviour, and less likely to find themselves in breach of one of the multitude of laws concerning required behaviour – for example, laws around payments to corrupt regimes, or environmental practice policies. The whole company can be fined, the directors can be fined, and individual employees can be fined if the responsibility for an infraction falls on their shoulders.

Carroll (1979) quoted that “the social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time” (p. 500). In his elaboration, he identified ethical responsibilities for business is a unique one. Thus Carroll (1979) has integrated ethical interest stressed by Davis (1960) as well as legal obligations emphasized by McGuire (1963) and has forwarded a comprehensive definition. Therefore his definition was accepted by the subsequent authors.

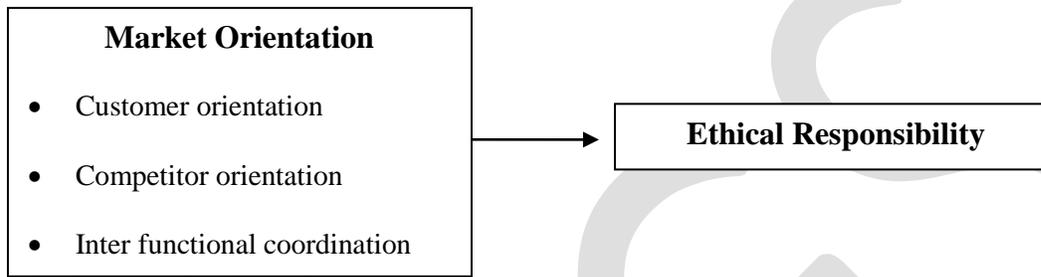
Furthermore Carroll’s (1979) four responsibilities can be looked at from stakeholders’ point of view. For instance expectations of customers, employees, business partners, environment, communities and investors can be categorized under any of the four dimensions proposed by Carroll (1979). Thus his definition on ethical responsibility fulfills expectations of contemporary researchers who perceive ethical responsibility from stakeholders’ point of view.

CONCEPTUALIZATION AND METHODOLOGY

CONCEPTUALIZATION

Based on literature survey following conceptual framework was developed. This conceptual framework establishes link between market orientation and ethical responsibility.

Figure 3.1 : Figure Conceptual model



(Source: Develop by researcher for study purpose)

The figure depicts the relationship between market orientation and ethical responsibility. According to figure, market orientation and ethical responsibility are the constructs. Market orientation can be measured in terms of three variables that are customer orientation, competitor orientation and inter-functional coordination as recommended by Narver and Slater (1990). Therefore customer orientation, competitor orientation and inter-functional coordination are considered as independent variables. Meanwhile ethical responsibility can be considered as dependent variables. Hence above conceptual framework establishes links between the variables of market orientation and with the variables of ethical responsibility.

Methodology

Researcher applied quantitative methodology for this study. Thus survey method has been adopted.

Sample selection

According to the Central Bank of Sri Lanka (2012), the Sri Lankan banking sector comprises of 2 major categories, namely licensed commercial banks (LCBs) and licensed specialized banks (LSBs). As at December 2012, there were 24 LCBs and 9 LSBs in Sri Lanka (Central Bank of Sri Lanka, 2012). In those 24 LCBs, there were 12 LCBs in Batticaloa district. This research is limited to the licensed commercial banks (LCBs) in Batticaloa district, Thus 12 LCBs main branches were considered as the population. Hence researcher distributed questionnaire to whole population.

Table 3.1 sampling framework

Licensed Commercial Banks In Batticaloa District		Staff Categorization			Total
		Manager	Assistant Manager	Staff	
01	Amana Bank	01	01	08	10
02	Bank of Ceylon	01	01	28	30
03	Commercial Bank	01	01	23	25
04	DFCC Vardana Bank	01	01	06	08
05	Hatton National bank	01	01	17	19
06	National Development Bank	01	01	06	08
07	Nation Trust Bank	01	04	09	14
08	Pan Asia Bank	01	01	06	08
09	Peoples Bank	01	01	13	15
10	Sampath Bank	01	01	06	08
11	Seylan Bank	01	01	13	15
12	Union Bank	01	01	05	07
TOTAL		12	15	140	167

Source- Formed for this research

Data collection methods and instruments

This study was carried out based on primary data. Structured questionnaires was used to collect data. The Questioner comprised of statements on three variables of market orientation; customer orientation, competitor orientation and inter functional coordination. Questioner was given to the whole 12 Licensed commercial banks main branches in Batticaloa.

Likert scale of 1-5 which ranges from “Strongly Disagree” to “Strongly Agree” were applied in the SET I and SET II of the questionnaire to identify responses. The numerical values were given for the purpose of quantification of quantitative variable as follows:

1. Strongly disagree
2. Disagree
3. Neither Agree nor Disagree
4. Agree

5. Strongly agree

4.5 Data presentation, analysis and evaluation

Data has been presented using tables. Meanwhile Inferential and descriptive analysis were used for data analysis. Hence under the descriptive analysis, mean and standard deviation were derived from the analysis of 154 samples. In inferential analysis, correlation and multiple linear regressions have been applied. Statistical package of SPSS 16.0 has been used for this purpose. Furthermore criteria shown in table were adopted to evaluate mean values. This was established to determine the degree of market orientation.

Table 4.2 Evaluation criteria for mean values

Range	Degree
1 ≤ X ≤ 2.5	Low level
2.5 < X ≤ 3.5	Moderate level
3.5 < X ≤ 5.0	High level

Source- Formed for this research

ANALYSIS AND FINDINGS

Sample profile

Researcher selected whole 12 commercial bank main branches in Batticaloa district, which consist of 167 employees. It includes Managers, assistant managers and staff. 154 employees responded to the questionnaires and the distribution of responded institutions have been presented in table 5.1

Table 5.1 Response Rate

Licensed Commercial Banks In Batticaloa District		Total Employees	Response	Response Rate
01	Amana Bank	10	9	90%
02	Bank of Ceylon	30	27	90%
03	Commercial Bank	25	24	96%
04	DFCC Vardana Bank	08	8	100%
05	Hatton National bank	19	17	89%
06	National Development Bank	08	8	100%
07	Nation Trust Bank	14	13	93%
08	Pan Asia Bank	08	8	100%
09	Peoples Bank	15	13	87%

10	Sampath Bank	08	7	88%
11	Seylan Bank	15	14	93%
12	Union Bank	07	6	86%
Overall		167	154	92%

Source-Data analysis

Descriptive statistics

This section presents mean and standard deviation for the variables of market orientation. There are two government banks and ten private banks in those twelve banks. Mean values have been distributed based on Likert's scale of between 1-5 which represent "Strongly Disagree" to "Strongly Agree". Meanwhile mean values were evaluated based on already established evaluative criteria which range from "Low level" to "High level".

Findings and discussion on market orientation of licensed commercial banking sector

This section provides findings and discussion on market orientation of the Sri Lankan Licensed commercial banking sector in order to meet the first objective of this study which is the examination of the market orientation.

Table 5.2 summary of the findings on market orientation

Variables	Mean	Std. Dev	Category of the organization	Mean	Std. Dev
Market Orientation	4.25	0.29	Government banks	4.23	0.10
			Private banks	4.25	0.32
Customer orientation	4.21	0.27	Government banks	4.13	0.22
			Private banks	4.23	0.28
Competitor orientation	4.46	0.36	Government banks	4.45	0.20
			Private banks	4.47	0.39
Inter-functional Coordination	4.06	0.53	Government banks	4.10	0.13
			Private banks	4.05	0.58

Source-Data analysis

As presented in table 5.2, Sri Lankan Licensed commercial banking sector is highly market oriented since the mean value of market orientation construct is 4.25. It shows that institutions in the commercial Banking sector have incorporated the needs, wants and

expectations of their customers. Thus banking entities like government banks and Private banks in Sri Lanka have introduced new products, value added services, technological developments and convenient delivery methods etc. in the past two decades. It has resulted in the higher level of market orientation in the licensed commercial banking sector. Meanwhile in-depth analysis of market orientation reveals that competitor orientation (mean value of 4.46) is contributing more than other components for the market orientation in financial institutions. Hence licensed commercial banking sector is more competitors oriented than customer oriented.

Key aspect of market orientation is to understand needs, preferences and expectations of their current and potential customers and adding value to them thereby customer orientation is the prime concern for market oriented businesses (Kohili & Jawarski, 1990; Kohli et al., 1993; Narver & Slater, 1990). It has been emphasized in any definition on market orientation. Thus satisfying customers is the fundamental principle of market orientation (Day,1994; Deshpande, et al., 1993; Harris, 2002). On contrary to this principle, Commercial banking institutions in Batticaloa have given more importance to competitor orientation than customer orientation. Even though financial sector has undertaken many developments and transformation in the past, it was more competitors oriented than customer oriented. Hence these measures were aimed at overcoming their competitors rather than really serving the needs and expectations of their customers.

Licensed commercial banking sector has been further divided into Government banks and Private banks for the purpose of segregate analysis. Segregate analysis has revealed that market orientation of private banks (mean value of 4.25) is significantly higher than that of government banks (mean value of 4.23) which states that private banks are highly market oriented than government banks. This is because of the significant differences in customer orientation and inter-functional coordination practices between government banks and Private banks (From table 6.1). Encouraging customer comments, after sales consultation, customer commitment, value creation practices and customer satisfaction significantly differ between government banks and Private Banks which have led to the significant difference in customer orientation. Similarly practices such as marketing information sharing, interaction among all departments and involvement of all departments in preparing business plans and strategies are significantly higher in government banks than Private banks that has created a significant difference in inter-functional coordination.

Relationship between market orientation and ethical responsibility

Correlation values were found to determine relationship between variables of marketer orientation and ethical responsibility. It has been presented in the table

Table 5.4 correlation between the variables of market orientation and ethical responsibility

Variables	Correlation with Ethical Responsibility
Market Orientation	.596*
Customer orientation	.607*
Competitor orientation	.560*
Inter-functional coordination	.266*

* Correlation is significant at the 0.05 level (2-tailed).

As in table all correlation values are positive and these values have been significant at 5% significant level ($P < 0.05$). This reveals that all market orientation variables are positively correlated with ethical responsibility. Hence there is a positive relationship between market orientation and ethical responsibility.

Analysis on the influence of market orientation on ethical responsibility

This section analyses the influence of market orientation on ethical responsibility. Thus it first presents analysis on the areas of orientation followed by analysis on the ethical responsibility construct. In this study the outcome or value of dependent variable (Ethical responsibility) depends on more than one independent variable (customer orientation, competitor orientation and inter-functional coordination). Therefore, to quantify the effect of different independent variables on the behavior of dependent variable, it is necessary to apply the technique of multiple regressions (Cooper & Schindler, 2007; Levin & Rubin, 1991).

In multiple linear regression analysis Adjusted R Square statistics as well as regression coefficient are considered to be important for analysis and interpretation. Adjusted R Square represents the amount of variance in the dependent variable that can be attributed to independent variable (Cooper & Schindler, 2007). Meanwhile the regression coefficient (value of B) implies the change in the outcome (dependent variable) resulting from a unit change in the independent variable (Cooper & Schindler, 2007). Hence ethical responsibility can be analyzed using the multiple regressions.

Table 5.5 Influence of market orientation on Ethical responsibilities

Independent variables	B
(Constant)	1.359
Customer orientation (Cu)	0.158
Competitor orientation (Co)	0.091
Inter-functional (In)	0.162

Adjusted R Square value 0.608

F statistic 6.678

Table 5.5 describes that customer orientation, competitor orientation and inter-functional coordination positively impact on ethical responsibilities. Furthermore this prediction has been significant at 5% P value ($P < 0.05$). Furthermore inter functional coordination is the mostly contributing factor in establishing ethical practices in the business. As revealed by Adjusted R Square statistic, 60.8% of variance in ethical responsibilities is determined by the variance in market orientation variables. Hence the regression equation for ethical responsibilities is derived as follows.

$$\text{Ethical responsibilities} = 1.359 + 0.158 (\text{Cu}) + 0.091 (\text{Co}) + 0.162 (\text{In})$$

F value statistic is 6.678 which mean that this model can be used for further analysis. Hence market orientation has significant impact on ethical responsibilities.

Theoretical contribution

This research has proven that market orientation significantly influences ethical responsibility of the Sri Lankan financial institutions. It has been further found that components of market orientation (customer orientation, competitor orientation, and inter-functional coordination) also have the significant impact on ethical responsibility. Thus customer orientation, competitor orientation, and inter-functional coordination determine the ethical responsible behavior of the financial entities in Sri Lanka. Hence this study has provided findings to fill the knowledge gap identified by Narver and Slater (1990).

In addition to the theoretical contribution, this study has also measured the degree of market orientation of the Sri Lankan Licensed commercial banking sector entities. These findings will be useful to the practicing business managers in the licensed commercial banking sector to develop policies pertaining to market orientation and ethical responsibilities

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5 Technologies to boost efficiency in the Transmission & Distribution system

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Abstract— These instructions give you guidelines for improving the efficiency of transmission & distribution system. One example of efficiency measures aimed primarily at the utilities that operate the Transmission and distribution system is an initiative underway at the US department of energy to implement new efficiency standards for distribution transformers. These are the grey cylinders you see perched atop utility poles in residential neighborhoods, and the metal housed units placed on cement pads at ground level.

Keywords— HVDC, FACTS, GIS, HTS CABLES, WAMS, transmission efficiency, Super conductors

INTRODUCTION

NOWADAYS the losses in the transmission and distribution lines are increased due to so many reasons. And due to the lack of the nonconventional energy sources it is important to save the energy. Most of the losses are occurring in electrical field are in power flow from generating end to the consumer end. So it is more important to save that losses as possible as possible and save our nonconventional energy sources. Now just moving in our topic...

There are over 40 million distribution transformers in service today in the US. They are among the most ubiquitous and the most standardize pieces of electrical equipment, and for that reason make a prime target for improvements that can be propagated across large areas.

The proposed standards will have a relatively modest impact on the efficiency of given transformer, around 4% overcurrent models. However when this incremental gain is multiplied across the thousands of units operated by even a small utility, the result is impressive.

There are other initiatives at the distribution level, but if we focus our attention on the measures that have the greatest potential for improving efficiency, we inevitably must look to transmission.

There are numerous technologies that are already being applied to boost efficiency in transmission, and still more that have yet to reach full commercial implementation.

