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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 Third Issue of the Forth Volume of International Journal of Engineering Research and General Science. A total of 123 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 innovative solutions for ongoing challenges. 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 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.

Er. Pragyan Bhattarai,

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Estimation of Potential Capacities for development and energy consumption scenario for fiscal progress

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Abstract— Energy framework incorporates renewable, atomic, and fossil vitality sources as well as electrical, warm, and fuel. Renewable sources at present supply some place between 15 percent and 20 percent of world's aggregate energy request. Renewable energy assets exist over wide land regions. India has an unfathomable supply of renewable vitality assets, and it has one of the biggest projects on the planet for sending renewable vitality items and frameworks. This review paper manages the review of renewable vitality and its commitment in different parts of the India taking into account MNRE reports which demonstrates that the force division in India is profoundly various with changed business hotspots for force era like coal, regular gas, hydro, oil and atomic and also whimsical wellsprings of vitality like sun oriented, wind, bio-gas and horticulture. It is concentrated on that, India's aggregate introduced limit of power era has extended from 105,045.96 MW toward the end of 2001–02 to 1, 57,229.48 MW toward the end of February, 2010. Actually, India positions 6th all around regarding absolute power era. The interest for force has been developing at a quick rate and overwhelmed the supply, prompting power deficiencies despite complex development in force era.

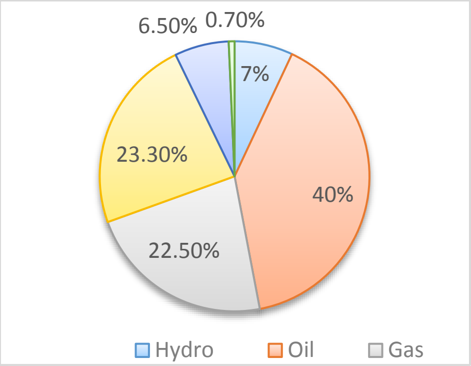
Keywords— Renewable Energy, Bio-sources, PV Technology, Solar energy, Climatic change, Clean Energy Technologies, Energy Forecasts

1. INTRODUCTION-

The capability of renewable vitality sources is colossal as it can, on a basic level, meet ordinarily the world's vitality request. Renewable energy sources, for example, biomass, wind, sunlight based, hydropower, and geothermal can give maintainable vitality administrations, in view of the utilization of routinely accessible, indigenous assets. The improvement and utilization of renewable sources can upgrade differences in vitality supply markets, contributing long haul maintainable energy supplies, and therefore helping in lessening nearby and worldwide climatic outflows, and give industrially alluring alternatives to meet particular vitality benefit needs. Renewable vitality is by and large characterized as vitality that originates from assets which are actually recharged on a human timescale, for example, daylight, wind, downpour, tides, waves, geothermal warmth. Renewable vitality replaces routine powers in four unmistakable ranges: power era, air and water warming and cooling, engine energizes, and rustic (off-lattice) vitality administrations.

2. GLOBAL MARKET OVERVIEW-

The supply is dominated by traditional biomass, mostly fuel wood used for cooking and heating, especially in developing countries in Africa, Asia and Latin America. A major contribution is also obtained from the use of large hydropower; with nearly 20 percent of the global electricity supply being provided by this source. New renewable energy sources (solar energy, wind energy, modern bio-energy, geothermal energy, and small hydropower) are currently contributing about two percent. Based on REN21's 2014 report [1]. Renewable contributed 19 percent to our global energy consumption and 22 percent to our electricity generation in 2012 and 2013, respectively. This energy consumption is divided as 9% coming from traditional biomass, 4.2% as heat energy (non-biomass), 3.8% hydroelectricity and 2% is electricity from wind, solar, geothermal, and biomass. In contrast to other energy sources, which are concentrated in a limited number of countries? Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation, and economic benefits. In international public opinion surveys there is strong support for promoting renewable sources such as solar power and wind power. At the national level, at least 30 nations around the world already have renewable energy contributing more than 20 percent of energy supply. National renewable energy markets are projected to continue to grow strongly in the coming decade and beyond.



The technologies featured here will make our families healthier, more secure, and more prosperous by improving our air quality, reducing our reliance on fossil fuels, curbing global warming, adding good jobs to the economy and -when they're properly sited protecting environmental values such as habitat and water quality. Working together, policymakers, communities, businesses, investors, utilities, and farmers can help build a sustainable future Conventional energy sources based on oil, coal, and natural gas have proven to be highly effective drivers of economic progress, but at the same time damaging to the environment and to human health. Furthermore, they tend to be cyclical in nature, due to the effects of oligopoly in production and distribution. Approximately 20% of electricity produced globally in 2009 came from renewable sources. Out of this, hydro-power accounted for about 16%. In 2012, 9% of the energy consumed in the USA came from renewable sources. This means the USA depends a lot on non-renewable sources. 30% of the energy from renewable sources came from hydropower, whiles biomass, bio fuels and wood, together accounted for about 49%. —Source: USEIA, Monthly Energy Review, April 2013.

Source	**Unit**	**Installed**
Wind Farms	MW	557
Wind Pump	No's	3289
Small Hydro (up to 3 MW)	MW	122
Bio Gasifiers	X 10 6	2.12
Solar PV	KW	825

Table 1- Actual installed renewable based plants in India [22]

3. INDIA AND RENEWABLE ENERGY-

India is a country of agriculture. India has a vast supply of renewable energy resources, and it has one of the largest programs in the world for deploying renewable energy products and systems. Sources of renewable energy available in India: We know where the nonrenewable energies – coal, oil and gas – are located and how these fuels are transported, combusted, and the power transmitted throughout the country over the power grid. Now, let's look at the renewable energies – hydro, solar, wind and biomass – and see where they are found. Considered an emerging economy," increasing GDP is driving the demand for additional electrical energy, as well as transportation fuels. India is a nation of extremes. Poverty remains in areas with no energy services, while wealth grows in the new business hubs. Coal fired generation currently provides two thirds of the generation capacity, and hydropower supplies the other third. India is blessed with vast resources of renewable energy in solar, wind, biomass and small hydro. In fact, the technical potential of these renewable exceeds the present installed generation capacity. Energy exists freely in nature. Some of them exist infinitely (never run out, called **renewable**), the rest have finite amounts (they took millions of years to form, and will run out one day, called **non-renewable). There are many forms of renewable energy**.

Most of these renewable energies depend in one way or another on sunlight. Wind and hydroelectric power are the direct result of differential heating of the Earth's surface which leads to air moving about (wind) and precipitation forming as the air is lifted. Solar energy is the direct conversion of sunlight using panels or collectors. Biomass energy is stored sunlight contained in plants. Other renewable energies that do not depend on sunlight are geothermal energy, which is a result of radioactive decay in the crust combined with the original heat of accreting the Earth, and tidal energy, which is a conversion of gravitational energy.

4- HYDRO POWER-

Hydropower is the largest renewable resource used for electricity. It plays an essential role in many regions of the world with more than 150 countries generating hydroelectric power. This form uses the gravitational potential of elevated water that was lifted from the oceans by sunlight. It is not strictly speaking renewable since all reservoirs eventually fill up and require very expensive excavation to become useful again. At this time, most of the available locations for hydroelectric dams are already used in the developed world. Moving water has kinetic energy. This can be transferred into useful energy in different ways. Hydroelectric power (HEP) schemes store water high up in dams. The water has gravitational potential energy which is released when it falls. The hydroelectric power refers to the energy produced from water (rainfall flowing into rivers, etc). Consequently, rainfall can be a good indicator to investors looking for a location to implement or build a new hydroelectric power plant in India. It is, in fact, the case, if we compare the map of Annual Rainfall and the "Energy Map of India" on page 6, that hydropower plants are situated in regions of the major rainfall. The dominant annual rainfall is located on the north/eastern part of India: Arunachal Pradesh, Assam, Nagaland, Manipur and Mizoram, and also on the west coast between Mumbai (Bombay) and Mahe. India utilizes twelve primary hydroelectric power plants: Three in Bihar, Punjab, Uttaranchal, Karnataka, Uttar Pradesh, Sikkim, Jammu & Kashmir, Gujarat, and two in Andhra Pradesh.

5. SOLAR ENERGY-

This form of energy relies on the nuclear fusion power from the core of the Sun. This energy can be collected and converted in a few different ways. The range is from solar water heating with solar collectors or attic cooling with solar attic fans for domestic use to the complex technologies of direct conversion of sunlight to electrical energy using mirrors and boilers or photovoltaic cells.

Unfortunately these are currently insufficient to fully power our modern society Because of its location between the Tropic of Cancer and the Equator, India has an average annual temperature that ranges from 25°C – 27.5 °C. This means that India has huge solar potential. The sunniest parts are situated in the south/east coast, from Calcutta to Madras.

State	MW	State	MW
Andaman & Nicobar	5.1	Kerala	12.02
Andhra Pradesh	475.74	Lakshadweep	0.75
Arunachal Pradesh	0.26	Madhya Pradesh	678.58
Bihar	5	Maharashtra	378.7
Chandigarh	5.04	Odisha	66.92
Chhattisgarh	73.18	Puducherry	0.02
Daman & Diu	4	Punjab	300.32
Delhi	6.71	Rajasthan	1264.35
Gujarat	1024.15	Tamil Nadu	562.94
Haryana	12.8	Telangana	392.39
Jharkhand	16	Tripura	5
Karnataka	104.22	Uttar Pradesh	140
Uttarakhand	5	West Bengal	7.21

Table 2- State wise installed solar power capacity [27]

Solar energy has several applications: photovoltaic (PV) cells are placed on the roof top of houses or commercial buildings, and collectors such as mirrors or parabolic dishes that can move and track the sun throughout the day are also used. This mechanism is being used for concentrated lighting in buildings. Photovoltaic (PV) cells have a low efficiency factor, yet power generation systems using photovoltaic materials have the advantage of having no moving parts. PV cells find applications in individual home rooftop systems, community street lights, community water pumping, and areas where the terrain makes it difficult to access the power grid. The efficiency of solar photovoltaic cells with single crystal silicon is about 13 % - 17%. High efficiency cells with concentrators are being manufactured which can operate with low sunlight intensities. Solar thermal power systems use various techniques to focus sunlight to heat an intermediary fluid, known as heat transfer fluid that then is used to generate steam. The steam is then used in a conventional steam turbine to generate electricity. At present, there are three solar thermal power systems currently being developed: parabolic troughs, power towers, and dish/engine systems.

6. WIND ENERGY-

The movement of the atmosphere is driven by differences of temperature at the Earth's surface due to varying temperatures of the Earth's surface when lit by sunlight. Wind energy can be used to pump water or generate electricity, but requires extensive areal coverage to produce significant amounts of energy. India is surpassed only by Germany as one of the world's fastest growing markets for wind energy. By the mid-1990s, the subcontinent was installing more wind generating capacity than North America, Denmark, Britain, and the Netherlands.

The countries that have been fueling wind energy's growth throughout this decade have mainly been in the Northern Hemisphere, in particular Europe, where issues regarding the environment, fuel security and electricity-generating diversity are a priority. Of the 10 countries with the highest installed capacity at the end of 1999, only the United States, India and China lie outside Europe. The ten machines near Okha in the province of Gujarat were some of the first wind turbines installed in India. These 15-meter Vistas wind turbines overlook the Arabian Sea. Now, in 2006, there is an installed capacity of 4,430 MW; however, ten times that potential, or 46,092 MW, exists. The main technical parameter determining the economic success of a wind turbine system is its annual energy output, which in turn is determined by parameters such as average wind speed, statistical wind speed distribution, and distribution of occurring wind directions, turbulence intensities, and roughness of the surrounding terrain. Wind energy is currently one of the most cost-competitive renewable energy technologies. Worldwide, the cost of generating electricity from wind has fallen by more than 80 percent, from about 38 US cents in the early1980s to a current range of 3-6 cents/kWh levelized over a plant's lifetime, and analysts forecast that costs will drop an additional 20-30 percent in the next five years.

States in India (Wind energy Potential)	**Gross Potential (MW)**
Andhra Pradesh	9063
Gujarat	7362
Karnataka	7161
Kerala	1026
Madhya Pradesh	4978
Maharashtra	4519
Orissa	1520
Rajasthan	6672
Tamil Nadu	4159
West Bengal	32

Table-3: State wise distribution of wind energy in India [1]

7. BIOMASS-

Biomass includes solid biomass (organic, non-fossil material of biological origins), biogas (principally methane and carbon dioxide produced by anaerobic digestion of biomass and combusted to produce heat and/or power), liquid bio-fuels (bio-based liquid fuel from biomass transformation, mainly used in transportation applications), and municipal waste (wastes produced by the residential, commercial and public services sectors and incinerated in specific installations to produce heat and/or power). The most successful forms of biomass are sugar cane bagasse in agriculture, pulp and paper residues in forestry and manure in livestock residues. It is argued that biomass can directly substitute fossil fuels, as more effective in decreasing atmospheric CO2 than carbon sequestration in trees. The Kyoto Protocol encourages further use of biomass energy. In developing countries it still accounts for an estimated one third of primary energy use while in the poorest up to 90% of all energy is supplied by biomass. Bio-energy comes either directly from the land, as dedicated energy crops, or from residues generated in the processing of crops for food or other products such as pulp and paper from the wood industry. Another important contribution is from post-consumer residue streams such as construction and demolition wood, pallets used in transportation, and the clean fraction of municipal solid waste (MSW). Some smaller gasification/engine systems have been applied relatively successfully in rural India and some other countries. India is very rich in biomass. It has a potential of 19,500 MW (3,500 MW from bagasse based cogeneration and 16,000 MW from surplus biomass). India has 537 MW commissioned and 536 MW under construction. The facts reinforce the idea of a commitment by India to develop these resources of power production as-

a) Andhra Pradesh (200 MW)
b) Bihar (200 MW)
c) Gujarat (200 MW)
d) Karnataka (300 MW)
e) Maharashtra (1,000 MW)
f) Punjab (150 MW)
g) Tamil Nadu (350 MW)
h) Uttar Pradesh (1,000 MW)

The biomass to bio-energy system can be considered as the management of flow of solar generated materials, food, and fiber in our society. These interrelationships are shown in Figure 1, which presents the various resource types and applications, showing the flow of their harvest and residues to bio-energy applications. Not all biomass is directly used to produce energy but rather it can be converted into intermediate energy carriers called bio-fuels. This includes charcoal (higher energy density solid fuel), ethanol (liquid fuel), or producer-gas (from gasification of biomass).

8. OTHER SOURCES OF ENERGY-

There are several other sources of energy as-Geothermal Energy, Tidal Energy, wave energy etc. that contribute in energy demand of India. Waste to Energy ventures taking into account Municipal Solid Waste (MSW), introduced in the nation starting 31st March 2015 is only 154 MW. MSW is a heterogeneous blend of combustibles, natural matter, inert and dampness. Vitality era through biochemical change or burning will rely on upon the levels of isolation and gathering productivity of MSW. This is a key center range of Ministry of Urban Development and also Urban nearby bodies (ULBs) the nation over and subsequently it is expected under all situations that by 2047: India has reasonably good potential for geothermal; the potential geothermal provinces can produce 10,600 MW of power (but experts are confident only to the extent of 100 MW). More than 300 hot spring locations have been identified by Geological survey of India (Thussu, 2000). The surface temperature of the hot springs ranges from 35 C to as much as 98 C. These hot springs have been grouped together and termed as different geothermal provinces based on their occurrence in specific geotectonic regions, geological and structural regions such as occurrence in orogenic belt regions, structural grabens, deep fault zones, active volcanic regions etc., Different orogenic regions are – Himalayan geothermal province, Naga-Lushai geothermal province, Andaman-Nicobar Islands geothermal province and non-orogenic regions are – Cambay graben, Son-Narmada-Tapi graben, west coast, Damodar valley, Mahanadi valley, Godavari valley etc. The most attractive locations are the Gulf of Cambay and the Gulf of Kachchh on the west coast where the maximum tidal range is 11 m and 8 m with average tidal range of 6.77 m and 5.23 m respectively. The Ganges Delta in the Sunderbans in West Bengal also has good locations for small scale tidal power development. The maximum tidal range in Sunderbans is approximately 5 m with an average tidal range of 2.97 m. The identified economic tidal power potential in India is of the order of **8000-9000 MW** with about 7000 MW in the Gulf of Cambay about 1200 MW in the Gulf of Kachchh and less than 100 MW in Sundarbans. The installed capacity of renewable energy has touched 32,269.6 Mw or 12.95% of the total potential available in the country, as on March 31, 2014. With this, the renewable energy, including large hydroelectricity, constitutes 28.8% of the overall installed capacity in India.

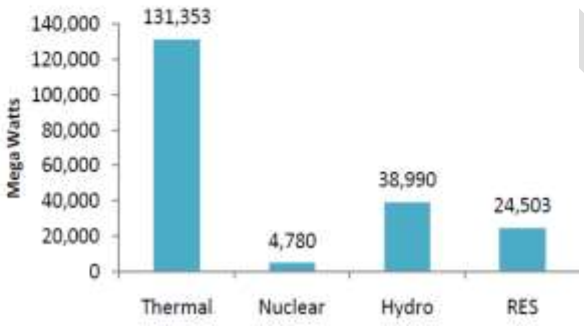


Fig 2- India's Installed Power capacity 2011 (Source: Ministry of Power, Government of India)

9. ENERGY CONSERVATION- DEMAND AND SUPPLY:

Growth in net electricity consumption is expected to be most rapid among the emerging economies of the world, including India. According to the EIA, the annual average increase will be about 4.0 percent from 2002 to 2025.This is the practice that results in less energy being used. It also includes running in the park or outside instead of running on the treadmill in the gym. Energy conservation is great because we can all do this everywhere and anytime.

It is a great behavior we must acquire. The potential of renewable energy sources is enormous as they can in principle meet many times the world's energy demand. Renewable energy sources such as biomass, wind, solar, hydropower, and geothermal can provide sustainable energy services, based on the use of routinely available, indigenous resources. A transition to renewable-based energy systems is looking increasingly likely as the costs of solar and wind power systems have dropped substantially in the past 30 years, and continue to decline, while the price of oil and gas continue to fluctuate.

In fact, fossil fuel and renewable energy prices, social and environmental costs are heading in opposite directions. Furthermore, the economic and policy mechanisms needed to support the widespread dissemination and sustainable markets for renewable energy systems have also rapidly evolved. The Global Wind Energy Council in its report says that Indian Wind Energy Outlook 09 estimates that there is a potential of around 90,000 MW for power generation from different renewable energy sources in the country, including 48,561 MW of wind power, 14,294 MW of small hydro power and 26,367 MW of biomass. In addition, the potential for solar energy is estimated for most parts of the country at around 20 MW per square kilometer of open, shadow free area covered with solar collectors, which would add to a minimum of 657 GW of installed capacity.

10. DISCUSSION & FUTURE TARGETS –

The incentive to use 100% renewable energy, for electricity, transport, or even total primary energy supply globally, has been motivated by global warming and other ecological as well as economic concerns. The average per capita consumption of energy in India is around 500 W, which is much lower than that of developed countries like the United States, Europe, Australia, Japan, etc. However, this figure is expected to rise sharply due to high economic growth and rapid industrialization. The Intergovernmental Panel on Climate Change has said that there are few fundamental technological limits to integrating a portfolio of renewable energy technologies to meet most of total global energy demand. Renewable energy use has grown much faster than even advocates anticipated [23]. At the national level, at least 30 nations around the world already have renewable energy contributing more than 20% of energy supply. According to the India Renewable Energy Status Reported in 2014 which was released at the Green Summit held in 2014 in Bangalore, the total renewable energy potential from various sources in India is estimated 2,49,188 MW. The untapped market potential for overall renewable energy in India is 2, 16,918.39 MW that shows huge growth potential for renewable energy in India.

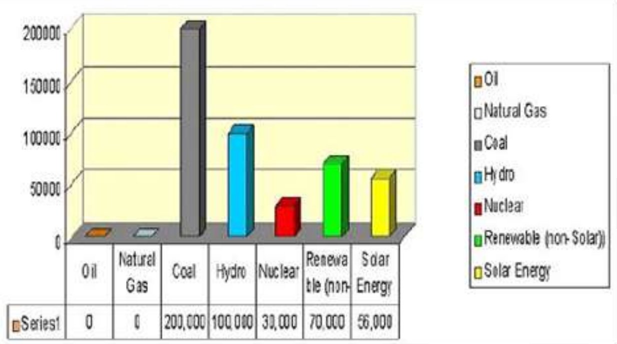


Table4- Estimates of Potential Capacities from Renewable Sources [1]

Source	Approx. Potential (MW)
Biomass energy	19,00.00
Solar energy	20,00.00
Wind energy	47,00.00
Small hydropower	15,00.00
Ocean energy	50,00.00

Fig.3- Energy consumption in Power Sector of India by 2030 (CWET)

Among the creating nations India keeps on being the pioneer took after by China. India had been one of the quickest developing wind markets in the mid-90s however has backed off significantly because of under execution of undertakings, transmission issues, political will and financial instability. India has the world's fifth-biggest power era limit, which at present stands at 243 GW. The force segment in India is exceedingly enhanced with changed business hotspots for force era like coal, normal gas, hydro, oil and atomic and in addition unusual wellsprings of vitality like sun based, wind, bio-gas and horticulture. The interest for force has been developing at a quick rate and surpassed the supply, prompting power deficiencies notwithstanding complex development in force era throughout the years. The organization needs to take an intense position between adjusting financial advancement and ecological supportability. One of the essential difficulties for India would be to adjust its current vitality blend, which is overwhelmed by coal, to a bigger offer of cleaner and practical wellsprings of vitality [2].

Most recent tasks are aiding in the improvement of indigenous examination and mechanical base, mastery, prepared labor and models/gadgets/frameworks in the nation are Hydrogen Energy, Chemical Sources of Energy (Fuel Cells), Battery Operated Vehicles, Geo Thermal Energy, Ocean Energy, Bio-powers. In the previous 30 years sun based and wind power frameworks have encountered quick deals development, declining capital expenses and expenses of power produced, and have kept on enhancing their execution attributes. Indeed, fossil fuel and renewable vitality costs, and social and natural expenses are heading in inverse bearings and the monetary and strategy instruments expected to bolster the far reaching spread and economical markets for renewable vitality frameworks are quickly advancing.

It is turning out to be clear that future development in the vitality division will be principally in the new administration of renewable energy, and to some degree normal gas-based frameworks, not in traditional oil and coal sources. As a result of these improvements market opportunity now exists to both develop and to exploit developing markets to advance renewable vitality innovations, with the extra help of administrative and well known estimation.

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Vertical axes wind turbine with permanent magnet generator emergency brake system simulation in MATLAB *Simulink*

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Abstract— Vertical axes wind turbines in the commercial market are used without pitch control systems and the special emergency systems should be implemented as main part in the system. The closer turbine is assembled to civil parts the safer turbine have to be. The simulations of the safety system can be useful part to get faster results and make lower costs for safety system calculations and tests. Simulation with MATLAB *Simulink* can be used for new braking system research for special VAWT. The research analyses the two braking system action on real VAWT simulation model. With new developed simulation models for emergency braking can be calculated and designed new brakes for VAWT. The simulation models works with electrical brake for PMSG and mechanical brake for low speed or high speed shaft. Simulation results for each brake type was tested with simulated signals and in the work with real turbine simulation model. The results showed that the simulation models are correct and achieved the target or the research.

Keywords— VAWT, MATLAB Simulink, Emergency brake, mechanical brake, simulation, electrical brake

INTRODUCTION

Vertical Axes wind turbines VAWT is used more and more all over the world. Global energy market makes useful to use wind turbine as an electric energy source [1]. Very much in worldwide is used the large size wind turbines and they are as far as possible from the living places or active people working zones. The VAWT is used more in the smaller scale and this makes the situation that the wind turbine is used in the places where it is more close to people [2].

Safety is the main topic of placing the wind turbine near, close, or at active people working, living zones. The closer wind turbine comes to people the more safety actions are needed. In the case to have turbine working just beside human house or kinder garden or shop or many other places in the city or village, people are concerned about the safety of themselves or they friends or relatives [3]. Many tests and analyses should be performed to prepare the wind turbine for the places to be near the people. Physical tests is the obligatory thing for every system to be produced, but before do the real actual tests on the system of the cases for the safety then many other pre-analyses and tests could be done [4].

Today we know many systems to work with for mathematical calculations or static analyse, but using MATLAB *Simulink* environment is option to test the real turbine action on some fail conditions. Using real turbine simulation model is possibility to test many safety features and system action on the specific safety process [5]. The safety always is related with functions stop as soon as possible, but because of the rotating parts of the VAWT the quick stop of the machine could make the bigger damages or even destroy the entire turbine system and make damages to human being [6].

The key of the work is to make simulation subsystem for turbine model with two main emergency stop systems, where one is mechanical and the second is electrical. The subsystem is tested and analysed by using the main simulation model of the VAWT. By the simulation results it will be possible to analyse the safety level for some specific turbine emergency brake system.

VAWT emergency system

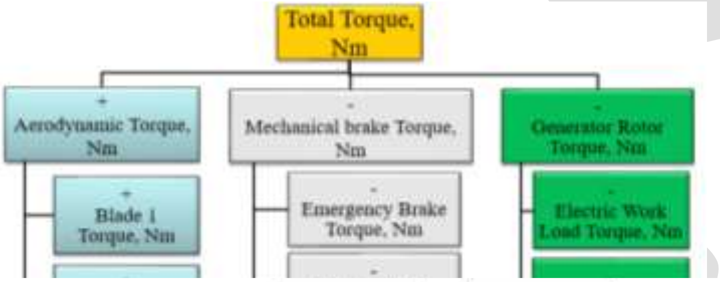
VAWT as small and middle size wind turbine have many system forces and the components by whom is made total active torque (Fig.1.). In classic turbine process the system have two main torques. The positive torque is aerodynamically torque from the wind energy transferred into the turbine blades and the rotor what works as the source of the energy. Electrical load torque what is controlled by the MPPT controller works as normal braking torque with the function to generate as much electric energy as possible according the actual wind speed. In the normal brake condition the stop of the wind turbine is performs by the MPPT controller and it is done by using the energy by feeding the energy into the grid. In emergency case when the MPPT controller is not able to stop the turbine or is malfunction of the controller then emergency system condition triggers the two brake systems. According the specific algorithm the brakes can be used either together or separately. In normal conditions if the generator is not malfunction the system is stopped with electrical brake, but very important note is that the simple electrical brake with active resistance can be used only if the wind turbine uses the permanent magnet synchronous generator. In this case with active resistor help is possible to achieve the maximal generator current and stop the turbine [7].

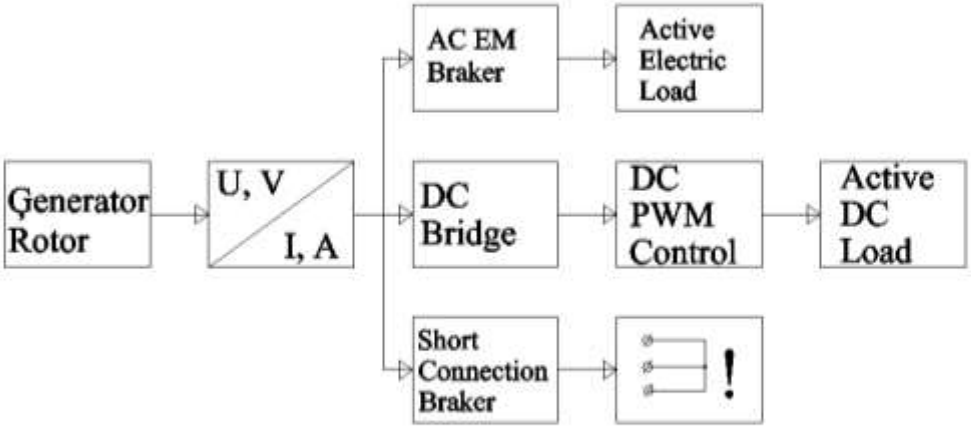
$$T_{sum} = T_a - ((T^1_{a.meh.} + T^2_{a.meh.}) + T_{a.ele.isl.} + T_{sl.} + T_{a.ele.sl.}),$$

where T_{sum} – total torque on the turbine shaft, Nm;
T_a – total aerodynamic torque reduced on the blades, Nm;
$T_{a.meh.}$ – mechanical emergency brake total reduced torque on rotation shaft, Nm;
$T_{a.ele.isl.}$ – electrical short brake emergency brake reduced total torque on rotation shaft, Nm;
$T_{sl.}$ – electric load on the generator shaft according the MPPT setpoint, Nm;
$T_{a.ele.sl.}$ – electrical emergency brake reduced total torque on rotation shaft, Nm.

Fig.1. Wind turbine torque structure

According the size of the active electric load the stop time will be reached. The bigger will be the size of the electric load the faster turbine will be stopped, but important note is that generator cannot achieve bigger current than it's rated current, so that means that generator cannot achieve bigger torque than its rated torque. That is very important for understanding when the mechanical brake should trigger [8].





Mechanical brake trigger should be performed after not achieving needed turbine rotor speed rump down time with electrical emergency brake system. That should make the main trigger for electrical emergency brake activation. The second trigger is when the malfunction is covered in the electric generator system. In that case the system should make emergency brake with mechanical brake. The important fact is that one turbine in best situation should have at least one emergency brake system. As now days is very popular to us PMSG in the wind turbine systems that makes ease way to use the electrical emergency brake system. But as every turbine have mechanical brake then make double brake system for one turbine sometimes can be too expensive.

Fig.2. Electrical emergency brake system structure

The electrical emergency brake system in normal situation is performed by the electric resistors where depending on the generator output voltage the emergency power is achieved (Fig.2.). Very important is to take into account that many active resistors nominal data information about the resistor power is shown at nominal voltage what means that in the moment when the generator speed is ramp down then the actual power of the emergency resistors is less than nominal. If the active resistors power is not calculated enough then can be situation that turbine is not stopped. The resistors can be over heated and the turbine can be damaged or destroyed [9].

Testing of the emergency cases in real life can be expensive and dangerous as well as the high wind conditions can be achieved not very often. This makes big challenge to test very accurate the emergency system wok on the specific wind turbine model. The best way how to test the emergency system before real life final test is to make the test with the simulation system. The usage of the MATLAB Simulink in this case would be very important as by help of the Simulink platform can be tested the system together under mathematical model in real time or non-real time simulation.

The Simulink model shown in the pictures is developed for accurate electrical emergency brake simulation (Fig.3.). The actual active torque from the electric emergency brake model is calculated by the transient process over generator current time constant what is calculated as electrical time constant of the generator taking into account the generator active phase resistance and the inductivity. Depending on the generator voltage and electrical brake active resistance the electric power is achieved P, W. but depending on the actual rotation speed of the generator the actual braking torque is calculated for the shaft of the turbine rotor.

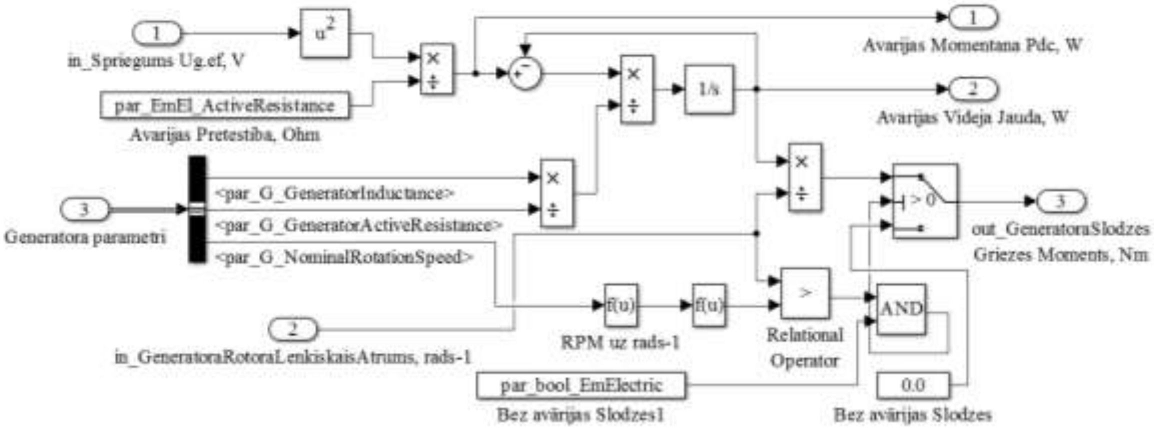


Fig.3. Electrical brake system *Simulink* model structure

In case of using the gearbox for the wind turbine rotor speed multiplication to generator then active braking torque should be reduced to the active shaft part where is calculated the active aerodynamical torque. If aerodynamical torque of the wind turbine model is reduced to the generator shaft then electrical braking torque is at the same point in the system with aerodynamical torque.

Mechanical brake MATLAB Simulink model is develop by using the transfer function for the torque transient process for the brake mechanical work (Fig.4.). Most of the mechanical brakes is designed by using the electrical actuators. The transient process of the mechanical system to achieve the maximal system brake torque depends on the speed of the system mechanics. After emergency is triggered the mechanical emergency brake start command is triggered and the mechanical brake system starts to apply the brakes. That takes time and for wind turbine very fast stop is not good as that can damage the wind turbine system. The mechanical emergency system should achieve the maximum braking torque in limited period of time.

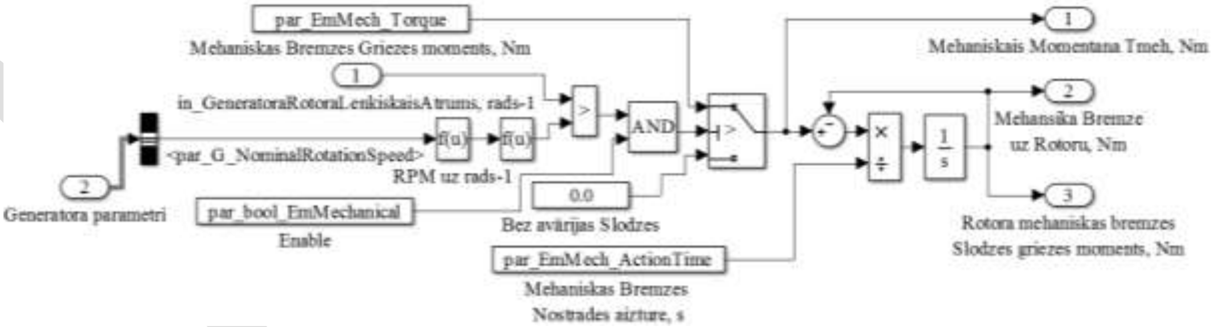


Fig.4. Mechanical brake system *Simulink* model structure

VAWT emergency system simulation result analyse

System model simulation is done first of all testing the each system simulation model separately and after that setting the emergency systems in to the VAWT simulation model to test the emergency system simulator. The first test is the electrical emergency brake system simulation with constant electrical voltage and constant generator electrical parameters. The emergency trigger is triggered at time T=0.018 when generator speed goes over rated rotation speed. The simulation measurement's shows how depending on the size of the active resistance of the emergency brakes changes the transferred output power of the brake system (Fig.5.). Simulation results shoves that the electrical simulation model is correct and can be used in the total VAWT system model.

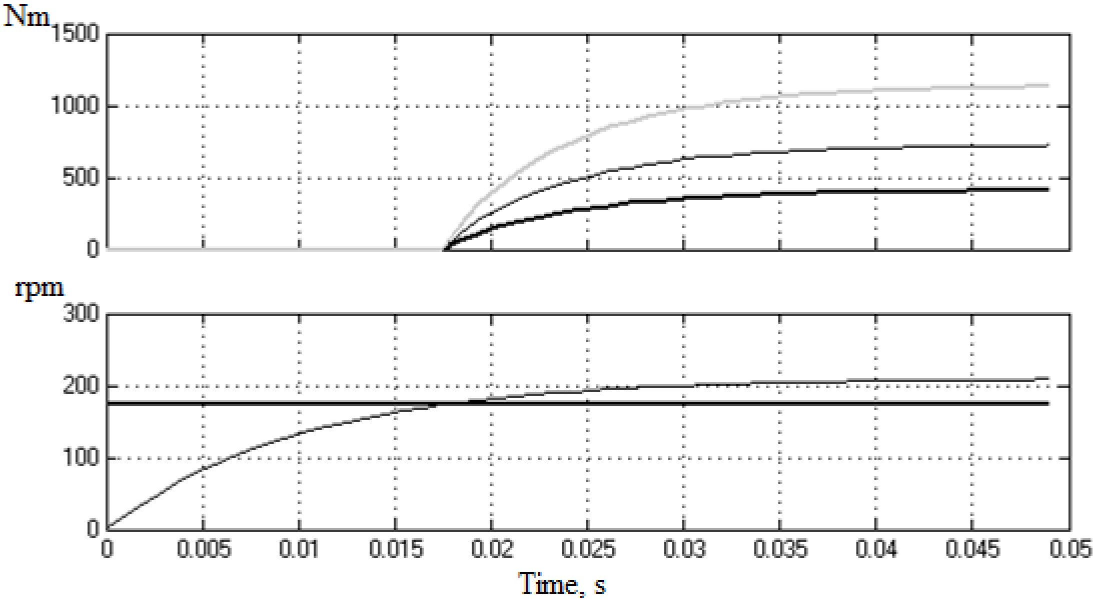


Fig.5 Electrical brake system simulation results with simulated input signals

Mechanical emergency brake system simulation model is simulated with emergency trigger at time T = 0.18 when generator is going in over speed mode. The system is mechanical closing the brake pads and the torque is achieved after the brake actuator is at the end position. Simulation results shows the system work at three different mechanical brake work time but the same maximal toque. The more actuator time is needed the later the maximal torque is achieved what is shown over the simulation records in the scope (Fig.6.). The simulation results shows that the developed mechanical emergency brake simulation model is correct and can be used for total VAWT simulation in simulation model.

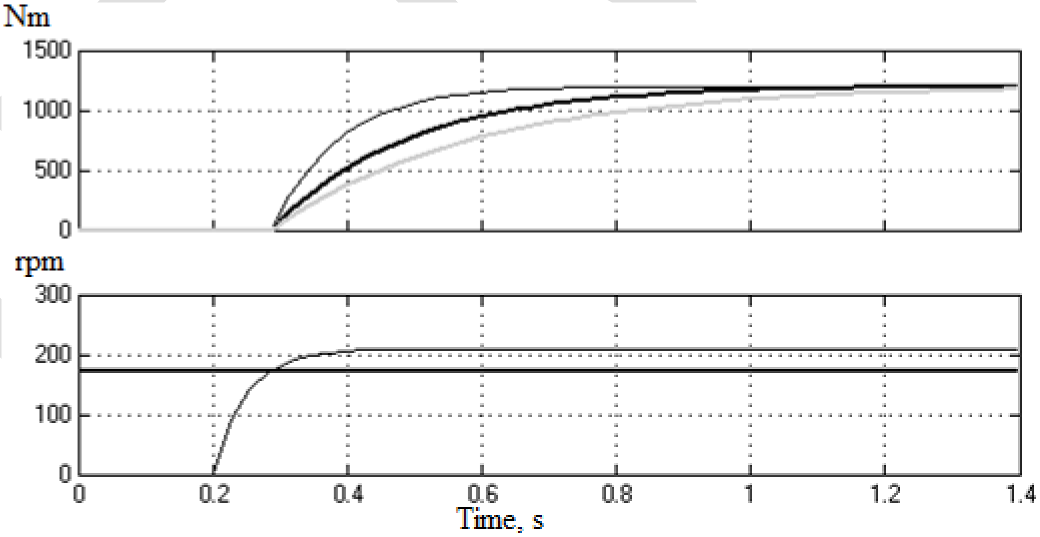


Fig.6 Mechanical brake system simulation results with simulated input signals

VAWT simulation model is developed and described in many other papers and researches for VAWT system simulation. The main goal for using developed simulation model is that the simulation model will show more accurate the new developed emergency braking systems models. Usage of not appropriate VAWT simulation model can give wrong results at the emergency system model verification what is important to be tested with as accurate as possible as the subsystems can be used for another wind turbine simulations.

First simulation is done by testing the electrical brake. As electrical brake theoretically can achieve big electrical brake torque but physically that cannot be more then generator maximal electrical torque. The VAWT simulation model is sated up with generator maximal torque 1248 Nm and the gearbox ration i = 4.28. The emergency system is triggered in the time T = 5s.

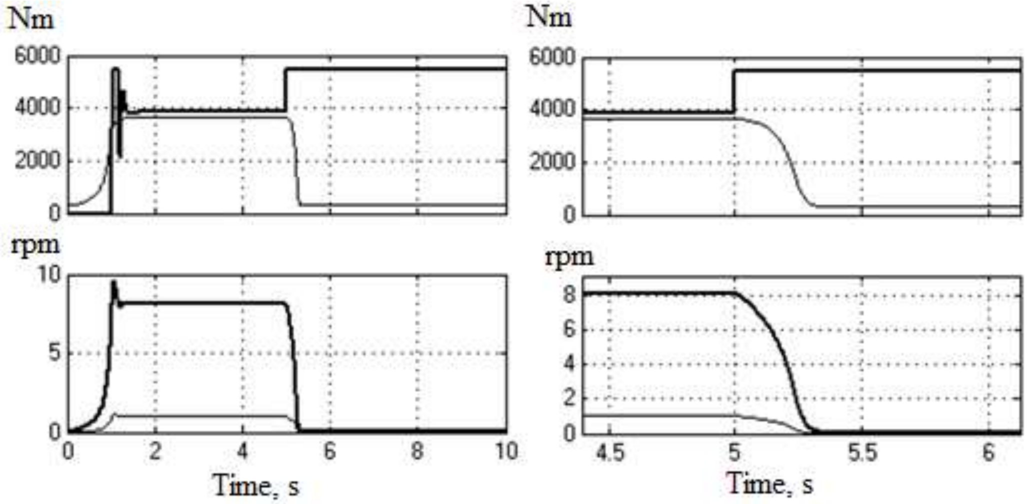


Fig.7 Electrical brake system simulation results integrated in VAWT simulation model

Simulation recorded results shows the system ability to stop the wind turbine with the simulated electrical brake with active resistance R = 1 Ω. As the turbine simulated Inertia was 250 kg ·m² then the turbine was stopped in 0.35s. In the time of stopping the turbine the turbine TSR is decreasing and the Cp is getting lower what makes the aerodynamic torque decrease on the wind turbine rotor. The braking torque achieved on the generator is at maximal ‘generator torque and reduced to the rotor slow speed shaft that is 5341 Nm (Fig.7.).

Simulation test for the mechanical emergency brake system was performed with the same VAWT simulation model and the same turbine settings and wind speed simulation. The mechanical brake was triggered at time T= 5s. The Maximal brake system toque was 10000 Nm and the brake was assembled on the high speed shaft of the wind turbine.

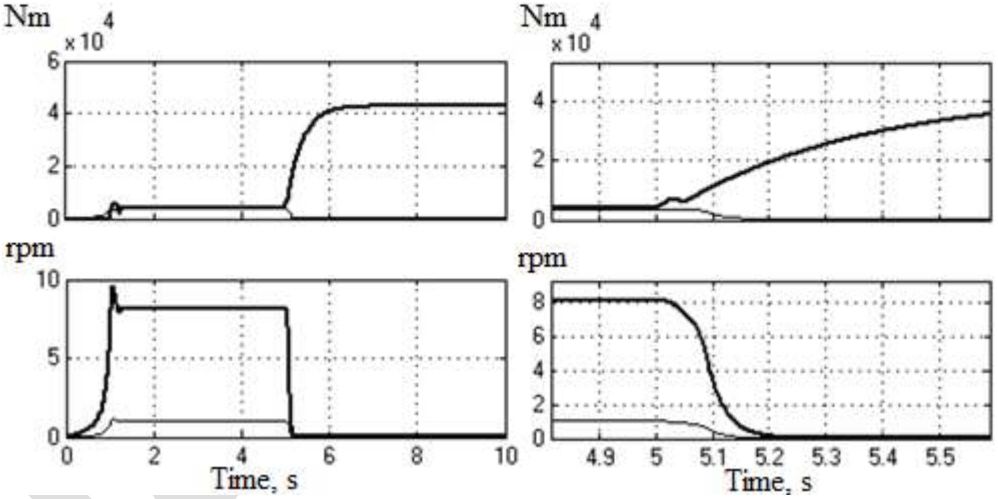


Fig.8 Mechanical brake system simulation results integrated in VAWT simulation model

Simulation recorded results shows that with this type of mechanical brake system with closing speed 1 s achieved the maximal torque with in 1s and reduced brake torque on the low speed shaft was 42 800 Nm, what stopped the wind turbine with in 0.2s (Fig.8.). what makes the conclusions for this turbine simulation that this turbine don’t need so high torque wind turbine as the turbine stopped already at time 0.2s and the brake maximal torque was achieved in time 1s. That means the brake maximal torque can be reduced as minimums for 50%.

Both real VAWT simulation results with emergency brakes showed that the developed new simulation models for the emergency brakes are accurate and can be used in other VAWT or HAWT simulation models.

ACKNOWLEDGMENT

The author is very grateful for support to thesis supervisor Andris Šnīders.

CONCLUSION

Developed MATLAB *Simulink* models shows that the simulation of the VAWT model with emergency brakes is correct and can be used in further emergency equipment tests and developments and used for final engineering calculation test. Simulation model used for emergency system simulation and mathematical test is flexible and easy to use without additional risk to destroy the equipment or attack to the human health what is the most important point in case of system failure. Simulation model is higher level testing solution comparing to the static mathematical calculation. Simulation model gives option to test system in dynamic and with variable process perturbations and system actions.

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Energy Dissipation By Using Different Slopes Of Ogee Spillway

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Abstract— This study aims to investigate the effects of different slope of ogee spillway surface on energy dissipation. Three ogee spillway models were prepared with slope of 1:1, 0.85:1, and 0.75:1. 18 test runs were carried out to investigate the energy dissipation downstream the three spillway models.

Keywords— Energy Dissipation, hydraulic jump, Froude number, discharge, Spillways, Slope, Relative energy loss

1. INTRODUCTION

A spillway is a structure used to provide the controlled release of flows from a dam or levee into a downstream area.

Spillway with various shapes has been considered the most hydraulic structures which used in open channel flow. They are widely used in water flow measurements and control of water surface levels. Spillway is a major part of a dam, which is built to release flood flow. Depend on the hydraulic conditions of flow and the geologic characteristics of the dams site spillways can be built in different types and shapes.

Spillways are invariably provided for all types of dam which may be located either within the body of the dam or at one end of dam or entirely away from the dam as an independent structure.

Spillway is safety device in a dam. Many failures of dams have been reported due to inadequate capacity or improper design of spillway, especially for earthen and rock fill type of dam which is likely to be destroyed, if overtopped, unlike concrete dams which may not fail with slight overtopping for a small period of time.

Today whole world is worried about the water and its proper management. So India is focusing on water management through construction of dam. Many Indian dams which are already constructed are not giving full efficiency for which they are constructed. On other hand while constructing dam we have to face fund related issue. In short we have to construct dam with high efficiency and low cost. This research paper is focusing on reducing downstream scouring at toe by using different slopes of ogee spillway.

2. EXPERIMENTAL MODELS

The models were of a width 10 cm, height of 25 cm measured from the crest, and the base is varied according to the change in surface slope which is equal to 25cm, 21cm, and 19cm for slope 1:1, 0.85:1, and 0.75:1, respectively.

These models were made from wood and well painted by a water proof varnish to prevent wood from changing its volume by absorbing water.

3. LABORATORY WORK

All The tests were carried out in the fluid mechanics laboratory of P.D.V.V.P.C.O.E., A'NAGAR of the Savitribai Phule Pune University. The laboratory has a flume of 10m long horizontal tilting flume of 0.3m in width and 0.45m in height. The bed of the flume was maintained at a horizontal slope during all of the tests. A centrifugal pump having a rated capacity of 40l/s was used to deliver flow to the flume. Measurements of depths water levels were observed by point gages which have the accuracy of 0.1 mm. Measurement of water level is taken at u/s and d/s side of spillway. The crest of the spillway and the channel bottom were used as reference for the upstream and downstream point gages, respectively. Upstream water depth was varying between 1.2cm and 5cm above the crest level. At these water depths, the minimum and maximum discharges were obtained of 37.72 cm^3/sec/cm and 258.68 cm^3/sec/cm of the 1:1 model, 47.15 cm^3/sec/cm and 261.38 cm^3/sec/cm of the 0.85:1 model, 55.24 cm^3/sec/cm and 257.34 cm^3/sec/cm of the 0.75:1 model respectively,. Spillway models were placed within the flume.6 test run were carried out on each spillway model.

In all test runs on three models follow the same laboratory procedure, which is summarized as follows:

- Operating the flume pump.

- Adjusting the control valve to obtain the required flow depth.

- Measuring the upstream water depth.

- Measuring the downstream water depth.

Fig.1 flow over ogee spillway

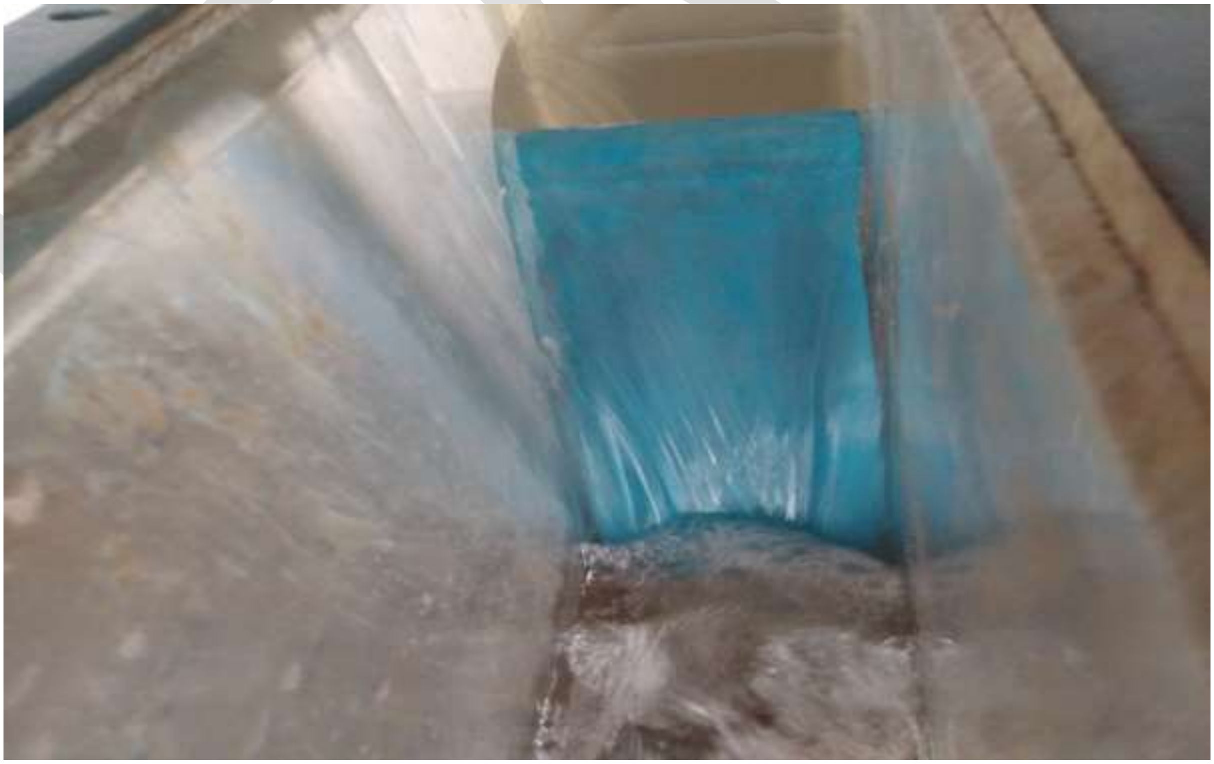
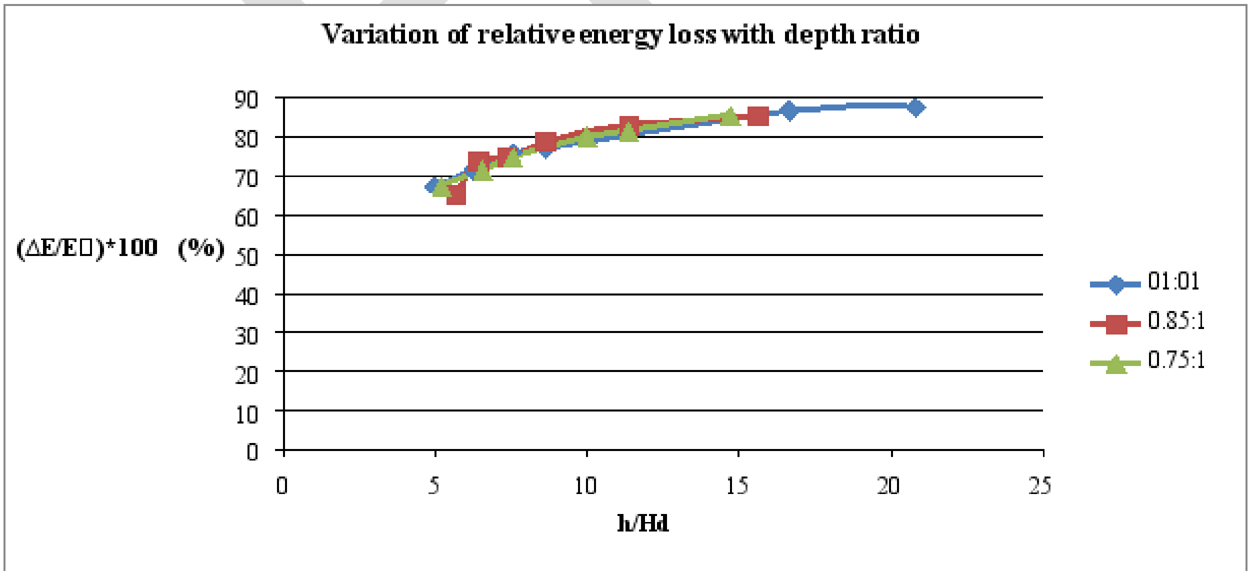


Fig.2 hydraulic jump at the toe of spillway

4. RESULT AND ANALYSIS

Eighteen tests runs were carried out on the three spillway models of different slope surfaces. For minimum depth ratio relative energy loss is 67%, 65.03%, 67.20% for slope 1:1, 0.85:1, 0.75:1 respectively. For maximum depth ratio relative energy loss is 87.17%, 85 %, 85.20% for slope 1:1, 0.85:1, 0.75:1 respectively.



CONCLUSION

In the entire tests, the flow over the ogee spillway was of high kinetic energy of the flow causes high values of ength of jump and height of jump to developed at downstream the spillway. As the slope of the spillway surface is milder as the values of length of jump and height of jump are reduced. . In tests runs, the values of relative energy loss varied between 67% and 87.17% , 65.03% and 85 %, and 67.20 % and 85.20%, for spillway models with slopes 1:1, 0.85:1, and 0.75:1, respectively.

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A Monopole Antenna with U-Shaped Slots for Wireless Applications

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Abstract – Antennas are alarmingly becoming a bridge between invisible Electromagnetic frequencies and visible electronic gadgets. It is a means to achieve communication in today's Era. Likewise, a monopole antenna is designed and fabricated in this paper, which operates in WLAN, WiMax and UWB frequencies. The antenna has two U-shaped slots embedded in the circular patch and feedline fed with coplanar waveguide. The modeling equations are elaborated with circuit analysis for the antenna. It has desirable gain features ranging from 3.56 dBi to 5.6 dBi with good radiation efficiency.

Keywords–

Circular patch, U-shaped slots, coplanar feed, equivalent circuit, Modeling equations, impedance bandwidth, current distribution.

I. INTRODUCTION

IEEE 802.11 standards for WLAN consist of 2.4 GHz (2.4–2.484 GHz), 5.2 GHz (5.15–5.35 GHz), and 5.8 GHz (5.725–5.825 GHz) frequency bands and IEEE 802.16 standards for WiMaX consist of 2.5-2.69 GHz, 3.40-3.69 GHz and 5.25-5.85 GHz [2][9]. Also, there is an increasing demand for Ultra wide band applications which covers 3.1 to 10.6 GHz. In order to achieve all these frequency bands in one device, the following antenna is designed with monopole characteristics. Recently, printed monopole antennas have become prominent for WLAN and WiMAX applications due to its low cost, process simplicity, good performance and portability nature[5]. This paper provides detailed antenna dimensions and modeling of it in HFSS software. The circuital analysis is elaborated with equations governing it.

In[1], a monopole antenna with two curved stripes connected to feed point was proposed for WLAN USB dongle application which did not cover UWB range. A miniature triple band monopole was designed in [2] but the gains achieved were less than required. Many other designs of triple band antennas are either complex in structure with protruding parts or large in size, which limit their availabilities for practical applications. In paper[4], a mechanical conical monopole antenna was designed operable in X band and Ku band. But it hardly makes the device portable for ready use in the communication field where space is an essential criteria. Hence, there is a need for small portable antenna which can be easily installed in the mobile phones or network cards.

In this design, the monopole antenna covers WLAN, WiMax and some UWB ranges with acceptable gains and wide impedance bandwidth. The slots are designed to operate at particular resonating frequencies. It has relatively low VSWR and efficient radiation efficiency.

II. ANTENNA DESIGN AND APPLICATION BANDS

The prototype structure of the antenna designed here consists of a dual U-shaped slots embedded in the circular patch and feedline fed through a coplanar waveguide (CPW) transmission line, which is in turn connected to a coaxial cable through a standard 50Ω SMA connector. The antenna is designed on a low-cost, durable FR4 substrate having relative dielectric constant ε_r=4.4, loss tangent tanδ=0.02 and thickness of h=1.6 mm. The overall size of the antenna is 48x65mm^2; while the circular patch is of optimized radius of 12 mm. A 50 ohm CPW transmission line of a signal strip width of 3.8mm with a gap distance of 0.3mm between the strip and the coplanar ground plane is used for feeding the antenna. The Coplanar feed is considered in order to reduce surface waves[2]. The feedline of coplanar feed acts as signal conductor while the ground planes situated at either side on the feedline acts as returning planes.

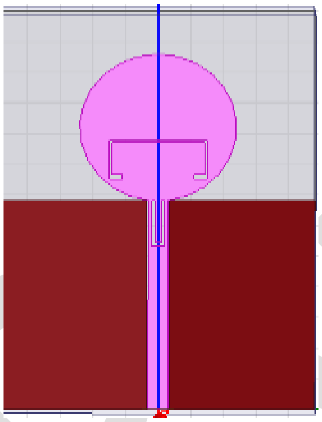

Fig.1. Design of monopole antenna with one U-shaped slot at the circular patch and other in the feedline.

The antenna is devised for the application in various WLAN (from 2.4-2.484 GHz, 5.15-5.35 GHz), WiMax (from 2.5-2.69 GHz, 3.3-3.8 GHz) and UWB (from 3.36-11.67 GHz) bands.

Table I

Parameter	**Unit (mm)**
Length of patch U-slot	32
Thickness of the slot	0.7
Length of the feedline U-slot	17.3
Radius of the circular patch	12
Ground plane dimension	34x22.2
Substrate dimension	48x65
Signal strip width	3.8

Table.1. Dimensions of the proposed antenna

III. DESIGN METHODOLOGY AND PARAMETER ANALYSIS

In order to interpret the principle of the slot technique, the antenna is analyzed with equivalent circuit model. Fig.2. gives the equivalent circuit of the antenna in Fig.1. Zslot1, Zslot2 and Zant expresses the equivalent impedance of the inverted U-shaped slotline at the circular patch, the U-shaped slotline at the feedline and the circular patch respectively. It is supposed that the resonant frequencies of the patch and feedline slotline are, respectively, f1 and f2. It can be concluded that the circuit is shorted when f=f1 or f2, since the two pieces of shorted slotlines are of the lengths of $\lambda_1/2$ and $\lambda_2/2$, respectively.

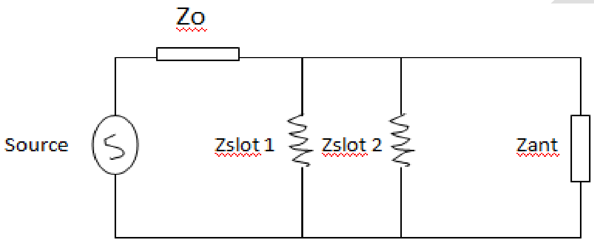

Fig.2. Equivalent circuit model of the antenna with two U-shaped slots expressed in the impedance form.

The Zo represents the characteristic impedance of the equivalent circuit. For resonating frequency, f_1=4.05 Ghz, the length of the slot of the patch is $Lslot_1$=32 mm and for resonating frequency, f_2=7.5 Ghz, the length of the slot of the feedline is $Lslot_2$=17.3 mm. The slot lengths are evaluated using the following formula;

$L_{slot=}C/[2f_o\{\sqrt{(_r+1)}\}/2]$.

The effective permittivity, ε_e is slightly less than εr because the fringing fields around periphery of the patch are not confined in the dielectric substrate but spread in the air. For FR-4 substrate, ε_r=4.4 and h=1.6mm;

$\varepsilon_{e=}\{\sqrt{(\varepsilon_r+1)/2}\}+\{\sqrt{(\varepsilon_r-1)/(2\sqrt{(1+(10h/W))})}\}$; therefore, ε_e =4.017.

The width of the patch is evaluated by the formula, W= $C/[2f_o\{\sqrt{(\varepsilon_r+1)}\}/2]$.

For f= 3.8 Ghz; W= 24mm (Diameter of the circular patch). The other parameter, effective length is evaluated in the antenna to understand the actual length extension of the antenna. The effective length is increased due to fringing effect. It is calculated as;

$L_e=L+2\delta L= C/\{2\ f_o\sqrt{(\varepsilon_e}\}$; for resonating frequency, f =4.5 Ghz , therefore Le=75 mm.

IV. RESULTS AND DISCUSSION

The antenna is designed and simulated with the help of HFSS – a high performance full wave EM field simulator. The results are optimized in HFSS and the frequency of operation , antenna gain and other antenna parameters are obtained. Fig.3 describes the simulated return loss against the frequency for the prototype antenna.

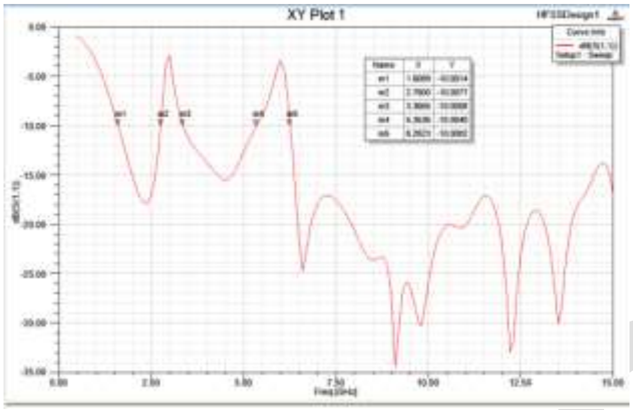

Fig.3 Reflection coefficient plot showing good impedance bandwidth of 1160 MHz at 1.6 to 2.76 Ghz and 1987 MHz at 3.366 to 5.353 Ghz.

U-shaped slot needs to be etched efficiently in order to obtain proper operating frequency. The result shows wide bandwidth response. The lower band of the proposed antenna has an impedance bandwidth of 1160 MHz (1.6-2.76 Ghz) and higher band has BW of 1987 MHz (3.366-5.353 Ghz) covering WLAN, WiMax and UWB bands.

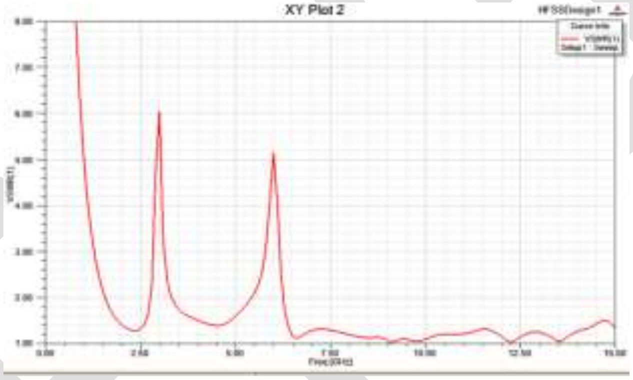

Fig.4. VSWR plot showing voltage standing wave ratio less than 2dB (Ideally VSWR<=1).

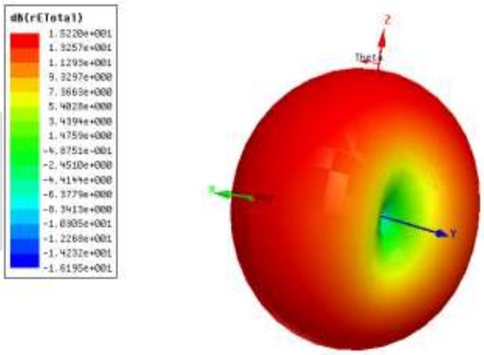

Fig.5. 3-D radiation plot for designed monopole antenna showing good omnidirectional radiation.

Fig.6 Peak Gain curve showing maximum gain at 9.2 GHz, whereas gain at WLAN band is about 2.05 dBi and at WiMax it is near to 1.06 dBi.

The gain increases with frequency and is maximum at 9.2 Ghz. Achievable gain at WLAN band is about 2.05 dBi and at WiMax its 1.06 dBi. The proposed antenna has a larger gain in the higher bands because the antenna gain is a function of its electrical dimensions relative to the wavelength of interest, current/field distribution and radiation pattern[13].

V. CONCLUSION

Good antenna radiation performance of operating frequencies across the WLAN, WiMaX & UWB bands are obtained. By embedding two U- shaped slots, efficient impedance bandwidth is achieved with gain ranging from 1.06 dBi to 5.32 dBi. Also, proper E-plane radiation is observed at desired frequencies giving the omnidirectional radiation nature for the monopole antenna.

VI. FUTURE SCOPE

It can be further modified for achieving higher frequencies by increasing slot structures. Also, necessary filter notch can be inserted in the design in order to eliminate unnecessary frequency.

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Improving Productivity by Implementing Lean Manufacturing

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Abstract— The Lean manufacturing process refers to wipe out or minimize the seven deadly wastes by keeping the production flow maximized. It is a management tool for making a schematic production process with the lean initiatives through the recorded orderly information and investigation led further. It is a procedure for planning the enhancements suggested including the cost, outline, process improvements and so on. The target of this study is to create a value stream map for an automobile company of anti-vibrations solutions. This specific tool allows the organization to focus upon their current lead time, stock levels and cycle times to find out the ratio of value added process to the total lead time of the product line being investigated. The initial step is to generate a current state map to analyze the production flow and to evaluate the company's current cycle times, process interchanges, and equipment capacity of machine. The essential objective is to eliminate the wastes by first identifying the ones which do not add any value for the final product in the production.

Keywords— Lean manufacturing, value stream map, production cost, PPIC, seven deadly wastes, productivity, inventory control, process mapping.

INTRODUCTION

Lean manufacturing is a concept to abolish waste in production department of an Organization. The aim of manufacturing firm is to continually increase productivity by maximum utilization of their recourses in operations. The objective is customer satisfaction with absolute product, quantity, quality and value in lesser time. For getting the profitable production, a conspicuous approach is required to minimize the wastes in production. The seven wastes targeted by the Lean Manufacturing Philosophy are: motion, overproduction, over-processing, inventory, defects, waiting and transportation [1]. Part of lean manufacturing is checking the operations only for the parts, processes or components which add to price instead of value [2]. Carefully observed all the production step during manufacturing and add only those which improve the value of the product and other could be assigned to an outsourcing company so that the staff can focus only on the value-added operations of its core business. Taiichi Ohno and Shigeo Shingo framed a new, disciplined as well as a process-oriented system which is today called as "Toyota Production System (TPS)" or "Lean Manufacturing" [3]. They developed a system that upgrade the productivity at Toyota in between 1945 and 1970.

A stream map can be used to document on the current production lead time, inventory levels and cycle times in order to create a vision of an ideal value flow between the various departments and processes [4]. A Lean 3P (production, preparation, process) method was design a new endoscopy unit, which shows that 3P is an effective tool on developing the designs as per requirements of multiple stakeholders. The accuracy and efficiency process system can be improved at same time, by ensure lean production [5]. A Kanban system works effectively in multinational organization and to identify factors hindering small and medium enterprises (SME) from implementing Kanban [6]. A lean route map is implementing in organization for lean manufacturing system [7]. A green Manufacturing can be applied in all manufacturing sectors that minimize waste & pollution and ultimately enable the economic progress and contribute in conserving the resources [8].The multi-dimensional concept, unavailability benchmark and uncertainty, which arises from the human judgments for the measurement of degree of leanness, is discussed by [9]. The objective of lean manufacturing is to manufacture a product exactly what the customer wants, it can be achieved by minimizing all non-value added activities in production [10].

The key principle of Lean is misspend "muda" the underlying driver of operational inefficiency [11]. Organizations should identify the waste from customer point of view and then regulate how to eliminate it. These waste increasing the product costs and adds no or just a zero value to manufacturing process [12]. The Process improvement is exact way for improvements of results as any organization.

An accurate inspection is required of work flows from one person or workstation to the next corresponding person or workstation. From a lean aspect, the first thing to create a value stream map following the indirect pathway of matter through the process [13].

PROBLEM IDENTIFICATION

The production management team of manufacturing firm is focusing on value-added activities to enhance their business productivity. Amid study it has been observed that they neglect the significance effect of non value added activities "wastes". There is a remarkable statistical effect on production cost by evacuating the seven wastes through lean manufacturing. The mapping with all value-added activities can help in focusing on every root cause in an on-going process. This paper focused on the application of Lean manufacturing in process engineering and Global Production System (GPS) department for productivity improvement.

OBJECTIVES

The fundamental objective of the present work is to research the current situation of wastes elimination in the manufacturing firm and its vital role to reduce the production cost. It is required to create a value stream map in terms of value and non value activities, cycle time, marketing, PPIC (Product Planning & Inventory Control), manpower requirements, purchase process flow and other departments. The ultimate target is to improve productivity by lean manufacturing.

METHODOLOGY

Lean manufacturing is a philosophy to shorten the time line between customer requests and fulfillment by eliminating the wastes (Figure 1); these can be achieved by mapping the value and non value activities. The process mapping at different stages in the production department for AV1370 with all the process is shown in Figure 2. According to the customer requirements, the activities which are generally adding value are forging, rolling, quenching and which do not adds values are transportation, inspection, motion are depicted in a stream map (Figure 3) for part VSM_SPCL_M14X9.

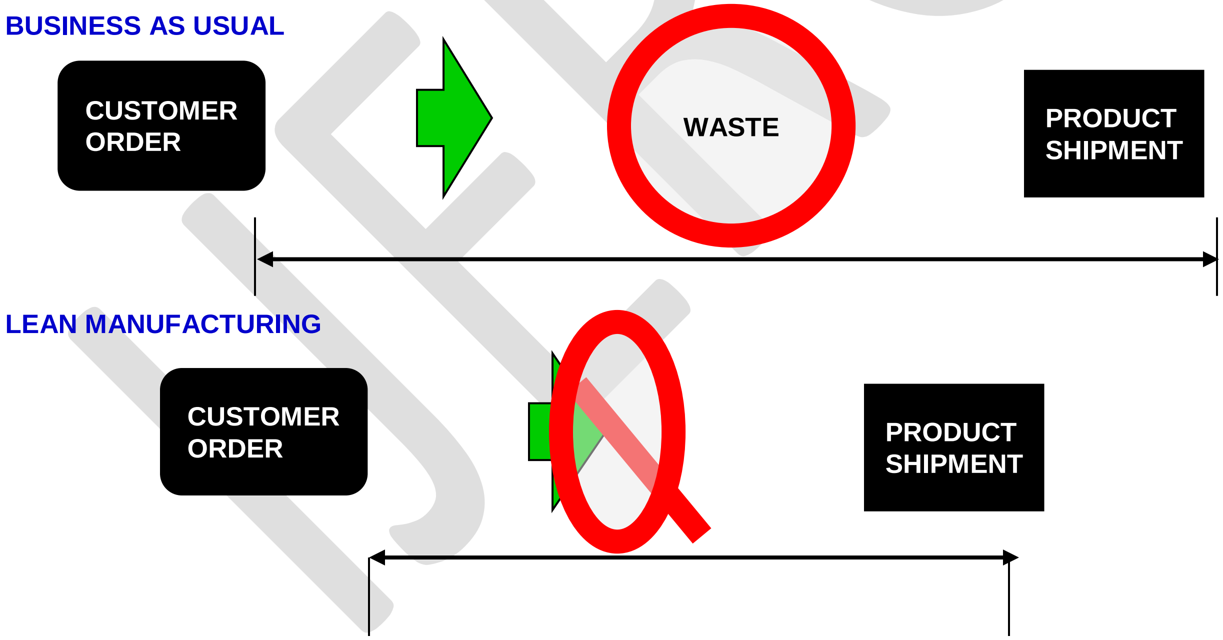

Figure 1: Reducing time by introducing lean manufacturing

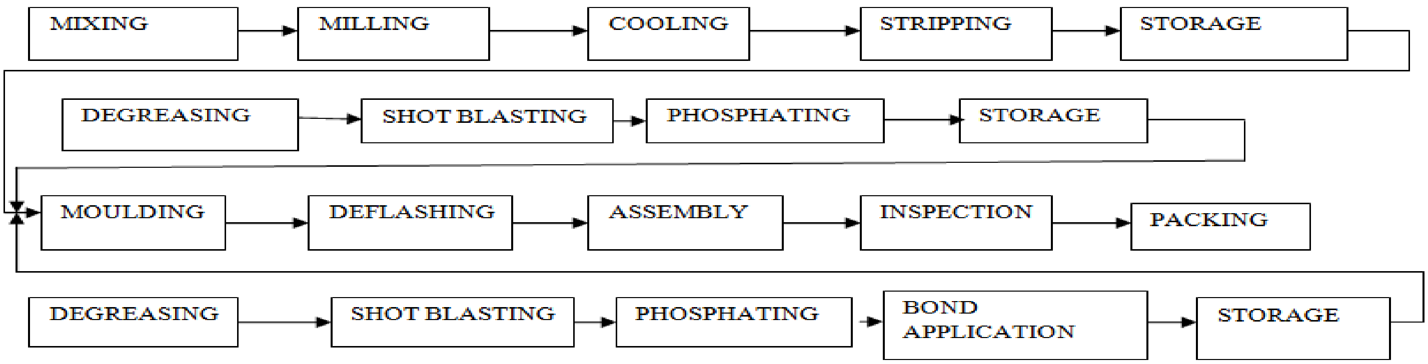

Figure 2: High level process mapping for AV 1730

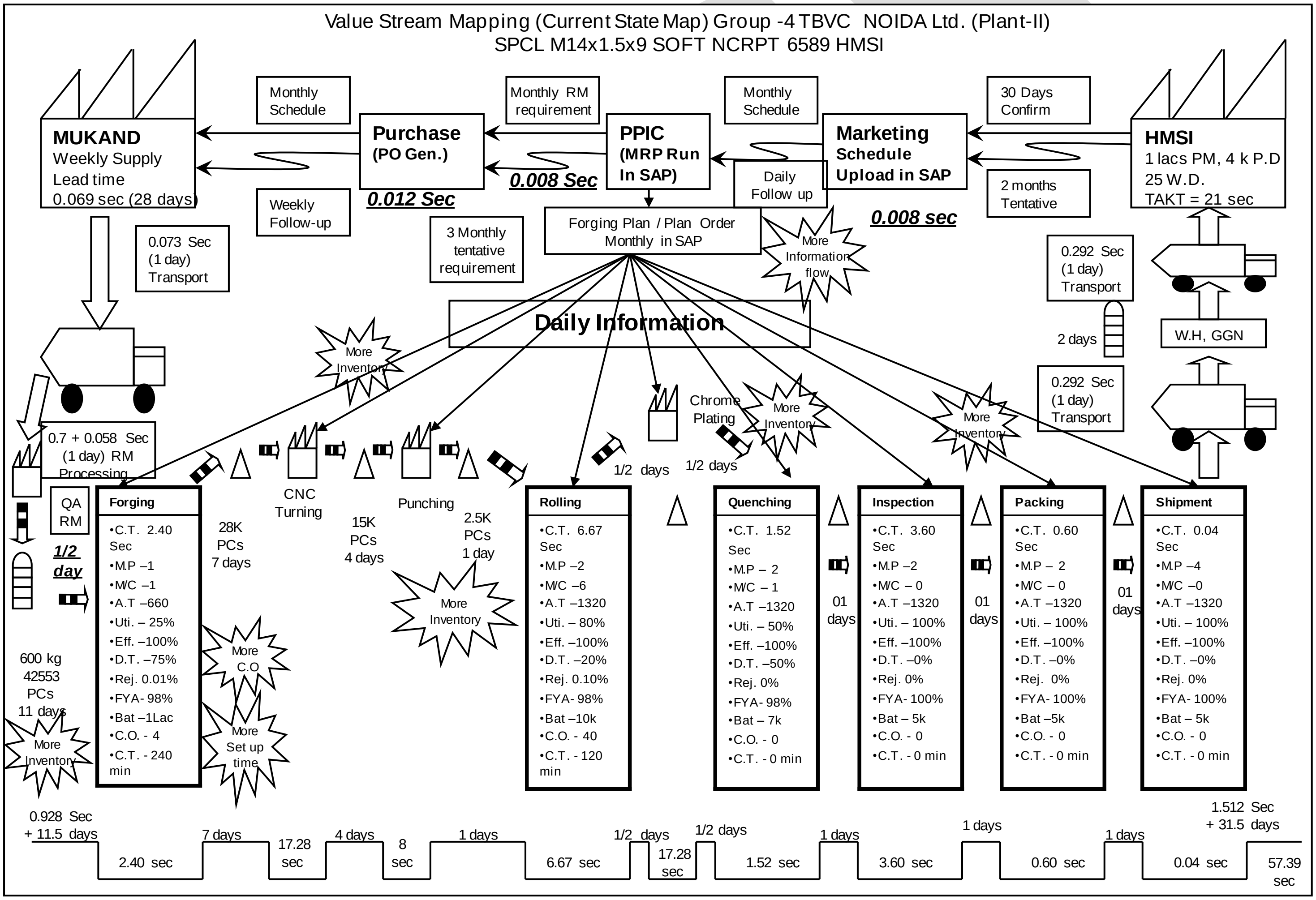

Figure 3: Value stream mapping for VSM_SPCL_M14X9

MARKETING PROCESS FLOW

Marketing process alludes the strategies or procedures that are created to ensure the customer has a positive and noteworthy experience when buying or utilizing the product or service. The marketing process flow is as shown in Figure 4 with the scheduling and planning as per customer requirements.

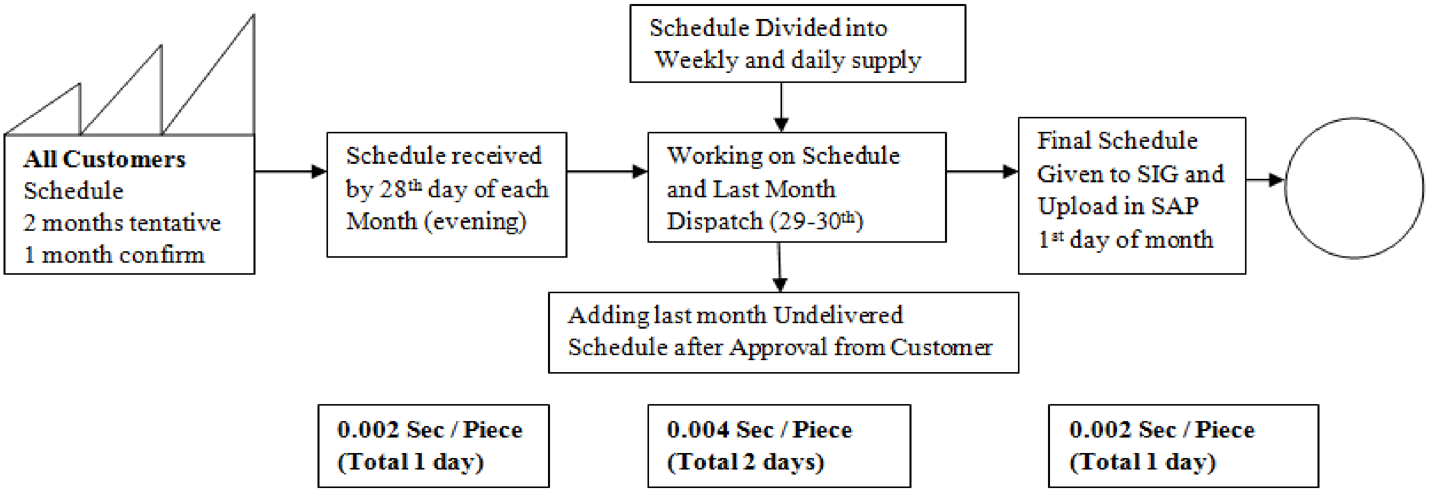

Figure4: Marketing process flow including scheduling and planning

PRODUCT PLANNING AND INVENTORY CONTROL

This procedure (Figure 5) indicates how the product planning flows along with inventory control process by keeping in mind to minimize the inventory cost and expand the use of assets, material and procedure.

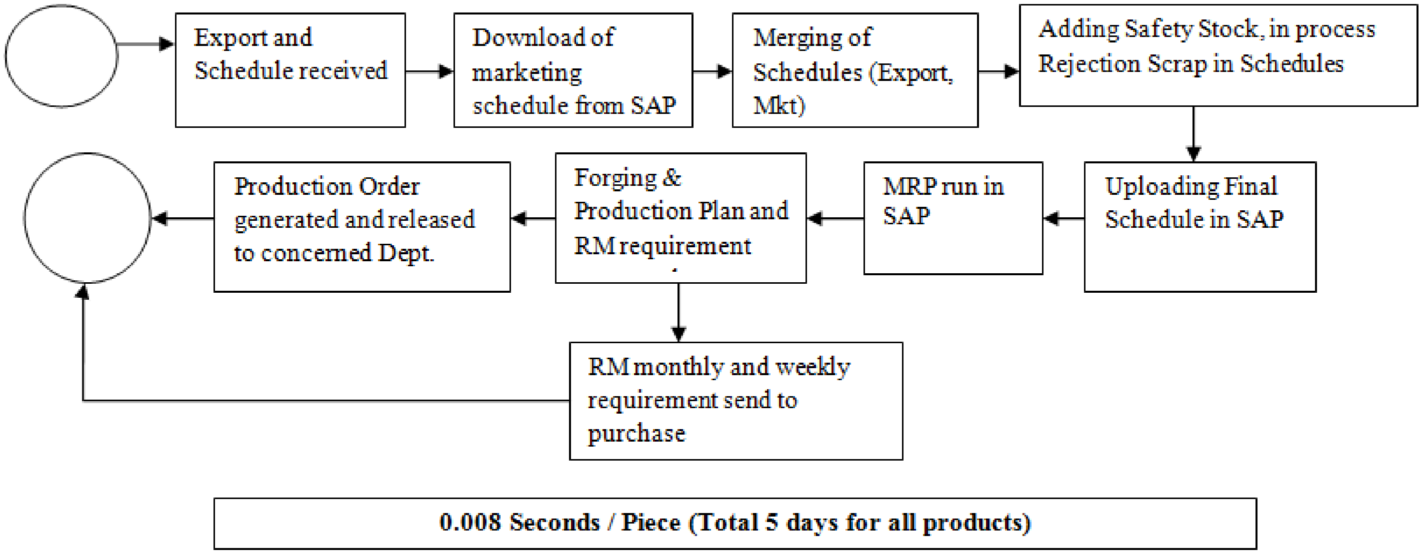

Figure5: Flow of Product Planning &Inventory Control

PURCHASE PROCESS FLOW

The method starts with a demand or prerequisites which could be for a physical part (inventory) or a service. It starts after receiving the requirements of raw materials from PPIC and later following the delivery of planned schedule and consignment flow as demonstrated in Figure 6.

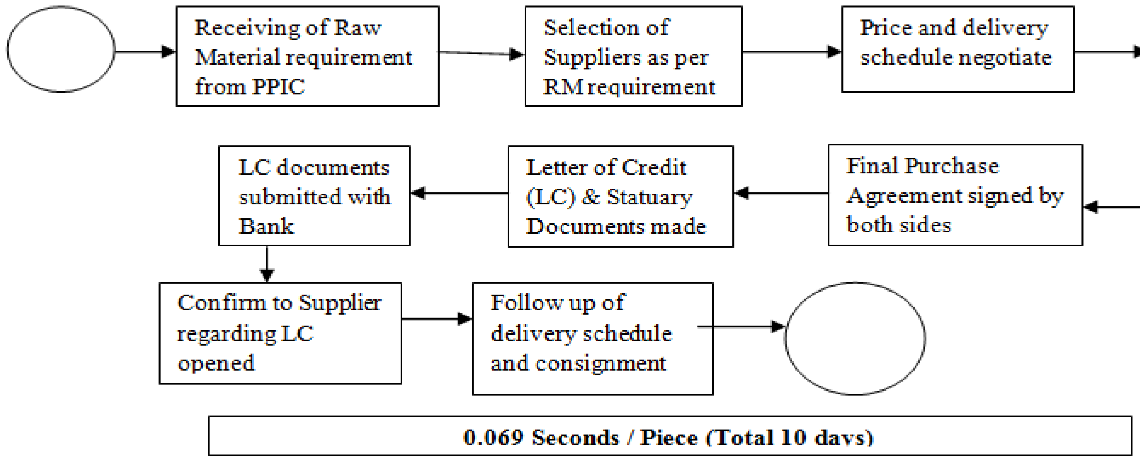

Figure6: Process flow of Purchasing Department

MARKETING AND PPIC PURCHASE

In this, the lead time is computed per piece of various activities such as Raw Material (RM), Marketing (MKT), PPIC Purchase involved as illustrated in Table 1.

Table1: Lead time calculation per piece for Purchase, Marketing, PPIC, RM

Activity	**Total Days**	**Total Hours**	**Total Seconds**	**UOM**	**Wt _ MT Nov 10**	**Seconds / Wt(Kg)**	**Product Wt (Kg)**	**Lead Time (Seconds) per Pc**
Marketing	4	92	331200	Sale Wt	608.100	0.54	0.0141	0.008
PPIC	5	115	414000	Final Deposit	771.011	0.54	0.0141	0.008
RM Purchase	10	230	828000	RM Purchase	974.163	0.85	0.0141	0.012
Supplier (RM)	28	644	2318400	RM Batch Process at Supplier End	475.000	4.88	0.0141	0.069
Transportation (RM Supplier)	1	23	82800	Supplier to RM Processing Vendor	16.000	5.18	0.0141	0.073
RM Processing Vendor (Option-I)	3	69	248400	RM Processing (Annealing + Drawn)	5.000	49.68	0.0141	0.700
RM Processing Vendor (Option-II)	0.5	11.5	41400	RM Processing (Drawn)	5.000	8.28	0.0141	0.117
Transportation (RM Processing Vendor)	0.5	11.5	41400	RM Processing Vendor to Factory	10.000	4.14	0.0141	0.058
Transportation (Factory to Warehouse)	1	23	82800	Factory to Warehouse	4.000	20.70	0.0141	0.292
Transportation (Warehouse to Customer)	1	23	82800	Warehouse to Customer	4.000	20.70	0.0141	0.292

RESULTS

In this section, the summary sheet of SPCL_M14X 1.5X 9.5 SOFT NCRPT 6589 is exhibited (Table 2) in which different activities are recorded with various departments. Amid study, the present value is noted down and target esteem which is to be accomplished is composed (Figure 7). The Target value is reduced as compared to present value. The most noteworthy decrease in target value can be seen in inventory days for computer numerical control (CNC) machine i.e. from 7 days to 1day which at last, profited in on-time delivery of the product. The production was increased along with the decrease in waiting time which is basically an elimination of one of the seven kinds of wastes. The production is increased along with the decrease in waiting time which is essentially an elimination of one of the seven kinds of wastes. The cost benefit analysis is carried out and number of resources is seen according to the prerequisite. The contribution of single project with total time is carried out. The total cost benefit is most extreme (INR 1,186,025) for manufacturing processes which are increasing the value to the product such as forging, punching, quenching, chrome plating and so forth (Figure 8). The base money saving advantage is accomplished by marketing department which is around INR 11,107. The benefit is seen for all the undersigned projects whether it will increase production or decrease cycle time, waiting time etc. So, overall value stream mapping is done which clearly depicts all the value-added and non-value added activities along with the individual cycle times so that benefits and maximum utilization of resources can be accomplished.

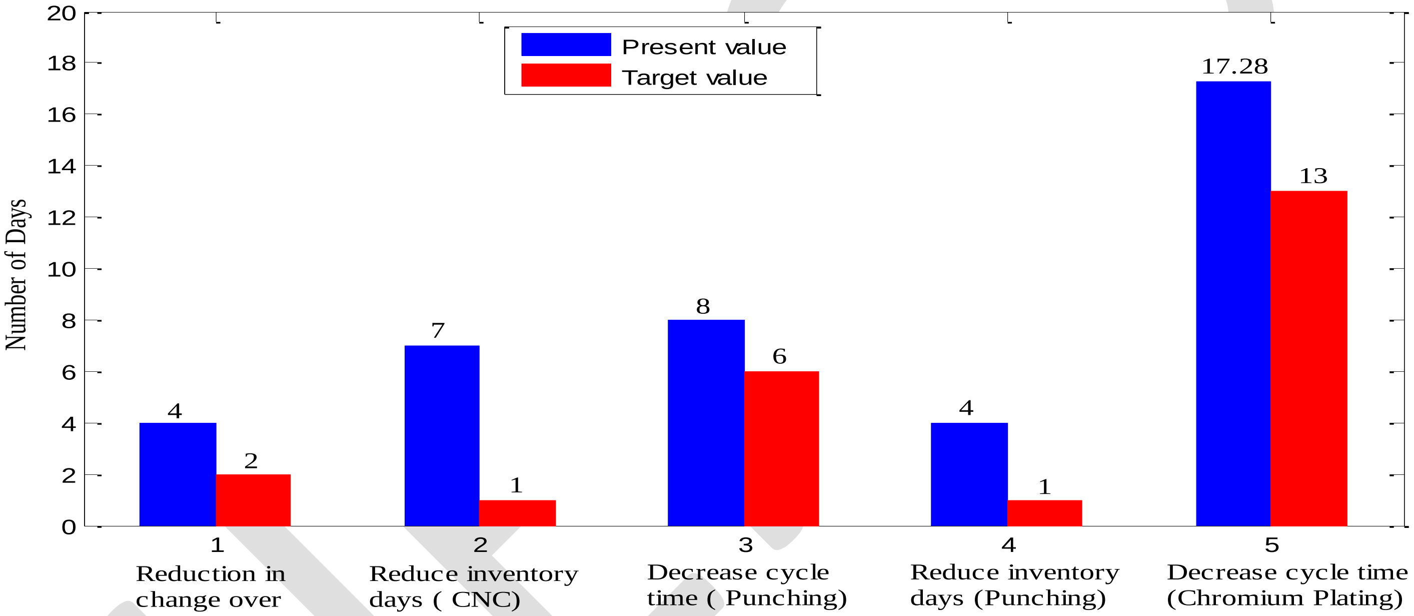

Figure7: Present & Target values comparison with different project activities

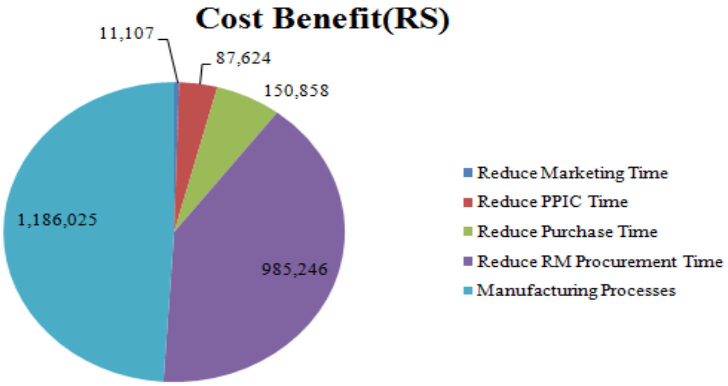

Figure8: Comparison of Cost benefits with the different departments of activities.

Table 2: Project Summary sheet including the benefits, project time, resources utilized

Sr. No.	Customer Criticality	Projects	Department	Type	Present Status	Target	Benefit	Cost Benefit	Project Time	Responsibility	No. of Resources	% of Total Time
1	9	Reduction of Down Time	Forging - 2D4B	Project	75%	53%	Increase Production	1,186,025	2 weeks	Forging	4	20%
2	9	Reduction in Change Over	Forging - 2D4B	KAIZEN	4	2	Saving of Set Up Hours		2 weeks	Forging	4	20%
3	8	Decrease Set Up Time	Forging - 2D4B	Project	240	180	More Production Hours		2 weeks	Forging and D & D	6	20%
4	9	Decrease Cycle Time	Vendor (CNC)	Project	17.28	11	Increase Production		2 weeks	D & D and SCM	3	20%
5	8	Reduce Inventory Days	Vendor (CNC)	KAIZEN	7	1	On-time Delivery		2 weeks	D & D and SCM	3	20%
6	9	Decrease Cycle Time	Vendor (Punching)	Project	8	6	Increase Production		2 weeks	D & D and SCM	3	20%
7	8	Reduce Inventory Days	Vendor (Punching)	KAIZEN	4	1	On-time Delivery		2 weeks	D & D and SCM	3	20%
8	9	Reduction in Change Over	Secondary - MTR 15	KAIZEN	40	20	Saving of Set Up Hours		2 weeks	Secondary	4	20%
9	8	Decrease Set Up Time	Secondary - MTR 15	Project	120	60	More Production Hours		2 weeks	Secondary and D & D	6	20%
10	8	Decrease Cycle Time	Secondary - MTR 15	Project	6.67	4	Increase Production		2 weeks	Secondary	4	20%
11	9	Decrease Cycle Time	Vendor (Chrome Plating)	Project	17.28	13	Increase Production		2 weeks	D & D and SCM	3	20%
12	8	Increase Batch Size	Quenching	KAIZEN	7000	20000	Decrease Waiting Time		2 weeks	Heat Treatment	2	20%
13	8	Decrease Cycle Time	Final Inspection	KAIZEN	3.6	2.5	Increase Production		2 weeks	Final Inspection	1	10%
14	8	Increase Batch Size	Final Inspection	KAIZEN	5000	20000	Decrease Waiting Time		2 weeks	Final Inspection	1	10%
15	8	Increase Batch Size	Packing	KAIZEN	5000	20000	Decrease Waiting Time		2 weeks	Packing Section	1	5%
16	3	Reduce Marketing Time	Marketing	Project	3 Days	2 days	Decrease Waiting Time	11,107	2 weeks	Marketing	3	20%
17	3	Reduce PPIC Time	PPIC	Project	4 Days	2 days	Decrease Waiting Time	87,624	2 weeks	PPIC	2	20%
18	3	Reduce Purchase Time	Purchase	Project	8 days	4 days	Decrease Waiting Time	150,858	2 weeks	Purchase	2	20%
19	3	Reduce RM Procurement Tim	Purchase	Project	33 days	15 days	Decrease Waiting Time	985,246	2 weeks	Purchase	2	20%
							Total Benefit	**2,420,860**				

CONCLUSION

Principle reason for this paper is to create a value stream map and recognize the contribution of waste in a specific undertaking which is influencing the lead time. After a specific assessment (Table 3), the production is increased due to decrease in downtime (forging) and decrease in cycle time (punching and chrome plating). The decrease in waiting time after the manufacturing operations is achieved with increase in batch size. The target value is diminished when compared with present value in inventory days for CNC machine which benefitted on-time delivery of the product (Figure 7). The total cost benefit is INR 1,186,025 for manufacturing processes.

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Drivers of Financial Inclusion to Reach Out Poor

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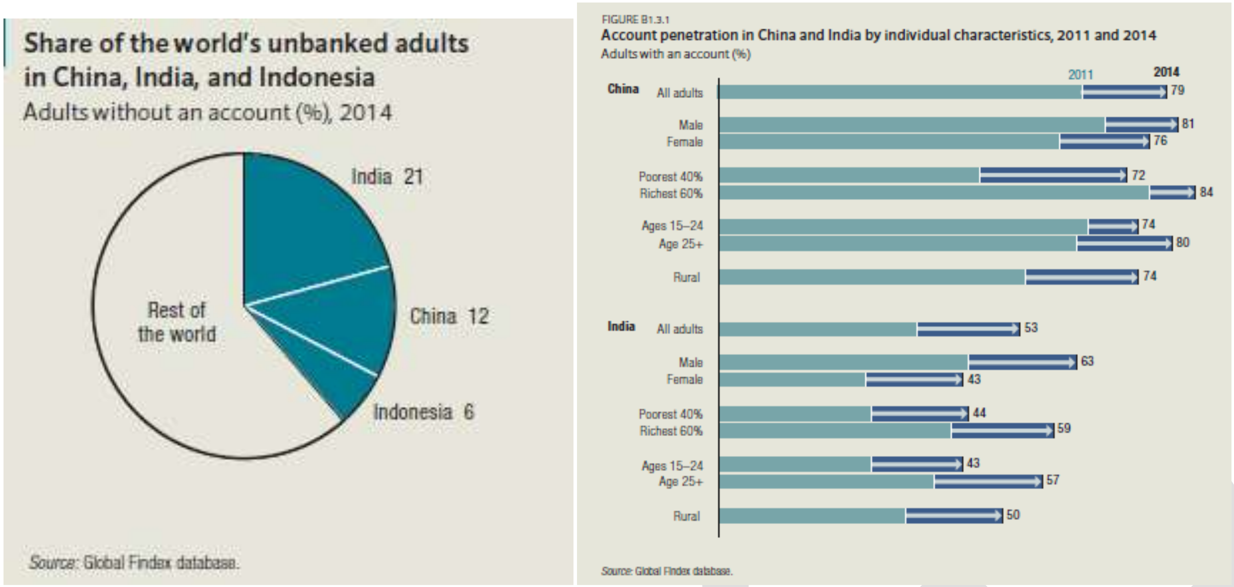
Abstract: Financial inclusion is defined as an activity of facilitating banking as well as financial services to the low income group people and people from most vulnerable group in the society. The successful achievement of financial inclusion can be done by the most effective and transparent financial services. In India, government has taken several initiatives to foster financial inclusion. Financial Institutions like banks has shown an immense increase in its extent to provide their banking services to the people from the unreached and excluded sections in the society. But World Bank Global Findex Database 2014 has highlighted that, in India 21% of adults are unbanked and only 53% of adult population possess financial services from a formal financial institutions. This paper identifies that financial literacy, high cost, technology, trust, income level, distance and inappropriate products are the factors that determine the financial inclusion in rural areas. This study discusses about the various innovative delivery channels used to reach the rural people and a conceptual model is developed to find out the factors that drives the financial inclusion.

Keywords: Banking Services, Financial Inclusion, Factors, Rural People, Innovative Delivery Channels

1. Introduction

In India Dr. K.C. Chakrabarty, Deputy Governor of Reserve bank of India in October 2011 defined financial inclusion as a process of providing access to the financial services and products for the most vulnerable groups such as people from low income and weaker sections in the society at a very low affordable cost in a proper and transparent way by the recognized institutional participants. He also defines the basic necessities and expectations of the excluded members of the financial system such as safety and security of deposits, less transaction costs, less paper work, recurring deposits, easy access of credits, remittances fit to their income and expenditures. According to the global snapshot report 2014, India has a very low access to financial products or services and the level of informal borrowing between members of family, friends and employees are quite high, whereas the formal credit is inadequate when compared to other countries in the study. According to World Bank Global Findex Database 2014, from figure1 it can be seen that India has 21% of adults are unbanked and the adults who possess financial services from the formal financial institution were only 53%. Leyshon and Thrift (1995) has stated that financial exclusion is nothing but excluding low income & poor people to get an access of financial products and services from the traditional financial institutions.

Figure 1: Unbanked adult percentage and account penetration in India



Source: Global Findex Report

1. Objectives

1. To analyze various factors that determines financial inclusion in rural areas.
2. To study the various innovative delivery channels used to reach out rural areas.
3. To develop a conceptual model to find out the factors that drives financial inclusion.

2.1. Factors Determining Financial Inclusion in Rural Areas

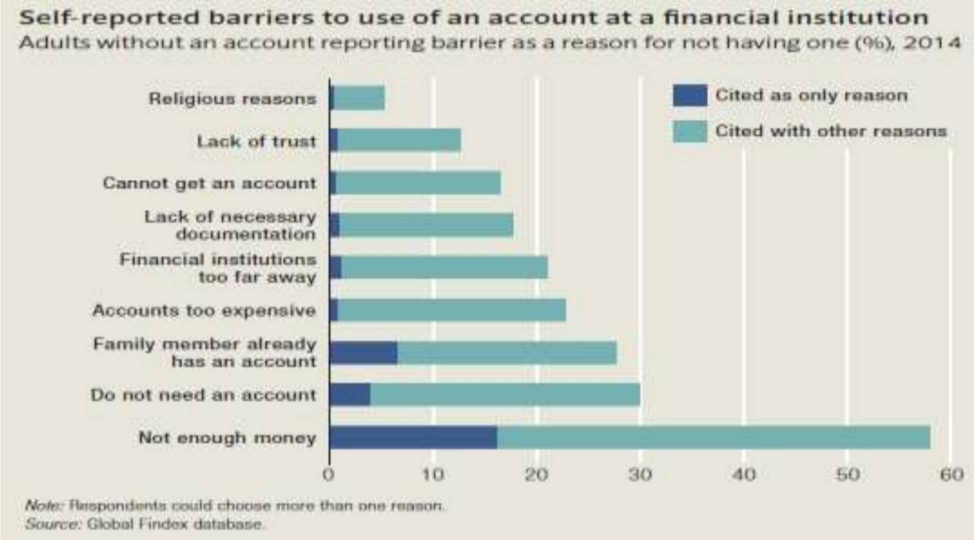
Global Findex Report 2014 has analyzed the self reported barriers for accessing account in financial institutions they are listed below:

- Religious reasons
- Lack of trust
- Cannot get an account
- Lack of necessary documentation
- Distance of financial institutions
- Expensive accounts
- Family members already has an account
- Do not need an account
- Not enough money

From figure 3 as per the report it was analyzed that 59% of adults were identified without an account and the most common reason is lack of money. PriyaNaik (2013) states that the ecosystem of financial system consists of many participants namely the government, Banks, Microfinance institutions, nonbanking financial institutions, Nongovernmental organizsations (NGOs) and Technology Venders. Financial Inclusion has to be viewed through the lens of two side barriers namely supply side barriers and demand side barriers. Supply side barriers are inappropriate products, Complicated Processes, Insufficient Reach and Access. The demand side barriers are financial literacy, Socio – Cultural Factors and Unfriendly interface.

Varun Kesavan(2015) analyzed the factors that are affecting access to financial services they are Psychological and cultural barriers, Legal identity, income level, terms and conditions, procedural formalities, Limited literacy, place of living, social security payments, Occupation types and product attractiveness. Dr. Anurag B. Singh, Priyanka Tandon(2012) listed that Gender issues, Legal identity, limited literacy, place of living, bank charges, income and occupation are the factors that affect the access to financial services. Indira Iyer(2014) analyzed that the policy and infrastructure are supply side barriers whereas financial capability, trust, lack of knowledge distance are said to be the demand side factors that determines the use of financial services.

Figure 3: Self- Reported barriers to use of an account at a financial institution



Note: Respondents could choose more than one reason.
Source: Global Findex database.

Source: Global Findex Database

Sylvia M. Wambuaa, Evelyne Datche(2013) analysed that perceived risk, Trust, User friendliness and Anti Money Laundering(AML) Requirements are the innovative factors the affects the financial inclusion in banking industry. Mwangi Isaac Wachira & Evelyne N. Kihiu (2012) has highlighted that obtaining financial services is not only dependent on financial literacy of rural people but also certain factors has to be considered such as distance of the bank branches, income level of the rural people, households size, age, gender, marital status and the education level. D.T. Pai (2010) identified the primary barriers in expanding financial services are Distance from bank, High charges and penalties, perception of financial services are complicated, and Banks do not prefer low income people. Later, he identified the demand and supply side barriers of financial inclusion. The supply side barriers are unbankable, deposit/loan account is too small, distance, high transaction cost, Inability to evaluate and maintain cash flow cycles, poor infrastructure, lack of banking habits and culture. The demand side barriers are high cost transactions, lack of awareness, hassles related to documentation, easy access of timely doorstep service from money lenders or internal resources.

Deepika Gupta (2015) divided the barriers for implementing financial inclusion into three different types which are listed below

1) Human Barriers: Financial status, absence of legal identification proof, high transaction cost and level of financial literacy among rural people.
2) Institutional Barriers: Absence of coordination between Government of India (GOI) and Reserve Bank of India (RBI), inadequate production for bank clients, Scarcity in grasping customer requirements, insufficient regulatory framework and inadequate quality in services.
3) Infrastructural Barriers: Inadequate Information and Communication Technology (ICT) Services for making banking transactions, position, distance from bank branches and inadequate inducements to Business Correspondents (BCs).

Angella Faith Lapukeni(2015) analysed that on the supply side by using powerful analytical tools with more data rich services can help them to get a risk free access which in turn fits the needs of the customers.

Minaxi Rani(2015) developed a conceptual framework to analyze the impact of financial inclusion by investigating the availability of banking and financial services in rural areas. The author stated out that financial illiteracy, lack of awareness about the product, failure in reaching the poor, various regulations, financial literacy, income level, trust and non availability of bank branches in rural areas are challenges of financial inclusion faced by banks. Isaac Munyao Muasya and Francis Kerongo (2015) reveal that financial services have been inaccessible for the rural people mainly due to the distance from the banks and lack of awareness about financial products and services.

Karen Ellis, Alberto Lemma and Juan-Pablo Rud (2010), has investigated on investment made by the household rural people. They suggested that formal financial services encourage rural customers to invest their money in a secured or potentially profitable manner. Mustafa K. Mujeri (2015) stated that even though financial institutions are licensed by the government, many household uses quasi – formal and informal channels to meet their financial services because existing finance, credit and payment systems do not serve well for the rural poor. This reduces the opportunity for the rural households to get financial services at an affordable cost. Madalitso Mandiwa (2014) analyzed that the use of financial products is especially low in rural areas. The author stated out the lack of funds and lack of understanding the financial products are the two main barriers for the rural households to access financial services in the banking industry.

2.2. Innovative Delivery Channels to reach out Rural Areas

In January 2006 Reserve Bank of India (RBI) has recommended commercial banks to engage Business Correspondents / Business Facilitators to act as intermediaries in order to provide doorstep financial services for the people from the rural areas. The Business Correspondents open bank accounts for the illiterate rural customers by using biometrics which makes the rural customers to ensure security of transactions and increases the trust level about the banking system. Reserve Bank of India (RBI) enables commercial banks to utilize services for offering financial services to the rural people from the below listed organizations and groups.

1. Microfinance Institutions
2. Non-Governmental Organizations
3. Self Help Groups

Naveen Kolloju(2014) reveals Business Correspondent Model has directed towards strengthening and deepening the association between financial institutions and unbanked rural people. S.Dhanalakshmi, Dr.J.Senthilvelmurugan(2015) analyzed various delivery model suitable for unbanked low income rural people. The effective delivery models for unbanked areas are opening banking outlets, Business Correspondent model, bank led model, Kisan Credit Cards & General purpose credit cards, Self – Help Group and Bank Linkage program for financial inclusion. Arup Mukherjee & Sabyasachi Chakraborty(2012) examined that role of institutions namely Regional Rural Banks(RRB), Self- Help Groups(SHGs), Cooperative Banks, Joint liability groups and non-banking finance companies plays an important role in promoting financial inclusion.

Shwetambara Sairam(2014), reviewed various cost effective delivery models followed by the banks across the whole world in order to provide profitable financial services for the rural customers. Business Correspondents (BCs) provides branchless banking to the rural customers from the unbanked areas. Microfinance Institutions, Non Governmental Organizations (NGOs), (MFIs) and other Civil Society Organizations (CSOs) play the role as mediators between the banks and the rural people for facilitating financial services. Business Correspondent (BCs)/Business Facilitators(BFs) acts as an agents of the banks to provide doorstep banking services for the rural people.

2. Conceptual Framework Determining the Factors that Drives Financial Inclusion

3.1 Demand Side Factors of Financial Inclusion

3.1.1. Irregular Income

Very low income and inconsistent flow of cash for the poor people are considered as a demand driven factors of financial inclusion (Barclays, 2014). Savita Shankar (2013) stated that financial capability is an important factor in a view of increasing complexity of financial products. Carmen Hoyo Martinez, Ximena Pena Hidalgo and David Tuesta (2013), analysed that variability of income is an important factor for the self exclusion of people from the rural areas. Aleksa Nenadovic and Pavle Golicin (2015) analyzed that irregular income of the poor people is a main cause for financial exclusion. Poor people from the most vulnerable groups in the society not only have low income but also they get an irregular income and various uncertainties in cash flows (FATF, 2011).

3.1.2. Lack of Trust

Savita Shankar (2013) reveals that negative experiences or negative perception of financial institutions makes the rural people to get mistrust of banks and which in turn leads to self exclusion from the formal financial institutions. Lack of trust by the unbanked rural people on the formal financial institution is the main barrier of financial inclusion (Global Findex Database, 2012). Disparities in financial inclusion has caused due to the lack of trust among the rural people in the banking systems (Felix Huefner and Arpitha Bykere, 2015). Improper supervisory mechanism in financial institutions led to the loss of customer trust (Shilpa Aggarwal and Leora Klapper, 2013).