In the following sections, we explore some of these technologies:

1. HVDC- High voltage direct current
2. FACTS (Flexible AC transmission systems) Devices
3. Gas-Insulated substations (GIS)
4. Superconductors / HTS Cables
5. Wide area monitoring systems

The above sections are explained in detail below:

1. HVDC- HIGH-VOLTAGE DIRECT CURRENT

Most of the transmission lines that make up the North American transmission grid are high-voltage alternation lines. In India also, Most of the transmission lines are alternating current lines. By the Way,

Direct current (DC) transmission offers great advantages over AC, however:

- a) **The DC transmission lines have 25% of lower line losses as compared to the AC transmission lines.**
- b) **DC transmission has two to five times the capacity of an AC line at the similar voltage.**
- c) **Ability to precisely control the flow of power.**



Figure 16 A 350 kV ABB HVDC Light transmission system that stabilizes weak power networks in Namibia also enables power trading in the expansive region of southern Africa.

Historically, the relatively high cost of HVDC terminal stations relegated the technology to being used only in long-haul applications like the Pacific DC Inertia, which connects the vast hydro power resources of the Columbia River with population centers of southern California. With the advent of new type of HVDC, invented by ABB and dubbed HVDC light, the benefits of DC transmission are now being realized on much shorter distances.

The cross sound cable connecting Long Island and Connecticut is one example of this technology.

FACTS (FLEXIBLE AC TRANSMISSION SYSTEMS) DEVICES

A family of power electronics devices known as Flexible AC transmission systems, or **FACTS**, provides a variety of benefits for increasing transmission efficiency. Perhaps the most immediate is their ability to allow existing AC lines to be loaded more heavily without increasing the risk of disturbances on the systems.



Figure 17 ABB Flexible AC transmission systems (FACTS) installation in Canada

Actual results vary with the characteristics of each installation, but industry experience has shown FACTS devices to enhance transmission capacity by 20-40%. FACTS devices stabilize voltage, and in so doing remove some of the operational safety constraint

that prevent operators from loading a given line more heavily. In addition to the efficiency gains, these devices also deliver a clear reliability benefit.

GAS INSULATED SUBSTATIONS

Most substations occupy large areas of land to accommodate the design requirements of the given facility. However each time power flows through a substation to step down the voltage. More energy is lost as the power flows through the transformer, switches & other equipment's. The efficiency of lower voltage lines coming out of the substation is also markedly lower than their high voltage counterparts.

If power can be transmitted at higher voltage to a substation that is closer to where the energy will be consumed, significant efficiency improvements are possible.

Gas insulated substations essentially take all of the equipment you would find in an outdoor substation and encapsulate it inside of metal housing. The air inside is replaced with a special inert gas, which allows all of the components to be much closer together without the risk of the flashover.



Figure 18 World's one of the largest SF6 gas insulated switchgear installation, at Three Gorges Dam in China: ELK-3 GIS, 73 bays, 550 kV

The result is that it is now possible to locate a substation in the basement of a building or other confined space so that the efficiency of high voltage transmission can be exploited to the fullest content.

SUPERCONDUCTORS / HTS CABLES

Superconducting materials at or near liquid nitrogen temperature have the ability to conduct electrically with nonzero resistance.

So-called high temperature super conducting cables now under development which still require some refrigeration can carry three to five times the power of conventional cables.

The losses in HTS cables are also significantly lower than the losses in conventional lines. Even when the refrigeration cost is included. A major vendor of superconducting conductors claim that the HTS cable losses are only a half a percent (0.5%) of the transmitted power compared to 5-8% of traditional power cables. Superconducting materials can also be used to replace the copper winding of transformers to reduce losses by as much as 70% compared to current designs.



WIDE AREA MONITORING SYSTEM

Much of the transmission system could feasibly be operated at a higher loading, were it not for reliability concerns. However, if operators given the ability to monitor grid conditions more precisely & in real time, some of this constraint would remove.

One example to relates to the simple fact that when transmission lines heat up, the metals becomes pliable and the line sag, which can cause a short circuit if they come in contact with a tree or other grounding objects.

Wide area monitoring system has many promising capabilities, one of which is line thermal monitoring. With this functionality transmission operators could conceivably change the loading of transmission lines more freely by virtue of having a very clear understanding of how close a given line really is to its thermal limits.

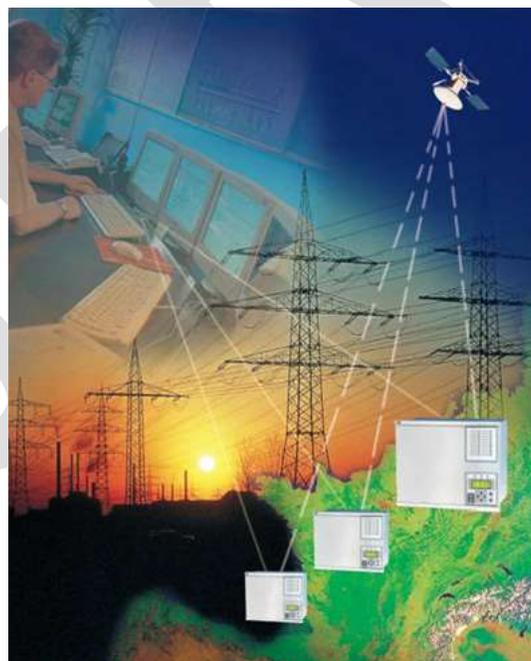


Figure 19 Wide Area Monitoring System

CONCLUSION

The transmission and distribution (T&D) system includes everything between a generation plants to end- use site. Along the way,

some of the energy supplied by the generator is lost due to the resistance of the wires that is line loss and equipment that the electricity passes through. The loss is mainly depends upon the type of transmission and wire resistance. For better transmission we need some special transmission method and good conductor that's what here we are showing some better methods for transmission and distribution from this all methods we can reduce the T&D losses

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Predicting Surface Roughness, Tool Wear and MMR in Machining Inconel 718: A Review

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Abstract- Increasing the productivity and the quality of the machined parts are the main challenges of manufacturing industry, in particular for heat resistant super alloys employed in aeronautic and aerospace applications. Superalloy, Inconel 718 is widely used in the sophisticated applications due to its unique properties. However, machining of such superior material is difficult and costly due its peculiar characteristics. The present article is an attempt to suggest optimization technique to study the machinability of Inconel 718 with respect to cutting parameters (speed feed, depth of cut) on output parameters such as surface roughness(Ra) and material removal rate (MMR) in high speed turning of Inconel 718 using cemented tungsten carbide (K20) cutting tool. Cost effective machining with generation of good speed, feed depth of cut. The output parameters like surface finish tool wear and metal removal rate can also be optimized for economical production.

Key words- CNC, MRR, Ra

1 Introduction

Turning processes comprise a very big portion of metal cutting process in industry. For the determination of ideal machinability properties, those parameters such as mechanical material properties, machine tool rigidity, feed rate, depth of cut, cutting speed and cutting tool geometry play an important role in machining. Cutting speed is the main parameters that affect machinability properties of the material. Although Inconel 718 can be machined by using cemented carbide tools at low cutting speeds, it must be machined by ceramic tools at higher cutting speeds. But the problem of machining inconel 718 is one of ever increasing magnitude due to extreme toughness and work hardening characteristics of the alloy.

Nickel-based alloys account for 80% of the super alloy, with the remainder being iron and cobalt based. Approximately 45–50% of the total material requirements for a gas turbine engine are met using nickel alloys. The properties that make nickel-based super alloys possess high yield strength (retained to approximately 750 °C), high ultimate tensile strength, high fatigue strength, retention of corrosion and oxidation resistance up to elevated temperatures and good creep resistance. Nickel and nickel-based alloys especially Inconel 718 is widely used in many industries, owing to its unique properties such as high oxidation resistance, corrosion resistance even at very high temperatures, and retains a high

Tool materials with improved room and elevated temperature hardness like cemented carbides (including coated carbides), ceramics and cubic boron nitride (CBN) are frequently used for machining nickel base superalloys. Despite recent advances in cutting tool materials, machining of nickel base superalloys at high speed conditions generally reduces the hardness and strength of cutting tools. Most of the literature advocates that the use of different tool materials such as ceramic tool materials like Al₂O₃/TiC mixed ceramics, Si₃N₄ ceramics: Sialon, latest SiC whisker reinforced Al₂O₃ ceramics (&25% SiC whiskers), multilayer (TiN/TiCN/TiN) coated carbide tools produced by the physical vapor deposition (PVD) technique, Cubic boron nitride (CBN) cutting tools, etc., appears to give better overall performance than cemented tungsten carbides while machining nickel-based alloys. Though the performance wise for the above mentioned tools are better, their cost limits the use in the engineering applications

Cemented tungsten carbide cutting tools are the oldest among the hard cutting tool materials. Cemented tungsten carbide tools are mainly used for continuous cutting operations. Over the years, the use of carbides for cutting tools has been established. Carbide tools are used to machine Inconel 718 in the speed range of 10–30 m/min. However, with the increasing demand to achieve fast material removal rate and better surface quality, high speed machining was introduced. For nickel-based alloys, the concept of high speed machining refers to speeds approximately over 40 m/min

2 Literature Review

It is essential to understand the past and present status of the machining of Inconel 718 process to suggest future areas of work. Extensive literature survey has been carried out to find the state of machining of Inconel 718.

Liao and Shiue (1996) analysed the wear mechanism of two cemented carbide tools K20 and P20 grades in dry turning of Inconel 718. The feed rate and the depth of cut were 0.10 mm/rev and 1.5 mm, respectively. The cutting speed was either 35 or 15 m/min. On the wear surface of the K20 carbide observation found that the sticking layer very close to the cutting edge was observed. Built-up edge was formed at a cutting speed of 35 m/min with chipping of the cutting edge. When P20 carbide was used, the sticking layer also could be found, but comparatively the wear was more irregular, the flank wear length was larger and the groove was deeper.

Rahman et al. (1997) revealed the machinability of Inconel 718 subjected to various machining parameters including tool geometry, cutting speed and feed rate. Flank wear of the inserts, workpiece surface roughness and cutting force components have been considered as the performance indicators for tool life. Tool life found to be increased as the SCEA increases from - 5 to 45°. This gives improved heat removal from the cutting edge, distributes the cutting forces over a larger portion of the cutting edge, reduces tool notching and substantially improves tool life. The PVD–TiN coated carbide insert exhibited excellent resistance to depth of cut notch wear at the approach angles of 15° and 45°

Dudzinski et al. (2004) in their study taken a review of developments towards dry and high speed machining of Inconel 718 alloy and presented recent work and advances concerning machining of this material. In addition, some solutions to reduce the use of coolants are explored and different coating techniques to enable a move towards dry machining are examined. Cemented carbide tools are largely used for machining nickel-based alloys at very low cutting speeds of 20–30 m/min, the K20 grade appears to be the best for cutting Inconel 718.

Krzysztof Jemielniak (2005) did comparison of cutting performance of several cemented carbide and CBN tools in finish turning ($a_p=0.2$ mm and $f=0.08$ mm/rev) of Inconel 718 and investigated that cutting forces are not always higher using CBN tools than using carbide tools. On the other hand, tool life of the best carbide tools appeared to be comparable with some of CBN tools. Generally cutting force values obtained using CBN tools were higher than those obtained using carbide tools, which is understandable having in memory special preparation of cutting edge of such tools.

I A Choudhury (1998) In this paper a general review of their material characteristic and properties together with their machinability assessment when using different cutting tools. The advantages and disadvantages of different tool materials with regard to the machining Inconel are highlighted. Uncoated carbide tool are better than coated tool for machining Inconel 718 apparently the coating does not improve the performance of coated tool

Benardos and Vosniakos (2003) presented the various methodologies and practices that are being employed for the prediction of surface roughness. It gave a review of the different approaches that are used for predicting the surface roughness and certain remarks concerning each approach. As is evident- from the referenced papers, in recent years there has been a great deal of research activity in the field and the results that have been produced are good. The trend that is formed encourages more automated systems building for on-line monitoring, measuring or control and is mainly driven by the fact that the processes themselves have been automated to a great extent. All the methodologies that are presented here can exhibit advantages and disadvantages when compared to one another, but

given this trend the most promising seem to be the theoretical and the AI approaches. A comparison of these two approaches reveals that AI models take into consideration the particularities of the equipment used and the real machining phenomena, information that is stored in the experimental data used to develop the models

Dudzinski *et al.* (2004) in their study taken a review of developments towards dry and high speed machining of Inconel 718 alloy and presented recent work and advances concerning machining of this material. In addition, some solutions to reduce the use of coolants are explored and different coating techniques to enable a move towards dry machining are examined. Cemented carbide tools are largely used for machining nickel-based alloys at very low cutting speeds of 20–30 m/min, the K20 grade appears to be the best for cutting Inconel 718

Abdullah Altin (2007) has study the effect of cutting speed and cutting tool geometry on cutting force metal removing process is carried out for four different cutting speed while constant feed and depth of cut As a result of experiments the lowest mean cutting force which depends on tool geometry is obtain as 672N with KYON2100SNGN120 712 ceramic tool maximum cutting force is determinated as 1346 N with the cersmic cutting tool having KYON4300 RNGN120 700 geometry

Ezugwu (2007) revealed the recent improvements in the machining of difficult-to-cut aerospace super alloys. A positive rake cutting edge is recommended for semi finishing and finishing operations whenever possible. Positive rake geometry minimizes work hardening of the machined surface by shearing the chip away from the workpiece in an efficient way in addition to minimising built-up-edge. Using a large nose radius wherever part geometry does not demand otherwise can reinforce the cutting edge. Thakur and Ramamurthy (2009) has optimized of high speed turning parameter of Inconel 718 using taguchi technique. The optimal parameters observed were cutting speed 75 m/min, feed 0.08 mm/rev and depth of cut 0.5 mm Thakur *et al.* (2009) attempted to use Taguchi optimization technique to study the machinability of Inconel 718 with respect to cutting force, cutting temperature, and tool life in high speed turning of Inconel 718 using cemented tungsten carbide (K20) cutting tool. It was demonstrated a correlation between cutting speed, feed, and depth of cut with respect to cutting force, cutting temperature, and tool life in a process control of high speed turning of Inconel 718 in order to identify the optimum combination of cutting parameters, It also revealed the effect of high speed cutting parameters on the tool wear mechanism and chip analysis

Thakur *et al.* (2009) did experiments on machining of Inconel 718 on lathe and proposed investigations of high speed turning on Inconel 718 using Taguchi optimization technique for cutting force, cutting temperature, and tool life in high speed turning of Inconel 718 using cemented tungsten carbide (K20) cutting tool. A correlation between cutting speed, feed, and depth of cut with respect to cutting force, cutting temperature also demonstrated in order to identify the optimum combination of cutting parameters. Mathew (2010) introduced aluminum as a versatile and attractive lightweight automotive material with significant cost savings. Standard surface roughness prediction methodologies were explored. Parameters affecting surface roughness of machined surfaces were detailed along with practical recommendations to improve surface quality

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Ahmad Yasir Moh (2011) has focus on the tool performance when finish turning Inconel 718 using single layer PVD coated TiAlN carbide insert at high cutting speed at various cutting speeds, depth of cut and feed rate under dry cutting condition . He concluded that the most significant factor that influences the flank wear or tool life at high cutting speed and dry machining is depth of cut followed by feed rate and cutting speed, respectively. Tool life is significantly influenced by temperature generated at the cutting zone

when machining Inconel 718 under dry cutting condition. Increasing the cutting speed and depth of cut affected the tool life and promoted wear progression..