3.1.3. Literacy Level

Financial isolation of the rural people often results in lack of understanding, which in turn makes them to distance themselves from the formal financial institutions. Even though banks have some suitable financial products for the poor people, due to their lack of knowledge and literacy level makes them an incorrect understanding of the products and hence opposed to use them (Barclays, 2014). Savita Shankar (2013) states that financial literacy is said to be one of the demand side factor which is a precondition for the first time users to access financial services. When financial Literacy was successfully delivered it creates a demand for financial services from the formal financial institutions which led to financial inclusion (Khadija Ali, Umer Khalid and Zahra Khalid, 2012). Lower the level of financial inclusion is highly associated with lower the level of financial literacy (OECD, 2008).

3.1.4. High Cost

An obstacles of financial inclusion from the demand driven factors are high transportation and opportunity cost for the rural people to bank with formal financial institutions (Barclays, 2014). Gadamsetty Sai Arun(2013), analyzed that people who lives in underdeveloped areas find it very difficult to reach nearest bank due to transportation cost and they lost their one day wages to reach the bank. Transaction cost is the barrier for the low income group household since they are more resource constrained (Amy Jensen Mowl and Camille Boudot, 2015). Low income group households either spends more time in travelling to the bank or spend high transaction cost for accessing financial services from the banks (Terri Friedline, 2016).

3.1.5. Technology

K.C.Chakrabarty (2012) stated out that the as the banking and payment space become increasing everywhere, the biggest challenge is to maintain the quality of security at the highest level in the financial sectors. Therefore the banks need to work on this regard in order to protect customers against fraudulences. Dr.V.Vimala (2015) reveals that banks can diverse services to customers with less man power through the introduction of IT related products in internet banking, electronic payments, security investments and information exchanges. Mihasonirina Andrianaivo and Kangni Kpodar (2010) stated that in order to improve the access to financial services for the households in rural areas and promote greater financial inclusion an appropriate framework and business environment should support a greater interaction between ICT and financial sector for addressing the challenges posed by mobile banking such as security concerns and compliance with Anti Money laundering rules. Gadamsetty Sai Arun(2013) narrate that the financial inclusion through ICT faces security challenges such as SMS spoofing attack, where the attacker send messages on network manipulating sender’s number. Virus attack software like Trojan Horses and Zeus are used to steal mobile transaction authentication number and Password.

3.2. Supply Side Factors of Financial Inclusion

3.2.1. Distance

Distance of the bank branch to reach the rural people is a common barrier of the supply driven factors (Savita Shankar, 2013). The greatest barrier of financial inclusion to reach rural areas is the distance from the bank (The Global Findex Database, 2012). Distance continues to be a major issue since Business Correspondent provides doorstep financial services to the outreach areas. A reasonable distance from the bank branch should be 3-4 kilometers (Dr. Debashis Acharya, 2013). For opening a bank account to the rural people distance and travelling from the bank branch to the remote areas is considered as a greatest challenge for the financial institutions (Chinemba Samundengu, 2014).

3.2.2. Policy Regulations

Savita Shankar (2013) analyzed that inability to provide documentation such as identity proof required by formal financial institutions is another frequently faced barrier. Banks are required by regulators to conduct sufficient identity checks before opening accounts. These regulations sometimes result in lack of access of genuine customers. Poor regulatory frameworks that reduces the quantity and quality of financial products and services that are accessible by the poor (Gilberto M. Llanto, 2015). Banks need to follow certain which was advised by Reserve Bank of India (RBI). This is again a barrier for the bank to target rural people for issuing checkbook, debit card for maintaining zero balance in their account (Minaxi Rani 2015). Current regulations advices Business Correspondent to settle the cash in the bank branches within 24 hours of transactions but, this may not be possible due to the huge distance from the bank (Anupam Kishore, 2012).

3.2.3. Inappropriate Products

Savita Shankar (2013) narrated that lack of inappropriate products is an important supply side barrier. Certain terms and conditions of financial products like maintain minimum balance in the account and accounts closed by banks due to infrequency in use does not suit for the low income group people. Priya Naik (2013) illustrated that inappropriate products and processes are said to be a supply side constraints of financial inclusion. Banks and other financial services play an important role from supply side by providing access to basic financial services to the poor and disadvantage social group .Access to financial products are constrained by certain factors like lack of awareness about the products, the financial products are not convenient, flexible and low quality(Purvi Shah and Medha Dubhashi ,2015). The main reason for the financial exclusion from the supply side is documentation procedures and unsuitable financial products (Akhil Damodaran).

3.2.4. Risk

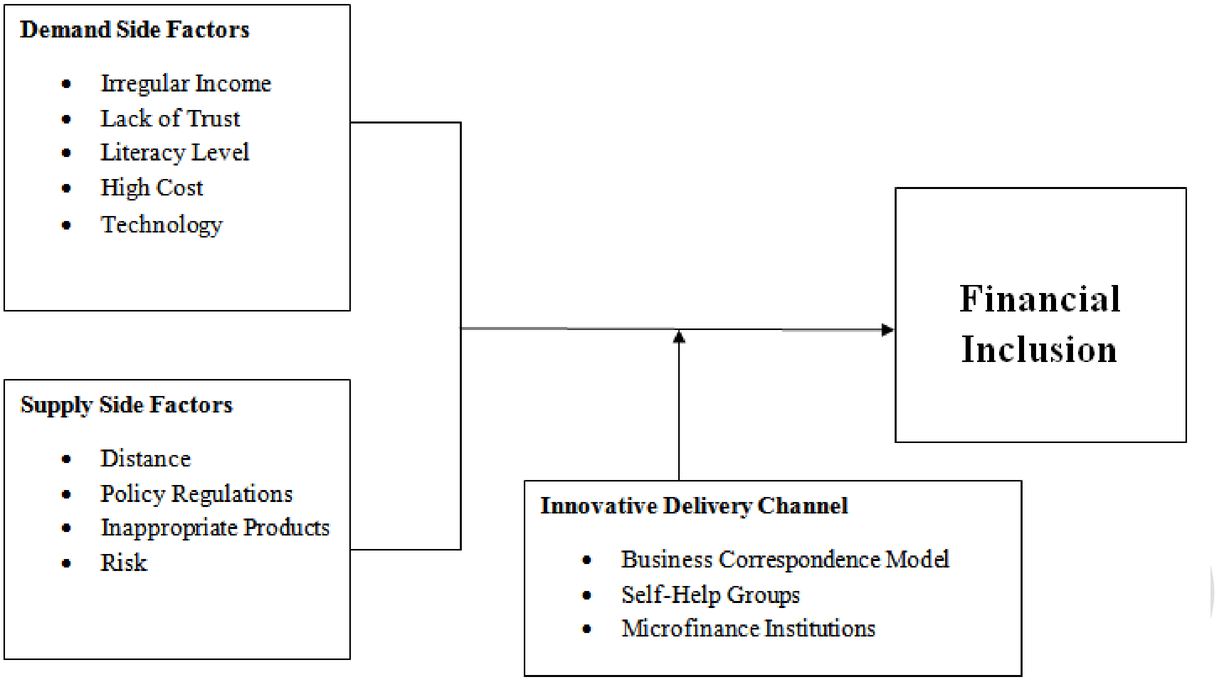
The banks bears risk due to the improper identification of customers and they use retail agents for money laundering or channel funding to terrorists (Nefa Chiteli, 2013). Anti-Money Laundering issues are regulated under the prevention of Money Laundering Act 2002. The law is applicable to both banks and financial institutions. For Banks, RBI has issued Know Your Customer (KYC) guidelines to categorize the customer into low, medium and high risk customers in order to adjust the identification requirements based on the risk category (CGAP, 2010). According to the guidelines of RBI Business Correspondent Model acts as intermediaries that bridges the gap between service seekers and service providers but, Banks and Business Correspondent are exposed to huge risk of cash management. This was the issue surfaced by both the regulators and the partner banks (Sonu Garg, Dr. Parul Agarwal, 2014).Out sourcing account opening and processing of retail transaction to inexperienced retail agents makes the banks difficult to observe and report doubtful transactions (Banking Policy & Regulatory Department, 2011)

3.3. Innovative Delivery Channels for Financial Inclusion

3.3.1. Business Correspondent Model

In 2006 RBI has adopted the technology based bank agent bank model as an alternative banking structure for providing banking services for the rural people. The significant role of the model is to provide doorstep delivery of banking service for the people from underdeveloped sections in the society. This model is aided with the technology tools like biometric devices and point of sale hand held devices to facilitate financial services for the rural people in a transparent manner (Karmakar, 2009). Frost and Sullivan (2009) stated the Business Correspondent is the authorized agent to take transactions on behalf of the bank. Khan (2012) narrated that BCs can bride a gap between the service providers that is banks and service seekers (Rural Clients). Naveen Kolloju(2014) states that the features of the model is to identify the borrowers, collection and verification of the various loan applications, creating awareness about the various financial products and services available for the poor people, post – sanction monitoring and collection of small value loans & deposits. The RBI guidelines strictly instructed banks to ensure that BCs cannot charge any fees to the customer for the services on behalf of the bank (CGAP, 2012).

Figure 3: Conceptual Framework



Source: Authors

3.3.2. Self Help Group – Bank Linkage Program

Uma Narang(2012) stated that Self Help group is a group formed by 15- 20 members for covering various development programmes. This group helps for alleviation of poverty and women empowerment. Self Help Group Bank Linkage Programme was started in 1992 on the basis of the recommendation of S.K Kalia Committee in order to expand a credit flow of financial services for the rural people with an affordable transaction cost. Archana H. N (2013) stated that Self Help Group is a registered or unregistered group of micro entrepreneurs and the members of the group agree to save small amounts regularly to enhance their saving into a common fund and to meet their emergency needs based on the mutual help basis. The Self-Help Group (SHG)-Bank linkage model is said to be an innovative channel in which the banks can directly lend to SHGs. Louis Manohar(2015) reveals that the main advantage of Self-Help Group (SHG)-Bank linkage program is to improve the economic condition by making them to access financial services without any collateral security. Dey.S, Nath. L & Kalita, P (2014) narrated that repayment of the loan amount is a critical factor that has a greater impact of Self-Help Group (SHG)-Bank linkage programme. The sustainability and success of Self-Help Group (SHG)-Bank linkage programme is highly influenced by the loan amount, frequency of availability, affordability and the repayment capacity of SHGs.

3.3.3. Microfinance Institutions

Savita Shankar (2013) examined that Microfinance Institutions has reduced many barriers and constraints of financial inclusion. Penetration of microfinance institution has taken some areas which were neglected by the banking sectors and they suggested policy incentives to encourage expansion to those neglected areas. Dr. Christabell. P. J and Vimal Raj. A (2012) examined that The Women’s Self Help Group movement is bringing a transformation in rural areas of India. Microfinance Institutions (MFIs) play a significant role in facilitating inclusion, as they are uniquely positioned in reaching out to the rural poor. Jayati Ghosh (2013) examined that microfinance cannot be considered as a development some microfinance institutions are profit oriented and problematic therefore it must be regulated and subsidized for financial inclusion to actively pursue the rural poor. Naveen K. Shetty examined that in the post-microfinance large number of the member households are not only accessing the credit services, but also they are competent enough to access the savings, micro-insurance and other non-financial services.

3.4. Implication of the Conceptual Model

From the model it is clear that there are certain demand and supply side factors that decrease the effectiveness of financial inclusion. The barriers of these factors were diminished by the innovative delivery channels like Business Correspondence Models, Self-Help Group Bank Linkage Programs and Microfinance Institution to elevate the financial inclusion in a transparent manner. As per the RBI guidelines banks directly approach Self Help Groups and Microfinance Institutions to lend money to the rural customers by engaging the Business Correspondents/Business Facilitators as intermediaries which is helpful for bridging the gap between the service providers (Banks) and service seekers (Rural Customers). This Innovative delivery channel helps the banks as well as the rural people to access financial services in a very low transaction cost and obtain adequate cash flow in a timely manner.

4. Conclusion

The government has taken several steps to promote financial inclusion. The innovative delivery channel is said to be the drivers of financial inclusion developed by the government helps in supporting the rural people to get an access for the financial services in a timely manner. But the rural people should be cultivated about the financial services and products by the officials of the bank to sustain their access in the formal financial institution.

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Strength Characteristics Of Concrete With Partial Replacement Of Sand By Unprocessed Fly Ash

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Abstract— Concrete is a composite mix which is used for construction of Dams, Buildings, Bridges, Roads etc. due to rapid growth of population in many developing countries like India the problem occurring in scarcity of sand and this is increasing day by day with respect to development of country, so it is necessary to find the alternative material to sand. On the other side due to uncontrolled extraction of sand from river bed causes many adverse impact on the natural environment. At the same time fly ash is a solid residue generated from coal combustion in Thermal power plant. In India availability of fly ash has already exceeded 170 tones and it is likely to increase in future days at faster rate. The disposal of fly ash is also the problem in India. Fly ash can be used to replace the sand partially. In this study sand is replaced partially by the unprocessed fly and compressive strength of the same is checked.

Keywords— Concrete, Ordinary Portland Cement, Sand, Fly Ash, Replacement, Compressive Strength, Curing.

INTRODUCTION

Fine aggregate occupies about 25% to 40% of total volume of concrete and hence provides great opportunity to utilize about 150 kg per m^3 waste materials like fly ash for replacement. The need of fly ash utilization also arises out of the fact that good quality Natural River sand required in concrete and in the cement mortar, is depleting day by day and scarcity of good quality sand is felt by all metro and mega cities in India. Also Natural sand is expensive due to high transportation cost from natural resources & due to large scale depletion of these resources creates environmental problem. Hence this study explores the possibility of replacing part of fine aggregate with fly ash and reducing the consumption of natural sand.

SYSTEM DEVELOPMENT— Materials used are as follows.

The materials used in making the concrete are unprocessed fly ash as the source material, aggregate, cement and water. The type cement used is ordinary Portland cement of 53 grade.

AGGREGATES

Local aggregate 20 mm and 12.5mm are coarse aggregate in saturated surface dry condition, were used. The coarse aggregate were crushed ballast type aggregate which are found in Deccan trap region. The fineness modulus of combined aggregate was 4.81. These size fractions are combined in fixed proportion to maintain grading complying with as per IS650: 1991.

SAND

Locally available river sand is used as fine aggregate. The sand is sieved using sieves of sizes 4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron. The fineness modulus of combined aggregate was 3.43.

Table: Properties of Aggregates

Properties	C A I	C A II	FA(sand)
Type	Crushed angular	Crushed angular	Spherical (River sand)
Maximum Size	20mm	12.5 mm	4.75 mm
Specific Gravity	2.563	2.592	2.593
Grading	Confirming to combination of CA-I : CA-II 65 : 35		Confirming to grading zone-III
Material finer than 75 micron	Nil	Nil	1.30 %
Water Absorption	0.59%	0.91%	1.87%
Moisture Content	Nil	Nil	Nil

MANUFACTURE OF TEST SPECIMENS

The concrete mix is prepared of proportion M (l: 1.5:3) as follows:

l) Material is taken on weight basis.

2) First aggregate is weighted to nearest gram and placed in mixing tray then sand is weighted and placed uniformly over aggregate. In the same way cement and fly ash is weighted and placed over mix of sand and aggregate.

3) Water cement ratio taken is 0.45. Water is then measured accurately in measuring cylinder and is uniformly poured in the mixture of cement, sand and aggregate. Care should be taken that uniformly mixing should be carried out and have uniform color.

4) When unprocessed fly ash is used in the mix it is taken on volume basis.

COMPRESSIVE STRENGTH TEST

SIZE OF TEST SPECIMEN-Test specimen cubical in shape shall be 15x15x15cm. The mould shall be 150mm size. In assembling the mould for use, the joints between the sections of mould shall be thinly coated with mould oil and a similar coating of mould oil shall be applied between the contact surfaces of the bottom of the mould and the base plate in order to ensure that no water escapes during the filling. The interior surfaces of the assembled mould shall be thinly coated with mould oil to prevent adhesion of the concrete.

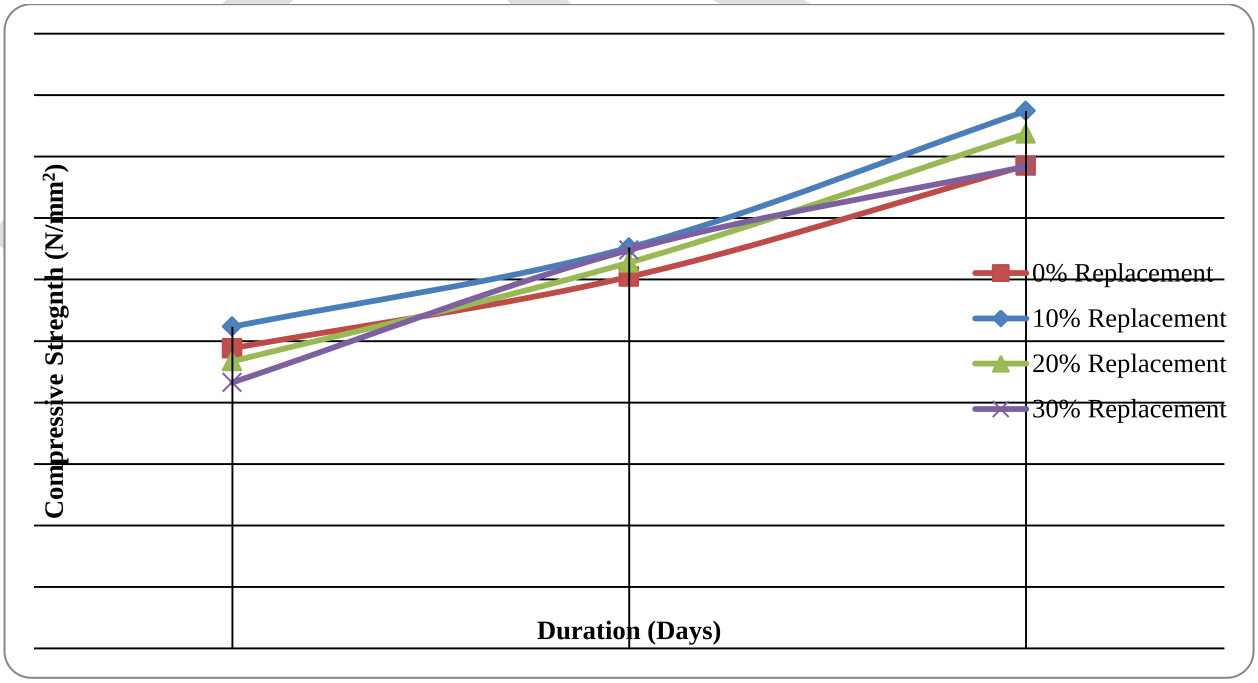
COMPACTION-The test specimens shall be made as soon as practicable after mixing, and in such a way as to produce full compaction of the concrete with neither segregation nor excessive laitance. The concrete shall be filled into the mould in layers approximately 5 cm deep. In placing each scoopful of concrete, the scoop shall be moved around the top edge of the mould as the concrete slides from it, in order to ensure a symmetrical distribution of the concrete within the mould. Each layer shall be compacted by hand. When compacting by hand, the tamping bar shall be used and the strokes of the bar shall be distributed in a uniform manner over the cross-section of the mould. The number of strokes per layer required to produce specified conditions for cubical specimens, in no case shall the concrete be subjected to less than 35 strokes per layer for 15 cm cubes. After the top layer has been compacted, the surface of the concrete shall be finished level with the top of the mould, using a trowel, and covered with a metal plate to prevent evaporation.

CURING-The test specimens shall be stored in the laboratory at a place free from vibration, under damp matting, for 24 hours ± ½ hour from the time of adding the water to the other ingredients. The temperature of the place of storage shall be maintained within the range of 22° to 32°C. After the period of 24 hours, they shall be marked for later identification, removed from the moulds and, unless required for testing within 24 hours, stored in clean water at a temperature of 24° to 30°C until they are transported to the testing.

TESTING-Tests shall be made at the 3, 7 & 28day's ages of the specimen. At least three specimens shall be made for testing at each selected age.

PROCEDURE-Specimens stored in water shall be tested immediately on removal from the water and while they are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fins removed. The bearing surfaces of the testing machine shall be wiped clean and any loose sand or other material removed from the surfaces of the specimen which are to be in contact with the compression platens. In the case of cubes, the specimen shall be placed in the machine in such a manner that the load shall be applied to opposite sides of the cubes as cast, that is, not to the top and bottom. The axis of the specimen shall be carefully aligned with the centre of thrust of the spherically seated platen. No packing shall be used between the faces of the test specimen and the steel platen of the testing machine. The load shall be applied without shock and increased continuously at a rate of approximately 140 kg/sq cm/min until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen shall then be recorded and the appearance of the concrete shall be noted.The measured compressive strength of the specimen shall be calculated by dividing the maximum load applied to the specimen during the test by the cross-sectional area, calculated from the mean dimensions of the section (150X150X150mm) and shall be expressed to the nearest N per sq mm. Average of three values shall be taken as the representative of the batch provided.

RESULT- The details are given below



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CONCLUSION

The conclusions drawn are summarized as follows,

1. Compressive strength of concrete could be slightly increases up to 10% replacement of sand by unprocessed fly ash and later decreases as a percentage of unprocessed fly ash in concrete increases.
2. The maximum compressive strength of concrete could be occur when 10% sand was replaced by unprocessed fly ash.

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Survey of Energy Efficient techniques in MANETs

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Abstract- The nodes in mobile ad hoc networks communicate wirelessly with each other. The basic function the nodes need to perform is to find path from source to destination node for which the nodes have to broadcast the route request messages. Such mechanisms cause lot of energy to be consumed on the part of the nodes. The following paper presents various energy efficient techniques or protocols that have been implemented or studied by various authors in the past.

Keywords— MANET, Energy efficient, Broadcasting, Routing overhead, M-AODV, Throughput, Delay.

Introduction

Mobile Ad Hoc Networks (MANETs) are self-organizing, infrastructure less, reliable networks of mobile nodes connected through wireless links without any centralized controller. Each node can send and receive data, and also forward the unwanted traffic unrelated to its own use. In MANETs the nodes need to maintain their independence and to preserve its resources like battery power, network lifetime, bandwidth etc. The mobile nodes can also leave the network at any time. So they are suitable for many types of networks like Personal area network, disaster relief, military areas or when the infrastructure is damaged due to earthquakes, floods etc.

Routing and Power Consumption is the main research issue for these type of networks and refers to discovering and maintaining paths between devices. Moreover, it involves selecting the best route where many routes are available. However, due to the freedom of movement of nodes, new routes need to be constantly recalculated. Most routing protocols use pure broadcasting to discover new routes, which takes up a substantial amount of bandwidth. Intelligent rebroadcasting reduces these overheads by calculating the usefulness of a rebroadcast, and the likelihood of message collisions. Unfortunately, this introduces latency and parts of the network may become unreachable.

In MANETS the mobile nodes are connected by multi-hop without any infrastructure requirement. The main aim of the MANETs is to provide robust and efficient operation in mobile environments. In ad-hoc networks all the mobile nodes are dynamically connected in an arbitrary manner. Nodes in such network maintain their own routes to other nodes in the network. Examples like in search and rescue operations, meetings and in defence services.

Related Works

[1] Thomas Chowdhury et.al proposed this paper which gives a new idea to find out many node-disjoint routing paths. This extended AODV balances energy and traffic overhead on full network to increment the network lifetime. The proposed method in this paper increase the performance of AODV by taking the advantage of different routes that can be occurred within route discovery process. This multipath routing effectively decreases the frequency of route discovery therefore the latency for finding another path is reduced when presently used path is broken. This research paper also represents a idea for discovering full node-disjoint routes within a pair of hubs/nodes in an on-demand manner. This method uses the same approach of AODV protocol which is accepted all over, but the memory storage is increased as the different routes are stored. The comparison has been done between the AODV and new method for instance Maximum Multipath AODV also known as (MM-AODV) which shows the better results as compared to AODV in case of packet delivery ratio with low energy consumption and routing overhead.

[2] Gopinath.S1 et.al concentrates on the objective of proposed protocol to find the minimum power-limitation path. The decision of minimum power limitation routes is taken by the node which has less energy from all the nodes in that path. So, this minimum power limitation route has more energy as compared to the minimum node energy in other path. Researchers also give a more accurate idea to track the energy consumption because of various factors, and enhance the performance during route discovery and in mobility scenarios. The proposed protocol is evaluated with NS2 simulator. Simulation results shows that the ODBEERP achieves good throughput, less delay, high packet delivery ratio and good energy efficiency than the existing protocol PEER.

[3] Hassanali Nasehi et.al has proposed an algorithm in this research to find out the different paths between source and destination nodes by the use of Omni directional antennas, to send or carry information through these antennas. So, for this method, the number of active neighbours is counted in each direction by using a strategy. These methods help to select the paths. The new approach is depends upon AODV routing algorithm, and at the end the comparison has been done with the multipath routing protocols like AOMDV, AODVM and IZM-DSR which are based on the AODV and DSR Protocols. The obtained simulation results show that by using this new algorithm, it creates a significant improvement in energy efficiency and reducing end-to-end delay.

[4] In this paper Sunsook Jung taken the energy constrained routing protocols and load balancing methods to improve the MANETs Routing protocols and energy efficiency protocols. Researcher gives a new routing protocol that used the adaptive load balancing method to the MANET routing protocols with node caching improvement. With limited power supply the researcher evaluate the new application of energy efficiency metrics to MANETs. This paper includes the New energy efficient AODV-based node caching routing protocol with adaptive workload balancing (AODV-NC-WLB, New application of energy efficiency metrics to MANET routing protocols; and An implementation and simulation work in NS-2 of energy efficient AODV-NC-WLB having improvement in throughput, overhead, delivery ratio and delay over the standard AODV for high mobility scenarios.

[5] Chansu Yu et.al. surveys this article and classified the energy-aware routing protocols proposed for Mobile ad hoc networks. They decrease the energy of the active communication required to send or receive packets or when the node remains idle not doing any work then the inactive energy is consumed but it listens to the network for any possible communication request from other nodes. Transmission power control technique and load distribution technique belong to the active communication, and sleep/power-down mode technique belongs to the inactive communication where the node stays idle. While it is not clear that whether any particular algorithm or a group of algorithms is the best for all scenarios, each protocol has its advantages/disadvantages and is well suited for certain situations or scenarios. The main purpose of this paper is to facilitate the research efforts in collaborating the previous solutions to grant a more energy efficient routing mechanism.

[6] In this paper Aarti Singh et.al. Discusses MANETs are typically required the battery power which is the limited source of energy and it is not easily replaced of recharged on the way. Therefore, battery power consumption becomes man issue and this lack of power with nodes which leads to node's selfish behaviour among nodes in case of commercial MANET. This work provides an in depth analysis of literature for routing protocols in MANETs and their effect on selfish behaviour of nodes.

[7] In this research paper Methaq jasam et.al. represents a comparison and evaluation study of Reactive routing protocols; Ad Hoc On-Demand Distance Vector Routing (AODV), Proactive routing protocols; routing information protocol (RIP2) and Position-based routing protocol; Location- Aided Routing (LAR1). And the evaluation of their performance was based on energy consumption metric. The evaluation has been done using the simulator QualNet v5.1. The results of this research paper shows that the AODV has the better performance in energy consumption in the most scenarios. In this paper, the work has been done on the three routing protocols that are AODV, RIP2, and LAR1 in terms of energy consumption which are based on four different scenarios. AODV protocol is analysed or evaluated as the best choice in most of the scenarios compared to the RIPv2 and LAR1 protocols. While LAR1 shows better performance than AODV in static motion as the pause time increase in the fourth scenario. In the other way, AODV shows better performance than RIPv2 in all the scenarios. This is because of AODV as reactive protocol does not need to maintain route to the destination if there is no data to send.

[8] In this paper the researcher Junaid A. Khan et.al. discusses that Mobile Ad Hoc networks are self-organizing without any centralized authority or base station and use multi-hop routing for sending the data from a source node to its destination node. To make MANETs a multi-hop routing technique it needs a routing protocol. Researchers taken the load balancing approach that can enhance the overall communication performance in a network. The researcher also present the better performance for the adopted protocol i.e. Energy Efficient Load Balanced (EFLBAODV) and compared it to the old existing reactive routing protocol Ad Hoc on Demand Distance Vector (AODV) therefore it using the load balancing approach to improve the node to node communication in the network. Also this new protocol is energy efficient as it consumes the less energy and reduced the communication time and communication overhead. The performance metrics like route discovery time, route errors, MAC delay, network load, end-to-end delay and throughput have been taken to evaluate the overall performance of the network.

[9] In this paper the researcher Suvarna P. Bhatsangave et.al. Discusses how energy or battery power is one of the main issue in MANETs. In this paper researcher proposed an Energy efficient AODV routing protocol. This paper represents an Optimized Mobile Ad Hoc Network on Demand routing protocol, which changes the broadcast mechanism of AODV routing protocol. AODV has two main processes that is route request and route reply and for successful delivery of the packets the RREP i.e. route reply is the important in MANETs. If route reply is lost, new path has to be discovers and route request has to be initiated again. OAODV ignores un-necessary sending of Route request. In this proposed technique, the node doesn't have to broadcast the route request (RREQ) again

to find the path if it does not have sufficient battery power and until the node density in its surrounding increased a particular threshold value. At last the comparison has been done between the AODV and OAODV in case of battery lifetime and throughput and the results shows that the OAODV is much better than the AODV and maximize the battery lifetime.

[10] In this paper Anu Kumari et.al. proposed a energy-efficient routing protocol Ad hoc On Demand Distance Vector Multipoint Relay Routing Protocol (AODVMPR) which gives efficient energy to the MANET.. AODVMPR is used to overcome the limitation of energy and the looping problem in a single routing protocol. This protocol helps to improve the performance of the network and traffic load also. The protocol which is used is AODV and with AODV Multipoint Relay Routing Protocol has been used which minimize the flooding of the control packets. In MPR every mobile node has calculated as a multipoint relay group. The nose which is out of the MPR group that cannot be transmit or broadcast the message. At last the AODVMPR shows the better performance because it increases the battery lifetime and it also improves the efficiency and QoS. And with this technique the congestion has also been improved.

[11]In this paper the authors May Cho Aye and Aye Moe Aung says energy consumption is an important issue in wireless networks because mobile nodes are battery powered. In order to maximize the battery power lifetime of these networks, it is the main issue to minimize the usage of energy of the nodes. In this paper, researchers proposed a new energy efficient multipath routing protocol for selecting energy efficient route. This proposed technique also take into consideration the residual energy and transmission power of the hubs or devices as the performance metrics in order to increase or maximize the battery power and to minimize the energy usage of the mobile devices. The main goal of this proposed technique is to discover a best route based on two energy metrics mentioned above while selecting a path to transmit data packets. The simulator that has been used is the NS2.34 and the results with performance metrics for instance the residual energy and transmission power of the nodes shows that the proposed technique is better than the traditional techniques and enhance the lifetime of the network and also improves the performance of the network.

[12] The researchers of this paper Sarabjeet Kaur et.al. Discusses that there are many kinds of restrictions in MANETs. The biggest issue is the battery lifetime i.e. the power consumption of the mobile nodes for which an energy efficient protocol has to be made so that the less power should be used and the network lifetime must be increased. Power of the mobile devices is used wile transmitting the data from one device to another device. This proposed method utilize the energy sharing technique in multi-hop mobile ad hoc networks to increase the efficiency & lifetime of the mobile nodes. They also discuss that the metrics like response time and throughput is also increases when traffic on the network increases. Therefore the main aim of this proposed method is to reduce the response time and increases the power and throughput of the mobile nodes within the network.

[13] In this paper author Shadi S. Basurra et.al worked on the Zone based Routing protocol with Parallel Collision Guided Broadcasting Protocol (ZCG) that uses parallel and distributed broadcasting methods to decrease duplicate broadcasting and to accelerate the route discovery process, while balancing a high reach ability ratio as well as the node energy consumption must be low. The reliable leaders led the network which is distributed in zones that are mostly static and have full battery resources by the use of ZCG which uses single hop clustering algorithm. The performance of the ZCG protocol is compared with the other routing protocol named as AODV and DSR which gives the results that the ZCG performs good under many circumstances.

[14] Rahul S.Kale et.al. the researchers of this paper elaborate the limitations and benefits of the existing energy efficient routing protocols in mobile ad hoc networks. There are many important issues in MANET like link failure, power failure of node, limited

bandwidth, and limited transmission power and to come over from these issues the energy efficient routing protocols has become an important research issue. To improve battery power or network lifetime, maintaining energy is the main objective in these networks. In this paper, the researchers elaborate the different energy efficient routing protocols which were proposed to sort out the issue of energy consumption of routing nodes in MANET. This paper surveys the various energy efficient protocols and provides parameter wise study of the existing protocols. And the protocols are also compared to provide an overview of the recent technique in this area.

[15] In this paper the authors Getsy S Sara et.al. surveys the few energy efficient routing protocols for MANET reviewed their performance and compared them. There are two types of communications that are active or inactive. In active communication the energy is consumed while transmitting or receiving the packets and in Inactive communication the energy is minimized when the nodes are idle but they still consumes the energy. There are many proposed techniques related to energy efficient routing protocols and mostly the enhanced work has been done to improve the performance of the existing energy efficient routing protocols. The main objective of this paper is to facilitate the research efforts in grouping the existing techniques to offer a more energy efficient routing techniques.

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Conclusion

In this paper we have analyzed various existing approaches in mobile ad hoc networks that focus on reducing the energy consumption of the nodes. In future we would further like to expand our research and improve the lifetime of the networks and other quality of service related parameters such as throughput and packet delivery ratio.

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SUSPENSION SYSTEM FOR AN ALL-TERRAIN VEHICLE: A REVIEW

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Abstract— Suspension System of an All-Terrain Vehicles is mainly distinguished from an On-Road Commercial Vehicles in terms of its all-terrain capability due to its large travel and Ride Quality; also it has to face various ground conditions such as mud, ice, rocks, bumpy tracks etc. Hence it needs to be Robust enough to sustain in such frequently occurring Undulations. Suspension systems of commercial vehicles are designed considering normal road conditions. While designing suspension system of an ATV, various terrain conditions have to take into consideration. This paper gives the review of suspension systems for ATV.

Keywords— ATV (all-terrain vehicle), Camber, Kinematics, Kinetics, Roll centre, Suspension System.

INTRODUCTION

An ATV (All-Terrain Vehicle) also is a vehicle that rides on low pressure tires with large wheel travel unlike On-road commercial vehicles. As the name implies, it is designed to tackle various kinds of terrain that Mother Nature has created. Suspension system is an integral part of any vehicle as it provides stability, safety and comfort. The suspension system can be considered as a muscle of vehicle due to its strength and flexibility. The main objective of providing suspension system is to provide comfort by isolating passengers from the shocks transmitted through irregular ground surface, maintain traction on all terrains and also to enhance the ride quality of vehicle [1]. It must also keep the tires in contact with the road, regardless of road surface. The suspension system comprises of two components viz. linkages and shock absorber. The linkages define the path traced by wheel with respect to chassis, during its travel on irregular surfaces. The shock absorber as the name suggests damps the impact of shocks and vibration transmitted through ground surface which in-turn prevent discomfort to the driver and passenger. The purpose of this paper is to give review about basic fundamentals of suspension system.

Types of Suspension System

The suspension system is classified into two main types [1]-

- Dependent Suspension System.
- Independent Suspension System.

Dependent Suspension System

This type of suspension system acts as a solid link between two wheels such that any movement of one wheel is transmitted to the other wheel. Also, the force is transmitted from one wheel to the other. Dependent suspension system is not suitable for ATVs where motion of the two wheels is needed to be independent.

Following are the examples of dependent suspension system-

1. Leaf Spring Suspension.
   Used in Heavy duty vehicles (trucks, bus, etc.)
2. Push and pull rod Suspension.
   Used in F1 cars.
3. Anti-Roll Bar Suspension.
   Used in passenger and luxury vehicles.

Independent Suspension System

This type of suspension allows the wheel to travel without affecting the motion of opposite wheel. This is widely used suspension system in passenger cars, luxury cars and ATVs because of its advantages over dependent suspension system.

Following are the examples of independent suspension system-

1. Macpherson Suspension.
   Used in front suspension of most of the commercial cars.

2. Double Wishbone Suspension.
   Used in ATVs.
3. Trailing Arm Suspension.
   Used in rear suspension of most of the commercial cars.

Suspension Kinematics

Suspension Kinematics describes the orientation of tire as a function of wheel travel and steering angle [5]. The motions of the tire are highly dependent on type of suspension.
Several parameters are considered while designing kinematic characteristics:-

1. Wheel base, wheel track
2. Wheel Alignment
3. Rolling characteristics
4. Anti-properties.

Wheel base

The wheel base is a distance between the front and the rear axle of the vehicle. Larger the wheel base lesser the pitching tendency of vehicle and vice versa. Wheel base influences the frequencies of front and the rear suspension according to 'Olley's criteria' [4].

Wheel Track

The wheel track is a measure of the distance between the centre of the tire contact patches at the front and rear of the vehicle when viewed from front. The wheel track changes with wheels travel through the suspension travel. Wheel track directly relates with the rolling of the vehicle, higher the wheel track lesser is the rolling of the vehicle and vice versa [4].

Roll Centre (RC)

Roll centre is the point in the lateral plane of vehicle about which the vehicle rolls. There are two roll centers in vehicle, one at front suspension and other at rear. The line joining both the RCs is called roll axis. During cornering the load transfer takes place about roll axis. The roll moment depends on the location of RC and Centre of Gravity (CG). The RC is located centrally in lateral direction. Thus while designing suspension only vertical position of RC with respect to CG is considered. The orientation of roll axis contributes to the over-steering and under-steering of vehicle [2].

Camber Gain

During cornering it is the normal tendency of outer tires to have a positive camber and inner tires to have negative camber. This increases the vehicle's rolling tendency. Thus suspension geometry is designed in such a way that during cornering when weight is transferred to outer wheel, the suspension compresses and achieves a small negative camber and compensates positive camber during cornering and provides vehicle stability [2]. The opposite condition will happen at the inner wheel.

Anti-properties

The path of wheel as a function of suspension travel in longitudinal plane determines the anti-property of suspension.
Anti-dive geometry reduces the pitching tendency of vehicle while braking thus reducing diving tendency of vehicle. Anti-squat geometry reduces the pitching tendency of vehicle while acceleration thus reducing squatting tendency of vehicle [6].

Suspension Kinetics

Suspension kinetics influences the performance of suspension while vehicle is in motion. Kinetics takes into consideration the mass of vehicle, driving force, braking force and the reaction forces coming from irregular ground surfaces. It also determines the ability of suspension to absorb shocks, driver comfort and ride quality of vehicle [5].
While designing suspension system following Suspension Kinetics characteristics are considered,

1. Ride Height
2. Motion Ratio
3. Spring Rate
4. Sprung and unsprung mass

Ride Height

Ride height is the distance between lowest part of sprung mass of vehicle and the ground when vehicle is loaded with passengers [2]. For an ATV it is necessary to have enough ride height to prevent vehicle body from any damage due to rough terrain. Eg. Rocks.

Motion Ratio

The motion ratio is the amount of spring travel per unit wheel travel [3]. It is always less than or equal to 1.

Spring Rate

Spring rate is the force per unit deflection of spring. This is one of the integral properties of suspension as it deals with its shock absorption capacity.

Sprung and Unsprung Mass

The mass of the vehicle supported by shock absorber is called sprung mass [3].
Eg. Frame, Engine, Powertrain etc.
The mass of the vehicle not supported by shock absorber is called Unsprung mass [3].
Eg. Wheels, Tyres, Hubs etc.

For having good suspension it is desired to have maximum sprung mass and minimum unsprung mass so as to minimize the vibrations transferring from ground.

CONCLUSION

From the above literature survey we studied all the parameters contributing to the design of suspension system for an automobile. For an ATV the values of such properties vary from commercial vehicles. Thus taking into consideration all the parameters and assuming some data the designing of suspension system for an ATV was initiated.

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DETERMINATION OF DENSITIES OF SOME R_4NI- SOLUTION IN NMF-DMF SOLVENT MIXTURES AT 25^0 C BY MAGNETIC FLOAT DENSITOMETER AND STUDY MASSON'S EQUATION FROM Φ_V-DATA

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Abstract— A new technique of measuring the densities of solvents and solutions by using magnetic float densitometer has been given .The densitometer works on the electrostatic attraction of force developed by the passage of current through a solenoid. Using this technique, the densities (ρ_o's) of NMF-DMF mixtures at 0, 25, 50, 75, and 100% NMF in DMF (v/v) and those of solution (ρ_s's) of some tetra alkyl ammonium iodide salts namely Et_4NI, Pr_4NI, Bu_4NI and Pen_4NI have been determined experimentally by magnetic float densitometer at 25 ^{0}C. The apparent molar volumes (ϕ_v) have been calculated from density data and a graph is plotted against √C. The slopes, (S_v) of these curves show that in low dielectric constant (ϵ) medium all the four tetra alkyl ammonium salts have positive slope. But as the dielectric constant (ϵ) of the solvent medium is increased by adding NMF in DMF, each of the four electrolytes has negative slope. Such type of changes occurs due to the presence of specific molecular interactions between electrolyte ions and solvent molecules which are responsible for the stability of molecular structure and causes change in the thermo-dynamical properties. It has been explained on the basis of dielectric constant of the mixture, size and charge density of the electrolyte ion.

Keywords— Magnetic Float Densitometer, Apparent molar volume (ϕ_v), Dielectric constant (ϵ), N-methyl Formamide, Dimethyl Formamide, Tetra alkyl ammonium iodide salts, molecular interactions.

INTRODUCTION

The study of apparent molar volumes (ϕ_v) [1, 9, 14, & 19] of tetra alkyl ammonium salts R_4NX in water and in non-aqueous solvent mixtures, eg. Formamide, N-methyl Acetamide (NMA),N-methyl Propionamide (NMP), Dimethyl Sulphoxide (DMSO) and Propylene Carbonate (PC) shows that the slope $\mathbf{S_v}$ of apparent molal volume, (ϕ_v) Vs $\sqrt{\mathbf{C}}$ varies with solvent to solvent and also show positive as well as negative slope S_v – values for having low and high dielectric constant (ϵ) of the medium respectively. There are various non- aqueous solvents with water as one of the constituent were also used by the scientists to prepare solutions of R_4NX salts as Aqueous-Non-aqueous mixtures and then verifying the Masson's equation by using apparent molar volume (ϕ_v) data. The dielectric Constant of the medium was changed by adding, water to the non-aqueous solvent gradually.[13, 14] The results of these workers indicate that there seems to be an effect of dielectric of the combinations of two non- aqueous liquids giving the solvent mixtures of varying dielectric constants using R_4NI salts as solutes. But no one has carried out a systematic study covering entire range (lower to higher) of dielectric constant (ϵ) of the medium. It seemed interesting for us to examine the problem of change of slope $\mathbf{S_v}$, with dielectric constant of the medium by selecting such combination of liquid which can cover the lowest to highest value dielectric constant [11] and also whose density values fit in according to our magnetic float densitometer [10] requirement. This may perhaps throw a light on the effect of dielectric constant (ϵ) on the variation of the slope, $\mathbf{S_v}$ – values. Such combination of liquid mixtures (DMSO-Dioxane system) giving the lower to medium dielectric range [$\boldsymbol{\epsilon}$ = 10.75 to 46.5] and the other combination, NMF- t-butanol Mixtures, covering medium to high dielectric constant range [ϵ = 46.00 to 182.4] have already been studied. This Paper includes a system of two liquids namely NMF-DMF mixtures, which suits us according to needs and requirement of our Magnetic Float Densitometer. This system also covers medium to high dielectric constant range [ϵ = 36.7 to 182.40] of the liquid mixtures for our study. The Magnetic Float Densitometer can be operated with those liquids or liquid mixtures whose density is greater than the density of the magnetic float (that is it should be greater than 0.940010 g/ml).The density coverage of the selected system (NMF-DMF system) from 0% DMF to 100% DMF is from 0.944000 to 1.011006 g/ml. In this paper R_4NI salts (R= Et, Pr, Bu, Pen) are studied in NMF-DMF mixtures at varying compositions from the point of view of apparent molar (Φ_v) using Magnetic Float Densitometer.

MATERIAL AND METHODS

Dimethyl Formamide (DMF), after drying on freshly ignited quicklime, was purified by repeated vacuum distillation. The specific conductance of this sample was of the order of 10^{-7} mhos cm^{-1}. N-methyl Formamide [commercial grade, glaxo] was purified by azeotropic distillation with benzene. There are four tetra alkyl ammonium iodide salts, Et_4NI, Pr_4NI, Bu_4NI and Pen_4NI, which were used in the present investigation were purified by the method of Conway et al. Due to solubility restrictions Me_4NI salt was excluded from our present investigation. N-methy1 Formamide was gradually mixed with Di-methyl Formamide to get 0, 25, 50, 75 and 100% NMF in DMF (v/v). The dielectric constants (ϵ) of these solvent mixtures were not found to be reported in the literature. Therefore these were determined graphically by assuming the linear relationship between the dielectric constant (ϵ) and the composition. A graph was plotted between dielectric constant and composition of solvent mixture .The values of dielectric constants of 0, 25, 50, 75, and 100% NMF in DMF (v/v) mixtures, are computed from the graph. The values of dielectric constant (ϵ) are 36.7, 73.0, 109.5, 146.0 and 182.4 respectively.

Table 1: Estimated values of dielectric constants (ϵ) of the NMF+DMF Mixtures obtained from graph at 25^0C

Sr. No.	Composition of NMF in DMF (v/v)	Dielectric constant, (ϵ)
1	0% NMF	36.7
2	25% NMF	73.0
3	50% NMF	109.5
4	75% NMF	146.0
5	100% NMF	182.4

These solvent mixtures were used for making solutions of tetra alkyl ammonium salts. First of all the densities of 0, 25, 50, 75, and 100% NMF in DMF (v/v) mixtures were determined by Magnetic Float Densitometer at 25^0C. For this, the solvent mixture was taken in the solution container. The weights were added to the float so that it just touched the solution container. Then the current was passed in the pull down solenoid and then in the main solenoid by operating the circuit in proper sequential steps, ie by selecting push button no. 3 in top section; push button no. 2 in the battery section and then sequentially push button 1, 2 and 3 turn by turn in middle section of circuit. The observations were taken for weight ‘w’ and corresponding hold down current ‘I’, when the float touch the button of the solution container .For getting this equilibrium condition, the resistance bridge was also adjusted accordingly. Thus different observations were taken for ‘w’ and corresponding value ‘I’ for each solvent mixture was recorded in a table 2. Then ρ value was calculated at 25^{0}C for each solvent mixture by using formula, $\rho_0 = (W + w + f \times I) / (V + w/\rho_{pt})$ [10]. Thus calculated ρ_0's were given in table 2.

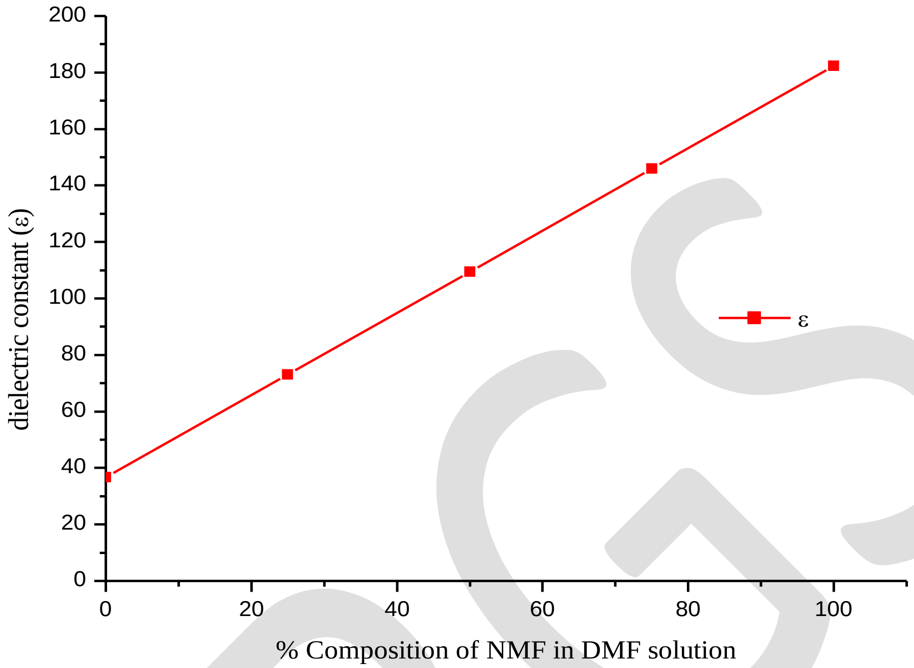

Figure1: Graph plotted between dielectric constant (ϵ) and % compositions of NMF in DMF solvent.

Table 2: Estimated values of densities (ρ_0's) of pure solvent mixtures at 25^{0}C

Sr. No.	**% Composition (v/v) of NMF in DMF**	**W (g)**	**I (mA)**	**ρ_0 (g/ml)**
1.	0% NMF	0.200	83.5	0.944000
2.	25% NMF	1.600	106.8	0.960700
3.	50% NMF	2.800	255	0.977549
4.	75% NMF	4.600	36.3	0.994000
5.	100% NMF	6.000	79.0	1.011006

RESULT AND DISCUSSION

The curves from Figure.2 of apparent molar volume ϕ_v v/s √C for Et_4NI, Pr_4NI, Bu_4NI and Pen_4NI electrolytes are straight lines for the entire concentration range (0.002M – 0.026M) studied. Therefore Masson's equation $\phi_v = \phi_v^\circ + Sv\sqrt{C}$ [2, 3 12] is valid for these electrolytes in DMF - NMF solvent mixtures also. Fig. 2 shows that ϕ_v v/s √C curves have positive slope in 0% NMF in DMF (i.e. in pure DMF) for all the above four electrolytes. The apparent molar volume (ϕ_v) increases with increase in electrolytes concentration and the density of Solutions also increases in each case as is evident from tables 3 to 6. Though the slope of each curve is positive yet it gradually decreases from Et_4NI to Pen_4NI. The value of apparent molar volume (ϕ_v) is greater for a molecule of larger size than the preceding one at a definite concentration. [4, 5, 6, 7, 8] The slope Sv becomes negative as we mix 25 % NMF in DMF ($\rho_0 = 0.960700$, $\epsilon = 73.0$), that is, if dielectric constant (ϵ) of the medium is increased from $\epsilon = 36.7$ to $\epsilon = 73.0$ by adding N-Methyl Formamide.

Table 3: Estimated values of weight (w), used, current (I), passing in the circuit and the corresponding values of ϕ_V

For 75% NMF in DMF Et_4NI salt solution at 25^0C

Sr. No.	M (molarity)	w (g)	I (mA)	ρ (g ml^{-1})	√C mole$^{1/2}$ dm$^{-3/2}$	ϕ_V dm^3.mole^{-1}×10^3
1.	0.002	4.610	40.5	0.994199	0.045	158.61
2.	0.006	4.620	57.0	0.994643	0.08	150.90
3.	0.010	4.630	74.0	0.995097	0.10	148.35
4.	0.014	4.640	92.0	0.995571	0.12	145.82
5.	0.018	4.650	110.0	0.996045	0.13	144.42
6.	0.022	4.660	130.0	0.996559	0.15	141.69
7.	0.026	4.670	147.5	0.997022	0.16	141.78

Table 4: Estimated values of weight (w), used, current (I), passing in the circuit and the corresponding values of ϕ_V

For 75% NMF in DMF Pr_4NI salt solution at 25^0C

Sr. No.	M (molarity)	w (g)	I (mA)	ρ (g ml^{-1})	√C mole$^{1/2}$ dm$^{-3/2}$	ϕ_V dm^3.mole^{-1}×10^3
1.	0.002	4.610	39.5	0.994179	0.045	225.12
2.	0.006	4.620	54.0	0.994584	0.08	217.24
3.	0.010	4.630	70.0	0.995018	0.10	212.75
4.	0.014	4.640	87.0	0.995472	0.12	209.38
5.	0.018	4.650	102.5	0.995896	0.13	209.19
6.	0.022	4.660	122.5	0.996409	0.15	205.00
7.	0.026	4.670	140.0	0.996873	0.16	203.99

Table 5: Estimated values of weight (w), used, current (I), passing in the circuit and the corresponding values of ϕ_V

For 75% NMF in DMF Bu_4NI salt solution at 25^0C

Sr. No.	M (molarity)	w (g)	I (mA)	ρ (g ml^{-1})	√C mole$^{1/2}$ dm$^{-3/2}$	ϕ_V dm^3.mole^{-1}×10^3
1.	0.002	4.610	39.0	0.994169	0.045	286.60
2.	0.006	4.620	53.0	0.994564	0.08	277.04

3.	0.010	4.630	68.5	0.994988	0.10	272.21
4.	0.014	4.640	85.5	0.995442	0.12	267.99
5.	0.018	4.650	102.5	0.995896	0.13	265.64
6.	0.022	4.660	122.5	0.996409	0.15	261.45
7.	0.026	4.670	140.0	0.996873	0.16	260.44

Table 6: Estimated values of weight (w), used, current (I), passing in the circuit and the corresponding values of ϕ_V

For 75% NMF in DMF Pen_4NI salt solution at 25^0C

Sr. No.	**M (molarity)**	**w (g)**	**I (mA)**	**ρ (g ml^{-1})**	**√C mole$^{1/2}$ dm$^{-3/2}$**	**ϕ_V dm^3.mole^{-1}×10^3**
1.	0.002	4.610	39.5	0.994179	0.045	338.02
2.	0.006	4.620	54.0	0.994584	0.08	330.14
3.	0.010	4.630	70.0	0.995018	0.10	325.64
4.	0.014	4.640	88.5	0.995501	0.12	320.20
5.	0.018	4.650	105.5	0.995945	0.13	319.35
6.	0.022	4.660	127.5	0.996509	0.15	313.32
7.	0.026	4.670	150.0	0.997072	0.16	309.19

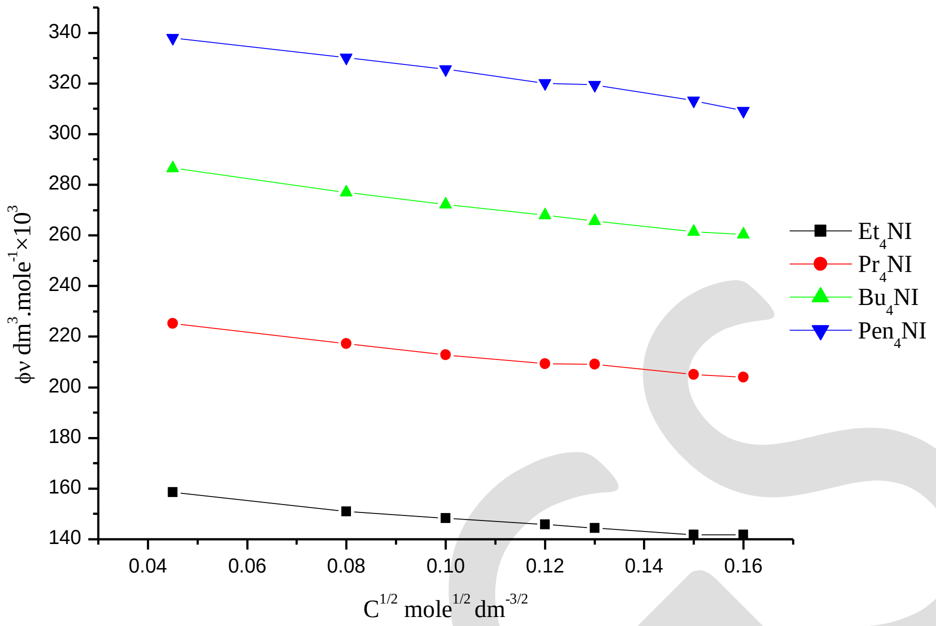

Figure 2: Graph plotted between apparent molar volume (ϕ_v) and root of concentration ($C^{1/2}$) of binary salt solutions (NMF + DMF + Salt).

The slope of all the electrolytes remains negatives in next other three compositions of NMF and DMF i.e. in 50, 75 and 100 % NMF. The electrolytes have positive slope in fig. 20 but these electrolytes have negative slope in fig. 21. As we proceed from fig. 21 to 24, the negative value of slope goes on increasing ie, the lines become more and more steep. Each figure shows that the steepness is higher for Pen_4NI than for Bu_4NI and, in turn, it is higher for Bu_4NI than Pr_4NI and so on. Thus it increases Et_4NI to Pen_4NI in the order $Et_4NI < Pr_4NI < Bu_4NI < Pen_4NI$ in a given solvent mixture having compositions 25% and more. In other wards if we look at the fig. 20 to 24 and see the nature of variation of slope from Et_4 NI to Pen_4NI in each solvent mixture (0, 25, 50, 75, and 100%, NMF in DMF). It decreases from smaller tetra alkyl ammonium ion to larger tetra alkyl ammonium ion, (ie. The negative slope becomes more negative). Table LXXII clearly show that for each electrolyte, the slope goes on decreasing as the dielectric constant is increased, by adding NMF gradually to DMF. It also decreases from Et4NI TO Pen4NI for a definite composition of solvent mixture. The observations of fig. 20 and 21 reveal that the changeover of the slope from positive to negative takes place at somewhere between 0% and 25% NMF, that is, between the dielectric constant ϵ = 36.7 and 73.0.

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CONCLUSION

The apparent molar volumes (ϕv) are positive and large for all the tetraalkyl ammonium salts in all the % compositions of NMF in DMF solvent due to the presence of weak ionic interactions of the solvent molecule. Thus we conclude that the variation of slope S_v – value from Et_4NI (smaller in size) to Pen_4NI (larger in size) shown in table no. 7. Table.7 clearly indicates that the S_v – value goes on decreasing as the dielectric constant (ϵ) is increased for each electrolyte, by adding NMF to DMF gradually to a definite % composition of solvent mixture. This observation confermed that the changeover of the slope from positive to negative takes place at somewhere between 0 % and 25 % NMF (ϵ =36.7 to 73.0)

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BULK USAGE OF FLY ASH IN SELF COMPACTING CONCRETE FOR M_{50} GRADE

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Abstract—Production of cement is an exhausted, energy giving process. Manufacturing of certain tones of normal cement need about more tons of raw materials which includes all materials. This paper shows the efforts for developing a SCC mixes of having high performance of fly ash added with other mineral added such as Silica Fume and Ground Granulated Blast Furnace Slag (GGBFS). For replacing cement used materials are GGBFS, silica fume, fly ash etc. can make sure the required concrete physical and chemical properties. In this paper three trial mixes prepared and their physical and chemical properties are enhanced in their first state. In first mixes 50% cement of M50 mix are replaced by fly ash. In second mix adding 20% of GGBFS and 50% of fly ash replacing for cement. In third mix by adding 50% fly ash, 20% GGBFS and 5% of silica fume. Totally 700 kg/m^3 cement content in all three mix. The result for the compressive strength, flexural strength shows better performance of all Self Compacting Concrete

Keywords— silica fume, fly ash, and Ground Granulated Blast Furnace Slag (GGBFS)

INTRODUCTION

Concrete is an important material used in most of the construction activities. There is a huge infrastructural insistent, all constructions must undergo a change in the country. The requirements of a normal concrete like high workability, good strength and more durability can be achieved by adding several mineral and chemical admixtures. Korean researcher has determined the CO_2 emission reductions by more volume of fly ash as a replaced for cement.

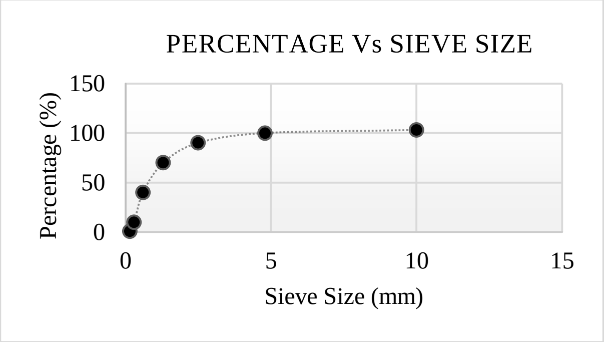

Fig. 1. Fine aggregate Mix Gradation Diagram

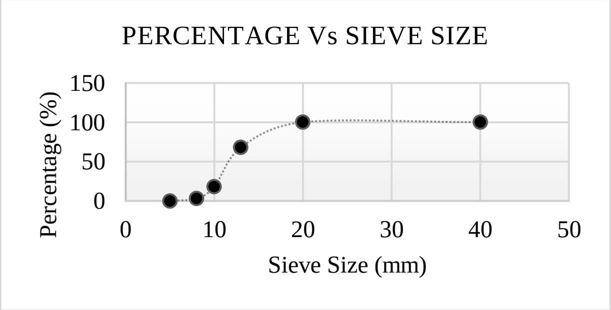

Fig. 2. Coarse aggregate Mix Gradation Diagram

MATERIAL: Physical properties of materials are given below

Cement: OPC 43 grade

Fine Aggregate: The specific gravity of river sand is 2.65 and fineness modulus is 3.11

Coarse Aggregate: Specific gravity is 2.6 and FM is 6.9 and the size of the particle 9 to 22 mm

Fly Ash: Fly ash collected from Ashtech (India) pvt. Ltd, Ashford center, Mumbai. The specific gravity of 3 and fineness of 1.24 m^2/g.

GGBFS: TANCEM cement company. Ltd from Virudhunagar provided GGBFS, which has the specific gravity of 2.83 and fineness of 420 m^2/kg. Table 1. Shows the chemical properties of GGBFS

Silica Fume: From Guru Corporation, Ahmedabad silica fume is purchased. Specific gravity of 2.22 and fineness 20000 m^2/kg.

Table 1. Mineral – Chemical Properties

Properties	Flyash	GGBFS	Silica fume
SiO_2	55.87	50.37	90.46
TiO_2	3.67	0.07	Nil
Na_2O	0.66	0.53	Nil
CaO	0.8	12.84	Nil
Fe_2O_3	2.83	0.25	Nil
Al_2O_3	31.82	25.27	7.89
SO_3	0.16	0.63	0.2
MgO	2.36	9.43	Nil
K_2O	1.99	0.3	0.23

Superplasticizer: A polycarboxylic which used commercially has a huge range of admixture. The optimal was obtained as 0.7% powder content by rheological apparatus.

Mix Proportions:
50% cement and 50% fly ash. – F50
30% cement ,20% GGBFS 50% and fly ash- F50G20
25% cement 5% silica fume, 20% GGBFS and 50% fly ash – F50G20S5

Testing of Specimens: Cubes Size 150 * 150 * 150 mm are tested in UTM for compressive, flexural strengths at 7, 14, 28, 60, 90 days of curing period. 100 * 100 * 500 mm size are tested for flexural strength, under two-point loading, after the curing period of 28 days. For Rapid Chloride Penetration Test, the power passes through the specimen of diameter 100 mm and thickness of 50 mm, the test was done for 6 hours.

Table 2. Mix design details in present study

Mix	M_{50}		
Mix design	F50	F50G20	F50G20S5
Fly ash, %	50	50	50
Content, kg/m^3	400	400	400
GGBFS replacement, %	0	40	40
Content, kg/m^3	0	160	160
Silica fume replacement, %	0	0	10
Content, kg/m^3	0	0	50
Super plasticizer, %	0.7		
Content, kg/m^3	3.8		
w/b ratio	0.31	0.31	0.31
w/c ratio	0.59	0.96	1.18
Cement (kg/m^3)	400	250	200
Fine Aggregate (kg/m^3)	824	815	804
Coarse Aggregate (kg/m^3)	790		

Type I (12 mm)	516	516	516
Type II (14 mm)	221	221	221
Water (kg/m^3)	175		
Viscosity modifying agent (kg/m^3)	-	0.37	-
SCC Properties			
Slump flow (mm)	750	774	680
T50 cm slump flow (sec)	6	6	6
J-ring (mm)	6	9	10
U-box (mm)	1	6	4
V-funnel flow (sec)	11	11	12

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RESULTS AND DISCUSSIONS

SCC - Workability: While casting SCC samples, workability tests Slump flow, V-funnel test, U-box, J-ring tests are done and the values are given in Table 2. Three mix of SCC shows a good result on passing ability, segregation resistance and flowing. The setting time problem extended which shows F50 mix has good flow properties. In F50G20 mix which is more viscous so viscosity modifying agent is essential. Alternative to use of Viscosity modifying agent, an additional silica fume was added with fly ash and GGBFS.

Compressive Strength: For 7, 14, 28, 60 and 90 days curing is done. For F50 the maximum compressive strength of 75 Mpa, for F50G20 the maximum compressive strength is 64 Mpa and for F50G20S5 the maximum compressive strength is 62. All mixes attain there maximum at 90 days of curing

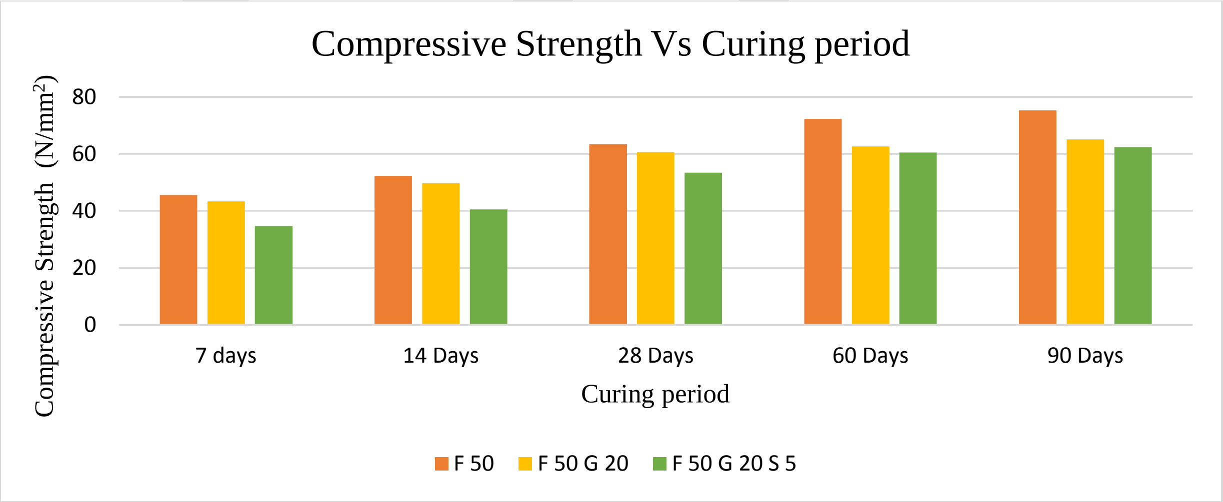

Fig. 3. Cube Compressive Strength at various curing periods

Flexural Strength: For 7, 14. 28, 60 and 90 days of curing the test been conducted. The flexural strength of the several self-compacting concrete mix is mostly near to other mixes. Among the three self-compacting mixes, F50 mix has more 28day flexural strength and shown in Fig. 4. The 28-day flexural strength of the three mixes are in the range 5.5-6.9 Mpa, which is higher or equal to 5.5 Mpa flexural estimated strength using BIS 456 (2000) Codal provisions

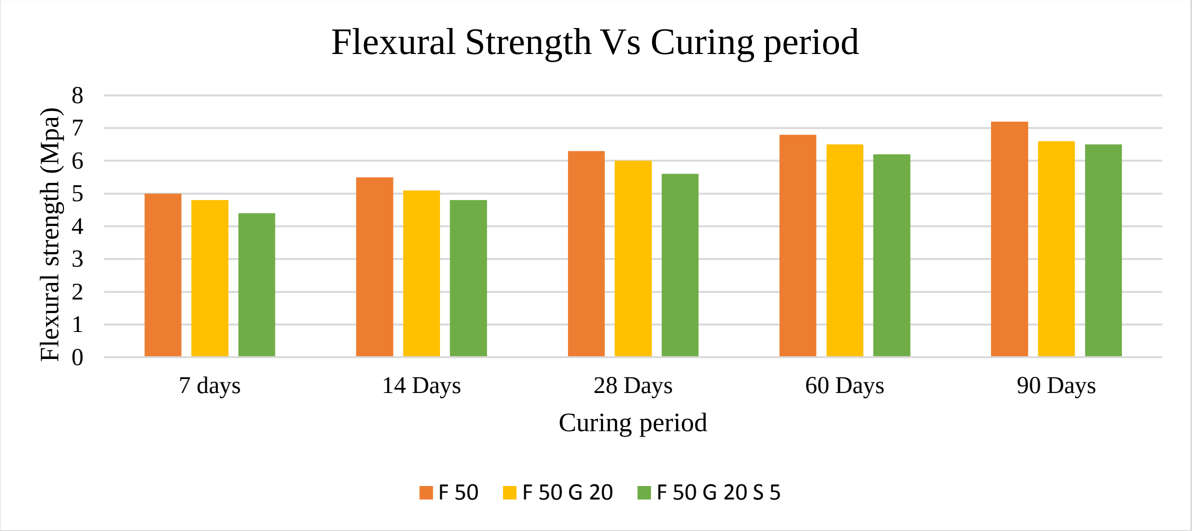

Fig. 4. Flexural Strength at various curing periods

I. CONCLUSION

In this study SCC using more volume fly ash, added with GGBFS and silica fume. Various experiments were conducted based on that conclusions are drawn. F50 mixes shows strength properties and high flow, as required for Self-compacting concrete, with superplasticizer, we are removing form work settling time will be extended Use of fly ash-GGBFS based F50G20 mixes improves the self-compacting settling characteristics of self-compacting concrete mixes, but flow properties of self-compacting concrete are not achieved in this F50G20 mix. Silica fume added to the F50G20S5 mixes without viscosity modifying agent improves the flow properties of the self-compacting concrete. Fly ash based F50 mix compressive strength is higher compared with F50G20 and F50G20S5 mixes at 28 days of curing.

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Performance of an evacuated tube collector with heat pipe technology

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Abstract- Renewable energy is mostly used by many countries now days for energy generation and save our environment as well as save conventional fuel resources. Solar energy is one of the most efficient, clean and affordable energy alternatives available today. With the current concerns about global warming and ever increasing energy rates, countries are seriously looking for domestic and industrial usage of solar energy. Cooling, refrigeration, and air conditioning processes are considered essential needs and major requirements for all human beings in our world today. In the present study, a detail review of the application of solar energy by using evacuated tube collector with heat pipe technology for hot water generation has been carried out. The utilization of solar energy for hot water generation system by Evacuated Tube Collector would help in improvement of energy economics, energy consumption and energy efficiency. The review focuses especially on Evacuated Tube Collector with Heat Pipe Technology. The study also includes thermodynamic equation to find out efficiency of Evacuated Tube Collector with Heat Pipe. Also reviewed Design parameters and theoretical model with equations and also reviewed comparison of theoretical and experimental result of Evacuated Tube Collector with Heat Pipe Technology. This technology used mainly for hot water generation which is further used for different purpose compared to any other collector or technology because of higher efficiency, less heat loss, less friction and many more advantages.

Keywords: Renewable energy, Solar energy, Evacuated Tube Collector, Heat Pipe Technology

1. INTRODUCTION

There are still fossil fuels are used by most of the countries for energy generation in different sectors such as domestic, transportation, industrial, commercial, institutional, etc. The sources of fossil fuels are limited. Fossil fuels are conventional energy sources which are limited and may be finished in near future. We pollute our environment by burning fossil fuels. By burning fossil fuels smoke produced which spread in environment and pollute it. Due to fossil fuel there are green house effect and global warming such a serious problem occur in our environment and it effect adversely. Fossil fuel deploys the ozone layer due to this the ultraviolet radiation coming from the sun directly radiated on earth which is harmful for human beings.

Energy is the heart of any country and it has continuous driving power for economic growth. We know that every day the demand for energy is increased. But we also know that the stock of fossil fuel is limited. So, we can’t reach demand. We have to find another way to fulfil this demand. We have to find such type of energy source which produce energy as much as conventional fuel like fossil fuel and that source must be not limited. There is one solution of the problem is renewable energy. Renewable energy is Non Conventional energy sources and we can use it again and again and also we can extract high energy from renewable energy sources.

Nomenclature

A_c	collector area (m^2)
C_p	specific heat capacity of solar fluid ($Jkg^{-1}K^{-1}$)
G_t	total global solar radiation on the collector’s surface ($W\ m^{-2}$)
$\dot{m}$	Solar fluid mass flow rate ($kg\ s^{-1}$)
Q_{aux}	auxiliary heating requirement (MJ)
Q_{uc}	useful heat collected (J)

Q_{ud}	useful heat delivered (J)
Q_{loss}	supply pipe heat loss (J)
Q_s	Solar yield (MJ)
SF	solar fraction (%)
η_c	collector efficiency (%)
η_s	system efficiency (%)

1.1 Renewable Energy

Renewable energy is defined as energy that comes from resources which are naturally build up again on a human time scale, such as sun light, wind energy, geothermal heat, rain, tidal energy, wave heat etc.

Renewable energy is used in four distinct areas such as air and water heating/cooling, electricity generation, energy services in rural areas and fuels in automobiles. There are significantly increasing energy security, less harmful climatic condition and make benefit economically to countries due to rapid utilization of renewable energy. Two countries named Iceland and Norway already generate all their electricity by renewable energy. Also, some other countries set their goal to produce much more energy using renewable energy in near future. For example in Denmark the government decided to switch the total energy supply to 100% renewable energy by 2050.

Comparison between fossil fuel energy and renewable energy is as given below:

Fossil fuel energy		Renewable energy	
1.	Energy is generated by burning fossil fuel and used where energy is prime factor.	1.	Energy is generated by utilizing energy from renewable sources such as sun, wind energy, tidal energy, geothermal energy, etc and converts it into useful form by different technologies.
2.	Energy from fossil fuel can pollute our environment.	2.	Energy from renewable sources is naturally and never pollute environment.
3.	It adversely affect environment and produce some serious problem such as green house effect and global warming.	3.	Renewable energy never produces any adverse effect on environment.
4.	W can get much more energy from fossil fuels than renewable energy.	4.	We can't get more energy than fossil fuels because of developing different technologies to convert renewable energy in useful form.
5.	Still most of the energy required is fulfilled by fossil fuel.	5.	Still we can't replace conventional energy sources by renewable energy sources.
6.	The sources of conventional energy such as fossil fuels are limited and it might be finished in near future.	6.	The sources of renewable energy are very wide and huge and also it will never finish because we can utilize it again and again.

There is one suitable solution of all environmental problems like- accumulation of greenhouse gases, global warming issue, etc. And the solution is Renewable energy. The energy from renewable sources is pollution free and environment friendly but we can't utilize it by 100%. So, different technologies are developed to use more renewable energy for energy production [9].

To save conventional energy sources and to protect the environment, renewable energy is the best aspect. A continuous and significant development of different technologies for utilizing renewable energy sources is remarkable for the future of a balanced global energy economy. As the demand for energy is increased, use of fossil fuel is also increased but only renewable energy sources can fill that gap between energy demand and use of fossil fuel. Because by using renewable energy sources we can reach demand by using less conventional energy like fossil fuels. Need of healthy and hygienic food products, air-conditioning, hot water supply, stored horticulture product for long time are such factors which encourages the use of renewable energy in industrial production and domestic process [13].

1.2. Solar Energy

All Solar energy is nothing but only heat from sun and radiant light. The solar energy is used in different technologies such as solar heating, solar cooling, solar thermal energy, photovoltaic, solar architecture and artificial photosynthesis. Among all of the renewable energy sources solar energy is an important source of energy. Solar energy technologies are classified as active solar and passive solar energy based on the way they capture and distribute solar energy or convert it into solar power. There are different active solar techniques to use solar energy like- photovoltaic system, solar water heating/cooling and concentrated solar power. Different passive solar energy techniques include orienting a building to the sun, selecting materials with favorable thermal mass or light dispersing properties and designing spaces that naturally circulated air. Solar energy is used everywhere now a days in different purposes. Somewhere it is used for electricity production, hot water generation, air-conditioning, refrigeration, domestic purpose and cooking etc.

In 2011, the International Energy Agency said that “the development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits. It will increase countries’ energy security through reliance on an indigenous, inexhaustible and mostly-import – independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating global warming, and keep fossil prices lower than otherwise. These advantages are global. Hence the additional costs of the incentives for early deployment should be considered learning investments; they must be wisely spent and need to be widely shared”.

There are different types of renewable energy are available such as – solar energy, wind energy, geothermal energy, tidal energy, etc. Solar energy is mostly used from all of the above mentioned energies because of its more likely distribution in nature and abundant source available. Solar energy is environment friendly, clean, low cost and easily available form of renewable energy. There are thermonuclear reactions are occur inside the core of the sun, which resulting electromagnetic radiation released by sun is known as solar energy. A huge amount of solar radiation is received by earth’s surface. As increasing energy prices, limited conventional fuels and increase global warming guide many countries to use renewable energy such as solar energy, wind energy, etc instead of conventional fuels. Solar energy is utilized for different purpose by different technologies such as photovoltaic, solar collectors, etc. Solar energy is used for different purpose like- electricity production, air conditioning, power plant, hot/cold water generation, refrigeration technologies, industrial process, domestic purpose, etc now a day. There are different types of collectors to collect solar radiation and convert it into useful form. Still we can’t use 100% of solar energy because of different losses. So, there are still many researches going on these areas to use more available solar energy and also for increasing performance of solar collector, resulting increase its efficiency.

2. SOLAR COLLECTORS

A Solar thermal collector collects radiation coming from sun (solar radiation) and converts that collected radiation (heat) into useful form. An absorber is placed inside the solar thermal collector to collect heat from sun radiation. Solar radiation is energy in the form of electromagnetic radiation from the infrared (long) the ultraviolet (short) wavelengths. Average solar energy which coming on earth’s surface is 1000 watts per square meter under clear skies, depending upon weather conditions, locations and orientation.

There are different solar collectors for different purposes. Some collector collect radiation to produce electricity, some collectors collects radiation for hot/cold water generation, air collectors used for air conditioning, etc. Simple collectors are typically used in residential and commercial buildings for space heating.

There are two forms of solar collectors (1) Concentrating collectors and (2) Non-concentrating collectors. In Non-concentrating collectors, the collector area is the same as the absorber area and whole solar panel absorbs light. In concentrating collectors, the collector area is bigger than the absorber area.

There are two types of solar collectors: (1) Flat plate and (2) Evacuated tube collectors.

Both of the above collectors are used for domestic hot water or cooling with absorption chillers and space heating.

2.1 Flat plate collectors

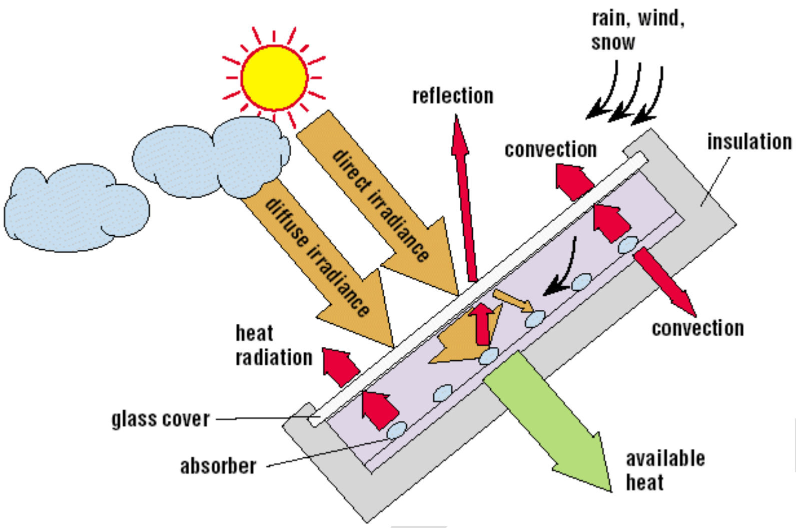


Figure1. Schematic of a flat plate collector

Flat plate collectors consist of

(1) A dark flat-plate absorber,

(2) A transparent cover,

(3) A heat-transfer fluid and

(4) A heat insulating backing.

A dark flat-plate absorber has a thin absorber sheet which is backed by a coil of fluid tubing. A grid or coil of fluid tubing is placed in an insulated casing with a glass or polycarbonate cover. In water heat panels, fluid is passed through tubing to transfer heat from the absorber to an insulated water tank.

In flat plate collectors first sun radiation is absorbed by absorber plate and converts solar energy into heat energy. This heat energy then transferred to the liquid (water) which is circulating through pipes which attached to the absorber plate. Absorber plates are painted with “selective Coatings” which absorb and retain heat better than ordinary black paint. The absorber plates are made from copper or aluminium because this type of metal is good conductor of heat which transfers more amount of heat by calculation. Mainly copper is used for absorber plate and it is more expensive, but less corrosive than aluminium.

2.2 Evacuated Tube Collectors (ETC)

Evacuated tube collectors are made from number of evacuated glass tubes. Each evacuated glass tube has an absorber plate in which heat pipe is placed inside the tube. Solar radiation incident on evacuated glass tube is absorbed by absorber plate and convert this solar radiation into heat. This heat is transferred from absorber plate to the heat pipe. This heat is utilised to generate hot water by transferring heat from heat pipe to domestic water which is passing through heat exchanger called “manifold”. So the heat is transferred generally from absorber tube to insulated hot water tank. The manifold is wrapped in insulation and covered by a protective sheet metal or plastic case. There are vacuum is created inside the glass tube so that it greatly reduced convection and conduction heat loss generally occurred outside of the tube. Therefore, we can get higher efficiency in evacuated tube collectors than flat plate collectors, especially in colder conditions. In warmer condition or in warmer climates this advantage is largely lost, except in those cases where very hot water is desirable.

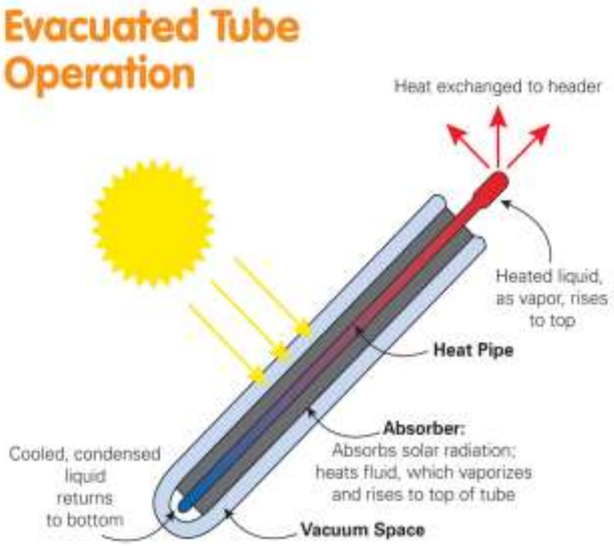


Figure2. Evacuated tube collector with heat pipe

There are different types of evacuated tube collectors available such as

(1) Glass- metal evacuated tube collectors

(2) Glass- Glass evacuated tube collectors

Glass –metal evacuated tube collectors further classified as concentric fluid inlet and outlet and separated inlet and outlet pipes according to flow of fluid in pipes.

There is a single glass tube in concentric fluid inlet and outlet tube. There is a copper heat pipe or water flow pipe with attached fin is inside the tube. In this type of construction each single pipe and absorber fins are free to rotate in any direction (angle) even if the collector is mounted horizontally.

Glass- metal with separated inlet and outlet pipes evacuated tube collectors are of traditional type collector. The shape of absorber in this type of collector is flat or curved. Vacuum is desirable inside the tubes and at lower working temperature efficiency of this type of evacuated tube collector is high.

In construction of glass-glass evacuated tube collectors two glass tubes fused together at one end. There are coating of integrated cylindrical metal absorber is available in the inner tube. This type of evacuated tube collectors is less efficient than the glass-metal type but cheaper in cost and more reliable than glass-metal type. Glass- Glass collectors are more efficient at high working temperatures.

Comparison of flat plate collector (FPC) and Evacuated tube collector (ETC) is as given below.

Flat plate collector (FPC)		Evacuated Tube Collector (ETC)	
1.	In flat plate collector an absorber plate with a sheet of copper, painted or coated black is bonded to pipes of transfer fluid.	1.	I evacuated tube collector a glass tube with vacuum inside it is surrounding an absorber plate or area.
2.	FPC has low cost.	2.	ETC has higher cost.
3.	Flat plate collector is more efficient than evacuated tube collector at ambient temperature.	3.	ETC is more efficient than FPC at lower working temperatures (conditions).
4.	The design of FPC is easy.	4.	The design of ETC is difficult because of vacuum

			inside the tube.
5.	FPCs are sensitive to sun angle and orientation.	5.	ETCs are less sensitive to sun angle and orientation.
6.	FPCs have longer life.	6.	ETCs have less life than FPCs.
7.	Flat plate gives better year round performance.		Performance of ETCs is less than FPCs.

2.3 Heat Pipe Technology

A heat pipe is a heat transfer device which transfers heat between two solid surfaces by using two principles as thermal conductivity and phase transition.

There are two sections are available mainly such as evaporation section (hot interface) and condensation section (cold interface). A liquid inside the heat pipe evaporates at hot interface by absorbing heat from the absorber. That generated vapour then travels to the cold interface and release latent heat to the working fluid passing from the manifold. So the liquid inside the heat pipe is condenses back into a liquid which again travels to evaporation section by capillary action, centrifugal force or gravity. Hence the cycle is completed and it continuously repeats to transfer high amount of heat. Heat pipes are highly effective conductors because of the very high heat transfer coefficients for boiling and condensation. Heat pipe length may affect the effective thermal conductivity of it. Thermal conductivity can approach 100 kW/ (m-K) for long heat pipe than approximately 0.4 kW/ (m-K) for copper. The schematic of heat pipe is shown as figure given below.

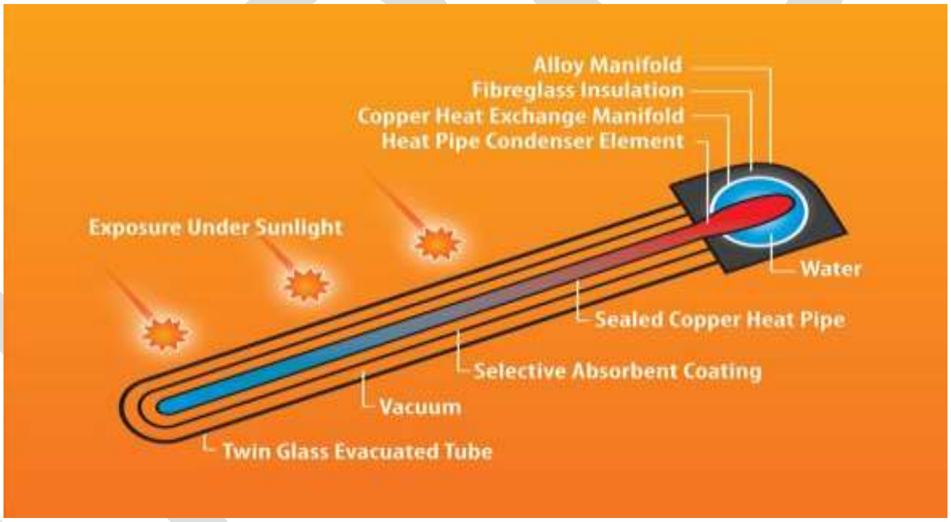


Fig.3. Schematic of heat pipe technology

Structure, design and construction:-

A typical heat pipe is nothing but a sealed pipe or tube which is made with compatible material with working fluid such as for water heat pipe copper is suitable and for ammonia heat pipes aluminium is suitable. When heat pipes are empty at that time for maintaining vacuum inside it a vacuum pump is used. After creating vacuum inside the heat pipes it fills partly with working fluid and then sealed. The working fluid mass is chosen so that the heat pipe contains both vapour and liquid over the operating temperature range. Below the operating temperature, the liquid is too cold and cannot vaporize into a gas. Above the operating temperature, all the liquid has turned to gas, and the environmental temperature is too high for any of the gas to condense. Whether too high or too low, thermal conduction is still possible through the walls of the heat pipe, but at a greatly reduced rate of thermal transfer. Working fluids are chosen according to the temperatures at which the heat pipe must operate. Water heat pipes are sometimes filled by partially filling with water, heating until the water boils and displaces the air, and then sealed while hot.

There must be a saturated liquid and its vapour present inside the heat pipe for transferring heat. The saturated liquid present inside the heat pipe is vaporize and then travel to the condensation section where that vapour condense by releasing latent heat and that saturated liquid again return to evaporation section by action of capillary, centrifugal force or by gravity. In a saturated heat pipe, the condensed liquid is returned to the evaporator using a wick structure exerting a capillary action on the liquid phase of the working fluid. Wick structures used in heat pipes include sintered metal powder, screen, and grooved wicks, which have a series of grooves parallel to the pipe axis. When the condenser is located above the evaporator in a gravitational field, gravity can return the liquid. In this case, the heat pipe is a thermosyphon. Finally, rotating heat pipes use centrifugal forces to return liquid from the condenser to the evaporator.

Heat pipes contain no mechanical moving parts and typically require no maintenance, through non-condensable gases that diffuse through the pipe's walls, resulting from breakdown of the working fluid or as impurities extent in the material, may eventually reduce the pipe's effectiveness at transferring heat. The advantage of heat pipes over many other heat-dissipation mechanisms is their great efficiency in transferring heat.

The most commonly used envelope (and wick)/fluid pairs include:

- Copper envelope/Water working fluid for electronics cooling. This is by far the most common type of heat pipe.
- Copper or Steel envelope/Refrigerant R134a working fluid for energy recovery in HVAC systems
- Aluminium envelope/Ammonia working fluid for Spacecraft Thermal Control
- Superally envelope/Alkali Metal (Caesium, Potassium, Sodium) working fluid for high Temperature heat pipes, most commonly used for calibrating primary temperature measurement devices.

3. PERFORMANCE EVALUATION

3.1 Performance of heat pipe

Chunjing Wong, Weije Feng, Qingtai Jiao, Shai Li and Dejun Cai et al [16] carried out study on heat transfer capacity of solar horizontal heat pipe.

They carried out study to determine the optimum range of volumes of the working fluid for the solar horizontal heat pipe and also to determine characteristics of the sensitivity of the heat pipe performance to the installation angle. So a researcher can design the horizontal heat pipe collectors optimally.

The heat transfer performance of solar horizontal heat pipe is mainly influenced by filling amount and it is one of the key parameters of the solar horizontal heat pipe. They obtain optimum heat transfer performance of the solar horizontal pipe when the level height of working fluid is about 19% - 22% of the inner diameter of the solar horizontal pipe. The solar heat pipe is also sensitive to angle. The heat transfer capacity decreased significantly at a small negative angle and the heat transfer capacity increased significantly at a small positive angle.

3.2 Performance of Flat plate collectors with heat pipe

M. Hammad et al [1] investigated experimental study of the performance of a solar collector cooled by heat pipes. He described the performance of a flat plate solar collector cooled by a set of heat pipes, designed and manufactured locally to work at low temperature conditions equal to that of flat plate solar collectors. He calculated the efficiencies and quantities of energy transferred to a water storage tank and resulted that it was comparable to those obtained by using water cooled solar collector. The collector efficiency mainly depends on time of day, solar intensity; ambient temperature and flat plate mean temperature. The unit was less expensive and suitable for rural areas because it was natural circulation water cooled unit. Following figure shows the effect of solar intensity and ambient temperature combine to affect the efficiency daily distribution.

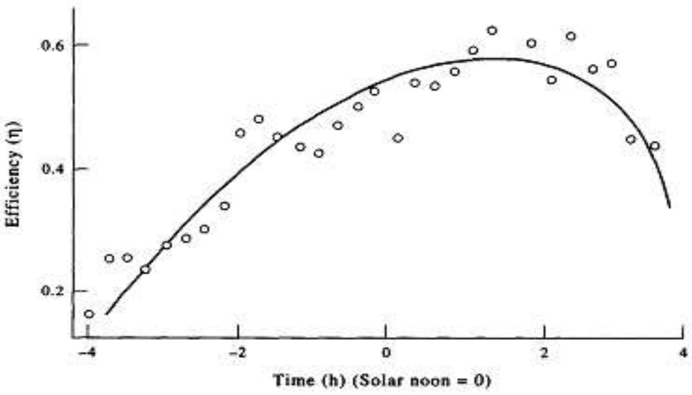


Fig.4. Efficiency vs. Time

Some important merits of unit are free of icing, free of corrosion and cooling of the daily heated water at night. He measured efficiency of unit was 60% and also noticed that the unit was working at low temperature conditions and give satisfactory performance.

E. Azad et al [5] studied the theoretical and experimental investigation of heat pipe solar collector. He investigated the thermal behaviour of a gravity assisted heat pipe solar collector theoretically and experimentally. The developed theoretical model was based on effectiveness-NTU method, for evaluating thermal efficiency of the collector, the inlet, outlet water temperatures and heat pipe temperature. He also determined optimum value of evaporator length to condenser length ratio. There is a very high thermal conductance structure in the heat pipe. This structure allows the heat transportation with a temperature drop of smaller magnitude. Heat pipes consist of a sealed container with a small amount of working fluid. There are two sections in heat pipe as: evaporator section and condenser section. In evaporator section the heat is transferred as latent heat energy by evaporating the working fluid in a heating zone. In condenser section the vapour is returned to the heating zone by the capillary structure which lines the inner wall of the container and the cycle is completed.

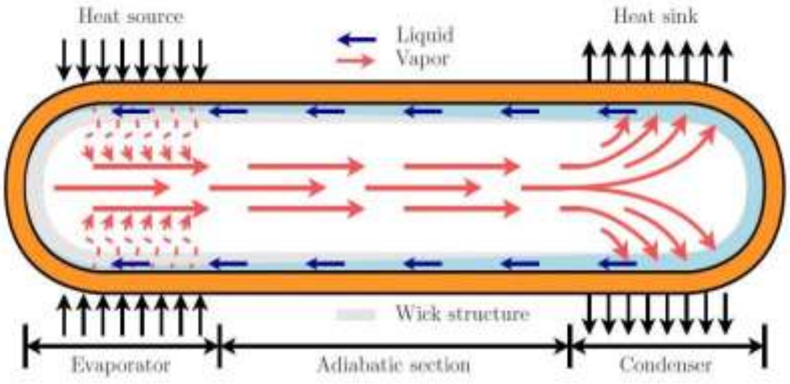


Fig.5. Heat Pipe Schematic

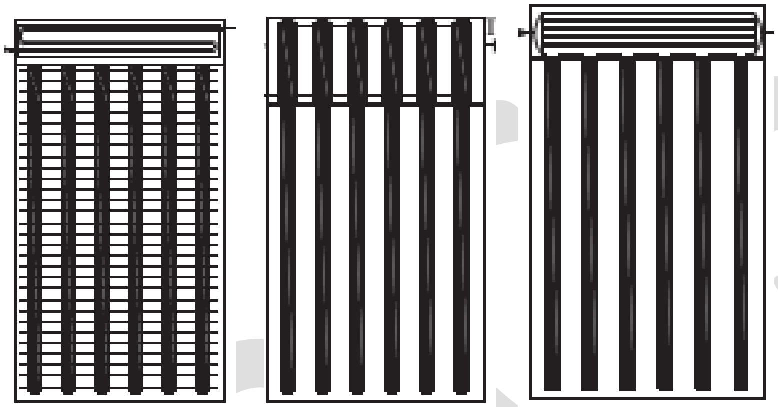
Gravity assisted heat pipes are unidirectional conductors-they behave as thermal diode. Heat is transferred from evaporator section to condenser section only but not in reversed direction, if we oriented heat pipe properly. So we can reduce heat loss when absorber is at lower temperature than the liquid flow inside the heat exchanger. Advantages of heat pipes are less corrosive, redundancy and if one heat pipe may fail then that does not effect on the performance of the collector. Only heat exchanger section must be insulated so that we can avoid freezing problem.

The condenser of the heat pipe is elevated so that the condensate returns to the evaporator with the assistance of gravity and we can get high heat transfer capability. There are no wick is required in the condenser section while for circumferential distribution a wick structure is required. When the heat pipe is operating in gravity assisted mode, a high heat transfer capability can be achieved. Further, no wick is required in the condenser since gravity drains the condensate from the wall to the paddle. However, a wick structure is required for circumferential distribution of liquid in the evaporator.

He experimentally investigated the thermal performance of heat pipe solar collector together with a simple theoretical analysis. Theoretical model can suggest an optimum heated length-cooled length ratio, so collector absorbs more heat and increase the overall amount of useful heat. With the increase of the heated length-cooled length, L_e/L_c, the absorber area will increase which may result in increased solar energy by absorber plate and also the heat loss from the absorber. Also, heat transfer coefficient in condenser will increase and hence increase the heat transfer rate in the condenser.

E.Azad et al [10] studied an assessment of three types of heat pipe solar collectors. He installed all of three collectors in parallel to each other. When all of three collectors are operating under variable conditions such as wide range of incidence solar radiation, the characteristics of three collectors are noticed by him.

All of three collectors of testing unit are as given below:



Type I Type II Type III

Fig.6. Heat pipe solar collector

Efficiency of three collectors is as given below:

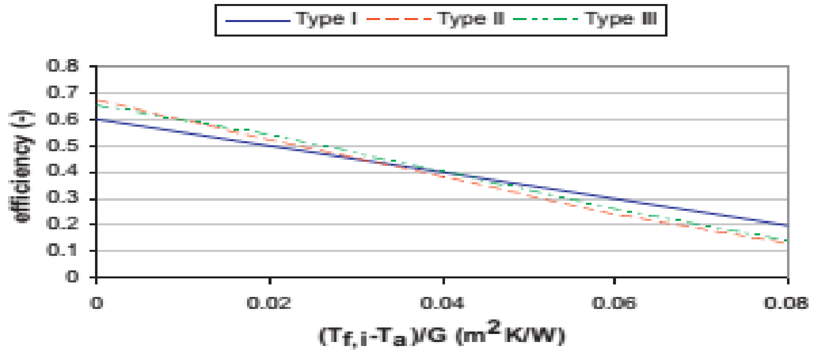


Fig.7. Heat pipe solar collector's efficiency line

He noticed that Type- I collector as shown above figure that are with fins gave better efficiency among three collectors. The fins attached with tubes can increase the performance of collector. This type of collector is of low cost and easily produced but leakages are there.

3.3 Performance of Evacuated Tube Collectors (ETC) with heat pipe

Evacuated tube collectors are such collectors which collect solar radiation (energy) and convert it into heat energy. With the help of heat pipe technology evacuated tube collector can transfer solar energy into heat energy. In heat pipe mainly two sections are available named evaporative section and condensation section. In evaporative section fluid inside the tube is evaporated and then vapours travel to condensation section where that fluid condensed and working fluid or air is heated by taking heat from the vapour inside the heat pipe at heat exchanger inside the manifold.

Convective heat loss is less in evacuated tube collectors because absorber surface is placed inside the vacuum. We can also reduce radiation loss by using a low emissivity absorber surface. A heat extraction from long thin absorber is the main problem with evacuated tube solar collector. Following methods are used to extract heat from evacuated tubes:

- Heat pipe
- Flow through absorber
- All glass tubes
- Storage absorber.

G.L. Morrison, I. Budihardjo, M. Behnia et al [2] studied water-in-glass evacuated tube solar water heaters and found that evacuated tube solar collectors have better performance than flat plate solar collectors, for high temperature operations.

S.B.Riffat, X.Zhao and P.S.Doherty et al [3] developed a theoretical model to investigated thermal performance of a thin membrane heat-pipe solar collector. He designed and constructed a thin membrane heat-pipe solar collector so that it can collect solar radiation efficiently with low cost. He also developed a heat balance equations for analysis purpose. He analysing heat transfer processes occurring at top cover, absorber and manifold areas. The test efficiency was found to be in the range 40-70%, which is a bitter lower than the values predicted by modelling.

A comparison of testing and modelling results of the thin membrane heat pipe solar collector is shown as following graph.

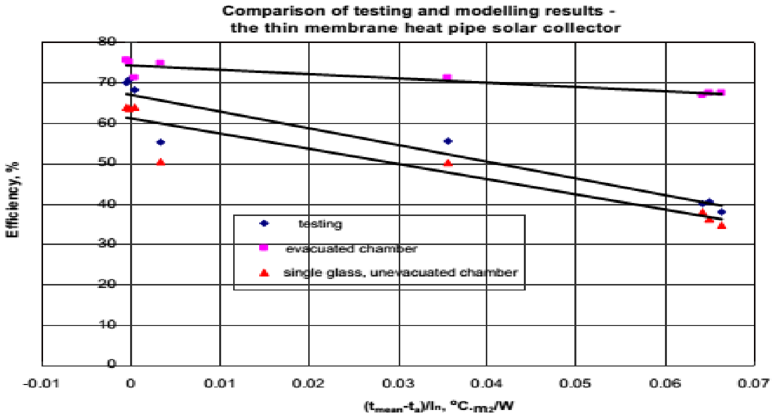
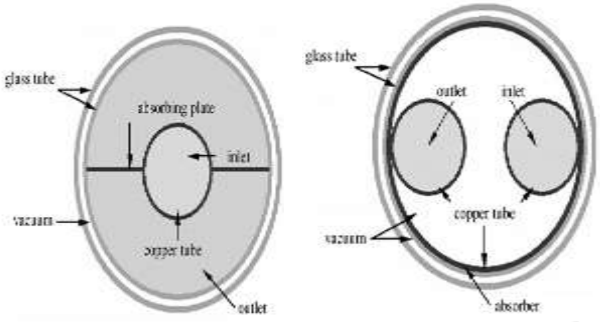


Fig.8. Comparison of testing and modelling result

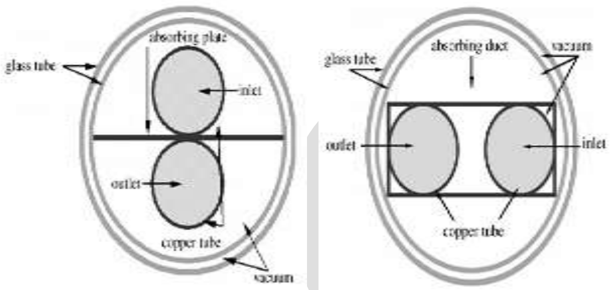
'Miniature' heat pipes cost are less than normal heat pipes used in evacuated tube collector or flat plate heat pipe solar collector. The measured efficiency of the test was in the range of 40-7- %. This value is lower than the prediction for evacuated case by modelling while higher than the prediction for unevacuated chamber with single glass cover. This was happened because in case of evacuated one the heat transfer resistance is more due to inert gas, argon is used for filling the chamber after evacuated. In unevacuated chamber heat resistance is less due to air inside the chamber. If we comparing both then we can find that the convective or conduction loss is more in unevacuated chamber than evacuated one.

Yong Kim and Taebeom seo et al [4] studied thermal performances comparisons of the glass evacuated tube solar collectors with shapes of absorber tube. The thermal performance of a glass evacuated tube solar collector is investigated numerically and experimentally for two layered glass tube and absorber tube. The working fluid is an air in this solar collector. The performance of four different shapes of absorber tubes of solar collectors are carried out to find out the best and optimum shape of absorber tube. They also compared the performance of collector model and simplified model in which only beam radiation is considered. They observed that the parameters which seriously affected the performance of solar collectors are incidence angle of solar radiation, shape of the absorber and arrangement of collector tube. The centre distance increases, the number of collector tube decreases and hence decrease utilized solar energy. They test the four models with only beam radiation for single collector tube and then beam radiation with the diffuse radiation and shadow effect for different collectors.

The four cross-sections of different shapes of absorber tubes are shown in following figure.



Model I Model II



Model III Model IV

Fig.9. Four cross-sections of different shapes of absorber

Model II gave the best performance among four different collectors, when we considered only beam radiation. Initially, when the incidence angle was small, the efficiency of model III was high but as soon as incidence angle increases the efficiency of model III becomes higher than that of model III. When the effects of the diffuse irradiation and the shadow due to adjacent tubes were considered, the performance of model III was the best for all ranges of the incidence angle.

I. Budhihardjo, G.L.Morrison et al [6] investigated the performance of water –in-glass evacuated tube solar water heaters. The performance was evaluated using experimental measurement of optical and heat loss characteristics and a simulation model of the thermosyphon circulation in single ended tubes. The performance of water-in-glass evacuated tube solar collector system was compared with flat plate solar collector in a range of locations.

The schematic of water-in-glass evacuated tube solar water heater is as given below.

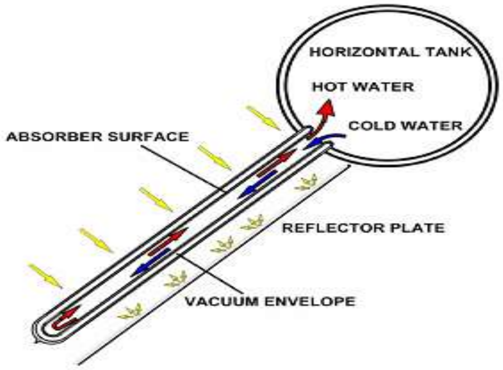


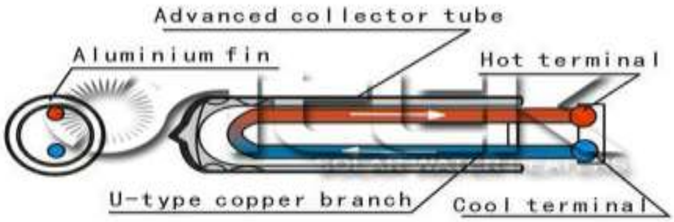
Fig.10. Natural circulation flow in a water-in-glass solar water heater

They prepared a model of water-in-glass evacuated tube solar water heaters and simulate the performance of it. An evacuated tube system with 30 tubes had slightly lower energy savings than a two panel (3.7 m^2) flat plate system.

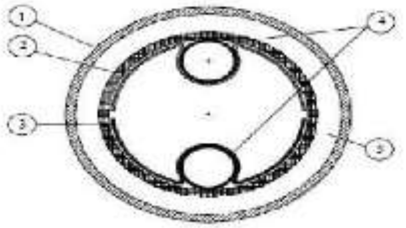
Liangdong Ma, Zhen Lu, Zhang and Ruobing Liang et al [7] studied thermal performance analysis of the glass evacuated tube solar collector with U-tube. They investigated thermal performance of the individual glass evacuated tube solar collector by analytical method. The solar collector is two layered glass evacuated tube and the absorber film is deposited in the outer surface of the absorber tube. Using one dimensional analytical solution, the heat loss coefficient and heat efficiency factor are analyzed. Also, they studied the influence of air layer between the absorber tube and the copper fin on the heat efficiency. The function relation of the heat loss co-efficient of the glass evacuated tube solar collector with temperature difference between the absorbing coating surface and the ambient air is nonlinear.

Anti-freezing, rapid start-up, resistance to high pressure, easy installation and maintenance, etc are the advantages of heat pipe evacuated tube solar collectors. Many countries have paid more and more attention to utilise solar energy and increase country economy by saving conventional fuels as much as possible. But the heat pipe evacuated tubular must maintain the vacuum environment. In the practical application, it is very difficult to maintain a vacuum inside the tube because lots of non-condensable gas will be produced in the heat pipe at the running process of the system. The thermal performance of the heat pipe will be subject to serious influence because of the accumulation of non condensable gas.

Currently, U-tube glass evacuated tube solar collector is much more widely used compared with the heat pipe. U-tube glass evacuated tube solar collector is shown in the figure given below.



1- Outer Glass Tube



2- Absorber tube

3- Copper Fin

4- U- Tube

5- Vacuum Jacket

Fig.11. Glass evacuated tube solar collector with U-tube (a) Illustration of the glass evacuated tube (b) cross-section

The influence of the thermal resistance of air layer on the heat efficiency is large. To evaluate thermal performance of the glass evacuated tube solar collector, heat efficiency as well as surface temperature of the absorbing coating is important parameters. The efficiency increases with increase of solar radiation intensity, but it reaches gradually to a constant. Variation of efficiency and coating temperature with radiation intensity is as shown below.

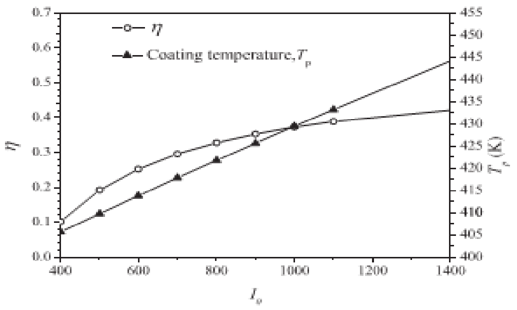


Fig.12. Variation of efficiency and coating temperature with radiation intensity

Dan Nchelatebe Nkwetta, Mervyn Smyth, Aggelos Zacharopoulos and Trevor Hyde et al [9] carried out optical evaluation and analysis of an internal low concentrated evacuated tube heat pipe solar collector for powering solar air conditioning systems. This analysis was carried out to enhance the collection of solar radiation for medium temperature applications. Ray trace analysis was carried out at different transverse angles to determine the quantities such as optical efficiencies, related optical losses and flux distribution on the absorber of the internal low-concentrating evacuated tube heat pipe solar collector. They investigated the truncated internal low-concentrated evacuated tube heat pipe solar collector with the respective acceptance half angle as shown in figure.

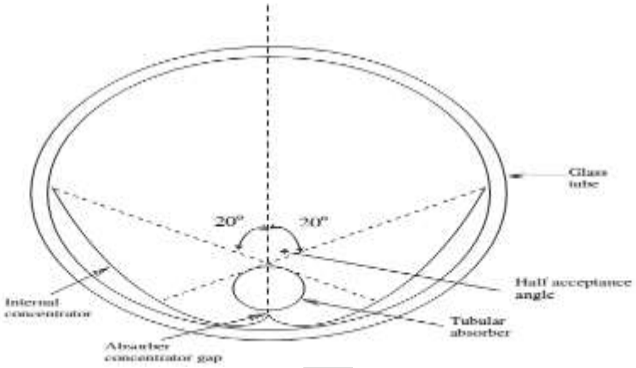


Fig.13. the truncates internal concentrating evacuated tube heat pipe (ICETHP) solar collector configuration

Ray trace diagram for the internal low-concentrated evacuated tube heat pipe solar collector with solar radiation incident at different transverse angles are as given below.

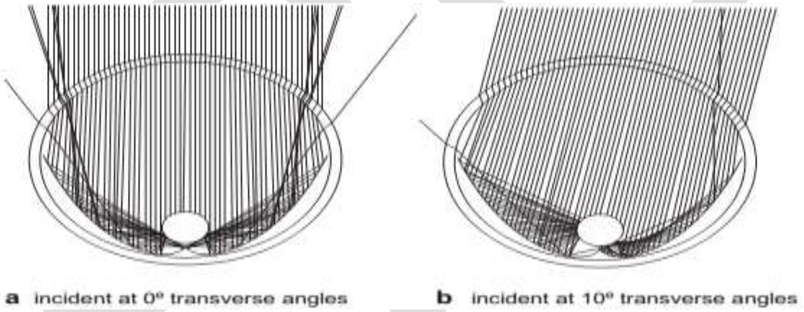

a incident at 0° transverse angles **b** incident at 10° transverse angles

Fig.14 Ray trace diagram for the internal low-concentrated evacuated tube heat pipe solar connector with solar radiation incident at (a) 0° (b) 10°

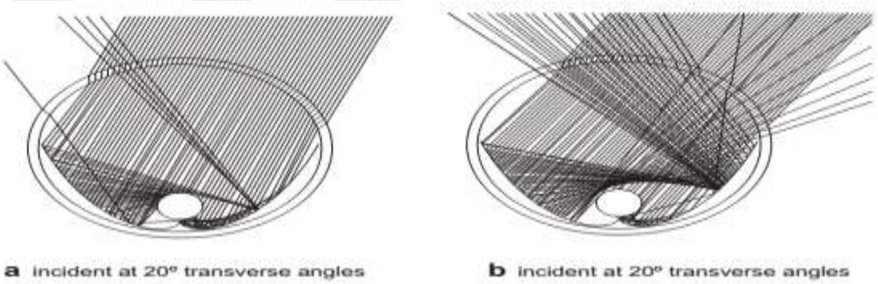

a incident at 20° transverse angles **b** incident at 20° transverse angles

Fig.15 Ray trace diagram for the internal low-concentrated evacuated tube heat pipe solar connector with solar radiation incident at (a) 20° (b) 30°

The variation in optical efficiencies at different transverse angles showed a non-linear relationship. The truncated internal reflector design reduced reflector losses and cost of the reflective material. We increased the irradiance level on the heat pipe absorber and reduce convective heat losses with combine use of concentration and evaluation. They achieved higher temperatures with larger temperature differential and hence improvement in the thermal performances.

Bin Du, Eric Hu and Mohan Kolhe et al [11] carried out an experimental platform for heat pipe solar collector testing. The parameters included in experiment were receiver and absorber areas, the effective heat capacity, the incidence angle modifier and the pressure drop and also its correlations with the instantaneous efficiency were investigated.

The pressure drop was an important parameter for the design of the solar collector. First we have to check that there were no impurities and bubbles in the moving working fluid before measuring the pressure drop. The measured parameters are the temperature of working fluid at the inlet collector t_i, the mass flow rate of working medium, the pressure difference between the inlet and outlet of collector. The calculation formula of the collector's pressure drop is:

$$\Delta p = 51838 m^2 + 1807 m \qquad (1)$$

Where, m= mass flow rate of working medium

All the measuring parameter's performance was as desirable and data of experimental and theoretical were within range.

Lacour Ayompe and Aidan Duffy et al [12] studied thermal performance analysis of a solar water heating system with heat pipe evacuated tube collector using data from a field trial.

Evacuated tube collectors (ETCs) have glass tubes with vacuum generated inside it. The absorber surface which absorbs solar radiation is located inside the glass tube and absorber surface has different shapes. ETCs may be subdivided in two types: (1) 'direct flow through' (or 'water-in-glass) and (2) 'heat pipe'. Direct flow through evacuated tube collectors have a set of glass tubes which are normally connected with a tank or shell. A larger diameter glass tube is used to surround each tube with the annular space between the tubes evacuated to reduce heat losses. The heat transfer liquid is heated as it circulates in the tubes.

A heat pipe (HP) has tubes which has high thermal conductance and there are small amount of working fluid is present inside the heat pipe. At a heating zone of heat pipe working fluid is evaporating by absorbing a latent heat of evaporation. That evaporated vapour then travel to cooling zone and it condenses by rejecting heat to fluid which flow through manifold. Then the condensate return back to the heating zone and the cycle complete. The condensate returns back to evaporative section by capillary action, gravity or by wick structure. The tubes are mounted with the metal tips projecting into a heat exchanger (manifold) containing flowing water or water/glycol. Heat is transferred into the manifold and through circulation pipe work to be used in heating and/or hot water applications.

A heat pipe evacuated tube collector (HP-ETC) has a heat pipe inside a vacuum generated tube. Due to vacuum present inside the tubes it reduces convection and conduction losses, so the collectors can operate at higher temperatures than flat plate collectors (FPCs). FPCs and HP-ETCs can collect both direct and diffuse radiation. Heat pipe evacuated tube collectors have higher efficiency at low incidence angles. Typically heat absorbing fins are attached to the tubes to maximise thermal gains.

The main difference in thermal performance between a HP-ETC and conventional HP technologies lies in the heat transfer processes from the absorber tube wall to the energy transporting fluid. In the HP-ETC there are three processes involved which are evaporation, condensation and convection. For conventional HP solar collectors, heat transfer occurs only in the absorber plate. Solar collectors with HPs have a faster response time because it has lower thermal masses.

HPs operate like a thermal diode, i.e., with unidirectional heat flow. This minimizes heat loss from the transporting fluid when incident radiation is low. Furthermore, when the maximum design temperature of the collector is reached, additional heat transfer can be prevented. This prevents overheating of the circulation fluid, a common problem in many solar collector systems.

The use of HP-ETCs in solar water heating systems (SWHSs) is increasing worldwide because of their high thermal efficiencies and operating water temperatures when compares to flat plate collectors (FPCs). Heat pipe evacuated tube and manifold is as shown in figure below.

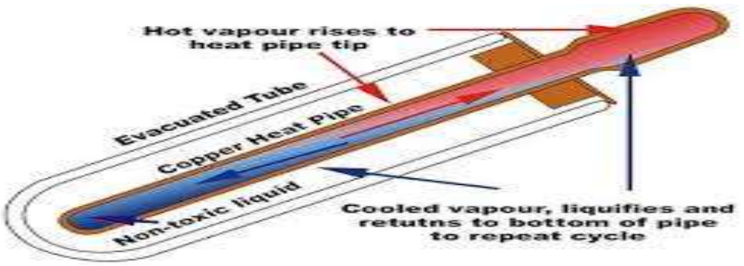


Fig.16 Heat pipe evacuated tube collector

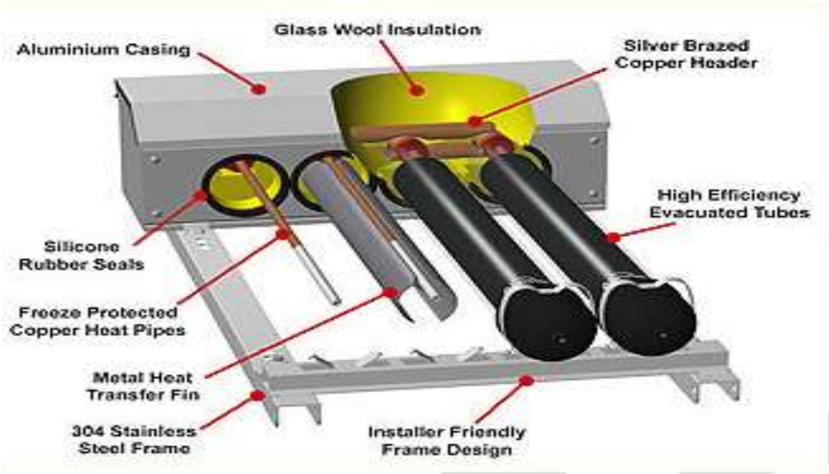


Fig.17. Manifold

Energy Performance Analysis:

1. **Energy Collected:**

The useful energy collected by the solar energy collector is given as:

$$Q_{uc} = \dot{m}\, C_p \,(T_{c,outlet} - T_{c,inlet}) \quad (2)$$

2. **Energy delivered and supply pipe losses:**

The useful energy delivered by the solar coil to the hot water tank is given as:

$$Q_{ud} = \dot{m}\, C_p \,(T_{sc,inlet} - T_{sc,outlet}) \quad (3)$$

Supply pipe losses were due to the temperature drop as the solar fluid flowed between the collector outlet and the solar coil inlet to the hot water tank. These losses were calculated as:

$$Q_{Loss} = \dot{m}\, C_p \,(T_{sc,inlet} - T_{c,inlet}) \quad (4)$$

3. **Solar Fraction:**

The solar fraction (SF) is the ration of solar heat yield to the total energy requirement for water heating and is given as:

$$SF = \frac{Q_s}{Q_s + Q_{aux}} \quad (5)$$

4. Collector efficiency:

The collector efficiency is calculated as:

$$\eta_c = \frac{\dot{m}\, C_p\, (T_{c,outlet} - T_{c,inlet})}{A_c\, G_t} \quad (6)$$

5. System Efficiency:

The system efficiency is calculated as:

$$\eta_s = \frac{\dot{m}\, C_p\, (T_{sc,inlet} - T_{sc,outlet})}{A_c\, G_t} \quad (7)$$

To reduce energy loss, the solar circuit supply pipes should be kept as short as possible. The low thermal mass of a HP-ETC causes it to absorb solar radiation and transmit heat quickly to the solar fluid. They also concluded that HP-ETCs are more efficient than flat plate counterparts when operating as components of a solar water heating system by comparison of study results.

Vishal Dabra, Laxmikant Yadav and Avdhesh Yadav et al [13] studied the effect of tilt angle on the performance of evacuated tube solar air collector: experimental analysis.

The Evacuated tube solar air collector is located at different collector tilt angles at 30° and 45° with the horizontal. Tilt angle played significant influence on the thermal performance of the evacuated tube solar air collector along with or without reflector. For 30° tilt angle evacuated tube solar air collector with reflector had better thermal performance than the 45° tilt angle evacuated tube solar air collector with or without reflector. Increasing collector tilt angle had no positive effect on the thermosyphon phenomenon inside the evacuated tubes.

They concluded that thermal performance of evacuated tube solar air collector at 30° tilt angle had more than at 45° tilt angle with and without reflector. They noted that steep collector tilt angle (45°) decrease the thermal performance of evacuated tube solar air collector and the thermosyphonic circulation phenomenon.

Hongfei Zheng, Jianying Xiong, Yuehong Su and Haiyin Zhang et al [15] studied the influence of the receiver's back surface radiative characteristics on the performance of a heat pipe evacuated tube solar collector.

There is a significant influence on the performance of a heat pipe evacuated tube solar collector of receiver's back surface radiative characteristics. This influence is generally related to the back surface emissivity and temperature. The heat loss of the evacuated tube collector increases with the increase of the back surface emissivity. The change of back surface emissivity can significantly affect the performance of the ETSC at higher temperature but affect little at lower temperature. The treatment on the receiver's back surface may solve the overheating problem of ETSC in summer by increasing the receiver's back surface roughness.

Heat transfer model of ETSC suggested by author is as shown in figure given below.

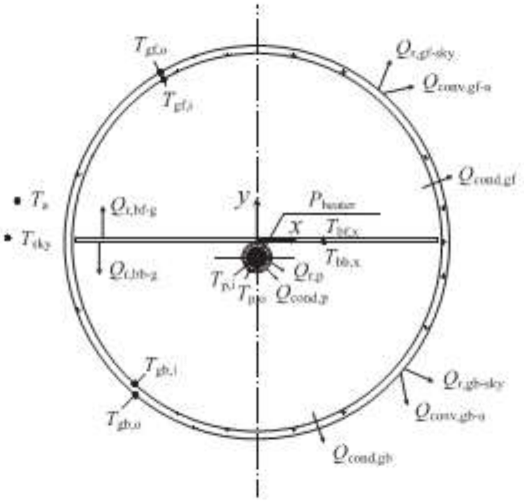


Fig.18. Heat transfer model of the ETSC

They mainly focuses on studying the methods of increasing or decreasing the heat loss of ETSC by changing the receiver's back surface emissivity and studied that by performing roughness treatment on the receiver's back surface. One can increase the emissivity of evacuated tube collector and the radiative heat loss can be reduced by adding sunshade plate.

The influence of the receiver's back surface emissivity, on the heat loss is more significant when the temperature is higher, while the effect is very limited when the temperature is in lower range.

4. CONCLUSION

L.M. Ayompe, A.duffy, M.conlon and S.J.McCormack et al [8] investigated comparative field performance study of flat plate and heat pipe evacuated tube collectors (ETCS) for domestic water heating systems in a temperature climate. They presented a year round energy performance monitoring results of two solar water heaters with 4 m^2 flat plate and 3 m^2 heat pipe evacuated tube collectors (ETCS) operating under the same weather conditions. They concluded that the 4 m^2 FPC system compares quite favourably with the 3 m^2 ETC system when connected to a 300l hot water tank.

Boris Rassamakin, Sergii Khairnasov, Vladilen Zaripov, Andrii Rassamakin and Olga Alforova et al [14] investigated aluminium heat pipes applied in solar collectors.

Metal heat pipes applications to liquid solar collectors, especially to evacuated glass tube ones, is an efficient solution for water heating plants. Still majority of thermal solar collectors can't fulfil the requirements such as small weight, easy assembly and installation, versatility, scalability and adaptability of design. There are also some problems in liquid solar collectors such as very high hydraulic resistance and low thermal efficiency less than 0.5. Authors are proposing to apply extruded aluminium alloy made heat pipe with wide fins and longitudinal grooves to avoid the drawbacks of liquid thermal collectors.

They concluded that axial grooves can enhance heat transfer inside the heat pipe similar to a wick. The developed solar collector had very high modularity and scalability.

They also noted that thermal performances of developed solar collectors are note worse than those of the compared ones without heat pipes or made of copper with high thermal conductivity. Also it had very low hydraulic resistance.

After reviewing such number of papers we reach on the conclusion that evacuated tube collector with heat pipe technology has best performance among all and also there is some improvements needed to increase the performance of evacuated tube solar collector. So, we are using evacuated tube solar collector for hot water generation which is required in refrigeration system used for horticulture product.

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Analysis of effect of Polyurethane Bushing on stress distribution of Anti-Roll bar

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Abstract— Anti-roll bars utilized in ground vehicle to reduce body roll by opposing any unequal vertical motion between the pair of wheels suffer from fatigue failure. The objective of this study is structural analysis of an anti-roll bar made of SAE 9262 with different bush wall thickness, were carried out by means of finite element (FE) technique using ansys workbench16 to determine stress distributions in bar. In this study we analyzed the hollow and solid bar. The result obtained by of FEA analyses using ansys workbench16 shows that equivalent stress in the inner surface of the corner bend of anti roll bar was the maximum; where is the chances of failure of bar more .The bush wall thickness (5, 7.5and 10 mm) was consider in this analysis. The roll stiffness of antiroll bar where calculated numerically. It was found that for both bars solid and hollow, thick wall thickness of bush tend to reduce stress in the cornering region. Result shows the Changing thickness of bush for solid bar from 5mm to 7.5 mm approximately 9 % improvement and that 5mm to 10mm approximately 11% .and that for hallow bar 6%.

Keywords— Anti-roll Bar,Ansys workbench16,Bush wall thickness, Fatigue failure, FEA analysis, Roll stiffness, solid and hollow bar

INTRODUCTION

In today's automotive industry the main task that faces the engineer to develop the vehicle which should be dynamically stable. The lot of research is going on in developing the parts which satisfies the above condition. The cost factor also considered during development.

Anti-roll bar also known as stabilizer bar or sway bar was one invention used in stabilizing the vehicle[1]. Anti roll bar utilized in ground vehicles to reduce body roll by opposing any unequal vertical motion between the pairs of wheels suffer from fatigue failure[2,3]. Basically structure of anti-roll bar is U shaped as shown in figure1.[1,4]

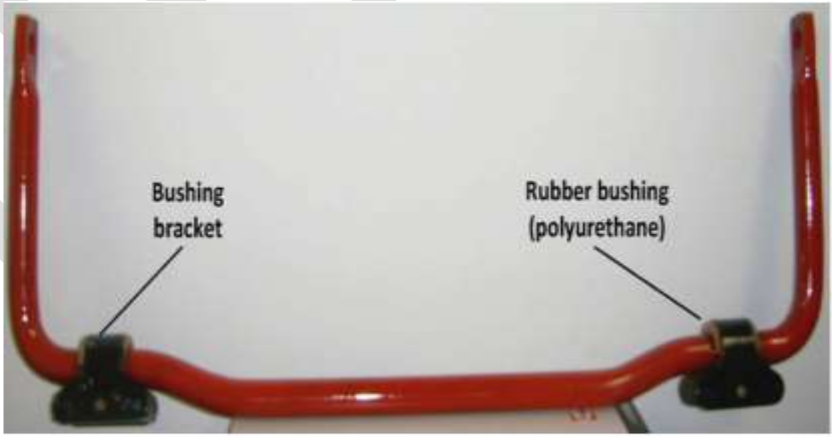

Fig.1-Anti roll bar with bush

The ends of the anti-roll bar are connected to suspension system. Anti- roll bar is made in hollow as well as solid. Now a days different shapes of anti-roll bar is available whose main function is reducing the body roll. Basically roll occurs during cornering due to weight transfer towards outer side [5,7].

Anti –roll bar attached to the chassis by means of bush. There are basically two common types of anti-roll bar bushings [6].They are classified according to (degrees of freedom) the axial movement of the anti-roll bar in the bushing. In both types, the bar is free to rotate within the bushing. In the first bushing type, the bar is also free to move along bushing axis while the axial motion is prevented in the second type.

Fig. 2– Bushing (rubber bushings and metal mounting blocks)

Material of bushing also effect the stress values of anti roll bar[8] .Thus bushing material is also another an influential parameter. Thecommonly used material for bushing are rubber, nylon or polyurethane[9]. Metal bushings are used in some race cars. Enhance in the spring stiffness of bushing material also increases the roll stiffness of anti roll bar [10].

The important function of anti-roll bar is to decrease the vehicle body roll. Vehicle body roll occurs when a vehicle diverge from straight-line motion where it goes. The imaginary line connecting the roll centers of front and rear suspensions forms the roll axis of a vehicle. C.G. of a vehicle body (center of gravity) is basically above this imaginary roll axis[11].

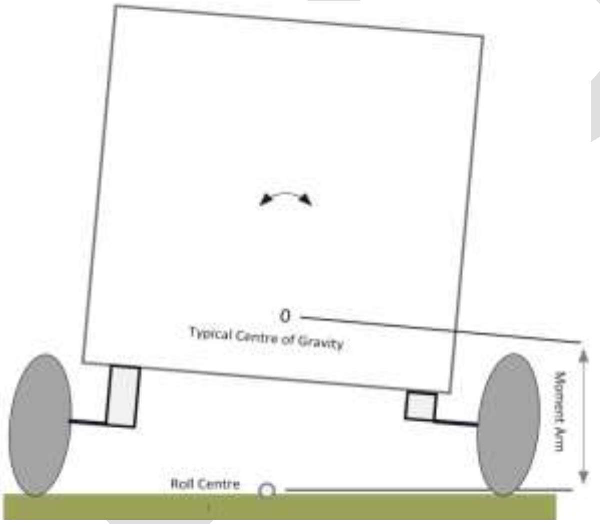

Fig.3-Centre of gravity and Roll axis of vehicle

Thus, while cornering the centrifugal and other cornering (side wind) force cause to produce a roll moment about the imaginary roll axis, which is equal to the product of centrifugal force with the distance between the roll axis and the center of gravity as shown in fig.3. This moment causes the inner suspension to extend and the outer suspension to compress, thus the body roll occurs [12]

In this analysis anti-roll bar made of SAE 9262 steel is used. SAE provides information about anti –roll bar manufacturing technique, equations to find roll stiffness etc.

The main objective of this paper is analyze the effect of different bush wall thickness on stress values of anti roll a bar .Author take here three types of bush wall thickness(5, 7.5,10mm) and analyzed its effect on solid as well as hollow bar. The polyurethane material used for bush

METHODOLOGY

1. CAD Modeling
2. FEA Analysis

3. Numerical Calculations

1. CAD MODELING

All Dimension of anti roll bar is taken from SAE. CAD Model is made in Unigraphics (NX9). The following Fig4.shows the CAD model. The Design is made for Solid and hollow bar.

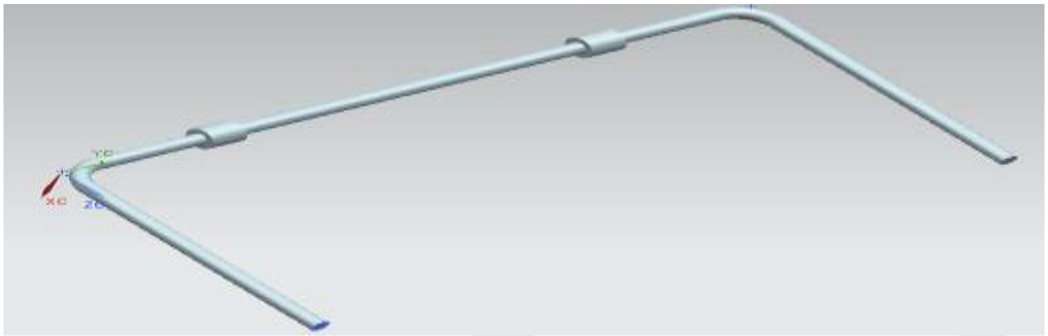

Fig.4- CAD model of anti-roll bar with bushing

According to design model was crated .sweep along curve and revolve command used many times. The model is saved in step file format. Same model was created for different bush wall thickness. Here bush wall thickness of 5mm, 7.5mm and 10 mm were modeled.

2. FEA ANALYSIS

FEA analysis were carried out using ansys workbench 16software. The analysis were carried out for different bush wall thickness. The following procedure were adopted while analysis.

Procedure for analysis

1. Import Step format file into ansys   workbench16.
2. Apply material properties to bush and bar.
3. Mesh the model.
4. Apply boundary condition and force condition.
5. Use Surface to surface contact between bush and bar.
6. Plot Von misses stress and total deformation.

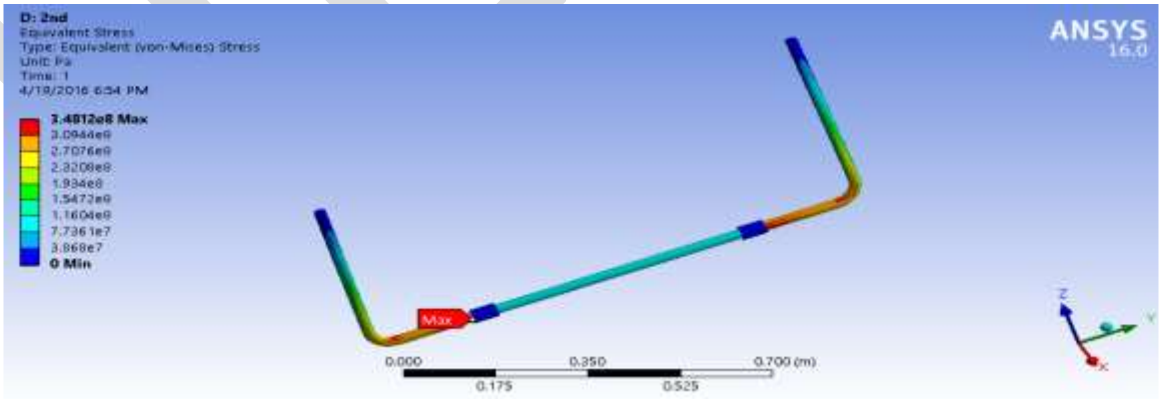

Fig.5- Principle stress for solid anti roll bar with bush wall thickness 5mm

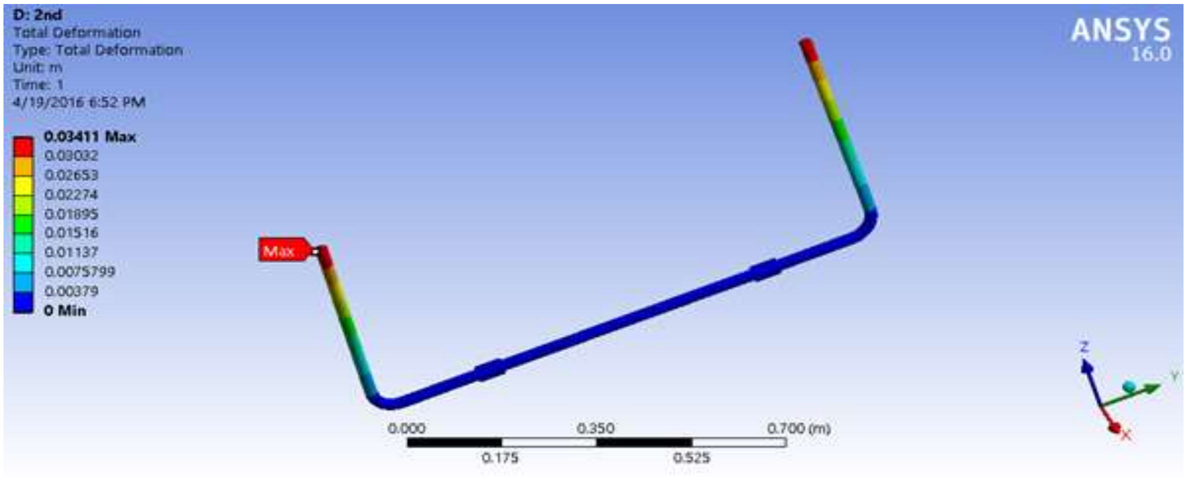

Fig.6- Deflection of solid anti roll bar with bush wall thickness 5mm

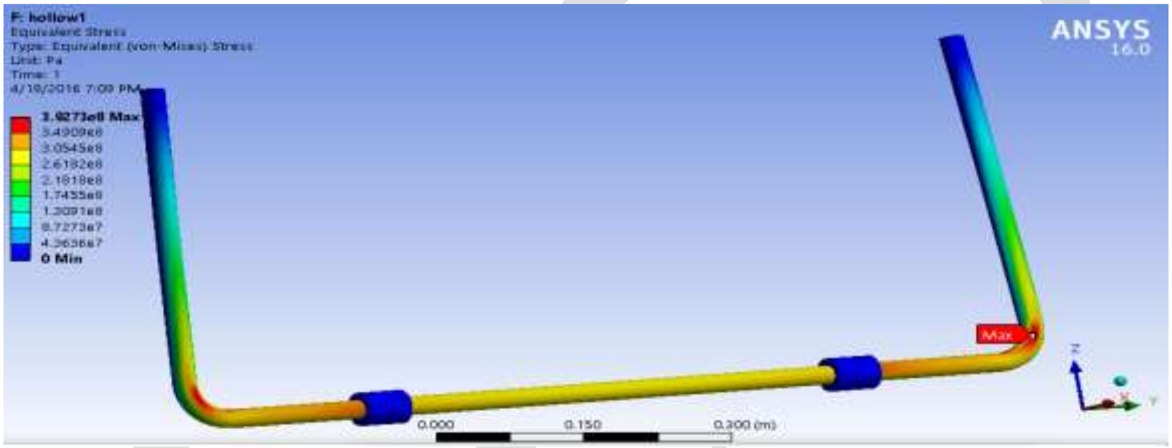

Fig.7- Principle stress for hollow anti roll bar with bush wall thickness 5mm

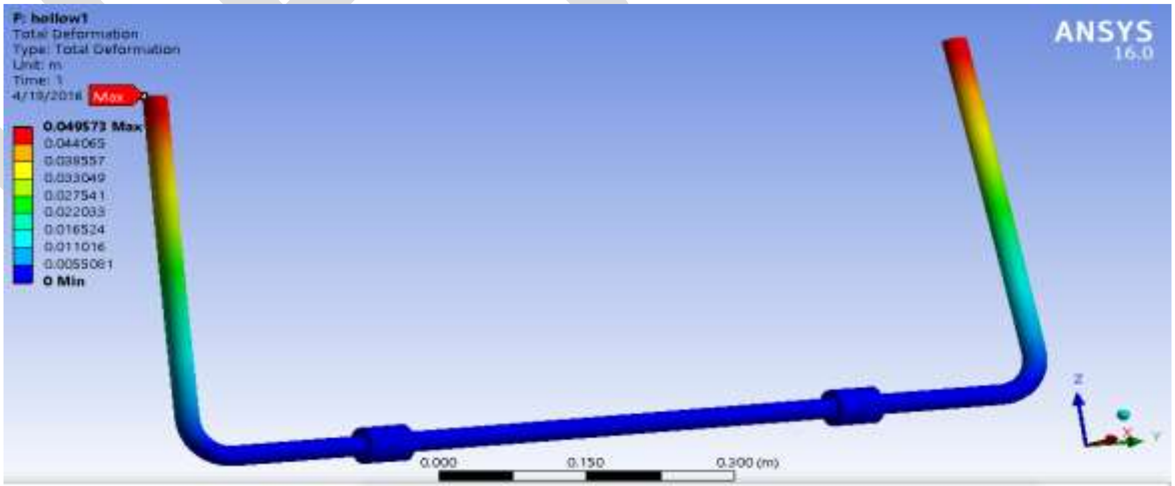

Fig.8-Deflection of hollow anti roll bar with bush wall thickness 5mm

3. NUMERICAL CALCULATION OF ROLL STIFFNESS OF ANTI ROLL BAR

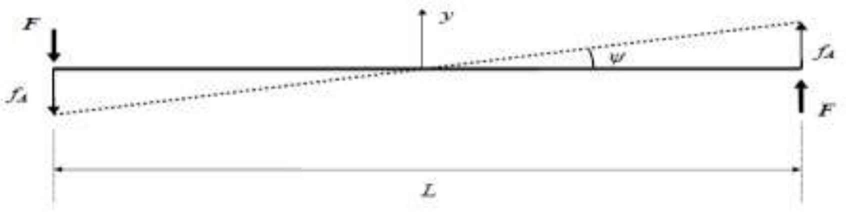

Fig6. FBD of bar

$$k_R = \frac{FL}{f_A} \quad \left(\frac{\text{Nm}}{\text{mm}}\right)$$

Where,

K_R= Roll stifness

F= Force

L= Lenghth of tortion bar

F_a= Displacement

$$k_R = \frac{FL}{\tan^{-1}(\frac{f_A}{L/2})} \quad \left(\frac{\text{Nm}}{\text{deg}}\right)$$

$$f_A = \frac{P}{3EI}\left[l_1^3 - a^3 + \frac{L}{2}(a+b)^2 + 4l_2^2(b+c)\right]$$

For solid Bar

$$f_A = \frac{1000[400^3 + 500 * 200^2 + 4 * 400^2 * 500] * 64}{3 * 2 * 10^5 * \pi * [25.5^4 - 17.5^4]}$$

f_A = 33.88mm

$$k_R = \frac{1000 * 1000}{\tan^{-1}\left[\frac{33.88}{500}\right]}$$

k_R= 257.96 Nm/degree

For hollow Bar

$$f_A = \frac{1000[400^3 + 500 * 200^2 + 4 * 400^2 * 500] * 64}{3 * 2 * 10^5 * \pi * [24^4]}$$

f_A = 41.34mm

$$k_R = \frac{1000 * 1000}{\tan^{-1}\left[\frac{41.34}{500}\right]}$$

k_R = 211.574 Nm/degree

Result and Discussion

The main purpose of this study to reduce the principle stress in critical zone(bent of Anti roll bar).So that fatigue life of anti roll bar is increased. To achieve this, analysis of anti roll bar with different wall thickness of bush were carried out. The following table shows the deflection of anti roll bar numerical method and FEA method.

Anti roll Bar	Roll stiffness (Nm/degree)	Deformation (mm) By Numerical method	Deformation (mm) by FEA method
Solid bar	211.09	33.88	34.812
Hollow bar	257.96	41.34	49.57

Table1- Roll stiffness and deformation of solid and hollow bar

Table 2 shows the variation of principle stress value on antiroll bar with changing the wall thickness of bush.

Anti roll Bar	Stress value(MPa) Bush thickness(5mm)	Stress value(MPa) Bush thickness(7.5mm)	Stress value(MPa) Bush thickness(10mm)
Solid bar	348.12	316.80	309.6
Hollow bar	392.73	377.02	369.16

Table2: stress values of solid and hollow bar for different bush thickness

It is clear that the principle stress value depends upon the material property and wall thickness of bush. With increase in bush wall thickness the principle stress value decreases.

Anti roll bar	Mass(Kg)
Solid bar	6.5913
Hollow bar	4.0344

Table3.Mass(kg) of solid and hollow bar

CONCLUSION

Stress distribution of an anti-roll bar has been investigated by using FEA method. Structural analysis shows that the stress values maximum at the corners of the hollow and solid bar that critical for fatigue failure. The position of maximum stress magnitude is at same place irrespective of bush size and bush material. It was concluded that the reduction in stress magnitude obtained by increasing bush wall thickness. Result shows the Changing wall thickness of bush for solid bar from 5mm to 7.5 mm approximately 9 % improvement in principle stress and that changing wall thickness from 5mm to 10mm approximately 11% . and that for hallow bar 6% improvement in principle stress.

Use of hollow bar reduces the weight , from result it is clear that approximately 2kg reduction in mass takes place by using hollow shaft.

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Enhancement of low exposure images underwater: A review

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Abstract: Image enhancement is an important image processing technique that processes images suitably for a specific application e.g. image editing. The light attenuation that travels through the water medium tends to destroy the image quality and gives image with low exposure. This therefore subjects to the problem of differentiating the image from the background. Many methods have been proposed to enhance the underwater images using threshold, histogram equalization, global and local contrast correction etc. This paper provides overview of such methods.

Keyword: Image Enhancement, image exposure, low exposure images.

1. INTRODUCTION

Image enhancement plays an important role in vision and image processing. Enhancement under the water medium refers to accentuation or sharpening of image features such as edges, boundaries, exposure or contrast to make a graphic display more useful for display and analysis and to differentiate it from the background. The enhancement process does not inherent information content in the data but increases the dynamic range of the chosen features so that they can be detected easily. The main objective of enhancement is to process an image so that the result is more suitable than the original image. For this, various underwater imaging techniques have been introduced into underwater image processing field. This paper gives an overview of the defined techniques.

2.PROBLEMS IN UNDERWATER IMAGING

Underwater images are subjected to many problems such as light absorption, reflection and inherent sea structure. The light travelling from air medium to water medium is partly reflected back from the water surface and partly enters the water .But this light disappears as we go deeply into the water. Thus, giving as a dark and low exposure image. It is only the blue colour that has longer wavelength and thus travels deeper into the water. This makes the water look blue in colour. In addition to it ,the blur image underwater has low brightness and low contrast. The light travelling through the water medium tends to lower the exposure and quality of the image, thus giving as a blur image since exposure determines the darkness or brightness of each element of the image.

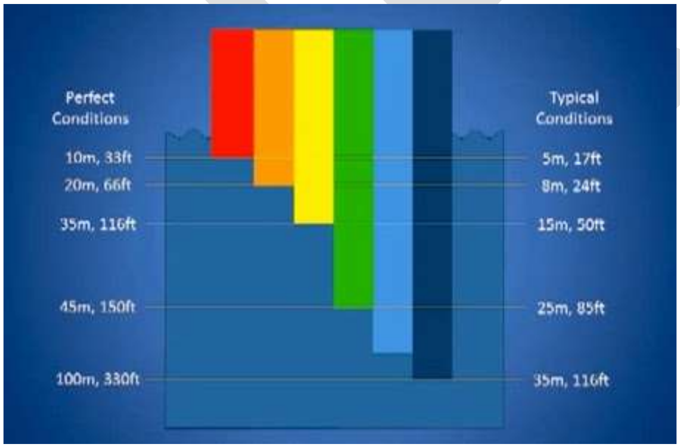

Figure 1: colour appearance underwater

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3. OVERVIEW OF VARIOUS DEFINED UNDERWATER IMAGING TECHNIQUES.

A. Recursive exposure based sub-image histogram equalization:

It is the extension of exposure based sub image histogram equalization method which is used for enhancement of low exposure images. The method first divides the histogram into two sub histograms based on medium intensity. The two histograms are further divided into sub histograms based on mean intensity. The sub histograms are equalized individually. Images with darker grey level are low exposed images and the images with brighter part possess higher exposure. Both the under and over exposed images are iterated until the exposure value is less than the threshold value. The two images are than concatenated to obtain an enhanced image.

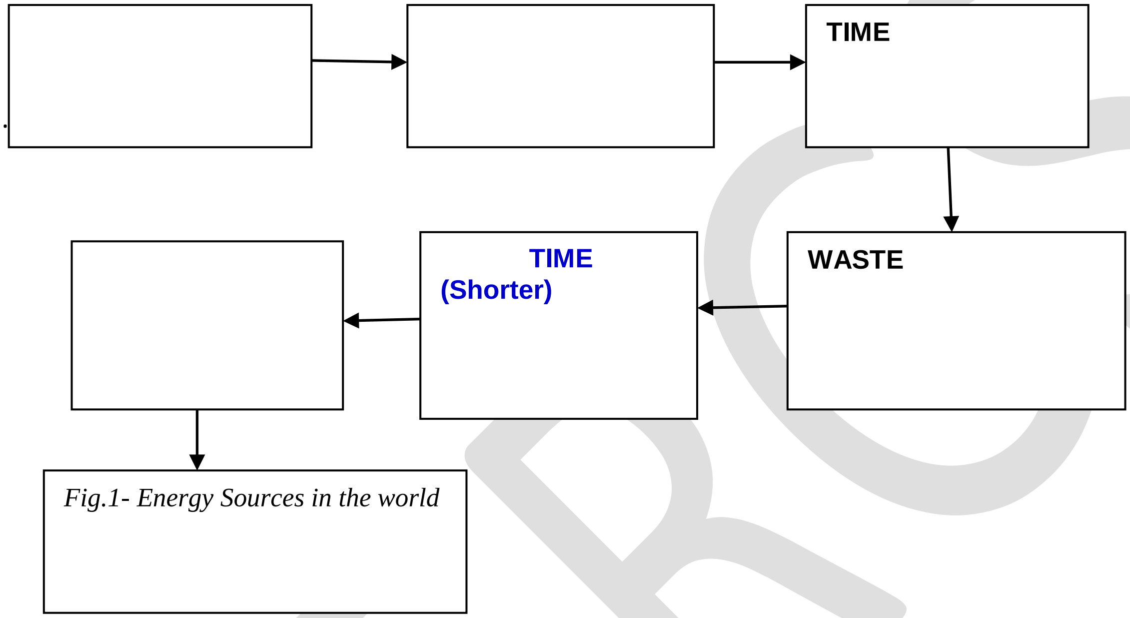

Fig.1- Energy Sources in the world

Figure2. Original underwater image

Figure3. enhanced Image

B. Recursively separated exposure based sub image histogram equalization

It is recursive version of exposure based sub image histogram equalization. Unlike recursive exposure based method, it performs recursive divisions of histogram based on exposure threshold of individual sub histogram up to a defined recursion level which are further equalized individually.

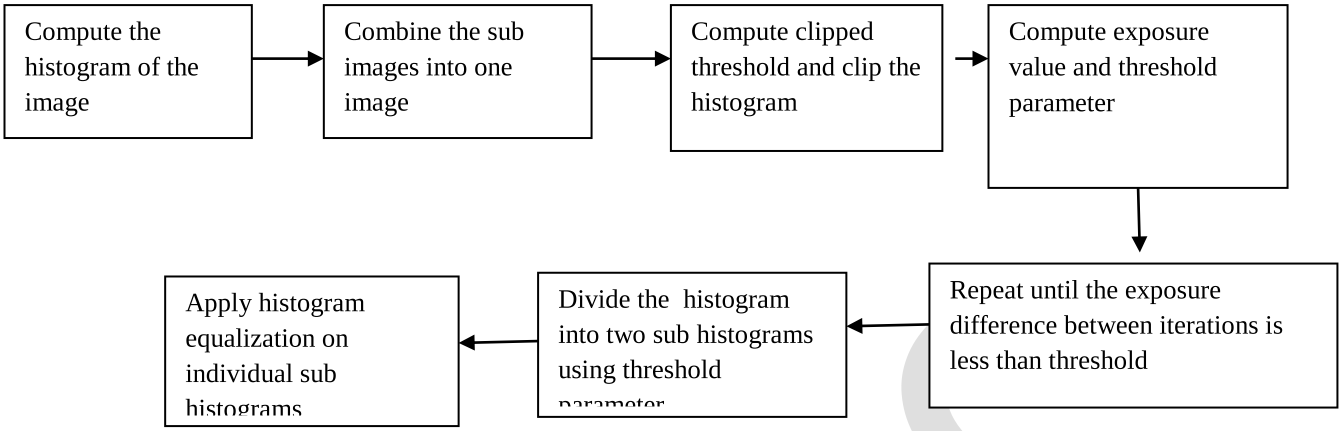

Figure4. original image

Compute clipping threshold and clip histogram

Figure5.enhanced red plane

4. LITERATURE SURVEY

References	Paper	Technique	Parameters
[1]	Saliency guided naturalness enhancement in colour images	Combine the concept of popular Retinex and the histogram equalization (HE) and propose an efficient image naturalness enhancement algorithm for both non-uniform and low light images.	Difference Mean Opinion Score(DMOS) Lightness-Order-Error Execution time
[2]	Enhancement of low exposure images via recursive histogram equalization algorithm	This paper proposes exposure based recursive histogram equalization methods for image enhancement. The proposed methods are very effective for images acquired in low light condition like under water sequences or night vision images.	Entropy
[3]	Enhancement of low quality Underwater images through integrated global and local contrast correction	dual-image Rayleigh-stretched contrast-limited adaptive histogram Specification, which integrates global and local contrast correction.	Entropy MSE PSNR Sobel Count MSSIM EMEE NIQE
[4]	Intensity and edge based adaptive un-sharp masking filter for color image enhancement	An adaptive gain adjustment method is proposed here aiming at minimizing the number of over-range pixels while maximizing the image sharpness and information content.	Entropy Neighbourhood Pixel Gradient Standard Deviation

[5]	Multi-level image fusion and enhancement for target detection	A novel infrared-to-visible image fusion algorithm for enhancing contrast and visibility is proposed	standard deviation, average gradient, spatial frequency, and information entropy

5.Conclusion

This paper gives an overview of enhancement of underwater imaging by enhancing low exposure images and quality of the images. It gives an overview of pre defined underwater imaging techniques such as recursive exposure based and recursive separately exposure based sub image histogram equalization technique. Both the techniques are suitable for bringing out the information contents of the image and provide efficient results for images acquired in dim light conditions.

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IOT based Energy Management System by Using Raspberry pi ARM cortex

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Abstract— The purpose of this paper is to acquire the remote electrical parameters like Voltage, Current, and Frequency from Smart grid and send these real time values using IoT. This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay. The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply. User can send commands in the form of IVR messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically (based on time settings) in the form of SMS and Web application. This system also sends SMS alerts whenever the Circuit Breaker trips or whenever the Voltage or Current exceeds the predefined limits, we use Raspberry pi as the heart of the project to control all the work involved.

Keywords— GSM Modem, Internet Of Things(IoT), Express SCH for Circuit design, Proteus for hardware simulation,IVR-Interactive voice response, Microcontroller (Raspberry pi).

INTRODUCTION

The time complicated interlocking and operation controlling requirements involved in Energy Management, which lead to necessity of automation of the undergoing process. In this respect, Energy Management automation, which is the creation of a highly reliable, self-healing power system that rapidly responds to real time events with appropriate actions, ensures to maintain uninterrupted power services to the end users with smart monitoring and maintaining of databases.

PROPOSED METHOD

This research paper aims at continuously monitor the load conditions of the specific location. It also monitors the temperature of the devices present in the specific location. If the load increases beyond the specific location rated capacity, the microcontroller will automatically shut down the specific location and intimates the same to the operator by sending a message through a GSM modem. A modem provides the communication interface. It transports device protocols transparently over the network through a serial interface. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. If the temperature of the specific location increases, then the microcontroller will automatically starts the cooling system for the specific location. At any point, if the operator wants to know the loads conditions and the temperature, he has to send a predefined message to the modem which is interfaced with the microcontroller and the controller acknowledges the operator with the required information.

1. Sensing different electrical parameters (voltage, current, temperature).
2. Update Webpage with real time data using IoT.
3. Forwarding the electrical parameters over GSM network.
4. Producing buzzer alerts (if necessary).
5. Automatic circuit breaking operation.

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers. Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. Here we use the most advanced microcontroller kit called the Raspberry Pi Arm Cortex for data acquisition and data processing.

The research IOT based Energy Management System by Using Raspberry pi ARM cortex using according to the instructions given by the above said microcontroller. Distributed transformers are prone to damages due to the rise in oil temperature when there is an overload or huge current flows through the internal winding of the transformer. When the oil temperature rises, it increases the probability of getting damages in the transformers. The transformers are to be monitored very cautiously during these situations. The proposed system consists of a monitoring unit that is connected with the distribution transformer for the purpose of monitoring the same. Hence, we introduce a simulation model which details the operation of the system to rectify the mentioned problem. The monitoring system is constituted by three major units, namely,

1. Data processing and transmitter unit
2. Load and Measurement Systems
3. Receiver and PC display unit

We have designed a system based on Raspberry Pi that monitors and controls the voltage, current and oil temperature of a distribution transformer present in a specific location. The monitored output will be displayed on a PC at the main station that is at a remote place, through RF communication. The parameters monitored at the distribution transformer are compared with the rated values of the transformer. Additionally the breakdowns caused due to the overload and high voltage are sensed and the signals are transmitted to the main station using RF communication. The software in the PC compares the received values with the rated measurements of the distribution transformer and shuts down the transformer so that it can be prevented from damages and performances can be enhanced quiet to a remarkable level. The controller consists of a sensing unit which collects the essential parameters such as current, voltage and the oil temperature within the distribution transformer. The digital display connected to the processing unit displays corresponding parameter values at the specific location for any technical operations. The controller also senses the overload and high current flow conditions in the internal windings that may lead to breakdown of the corresponding unit. The microcontroller is programmed in such a manner so as to continuously scan the transformer and update the parameters at a particular Time interval. The parameter values sensed by the microcontroller are transmitted through the RF transmitter connected to the microcontroller unit. The transmitted signals are received at the main station using the RF receiver. The received signals are then passed to the PC. The software loaded in the PC is used to monitor the changes in the parameters that are measured from the distribution transformer. When a remarkable change is noticed in the measured values it controls the unit by ending it from any serious damages.

The values of voltage, current and temperature of the transformer is directly applied to Port A (one of the input ports of the microcontroller). Along with this, a display is connected in the Port B (another input port of the microcontroller). The RF transmitting section and the load variation control are connected to the Port C (one of the output ports in the microcontroller).

The monitoring PC is connected to the main station. The microcontroller at the specific location monitors and captures the current, voltage and temperature values for a particular period of time interval. The captured values are stored in the data register and displayed using the LCD display.

The monitored voltage, current and temperature values of the transformer are transmitted using the RF transmitter for each and every time interval. Any antenna tuned for the selected RF frequency can be utilized for the transmission of the RF signal but the antenna has to exhibit a unidirectional radiation pattern. In the receiver side of the proposed system, the receiver antenna converts the RF signal into electrical signal and acquires the information which has been transmitted by the transmitter. Based on the received information, controlling operation is performed. If the receiver receives the transformer parameters which is greater than the fixed threshold level, then immediately the units is shutdown so as to protect the same. The voltage level is reduced using transformers and power is transferred to customers through electric power distribution systems. Power starts from the transmission grid at distribution specific location where the voltage is stepped-down (typically to less than 10kV) and carried by smaller distribution lines to supply commercial, residential, and industrial users. Novel electric power systems encompassing of power transmission and distribution grids consist of copious number of distributed, autonomously managed, capital-intensive assets.

Divide histogram into sub histograms using threshold parameter

Real Time System Design

Real time systems have to respond to external interactions in a predetermined amount of time. Successful completion of an operation depends upon the correct and timely operation of the system. Design the hardware and the software in the system to meet the Real time requirements. Designing real time systems is a challenging task. Most of the challenge comes from the fact that Real time systems have to interact with real world entities. These interactions can get fairly complex. A typical Real time system might be interacting with thousands of such entities at the same time.

Architecture and Working of GSM Networks

A GSM network consists of several functional entities whose functions and interfaces are defined. The GSM network can be divided into following broad parts. The Mobile Station (MS), The Base Station Subsystem (BSS), The Network Switching Subsystem (NSS), The Operation Support Subsystem (OSS). The added components of the GSM architecture include the functions of the databases and messaging systems: Home Location Register (HLR), Visitor Location Register (VLR), Equipment Identity Register (EIR), Authentication Center (AuC), SMS Serving Center (SMS SC), Gateway MSC (GMSC), Chargeback Center (CBC), Transponder and Adaptation Unit (TRAU)The MS and the 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 A interface.

In a GSM network, the following areas are defined:

Cell: Cell is the basic service area: one BTS covers one cell. Each cell is given a Cell Global Identity (CGI), a number that uniquely identifies the cell.

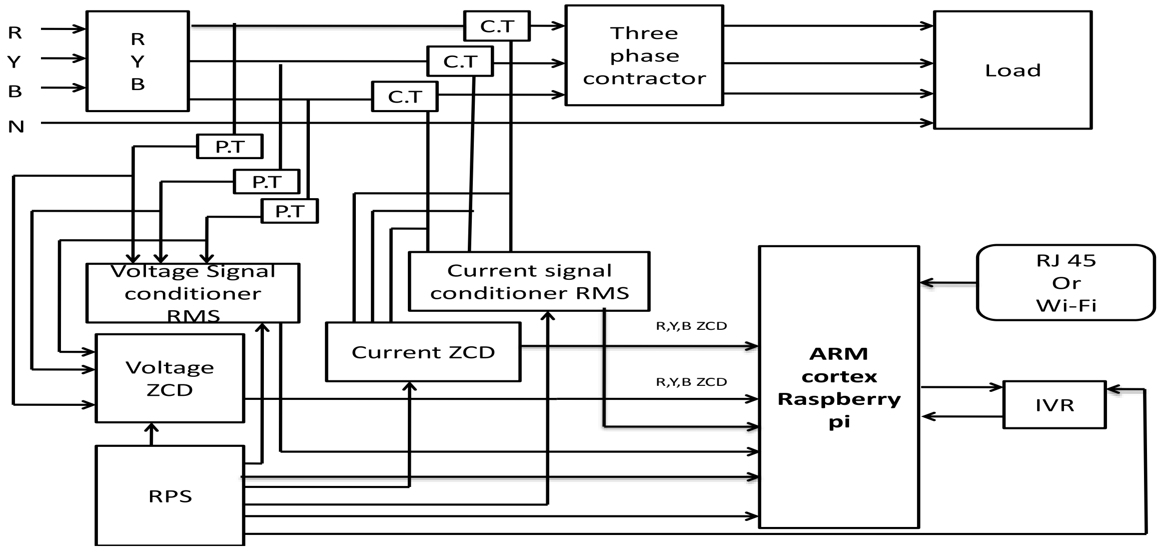
Location Area: A group of cells form a Location Area. This is the area that is paged when a subscriber gets an incoming call. Each Location Area is assigned a Location Area Identity (LAI). Each Location Area is served by one or more BSCs.

MSC/VLR Service Area: The area covered by one MSC is called the MSC/VLR service area.

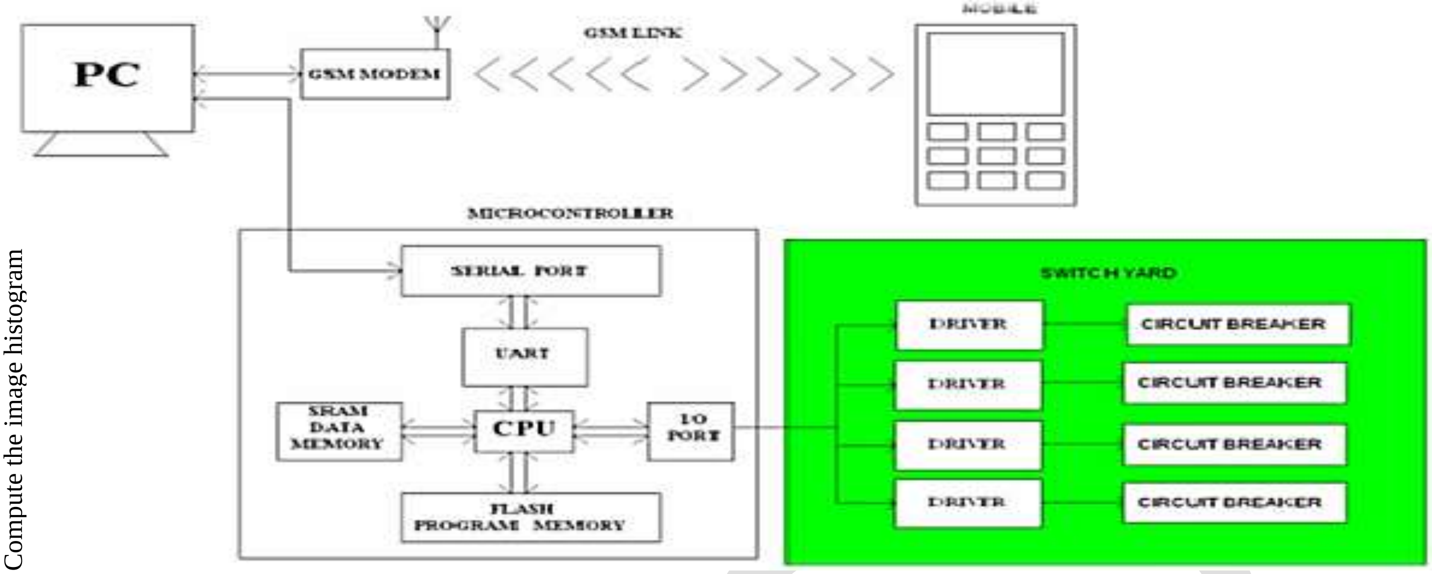
PLMN: The area covered by one network operator is called PLMN. A PLMN can contain one or more MSCs.

BLOCK DIAGRAM OF THE PROPOSED RESEARCH PAPER

The circuit was designed using Proteus software. This software was used to design a sample for the power supply which was incorporated on the receiver system. The receiver sections were designed by this computer aid. In designing the power supply, the software has a menu that contains the various components of the circuit. One has to identify which menu contains the component for the power supplies were selected. The components that were selected are: diodes (1n4001) capacitor (220µF and 10µF) and regulator 7805. A step down transformer of 240/12V AC Was also selected was also selected. These components were laid out and their pins were joined appropriately with lines. These lines are similar to the conductors on the printed circuit board (PCB). The same procedure was followed in the design of the receiver circuit. The receiver was constructed on printed circuit board (PCB) of 30mm x 14mm x 1.5mm dimensions. The PCB was etched in accordance with the receiver circuit shown below with various integrated circuit (IC) pin hole drilled. The Raspberry pi, circuit breakers and the relays were all inserted on the board to form a complete receiver unit. The implementation of the system involves two steps which are: Setting up the system and inter facing with graphic user interface (i.e. application software). The application software for the system has been developed by using a high lever language C-programming debugger. The debugger contains a high speed simulator and a target debugger that let you simulate an entire Raspberry pi system including on chip peripherals [4] [5].



Compute the image histogram



The system was tested by connecting a GPRS modem and RS232 cable to the PC. The RS232 cable is connected to microcontroller through an interface MAX 232Ic. The microcontroller PIC16F877A is connected to the circuit breaker through a relay. When the circuit is powered by connecting it to 240 V AC supply, the incoming AC voltage is rectified by bridge rectifier. The voltage is then reduced to 5V by a regulator which serves as an input to the microcontroller. The system was tested manually by pressing a knob on the software to activate the circuit breaker. Secondary, the system was tested remotely by sending an SMS message to the GPRS or modem through the PC to RS232 cable to the microcontroller and it also worked. Below is the screen shot of the system control Panel with circuit breaker turned ON. Thus the automation of electrical power specific location is designed and implemented using GSM technology [6]. This brings out the efficient way of power transmission and distribution in electrical specific location though it is carried out using wireless mobile communication technology. AT commands are used to communicate the GSM modem and the microcontroller. Cellular phones have been invading all over the globe. Cellular phones enable people to communicate over a wide area by using a network of radio antennas and transmitters arranged in small geographical area called cells.

By using a rooming facility provided by cellular phone providers, communication could be effective wherever you are on a globe. Technology can explore more benefit on the utilization of cellular phones. The GPRS was able to read the data sent by cell phone at a frequency of 900MH. The GPRS uses packet switching method to transfer data, which means that data is sent over the time, which has less traffic. The Raspberry pi is a low power, high performance CMOS 8-bit computer. It provides high-flexible and cost effective solution to the control applications. The above schematic diagram explains the interfacing section of each component with micro controller and GSM module. [6]

SCOPE OF THE RESEARCH

Our research paper "IOT based Energy Management System by Using Raspberry pi ARM cortex" is mainly intended to operate the devices like fans, lights; motors etc.., through a GSM based mobile phone. The system has a GSM modem, temperature, current, voltage sensors and the devices to be operated through the switches like Relay which are interfaced to the microcontroller. The micro controller is programmed in such a way that if a particular fixed format of SMS is sent to GSM modem from mobile phone, which is fed as input to the microcontroller which operates the appropriate devices. A return feedback message will be sent to the mobile from GSM modem. The temperature at the place where devices are being operated can be known. In future we can use this research paper in several applications by adding additional components to this research paper. This research paper can be extended by using GPRS technology, which helps in sending the monitored and controlled data to any place in the world. The temperature controlling systems like coolant can also use in places where temperature level should be maintained. By connecting wireless camera in industries, factories etc. we can see the entire equipment from our personal computer only by using GPRS and GPS technology. The monitoring and controlling of the devices can be done from the personal computer and we can use to handle so many situations. By connecting temperature Sensor, we can get the temperature of dangerous zones in industries and we can use personal Computer itself instead of sending human to there and facing problems at the field. The temperature sensor will detect the temperature and it gives information to the micro controller and micro controller gives the information to the mobile phone from that we can get the data at pc side.

CONCLUSION

An IOT based Energy Management System by Using Raspberry pi ARM cortex has been designed and developed toward the implementation of an intelligent building. The developed system effectively monitors and controls the electrical appliance usages at an elderly home. Thus, the real-time monitoring of the electrical appliances can be viewed through a website. The system can be extended for monitoring the whole intelligent building. We aim to determine the areas of daily peak hours of electricity usage levels and come with a solution by which we can lower the consumption and enhance better utilization of already limited resources during peak hours. The sensor networks are programmed with various user interfaces suitable for users of varying ability and for expert users such that the system can be maintained easily and interacted with very simply. This study also aims to assess consumer's response toward perceptions of smart grid technologies, their advantages and disadvantages, possible concerns, and overall perceived utility. The developed system is robust and flexible in operation. Local and remote user interfaces are easy to handle by a novice consumer and are efficient in handling the operations. In future, the system will be integrated with co-systems like smart home inhabitant behavior recognitions systems to determine the wellness of the inhabitant in terms of energy consumption. Hence smart management of energy and monitoring of data in real time from anywhere is possible.

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THE WATER FLOW MONITORING MODULE

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Abstract— As the world population is continuously undergoing an exponential rise, the ability to source clean water is becoming a pressing concern. The average water consumption of the world per person is estimated to be somewhere in between 120 – 140 liters. Hence it becomes a challenge to constantly generate the required quantity of water in order to sustain the population and cater to its needs. This paper aims at developing a cheap, portable and an on-the-go-plug-in kind of mechanism of a Water Flow Monitor Module to monitor the rate of water usage per household and keep a metric of it in order to keep tabs on the water usage on a weekly, monthly or a yearly basis. Metrics like Water Flow Rate per minute, per second and the total liters of water flow since the start of the day can be captured by this module and a graphical representation of these metrics can be obtained which will make the interpretation of the data much easier. By this means, a social awareness about the wastage and inefficient consumption of water can be brought about into the society so that necessary remedies could be adopted and steps could be taken to reduce the uncontrolled and ineffective use of water and water sources.

Keywords— Water Flow Indicator, Water Flow Monitor, Water Flow Sensor, Water Usage Indicator, Water Conservation, Awareness on Water Wastage.

INTRODUCTION

Water conservation highlights the methods and practices that one must adopt in order to conserve and put an efficient effort to make the usage of freshwater a very sustainable resource, to protect the water source and to meet the current and future human demand of consumption in a constructive way.

In the present scenario, where population boom across the world poses a real and an imminent threat to all the natural resources and bio-diversity, the scarcity of availability of fresh-water supply in a given locality with a high population density can be directly linked to wastage of water and in-efficient sourcing of water to the consumers. Cleaning and transporting water takes a large amount of energy. When this water is wasted, larger amounts must be cleaned and transported, and this requires the use of more fossil fuels and other non-renewable energy sources. The more water that is wasted, the faster these resources become depleted, and the more quickly their dangerous by-products such as carbon dioxide build up in the Earth's atmosphere. This further ends up taking a toll on the bio-diversity, which in turn has adverse effects on the natural habitats of plants and animals. Drastic wastage of water in household means there will be lesser amount of freshwater left for agriculture. This would yield a lesser crop produce which threatens the food supply for humans and the livestock.

Shortage of water supply would result in exploitation of underground aquifers. Already, aquifer reserves are getting depleted at an alarming rate due to reduced availability of freshwater on the surface due to drought and decrease in rainfall. The depletion of aquifers will further accelerate destruction of landscapes.

This calls for various measures that are pre-cautionary as well as provide an awareness regarding what could be the shortcomings of water wastage.

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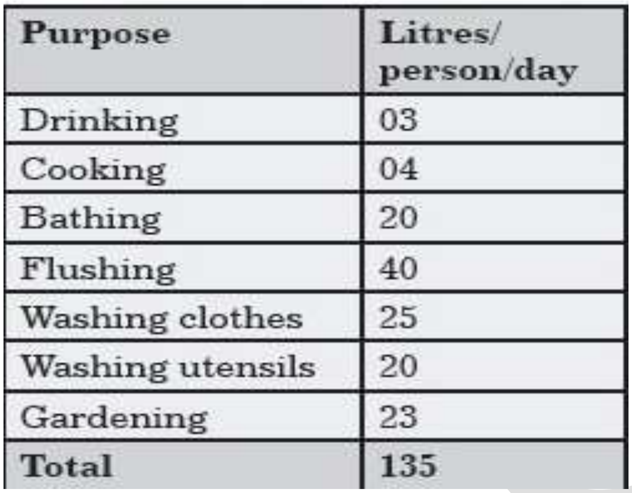


Purpose	Litres/ person/day
Drinking	03
Cooking	04
Bathing	20
Flushing	40
Washing clothes	25
Washing utensils	20
Gardening	23
Total	**135**

Table [I] Average Consumption of Water per Person

GOALS

The goals that are aimed to be achieved by the "Water Flow Monitor Module" are as follows:

I. *Sustainability*: Water usage must not exceed a specified limit such that future generations are not affected.

II. *Energy Conservation*: Inefficient usage of water leads to a large quantity of waste water produced that would need further treatment which in turn consumes more power/energy. This has to be cut down at least by 15%.

III. *Habitat Conservation*: Minimizing human usage of water means more availability of water to the natural habitat of animals as well as reducing the building of dams and other man made structure that impact the bio-diversity.

OBJECTIVE OF THE PAPER

This paper aims at spreading the knowledge about the systematic steps and approach that could be followed in order to *install and use* a *Water Flow Monitor Module* such that each household can maintain a metric of the amount of water that has been consumed on a daily basis.

The *Water Flow Monitor Module* has been built keeping in mind the (i) *Cost Effectiveness*, (ii) *Ease of Usage*,

(iii) *Efficiency*, (iv) *Ease of Availability* and (v) *Ease of Interpretation of Data*.

To make available a detailed instruction set on how to *Setup*, *Install* and *use* the *Water Flow Monitor Module* on a day-to-day basis and keep tabs on the amount of water being consumed.

By this, a social awareness on the perks of conserving water so as to trigger a positive attitude towards water conservation is meant to be achieved.

ASSEMBLING THE MODULE

I. The Water Flow Sensor

An accurate flow measurement is essential, both from a qualitative and an economic point of view. Keeping this in mind, the type of Water Flow Sensor used here is *YF-S201*.The sensor contains a pinwheel and sits in line with the water line such that water will pass through the sensor striking the pinwheel and rotating it to measure how much water has passed through it.

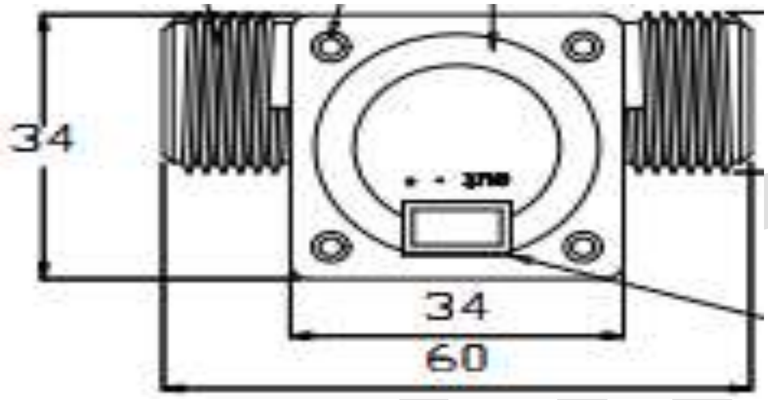


Fig. 1(a). The Water Flow Sensor

There is an integrated magnetic Hall-Effect Sensor that will output an electric pulse for every revolution of the pinwheel. By using a suitable conversion formula, we can translate the number of pulses into liters of water that has flown through it.

The Hall Effect Sensor - "The Hall effect is the production of a voltage difference (the Hall voltage) across an electrical conductor, transverse to an electric current in the conductor and a magnetic field perpendicular to the current."

Fig. 1(b). YF-S201 Water Flow Sensor

YF-S201 Water Flow Sensor can be used to measure the flow of liquids in both industrial and domestic applications. This sensor basically consists of a plastic valve body, a rotor and a Hall Effect sensor. The pinwheel rotor rotates when water / liquid flows through the valve and its speed will be directly proportional to the flow rate. The Hall Effect sensor will provide an electrical pulse with every revolution of the pinwheel rotor. This water flow sensor module can be easily interfaced with Microcontrollers, Arduino Boards and Raspberry Pi.

II. Circuit Diagram

The circuitry basically consists of three components namely The Water Flow Sensor, The Micro-Controller Board and a Computer that is used for processing all the raw data that is obtained from the Micro-Controller Board.

The operating voltage of the *YF-S201*lies anywhere in between 5V-18V. The signal pin of the sensor is given to the Digital I/O pin of the Micro-Controller which will produce a corresponding pulse for every value recorded by the sensor.

The Micro-Controller is connected to the Computer via a USB cable that ensures a fast paced transmission of data between both the devices.

The post processing is done on the Computer where raw values that have been obtained from the sensor is translated into corresponding liters of water that has flown though the sensor.

The values that have been obtained after post processing are periodically dumped into a text file so as to maintain a database of values through which a graphical interpretation of data is possible in the future.

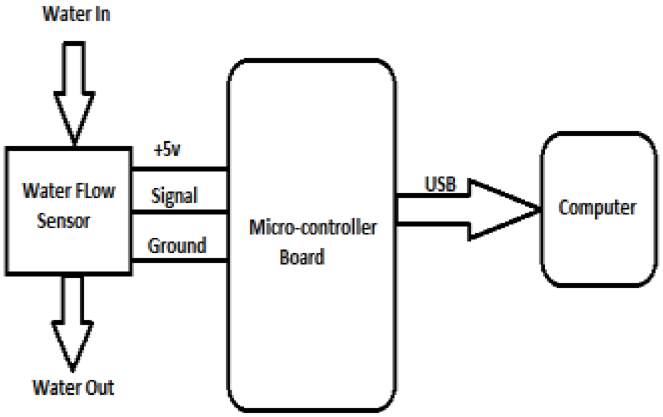


Fig. 2. Circuit Diagram of the Module

WORKING OF THE MODULE

The design and the type of circuitry involved in the Water Flow Monitor Module has been approached keeping in mind the ease of installation and a minimalistic hindrance. A micro-controller module that can communicate wirelessly with the computer can also be used instead of a USB connection.

Fig.3. The Circuitry

The *YF-S201* can measure a maximum of *30 Liters* of water flow per minute. Therefore the Flow Rate Characteristic of the sensor is:

Frequency (Hz) = 7.5 * Flow Rate (L/min)

= 7.5 * 30 (L/min)

= 225 Hz

The sensor will output 450 Pulses for a Liter of water that will pass through it, hence if 1 Liter of water will flow through the sensor in a minute, we would be getting 450 pulses a minute. Therefore, for 1 second there will be approximately 3.75 pulses per second per Liter of water flow. Hence the calibration factor is set to 3.75. The sensor is connected to the Digital Pin 2 which uses an "Interrupt 0" and this is configured to trigger on a "Falling Edge". Since the calibration factor over here is considered for every second, there are cases in which the loop will not execute in a second. Hence we calculate the number of milliseconds that have passed since the last execution and scale the output according to that. We also apply the calibration factor to scale the output based on the number of pulses that the sensor outputs at that second.

This is given by the following formula:

FlowRate = *((1000.0 / (millis () - timePassed)) * pulseCount) / calibration;*

The time stamp at which the previous processing pass was executed is recorded. This is because the *millis() function*, that keeps a check on the number of milliseconds passed since the starting of the execution of the program stops counting when the interrupt is disabled. But it will return the time stamp at which the interrupt was disabled. A record of this is made.

oldTime = millis();

The number of Liters of water that has flowed through the sensor per second can be obtained by dividing the Flow Rate by 60.

*flowInmLiters = (FlowRate / 60)*1000;*

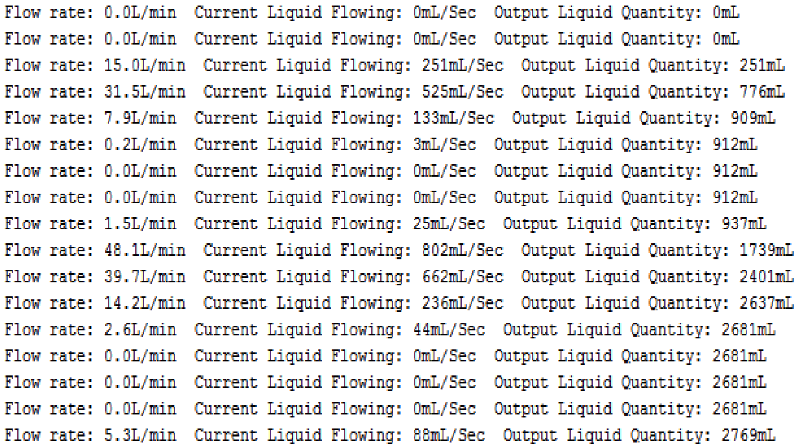
The total number of milliliters that have been flown since the start of the execution of the program can be obtained by cumulatively adding the FlowRate obtained from each iteration to its previous value. At first, the variable *totalFlow* is initialized to zero:

totalFlow = 0;

The value of flowInmLiters keeps on updating depending on the rate of flow of water through the sensor per second. This value is recorded and cumulatively added to the *totalFlow* variable such that the total amount of water that has flown through the sensor for a given period of time can be determined.

totalFlow = totalFlow + flowInmLiters

The graphs can be generated from the available data for Daily Usage, Weekly Usage and Yearly Usage .In this particular project, we use the *Data Driven Documents* for generating the graphs. It is an open source software with various number of interactive charts that could be used to improve the visualization of data.



```
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 0mL
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 0mL
Flow rate: 15.0L/min  Current Liquid Flowing: 251mL/Sec  Output Liquid Quantity: 251mL
Flow rate: 31.5L/min  Current Liquid Flowing: 525mL/Sec  Output Liquid Quantity: 776mL
Flow rate: 7.9L/min  Current Liquid Flowing: 133mL/Sec  Output Liquid Quantity: 909mL
Flow rate: 0.2L/min  Current Liquid Flowing: 3mL/Sec  Output Liquid Quantity: 912mL
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 912mL
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 912mL
Flow rate: 1.5L/min  Current Liquid Flowing: 25mL/Sec  Output Liquid Quantity: 937mL
Flow rate: 48.1L/min  Current Liquid Flowing: 802mL/Sec  Output Liquid Quantity: 1739mL
Flow rate: 39.7L/min  Current Liquid Flowing: 662mL/Sec  Output Liquid Quantity: 2401mL
Flow rate: 14.2L/min  Current Liquid Flowing: 236mL/Sec  Output Liquid Quantity: 2637mL
Flow rate: 2.6L/min  Current Liquid Flowing: 44mL/Sec  Output Liquid Quantity: 2681mL
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 2681mL
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 2681mL
Flow rate: 0.0L/min  Current Liquid Flowing: 0mL/Sec  Output Liquid Quantity: 2681mL
Flow rate: 5.3L/min  Current Liquid Flowing: 88mL/Sec  Output Liquid Quantity: 2769mL
```

Fig.4. Output

GRAPHS

Graphs help to give a visual representation of the data to the consumer regarding the amount of water that has been consumed. Graphical data is always easier to interpret that raw text, hence for the ease of the consumer an option to view the graphical data is also included. These include individual graphs for Daily Usage, Weekly Usage and Yearly Usage.

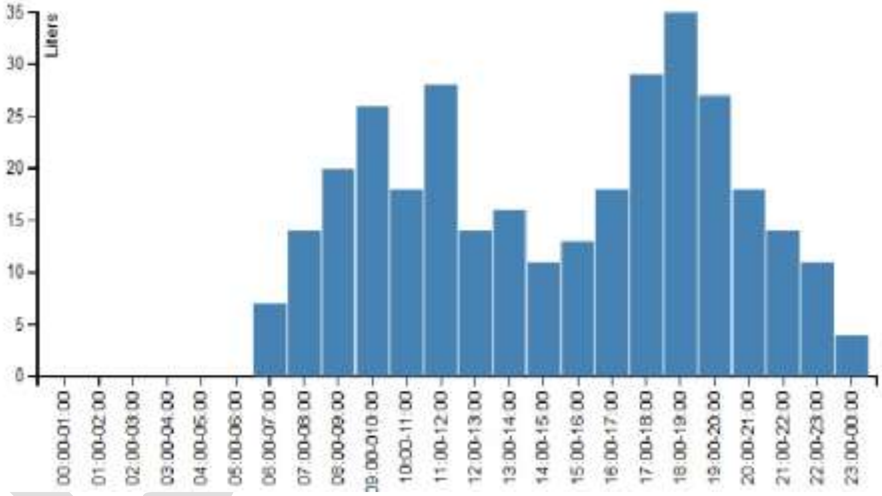


Fig.5(a). Graph For Daily Usage

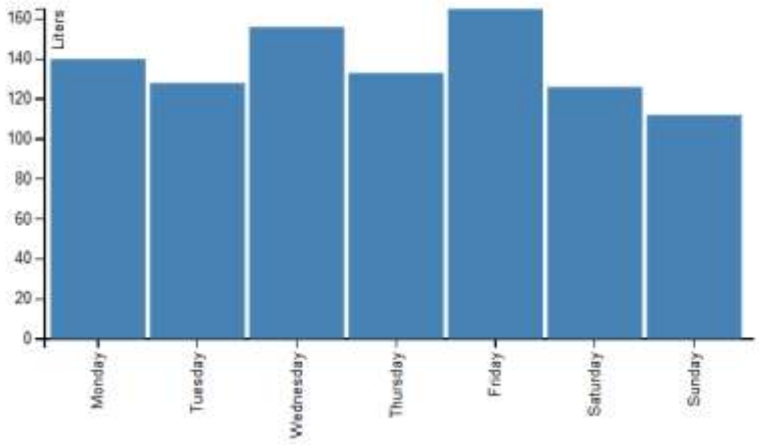


Fig.5(b). Graph For Weekly Usage

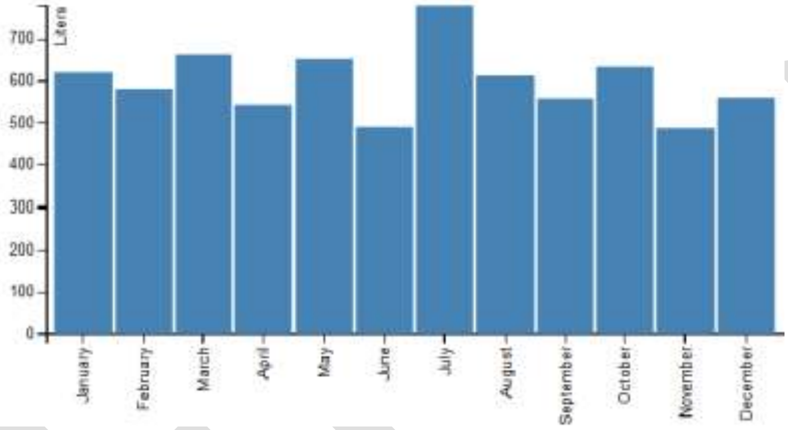


Fig.5(c). Graph for Yearly Usage

CONCLUSION

Hence, the necessary procedure needed to successfully install and use the Water Flow Rate Sensor Module are addressed by this paper. This paper also aims at spreading an awareness regarding the uncontrolled and ineffective means of supplying and using water resources and aims to reduce the practice of casual wastage of water by helping the consumer maintain a metric of the usage such that initial steps are taken to suppress the common trend to profligate water.

This paper aims at establishing a trend that results in water conservation. Households in both urban and rural areas will be able to create their own "Water Flow Rate Sensor Module" based on the guidelines that have been mentioned in this paper.

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Salient Region Extraction for 3D-Stereoscopic Images

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Abstract— Detecting region of interest in images is an interesting topic. It has wide range of applications in Image Processing. With the emerging application of stereoscopic display, it became necessary to design saliency detection for stereoscopic images. The field of optical flow estimation is making steady progress now a days. In this paper, a new optical flow method is designed to estimate the relative motion of the images captured by left eye and right eye of the observer from the scene. DCT feature map promises energy compactness property. The method promisingly obtained efficient result over the existing methods.

Keywords— visual attention, optical flow, 3D saliency, motion vector, median filtering, DCT feature map, temporal saliency.

INTRODUCTION

In the Human Visual System (HVS), Visual attention is an important characteristic in visual information processing. Attention helps us to decide where to move our eyes next. It would selectively process the important part by filtering out others. Thus it helps to reduce the complexity of scene analysis. These visually important information is also termed as Salient regions or Region of Interest. Two mechanisms of visual attention are usually distinguished as: bottom-up and top-down. Bottom-up mechanism, which is image-driven and task-independent, is a perception process for automatic salient region selection for natural scenes while top-down mechanism is a knowledge driven and task-dependent cognitive processing. These two mechanisms interact with each other and affect the human visual behavior.

Visual attention models have many image processing applications, such as classification, visual retargeting, visual coding, watermarking, image segmentation, image retrieval etc. Many bottom up saliency detection models have been proposed for 2D images/videos. With the emergence of stereoscopic display, which is capable of conveying depth perception to the viewer, the requirement of designing computational saliency detection models for 3D multimedia applications increased. Different from that of 2D images, it is important to consider the depth factor, in Saliency detection for 3D images.

In this paper, a new technique is designed for 3D saliency detection. Inspired from the concepts of video which is a collection of frames, Optical flow algorithm is performed on the input stereoscopic image (comprises of left and right eye view images). The resultant image clearly shows the relation motion of the scene in two images. Thereafter, DCT feature map of the obtained result are taken into account to obtain a pre-final saliency map. The final saliency map is calculated based on the feature contrast.

RELATED WORK

Visual attention is a set of cognitive operations that allow us to efficiently selecting relevant information and by filtering out others. Attention is a highly flexible mechanism, because it can operate on regions of space, specific features of an object, or on entire objects. Corresponding to bottom up and top-down approaches in perception process, the attention mechanism may be stimulus-driven or goal-driven.

Many studies have been done in the field of visual attention. Itti *et al.* proposed the earliest computational saliency detection models based on the neuronal architecture of the primates' early visual system [19]. The saliency map is obtained by calculating multiscale center-surround differences using features like intensity, color, and orientation. Harel et al. extended Itti's model [18]. In that study, saliency from feature contrast is measured using the graph- based theory, a more accurate measure of dissimilarity. Hou et al. proposed a saliency detection method using the concept of Spectral Residual [17]. The saliency map is computed by log spectra representation of images from Fourier Transform. Now a days, some saliency detection models have been proposed by patch-based contrast and obtained promising performance [5]–[7]. A saliency detection model in compressed domain is designed by Fang et al. for the application of image retargeting [5]. A context-aware saliency detection model is proposed by Goferman based on feature contrast from color and intensity using image patches [7]. Achanta *et al.* [6] tried to obtain more frequency information to get a better saliency measure.

Besides 2D saliency detection models, in [2], Bruce at al. proposed a stereo attention framework by extending an existing attention structure to the binocular domain. However, there is no computational model proposed in that study [2]. The key of 3 Dimensional saliency detection model is how to adopt the depth cues besides the traditional 2 Dimensional features such as color, intensity and orientation. Studies from neuroscience indicate that the depth feature as well as other low level features would cause human beings' attention focusing on the salient regions [3]. Therefore, an accurate 3 Dimensional saliency detection model should take depth contrast into account as well as contrast from other common low-level features. Based on multiple perceptual stimuli, Zhang et al. designed a stereoscopic visual attention algorithm for 3D video [4]. Chamaret et al. built a Region of Interest extraction method for adaptive 3D rendering [8]. Both studies [4] and [8] adopt depth map to weight the two dimensional saliency map to calculate the final saliency map for 3D images. Another method of 3 Dimensional saliency detection model is built by incorporating depth saliency map into the traditional 2D saliency detection methods.

In [9], Ouerhani et al. extended a 2 Dimensional saliency detection model to 3 Dimensional saliency detection by taking depth cues into account. Potapova introduced a 3 Dimensional saliency detection model for robotics tasks by incorporating the top-down cues with the bottom-up saliency detection [10]. Recently, Wang et al. proposed a computational model of visual attention for 3 Dimensional images by extending the traditional 2 Dimensional saliency detection methods. In [2], a public database with ground-truth of eye-tracking data is provided.

The concepts of some video saliency detection models were very helpful in designing the new method. In [13], a phase-based saliency detection model for video was proposed. The saliency map is obtained through inverse Fourier transform on a constant amplitude and the original phase spectrum of input video frames. Itti *et al.* [11] developed a model for detecting the surprising events in video, considering that surprising events attracts human beings' attention. Studies were also done in combining spatial saliency maps with temporal saliency map [12]. Based on the rarity of features, the authors of [14] designed a dynamic visual attention model. The main idea to the proposed technique is contributed by [13].

PROPOSED FRAMEWORK

Depth perception is highly correlated with visual attention, especially in the case of stereoscopic images. Therefore, saliency detection in stereoscopic images definitely considers the factor of depth. Slightly different from that, in this paper, a new saliency detection technique is designed by considering the relative motion of the scene captures by the left eye and right eye of the observer. That is, the visual perception information is the factor considering here. It can be termed as temporal saliency. This temporal saliency evaluation algorithm starts with Optical flow based motion estimation. The new method directly incorporates motion information by modeling the visual perception process in an information communication framework. The proposed framework is shown in figure 1.

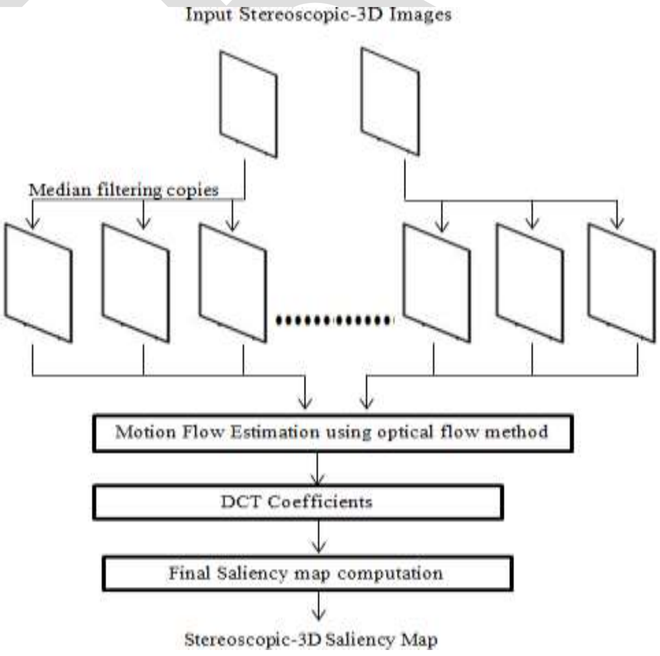

Figure 1: The framework of the proposed model

From the figure itself, it is very well understood that the proposed system is consisting of mainly 4 steps.

1. Create filtered version of Input Image

2. Motion vector calculation using optical flow
3. DCT feature map of image blocks
4. Saliency map calculation

1. Create filtered version of Input Image

In this step, first the input Stereoscopic Image is selected. In order to estimate the optical flow, it is needed to have multiple frames. Due to the lack of multiple frames, it is necessary to make the copies of the input Images. For that, filtered versions of the Input Stereoscopic Images are created using median filtering.

The median filter is used to reduce noise of image or simply the outliers. It is like the mean filter/average filter. It is better than the mean/average filter. Like mean filter, the median filter considers each pixel in the image to find whether or not it is representative of its surroundings. Instead of replacing pixel value with the mean of neighboring pixels, it replaces with median of those values. The median can be calculated by sorting all the pixel values from the neighborhood and then replacing the pixel with the middle pixel value. The median filter allows high spatial frequency detail to pass and it is very effective at removing noise on images where less than half of the pixels have been affected.

Advantages of using Median filter

- Preserves useful detail in the image.
- Single unrepresentative pixel in a neighborhood will not affect median value.
- No degradation to the underlying image.

2. Motion vector calculation using optical flow

Optical flow can be explained as the pattern of apparent motion of objects or surfaces. From a sequence of images, it is possible to find local image motion. The field of optical flow estimation is making steady progress now a days. The basics of today's methods are just the resemblance of Horn and Schunck (HS).
First of all, the left view mage and right view image are selected. After creating filtered copies of input Image, in order to compute the motion flow, the Classical optical flow method is used.

The classical optical flow algorithm is a direct descendant of the original **HS** formulation. Applying a median filter to intermediate flow values increases the accuracy of the recovered flow fields. It is found that the classical flow formulation is the best method in optical flow methods. Classical Optical Flow is a widely used differential method for optical flow estimation. Here, the assumption is that, the displacement of the image contents between two nearby frames is approximately constant and small within a neighborhood of the point p under consideration, and solves the basic optical flow equations for all pixels in that neighborhood. The classical optical flow objective function in its spatially discrete form as:

$$\mathrm{E}\ (\mathrm{u},\mathrm{v})=\sum_{i,j}\left\{\rho D\left(\ I_1\,(i,j)-I_2\big(i+u_{i.j},j+v_{i,j}\big)\right)+\lambda[\rho s(u_{i,j}-u_{i+1.j})+\rho s\big(u_{i,j}-u_{i.j+1}\big)+\rho s\big(v_{i,j}-v_{i+1.j}\big)+\rho s(v_{i,j}-v_{i.j+1})]\right\}$$

where u and v are the horizontal and vertical components of the optical flow field to be estimated from images I_1 and I_2, λ is a regularization parameter and ρD and ρS are the data and spatial penalty functions.

There are three different penalty functions: (1) the quadratic HS penalty $\rho(x) = x^2$; (2) the Charbonnier penalty (Classic C) $\rho(x) = \sqrt{x^2 + \epsilon^2}$ [13], a differentiable variant of the absolute value, the most robust convex function and (3) the Lorentzian (Classic L) $\rho(x) = \log(1+\frac{x^2}{2\sigma^2})$, which is a non-convex robust penalty. Another recent classical flow method is classic NL, which is faster than the other two.

The main equation we are implementing to calculate the flow is

$$V = MV_P + (-1) * MV_f$$

where MV is the original motion vector. $\mathrm{MV_f}$ and $\mathrm{M}V_P$ are the past reference and the future reference frames respectively [15].

In this paper, the Rudin-Osher-Fatemi (ROF) structure texture decomposition method is followed to pre-process the input sequences and linearly combine the texture and structure components. The optical flow estimated at a coarse level is used to warp the second image toward the first at the next finer level, and a flow increment is calculated between the first image and the warped second image. The standard deviation of the Gaussian anti-aliasing filter is set to be $\frac{1}{\sqrt{2d}}$, where d denotes the down-sampling factor. Each level is recursively down sampled from its nearest lower level.

At each warping step, data term is linearized which involves computing terms of the type $\frac{\partial}{\partial x} I_2\left(i + u_{i,j}{}^k, j + v_{i,j}{}^k\right)$, where $\frac{\partial}{\partial x}$ denotes the partial derivative in the horizontal direction, u^k and v^k denote the current flow estimate at iteration *k*. Then the derivative of the second image is taken and warped the second image and its derivatives towards the first using the current flow estimate by bi-cubic interpolation. Then the spatial derivatives of the first image is taken and average with the warped derivatives of the second image.

Graduated non-convexity (GNC) scheme is a technique that attempts to solve a difficult optimization problem by initially solving a greatly simplified problem, and progressively transforming that problem until it is equivalent to the difficult optimization problem. For the Charbonnier (Classic C) and Lorentzian (Classic L) methods, the Graduated non-convexity (GNC) scheme that linearly combines a quadratic objective with a robust objective in varying proportions, from fully quadratic to fully robust is used.

3. DCT feature map of image blocks

As the image is divided into patches, it is essential to find the relative motion of i^{th} patch. Salient regions in visual scenes have feature contrast from their surrounding regions. Thus, calculating the feature contrast between the image patches and their surrounding patches is the direct method to extract salient regions in visual scenes. We calculate the saliency value of each image patch based on the feature contrast between this image patch and all the other patches in the image. Here, we use a Gaussian model of spatial distance between image patches to weight the feature which determines the impact of neighboring patches based on their distances to the current patch.

$$v_i = \sum_{j\neq i} \frac{1}{\sigma\sqrt{2\pi}} e^{l_{ij}^2} / (2\sigma^2) D_{ij}^v$$

where D_{ij}^v is the length of the vector difference between the mean absolute motion vectors of patches i and j. l_{ij}^2 represents the spatial distance between image patches *i* and *j*. σ is the parameter of the Gaussian model.

4. Final Saliency Map Calculation

It would be a surprising event to HVS, if an object is of strong motion with respect to the background. HVS would pay more attention to such events. So, visual attention of motion can be calculated on the basis of the perceptual prior probability distribution about the speed of motion. Based on the results of [16], the perceptual prior probability distribution of motion speed can be defined with a power-law function:

$$p(v) = \kappa / v^a$$

where v is the motion speed; and κ and α are two positive constants. That is, with increasing object speed, the probability decreases and hence the visual surprise increases. This also helps to compute the motion speed based temporal saliency using its self-information as

$$S_t = -\log p(v) = \alpha \log v + \beta$$

where $\beta = -\log k$ is a constant. The value of parameters α and β are based on the study [16]. Removing the GNC step for the Charbonnier penalty function causes high EPE on most sequences and higher energy on all sequences.

EXPERIMENTS & RESULTS

A publicly available Stereoscopic image dataset Middlebury 2005/2006/2014 is used to evaluate the performance of the proposed model. The database contains more than 30 stereoscopic images with various types such as outdoor scenes, indoor scenes, scenes including objects, scenes without any various object, etc. Some of them are shown below.

Figure 2: Sample Images of Middlebury dataset

Stimuli were displayed on a 26-inch Panasonic BT-3DL2550 LCD screen with a resolution of 1920 × 1200 pixels and refresh rate of 60 Hz. The stereoscopic stimuli was viewed by participants with a pair of passive polarized glasses at a distance of 93 cm. The environment luminance was adjusted for each observer and thus the pupil had an appropriate size for eye-tracking. The data was collected by SMI RED 500 remote eye-tracker and a chin-rest was used to stabilize the observer's head.

Generally, an efficient saliency detection model would have high response at the most attractive region and no response at random locations. The performance of the proposed model is measured by comparing the ground-truth and the saliency map from the saliency detection model. Some of the performance evaluation measures for Saliency detection models are KLD (Kullback Leibler Distance), PLCC (Pearson Linear Correlation Coefficient) and AUC (Area under the Receiver Operating Characteristics Curve).

Among this, Kullback Leibler Distance is used to measure the similarity between these two distributions. Here saliency distributions at the most attractive region and random locations are calculated over the saliency map as:

$$\mathrm{KL}\ (\mathrm{H},\ \mathrm{R}) = \frac{1}{2}\left(\sum_{n} \mathrm{h_n}\ \log \frac{\mathrm{h_n}}{\mathrm{r_n}} + \sum_{n} \mathrm{r_n}\ \log \frac{\mathrm{r_n}}{\mathrm{h_n}}\right)$$

where H and R are saliency distribution at the most attractive region and random locations with probability density function h_n and r_n respectively. The saliency detection model with larger KL distance value gives better performance.

PLCC (Pearson Linear Correlation Coefficient) is another measure, with its low value gives better performance. It is calculated directly from the comparison between the fixation density map and the predicted saliency map. Table 1 shows the performance evaluation measure values of PLCC and KL distance for existing methods and the proposed one.

$$r = \frac{\sum XY - \frac{(\sum X)\,(\sum y)}{n}}{\sqrt{(\sum X^2 - \frac{(\sum X^2)}{n})\ (\sum Y^2 - \frac{(\sum Y^2)}{n})}}$$

where X and Y are the pixel points in the saliency map.

Table I: KL Distance & PLCC value for existing methods and the proposed system.

Models	KL Distance	PLCC
Model [19]	0.364	0.6
Model [5]	0.346	0.58
Model [14]	0.438	0.46
Model [15]	0.301	0.424
Model[2]	0.443	0.4
Model[1]	0.6487	0.389
Proposed system	0.7030	0.301

From the table it is clear that the proposed method have the maximum KL Distance value over the previous methods, which means that the most salient region will be away from other random locations. This gives an accurate saliency map. Figure 3 shows the visual comparison of stereoscopic saliency detection models. It shows the final output obtained from different existing methods and the proposed one.

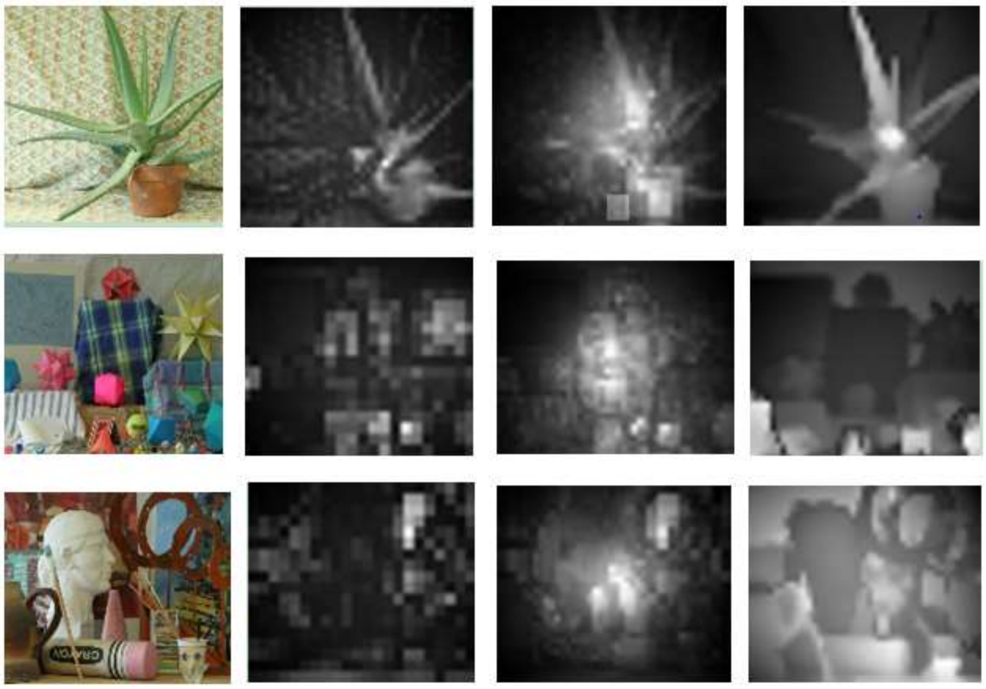

Figure 3. Visual comparison of stereoscopic saliency detection models. (a) Input Image (b) Saliency map using model [2] (c) Saliency map obtained using Adaptive feature map fusion[1] (d) Proposed model.

From the figure, we can clearly see that the output obtained from the optical flow method is clear over the other two. In [1] and [2], the salient region is spread and so that a particular region cannot point out. They destroys the overall information and makes the image unclear. The proposed method is far better than the existing stereoscopic saliency detection methods [2], [1] and it almost preserves the scene as it is.

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CONCLUSION

Visual saliency is the distinct subjective perceptual quality which immediate attracts humans' attention. Saliency detection models finds this most attractive region. Different from all existing methods, we have proposed a new stereoscopic saliency detection using Optical flow method. It takes the concepts of relative motion of the scene in the Image captured by the left eye and right eye. The limitation is the availability of stereoscopic image pairs having good resolution. The method gives a promising and efficient result over all existing methods. In future, it can be enhanced for the salient region/object detection in videos.

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Salient Object Recognition Using Label Propagation and Saliency Maps

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Abstract— In this paper an object recognition method using saliency maps is proposed. Saliency maps are used to find the most informative part in an image. Label Propagation Saliency (LPS) method is used to generate saliency maps on the basis of background and objectness labels extracted from the image. Object recognition can be performed on saliency maps using Principal Component Analysis (PCA) and k-Nearest Neighbor search (k-NN). During training phase 357 images are trained by applying PCA to retrieve the key features and they are stored in database. During testing phase PCA is applied on the input image to retrieve features. The stored values are loaded and a kd-Tree is constructed and searching is done on it which trains the features into different categories based on Euclidean distance. kd-Tree search values and PCA values of input image are given as input to k-NN algorithm to find the category of input image.

Keywords— Saliency Maps, Background labels, Objectness labels, Label Propagation Saliency(LPS), Principal Component analysis(PCA), kd-Tree, k-Nearest Neighbor(k-NN)

INTRODUCTION

Object recognition is considered as an important application of image processing. Object recognition is a process of identifying specific objects in an image. Object recognition can be effectively computed using saliency maps. Image saliency detection aims to effectively identify important and informative regions in images. Salient object detection is typically accomplished by image contrast computation, either on a local or a global scale estimates the saliency degree of an image region by computing the contrast against its local neighborhood. Various contrast measures have been proposed, including mutual information, incremental coding length and center- versus-surround feature discrepancy.

It has been verified that color contrast is a primary cue for satisfying results .Other representations based on the low-level features try to exploit the intrinsic textural difference between the foreground and background, including focusness ,textual distinctiveness, and structure descriptor . They perform well in many cases, but can still struggle in complex images.

In the work done by [1], viewed the problem from a different viewpoint: It focused more on the background instead of the object. They exploited two common priors about backgrounds in natural images, namely boundary and connectivity priors, to provide more clues for the problem. Accordingly a novel saliency measure called geodesic saliencies proposed. It is intuitive, easy to interpret and allows fast implementation. Furthermore, it is complementary to previous approaches, because it benefits more from background priors while previous approaches do not.

In [2] a unified approach to incorporate low-level features and the objectness measure for saliency detection via label propagation is proposed. Since the border regions of the image are good indicators to distinguish salient objects from the background ,we observe that the boundary cues can be used to estimate the appearance of the background while the objectness cues focus on the characteristics of the salient object. Therefore, a refined co-transduction [3] based method, namely label propagation saliency (LPS), is proposed. In this framework, the most certain boundary and object regions are able to propagate saliency information in order to best leverage their complementary influence. As the boundary cue can be quite effective in some cases and the objectness measure requires additional computation, a compactness criterion is further devised to determine whether the results propagated by boundary labels are sufficient.

Object recognition is performed on saliency maps using Principal Component Analysis (PCA) and k-Nearest Neighbor algorithm (k-NN). During the training phase image features are extracted using PCA. During the testing phase, a kd-Tree is constructed from the stored values during the training phase. PCA is applied on test image to extract the key features .This kd-Tree along with the key features of test image are given as input to k-NN algorithm. It gives exact classification and class of test image.

RELATED WORK

Due to the absence of high level knowledge, all bottom up saliency methods rely on assumptions or priors1 on the properties of objects and backgrounds. Arguably, the most fundamental assumption is that “appearance contrast between object and background is high”. This assumption states that a salient image pixel/patch presents high contrast within a certain context. It is intuitive and used in all saliency methods, explicitly or implicitly. In geodesic saliency it is called as contrast prior for conciseness.

Contrast prior based methods have achieved success in their own aspects, but still have certain limitations. Typically, the boundaries of the salient object can be found well, but the object interior is attenuated. This “object attenuation” problem is observed in all local methods and some global methods. It is alleviated in global methods [4], [5], but these methods still have difficulties of highlighting the entire object uniformly.

In essence, the saliency object detection problem on general objects and background is highly ill-posed. There still lacks a common definition of “what saliency is” in the community and simply using contrast prior alone is unlikely to succeed. While previous approaches are mostly based on their own understanding of “how the contrast prior should be implemented” huge behavioral discrepancies between previous methods can be observed, and such discrepancies are sometimes hard to understand.

Jiang et al.[6] introduce an absorbing Markov chain method where the appearance divergence and spatial distribution between salient objects and the background are considered. Cheng et al. [7] formulate a regional contrast based saliency algorithm which simultaneously evaluates global and local contrast differences. Inspired by these works, in LPS an affinity matrix is constructed based on the color feature of superpixels with two adjustments to involve spatial relations.

A novel label propagation method is proposed in [8] to rank the similarity of data points to the query labels for shape retrieval. We apply and refine the theory to make full use of the background and foreground superpixels, which has been rarely studied in saliency detection. Distinct from the work of Yang et al. [9] where a manifold ranking algorithm assigns saliency based on priors of all boundary nodes, in this work,(a) we only take some boundary nodes to eliminate salient regions that appear at the image border; (b) both boundary and foreground nodes are selected as complementary labels in a co-transduction framework to fully distinguish salient areas from the background; and (c) the revised label propagation algorithm has zero parameter whereas in [9] the sensitive α has a vital effect on results in different datasets.

PCA- Based Feature Extraction and k-NN algorithm for detection of jaundice in children was proposed in[12].The proposed jaundice detection algorithm localizes the face from the given input image using the Haar Classifer method were employed. The detected face image is projected using Eigen face analysis and classified using the k nearest neighborhood (k-NN).

PROPOSED METHOD

In this object recognition method two phases are included Training phase and Testing phase to correctly classify the object into corresponding class.

1. TRAINING PHASE:

Images are trained to extract their key features in the training phase. 357 images of different category are used. At first saliency detection is performed on each of training images and then Principal Component Analysis(PCA) is used to extract the key features. PCA helps to extract those values which show maximum variance in the shape of saliency image and the data is projected to a new dimension of maximum variance that best discriminates the data. Saliency detection for each image is performed using Label Propagation Saliency (LPS) method and this saliency map is used for object recognition.

1.1 Label Propagation Saliency (LPS)

LPS mainly uses background and objectness labels to propagate their information and find saliency maps from the propagated information. First an affinity matrix is constructed among superpixels to be used in the propagation algorithm. L0 gradient minimization [10] is implemented to obtain a soft abstraction layer while keeping vital details of the image. Superpixels are generated to segment the smoothed image into N regions by the SLIC algorithm [11], where regions at the image border form a set of boundary nodes, denoted as B. In this work, we refer the superpixel as a node or a region.

The similarity of two nodes is measured by a defined distance of the mean features in each region. Based on the intuition that neighboring regions are likely to share similar appearances and that remote ones do not bother to have similar saliency values even if the appearance of them are highly identical, we define the affinity entry w_{ij} of superpixel i to a certain node j as the difference between mean of features between two nodes.

Some background nodes are selected as boundary nodes and they are set as query labels to propagate saliency information on the basis of affinity matrix. This method is called inner propagation.

Given an affinity matrix, we endeavor to propagate the information of the background labels to estimate saliency measure of other superpixels. The similarity measure V (r_i) satisfies.

$$V_{t+1}\,(r_i\,) = \sum_{j=1}^{N} a_{ij}\ \ V_t(r_j) \qquad (1)$$

Algorithm 1 Inner Label Propagation via Boundary Nodes

Input: The N× N row –wise normalized color affinity matrix $A_{\,c}$.The set of selected boundary labels $B^{'}$ and the set of unlabelled $U=\{R\backslash B^{'}\}$.

```
t = 0
Initialize, set $V_t(r_i)$=1 for $r_i \in B^{'}$ and $V_t(r_i)$= 0 for $r_i \in U$
while check > thres do
    for $r_i \in U$ do
        $V_{t+1}\,(r_i) = \sum_{j=1}^{N} a_{ij}\ \ V_t(r_j)$
    end for
    t = t+1
    check = var $(\boldsymbol{V_t}, \boldsymbol{V_{t-1}}\ldots\ldots\ldots\ldots,\boldsymbol{V_{t-const}})$
end while
$\boldsymbol{S}^B$ = ones (N) – normalize ( $\boldsymbol{V_t}$)
$\boldsymbol{S}^B(r_i)$ = sp2map ($S^B$)
```

Output: The regional map .$S^B(r_i)$ from background labels.

Algorithm 1 summarizes the inner label propagation via boundary nodes. The convergence of the similarity measure V is ensured by checking whether its average variance in the last 50 iterations (i.e., const = 49) is below a threshold. sp2map(.) means mapping the saliency measures of N regions into an image-size map.

In most cases, the inner propagation with help of the boundary labels works well whereas in some complex scenes, depending on the boundary prior alone might lead to high saliency assignment to the background regions. It naturally suggests us to use some foreground prior to improve the results further.

In some cases, the inner propagation via boundary labels alone has better saliency maps than a combination of boundary and objectness labels, which results from the slight disturbance of objectness measures near the salient object. A compactness score is used to evaluate the quality of regional saliency map $\boldsymbol{S}^B(r_i)$ generated by Algorithm 1.

$$\mathrm{C(S)} = \sum_{b=1}^{10} w(b).\,h^s(b) \qquad (2)$$

b denotes each quantization of the resultant saliency map, $h^s(b)$indicates a 10 bin histogram distribution of the map and w(b) indicates the weight upon each bin. Based on the aforementioned characteristic of the failure saliency maps in the inner boundary propagation, we take a triangle form of the weight term, ie. w(b) = min(b,(11-b)).Only the saliency maps with score lower than a compactness score(1.6) will be updated by the inter propagation via a co-transduction algorithm. Such a scheme not only ensures high quality of the saliency maps, but also improves the computational efficiency.

Due to shortcomings of background priors in case of complex images objectness priors are introduced. Several useful priors are exploited and combined in a Bayesian framework, including multi-scale saliency (MS), color-contrast (CC), edge density (ED). MS measures the uniqueness of objects according to the spectral residual of the image's FFT. CC considers the distinct appearance of objects via a center-surround histogram of color distribution. ED capture the closed boundary of objects. It computes the density of edges near window borders. These cues are combined independently in a naive Bayes model.

Let $p_m$be a probability score of the m-th sampling window, the pixel-level objectness map O (p) is obtained through overlapping scores multiplied by the Gaussian smoothing kernel of all sampling windows.

$$\mathrm{O}\ (\mathrm{p}) = \sum_{m=1}^{M} p_m .\ \exp\left[-\left(\frac{(\mathrm{x_p}-\mathrm{x_m^c})^2}{2\sigma_\mathrm{x}^2} + \frac{(\mathrm{y_p}-\mathrm{y_m^c})^2}{2\sigma_\mathrm{y}^2} \right) \right] \tag{3}$$

where M = 1000 is the number of sampling windows x_p ,y_p,x_m^c,y_m^cdenote the coordinates of pixel p and the center coordinates of window m respectively. σ_x= .25W and σ_y= .25 H, where W is the width and H the height of an image. The region-level objectness map O (r_i) is the average of pixels objectness values within a region:

$$\mathrm{O}\ (r_i) = \frac{1}{n_i} \sum_{p \in r_i} O_p \tag{4}$$

Where n_i indicates number of pixels in region r_i .A simple average of pixels scores within a region leads to mid-value saliency in vast background areas since the pixel-level map from which the region-level map is generated is ambiguous around the salient object in the first place.