V Dhanalakshmi (2010) she mainly studies on wear analysis if ceramic cutting tool the experiment result indicate that the cutting speed is the most significant factor to overall performance the correlation with cutting speed and feed with tool wear and surface are obtained by variable linear regression it has been found that the less tool wear and good surface finish are obtained using ceramic tool when finished turning inconel at low speed the optimum cutting condition for good surface finish is 100 mm/min. and 0.1 mm/rev the tool failure are obtained when cutting speed of 200m/min and feed rate of 0.15mm/rev and has concluded that performance is better at low cutting speed

Ahmad Yasir Moh (2011) has focus on the tool performance when finish turning Inconel 718 using single layer PVD coated TiAlN carbide insert at high cutting speed at various cutting speeds, depth of cut and feed rate under dry cutting condition . He concluded that the most significant factor that influences the flank wear or tool life at high cutting speed and dry machining is depth of cut followed by feed rate and cutting speed, respectively. Tool life is significantly influenced by temperature generated at the cutting zone when machining Inconel 718 under dry cutting condition. Increasing the cutting speed and depth of cut affected the tool life and promoted wear progression.

Colak (2012) deals with experimental investigation on machinability of Inconel 718 in conventional and alternative high pressure cooling conditions The experiment results have prove that the tool flank wear and cutting forces considerably decrease with the delivery of high pressure coolant to the cutting zone. Moreover, ANOVA results also indicate that high pressure cooling has a significant beneficial effect on cutting tool life

Tran Minh-Duc (2013) In his study, an attempt has been conducted to investigate the effects of cutting parameters on tool wear and surface roughness during hard turning of Inconel 718 material. By taking into account the Analysis of Variance (ANOVA) in accordance to Central Composite Design (CCD); the mathematical model of the flank wear and surface roughness are developed with transformation of the natural logarithm. when machining at higher cutting speed, around 50-75m/min, the surface roughness is significantly improved due to the disappearance of built-up-edge. However, due to the hard particles of the Inconel 718 material against the cutting tool, the abrasive wear increases rapidly at high cutting speed, more than 90m/min. As evidenced from this paper, in order to achieve a high surface quality with low cutting tool wear, a cutting speed in the range of 50- 70 m/min is highly recommended for the hardened Inconel 718 using PVD coated cutting tool

3 Conclusions and discussion

The current work presented a review of the different approaches that are used for predicting the surface roughness tool wear and MRR certain remarks concerning each approach can be found in the respective sections. As is evident from the referenced papers, in recent years there has been a great deal of research activity in the field and the results that have been produced are good. The trend that is formed encourages more automated systems building for on-line monitoring, measuring or control and is mainly driven by the fact that the processes themselves have been automated to a great extent. All the methodologies that are presented can exhibit advantages and disadvantages when compared to one another, but given this trend the most promising seem to be the theoretical and taguchi which gives more advantages and negligible disadvantages

Inconel 718 retain high strength at the temperatures typically encountered during cutting leading to high cutting forces and high temperatures in the shear zone which causes plastic deformation of the cutting tool edge. These alloys also contain inclusions of

highly abrasive carbide particles (that improve creep resistance) and show a tendency to work-harden which leads to abrasive wear of the tool, particularly at the leading edge and depth-of-cut positions. These alloys appeared to be difficult to machine because of a tendency of the maximum temperature of tool face existing at the tip of the tool. Due to precipitating the hard secondary phase of (Ni_3Nb) during machining, it makes the cutting condition even worse. All these difficulties lead to serious tool wear and less material removal rate (Rahman et al., 1997; Choudhury and El-Baradie, 1998). Welding and adhesion of worked material onto the cutting tool frequently occur during machining causing severe notching as well as alteration of the tool rake face due to the consequent pull-out of coating and tool substrate. For the coated carbide tools, the right selection of the tungsten carbide cobalt alloy for the substrate, the associated coating materials, the coating procedure and the cutting conditions choice are the main problems.

As Inconel 718 works harden rapidly, having low thermal conductivity, high strength and high pressures produced during machining cause a hardening effect that makes further machining more difficult. Severe tool injury usually occurs in cutting this material. Rapid tool wear and its influence on surface quality in machining have long been recognized as a challenging problem. Hence careful machining practices are must.

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Improved sorted switching median filter for removal of impulse noise

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Abstract— Digital image processing plays important role in our daily life. Digital Image Processing involves the modification of digital data for improving the image qualities with the aid of computer. The processing helps in maximize the clarity, sharpness of image and details of features of interest. The digital image is given as input into a computer and computer is programmed to change data with the help of various computations and then store the values of the computation for each pixel. Noise is defined as unwanted signals. The noise is removed with the help of image denoising algorithm. In this paper a filtering algorithm, improved sorted switching median filter (ISSMF) is introduced. In this algorithm two phases are included. In the first phase, the processing pixel is checked whether it is corrupted or uncorrupted. If processing pixel is uncorrupted then it remains unchanged and if processing pixel is corrupted then it is passed to second phase. In the second phase the filtering process is applied to corrupted pixel and value of corrupted pixel is replaced with the calculated median value using ISSMF. In order to preserve the edges detail, the gradient smoothing is applied. Several extensive simulation results conducted on both grayscale and color images with various density levels and ISSMF performs better than the existing median-based filters.

Keywords—Digital image, Processing pixel, Impulse noise, Denoising, ISSMF, Edge detection, Gradient, PSNR, MSE, RMSE, BER.

INTRODUCTION

With advancement in technology, the digital image processing plays important role in various areas such computational biology, digital art, education, web design, graphics design, virtual reality etc. The digital images are corrupted with the impulse noise during image acquisition, recording and transmission. The image denoising is used to remove the noise from image. Image denoising involves the manipulation of the image data to produce a visually high quality image. The major property of a superior image denoising model is that it must completely eliminate noise as far as possible as well as preserve edges. In the improved sorted switching median filter method the processing pixel is checked whether it is corrupted or uncorrupted. If the value of processing pixel is between the minimum (0) and maximum (255) then it is treated as uncorrupted pixel. If the value of processing pixel is either minimum (0) or maximum (255) then it is treated as corrupted pixel, the value of corrupted pixel is replaced with the median value.

RELATED WORK

The noise removal is essential part of the image processing. Various methods are introduced to suppress the noise while preserving edge details. One of the most common method is median filter. It is reliable method to remove the impulse noise with preserving the edge detail, but the major disadvantage of median filter is that it operates well at lower intensity level [1]. Adaptive median filter has a variable window size for removing impulse noise while preserving sharp-ness [4]. A progressive switching median filter was developed using a switching scheme and progressive method to denoise progressively through several iterations [6]. A nonlinear filter, called tri-state median filter is developed for preserving image details while effectively suppressing impulsive noise. The standard median filter and the center weighted median (CWM) filter are incorporated into noise detection framework to determine whether a pixel is corrupted before applying the filtering operation [7]. A novel switching median filter is developed for effectively denoising extremely corrupted images is. To determine whether the current pixel is corrupted or uncorrupted, the algorithm first classifies the pixels of a localized window, centering on the current pixel, into three groups-lower intensity impulse noise, uncorrupted pixels, and higher intensity impulse noise [9]. A new decision-based algorithm is used for restoration of images that are highly corrupted by impulse noise. The proposed method removes only corrupted pixel by the median value or by its neighboring pixel value [10]. A new method is developed which uses the concept of substitution of noisy pixels by linear prediction prior to estimation. The objective of algorithm is removal of high-density salt and pepper noise in images [11]. A new algorithm is introduced to remove high-density salt

and pepper noise using modified shear sorting method. The new algorithm has lower computation time when compared to other standard algorithms [12]. Various hybrid filtering techniques are introduced for removal of Gaussian noise from medical images. The performance of Gaussian noise removal using hybrid filtering techniques is measured as RMSE and PSNR [14]. Adaptive Two-Stage Median Filter (ATSM) is used to denoise the images corrupted by fixed-value impulse noise. In Adaptive Two-Stage Median Filter (ATSM), the corrupted pixels are checked. For each window W , if the central pixel M_{ij} is corrupted then its intensity is estimated using the principle of ASTM. Standard 5-point formula is used for computing the median [17]. A Switching Non-Local Means (SNLM) filter is presented for high-density salt and pepper noise reduction. Firstly, the impulse noises are detected, based on the fact that their values must be the extreme gray-level of the image. Then, at the filtering stage, the noise-free pixel remains unchanged and noisy pixels are restored using a modified non-local mean filter. However, to calculate the weights of the filter, only noise-free pixels are considered [20]. A hybrid filtering technique is used to enhance the image. In this curvelet transformation, median filter and unsharp mask filters are collectively used to denoise the noise [21]. A novel Sorted Switching Median Filter is used for denoising extremely corrupted images while preserving the image details. The center pixel is considered as "uncorrupted" or "corrupted" noise in the detecting stage. The corrupted pixels that possess more noise-free surroundings will have higher processing priority in the SSMF sorting and filtering stages to rescue the heavily noisy neighbors [22].

METHODOLOGY

In improved sorted switching median filter algorithm, the processing pixel is checked whether it is corrupted or uncorrupted. If the value of processing pixel is between the minimum (0) and maximum (255) then it is treated as uncorrupted pixel. If the value of processing pixel is either minimum (0) or maximum (255) then it is treated as corrupted pixel. The value of corrupted pixel is replaced with the median value. If all the values around the processing pixel is 0's and 255's then the value of processing pixel is replaced with the best optimized value. If some values around the processing pixel are 0's and 255's then calculate the median by trimming all 0's and 255's and replace the value of processing pixel with the calculated value. In order to preserve edge details, the gradient smoothing is applied.

PERFORMANCE PARAMETERS

The various performance parameters are available for measuring the quality of the image in terms of qualitative and quantitative measures. In this paper we will calculate the performance of the image in terms of PSNR, MSE, RMSE, BER.

PSNR (Peak Signal To Noise Ratio)

PSNR is defined as the ratio between maximum power of a signal to the power of corrupting noise. It is expressed in the form of logarithmic decibel. If the PSNR will be higher, the quality of image will be higher and is calculated as:

$$PSNR = 10 \log_{10} \frac{L^2}{MSE}$$

MSE (Mean Square Error)

MSE is defined as mean of square of the difference of the estimated values and the observed values and is calculated as:

$$MSE = \frac{1}{n} \sum_{i=1}^n (\hat{Y}_i - Y_i)^2.$$

BER (Bit Error Rate)

The bit error rate or bit error ratio (BER) is the number of bit errors divided by the total number of transferred bits during a studied time interval. BER is a unit less performance measure, often expressed as a percentage.

RMSE

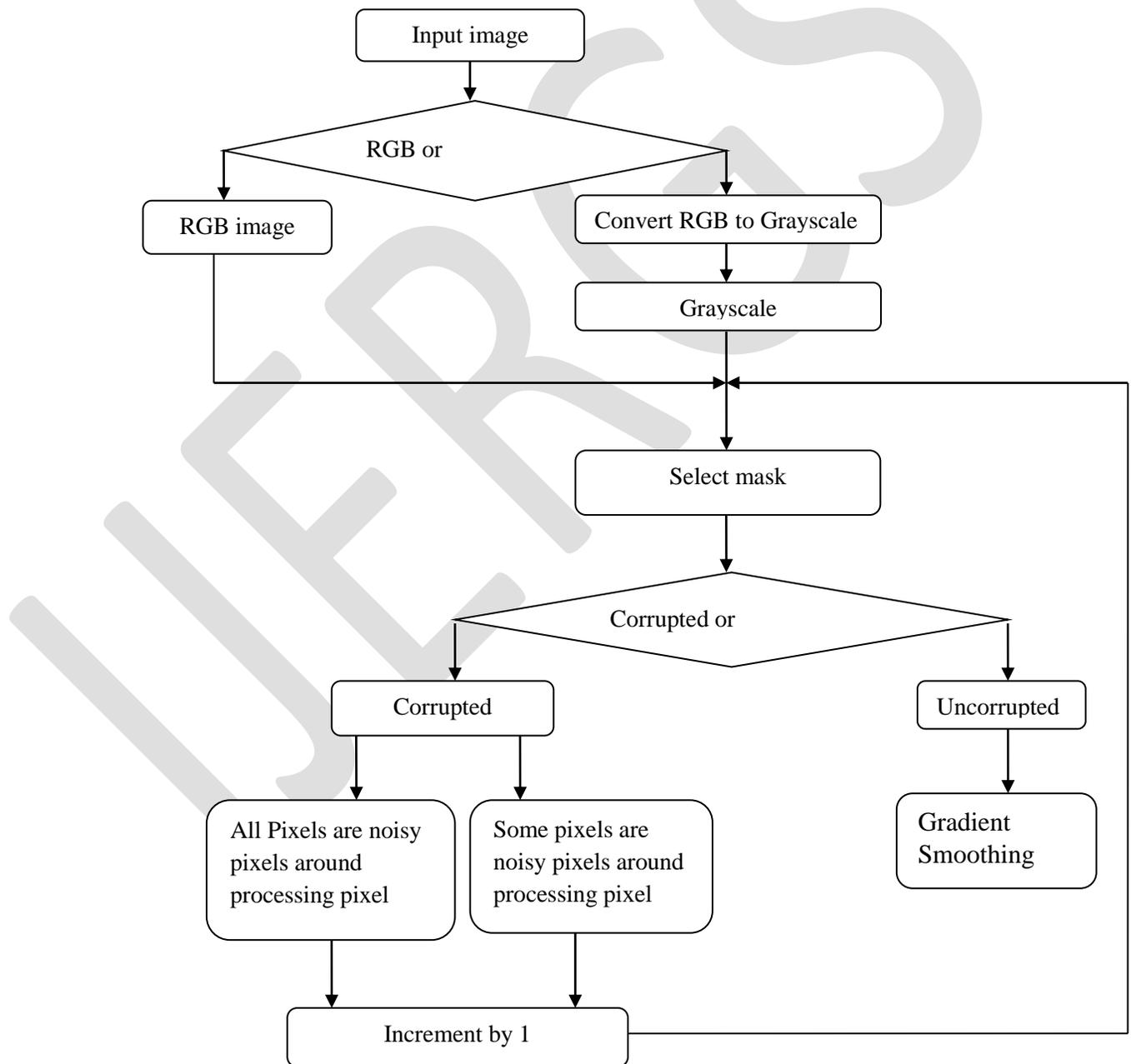
The root-mean-square error (RMSE) is a frequently used measure of the differences between values predicted by a model or an estimator and the values actually observed. The square root of mean square error is known as root mean square error.