Based on the fact that high values of region-level objectness score calculated by Eqn.4 can better indicate foreground areas, the set of objectness labels O is created from superpixels whose region-level objectness O (r_i) is no less than the objectness criterion. Thus a complementary combination of the boundary and objectness labels could be a better choice.

A new co-transduction algorithm for saliency detection is implemented which uses one label set to pull out confident data and add additional labels as new hints to the other label set. The inter label propagation algorithm is summarized in Algorithm 2. During each iteration in Algorithm 2 (through line 11 to 16), $p_1$superpixels which are most different from the boundary labels are picked out and added to the objectness set and the update of the boundary set is similarly achieved with a different superpixel number p_2.We set $p_1, p_2$to be $p_1 << p_2$ because the background regions often significantly outnumber the foreground ones. Final saliency measure is computed as a linear combination of the resultant $S^B$and S^Oin the last iteration from boundary and objectness labels respectively.

The inter propagation algorithm strengthens the connection of salient regions by employing objectness labels and distinguishes the foreground better from the background by enlarging the set of boundary labels from objectness cues, thus best leveraging the complimentary information of both label sets.

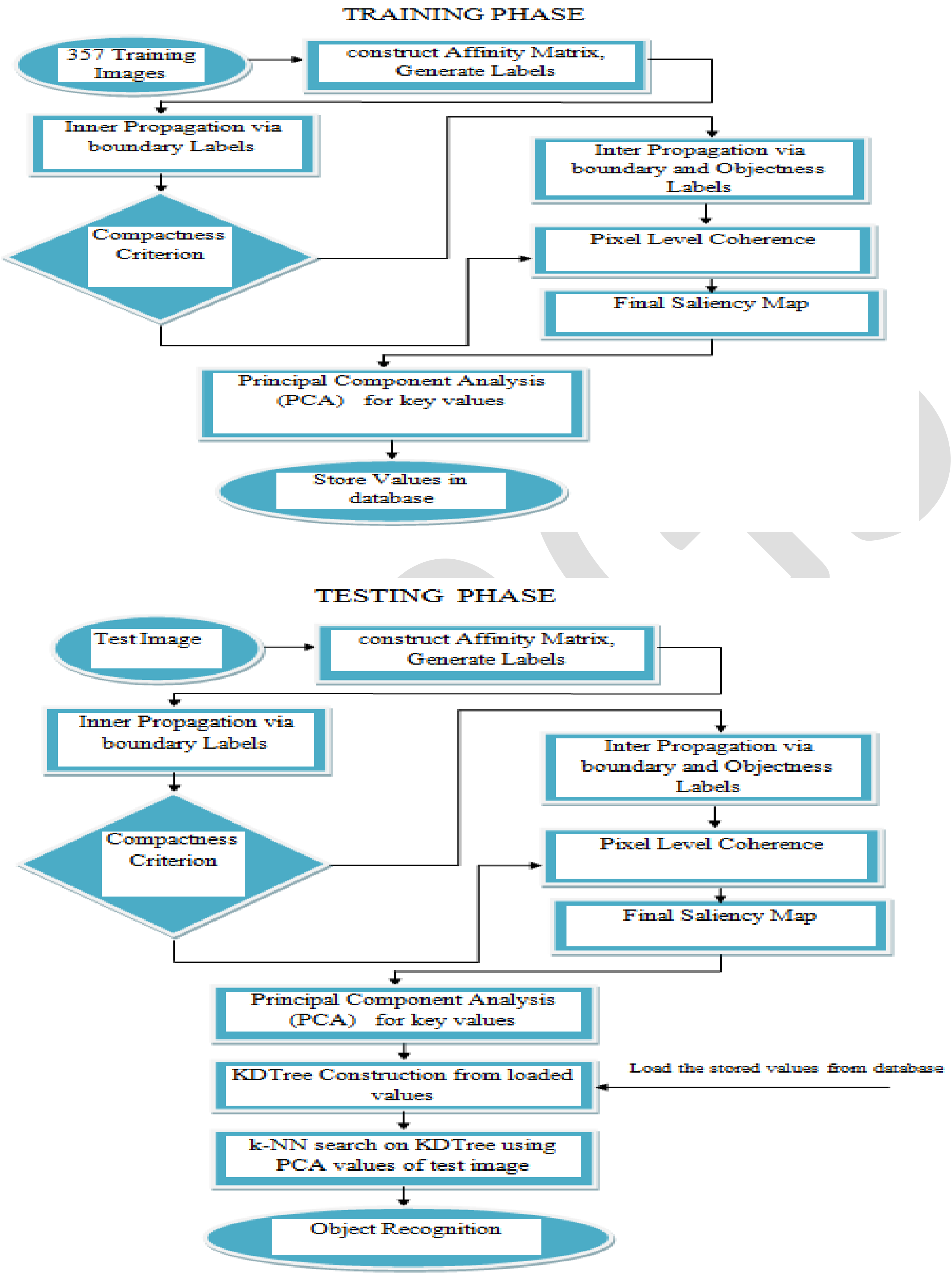


Fig:1 Block Diagram of Proposed System

Algorithm 2 Inter Label Propagation via Boundary and Objectness Nodes

Input: The N ×N row-wise normalized color affinity matrix Ac. The set of selected boundary labels B0 and the set of objectness labels O.

```
t = 0
Initialize $V_t^B$= 0, $V_t^O$= 0
while $check^B$,$check^O$> thres do
    set $V_t^B(r_i)$=1 for $r_i \in B'$ and $V_t^O(r_i)$=1for $r_i \in O$
    Create unlabelled sets $U_1$and $U_2$such that $U_1$= {R\$B'$},$U_2$= {R\O}
    for $r_i \in U_1, r_i \in U_2$ do
        $V_{t+1}^B(r_i) = \sum_{j=1}^N a_{ij}\ V_t^B(r_j)$
        $V_{t+1}^O(r_i) = \sum_{j=1}^N a_{ij}\ V_t^O(r_j)$
     end for
    t = t + 1
$check^B = var(V_t^B,\ldots\ldots. V_{t-const}^B)$
$check^O = var(V_t^O,\ldots\ldots. V_{t-const}^O)$
temp1= sort ($V_t^B$ ,'ascent')
temp2= sort ($V_t^O$ ,'ascent')
$L^B$= temp1(1: $p_1$) , $L^O$= temp2(1: $p_2$)
$B'$ = $B' \cap L^O$, O = $O \cap L^B$
end while
$S^B$ = ones(N) – normalize($V_t^B$)
$S^O$ = normalize($V_t^O$)
$S^c$ = normalize (α$S^B$ +β$S^O$ )
$S^c(r_i)$ = sp2map ($S^c$)
```

Output: The combined regional saliency map $S^c(r_i)$.

In order to eliminate the segmentation errors of the SLIC algorithm, pixel-level saliency is defined as a weighted linear combination of the regional saliency $S^B(r_i)$ or $S^c(r_i)$ of its surrounding superpixels.

$$S(p) = \sum_{i=1}^{G} \exp(-(k_1 \| c_p - c_i \| + k_2 \| z_p - z_i \|)) S^{B/C}(r_i) \tag{5}$$

Where c_p, c_i, z_p, z_i are the color and coordinate vectors of a region or a pixel, G denotes the number of direct neighbors of region $r_i$and S^B, S^c indicates the straightforward region level result descending from Algorithm 1 or Algorithm 2. By choosing a Gaussian weight it is ensured that the up sampling process is both local and color sensitive.k_1 and $k_2$are parameters controlling the sensitivity to color and position, where k_1= 0.2 and k_2 =0.01.

1.2 Principal Component Analysis (PCA)

PCA is applied on all the 357 saliency maps produced from the corresponding training images to extract the key values. Key values produced as a result of application of PCA along 50 dimensions are stored on database along with category labels.PCA can be used to find the maximum variance in the original space.PCA is used to extract feature vector and reduce the dimensions of process data.PCA is a technique that can be used to simplify a dataset. It is a linear transformation that chooses a new coordinate system for the data set such that variance by any projection of the data set lie on the first axis (first principal component), the second variance on the second axis, and so on. PCA can be used for reducing dimensionality by eliminating the later principal components. Principal component analysis provides a road map for how to reduce a complex data set to a lower dimension. Thus dimensionality reduction is also performed which helps classification works faster. The important steps of PCA are:

1. Take the whole training images consisting of d-dimensional samples ignoring the class labels.
2. Compute the d-dimensional mean vector (i.e., the means for every dimension of the whole training images.
3. Compute eigenvectors $(e_1, e_2 \dots . e_d)$ and corresponding eigenvalues $(\lambda_{1,}\lambda_2 \dots \lambda_d)$. Eigen values are a product of multiplying matrices however they are as special case. Eigen values are found by multiples of the covariance matrix by a vector in 2 dimensional space.
4. Sort the eigenvectors by decreasing eigenvalues and choose k eigenvectors with the largest eigenvalues to form a d × k dimensional matrix.
5. Use this d × k eigenvector matrix to transform the samples onto the new subspace.

2. TESTING PHASE

When an test image is given as input saliency map is constructed from that image using the Label Propagation Saliency (LPS) methods used in training phase. Principal Component Analysis (PCA) is applied on test image to extract key features of input image. Object values extracted from training images that are stored in database are loaded in this phase. These loaded features are given as input to kd-Tree which trains the features into different categories based on Euclidean distance.

2.1 kd-Tree Construction

The kd-Tree is a generalization of the simple binary tree used for sorting and searching. The kd-Tree is a binary tree in which each node represents a subfile of the records in the file and a partitioning of that subfile. The root of the tree represents the entire file. Each non terminal node has two sons or successor nodes. These successor nodes represent the two sub files defined by the partitioning. The terminal nodes represent mutually exclusive small subsets of the data records, which collectively form a partition of the record space.

In the case of one-dimensional searching, a record is represented by a single key and a partition is defined by some value of that key. All records in a subfile with key values less than or equal to the partition value belong to the left son, while those with a larger value belong to the right son. The keg variable thus becomes a discriminator for assigning records to the two sub files.

In k dimensions, a record is represented by k keys. Any one of these can serve as the discriminator for partitioning the subfile represented by a particular node in the tree; that is, the discriminating key number can range from 1 to k. The discriminator for each level is obtained by cycling through the keys in order. That is, d= L mod k + l where d is the discriminating key number for level L and the root node is defined to be at level zero. The partition values are chosen to be random key values in each particular subfile.

The k-d tree data structure provides an efficient mechanism for examining only those records closest to the query record, thereby greatly reducing the computation required to find the best matches.

The search algorithm is most easily described as a recursive procedure. The argument to the procedure is the node under investigation. The first invocation passes the root of the tree as this argument. Available as a global array is the domain of that node; that is, the geometric boundaries delimiting the subfile represented by the node. The domain of the root node is defined to be plus and minus infinity on all keys. These geometric boundaries are determined by the partitions defined at the nodes above it in the tree. At each node, the partition not only divides the current subfile, but it also defines a lower or upper limit on the value of the discriminator key for each record in the two new subfiles. The accrual of these limits in the ancestors of any node defines a cell in the multidimensional record-key space containing its subfile. The volume of this cell is smaller for subfiles defined by nodes deeper in the tree. If the node under investigation is terminal, then all the records in the bucket are examined. A list of the m closest records so far encountered and their dissimilarity to the query record is always maintained as a priority queue during the search. Whenever a record is examined and found to be closer than the most distant member of this list, the list is updated. If the node under investigation is not terminal, the recursive procedure is called for the node representing the subfile on the same side of the partition as the query record. When control returns, a test is made to determine if it is necessary to consider the records on the side of the partition opposite the query record. It is necessary to consider that subfile only if the geometric boundaries limiting those records overlap the ball centered at the query record with radius equal to the dissimilarity to the m^{th}closest record so far encountered. This is referred to as the "bounds-overlap-ball" test. If the bounds-overlap ball test fails, then none of the records on the opposite side of the partition can be among the m closest records to the query record. If the bounds do overlap the ball, then the records of that subtree must be considered and the procedure is called recursively for the node representing that subfile. A "ball-within-bounds" test is made before returning to determine if it is necessary to continue the search. This test determines whether the ball is entirely within the geometric domain of the node. If so, the current list of m best matches is correct for the entire file and no more records need be examined.

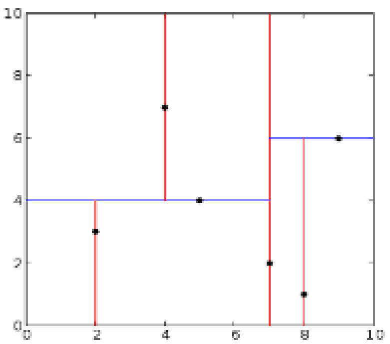


Fig:2 kd-Tree decomposition for the point set

(2,3), (5,4), (9,6), (4,7), (8,1), (7,2)

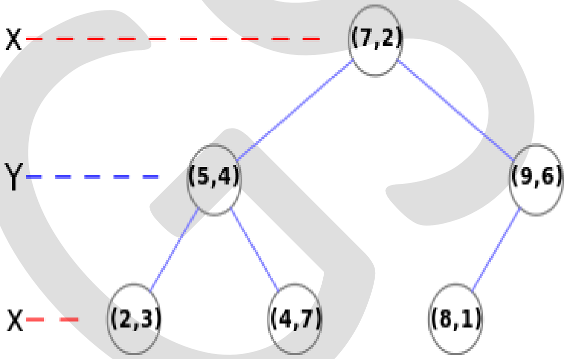


Fig: 3 The resulting k-d tree

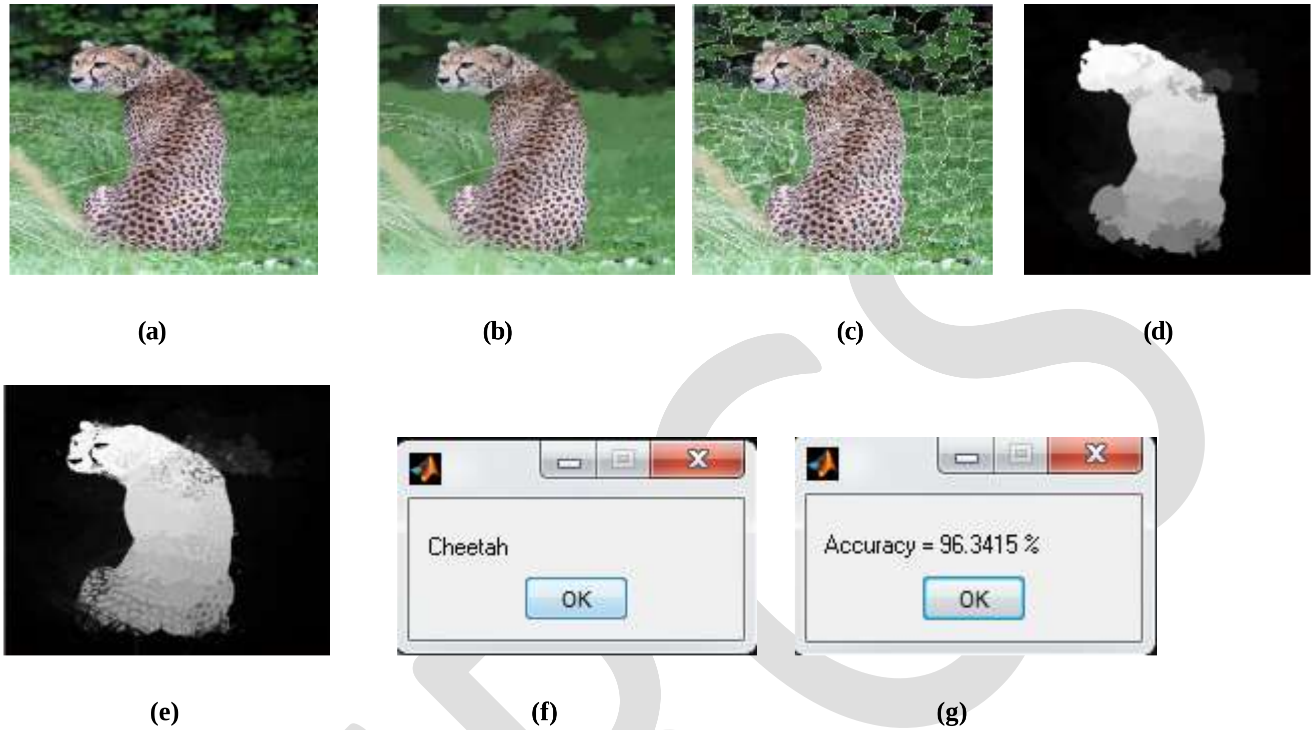
2.2 k-Nearest Neighbor Search(k-NN)

Once a kd- Tree searcher model object is created, the stored tree can be searched to find all neighboring points to the query data by performing a nearest neighbors search using k-NN search. The nearest neighbor search (NN) algorithm aims to find the point in the tree that is nearest to a given input point. This search can be done efficiently by using the tree properties to quickly eliminate large portions of the search space. Searching for a nearest neighbor in a kd-Tree proceeds as follows:

1. A positive integer k is specified, along with a new sample. It can provide the k nearest neighbors to a sample by maintaining k current bests instead of just one. A branch is only eliminated when k points have been found and the branch cannot have points closer than any of the k current bests.
2. Starting with the root node, the algorithm moves down the tree recursively, in the same way that it would if the search point were being inserted (i.e. it goes left or right depending on whether the sample value of test image is lesser than or greater than the current node in the split dimension).
3. Select the k entries in our database (nodes of kd-Tree) which are closest to the new sample.
4. Find the most common classification of these entries. This is the classification we give to the new sample

EXPERIMENTAL RESULTS

The proposed method is evaluated on cmu-cornell icoseg dataset. 357 images are used for training and more than 150 images are tested. The results produced shows that the saliency map produced from the method is of high quality. PCA gives the exact key features which helps to discriminate classes. kd-Tree helps to reduce the execution time. The execution of the entire process is estimated to be 30 seconds which is possible with help of fast searching using kd-Tree. k-NN correctly classifies the test image. The entire process is evaluated and accuracy of overall process is estimated to be 96.3415%. The results of the entire process is shown in Fig:3.


(a) (b) (c) (d)

(e) (f) (g)

Cheetah

Accuracy = 96.3415 %

Fig 4: Results of object recognition method (a) Input Image (b) L0 Smoothing (c) SLIC segmentation (d) LPS method of saliency detection (e) Pixel Level Coherence (f) Detection from saliency map (g) Accuracy of method

CONCLUSION

An object recognition method from saliency maps is proposed. Saliency maps are generated using Label Propagation saliency method (LPS). In this method background and objectness labels are extracted from the SLIC segmented image. These labels are used to propagate the similarity of other segments to these labels. On the basis of the LPS algorithm the salient portion in an image is extracted. This saliency detection is performed on all the test images during the testing phase and then PCA is used to extract key features and they are stored in database along with class labels. During testing phase the stored values are loaded and a kd-Tree is constructed from the values and then k-Nearest Neighbor(k-NN) algorithm is applied on kd-Tree to get the correct classification of test image and hence recognize the class of test image. Performance evaluation shows the method works well in the case of almost all images.

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Automation of Training and Placement Cell

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ABSTRACT: Training and Placement may be a department existing in several organizations that involve in providing needed coaching and inserting them in acknowledged institutes. Typically they have large documentation method that is cumbersome once done manually. Automation of Training and Placement Cell may be a net-based application developed within the windows platform for the training and placement department of the faculty so as to produce the main points of its students during information for the businesses to their method of accomplishment supplied with a correct login. This method is often used as an website application for the TPO of the faculty to manage the college data with regards to placement. Students will try Online examination or search the fabric needed for the choice method like technical and reasoning. Once field picks area unit conducted the college ought to offer their CV to the priority officer for attending the field interviews. This method mimics the manual procedures, like maintenance of their resumes and credentials, causing job alerts.

Keywords— Training and Placement Cell, Automation, TPO, Online Examination, Net-based application, Website, Job alerts.

1.INTRODUCTION

Placement coaching plays a significant role in shaping up the career goals of scholars. It's the dream of each engineering student to urge placed in a very prime organization visiting their field for achievement. Keeping this key side into thought, it's complete that coaching is very important for engineering students to boost their employability skills and succeeds good placement in varied Industries. At present, the competition for employment is increasing daily and placement has become a difficult task. Coaching of scholars and armament them with life skills has become a vital responsibility of the establishment. At the side of technical experience development of a holistic temperament is additionally necessary. The coaching and Placement Section of the Institute centrally handles field placement of the graduating students of all Departments, Centers and colleges [1]

The Section provides glorious infrastructure to support each stage of the location method. Arrangements for Written Tests, Pre-Placements Talks, Group Discussions, Interviews and so on. Square measure created as per the necessities of the organizations. The section conjointly arranges for summer sensible coaching for all pre-final year B. Tech. Students and third year students of five year twin degree M. Tech courses over seventy fifth of total students placed beneath field placement achievement for each batch starts from forwards. On top of half-hour of scholars are becoming over one placement. In each branch concerning students crack varied post graduate exams like CAT, GRE, GATE, GMAT etc. These students get recruited by top universities round the world. Now a days field placement area unit conducted all told schools. Various code and alternative sector firms area unit conducting field picks for choosing advantage candidates. When field picks area unit conducted the scholars ought to give their summary to the priority officer for attending the field interviews [2, 3]

2. AUTOMATION OF TRAINING AND PLACEMENT CELL

To reduce the work needed to manage student information and therefore this information of varied recruiters, a replacement system is projected that is processed through computers [4]. To develop a system that will accomplished the following:-

- Reduce the work and hold. Improve the output of operators. Improve accuracy in result.
- Allow simple navigation through CV's and company information.
- Manage the person and machine resources with efficiency.
- Its user friendly interface having fast access to documents.
- Easily ascendible to grow with ever-changing system demand.
- Secured sign in and updates.

2.1 TRAINING ACTIVITIES

- Create awareness regarding "career planning" and "career mapping" among the scholars.
- Equip the coed with life skills.
- Train the scholars on "Personality development".

- Organize numerous coaching Programs to coach the scholars within the areas of Quantitative ability, Logical Reasoning and Verbal reasoning through the putative external coaching organizations and in-house trainers.
- Train the scholars through Mock Interviews to perform well within the skilled interviews as per the expectations of the company world.
- Train the scholars on give-and-take techniques.
- Conduct on-line tests and written ability tests.

2.2 PLACEMENT ACTIVITIES

- Job alerts
- Campus selection alerts
- Short list students
- Maintain company profiles
- Maintain Student profiles
- Selected students list maintenance

2.3 ROLE OF TRAINING AND PLACEMENT CELL

The decision on the selection of intervention a technique is solely supported the Pre coaching Analysis report. A series of Pre coaching Assessments are going to be administered to every and each individual and can be mapped on the skill-will matrix. The scholars can then be coached, guided, mentored, supported or trained counting on the requirements of the scholars. So as to live the coaching effectiveness the scholars also will be subjected to a series of Post coaching Assessment when completion of every of the coaching module [5]. The scholar's square measure trained to achieve the higher than objectives through a spread of programs surpass the Training and Placement Cell such as:

- Corporate leaders from numerous leading industries square measure invited often to act with students.
- Language learning programs to coach students in developing their communication skills and foreign language skills like German and French exploitation a people Language science laboratory.
- Training through cluster Discussions for college kids to perform well within the skilled interviews that is that the screening ways utilized by leading firms lately.
- Training through Mock Interviews for college kids to perform well within the skilled interviews as per the expectations of the company world.

2. 4 ARCHITECTURE OF TRAINING AND PLACEMENT CELL

In the design of Training And Placement Cell we tend to designed two users TPO and Student.Training and Placement officer and Student were produce a placement cell module through the net and these are keep within the information [6].

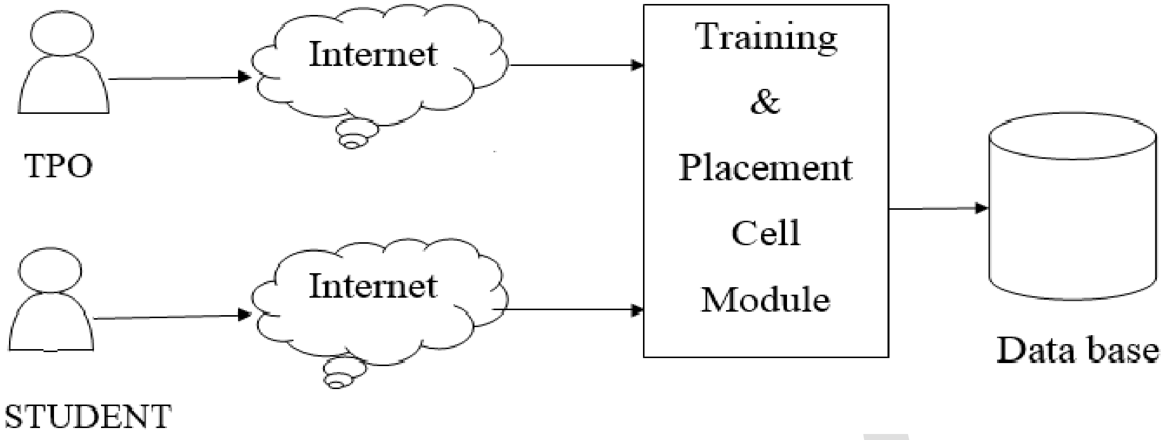


Fig. 1: Architecture of training and placement cell

2.5. TRAINING AND PLACEMENT/STUDENT OPERATION:

In the Placement Officer and Student operations, the coed will register his details and send to the location officer for applying the roles. Then the officer's post-employment for student weather they'll settle for or decline the task post then they were attending the actual drive [7]. The Training and Placement Cell Officer was conducting the drive those are through for interview publish select list for college students. The colleges were checking the chosen list for drives conducted.

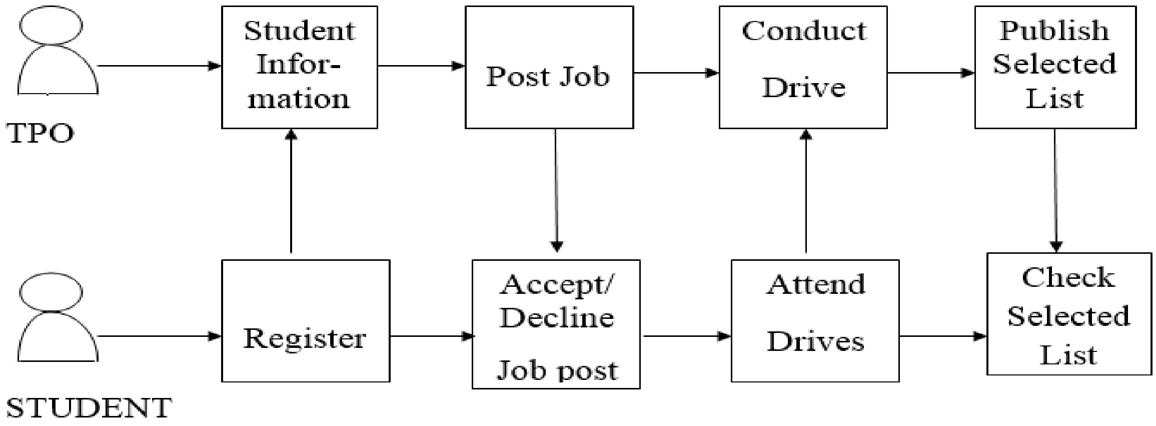
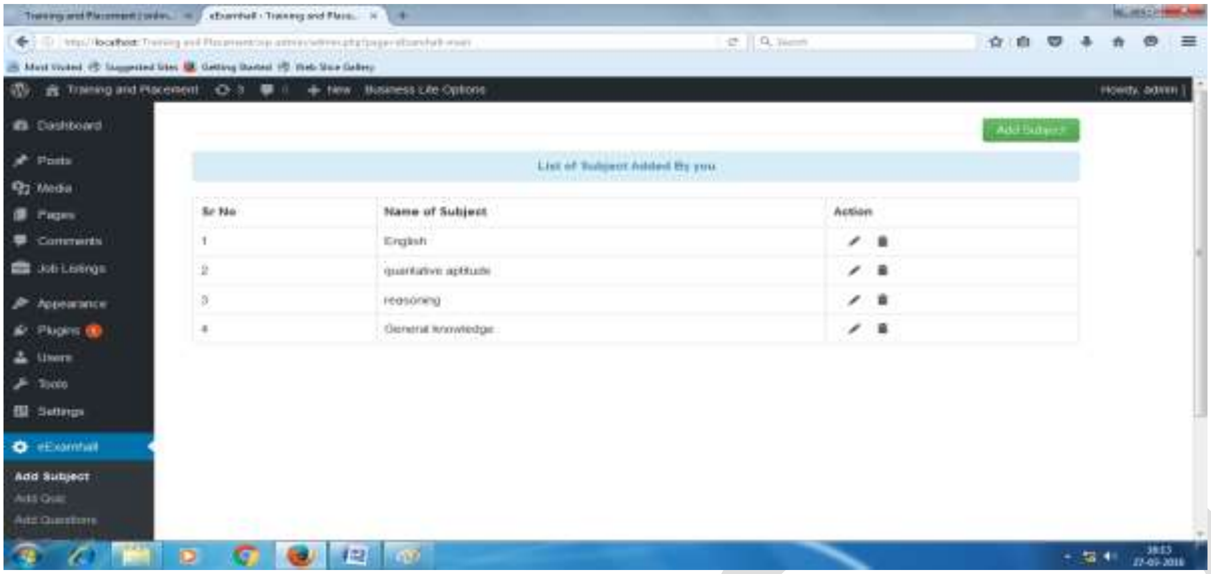


Fig. 2: Training and placement/Student operation

3. RESULTS

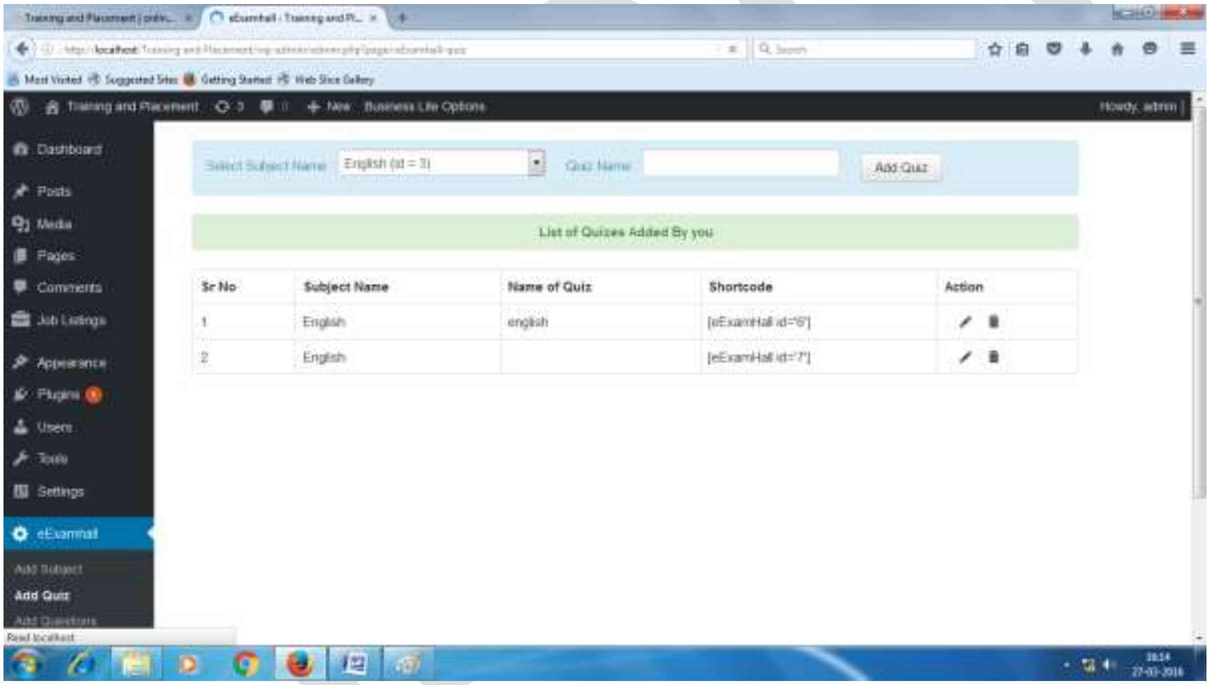
The following screenshots that we designed for Training and Placement Cell are



List of Subject Added By you

Sr No	Name of Subject	Action
1	English	
2	quantative aptitude	
3	reasoning	
4	General knowledge	

Fig. 3: Add Subjects

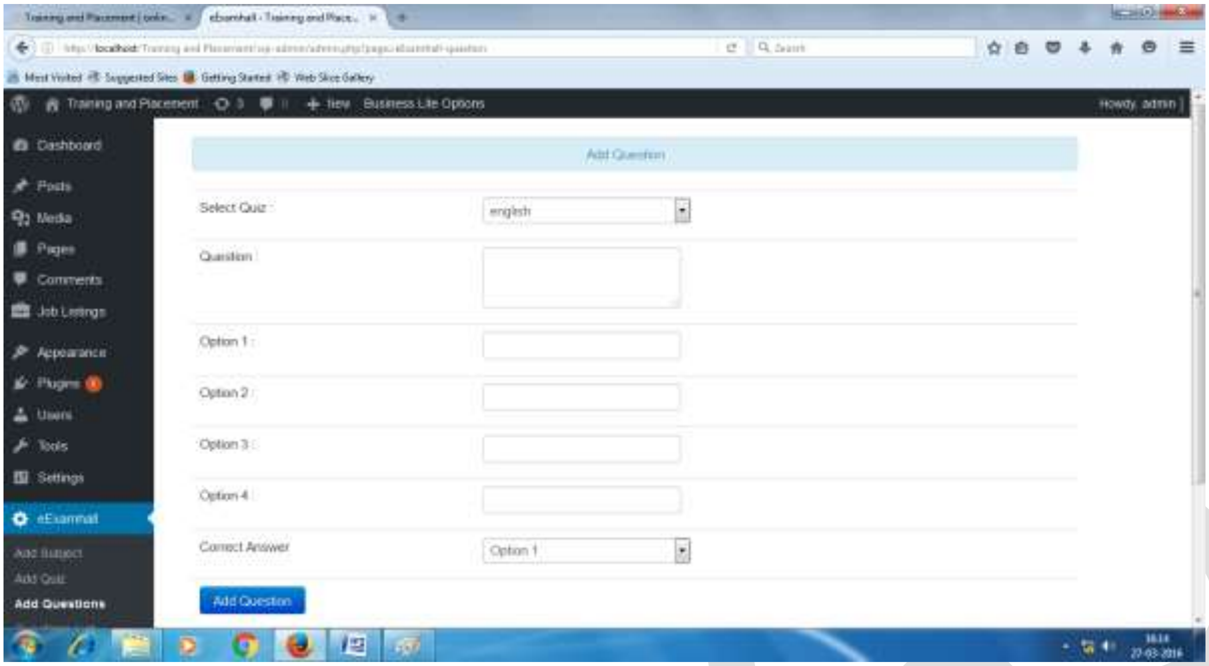


Select Subject Name: English (id = 3)
Quiz Name:

List of Quizes Added By you

Sr No	Subject Name	Name of Quiz	Shortcode	Action
1	English	english	[eExamHall id='6']	
2	English		[eExamHall id='7']	

Fig. 4: Add Quiz



Add Question

Select Quiz : english

Question :

Option 1 :

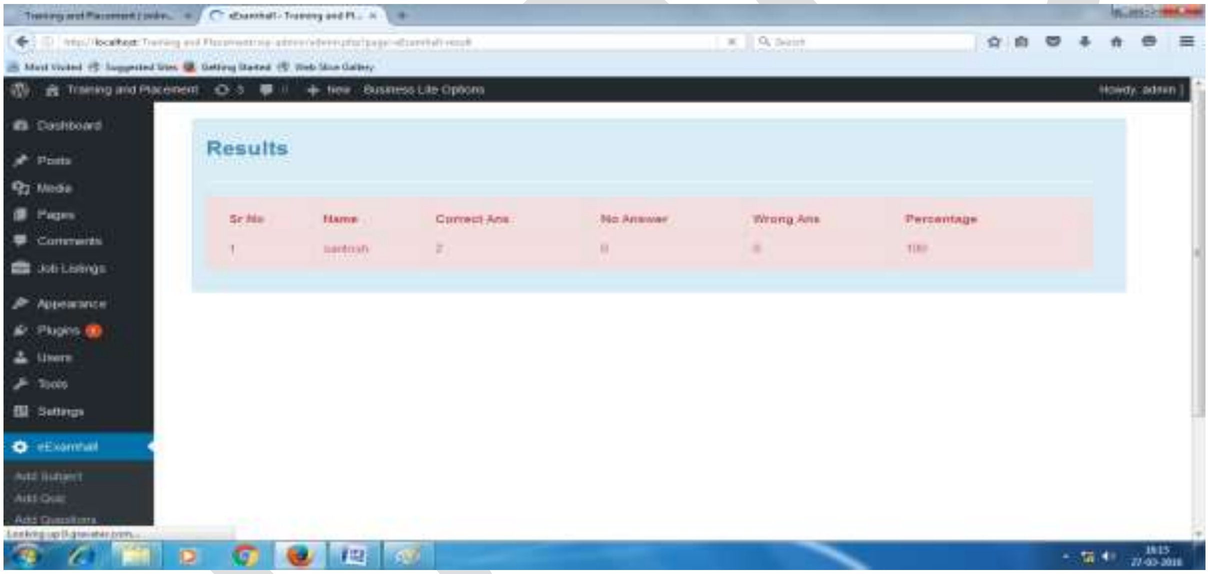
Option 2 :

Option 3 :

Option 4 :

Correct Answer: Option 1

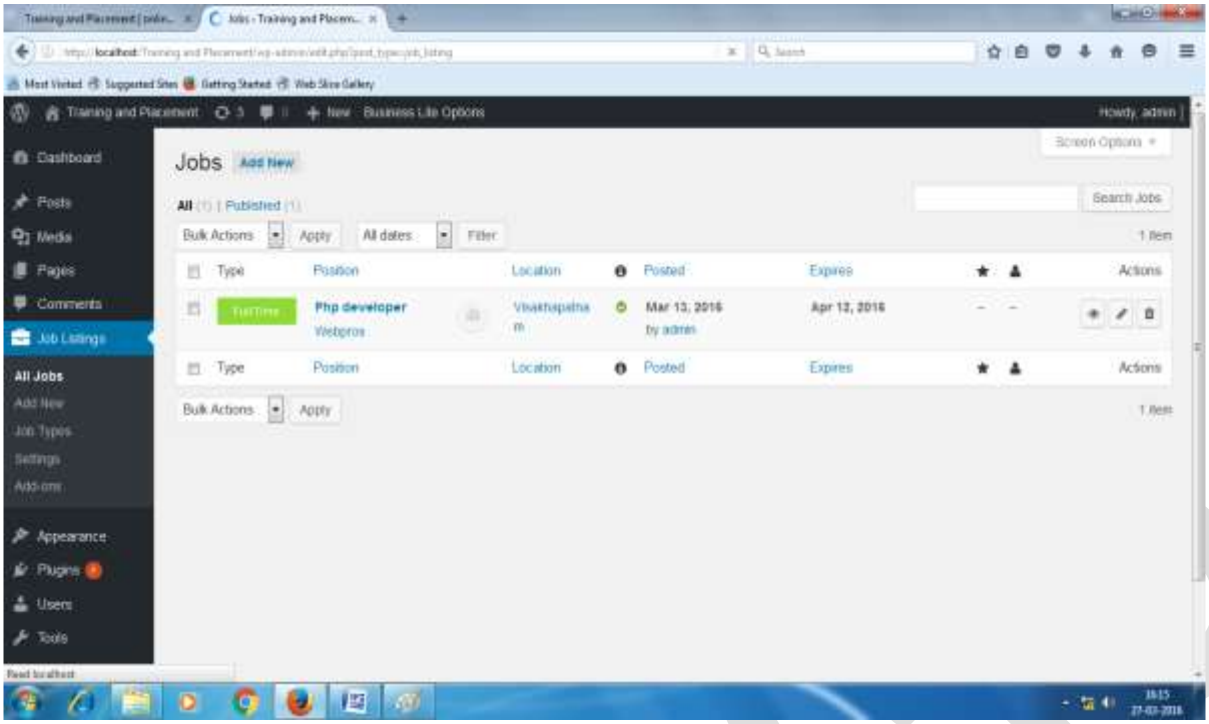
Fig. 5: Add Questions



Results

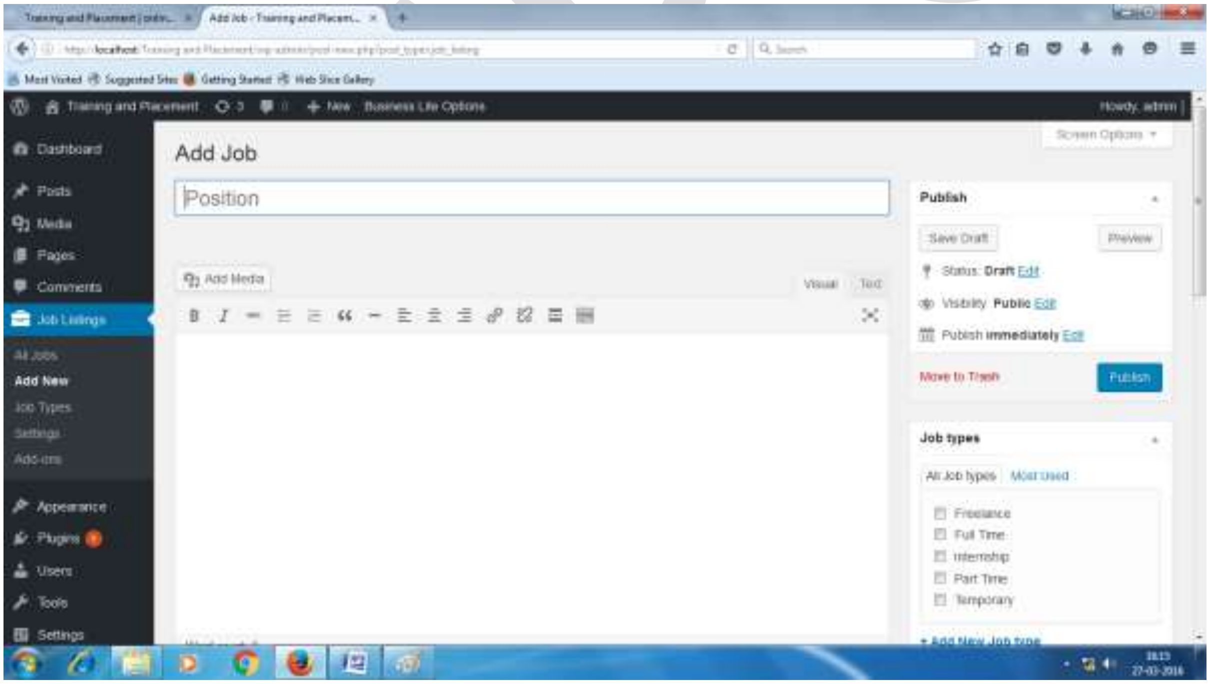
Sr No	Name	Correct Ans	No Answer	Wrong Ans	Percentage
1	santosh	2	0	0	100

Fig. 6: Results



Type	Position	Location	Posted	Expires	Actions
Full Time	Php developer Webpros	Visakhapatnam	Mar 13, 2016 by admin	Apr 12, 2016	

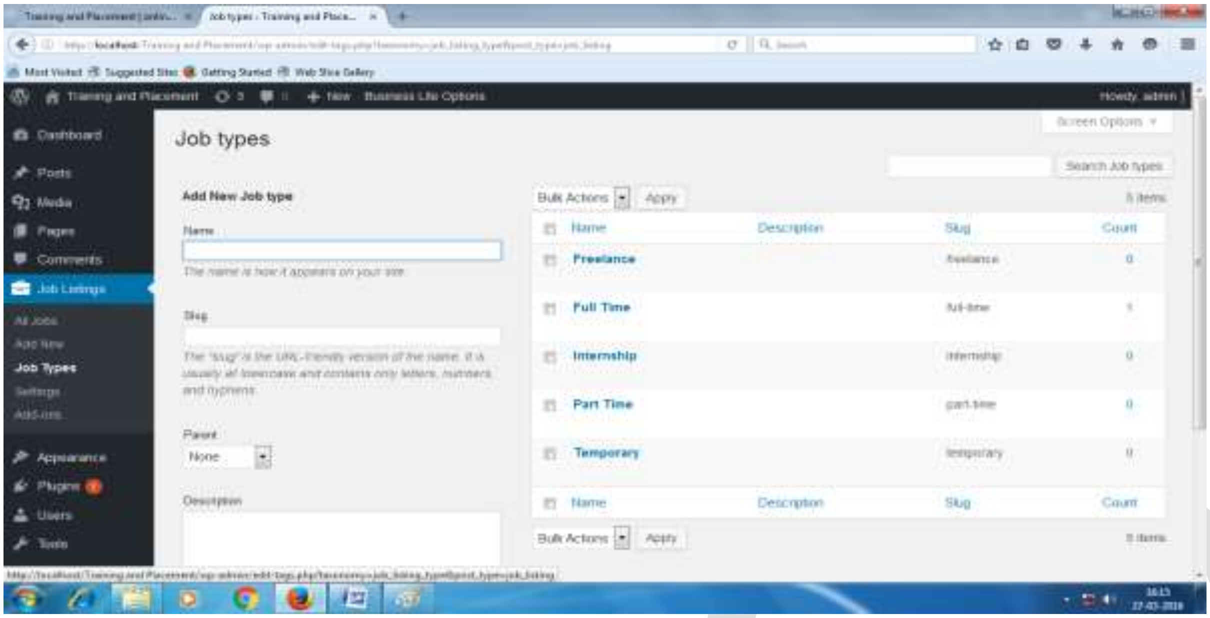
Fig. 7: All Jobs



Status: Draft Edit
Visibility: Public Edit
Publish immediately Edit

☐ Freelance
☐ Full Time
☐ Internship
☐ Part Time
☐ Temporary

Fig. 8: Add Jobs



Job types

Add New Job type

Name

The name is how it appears on your site.

Slug

The "slug" is the URL-friendly version of the name. It is usually all lowercase and contains only letters, numbers, and hyphens.

Parent: None

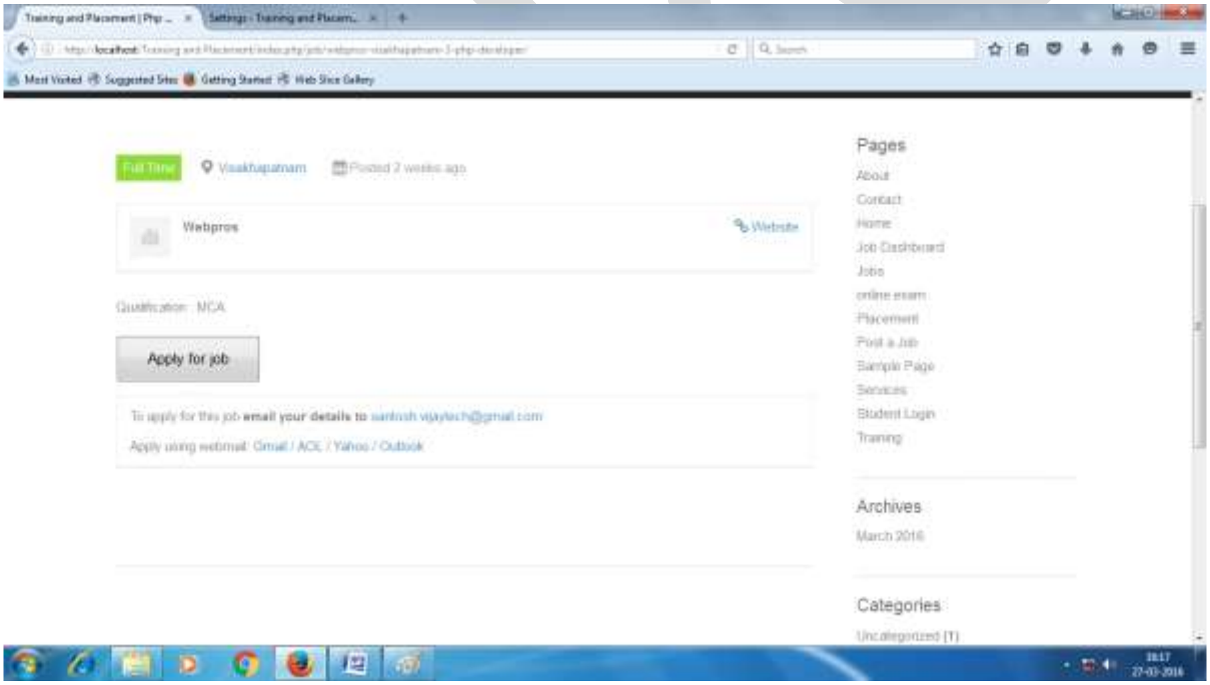
Description

5 items

Name	Description	Slug	Count
Freelance		freelance	0
Full Time		full-time	1
Internship		internship	0
Part Time		part-time	0
Temporary		temporary	0

5 items

Fig. 9: Job Types



Webpros

Qualification : MCA

To apply for this job **email your details to** santosh.vijaytech@gmail.com

Apply using webmail: Gmail / AOL / Yahoo / Outlook

Fig. 10: Apply for Job

Take Quiz

Question 1 : Arrange this in Alphabetical Order "HELLO"

○ LLOEH
○ EHLLO
○ EHLOL
○ LOELH

Fig. 11: Online Exam

4. ACKNOWLEDGMENT

We would like to thank our friends for their cooperation and encouragement besides providing necessary information to complete this paper.

5. CONCLUSION

The industrial web site that designed to produce world category facilities of visited corporations. The coming up with of web site has been tired associate degree interactive manner keeping in mind the comfort of the user. This is useful to the scholars because this consists of following options. This generates reports that offer description details as well as varied numbers of scholars placed in company. This conjointly provides placed student info in step with company.

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WEIGHT REDUCTION OF HEAVY DUTY TRUCK CHASSIS THROUGH MATERIAL OPTIMIZATION

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Abstract— A well-structured and properly built chassis improves crash worthiness, passenger safety and weight efficiency. But there is a need for weight reduction of vehicles for improved fuel economy, performance and emissions. This paper is aimed at weight reduction of a 16 tonne truck chassis through FEA analysis. The chassis was designed and simulated for stresses and displacements using "Altair Hyperworks 13.0". Effects of material change on various factors was studied. The possible areas of material reduction were identified using topology optimization and the chassis was optimized for minimum weight.

Keywords— Truck chassis, FEM, weight optimization, carbon fiber, Hypermesh

INTRODUCTION

When the vehicle is running it is acted upon various loads over the complete course of time it's running like, vertical loading, braking and acceleration loading, cornering forces, torsional forces etc. Out of the all these the vertical load decides the maximum load carrying capacity of chassis. Truck chassis are of ladder type, with two side members connected to each other by lateral cross members to form an integral support structure for all the components and payload. The side members provide vertical rigidity while the cross members provide torsional rigidity.[1]

Vehicle weight is one of the important factor considered while designing. The weight of chassis is the major contributor to the unsprung mass of the vehicle. Improvements are always welcome when the reduction in unsprung mass is considered in order to make the system less bulky. This has to be done by using trial and error method, but doing it on prototype is expensive and time consuming hence finite element methods(FEM) are used.

METHODOLOGY

Weight optimization is carried out in 5 steps.

Step 1 : Modeling and meshing of chassis

A heavy duty truck chassis was modeled using “SolidWorks 2013”. The chassis was modeled using surfacing modeling as shown in fig no.1. The meshing was carried out using "Altair Hyperworks 13.0". The side members and cross members were meshed as 2D shell elements where as the axles were modeled and meshed as 1D bar elements.[12]

Figure 2: CAD Model of Chassis

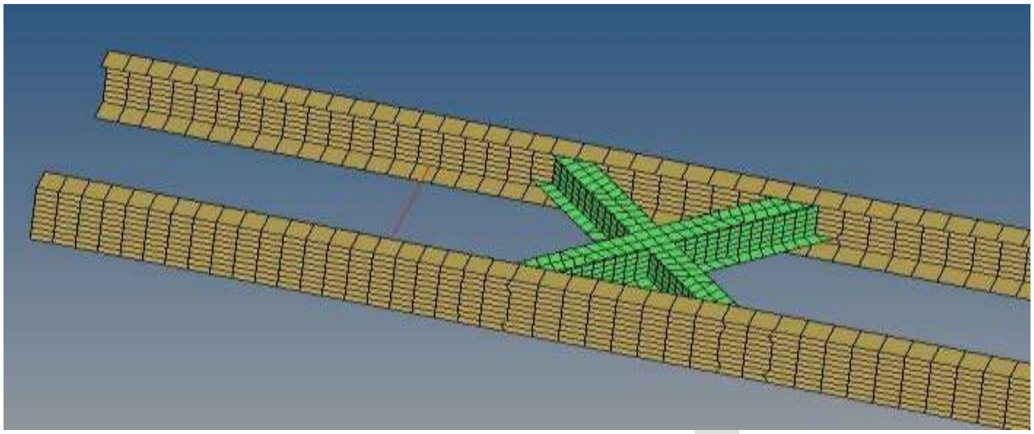

Figure 3: Meshed Model

Step 2 : Application of various loads on chassis

The loads considered are of the unsprung components. The details of the loads and the point of application are as below;[1]

TABLE 1: LOADS APPLIED ON THE CHASSIS

Sr No.	Component	Load (kg)	Distance from front Axle (mm)
1	Radiator	48	576
2	Cabin	619	307
3	Engine + Gear box	650	623
4	Battery	35	1294
5	Fuel Tank	250	1630
6	Payload	11698	1630 onwards UDL

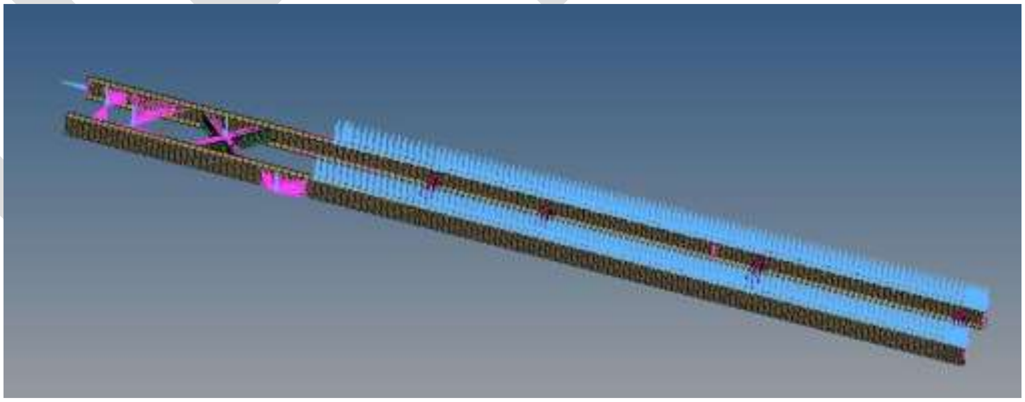

Figure 4: Applied Loads

Step 3: Static analysis

By the use of the Optistruct solver of "Altair Hyperworks 13.0" static analysis was carried out. In this analysis vertical loading i.e. the self wait of all the components attached to the chassis and torsional moment applied at the front end of the chassis is considered.

Step 4: Topology Optimization

Using the Optistruct module of "Altair Hyperworks 13.0" topology optimization is carried out. Element density is checked and the critical and non critical areas are found out.

Step 5: Material Change

Various combination of materials were used for different components of chassis like side members, cross members etc. and static analysis was carried out to check the structural strength. The various materials which were used are;

TABLE 2: PROPERTIES OF VARIOUS MATERIALS USED [3]-[6]

Sr No.	Material	Yield Strength (MPa)	Density (gm/cc)
1	HLSA350	350	7.79
2	HLSA420	420	7.89
3	HSLA550	550	7.80
4	Aluminium2045-T4	480	2.60
5	Carbon Epoxy	1730	1.60

RESULTS AND DISCUSSION

The static analysis carried out helps in finding out the maximum vertical displacement of the chassis and the bending stresses induced due to the applied static loads. The material used for the primary analysis was steel (Young's Modulus 210MPa; Density 7.9gm/cc). The maximum displacement was found out to be 22.55mm whereas the maximum stress developed was 379.3MPa.

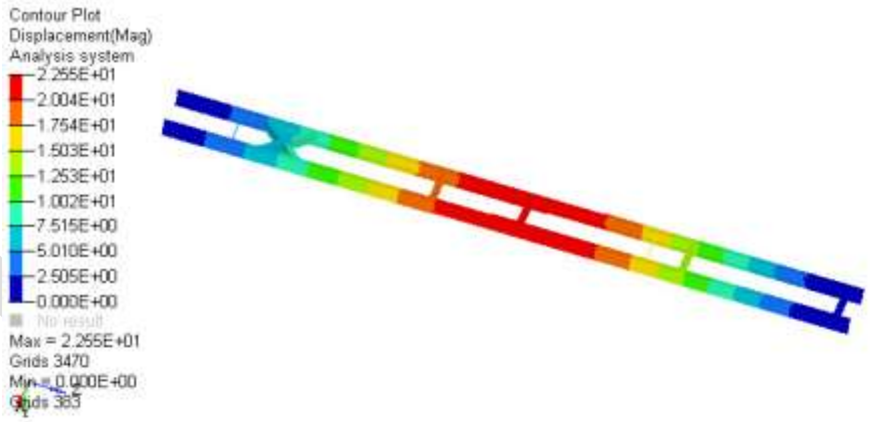

Figure 5: Displacement Plot for steel

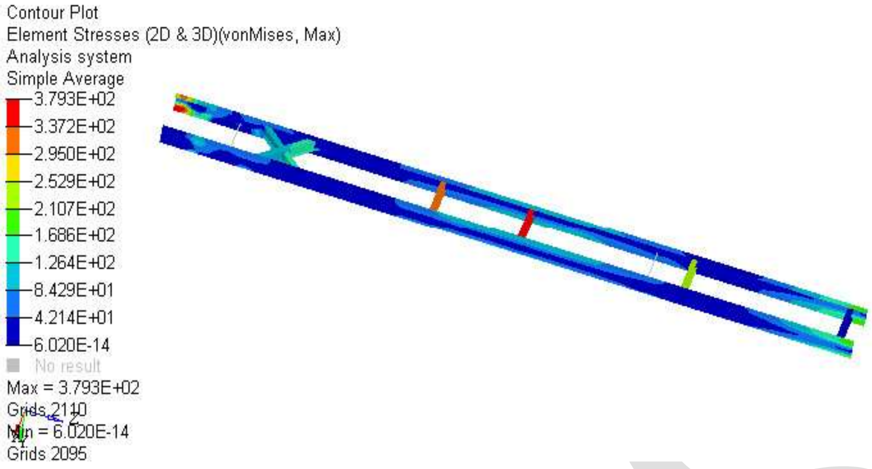

Figure 6: Stress Plot for steel

The mass was calculated using the mass calculate command in "Altair Hyperworks 13.0". To start optimization it is necessary to study the element density cloud. Topology optimization was carried out, where it was seen that the critical areas (i.e. areas with maximum requirement of materials) were the side members, whereas the cross members and axels were less critical. This helps in deciding which material can be used for which components

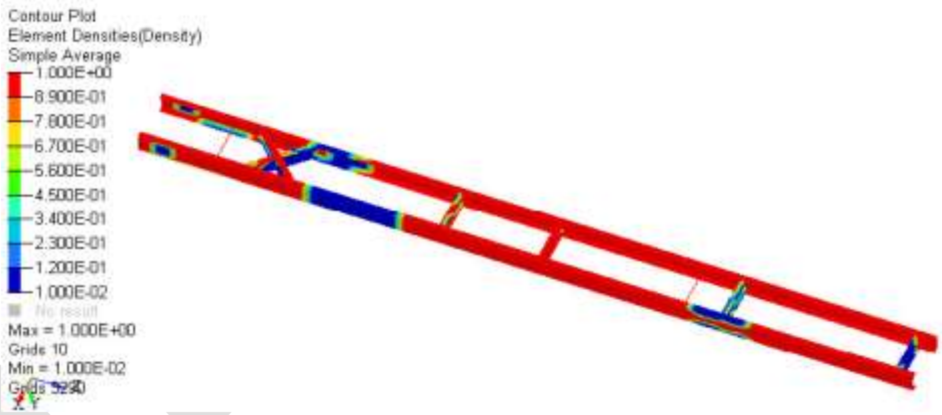

Figure 7: Topology Optimization

Taking this element density cloud into consideration various combinations were tried out for weight optimization. Table 1 shows the different combinations and weight change for all of them.

TABLE 3: RESULT TABLE OF WEIGHT OPTIMIZATION

Sr No.	Side Member	Cross Member	X- Member	Axle	Total Weight (kg)	% Difference
1	Steel				719.393	
2	HSLA 550				710.286	1.266%
3	HSLA 420				718.482	0.127%
4	HSLA 350				709.376	1.392%
5	HSLA 550	Al	Al	HSLA 350	650.23	9.614%
6	HSLA 550	Al	Carbon Fibre	HSLA 350	644.017	10.478%
7	HSLA 550	Carbon Fibre	Carbon Fibre	HSLA 350	637.904	11.327%

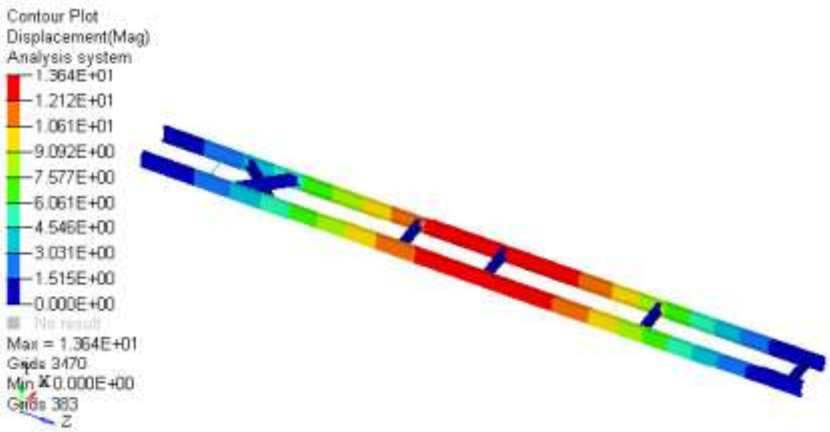

Figure 8 : Displacement Plot for Material 5

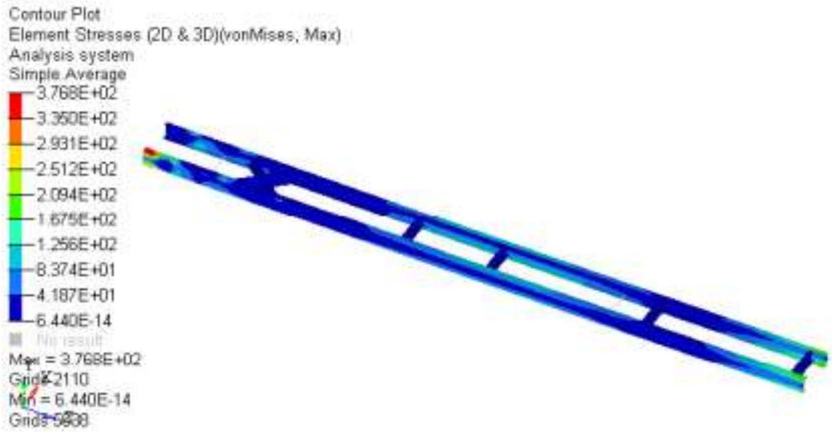

Figure 9: Stress Plot for Material 5

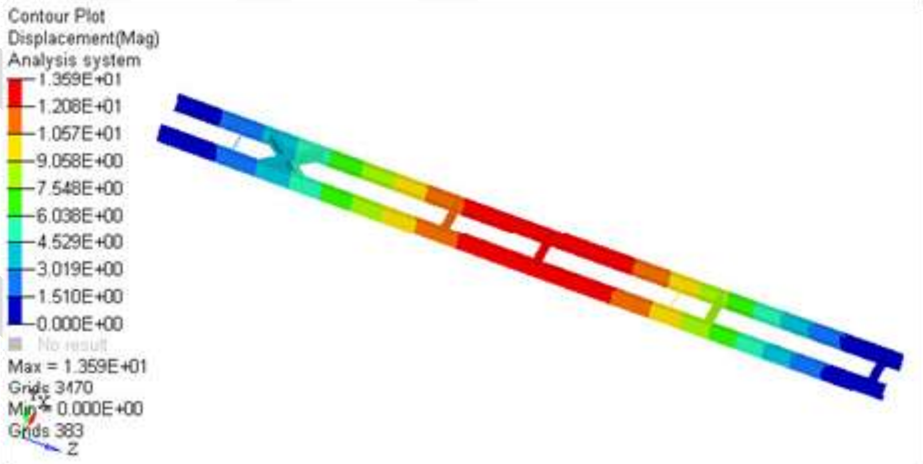

Figure 10: Displacement Plot for Material 7

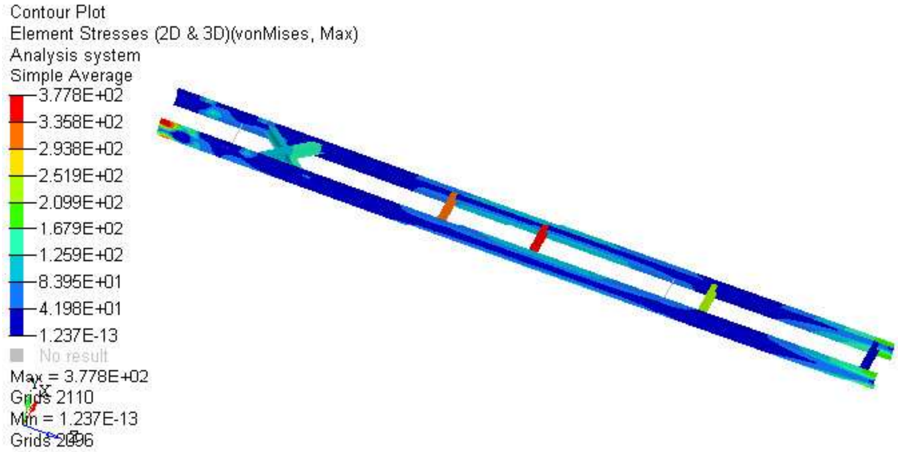

Figure 11: Stress Plot for Material 7

It can been seen that for material combination no 7 maximum weight reduction is possible economically. Also the stress and displacement values were reduced.

CONCLUSION

Static structural analysis of truck chassis was carried out. Chassis model was optimized for decreasing the weight by volume reduction and material change. Critical areas in the chassis were identified using topology optimization, where different materials were tried and simulated for weight reduction while retaining the displacement and stresses within the allowable limits. It was found the changing the materials of side members to high strength steel and cross members to carbon fiber weight reduction of 11% is possible without any reduction in strength of the chassis along with reduction in static displacement of the chassis.

FUTURE PROSPECTS

Carbon fiber is used in the production of race cars since high speed is of the utmost importance. For the use of carbon fiber in commercial vehicles some technical issues need to be resolved. Some of the issues which need to be addressed are;

1. Suitability of carbon fiber for high volume production.
2. Strengthening of composite material for high load bearing capacity.
3. Procedures for joining composites with steel.
4. Composite material process automation, especially for the positioning of reinforcements.

After addressing these issues we can successfully implement the use of carbon fiber in truck chassis.

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Emotion Recognition Using Neural Network Approaches: A Review

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Abstract— It is very interesting to recognize the human gesture for general life applications. For example, observing the gesture of a driver when he/she is driving and alerting him/her when in sleepy mood will be quite useful. Human gestures can be identified by observing the different movements of eyes, mouth, nose and hand. There are number of techniques which we use for recognizing the facial expression. Facial expressions are generated by contractions official muscles, which results in temporally deformed facial features such as eye lids, eye brows, nose, lips and skin texture, often revealed by wrinkles and bulges. The term face recognition refers to identifying, by computational algorithms, an unknown face image. Facial expressions give us information about the emotional state of the person. Moreover, these expressions help in understanding the overall mood of the person in a better way. Facial expressions play an important role in human interactions and non-verbal communication. Classification of facial expressions could be used as an effective tool in behavioral studies and in medical rehabilitation. Facial expression analysis deals with visually recognizing and analyzing different facial motions and facial feature changes. This operation can be done by comparing the unknown face with the faces stored in database. Face recognition has three stage , face location detection, feature extraction and facial image classification.

In this research, we carry out a study to recognize basic emotions (sadness, surprise, happiness, anger, and fear). Also, we propose a methodology and Neural Network for classification of emotions based facial features extraction.

The aim of this research is to develop an efficient identification algorithm based on computational intelligence approaches, with accuracy similar to that achieved by experienced Analyst.

Keywords— Emotion, expressions, identification, communication, analyzed, Recognition, behavioral.

INTRODUCTION

Humans belong to various ethnic groups with different attributes of facial features (shape, color and size). Also, they have diverse emotion expressions, depending on culture, age and gender. A system for facial emotion expression has become an active research filed in different areas such as: human robot interaction, marketing analysis, facial nerve grading in medicine, social network control and new computer game. Facial expressions reflect of physiological signals and mental activities in social interaction. Facial expressions are one of the important ways in humans and animals to conveying social information in nonverbal communication. Each emotion expression corresponds to a different motion of the facial muscles. Humans can adopt a facial expression and different emotion in each case. There are two brain pathways associated with facial expression namely: involuntarily (neural in the brain) or voluntarily (socially conditioned in the brain). But in the brain neural mechanisms and muscles are responsible for controlling the different expression in each emotion.

Facial emotion expression have been considering as one of the universal and prompt methods for human communication. People view and understand facial expressions in the social situations around them. Face Recognition generally involves two stages: firstly, is searched to find any face in the image (face Detection) and secondly, is detected, processed face and compared the results to a database of known faces (face Recognition). Finally, system decided base on sets of information and rules. Facial expressions are generate by contractions of facial muscles such as: eyebrows, eyes, eye lids, lips, mouth and wrinkles of the noise. In facial expressions the lips and eyes are often as an important component for emotion recognition. Typical changes of muscular activities are brief, lasting for a few seconds, but rarely more than 5s or less than 250ms.The reasons for this interest in facial research and analysis are multiple that namely: face tracking, face detection and face recognition in different area of the sciences.

Literature Review

Till Date What is the status of the related research work has been given:

Zhengjun Pan, Alistair G.Rust and Hamid Bolouri (2000) research on image redundancy reduction for Neural Network Classification Using Discrete cosine Transforms, Outcome of research was The available DCT features, our DCT based approach produces a recognition rate comparable to the best results reported to date from this 77% Faces identification in MLP network.

Meng Joo Er, Shiqian Lu and Hock Lye Toh (2002) Design the system achieves excellent performance both in terms of error rates of classification and learning efficiency in Face Recognition with Radial Basis Function (RBF) Neural Network. Using Kernel Direct Discriminant Analysis Algorithms Juwei Lu,Konstantinos N. Plataniotis And Anastasios N. Venetsanopoulos (2003) found a system which used for recognize facial expressions, Average Percentages Of The Error rate of KDDA is reduce in RBF and RBF polynomial 47.765%

L. Ma and K. Khorasani (2004) use Two-dimensional (2-D) discrete cosine transform (DCT) for Facial Expression Recognition Using Constructive Feedforward Neural Networks. Outcome is 83.65% Facial identify.

Meng Joo Er, Weilong Chen, and Shiqian Wu(2005) research on High-Speed Face Recognition Based on Discrete Cosine Transform and RBF Neural Networks. The Outcome of research is High Training and recognition speed, high recognition rate as well as very good illumination robustness.75.53% face identification in cosine transform and RBF Neural Network.

Mohammed Yeasin, Baptiste Bullot, and Rajeev Sharma (2006) research on Recognition of Facial Expressions and Measurement of Levels of Interest from Video. Using Visual data which is based on computer level of interest Outcome of research is recognizing six universal facial expression.The proposed approach achieved in average recognition rate of 70.9%

From the Rigorous review of the related work on Face recognized technique, it is noticed that:

1. Deciding to adopt, install, operate, and maintain accuracy in Face recognized technique

2. Facial recognition research is a subfield in a larger field of pattern recognition research and technology. Pattern recognition technology uses statistical techniques to detect and extract patterns from data in order to match it with patterns stored in a database.

3. It is very important for these systems to be able to locate or detect a face in a field of vision so that it is only the image pattern of the face (and not the background “noise”) that is processed and analyzed. This problem, as well as other issues, will be discussed as the report proceeds.

4. In these discussions we will attempt to develop the reader’s understanding of the technology without going into too much technical detail. This obviously means that our attempts to simplify some of the technical detail might also come at the cost of some rigor.

Research Methodology

i) Statistics

ii) Signal & Image processing

iii) Learning Machines such as neural network.

iv) Transformed domain techniques such as FFT, DCT, WHT etc.

For choice of suitable classifier following configuration will be investigated.

i) Multilayer perceptron Neural network.

ii) Radial Basis function Neural network.

iii) Kohonen's Self organizing feature map Neural network

For each of the architecture, following parameters are verified until the best performance is obtained.

i) Train-CV-Test data

ii) Variable split ratios

iii) Retraining at least five times with different random initialization of the connection weights in every training run.

iv) Possibility different learning algorithms such as Standard Back-Propagation, Conjugate gradient algorithm , Quick propagation algorithm, Delta Bar Delta algorithm,Momentum etc.

v) Number of hidden layers

vi) Number of processing elements of neurons in each hidden layer.

Vii) Value of step size and momentum term in each layer.

After regions training & retraining of the classifier, it is cross validated & tested on the basis of the following performance matrix.

i) Mean Square Error

ii) Normalized Mean Square Error

iii) Classification accuracy

iv) Sensitivity

v) Specificity

In order to carry out the proposed research work, Platforms/Software's such as Matlab, Neuro solutions, Microsoft Excel will be used.

Research Objectives

- To maintain the correctness & accuracy in the Face images even though the input images are contaminated by known or unknown noise.
- To increase the classification accuracy for the identification of Face emotion.

Acknowledgment

We are grateful to our HVPM College Of Engineering and Technology to support and other faculty and associates of EXTC Department who are directly & indirectly helped me for this paper.

Conclusion

This research is useful to increase the classification accuracy for the identification of Face emotion and with the help of this we can avoid many accidents.

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ADVANCED DRIVER ASSISTANCE SYSTEMS

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Abstract—The necessity of Advanced Driver Assistance Systems (ADAS) is driver error will be reduced or even eliminated, and efficiency in the traffic and transport is enhanced. The benefits of an ADAS implementations are potentially considerable because of the significant decrease in human suffering or stress, economical costs and pollution. However, there are potential problems to be expected, since task of driving an ordinary motor vehicle is changing in nature, in an direction of supervising a (partly) automated moving vehicle.

Keywords— adaptive cruise control, automotive navigation system, driver drowsiness, electronic stability control, intersection assistant, steering wheel movement

INTRODUCTION

There are many number of reasons why in recent years electronic driving aids are extremely well developed and implemented at an increasing rapid rate and speed. The first priority reason is safety (i.e. the unacceptable number of road accidents), but also the major economic principles (time is wealth, among others) are a compelling drive, while bringing comfort for the driver population is also a good sales argument. Last one which can't be ignored, environmental arguments play a pivotal role of growing importance [1].

A. *Accident causes*

Driver error is the foremost reason foe causes of accidents. Driver error stands for the mistakes made by the driver. According to the statistics 6% of world accidents are caused in India itself. Some of the main reasons for this are listening to loud music while driving car, talking in cell phones during driving, increase in number of vehicles on road, incredible roads specifically in India.

B. *Accident causation*

Tunbridge et al. (2000) argue that examination of major accidents which is most prevailing factors shows, the two most common "What happened?" some of the factors being loss of control and also failing to avoid a vehicle in the carriageway (i.e. a collision). These factors can be hierarchically categorized as representing Driver errors (& impairment), Environment, and the Vehicle factors contributing to accidents (Shinar, 1998). The incidence of alcohol was established at 3.8%, which is major reason for all accidents in England where a driver is known to be over the allowable drink drive limit (4.2%). The other important impairment related factors the situation is not very much straightforward. Impairment due to fatigue is recorded as the factor in only 0.8% of the accidents, whereas in-depth studies and large volume of anecdotal evidence shows that the above factor is more like 7-10%. This under-representation of the fatigue related accidents is now well recognized and results largely from absence of direct evidence of sleepiness or tiredness being major factors. There is no quantitative measure of all these effects on drivers. If drivers survive by an accident caused due to sleepiness they are unlikely to admit it; if they do not survive there is always often very little direct physical evidence. Other factors such as vehicle defects, which are often erroneously viewed as causes, usually need to be eliminated before the fatigue becomes apparent and dangerous [2].

C. *Electronic aids*

The reduction of traffic accidents requires the counter measures that have to be devised and introduced to prevent those behaviors contributing to major accidents. In Europe, the USA and Japan combined ergonomic and engineering approaches to hazard assessment and the indication of driver's performance limits have developed into research and development of new and appropriate (primary) safety measures. Brookhuis & Brown (1992) argue that an ergonomic approach to behavioral change via engineering measures that is in the form of electronic driving aids that needs to be adopted in order to improve road safety, transport efficiency and improve environmental quality. Driver comfort appears to be a strong asset for the development of electronic driving aids also, at least from the marketing point of view. Car manufacturers are keen on driver comfort and invest considerable amount of revenue or effort in the development and improvement in the comfort enhancing electronic aids. Some of the well-known examples of this type of applications are automotive navigation systems and adaptive cruise control systems (acc's). Though may be expensive, prototypes of various type of systems passed a number of tests (and improvements) and most of them were successfully placed on the consumer market. Before the actual marketing, to which user needs research (or marketing research) is indispensable, but also studies on acceptance and certainly safety effects are still necessary after the implementation [4].

EASE OF USE

Advanced Driver Assistance Systems, commonly called **ADAS**, are the systems to help the driver in the driving process. When designed with a safe and appropriate Human-Machine Interface, they should increase the safety of car and more generally the road safety.

Advanced driver assistance systems (ADAS) are technologies that provide a driver with needed information, automate difficult and repetitive tasks, and lead to the overall increase in safety of the car for. Some of these technologies have proven to an improved driving experience and better overall road safety. GPS navigation, taking an example, has become increasingly the most common in OEM infotainment systems since first being introduced in the 1990s.

However, a lot more of ADAS are right on the cutting edge of the emerging automotive technologies. Some of these systems will have staying power to stick around, and you can expect to see at least a few of them in future car. Others may disappear or be replaced by better implementations and modernization of the same basic idea. Since ADAS rely on electronics and mostly include firmware elements, the development of these cutting edge systems is governed by the international safety standards such as IEC-61508 and ISO-26262.

- **A brief History**

ADAS has amount of considerable history. In Europe several car manufacturers and research institutes started the Prometheus initiative in around 1986. A series of projects were carried out under this tree, most of them were aiming at practical solutions to the urban traffic problems. The European Union initiated the DRIVE which stands for Dedicated Road Infrastructure for Vehicle safety in European country, program most shortly thereafter, in which a considerable number of projects solved practical problems as well as basic issues. An example of the latter is the GIDS which stands for Generic Intelligent Driver Support project, which is the largest project in DRIVE 1, ahead of its time and still be relevant (Michon, 1993). The overall goal of this ambitious project was "to determine the requirements and design standards for a section of intelligent driver supported systems which will confirm with the accurate information requirements and performance capabilities of an individual driver". On one of the hand this section of systems will aid the driver's detection and assessment of the road and traffic hazards, on the other hand they will provide guidance on the driver's ability to deal with specific hazards [3].

METHODOLOGY

The following ADAS are available in various production models from a variety of OEMS:

A. Autonomous Cruise Control

Autonomous cruise control (ACC; also called as adaptive cruise control or radar cruise control) is an cruise control system for various road vehicles that will automatically adjusts the speed of our vehicle to maintain a safe distance from vehicles ahead. There are basically two types of systems through we can attain the adaptive cruise control, those are, **laser** based systems and **radar** based systems.

Laser based system uses light pulses whereas Radar based system uses radio waves to develop a communication between the vehicles. The radar based system is preferred over laser based system because the in adverse weather conditions such as fog and if at all the front vehicle whose speed has to be tracked is covered with dust then laser based system will show no use.

Thus based on the speed of the front vehicle our vehicle slows down when the distance between two vehicles is less and accelerates to the preset value when there is a considerable amount of distance between the vehicles [5].

Figure 1. Adaptive Cruise Control using Radar based systems

B. Automotive Navigation System

As we know today people are using the global positioning system commonly called GPS system to know the address of the locations they need to travel. This GPS system can be modified and implement inside the dashboard of the car to obtain the real time traffic information.

The traffic information comes from a variety of sources such as traffic data providers, transportation department, police and even emergency services, road sensors, traffic cameras, and also aircraft reports. This information is made to be compiled and delivered through radio frequency (FM/HD Radio or satellite) to our navigation system embedded inside the car.

In the terrestrial FM applications, the traffic signals are broadcasted over the FM Radio Data System (RDS), which is a special application of the radio band for sending small amounts of digital information. Most of the car stereos support FM radio signals, which is how you can see radio station call letters or other artist and various songs title information on your display when tuned to certain amount of radio stations [6].

- **What are the benefits?**

The major primary benefit is the *time*. Most of the times, it gives real time traffic information on your way, or if any other construction of buildings happening in your way. Thus the system gives time to change the route so that we can avoid much amount of wastage of time and utilize this time for other works. And this means less time spent sitting in the gridlock.

Figure 2. Automotive Navigation System Using GPS navigation device

C. Driver Drowsiness Detection

Driver drowsiness detection is one of the car safety technologies which helps prevent accidents caused by the driver getting drowsy. Various studies have also suggested that around 20% of the road accidents happening are fatigue-related, up to 50% on certain amount of roads.

Some of the current systems learn driver patterns and can detect when a driver is becoming drowsy.

- Technology

Various technologies may be used to try to detect driver drowsiness.

a) ***Steering pattern monitoring***
Primarily uses the steering input from electric power steering system.

b) ***Vehicle position in lane monitoring***
It uses the lane monitoring camera.

c) ***Driver eye/face monitoring***
It requires one of the cameras watching the driver's face.

d) ***Physiological measurement***
It requires body sensors for measurement of parameters like brain activity, heart rate, skin conductance, muscle activity [7].

- **Steering pattern monitoring**

Steering Wheel Movement (SWM) is measured using the steering angle sensor and it is one of the widely used vehicle-based measures for detecting the level of drowsiness of the driver. Using an angle sensor which is mounted on the steering column, the driver's steering behavior will be measured. When drowsy, the number of micro-corrections on the steering wheel normally reduces compared to normal driving because of drowsiness. Furlough and Graham observed that sleep deprived drivers made fewer steering wheel reversals than the normal drivers .To eliminate effect of lane changes, the researchers considered only small amount of steering wheel movements i.e., between 0.5° and 5°,which are needed to adjust lateral position within the lane . Fig below shows the SWM based detection. In general, steering behavior is influenced by the characteristics of driving task (e.g. speed, curvature, and lane width), even driver traits (e.g. driving experience), and driver states (e.g. laxness, distraction or fatigue). Drivers will be constantly judging the situation ahead and applying small, smooth, steering adjustments to correct for the small road bumps and crosswinds by turning the steering wheel in small increments [10].

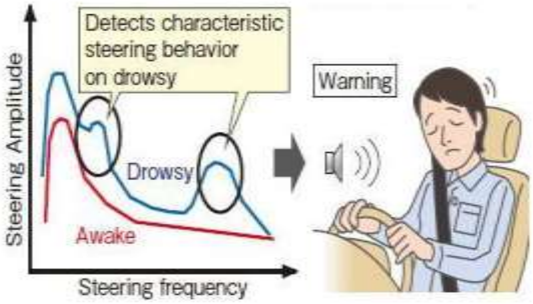


Figure 3.comparison of steering frequency vs. steering amplitude

D. Electronic Stability Control

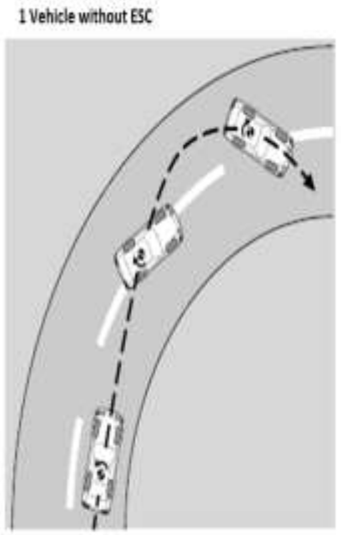
Electronic stability control (ESC), even referred to as electronic stability program (ESP) or dynamic stability control (DSC), is one of the computerized technology that improves a stability of vehicle by detecting and reducing loss of traction, even called as *skidding*. When ESC senses loss of steering control, it automatically applies the brakes to control "steer" of the vehicle where the driver intends to go. Braking will be automatically applied to wheels individually, such as the outer front wheel to achieve over steer or the inner rear wheel to undergo under steer. Some ESC systems also tend to reduce engine power until control is regained. ESC will not improve a vehicle's cornering performance; instead, it helps to minimize the loss of control of vehicle. One-third of major accidents could be prevented by the use of this technology.

Operation :

During normal driving the ESC tends to work in the background and continuously monitor steering and vehicle’s direction. It compares the driver's intended direction which is determined through the measurement of steering wheel angle to the vehicle's actual direction which is determined through measured lateral acceleration, vehicle rotation, and the individual road wheel speeds.

ESC interrupts only when it detects a probable loss of control in steering, i.e. when the vehicle is not going where the driver intended to steer.For example, when skidding during the emergency evasive swerves, under steer or over steer during wrongly judged turns on slippery roads, or even hydroplaning. ESC may also interrupt in an unwanted way during high-performance driving, because input of steering may not be always directly indicative of the intended direction of travel that is called controlled drifting. ESC estimates direction of the skid, and then applies brakes to the individual wheels asymmetrically in order to create torque about the vertical axis of the vehicle, opposing the skid and bringing the vehicle back to track with the driver's provided direction. Additionally, the system may even reduce engine power or operate the transmission to slow the vehicle down.

ESC can work on any of the surface, from dry pavement to even frozen lakes. It reacts to this and corrects skidding at much faster rate and more effectively the typical can human driver, often before the driver is even aware of imminent loss of control. In fact it led to some concern that ESC could allow drivers to become more confident in their own vehicle's handling and their driving skills. For this reason the ESC systems typically informs the driver when they interrupt, so that the driver knows that the handling of vehicle limits have been approached. Most of times it activates the dashboard indicator light and(or) even alert tone; sometimes it intentionally allow the vehicle's corrected course to deviate very slightly from the driver intended direction, even if it is possible to precisely match it [8].



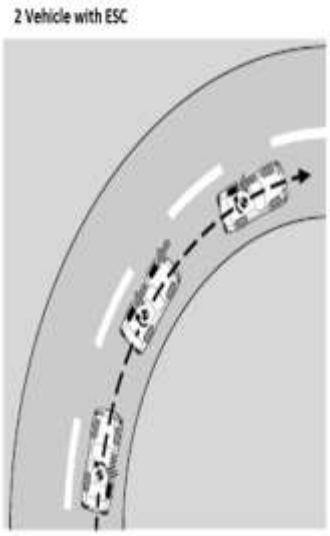


Figure 4. Vehicle without ESC   Figure 5. Vehicle with ESC

E. Intersection Assistant

A driver’s miscalculation or misconception of speed and distance or failure to stop at signals during red lights or are some of common causes of accidents at intersections.

The intersection assistant system identifies this type of critical situation at intersections and alerts the driver of red light infringements or hazardous turnoff situations. The system can even recommend the needed speed for a green traffic light wave or when approaching the red traffic light.

At the crossroads, the intersection assistant system supports the driver by establishing a direct communication between the vehicle and traffic signals. Various camera systems are installed at the intersection that monitors the traffic situation and send this obtained information together with the signal to the vehicle through wireless technology. The system evaluates the data received via wireless technology together with onboard information present from the vehicle such as speed, distance from the intersection and even direction of movement.

Appropriate traffic infrastructure equipment and various links between the infrastructure and also the vehicle communication technology offer potential for improvising traffic safety further. The driver always holds responsibility for the vehicle and will be offered support in hazardous situations from the intersection assistant system [9].

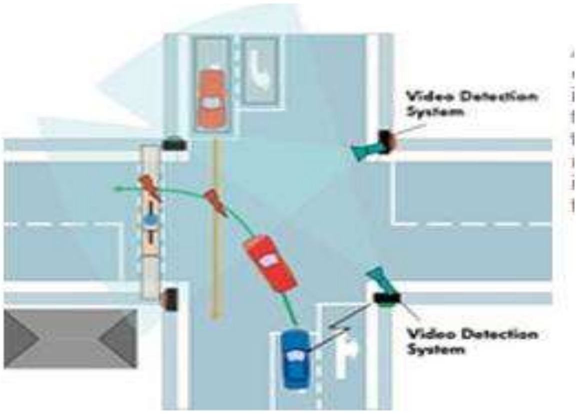


Figure 6.intersection assistant at junction

ADVANTAGES

- Managing traffic flow to increase road capacity, i.e., number of vehicles on road
- Relieving vehicle occupants from driving and allowing them to concentrate on other tasks or to rest during their journeys by relieving the driver from stress.
- To avoid the accidents as much as possible.
- Increasing roadway capacity by reducing the distances between cars by making use of adaptive cruise control.
- The track the location of vehicle can be determined using global positioning system (G.P.S) [11].

DISADVANTAGES

- If at all the vehicle is using internet which is having less security then from the hacker's point of view in some cases the vehicle can be switched off on the road itself.
- Hackers who can decrypt the encrypted information can change the route which is plotted in the system.
- If at all there is failure of main sensor and backup sensors the vehicle can create a chance of accident [12].

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CONCLUSION

The strength of ADA systems is great, provided ADAS is completely accepted and widely introduced in the future. The ADA systems will all have to be made as fail-safe as possible. Whenever the system fails to succeed, safety is to be determined by the provisions taken to avoid major accidents and in case of any accident the measures to minimize the consequences for passengers. Acceptability from customers of ADAS is highly dependent upon solid demonstration of these many features. Acceptability is also found to be most dependent of the form in which ADAS applications are implemented. For the end-user or customer the benefits should be clear and preferably directly noticeable. For this reason comfort enhancing features need a better changeover than safety enhancement properties. Most drivers consider themselves as at least better drivers with respect to safe behavior than average driver. Strict requirements for ADAS applications by all stakeholders are safe (and valid) operation and also reliability, false alarms are not all acceptable for end-users particularly

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A Review on IOT Based Smart GPS Device for Child and Women Safety Applications

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Abstract— This paper is based on IOT (Internet of Things). As we know in present era everything is based on digital technology. Nowadays every person is connected with each other by many ways,where most popular communication is internet so it is internet which connects people. This paper proposes an Android based solution to aid parents to track their children in rea ltime. Different devices are connected with a single device through channels of internet. The concerned device is connected to server via internet.The device can be used by parents to track their children in real time or for women safety. The proposed solution takes the advantage of the location services provided by GSM. It allows the parents to get their child's location on real time by SMS. Here,a prototype model (device) is created which is simulation based. The work comprises ARM-7 LPC2148 as microcontroller, along with GPS and GSM module. Embedded C core compile using Keil and virtual simulation check using Proteus 8.1 is done.A server is created which will collect all the data generated by our prototype system and send the same to server using GPRS. A Dummy server will be created by using Filezilla. This device will also have the facility of Emergency help key (SOS), if anyone presses the key , automatic help message will be sent to 3 registered mobile numbers on Server.

Keywords— Embedded System,Smart System,Internet,

1.INTRODUCTION

The Internet of Things (IoT) refers to the use of intelligently connected devices and systems to exploit data gathered by embedded sensors and actuators in machines and other physical objects [11]. IoT refers to the ability of network devices to sense and collect data from the world around us, and then share the data across the Internet where it can be processed and utilized for various purpose.

The IoT is comprised of smart machines interacting and communicating with other machines, objects, environment and infrastructures. Almost every device today has an embedded processor typically a microcontroller or MCU, along with user interfaces, that can add programmability and deterministic "command and control" functionality. The electrification of the world and the pervasiveness of embedded processing are the keys to making objects "smart." Your old toaster that mechanically controlled the color of your toast now has an MCU in it, and the MCU controls the color of your toast. The toaster completes its task more consistently and reliably, and because it is now a smart toaster, it has the ability to communicate with you electronically using its touchpad or switches. After a device becomes smart through the integration of embedded processing, the next logical step is remote communication with the smart device to help make life easier. For example, if I am running late for the office, can I turn on my house lights for security reasons using my laptop or mobile phone?

Communication capability and remote manual control lead to the next step … how do I automate things , based on my settings having sophisticated cloud-based processing, make things happen without my intervention? The ultimate goal of some IoT applications is to connect with the Internet to achieve the goal,for which they must first become "smart" (incorporate an

MCU/embedded processor with an associated unique ID) then connected and, finally, controlled. Those capabilities can then enable a new class of services that makes life easier for users.

The term Internet of Things was first coined by Kevin Ashton in 1999 in the context of supply chain management. However, in the past decade, the definition has become more inclusive covering wide range of applications like healthcare, utilities, transport, etc. Although the definition of 'Things' has changed as technology evolved,however, the main goal of making a computer sense information without the aid of human intervention remains the same. The evolution of current Internet into a Network of interconnected objects not only harvests information from the environment (sensing)and interacts with the physical world (actuation/command/control), but also uses existing Internet standards to provide services for information transfer, analysis, applications, and communications. Fueled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well as embedded sensor and actuator nodes, IoT has stepped out of its infancy and is on the verge of transforming the current static Internet into a fully integrated Future Internet. The Internet revolution led to the interconnection between people at an unprecedented scale and pace. The next revolution will be the interconnection between objects to create a smart environment. Only in 2011 did the number of interconnected devices on the planet overtook the actual number of people. Currently there are 9 billion interconnected devices and it is expected to reach 24 billion devices by 2020.

In today's world, over 80% of the world population, including children around the age of eight or seven, owns smart phones. This is due to many reasons. One of them is the remarkable features and capabilities that new smart phones offer especially Android based smart phones. GPS offers outstanding capabilities in locating position and this can be used to develop resourceful application that helps in locating missing or lost children [1].

The essential idea of the *IoT* has been around for nearly two decades, and has attracted many researchers and industries because of its great estimated impact in improving our daily lives and society [2]. When *things* like household appliances are connected to a network, they can work together in cooperation to provide the ideal service as a whole, not as a collection of independently working devices. This is useful for many of the real-world applications and services, and one would for example apply it to build a smart residence; windows can be closed automatically when the air conditioner is turned on, or can be opened for oxygen when the gas oven is turned on. The idea of IoT is especially valuable for persons with disabilities, as IoT technologies can support human activities at larger scale like building or society, as the devices can mutually cooperate to act as a total system [2]. The Internet revolution led to the interconnection between people at an unprecedented scale and pace. The next revolution will be the interconnection between objects to create a smart environment [10].

The wide variety of potential IoT applications needs a software development environment that ties together the applications, the command, control and routing processing and the security of the node and system. While the importance of software in MCU solutions has increased during the past few years, for MCUs supporting the IoT, even more software, tools and enablement will be needed. A broad ecosystem with easily accessible support is key to enabling the development of embedded processing nodes and IoT applications [9].

These days, however, with technology growing at a fast pace, automated vehicle tracking system is being used in a variety of ways to track and display vehicle locations in real-time. In this project we are using the concept of tracking the child instead of vehicle. One device is connected with server via internet. Using that device parents will track their children in real time or women safety. The proposed solution takes the advantage of the location services provided by GSM since kids carry that device. It allows the parent to get their child's location on a real time by SMS.

2. Literature Review

Ten "critical" trends and technologies impacting IT for the next five years were laid out by Gartner [5]. The Internet is expanding into enterprise assets and consumer items such as cars and televisions. The problem is that most enterprises and technology vendors are yet to explore the possibilities of an expanded Internet and are not operationally or organizationally ready. Gartner identifies four basic usage models that are emerging:

- Manage
- Monetize
- Operate
- Extend

These can be applied to people, things, information, and places, and therefore the so called "Internet of Things" will be succeeded by the "Internet of Everything."

The Internet of Things is not a single technology, it's a concept in which most new things are connected and enabled such as street lights being networked and things like embedded sensors, image recognition functionality, augmented reality, near field communication are integrated into situational decision support, asset management and new services. These bring many business opportunities and add to the complexity of IT. To accommodate the diversity of the IoT, there is a heterogeneous mix of communication technologies, which need to be adapted in order to address the needs of IoT applications such as energy efficiency, security, and reliability. In this context, it is possible that the level of diversity will be scaled to a number of manageable connectivity technologies that address the needs of the IoT applications, adopted by the market, that have already proved to be serviceable, supported by a strong technology alliance. Examples of standards in these categories include wired and wireless technologies like Ethernet, Wi-Fi, Bluetooth, ZigBee, and Z-Wave. Distribution, transportation, logistics, reverse logistics, field service, etc. are areas where the coupling of information and "things" may create new business processes or may make the existing ones highly efficient and more profitable. The Internet of Things provides solutions based on the integration of information technology, which refers to hardware and software used to store, retrieve, and process data and communications technology which includes electronic systems used for communication between individuals or groups. The rapid convergence of information and communications technology is taking place at three layers of technology innovation: the cloud, data and communication pipes/networks and device. The synergy of the access and potential data exchange opens huge new possibilities for IoT applications. Already over 50% of Internet connections are between or with things. In 2011 there were over 15 billion things on the Web, with 50 billion+ intermittent connections.

Enabling technologies for the Internet of Things considered can be grouped into three categories: i) technologies that enable "things" to acquire contextual information, ii) technologies that enable "things" to process contextual information, and iii) technologies to improve security and privacy. The first two categories can be jointly understood as functional building blocks required building "intelligence" into "things", which are indeed the features that differentiate the IoT from the usual Internet.The third category is not a functional but rather the de facto requirement, without which the penetration of the IoT would be severely reduced.The IOT development implies that the environment, cities, buildings, vehicles, clothing, portable devices and other objects have more and more information associated with them and/or the ability to sense, communicate, network and produce new information. In addition, the network technologies have to cope with the new challenges such as very high data rates, dense crowds of users, low latency, low energy, low cost and a massive number of devices, The 5G scenarios that reflect the future challenges and will serve as guidance for further work are outlined by the EC funded METIS project [2]. As the Internet of Things becomes established in smart factories, both the volume and the level of detail of the corporate data generated will increase. Moreover, business models will no longer involve just one company, but will instead comprise highly dynamic networks of companies and completely new value chains. Data will be generated and transmitted autonomously by smart machines and these data will inevitably cross company boundaries. A number of risks are associated with this new context – for example, data that were initially generated and exchanged in order to coordinate manufacturing and logistics activities between different companies could, if read in conjunction with other data, suddenly provide third parties with highly sensitive information about one of the partner companies that might, for example, give them an insight into its business strategies. New instruments will be required if companies wish to pursue the conventional strategy of keeping such knowledge secret in order to protect their competitive advantage. New, regulated business models will also be necessary – the raw data that are generated may contain information that is valuable to third parties and companies may therefore wish to make a charge for sharing them. Innovative business models like this will also require legal safeguards (predominantly in the shape of contracts) in order to ensure that the value added created is shared out fairly, e.g. through the use of dynamic pricing models.

United States border security has become a major concern in the recent past. In order to enhance border security, a system must be put in place to allow the tracking of shipments from origin to destination. U.S. Department of Homeland Security requests proposals of cargo transportation security tools for U.S. Customs and Border Protection (CBP). This project is to develop a centralized, internet based security tool which utilizes RFID and GPS technologies to identify drivers and track the load integrity. The system will accomplish the security testing in real-time using the internet and the U.S. Customs' database (ACE). A central database and the interfaces between the database and ACE will be established. After the vehicle is loaded, all openings of the tanker are sealed with RFID tags (E-seals). Then the RFID antenna and tag reader received and transmitted the signal, wirelessly connected with the databases. Also the GPS tracker traced the cargo's location at any time and reported to the system when necessary. This will serve as testing grounds for the implementation of security measures that can help prevent future terrorist attacks and help in assuming that the goods & products are not compromised while in transit. The system will reduce the labor work of security check to its minimum. It will also help in online billing. This technology's two main focuses are private companies and the government. It can be used by a company to expedite the shipment and receiving process, streamline the billing and invoicing process, and to automate potential Federal Government container racking requirements. The government can utilize this technology for shipping container validation, verification of load integrity, potential notification of special scenarios such as late or lost shipments, and as a tool to interact with the U.S. Customs and Border Protection's ACE database for border control [7].

Many types of smart devices are available in the world. Some devices for personal safety and some are for vehicle tracking. This project is designed to be used by parents and aimed to help locating missing or lost children. It takes advantage of the fact that many of today's children own smart phones which is convenient for this kind of situation. In this work, GPS is combined with one of the basic service of a smart phone which is GSM, more specifically SMS, in one system. An application at the parent's side will allow parents to send a location request to child side then retrieve the location from the request reply and display it on the map. On the other hand, the application at the child's side gathers the necessary information of the smart phone that will be used to locate the smart phone. Information such as GPS coordinates and time are gathered and sent to the parent smart phone that's preregistered on the application. The communication between the parent and the child applications is done using Short Message Service (SMS). It will allow the system to work without the need of internet connection thus allows the application to be implemented on smart phones that don't support GPRS, 2G or 3G internet connectivity. The system sends the location of child's smart device to parent's smart phone when the parent wishes to check on the child [1].

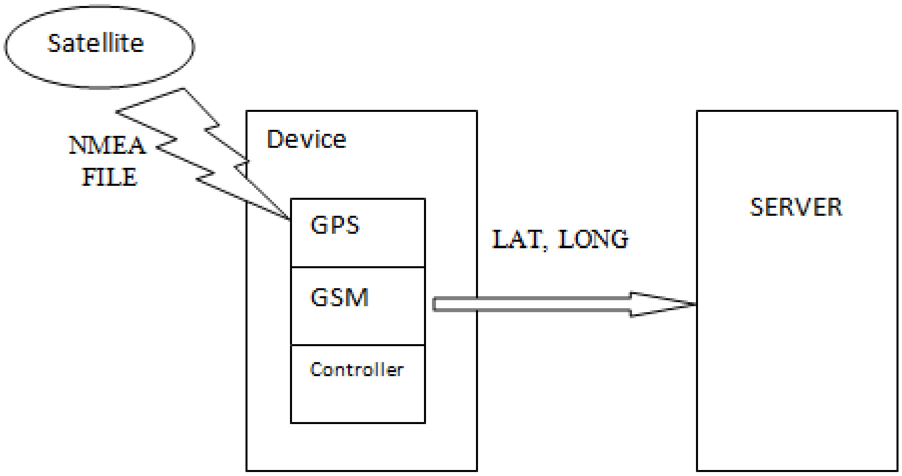

Fig.1 Architecture of the Proposed System

Recently, new device models have dropped to sizes wearable in a wristwatch capacity [6]. Some research uses stand-alone GPS chips alongside several other off-the-shelf embedded development components to create a GPS-based statistical wristwatch for runners. Some existing products utilize accelerometers to gather data such as velocity. A GPS-based, watch-sized device could deliver more consistent, higher precision velocity data as well as location data. Runners could view this data to compete with themselves for their best time up. Several current solutions exist for runners who desire the functionality our proposed device offers. Cellular phones are often the bane of specialized devices, and applications exist which provide GPS-based running data [6].

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CONCLUSION

We have already seen the wide application of IOT. More objects are becoming embedded with sensors and gaining the ability to communicate.There are many types of applications emerging one of most common being tracking system i.e monitoring the behavior of persons,things,or data through space and time.The solution proposed in this paper takes advantage of the rich features offered in Androids smart phones. This work presents a model which is based on GPS tracker system.Here,ARM-7 LPC2148 is to be used as microcontroller,along with GSM and GPS module.The programming is done using Keil and the simulation check will be done by Proteus 8.1.A server will be created which will collect all data generated by the prototype system.By help of GPRS,same is sent to the server.The main feature of this application is to get the child’s location without its interaction in the process with simple and cost effective method,done by use of GSM and SMS.

The device will also have the emergency key (SOS).In case of any emergency,if anyone presses the key ,automatic help message will be sent to any 3 registered mobile numbers on the server. like any software product or design, there is still room for enhancement. Features can be added to enhance the system. The proposed system will be implemented, continued, reviewed And improved in a later work.

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Treatments to Distillery Spent wash by Electro coagulation [EC] and Adsorption: A Review

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ABSTRACT- Distillery industries are one of the most polluting industries in world, generating very high strength wastewater which effect seriously on environment. The industry produces dark brown colored wastewater which have unpleasant odor known as spent wash. On production of alcohol, large amount of wastewater produced. Generally 8-15 lit of spent wash was generated on production of 1 lit of alcohol. The spent wash has high characteristics like COD, BOD, Color and TDS, which are difficult to remove easily. For supplementing existing waste treatment, there are number of studies carried out for removal of color and COD of spent wash. This review represent on overview of pollution caused by distillery spent wash and treatment technologies used such as Electro coagulation, adsorption and combination of different sand media as a filter.

Keywords: spent wash, melanoidin, decolourization, Electro coagulation, molasses, adsorption, activated charcoal.

INTRODUCTION

Distillery industries are one of 17 most polluting industries in India and generate large volumes of spent wash that effect on environment [Khandegar et al., 2014]. Sugarcane molasses is the raw material which used for production of alcohol. Molasses is the dark brown, viscous liquid, which is very common feed stock for industrial fermentation process, for effective fermentation process molasses diluted 1-3 fold [wagh et al., 2015].The dark brown color of spent wash affect the process of photosynthesis if disposed without any treatment and causes depletion of dissolved oxygen [Khandegar et al., 2014]. Spent wash released to environment is hazardous and introduces various toxic substances which result in change in physicochemical characteristics of soil and water [Eyob Kebede et al., 2015]. The odor of spent wash spread over the area and result into serious public hazard [Bharat kumar et al., 2015]. Economical and eco-friendly treatments are need of society also greatest challenge to environmentalist [wagh et al., 2015]. Spent wash contains 2% of melanoidins pigments that result of mailard type reactions of amino acids with reducing sugars [Wagh et al., 2015]. There are number of methods to treat distillery waste especially COD and color such as physical, chemical and biological [wagh et al., 2015]. Anaerobic treatment is an accepted practice for treatment of spent wash but however even after treated by anaerobic treatment pollutant level cannot meet effluent standards laid by CPCB [Kolte et al., 2014]. Bio-methanation of raw distillery spent wash followed by aerobic treatment is the common practice in India. Aerobic treatment can remove 50-70% of COD and Color but still 100% result yet to be achieving. [wagh et al., 2015].

General characteristics of spent wash generated during alcohol production are summarized as follows:

Table I Characteristics of spent wash **[**Khandegar et al., 2014; wagh et al., 2015**]**

Sr.No	Parameter	Range
1	Ph	3 – 4.5
2	BOD	50,000 – 60,000
3	COD	1,10,000 – 1,90,000
4	TS	1,10,000 – 1,90,000
5	TSS	13,000 – 15,000
6	TDS	90,000 – 1,50,000

7	Chlorides	8,000 – 8,500
8	Phenols	8,000 – 10,000
9	Sulphate	7,500 – 9,000
10	Phosphate	2,500 – 2,700

Distilleries Effluent Discharge Standards

Ministry of Environment and Forests (Government of India) has specified Standards for different industries taking into account the characteristics of the effluents the drainage water from the land after such treatment has to satisfy a limit of 30 mg/l of BOD.

Table II [Wagh et al., 2015, CPCB &M_OEF 2002]

Sr.No.	Parameter	Standards
1	pH	5.5-9
2	Color and Odor	Absent
3	BOD 3 at 27 0C mg / l Max 1. Disposal into land surface water/ rivers/ streams 2. Disposal on land or for irrigation 3. Suspended Solids mg/l Max	30 100 100

II. Process Description

Alcohol Manufacturing Process

Alcohol manufacturing process consists of different steps such as feed preparation, fermentation process, distillation process and packing shown in figure

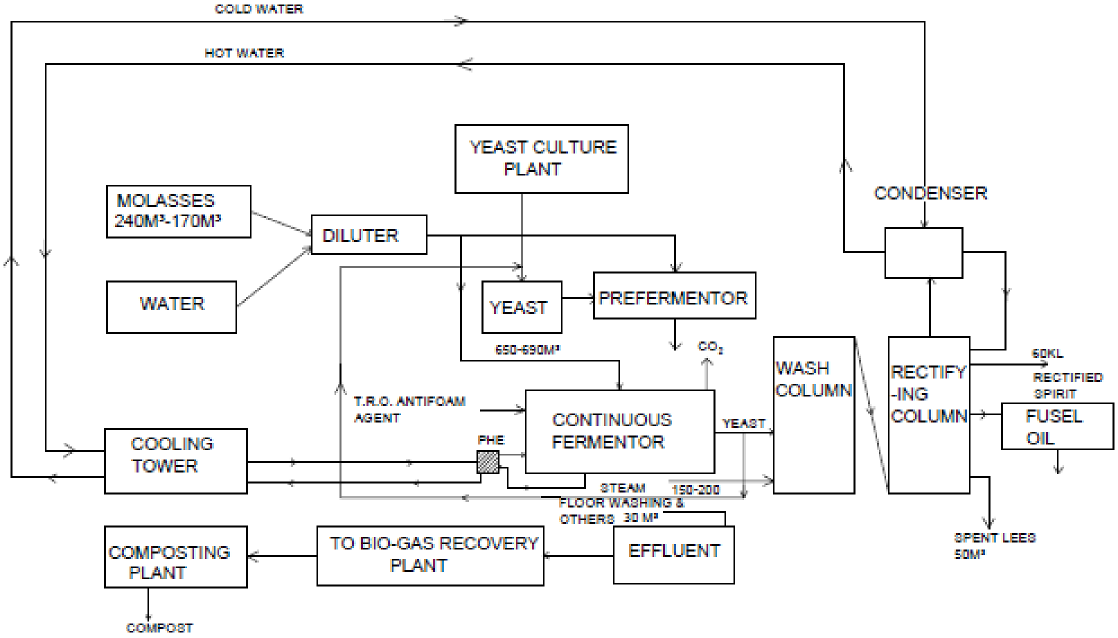

Figure 1. Alcohol manufacturing process flow diagram [wagh et al., 2015]

Electro coagulation:

Electro coagulation is an emerging technology that combines the advantages of conventional floatation, coagulation and electrochemistry in water and wastewater treatment [Kuokkanen et al 2013]. Then requirement for quality drinking water expanded all around, and profluent principles of wastewater get to be stringent, thusly it important to create compelling conservative and eco friendly treatment. This prompted enthusiasm for electro coagulation as exploration for researchers [Kuokken et al., 2013]. Electro coagulation is a straightforward and successful treatment strategy for wastewater [Khandegar et al., 2014]. Wagh et al., (2015) uncovered that most extreme 99.78% shading expulsion was gotten by utilizing Fe-Fe anodes at 25 Volts for pH 8 and ideal COD evacuation of 85.71% for pH 3 at EC time of 150 minutes. Shading expulsion productivity of electro coagulation is reductions with expansion in convergence of melanoidin he additionally specified that cathodes utilization increments with increment in centralization of melanoidin [kobya et al., 2012]. Proficiency of the Chemical oxygen demand (COD) expulsion hindered with expansion in pH, separating between anodes assumes critical part in decolourization of melanoidin , COD evacuation productivity quicken with expansion out yonder between electrodes[Khandegar et al., 2014]. Acidic condition is more positive for treatment of refinery spent wash because of diminished creation of chlorine or hypochlorite at higher pH[Krishna B.M. et al., 2010]. Al-Al cathodes are more compelling to evacuate shade of distiller spent wash when contrasted with al-fe and Fe-Fe anodes because of Fe iron produced amid the EC proclaim from iron terminals has high dissolvability at acidic condition and are effectively oxidized into Fe, since Fe is hard to settle [kobya et al., 2003, 2012]. Aluminum anodes are evacuate most extreme shading up to 96.09% aluminum cathodes are more powerful than iron terminals. By utilizing graphite – graphite electrodes 85.2 % COD evacuation at pH 6.9-7.2 and span is 180 minutes, by utilizing Al-Al terminal 72.3% COD expelled in 2 hours when pH 3[Krishna B.M et al., 2010, Khandegar et al., 2014; kobya at al., 2003]. Electro coagulation strategy can be effectively utilized for the treatment of refinery spent wash [Khandegar et al., 2014]. The upsides of EC over traditional coagulation incorporate financial viewpoints (moderately low speculation, maintaince, vitality and treatment costs), altogether bring down volume of muck produce, better slop quality, comparative or marginally better effectiveness, shirking of compound increments, simplicity of robotization ,straightforward equipment and conservative size of EC frameworks, more noteworthy practical pH extent and pH balance impact and the nearness of electro floatation [Kuokkanen et al., 2013].

Electrolysis is a procedure in which oxidation and decrease responses happen when electric current is connected to an electrolytic arrangement. At it least difficult, an electro coagulation framework comprises of an anode and a cathode made of metal plates, both submerged in watery arrangement being dealt with [Emamjomeh et al., 2009]. An Electro coagulation framework may contain it is possible that one or various anode-cathode combines and might be associated in either bipolar mode [Emamjomeh et al., 2009]. The most imperative variable affecting the productivity of EC procedure are the anode materials utilized , connected current thickness, treatment time, and arrangement science, including beginning pH and the concoction creation of the aqueous arrangement being expelled. The arrangement temperature , kind of salt used to raise conductivity, nearness of chlorides, cathode hole, passivation of anode, water stream rate additionally affect the evacuation efficiency and financial sturdiness of a given EC application [Kuokkanen et al., 2013]. Krishna Prasad et al., (2008) found that 95% shading expulsion was acquired with 31 mA / cm^2, weakening of 17.5%, and 4 hour electrolysis plan. Körbahti et al., (2008) presumed that 100% contamination load, 61.6% COD, 99.6% color removal, and 66.4% turbidity were expert by an electrochemical reactor, where ideal conditions for leading the investigation were at temperature of 30 degrees Celsius, 25 g/L electrolyte focus, 8 V electrical potential, with a 35.5 mA / cm^2 current thickness.

Having considered current thickness, pH, and electrolysis outline, the creators were fit for concentrating on the impacts of COD, turbidity, TS evacuation, and ooze settling with aluminum cathodes. Vasudevan et al., (2010) considered utilizing mellow steel as anode and cathode, expelling 98.6% arsenate at a present thickness of 0.2 A/dm2, and a pH of 7. Energy established that the evacuation was inside 15 minutes, taking after a second request rate retention. At long last, Langmuir adsorption isotherm portrays fittingly this condition. Balasubramanian et al., (2010) displayed adsorption isotherm energy for arsenic expulsion from watery arrangements by method for electro coagulation through reaction surface philosophy.

Thakur et al., (2009) presumed that COD and shading evacuation of 61.6% and 98.4%, individually, were equipped for treating bio-digester gushing inside an electro coagulator. This was a consequence of a bio-digester plant took after by two-stage oxygen consuming treatment. While considering a second-arrange relapse model for this wonders—pH, current thickness, between cathode separation, and electrolysis time as parameters, the model closed a r2 estimation of 0.9144 for COD and 0.7650 for shading.

Gadd et al., (2010) presumed that treatment productivity was identified with the anode region, alongside coagulant and air pockets, elements of terminal zone, current thickness, and effectiveness. This operation was finished utilizing a vertical plate electro coagulation treating molasses process wastewater. M. Kobya et al., (2007) uncovered that Acidic medium is best for a high COD expulsion for both terminal materials; iron cathode performs obviously better with BP-S mode, while the execution of aluminum is not unequivocally subject to association mode. For a high turbidity expulsion, the ideal pH relies on upon the terminal material; aluminum anode associated in BP-S mode performs better in acidic medium, while the poor filterability of the flocs manages pH 7 to be more appropriate for the iron cathode associated in MP-S mode.

Modified Table Electro coagulation used for treatment of distillery spent wash (Wagh et al., 2015).

Current density in A/cm^2	Time (Min)	pH	% Colour Removal	% COD Removal	Anode –Cathode	Reference
0.817	120	3	-	81.3,71.8,52.4	Al-Al, Al-Fe, Fe-Fe	Khandegar et al., 2014
0.01	140	3	-	56	Al-Al	Krishna B.M.et al., 2010
0.143	180	5	-	37	RuO2-Ti – SS	Prasad et al., 2009
1.467	150	6.75	-	61.6	SS-SS	Thakur et al., 2009
0.06	180	6.9-7.2	-	85.2	Graphite-Graphite	Manishankar et al., 2004
0.03	180		-	84	Mixed metal oxide (MMO) electrode	Asaithambi et al., 2012
0.71 0.718	60 60	7.5 7.2	-	60,50 99.88	Al-Al, Fe-Fe Al-Al, Fe-Fe	Khandegar et al., 2014
0.03	140	7	94	-	Al-Al	Shruti et al., 2013
0.03	140	7	97.76	-	Al-Al with Fenton reagent	Shruti et al., 2013

0.03	240	6	100 89 7	83 60 7	Ozone assisted EC Al-Al electrodes Ozonation	Asaithambi et al., 2012
- -	150 150	8 3	99.78 -	- 85.71	Fe-Fe electrode Al-Al electrode	Wagh et al., 2015
0.04	120	3	96.09	85.7	Al-Al electrode	Wagh et al., 2015

Adsorption techniques

Bharat kumar et al., (2015) revealed that adsorbent technique is one of best method for removal of pollutants from distillery spent wash and we can reuse the effluent characteristics so it could be used for irrigation to reduce pressure over normal irrigation water. It is beneficiary to use diluted effluent for better growth of plants. Activated charcoal is an ideal adsorbent for removal of color of wastewater and 99.7% discoloration was found and maximum COD removal of 58.15% by using activated charcoal [Bharat Kumar et al., 2015]. Carbon has been utilized as an adsorbent for a considerable length of time. Enacted carbon capacity to expel mixes from wastewater expanded its utilization from most recent 30 years. Adsorption is normal procedure by which atoms of a broke up compound gather on and hold fast to surface of an adsorbent solid[Bhise et al., 2012]. It is ideal to go for adsorption by utilizing enacted carbon before treating refinery spent wash by electro coagulation. When all is said in done the most extreme rate decrease in every parameter has been found in filtration bed containing sand, dirt and charcoal [Eyob kebede et al., 2015]. The most extreme shading expulsion with adsorption process with was discovered 0.550 [Bhise et al., 2012].

Primary treatment through biomethanation and energy recovery – an economic process practiced in Indian distilleries is however, does not meet the discharge standards (CPCB, 2002). In absence of acceptable and efficient methods for further treatment of digested spent wash, many a times it is discharged into water bodies or on the land directly. It is much more hazardous when disposed into water bodies, since it will lead to complete depletion of dissolved oxygen and destruction of aquatic life. If disposed untreated on land, it reduces alkalinity of the soil, and crops may be destroyed. In some parts of the country, color problems in groundwater are very acute (Chauhan and Dikshit et al., 2007).

Shivayogimath et al., (2014) concluded that maximum removal of COD,TDS and color of 95.2%, 89.8% and 62.83% respectively & obtained at parameter 6 hours of contact when treated with a activated carbon dose of 10g/ml at pH 2.& also activated carbon could be a feasible alternative for the treatment of biomethanated distillery spent wash. Conventional methods can accomplish only low degradation of melanoidins it is necessary to explore additional treatments to remove color from molasses effluent. Melanoidins can be removed by physicochemical treatments, but these methods require high reagent dosages & generate large amount of sludge (Chine and Korake et al., 2012). Adsorption is one of the set up unit operations utilized for the treatment of wastewater. Enacted carbon is the most utilized adsorbent. As business enacted carbons are exorbitant; subsequently elective ease adsorbent has been the centered. Also, the preparing and change of farming deposits into enacted carbon with great adsorption properties would mitigate issues of transfer and administration of these waste by-items, while giving an astounding finished item for water and wastewater treatment [Shivayogimath et al., 2014]. It was prescribed that the waste slime from this industry be used as a substitute for ordinary coagulants. Adsorption happens when the attractive strengths at the carbon surface defeat the appealing powers of the fluid. Granular enacted carbon is great retentive medium because of its high surface range to volume proportion. Likewise other material is utilized to evacuate the metal, for example, peat, fleece and silk.[Sohail Ayub, Nusrat Ali et al., 2016]

Sand filtration technique

There are several technologies that have been explored for treatment of waste water; this can be generally classified as physical, chemical and biological methods. The aim of present study is to develop a simple and economical method of wastewater treatment disposed from distillery industry. Maximum percentage reduction in COD and color was in filter containing sand, clay and charcoal. The proficiency of filtration bed can be requested as sand: dirt, sand: clay: ash, sand: clay: charcoal mix. There are different propelled strategies for wastewater treatment yet most are uneconomical yet sand filtration procedures can be considered as an option and prudent strategy to treat waste water [Eyobe kebede et al., 2015].

Prasad G. et al., (2007) concluded that maximum COD removal of 78.96% was recorded at 2 feet sand depth of sand soil ratio of 3:1. The distillery effluent was passed through filter bed with various ratios. There is significant reduction in removal of COD, BOD and color without any labour and energy cost except filtration bed. Optimization of sand size, depth of filter and with mathematical modeling is required to increase filtration rate.

Conclusions

Electro coagulation with Adsorbent and sand filtration can be prove efficient technology to treat highly polluted wastewaters, from above literature we conclude that

- It is possible to reduce the pollution from waste water by using locally available material by application of sand and soil as an alternative and economical method to treat wastewater.
- Adsorption using activated carbon is better choice before treating distillery spent wash before Electro coagulation.
- The distillery wastewater after adsorbent treatment is suitable for irrigation purpose.
- On increasing of contact time and adsorbent dose after the limit there is not much effect on removal of pollutants.
- Electro coagulation is an economical method for treatment of distillery spent wash but only problem is about secondary sludge developed during EC process.

Acknowledgement

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Bursting and Chaotic Activities in the Nonlinear Dynamics of FitzHugh-Rinzel Neuron Model

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Abstract— Selection of an appropriate neuron model for neuroscience studies is a crucial task for researchers. Some of the neuron models are too simple to exhibit the complex dynamics of the neuron and others are very complex and cannot be used in a network as they result in computationally expensive analysis. Study of chaotic behavior and bursting phenomenon of biophysical neuron models is an important step towards analyzing the overall functioning of the brain. In-depth analysis of bursting and chaotic behavior of FitzHugh- Rinzel neuron model has been made in this paper work.

Keywords— Biological Neuron, Time Response, Phase Portrait, FitzHugh-Rinzel Model, Nonlinear Dynamics, Bursting, Chaotic Behavior.

INTRODUCTION

The brain is one of the most complex objects in the universe. Although many attempts have been made to investigate and model the functionalities of the brain, the exact working of it is still unknown. The research in the field of computational neuroscience is aimed to know about the brain with more intricacy and to develop more realistic models of its constituents. These models are important tools for characterizing what nervous systems do, determining how they function, and understanding why they operate in particular ways. As most of these models are dynamical in nature, theory of dynamical systems is useful in gaining new insights into the operation of nervous system. The primary step for understanding the brain dynamics is to understand the dynamical behavior of mathematical models of individual neurons. The most important part of this study is the bifurcation analysis of the neurons and their networks. Certain bifurcations in the membrane potential result in neural excitability, spiking, and bursting. Revealing these bifurcations in neuron models helps in knowing various functions of the brain. Such types of studies include the analysis of chaotic behavior of neural systems. These neural systems can be individual neurons or their interconnections. The ongoing research in this regard is to examine the role of chaos in learning. Exploring dynamics of biological neuron models is helpful not only in neuroscience studies but also in neural network applications.

In literature, different dynamical models are proposed to represent bio- physical activities of neurons. Commonly used models for the study of spiking and bursting behaviors of neurons include integrate-and-fire model and its variants [5, 6, 18, 30], FitzHugh-Nagumo model [7], Hindmarsh-Rose model [15, 10], Hodgkin-Huxley model [13, 11] and Morris-Lecar model [25]. A short review of these models is provided by Rinzel in [26, 27, 28]. An excel- lent comparison of more than twenty neurocomputational properties of the most popular spiking and bursting models have been made in [16]. Bifurcation phenomena in individual neuron models including the Hodgkin-Huxley, Morris-Lecar and FitzHugh-Nagumo models have been investigated in the literature [15, 27, 4]. Rinzel and Ermentrout [27] studied bifurcations in the Morris-Lecar model by treating the externally applied direct current as a bifurcation parameter.

From various experiments, it has been well established that neuronal activities show many characteristics of chaotic behavior. Some researchers believe that this sort of behavior is necessary for the brain to engage in continual learning – categorizing a novel input into a novel category rather than trying to fit it into an existing category [29, 9, 1]. Freeman developed a mathematical model for EEG signals generated by the olfactory system in rabbits [9]. He suggested that the learning and recognition of novel odors, as well as the recall of familiar odors can be explained through chaotic dynamics of the olfactory cortex. Attempts have been made to represent the neurodynamics of biological neural networks in terms of artificial neural network type of structures with some extent to their intricacies. Chaotic dynamics based neural networks have also been proposed to capture some of the characteristics of learning in the brain [2]. Nonlinear dynamics of various neuronal models has been investigated in [24, 19, 20]. Chaos in firing rate recurrent neural network models have been investigated in [22]. The effect of synaptic bombardment has been explored in the dynamics of various biological neuron models [21]. Nonlinear dynamical analysis on coupled modified FitzHugh-Nagumo neuron model has also been performed [23].

The brain takes the incoming sensory data as input, encodes them into various biophysical variables and performs a number of computations on these variables to extract relevant features from the input. Biophysical mechanisms responsible for these computations are dynamical in nature and lead to various types of learning. Therefore, there are two closely related issues in computational neuroscience – nonlinear dynamics of different constituents of nervous system and the roles of various biophysical activities in learning. There have been many evidences in literature to experimentally explore the chaotic behavior of neuronal activities. Study of chaos and other phenomena of nonlinear dynamics in various levels of brain modeling can provide a significant help in investigating the learning mechanism.

Nonlinear dynamical analysis of FitzHugh-Rinzel neuron models is carried out to investigate different bifurcations and chaos. The same analysis has been carried out also for a firing-rate recurrent neural network of three neurons and it is observed that its dynamical behavior becomes chaotic at some set of parametric values. This study supports the role of chaos in continual learning – categorizing a novel input into a novel category rather than trying to fit it into an existent category.

NEURON MODELS

Neurons or nerve cells are the fundamental building blocks of the nervous system. These cells form the basis of the brain. Therefore, a sufficient in-depth knowledge of neurons is necessary for study of the brain. A typical human brain consists of approximately 100 billion neurons, each neuron having at least 10,000 connections with other neurons. A typical neuron has three major regions: the soma, the axon and the dendrites. Dendrites form a dendritic tree which is a very fine bush of thin fibers around body of the neuron. Dendrites receive information from neurons through axons– long fibers that serve as transmission lines. An axon is a long cylindrical connection that carries impulses from the neuron. The end part of an axon splits into a fine arborization which terminates in a small end-bulb almost touching the dendrites of neighboring neurons. The connections between the ends of axons and the dendrites or cell bodies of other neurons are specialized structures called synapses. Electrochemical signals flow in neurons, originating at the dendrites or cell body in response to stimulation from other neurons and propagating along axon branches which terminate on the dendrites or cell bodies of thousands of other neurons [3].

Various mathematical models for biological neurons have been proposed in literature [7, 15, 13, 25, 26, 16] to represent their biological activities. As it is generally believed that neurons communicate with each other via action potentials, almost all of these models represent neuronal behavior in terms of membrane potential and action potential. Some most popular models are Hodgkin-Huxley [13], integrate-and-fire [18], FitzHugh-Nagumo (FHN) [7], FitzHugh-Rinzel (FHR) [26], Morris-Lecar [25], Wilson-Cowan [31, 14], Izhikevich [16] and Hindmarsh-Rose [10] models. These neuron models represent the characteristics of the responses of different types of real neurons with different levels of biological plausibility.

Some widely used models of spiking and bursting neurons [7, 15, 13, 25, 26, 16] are reviewed in the remaining part of this section. These models can be expressed in the form of ordinary differential equations (ODE). It is discussed whether these models have biophysically meaningful and measurable parameters and can exhibit bursting and chaotic activities.

FITZHUGH-RINZEL MODEL

Dendrites receive electrical signals through dendritic spines that consist of a spherical head and a stem connected to the dendrite. FitzHugh-Rinzel (FHR) model describes the dynamics of dendritic spines [28]. This model shows how the potential difference between the spine head and its surrounding medium vacillates between the silent phase and the active phase or bursting. The system switches phases depending on the strength of the slowly changing drift current in the dendrite. This model is a modification of the FHN model and incorporates a third state variable to model the bursting behavior of neurons. This model is represented by a set of three coupled nonlinear differential equations. It takes the following form

$$\frac{dv}{dt} = v - \frac{v^3}{3} - w + y + I \tag{1}$$

$$\frac{dw}{dt} = \delta(a + v - bw) \tag{2}$$

$$\frac{dv}{dt} = \mu(c - v - dy) \tag{3}$$

Variable v represents the potential difference between the dendritic spine head and its surrounding medium, w is recovery variable and y represents the slowly moving current in the dendrite. In this model, v and w together make up a fast subsystem relative to y.

NONLINEAR DYNAMICS OF FITZHUGH-RINZEL MODEL

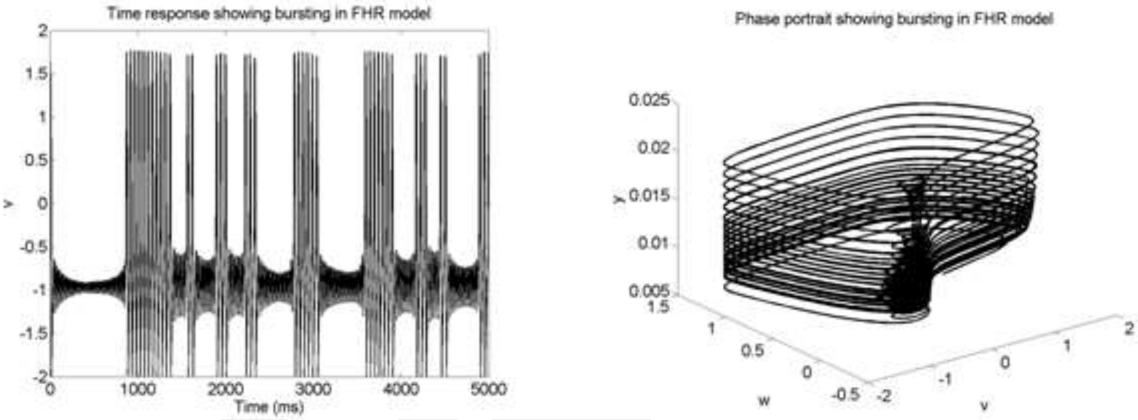
FitzHugh-Rinzel (FHR) model is a three dimensional model derived from the FHN model to incorporate bursting phenomena of nerve cells. It takes the following form

$$\frac{dv}{dt} = v - \frac{v^3}{3} - w + y + I \tag{4}$$

$$\frac{dw}{dt} = \delta\,(a + v\, - bw) \tag{5}$$

$$\frac{dy}{dt} = \mu\,(c\, -\, v\, -\, dy) \tag{6}$$

This model exhibits spiking as well as bursting phenomenon of the neuron. Figure 1 shows time response and phase portrait of this system at $I = 0.3125$, $a = 0.7$, $b = 0.8$, $c = -0.775$, $d = 1$, $\delta = 0.08$, and $\mu = 0.0001$. It is observed that the model exhibits bursting at these values of parameters.



(a) Time Response (b) Phase Portrait

Figure 1: Time response and phase portrait of FHR model at $I = 0.3125$, $a = 0.7$, $b = 0.8$, $c = -0.775$, $d = 1$, $\delta = 0.08$ and $\mu = 0.0001$. The model exhibits bursting at these values of parameters.

BIFURCATION ANALYSIS OF FITZHUGH-RINZEL (FHR) MODEL

Bifurcation analysis of FHR model has been carried out with respect to different parameters.

BIFURCATION ANALYSIS WITH μ AS A BIFURCATION PARAMETER

Jacobian matrix, J of this model at the equilibrium point (v_e, w_e, y_e) for $I = 0.3125$, $a = 0.7$, $b = 0.8$, $c = -0.775$, $d = 1$ and $\delta = 0.08$, in terms of the bifurcation parameter μ is gives as

$$J = \begin{bmatrix} 1 - v_e^2 & -1 & 1 \\ \dfrac{2}{25} & -\dfrac{8}{125} & 0 \\ -\mu & 0 & -\mu \end{bmatrix}$$

Eigenvalues of the linearized system are computed by solving $|\lambda I - J\,| = 0$ for λ. Thus, eigenvalues λ_1, λ_2, and λ_3 are the roots of following characteristic equation of the linearized FHR system.

$$\lambda^3 + \lambda^2\mu - \frac{117}{125}\lambda^2 + \frac{8}{125}\lambda\mu + \frac{2}{125}\lambda + v_e^2\lambda^2 + v_e^2\lambda\mu + \frac{8}{125}v_e^2\lambda + \frac{8}{125}v_e^2\mu = 0$$

This characteristic equation can be written as

$$\lambda^3 + A\lambda^2 + B\lambda + C = 0$$

where

$$A = \mu - \frac{117}{125} + v_e^2$$

$$B = \frac{8}{125}\mu + \frac{2}{125} + v_e^2\mu + \frac{8}{125}v_e^2$$

$$C = \frac{2}{25}\mu + \frac{8}{125}v_e^2\mu$$

Applying Routh-Hurwitz stability criteria, we get the following array

$$\begin{array}{lcc} \lambda^3 & 1 & B \\ \lambda^2 & A & C \\ \lambda^1 & \dfrac{AB-C}{A} & 0 \\ \lambda^0 & C & 0 \end{array}$$

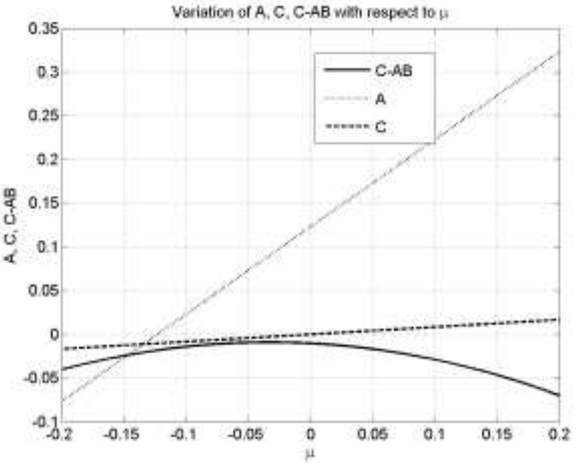


Figure 2: Plots of A, C and $C - AB$ with respect to μ. A, B, and C are the coefficients of the characteristic equation of FHR model. $C - AB$ is always negative for all values of bifurcation parameter μ. A and C crosses zero value at $\mu = -0.13$ and $\mu = -0.02$, respectively. Therefore, Hopf bifurcation takes place at these values of μ.

It is found that there are possibilities of Hopf bifurcations at those values of parameter μ for which $A = 0$, $C = 0$ or $C - AB = 0$. At the equilibrium point $(-1.0292, -0.4116, 0.2542)$, $C - AB$, in terms of μ comes out to be

$$C - AB = -1.1233\mu^2 - 0.0744\mu - 0.0103$$

Thus, $C - AB$ is always negative for all values of bifurcation parameter μ. Plots of A, C, and $C - AB$ with respect to μ are shown in Figure 2. It is clear from this figure that A and C crosses zero value at $\mu = -0.02$ and $\mu = -0.13$ and therefore Hopf bifurcation takes place at these values of μ. However, these values do not lie in the practical range of μ. To reveal the bifurcation phenomenon in the practical range of μ, the bifurcation diagram and largest Lyapunov exponent are plotted. Figure 3 shows the bifurcation diagram with μ as bifurcation parameter. Plot of largest Lyapunov exponent with respect to μ is shown in Figure 4. Positiveness of the largest Lyapunov exponent for some values of μ indicates its chaotic behavior which is also observed in the bifurcation diagram. Time response and phase portrait are plotted for $\mu = 0.0002$ in Figures 5(a) and 5(b), respectively. These plots show the chaotic behavior.

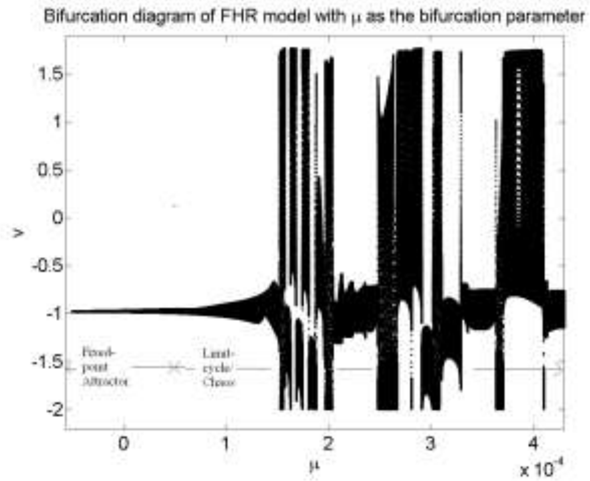


Figure 3: Bifurcation diagram of FHR model with μ as bifurcation parameter. This bifurcation diagram shows that the minimum value of μ for either spiking or bursting or chaotic response is of the order of 1×10^{-4}. y-axis of this plot shows the values of variable v at different time instants after transients.

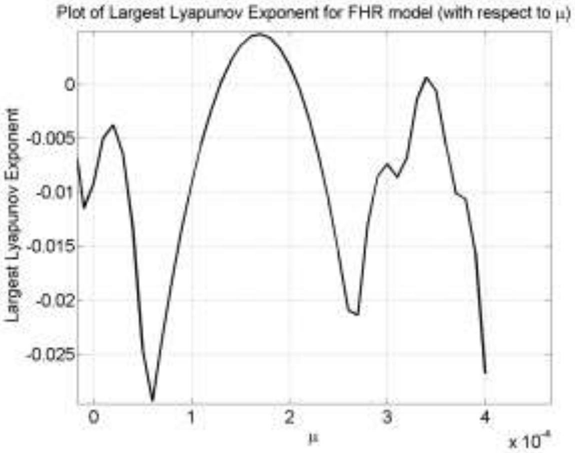


Figure 4: Plot of the largest Lyapunov exponent of FHR model with respect to μ. It is positive for $1.4 \times 10^{-4} < \mu < 2.2 \times 10^{-4}$ and $3.4 \times 10^{-4} < \mu < 3.43 \times 10^{-4}$. Therefore, the model exhibits chaotic response for these ranges of μ.

BIFURCATION ANALYSIS WITH *I* AS A BIFURCATION PARAMETER

Bifurcation analysis, with current (I) as a bifurcation parameter, is carried out in order to investigate the effect of stimulus on the spiking behavior of FHR model. For this, the Jacobian matrix, J of this model at the equilibrium point (v_e, w_e, y_e) for $\mu = 0.0001$, $a = 0.7$, $b = 0.8$, $c = -0.775$, $d = 1$, and $\delta = 0.08$, in terms of the bifurcation parameter I is given as

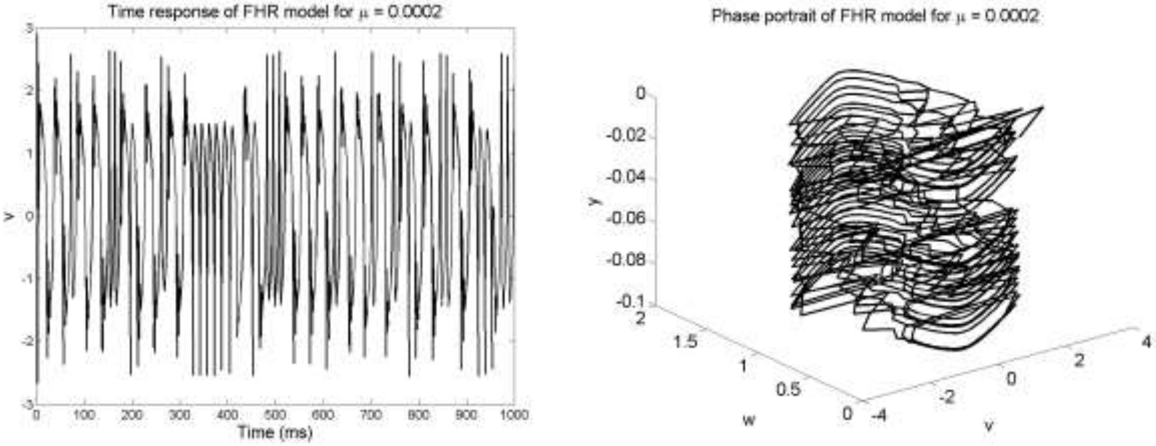
$$J = \begin{bmatrix} 1 - v_e^2 & -1 & 1 \\ \frac{2}{25} & -\frac{8}{125} & 0 \\ -\frac{1}{10000} & 0 & -\frac{1}{10000} \end{bmatrix}$$

For the above values of parameters, there exists one and only one equilibrium point for all values of I. Figure 6 shows the location of this equilibrium point as a function of I. Characteristic equation, in terms of v_e, comes out to be

$$\lambda^3 - \frac{9359}{10000}\lambda^2 + \frac{2501}{156250}\lambda + \frac{1}{125000} + v_e^2\lambda^2 + \frac{641}{10000}v_e^2\lambda + \frac{2501}{156250}v_e^2 = 0$$

$$v_e = \frac{1}{10}\sqrt[3]{\sigma} - \frac{25}{2}\frac{1}{\sqrt[3]{\sigma}}$$

$$\sigma = -2475 + 1500I + 25\sqrt{12926 - 11880I + 3600I^2}$$



(a) Time Response (b) Phase Portrait

Figure 5: Time response and phase portrait of FHR model for μ = 0.0002. The model exhibits chaotic response for this value of μ.

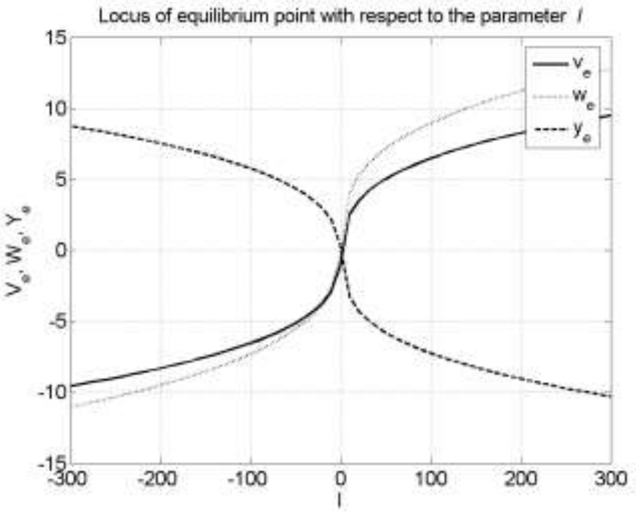


Figure 6: Locus of equilibrium point of FHR model as a function of *I*. There is one equilibrium point for every value of *I*.

This characteristic equation can be written as

$$\lambda^3 + A\lambda^2 + B\lambda + C = 0$$

where

$$A = v_e^2 - \frac{9359}{10000}$$

$$B = \frac{641}{10000}v_e^2 - \frac{2501}{156250}$$

$$C = \frac{1}{156250}v_e^2 - \frac{1}{125000}$$

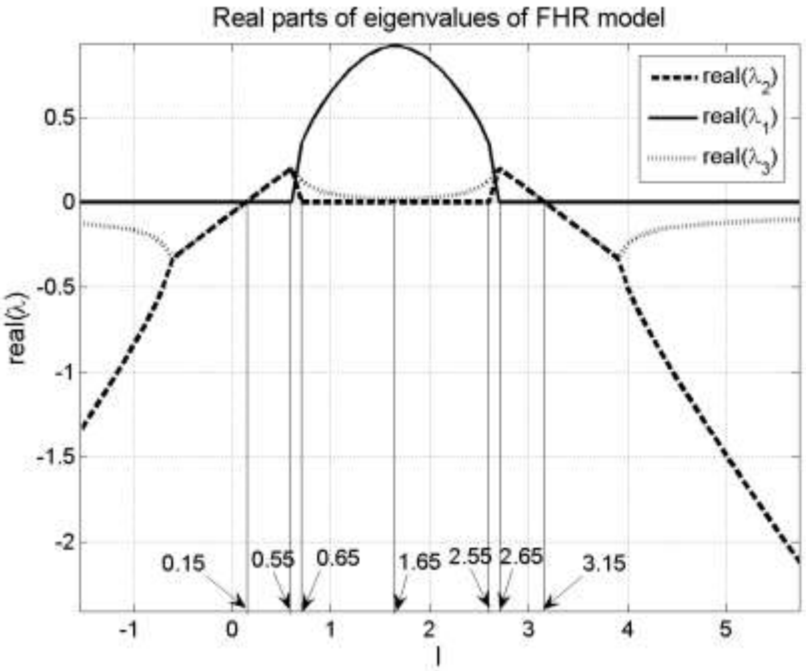


Figure 7: Real parts of eigenvalues of the FHR model. This plot indicates the values of *I* for which the real parts of eigenvalues vanish.

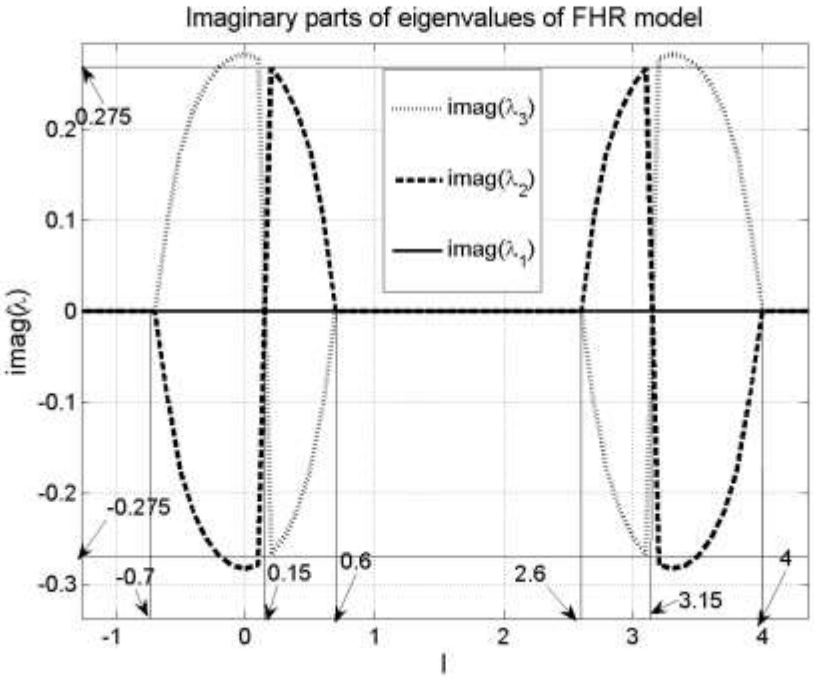


Figure 8: Imaginary parts of eigenvalues of the FHR model. This plot indicates the range of *I* for which there exist complex eigenvalues.

Routh-Hurwitz stability criterion shows that there are possibilities of Hopf bifurcations at those values of parameter *I* for which $A = 0$, $C = 0$ or $C - AB = 0$. First condition, i.e., $A = 0$, is equivalent to $v_e = 0.2532$ and the second condition, i.e., $C = 0$, will not be satisfied for any real value of v_e. Third condition, i.e., $C - AB = 0$, can be expressed as

$$-0.641v_e^4 + 0.584v_e^2 + 0.015 = 0$$

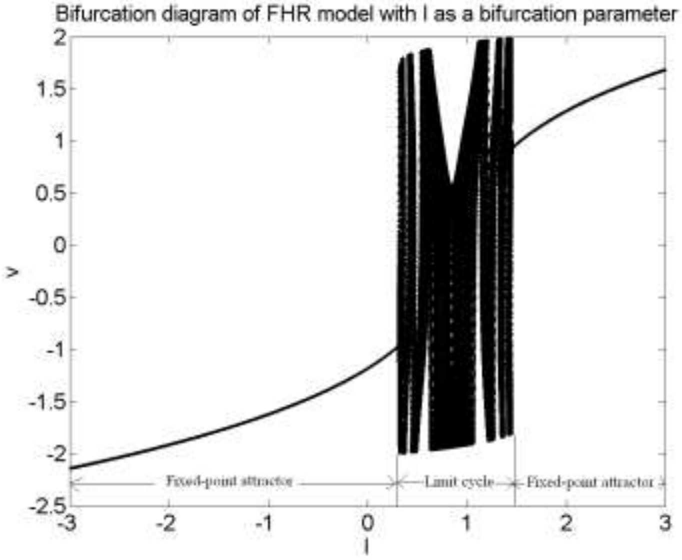
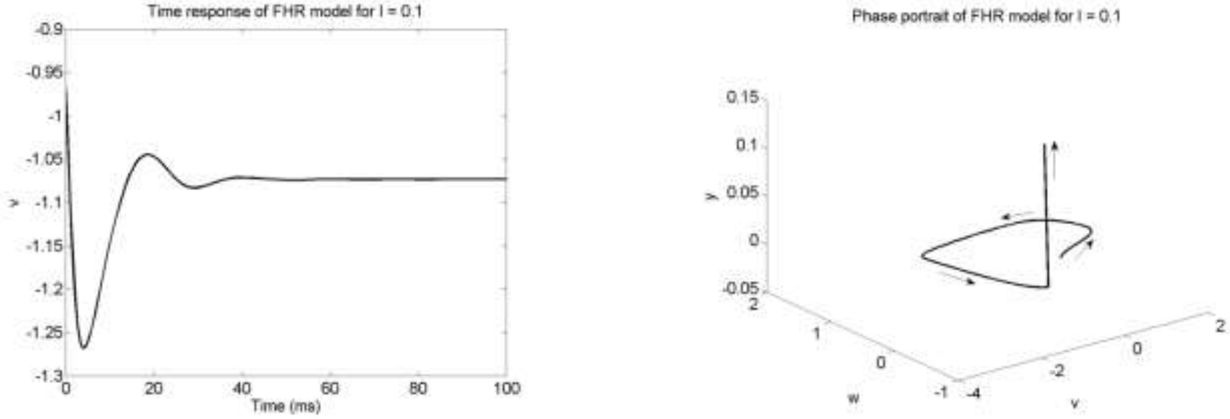


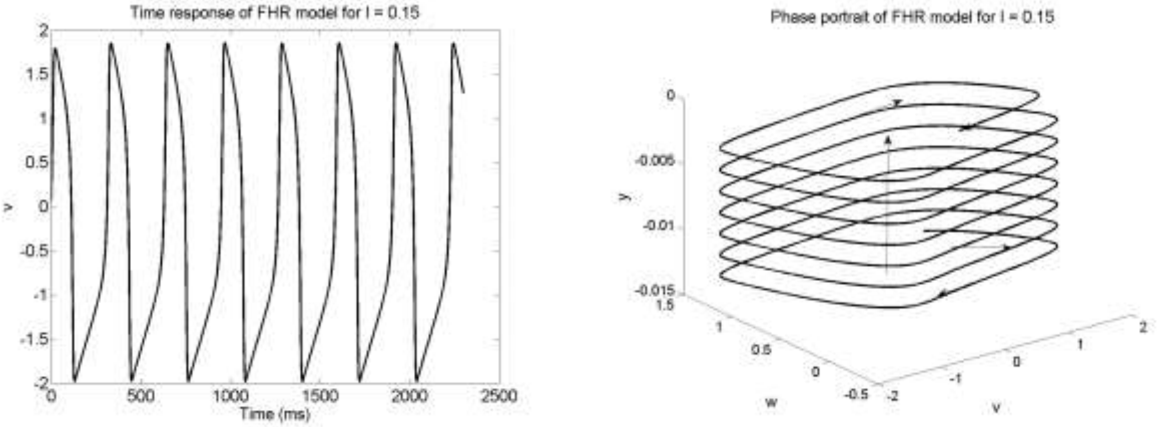
Figure 9: Bifurcation diagram of FHR model with *I* as a bifurcation parameter. Qualitative change in the dynamical behavior of the model takes place as the parameter *I* is changed. The dynamics changes from converging to periodic and again from periodic to converging as *I* is increased. *y*-axis of this plot shows the values of variable *v* at different time instants after transients.



(a) Time Response

(b) Phase Portrait

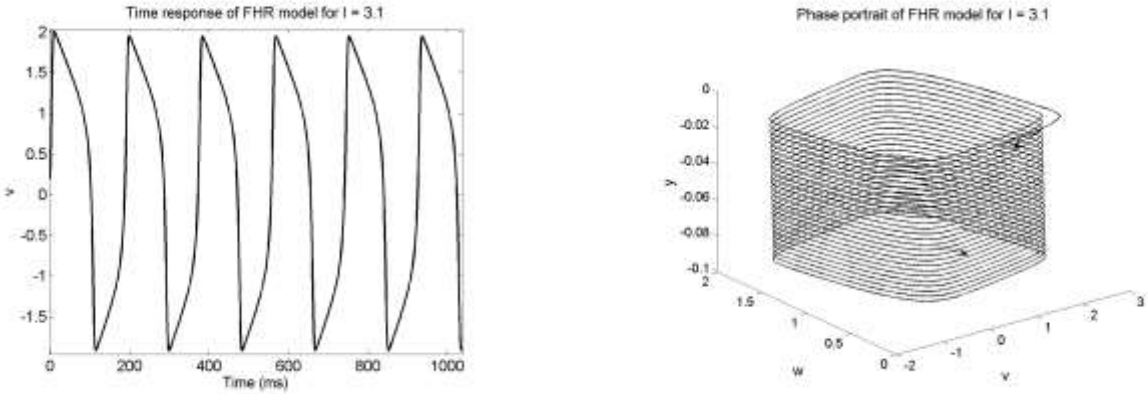
Figure 10: Time response and phase portrait of FHR model for *I = 0.1*. The model exhibits a fixed-point attractor for this value of *I.*



(a) Time Response

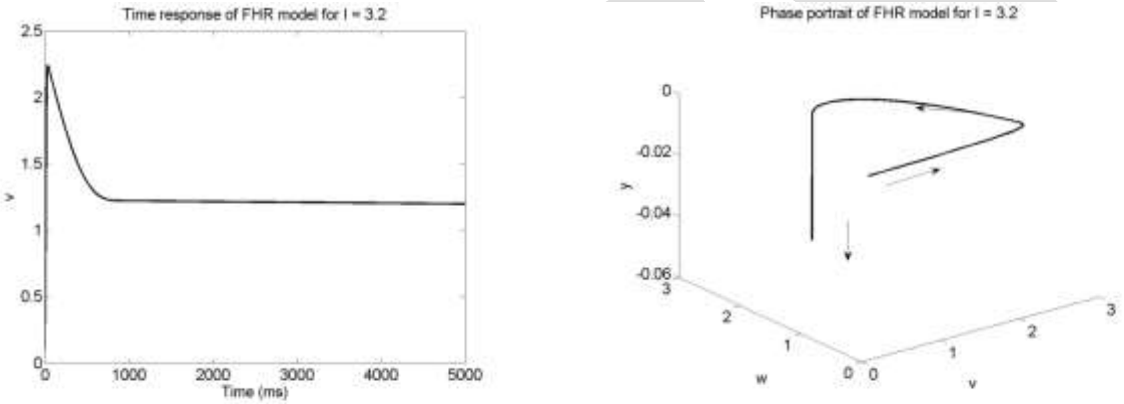
(b) Phase Portrait

Figure 11: Time response and phase portrait of FHR model for *I = 0.15*. The model exhibits a limit-cycle attractor for this value of *I.*



(a) Time Response (b) Phase Portrait

Figure 12: Time response and phase portrait of FHR model for $I = 3.1$. The model exhibits a limit-cycle attractor for this value of I.



(a) Time Response (b) Phase Portrait

Figure 13: Time response and phase portrait of FHR model for $I = 3.2$. The model exhibits a fixed-point attractor for this value of I.

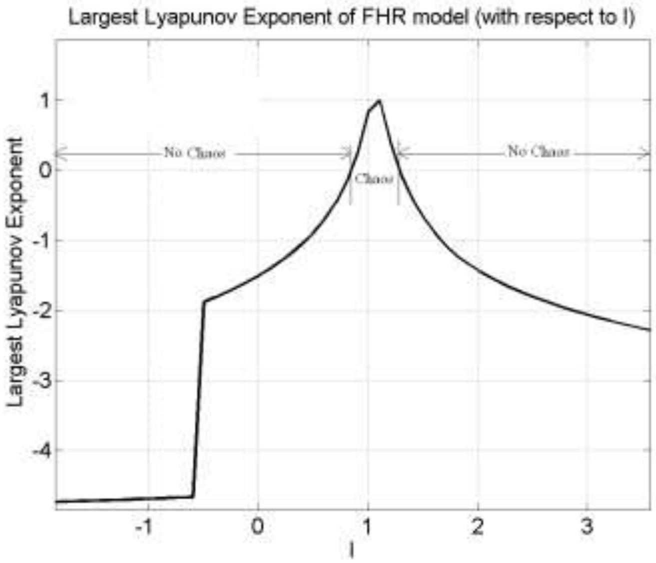
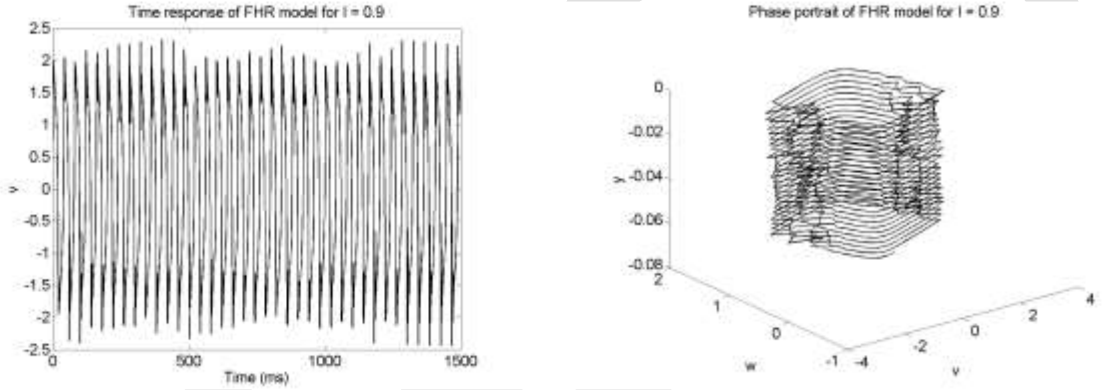


Figure 14: Plot of the largest Lyapunov exponent with respect to the bifurcation parameter I. The largest Lyapunov exponent is positive for $0.8 < I < 1.2$. Therefore, the model exhibits chaotic behavior in this range of I.

This equation has four roots among which two are real and are $v_e = \pm 0.9675$. Thus, Hopf bifurcation takes place at three values of I corresponding to three values of v_e, i.e., $v_e = -0.9675, 0.2532, 0.9675$. The values of I at which Hopf bifurcation takes place, are calculated by solving Equation 8 for above mentioned values of v_e. It is found that there are possibilities for Hopf bifurcation to take place for $I = 0.1387, 1.9719, 3.1612$. Eigenvalues at these values of I are calculated by solving the characteristic equation and are given in Table 1. There is no Hopf bifurcation for $I = 1.9719$ as there is no pair of complex conjugate eigenvalues passing $j\omega$-axis for this value of I. Thus, Hopf bifurcation takes place for $I = 0.1387$ and $I = 3.1612$. Real and imaginary parts of eigenvalues of the FHR model linearized at its equilibrium points are plotted against I in Figures 7 and 8, respectively. Figure 8 indicates the range of I for which there are complex eigenvalues. There is no possibility of Hopf bifurcation at other values of I. Figure 7 indicates those values of I at which real part vanishes and its rate of change with respect to I is nonzero. It is observed from these plots that real part of eigenvalues vanishes without its imaginary part becoming zero at $I = 0.1387$ and $I = 3.1612$. It indicates the Hopf bifurcation at these points. These points are observed with a poor accuracy in the bifurcation diagram of Figure 9. Possible reasons of this inaccuracy are related to the limitations of numerical methods used for integration. Presence of Hopf bifurcation at $I = 0.1387$ as well as $I = 3.1612$ is verified by plotting time responses and phase portraits for I just before and just after these values. Figures 10, 11, 12, and 13 represent time responses and phase portraits for $I = 0.1, 0.15, 3.1,$ and 3.2 respectively. It is observed that the response exhibits a fixed-point attractor at $I = 0.1$ and 3.2 while it is oscillatory at $I = 0.15$ and 3.1. Therefore, $I = 0.1387$ and $I = 3.1612$ are two Hopf bifurcation points. Lyapunov exponent analysis is performed for investigation of presence of chaos in FHR model when I is a bifurcation parameter. Largest Lyapunov exponent is plotted in Figure 14, against the bifurcation parameter I in order to detect the presence of chaotic attractors in this model. It is observed that the largest Lyapunov exponent is positive for some values of I. For these values of I, response of the FHR model is chaotic. Figure 15 represents time responses and phase portrait for $I = 0.9$. It is observed that the response exhibits chaos for this value of I.



(a) Time Response (b) Phase Portrait

Figure 15: Time response and phase portrait of FHR model for $I = 0.9$. The model exhibits chaotic behavior for this value of I.

Table 1: Equilibrium points and eigenvalues for three different values of I

I	v_e	w_e	y_e	λ_1	λ_2	λ_3
0.1387	-0.9675	-0.3344	0.1925	-0.0002	0 - j 0.2757	0 + j 0.2757
1.9719	0.2532	1.1915	-1.0282	0.8481	-0.0004	0.0241
3.1612	0.9675	2.0843	-1.7425	-0.0002	0 - j 0.2757	0 + j 0.2757

CONCLUSIONS

One of the most effective approaches for the study of the nervous system is to look at its constituents as nonlinear dynamical systems. Dynamical analysis has been carried out on FHR neuron models. Eigenvalue analysis is performed for the detection of Hopf bifurcation and Lyapunov exponents are plotted for the study of chaos. Lyapunov exponent and eigenvalue analysis show that FitzHugh-Rinzel neuron model exhibits fixed points, limit cycles as well as chaotic (strange) attractors at various values of parameters. This study identifies FitzHugh-Rinzel neuron model as an appropriate model for investigating roles of bursting and chaos in continual learning. This research work can be extended in various directions. Dynamical analysis in other neuron models (including stochastic neuron models) and their interconnections can be performed in order to study various characteristics of brain signals (e.g., bursting, chaos, stochastic resonance, and threshold variability).

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Capacitive Sensing & Its Applications

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Abstract— The paper includes the study of the capacitive sensing technology and its applications in modern technology. The subject describes the behavior of electric field induced due to a capacitor. Capacitors are the basic building blocks of the electronic world. Capacitance is the ability of a capacitor to store an electrical charge. The sense of touch is an important human sensory channel. During interaction with physical objects, pets and human beings, touch (physical contact) constitutes an extremely significant event. The technology used to respond to such a physical touch is termed as **capacitive sensing.** In this paper we are going to define the capacitive sensing technology in the production of new age devices. Such device uses the human body capacitance as their input and according to the sensory feedback they provide output. These devices have a major role in the current scenario. Such devices are used to overcome accidents, which are a major cause in the present time. In this paper we are also going to define the use of such technology to design such king of helmet that can reduce the percentage of road accidents. When the driver wears that helmet then only his/her vehicle will be activated. This helmet uses the capacitance of the human ear as input. Now a days capacitive sensing has many applications, as such it is used in the smart phones used widely in the whole world. Many types of sensors use this technique. The major applications include the sensors used to measure or detect proximity, position or displacement, humidity, fluid level & acceleration. Capacitive sensing is different from that of the inductive sensing and its main advantage is that it can sense different kind of materials like skin, plastic, metal & liquid.

Keywords— proximity sensing, capacitive sensing, electrodes, traces.

INTRODUCTION:

In 1831, **Michael Faraday** discovered electro-magnetic induction. Essentially, he found that moving a conductor through a magnetic field creates voltage that is directly proportional to the speed of the movement—the faster the conductor moves, the higher the voltage induces. Today, inductive proximity sensors use ***Faraday's Law of Electromagnetic Induction*** to detect the nearness of conductive materials without actually coming into contact with them. The primary deficiency of these sensors, however, is that they only detect metal conductors and different metal types can affect the detection range.

Capacitive sensors, on the other hand, adhere to the same principle but can detect anything that is either conductive or has different dielectric properties than the sensor's electrodes surroundings. Proximity capacitive sensors have become increasingly popular as more user/machine interfaces are designed using touch panels to reliably respond to commands.

Capacitors are the basic building blocks of the electronic world. To understand how capacitive sensors operate, it is important to understand the fundamental properties and principles of capacitance.

Capacitance is the ability of a capacitor to store an electrical charge. A common form – *a parallel plate capacitor* whose capacitance is calculated by **$C = Q / V$**, where C is the capacitance related by the stored charge Q at a given voltage V. The capacitance (measured in Farads) of a parallel plate capacitor consists of two conductor plates.

The sense of touch is an important human sensory channel. During interaction with physical objects, pets and human beings, touch (physical contact) constitutes an extremely significant event. The technology used to respond to such a physical touch is termed as **capacitive sensing.** Now a days capacitive sensing has many applications, as such it is used in the smart phones used widely in the whole world.

Capacitive sensing depends on the phenomenon of the capacitive coupling. In this technique the input to the system is human body capacitance. Capacitive sensors can detect anything. The only condition for the detection is that the object must be conductive or it has a dielectric different from that of air.

Many types of sensors use this technique. The major applications include the sensors used to measure or detect proximity, position or displacement, humidity, fluid level & acceleration. Digital audio players, mobile phones & tablet computer use capacitive sensing touchscreens as input devices. Capacitive sensors can also replace mechanical buttons.

ADVANTAGES OF CAPACITIVE SENSING

1. It can sense different kinds of materials like skin, plastic, metal, liquid.
2. It is contactless and wear-free.
3. It has the ability to sense up to a large distance with small sensor sizes.
4. It is a low power solution.

POINTS TO BE KEPT IN MIND WHILE DESIGNING A CAPACITIVE SENSOR

1. Design electrode plates to measure the desired variable. Maximize capacitance with large-area, close-spaced plates.
2. Surround the sensor with appropriate guard or shield electrodes to handle stray capacitance and crosstalk from other circuits.
3. Calculate sensor capacitance, stray capacitance and output signal swing.
4. Choose an excitation frequency high enough for low noise. As excitation frequency increases, external and circuit-generated noise decreases.
5. Design circuit to meet accuracy specifications and provide immunity to environmental challenges.

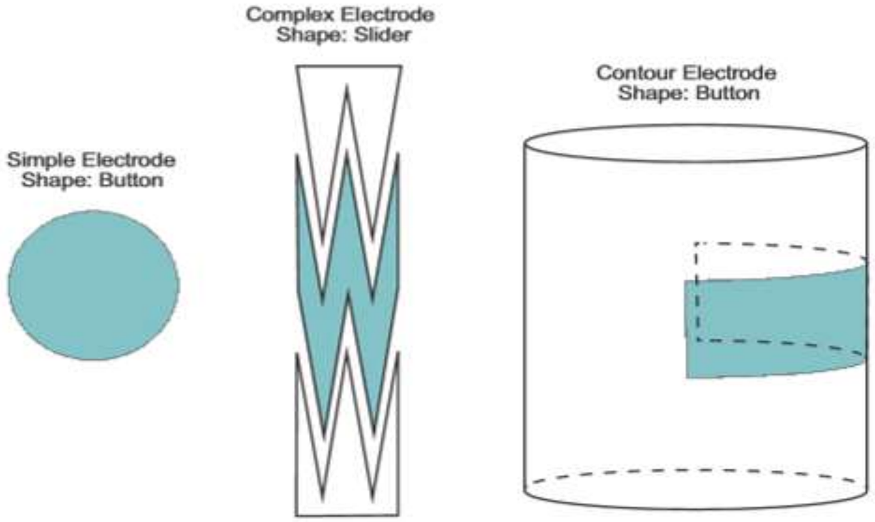
APPLICATIONS OF CAPACITIVE SENSING

1. **Flow:** Many types of flow meters convert flow to pressure or displacement, using an orifice for volume flow. Capacitive sensors can then measure the displacement.
2. **Pressure:** A diaphragm with stable deflection properties can measure pressure with a spacing-sensitive detector.
3. **Liquid Level:** Capacitive liquid level detectors sense the liquid level in a reservoir by measuring changes in capacitance between conducting plates which are immersed in the liquid, or applied to the outside of a non-conducting tank.
4. **Spacing:** If a metal object is near a capacitor electrode, the mutual capacitance is a very sensitive measure of spacing.
5. **Scanned multi-plate sensor:** The single-plate spacing measurement can be extended to contour measurement by using many plates, each separately addressed. Both conductive and dielectric surfaces can be measured.
6. **Thickness measurement:** Two plates in contact with an insulator will measure the insulator thickness if its dielectric constant is known or the dielectric constant if the thickness is known.
7. **Ice detector:** Airplane wing icing can be detected using insulated metal strips in wing leading edges.
8. **Shaft angle or linear position:** Capacitive sensors can measure angle or position with a multi-plate scheme giving high accuracy and digital output, or with an analog output with less absolute accuracy but faster response and simpler circuitry.
9. **Limit switch:** Limit switches can detect the proximity of a metal machine component as an increase in capacitance, or the proximity of a plastic component by virtue of its increased dielectric constant over air.
10. **Accelerometers:** Analog Devices has introduced integrated accelerometer ICs with a sensitivity of 1.5g. With this sensitivity, the device can be used as a tiltmeter.

CAPACITIVE TOUCH HARDWARE DESIGN

To design a good touch sensor, all about we require is the good study of the capacitive sensing. The purpose of this paper is to describe the design of such a capacitor sensor that can achieve maximum performance. By achieving maximum performance in the hardware, the capacitive touch software library can perform the capacitive touch measurements with the lowest power consumption. The design for the sensor includes the schematic as well as the mechanical part. The schematic and mechanicals are treated as design requirements that influence the PCB layout. This paper first describes requirements that might be found in the schematic and mechanical requirements of the product. These requirements have an effect on the layout and must be considered first. After the requirements of the product are understood, then the PCB layout can begin. The figure below shows an equivalent circuit that provides the basic concepts for understanding how the different aspects of the design contribute to the overall performance. Before discussing the equivalent circuit, it is important to understand the basic terminologies used for the designing of the capacitive sensors. These terminologies include **electrode, traces,** and **capacitance.** The little description about these three terminologies is explained below:

1. **Electrodes:** An electrode is the physical conductive structure that a person interacts with. This structure is typically thought of as the copper on a printed circuit board (PCB), but can also be made of transparent materials such as Indium Tin Oxide (ITO) or other conductive materials like silver. The electrode shape can be very simple (for buttons) or very complex (for interdigitating). The electrode does not necessarily need to be planar. One of the benefits of capacitive touch detection is that it allows an application to use buttons, wheels, or sliders that conform to the shape of irregular surfaces.



2. **Traces:** A trace is the conductive connection between the microcontroller and the electrode. Similar to the electrode, the trace is typically a copper trace on a PCB, but it could also be made of materials like ITO and silver.

3. **Capacitance**: Capacitance is the ability of the electrode to store an electrical charge. In the context of capacitive touch detection, there are two common categories of capacitance: **mutual capacitance** and **self-capacitance**. As the names imply, self-capacitance refers to the capacitance of one electrode, while mutual capacitance refers to the capacitance between two electrodes. Self-capacitance is the topic of this document, and the concepts described here pertain primarily to self-capacitance solutions.
   An important concept within capacitive touch detection is baseline capacitance. This represents the steady-state no-interaction capacitance seen by the microcontroller. The baseline capacitance is the sum of the parasitic capacitances, which include the electrode, trace, and parasitic capacitances associated with the microcontroller pins, solder pads, and any discrete components associated with the circuit. The baseline capacitance is important because sensitivity is a function of the relative change in capacitance. If the baseline capacitance is too large, then any change in capacitance caused by a touch or proximity event is very small and might not be distinguishable from the baseline.

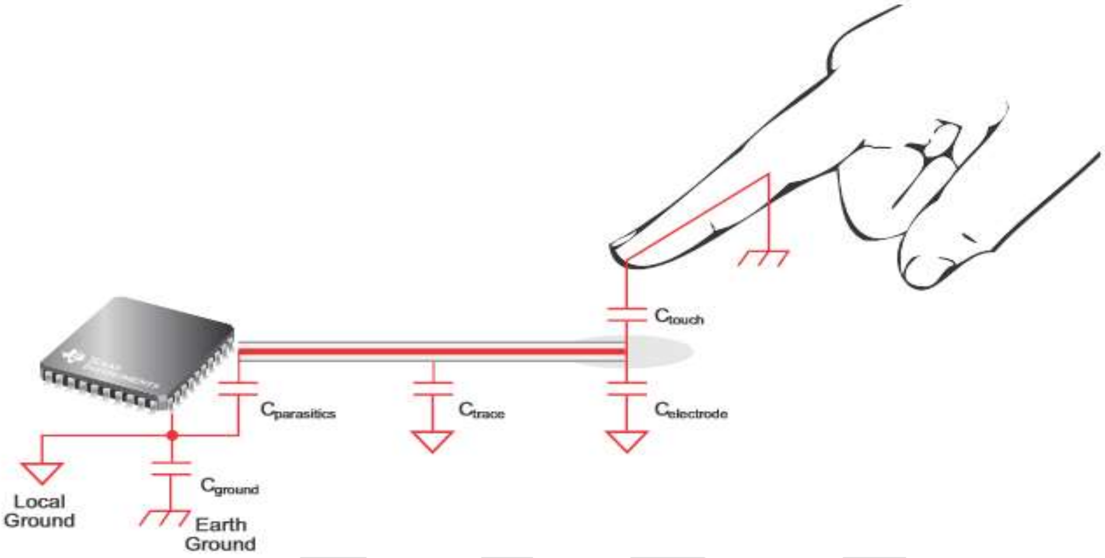
EQUIVALENT CIRCUIT

In the figure shown below, there are five capacitances –C_{touch}, C_{trace}, $C_{electrode}$, $C_{parasitic}$ & C_{ground}.

1. C_{ground} is the capacitance between the device under test (DUT) ground and earth ground. In some applications, local and earth ground are connected when the DUT uses mains power, but typically the local ground is capacitive coupled back to earth ground.
2. C_{trace} and $C_{electrode}$ is the capacitance between the trace and electrode structures back to the local ground. This capacitance is most directly affected by surrounding structures, typically ground pours, that are either on the same layer or on adjacent layers. Not shown is the capacitance between the trace and electrode structures and earth ground. These capacitances are not

without merit; however, for simplicity and in the context of this document, the design guidelines are given with the principle of affecting the local capacitance (that is, separation between local ground and the traces and electrodes).

3. The capacitance **$C_{parasitic}$** is a combination of the internal parasitic capacitance of the microcontroller and any components within the circuit. This capacitance is also referenced to local ground.
4. The touch capacitance, **C_{touch}**, is the parallel plate capacitance formed between the touch interaction and the electrode. In the example of a touch, as the finger presses against the overlay, the flattened surface of the finger forms the upper plate and the electrode forms the lower plate. The capacitance is a function of the area of the two plates, the distance between them, and the dielectric of the material that separates them.



PERFORMANCE PARAMETER ASSOCIATED WITH SIGNAL & NOISE

1. Signal & Noise: Capacitive touch detection is a type of analog-to-digital converter (ADC), specifically a capacitance to digital converter. As with most ADCs, the terms of interest are resolution, signal-to-noise ratio (SNR), and linearity, in the specific cases of wheels and sliders. Throughout this document, the design guidance helps to maximize signal, minimize noise, and address when these two goals are at odds.

2.Signal: The basis of capacitive touch detection is the ability to measure a change in capacitance. This change in capacitance is the signal that the capacitive touch solution identifies. The term **sensitivity** is often used to describe the signal strength—a more sensitive solution has a stronger signal.

Equation (1) serves as the basis for layout recommendations.

$$C = \varepsilon \times \left(\frac{A}{d}\right)$$

$$C = \varepsilon_r \times \varepsilon_0 \times \left(\frac{A}{d}\right) \ldots\ldots\ (1)$$

The dielectric constant (ε), area (A), and distance (d) are described throughout this document with the intent of positively influencing the capacitance for a touch system.

3.Parasitic Capacitance: Although parasitic capacitance is presented separately, it is a part of the sensitivity and signal. As already mentioned, the capacitance of interest is the relative change in capacitance. The change in capacitance is based upon the touch interaction, but this change is perceived relative to the parasitic capacitance of the system. The parasitic capacitance is also called the steady-state capacitance or baseline capacitance. If the introduced change is 100fF, then the sensitivity, which is the relative change in capacitance, can be increased by decreasing the parasitic capacitance. The capacitances **C_{trace}, $C_{electrode}$,** and **$C_{parasitic}$** are generically referred to as parasitic capacitance.

4.Resolution: The term resolution can be used in several different contexts in capacitive touch detection. In the broadest sense, resolution is sensitivity and defined in terms of capacitance. A measurement system may be designed to resolve changes in capacitance in 0.1 pF steps and, therefore, the resolution is 0.1 pF

5.Linearity: The term linearity is often used to describe the performance of capacitive touch wheels and sliders. Similar to the linearity performance of ADC or digital to analog converter (DAC), the linearity is how well the reported position matching with the actual position.

6.Range: Range applies to proximity sensors. The range or distance is directly proportional to the sensitivity. The more sensitive the hardware design, the greater the distance or range can be achieved with a proximity sensor.

7.Noise: The signal is the change in capacitance that results in a meaningful change in counts. Noise, on the other hand, is any disturbance that does not change the capacitance but does change the counts. Most often these disturbances are the result of power supply switching noise, electrostatic discharge (ESD), electrically fast transients (EFTs), radiated noise, or some other type of electrical noise that couples into the system.

8.Signal-to-Noise Ratio (SNR): The SNR is a system-level specification and needs to be tested at the system level. Good layout alone is not adequate but is part of the overall design to achieve an acceptable SNR. The main idea in providing good sensitivity is to maximize the capacitance associated with a touch and minimize the parasitic capacitance. The noise must be mitigated and reduced with good design practices for noise immunity (for example, ESD, RF, or EMC).

SCHEMATIC OF CAPACITIVE SENSOR

At the schematic stage of development, the two key elements are noise and parasitic capacitances associated with components.

1. **Components used for Designing:** External components are not ideal with capacitive touch solutions because of the additional parasitic capacitance associated with any component. Therefore, components selected to be part of the capacitive touch circuit should have the smallest footprint area possible. Capacitance is directly proportional to area, so any reduction in footprint reduces capacitance. Typically, these external components are related to ESD protection such as current-limiting resistors placed between the microcontroller and the electrode. The concept of minimizing footprint also applies to connectors or any other component in the capacitive touch circuit. Ideally, any component would have a very low drift factor with temperature and time. While this is not a necessity, because the software has drift compensation, it is preferred to keep the touch circuit and all associated components as stable as possible over time and temperature.

2. **ESD Protection:** ESD protection should be designed with consideration of the laminate material that acts as a barrier between potential ESD strikes and the PCB. Relying on the high-dielectric breakdown voltage of the overlay is preferred to adding ESD components to the touch solution, because these components add parasitic capacitance to the circuit and reduce sensitivity. If additional ESD protection is required, small current-limiting resistors and low-capacitance clamps are recommended.

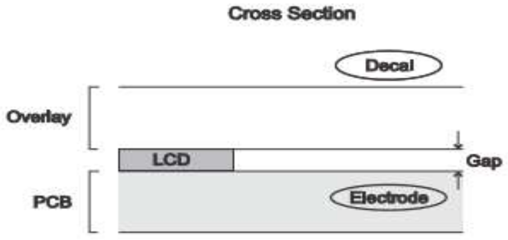
3. **Power:** The drift compensation found within the capacitive touch software library accounts for drift in VCC over time (this drift may be associated with battery decay in portable applications). More spurious shifts in VCC, such as those associated with noise spikes or ripple, can affect the measurement and even the drift compensation if the noise lasts for a long period of time. The most common method of reducing power supply noise is the use of filters. A PI filter is typically the filter of choice. An LDO can also be used to reduce power supply noise.

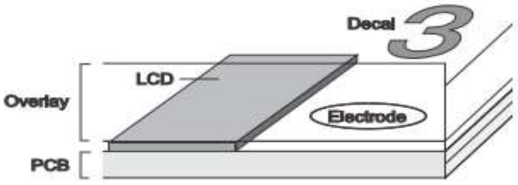
4. **Mechanical Parts:** The mechanicals are the mechanical characteristics of the design. The mechanicals include the overlay material, ink on top of the overlay, any adhesives used to bond the electrode to the overlay or enclosure, and any transition materials used to remove air gaps between the electrode and the overlay. Mechanicals also include the types of materials used for the electrodes. The mechanicals affect both the signal and the parasitic capacitance.

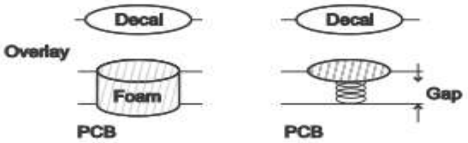
OTHER SITUATIONS

Not all applications fit into the typical category, and this section describes two special cases. The first is intentional air gaps that are greater than 2 mm between the electrode and the overlay material, and the second is the use of gloves.

Air gaps: In some applications, components are on the same layer as the electrode. This prevents the overlay from being directly applied to the electrode. A common example of this is when an LCD is mounted near the electrode (see Figure below). Another scenario is when the overlay material is not a uniform surface and, therefore, the electrode cannot make direct contact with the overlay. In either case, the gap must be filled or bridged with nonconductive filler (typically adhesive) or a conductive extension. When the gap is in excess of 2 mm, then a conductive extension, either foam or metal, should be used. The metal or foam must be malleable to conform to the shape of the surfaces and prevent the formation of gaps. As shown in Figure below, the area created by the foam or metal in contact with the overlay is now the area that influences the capacitance.







1. **Gloves:** Gloves are simply another layer of medium between the electrode and the finger, and the same principles of thickness and dielectric apply. The challenges with glove applications include the ability to support both gloved and ungloved hands as well as the variation in the types of gloves the application might require. Typical leather or plastic gloves have a dielectric constant in the range of 2 to 4, and fabric gloves and gloves with insulation can have a dielectric constant less than 2.

LAYOUT

After the mechanicals are understood, the electrodes can be sized and designed to provide the most signal. Independent of the mechanicals, the layout design is affected by the distance between the microcontroller and the electrodes, the PCB stackup (for example, one layer, two layer, or four layer), and other electrical circuits on the PCB.

The first item to consider relates to the schematic and the placement of any external components that are associated with the capacitive touch solution. This is typically found with the comparator solutions, and the resistor is part of the feedback path that creates the oscillator. Other examples are of ESD protection components. In all cases, the components should be kept as close as possible to the microcontroller. As the components move farther away from the microcontroller, the increased area correlates to an increased risk of noise or ESD conducting into the device.

ELECTRODE DESIGNING

The electrode design must accomplish two goals. First, the design must provide sufficient signal (change in capacitance with interaction). The design must project the e-field up and out so that the appropriate level of sensitivity is achieved at the desired distance. Understanding the stackup, thickness and dielectric, the electrode can be sized and shaped to provide the maximum signal. Second, the electrode design needs to have a minimal parasitic capacitance.

In the following sections the shape and area of the electrode are discussed with the intent of maximizing the signal for different implementations (buttons, sliders, and wheels). The basis for controlling the parasitic capacitance is common to different sensor implementations and is discussed here.

Figure below shows an example PCB cross-section and the important parameters that influence the parasitic capacitance. Similar to figure in the above section, the height, width, and separation have a direct effect on the parasitic capacitance of the electrode, $C_{electrode}$. The fundamental parameter area is not shown in Figure below, because this has a direct effect on both the touch capacitance (C_{touch}) and the parasitic capacitance ($C_{electrode}$). This section describes how changes to the height and separation can minimize the parasitic capacitance. The following sections describe how changes to the area can maximize C_{touch}.

1. **Proximity:** Proximity electrodes have a circular or square shape, the same as buttons. Proximity sensors require a higher degree of sensitivity than buttons, and this higher sensitivity is accomplished by increasing the area and the separation from other conductors.

2. **Wheels and sliders:** The concept of a wheel is identical to a slider with the exception that the slider needs to be terminated at the ends.

3. **Shape of the Electrode:** The capacitance of the electrode is a function of area, but the shape is important to consider, because the shape can influence the area.

4. **Buttons:** For buttons, the electrode shape is typically round or rectangular. One common mistake is to make the electrode the same shape as the icons printed (in nonconductive ink) on the overlay. As shown in Figure 11, this can lead to electrodes with odd shapes that create discontinuities and reduce surface area.

5. **Area of the electrode:** An important detail of designing the electrode shape is not to design shapes that have low surface area. The area of each electrode must provide the maximum Ctouch, which in turn produces the most signal (the change in capacitance) when a touch event occurs.

    a) **Proximity sensors:** Proximity sensors typically have a larger area in order to detect large surfaces (palm of the hand) at larger distances. In most applications the electrode size is limited by the end product dimensions. These applications depend heavily upon the measurement algorithm and longer measurement times to provide sufficient sensitivity. The longer measurement times translates into higher power consumption.

    b) **Sliders and wheels:** Sliders and wheels are different from buttons in that the interaction involves multiple electrodes. As shown in Figure 13 the area of the electrode is not as critical as the percentage of coverage across multiple electrodes.

c) **Electrode Material:** As discussed in the above sections, conductivity becomes an issue in more resistive materials like ITO. Although the transparency of ITO is very good, the resistivity is high when compared to materials like silver and copper. Typically the physical dimensions prohibit increasing the area of the ITO electrodes, and therefore any degradation in sensitivity must be compensated for in the firmware. This typically results in slightly longer measurement times and consequently increased power consumption.

d) **Spacing between the electrodes:** As mentioned previously, one of the unique features of the capacitive touch software library, 1, is that the electrodes are scanned sequentially. This and following the recommendation to drive the signals to GND as the default state of the electrodes allows neighbouring electrodes to be treated as an extension of the ground pour. Therefore, the spacing between the electrodes follows the same rules for spacing from ground. The goal is provide enough spacing so that the e-field propagates up and through the overlay material. A minimum spacing of one-half the laminate thickness has been found to provide sufficient signal (sensitivity).

VEHICLE ACTIVATING KIT BASED ON CAPACITIVE SENSING

Bike manufacturers are constantly launching newer, faster machines for the customers, but few include safety as a prime feature. Keeping this in mind, some students of the Veermata Jijabai Technological Institute (VJTI), Matunga, have developed the **'Smart Helmet'**, which not only ensures safer driving, but also activates the bike only when the rider puts on the helmet. The helmet has been developed by six students of 3rd year majoring in Electronics and Information Technology, in collaboration with a company called Creative Concept. One of the inventor, Saurabh Doiphode, said, "The smart helmet consists of a pressure sensor. When the user wears the helmet, this sensor gets activated, and is detected by the microcontroller placed on the helmet. This microcontroller sends a signal wirelessly through radio waves to the receiver present on the bike. It turns the ignition system on with the help of a relay circuit attached to the bike itself." The students have also changed the ignition circuit of the bike, which therefore, cannot be started with a push of the ignition button or a kick of the starter. The students have also added an LCD screen to the bike to guide the biker.

New in this technology: The smart helmet was based on the pressure sensing technology. The helmet which we are going to make is based on **Capacitive Sensing Technology.** There will be a proximity sensor placed inside the helmet which takes the capacitance value of the ear of humans. This capacitance value is rather different from the parasitic capacitance. As the smartphones of the present era works, in the same fashion, this helmet is going to work. As the sensor placed in the helmet gets activated, it gives its output to the microcontroller placed inside the helmet and this microcontroller will gives its output to the relay present in the ignition system of the two wheeler vehicle. The ignition system is activated only when the condition will be fulfilled that the bike rider wears the helmet or not. The newer concept in this technology is the **call attending facility.** In the helmet there is a Bluetooth module which is directly interfaced with the mobile phone and the microcontroller. The circuit consists of a 16x2 LCD display which shows the initial message as "Wear your helmet to drive your vehicle". As any person tries to call the bike rider, the LCD will display a message which shows the caller identity and his/her mobile number. With just a single tap on the helmet, the rider will be able to attend the call with the use of the Bluetooth module inbuilt in the helmet. This technology ensures the safety of the bike rider and the feasibility of the ride. The circuit will include some cost in the implementation but it ensures the reduction in the road accidents, which is a major problem in the present time.

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Pyroelectric Simulation System - Advancing Programmability and Portability Concepts

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Abstract—A novel technique has been implemented to develop a simulation system comprising of programmability and portability for pyroelectric materials. The technology used an advance form of applications of electronic engineering and uses the technological concept of microcontroller based controllability of the simulation process. This process requires usage of advanced technologies in assuring proper functionality of the simulation system framework. Applications of pyroelectric materials in numerous fields can be further improved and new potent utilizations will be nurtured with the help of this accurate and user-friendly simulation system precisely simulating various real world conditions. The technology discussed here is one such technology which assures reliability of the simulation output. The easy programmability certainly adds an extremely useful feature to the simulation process that was never used before. The concept of portability is also considered and included in the feature. The technology has been devised and implemented with objectives to ensure features like battery rechargeable, programmable, low power usage, portable and over driven load protection.

Keywords— Pyroelectric materials, Simulation System; PSpice Simulation; Microcontroller; Equivalent circuit; Tri-state; Android Oscilloscope; Impedance matching, Hi-Z.

INTRODUCTION

The pyroelectric effect though first described by Theophrastus in 315 BC has been known for many centuries and can be explained as a change in temperature in a material causing a release of electric charge. With more sophisticated research techniques being developed, applications of pyroelectric materials speeded up from 1960. David Brewster first used the term "pyroelectricity" in 1824 [1]. A basic concept of the pyroelectric effect can be simply illustrated as shown in Figure 1.A pyroelectric material displays a release of charges at their surface when its temperature is changed and hence then these charges can be detected as current flowing in the external circuit.

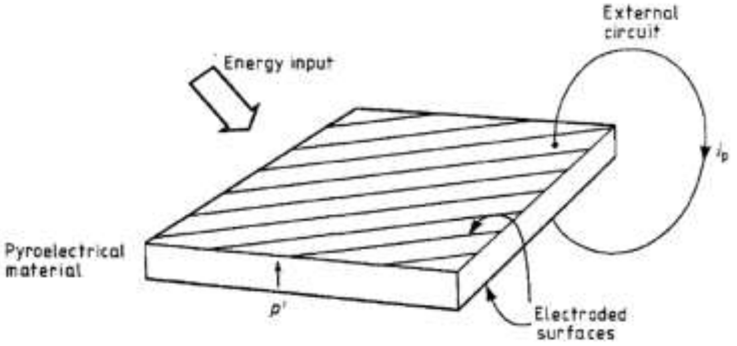


Figure 1: Simple illustration of pyroelectric effect.

More elaborately, the pyroelectric effect is explained as change in electrical dipole moment appearing as macroscopic pyroelectric effect caused by change in mean equilibrium position in lattice by any excitation resulted from change in lattice temperature. Heckmann diagram as shown in Figure 2 illustrates the reversible relations among various properties of a crystal [2, 3]. Pyroelectric effect relates to the electrical and thermal reversible relations in the Heckmann diagram. The pyroelectric effect is a collective contribution of two effects. The primary effect is the constant strain denoted as S, prevents expansion or contraction of the crystal and thus a change in temperature causes a change in electrical dipole moment of the crystal. The secondary effect is due to the crystal deformation. Thus, pyroelectricity is a coupled effect that is related between changes in temperature to electrical displacement D. Quantitatively the pyroelectric effect is given by the equation $\Delta P_s = p\Delta T$ in terms of vector called the pyroelectric coefficient p, given by the rate of change of electrical dipole moment (or spontaneous polarization) P_s with temperature gradient (ΔT).

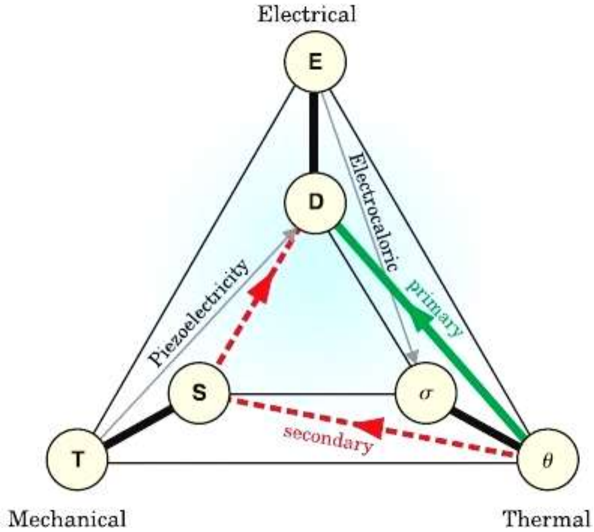


Figure 2: Heckmann energy diagram.

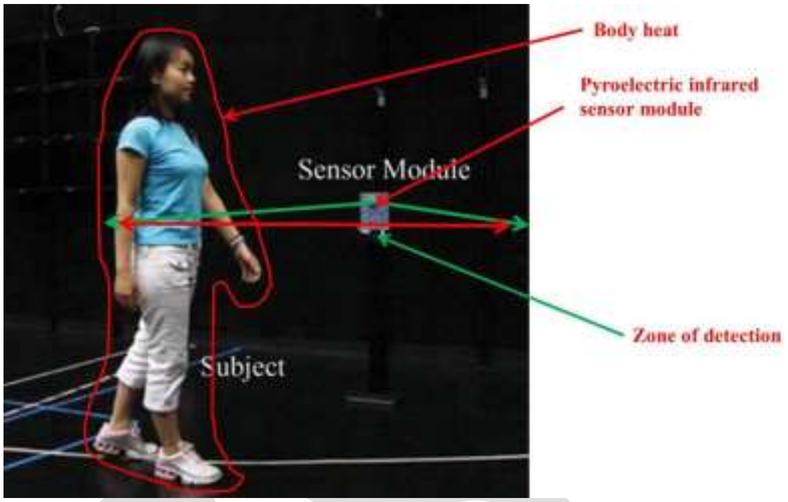


Figure 3: Application of pyroelectricity in detection.

Pyroelectric materials have wide range of applications as detectors and sensors. The major advantage of pyroelectric detectors over semiconductor detectors is that it works on wide range of wavelengths provided some means for absorbing the radiation, have higher sensitivity over wide range of temperature, requires low power, fast in response and requires low cost to manufacture[4]. Pyroelectric elements can be used to attenuate noise caused by ambient temperature changes and from vibrations. These advantages have led their vast use in firefighting, law enforcement, border patrol, land mine detection, building surveillance, process control, vision testing, facial recognition and traffic control. An example of pyroectricity in sensor technology is shown in Figure 3 [5].With growing energy demands all over the world, harvesting energy from alternate energy sources is currently considered a topic of huge interest. In this regard pyroelectric materials can play an important role as an alternate energy source and hence can be put in use for numerous applications in various fields as energy harvesters. Pyroelectric harvesters work by converting a time-dependent temperature variation into electric current. A pyroelectric cells based energy harvesting technique is shown in Figure 4 [6].Pyroelectric materials can be used as the power source of many lifesaving and pain relief medical applications from implanted cardiovascular devices and pacemakers to muscle stimulation for pain management using implanted pulse generators by using of the temperature variations within human body to generate required power for such implanted medical devices. An application of pyroelectric material as energy harvester in various implanted medical devices as shown in Figure 5 [7].

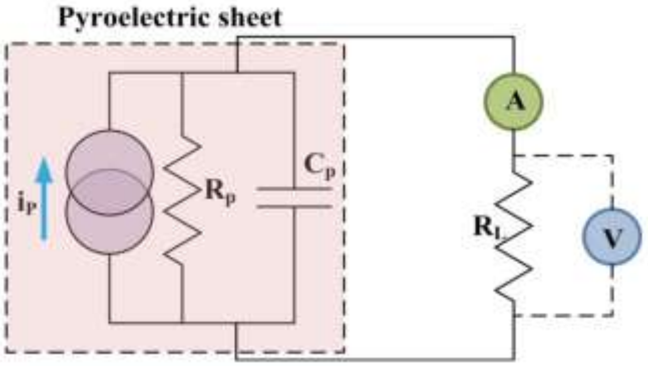


Figure 4: Energy Harvesting from Pyroelectric cell.

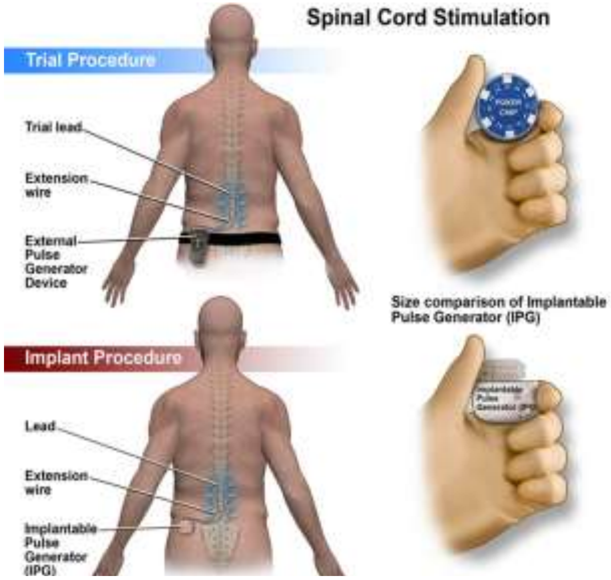


Figure 5: Pyroelectric energy harvester for implanted medical devices.

Dire and even catastrophic consequences may arise from using pyroelectric devices without prior tests and trials which can be avoided today by this simulation system to determine the various characteristics and behavior of pyro electric materials while using as the life-long power source for these implants. Taking into account the tremendous applicability of pyroelectric materials in numerous fields it is imperative to validate proper and precise testing methods to determine the behavior of pyroelectric materials under any particular application to make it work best to serve the intended purpose. These goals can be reached if precise and real world simulation is possible for pyroelectric materials considering a particular condition and application. In this regard a fully programmable pocket sized portable simulation system for pyroelectric material is designed and implemented with wide range of variations in the loading to depict precisely various applications and conditions.

DESCRIPTION OF THE SIMULATION SYSTEM

The objectives considered while implementing the idea of a simulation system for pyroelectric material are profound for the fact that they are all contributors in making a fully programmable simulation system and constitute all the parameters require to simulate the energy output of a pyroelectric material under any given condition and for any given application. The system simulates using some manually given parameters for the program simulating the signal output which, in fact, resembles that of the expected signature of the signal of a pyroelectric material under a particular condition. Using the same signature, additional output amplification is controlled by the microprocessor in order to give the same output power by the simulation of the same pyroelectric material. This provides data of great value while considering pyroelectric material as an energy harvester. Taking into account all these necessitates, a pocket sized ((1.75”X2.5”X1”) portable fully programmable simulation system is devised that can be powered by a set of rechargeable batteries. The simulator system has been implemented incorporating some essential features that ensure wide range of applications to be simulated, user-friendliness of operation, simulating behavior of pyroelectric materials under various load conditions, low power consumption by the system, fully programmable and pocket sized portable. Also, it is possible from the simulation system to calculate the stored energy in the pyroelectric material and the deliverable energy to the load, thus, helping system designers to precisely approximate the energy requirement and energy deliverable from pyroelectric materials.

Design and Simulation of the Circuitry:

The design and implementation of the simulation system burgeoned from simulating the equivalent circuit of the pyroelectric material. Mathematical derivations and computations carried out beforehand to ensure theoretically that the functionality of the final system will yield. Taking these further, the draft hardware were designed considering necessary electrical components of required values in designing the circuitry in order to yield the required outcomes from the circuit. This designed circuit was then simulated using PSpice simulation software under various conditions by varying the parameters and electrical components’ values, monitoring and recording every time the corresponding results of the simulation and are compared to ensure the functionality of the circuit is zeroing in to the final and desired outcome confirming the functionality of the circuit as required for the simulation system. The PSpice simulation result is provided in Figure 6 below. The simulation was conducted with the objective to best resemble the voltage and current outputs of the designed circuit to the actual voltage and current behavior of pyroelectric material under a particular condition. Precise changes are made in the hardware until the required voltage and current waveforms are obtained at the output of the circuit resembles precisely the voltage and current waveforms of a pyroelectric material. The variation of the output waveforms according to the loading of the circuit is also ensured through simulations so that the expected range of operation is achieved. Various parameters of the input signal to the circuit (which is from the microcontroller) are also varied in the PSpice simulation to monitor changes in the outcomes of the circuit. This provided extremely useful information and the basic understanding of the programming codes for the microcontroller that will be used to drive the equivalent circuit.

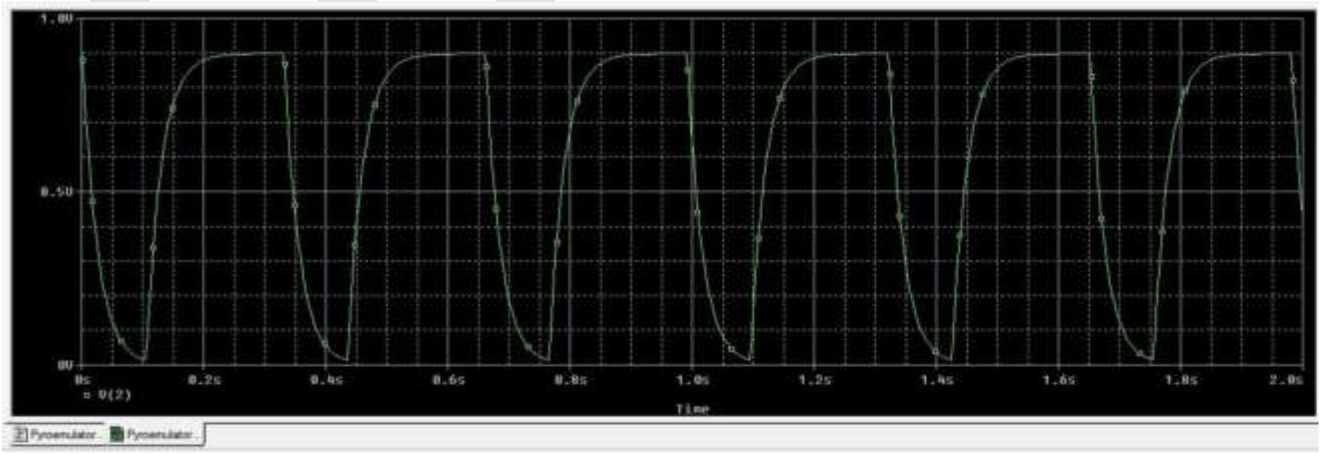


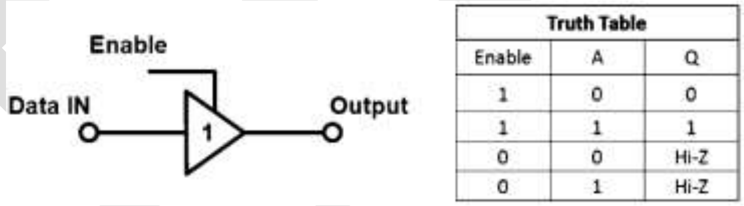
Figure 6: PSpice simulation result of the designed pyroelectric equivalent circuit at minimum (no) load.

Microcontroller and Software Framework:

ATmega328 based microcontroller board is used to perform the controlling of the circuit and thus making the entire system fully programmable with a user friendly interface [8]. The programming codes are written to depict any particular condition the pyroelectric material will be subjected to. Various forms of ATmega328 boards are shown in Figure 7. The user friendly interface is obtained by programming the microcontroller in a way that only few parameter changes are required in order to achieve the desired simulation output. The coding of the program for the microcontroller is performed with an objective that various components of the circuitry can be switched on and off depending on the loading conditions the user desires. The logics of the codes are such that the microcontroller drives the circuitry according to the desired condition and hence attains the intended waveforms at the output of the circuit. The frequency variation of the simulated output signal depicts the outcome of a pyroelectric material when subjected to such frequency of temperature changes.

Figure 7: ATmega328 based microcontroller boards.

The switching on and off of circuit components as per the commands directed from the microcontroller in order to simulate a particular condition required the components that are intended to be switched "on" at a different state where as the components that are intended to be switched "off" at a different state such that they do not affect the operation of the circuit. Hence, the Tri-state logic on input/output (IO) pins of the microcontroller is put into effect. The two modes of IO pins are attained by setting the IO pins to "Low" when the pins are in effect and setting at Hi-Z mode when the pins are required to be at High Impedance mode and hence not in operation. The tri-state acts as a buffer that allows controlling when current will pass and when not through the IO pins which is essential for the operation of shared electronic bus. The truth table along with gate design for tri-state operation of the microcontroller is given in Figure 8 [9, 10].



Truth Table		
Enable	A	Q
1	0	0
1	1	1
0	0	Hi-Z
0	1	Hi-Z

Figure 8: Gate design and truth table for Hi-Z operation of the IO pins of the microcontroller.

Programmable Pyroelectric Equivalent Circuit:

The pyroelectric equivalent circuit as shown below in Figure 9 consists of a current source, capacitor and resistor. The circuit is a current source in parallel with internal capacitance C_P and internal resistance R_P and the voltage V_P is the voltage at the output of the pyroelectric equivalent circuit. The current I_P from the pyroelectric element is proportional to the rate of change of temperature and is given by the formula shown below [11]:

$$\boldsymbol{i_P = \frac{dQ}{dt} = pA\frac{dT}{dt}}$$

Here 'P' is the pyroelectric coefficient; 'A' is the surface area and 'T' is the rate of temperature difference with respect to time.

The net charge "Q" developed due to the temperature change ΔT can be found by integrating the equation of 'i_P' with respect to time "t":

$$\boldsymbol{Q = \int (pA\,dT/dt)\,dt = pA\Delta TC = \frac{A\in_{33}^{\sigma}}{h}V = \frac{p}{\in_{33}^{\sigma}}h\Delta T}$$

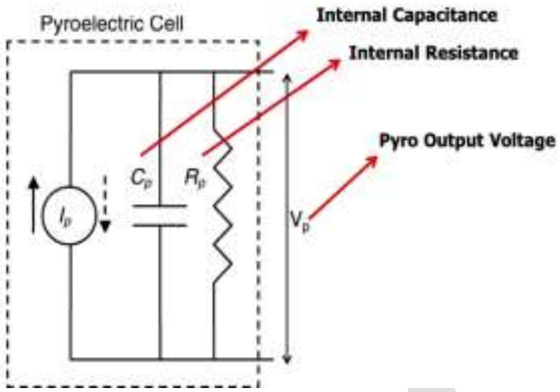


Figure 9: Pyroelectric equivalent circuit.

The pyroelectric material is typically of dielectric in nature and the equivalent capacitance (*C*) given by formula shown above and the open circuit voltage and the electric field developed can be derived from the $Q = CV$ equation, where ε_{33} is the permittivity in the polarization direction at a constant stress. This circuit is most commonly called RC circuit. The charges produced by temperature changes charges the capacitor which discharges through the resistor connected. These charging and discharging of the capacitor is related exponentially to the time constant (τ) which is given by the product of the value of capacitor and the resistor by the below mentioned equations [12].The time constant (τ) is inversely related to the cutoff frequency f_c which is an alternative parameter for the RC circuit. Relation between the time constant and cutoff frequency are also shown below:

$$\textbf{Charging: } V(t) = V_o\,(1 - e^{-t/\tau}) \qquad \textbf{Discharging: } V(t) = V_o\,(e^{-t/\tau}) \qquad \textbf{Time Constant: } \tau = RC = \frac{1}{2\pi f c}$$

The charging and discharging of the capacitor are varied by the programmable circuit driven by the microcontroller as shown in the equivalent pyroelectric circuit with loadings in Figure 10. R_E and C_E are external or load resistor and capacitor respectively. The command from the microcontroller drives the circuit according to the loading condition user wants to conduct simulation by connecting components of the circuit or by putting into a buffered condition by attaining Hi-Z state of the IO pin. This confirms that the component does not to even slightest extent affect operation of the circuit. This grounding and Hi-Z state of capacitors and resistors varies the time constant of the RC circuit and hence the waveforms at the output of the circuit. The waveforms at the output of the circuit are generated by repeated charging and discharging of the capacitors through resistors by the input signal from the microcontroller at a definite frequency and therefore resemble different loading conditions the pyroelectric material is simulated for. IO pins assigned for each capacitor and resistor are changed by the microcontroller between Hi-Z state and ground state as required to obtain simulation of a particular real world condition.

Energy Stored and Energy Deliverable from the Pyroelectric Equivalent Circuit:

The energy produced from the pyroelectric material is certainly comparable to the energy stored in a capacitor and it is very similar to the energy from a battery used for charging a capacitor. As stated earlier the voltage across the capacitor is proportional to the charge stored in the capacitor and hence the stored energy. The energy stored in a pyroelectric material at the end of the temperature change is equal to energy stored in the equivalent capacitor and can be deduced from the open circuit voltage by using the formula for the energy stored in capacitors [13, 14]. These relations can be expressed by equations given below:

$$E_{capacitor} = \frac{1}{2}\sum_{n=1}^{k} Q_k \sum_{n=1}^{k} V_k = \frac{1}{2}\sum_{n=1}^{k} C_k \sum_{n=1}^{k} V_k^2 E_{pyro} = \frac{1}{2}\frac{p^2}{\epsilon_{33}^{\sigma}} Ah\,(\Delta T)^2$$

Where, *Q* (charge in Coulombs), *V* (in volts) and *C* (capacitance in Farads) are charge, voltage and capacitance and E_{pyro} is the stored energy in pyroelectric material with ΔT temperature difference across the pyroelectric material. Therefore in order to infer the energy stored in the pyroelectric material from simulation, the energy stored in the capacitor needs to be calculated. Since varying the capacitor and resistor varies the total energy stored and energy deliverable it is essential to find the variations between the time constant (τ) which also depends on *RC* as stated earlier and the E_{pyro}. The Table 1 shows the total energy available and the stored energy for external load with respect to time constant.

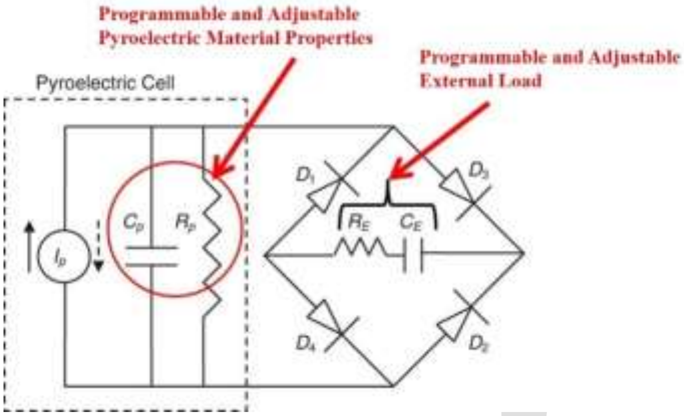


Figure 10: Pyroelectric equivalent circuit along with adjustable loading circuit.

Table 1: Simulated total output energy from the Pyroelectric material at certain program setup from few hundred selection choices.

RC Time Constant, τ (milliseconds)	Simulated total energy available from Pyroelectric material (micro-Joules)	Stored energy available for external load (micro- Joules)
103	3.35	3.2
22	7.2	7.1
16	0.163	0.161

Simulation System Setup:

The simulation system setup can come in different forms of packages that are shown in the Figure 11 and Figure 12. The pocket sized simulation system comes with the simulation system module and a pocket sized oscilloscope. The system needs to be preprogrammed in this setup and the user will just connect the probes of the oscilloscope to the module in order to get the waveforms. The desktop system consists of the simulation system module and a desktop oscilloscope and is considered to be not portable. Another setup which is portable consists of an android display made compatible by android coding along with the simulation system module.

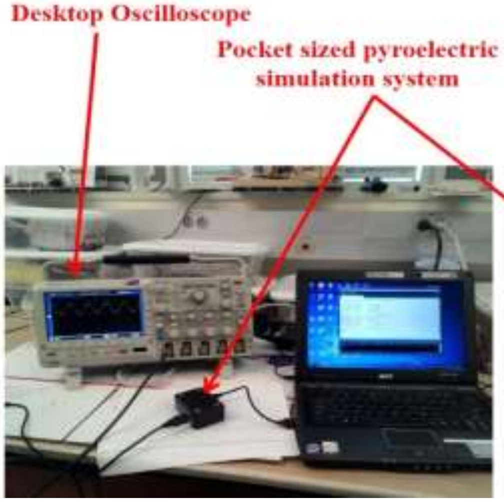


Figure 11: Desktop simulation system setup.

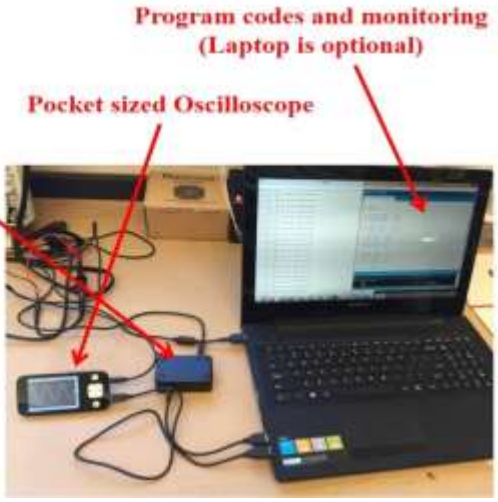


Figure 12: Pocket sized simulation system setup.

System Process and Flow Chart:

The flow chart of the system in given and shows the various steps the simulation system goes through depending on different logics and condition. The program logic is based on the inputs from Hi-Z state and ground switching that decides which IO pins and in turn which capacitor and resistor will undergo state change and eventually allows conduction through them. This allows energy to be stored in the capacitor. This multifunctional operation makes the system very simple and highly user friendly to operate and is illustrated in Figure 13.

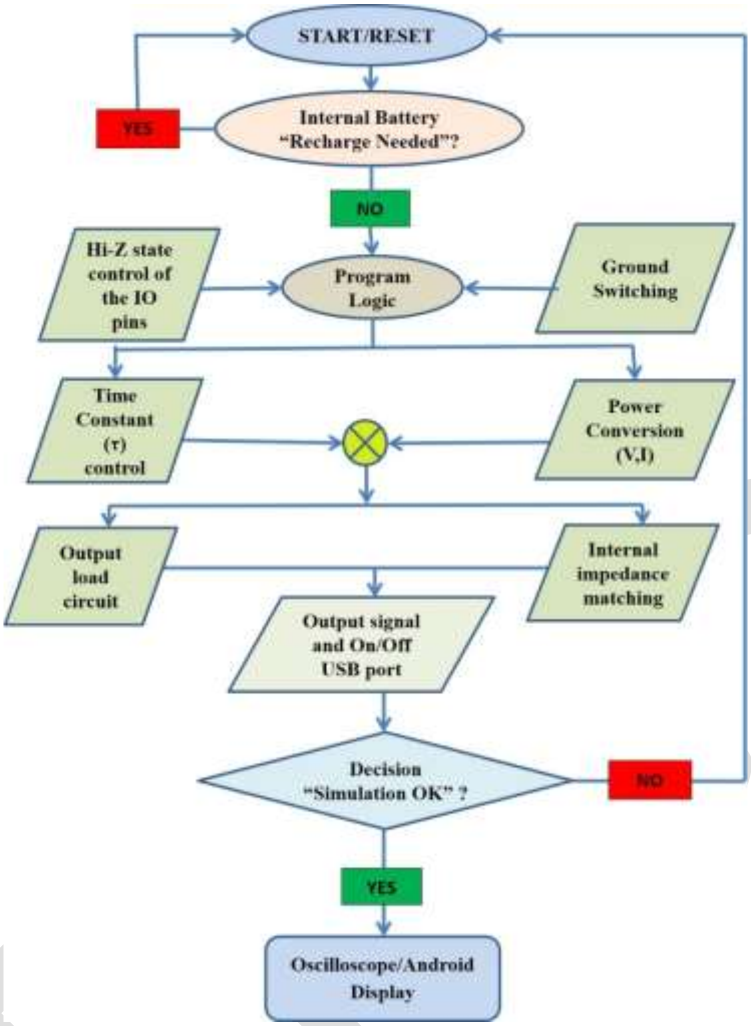


Figure 13: Flow chart of the pyroelectric simulation system.

The output load connection and the internal impedance matching are completed which leads to the output of the circuit to be displayed on the oscilloscope. The provision for recharging the batteries through the same universal serial bus (USB) as uploading program codes adds to the flexibility of the entire system. There is another provision in the system that it allows the system to switch "ON" only when the oscilloscope probe is connected to it. The sensing used to switch the system "ON" when the oscilloscope probe is connected and is the process to recharge the battery is unique in the sense that this switching process is implemented with an objective to save unnecessary power usage from the system. The design of the software framework also allowing the user to monitor all necessary data from the simulation on the computer screen exactly showing the simulation result values required to get to a detailed understanding of the behavior of the pyroelectric material under simulation.

RESULTS AND DISCUSSION

The simulation system functioned properly meeting the intended and desired objectives for a fully programmable pyroelectric portable simulation system. The system performance has been verified to various changes in the deciding parameters and every time the system has performed satisfactorily. Different load changes are precisely simulated by the simulating system and matching the waveforms resulted from the PSpice simulation of that particular condition. The waveforms resemble precisely the waveforms from pyroelectric material and have proved extremely handy in simulation of various applications of pyroelectric material. The program for controlling the circuit has achieved the expectations of a user friendly platform that is very essential for easy operation of the simulation system. The deciding parameters of the system can be easily changed using the program and thus save valuable time to make necessary changes adapting to various condition intended to be simulated. This system can play a defining role in designing futuristic applications of pyroelectric materials as they can provide deciding values necessary to engender a flawless and working application. Engineers and researchers will be the most benefited and will be greatly encouraged to explore wider area of pyroelectric material applications. The simulation system provides the energy generated from the pyroelectric material that will help decide the applications defined by energy requirements. The output signal waveforms obtained at different loading of the pyroelectric material are shown in the Figure 14 and Figure 15. The variations expected in the waveforms when simulating a particular condition also resembles that of a pyroelectric material under that particular condition.