RMSE is calculated as

$$\text{RMSE}(\hat{\theta}) = \sqrt{\text{MSE}(\hat{\theta})} = \sqrt{E((\hat{\theta} - \theta)^2)}.$$

FLOWCHART

Flowchart for improved sorted switching median filter is given below:



EXPERIMENTAL RESULTS

The experimental results are performed on color images as well as on grayscale images. The result of proposed filter is better than the existing filters. The result of various images are performed at noisy density 0.5. The tables(1.1-1.4) and figures(1.1-1.4) shown results.

PSNR Values at noise density 0.5						
Images	Noisy	Median	Adaptive	PSMF	SSMF	Proposed
Image1	7.6972	14.3669	18.7157	19.3456	24.2747	27.2318
Image2	8.062	14.5135	18.2541	18.8162	23.6748	24.7264
Image3	8.1521	14.8572	19.6428	20.6412	26.0089	29.5575
Image4	7.2833	13.9213	18.1005	19.3513	23.8011	26.0625
Image5	7.9680	14.9606	19.9157	21.0807	26.3124	31.4098

Table 1.1 PSNR of various images

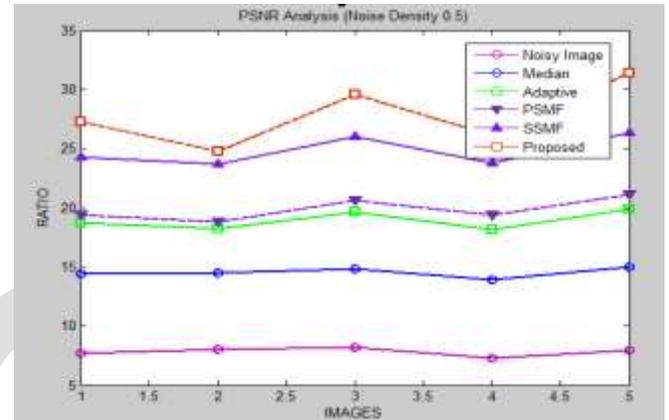


Figure 1.1 PSNR of various images

MSE Values at noise density 0.5						
Images	Noisy	Median	Adaptive	PSMF	SSMF	Proposed
Image1	11050	2379	874	756	243	123
Image2	10164	2300	972	854	279	219
Image3	9951	2125	706	561	163	72
Image4	12155	2636	1007	755	271	161
Image5	10382	2075	663	507	152	45

Table 1.2 MSE of various images

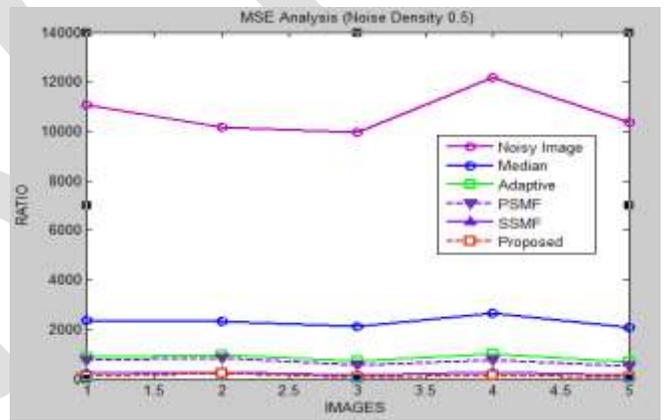


Figure 1.2 MSE of various images

BER Values at noise density 0.5						
Images	Noisy	Median	Adaptive	PSMF	SSMF	Proposed
Image1	0.1299	0.0696	0.0534	0.0517	0.0412	0.0367
Image2	0.1241	0.0689	0.0548	0.0531	0.0422	0.0414
Image3	0.1227	0.0673	0.0509	0.0484	0.0384	0.0338
Image4	0.1373	0.0718	0.0552	0.0517	0.0420	0.0384
Image5	0.1255	0.0688	0.0502	0.0474	0.0380	0.0318

Table 1.3 BER of various images

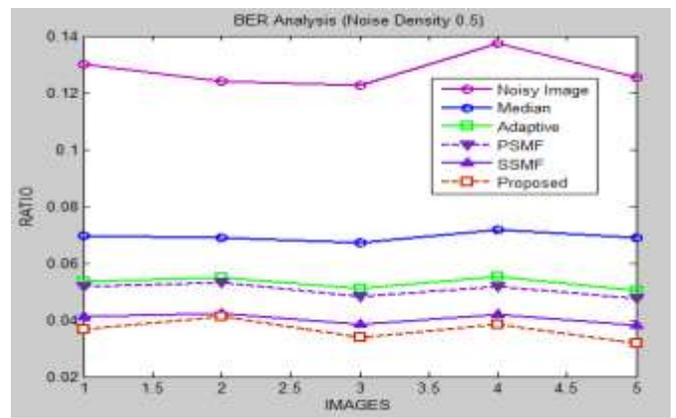


Figure 1.3 BER of various images

RMSE Values at noise density 0.5						
Images	Noisy	Median	Adaptive	PSMF	SSMF	Proposed
Image1	105.1119	48.7750	29.5637	27.4955	15.5885	11.0905
Image2	100.8167	47.9543	31.1769	29.2233	16.7033	14.7986
Image3	99.7547	46.0977	26.5707	23.6854	12.7671	8.4853
Image4	110.2497	51.3420	31.7333	27.4773	16.4621	12.6886
Image5	101.8921	45.5522	25.7488	22.5167	12.3288	6.8557

Table 1.4 RMSE of various images

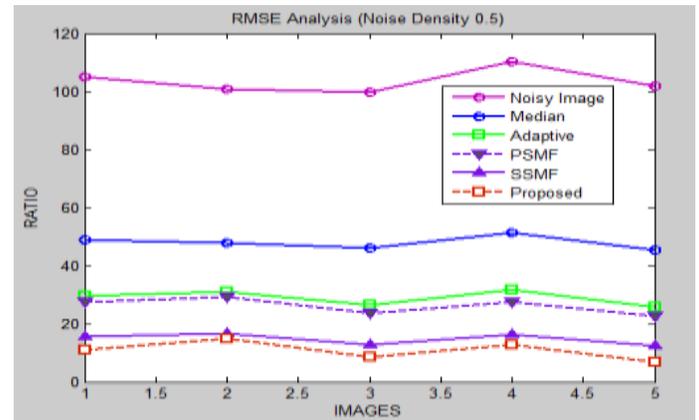


Figure 1.4 RMSE of various images

CONCLUSION

The proposed algorithm identifies the corrupted or uncorrupted pixel. After identification the algorithm replaces the value of processing pixel. The experimental result shows that the proposed algorithm performs better than the existing algorithms.

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IJERGS

Contrasting various Skull Identification Schemes: A Review

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Abstract— One of the most noticeable disciplines in forensic medicine is human identification. When this task is done by reviewing the skeleton remains, we refer to the area of Forensic Anthropology. Over the past few decades, anthropologists have paid their attention on improving those techniques that allow a more precise identification. Hence, Forensic Identification has become a very active research area & Skull identification has been emerging as a vital field in this discipline. The existing methodologies rely essentially on the accurate abstraction and depiction of the intrinsic relationship between the skull and face in terms of the morphology, which still remain unresolved. They have high ambiguity and a low identification capability. Thus we are establishing this technique with the help of CCA (Canonical Correlation Analysis) & ICAAM (Inverse Compositional Active Appearance Model) which in which model parameters are institute to maximize the “match” among the input image and the model instance. Then the model parameters are used in any application. For example, the parameters might get delivered to a classifier to yield a face recognition algorithm. Moreover we are focusing on 3D face models reconstructed from 2D face photos, by this way non-intrusive 3D face data capture will become readily available and cost proficient; the construction of huge 3D face databases will be feasible in the field of communal security. The suggested technique will surely come into an extensive application.

Keywords— Canonical Correlation Analysis (CCA), Inverse Compositional Active Appearance Model (ICAAM), Forensic Anthropology, Morphology, Skull Identification, Forensic facial reconstruction.

INTRODUCTION

Forensic facial reconstruction is the art of regenerating the face of an unknown individual from their skeletal remains through the combination of artistry, forensic science, anthropology, osteology, and anatomy. It is one of the most subjective as well as most controversial technique in the field of Forensic Anthropology. Skull Identification has drawn wide attention and been applied in huge number of forensic cases, ranging from the identification of victims of the Indian Ocean tsunami [1], Uttarakhand disaster to the identification of terrorists. Skull identification technique is far different than the various techniques which are based on biological features like DNA Fingerprinting.

However, due to the computational complexity, expensive equipment and fussy pretreatment, 3D technology is yet not used widely in practical applications. Generally, 3D face recognition systems require that probe and gallery set are both 3D face data. However, in some application, there are only 2D images available for recognition (assuming the enrollment is done), such as the low resolution mugshot on ID card or the snapshot captured by video surveillance camera. The conventional 3D face recognition system cannot work under these circumstances. The second disadvantage of the 3D face recognition system lies in its 3D data acquisition equipment. To procure the accurate 3D face data, some very pricy equipment must be used, like 3D laser scan or stereo camera system. These techniques are not as even and proficient as 2D cameras, and for some cases such as the stereo camera system, standardization is needed before use. Moreover, both of them will take a longer time to obtain (or reconstruct) the 3D face data compared with the 2D camera only taking the 2D images. Besides, in some applications there is not so much time to capture user's 3D face data on-site, such as airport access control or E-passport. Respecting these facts, 3D face recognition is still not as applicable as 2D face recognition.

This paper is organized as follows: Various Schemes and Literature survey are discussed in section I, proposed scheme is discussed in section II, comparative analysis of different schemes is conducted in section III and section IV gives the conclusion.

I. REVIEW OF LITERATURE

This section describes the various existing schemes which are compared in this paper [10][15-18].

Anthropometric Information.

It is an approach that modifies the existing multiresolution scheme to locate the face in an image. After the face is located successfully, the 2-D position of feature points can be obtained and then the 3-D facial model can be estimated. Since only front-view facial image is required for model synthesis, we do not need two cameras simultaneously and the “pre-processing stage.” All it need is for the subject to sit right in front of the camera for front-view facial image capturing that is available in many applications, such as news broadcasting or video conferencing. Firstly it randomly select ten front-view facial images from the database to construct facial templates. These images are face-only and each is appropriately resized and aligned to encompass facial regions ranging from upper eyebrow to lower lips & then average these ten facial images to obtain a level-0 facial template (size 256*256).

Kernel Canonical Correlation Analysis (KCCA).

They manually situate 34 points as landmark from each facial image and then transfer these geometric points into a label edge graph (LG) vector with the help of Gabor wavelet transformation to represent the facial features. While for training every facial image, the semantic ratings explaining the basic expressions are grouped into a six-dimensional semantic expression vector. KCCA is a nonlinear extension of CCA via the “kernel trick” to overcome the singularity problem of the Gram matrix by simply adding a regularization to the Gram matrix such that the Gram matrix becomes invertible. Theoretical optimality of canonical vectors can only be guaranteed via complete bases. Computationally this leads to the problem of estimating the dimensions of the effective feature spaces by looking at the eigenspectra of the kernel Gramians during the computation of KCCA.

Face Matching using Volumetric Data.

The customary manual method for regenerating a face is to reconstruct the head using a cast of the identified skull as a basis. It requires an skillful knowledge of anatomy as well as artistic cleverness. This method recognizes skull which is to be scanned by a CT scanner to gather volumetric data. A reference head is chosen that has the equal sex, racial and age characteristics as the recognized skull & a correspondence is created between the two heads, and through this the soft tissue from the reference head is profiled onto the discovered skull giving a candidate face for the unknown person. the most significant being the fact in this method is that the reconstruction is based upon one view in the direction of the viewing angle, which causes some tissue such as the ears not be be reconstructed, removing this restriction has implications for several stages of the pipeline [18].

Weighted and Fuzzy-Set-theory-based landmarks.

It is a method based on an evolutionary algorithm which superimposes automatically the 2-D face photo and the 3-D skull model with the aim to conquer the drawback that are related to the various sources of uncertainty, which are currently in the problem. Completely two different approaches to solve the imprecision are proposed, which are fuzzy-set-theory-based and weighted landmarks [9].

Craniofacial Superimposition & Craniofacial Reconstruction.

Craniofacial superimposition is a practice that leads to recognize a person by overlaying a photograph and a copy of the skull. This technique is generally carried out physically by forensic anthropologists; thus being very lengthy, time consuming and showing several difficulties in finding a proper fit among the 3D model of skull and the 2D face photo. Hence Craniofacial Reconstruction becomes quite tedious when performed through superimposition. It mainly uses Principle component analysis (PCA) is a powerful tool for building statistical shape models. PCA finds the major and minor modes of the shape variation across the training dataset and represents a mean normalized shape as a combination of variation modes & lastly To boost the matching accuracy, this method has divided the skull and face skin into five physiological feature regions, establish five correlation analysis models, and make a decision by model fusion.

II. PROPOSED SCHEME

Various Skull Identification schemes are discussed in the above section this section focuses on the enhanced scheme which overcomes all the drawback of previous schemes. Therefore the mentioned research work is being implemented through CCA. CCA is a powerful multivariate analysis method [3]. It has various applications in pose estimation [8] and face matching [15]. For two sets of variables, CCA is to construct the CCA subspace to mutually maximize the correlation between these two sets variables. This method consists of two steps. In learning step, 2D-3D face data pairs are given as a subjects for training, & similar steps like PCA is firstly employed on 2D face image and 3D face data to avoid the curse of di-mensionality and minimize noise & then CCA regression is performed in between features of 2D-3D in the preceding subspaces. In the recognition step, 2D face image is given as a probe, the correlation between probe and gallery is evaluated as corresponding score by using the learnt re-gression [2] or face recognition task, different parts of face do not have the same contribution to the final recognition results.