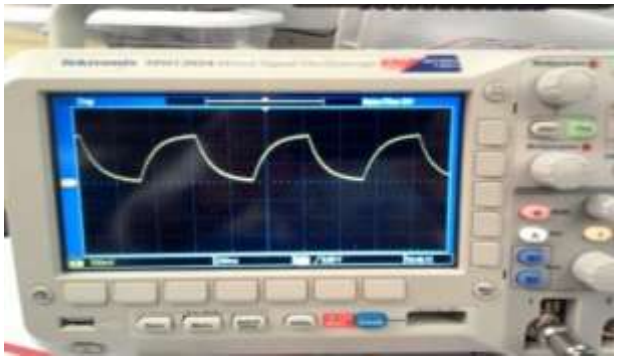


Figure 14: Output signal waveform at lower loading.

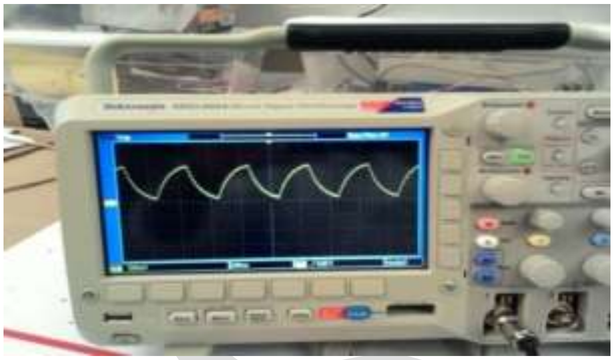


Figure 15: Output signal waveform at higher loading.

ACKNOWLEDGMENT

Authors like to thank UTSA_OCI for encouragements and assistance towards advancement of this technology. Furthermore, few online picture illustrations are made available here to clarify existing systems and technologies. This technology is currently under process of filing for a patent at USPTO through UTSA_OCI.

CONCLUSION

The use and benefits of the pyroelectric simulation system cannot be limited to sophisticated applications by researchers and engineers working on the application of pyroelectric materials. This simulation system can also come to the learning of pyroelectric material behavior. This simulation system can be easily carried for display and teaching to school pupils regarding the pyroelectricity and their behavior under different condition that will encourage future generations to take up challenging experiments in the application of pyroelectric material. For more realistic and successful application of the alternate energy source that world is craving for, the simulation system can help bring about breakthroughs in the research of pyroelectric material and their applications. This simulation system is thus equally useful in industries as well as research institutions and should be an inseparable part of researches involving pyroelectric materials and their applications.

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DESIGN OF RECONFIGURABLE SYSTEM ON CHIP BASED HIGH SPEED DATA ACQUISITION SYSTEM FOR MARINE APPLICATION

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Abstract -- The main aim to propose a processor for the data acquisition by sensors, which can be monitored and transmitted. A flexible and reconfigurable SoC is developed. A NIOS II based system on chip is used for the SOPC creation. The Altera Quartus tool with the SOPC builder used for building the hardware part of the processor and the NIOS II IDE used for the building of software part of the processor. A pressure signal can be acquired by the pressure transducers (PTX 1830/1840) from the source side and converted into pressure signal and then transmitted to the destination. Transmission can be done by using ZigBee protocol. Then those signals can be compared with the data sheets and warning can be given.

Keywords – NIOS, SoPC, Altera FPGA, Pressure Transducer, ZigBee.

I. INTRODUCTION

To design a reconfigurable processor with the high speed data acquisition from the sensor, the processor is designed by the NIOS II software with the help of system on chip (SoC) concept to build the software part of the system with the requirements of external hardware components for the processor. Then the reconfigurable processor the developed with the basic ALU unit, memory unit, and control unit. The ALU unit performs basic arithmetic and logical operations. The memory unit will stores the output data in the external data card (SDRAM).then the control unit controls all other unit in the processor. So the software part of the system is design with the NIOS II processor and the hardware part is done with the Altera Cyclone IV, DE-0 Nano board for the data acquisition from the sensor, a flexible and reconfigurable SoC is developed for the efficient data acquisition. The data acquisition by the sensor which converts any measurement parameters to an electrical signal which can be monitored displayed and transmitted to an control room. The external SDRAM card is used for the memory purpose and the transmission is done through the wired/wireless medium to the control room.

This project describes the Nios II processor from a high-level conceptual description to the low-level details of implementation. The primary reference for the Nios II family of embedded processors and is part of a larger collection of documents covering the Nios II processor and its usage that you can find on the page of the Altera website

1.1 Nios II Processor System:

The Nios II processor is a general-purpose RISC processor with the following features:

- Full 32-bit instruction set, data path, and address space
- 32 general-purpose registers.
- Optional shadow register sets.
- 32 interrupt sources.
- External interrupt controller interface for more interrupt sources.
- Single-instruction 32 × 32 multiply and divide producing a 32-bit result.
- Dedicated instructions for computing 64-bit and 128-bit products of multiplication.
- Floating-point instructions for single-precision floating-point operations.
- Single-instruction barrel shifter.
- Access to a variety of on-chip peripherals, and interfaces to off-chip memories and peripherals.
- Hardware-assisted debug module enabling processor start, stop, step, and trace under control of the Nios II software development tools.
- Optional memory management unit to support operating systems that require MMUs.
- Optional memory protection unit (MPU).
- Software development environment based on the GNU C/C++ tool chain and the Nios II Software Build Tools (SBT) for Eclipse.

- ■ Integration with Altera's SignalTap II Embedded Logic Analyzer, enabling real-time analysis of instructions and data along with other signals in the FPGA design.
- ■ Instruction Set Architecture (ISA) compatible across all Nios II processor systems.
- ■ Performance up to 250 DMIPS.

A Nios II processor system is equivalent to a microcontroller or "computer on a chip" that includes a processor and a combination of peripherals and memory on a single chip. A Nios II processor system consists of a Nios II processor core, a set of on-chip peripherals, on-chip memory, and interfaces to off-chip memory, all implemented on a single Altera device. Like a microcontroller family, all Nios II processor systems use a consistent instruction set and programming model.

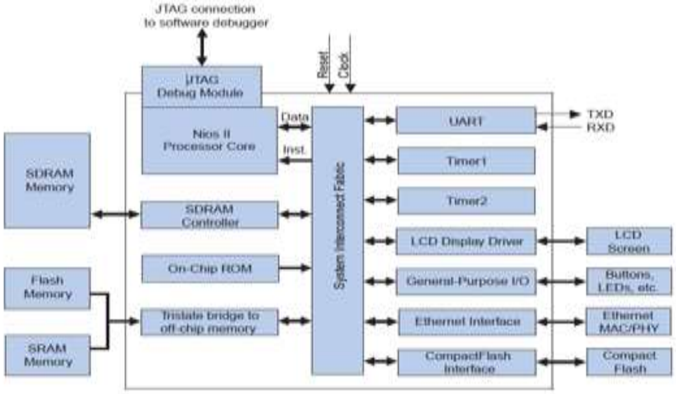

Fig 1.1. Example of a Nios II Processor System

Using the Nios II hardware reference designs included in an Altera development kit,you can prototype an application running on a board before building a custom hardware platform. Figure 1–1 shows an example of a Nios II processor reference design available in an Altera development kit.If the prototype system adequately meets design requirements using an Altera-provided reference design, you can copy the reference design and use it without modification in the final hardware platform. Otherwise, you can customize the Nios II processor system until it meets cost or performance requirement.

1.2. Design of Reconfigurable system:

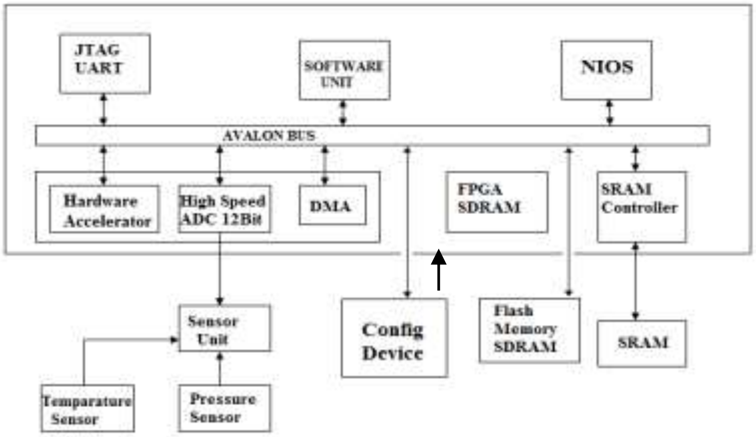

Fig 1.2 Block Diagram of the Reconfigurable System

Avalon Bus:

It is a communication protocol.

It establishes the communication between NIOS processor and overall system component.

It uses two Avalon bus interface named as (i) MM (ii) ST

Jtag Uart:

It is used for debugging purpose while run time.

It is also used for serial data transmission between hardware and PC.

It is used to insert hardware break points in the run time and used for efficient

debugging.

Baud rate for this Jtag Uart is 9600bps and default is 115200bps.

Software Unit:

It denotes the coding part.

This unit is user interface to the hardware.

It is written in Embedded C and it also can be done by assembly language.

System.h header file defines the H/W Abstraction Layer (HAL) of overall system.

A main.c is added to accumulate all the top level system access.

Hardware Accelerator:

A H/W accelerator is developed to access high speed 12bit ADC data from ADC 128S022 lower power 8 channel CMOS 12 bit A/D convertor.

It uses SPI controller to acquire data.

On SPI master/slave protocol is designed as Verilog module to access data.

DMA:

It is used as a separate buffer unit to hold the ADC data temporarily.

External interface to ADC is given through GPI02.

Config Device:

SRAM object file is loaded in config device after overall H/W development is finished.

SRAM Controller:

Used for internal data/register storage for the processor.

FPGA SDRAM:

NIOS II will boot by this SDRAM only.

32MB SDRAM starts the NIOS core.

A special/dedicated SDRAM controller IP is developed for the memory access in processor.

II. PROPOSED & EXISTING SYSTEM

2.1. Existing system:

Fig 2.1.Model of the existing system

The data from the pressure transducer can be acquired in the array of transducers and combined into a single data and given into a junction box. Then the data can be sent to the data logger unit for splitting the data and stored in a memory unit. Then the data is taken in a memory card and sent to the control room through a wired medium.

2.2. Proposed System:

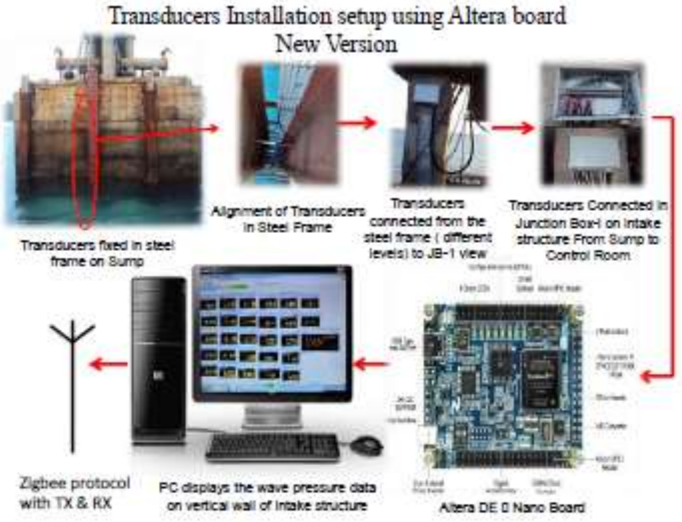

Fig 2.2.Model of the proposed system

Here the data acquisition can be done in similar way as existing one. The usage of the data logger unit is replaced by the altera FPGA board. The acquired data has been displayed in the system as continuously. Then those signals are transmitted to the control room through wireless protocol ZigBee.

III. INSTRUMENTATION USED FOR SYSTEM

The major instruments was used in the present study

- Pressure transducers
- Altera DE-0 Nano Board
- ZigBee protocol(TX & RX)

3.1. Pressure transducers

Pressure transducer of 15 No's used for measurement of waver pressures on the vertical wall. The time history of dynamic pressures will be measured by using GE Druck make (PTX 1830/1840) diaphragm type pressure transducers. The capacities of the pressure transducers are 0 -5 bar. The instantaneous change in the displacement of the diaphragm due to the action of external pressure is proportional to the instantaneous change in the applied pressure. Figure shows installation drawing of PTX 1830/1840 pressures transducer & Figure actual view of PTX 1830/1840 pressures transducer used in the present study. Displacement transducers will be fixed on the wall, sense the displacement of the diaphragm accurately. The real time histories of the proposed measured pressures are arrived by using the calibration coefficients of the pressure transducers. Table 1 shows technical specification of the pressure transducers.

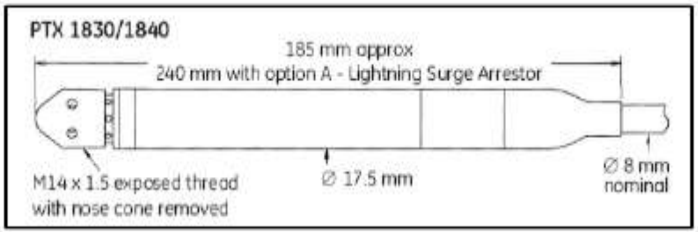

Fig 3.1. Installation drawing of PTX 1830/1840 pressures transducer

Fig 3.2 Actual view of PTX 1830/1840 pressures transducer

Table 1-Technical specification of Pressure Transducer

S.No	Description	Value
1.	Range	0-5 bar
2.	Accuracy	± 0.1% F S
3.	Type	2 wire
4.	Output current	4 t0 20 mA
5.	Application	Sea water
6.	Material	Titanium / SS 316L
7.	Process connection	1/2” NPT
8.	Protection	IP 68 / submersible in Marine Environment
9.	Operation Temperature	0-50º C
10.	Frequency	2000 Hz

3.2. Altera DE-0 Nano Board:

Layout and Components:

The picture of the DE0-Nano board depicts the layout of the board and indicates the locations of the connectors and key components.

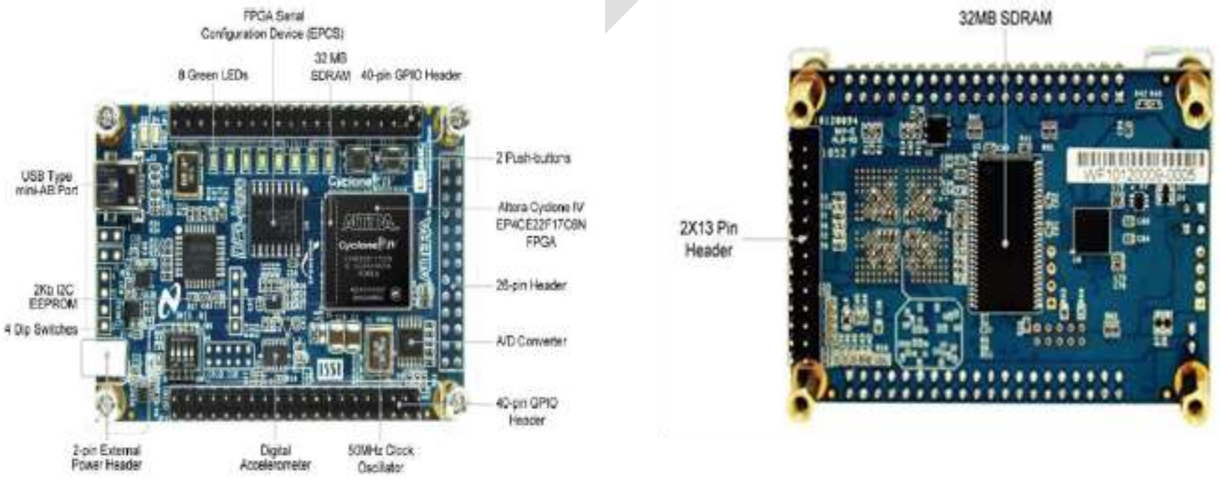

Fig-3.3. The DE0-Nano Board PCB and component diagram (top & bottom view)

Block Diagram of the DE0-Nano Board:

The block diagram of the DE0-Nano board is to provide maximum flexibility for the user all connections are made through the Cyclone IV FPGA device. Thus, the user can configure the FPGA to implement any system design.

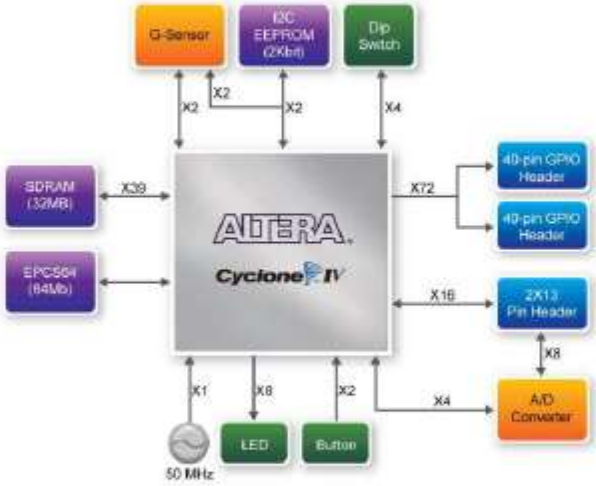

Fig-3.4.Block diagram of DE0-Nano Board

IV. RESULTS AND DISCUSSION

4.1. Calibration of Pressure Transducers

The static calibration of pressure transducers was done using the conventional method by lowering and raising the pressure transducer to known depth of immersion and registering the changes in the corresponding currents and pressure using multimeter and data logger. The calibration charts for all the pressure transducers used in the present investigation.

Table 2 shows the sample calculation of calibration constant for pressure transducer.

Sl. No	Water Depth in m	Measured Current In mA		Average in mA	Difference in mA
		Lowering	Lifting		
1	0	3.99	3.99	3.99	
2	1	4.31	4.31	4.31	0.32
3	2	4.62	4.62	4.62	0.31
4	3	4.93	4.93	4.93	0.31
5	4	5.24	5.24	5.24	0.31
6	5	5.56	5.56	5.56	0.32
7	6	5.88	5.88	5.88	0.32
				Average	**0.32**

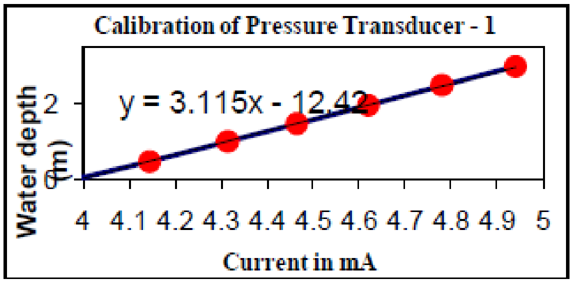

Figure 4.1 Calibration chart for pressure transducer-1

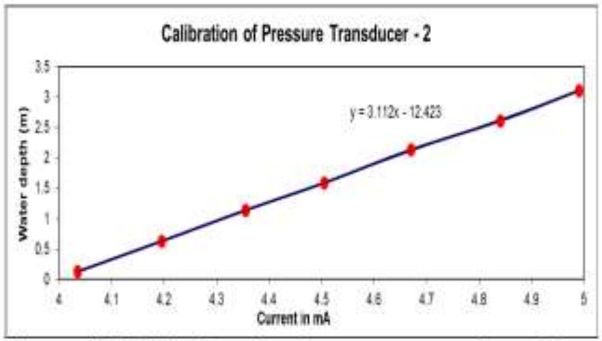

Figure 4.2 Calibration chart for pressure transducer-2

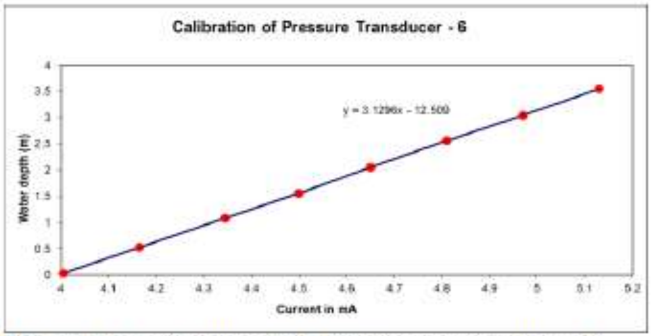

Figure 4.6 Calibration chart for pressure transducer-6

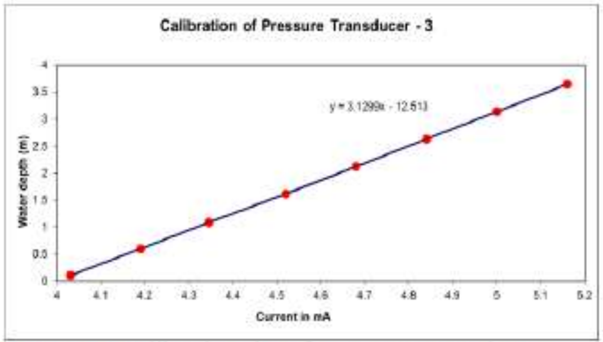

Figure 4.3 Calibration chart for pressure transducer-3

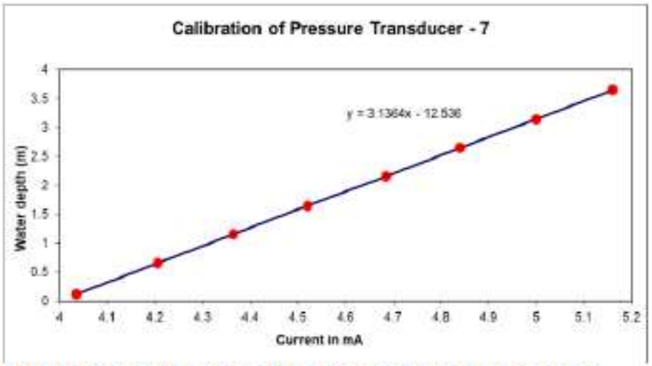

Figure 4.7 Calibration chart for pressure transducer-7

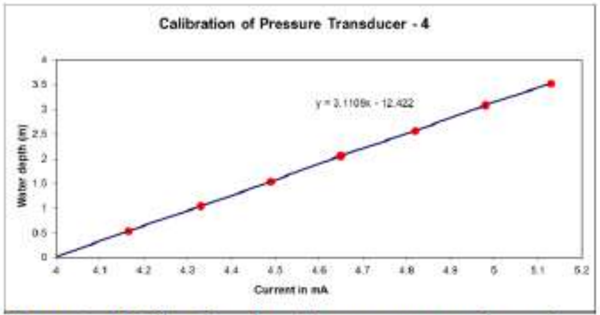

Figure 4.4 Calibration chart for pressure transducer-4

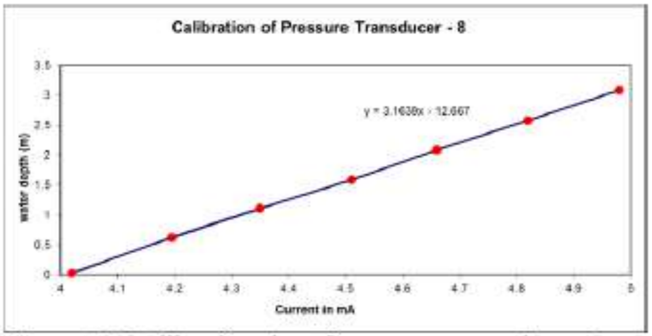

Figure 4.8 Calibration chart for pressure transducer-8

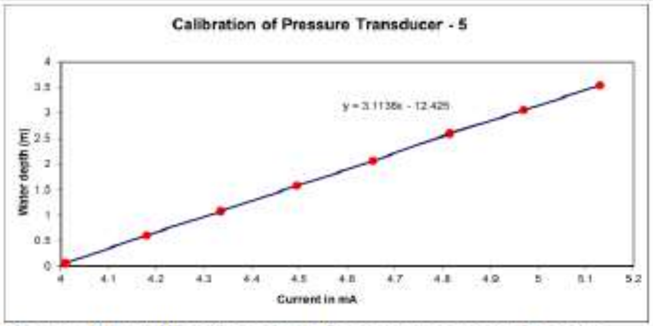

Figure 4.5 Calibration chart for pressure transducer-5

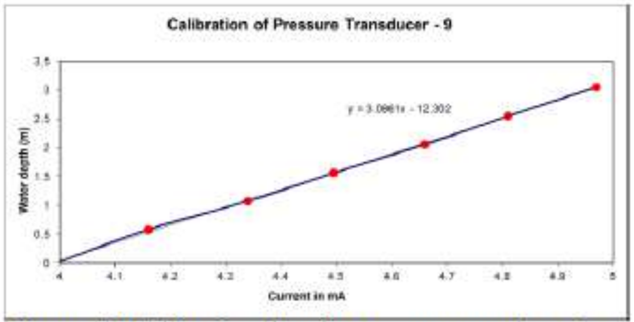

Figure 4.9 Calibration chart for pressure transducer-9

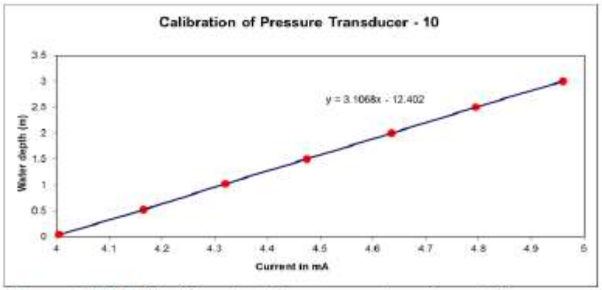

Figure 4.10 Calibration chart for pressure transducer-10

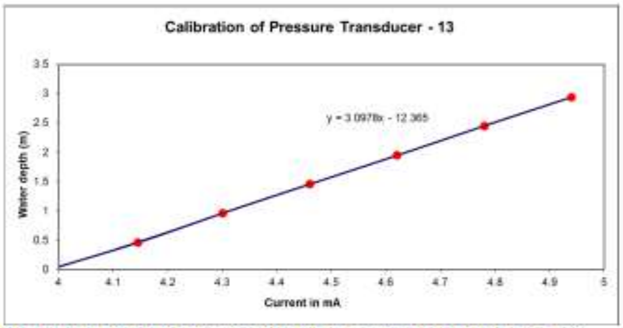

Figure 4.13 Calibration chart for pressure transducer-13

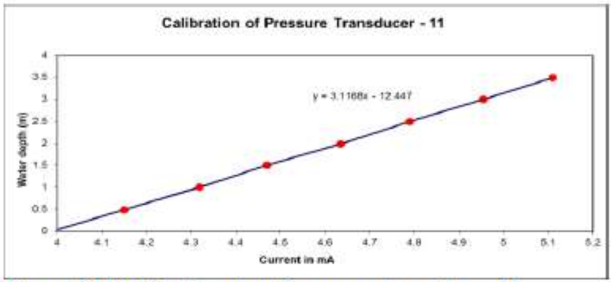

Figure 4.11 Calibration chart for pressure transducer-11

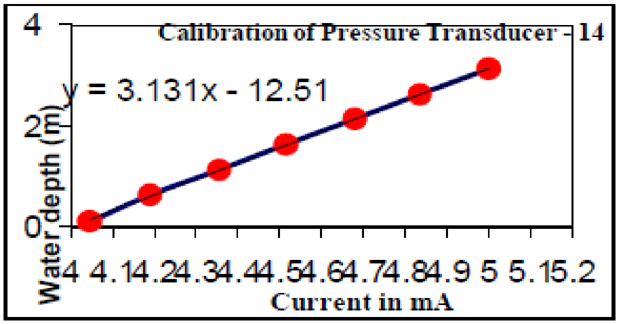

Figure 4.14 Calibration chart for pressure transducer-14

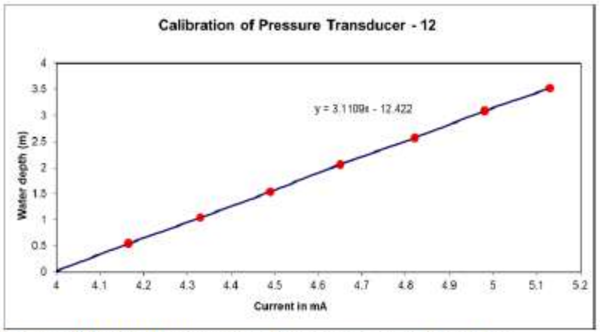

Figure 4.12 Calibration chart for pressure transducer-12

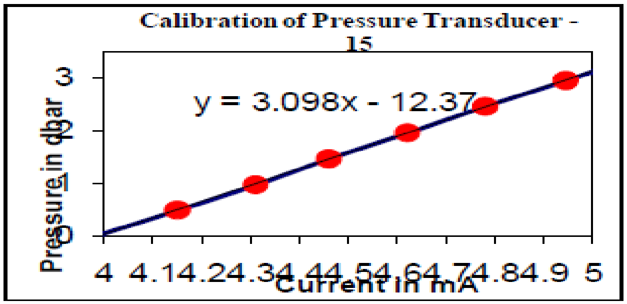

Figure 4.15 Calibration chart for pressure transducer-15

V. CONCLUSION AND FUTURE WORK

5.1. Conclusion:

Thus the data acquisition for a marine application using a reconfigurable system on chip concepts was concluded that the acquired pressure data from the transducer by the Altera DE-0 Nano Board will be monitored by the system, and the data was transmitted to the control room by ZigBee wireless protocol with a distance of 40-50 meters. Based on the resulting values the corresponding warning signals like tsunami, cyclone etc., will be announced to the people by the scientist from the control room.

5.2. Future Work:

The acquired data can be transmitted to the destination by the same wireless protocol with a distance of 1000's of meters and the warning signals will be given to the people by automatically using some software through online.

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Smart Shopping Using Augmented Reality on Android OS

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Abstract— Now days, a mobile application has bought a lot of changes in shopping. Specially, the new technology called augmented reality system made in feasible an advanced way of information collecting by giving data of the virtual world to real world. Smart shopping using augmented reality developed in android for shopaholics who have crazy about shopping. The shoppers use this application (app) while shopping to reduce their bucks and time. Shopping is an interesting process in which a customer selects the available materials or services provided by one or more retail merchant with the intention to buy a suitable selection of them. The advantages of this application, shoppers no need to walk in to the stores. Rather than that use their device to get detailed information of shops or malls they are interested in simply by panning the devices video camera over the shop. This application is inexpensive, as a user need not actually purchase the object to see how it fits in the environment, instead customer can see before the purchase itself. The geolocation technology is used in this application to refer the finding location of a building. Geolocation is completely related to the use of positioning of mall or shops.

Keywords- Augmented Reality, Geolocation, Smart Shopping, Unity3D, Android OS

INTRODUCTION

Augmented reality (AR) is a field of computer research which deals with combination of reality with computer generated data. It is related to a real world and virtual world which is created or modified by a computer or related device. The information about the surrounding real world of the user becomes interactive and digitally manipulate with the help of advanced AR technology [1].

Smart Shopping augmented reality on android OS developed in android for who have interest about shopping. The shoppers use this application (app) while shopping to reduce their bucks and time. Today's online has come to expect a retail experience that is filled with personalized recommendations and information, helpful product comparisons, links to reviews, access to flash sales and special offers.

A new augmented reality mobile shopping app that enables retailers to personalize each individual customer's shopping experience right from the palm of their hands, via their smart phone or tablet.

Now, Shoppers no need to walk into the store rather than that device to get detailed information of shops or malls they are interested in simply by panning the devices video camera over the shop or mall.

The augmented reality technology identifies the shop and displays the important information to the shoppers that is superimposed on the product image, such as shirts, pants or dress materials. Smart shopping using Augmented Reality mobile application that will make it possible for to categorized products and receive personalized product information, cost and offers.

Before entering to the store, consumers download the app on their smart phone or tablet. After that open the application, point their device camera at shop or mall, the app will instantly recognize the shop image via augmented reality technology, and overlay digital details over the shop images – such as category of dress, shop details and about offers.

Geo-based Augmented Reality is the combination of Augmented Reality, Location Based System and GPS giving birth to such an advanced and innovative technology. Geolocation is closely related to GPS but a slight distinguishable concept may break them apart. Global Positioning System also known as GPS gives the geographic coordinates whereas geolocation gives the meaningful locations rather than just set of coordinates, for example- street address or shop address [2].

LITERATURE REVIEW

On the basis of Augmented Reality concept, it took a massive amount of time and effort spent on developing system. It is necessary to utilize high performance computers and camera in order to perform complex image processing and to get information it needs to be connected to system.

In many countries AR related research has been done in many ways for some purpose.

The Tinmith System which was developed by Piekarski and Thomas is demonstrating new techniques for mobile Augmented Reality modeling.

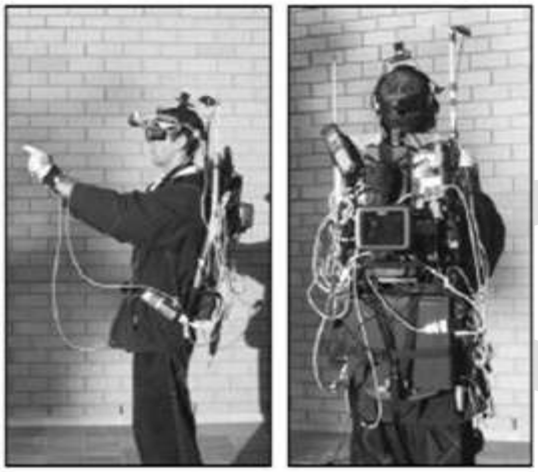

Figure I: The Tinmith System

In late 1999 a research has been done on basis of user interface technology which was built user interface technology which was built using a glove based menu and 3D interaction techniques. The system was especially designed with purpose to support applications which allow access to construct simple models of outdoor structure [3].

An Informational Tool in Tourism

Figure II: Tourism Application [4]

Based on the research was tourism application using AR in 2013 in Ireland. It was the most successful application.

The tourism application was built in order to be used as an informational tool in tourism. This application reveals that user can know about the content relevant to a place it means pointing a phone at specified location, the phone, using GPS can know what it is currently seeing and generates the contents automatically [4].

Regards have developed A Survey of Augmented Reality

This survey was identified the rapidly changing technologies and the revolution of AR. Recent days, 3D virtual objects are merged into a 3D real environment in real time. It has been used and explored various areas like the medical, manufacturing, visualization, and path planning, entertainment and military applications [5].

Shopping is made more personal by using Augmented Reality with new mobile application from IBM research which helps in case of supermarket shopping. The research was developed by IBM researcher which is an existing system.

This mobile application provides a personalized shopping experience with the feature of product comparisons and to identify a product (or) row of some items and image processing has been used, where it captures the images through the built in video camera on a users Smartphone. When the product is identified it displays the information above the product images and it will rank them based on a number of criteria, such as price and numerical value. It also provides the shoppers with any rewards of loyalty (or) incentives which may apply and suggest some of the complementary items on basis of what the customers has viewed already [6].

By analyzing the literature review, there is no augmented reality based mobile application for the shoppers to get details of shop or malls. Also because of the peoples busy life style, they always requiring for an efficient ways to do their day today work. So that developed mobile application which can track give details over the shop images - such as category of dresses, shop details, and about offers.

ABOUT ANDROID OS

Among the rapidly growing technologies Android is also stated as one of the most. Due to the advent of 2010 there is increase in stress and has given on the usage of Free and Open Source Software (FOSS). Android is leading the current O.S market as shown in figure III, because it is open source and developed by a consortium of more than 86 leading M.N.C's called Open Handset Allowance (O.H.A). More and more applications have been developed and modified by third party user[7].

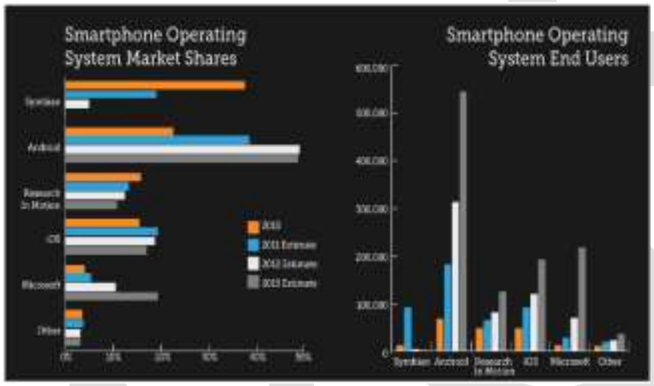

Figure III: Smartphone OS market shares

Furthermore, the Android O.S is user friendly. It has a feature of high performance and processing power.

PROPOSED SYSTEM ARCHITECTURE

At the earlier stage, the simplest augmented reality system was formed from camera, which is a computational device and some form of display. At present, such type of system incorporates all of those elements into a single device, as like tablet, personal computers or mobile phones.

The captured image will track with some specialized software. The tracker calculates proper location and orientation of virtual overlay. Afterwards, combines the original image and virtual image using the rendering module. Rendering module calculates the 'pose' and renders the final image of Virtual image or components to the display.

The important component of this system is tracking module. It calculates the pose of the camera in real time. In this context the term “pose” designates the six degrees of freedom, namely the position and rotation of an object in 3D. By using this piece of information, the tracking module prepares a virtual element to be displayed in the real scene.

The block diagram represents the architecture of a proposed system in Figure 5.2.

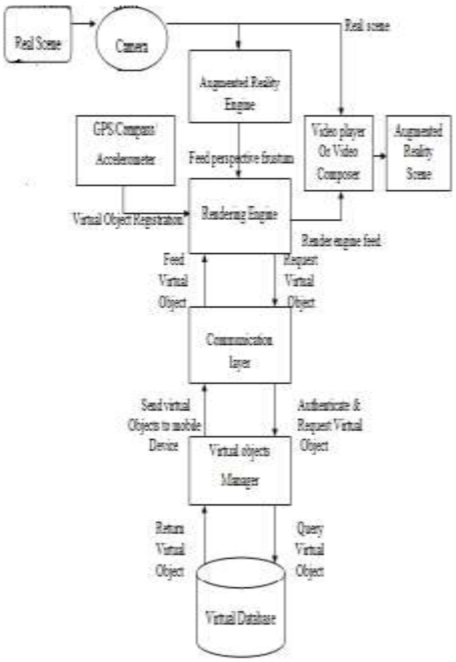

Figure IV: Architecture Block Diagram

The proposed system architecture has contains 4 following modules.

1. Camera

2. Image Capturing Module

3. Tracking module

4. Rendering module

1. Camera

A real world live video serves as an input from the android all phone cameras to the Android all phone camera to the camera module. In Augmented Reality displaying the live feed from the android cell phone camera is the reality. For image capturing module this live video stream is given as an input.

2. Image Capturing Module

The live video feed from the camera of a mobile device is the input to image capturing module. Each frame in the video is analyzed by analyzing camera feed in the module. Binary images are generated by this module i.e. a digital image which has only two possible values for each pixel. Black and white is the two columns used for a binary image. For Image processing module these binary images are provided as an input.

3. Tracking module

The tracking module is the most important process of this project, as it calculates the relative pose of the camera in real time. In this context the term “pose” designates the six degrees of freedom, namely the position and rotation of an object in 3D. By using this piece of information, the tracking module prepares a virtual element to be displayed in the real scene.

4. Rendering module

It consists of 2 inputs. The calculating pose from the tracking module is the first and second is the virtual object to be augmented. The original image and the virtual components are combined using calculated pose in the rendering module and augmented image is rendered on the display screen of the mobile device.

RESULT AND DISCUSSION

In this section contains the result of smart shopping using Augmented Reality on Android OS project and what were the new approches found to address further researches. The project smart shopping using Augmented Reality is developed android mobile application for capture the shop or mall from user own mobile phone. That application was developed by Unity3D software. After user capture the shop or mall that image process through web service and display detail of the shop or mall lively via mobile application. The mobile application selects and recognise the specific area, in which is going to put the digital content.

Figure V: Capture Building interface

Figure VI: Display details of lifestyle & apparels

Figure VII: Display details of Men’s clothing

Figure VIII: Display details of cost of products

Figure IX: Display details of mall or shop

In this project recognise the specific area like mall or any shops. These recognised area stores in servers. Then server sends the virtual object on top of the malls or shops. When the image and its characteristics are stored in the database, then the mobile application sends the extracted features of the image (captured by video camera) to server using the API.

The server processes the features received, and then searches it on the database. Then, when processing is complete, sends the results to mobile devices with digital content.

The mobile application is an Augmented Reality app developed with c# programming language using Unity3D software. The server-side implementation is done with API, which was developed using REST. REST is an architecture of web development, which is supported in the HTTP standard, allowing to create services & applications that can be used by any device that understands HTTP[8][9].

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CONCLUSION

This paper proposes a smart shopping using augmented reality on android operating sytem which will help to combine virtual object with the real environment in various applications. The main advantage is use low cost devices as compared to the costly head mounted display services. Second advantage is now hoppers no need to walk into the store rather than that device to get detailed information of shops or malls they are interested in simply by panning the devices video camera over the shop or mall. In the future, it is necessary to apply the augmented reality system suggested areas including advertising, education, and tourism, by making interaction between users and augmented reality system. AR has been effective for a better learning performance, learning motivation, student engagement and positive attitudes.

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Mapping and Analysis of Soil Fertility Using Remote Sensing and GIS; A Case Study of Tharangambadi Taluk, Nagappatinam District

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Abstract: Soil is the basic requirement of all life on earth. The origin of life has been attributed is soil along with other basic elements. Soil nutrients are the major source of soil fertility that helps for the plant growth. Soil nutrients has become a necessary resource to be enhanced further over the past years due to the increase in usage of inorganic fertilizers, disposal of waste water from domestic and industrial sector etc. soil resource is now facing threats due to various soil nutrients deficiency. The soil quality is equally important as that of crop production. Mapping of spatial variability of soil nutrients and its quality is vital important and it is particularly significant, where soil fertility is primary source of agriculture. The present study focus on spatial variability and temporal variability of soil quality. This variation maps of soil nutrients were prepared using GIS technology and other related maps were prepared from remote sensing data in ArcGIS 10.1. The soil nutrient index is determined to identify the nutrient status in the study area. From the soil nutrient index, the crops response to the nutrient, causes for the nutrient deficiency and consequences of such nutrient deficiency are analyzed. Samples were collected from twenty five locations in the study area. Soil nutrient analysis of the collected samples are done for 2015.The results were shown in spatial format using remote sensing and GIS. Suggestions to overcome such nutrient deficiency is also discussed in order to improve the crop productivity in the study area.

Keywords: soil nutrients, spatial variability, remote sensing, GIS, Macro and micro nutrients, soil nutrient index (SNI),

I.INTRODUCTION

Soil is the basic requirement of all life on earth. The origin of life has been attributed is soil along with other basic elements. Soil the source of life is passionate. It must be remembered that any natural or manmade activity on the surface of the earth will have its own impact on the quantity and quality of soil this will be taken into the biosphere systems and ultimately lead to hazardous extremes. The increase in population and urbanization and its necessities in growth of agricultural practices which leads to exploitation of soil nutrients. The dependability on inorganic fertilizers has reached high in recent decades due to reasons such vagaries of monsoon, increasing the crop yield, making money at short duration. This has resulted in over exploitation all over the country and in certain places it has reached critical levels like deficient soil nutrients. Soil nutrients (generally NPK) being one of the basic necessities for plant life. The source of life in its natural state is free from pollution but when man tampers the soil nutrients it loses its natural conditions. Soil nutrient has become an essential resource over the past few decades. Remote sensing and GIS are effective tools for soil quality mapping. Hence this technique is adapted to analyze the soil quality based on soil nutrient parameters

II.STUDY AREA

The study area located in the South east coast of India Tamilnadu state which falls in between north latitudes 10° 15' and 11° 00'and east longitudes 79° 30' and 80° 00' . The study area (topographic sheet no. 58N/11, 58N/13, 58N/14, and 58N/15) comprises south-eastern part of the Nagapattinam district the length of total coastal stretch around 55 km and total extent 1381 sq.km. The Nagapattinam district lies along the east coast of India, located to the south of Cuddalore district and another part of the Nagapattinam district lies to the south of Karaikal and Thiruvarur districts. The major soil types in this taluk are Sandy coastal alluvium soil and Clay soil. Sandy coastal alluvium soils are prevalent in coastal areas of tharangambadi taluk and some interior areas like Memathur, Seridiyur, Kulichar, Nangur etc..,while clay soil are found in south-west part of tharangambadi taluk.

Climate and Rainfall:

- Average maximum temperature is about 32° C
- Average minimum temperature is about 24.60°C
- ➢ During south west monsoon
    - Normal rainfall is 265.2mm
    - Actual rainfall is 250.6mm
- ➢ During north east monsoon
    - Normal rainfall is 908.8mm
    - Actual rainfall is 969.2mm

Fig 1. Study Area

III.METHODOLOGY

It is important to use the proper equipment for sampling soils. A soil probe can be used to collect soil samples and a small wooden rod can be used to remove the soil core from the tube. Here in tharangambadi taluk, the soil samples are collected by using a spade by digging a V-shaped hole to sample depth and then a thin slice of soil is taken from one side of the hole. The field, where the soil sample is collected is divided into four quadrants and then the soil sample is taken by above method. The samples collected from each quadrants is mixed and labeled as sample no.1. In similar manner 25 random locations are sampled and labeled. Then the soil samples are dried and sieved in order to remove other particles. Then 1 to 1 1/2 cups of soil sample (each in 25 samples) is sent to the laboratory for analysis. Samples were analyzed for macro nutrients and micro nutrients by using the standard procedures. Detailed macro and micro nutrients like Calcium carbonate ($caco_3$), EC (dsm^{-1}), P^H,organic carbon (%), nitrate, phosphorus, potassium, iron, manganese, zinc, copper were measured by Orion ion electrodes using standard procedure to understand the soil nutrients behavior. The Tharangambadi taluk map is scanned and georeferenced using ArcGIS software. Ground Co-ordinates are gained from Google map. Using these co-ordinates pixel co-ordinates of scanned image are

converted into ground co-ordinates. The georeferenced map is digitized by creating personal geodatabase and feature classes (point, line, and polygon). The map is digitized and it is projected for accurate information. The layout of the map is prepared with latitude and longitude for better understanding and more informative.

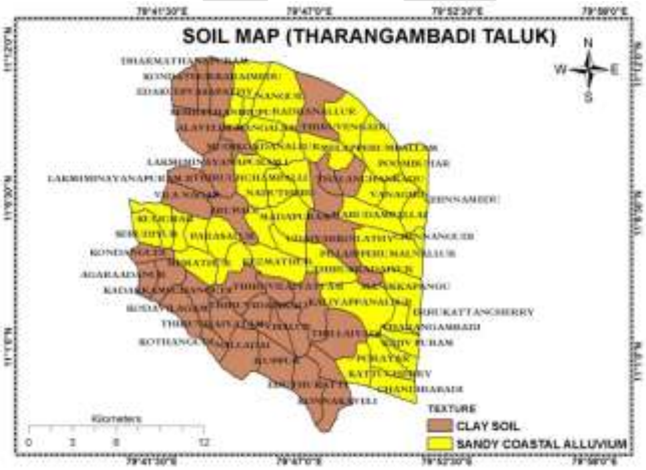


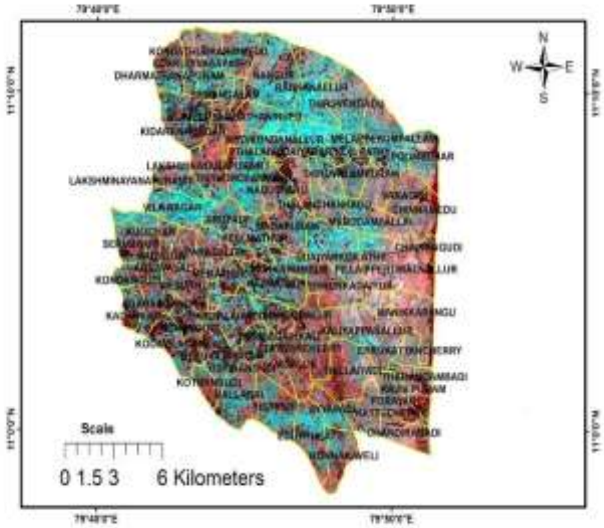
Fig 2: Soil map of the study area

Fig 3. Methodology

IV. RESULTS & DISCUSSIONS

1. SATELLITE MAPS

Raw satellite images of the given area is pre-processed using ENVI software. Satellite images are usually downloaded from USGS website. Geometric and Radiometric correction are applied to correct for these distortions and produce an image with geometric integrity of the map. Here the red band shows the vegetation areas, blue band shows water bodies where green band shows built up and barren lands. The satellite images of 1993, 2014 and 2015 is given below to understand the land cover variation



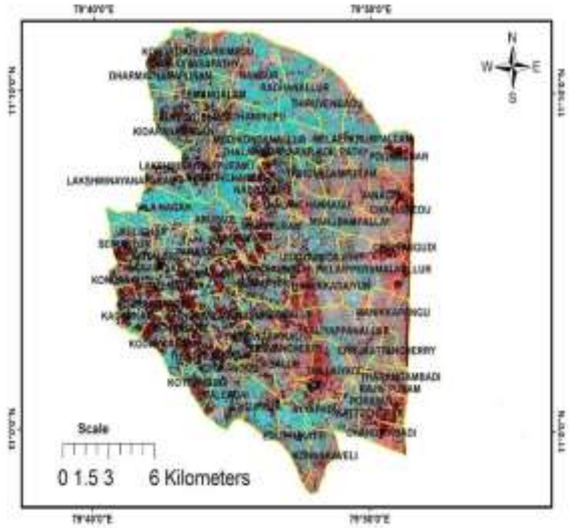


Fig 4: Satellite map of the study area (1993) **Fig 5: Satellite map of the study area (2014)**

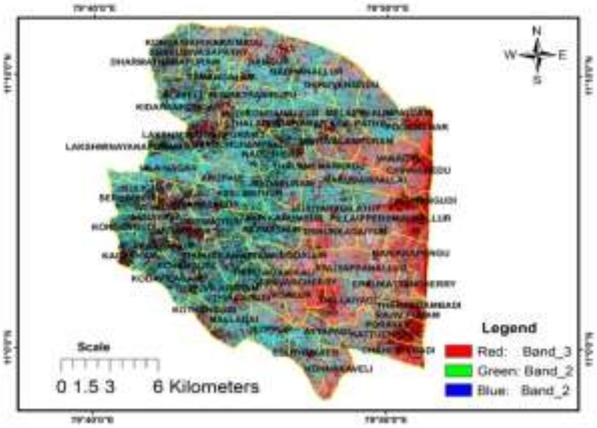
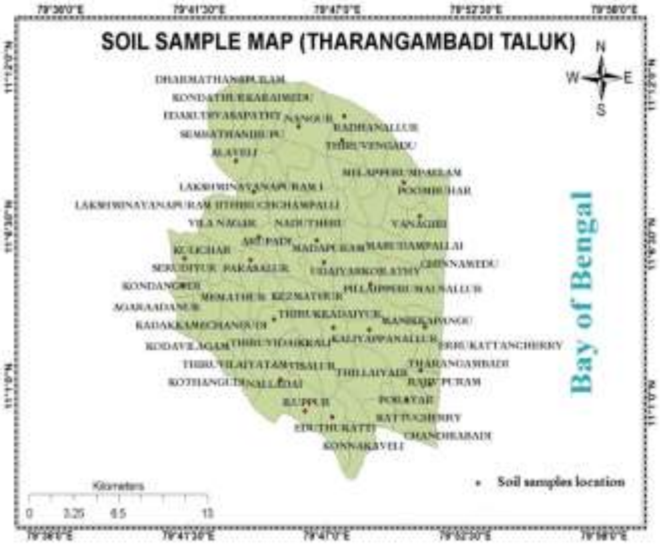


Fig 6: Satellite map of the study area (2015)



LOCATION	N in kg/acre	P in kg/acre	K in kg/acre	Fe in ppm	Mn in ppm	Zn in ppm	Cu in ppm
RAJIVPURAM	12.6	26	54	15.23	7.92	0.21	0.37
PORAYAR	53.2	25	76	14.62	4.31	0.33	0.29
EDUTHUKKATI	133	25	128	15.33	6.91	0.28	0.38
ILLUPUR	32.2	8	92	13.28	4.2	0.64	0.63
KOTHANGUDI	50.4	6.5	56	13.91	2.81	0.61	0.71
PERAMBUR	91	21	148	13.41	3.91	0.38	1.31
KADAKKAM	15.4	13	52	15.43	6.79	0.39	1.04
OZHUGAIMANGALAM	23.8	18	60	16.71	6.81	1.01	0.79
THIRUVIDAKAZHI	117.6	9	52	12.87	5.43	0.79	0.81
ECHANGUDI	121.8	11	76	12.79	6.38	1.28	0.96
MANIKKAPANGU	50.4	16	54	12.41	4.31	0.39	0.91
KAZHIYAPPANALLUR	39.2	10	48	15.42	7.41	0.71	0.55
PILLAIPERUMANALLUR	15.4	13.5	50	15.42	7.41	0.71	0.55
MANNAMPANDAL	35	13	52	13.39	3.92	0.53	0.31
PARASALUR	19.6	6.5	56	12.45	4.56	0.59	0.39
SERIDIYUR	40.6	25	124	16.12	3.94	0.86	1.03
VANAGIRI	7	15	50	14.39	5.38	1.21	1.09

ARUPATHY	85.4	15.5	68	14.32	3.56	0.91	0.86
THIRUCHAMPALLI	39.2	11	50	16.71	6.13	0.87	0.93
RADHANALLUR	99.4	14	176	15.91	2.91	1.25	0.39
NANGUR	71.4	18.5	96	12.68	3.56	0.38	0.64
ALAVELI	89.6	20	92	12.73	2.58	0.47	0.39
UMAYALPURAM	72.3	2.5	58	13.34	3.91	0.38	0.28
POMPUHAR	33.6	1.5	56	17.47	4.97	0.49	0.35
THIRUVENGADU	78.4	2.5	144	13.28	3.95	0.31	0.33

Table-1: Macro and micro nutrients of the samples collected

Fig 8: Soil sample collection, labelling, Drying, Sieving and removing other particles from sand

Macronutrients

Soil Test Category	Phosphorus (P) in Kg/acre	Potassium (K) in Kg/acre	Nitrate (N) in Kg/acre
Deficient (low)	0-5	0-40	0-50
Optimum (high)	6-10	41-100	51-100
Exceeds Crop Needs (very high)	>10	>100	>100

Micronutrients

Soil Test Category	Iron (Fe) in ppm	Manganese (Mg) in ppm	Copper (Cu) in ppm	Zinc (Zn) ppm
Deficient (low)	0-10	0-1	0-1.2	0-10
Optimum (high)	11-20	1.1-10	1.3-10	11-20
Exceeds Crop Needs (very high)	>20	>10	>10	>20

Table-2: Soil Test Categories for Nutrients

NITRATE:

Nitrogen is the basic nutrient helps in seed formation and increases the food and feed value of crops. The nitrogen-deficient plants are light green in colour. The lower leaves turn yellow and in some crops they quickly start drying up as if suffering from shortage of water. The analyzed sample varies from 7 – 135 kg/acre in the study area.

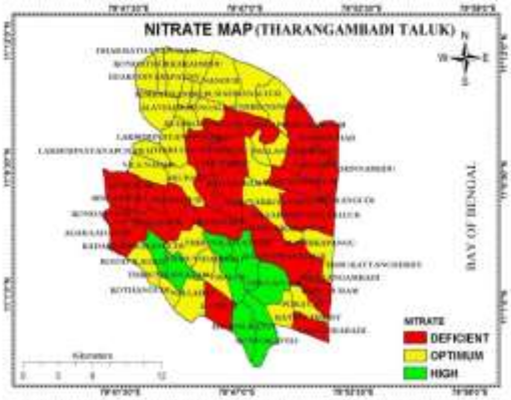


Fig 9: NITRATE MAP

PHOSPHORUS:

Phosphorus is particularly helpful in the production of legumes, as it increases the activity of nodular bacteria which fix nitrogen in the soil. Generally phosphorous deficiency causes the plant is dark-green but the lower leaves may turn yellow and dry up. Growth is stunted and leaves become smaller in size. The analyzed sample varies from 1.5 – 26 kg/acre in the study area.

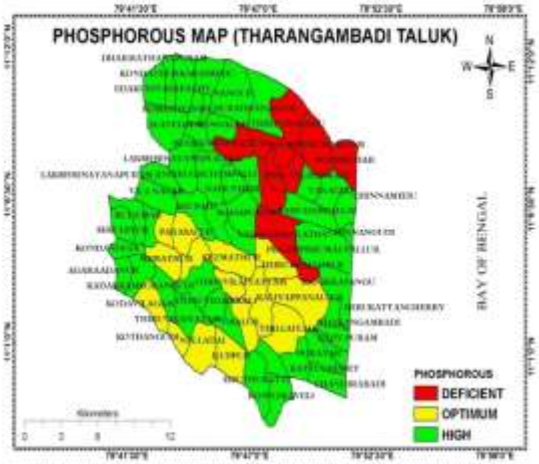


Fig 10: PHOSPHOROUS MAP

POTASSIUM:

Unlike nitrogen and phosphorus, potassium is not a constituent of the carbohydrates, oils, fats and proteins, the substances which form the fabric of the plants. But it plays a vital role in the formation or synthesis of amino acids and proteins from ammonium ions which are absorbed from the soil. Deficiency of potassium causes the margins of leaves turn brownish and dry up. The stem remains slender. The analyzed sample varies from 48 – 176 kg/acre in the study area.

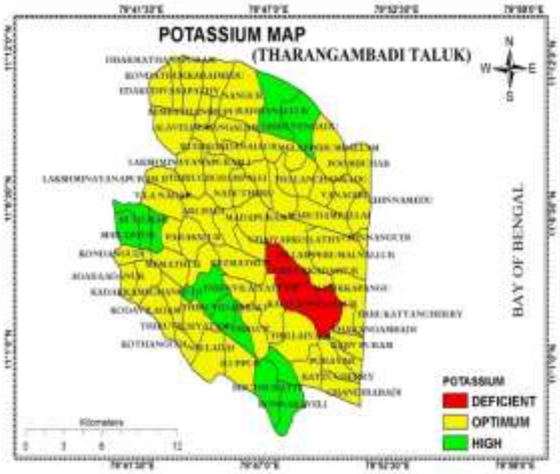


Fig 11: POTASSIUM MAP

IRON:

Although iron does not enter into the composition of chlorophyll, its deficiency manifests itself in chlorosis, yellowing or whitening of leaves. The concentration of iron ions plays and important part in the oxidation process in leaf cells. Sever deficiency results in chlorosis and leaves turn white and eventual leaf loss and the growth of plants is very much restricted. The analyzed sample varies from 12.41 – 17.46 ppm in the study area.

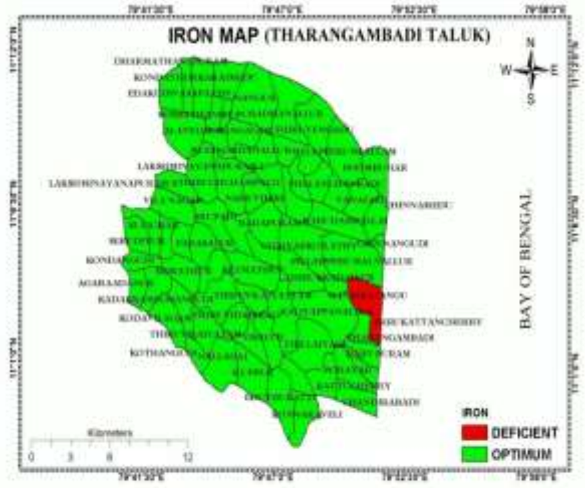


Fig 12: IRON MAP

MANGANESE:

Manganese is an essential element and appears to have a role in the formation or synthesis of chlorophyll. Due to deficiency of manganese the carbohydrate synthesis is disturbed, resulting in retarded growth, decrease in the content of ash and failure to reproduce. The analyzed sample varies from 2.58 – 7.92 ppm in the study area.

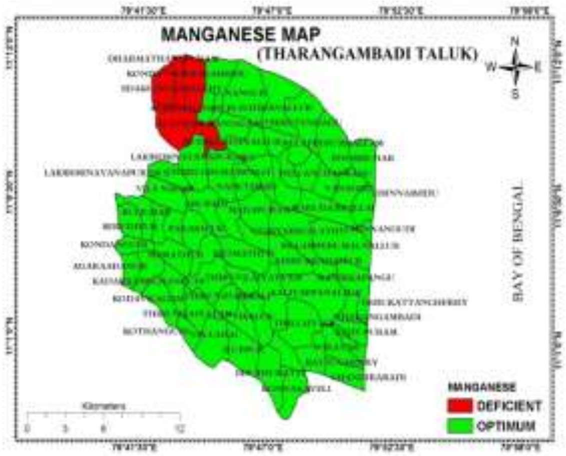


Fig 13: MANGANESE MAP

ZINC:

Zinc is associated with the development of chlorophyll in leaves and a high content of zinc is correlated with a high amount of chlorophyll. In its absence growth is less, buds fall off and seed development is limited. Extreme deficiency of zinc manifests in chlorotic conditions and in darker coloured veins of leaves the analyzed sample varies from 0.21-1.28 ppm in the study area.

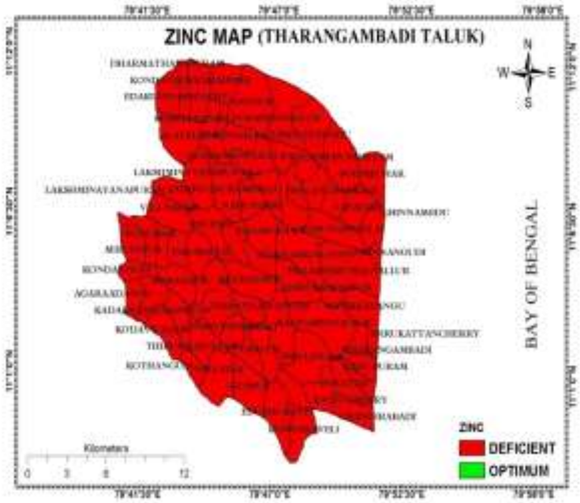


Fig 14: ZINC MAP

COPPER:

In the chloroplasts of leaves there is an enzyme which is concerned with the oxidation-reduction processes. The presence of copper is essential for this enzyme to function. Thus, copper plays an important role in the process of photosynthesis. In extreme deficiency there may occur excessive leaf shedding. The analyzed sample varies from 0.28 – 1.31 ppm in the study area.

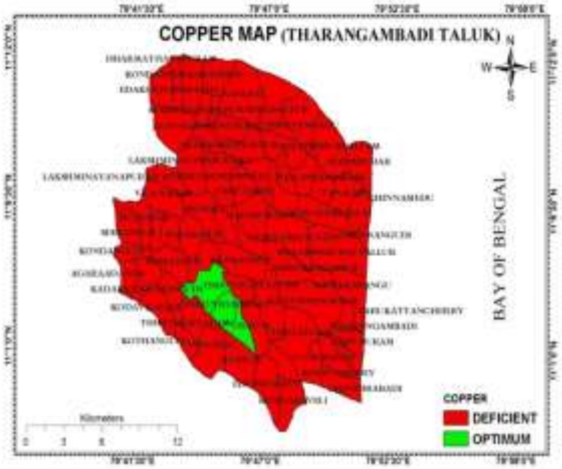


Fig 15: COPPER MAP

ESTIMATION OF SOIL NUTRIENT INDEX (SNI)

Parker's (1951) method of calculating Nutrient Index (NI) values to indicate fertility status of soils for the purpose of mapping. The following equation is used to calculate Nutrient Index Value:-

$$\text{Nutrient Index} = \frac{(Nl \times 1) + (Nm \times 2) + (Nh \times 3)}{Nt}$$

Nh = Number of samples falling in high category of nutrient Status.

Nt = Total number of samples analyzed for a nutrient in any given area.

Nl = Number of samples falling in low category of nutrient status.

Nm = Number of samples falling in medium category of nutrient status.

Separate indices are calculated for different nutrients like nitrogen, phosphorus and potassium. Based on the above WQI values, the soil nutrient index is rated for the study area (tharangambadi taluk).

Table 3: soil nutrient index standards

Parker's nutrient index standard	Description
<1.5	Low nutrient status
1.5-2.5	Optimum nutrients
>2.5	High nutrient status

Table 4: soil nutrient index for the study area

Nutrient	Soil nutrient index	Description
Nitrate (N)	1.6	Optimum nutrients
Potassium (K)	2.36	Optimum nutrients
Phosphorus (P)	2.62	High nutrient status
Iron (Fe)	2	Optimum nutrients
Manganese (Mg)	2	Optimum nutrients
Copper (Cu)	**1**	**Low nutrient status**
Zinc (Zn)	**1.02**	**Low nutrient status**

V.CONCLUSION

Soil nutrients are the prime requirement for the existence of life. Soil resources is a precious resource of finite extent. Over the years increasing population urbanization and expansion in agriculture has head in the scientific exploitation of soil nutrients by using inorganic manures in order to increase the yield creating soil quality contamination condition. Tharangambadi taluk area is under threat due to the critical issues of environmental pollution and salinity problem. The soil quality in tharangambadi taluk has been reduced due to pollution. Hence monitoring the soil quality is indispensable. The study was carried out in tharangambadi taluk in Nagappatinam district. GIS techniques can provide appropriate platform for convergent analysis of large volume of multi-disciplinary data. It helps in decision making for soil nutrient studies. The soil nutrient map will serve as a tool for the general public to identify the soil response to crops. The analysis of the results drawn at various stages of work revealed that integration of Remote Sensing and GIS are effective tools for the preparation of various thematic layers. From the various inference from the thematic maps we came to conclusion that the soil quality in the study area should be enhanced further. Hence it is suggested that to enhance the soil fertility appropriate organic fertilizers should be used.

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The role of antioxidant vitamins in Ciprofloxacin induced oxidative stress in pancreas

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ABSTRACT: The present study was undertaken to evaluate the effect potential of Ciprofloxacin (CPFX) to induce pancreatitis in rats with reference to its doses of treatment along with restoration of anti-oxidant vitamin supplementations. Adult male wistar strain weighing about 150 – 250g were subdivided into seven groups. I – Control group received normal saline. II Low dose group: 250mg of ciprofloxacin /kg. body weight /day. III High dose group: 400mg of ciprofloxacin /kg. body weight/day. IV High dose + Vitamin A: 400mg. of ciprofloxacin followed by 7.5mg.of vitamin A /Kg. body weight/day. V High dose + Vitamin C: 400mg. of ciprofloxacin followed by 500mg. of vitamin C /Kg. body weight/day. VI High dose + Vitamin E: 400mg. of ciprofloxacin followed by 600mg. of vitamin E / kg. body weight/day. VII High dose withdrawal: 400mg. of ciprofloxacin as an oral dose and were allowed a withdrawal period of the drug for further seven days. Body weight, organ weight, insulin levels and histopathology of pancreas were studied. The drug did not cause any significant alteration in the body weight. Whereas, an increase in the organ weight of the pancreas and rise in insulin levels were noted after the drug treatment. In low dose treatment group, the compactness of the exocrine pancreatic cells is considerably reduced and endocrine islet cells showed extensive damage to α and β cells. In high dose treatment group the α and β cells had disappeared and endocrine pancreas.

KEYWORDS: Ciprofloxacin, oxidative stress, pancreas, vitamin A, Vitamin C, Vitamin E

INTRODUCTION

Quinolones are potent antimicrobials with broad spectrum activity and are effective against a wide range of infections caused by Gram – positive and gram – negative bacteria including *Bacillus anthracis*.[1] They exert their bactericidal effect by inhibiting the bacterial DNA gyrase, a type II topoisomerase.[2] They have the advantage of possessing relatively well tolerated.[1] However, clinical experience has indicated that they have some undesirable side effects including cutaneous reactions like phototoxicity, juvenile cartilage toxicity, and although the incidence is very low, adverse central nervous system reactions including epileptogeni convolutions.[3,4] The mechanism underlying these adverse effects still not well known. Interactions of quinolones with dopamine and opiate receptors were also postulated.[5] Fluoroquinolone antibiotic ciprofloxacin (CPFX) induces oxiadative stress in cerebral and hepatic tissues of rats as indicated by significant level of lipid peroxidation and alterations in glutathione (GSH) redox status.[6] Vitamins are well established to act as antioxidants in many systems.

Since this drug is used for prolonged period, it will be worthwhile to study its effect on endocrine organs especially pancreas, in order to assess its toxic effects, if any. In the recent years, toxicity by any agent working through lipid peroxidation, reactive oxygen species (ROS) generation is known to be counteracted by many anti-oxidants, one among them being the vitamins supplementations. In this study also, the role of vitamins A, C and E have been investigated for their probable rescue effects from the ciprofloxacin-induced toxicity in pancreas, if any.

MATERIALS AND METHODS

Animals

Wistar strain albino rats weighing about 180-200g, readily amenable to ease of handling and restraint during various dosing parameters, have been selected for this study. The rats were procured from Tamil Nadu Agricultural University, Coimbatore, and acclimatized to our animal house conditions for 2 weeks. The animals were housed in a well ventilated, temperature and humidity controlled animal house with constant 12 ± 1 hours light and dark schedule. They were provided with standard diet and clean water *ad libitum.* They were then carefully monitored until the end of the experiment. The experiments were approved by the Animals Care Committee of the Institute (722/02/a/CPCSEA).

Experimental protocol

The animals were divided into seven groups as follows. The animals were treated with Ciprofloxacin and vitamins supplementation at 12 hours interval for seven consecutive days (Short duration).

1. **Control group**: Received 0.9% saline orally
1. **Low dose**: Received 250mg of ciprofloxacin /60kg. body weight /day
2. **High dose**: Received 400mg of ciprofloxacin /60kg. body weight/day
3. **High dose: + Vitamin A supplementation**: Received 400mg. of ciprofloxacin followed by 400 mg.of vitamin A /60Kg. body weight/day.
4. **High dose + Vitamin C supplementation**: Received 400mg. of ciprofloxacin followed by 400mg. of vitamin C /60 Kg. body weight/day.
5. **High dose + Vitamin E supplementation**: Received 400mg. Of ciprofloxacin followed by 400mg. of vitamin E / 60 kg. body weight/day.
6. **High dose withdrawal**: Received 400mg. of ciprofloxacin as an oral dose and were allowed a withdrawal period of the drug for further seven days

Sample collection and histological study

The animals were weighed before and after treatment. Twenty-four hour after the last treatment schedule the animals were sacrificed by decapitation method. The pancreas was dissected out and weighed. The pancreas was then fixed for histological studies in freshly prepared Bouin's fluid, dehydrated in a graded ethanol series, cleared in benzene and embedded in paraffin wax. Tissues were sectioned at 6 um and the sections were stained with periodic acid – schiff (PAS) and counter stained with haematoxylin.

RESULTS AND DISCUSSION

The exocrine pancreas presented marked inflammation of the acinar cells after CPFX treatment in the present study suggestive of acute pancreatitis. Inflammation of the pancreas, almost always associated with acinar cell injury, is termed pancreatitis.[7] Acute pancreatitis is caused by the distructive effects of pancreatic enzymes which run much, within the pancreatic parenchyma.[8,9] Drugs have been implicated in the aetiology of acute pancreatitis.[10,11,12] In control group (Fig 1), the pancreas shows normalcy. It consists of α cells, β cells, δ cells acinar cells, blood vessels and connecting tubules. In low dose treated group (Fig 2), the compactness of the cells was reduced. Endocrine islet cells became damaged with reduced number of light and dark cells. In high dose (Fig 3), islet cells are highly damaged with disappearance light and dark cells and clumping of all the cells lead to fibrocystis.

In the endocrine pancreas, presence of antagonic substance leads to a constant overproduction of insulin and consequently to hypertrophy of the islets and then to hydropic degeneration and hyalinization. The exocrine pancreas presented marked inflammation of the acinar cells after ciprofloxacin treatment in the present study. Inflammation of the pancreas almost always associated with acinar celll injury is termed as pancreatitis. Acute pancreatitis includes a mild, self limited form termed interstitial or edematous pancreatitis and a move serious, severe type. The initial stage of pancreatitis is characterized by swelling and edema and this may be the condition observed. This stage may lead to necrosis of pancreatic tissue. Acute pancreatitis is caused by the destructive effects of pancreatic enzymes which run among within the pancreatic parenchyma.

In the present study also we observed that, in low dose treated animals there was a acinar cell injury i.e. pancreatitis. Whereas in high dose treated groups necrosis of pancreatic tissue was observed. Drug have been implicated in the aetiology of acute pancreatitis. Anectodal case reports are found associated with pancreatitis with the NSAIDs namely sulindac,[14] indomethacin[15] keto profen,[16] naproxen,[17] aspirin,[18] piroxicam,[19] mefenamic acid[20] and ibuprofen.[21] In the present study ciprofloxacin also caused acute pancreatitis.

In low dose treated animals, all the pancreatic cells are minimally damaged whereas in high dose treatment, all the cells are damaged and reduced in their number particularly B cells. Vitamin 'A' supplementation (Fig 6) greatly recovers the pancreatic toxicity induced by ciprofloxacin.

Vitamin E, as a scavenger of peroxyl radicals, is probably the most important, inhibitor of the free-radical chain reaction of lipid peroxidation in animals. Initiation of lipid peroxidation can be prevented by enzymes that savenger ROS / RNS and proteins that sequester transition metal ions. Sequestration of metal ions also prevents them from decomposing perioxides into chain-propagating peroxyl and alkoxyl radicals. The dietary content of vitamin E is one factor that affects the sensitivity of laboratory animals to certain toxins or to tissue insults such as ischaemia reperfusion.[22] Vitamin 'C' (Fig 5) and 'E' (fig 4) supplementation had also showed similar restorative effect. Whereas, withdrawal group gives partial recovery of pancreatic toxicity (Fig 7).

The pivotal roles of nutritional antioxidants are clearly understood, as evidenced by the antioxidative function of vitamin E, which is frequently used as a food additive as well as supplement to protect against oxidation. Vitamin A and C also have antioxidative functions. These compounds react directly with ROS and decrease their toxicity.

Vitamins are well established to act as anti-oxidants in many systems. In this study also their supplementation proved to be effective in restoring the balance of the tissue and lowering the ciprofloxacin toxicity. Drug withdrawal was not very effective like vitamin supplementations in the restorative activity suggesting a need for an extended period of drug withdrawal needed by the pancreas.

Fig – 1 Control Group

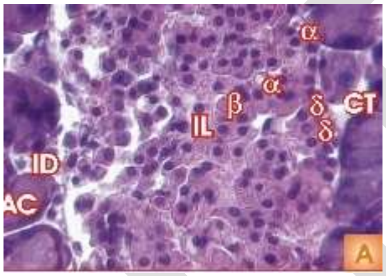


Fig – 2 Low Dose Ciprofloxacin

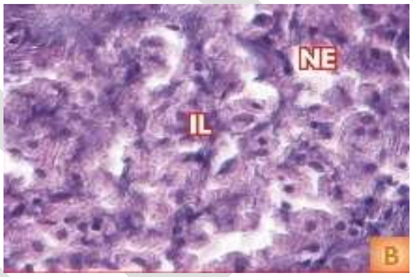


Fig - 3 High Dose Ciprofloxacin

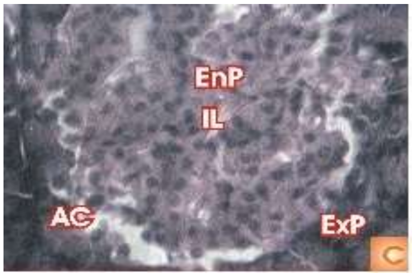


Fig – 4 High Dose + Vit ' E' Group

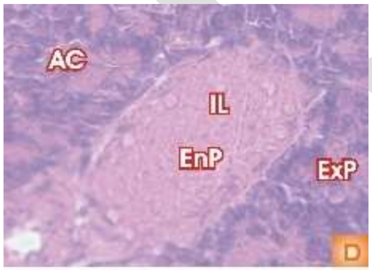


Fig – 5 High Dose + Vit 'C' Group

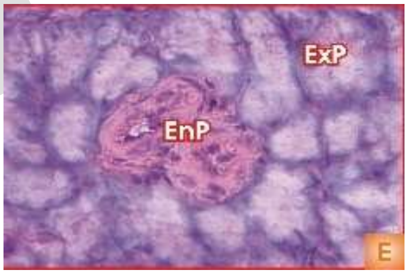


Fig – 6 High Dose + Vit 'A' Group

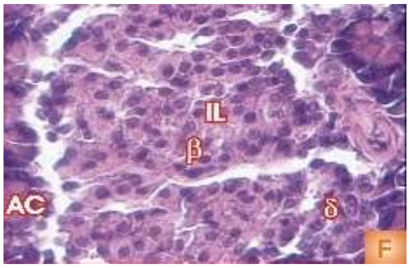
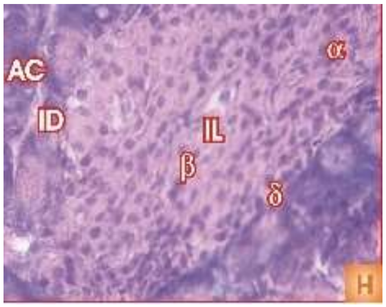


Fig –7 High Dose + Withdrawal Group



LEGEND

AC - Acinar cell

ID - Intralobular duct

IL - Islets of Langerhans

B - B or β cells

A - A or α cells

D - D or δ cells

CV - Connective tubules

BV - Blood vessels

EnP - Endocrine Pancreas

ExP - Exocrine Pancreas

NE - Necrosis

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CONCLUSION

In the present study we found the ciprofloxacin induced pancreatic toxicity and Vitamin ‘A’ as an very good rescue agent. Drug withdrawal shows partial recovery. So we should avoid to taking too much of antibiotics.

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Experimental Investigation and Optimization of Cutting Parameters on Surface Roughness and Material Removal Rate in Turning of Nylon 6 Polymer

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Abstract— Plastic materials, having good mechanical properties, are replacing metals in variety of applications. Weight and price of plastic components are lesser than metallic components. For near net shape plastic products, plastic molding processes like injection molding, compression molding, blow molding are generally preferred. However, need of machining of plastics has increased due to requirement of small scale production and good surface quality of machined part. Nylon 6, one of the thermoplastic, is widely used due to its good mechanical properties. This paper discusses optimization of surface roughness and material removal rate during turning on Nylon 6. Empirical investigation of effect of speed, feed and depth of cut is carried out by following Taguchi's design of experiments; and analysis of experimental results is done by signal to noise ratio, analysis of variance and regression analysis for single response optimization, followed by grey relational analysis for multi response optimization. Study identified feed as most significant factor affecting both surface roughness and material removal rate and suggests optimal combination of process parameters.

Keywords— Plastic machining, Machining on polymers, Plastic materials, Processing on polymers, Optimization techniques, Statistical analysis, Grey relational analysis.

INTRODUCTION

Nylon (polyamide-PA 6) is thermoplastic used as replacement material for metals such as bronze, cast iron and aluminum; due to its properties like toughness, rigidity, abrasion resistance, heat resistance, wear resistance, chemical resistance, etc. Nylon 6 and Nylon 6/6 are two common grades of Nylon; widely used in automotive, electronics, textiles, paper and aircraft industries. Specifically it is used for manufacturing of gears, cams, bearings, bushes, valve seats, etc.

Although majority of plastic components are processed by molding, it is not justified for smaller quantities due to costs involved in making mold, process setting time, wastage of material through runners and during trial runs. Such requirements of small quantities are fulfilled by machining process. During machining, surface characteristics gets affected by process parameters like cutting speed, feed rate, depth of cut, etc. Precision machining of plastics is preferred for manufacturing of machine components, electronics and optics; where dimensional accuracy is important along with surface characteristics.

Researchers have studied machining of different plastic materials. During study of ultraprecision machining on Polymethyl Methacrylate (PMMA), Kobayashi and Hirakawa, (2006) advocated machining of plastics for achieving high dimensional accuracy and good surface finish; and observed that surface roughness decreases as the feed rate decreases. Thus, plastic components requiring precision dimensions can be obtained by machining process. Jagtap and Pawade, (2014) observed feed and speed affect surface quality of machined plastic components and concludes spindle speed is most significant parameter affecting surface roughness. If spindle speed is less then surface roughness is better. Study of researchers on PMMA indicating requirement of dimensional accuracy and good surface finish of component can be achieved by machining with considering speed and feed as prime influencing factors. While studying machinability of polymers, Keresztes et al. (2011) noted that injection molding is being widely used for production of plastic components; however machining of plastics is preferred for requirement of plastic products in smaller quantities. This study illustrates importance of machining process in production of small quantities plastic components. For Ultra High Molecular Weight Polyethylene (UHMWPE), Salles and Goncalves, (2003) found that cutting speed doesn't affect much on surface roughness, whereas with increase in feed rate, surface roughness increases. Thus earlier research states that roughness is insignificant for speed in case of UHMWPE; whereas, for PMMA speed affects roughness. There is little agreement in study of plastic machining that effect of speed on surface roughness is material specific.

Jagtap et al. (2012) suggested for Nylon and Polypropylene (PP) that good surface quality can be achieved by primarily considering feed and insert clearance angle. Researchers observed that feed as an effective parameter gives good surface finish at its lower level;

and larger degree insert clearance angle gives better surface quality than the smaller degree insert clearance angle. This study indicates that along with cutting parameters, insert clearance angle needs to be considered for achieving better surface characteristics. Lazarevic et al. (2011) suggested that for polyamide 6, cutting speed can be set at the highest level to obtain higher material removal rate. Authors observed that feed rate, depth of cut and tool nose radius are proportionally affecting on surface roughness for polyamide 6 (PA 6). However, the influence of cutting speed is negligible. Apparently, behavior of cutting parameters on roughness for machining of plastic materials is changing. Davim et al. (2009) carried out turning on polyamide and reinforced polyamide; and analyzed that surface roughness for the polyamide increases with feed rate; whereas it is insensitive to reinforced polyamide. This study indicates that machining behavior of plastic and reinforced plastic is not same. While carrying out experimental investigation Gaitonde et al. (2008) observed that more machining force, cutting power are required for PA6 than for PA66 GF30 polyamides. Authors detected machining force and cutting power both increase with feed rate and experimentation has performed by using carbide tool during turning. This study illustrates that machining nature of PA66 GF30 is better than PA6. While machining on composites of polyamide Haghi et al. (2013) noticed that content of nano calcium carbonate in polyamide 6 decreases the cutting forces, but it doesn't have any effect on surface roughness. Cutting force is maximum for lower cutting speed. From this study, it can be seen that composites of polyamides give better machinability.

Researchers have carried out machining on Glass fiber reinforced plastic (GFRP) and studied effect of cutting parameters on surface quality. Kini and Chincholkar (2015) found that surface roughness is inversely proportional to feed rate and cutting speed. For lower tool nose radius, the depth of cut and feed rate, the material removal rate is small. Gupta and Kumar (2013) observed that depth of cut followed by feed rate have great influence on surface roughness and material removal rate. Hussain et al. (2011) found that surface roughness increases with increase in feed rate and it decreases with increase in cutting speed. Depth of cut has very little effect on surface roughness. Cutting forces are highly influenced by feed followed by cutting speed. Study on GFRP indicates that composition of GFRP is affecting its machining nature and cutting speed and feed rate are primarily considered as important parameters for better surface quality. Kumar et al. (2012) observed machining on unidirectional GFRP is different from the metals. Bending rupture, shearing and plastic deformation are perceived during machining of composites. Surface roughness is inversely proportional to cutting speed and directly proportional to feed rate and depth of cut. It is realized from study that surface quality of machined plastic component is depending on directions of glass fiber reinforcement.

This paper discusses investigation of effect of processing parameters like cutting speed, feed rate and depth of cut, during turning on Nylon 6 polymer. Considering the responses surface roughness and material removal rate individually and simultaneously, analysis of experimental results have carried out to optimize control factors. By using analysis tools like Signal to noise (S/N) ratio, analysis of variance (ANOVA) and regression analysis for single response optimization and grey relational analysis for multi-response optimization results are discussed. Considering scope for study, experimentation details have been discussed in next section.

EXPERIMENTATION DETAILS

For present study, objective was to simultaneously optimize surface roughness and material removal rate during machining of Nylon 6. Considering responses as surface roughness and material removal rate and process parameters as speed (v), feed (f) and depth of cut (d), machining on CNC was carried out on workpiece material Nylon 6. Rod of Nylon 6 having 48 mm diameter and 70 mm length were turned on CNC lathe (JYOTI, India), maximum speed 4000 rpm, 20 KW power using carbide insert TNMG 160404 under dry cutting condition. Levels of process parameters have been selected based on levels recommended by researchers Lazarevic et al. (2012) for study and few pilot experiments. Pilot experiments, for selection of levels of one process parameter, have been conducted by varying only one process parameter and keeping other process parameters constant. Then after responses were measured and as per requirement of responses, levels of process parameter were selected. The process parameters and their levels are presented in Table 1.

Table 1
Process parameters and their levels

Levels	Cutting speed v (m/min)	Feed rate f (mm/rev)	Depth of cut d (mm)
1	214.3	0.049	2
2	254.6	0.098	3
3	295.2	0.196	6

Literature suggested use of experimental design recommended by Taguchi in the form of standard L_9 orthogonal array. Experiments were designed and conducted accordingly. Three replications of each experiments have been conducted to minimize the effect of noise factor. Experiments are conducted in random order to avoid systematic error.

After experimentation, surface roughness is measured by MITUTOYO SURFTEST SJ-210 (Surface roughness measuring tester) and material removal rate is obtained by measuring weight of the component before and after machining in terms of g/min.

RESULTS AND DISCUSSION

For single response optimization of surface roughness or material removal rate has been done by using S/N ratio, ANOVA and regression analysis. S/N ratio gives parametric combination of process parameters for single response; ANOVA has been performed to see significance of control factors on response. Regression analysis gives correlation of control factors and response parameters by regression equation. In case of multi response optimization, two or more responses are considered simultaneously. For present study, grey relational analysis has been used as multi response optimization tool to obtain optimal combination of control factors considering both responses simultaneously. These analysis tools have discussed in upcoming subsections.

Lower surface roughness in general, and, higher material removal rate in particular, are the indicators of better performance in turning process. Hence, for surface roughness (Ra) 'lower-the-better' and for material removal rate (MRR) 'higher-the-better' criterion have been used for analysis of experimental results.

1. Parametric combination for surface roughness and material removal rate (S/N ratio)

The term S/N indicates that ratio of signal to noise. The word 'signal' (S) represents desirable characteristics and word 'noise' (N) represents undesirable characteristics of the process.

S/N ratio, (Sahoo et al., 2012; Ganta and Chakradhar, 2014) has been calculated for surface roughness of smaller-the-better criterion as:

$$S/N = -10\log_{10}\left(\frac{1}{n}\sum_{i=1}^{n} y_i^2\right) \qquad (1)$$

Where, y_i is the value of surface roughness for the ith test, n is number of measured data samples for one particular run.

Similarly for material removal rate, having criterion 'higher-the-better' is given by

$$S/N = -10\log_{10}\left(\frac{1}{n}\sum_{i=1}^{n} \frac{1}{y_i^2}\right) \qquad (2)$$

Where, y_i is the value of material removal rate for the i^{th} test, n is number of measured data samples for one particular run.

S/N ratio for experimental results are presented in Table 2.

Table 2
Experimental results and S/N ratios

Run No.	Speed (m/min)	Feed (mm/rev)	Depth of cut (mm)	Experimental results of Ra			S/N Ratio for Ra		Experimental results of MRR			S/N ratio for MRR
				Ra_1 (µm)	Ra_2 (µm)	Ra_3 (µm)			MRR_1 (g/min)	MRR_2 (g/min)	MRR_3 (g/min)	
1	214.3	0.049	2	1.559	1.015	0.817	-1.3864		26.144	26.406	25.254	28.2728
2	214.3	0.098	3	1.658	1.647	1.881	-4.7711		72.075	71.588	71.483	37.1121
3	214.3	0.196	6	2.053	2.253	2.467	-7.0975		254.596	253.900	254.526	48.1083
4	254.6	0.049	3	1.451	1.289	1.584	-3.2056		43.431	42.748	42.934	32.6764
5	254.6	0.098	6	1.814	1.904	2.254	-6.0193		151.179	150.517	151.221	43.5779
6	254.6	0.196	2	2.224	2.188	2.359	-7.0752		118.543	119.288	119.702	41.5237
7	295.2	0.049	6	0.897	1.229	1.391	-1.5126		88.654	87.839	88.247	38.9138
8	295.2	0.098	2	1.612	1.754	1.771	-4.6793		70.935	69.784	69.209	36.8976
9	295.2	0.196	3	1.638	1.904	2.324	-5.9141		197.409	198.177	198.848	45.9395

Higher value of S/N ratio gives near to optimal combination of control parameters. Ranks are allotted to each process parameter from higher to lower values of difference between minimum and maximum of mean of S/N ratios (delta). Mean of S/N ratios at each level and for each factor has been calculated and presented in Table 3.

Table 3
Mean S/N ratio response

Process parameters	Mean of S/N ratio for Ra				Rank		Mean of S/N ratio for MRR				Rank
	Level 1	Level 2	Level 3	Delta			Level 1	Level 2	Level 3	Delta	
v	-4.4183	-5.4334	-4.0353	1.3981	2		37.83	39.26	40.58	2.75	3
f	-2.0349	-5.1566	-6.6956	4.6607	1		33.29	39.20	45.19	11.90	1
d	-4.3803	-4.6303	-4.8765	0.4962	3		35.56	38.58	4353	7.97	2

Table 3 clearly indicates that feed rate is much affecting parameter on both responses. Thenafter, for surface roughness, speed followed by depth of cut are affecting; whereas depth of cut followed by speed are affecting on material removal rate. Main effect plot i.e. graph of level vs mean of S/N ratio gives optimal parametric combination of control factors. Main effect plot for Ra and MRR are shown in Fig. 1 and Fig. 2 respectively.

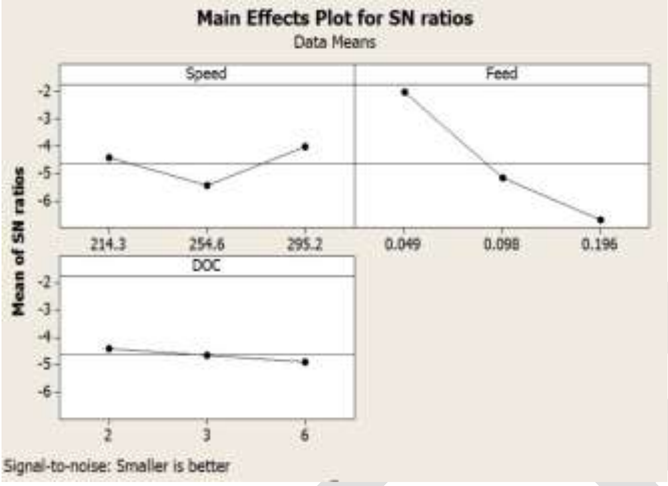

Fig. 1. Main effect plot of S/N ratios for Ra.

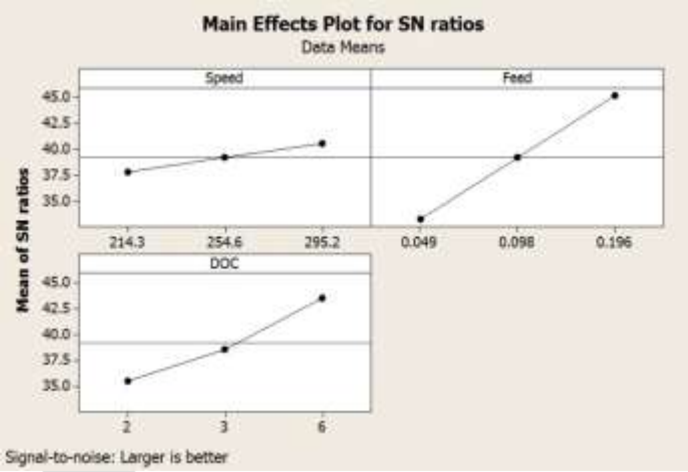

Fig. 2. Main effect plot of S/N ratios for MRR.

Main effect plot for S/N ratios shows that optimal parametric combinations for surface roughness is v3–f1–d1; i.e. cutting speed at level 3 (295.2 m/min), feed at level 1 (0.049 mm/rev) and depth of cut at level 1 (2 mm); and for material removal rate, optimal parametric combinations are v3–f3–d3 i.e. Cutting speed at level 3 (295.2 m/min), feed at level 3 (0.196 mm/rev) and depth of cut at level 3 (6 mm).

Next subsection discusses ANOVA to check significance of control factors on individual response.

2. Analysis of Variance (ANOVA)

Significant factors and its percentage contribution of effect on responses has been studied by Analysis of Variance (ANOVA). Most of the researchers have analyzed the results at 95% confidence level; therefore analysis of present study is carried out at 95% confidence level. ANOVA for surface roughness is presented in Table 4.

Table 4
ANOVA for surface roughness (Ra)

Source	DOF	SS	MS	F-ratio	P	Contribution (%)	Remarks
v	2	3.1316	1.5658	5.22	0.161	8.25	
f	2	33.8360	16.9180	56.38	0.017	89.19	Significant
d	2	0.3692	0.1846	0.62	0.619	0.98	
Error	2	0.6002	0.3001			1.58	
Total	8	37.9370				100	

$F_{0.05,2,2}$= 19 for F-test.

ANOVA table indicates that feed is the most influencing factor having 89.19 % contribution of effect on surface roughness. F-ratio calculated value (56.38) is greater than F-ratio at Critical values of F-distribution (at 5 %). Hence, based on F-test and P-value feed is most significant factor. Cutting speed and depth of cut do not have significant effect on surface roughness.
Similarly, ANOVA for MRR is performed and is presented in Table 5.

Table 5
ANOVA for MRR

Source	**DOF**	**SS**	**MS**	**F-ratio**	**P**	**Contribution (%)**	**Remarks**
v	2	11.370	5.685	1173.21	0.001	3.54	Significant
f	2	212.520	106.260	21928.10	0.000	66.20	Significant
d	2	97.142	48.571	10023.20	0.000	30.26	Significant
Error	2	0.010	0.005				
Total	8	321.042				100	

For material removal rate feed is the most affecting factor contributing 66.20 %. F-test and probability significance show that speed, feed and depth of cut all are significant factors.
Regression analysis quantifying simultaneous effect of each control factor on response variable is presented in next subsection.

3. Regression Model

Regression is the determination of a statistical relationship between two or more variables. For present study, regression model is developed at 95% confidence level in statistical software package – Minitab 15. Regression model for speed, feed and depth of cut as independent parameters affecting Ra is presented in equation 3.

$$Ra = 1.26 - 0.00115\,v + 5.80\,f + 0.0282\,d \qquad (3)$$

Terms R^2 and R^2 (adjusted) help to judge the adequacy of regression model developed. For this regression model values of R^2 and R^2 (adjusted) are presented.

$R^2 = 81.6$ %, R^2 (adj) = 70.5 %

Value of R^2 indicates that 81.6 % of the total variations are explained by the model. The range of R^2 may be written as $0 \leq R^2 \leq 1$. When R^2 value approaches to unity; it gives possibility of reduction of variability in responses. However, this prediction is not always favorable, because addition of factors in model may increase value of R^2. Hence adjusted value of R^2 also need to be considered while checking of fitting of the model. Because addition of factors in model does not always increase value of adjusted R^2, rather it decreases when insignificant factor is added in the model. Considerable difference between values of R^2 and R^2 (adjusted) indicates maximum possibility of insignificant factor being present in the model.

For regression model, there is considerable difference (11.1 %) between values of R^2 and R^2 (adjusted); therefore there is maximum possibility of insignificant factor may present in the model. However, to study this possibility ANOVA for regression model can be done.

Although R^2 value explains variability of model, still it doesn't explain significance of regression model developed. Therefore, to study significance of regression model, ANOVA has been performed and presented in Table 6.

Table 6
ANOVA for surface roughness (Ra) regression model

Source	**DOF**	**SS**	**MS**	**F-ratio**	**P**	**Remarks**
Regression	3	1.1664	0.3888	7.38	0.028	Significant
Residual Error	5	0.2635	0.0527			
Total	8	1.4298				

$\mathbf{F}_{0.05,3,5}$= 5.41 for F-test.

ANOVA of regression model shows that regression model is significant based on F-test and probability significance. Significance of factors in model is supported by ANOVA for Ra; in which speed and depth of cut are found insignificant factors. Therefore, regression model consisting control factors speed and depth of cut are obviously insignificant.

Montgomery, (2013) suggested use of normal probability plot to study the significance of regression model developed.

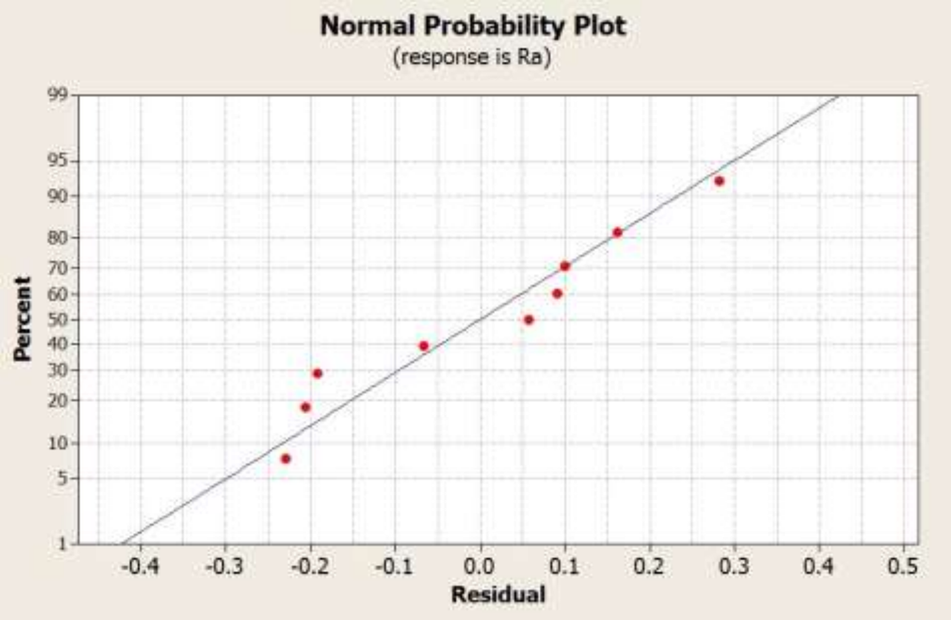

Fig. 3. Normal probability plot for Ra.

Normal probability plot of residuals shows that the residuals lie approximately close to a straight line; indicating model is significant. Sahoo et al. (2012) considered reasonable limit of maximum residual at 1.875. Present regression model having maximum residual 0.281 is within the reasonable limit; hence, it indicates significance of model developed.

Similarly, Regression model for MRR is presented in equation 4.

$$MRR = - 81.2 + 0.018\, v + 941\, f + 22.5\, d \tag{4}$$

$R^2 = 94.6\%$; $R^2(adj) = 91.4\%$

R^2 indicates that 94.6 % of the total variations are explained by the model. Difference between values of R^2 and R^2 (adjusted) are less. This indicates that all factors present in the model having maximum possibility of being significant. ANOVA for MRR presented in Table 5 supports the indication of all control factors being significant.

Table 7
ANOVA for material removal rate (MRR) regression model

Source	DOF	SS	MS	F-ratio	P	Remarks
Regression	3	42917	14306	29.42	0.001	Significant
Residual Error	5	2431	486			
Total	8	45348				

$\mathbf{F}_{0.05,3,5}$= 5.41 for F-test.

Significance of regression model developed is confirmed by probability significance and F-test in ANOVA for regression model of MRR presented in Table 7.

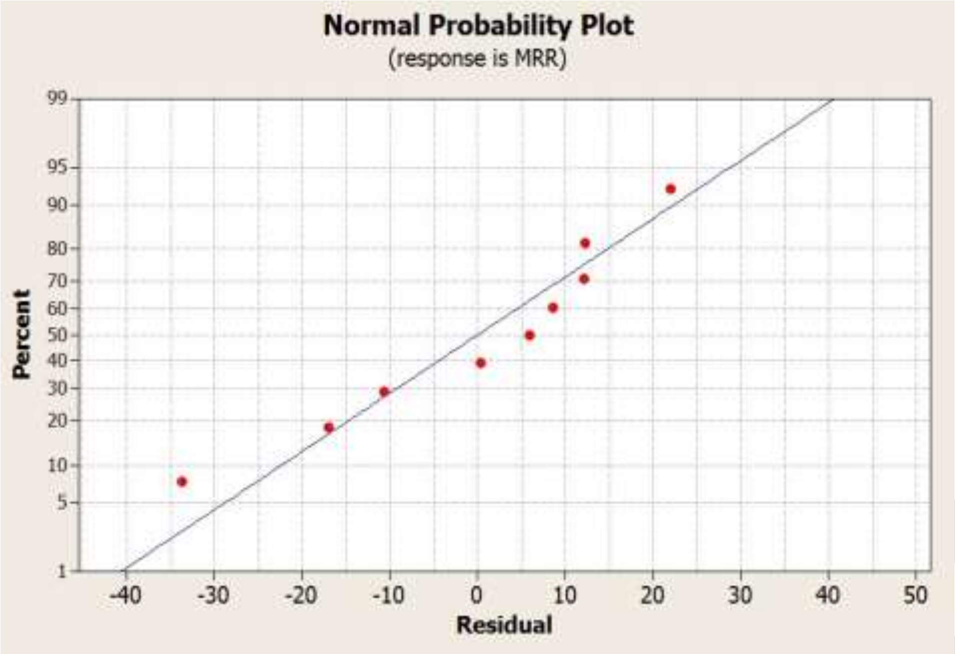

Fig. 4. Normal probability plot for MRR.

Normal probability plot of residuals shows that the residuals lie reasonably close to a straight line indicating that model is significant. Analysis of experimental results of surface roughness and material removal rate have been studied separately. To study combine effect of both responses simultaneously, multi response optimization by using grey relational analysis is discussed in next subsection.

4. Multi response optimization using grey relational analysis

Grey relational analysis (GRA) enables optimization of multiple responses simultaneously. For present study, multiple responses are surface roughness (Ra) and material removal rate (MRR). GRA starts with ‘grey relational generation i.e. normalization of experimental results of “lower-the-better” criterion in the case of surface roughness and “larger-the-better” criterion for material removal rate in range of zero to one.

Normalization of Ra data, having criterion of lower-the-better, is obtained by equation 5,

$$x_i^*(k) = \frac{\max x_i^o(k) - x_i^o(k)}{\max x_i^o(k) - \min x_i^o(k)} \tag{5}$$

Similarly. Normalization of MRR data, having criterion of larger-the-better, can be obtained by equation 6,

$$x_i^*(k) = \frac{x_i^o(k) - \min x_i^o(k)}{\max x_i^o(k) - \min x_i^o(k)} \tag{6}$$

Where, $x_i^*(k)$ is Normalized value for ith run, $x_i^0(k)$ is value of response for ith run, ‘max $x_i^0(k)$’ is maximum value of response from all runs, ‘min $x_i^0(k)$’ is minimum value of response from all runs.

By using normalized data of response, deviation sequence (Δ_0) for each run is evaluated. Deviation sequence is difference between reference sequence (maximum value of grey relational generation from all runs) and comparability sequence (value of grey relational generation of respective run). Deviation sequence is required for calculation of grey relational coefficient.

Normalized data of responses and values of deviation sequence are presented in Table 8.

Table 8
Grey relational generation

Run No.	Grey relational generation			Deviation sequence (Δ_{0i})	
	Ra	**MRR**		**Ra**	**MRR**
1	1	0		0	1
2	0.4690	0.2004		0.5310	0.7996
3	0	1		1	0
4	0.7243	0.0749		0.2757	0.9251
5	0.2367	0.5474		0.7633	0.4526
6	0.0009	0.4082		0.9991	0.5918
7	0.9628	0.2728		0.0372	0.7272
8	0.4840	0.1928		0.5160	0.8072
9	0.2686	0.7540		0.7314	0.2460

Next step is calculation of Grey relational coefficients by equation 7,

$$\xi_i(k) = \frac{\Delta_{\min} + \zeta\Delta_{\max}}{\Delta_{oi}(k) + \zeta\Delta_{\max}} \tag{7}$$

Where, ξ_i (k) is grey relational coefficient for respective run, $\Delta_{\min}$ is minimum value of deviation sequence from all runs, $\Delta_{\max}$ is maximum value of deviation sequence from all runs, Δ_{oi} (k) is value of deviation sequence for respective run.

Distinctive coefficient (ζ) is used to regulate the difference of the relational coefficient. It is in the range of 0 to 1 ($\zeta \in [0,1]$). Following the practices followed by Nayak et al. (2014) and Sahoo et al. (2012) for present study, ζ is taken as 0.5. Grey relational grade is the average of grey relational coefficients of all responses for each run. Grey relational coefficients and grey relational grade are presented in Table 9.

Table 9
Grey relational coefficient and grey relational grade

Run No.	Grey relational coefficient		Grey relational grade	Rank
	Ra	**MRR**		
1	1	0.3333	0.6667	2
2	0.4850	0.3847	0.4348	8
3	0.3333	1	0.6667	3
4	0.6446	0.3508	0.4977	5
5	0.3958	0.5249	0.4604	6
6	0.3335	0.4580	0.3958	9
7	0.9308	0.4074	0.6691	1
8	0.4921	0.3825	0.4373	7
9	0.4060	0.6702	0.5381	4

Larger grey relational grade gives better multiple performance characteristics. In other words, parameter combination having higher grey relational grade is closer to the optimal. Response table for mean grey relational grade is presented in Table 10.

Table 10
Mean response table for grey relational grade

Process parameters	Mean of grey relational grade				Rank
	Level 1	Level 2	Level 3	Max-Min	
v	0.5894	0.4513	0.5482	0.1381	2
f	0.6112	0.4442	0.5335	0.1670	1
d	0.4999	0.4902	0.5987	0.1085	3

From mean response table for grey relational grade, it is observed that feed is most influencing parameter, followed by cutting speed and depth of cut. Main effect plot for grey relational grade is presented in Fig. 5.

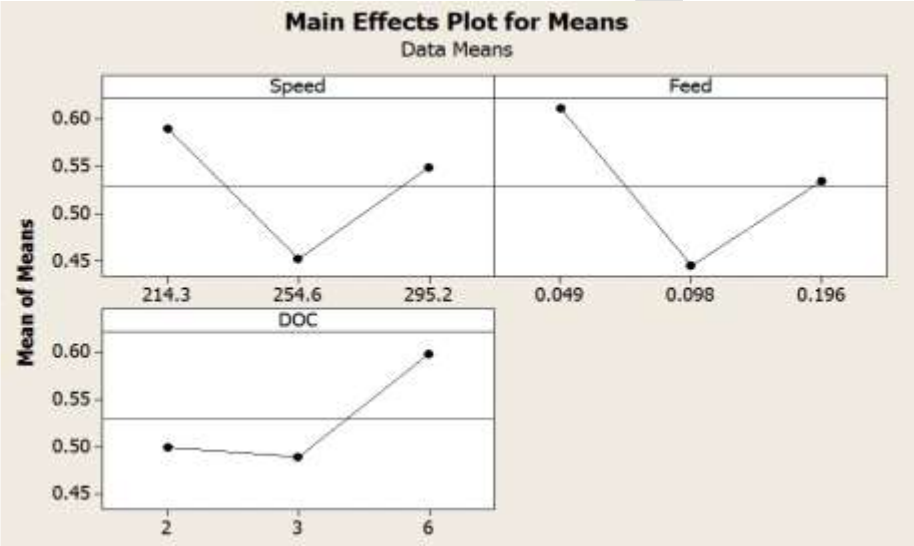

Fig. 5. Main effect plot for grey relational grade.

From main effect plot for grey relational grade, it is observed that cutting speed (v) at level 1, feed (f) at level 1 and depth of cut (d) at level 3 is the optimal combination of parameters. (V1-f1-d3).

v=214.3 m/min; f= 0.049 mm/rev; d=6 mm

These optimal results obtained by GRA need to be validated by performing experiment. Next section discusses about validation of results.

CONFIRMATORY TEST

Experimentation is carried out on optimal levels of process parameters to check validation of results. Following experimental observations have been obtained:

Ra= 1.1316 µm, MRR= 66.6493 g/min

For the obtained experimental observations, grey relation grade for experiment is calculated by procedure discussed in section 3. Obtained GRG for experiment is 0.6876. Ganta and Chakradhar, (2012) studied prediction of GRG by equation 8.

$$\hat{\gamma} = \gamma_m + \sum_{i=1}^{o} (\bar{\gamma}_i - \gamma_m) \qquad (8)$$

Where, γ_m is the total mean of the grey relation generation, $\bar{\gamma}_i$ is the mean grey relation generation at the optimal level, o is the number of the design parameters.

For combination of confirmatory experiment, grey relation generation is calculated,

$$\hat{\gamma} = 0.5296 + [(0.5894 - 0.5296) + (0.6112 - 0.5296) + (0.5987 - 0.5296)]$$

$$\hat{\gamma} = 0.7401$$

Predicted value and experimental value of GRG are very close and higher than grey relational grade of rank one run. Therefore, it validates the results and gives an optimal combination of control factors.

Conclusions drawn on present study are discussed in next section.

CONCLUSION

Nylon 6 is replacing metals in few applications. Its applications are gears, cams, bushes, etc. Requirement of small quantities of plastic product can be fulfilled by machining process, rather than molding process. The empirical work of CNC turning on Nylon 6 polymer by carbide insert has been carried out to study effect of machining parameters on surface roughness and material removal rate. Further experimental results are analyzed by using statistical tools like S/N ratio, ANOVA, regression analysis and grey relational analysis. Following conclusions are drawn based on the study.

1. While obtaining surface roughness on Nylon 6 by turning, feed rate is the significant factor, whereas cutting speed and depth of cut are insignificant. As feed increases, surface roughness also increases. Optimal combination of process parameters for surface roughness: v3 = 295.2 m/min, f1 = 0.049 mm/rev, d1 = 2 mm.
2. Material removal rate gets affected significantly and is directly proportional to all three machining parameters i.e. v, f and d. Optimal combination for M.R.R: v3 = 295.2 m/min, f3 = 0.196 mm/rev, d3 = 6 mm. Effect of all parameters are not equally contributed. Contribution of effect of parameters are: speed = 3.54%, feed = 66.20%, depth of cut= 30.26%.
3. For material removal rate, feed rate is most affecting parameter followed by depth of cut and cutting speed.
4. Regression equations for surface roughness and material removal rate provide guidelines for prediction of response values within given range.
5. While considering surface roughness and material removal rate simultaneously, feed rate is found most significant factor. And optimal combination is v1 = 214.3 m/min, f1 = 0.049 mm/rev, d3 = 6 mm.
6. While considering both responses, feed is most influencing parameter followed by cutting speed and depth of cut. Further observation of analyzed results suggests that interaction effect of speed and depth of cut help to predict responses.
7. Earlier researchers claimed that cutting speed can be increased for achieving higher material removal rate. However, considering surface roughness and material removal rate, optimum cutting speed is observed at level one i.e. 214.3 m/min.
8. This study will provide guidelines to select levels of control factors to industries for machining of Nylon 6.
9. Study on machining on Nylon 6 can be extended to consideration dimensional accuracy.

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Role of Compilers in Computer Architecture

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Abstract -- A compiler is a software layer that helps the high level executions that are made in a programming language to be compiled and implemented by the underlying hardware computer architecture. Though a compiler is majorly designed based on the language specification, the hardware that it is going to implement on has a significant role in the compiler design. Effective compilers allow for a more efficient execution of application programs for a given computer architecture, while well-conceived architectural features can support more effective compiler optimization techniques. A well thought-out strategy of tradeoffs between compilers and computer architectures is the key to the successful designing of highly efficient and effective computer systems. From embedded micro-controllers to large-scale multiprocessor systems, it is important to understand the interaction between compilers and computer architectures. The factors in which the compiler and the computer architecture have to agree on are: regularity, orthogonality and compensability. Any issue with these factors result in a tougher task for the compiler designer. So, making an efficient compiler involves the collaborative work of both a compiler designer and the hardware architects who built the computer architecture.

Keywords – Compiler, HLL(High Level Language), Compiler optimization, Cost equation, Regularity, Orthogonality, Compensability

INTRODUCTION

Today almost all programming is done in high-level languages for desktop and server applications. In earlier times for these applications, architectural decisions were often made to ease assembly language programming or for a specific kernel. Because the compiler will significantly affect the performance of a computer, now a days, understanding compiler technology is critical to design and efficient implementation of an instruction set. Once it was popular to try to isolate the compiler technology and its effect on hardware performance from the architecture and its performance, just as it was popular to try to separate architecture from its implementation. This separation is essentially impossible with today's desktop compilers and computers. Architectural choices affect the quality of the code that can be generated for a computer and the complexity of building a good compiler for it, for better or for worse. In this section, we discuss the critical goals in the instruction set primarily from the compiler viewpoint. It starts with a review of the structure of current compilers. Next we discuss how compiler technology affects the decisions of the architect, and how the architect can make it hard or easy for the compiler to produce good code.

This paper focuses on listing the structure of a compiler and the underlying architecture, the mutual dependency between them and how the efficiency can be increased by several factors that are modified in the compiler level and also in the architectural level. Next we discuss what is compiler, hardware compilation, impact of optimizations on performance, the Impact of Compiler Technology on the Architect's Decisions, Factors in architecture that affect the compiler optimization

1.1 What is a Compiler?

Over the years, the use of higher level languages for programming(HLLs) has become widespread. In the last two decades two other factors, namely portability and maintainability of programs have come up leading to the development of programming languages with more powerful features. However computers do not understand HLLs. So a programmers view of the execution of his program cannot be realized in practice. So in order to execute an HLL program written by a programmer it is necessary to convert it into a language understandable by a machine which is called as machine language. A translator is a program which performs translation from HLL into the machine language of computer. It also performs diagnostics i.e error detection.

1.2 Structure of Compiler

The structure of the compiler can be classified as front end and backend in which the last one is more dependent on the architectural framework of the system. The front end consists of the Lexical Analyzer, Syntax Analyzer and Semantic Analyzer.

Lexical Analyzer: It isolates each part of the statement and tokenizes them as operands, operator, variable, constants etc. The lexical analysis phase reads the characters in the program and groups them into tokens that are sequence of characters having a collective meaning.

Syntax Analyzer: It parses the token sequence and identifies the syntactic structure of the program.

Semantic Analyzer: This phase of the compiler checks for type errors and adds all the necessary semantic information to the parse tree.

The back end consists of the Intermediate Code Generator, Code Optimizer and Code Generator.

Intermediate Code Generator: This phase of compiler transforms parser tree into an intermediate language representation of the source program. Intermediate codes are machine independent codes, but they are close to machine instructions.

Code Optimizer: Code optimization is the process of modifying the working code to a more optimal code based on a particular goal. The code optimization phase attempts to improve the intermediate code, so that faster running machine code will result.

Code Generator: It takes the optimized intermediate representation of the source program as input and produces a target program or object program as its output. The final
phase of the compiler is the generation of the target code or machine code or assembly code. Memory locations are selected for each of the variables used by the program. Then intermediate instructions are translated into a sequence of machine instructions that perform the same task.

The back end performs the intermediate code generation, code optimization and generation which are very significant parts in the compilation process.

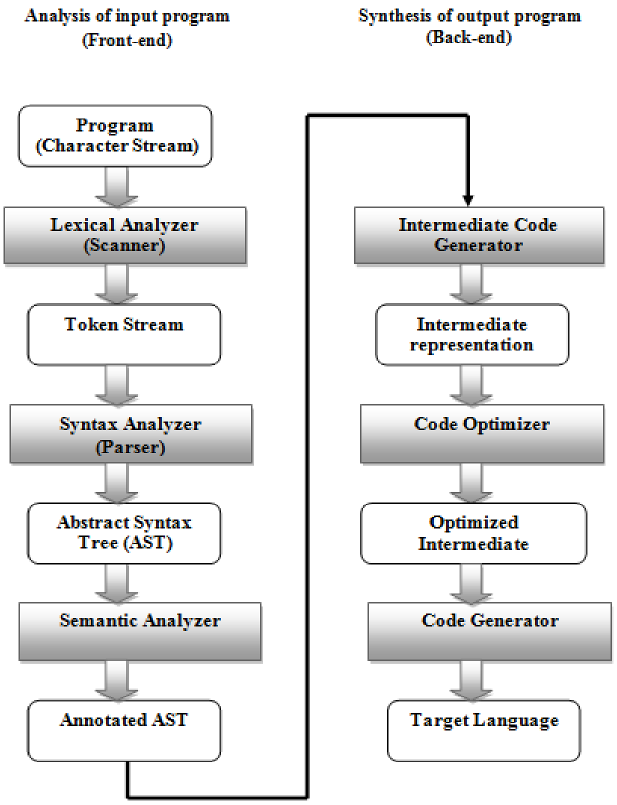

Figure 1: The Complete Structure of a compiler.

1.3 Overview of compilation process

The process of translating from on language to another is composed of two important phases:- (1) analysis of the source text, and (2) synthesis of the target text. This model of translation is very general. In order to apply this model to translation from an HLL to machine language, we must determine the component subtasks for analysis/synthesis and consider their design pre-requisites.

In the analysis phase, we are concerned with determining he meaning of a Source language text. In other words we must know the grammar of the source language. Also we should know how to determine the statement once its grammatical structure is revealed. In the terminology of translators we call the rules of grammar and the rules of meaning as syntax and semantics of the language respectively.

In order to fulfill the task of compilation we need to find out something more than merely meaning of the source program. We should find out what particular instructions and what addressing modes we should use in the target program to perform the above steps. Such aspects of compilation concerned with the nature of target machine are known as the pragmatics of compilation. Thus if we consider different compilers for an HLL, we find that the semantics used by them are identical while the pragmatics used by them are different. For this reason we associate the term semantics with programming language and the term pragmatics with the compiler. Pragmatics of a compiler would be used during the synthesis phase, to determine how to reflect the meaning of a source language program into target program.

Analysis + Synthesis = Translation

1.4 **The Structure of Recent Compilers:**

The figure below shows the structure of recent compilers. In this figure compilers typically consist of two to four passes or phrases, with more highly optimizing compilers having more passes. This structure maximizes the probability that a program compiled at various levels of optimization will produce the same output when given the same input. The optimizing passes are designed to be optional and may be skipped when faster compilation is the goal and lower-quality code is acceptable. A pass is simply one phase in which the compiler reads and transforms the entire program. Because the optimizing passes are separated, multiple languages can use the same optimizing and code generation passes. Only a new front end is required for a new language.

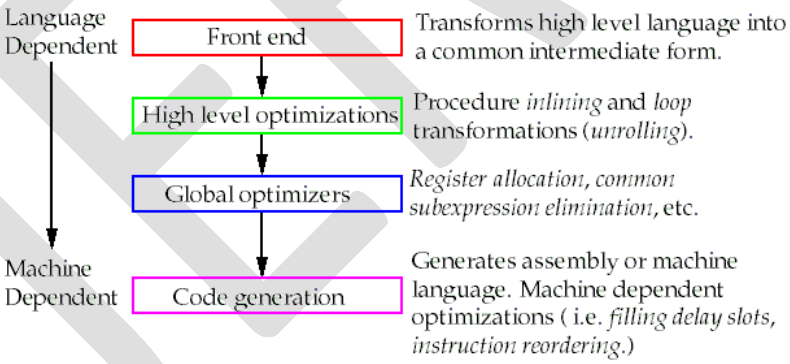

Figure 2: Structure of recent compilers

A compiler writer's first goal is correctness—all valid programs must be compiled correctly. The second goal is usually speed of the compiled code. Typically, a whole set of other goals follows these two, including fast compilation, debugging support, and interoperability among languages. Normally, the passes (phrases) in the compiler transform higher-level, more abstract representations into progressively lower-level representations. Eventually it reaches the instruction set. This structure helps manage the complexity of the transformations and makes writing a bug-free compiler easier.

The complexity of writing a correct compiler is a major limitation on the amount of optimization that can be done. Although the multiple-pass structure helps reduce compiler complexity, it also means that the compiler must order and perform some transformations before others. In the diagram of the optimizing compiler in Figure 2 above, we can see that certain high level optimizations are performed long before it is known what the resulting code will look like. Once such a transformation is made, the compiler can't afford to go back and revisit all steps, possibly undoing transformations. Such iteration would be prohibitive, both in compilation time and in complexity. Thus, compilers make assumptions about the ability of later steps to deal with certain problems.

For example, compilers usually have to choose which procedure calls to expand inline before they know the exact size of the procedure being called. Compiler writers call this problem the ***phase-ordering problem***.

How does this ordering of transformations interact with the instruction set architecture? A good example occurs with the optimization called ***global common sub-expression elimination***. This optimization finds two instances of an expression that compute the same value and saves the value of the first computation in a temporary. It then uses the temporary value, eliminating the second computation of the common expression.

For this optimization to be significant, the temporary must be allocated to a register. Otherwise, the cost of storing the temporary in memory and later reloading it may negate the savings gained by not re-computing the expression. There are, in fact, cases where this optimization actually slows down code when the temporary is not register allocated. Phase ordering complicates this problem because register allocation is typically done near the end of the global optimization pass, just before code generation. Thus, an optimizer that performs this optimization must assume that the register allocator will allocate the temporary to a register.
Optimizations performed by modern compilers can be classified by the style of the transformation, as follows:

High-level optimizations are often done on the source with output fed to later optimization passes.

Local optimizations optimize code only within a straight-line code fragment (called a basic block by compiler people).

Global optimizations extend the local optimizations across branches and introduce a set of transformations aimed at optimizing loops.

Register allocation associates registers with operands.

Processor-dependent optimizations attempt to take advantage of specific architectural knowledge.

THE IMPACT OF COMPILER TECHNOLOGY ON THE ARCHITECT’S DECISIONS:

The interaction of the compiler and the high level language majorly depends on what instruction set architecture it works on. To have an understanding of how the variables are allocated and addressed and the number of registers used for it can be obtained on looking into the ways how high level language allocate their data:

Stack – used for local variable allocation which is referenced in case of procedure call or return and does not push or pop as it is used only as activation records.

Global data area – for global variables or constants and other data structures as arrays

Heap – for dynamic objects which do not fit in stack and they are accessed using pointers. The concept of register allocation that we earlier found as optimization technique is suitable for stack allocated objects than the other two. For heap objects it is impossible as a pointer is
used to access it. Some compilers may not allocate register to any local variable if any one of them is addressed by a pointer fearing for its dependency factors.

FACTORS IN ARCHITECTURE THAT AFFECT THE COMPILER OPTIMIZATION:

Generally the major factor affecting the compiler optimization is the machine on which the code is to be executed because of which few compilers like *gcc* machine description parameters that can be altered have based on the machine in which the compiled code is to be executed.

Number of CPU Registers

The more the number of registers, it makes it easier for the compiler to allocate registers. The local variables will be allocated registers instead of a stack data representation and other intermediate values can also be stored in registers. Here, it is to be noted that RISC uses the multiple register set as any instructions has to be from/to the internal registers but the CISC uses only a single register set as it can address operands directly from the memory bypassing the registers.

RISC vs. CISC

The CISC (Complex Instruction Set Computers) has a 200 to 250 instructions and has a variable length instructions and addressing modes because of which ends up providing a large case analysis for the instructions to be chosen. Even for simple function it provides several choices and the decision making part for choosing the best instruction out of it makes the compilation speed to slow down. But in RISC (Reduced Instruction Set Computers) which typically has only 20 to 30 most commonly used instructions has a fixed length of instructions and also only specific addressing modes. Any instruction has to pass through the internal registers unlike CISC which references directly to the memory for operands. The compiler has relative cost criteria based on which it chooses the necessary ISA (Instruction Set Architecture).

Pipelines

An instruction can have several execution stages in code generation in which it can be of stages: instruction decode, address decode, memory fetch, register fetch, compute, register store etc. Pipelining comes into picture when one instruction is in memory fetch stage and the other instruction is in register store stage and that they happen to be inter-dependent similar to a deadlock condition. Pipeline conflicts can lead to pipeline stalls which can be reduced by scheduling or re-ordering the instructions.

Number of Functional Units

Some of the architectures have several Arithmetic and Logical Unit (ALU) and Floating Point Unit (FPU) which process certain instructions from a program simultaneously. Analogous to the pipeline conflicts the instructions may be inter-dependent which can also be eliminated by proper instruction scheduling to different units of the CPU.

Cache Size and type

The cache size that is available in current architectures is 256 KB to 12 MB and type is directly mapped, fully associative. Techniques like inline expansion and loop unrolling require more cache space and may increase the length of code which may have trouble in fitting into the cache memory available. At time due to cache collisions which occur as it is not fully associative will make the available cache memory unproductive at the code execution time.

Cache/Memory transfer rates.

The compiler is indicated of the issue occurred because of cache collisions or unusability of the cache memory. This may cause efficiency issues in some specialized applications.

WULF’s VIEWS :

William A. Wulf published a paper on the relationship between Computer architecture and compilers in July 1981 which includes some of the principles that were evolved to architectural changes that can simplify the work of the compiler and provide much efficient object code. In this paper, the author discusses a cost equation evaluating the efficiency and cost factors that are taken to consideration from the perspective of the compiler and the architecture.

Cost Equation

The author classifies the cost based on the software or the compiler design and the hardware i.e. computer architecture part.

Based on the compiler related costs:
- Designing compilers
- Executing the compiler
- Executing the compiled program

In the above listed costs, the designing part is a one-time cost which is high in comparison to the hardware cost. The last two costs are difficult to be related acquisitively but any flaw with it may result in decreased productivity, unavailable functionality and a fall in reliability.

- Based on the computer architecture costs
- Designing the hardware architecture
- Designing the hardware implementation for the architecture
- Manufacturing the hardware

In the above listed costs, the replication of the designed implementation or in other words the manufacturing of the hardware is the only cost that has been reducing over years. The designing cost is always more as the critical part of the whole architecture is the designing and the one-time work if any irregular structure occurs then it keeps repeating as the implementation is only replicated from the initially designed flawed architecture which would turn expensive if not corrected at design level.

GENERAL PRINCIPLES:

Regularity

The principle of regularity states that any process if done in one way in one part of the program, then it should be done in the same way whenever the process is done. This is called "the law of least astonishment" in the computer design community. The author applauds that regularity is used in most of the architectures as they accept several different data types and the ability of the compiler to treat the source and destination same way just like how the memory and registers can be treated alike. The irregularities that he complains are about the arithmetic shift and the "immediate mode" arithmetic.

Orthogonality

The feasibility to do a clear lexical analyzing on the machine code i.e., any instruction should provide a clear view of the function, the operands or constants involved in the process.

Some machines provide different instruction sets to memory-to memory, register-to-memory, and register-to-register operations which offers a large case analysis for the compilers to choose from. At times the instruction to be chosen also depends on the addressing mode chosen by the instruction.

Compensability

The proper usage of the regularity and orthogonality without any deviation will automatically provide compensability i.e., the ability to compose the orthogonal and regular notions in arbitrary ways. The author identifies the root of the problem as the programming languages views data type as a property of data whereas the machine language views data type as a property of operator. Due to this problem, any data type cannot be used from any addressing mode which is viewed as a violation of the composability principle.

Other Principles:

One vs. All

Any instruction must be provided with one possible way to do it or all possible ways to do it. For example, if the instruction may appear in 6 possible scenarios, the instruction set must provide one solution for all or 6 possible solutions which will reduce the work of the compiler by just routing it to the specific case or general case. Instead if there exist instruction sets for the instruction, the compiler will have a tough time deciding which scenario the instruction has to be put in. Thus, either one or all will simplify the work of the compiler.

Provide primitives, not solutions

The author states that it is better to provide primitive conclusions from which the programs can synthesis its own solution. The complicated functions as procedure call or case statements the instruction set provided seem to suit few languages well but end up givinga semantic clash with other languages. This is because of providing too much of semantic content to the instruction because of which the compiler can only use those instructions in specific contexts.

Addressing

The addressing computations are paths and are not specific to array or other data structures. The referencing from a memory or through pointers appears more complex than it can be which reduces the scope and context in which they can be used.

Environment Support The handling of run-time environment issues is the environment support expected from the architecture from the compiler's view. Some run-time environment issues are stack frames, displays or static/dynamic links, exceptions, processes etc.

The common run-time issues that need support are: (a) Uninitialized variables (b) Constraint checks (c) Exceptions (d) Debugging support

Deviations

Only in cases where the instructions are implementation independent, the deviation of these principles should occur.

HOW ARCHITECT CAN HELP COMPILER WRITER?

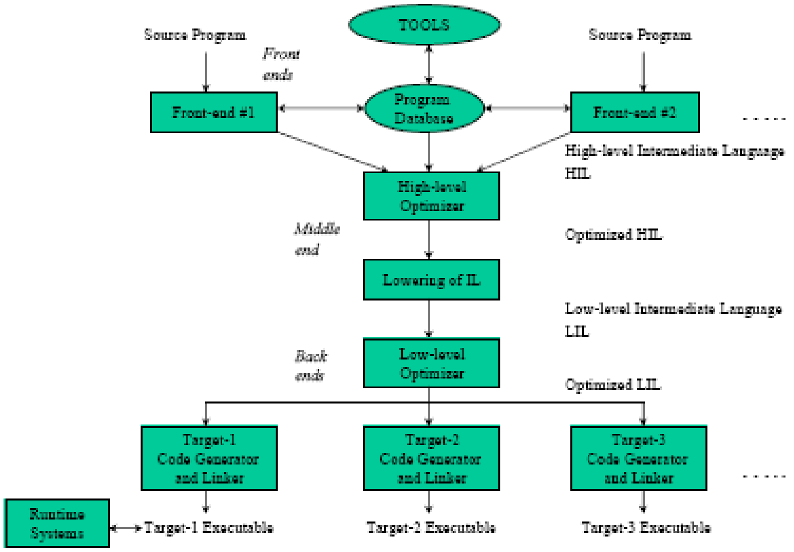

Figure 3 : Structure of Optimizing Compilers

Today, the complexity of a compiler does not come from translating simple statements like A = B + C. Most programs work fine for simple translations. The complexity arises with large programs and globally complex in their interactions. The structure of compilers chooses the best instruction for the given statement in a small fraction of time. Compiler writers usually work based on a goal where the quality is highly tested for the most frequent instructions and the accuracy is aimed at for the infrequent and complicated instructions. They consider the simple instructions to be available fast and the complex instructions though slow should give accurate results. Some instruction set properties help the compiler writer and makes it easier to write a compiler that will generate efficient and correct code.

Providing regularity—it is important to remember that in any instruction set, the influencing factors are the operation, the data type used for the variables and the addressing mode used to call the variable must be orthogonal. In this context orthogonality more about not being inter-dependent on each other i.e., irrespective of the chosen data type any addressing mode can be used should be the condition. For example, the addressing modes and operations are orthogonal if for every operation all addressing modes are applicable. On following this type of regularity, the compiler's code generation will be simpler and much less complex it need not choose between two different passes for an instruction. One evidence of irregularity is when a specific operation demands for only specific registers. For example, in case of taking D= (A+B)*C in which the addition operation need not have to look out for an even register and on register allocation it may end up with an even or odd one but the multiplication process which chooses an even register will have to make an extra data to move to compute the expression. This would result in having available registers but not the one needed (in this case even register) for register specific applications.

Provide primitives, not solutions—the generalization of a high level language functionality often fails results in supporting one high level language well and creating a semantic clash in the other languages. So it is much better not to add the special features in the instruction sets so that the features in the architecture are much generalized for use of all languages and can be synthesizing its own necessary solution from the given set of instruction sets.

Simplify trade-offs among alternatives—the biggest challenge for current compilers is dealing with a large case analysis. When several suggestions are made for a specific statement the compiler can choose the simple instruction set and implement the goal of the statement but the decision making time itself is more to choose which is the best and efficient instruction set of those available which consumes most of the compilation time. With pipelining and cache memory too it is difficult to handle the code size that is generated after compilation which was comparatively much less earlier. It is more important for the compiler writer to understand the alternative code sequences suggested and then choosing the best instruction set for the statement. The register-memory architecture is the most difficult tradeoff in deciding how many times a variable should be referenced before it is cheaper to load it into a register. This threshold point is very hard to compute and, in fact, may vary among models of the same architecture.

The architecture provides instructions that bind the quantity known at compile time as constants. Not all variables that have a value at the compiler time can act the same way in run-time, and this case when considered vice-versa by the architecture makes the compiler writer's job more complex. Good counter examples of this principle include instructions that interpret values that were fixed at compile time. For instance, the VAX procedure call instruction (calls) dynamically interprets a mask saying what registers to save on a call, but the mask is fixed at compile time.

CONCLUSION

An effective compiler allows a more efficient execution of application programs for a given computer architecture, while well-conceived architectural feature can support more effective, compiler optimization techniques. Both the compiler writer and machine designer have multiple objectives. When the compiler writer and the machine designer work on their objectives also having in mind the objectives of the other then it is possible achieve what they need to accomplish and also what can be accomplished using the feature or optimization built by them. The compiler writer will benefit by having more space to research on the optimization techniques of the compiler and the machine designer will profit on the reduced execution time it takes to implement because of the well structured architecture that complies with the needs of a compiler writer and also achieves its primary goals. From embedded micro-controllers to largescale multiprocessor systems, it is important to understand the interaction between compilers and computer architectures. A machine designer should upgrade his architecture in a way that helps implement the high-level languages. But the up-gradation must take into consideration cost, reliability, and customer acceptance factors also. It is of no use if it is very high level language oriented as it fails to generalize the concept of how the same is dealt in other languages. Similarly, a compiler writer should apply the semantics that are provided in the source code and translate the same to the code that can be interpreted by the machine for hardware implementation and also provide a user-friendly interface that doesn’t make the work of the program complex. Correctness and efficiency is the major factors that are expected from an efficient compiler. To achieve both it needs a proper interaction with the computer architecture and an understanding of how things need to be conceived which would result in efficient and accurate compilers.

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Survey on ODX (open diagnostics data exchange)

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Abstract—Demands on the diagnostic applications to support modern vehicles have been increased. This is because the complexity of modern vehicles has grown. Today to diagnose modern vehicles have a difficult task. They need to keep up with rapid changes, variant management and complex systems. This makes it challenging to test them and develop in an efficient way.

These problems can be mitigated or solved with a simulator which the diagnostic application can be run against.

There are two common vehicle description formats: ODX and ASAP2. ODX contains many components that offer great flexibility such as its parameter, service structures and memory.

Keywords— ODX=Open Diagnostic Data Exchange, ASAM=Association for Standardization of Automation and Measuring systems), XML =Extensible Markup Language, MCD =Measurement, Calibration, and Diagnostics, CAN= Controller Area Network) ,ECU =Electronic Control Unit , ISO =International Organization for Standardization.

INTRODUCTION

Today's cars contain a large number of onboard computers which are there both to provide services for the driver and to perform fine-grained engine mechanisms.

It has become harder to develop diagnostic applications and service tools to support these systems, as the complexity of vehicle electronics has increased. Many diagnostic services of a vehicle use standardized communication interfaces which is required by law but many difficulties remain. The tool providers must offer more features than diagnostic read-outs .This is because the service technicians can perform their work with as few tools as possible. Complicated task for the service tool developer to support vehicle variation which involves various communication interfaces, software and hardware.

Many diagnostic tools include a simulation mode. It is used to test the application itself without the need to access real hardware. Uses for the simulation mode are for educational purpose, easier testing during development of the tool and demonstrational use.

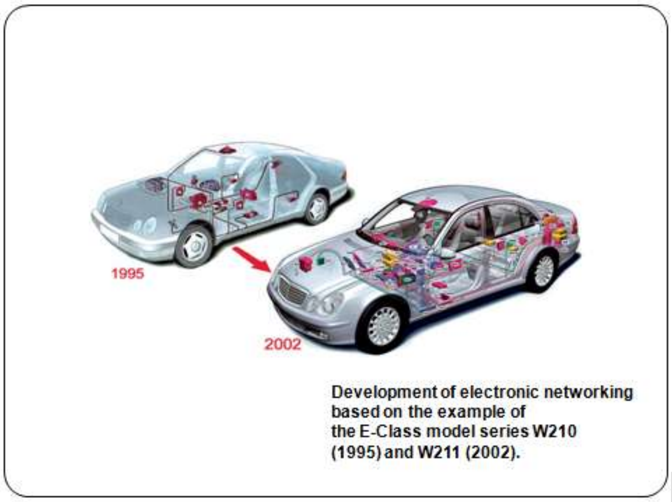

FIGURE 1**:** Development of electronic networking based on the example of the E-Class model series W210 (1995) and W211 (2002)

During the second half of the 1980s there is fast growth of electronic functions in vehicles. Firstly it led to many limited solutions that prevented comprehensive concepts from taking hold in the area of electrical architectures. A consolidation phase began at the beginning of the 1990s that was marked by development of electrical/electronic structures and associated networking topology from a inclusive perspective. This shows that its networking and electrical/electronic content could claim an undisputed position in the vehicle. The recognition that with the help of electronics many functions could only be implemented sensibly also prevailed. So the electronics' image transformed from being a necessary evil to being a key to new, innovative and interesting functions.

PROBLEM DESCRIPTION AND PURPOSE

- How are diagnostic applications being used?
- What are the needs of diagnostic applications.?
- Testing the diagnostic application.
- Better diagnostic application that can lead to better stability and performance for the end user.
- Easier testing against different vehicle versions and to add new hardware to simulate.
- Easier debugging during development and test of diagnostic application.

ODX(OPEN DIAGNOSTIC DATA EXCHANGE)

1.Diagnostic

Vehicle diagnostics describes the alignment of symptoms and fault detected to electronic components and sensor in vehicles. It covers methods and applications for fault analysis while repairing, quality control and statistics thru the vehicle life cycle. Additionally it informs and warns the driver about mal functions and possibly deactivation of vehicle components or functions. Generally vehicle diagnostics is divide in two parts:

- On Board (diagnostic functionality within the vehicle)
- Off Board (diagnostic information and equipment outside the vehicle)

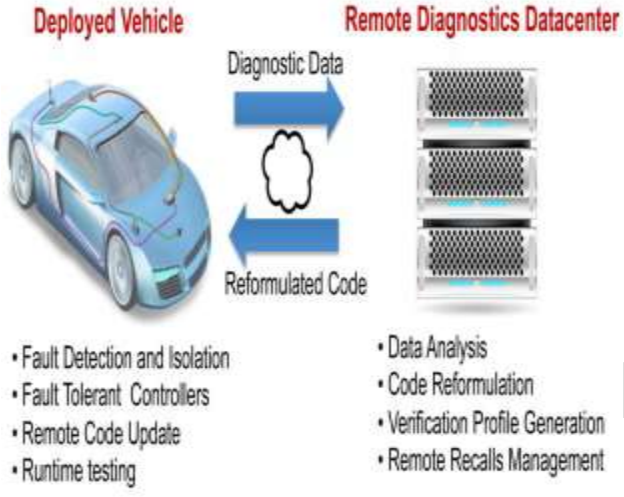

FIGURE 2: Remote Diagnostics of automotive control systems[1]

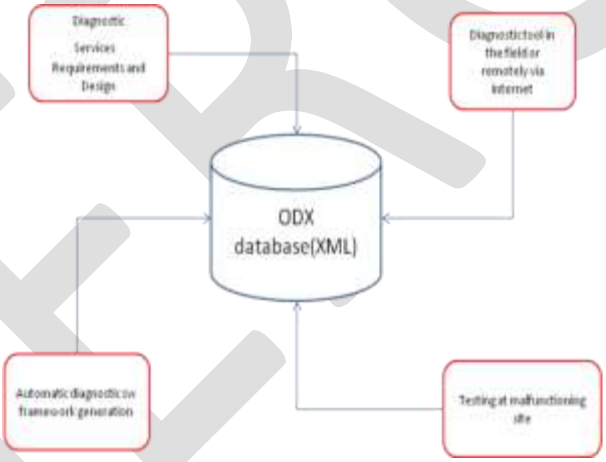

FIGURE 3: *ODX context*

The goal behind ODX is to provide a single source of diagnostic information for the different parties involved in the car diagnostics. These parties include the software development team that designs and implements the diagnostics software, manufacturing staff and service personnel.

ODX defines the diagnostics services of a car type in an XML file. A diagnostic or testing tool from any vendor can read this XML file to configure itself to be able to perform diagnostic tests embedded into the car control system. Furthermore, the XML file can be fed as an input to a code generation tool to produce the framework for the diagnostic software of the electronic control units, thus speeding up the diagnostic software production process.

2.How ODX works

FIGURE 4: Basic structure of a diagnostic system[2]

In a sense, diagnostics in the vehicle industry means the communication between a test equipment (diagnostic tester – client) and the control units (ECU – server) using a diagnostic communication protocol. The link between the on-board and off-board is given by a diagnostic data base (e.g. ODX) describing all relevant information like parameters, request and responses and as well as conversion of data in physical values.

METHADOLOGY

ASAM

ASAM full form is Association for Standardisation of Automation and Measuring Systems. It was founded in December 1998 as an initiative of German Car manufacturers. This association provides standards for interfaces, data models, and syntax specifications for a variety of applications for example testing, evaluation and simulation. For the development of ASAM standards ,ASAM provides an professional project management platform which is efficient. ASAM head office is located near Munich, Germany. ASAM members are from the Automotive OEM, Tier One and tool supplier communities, as well as universities.

ISO

ISO (International Organization for Standardization) is the world's largest developer and publisher of International Standards. ISO is a network of the national standards institutes of 163 countries, one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system.

ODX

ASAM MCD-2 D (market name: ODX) defines a unique, open XML exchange format for diagnostics data. The ODX standard, which is also named MCD-2D, is an extensible Markup Language (XML) based format to describe diagnostic data, functionality, and communication interfaces of ECUs inside a vehicle. The ODX standard is currently jointly being developed by ASAM and ISO. The ODX specification contains a model to describe all diagnostic data and information about a vehicle and its physical ECUs. Some examples of what this data can contain are the following: diagnostic trouble codes, data parameters, identification data, variant coding data, and communication parameters. The ODX model itself is described in Unified Modeling Language (UML) and the data exchange format uses XML.

ADVANTAGES

- ODX can describe the layout of diagnostic request and response messages as well as decoding and encoding information for conversion of message parameters from hexadecimal to physical representation

- ODX can capture information about the topology of the on-board ECU network and the pin-out of the vehicle fitted diagnosis connectors

- ODX provides description elements for ECU reprogramming, session handling and flash data .
- The seamless exchange of data between different partners and tools in the process chain is a major progress supported by ODX.

- Diagnostics utilities like service testers or development tools can be parameterized by ODX data.

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I am thankful to the almighty for giving me the opportunity for carrying out this work under the guidance of Prof. ARUN TIGADI. His encouragement and teachings have helped me grow intellectually in a truly efficient manner. I am really grateful to him for the time he has spent in helping me accomplishing this work.

I would like to express special thanks to my parents for the support and encouragement.

CONCLUSION

Vehicle communication and diagnostics is a vast area of complex standards. It is not possible to cover this whole area in the time scope of this project. Some parts and ideas have deliberately been left out while some interesting ideas that have occurred have been dropped to keep realistic limitations of this project. ODX data modeling principles is impressive and provides flexible structures that is said to not depend on underlying communication standards. One interesting area would be to compare ODX to Autosar and see how these standards solve common communication/diagnostic idioms such as parameters and memory structures.

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IMAGE QUALITY ASSESSMENT METHOD FOR FAKE IRIS DETECTION

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Abstract - In this paper we are doing a biometric technique method by iris recognition to check the iris is real or fake based on an image quality measure. Research and practical applications iris recognition is becoming a very active topic .The most reliable and accurate available biometric identification system is iris recognition method. Iris recognition system is used for the further segmentation and normalization for extracting its feature. In this paper Daughman's Algorithm segmentation process for Iris segmentation and an image quality is used to check whether the image is real or fake.

Keywords
Image quality assessment, biometric, visual saliency, Daughman segmentation, fake iris, VSI.

Introduction

Biometric recognition using iris is a mature technology used in many government and civilian applications such as e-passports, ID cards, and border control. However, during the past few years, biometric quality measurement has turn into a significant concern. In recent years, the increasing interest in the evaluation of biometric systems security has led to the development of numerous and very diverse initiatives that focus security measures as main field of research [1]. Fake user first detain the original identity of the real user and then they make the fake sample for verification ,but biometric system have more method to notice the fake users and that's why the biometric system is more protected, Because each person have their only one of its kind characteristics identification. Biometrics system is more protected than other security methods like password, PIN, or card and key. .Image quality assessment is might by belief that it is predictable that a fake image and real sample will have different quality obtaining. Predictable quality differences between real and fake sample may contain: color and luminance levels, general artifact, quantity of information, and quantity of sharpness, its value found in both type of images, structural distortions or natural appearance. In this paper we can find the iris is real or fake based on the image quality measure. Iris recognition is the foremost part of iris recognition system. There are four steps in iris recognition, segmentation, normalization, encoding and matching. Segmentation and normalization technique depends on performance of iris recognition system .iris information of iris pattern Iris segmentation refers to the method of extracting features that provide the information of iris model normalization refer to prepare a segmented iris image for the encoding process. The next step is the encoding technique.

Proposed Work

In this paper we are doing to check that the iris is real or fake based on the image quality value. First the eye image is selected from the UBIRIS database and segmented the iris portion from the eyes using the - Daugman's Iris Segmentation method [3].There are several steps used in Segmentation method like image acquisition, image preprocessing, template matching [4]. In this method first apply the filter then initialize center and radius of the iris ,construct the circle with given radius and center, then calculate the circle gradient ,if the gradient is maximum set as maximum gradient circle, otherwise change the center and radius.

Motion filter is used to create the distorted image from the segmented image. It results when the image being record change during the soundtrack of a single contact, either due to rapid movement or long exposure Image, filtering allow you to apply various belongings on photos. . Motion blur is achieved by blurring in only 1 direction. It's as if the camera is move from the top left to the bottom right, hence the name is motion filter, then created the visual saliency map, [5] The Saliency Map is a topographically given map that represent visual saliency of a corresponding visual scene it can be see that in the majority cases, changes of VS maps can be a good indicator of distortion degrees and thus, in this paper propose to use the VS map as a feature to characterize the image's local quality.

There are several method to create the VS map, in this paper use SDSP [6] method to create VS map. The main step of SDSP method is first find the frequency prior then location and color prior, based on the combination of three visual saliency map is created. In the quality distortion indicator, VS map does not work quite well for the distortion type CTC (Contrast Change). The root reason is that due to the normalization operations involved in VS computational models, the VS value at a pixel is a measure to reflect its relative distinctiveness to its surroundings, which makes VS weak to characterize image's absolute contrast However, such a quality degradation caused by contrast reduction cannot be reflected in their VS maps, since no significant difference can be observed in VS map, Fortunately, we can use an additional feature to recompense for the need of contrast sensitivity of VS. The simplest aspect of this type may be the gradient modulus (GM).

There are several different operators to compute the image gradient, such as the Prewitt operator, the Sobel operator, the Roberts operator and the Scharr operator [7] and here implement the Scharr gradient operator, which has been prove very dominant in several work . With Scharr gradient operator, the partial derivatives Gx (x) and Gy (x) of an image f (x) are calculated as:

$$G_x(\boldsymbol{X}) = \frac{1}{16}\begin{bmatrix} 3 & 0 & -3 \\ 10 & 0 & -10 \\ 3 & 0 & -3 \end{bmatrix} * f(\boldsymbol{X})$$

$$G_y(\boldsymbol{X}) = \frac{1}{16}\begin{bmatrix} 3 & 10 & 3 \\ 0 & 0 & 0 \\ -3 & -10 & -3 \end{bmatrix} * f(\boldsymbol{X})$$

GM map has a good potential capability in reflecting the local contrast loss of images. Therefore, VS and GM are matching and they replicate different feature of the HVS in assess the local value of the input image, it can also be seen that as a quality distortion indicator, VS map does not work quite well for the distortion type CCS (Change of Color Saturation) either. Actually, color distortion cannot be well characterize by gradient either since usually gradient is evaluate from the luminance channel of images. Thus, to make the IQA metric possess the ability to deal with color distortions, chrominance data should be give special considerations. Consequently, for RGB color images, we first transform them into an opponent color space [8].

$$\begin{bmatrix} L \\ M \\ N \end{bmatrix} = \begin{bmatrix} 0.06 & 0.63 & 0.27 \\ 0.30 & 0.04 & -0.35 \\ 0.34 & -0.6 & 0.17 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

The weights in the above conversion are optimized for the HVS. Then, the gradients are computed from L channels. M and N, two chrominance channels, will be used as features to characterize the quality degradation caused by color distortions.

With the extracted VS, GM, and chrominance features, we can define a VS-based index (VSI) for IQA tasks. Then check the resemblance between images f1 and f2. Denote by VS1 and VS2 the two VS maps extracted from images f1 and f2 using a specific VS model; denote by G1 and G2 the two GM maps; denote by M1 and M2 the two M channels; and denote by N1 and N2 the two N channels. The computation of VSI consists of two stages. In the first stage, the local similarity map is calculated, and in the second stage, group the similarity map into a single quality score. Then separate the similarity measurement between f1(x) and f2(x) into three components, one for VS, one for GM, and the other for chrominance. First, the similarity among VS1(x) and VS2(x) is distinct as:

$$S_{V\,S}(\mathbf{x}) = \frac{2V\,S_1(\mathbf{x})\,.V\,S_2(\mathbf{x}) + C_1}{V\,S_1^2(\mathbf{x}) + V\,S_2^2(\mathbf{x}) + C_1}$$

Wherever $C1$ is a positive constant to increase the stability of SVS. Similarly, the GM values $G1(\mathbf{x})$ and $G2(\mathbf{x})$ are compared as:

$$S_G\,(\mathbf{x}) = \frac{2G_1(\mathbf{x})\,.\;G_2(\mathbf{x}) + C_2}{G_1^2(\mathbf{x}) + G_2^2(\mathbf{x}) + C_2}$$

Where $C2$ is another positive constant. The similarity between the chrominance components is simply defined as:

$$S_C(\mathbf{x}) = \frac{2M_1(\mathbf{x})\,.\;M_2(\mathbf{x}) + C_3}{M_1^2(\mathbf{x}) + M_2^2(\mathbf{x}) + C_3}\,.\,\frac{2N_1(\mathbf{x})\,.\;N_2(\mathbf{x}) + C_3}{N_1^2(\mathbf{x}) + N_2^2(\mathbf{x}) + C_3}$$

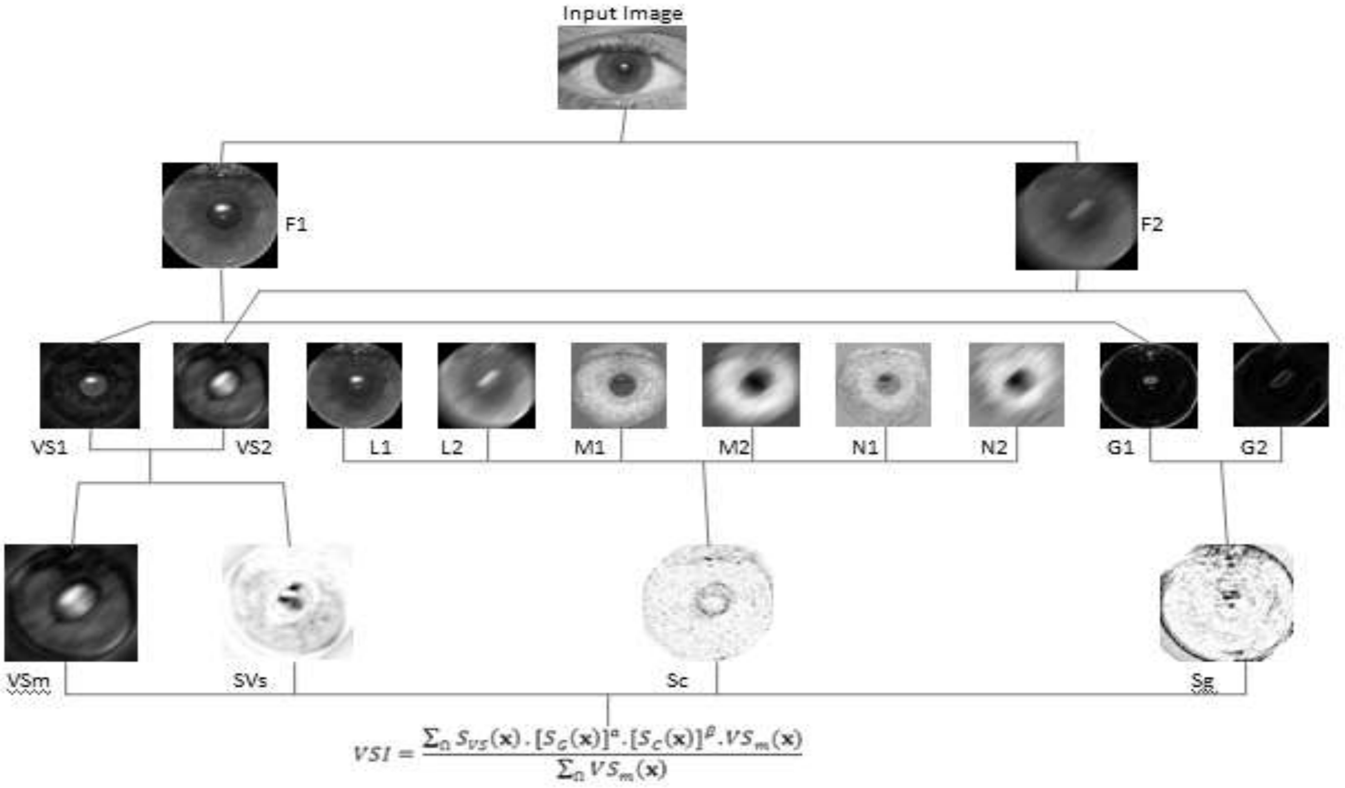
In our experiments, *C*1, *C*2 and C3 are all fixed so that the proposed VSI can be conveniently applied to all datasets. Then, *SV S*(**x**), *SG*(**x**) and *SC*(**x**) are combined to get the local similarity *S*(**x**) of *f*1(**x**) and *f*2(**x**). We define *S*(**x**) as follows

$$S(\mathbf{x}) = S_{V\,S}\,(\mathbf{x}).\,[S_G(\mathbf{x})]^{\alpha}\,.\,[S_C(\mathbf{x})]^{\beta}$$

Where α and β are two parameters used to adjust the relative importance of VS, GM, and chrominance features. Having obtained the local comparison *S*(**x**) at each point **x**, the overall similarity between *f*1 and *f*2 can be calculated It has been widely accepted that different locations can have different contributions to the HVS' perception of the image quality and it would be better if the score pooling strategy could be correlated with human visual fixation. Consequently, in our VSI framework, it is natural to choose the VS map to characterize the visual importance of a local region Instinctively, for a given position **x**, if anyone of *f*1(**x**) and *f*2(**x**) has a high VS value, it implies that this position **x** will have a large force on HVS when it evaluates the similarity between *f*1 and *f*2. Therefore, we use *VSm*(**x**) = max(*VS*1(**x**), *VS*2(**x**)) to weight the significance of *S*(**x**) in the largely similarity. Actually, a similar form was used at last the VSI metric connecting *f*1 and *f*2 is term as:

$$VSI = \frac{\sum_{X\in\Omega} S(\mathbf{x})\ .\ V\,S_m(\mathbf{x})}{\sum_{X\in\Omega} V\,S_m(\mathbf{x})}$$

Based on these value easily identify that the image is real or fake. In VSI method .9 and above value image are real image. The UBIRIS database used in the VSI method, it can easily identify that that the iris is real or fake.



Experimental Results

In our paper we use the UBIRIS dataset is used to check the iris is real or fake. With the distinct need for consistent personal identification, iris recognition has become a significant enable technology in our society. Even though an iris pattern is obviously an ideal identifier, the increase of a high-performance iris recognition algorithm and transfer it from research lab to practical applications is at rest a challenging task. CASIA Iris Image Database (CASIA-Iris) develop by research group has been released to the international biometrics groups and updated from CASIA-IrisV1 to CASIA-IrisV3 since 2002. Iris images of CASIA-Iris-Interval were taken with self-developed close-up iris camera. The most important feature of iris camera is that have made a circular NIR LED array, with appropriate luminous flux for iris imaging.

Conclusion

In this paper, we proposed a biometric method for IQA, namely image quality assessment for fake Iris detection and it can conclude that daughman segmentation is suitable for segmentation, then create the VS map. It is based on the assumption that an image's VS map has a close relationship with its perceptual quality. In the visual saliency (VS) map is explored at two stages. At the stage of local quality map computation, the VS map is taken as an image feature; while at the quality score pooling stage, it is used as a weighting function to characterize the importance of a local image region. Several representative VS models were examined under our framework of VSI for IQA tasks, and among them the SDSP model performs the best.

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Implementation of AES-192 Algorithm to Overt Fake Keys against Side Channel Attacks

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Abstract— Cryptography is the study of mathematical techniques related to aspects of information security such as confidentiality, data integrity, entity authentication and data origin authentication. In data and telecommunications, cryptography is necessary when communicating over any unreliable medium, which includes any network particularly the internet. In this paper, an approach to overt the cryptographic key with a fake key, when there happens any counter attack so-called side-channel attack (SCAs) is applied to break the security of AES-192. SCAs happens based on the correlation produced by the data provided as input and operations performed by the device for the data provided and its actual power consumption for the operation. The proposed approach revealing false key introduces few modifications in the existing AES algorithm which aims at masking the true key by reinforcing the correlation coefficient in such a way that the attack leads to a false key which misleads the attacker. The algorithm is coded in Verilog and simulated using Modelsim DE6.5e. The synthesis process is done using Xilinx ISE8.1i and implemented in Xilinx Spartan 3E device. Experimental Matlab R2014a results show the strength of the proposed system, which is capable of successfully hiding the true cryptographic key.

Keywords— Advanced Encryption Standard Encryption Standard, Data Side-channel attacks, Cryptography, cipher text, SubByte, ShiftRow, MixColumn, AddRound key

I. INTRODUCTION

In the late 1990s, Kocher et al. [1] proposed a simple methodology to obtain the key of a cryptographic algorithm which was based on analyzing the power consumption associated with the hardware device used in the implementation of such an algorithm. The information related to the revealed key through power consumption is used to perform the Side-Channel Attacks (SCAs). In addition to their conceptual simplicity, these attacks only need cheap instrumentation equipments used for capturing and data processing. Although authors implemented their proposal on a Data Encryption Standard (DES) algorithm, nowadays the process has been successfully applied over different cryptographic algorithms of private key [2]. However due to the high level of security, most publications have intended to find out the key of the popular Advanced Encryption Standard (AES) algorithm. Since its adoption by the NIST [13] as standard, this algorithm has significantly increased its popularity.

Hence this forms the basis for encrypting many official documents by the National Security Agency (NSA) and by the EUA government itself [3]. Many techniques have been developed to protect the integrity of cryptographic systems due the advent of SCAs. Counter measures that has been proposed for hiding leads to design a systems where the data processed and the power consumed are independent[12]. Such a system is achieved either by creating systems that are featured with random power consumption or systems whose power consumption is constant for every clock cycle [2].Another type of countermeasures called masking techniques was proposed. The robustness of such techniques is based on masking the data with random values that are unknown by the hackers. These Masked data change the power consumption of the masked data from the original data. It is to be noted that the functionality of the algorithm is not changed at any point of the system execution.

The countermeasures based on masking or hiding for Different versions of AES have been proposed and implemented in the past. Most of these proposals are based on implementations performed on microprocessors, ASIC or FPGAs [4] [5]. All these proposals are always addressed to design systems in which all the permitted keys that have been obtained upon a SCAs analysis are equally likely hence the concept of equiprobability is the real measure of protection is adopted. This paper presents a completely different approach towards masking of data that includes, instead of protecting the equiprobability of keys, the countermeasure is based on designing the algorithm in such a way that a false key becomes the key with the highest probability obtained in a SCA by the attacker[6][7]. In fact, the system seems to behave as an unprotected system but when an attacker performs a classical SCA then the system culminates in a false positive [8].

The paper is organized in five sections. Section I describes about the evolution of AES. Section II describes the theoretical basis adopted in SCA and the existing work using AES-192. Section III shows proposed work of reveal false keys for AES-192. Section IV presents the experimental results, and finally section V shows the conclusions.

II. CLASSICAL STATISTICAL ATTACKS BASED ON POWER ANALYSIS

A. AES algorithm

Fig. 1 shows the general architecture of a crypto-processor system. A cryptographic algorithm is applied over a plain text in order to obtain a cipher text [10].

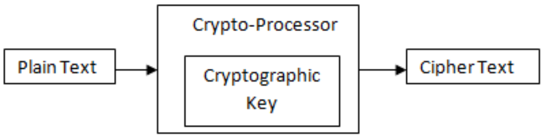


Fig.1 Crypto-processor architecture.

The brute-force attack, which tries to obtain the plain text without knowing the actual cryptographic key, is unfeasible. AES is a symmetric block cipher, so that it uses the same key for encrypting and decrypting both the plain and the cipher texts, respectively. The Advanced Encryption Standard is a block cipher whose design principle is known as a substitution permutation network. The operation of AES is performed on data of a fixed block length, using a key that can either have 128, 192, or 256 bits (this paper is based on a version of 192 bits). The AES algorithm with 128-bit, 192-bit and 256-bits are usually referred to as AES-128, AES-192 and AES-256 respectively. The key length represents the number of 32-bit words in the key, and thus is equal to 4, 6 or 8 in this standard. The input block, the output block and the intermediate cipher result all have the same length of 128 bits. The block size represents the number of 32-bit words in the block. The number of AES round is determined by its key size: 10 rounds for AES-128, 12 rounds for AES-192, and 14 rounds for AES-256[11].

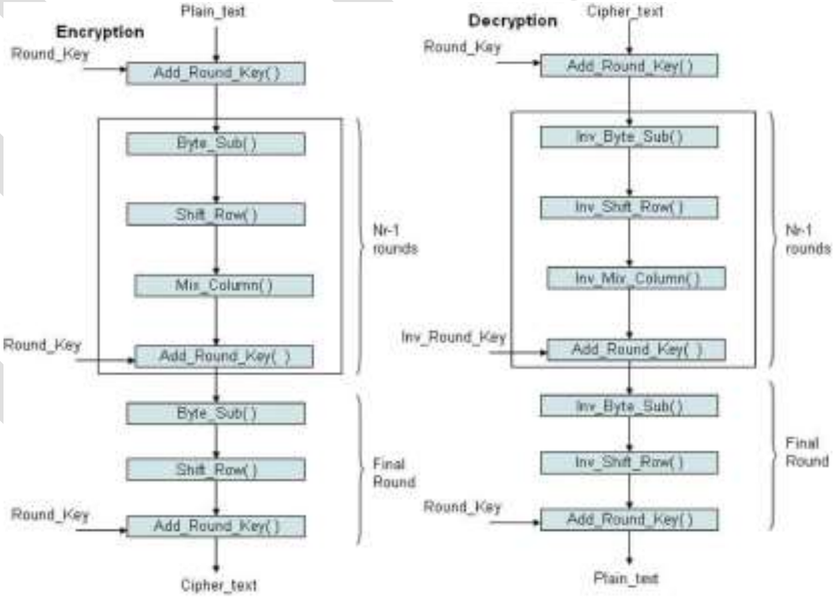


Fig.2. AES Encryption and Decryption

The algorithm applies several substitutions and permutations on a block of 128 bits, called the state, which initially is obtained by combining the plain text and the key by an exclusive-or operation [11]. Thus, the state is represented by an array of 16 bytes with four rows and four columns. Such functions are repetitively applied on the state during several iterations calls rounds. For both its Cipher and Inverse Cipher, the AES algorithm uses a round function that is composed of four different byte-oriented transformations as shown in fig 2:

- Byte substitution using a substitution table (S-box),
- Shifting rows of the State array by different offsets,
- Mixing the data within each column of the State array, and
- Adding a Round Key to the State.

In each round, the state is again combined with a new key, called round key, which is created by the key scheduling algorithm (key expansion). A detailed description of the AES algorithm can be found in [3]. According to the theory of SCAs, the most vulnerable blocks that can be attacked are *AddRoundKey* and *SubBytes*. The AddRoundKey block is a simple bitwise XOR operator, whereas the SubBytes block is a non-linear function that is applied to each individual byte of the state.The*SubBytes* function can be implemented by means of a look-up table of 256 elements, which is called 16 times (one time for each byte of the state) per round.

B. AES Encryption

In encryption mode, the initial key is added to the input value at the very beginning, which is called an initial round. This is followed by 11 iterations of a normal round and ends with a slightly modified final round. During one normal round the following operations are performed in the following order: Sub Bytes, Shift Rows, Mix Columns, and Add Round key [11]. The final round is a normal round without the Mix Columns stage.

Steps in AES Encryption

- Sub Bytes—a non-linear substitution step where each byte is replaced with another according to a lookup table.
- Shift Rows—a transposition step where each row of the state is shifted cyclically a certain number of steps.
- Mix Columns—a mixing operation which operates on the columns of the state, combining the four bytes in each column
- Add Round Key—each byte of the state is combined with the round key; each round key is derived from the cipher key using a key schedule

The Sub Bytes transformation is a non-linear byte substitution that operates independently on each byte of the State using a substitution table (S-box). This S-box which is invertible is constructed by composing two transformations which include an inverse function GF(2^8) and an invertible affine transformation. Conventionally, the coefficients of the SBox and inverse S-Box are stored in the lookup tables, or a hard wired multiplicative inverter over GF(2^8) can be used, together with an affine transformation circuit as in Fig.3.

In the Shift Rows transformation, the bytes in the last three rows of the State are cyclically shifted over different numbers of bytes (offsets). The first row is not shifted at all, the second row is shifted by one the third row by two, and the fourth row by three bytes to the left. This has the effect of moving bytes to lower positions in the row (i.e., lower values of c in a given row), while the lowest bytes wrap around into the top of the row (i.e., higher values of c in a given row)[11]. The MixColumns function applies a linear transformation to the state, and it operates on the matrix column by column. Each column is treated as a polynomial over GF(2^8) and multiplied modulo x^4+1 with a fixed polynomial. The AddRoundKey transformation adds a round key to the state by using a simple bitwise XOR operation. Each round key used is derived from the secret key by employing the key schedule.

C. AES Decryption

In decryption mode, the operations are in reverse order compared to their order in encryption mode. Thus it starts with an initial round, followed by 11 iterations of an inverse normal round and ends with an AddRoundKey. An inverse normal round consists of the following operations in this order: AddRoundKey, InvMixColumns, InvShiftRows, and InvSubBytes. An initial round is an inverse normal round without the InvMixColumns. The Inverse Sub Bytes (InvSubByte) function applies the inverse S-box to each byte of the state. The operation is carried out by inverting the affine transformation and then taking the multiplicative inverse in GF(2^8). The Inverse Shift Rows Transformation (InvShiftRows) operation, the first row is unchanged, and row I is shifted to the right i byte(s) cyclically, where i=1, 2, or 3. The InvMixColumns is the inverse of MixColumn operation. Each column of the state is multiplied modulo x^4+1 with a fixed polynomial. The AddRoundKey transformation is its own inverse as it only involves the xor operation [11].

D. Fundamentals of statistical attacks

SCAs exploit the existing correlation between the power consumption of the electronic device and the data and operations performed during the execution of the AES algorithm [9]. The attack process performed to find out the key consists of the following steps:

1. The Attack mainly focuses on one of the blocks, either the AddRoundKey block or the SubByte block. The usual preferred point is the output of SubBytes in the first round. The output of AddRoundKey block is also vulnerable but it offers poorer results. In general both the candidates are considered to be attacked first.

2. Let T be the traces associated with the power consumption during the execution of a function that is being captured. Each trace Tj indicates the plain text that is known by the attacker.

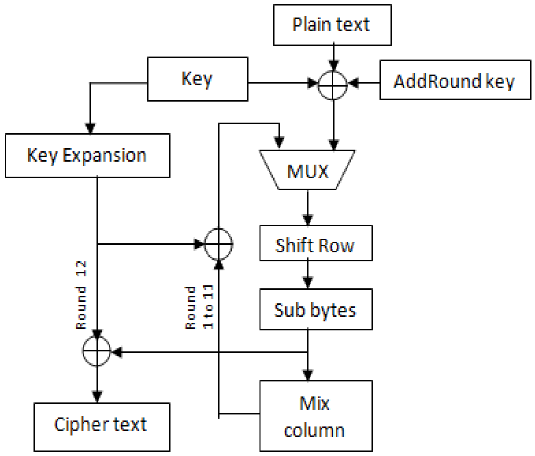


Fig.3 Block diagram for AES-192 bits.

3. In order to simplify the calculation process, the traces are compressed. In our assumption, the average value associated with its power consumption is given by clock cycles. Let us assume that t_a be the point chosen to be attacked. A new vector T_{ta} of length L is generated, which contains all points t_a associated with all compressed traces.

4. The whole process is focused mainly on a particular byte of the function that is chosen in step one. This byte depends only on one byte of the key, which is unknown, along with a byte which is known of the plain text. Only one of the 256 potential keys is correct. For each possible keys a theoretical model of power consumption (hamming-weight) H_k (k=1..256) is created for each element of vector T_{ta}.

5. The correlation coefficient ρ_k (k=1 to 256), between the vector T_{ta} and theoretical model H_k represents the real power consumption, that is calculated.

6. The first byte of the correct cryptographic key corresponds to the highest correlation ρ_k.

7. The process is repeated for each of the 15 remaining key bytes.

III. ALGORITHM STRUTURE TO REVEAL FAKE KEYS

A. Theoretical basis for hiding the true key

The basic idea behind the fake key production is represented in Fig. 4 which is focused on function *SubBytes* that is denoted as SBox. The real key KEY_{REAL} is concealed with a mask $FAKE_{MASK}$ through an exclusive-or operator [9].The result of this operation is the fake key KEY_{FAKE}, which is used for encrypting the plain text that leads to false positive.

It is seen that the system is protected, and if any statistical attack is performed on functions *AddRoundKey* or *SubBytes*then it will reveal the false key KEYFAKE which misleads the attacker. However, some modifications have to be introduced along the encrypting process, the cipher text must be encrypted with the realkey KEY_{REAL}.

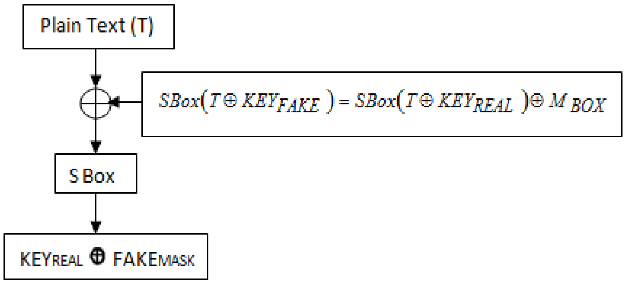


Fig.4 Scheme for encrypting the plain text with a false key.

Note that the output of SBox (the state) can be represented as:

$$SBox(T\oplus KEY_{FAKE})=SBox(T\oplus KEY_{REAL})\oplus M_{BOX} \tag{1}$$

where MBOX is a vector of 8-bits length.

Expression (1) allows retrieving the state related to the real key just operating the actual output of Sbox with an exclusive-or. Moreover, M_{BOX} satisfies the following equality:

$$M_{BOX}(j)=SBox(j)\oplus SBox(j\oplus FAKE_{MASK}) \tag{2}$$

Being $j=T\oplus KEY_{FAKE}$. Note that j can take 256 different values. MBOX can be seen as a look-up table of 256 elements, which can be pre-computed only once, at the beginning of the encrypting algorithm:

```
for (j=0; j<256; j++) {
    $M_{BOX}(j)=SBox(j)\oplus SBox(j\oplus FAKE_{MASk})$
}
```

B. Structure of the modified AES.

The complete architecture proposed in this paper to reveal fake keys is as shown in Fig.5. It can be clearly seen that there are only some small differences between the two models. Further, there are some features that are to be mentioned regarding our proposed system:

1. At any time, the calculations done on the basic functions like *AddRoundKey*, *ShiftRow*, *SubBytes* and *MixColumn*is always based on the false key KEY_{FAKE}. Thus, any statistical attack performed on any of these functions would lead to a false positive (false key).

2. Since the M_{BOX} in our proposed system is pre-computed, so that its execution is very fast and comparable with the function *SubBytes*. Thus, the total execution time is less.

3. Function *MixColumn* has been implemented twice though the second implementation which is connected to the output of M_{BOX}, is not strictly necessary, but we have included it for the success of any attack that was performed in MixColumn.

4. The output of MBOX has been masked with m2 for security purpose. It is a mask which randomly changes for each encrypted plain text. This attempt to prevent a second order attack was carried out by processing the outputs of functions *SubBytes* and MBOX.

It is clear from the block diagram of our proposed model that, the *ShiftRows*is located between *AddRoundKey* and *SubBytes* blocks, so that any attack that has been performed on this function will lead to an identical result similar to the one that we obtained for *AddRoundKey*. Some constrains has been imposed on the attack that is performed on output of *MixColumn* block. Since the *MixColumn* operates on bytes (four bytes) coming from the output of*SubBytes*, key hypotheses of 32 bits should be performed while calculating the correlation coefficient. Usually, attacks based on hypotheses of more than 24 bits are considered unfeasible, in order to overcome this problem, we use plain texts with 3 bytes fixed. The position of these 3 bytes depends on the location of the byte that has to be attacked.

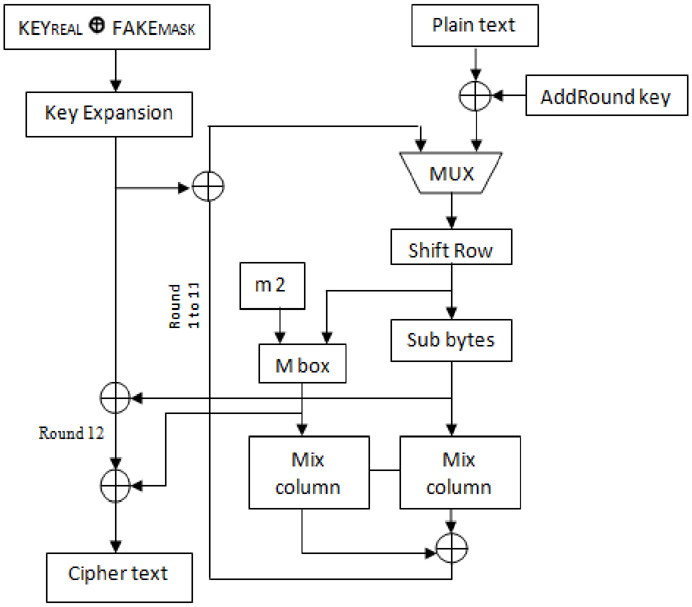


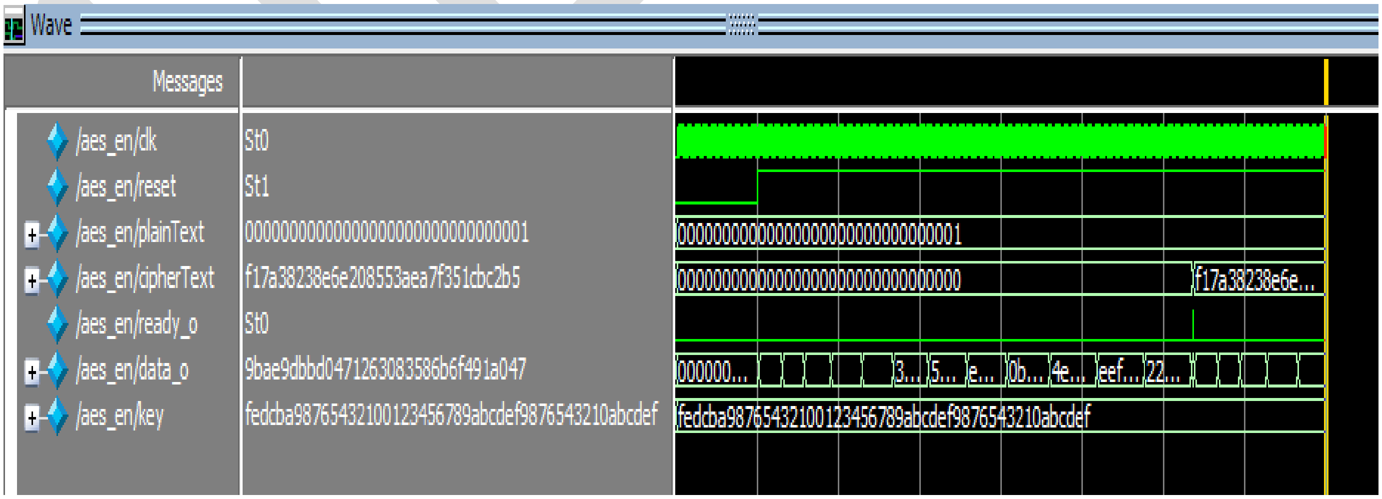
Fig.5 Proposed structure for AES algorithm to reveal fake keys.

For instance, if the target is the byte 4 of the key, then bytes 5, 6 and 7 are fixed. These fixed bytes produced a constant power, which does not affect the correlation coefficient. All cases of simulation have revealed the expected false key KEY_{FAKE}, as the key hypothesis by concealing the true key KEY_{REAL} from the hacker.

IV. SIMULATION RESULTS

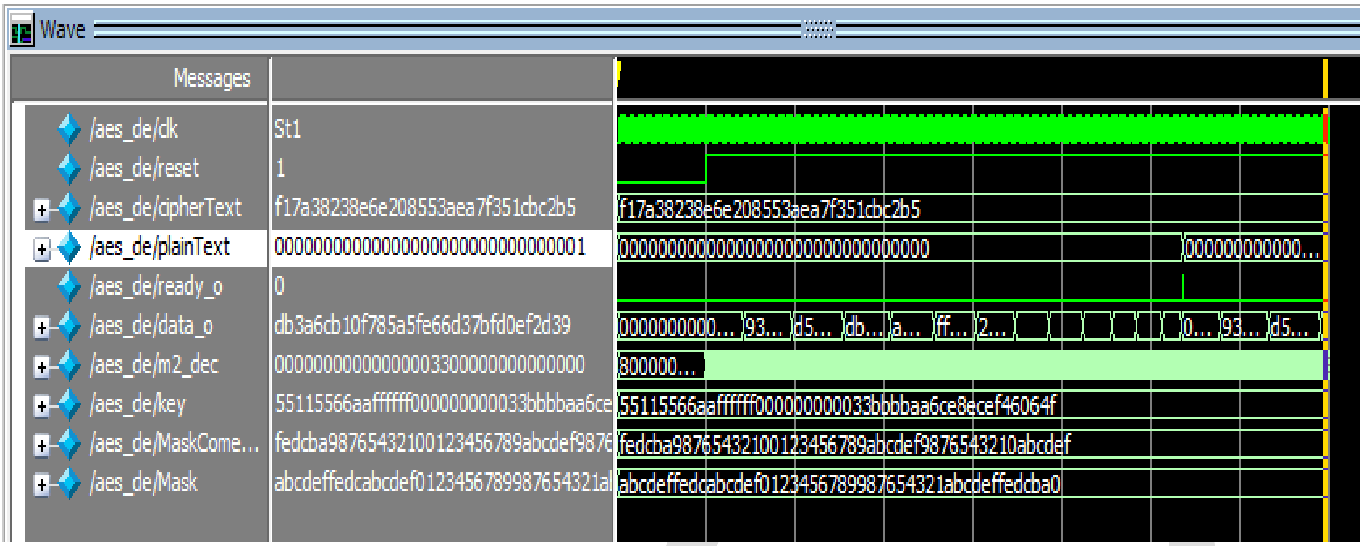
A. Simulation results

Several simulations have been performed in ModelSim6.5e software based on the assumptions made on section III and for the sake of simplicity, pre-fixed values has been used for all simulated attacks. On the other hand, mask m2 as in our proposed model is randomly chosen in each encryption process. Fig 6 and 7 shows the simulated output of the encryption and decryption of proposed AES algorithm. The proposed system of obtaining a fake key for the actual text is observed in decryption part of the simulation. A fake key has been obtained for the actual text which acts as the temporary fake key without which the hacker cannot hack the data.



```
/aes_en/clk         St0
/aes_en/reset       St1
/aes_en/plainText   00000000000000000000000000000001
/aes_en/cipherText  f17a38238e6e208553aea7f351cbc2b5
/aes_en/ready_o     St0
/aes_en/data_o      9bae9dbbd0471263083586b6f491a047
/aes_en/key         fedcba98765432100123456789abcdef9876543210abcdef
```

Fig.6 Simulation output of AES-192 Encryption



Wave

Messages	
/aes_de/clk	St1
/aes_de/reset	1
/aes_de/cipherText	f17a38238e6e208553aea7f351cbc2b5
/aes_de/plainText	00000000000000000000000000000001
/aes_de/ready_o	0
/aes_de/data_o	db3a6cb10f785a5fe66d37bfd0ef2d39
/aes_de/m2_dec	00000000000000000330000000000000
/aes_de/key	55115566aaffffff00000000000033bbbbaa6ce
/aes_de/MaskCome...	fedcba98765432100123456789abcdef9876
/aes_de/Mask	abcdeffedcabcdef0123456789987654321al

Fig.7 Simulation output of AES-192 Decryption

Fig. 8 and 9, show a comparison of how a brute force attack on both the existing and proposed model is being carried on in MatLabR2014. Here a brute force attack is performed by generating certain number of keys by the attacker and it is being compared with the original key in order to hack the actual data and plotted as a figure of correlation between the generated key and the 192 bit input data

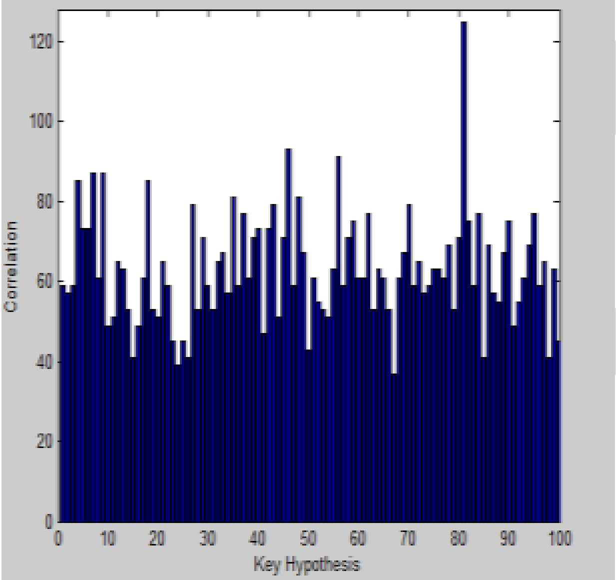


Fig.8 High correlation between actual key and hacker's key.

(Existing Model)

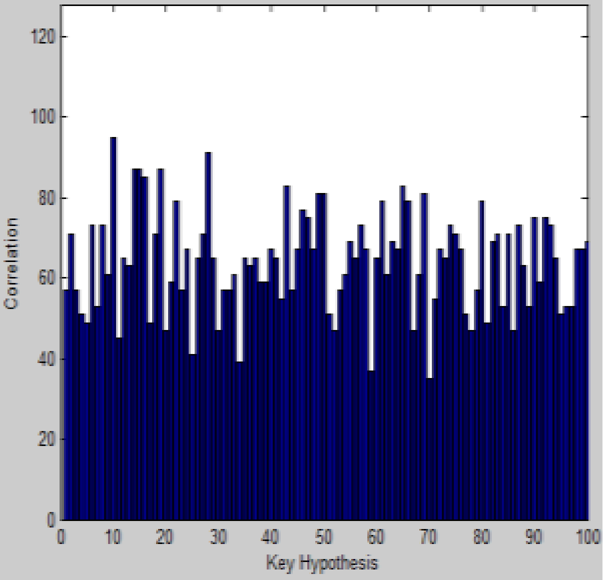


Fig.9 Low correlation between actual key and hacker's key.

(Proposed Model)

Moreover, it is observed that the maximum key is hacked (98%) in existing system without masking scheme indicating that the system is vulnerable and also the time delay was low (0.1157secs). Whereas in our proposed system, when the brute force attack is performed, we find that the correlation between the key and data was found to be minimal (74%) with time delay of 0.6310secs that makes the system reliable and robust when compared to the existing one The experimental results were focused mainly on performing the correlation attacks on functions *AddRoundKey*, *SubBytes* and *MixColumn.*

TABLE I DATA HACK% AND ITS TIME DELAY IN AES-128 AND AES-192[9].

AES Algorithm	Data Hacked	Time Delay
Original AES-128 (with no countermeasures)	98%	0.1045secs
Faked AES-128 (with countermeasures)	84%	0.7321secs
Original AES-192 (with no countermeasures)	98%	0.1157secs
Faked AES-192 (our proposal)	74%	0.6310secs

C. Execution and processing times

Table II shows the execution time of different versions of AES. The original AES-128 and AES-192, with no countermeasures, takes about 16.144 ns and 20.349ns, whereas the protected version using faked AES key is executed in 18.707 ns and 20.341ns. The proposed concept of AES-192 is executed in 20.341ns, including the pre-computation of M_{BOX} and the masking of some intermediate values [9].

TABLE II DELAY TIME FOR DIFFERENT IMPLEMENTATIONS OF AES-128 AND AES-192

AES Algorithm	Delay
Original AES-128 (with no countermeasures)	16.144 ns
Faked AES-128 (with countermeasures)	18.707 ns
Original AES-192 (with no countermeasures)	20.349 ns
Faked AES-192 (our proposal)	20.341 ns

Since the statistical attack is usually performed on the first (1 or 2) or on the last (8, 9 or 10) rounds, the faking countermeasure can be disable during the intermediate rounds (3 to 7) to accelerate the execution time.

TABLE III POWER CONSUMPTION FOR DIFFERENT IMPLEMENTATIONS OF AES-128 AND AES-192

AES Algorithm	Dynamic power (mW)	Static power (mW)
Original AES-128 (with no countermeasures)	457	338
Faked AES-128 (with countermeasures)	295	337
Original AES-192 (with no countermeasures)	347	295
Faked AES-192 (our proposal)	382	295

Table III shows the power consumption (both static and dynamic) for different versions of AES. The original AES-128 and AES-192, with no countermeasures, takes about 457 mW and 347 mW of dynamic power along with 338 mW and 295mW of static power, whereas the protected version using faked AES key for AES-128 and AES-192 consumes about 259 Mw and 382mW of dynamic power along with 337 mW and 295Mw of static power. It is clear from the observation that the proposed scheme has increased power consumption of 10% when compared to convectional model but with the advantage of having increased security of the system [9].

The brute force attack process was programmed in MATLAB R2014a and executed on a laptop clocked at 1.90GHz with a RAM memory of 8.0 GB.

V CONCLUSION

A new countermeasure against side-channel attacks was presented for AES-192. The cryptographic key is protected when a classical statistical attack is performed on any of the functions implemented on the AES algorithm by revealing a false key. The proposal was tested executing the algorithm in ModelsimDE6.5e. Experimental results showed the effectiveness of the proposed method by revealing false keys under brute force attack from hackers using MatLabR2014a Software.

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EFFECT OF OPERATIONAL PARAMETERS ON REMOVAL OF CHROMIUM FROM TANNERY EFFLUENT BY USING *AZADIRACHTA INDICA*

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Abstract - Heavy metal contamination of the rivers is a world wide environmental problem and its removal is a great challenge. The tanneries release their treated effluent in the near by water ways containing Cr metal that eventually merges with the river. The effluent of tannery industries are the major source of chromium contamination in the ground and surface water. Neem leaves powder adsorbent used in this study has been prepared at laboratory scale and has been observed to be very effective for removal of chromium from aqueous solution. In this study, different method of investigation and detailed experimental procedure were taken into consideration to obtain the effect of pH, dosage concentration and contact time on batch absorption. The biosorption of metal show in the present study that the naturally occurring microbes have enough potential to mitigate the excessive contamination of their surroundings and can be used to reduce the metal concentrations in aqueous solutions in a specific time frame. The removal of chromium (VI) by activated Neem leaves powder adsorption by batch adsorption studies expose that Neem leaves powder has a essential capacity for biosorption of Cr-(VI) from effluent. The maximum removal efficiency is tends up to 94.5% for bio sorbent prepared form Neem leaves.

Key Words – Chromium, Neem leaves powder (NLP), Biosorption, Batch Process, adsorption, efficiency, UV-spectrophotometer.

Introduction-

The most common forms of chromium that occur in natural waters in the environment are trivalent chromium (chromium-III), and hexavalent chromium (chromium-VI). Both valences of chromium are potentially harmful being mutagen and also carcinogen (Altundogan 2005; Dakiky *et al*., 2002). Heavy metal chromium is the one of most abundant metal founded in the high proportion in is untreated municipal wastewater. Industrial effluent discharged from different industries such as a tannery, paint, coating, electroplating etc. the major industrial activities that lead to chromium pollution to the environments. Natural materials that are available in large quantities or certain waste products from industrial or agricultural operations may have possible as low-cost .

sorbents (Ahalya *et al*., 2010).Chromium is metallic elements periodic table and it found naturally in rock, plants, soil, volcanic ash, human and animals that most common form chromium in the environment trivalent (Cr-III), hexavalent (Cr-VI), chromium -3 occurring naturally in Many groups, yeast, meals, fruits and vegetable. Cr-(VI) is produced by industrial process, and major source of chromium VI in drinking water are discharged from tannery and tends to erodes naturally deposit of chromium-III. Some of the researchers have used both natural and synthetic material as adsorbent for removal of heavy metals and few authors used chemically treated natural materials as adsorbent for removal of heavy metals from the aqueous solution. Some of the adsorptive material such as green algae (Malkoc *et al*. 2003,Gupta *et al*. 2001) ,maple sawdust (Yu *et al*. 2003), a sugar industry waste (Gupta &Ali 2004a), oriental beech sawdust (Acar&Malkoc 2004), distillery sludge , soya cake (Daneshvar *et al*. 2002), persimmon tannin gel (Nakajima&Baba 2004), duolite (Gupta *et al*. 2004b), bagasse fly ash (Gupta *et al*. 2003), red mud (Gupta & Sharma 2002), activated carbon derived from fertilizer waste (Mohan *et al*. 2001), activated rubber wood sawdust (Kalavathy*et al*. 2005)**,** tea factorywaste (Malkoc& Nuhoglu 2005, Cay *et al*.2004) granular ferric hydroxide (Mukhopadyay *et al*.2007) has used in heavy metal removal from wastewaters and drinking water in meeting standards. Among all the natural adsorbent Azadirachta Indica (neem) leaves has high potential to remove the heavy metals. In India, Azadirachta Indica is a tree which is commonly seen in all over of India, the leaves of this tree is burnt and the burnt carbon can be utilized for the purification of water at a cheaper cost without heavy operation. Cr (VI) has been removed by neem leaves powder (Tawde and Bhalerao, 2010). Some of the study reports the biosorption kinetics and the biosorption equilibrium of Zinc by Neem leaves and stem bark powder (Arshad, *et al* 2010). Neem bark powder (NBP) has also been used as an adsorbent for the removal of hexavalent chromium from aqueous solutions (Saravanakumar and Phanikumar 2012). The potentiality of Neem has been widely studied by different researchers for solving various problems related to agriculture, public health, population control and environmental pollution (Arshad, *et al* 2010). Hence in the present work, Azadirachta indica (Neem) leaf powder is studied for their adsorptive capacity to remove chromium (VI) from aqueous solution.

Method and Materials –

In this method of absorbent is made by neem leaves to remove chromium from industrial effluent. The various parameters is display to pre-treatment of absorbent and analytical method for preparation of chromium ions solution.

Preparation of Adsorbent

The Neem leaves were washed many times with normal water & distilled water to remove dust and soluble impurities then dried the leaves in tray dryer for complete removal of moisture. It takes nearly 2-3 hrs at 110^0C. Then the dried leaves crushed and kept in muffle Furnace for 3-1/4 hrs at 250^0C. The heating period depends on the atmospheric temperature. After heating a blackish gray powder, form of Neem Leaves powder was obtained.

S.No.	Chemical Requirement	S.No.	Equipment Requirement
1.	Neem leaves	1	Glass Bakers
2.	Distilled Water	2.	Weighing Machine

3.	Muffle Furnace	3.	Potassium Chromate/Dichromate
4.	HCL, NaOH, H_2SO_4	4.	Measuring Cylinder
5.	DPC	5.	Burettes and Pipettes
	-	6.	Filter Paper
	-	7.	Conical Flaxes
	-	8.	UV-Spectrophotometer
	-	9.	pH meter

Determination of Maximum wavelength for operation-

The stock solution of 1000 mg/L of chromium prepared by dissolving 1 gm of chromium chloride in 1000 ml of distilled water. Then their absorbance was recorded at different wavelength by using UV-Spectrophotometer. Up to certain wavelength % absorption increases and then decreases, at the point where the % absorption is maximum that point is considered as maximum wavelength of operation.

Determination of standard calibration curve for chromium

For this purpose, solution of chromium chloride of different concentration was prepared and their absorbance was recorded by sing UV Spectrophotometer. The Spectrophotometer is set to Zero absorbance with the reference solution (Distilled water) and then the absorbance of standard solution was measured. With the help of these Reading standard calibration curve plotted between% absorption an standard chromium chloride solution of various concentrations.

The standard calibration curve for chromium

Concentration (ppm)	Absorbance
1	0.1
2	0.19
3	0.32

4	0.38
5	0.48
6	0.5
7	0.64
8	0.7
9	0.87
10	0.99

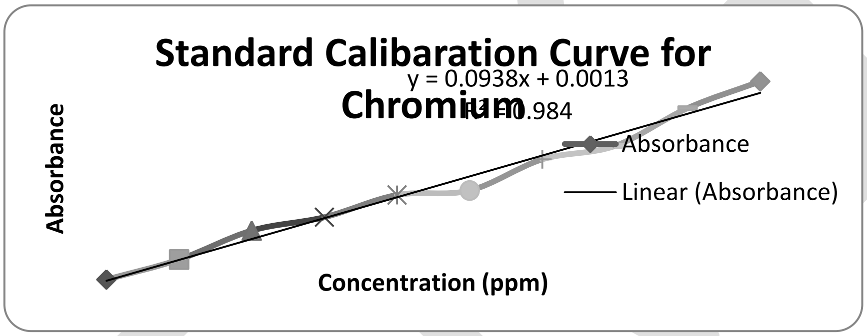

Fig.1 – Standard Calibaration Curve for Chromium

Result and Discussion –

Biosorption studies were performed through Batch Technique to obtain the rate and Equilibrium data. The removal efficiencies of neem leaves powder during the investigation of batch adsorption process had been studied.

Effect of pH -

pH affects the solution of chromium ion to a great extent. The pH of aqueous solution is the controlling factor in the adsorption process: hence, it becomes necessary to determine at what pH, max adsorption will takes place. Percentage removal of chromium goes on decreasing with increases in pH values. The maximum removal efficiency was 93.67% at pH 5 value. The Chromium removal was higher at lower pH values.

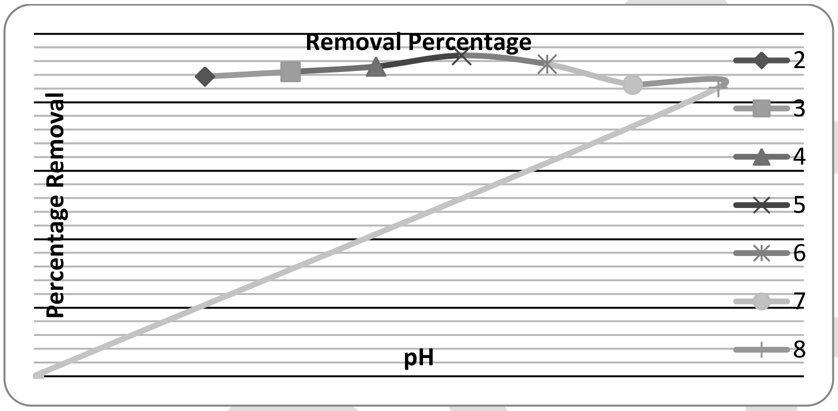

Fig.2- Effect of pH on removal of Cr- (VI) ion

Effect of Contact Time

Graph shows that Removal efficiency of Cr-(VI) ion increases with respect to increase in contact time (in min.) of adsorbent. Thus the contact time is found to be directly proportional to the removal efficiency.

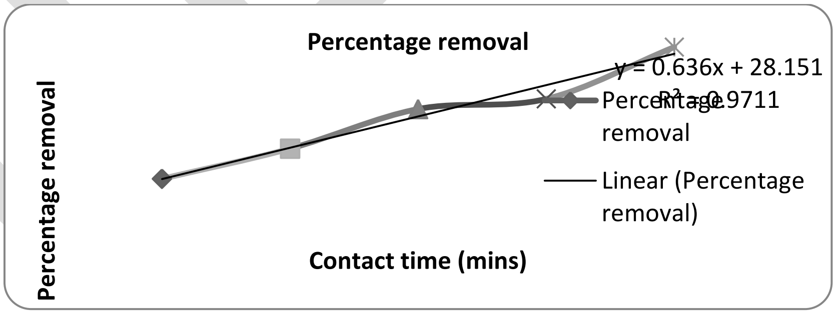

Fig.3 – Effect of contact time on removal of Cr-(VI) ion

Effect of Initial Metal Ion Concentration-

It was observed that the activity of adsorbent material falls sharply with an increase in initial concentration of chromium ion. The max Cr removal efficiency for all the set of optimized parameter was found to be 100% for Neem Leaves at initial concentration of 100mg/l. This is evident that the lower the concentration of the initial dose the higher the removal efficiency is observed.

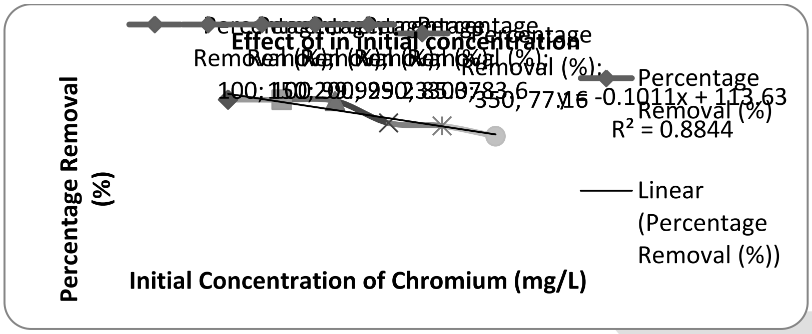

Fig.4- Effect of initial concentration on removal of Cr-(VI) ion

Effect of adsorbent Dose-

It can be seen that the rate of the removal of chromium ions increase with an increase in the amount of adsorbent dosage (in gm). The amount of adsorbent dose varies from 2gm/100ml to 10gm/100ml. the removal efficiency is maximum at dose of 10 gm/100 ml which is up to 94.5%.

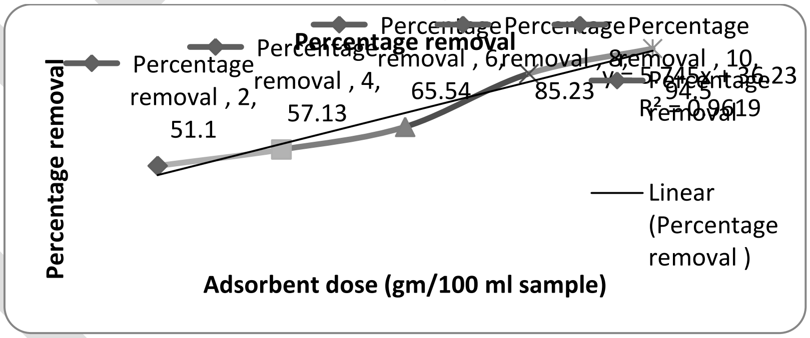

Fig.5- Effect of adsorbent dose on removal of Cr-(VI) ion

Conclusion

The present work is attempt for the systematic studies of removal of chromium from waste water using low cost adsorbent prepared form Neem Leaves. From the Experimental Findings it has been observed that the adsorbent material can be used successfully for removal of chromium form waste water. The maximum efficiency was observed up to 94.5% for biosorbent prepared form Neem Leaves at the optimum values of parameters.

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Studies of treatment of wastewater to produce green energy by using Microbial Fuel Cell - A Review

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Abstract— Environmental protection and energy crisis are two major challenges human beings are facing today. As the energy sources decrease and the climate conditions change, demand for new and clean sources of energy has increased. Microbial fuel cell (MFC) represents a promising technology for sustainable energy production. Microbial fuel cell is one of the best alternative sources of green energy production which add wastewater to the list of renewable resources of energy. In this review, microbial fuel cell and its working have been briefly reviewed. Also different substrates that can be used in MFC and different factors affecting the performance of MFC have been briefly reviewed.

Keywords— Microbial Fuel Cell, Wastewater Treatment, Electricity, Anaerobic treatment, COD Removal, Green energy, Biological Treatment

1. INTRODUCTION

Increasing global energy demands and over consumption of non-renewable resources of energy have led to search and use of renewable and cost-effective sources of energy. At present, global energy requirements are mostly dependent on fossil fuels. Combustion of fossil fuels also has serious negative effects on environment due to CO_2 emission like global climate change, environmental degradation and health problems. This has intensified the search for alternatives to replace fossil fuels [1,2,3]. One of the renewable and green energy sources for the production of electricity is fuel cells (FC) [4,6]. Microbial fuel cells (MFCs) are a special type of FCs that has dual advantage. The microbes added convert organic matter into electricity and at the same time purify wastewater, thus may offset the operating costs of wastewater treatment plant [5,6]. The microbial fuel cell (MFC) is a new form of renewable energy technology that can generate electricity from what would otherwise be considered waste [7].

While the concept of bioelectricity generation was first demonstrated nearly a century ago, MFCs need to be considered as new technology. Biofuel cells conducted with yeast and bacteria that needed chemical mediators to be added to the reactor were very unlikely to have practical applications. Thus, modern MFCs can be considered to have only emerged in 1999 with the finding of electricity generation without the need for exogenous mediators. [8]

MFC converts organic matter present in wastewater into electricity through the catalytic activity of microbes. The energy present in C–C bonds of organic matter is directly converted into electricity. The electrons produced during the oxidation process are transferred to the anode from where they flow through the external circuit thus generating electricity. The electrons are transferred to the anode either through direct bacterial contact to the anode or through the use of mediators especially electrodes. [9]

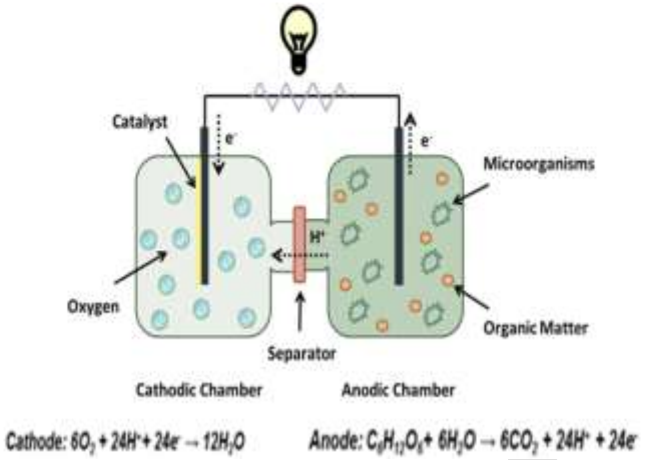
Oxidation half- reaction (Anode chamber):

Biodegradable matter + bacteria $\longrightarrow CO_2 + H^+ + e^-$ (anaerobic condition)

The electrons travel across the external circuit connected with an external resistance and reaches the aerated cathode where the electrons and the protons along with the molecular oxygen produce water completing the reduction half-reaction.

Reduction half-reaction (Cathode chamber):

$H^+ + e^-$ + Oxygen $\longrightarrow H_2O$ (Aerobic condition) [10].



Scheme of a double-chamber MFC using glucose as substrate. [11]

2.STUDIES ON DIFFERENT SUBSTRATES USED IN MFC:

In MFCs, substrate is regarded as one of the most important biological factors affecting electricity generation. A variety of substrates can be used for bioelectricity generation in MFCs such as saccharides, organic acids, alcohols as well as inorganic substances e.g. sulphate. In addition, there is a significant research interest towards complex materials i.e. industrial and municipal waste streams, which are potential starting materials of power generation in MFCs because of their high organic matter content [12].

Wastewaters from chemical, distillery, brewery industries, pharmaceutical industry, textile, petrochemical, vegetable oil, food industries, animal carcass waste water, swine waste water, municipal waste water and domestic wastewater could be treated using aerobic or anaerobic MFC. Sulphide, ammonia, nitrate, nitrite, perchlorate, chlorinated compounds, copper, mercury and iron could be effectively removed by MFC [9].

Table 1: List of wastewater used as substrate in MFC studies.

Substrate	MFC Type		Power generation	References
Swine	Single chamber		$261mW/m^2$	[13,14]
	Two chamber		$45mW/m^2$	
Saline domestic sewage sludge	Two chamber		$41W/m^3$	[15]
Nitrogen-containing organic compounds (pyridine and methyl orange)	single-chamber air-cathode MFCs	Single MFC	$502.5 \pm 17mW/m^2$	[16]
		Two MFC connected in series	$401.6 \pm 23\ mW/m^2$	
Paper recycling wastewater+ 100mM PBS	Single chamber MFC		672±27 mW/m2	[17]
Urine	Two chambered		$8mA/m^2 \pm 0.5mA/m^2$	[18]
Lemon peel waste	Dual chamber		$371 \pm 30\ mW/m^2$	[19]
Domestic	Air-cathode		$422mW/m^2$	[13,20]
Leachate	Air-cathode		$344mW/m^2$	[13,21]
Starch	Air-cathode		$239{,}4mW/m^2$	[13,22]
Beer Brewery	Air-cathode		$205mW/m^2$	[13,23]
	Single chamber		$170mW/m^2$	

3.STUDY ON EFFECT OF PARAMETERS:

3.1 Effect of temperature:

Temperature is an important wastewater characteristic, but most studies have examined performance at a single temperature, with typical temperatures chosen of room temperature or higher (20–35°C). When temperatures have been varied during a study, different results have been obtained relative to impact of temperature on performance, although in almost all cases lowering the temperature reduced performance. In two different studies with single-chamber MFCs operated in fed-batch mode, the power density decreased by 10% when the temperature was reduced from 32°C to 20°C [24,25,26]. In another study with a single-chamber MFC operated with continuous mode, the power density decreased by 21% when the temperature decreased from 35°C to 24°C, but only by 5% when the temperature was decreased from 30°C to 24°C [24,27]. In contrast, it was reported that when using a two-chamber MFC with a ferricyanide cathode, that the power density was reduced by 39% when for a temperature decrease from 30°C to 22°C, and that there was no appreciable power generation at 15°C [24,28]. In another two-chamber MFC study with a dissolved oxygen (DO) catholyte, however, current increased from 0.7mA to 1.4mA when the temperature decreased from the range of 20–35°C to 8–22°C [24,29]. In a study it shows that upper temperature limit for MFC operation is 40°C and lower temperature limit is -5ºC. [30]

3.2 Effect of pH:

In a batch study, MFC have shown the best performance at anodic pH 7 and its performance decreases with increase in alkalinity and acidity of the substrate solution and show minimum voltage generation of 6.2 and 10.9 mV and minimum power generation of ~53 and ~3 mW/m^2 at anodic pH 5 and 9, respectively.[31]

3.3 Effect of initial COD:

In a batch study, it is shown that that both voltage and power density increase with increase in time and become almost stable after around 5–6 days of operation for all the initial COD values. This is because of the adaptation of microbes in new environment. Voltage and power density in MFC increase with increase in initial COD value, reaches maximum at the initial COD value of around 1500 mg/L and then decreases. Maximum voltage and power density achieved after ~7 days of operation with 1500 mg/L initial COD are 14.8 mV and ~272 mW/m^2, respectively.[31]

3.4 Effect of metal ions:

3.4.1. Effect of Chromium (Cr^{6+}):

In a study, it is shown that both voltage and power density generation in MFC initially increases with increase in Cr^{6+} concentration upto 7 mg/L and decreases thereafter. The maximum voltage and power density generation after around 5 days of operation under the optimum concentration of Cr^{6+} (7 mg/L) are ~490 mV and ~508 mW/m^2, respectively. These values are ~33 times and ~1800 times higher than the corresponding values of voltage and power density generation in absence of Cr^{6+}.[31]

3.4.2. Effect of Iron (Fe^{3+}) Concentration:

In a study, it is shown that both voltage and power density generation in MFC initially increases with increase in Fe^{3+} concentration up to 10mg/L and decreases thereafter. The maximum voltage and power density generation after around 5 days of operation under the optimum concentration of Fe^{3+} (10 mg/L) are ~321 mV and ~193 mW/m^2, respectively. These values are ~22 times and ~709 times higher than the corresponding values of voltage and power density generation in absence of Fe^{3+}.[31]

3.4.3. Effect of Zinc (Zn^{2+}) Concentration:

In a study, it is shown that both voltage and power density generation in MFC initially increases with increase in Zn^{2+} concentration up to 8 mg/L and decreases thereafter. The maximum voltage and power density generation after around 6 days of operation under the optimum concentration of Zn^{2+} (8 mg/L) are ~135 mV and ~7 mW/m^2, respectively. These values are ~9 times and ~26 times higher than the corresponding values of voltage and power density generation in absence of Zn^{2+}.[31]

3.5. Effect of agarose concentration in salt bridge of dual chambered MFC:

In a study on performance of MFC with agarose concentrations 7,8,9,10,11 and 12 %. MFC with 10% agarose have produced maximum voltage and current and one with 12% produced minimum. The voltage developed showed a comparative hike from 7% agarose concentration to 10% concentration, and this could be due to the reason that as the concentration of agarose increases, the gel is highly polymerized, inhibiting the inter mixing probability of the two separated chamber fluids. Highly polymerized gel also prevents the entry of native and molecular oxygen from the aerobic chamber to the anaerobic chamber through the salt-bridge passage, maintaining the anaerobic conditions of the anode chamber. But a decrease in voltage production was observed for 11% and 12% agarose concentration, as the salt-bridge is highly polymerized reducing the pore size, hindering the movement of proton across the bridge.[10]

It was observed that there is an increase in current production as the concentration of agarose increases from 7% to 10%. This was due to effective proton transfer and as the gels is highly polymerized; it prevents the diffusion of oxygen from the cathode chamber to anode chamber through the salt-bridge, thus maintaining a better anaerobic environment in the anode chamber encouraging the growth of anaerobic bacteria for increased electrons release [32,10]. But there was a decrease in current production for 11% and 12% agarose concentration as the extremely polymerized gel prevents the effective movement of protons, increasing the concentration of protons in the anode chamber, reducing the pH, making the anodic environment highly acidic for the microbes to survive [10].

3.5 Effect of spacing between anode and cathode on power production:

In a study under variable external resistance, the power density has increased with decrease in distance between the electrodes. Maximum power density of 10.9, 8.6, and 7.4mW/m^2 was observed at electrode spacing 20, 24 and 28 cm, respectively. The maximum power density was observed at external resistance between 900 ohm and 1200 ohm. Decrease in power density was observed with increase in resistance beyond 1200 ohm, indicating importance of external load for controlling power production. These results suggest that, at higher external resistance the electron transfer through the external circuit to the cathode might be the limiting factor. In addition, this suggests that, ML–MFC should be constructed by placing electrodes as close as possible to increase power output.

4. CONCLUSION:

With the above review following conclusion may be drawn:

- Microbial fuel cell (MFC) is a promising technology may be proved in future to fulfill the needs of energy.
- It is also a promising technology for treatment of wastewater as well as alternative sources of green energy production.
- Its power production is still low for the practical applications therefore further extensive studies will be required for practical applications.

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Deformation Analysis of a 3-Axis Gantry System

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Abstract— Micro applications are found in areas like Biomedical, Watch maker and Jewelers, Information Technologies, Telecommunication, Automotive, Aerospace, etc which requires ultra precision machineries. For this machineries high accuracy and high precision is required. Accuracy of the machine components depends upon the precision positioning slides i.e. X, Y and Z slides which are supported by the gantry system. Applications of various forces may cause the deformation of machine slides and which affects on accuracy of the machine. In this paper deformation analysis of the slides of the gantry system are carried out and the results are validated using simulation tool.

Keywords— Gantry system, micro applications, precision, accuracy, positioning slides, deformation analysis, simulation tool

INTRODUCTION

The first NC machines were built in 19th centuries based on existing tools that were modified with motors that moved the controls to follow points fed into the system on punched tape. These early servomechanisms were rapidly augmented with analog and digital computers, creating the modern CNC machine tools that have revolutionized the machining process. Multi axes CNC machines are used for complicated geometry where perfection and intelligence is highly required to meet the daily demands of high speed production [1]. As time passes, micro applications are found in areas like Biomedical, Watch maker and Jewelers, Information Technology, Telecommunication, Automotive, Aerospace, etc which requires ultra precision machineries.[2] Micro machining requires accuracy and high resolutions which offered by machining tool. Accuracy of the machine components depends upon the precision slides i.e. X, Y and Z slides which are supported by the gantry system. A retrofit design is developed for a 3-axis gantry system by using components form salvage.[3] The dimensions of the gantry system are considered according to the work piece envelope of size 100 x 50 x 50 mm on which machining operation are carried out.

After designing a 3-axis gantry system, there is a need to perform the deformation analysis by analytical method and then analytical results are validated using simulation tool.

LITERATURE REVIEW

The FEA software will be the tool used to perform the structural analysis and predict the behavior of the structure under the work loads. The Finite Element Method decomposes the structure into small elements that are connected at nodes, through the application of a mesh. The mesh will transform a continuous domain into a finite domain that enables the calculation of simultaneous algebraic equations. This method requires the application of boundary conditions such as fixed or pinned constrains and the application of external loads and/or gravity in order to consider the self-weight of the structure. The FEA can be performed in a structural application but also in thermal or fluid flow problems. The structural analysis can be linear or non-linear. If the interest of the analysis is to preview the behavior of the structure in the elastic domain then is used a linear analysis. On the other hand, if the work loads are probable to overcome the yield stresses in some areas of the model, some hardening will happen and the material properties will differ along the model, therefore a non-linear analysis shall be performed.[4]

A static analysis calculates the effect of steady loading conditions on a structure, while ignoring inertia and damping effects, such as those caused by time varying loads. A static analysis can, however, include steady inertia loads and time varying loads that can be approximated as static equivalent loads. Static analysis determines the displacements, stresses, strains and forces in structure or components caused by loads that do not induce significant inertia and damping effects. Steady loading and response condition are assumed; that is, the loads and the structure's response are assumed to vary slowly with respect to time. [5]

Analysis of the machine tool structure for the various purpose by the analytical method is the more time consuming and very complex method also it doesn't gives the precise way for the analysis because of its complexity but by using the FEA software we can get batter result with the more precision and more accurately than analytic method and also in this FEA, Static and Dynamic analysis of machine tool structures plays an important role on the efficiency and job accuracy of the machine tool. Static analysis is useful for estimating stresses, strains and deflections, and also improving structural stiffness whereas dynamic analysis deals with the prediction of natural frequencies and corresponding mode shapes, which will in turn; prevent the catastrophic failure of the machine tool structures. [6]

A review is carried out which is related to the structural analysis. It is found that FEA method is widely used by the researcher for structural analysis.

DEFORMATION ANALYSIS BY ANALYTICAL METHOD

In correspondence to the objective of the deformation analysis, detailed analysis of the positioning slide as shown in Fig.1 is carried out by using classical bending equations.

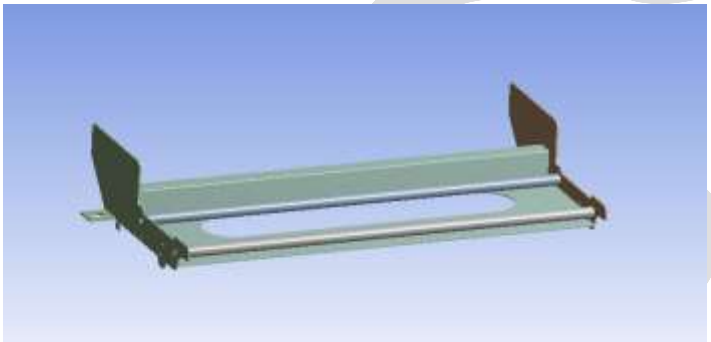

Fig.1 : CAD model of slide for Analysis

In the deflection analysis of slide, as it is fixed at both the ends, it is considered as a case of fixed supported beam and the point load is acting at the centre of the beam. The detailed analytical steps are presented here with.

Deflection of the beam when both ends are fixed and load is acting at centre is given by equation (1),

$$y_c = \frac{wl^3}{192EI} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where,

w = half of the total weight = 6.20 N

l = length of the slide = 232 mm

D= outer diameter of the block = 12mm

d = inner diameter of the block = 4mm

E = Young's modulus for steel = 210 GPa

I = moment of inertia

y_c = 0.0095548 mm

In order to validate the deflection obtained by analytical equation, a simulation is carried out by using ANSYS Workbench.

DEFORMATION ANALYSIS BY NUMERICAL SIMULATION METHOD

ANSYS Workbench is used to carry out numerical simulation. Preprocessor, solution and postprocessor are the three steps includes in the numerical simulation procedure. The aim of the present work is carried out the static analysis of the 3-axis gantry system. As Dynamic aspect is not considered in present work, in tune with the objective and scope of the study, “Static Structural Analysis” module in ANSYS workbench is considered for analyzing the positioning slides. In static analysis, the focus is on force and displacement or deformation relationship.

a) Preprocessor:

In preprocessor step, the CAD model is developed and is imported into the ANSYS workbench. In this, Boundary conditions must require imposing for the analysis. The two slide rods are fixed at both the ends and the force is applied at the centre and top of the slide surface. The applied cutting force is varying from 1N to 10N.

b) Solution

The next step is solution for the resulting deformation. The compiler processes the model and keeps the solution ready for the further process.

c) Postprocessor in ANSYS:

This step includes the general solution report. Following Fig.2 shows the total deformation result. The maximum deformation of 0.0074433 mm is observed corresponding to a force of 6.20N.

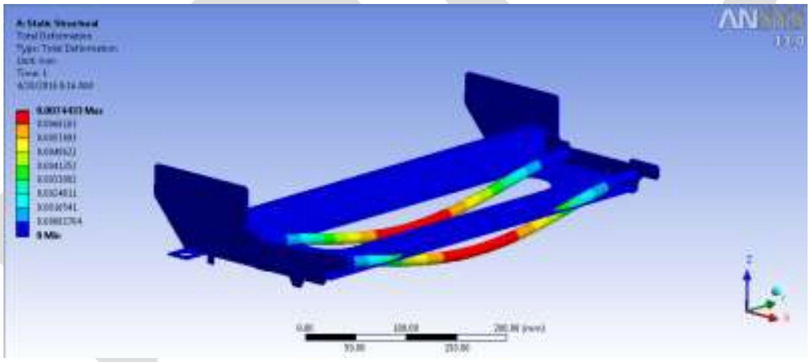

Fig.2: Total Deformation

Fig.3 shows maximum von misses stresses developed.