The correlation obtained through CCA will be transferred to ICAAM (Inverse Compositional Active Appearance Model) [17] where, 3D figure of the object and the geometry of the camera are involved as part of the minimizing parameters of the AAM algorithm in order to decide the full 6 degree-of-freedom (DOF) view of the object. This work is a bifold, major advancement of this method is, first by employing the inverse compositional algorithm to the image alignment phase and second, by integrating the image gradient information into the same image alignment formulation. Both phases make the method not only more time efficient, but they also increase the tracking accuracy, especially when the object is not rich in texture. Moreover, since this method is appearance-based, it does not require any customized feature extractions, which also translates into a more flexible alternative to situations with cluttered background, complex and irregular features.

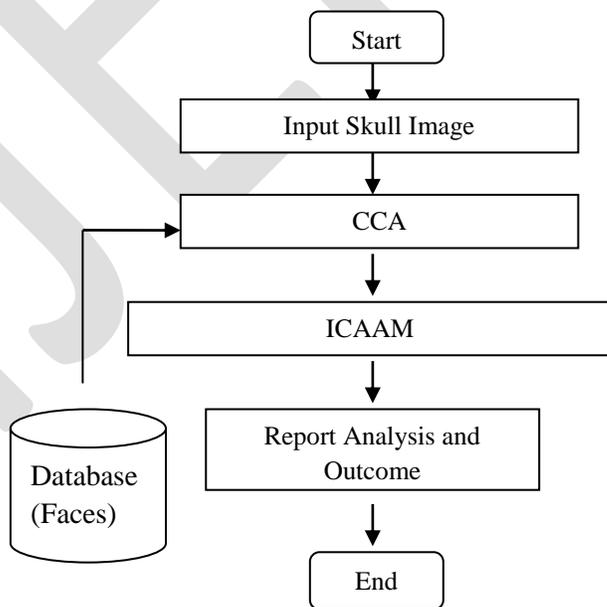


Fig. 1.Content Flow Architecture

Active Appearance Models (AAMs) and the strongly related concepts of Active Blobs and Morphable Models are the generative models of visual phenomenon. Even though linear in both shape and appearance, in terms of pixel intensities AAMs are the nonlinear parametric models. An efficient fitting algorithm for AAMs depend upon the inverse compositional image alignment algorithm to shows that effects of emergence deviation during fitting can be pre-computed and can be extended to incorporate a global shape normalizing warp, typically a 2D similarity makeover. It also analyse that which of its unique aspects improve AAM fitting performance [17].

III. COMPARATIVE ANALYSIS

A multiresolution scheme [7] is proposed for locating the face in an image and on the basis of this 2-D position of feature points 3D facial model is estimated. this scheme requires only front view facial image hence this method does not requires multiple cameras this scheme lacks in extracting the physiological features.

Some schemes such as [6] indicated in figure.2 uses landmark points from each facial image and convert this geometric points into a label graph vector using the gabor wavelet transform method this scheme has less accuracy as compared to the other schemes. A powerful multivariate analysis method [2] for pose estimation and face matching is proposed along with a patch based method to deal with 2D to 3D face matching problem. Principle component analysis (PCA) is a most commonly used algorithm in forensic science because it minimizes the redundancy of data related to image grouping but simultaneously maximizes the computing complexity and it can only process the faces have the same face expression. While CCA comprises of reducing the error among closest model instance and input image, hence solving a non-linear optimization problem.



Fig. 2. Locating 34-Landmark Points on Face[6].

Patch	1	2	3	4	5	6	7	8	9
Weight	0.5	0.7	0.5	0.4	0.6	0.4	0.2	0.3	0.2

Fig. 3. The Weight of each Patch[2].

The supported features and comparison between different schemes is illustrated in the Table-1.

TABLE I
 COMPARATIVE ANALYSIS OF SCHEMES.

Schemes Features	Anthropo- -metric info.	KCCA	Volum- -etric Data	Weighted & Fuzzy Set Theory	CS & CR	CCA & ICAAM
2D & 3D support	x	x	x	✓	✓	✓
Physiological Features Eradication	x	✓	x	x	✓	✓
Gradient Information	x	x	✓	x	✓	✓
Prophetic Efficiency	✓	x	✓	x	x	✓
Time Draining	x	x	x	x	x	✓

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IV. CONCLUSION

In this paper a comparative analysis of different schemes is given based on their features which briefly describes the various schemes of skull identification. Analysis shows that the proposed scheme overcomes the limitations of other existing schemes also solve the problem of becoming intrusive, costlier and provides better accuracy. An extension to this paper will be published showing the results and evaluation based on parameters mentioned in table-1 of the proposed scheme.

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Decision Support System on Prediction of Heart Disease Using Data Mining Techniques

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Abstract - Hospital Industry collects large amount of data, which is not perfect to diagnose the disease. Mining of huge data must be necessary, to diagnose the disease. Medical industry has rich information but poor knowledge. Mining of data is necessary for discovering the hidden patterns and relationships necessary for decision making. Data Mining Techniques are used in medical decision support system for prediction of various diseases. Prediction or Diagnosis of Heart Disease is one of the most important application of Data Mining Techniques.

This paper describes the diagnosis of heart disease using data mining techniques such as Naive Bayesian and K-Nearest Neighbors (KNN). Traditional support system can answer only simple queries but can not answer complex queries like 'What If'. This system can answer complex queries like what if queries. Using medical attributes such as sex, age, blood sugar, blood pressure etc. can predict the likelihood of Patient having heart disease. Data mining extract the knowledge such as hidden patterns and relationship between medical attributes related to heart disease. This training tool is useful for medical students and nurses for prediction of heart disease.

Keywords- Heart Disease, Data Mining, Decision Support System, Naive Bayesian, KNN, Hospital Data, Diagnosis System etc.

I. INTRODUCTION

Data mining is defined as finding hidden patterns and relationships in a database. it is also called as exploratory data analysis, data driven discovery. Traditional queries access database using a Structured Query Language named SQL [1]. Output of the query consist data from the database that satisfies the query. The output is a subset of the database but it may contain aggregations. Data mining access the database which is different from the traditional access. The data must be cleaned and modified to better support to the mining process. The output of the data mining query is not a subset of the database, instead it is the output of some analysis of the contents of database.

Data mining is used to extract useful information from huge amount of data. It includes various types of areas like machine learning, statistics, pattern recognition,

artificial intelligence and data visualization [2]. Data Mining has different types of models such as predictive and descriptive model. Predictive Model makes a prediction about values of data using known results found from different data. Descriptive model identifies patterns and relationships in data. It explore the properties of data, not to predict new properties. The Predictive models such as Naive Bayesian and KNN are used for the prediction of heart disease.

The huge amount of data from the hospital contains charts, image, text and numbers. Rarely these data are used for clinical decision making. It contain hidden information which can be used for prediction of several diseases. Some hospitals use traditional decision support system which can answer only simple queries but can not answer complex queries. They can answer simple queries such as "How many patients are there having heart disease between the age 30 to 50?". But, they can not answer complex queries like "Predict the probability of patient getting the heart disease from the given record." [3]. Wu, et al proposed that integration of clinical decision support with computer-based patient records could reduce medical errors, enhance patient safety, decrease unwanted practice variation, and improve patient outcome [4].

II. LITERATURE SURVEY

Intelligent Heart Disease Prediction System uses Decision Tree, naive Bayesian and Neural Network was proposed by Sellappan Palaniappan et al, Rafiah Awang [4]. This system answers the complex queries which can not be answered by conventional system. The Diagnosis of Heart Disease using Neural Network was proposed by Niti Guru et al [5]. This system uses sample database of patients' records. In this system input is tested and uses 13 trained attributes such as sex, age, blood pressure etc. When unknown input is given then system compares this input with trained data and produce the list of probable disease.

Enhanced Prediction of Heart Disease with Feature Subset Selection using Genetic Algorithm proposed by m. Anbarasi, e. Anupriya and n.ch.s.n.Iyengar. This system predict the heart disease by reducing the input attributes such as Chest pain type, Resting blood pressure, Exercise Induced angina, old peak, No. of vessels colored, Maximum heart rate achieved. Milan Kumari et al. [6], proposed a system which contain data mining classification techniques such as Decision Tree, Artificial neural networks (ANNs), and Support Vector Machine (SVM). These technique are used for cardiovascular disease dataset. Accuracy of Decision Tree, ANN and SVM are 79.05%, 80.06% and 84.12% respectively. The extraction of patterns from the heart disease warehouse for prediction was proposed by Shantakumar B.Patil et al [7]. First, the data warehouse is pre-processed then the heart disease warehouse is clustered with the K-means clustering algorithm. The patterns which are extracted are mined with the MAFIA algorithm. In addition, the patterns of heart attack prediction are selected. The neural network is trained with the selected patterns for the prediction of heart disease.

III. RESEARCH OBJECTIVE

The main objective of this paper is to predict or diagnose the heart disease using data mining techniques such as Naive Bayesian and KNN algorithm etc. This system generates and extracts hidden information i.e. patterns and relationships between different attributes from the historical heart related database. It can answer complex queries which can not be answered by traditional decision support system. If this system is used, treatment cost may be reduced which is affordable to each and every patient. It also improves the quality of clinical decisions.

IV. DATA SOURCE

A total of 1000 records with 13 attributes were obtained from the database. These records are divided into two dataset i.e training dataset (700) and testing dataset (300). Records for each set are selected randomly to avoid bias. The 'Diagnosis' attribute is used to predict the heart disease with value "2" for patient having heart disease and "1" for patient having no heart disease. The 'PatientID' attribute is used as key and others are input attributes.

Predictable attributes

1. Diagnosis (value 2 – Patient having heart disease and value 1- Patient having no heart disease)

Key Attribute

1. PatientID – Patient's identification number

Input Attributes

1. Age (value 1: <=40, value 2: <=60 and >40, value 3: >60)
2. Sex (value 0: female, value 1: male)
3. Chest Pain Type (value 1:Low, value 2: Medium, Value 3: High, Value 4: Very High)
4. Blood Pressure (value 1:<=80, value 2:<=120 and >80, value 3: >120)
5. Blood Sugar (value 0: Low, value 1: High)
6. Serum Cholesterol(value 1:<=180, value 2:<=400 and >180, value 3: >400)
7. Resting ECG (value 0: normal, value 1: wave abnormality, value 2: showing probable or definite left, ventricular hypertrophy)
8. Heart Rate (value 1:<=120, value 2:<=180 and >120, value 3: >180)
9. Exercise Induced Angina (value 0: Low, value 1: High)
10. Oldpeak (ST depression value 1:<=1, value 2:<=2.5 and >1, value 3: >2.5)
11. Slope of the peak Exercise (value 1: unslopping, value 2: flat, value 3: downslopping)
12. No.of major vessels(value 1:Low, value 2: Medium, Value 3: High, Value 4: Very High)
13. Thal (value 3: normal; value 6: fixed defect; value 7:reversible defect)

Figure 1. Description of Attributes

V. DATA MINING TECHNIQUES

Fayyad defines data mining as "a process of nontrivial extraction of implicit, previously unknown and potentially useful information from the data stored in a database". It is an exploratory data analysis, trying to discover useful patterns in data. This system is implemented using Naive Bayes or Bayes' rule and K Nearest Neighbors (KNN) algorithm.

1. Naive Bayes algorithm

Bayes' rule is the basis for many machine learning and data mining methods [8]. Naive bayes algorithm has been proposed that is based on bayes rule of conditional probability. By analyzing the contribution of each "independent" attribute, a conditional probability is determined. The approach is called "naive" because it assumes the independence between the various attribute values. This algorithm is used to create models with predictive capabilities. Bayes rule is a technique to estimate the likelihood of a property from

the given set of data. Naïve Bayes classification can be viewed as both descriptive and predictive type of algorithm. The probabilities are descriptive and used to predict the class membership for a target tuple

This approach can easily handle missing values by simply omitting that probability when calculating the likelihoods of membership in each class.

1) Algorithm

Given the Hospital data set

1. Estimate the prior probability $P(c_j)$ for each class by counting how often each class occurs in the training data.
2. For each attribute X_i find $P(x_i)$ by counting the number of occurrences of each attribute value.
3. Find probability $P(x_i/c_j)$ by counting how often each value occurs in the class in the training data.
4. Do this for all attributes and all values of these attributes. To classify a target tuple estimate $P(t_i/c_j) = \prod_{k=1}^n P(x_{ik}/c_j)$.
5. Calculate $P(t_i)$. This can be done by finding the likelihood that this tuple is in each class and then adding all this values.
6. Find posterior probability $P(c_j/t_i)$ for each class. It is the product of conditional probabilities for each attribute value.
7. Select class with highest probability value of $P(c_j/t_i)$ value for test tuple

2) Mathematical Formulae

$$P(\text{HeartDis Yes}) = \frac{\text{No.of Records with Result Yes}}{\text{Total no. of Records}}$$

$$P(\text{HeartDis N}) = \frac{\text{No.of Records with Result No}}{\text{Total no. of Records}}$$

$$P(t/\text{yes}) = P(\text{Age (low) yes}) * P(\text{Sex (Male) yes}) * P(\text{BP (High) yes}) * P(\text{Chol (High) yes}) * P(\text{Heart_Rate (High)yes}) * P(\text{Vessels(High)yes}) * P(\text{Chest_Pain(High)yes}) * P(\text{ECG(High)yes}) * P(\text{Exer_angina(High)yes}) * P(\text{old_peak(High)yes}) * P(\text{Thal(High)yes}) * P(\text{Blood_sugar(High)yes}) * P(\text{Slope_peak(High)yes})$$

$$P(t/\text{no}) = P(\text{Age (low) no}) * P(\text{Sex (Male) no}) * P(\text{BP (High) no}) * P(\text{Chol (High) no}) * P(\text{Heart_Rate (High) no}) * P(\text{Vessels(High)no}) * P(\text{Chest_Pain(High)no}) * P(\text{ECG(High)no}) * P(\text{Exer_angina(High) no}) * P(\text{old_peak(High) no}) * P(\text{Thal(High) no}) * P(\text{Blood_sugar(High) no}) * P(\text{Slope_peak(High) no})$$

$$P(\text{Likelihood of yes}) = P(t/\text{yes}) * P(\text{Heart_Disease yes})$$

$$P(\text{Likelihood of no}) = P(t/\text{no}) * P(\text{Heart_Disease no})$$

Now we find the total probability,

$$P(\text{yes}/t) = \frac{P(t/\text{yes}) * P(\text{Heart_Disease yes})}{P(T)}$$

$$P(\text{no}/t) = \frac{P(t/\text{no}) * P(\text{Heart_Disease no})}{P(T)}$$

If $P(\text{yes}/t) \geq P(\text{no}/t)$ then input query is classified as Heart Disease category
Else No Heart Disease category

B. K Nearest Neighbors Algorithm

One common classification scheme based on the use of distance measures is that of K Nearest Neighbors (KNN). K-NN is a type of distance-based learning. The k-nearest neighbor algorithm is amongst the simplest of all machine learning algorithms. KNN is a *non-parametric lazy learning* algorithm. It means that it does not make any assumptions on the underlying data distribution. This is very useful, as in the real world most of the practical data does not obey the typical theoretical assumptions. The KNN technique assumes that the entire training set includes not only the data in the set but also the desired classification for each item. When a classification is to be made for a new item, its distance to each item in the training set must be determined. Only the K closest entries in the training set are considered further. The new item is then placed in the class that contains the most items from this set of K closest items.

1) Algorithm

Given the Hospital Data Set

1. Enter the value of K

2. Give the Input Query
3. Find the Square Distance to Query Instance
4. Map Square Distance w.r.t. Output and Store it in Array
5. Sort the Square Distance and also sort the Output w.r.t. Square Distance
6. Find out the Count of Yes_Heart_Disease and No_Heart_Disease up to the K
7. Compare Yes_Heart_Disease Count and the No_Heart_Disease Count and
8. If(Count(Yes_Heart_Disease) >= Count (No_Heart_Disease))
9. Print (“Record is classified as the Heart_Disease Category”);
10. Yes_Count++; Else
Print (“Record is classified as the No Heart_Disease Category”);
11. No_Count++;
12. Calculate Accuracy

2) Mathematical Formulae

Euclidian Square Distance Formulae

$$\text{Square Distance} = (X_{\text{age}} - X_{\text{in_age}})^2 + (X_{\text{BP}} - X_{\text{in_BP}})^2 + (X_{\text{chol}} - X_{\text{in_chol}})^2 + (X_{\text{hrtRate}} - X_{\text{in_hrtRate}})^2 + (X_{\text{oldPeak}} - X_{\text{in_oldPeak}})^2 + (X_{\text{SlopePeak}} - X_{\text{in_SlopePeak}})^2 + (X_{\text{vessels}} - X_{\text{in_vessels}})^2 + (X_{\text{thal}} - X_{\text{in_thal}})^2 + (X_{\text{chestPain}} - X_{\text{in_ChestPain}})^2 + (X_{\text{oldPeak}} - X_{\text{in_oldPeak}})^2 + (X_{\text{angina}} - X_{\text{in_angina}})^2 + (X_{\text{ecg}} - X_{\text{in_ecg}})^2 + (X_{\text{BloodSugar}} - X_{\text{in_BloodSugar}})^2$$

Accuracy Calculation

Accuracy refers to the percentage of correct predictions made by the model compared with actual classifications in the test data.

$$\text{Accuracy} = \frac{\text{Total no. of Correctly Predicted Record}}{\text{Total no. of training Record}}$$

VI. PROPOSED SYSTEM

The main goal of this system is to predict heart disease using different data mining techniques. Raw hospital data set is used and then preprocessed and transformed the hospital data set. Then apply the data mining techniques i.e. K-NN and Naïve Bayes algorithm on the transformed data set. After applying the data mining algorithm, heart disease is predicted and then accuracy is calculated.

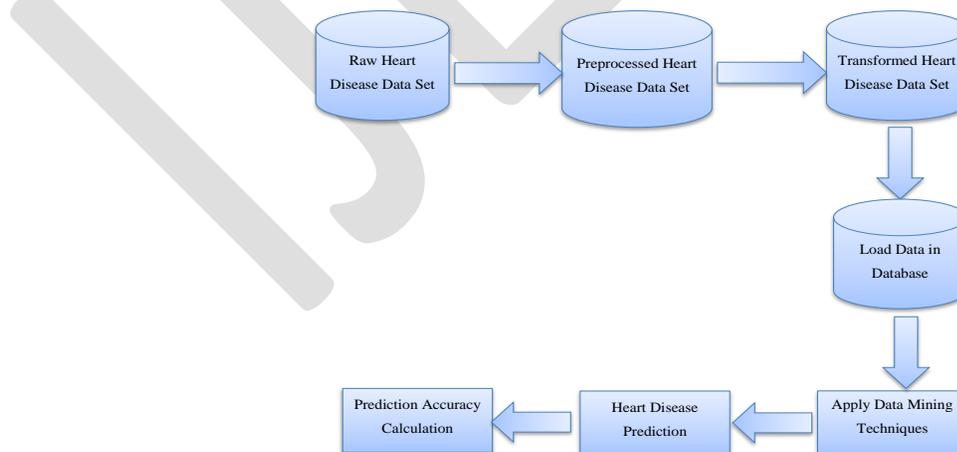


Figure 2: System Architecture

VII. PRACTICAL RESULTS AND ENVIRONMENT

In this section , practical environment as input of the system, operating environment, software and hardware requirement and the result of the system are represented.

A. Input Database

Total 13 attributes i.e. input attributes such as age, sex, blood sugar, cholestrol, heart rate, chest pain etc. are provided to the system.

B. Hardware Requirements

1. Processor : Intel Dual-Core processor.
2. RAM : 512 MB.
3. HDD : 10 GB.

C. Software Requirements

1. Operating System - Windows 2000, Windows 2007/XP.
2. Documentation -MS Word, MS PowerPoint, MS Excel.
3. Database - Oracle 10g.
4. Language - Java
5. Software Tools - Eclipse IDE, SQL Loader, Java J2SE
JDK 1.6

D. Result of the System

Table 1: Accuracy Of Algorithm

Algorithm used	Accuracy
Naive Bayes	84%
KNN	76%

From the result , it is concluded that Bayesian algorithm works better than KNN algorithm.

VIII. CONCLUSION

This system uses two data mining techniques such as Naive Bayesian and K- Nearest Neighbor algorithm. This system extracts patterns and relationships from the historical database. This system is useful in hospital for prediction of disease. After execution, it found that Naive Bayesian works better than KNN algorithm. You can add more attributes to enhance and expand the system. You can also use other data data mining techniques such as clustering, time series, association rules etc. We can also use Text Mining for mining the data which is not structured. We can also integrate data mining and text mining.

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IJERGS

A SURVEY ON COGNITIVE RADIO USING SPECTRUM SENSING

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Abstract: The developing interest of wireless applications has put a great deal of imperatives on the utilization of accessible radio spectrum which is restricted and valuable asset. Nonetheless, a settled spectrum task has lead to under usage of spectrum as a great portion of authorized range is not adequately used. The greater part of the accessible spectral resources have as of now been authorized, so it gives the idea that there is almost no space to include any new administrations, unless a portion of the current licenses are ceased. Moreover, recent studies and estimations have demonstrated that tremendous allotments of the authorized spectra are seldom utilized because of the unyielding spectrum regulations. The entire thought behind cognitive radio (CR) utilization is that it ought to incite compelling spectrum use, since intelligence and learning procedures support the radio framework to get to the spectrum effectively. Cognitive radio is generally anticipated that would be the following Big Bang in wireless communications. Spectrum sensing, that is, distinguishing the vicinity of the primary users in a authorized spectrum, is a principal issue for cognitive radio. In this paper, spectrum sensing techniques are reviewed. The difficulties and issues concerned in usage of spectrum sensing methods are examined in detail giving relative study of assorted methodologies

Keywords: Cognitive Radio, Dynamic Spectrum Access (DSA), Primary User (PU), Secondary User (SU), Software Defined Radio (SDR)

1. INTRODUCTION

The accessible electromagnetic radio spectrum is a restricted common asset and getting gathered step by step on account of expansion in wireless devices and applications[1]. On the other hand it's been additionally found that the allotted spectrum is underutilized owing to its static allocation that is that the standard approach of spectrum management and is incredibly inflexible to work in a certain frequency band. Given the constraints of the natural frequency spectrum, it becomes obvious that this static frequency allocation schemes can't accommodate the requirements of an increasing number of higher information rate gadgets. Therefore, creative strategies that may offer new ways of exploiting the offered spectrum are required. The problem of spectrum underutilization in wireless communication are often solved in an exceedingly higher approach mistreatment utilizing *Cognitive radio (CR)* technology. Cognitive radios are outlined so that extremely reliable communication will be supplied to all users of the network, wherever and whenever required and to encourage viable usage of the radio spectrum[2].

The CR enables the usage of temporally unused frequency bands which are commonly known as spectrum holes. Usually spectrum holes are generally categorized into temporal spectrum holes and spatial spectrum holes. A temporal spectrum hole is unoccupied by the PU during the time of sensing. Hence, this band can be used by SUs in the current time slot. Spectrum sensing of this kind does not require complex signal processing[3]. A spatial spectrum hole is a band which is unoccupied by the PU at some spatial areas; and therefore can be occupied by SUs. If the band is used more by a PU, the CR moves to another spectrum hole as shown in figure 1.

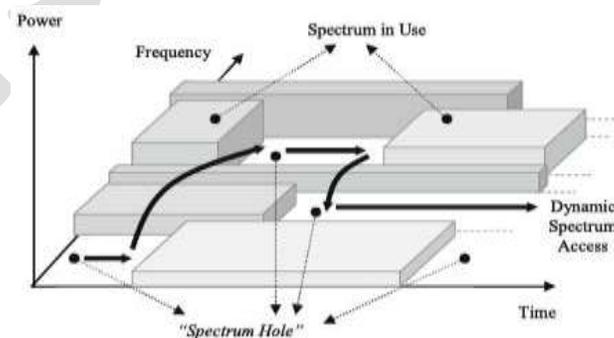


Fig. 1: Spectrum Hole

A standout amongst the most essential parts of the cognitive radio concept is the capacity to sense, learn, measure and be aware of the parameters identified with the radio channel characteristics, accessibility of spectrum and power, radio's working surroundings, user prerequisites and applications, accessible networks (frameworks) and nodes, local policies and other working restrictions[4]. Cognitive radio includes spectrum sensing, spectrum management, and spectrum sharing and spectrum mobility.

- Spectrum sensing: Detecting unused spectrum and imparting the spectrum without harmful impedance to different users.
- Spectrum management: Capturing the best accessible spectrum to meet user correspondence prerequisites.
- Spectrum mobility: Maintaining consistent correspondence necessities amid the move to better spectrum.
- Spectrum sharing: Providing the reasonable spectrum scheduling method among existing together xG users.

I. Dynamic Spectrum Access

Radio Spectrum has many dimensions such as: space, time, frequency, polarization, power of signal and interference. The static spectrum management has many challenges to provide spectrum utilization to different users in different areas. So the concept of DSA developed in CR's. It is rightly observed that spectrum scarcity was the byproduct of the antiquated spectrum management and though a large part of prime spectrum was assigned, allocated, it remained highly underutilized [5]. The static spectrum has barrier to access in many spectrum or multi dimensions to provide services to rapidly increasing demand of spectrum. The wireless networks of today can be classified into two broad classes: (1) cellular, infrastructure based networks characterized by a entity called base station providing a centralized switching point for communication from devices in a geographical area. (2) peer-to-peer or ad hoc networks where communicating nodes do not rely on a centralized node [5]. The Standing for the opposite of the current static spectrum management policy, the term dynamic spectrum access has broad connotations that encompass various approaches to spectrum reform. The diverse ideas presented on New Frontier in Dynamic Spectrum Access Networks (DySPAN) at the first IEEE symposium suggest the extent of this term [6]. The band spectrum of TV Broadcast is very widely unused and to utilize it efficiently, the DSA is implemented on it. And it is an unlicensed bands known as "White Space". In order to fully utilize the spectrum, the dynamic spectrum allocation using auctions has become a promising approach that allows SU's to lease unused bands by the PU's [7].

II. Dynamic Spectrum Allocation and sharing

When the communication over a cognitive network is established then it is not possible for the cognitive network to continue that communication very smoothly because the channel over which the communication is occurring might belong to some other primary user and that primary user may demand it back. Such a situation is bound to arise in cognitive network. The secondary network then has no choice but to return the borrowed spectrum and then switch to some other vacant spectrum to avoid the delaying or termination of the communication. Returning the borrowed spectrum and switching over to other channels is termed as SPECTRUM HANDOFF. For a successful spectrum handoff we require efficient mechanisms of spectrum handoff. Some theories are also proposed which states that for a continuous communication the secondary networks should access the spectrum from not only one primary user but other primary sources and other licensed sources also. This approach seems to be more pragmatic than other approaches as in others, there has to be a tradeoff among some important parameters.

III. Motivation: Spectrum Sensing For Spectrum Sharing

Spectrum sensing is the ability to measure, sense and be aware of the parameters identified with the radio channel characteristics, accessibility of spectrum and transmit power, obstruction and noise, radio's working surroundings, user prerequisite and applications, accessible systems/framework) and nodes, local policies and other working restrictions[7]. It is done across Frequency, Time, Geographical Space, Code and Phase. Among all different functions, Spectrum sensing is accepted as the most vital errand to establish cognitive radio systems. It can be characterized as "action of a radio measuring signal feature".

4.1 Principle of Spectrum Sensing

Fig. 2 demonstrates the standard of spectrum sensing. In the fig. the PU transmitter is sending information to the PU receiver in an authorised spectrum band while a couple of SUs intends to get to the spectrum. The SU transmitter needs to perform spectrum sensing to recognise to guarantee the PU transmission, whether there is a PU receiver in the scope of the SU transmitter.

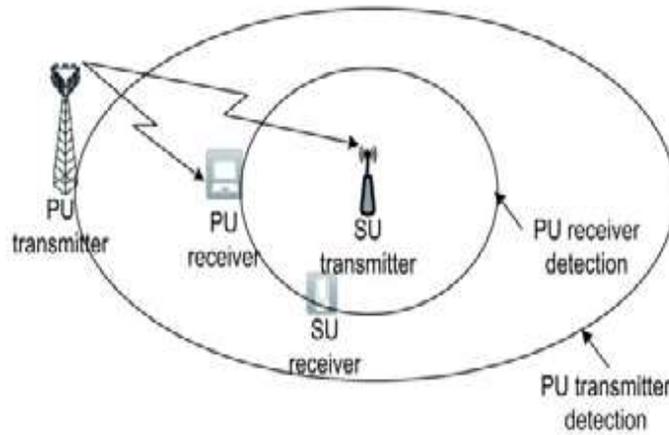


Fig. 2: Principle of Spectrum Sensing

IV. Spectrum Sensing Detection Methods

Spectrum sensing (a.k.a. spectrum detection technique) is the main task in cognitive cycle and the main challenge to the CRs. In spectrum sensing studying the spectrum and find the unused bands and sharing it while avoiding the spectrum that is occupied by PU. Figure 3 demonstrates the itemized arrangement of spectrum Sensing techniques. They are extensively characterized into three fundamental sorts, transmitter identification or non cooperative sensing, cooperative sensing and obstruction based sensing. Transmitter identification procedure is further ordered into three types i.e. energy detection, cyclostationary feature detection and matched filter detection. In this section, some of the most common spectrum sensing techniques in the cognitive radio literature are explained.

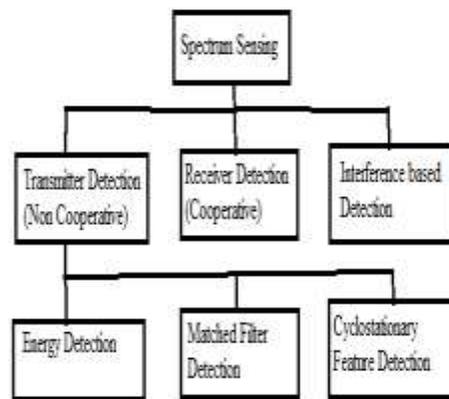


Fig. 3: Spectrum sensing Techniques

4.2 Matched Filter Detection

The matched filter detector that can use as CR has been initially proposed in [8]. The matched filter, it can think about as a best sensing method if CR has information of PU waveform. It is extremely exact since it maximizes the received signal-to-noise ratio (SNR). Matched filter compares between the final output of matched filter and predetermined threshold will determine the PU vicinity. Thus, if this data is not exact, then the matched filter works feebly.

4.2.1 Advantages

Matched filter detection needs less discovery time in light of the fact that it requires only $O(1/\text{SNR})$ tests to meet a given likelihood of identification limitation. When the cognitive radio user knows the data of the primary user signal, matched filter detection is optimal detection in stationary Gaussian noise.

4.2.3 Disadvantages

- i) Matched filter detection obliges an earlier information of each essential signal.
- ii) For Matched filter detection CR would require a committed recipient for every sort of primary user.

4.3 Cyclostationary Feature Detection

Implementation of a cyclostationary feature detector, has been initially introduced in [9], as spectrum sensing which can separate the modulated signal from the additive noise. If the mean and autocorrelation are a periodic function, then, a signal is said to be cyclostationary. Feature detection signifies to separating features from the received signal and performing the detection based on the extracted features. cyclostationary feature detection can recognize PU signal from noise, and utilized at very low Signal to Noise Ratio (SNR) detection by utilizing the data implanted as a part of the PU signal that are not present in the noise. primary disadvantage of this technique is the intricacy of calculation. Additionally, it must manage all the frequencies keeping in mind the end goal to create the spectral correlation function, which makes it an extensive calculation. The benefit of feature detection is that it typically allows different among dissimilar signals or waveforms[9][10].

4.3.1 Advantages

- i) It performs better than energy detection in low SNR regions and Robust to noise vulnerabilities.
- ii) In cyclo stationary though we need priori knowledge of the signal characteristics anyway it is equipped for recognizing the CR transmissions from different sorts of PU signals.
- iii) Synchronization prerequisite of energy detection in cooperative sensing wiped out utilizing this procedure.
- iv) Improves the overall CR throughput.

4.3.2 Disadvantages

- i) High computational complexity
- ii) Long sensing time.

4.4 Energy Detection

Energy detection (also denoted as non-coherent detection), is the signal detection mechanism utilizing an energy detector (also known as radiometer) to indicate the vicinity or absence of signal in the band. Energy Detection (ED) is one of the most basic sensing schemes. It is optimal if both the signal and the noise are Gaussian, and the noise variance is perfectly known. However, its performance degrades rapidly when there is uncertainty in the noise power value and is also incapable to differentiate between signals from different systems and between these signals and noise. This energy detection method is optimal for detecting any zero-mean constellation signals. In this energy detection approach, the received signal strength indicator (RSSI) or radio frequency (RF) energy in the channel is measured, in order to determine whether the channel is occupied or not. Firstly, in order to select the bandwidth of interest; the input signal is filtered by a band pass filter. After getting the square of the output signal, it is integrated over the observation interval. At the end, the output from the integrator is compared to a predetermined threshold value to conclude the presence or not of the PU signal. Fast Fourier transforms (FFT) based methods are used when the spectral is analyzed in the digital domain. Then the peak of this power spectrum is located and after windowing the peak of spectrum we obtain. Then the signal energy in the frequency domain is collected.

We also call Energy detection technique as BLIND SIGNAL DETECTION because it disregards the structure of the signal and evaluations the vicinity of the signal by contrasting the energy received with a known threshold derived from the statistics of the noise.

4.4.1 Disadvantages

- i) High sensing time taken to attain to a given likelihood.
- ii) Detection performance is liable to the uncertainty of noise power.
- iii) Using Energy Detection technique it is hard to recognize primary signals from the CR user signals.
- iv) ED not suitable to identify spread spectrum signals.

V. Challenges

Some of few Challenges associated with the spectrum sensing for cognitive radio are given in this section.

5.1 Hardware Requirements

Spectrum sensing for cognitive radio applications obliges high sampling rate, high resolution analog to digital converters (ADCs) with large dynamic range, and high speed signal processors. Noise variance estimation techniques have been prominently utilized for optimal receiver designs like channel estimation, soft information generation *etc.*, as well as for improved handoff, power control, and channel allocation techniques [11]. Thus, cognitive radio ought to have the capacity to catch and analyze a relatively larger band for identifying spectrum opportunities. The large operating bandwidths impose additional requirements on the radio frequencies (RF) components such as antennas and power amplifiers as well. These components should be able to operate over a range of wide operating frequencies. Furthermore, high speed processing units (DSPs or FPGAs) are required for performing computationally demanding signal processing tasks with relatively low delay.

6.2 Hidden Primary User Problem

The hidden primary user problem is similar to the hidden node problem in Carrier Sense Multiple Accessing (CSMA). It can be caused by many factors including severe multipath fading or shadowing observed by secondary users while scanning for primary users' transmissions. Fig. 4 shows an illustration of a hidden node problem where the dashed circles show the operating ranges of the primary user and the cognitive radio device. Here, cognitive radio device causes unwanted interference to the primary user (receiver) as the primary transmitter's signal could not be detected because of the locations of devices.

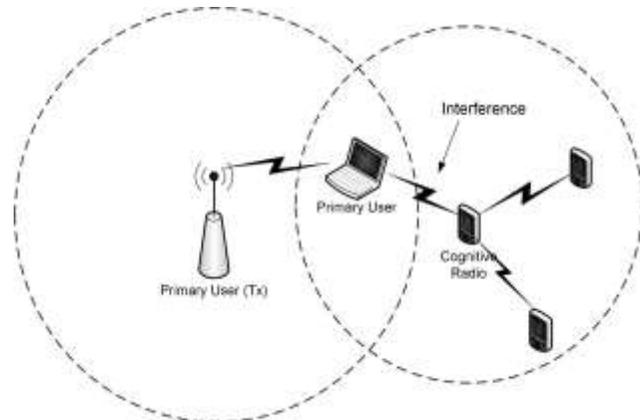


Fig. 4: Illustration of hidden primary user problem in cognitive radio systems

VI. Fault-Tolerance

A sensor node may fail due to physical damage or lack of energy (power). If some of the nodes fail, the protocols that are working upon must accommodate these changes in the network[12]. As an example, for routing or aggregation protocol, they must find suitable paths or aggregation point in case of these kinds of failures.

VII. Scalability

Depending upon the application, the number of sensor nodes deployed could be in order of hundreds, thousands or more[13]. The protocols must be scalable enough to respond and operate with such a large number of sensor nodes.

VIII. SDR and its relationship with Cognitive Radio

The Software Defined Radio (SDR) was presented for taking care of more than one communication technology such that with respect to the software, the terminals can change their operation. In recent times different signalling methods have been proposed and utilized in different communication technologies everywhere throughout the world. Prior to the development of cognitive radio, SDR was centered around multi-mode and multi-standard devices. To avoid analog circuits and components, SDR gives variable radio functionality. The cognitive radio is essentially a SDR which already knows the condition, state, position and consequently adjusts its functions according to the desired objectives.

The connection between the SDR and the cognitive radio can be exhibited in Fig 5. It is clear from the diagram that the cognitive radio envelops the SDR. The SDR is based on Digital Signal Processing and developed in software with the modifiable Radio Frequency components. Subsequently, the SDR is a generic radio platform which has the capacity to work in different bandwidths over an oversized variety of frequencies furthermore as using different modulation schemes and waveform formats. As a result of this, the SDR can support multiple standards such as GSM, WCDMA, WIMAX etc., and multiple access schemes such as TDMA, OFDM and SDMA etc.

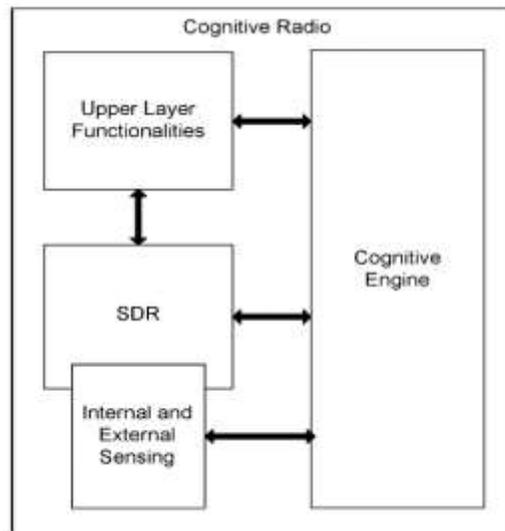


Fig. 5: Illustration of the relationship between the SDR and the cognitive radio

IX. Spectrum Sensing in Current Wireless Standards

Recently developed wireless standards have started to include cognitive features. Even though it is difficult to expect a wireless standard that is based on wideband spectrum sensing and opportunistic exploitation of the spectrum, the trend is in this direction. In this section, wireless technologies that require some sort of spectrum sensing for adaptation or for dynamic frequency access (DFA) are discussed. However, the spectrum knowledge can be used to initiate advanced receiver algorithms as well as adaptive interference cancellation.

10.1 IEEE 802.11k

A proposed extension to IEEE 802.11 specification is IEEE 802.11k which defines several types of measurements [14]. Some of the measurements include channel load report, noise histogram report and station statistic report. The noise histogram report provides methods to measure interference levels that display all non-802.11 energy on a channel as received by the subscriber unit. AP collects channel information from each mobile unit and makes its own measurements. This data is then used by the AP to regulate access to a given channel. The sensing (or measurement) information is used to improve the traffic distribution within a network as well. WLAN devices usually connect to the AP that has the strongest signal level. Sometimes, such an arrangement might not be optimum and can cause overloading on one AP and underutilization of others. In 802.11k, when an AP with the strongest signal power is loaded to its full capacity, new subscriber units are assigned to one of the underutilized APs. Despite the fact that the received signal level is weaker, the overall system throughput is better thanks to more efficient utilization of network resources.

X. Bluetooth

A new feature, namely adaptive frequency hopping (AFH), is introduced to the Bluetooth standard to reduce interference between wireless technologies sharing the 2.4GHz unlicensed radio spectrum [15], [16]. In this band, IEEE 802.11b/g devices, cordless telephones, and microwave ovens use the same wireless frequencies as Bluetooth. AFH identifies the transmissions in the industrial, scientific and medical (ISM) band and avoids their frequencies. Hence, narrow-band interference can be avoided and better bit error rate (BER) performance can be achieved as well as reducing the transmit power. Fig. 5 shows an illustrative Bluetooth transmission with and without AFH. By employing AFH, collisions with WLAN signals are avoided in this example. AFH requires a sensing algorithm for determining whether there are other devices present in the ISM band and whether or not to avoid them. The sensing algorithm is based on statistics gathered to determine which channels are occupied and which channels are empty. Channel statistics can be packet-error rate, BER, received signal strength indicator (RSSI), carrier-to-interference-plus-noise ratio (CINR) or other metrics [15]. The statistics are used to classify channels as good, bad, or unknown [16].

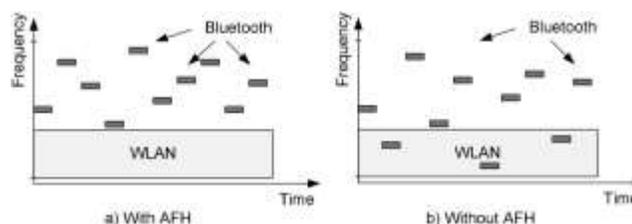


Fig. 5. Bluetooth transmission with and without adaptive frequency hopping (AFH). AFH prevents collisions between WLAN and Bluetooth transmissions.

XI. IEEE 802.22

IEEE 802.22 standard is known as cognitive radio standard because of the cognitive features it contains. The standard is still in the development stage. One of the most distinctive features of the IEEE 802.22 standard is its spectrum sensing requirement [17]. IEEE 802.22 based wireless regional area network (WRAN) devices sense TV channels and identify transmission opportunities. The functional requirements of the standard require at least 90% probability of detection and at most 10% probability of false alarm for TV signals with -116 dBm power level or above [18]. The sensing is envisioned to be based on two stages: fast and fine sensing. In the fast sensing stage, a coarse sensing algorithm is employed, *e.g.* energy detector. The fine sensing stage is initiated based on the fast sensing results. Fine sensing involves a more detailed sensing where more powerful methods are used. Several techniques that have been proposed and included in the draft standard include energy detection, waveform-based sensing (PN511 or PN63 sequence detection and/or segment sync detection), cyclostationary feature detection, and matched filtering. A base station (BS) can distribute the sensing load among subscriber stations (SSs). The results are returned to the BS which uses these results for managing the transmissions. Another approach for managing the spectrum in IEEE 802.22 devices is based on a centralized method for available spectrum discovery. The BSs would be equipped with a global positioning system (GPS) receiver which would allow its position to be reported. The location information would then be used to obtain the information about available TV channels through a central server. For low-power devices operating in the TV bands, *e.g.* wireless microphone and wireless camera, external sensing is proposed as an alternative technique. These devices periodically transmit beacons with a higher power level. These beacons are monitored by IEEE 802.22 devices to detect the presence of such low-power devices which are otherwise difficult to detect due to the low-power transmission.

XII. Conclusion

Spectrum is an extremely profitable asset in wireless communication systems, and it has been a point of convergence for innovative work endeavors throughout the most recent quite a few years. Cognitive radio, which is one of the endeavors to use the accessible spectrum more efficiently through shrewd spectrum usage, has turned into an energizing and guaranteeing idea. One of the imperative components of cognitive radio is sensing the accessible spectrum opportunities. In this Paper, Various aspects of the spectrum sensing task are explained in detail. Considering the difficulties raised by cognitive radios, the utilization of spectrum sensing strategy shows up as a urgent need to accomplish acceptable results as far as proficient utilization of accessible spectrum and restricted interference with the authorized primary users.

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Implementation of Voice, Video and Text Data over Wi-Fi

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Abstract- Communication through mobile phones comes at a certain expense. What if we cut down the expenses and make this communication a cost-free communication. This is the concept of Voice over Wi-Fi. This paper consists of three modes of mobile based communication over Wi-Fi i.e. Messaging, Voice calling and Video calling.

Keywords— Android, Wi-Fi peer to peer, Smartphone, Router, Proxy Server, APIs, Wi-Fi-Direct.

I. INTRODUCTION

Communication has developed from a simple cell-phone to an advanced smart-phone thus increasing the functionality and user interactivity. Due to its increasing efficiency and reliability, it can be seen today in everyone's pocket. Thus providing users with cheaper and smarter phones has become a lucrative business for many manufacturers. With the increasing demand for mobile devices, there is an increase in the number of service providers too. But the cheaper service providers usually win over the costlier ones. Service providers that have already earned a name are still expanding further and further to earn recognition throughout the globe. With the worldwide communication between people through mobile phones increasing day-by-day, it has become a priority to reduce the costs of data transmission through a certain sets of texts, voice or video.

The concept behind modulation is to neglect low frequency noise and to make it feasible for long distance transmission and at a higher efficiency. This concept being very useful and productive has made a mark in the field of data transmission. There has been increasing demands to have cheap communication within a fixed range, like an office, in a building or a township. The recent advancements in the mobile phone technology have incorporated the features of accessing Wi-Fi from a very small device. The presence of Wi-Fi in the latest mobiles allows the user to access internet with the help of a Wi-Fi router. Exploiting the entire bandwidth of 2.4GHz for making voice calls between devices, it eliminates the need of using the service provider's bandwidth. Hence voice calls, messaging and video calls can be made at zero cost.

Almost all of the recent launches of phones comes with Wi-Fi. The number of people using Wi-Fi devices is increasing day-by-day. Our proposed model would eliminate the use of service providers and would provide zero cost communication for short distance. The base idea is unifying voice and data onto a single network infrastructure by digitizing the voice signals, convert them into IP packets and send them through an IP network together with the data information.[2]

II.SYSTEM DESIGN

A. Messaging

- Analysis



Fig.1

Internet- based instant messaging applications allow users to send/receive messages over the internet. There are many such existing apps. For example Viber, Skype, BBM etc. But these applications require internet connection from mobile service provider which is not free of cost. In this paper, we propose a communication system that allows android based smartphone users to send and receive messages over the Wi-Fi range which requires neither any internet connectivity nor any messaging service from the mobile service providers as shown in figure 1.

The APIs used to develop this app is wifi.p2p which provides classes to create peer-to-peer (P2P) connections with Wi-Fi.

Proposed architecture basically consists of client and router which may include the following steps. 1. First of all router is set with an id and password 2. Then client program runs on android based mobile device and send a request to connect with router.

3. Once the client is successfully connected, the application provides the list of all other active users to the client.
4. Client can view the list of all active users and can communicate with them.
5. When a client sends a message to another client, this message first goes to the router.
6. Then router sends this message to the appropriate receiver.
7. Once the receiver receives the message, can read it.
8. In the same way receiver can reply message to the sender.
9. This application basically uses the concept of Wi-Fi peer to peer socket programming. This approach allows Message transfer between android based devices which is implemented, tested and works on or above Android version 4.1.

B. Voice Calling

- Analysis:

The idea of voice calling predominantly comes from the fact that people all over the world are connected through mobile phones that mainly uses voice calling as its main source of communication. The idea of VoWi-Fi was derived from the fact that the existing wireless local area networks that were initially designed to support data communications, can eventually support voice communication. However, there were issues pertaining to voice quality as people communicate from different parts of the world. This may sometimes lead to voice disturbance, noise, improper sending and reception of noise, etc. This resulted in many manufacturers coming out with their own designs and implementations to support voice over wireless network. . In this paper, we propose a communication system that allows android based smartphone users to send and receive voice data over the Wi-Fi range which doesn't require any internet connectivity. Services such as MAC as well as Real Time Transport Protocol (RTP) and Real Time Transport Control Protocol (RCTP) will be used.

- Working



Fig. 2

The above figure [1] no.2 shows a general architecture of audio transmission application. It shows a typical chain of how a data is transmitted.

Proposed architecture functions according to the following steps:

1. First data is digitized and recorded.
2. Then the recorded data is converted into samples of 20ms or 30ms.
2. The recorded data is then encoded to minimize the transmission bit rate and are transmitted.
3. In the receiver side, the received data is decoded using audio decoder.
4. The decoded data is then reproduced using audio player.

The APIs that are needed to build this app are as follows:

- android.os:
It provides basic operating system services, message passing and inter-process communication on the device.
- android.util:
It provides common utility methods such as date/time manipulation, base64 encoders and decoders, string and number conversion methods, and XML utilities.
- android.view:
It provides classes that expose basic user interface classes that handle screen layout and interaction with the user.
- android.app:
It contains high level classes encapsulating the overall Android application model.
- android.net:
It contains classes that help with network access beyond the normal java.net.*API'S.
- android.media:
It provides classes that manage various media interfaces in audio and video.[5]

C. Video Calling

- Analysis

In a typical Wi-Fi network, clients discover and associate to WAPs which are recreated and announced. In this way, a device unambiguously behaves either as an AP or as a client, both having different functionalities. With Wi-Fi Direct one main advantage is that it is dynamic, that is it behaves both as an AP as well as a client depending upon the need. These roles are therefore logical roles that could even be executed by the same device simultaneously. In order to establish a connection, P2P devices have to agree on a role that each device will assume. In the following, we describe the steps or methods that are needed for video sharing.

- Working

We have built a voice calling module between the mobile devices using Wi-Fi Direct. Our problem can be simply described as that when 2 mobile devices encounter with each other, one needs to detect whether there is a mobile in the vicinity. In the real case, it could be multiple devices sharing information at the same time. After we find the peers, we will connect peers via Wi-Fi Direct. The Wi-Fi Direct has many limitations, like crash problems, only in Android 4.0 device, and all the devices need open Wifidirect all the time to wait for connection. Since it is convenient, we will use it to simplify the work, and we will focus on developing the protocols and algorithm.

After connecting with peers, we will establish socket communication. Then we need use some protocols to check the availability. After all the work set, we can transmit the data based on the requirement.

The basic steps for a Wi-Fi Direct application are:

- Initial Setup
 - Discovering Peers
 - Connecting to Peers
 - Transferring Data
- Establishing the connection

The Client Server processes are similar to each other. The client will send out the request message upon connection set up. Server and client get the requests and they open the video activity screen. The client starts recording and tap on the send button to send the messages from the client to the server.

The APIs used for video calling are:

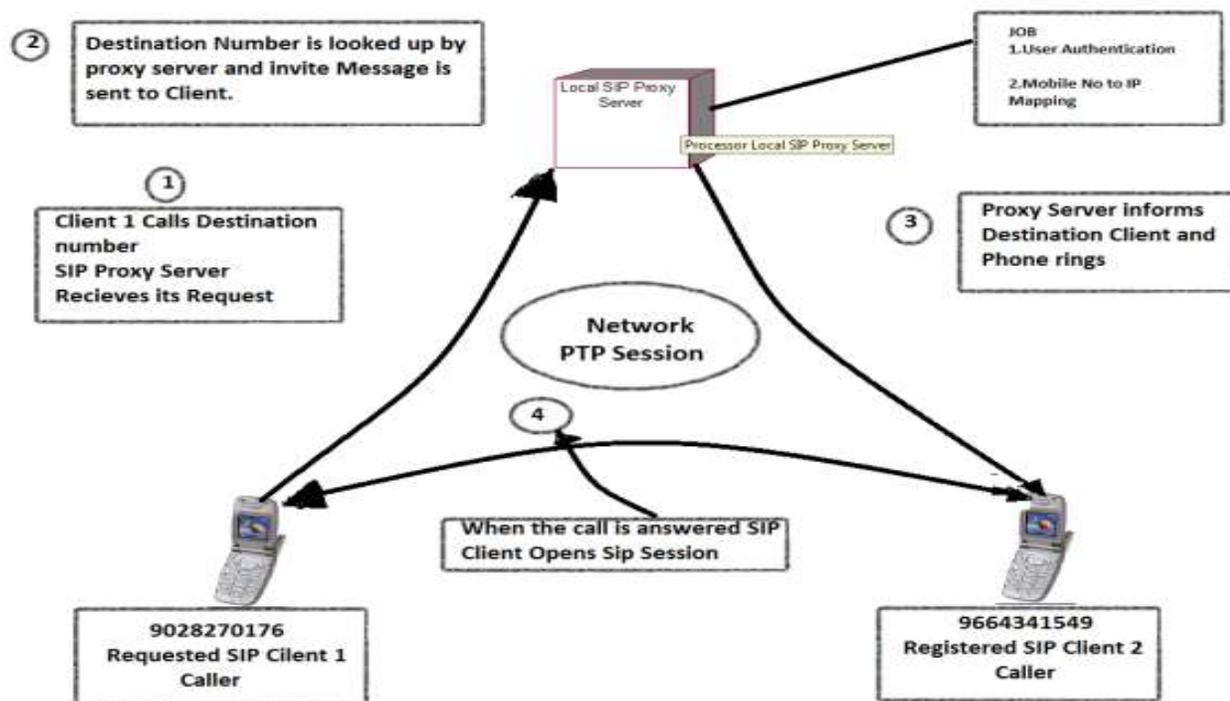
- android.os:

It provides basic operating system services, message passing, and inter-process communication on the device.

- **android.util:**
It provides common utility methods such as date/time manipulation, base64 encoders and decoders, string and number conversion methods, and XML utilities. It is a very important API.
- **android.view**
It provides classes that expose basic user interface classes that handle screen layout and interaction with the user.
- **android.net.wifi:**
It provides classes to manage Wi-Fi functionality on the device.
- **android.net.wifi.p2p:**
It provides classes to create peer-to-peer (P2P) connections with Wi-Fi Direct.
- **android.app:**
It contains high-level classes encapsulating the overall Android application model. An Android application is defined using one or more of Android's four core application components. Two such application components are defined in this package: Activity and Service. The other two components are from the android.content package: BroadcastReceiver and ContentProvider. An Activity is an application component that provides a screen with which users can interact in order to do something, such as dial the phone, take a photo, send an email, or view a map. An activity can start other activities, including activities that live in separate applications.
The Fragment class is also an important part of an application's design—especially when designing for large screen devices, such as tablets. A fragment defines a distinct part of an activity's behavior, including the associated UI. It has its own lifecycle that is similar to that of the activity and can exist alongside other fragments that are embedded in the activity. While an activity is running, you can add and remove fragments and include each fragment in a back stack that's managed by the activity—allowing the user to navigate backwards through the fragment states, without leaving the activity. This package also defines application utilities, such as dialogs, notifications, and the action bar.
- **android.content:**
It contains classes for accessing and publishing data on a device. It includes three main categories of APIs: Content sharing. For sharing content between application components. The most important classes are: ContentProvider and ContentResolver for managing and publishing persistent data associated with an application. Intent and IntentFilter, for delivering structured messages between different application components—allowing components to initiate other components and return results.
- **Package management (android.content.pm)**
For accessing information about an Android package (an .apk), including information about its activities, permissions, services, signatures, and providers. The most important class for accessing this information is PackageManager.
- **Resource management (android.content.res)**
For retrieving resource data associated with an application, such as strings, drawables, media, and device configuration details. The most important class for accessing this data is Resources.
- **android.media:**
It provides classes that manage various media interfaces in audio and video. The Media APIs are used to play and, in some cases, record media files. This includes audio (e.g., play MP3s or other music files, ringtones, game sound effects, or DTMF tones) and video (e.g., play a video streamed over the web or from local storage).
- **android.hardware:**

It provides support for hardware features, such as the camera and other sensors. Be aware that not all Android-powered devices support all hardware features, so you should declare hardware that your application requires using the <uses-feature> manifest element.[5]

III.NETWORK DIAGRAM



IV.RESULT



Home Screen



Messaging



Voice Calling 1



Voice Calling 2



Searching devices for Video transmission



Recording Screen for Video transmission

V.SCOPE

In the early stages, Voice over IP (Vo-IP) was used in many places because of coaxial phone cable system. But since the advent of Voice over Wi-Fi (VoWi-Fi), it has been useful since it found a replacement to costlier coaxial phone cable system. What VoWi-Fi has brought into the market is its lower cost, portability and mobility because of which it is affecting the cell phone business.

A company with fixed warehouses or locations would take advantage of their existing Wi-Fi network and use VoIP for employees to communicate with one another. This system can also be used like Land Mobile Radio System or Walkie-talkie systems with push to talk and emergency broadcast channels. It can also be used in educational institutions to contact within departments and also in various organizations like banks etc. Video calling can be used between companies at different locations where employees need video conferencing for communicating.

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VII. CONCLUSION

Communication is a field which will modify from one technology to another technology depending on various factors such as cost, reliability, etc. In such rapidly growing and changing environment it is possible that certain factors will not be considered. This may result into a new technology with all the factors considered that weren't before. Our paper provides an efficient way of sending

messages, sending and receiving data through voice and through video. This all facilities are provided at zero cost. All the calls within the network are free. This model can be used in many places where communication between peoples is of prime importance.

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