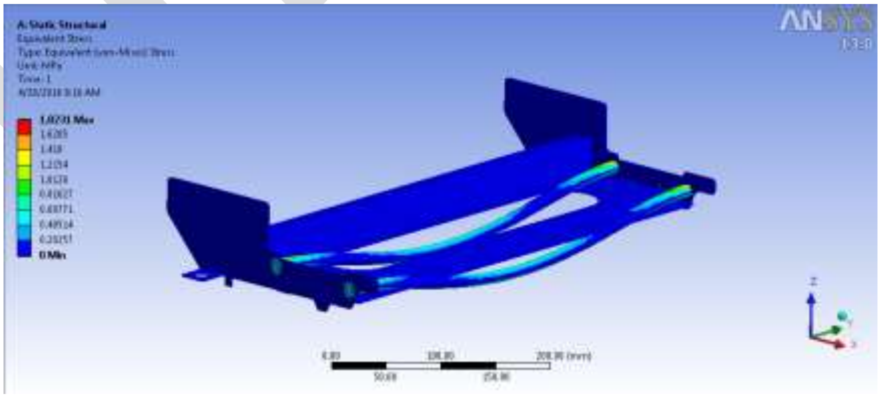

Fig.3: Von Misses Stresses

The maximum Von misses stress of 1.832 MPa is observed corresponding to a force of 6.20N.

RESULTS

The results of deformation analysis by using analytical and ANSYS method are plotted on graph as shown in Fig.4 for a range of force from 1N to 10N (1-1-10N). From the graph it is observed that the deformation curve for the forces is linear. The deflection is maximum of 0.012005mm for 10 N force.

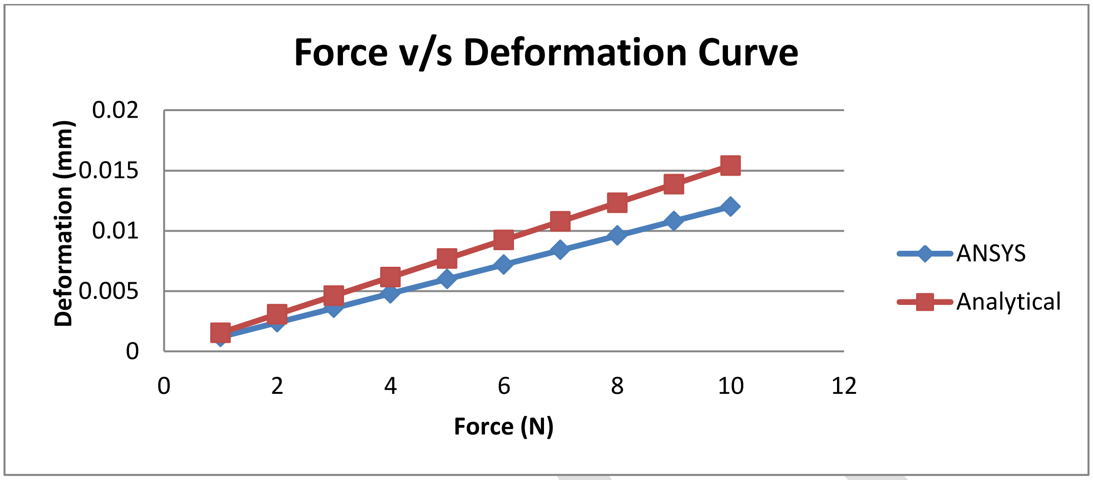

Fig.4: Force V/s Deformation Curve

The graph shows that results by analytical method and by ANSYS method have very close agreement. Hence it indicates the correctness of the analytical method adopted for deformation analysis of positioning slides.

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CONCLUSION

The results of the deformation analysis of the positioning slide by analytical method are validated by using simulation method. Hence the design is found to be satisfactory as deflection is very negligible for selected dimensions of slide. The ANSYS Workbench results proved that the simulation method is an very important tool for analysis of the complex machine parts.

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Hydrogen Powered Vehicle

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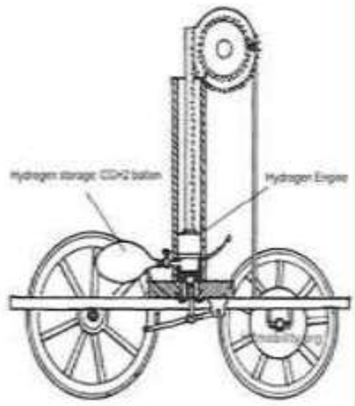
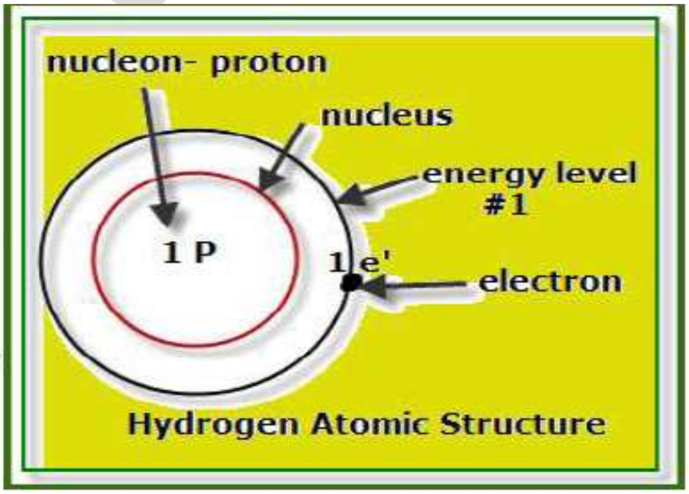
Abstract-Nowadays, availability of fossil fuel is being very critical and due to this the cost of these fuels are increasing. The use of these conventional fossil fuel increases the pollution of atmosphere due to higher carbon emission rate. To overcome from these drawbacks of nonconventional fuel such as hydrogen can be used as fuel because hydrogen is most commonly found on the earth and it can be obtained from water (H2O). The purpose to use hydrogen as a fuel in automobile vehicle is to reduce the emission of carbon monoxide and carbon dioxide and this hydrogen fuel can be produce by widely and readily available water. Thus, hydrogen is an environmental friendly fuel that has the potential to dramatically reduce our dependence on imported oil. Currently, the technology of hydrogen fuel vehicle is in developing phase, therefore several significant challenges must be overcome before it can be widely used. In this project we have used hydrogen along with the petrol as the fuel which has considerably increased the efficiency of engine

Keywords-Hydrogen Energy1, Hydrogen Engine2, Hydrogen Kit3, Chemical Process4, Equipment Cost5, Inexpensive6, High Mileage7

Introduction- In a compound state, hydrogen is most commonly found on the earth in the form of water, or H2O. Potentially, as a motor fuel, the main source of hydrogen is natural gas and methanol. Hydrogen fuel may contain low levels of carbon monoxide and carbon dioxide, depending on the source. In order to be useful as a motor fuel, hydrogen must be manufactured from other sources. Pure hydrogen can be extracted from virtually any hydrogencontaining compound. A hydrogen atom is an atom of the chemical element hydrogen The electrically neutral atom contains a single positively charged proton and a single negatively charged electron bound to the nucleus by the Coulomb force. Atomic hydrogen constitutes about 75% of the elemental (baryonic) mass of the universe In everyday life on Earth, isolated hydrogen atoms (usually called "atomic hydrogen" or, more precisely, "monatomic hydrogen") are extremely rare. Instead, hydrogen tends to combine with other atoms in compounds, or with itself to form ordinary (diatomic) hydrogen gas, H2. "Atomic hydrogen" and "hydrogen atom" in ordinary English use have overlapping, yet distinct, meanings. For example, a water molecule contains two hydrogen atoms, but does not contain atomic hydrogen (which would refer to isolated hydrogen atoms). Hydrogen was the first element ever discovered and put on the periodic table (the periodic symbol H). The hydrogen atom has only one electron circling the nucleus. Hydrogen is the simplest element as it has only one nucleus, one shell and one electron. The trouble with today's cars is that they still put out a lot of pollution, and use up fossil fuels. One day, we have to run out of fossil fuels. People have been talking about running cars on water for ages. Unfortunately, most of the time, these people are crackpots. But there is a certain amount of truth in what they say.





Hydrogen Energy-Hydrogen energy is an important part of developed nation’s clean energy plan. Like most sources of clean energy, it is relatively new, and as such there is much more to discover about it. Let’s look at and answer a few questions about hydrogen energy with our focus being a survey of its positives and negatives. Hydrogen is the most basic of all Earth elements. The hydrogen atom is made up of a single proton and a single electron. As such, it is very abundant, but it doesn’t really exist as a separate with no emissions of either CO2, toxic chemicals or form of matter. Instead it is usually combined with other elements. To separate hydrogen gas from its companion substances takes a lot of work but it produces a powerful, nearly clean source of energy. As a gas, it can be used in fuel cells to power engines. There are following reaction processes take place between various metal electrodes and electrolyte to generate hydrogen as a product of reaction process.

(1) $CH_4 + H_2O \rightarrow CO + 3H_2$
$CO + H_2O \rightarrow CO_2 + H_2$

(2) $Al + 3H_2O + NaOH \rightarrow NaAl(OH)_4 + 1.5H_2$
(3) $Al + 3H_2O \rightarrow Al(OH)_3 + 1.5H$

Components and their Energy

1. Battery: It is a source of energy through which power is supply to hydrogen kit.

2. Hydrogen kit: It comprises mainly three elements anode, cathode & electrolyte. Copper plates are used as anode & cathode.

3. Carburetor: Produced hydrogen is then supplied to carburetor, where it mixes with air.

4. Electrolyte: is a composition of potassium hydroxide and distilled water. Generation of hydrogen take place by reaction between KOH, H_2O & Cu.

5. Hydrogen Engine: from carburetor Hydrogen air mixture is supplied to the engine cylinder, where ignition takes place through spark plug

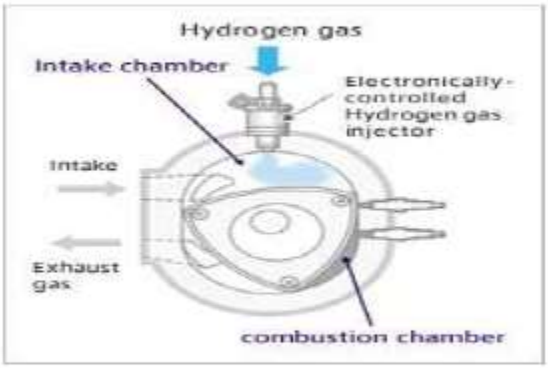


Fig. Combustion process

Hydrogen Kit- Hydrogen kit mainly consist of following elements:

- Copper or high grade steel plate electrode
- Electrolyte solution.
- Container.
- Hose pipe.
- Conduction wire.
- We use many combination of hydrogen kit to get the best result from our experiment. The combinations that we use

in our experiment in order to get best result are as follows.

1. Single container kit having plain water as electrolyte and high grade steel plates as electrode.
2. Single container kit having distilled water with 5 gm of KOH as electrolyte and copper plates as electrodes.
3. Single container kit having distilled water with 10 gm of KOH as electrolyte and copper plates as electrodes.
4. Single container kit having plain water with 20 gm of NaOH as electrolyte and copper plates as electrodes.
5. Double container kit having distilled water with 20 gm of KOH as electrolyte and copper plates as electrodes.

Fig. Components of Hydrogen Kit

Technical Specifications of Car

Dimensions and weights

- Overall length: 3,340 mm (131.5 in)
- Overall width: 1,440 mm (56.7 in)
- Overall height: 1,405 mm (55.3 in)
- Wheelbase: 2,175 mm (85.6 in)
- Ground clearance: 160 mm (6.3 in)
- Curb weight: 650 kg (1,433 lb)
- Gross vehicle weight: 2,000 kg (4,409 lb)

Capacities

- Seating capacity: 5person maximum
- Fuel tank capacity: 28 L (7.4 US gal)
- Engine oil: ~2.7 Lt including oil filter
- Transmission oil: ~2 Lt
- Coolant: 3.6 Lt

Performance

- Maximum speed: 120 km/h (75 mph)
- 0–100 km/h (0–62 mph): 18.8 seconds
- 1/4-mile: 28.5 seconds

Fuel economy

- Mileage highway: 20 km/l (5.0 l/100 km;
- 47 mpg-US)
- Mileage city: 18 km/l (5.6 l/100 km;
- 42 mpg-US)
- Mileage overall: 19 km/l (5.3 l/100 km;
- 45 mpg-US)

Engine

- Engine model: F8
- Displacement: 796 cc (49 cu in)
- Valves per cylinder: 2
- Number of cylinders: 3 inline
- Power: 37 HP at 5000 rpm
- Rpm limiter: ~7000 rpm
- Torque: 57 Nm at 2500 Rpm

Suspension

  - Front suspension: McPherson strut and coil
- spring
  - Rear suspension: Coil spring with gas-filled
- shock absorbers

Steering

- Steering type: Rack and pinion
- Minimum turning radius: 4.4 m (14.4 ft)

Brakes

- Front Brakes: Drum, disk
- Rear Brakes: Drum

Wheels and tyres

- Tyres (radial optional): 145/70 R12, 145/80
- R12

Features of a Hydrogen Car

- Use of technically advanced technique
- Qualitative, and clear light display
- Light secured by high quality glass
- Superior strain gauge load cells
- Durable design with strong structure
- Compact and light in weight
- Easy to carry and clean
- Battery level indication
- Large backlit LCD display
- High resolution and luminosity light
- Precise results in nano second speed

Discussion- To reach up to the desired results discussion is necessary with competent people which can make execution regarding to the project. We have taken guidance from many experienced people which also helped us in making decision for execution of project.

We have discussed with many expert mechanic regarding to the car before buying it which is to be modified according to the requirement of the project.

We have also discussed with our project guide related to the required modification in the car for execution of the project.

Result- We have conduct the experiment with various combination of electrolyte solution and metal electrodes to get the best result. We used following combination of apparatus to obtain maximum amount of hydrogen that can be supplied to the engine with minimum drawbacks.

☐ **Catalyst used: 1**. NaOH
2. KOH
☐ **Electrode Materials:**
1. High grade stainless steel electrode
2. Copper electrode
☐ **Constituents of electrolyte:**
1. Distilled water with NaOH

2. Distilled water with KOH

- **Electrode Materials:**

1. High grade stainless steel electrode
2. Copper electrode

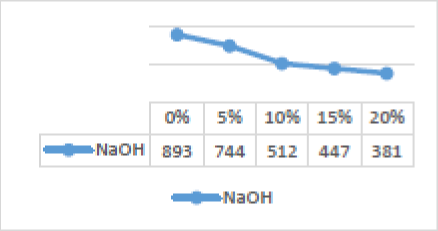


Fig. Percentage of NaOH increases

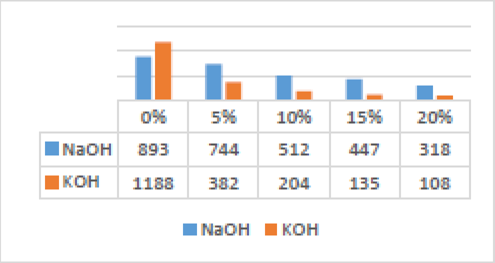


Fig. Production rate with copper electrode

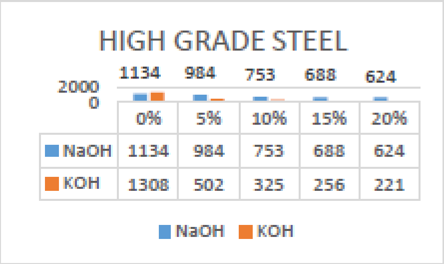


Fig. Percentage of catalyst increases

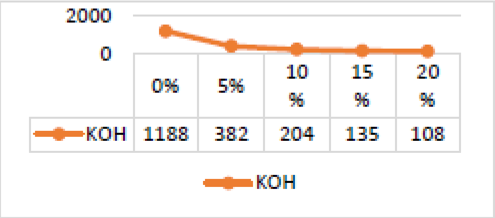


Fig. Percentage of KOH increases

Conclusion- From the result and whole literature review, we observe that to run an automobile vehicle only on hydrogen gas, we required the hydrogen supply to the engine at very high pressure and that need to be stored in high pressure tank at approximately 200 bar. Tis requires high strength storage which increases the cost of vehicle considerably. So, we used hydrogen along with petrol as the fuel in the engine which increased the efficiency of the vehicle to a large extent as shown in result. Thus, from this experimental project we can say that hydrogen can be used as a fuel to increase the efficiency of automobile vehicle which also reduce the carbon emission to very large extent. Due to these advantages, we can say that, the scope of hydrogen fueled automobile vehicle is too bright in the future.

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Thermo Mechanical analysis of Cylinder Liner

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ABSTRACT - Many times it is difficult to analyze the actual working conditions and problems created which may lead to development of stresses and thus may cause failure, also it's difficult to find the stresses developed in each section of component thus the, material required to added or subtracted not easily analyzed. Even material properties can't be considered only by mathematical modeling without virtual analysis.Hence Finite Element Analysis is done by using different software's such as ANSYS and NASTRAN. This makes it easy to design a component for more durability with help of virtual work by knowing its different physical condition in actual working.In this Case study thermo-mechanical (coupled filed) analysis on cylinder liner of 4-stroke diesel engine of SANTRO vehicle of Hyundai Motors performed.

Keywords— Ansys, Nastran, Santro, Thermomechanical, Cylinder, Liner

INTRODUCTION –

FEA is a numerical procedure that can be used to obtain solution to large class of engineering problems involving stress analysis, heat transfer, electro magnetism and fluid flow.A finite element model is a discrete representation of the continuous, physical part that is being analyzed. This discrete representation is created using nodes and elements. Nodes are connected together to form elements. The nodes are the discrete points on the physical part where the analysis predicts the response of the part due to applied loading. This response is defined in terms of nodal degrees of freedom (DOF). For stress analysis, up to six degrees of freedom are possible at each node (three components of translation and three components of rotation). Depending on the element type selected (e.g., beam, plate, 2-D and 3-D elements, etc.), the number of required degrees of freedom at each node is determined.

Phases in Finite Element Analysis:

In general, there are three phases in any computer-aided engineering task:

1. Pre-processing: Defining the finite element model and environmental factors to be applied to it.
2. Analysis solver: Solution of finite element model.
3. Post-processing of results using visualization tools.

VEHICLE SPECIFICATION: -

Various engine specifications of SANTRO vehicle required for this case study are as follows: -

Engine Type/Model: -	Hyundai Epsilon
Combustion principle	4-stroke
Engine Displacement: -	999cc
Maximum Horsepower (PS @rpm): -	55 PS @ 5500 rpm
Maximum Torque (Nm @rpm): -	84 Nm @ 2500 rpm
Bore (mm): -	66 mm
Stroke (mm): -	77 mm
Compression Ratio: -	8.9:1

Configuration and No of Cylinders: - In-Line 4Cylinder 12 Valves SOHC

Cylinder Block: - Iron

Cylinder head: - Aluminum

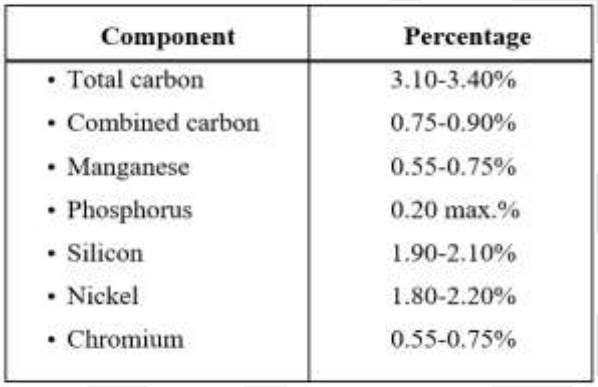
Fuel system: - Multipoint fuel injection

Performance: - Maximum Speed 141 Km/Hour 0-100kmph 16.9 seconds 1/4 Mile 20.6 seconds

Material for Liner-

For increasing some properties of cast iron some material is alloyed as shown in below:

Table 1:Properties of material



Component	Percentage
• Total carbon	3.10-3.40%
• Combined carbon	0.75-0.90%
• Manganese	0.55-0.75%
• Phosphorus	0.20 max.%
• Silicon	1.90-2.10%
• Nickel	1.80-2.20%
• Chromium	0.55-0.75%

Nickel-Chromium Iron - composition: The high nickel content of this alloy provides excellent resistance to chloride-ion stress corrosion cracking and imparts resistance to corrosion by a number of organic and inorganic compounds. chromium gives this alloy its resistance to oxidation at temperatures up to 2150°f (1175°c).combines high strength with desirable workability. it has excellent mechanical properties from sub-zero to elevated temperatures.[7].

CAD Model-

General purpose finite element modeling package for numerically solving a wide variety of mechanical problems. These problems include: static/dynamic structural analysis, heat transfer and fluid problems, as well as acoustic and electromagnetic problems. ANSYS, finite element analysis software enables engineers to perform the following tasks:

- Build computer models or transfer CAD models of structures, products, Components or systems.
- Apply operating loads or other design performance conditions.
- Study physical responses such as stress levels, temperature distributions or electromagnetic fields.
- Optimize a design early in the development process to reduce production costs.
- Do prototype testing in environments, where it otherwise would be undesirable or impossible (for example, biomedical applications).

Import CAD model in a ANSYS software for analysis.

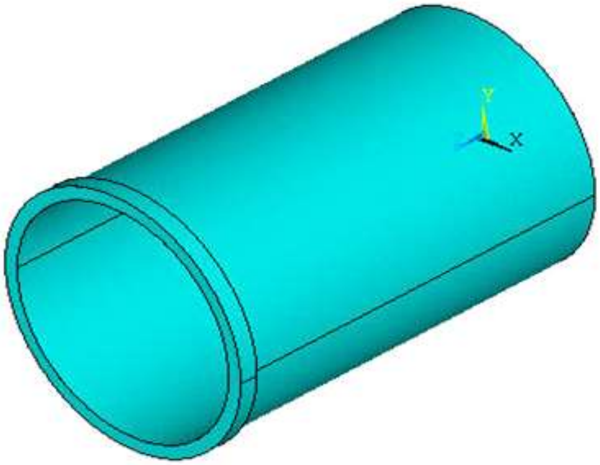


Fig 1: Importing CAD model

Mesh Model-

A given problem is discredited by dividing the original domain into simply shaped elements. All the elements are connected to each other by nodes called as mesh model. Here we are using the Brick solid 45 elements for structural analysis.

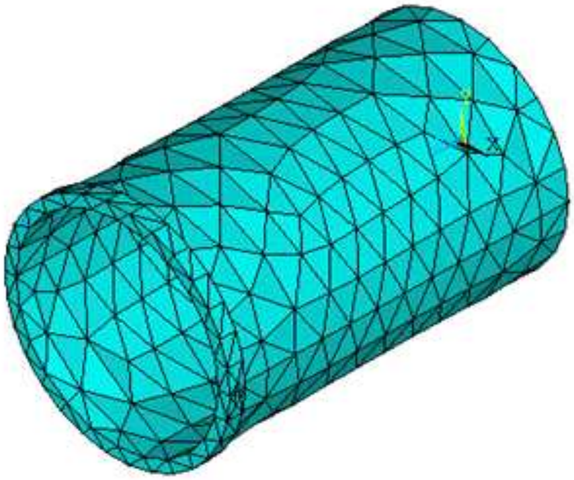


Fig 2: Mesh model

Boundary Conditions-

While performing the analysis the degrees of freedom have to be restricted. Here all degree of freedom is restricted for the structural analysis In the ANSYS the Surface loads are typically pressures for structural element types, convections or heat fluxes for thermal element types, etc.We are considering the 60 bar pressure on inside surface of cylinder liner.

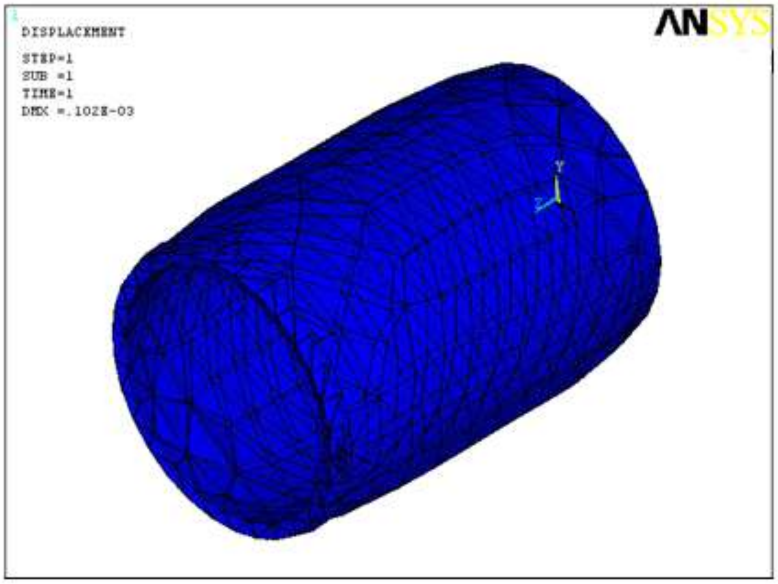


Fig 3:Deformation of liner due to high pressure

The pressure is uniform inside the liner therefore the deformation of liner is 0.102e-3 mm

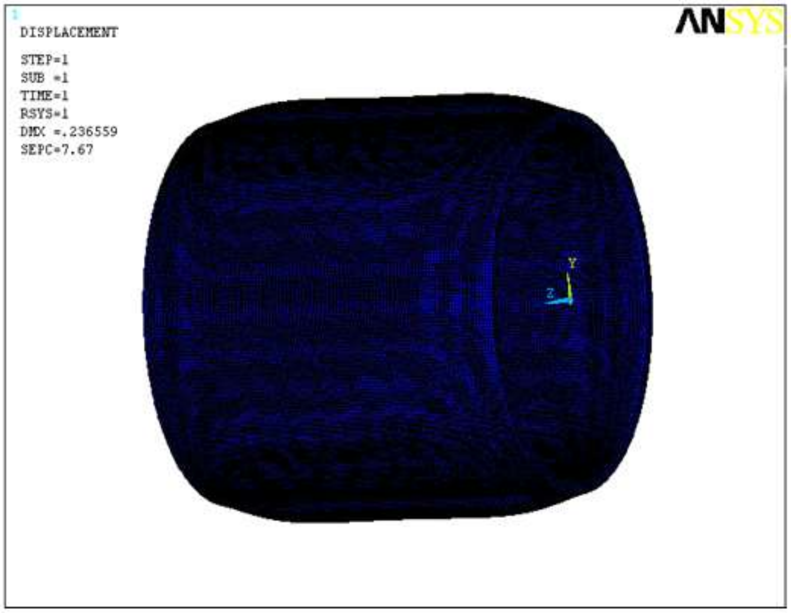


Fig 4:Deformation due to Thermal Stress

Due to temperature difference the deformation occur is 0.236559 mm

OPTIMIZATION OF DESIGN

Optimization deals with the study of minimization or maximization. Design optimization are basically depends upon number of parameters which are cost, size, strength, weight, reliability and performance. In that case if the designer select weight as an optimization criteria then the overall analysis is performed to solve the problem for weight minimization. For that we perform the stress analysis for weight minimization of that part. The stress analysis performed on that part gives idea that if we remove certain amount of structure of that component. While performing these stress analysis we take care of overall factor of safety requirement and load acting on that critical component.

One more key point to keep in mind that engineering system assembled by number of component ,optimizing assembly component that makes up the system did not require lead to an optimize overall system. This study shows basic techniques for design optimization of mechanical system. In this paper we define weight as crucial optimization criteria. Previously the improvement in design initiate from starting with basic design ,analysis on that initial design ,observing on results and conclude whether or not can we modify the initial design. From some previous years the optimization process changes from linear programming to non linear programming techniques.

Optimization Statement and Constraints:

The structural and gas load is major load coming on the cylinder liner hence the objective of the optimization was to minimize the mass of the crankshaft under the effect of static load comprising the peak gas pressure load, such that equivalent stress amplitude are within the limits of allowable stress. The optimized cylinder liner has to be interchangeable with existing one in current engine. Each of these requirements or constraints, are now briefly discussed.

ANALYSIS ON LINER FOR OPTIMIZATION

For optimization two cases are taken as follows: -

Case 1: - In this case the thickness of cylinder liner is reduced up to 1.5 from 2.31 so hoop stress increased to 144.216 N/mm2

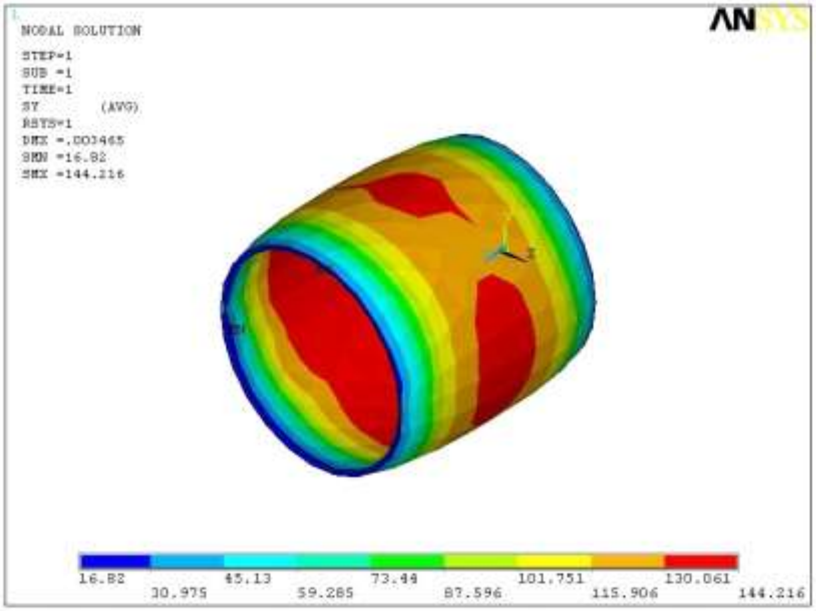


Fig 5: Hoop stress for reduced thickness

In this case study the thickness of cylinder liner is reduced upto 1.5 from 2.31 .the main objective of these case study I(a) was to analyze the various stresses acting on the cylinder liner. The variation of hoop stress, combined stress and maximum thermal stress and effect of these stresses on cylinder liner geometry are observed. The red color indicates the maximum hoop stress impacting area.

So finally from this ANSYS result it is observed that as the thickness of liner reduced the hoop stress acting on cylinder liner increased .In this case the thickness of cylinder liner is reduced up to 1.5 from 2.31 so hoop stress increased to 144.216 N/mm^2.

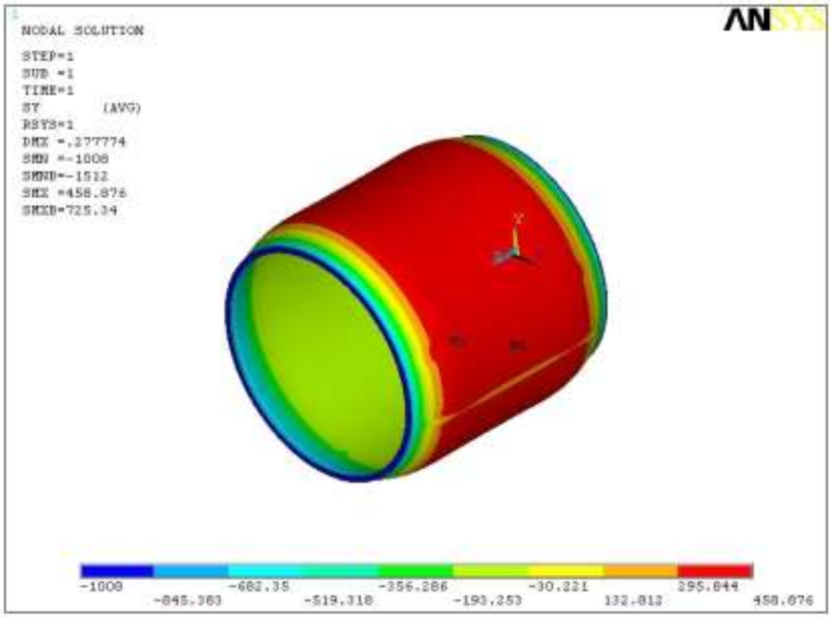


Fig. 6: Combined stress for reduced thickness

In this case study the thickness of cylinder liner is reduced upto 1.5 from 2.31 .the main objective of these case study I(b) was to analyze the various stresses acting on the cylinder liner. The variation of hoop stress, combined stress and maximum thermal stress and effect of these stresses on cylinder liner geometry are observed. The red color indicates the maximum combined stress impacting area. So finally from this ANSYS result it is observed that as the thickness of liner reduced the combined stress acting on cylinder liner increased .In this case the thickness of cylinder liner is reduced up to 1.5 from 2.31 so combined stress increased to 725.34 N/mm^2.

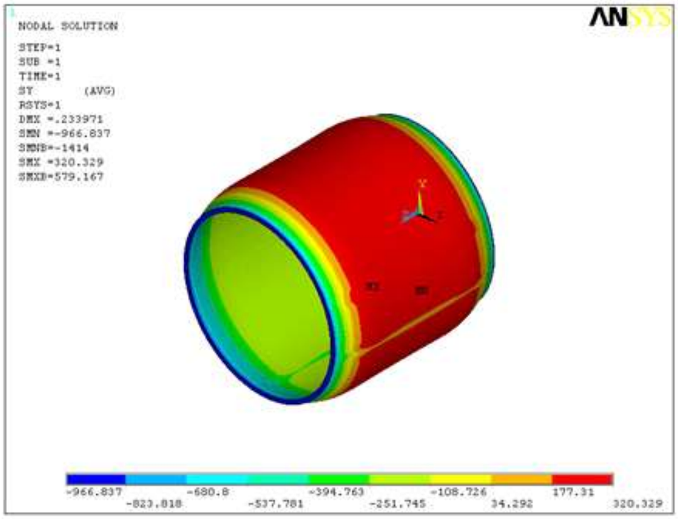


Fig 7 :Max thermal stresses for reduced thickness

In this case study the thickness of cylinder liner is reduced upto 1.5 from 2.31 .the main objective of these case study I(c) was to analyze the various stresses acting on the cylinder liner. The variation of hoop stress, combined stress and maximum thermal stress and effect of these stresses on cylinder liner geometry are observed. The red color indicates the maximum thermal stress impacting area. So finally from this ANSYS result it is observed that as the thickness of liner reduced the maximum thermal stress acting on cylinder liner increased .In this case the thickness of cylinder liner is reduced up to 1.5 from 2.31 so maximum thermal stress increased to 579.167 N/mm^2.

Case 2: Taking thickness equal to 5 mm the results obtained are as follows

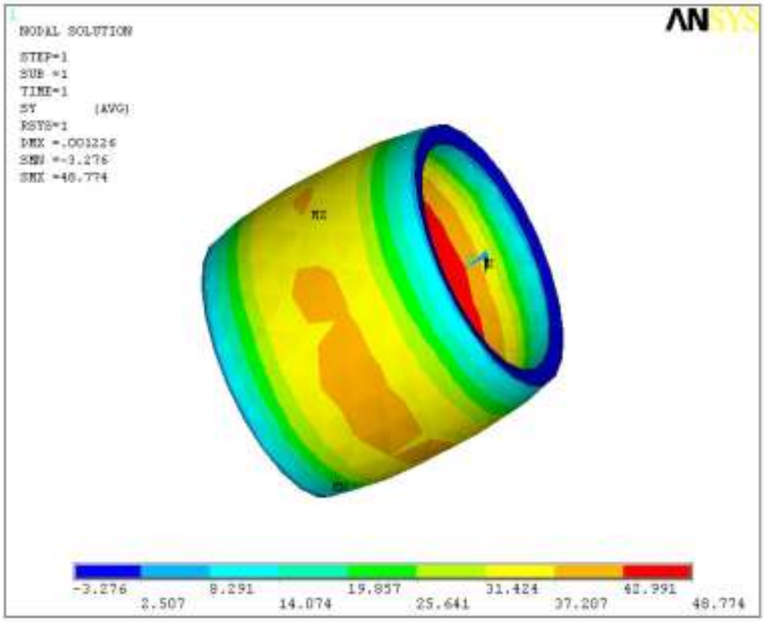


Fig 8 : Hoop stress for thickness 5 mm.

In this case study the thickness of cylinder liner is incresed upto 5mm from 2.31.The main objective of these case study II(a) was to analyze the various stresses acting on the cylinder liner. The variation of hoop stress, combined stress and maximum thermal stress and effect of these stresses on cylinder liner geometry are observed. The red color indicates the hoop stress impacting area. So finally from this ANSYS result it is observed that as the thickness of liner increased the hoop stress acting on cylinder liner decreased .In this case the thickness of cylinder liner is increased up to 5mm from 2.31 so hoop stress decreased to 48.774N/mm^2.

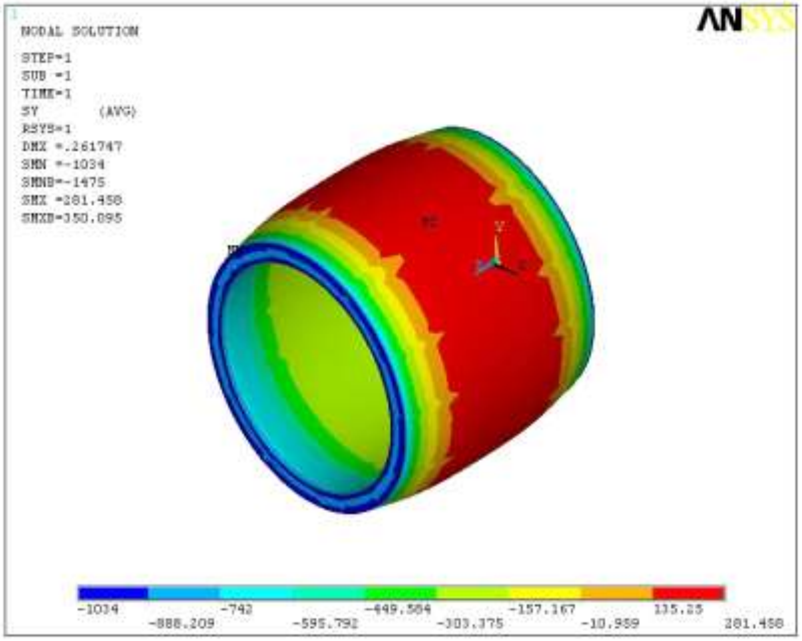


Fig 9 :Max. thermal stress for 5 mm

In this case study the thickness of cylinder liner is incresed upto 5mm from 2.31.The main objective of these case study II(b) was to analyze the various stresses acting on the cylinder liner. The variation of hoop stress, combined stress and maximum thermal stress and effect of these stresses on cylinder liner geometry are observed. The red color indicates the Max. thermal stress impacting area. So finally from this ANSYS result it is observed that as the thickness of liner increased the Max. thermal stress acting on cylinder liner decreased .In this case the thickness of cylinder liner is increased up to 5mm from 2.31 so Max. thermal stress decreased to 281.458N/mm^2.

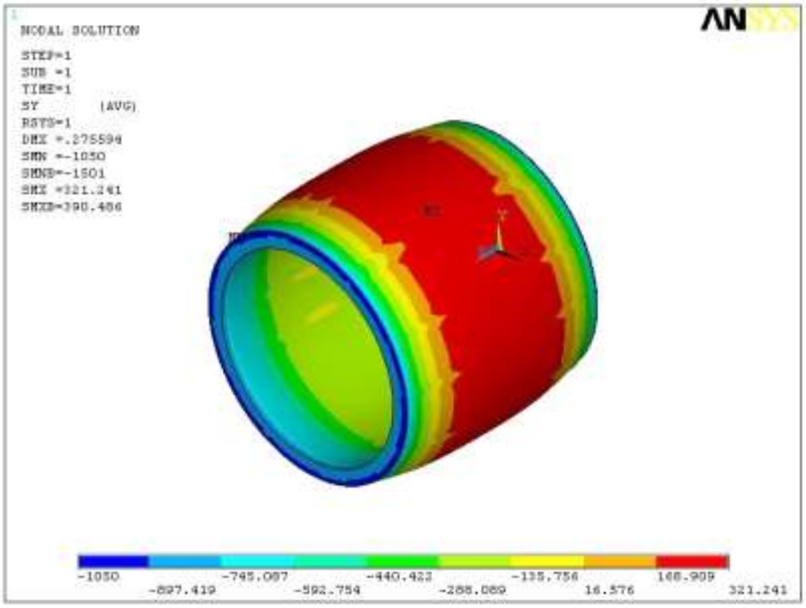
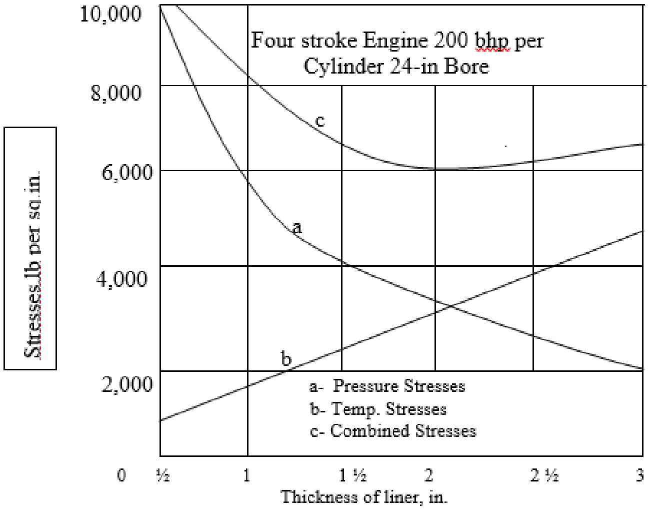


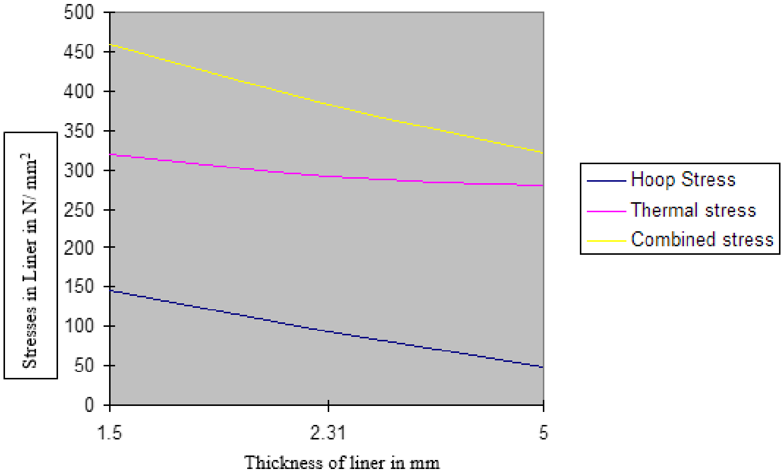
Fig 10 :Combined stress for thickness 5 mm.

In this case study the thickness of cylinder liner is incresed upto 5mm from 2.31.The main objective of these case study II(c) was to analyze the various stresses acting on the cylinder liner. The variation of hoop stress, combined stress and maximum thermal stress and effect of these stresses on cylinder liner geometry are observed. The red color indicates the Combined stress impacting area. So finally from this ANSYS result it is observed that as the thickness of liner increased the Combined stress acting on cylinder liner decreased .In this case the thickness of cylinder liner is increased up to 5mm from 2.31 so Combined stress decreased to 321.241 N/mm^2.For increased thickness of liner Hoop stress, Maximum thermal stress, and combined stress gets reduced.

Result



Graph 1Actual graph for stresses in liner



Graph 2 Practical graph for stresses in liner

CONCLUSION

- The thermal analysis of cylinder liner component is done by using:

- Solid 45 brick element → structural analysis
- Solid 70 brick element → thermal analysis
- The outer surface of cylinder liner is under maximum stress
- From case study I it is concluded that

By reducing the thickness of cylinder liner component hoop stress, maximum thermal stress and combined stress increase

- From case study II it is concluded that

For increased thickness of cylinder liner, hoop stress, maximum thermal stress and combined stress gets reduced.

Future scope for the project:

- For the analysis of cylinder liner
  - Solid 45 brick element → structural analysis
  - Solid 70 brick element → thermal analysis
- The future scope is
  - 20 node solid 90 → thermal analysis
  - 20 node solid 92 → structural analysis
- In this work we use linear method because of isotropic material property by assuming alloying elements no linear methods can be used.
- Advanced Materials for Liner can be used such as
- GOE323 (GJL) is a micro alloy cast iron with flake graphite.
- GOE330 (GJV) is a compacted graphite cast iron and belongs to the group of ductile cast irons.
- We have performed the Analysis by using Sequential Coupled Analysis –ANSYS Multi-field solver; it can also be performed by using Direct Coupled-Field Analysis.

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How old are you?

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ABSTRACT

Gerontology is the study of social, psychological and biological aspects of aging. It encompasses scientific research on various aspects of aging which provides us a way to gain knowledge and to know how many more years one can expect to live actively. Factors that contribute aging include behavioural traits, environment and genes. Due to over exposure of humans to unhealthy condition leads to premature aging. There are numerous syndromes associated with premature aging. Even though current advances provides way to control premature aging, further more research studies are still under progress. Research in gerontology offers us the opportunity to enjoy more life experiences and to obtain healthy aging.

Key words – Gerontology, Premature aging, Telomere shortening, Stress, Hormonal secretion, DNA damage, Mutations, Free radicals.

1. INTRODUCTION

Gerontology (from Greek: *geron*, "old man" and - *logy*, "study of") is the study of the social, psychological and biological aspect of aging. This term was coined by Ilya Ilyich Mechnikov in 1903. Scientists who study aging are called Gerontologists**.** Gerontology is concerned primarily with the changes that occur between the attainment of maturity and the death of the individual. Gerontologists view aging in terms of four distinct processes: chronological aging, biological aging, psychological aging, and social aging. Chronological aging is the definition of aging based on a person's years lived from birth. Biological aging refers to the physical changes that reduce the efficiency of organ systems. Psychological aging includes the changes that occur in sensory and perceptual processes, cognitive abilities, adaptive capacity, and personality. Social aging refers to an individual's changing roles and relationships with family, friends, and other informal supports, productive roles and within organizations [1].

Aging can be defined as the time related deterioration of the physiological functions necessary for survival and fertility. Aging begins as soon as adult hood is reached and is as much a part of human life as are infancy, childhood, and adolescence. Aging is known to be a major risk factor for several most diseases. It is also an important part in every human.

The maximum lifespan is a characteristic of a species. It is the maximum number of years a member of species has been known to survive.The maximum longevity of humans is 122 years, recorded by the late Jeanne Calment [2]. Life expectancy is not a characteristic of species, but of populations. It is the age at which half the population still survives. Life expectancy of Indians: Men - 65.77 years; Women- 67.95 years.

2. AGING THEORY

Theories of aging are numerous and no one theory has been accepted to full extent. Regardless of the theory, a commonality is that as human beings age, functions of the body decline. Some of those theories are listed below:

- **Programmed Aging Theory: Hay flick Phenomenon & Telomere shortening**

The Hay flick limit has been found to correlate with the length of the telomere region at the end of a strand of DNA. During the process of DNA replication, small segments of DNA at each end of the DNA strand (telomeres) are unable to be copied and are lost after each time DNA is duplicated. The telomere region of DNA does not code for any protein; it is simply a repeated code on the end region of DNA that is lost. After many divisions, the telomeres become depleted and the cell begins apoptosis. This is a mechanism that prevents replication error that would cause mutations in DNA. Once the telomeres are depleted, due to the cell dividing many times, it will no longer divide. This is when the cell has reached its Hay flick limit [3].

- **Wear & Tear Theory**

Dr. August Weismann, a German biologist, first introduced this theory in 1882. He believed that the body and its cells were damaged by overuse and abuse. The organs, liver, stomach, kidneys, skin and so on are worn down by toxins in our diet and in the environment; by the excessive consumption of fat, sugar, caffeine, alcohol and nicotine; by the ultra-violet rays of the sun and by the many other physical and emotional stresses to which we subject our bodies. Wear and tear is not confined to our organs, however; it also takes place on the cellular level. Of course even if you've never touched a cigarette or had a glass of wine, stayed out of the sun and eaten only natural foods, simply using the organs that nature endowed you is going to wear them out. Abuse will only wear them out more quickly. Likewise as the body ages our very cells feel the effect; no matter how healthy is our life style [4].

- **Free Radical Theory/Accumulation**

The free-radical theory of aging was formally proposed by Denham Harman in 1956 and postulates that the inborn process of aging is caused by cumulative oxidative damage to cells by free radicals produced during aerobic respiration. Free radicals are atoms or molecules with single unpaired electrons. They are unstable and highly reactive, as they attack nearby molecules in order to steal their electrons and gain stability, causing radical chain reactions to occur. Free radicals are generated in vivo primarily within mitochondria during mitochondrial electron transport as well as by other physiological processes. Harman later extended the free-radical theory of aging to incorporate the role of mitochondria in the generation of free radicals and other reactive oxygen species. The theory proposes that the rate of oxidative damage to mitochondrial DNA primarily determines life span [5].

3. FACTORS THAT CONTRIBUTE AGING

3.1. Physical basis of aging

Physical factors play vital role in aging faster or slower, some of the conditions that drives aging are seems to be lifestyle choices, exercise, nutrition, stress management, genetics, and environment. The seven most common physical factors contribute in premature aging are attitude, smoking, drinking, drug use, stress, diet, climatic conditions [6].

The mind plays a significant role in whether we are aging faster or slower, and we can use the mind to help us accelerate or decelerate the process. Happier people are quite simply younger looking people. The more you hold hope, optimism, and joy at the top of your list of priorities the younger your face will appear. Moreover, happier people live longer often with fewer health problems like heart disease, high blood pressure, and even aching joints and bones. A happier face is devoid of wrinkled eyebrows and scowl marks because the muscles have spent more time in a relaxed state.

3.2 Chemical basis of aging

Chemical factors also contribute equally for premature aging. Chemicals that are involved in our day toady lifestyles cause aging. Some of the chemicals that are present in day today lifestyle are listed which causes premature aging:

i) Sulfates: These are harsh, corrosive, and drying ingredients you’ll find in your cleansers, body washes, shampoos, and even in your toothpastes. They cause skin irritation and corrosion, and over time, leads to increased dryness and more visible fine lines and wrinkles. In fact, studies have indicated that sulfates can age the skin.

ii) Certain alcohols: In most of the anti-aging skin products we may find ingredients like specially denatured alcohols, methanol, ethanol, propanol and benzyl alcohol. These are all drying ingredients that strip away skin’s natural oils and lead to premature aging and irritation.

iii) Mineral oil: It comes from petroleum, and it forms a sort of film over the skin, clogging pores and hindering the skin’s natural ability to get rid of toxins. With extended use, it can encourage acne and actually irritate and inflame skin. The result is an aging effect that can make fine lines and wrinkles much more visible.

iv) Chemical sunscreens: Many so called sunscreens includes chemicals like oxybenzone, benzophenone-3, and octyl methoxycinnamate can actually encourage free radical damage when exposed to sunrays. Free radicals and UV exposure are the primary causes of wrinkles and fine lines.

3.3 Biological basis of aging

(i) Cellular

All cells change as they age, generally becoming larger. Their capacity to divide and reproduce tends to decrease. Normal cells have built in mechanisms to repair minor damage, but the ability to repair declines in aged cells. DNA is damaged through the aging process and changes occur in cellular membranes, enzymes, transport of ions and nutrients. Due to this the nucleus of chromosomes undergoes changes such as clumping, shrinkage, and fragmentation.

The changes like reduction in the number of mitochondria and lysosomes occur, causing cells to function less efficiently. When the mitochondria decrease in function, metabolism is decreased to about 95% of capacity by age 50, and to 85% by age 70. This effect also ties in with a decrease in hormonal secretions. A decrease in metabolism has several effects: toleration of cold is less, a tendency to gain weight increases, there is a decreased efficiency in the body’s use of glucose.

Cellular aging alters the tissues formed by these cells which, in turn, affect organ function. For instance, by the age of 85, lung capacity has decreased by 50%; muscle strength by 45%; and kidney function by 30%. Collagen and elastin decrease in connective tissue formation, resulting in joint tissues becoming stiffer, less elastic, and less efficient in their function. In men, there is a gradual increase in tissue lipids and fat until age 60; then there is a gradual decrease. In women, lipids and fats accumulate in the tissues continuously, but there is no decline as happens in men. Then the total amount of water in the body gradually decreases. These changes in body fat and water reduction are the main reasons why the elderly respond differently to drugs than the younger population [7].

(ii) Extracellular

When our brain ages some brain regions shrink, while others remain stable as we age. Aging of the brain also impairs the ability of the brain to encode or decode new memory and processing speed. In case of skin and hair aging is visible very prominently. Our skin begins to develop wrinkles and dark spots. The ability of skin to produce oils reduces resulting in dry and lusterless skin. Hair becomes thinner than normal and the change in hair color from gray initially to turning white eventually marks aging. With bones the friction between the joints increases causing pain while moving. The bones also become porous and there is a gradual yet constant loss of density and strength. Bones are reservoirs of minerals like calcium and phosphorus, but during the process of aging there is a typical depletion of these minerals making bones fragile and weak [8].

As we age the retinas become thinner than usual, the sharpness that should be achieved in viewing objects at a distance is impaired and objects placed at a distance appear blurred. The irises get stiffened; hence, the pupils become less responsive and more sensitive to glare. Eye problems like cataracts and glaucoma are common as you age. Aging also leads to hearing loss. The eardrums thicken, making hearing more difficult than usual. Due to aging the blood vessels lose their elasticity and the fatty deposition on the artery walls makes the arteries smaller or rather narrow the space for the blood flowing through it. All these factors make the heart work harder than usual to pump the blood to other parts of the body. The result is hypertension, cardiac arrest, arteriosclerosis and other serious disorders.

4. PREMATURE AGING SYNDROMES

Premature aging syndromes are also known as progeria. It includes two very rare inherited conditions, Hutchinson-Gilford syndrome and Werner syndrome. Both are autosomal recessive disorders, which mean an individual has inherited a mutated gene from both parents. 1 in 4 offspring would be expected to have the disorder and others may be carriers of the gene.

(i) HUTCHINSON-GILFORDSYNDROME

Figure1. A boy with Hutchinson-Gilford syndrome

Hutchinson-Gilford syndrome [9][10] is characterized by normal development in the first year of life followed by rapid aging. It is caused by a genetic defect. It has been found that there is a mutation in the gene LMNA (Lamin A/C) that produces the protein Lamin, which is the structural scaffolding that holds the nucleus of a cell together. The cellular instability lead to premature aging. Symptoms include dry and wrinkled skin, total baldness, prominent scalp, veins and eyes, small jaw, delayed tooth formation, short stature, joint stiffness, hip dislocations, thin limbs with prominent joints and birdlike facial features. Average life expectancy is 13 years, with approximately 75% dying from heart disease. The signs of progeria begin to show around 6-12 months when the baby fails to gain weight and skin changes occur in about 1 in 8 million children [11].

(ii) WERNER SYNDROME

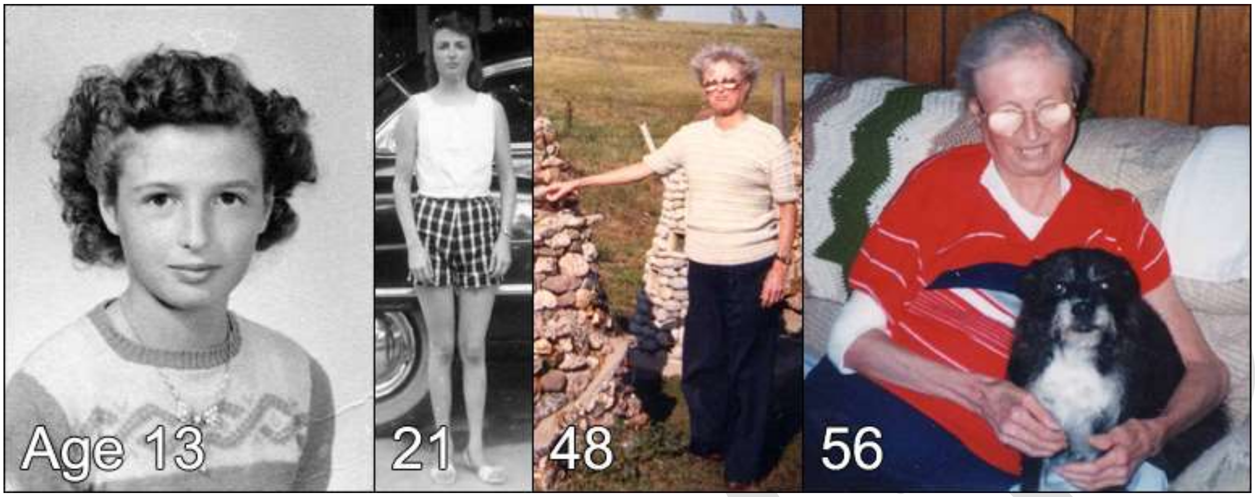

Figure2. Werner syndrome patient at various ages

Werner syndrome is a rare, inherited disease that causes a rapid acceleration of aging. While the person is only in his or her twenties, first sign of syndrome appears. Other than that the child fails to have a normal growth spurt, or may be delayed until an individual is as old as 30 years. It is caused by a defect at the Werner syndrome gene [12] (WRN) locus, which provides instructions to a protein called helicase. Werner syndrome is caused by a helicase defect, which affects the way DNA and RNA are replicated and repaired in the body. Characteristic features include: Greying hair and/or balding, wrinkling and aging of the face, sunken cheeks, small jaw, small stature (usually less than 1.6m tall), muscle weakness, thickened, tight and shiny skin over joints, leading to ulcers and high-pitched voice [13]. Werner syndrome occurs in about 1 in 1 million individuals [14]. There is tendency to develop diabetes mellitus, cancer, and cardiovascular disease. Most afflicted individuals die before age 60. Death usually occurs in patients between 30-60 years, with most dying from heart disease or cancer.

5. CONCLUSION

Aging is the natural process of the growing older. Yet there are many factors that play a role in aging. Out of two in one are aging faster than their biological age. This is because either we engage in behaviours that increase our aging, or we do not actively support a more youthful body through our action. Knowledge is the power and the more you know about fighting the aging process the more control you can gain over it. Although aging comes in with its own discomforts like aches, pains, diseases, sags and forgetfulness; regular exercise, practicing relaxation techniques, keeping stress under control and taking good care of your body and brain can ensure more active and pain free old age. Research in gerontology offers us the means to a healthier, longer life. Advancement in gerontology gives us an opportunity to spend more time with our loved ones, meet our great-great-grandchildren, to enjoy more life experiences and to obtain healthy aging.

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Modelling and Simulation of Unipolar HVDC Link

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Abstract—The use of high voltage AC transmission of bulk power over long distance invite the attention of transmission of high voltage DC for long lengths of line. HVDC systems suffer relatively lower electrical losses and require relatively lower economic expenditure, for long distance transmission. In this paper we simulate a unipolar HVDC transmission link using twelve pulse thyristor convertors. The changes in output waveforms are noted for change in firing angles and DC fault conditions.

Keywords—*HVDC, Unipoar, Rectifier, Inverter, Three Phase AC, Firing angle and DC fault.*

INTRODUCTION

Voltage conversion in an AC system is simple as high power levels and high insulation levels are allowed by an AC transformer in one unit, and also losses are low. Its simplicity and superiority of a three phase synchronous generator over DC generator led and encouraged the introduction of AC technology in the development of electrical power systems. But, disadvantages linking to AC transmission like limits on transmission capacity due to inductive and capacitive elements of overhead lines, impossibility of direct connection between two AC systems with different frequencies and system instability caused by direct connection between two AC systems with the same frequency compelled and engaged engineers over ages in substituting AC transmission by DC transmission. With the invention of mercury arc rectifiers in the 20th century, line commutated current sourced converter could be designed. Next major development occurred when thyristor valves replaced mercury arc valves. The need for parallel connection and large number of series connected thyristors per valve has been extinguished by the development of thyristors with high current and voltage rating. Innovations and appreciable development in areas of HVDC have increased reliability of HVDC systems significantly.

METHODOLOGY

General Overview

In this paper we have illustrated the modelling of a unipolar HVDC link using 12 pulse thyristor converters and perturbations are applied to examine performance of the transmission system. A 1000 MW (500kV, 2KA) DC unipolar link is used to transmit power from a 500kV, 5000 MVA, 50Hz system to a 345 kV, 10000 MVA, 50Hz system. The AC systems are represented by an emf source in series with inductance and damped L-R equivalents.

Circuit Block Diagram

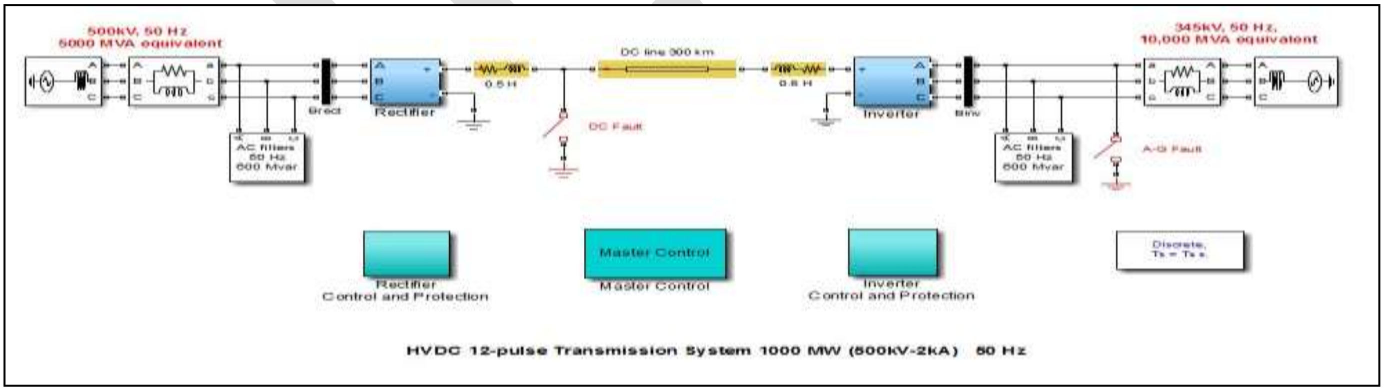

Fig. 1: Circuit Block Diagram

The rectifier and inverter are 12-pulse bridge converters using two Universal Bridge blocks. These two Universal Bridge blocks are connected in series. A 300 km line is used to interconnect the converters. 0.5H smoothing reactors are used on both sides. The Three Phase Three Winding blocks are used as the converter transformers blocks. These are Wye grounded on primary side, Wye connected on secondary side and Delta on tertiary side. The tap changing of the transformer is not simulated and hence the tap positions are fixed and determined by a multiplication factor of 0.9 for the rectifier and 0.96 for inverter which applied to the primary voltage of the three phase three winding transformers. The HVDC converter acts as a source of harmonic currents for the AC side. and harmonic voltages for the DC side. The order of the ac harmonic is one less than or greater than the intergral multiple of number of pulses and that of dc harmonic is integral multiple of number of pulses.

$n = kp \pm 1$ (for AC current)

$n = kp$ (for direct voltage);

k being an integer and p being number of pulses,

Since we have used 12 pulse circuit, hence the harmonics on AC side are of the order 11,13,23,25 and so on and that on DC side is of order 24,36 and so on.

AC filters are used to control the spreading out of the odd harmonic currents on the AC system and high passes damped filters are used to control even harmonics. The filters are grouped into two subsystems. These filter subsystem also contains a capacitor bank which is used to provide reactive power compensation to the circuit. This reactive power compensation is required because of the different firing angle of the thyristors in the converter circuit. The series RLC filter is used to eliminate the 11th and 13th harmonic and high pass damped filter is used to eliminate 24th harmonic.

The breaker block applies faults on the reactifier DC side to check for the stability of the system during fault. The sample time of Ts=50µs with the disrete steps are used for both the HVDC system and the rectifier and inverter control and protection subsystems. These control susbsystems are basically the PI controllers which takes the error inputs and based on those inputs generate the output current reference for both the rectifier and inverter and helps in the starting and stopping of the HVDC power transmission. The protection systems can be switched ON and OFF.

SIMULATIONS

In the first case the circuit is run and output waveforms are analyzed. In second case the firing angle is changed and circuit is simulated. In the third and final case DC fault condition is simulated and output waveforms analyzed accordingly.

Case 1

The simulation of unipolar HVDC link is run with the inverter firing angle between 92° and 166°. The simulation is started, current is first ramped up to the steady state, then negative current step is added, after some time positive voltage step is added and the current is ramped down at the time of stopping of the system. The different waveforms are studied in the rectifier and inverter scope. The waveforms reproduced are as follows:-

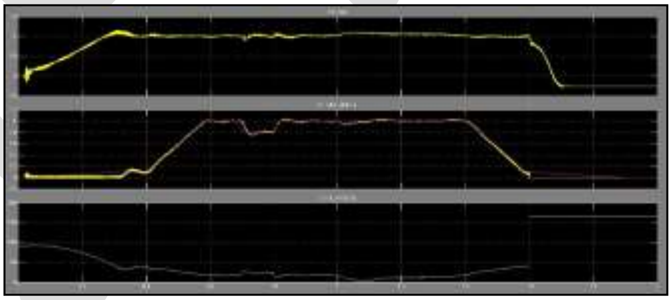

Fig. 2: V_{dL}, I_d and alpha_order v/s time waveforms across Rectifier

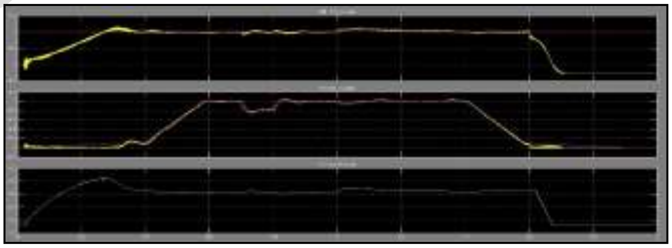

Fig. 3: V_{dL}, I_d and alpha_order v/s time waveforms across Inverter

At the start of simulation the converters pulse generators in the master control are deblocked and the power transmission started by ramping the reference current at t=20ms and triggering the 12 pulse rectifier and inverter circuit with firing angle of 92^o and 102^o respectively. At t=0.3s, the reference current reaches a value of 0.1pu, the DC current starts to build, the inverter firing angle α reaches the maximum value of 166^o and the voltage V_{dL} across rectifier and inverter crosses the reference voltage 1pu and makes an overshoot to 1.2pu meanwhile the current I_d takes an overshoot and reaches the value around 0.1pu. At t=0.4s, the reference current is ramped from 0.1 to 1 pu (5kA) in 0.18s (5pu/s) and the dc current I_d increases with the reference current keeping V_{dL} constant and then the dc current shifts from transient to steady state at t=0.58s. The trace 1 of rectifier and inverter scope shows the DC line voltage (1pu=200 kV), trace 2 shows the reference current and the measured I_d current (1pu=5 kA) and trace 3 shows the firing angle of both the rectifier and inverter. The rectifier and inverter are current and voltage controlled device resp. but during ramp both controls current. At t=0.7s, a -0.2pu step is applied during 0.1s to the reference current, hence the current I_d decreases with the step but the slight decrease in voltage seen keeping it constant. At t=1.0s, a 0.1pu step is applied during 0.2s at the inverter reference voltage. The voltage takes the shoot to 1.1pu mean while current decreases to 0.9 and becomes constant after which voltage regulator regulates the voltage and the voltage and current reaches the value of 1pu. The firing angle α of rectifier and inverter are around 16.5 degree and 143 degree respectively at t=1.35s. At t=1.4s the controller stops the simulation by ramping down the current to min value of 0.1pu keeping the voltage constant. At t=1.6s the firing angle alpha is forced to 166 deg at the rectifier and to 92 deg at the inverter which extinguishes the current and brings down the DC voltage due to the trapped charge in the line capacitance. At t=1.7s the pulses are blocked in both converters.

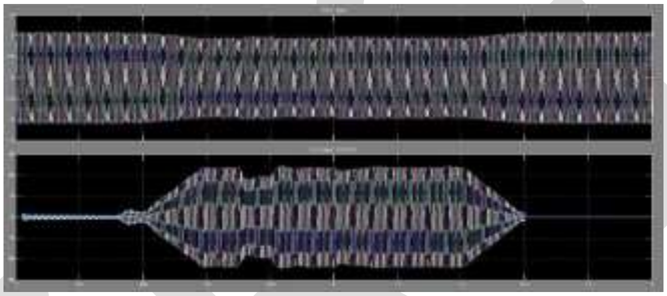

Fig. 4: AC voltage and current v/s time On Rectifier Side

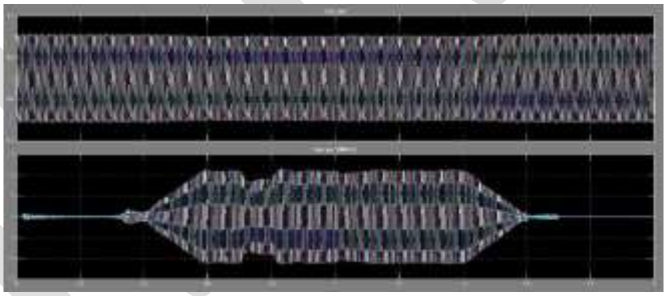

Fig. 5: AC voltage and current v/s time On Inverter Side

At t = 0 s, V_{abc_r} is around 1.1 pu and V_{abc_i} is around 1.06 pu but the I_{abc_r} and the I_{abc_i} are 0 pu/100 MVA. Then At t = 0.3 s, I_{abc_r} and I_{abc_i} increases to 2 pu/100 MVA and 1.6 pu/100 MVA resp. meanwhile V_{abc_r} and V_{abc_i} decreases to 1.08 pu and 1.05pu resp. At t = 0.4 s, V_{abc_r} decreases from 1.08 pu to 0.9 pu and V_{abc_i} decreases from 1.05 pu to 1 pu and the I_{abc_r} increases from 1.5 pu/100 MVA to 12 pu/100 MVA and I_{abc_i} increases from 1 pu/100 MVA to 11 pu/100 MVA. At t=0.7s, V_{abc_r} and V_{abc_i} increases to 1pu and I_{abc_r} and I_{abc_i} decreases to 9 pu/100 MVA and 8.2 pu/100 MVA. At t=0.8s, V_{abc_r} and V_{abc_i} continue to remain same and I_{abc_r} and $_{Iabc\_i}$ increases to 12pu/100 MVA and 11.2pu/100MVA. At t=1.4s, V_{abc_r} starts increasing to 1.1 pu but V_{abc_i} is same and I_{abc_r} and I_{abc_i} drops from 12 to 1.1pu/100 MVA and 11 to 1 pu/100 MVA respectively. At t=1.6s, V_{abc_r} and V_{abc_r} are same and I_{abc_r} and I_{abc_i} finally attains a value of 0.1pu/100 MVA.

Case 2

The simulation of unipolar HVDC link is run with the change in inverter firing angle between 105^o and 142^o. This is because whenever there is change in load in the inverter end (the load can be inductive, capacitive or anything), the required current changes or the reactive power compensation is required hence the firing angle of the inverter is changed manually. The simulation is started, current is first ramped up to the steady state, then negative current step is added, after some time positive voltage step is added and the current is ramped down at the time of stopping of the system. The different waveforms are studied in the rectifier and inverter scope. The waveforms reproduced are as follows:-

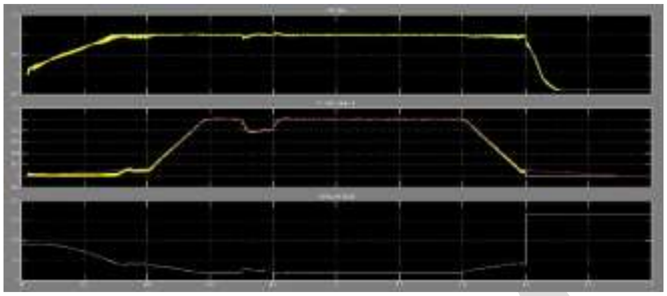

Fig. 6: V_{dL}, I_d and alpha_order v/s time waveforms across Rectifier

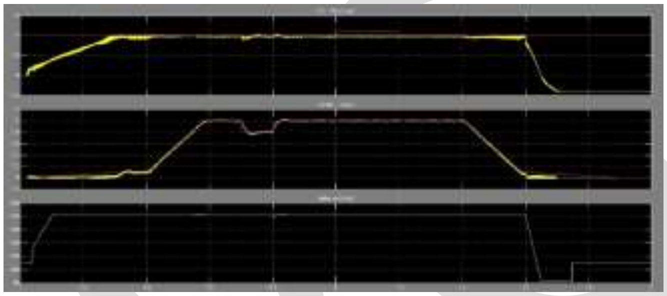

Fig. 7: V_{dL}, I_d and alpha_order v/s time waveforms across Inverter

At the start of simulation the converters pulse generators in the master control are deblocked and the power transmission started by ramping the reference current at t=20 ms and triggering the 12 pulse rectifier and inverter circuit with firing angle of 92^o and 117^o. At t=0.3 s, the reference current reaches a value of 0.1 pu, the DC current starts to build, the inverter firing angle α reaches the maximum value of 142^o and the voltage V_{dL} across rectifier and inverter takes an shoot to 1 pu and then reaches the steady state 1 pu value, meanwhile the current I_d increases from 0 pu and reaches the value around 0.1 pu. At t=0.4s, the reference current is ramped from 0.1 to 1 pu (2 kA) in 0.18 s (5 pu/s) and the dc current I_d increases with the reference current keeping V_{dL} constant and then the DC current shifts from transient to steady state at t=0.58 s. The trace 1 of rectifier and inverter scope shows the DC line voltage (1 pu=200kV), trace 2 shows the reference current and the measured I_d current (1pu=5kA) and trace 3 shows the firing angle of both the rectifier and inverter. The rectifier and inverter are current and voltage controlled device resp. but during ramp both controls current. At t=0.7s, a -0.2 pu step is applied during 0.1 s to the reference current, hence the current I_d decreases with the step and the rectifier voltage decreases to 0.9 pu and then increases to 1.1 pu at the end of step but the slight decrease in inverter voltage seen keeping it constant. At t=1.0s, a 0.1 pu step is applied during 0.2 s at the inverter reference voltage. The voltage and current remains constant. The firing angle α of rectifier and inverter are around 18.5 degrees and 142 degrees respectively at t=1.35s. At t=1.4s the controller stops the simulation by ramping down the current to min value of 0.1pu keeping the voltage constant. At t=1.6s the firing angle alpha is forced to 166 deg at the rectifier and to 92 deg at the inverter which extinguishes the current and brings down the DC voltage due to the trapped charge in the line capacitance. At t=1.7s the pulses are blocked in both converters.

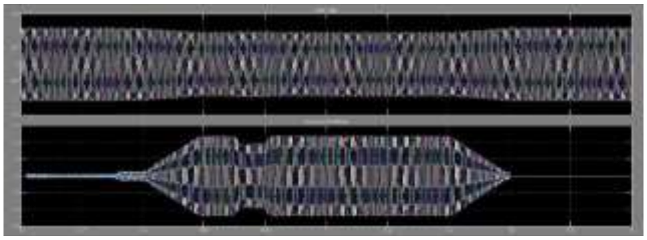

Fig.8: AC voltage and current v/s time on Rectifier Side

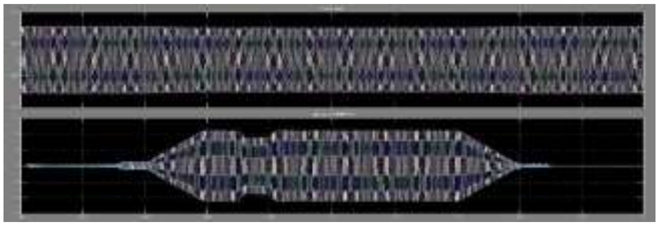

Fig.9: AC voltage and current v/s time on Inverter Side

At t=0s, V_{abc_r} and V_{abc_i} are around 1.1pu and 1.06pu respectively but both the I_{abc_r} and I_{abc_i} are 0 pu/100 MVA. Then at t=0.3s, I_{abc_r} and I_{abc_i} increases to 1.5 pu/100 MVA and 1.3 pu/100 MVA respectively but V_{abc_r} decreases to 1.08 pu keeping V_{abc_i} constant. At t = 0.4 s, V_{abc_r} and V_{abc_i} decreases to 0.9 pu and 1.06pu but the I_{abc_r} increases from 1.35 pu/100 MVA to 11.8 pu/100 MVA and I_{abc_i} from 1.2 pu/100 MVA to 11.1 pu/100 MVA. At t=0.7s, V_{abc_r} and V_{abc_i} increases to 0.98 pu and 1.01pu but I_{abc_r} and I_{abc_i} decreases to 9.2 pu/100 MVA and 8.6 pu/100 MVA. At t=0.8s, both V_{abc_r} and V_{abc_i} continue to remain same and I_{abc_r} increases to 12pu/100 MVA and I_{abc_i} to 11.2pu/100 MVA. At t=1.4s, V_{abc_r} increases to 1.1 pu keeping V_{abc_i} constant but I_{abc_r} drops from 12 to 1.1pu/100 MVA and I_{abc_i} from 11.1 to 1.5 pu/100 MVA. At t=1.6s, both V_{abc_r} and V_{abc_i} are same and both I_{abc_r} and I_{abc_i} finally attains a value of 0.05 pu/100 MVA.

Case 3

The simulation of unipolar HVDC link is run with inverter firing angle between 92^o and 166^o with the dc fault. The DC fault is mainly the line to ground fault of the DC line. DC fault is applied by deactivating the steps applied on the current reference and on the voltage reference in the Master Control and in the Inverter Control and Protection respectively by setting the switches in lower position. The simulation is started, current is first ramped up to the steady state, then the dc fault is applied and then the current is ramped down at the time of stopping of the system. The different waveforms are studied in the rectifier and inverter scope. The waveforms reproduced are as follows:-

Fig 10: AC and DC Fault Current v/s time

At t=0.7s dc fault is applied and the fault current increases to 7500A with the transient reaching 0A at t=0.725s and then slightly increases to 1000A and then extinguishes at t=0.75s. The ac fault current remains 0A.

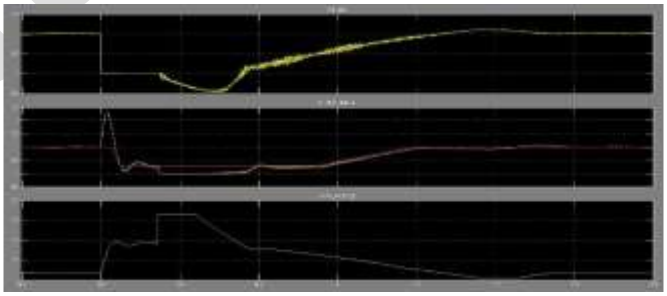

Fig. 11: V_{dL}, I_d and alpha_order v/s time waveforms for Rectifier

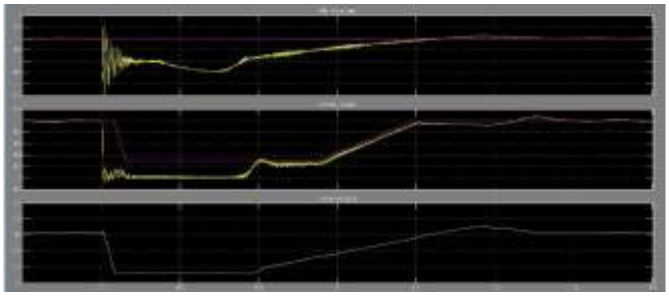

Fig. 12: V_{dL}, I_d and alpha_order v/s time waveforms for Inverter

At t = 0.7 s, the dc fault is applied and the dc current at rectifier increases to 2.2 pu and at inverter drops to zero but the dc voltage at rectifier and inverter falls to zero. This Voltage Dependent Current Order Limiter (VDCOL) and the DC Fault protection detects the DC voltage drop and hence reduces the reference current at both the rectifier and inverter to 0.3 pu. A DC current flows between the line to ground fault. Then, at t = 0.77 s, a low DC voltage is detected by the DC fault protection circuit which forces the rectifier and inverter firing angles α to 166 and 92 degrees respectively. The rectifier then operates in inverter mode and inverter in rectifier mode due to which the energy stored in the lie is returned to the ac system which forces the dc fault to extinguish also the line voltage becomes negative and reaches the maximum value of -0.5 pu. Then at t=0.82s the firing angle of rectifier decreases and that of inverter increases due to which dc current increases to 0.3pu with voltage crossing 0pu. Then at t=0.9s the current reference is then ramped and reaches the value of 1pu and the dc current and voltages increases with the ramp. Now the dc voltage and dc current takes a shoot to 1.1 pu then reaches the value of 1 pu between 1.18 s and 1.25 s in both rectifier and inverter.

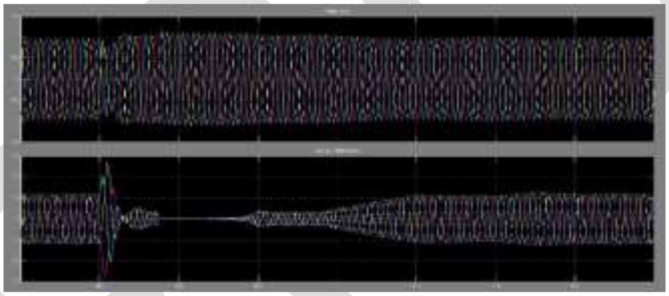

Fig.13: AC voltage and inverter v/s time on Rectifier Side

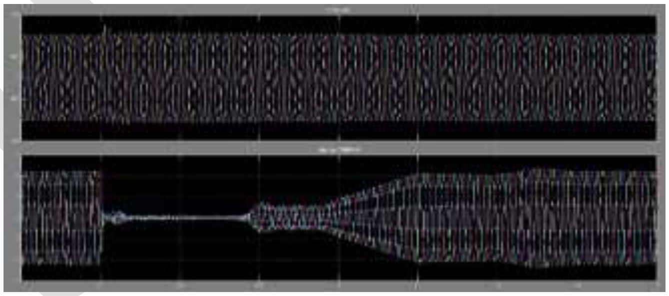

Fig.14: AC voltage and current v/s time on Inverter Side

At t=0.7s, V_{abc_r} decreases to 0.7 pu and V_{abc_i} increases to 1.3pu but I_{abc_r} increases to 25 pu/100 MVA and I_{abc_i} decreases to 1pi/100MVA. Then at t=0.73s, V_{abc_r} increases to 1.1pu and V_{abc_i} decreases to 1.1pu and I_{abc_r} decreases to 2 pu/100 MVA and I_{abc_i} increases to 2 pu/100 MVA. At t=0.75s, both V_{abc_r} and V_{abc_i} remains same and I_{abc_r} increases to 5 pu/100 MVA and I_{abc_i} decreases to 0.5 pu/100 MVA. At t=0.85s, V_{abc_r} and $_{Vabc\_i}$ decreases to 0.95pu and 1.05pu respectively and I_{abc_r} and I_{abc_i} increases to 10pu/100 MVA and 4 pu/100 MVA respectively. At t=1.2s, both V_{abc_r} and V_{abc_i} increases to 1 pu and I_{abc_r} and I_{abc_i} increases to 13 pu/100 MVA.

CONCLUSION

This paper concludes with the observation that whenever the system is simulated, the controller increases the reference current slowly with the ramp so that transient surges are prevented from occurring so that the dc current and voltage increases with the reference current and becomes constant at the steady state. Also if any fault occurs in the HVDC system the system detects the fault and extinguishes the fault automatically without changing the system parameters making the system stable.

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GLCM Based Feature Extraction of Neurodegenerative Disease for Regional Brain Patterns

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Abstract—An accurate diagnosis of Alzheimer's diseases (AD) based on saliency map and gray level co-occurrence matrix (GLCM). Extracting salient features of input brain magnetic resonance image (MR) and the region of interest is identified using grey level co-occurrence matrix (GLCM). In GLCM method, the matrix is converted into vector that can be used in classification process. This paper gives fully automatic image analysis method and endeavor an approach for classification of brain images to find out pathology and normality part of brain. A support vector machine (SVM) a supervised learning process is used for classification of AD, which is identified as blue color is associated with normal part and red color is associated with pathology related.

Keywords— gray-level co-occurrence matrix (GLCM), Alzheimer's disease (AD), support vector machines (SVMs), saliency map, Anatomical patterns, normal controls (NC).

INTRODUCTION

Neurodegenerative diseases mainly affect central nervous system. Neurodegenerative is combination of two words; they are Neuro means 'nerve cell' and Degeneration means 'progressive losses' .Overall definition of Neurodegenerative diseases is progressive loss of memory that includes loss of neurons and death of neurons that intern leads to loss of structure of nerve and functions of nerve. Examples of Neurodegenerative diseases are Parkinson's, Alzheimer's and Huntington's disease. An Alzheimer's diseases start as small or mild and progressively it will get worse. The symptom of Alzheimer's diseases includes loss of thinking skills, memory and behavioral changes.

The diseases is characterized under three stages based on functional differences, those are pre-dementia, moderate and advanced. In pre-dementia, those are like short time memory loss; in this it shows that difficult to remember the recent happened facts. In early stage the patient faces difficulties with perception and language. In moderate stage the performance of most common daily living activities is forgotten and speaking difficulties also occurs. In advanced or final stage the patient is completely depend upon others or caregivers and language is reduced to phrases or even single word this leads continuous loss of speech.

Neuroimaging may become a valuable tool in the early diagnosis of neurodegenerative disorder such as Alzheimer diseases. By separating structural arrangement and explain hidden relationship from basic magnetic resonance (MR) images. Neuroimaging include the extraction of anatomical patterns is based on visual saliency maps. Those saliency maps are used to differentiate between Normal controls (NC) and Alzheimer's diseases (AD)

RELATED WORK

The previous methods used for classification of Neurodegenerative diseases are fully automatic segmentation method is carried out by "Chupin M, Geradin E and Boutet C" [1].The results are compared with eight patients with Alzheimer disease (AD). The classification method proved accuracy is 60 to 80 percentages. In second method uses different learning parameters and maximum like hood method "Zhang D, wang Y"[2]. This method is to classify the data images and the accuracy is 74 percentages on classification process. In third method "Christos Davatzikos, Yong Fan"[3] proposes that cross validation of Alzheimer diseases differentiation via pattern classification method using mci group images uses a detection of pattern of brain diseases that leads to 90 percentage of classification accuracy.

In existing system for analyzing the Discriminative Anatomic pattern Voxel-based morphometry (VBM) and Deformation-based morphometry (DBM) methods were used. In VBM, the patterns were examined by local differences, found in brain tissue segmentations, are voxel-by-voxel statistically analysed. In DBM compared information which from the deformations fields obtained after registration to the template, in these methods one-to-one correspondences between subjects are assumed and statistics are computed for the same voxel across all subjects. Finally the recent approach for Brain Pattern were diagnosed with feature-based morphometry (FBM) technique, In FBM approach is represented by scale-invariant salient features, along with a probabilistic framework that together permit to evaluate the significance and differentiation degree of salient features, Which established differences between normal controls and probable AD patients. These sets of features are considered as group-related anatomical patterns. It recommends neuroimaging may become an important tool in the early analysis of neurodegenerative disorder. By separating structure arrangement and explain hidden relationship from basic magnetic resonance (MR) images. An automated intellect morphometric search that do behave this measure to give very little to the apprehension of the disease. In preceding ROIs portrait are highly time-exhausting and expert-reliant. This approach is able to graph any intellect to a set of optical designs that previously have been studied as they related to the medicinal or normal position. By applying the Voxel Based Morphometry (VBM) for feature selection and extraction of the most relevant features. Finally using this Feature Extraction values classify the values by using the SVM Classifier. The constant checking system is achieved by expert neurologists or radiologists, who are able to figure out complicated structural patterns and slight changes with clinical context. Finally they identify the Alzheimer's disease.

PROPOSED WORK

The proposed method contains two sections, trained section and test section. In trained section first all the images to be trained and stored in database as database brain images. After that test one by one brain image for further classification process of Alzheimer diseases.

Brain images from the database are given as input then the given input image is converted into Gray image so that computation in mat lab is reduced. All images should be processed in Gray format. The converted Gray image is passed through saliency method to get saliency map. After getting saliency map it compares with some predefined threshold values which is stored in dot mat file and gives saliency map of input image. After getting saliency image the normalization process is carried out so that range of pixel intensity values changes. After saliency calculation the fusion method is carried out to get master saliency of each scaled images. Using Gray-level co-occurrence matrix (GLCM) method depending on feature values the relevant information is extracted, classified using SVM classifier and anatomical pattern analysis is done. Support vector machines are supervised learning model that associated with learning algorithms that used to analyze the data and identify the patterns which are used for classification process and map the trained data to classify accurately. Red regions are associated with pathology and blue regions are associated with normality for identification of brain diseases. In this way anatomical interpretation is done. Performance analysis is based on accuracy, sensitivity and specificity is done.

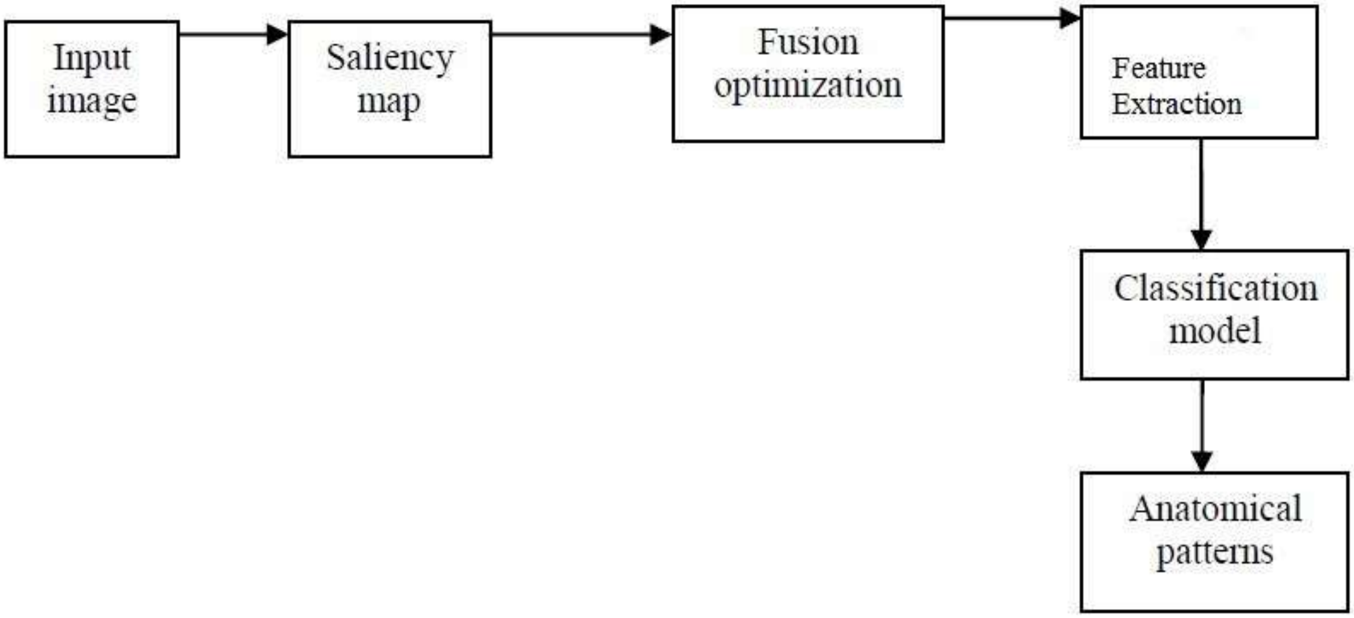

Figure A: Block diagram of proposed system

From the figure itself, it is very well understood that the proposed system is consisting of mainly six steps.

1. Saliency map
2. Normalize
3. GLCM based Feature Extraction
4. SVM classifier
5. Anatomical interpretation
6. Performance analysis

1) Saliency Map

An Automatic estimation of regional (salient) object regions across brain image without any prior knowledge of the contents of the corresponding scenes. Introduce a contrast based salient object extraction algorithm which simultaneously evaluated global contrast different and spatial weighted coherence scores. Proposed algorithm is simple, efficient, and naturally multiscale and produces full resolution high-quality saliency maps.

This saliency map module gives the saliency map of given input brain image that maps the each feature into its neighboring pixel feature so that degree of difference is calculated using Euclidian function. Each feature maps into a complete measure using saliency map that combines related information from single information into a global measure. Saliency typically calculated from contrasts between the given location and their neighborhood. There are three methods for calculation of saliency maps first one is feature extraction second one is activation maps and third is combination.

In figure B the saliency map construction is shown. The input brain image is divided into multiple of three scales and based on intensity orientation and contrast the features are extracted of each scaled images and saliency calculation is done using above three methods and kernel k-means method and all three images summed together to get master saliency map. The main method is to get saliency map of given input image, based on orientation, intensities and contrast as shown in figure B.

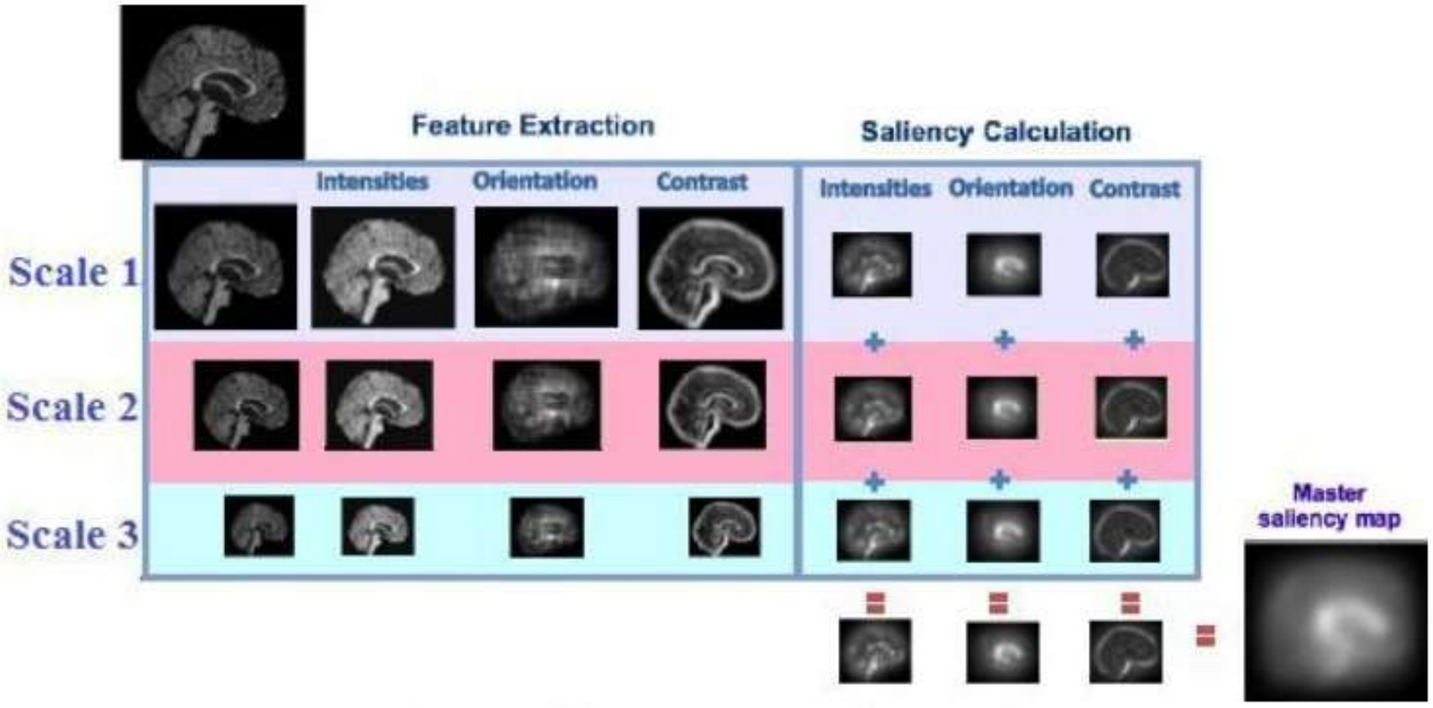

Figure B: Saliency map construction

2) Normalize

This normalize module, a process that changes the range of pixel intensity values In normalization process same constant dimensions are identified and differentiated, so that it is used to produce anatomical regions. Applications of normalization process include photographs with poor contrast due to glare. Sometimes normalization process also called contrast or histogram stretching. General Fields of data processing such as digital signal processing it is referred to as dynamic range expansion. To changing the Intensity, Coordinates values etc.….In image processing, normalization is a process that changes the range of pixel intensity values. In image processing auto-normalization software typically normalizes to the full dynamic range of the number system specified in the image file format.

3) Gray Level Co-occurrence Matrix (GLCM) based Feature Extraction

A feature is an image characteristic that can capture certain visual property of the image. Texture is an important feature of many image types, which is the pattern of information or arrangement of the structure found in a picture. A co-occurrence matrix, also referred to as a co-occurrence distribution, is defined over an image to be the distribution of co-occurring values at a given offset. It represents the distance and angular spatial relationship over an image sub region of specific size. The GLCM is calculates how often a pixel with gray-level (grayscale intensity or Tone) value i occurs either horizontally, vertically, or diagonally to adjacent pixels with the value j. GLCM contains the second-order statistical information of neighboring pixels of an image. Textural properties can be calculated from GLCM to understand the details about the image content. Gray Level Co-occurrence Matrix is a tabulation of how often different combinations of pixel brightness values occur in an image. GLCM contains the information about the positions of pixel having similar gray level values. GLCM calculation units receive pairs of gray level values as input. The GLCM calculation unit consists of the different combinations of gray values. This gives the deviation present in the image when compared with original image by predictive image.

4) SVM Classifiers

Support vector machines (SVMs) also called support vector networks are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. Given a set of training examples, each marked as belonging to one of two categories, an SVM training algorithm builds a model that assigns new examples into one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible.

5) Anatomical interpretation

Red regions are pathology and blue regions are normality for identification of brain diseases. The discipline of anatomy is divided into macroscopic and microscopic anatomy. Macroscopic anatomy, or gross anatomy, is the examination of an animal’s body parts using unaided eyesight. Gross anatomy also includes the branch of superficial anatomy. Microscopic anatomy involves the use of optical instruments in the study of the tissues of various structures, known as histology and also in the study of cells. The history of anatomy is characterized by a progressive understanding of the functions of the organs and structures of the human body. Methods have also improved dramatically, advancing from the examination of animals by dissection of carcasses and cadavers (corpses) to 20th century medical imaging techniques including X-ray, ultrasound, and magnetic resonance imaging. Anatomy is the study of the structure of animals and their parts, and is also referred to as zootomy to separate it from human anatomy. The discipline of anatomy is divided into macroscopic and microscopic anatomy. Macroscopic anatomy, or gross anatomy, is the examination of an animal’s body parts using unaided eyesight. The history of anatomy is characterized by a progressive understanding of the functions of the organs and structures of the human body. Red regions are pathology and blue regions are normality identifying the diseases in brain. In this way anatomical interpretation is done.

6) Performance analysis

Performance analysis is based on accuracy, sensitivity and specificity is done. Result analysis of our process accuracy, sensitivity, specificity. To avoid the possible inflated performance estimation on the unbalanced datasets, the balanced classification accuracy was also computed, a simple arithmetic mean of the sensitivity and specificity. The balanced accuracy (BAC) removes the bias that may arise by imbalanced datasets. In a binary classification problem, if the classifier performs equally well on either class, BAC reduces to the ordinary accuracy. If, however, the classifier has taken advantage of an imbalanced dataset, then the ordinary accuracy will be inflated, whereas the BAC will drop to chance (50%), as desired. The time is set aside during the training phase and then classified using the SVM model trained with the remaining subjects. To avoid the possible inflated performance estimation on the unbalanced datasets. The balanced accuracy (BAC) removes the bias that may arise by imbalanced datasets. The balanced classification accuracy was also computed, a simple arithmetic mean of the sensitivity and specificity. Result analysis of our process accuracy, sensitivity, specificity.

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CONCLUSION

In this paper the accuracy of 96% is achieved using saliency map characterization and gray level co-occurrence matrix(GLCM) method is adapted which is very useful in differentiation of Neuro degeneration diseases with better accuracy. The thesis has introduced and adapted biologically inspired methods for identification of diagnostic-relevant image regions in a very complex and challenging problem, the Alzheimer's disease (AD). The automatic strategies herein developed have included prior anatomical and medical knowledge within the morpho-metrical analysis. The set of proposed tools constitute an innovative framework in the context of anatomical studies: sparse-based representations and visual attention methods, together with machine learning techniques, provide efficient representations of the image content in terms of visual features, leading to the discovery of visual patterns directly related with a specific pathology. The present investigation has included an extensive validation and parameter study, evaluating both its accuracy for discriminating different experimental groups and its capacity of determining the relevant anatomical regions together with their weights. Regarding discriminative power, different parameters involved in the top-down and bottom-up information flows, were assessed in terms of classification accuracy, allowing identifying the influence of the different visual features and image scales in the final discrimination between AD and NC classes. The simpler version of our proposal (combining a single saliency-based kernel with SVM learning) has reached an equivalent performance to a state-of-the-art approach. Finally, we want to highlight that the quality of the model is not only given by the quantitative performance measures, but by its aptness to automatically detect highly discriminative brain regions, consistent with those regions that have been described as important in the progression of the disease.

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AN APPROCH FOR PASSWORD AUTHENTICATION USING HONEYWORDS

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Abstract— The number researches are taking place in the field of security of passwords and here we know that our passwords are steeled very easily and it has been hacked by the hacker or an adversary to find the data which is very confidential that is it can be bank account ,it can be facebook account .sometimes an adversary steals the hashed passwords and tries to find out the password of the particular account So if password is hashed the attacker finds it difficult to crack the password and malicious attacker uses Brute force attack method .I propose a simple straightforward method for improving the security of the hashed passwords ,which helps in adding the additional words called "honeywords" to the passwords. The honeywords are also called as false words and are associated with each and every user account. The hacker who steals a file of hashed passwords and modifies the hash function cannot tell whether he has got the password or not. The attempted use of a secret word for login sets off alarm . the auxiliary server ie honey checker can differentiate the user secret from honey words by setting off the alarms.

Keywords— Honeywords, honeychecker , password authentication, Userlogin, user registration ,hashed passwords

1. INTRODUCTION

Within the authentication technique it turns into hard to deal with safety of passwords because there are n range of end users using many on line accounts like facebook, Gmail, linkedin.,on-line bank money accounts so on. here for each user there can be specific online account and these online accounts could be secured with username and password . that’s why password have become the maximum important asset to login but end-users pick out susceptible passwords so the end users deliver very friendly and easy password that can be anticipated with the aid of the attacker the use of brute force, dictionary, rainbow desk assaults and many others. So it turns into much easier to crack a password hash. An adversary can get better a user’s password the use of brute-force attack on password hash. once the password has been recovered no server can detect any illegitimate user authentication. So Honeywords performs an vital role to protection towards stolen password files. specifically, they may be misleading passwords located inside the password report of an authentication server to misinform attackers. Honeywords resemble regular, user-decided on passwords. An auxiliary service known as a honeychecker assessments whether or not a password submitted by using a user on login is her genuine or true password or a honeyword. The password system itself stores a given person’s password randomly alongside honeywords. The past 12 months has also visible numerous excessive profile thefts of files containing end users passwords; the hashed passwords of Ever note's 50 million customers have been exposed as were the ones of end users at Yahoo, LinkedIn, and e-harmony, amongst others . one billion guess is enough to crack %40.3 of the passwords that comply with the “basic8” policy, i.e., all passwords must have at least 8 characters. Golubev showed that the cracking speed of hashes has reached 5.6 billion/s for MD5 and 2.3 billion/s for SHA1 on a single GPU [2]. One approach to improving the state of affairs is to make password hashing very complex and time-consuming.

2. LITERATURE SURVEY

Users reuse the passwords for login high important account and the reason behind that was it easy to remember also passwords were extremely weak: being too short, containing lowercase letters only, digits only or a combination of the two, or being easily found in dictionaries or lists of names.[13].

So There will be n number of attacks on passwords ,and the attack description is as shown below

2.1 TYPES OF ATTACK FOR PASSWORD :

There are n number of attacks made by the cyberpunk to crack the passwords so here is the table of attacks as shown below:

SL NO	NAME OF ATTACK	DEFINITION
1)	**BRUTE FORCE ATTACK**	when the cyberpunk make use of some set of code lines or script to find the feasible combos of passwords and the hacker will be able to guess the easy passwords by using the dictionary and so on .Consider if the cyberpunk has the list of all the employees working in software company and think that he wants the more confidential data from that company and consider there is a employee named "reshma" and think that she has password "reshma123",he can easily logon to that account.
2)	**DICTIONARY ATTACK**	According to the survey ,we all realize that password are very hard to cope with in terms of the authentication .And for the quit users its tough to remember the more than one passwords for the more than one account so right here the users deliver the very easily guessable password so the cyberpunk makes use of all the set of dictionary phrases to crack the password this assault is known as dictionary attack.
3)	**MALWARES**	A Trojan program can capture the key strokes and send this information to the adversary [4]. There are some advanced malwares that can steal the login information from messenger like Software's some of which does not keep the login information encrypted [5].
4)	**VISIBLE PASSWORDS**	A password that is written to a stickie may be seen by an adversary. He can also Watch a user even as she enters her password. This is nothing but the shoulder surfing.
5)	**PHISHING ATTACK**	A user can submit her login information to a web page prepared by an adversary Which seems very likely to the original system's login screen? This technique is relatively new, the First attempt was reported in the mid-1990s [3].

3 PROBLEM DEFINITION

The n number of end users use identical password on distinctive systems. An antique password of a end users on a few machine may be the cutting-edge password of that person on every other system. So to protect the data from the cyberpunk we propose a simple straight forward technique for improving the security of hashed passwords by adding the extra false passwords to the current passwords and putting the cyberpunk into dilemma.

4 PURPOSE AND SCOPE OF THE PROPOSED SYSTEM

- we should make the cyberpunk to get confuse by including the fake information of the account.
- Here the password misuse can be protected from the cyberpunk for the further access of the user account.
- The important purpose of the project is to validate the user data access this helps in preventing the misuse.
- So here we propose the simple straight forward method to improve the security of hashed passwords by using the honeywords called as false passwords .
- And we have a honeychecker a distinguished server that displays the all the users who have tried to login to the particular account.

5 PROPOSED ALGORITHM

The algorithm for the proposed project is as shown below to prevent the data for misuse from the cyberpunk

```
Step 1 :  Start
Step 2 :  Fill the details for registering to the account
Step 3 :  Enter the User Credentials like password or the database
Step 4 :  while entering the details of the User here the system displays the IP address of a particular machine which
enhances         the security of authenticating password.
Step 5 :  enter the username
Step 6:  If(User==Null)
             Display the message please enter the user name

         Else if(Username != true )
             Create the honeyword i.e. false password using the SHA-1 Algorithm.
             The creation of the false database  and raises the alarm to the administrator
             Then Displays the  end users who have logged into the particular account in the honeychecker
Step 7 : Enter the password
Step 8 : :  If(password==Null)
             Display the message please enter the password

         Else if(password != true )
             Create the honeyword i.e. false password using the SHA-1 Algorithm.
             The creation of the false database  and raises the alarm to the administrator
             Then Displays the  end users who have logged into the particular account in the honeychecker (The auxiliary
server)
Step 9 : if (username && password  && IP address== true)
        Login to the system and displays message a successful login
```

Step 10 : Exit

6 MATHEMATICAL MODEL

Consider we have database "DB" and "P" number of attribute such as login id, end username, Phone number, photo of the end user and so on

$DB = \{R|R \,\varepsilon\, \text{Information of user}\}$

Here DB is the set of all R such that R is information of end user which is to be store on server.

Consider following function

STORE (DB, SERVER):

Here admin uploads the user information into database at server.

- Let us consider that the receiver provide us with value “S” for every input it obtain from the every time login account of the particular end user .so we can further assume to have a set X to have value “P‟ number of detect value at particular instance.

Let us denote the current situation in the following manner $Z \,\varepsilon\, DB \;\exists\; ID$ for attacker$\}\forall T = \{X|$ Here S is the set all X such that for all X there exits Id for user. Now, for some A value that match with some value inside the database when admin check user account update.

1. GET(D,X,SERVER): Admin get all the details about the end user account from the server which he tries to login.
2. PUT(X,ATK,SERVER): The admin will upload attackers details on server.
3. UTP(X,REPORT,SERVER) : The admin upload daily report on server.

7 FUTURE SCOPE

Consider the scenario when the cyberpunk by chance finds the password and directly he can login into the account and get the details so to avoid this chance we can also enable the One time password and we can verify the end users phone number .And for providing much more security for the password we should make hash function very complex such that cyberpunk cannot crack the password.

8 CONCLUSION

The honeywords are very simple to implement and a easy technique .Such that here by using the honeywords we can put cyberpunk in dilemma and we can easily raise the alarm to the administrator and we can overcome all the disadvantages of the current system. And here the main drawback of this project is Storage in future we can work on this.

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INTERACTIVE EXAMPLE-BASED COLOUR TRANSFER USING SPEEDED UP ROBUST FEATURE

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Abstract— Example based colour transfer aims at copying the colour appearance from a given example to a target colour image. The presences of corruptive artifacts in example based colour transfer can be suppressed using self learning filtering scheme. Object preservation is the main problem of example based colour transfer. During Colour transfer some objects in the target image will be covered with some unwanted colours .This can affect the natural look of object. This paper presents an interactive example based colour transfer which aims at corruptive artifacts suppression along with objects preservation. In this user can select the object that he wishes to preserve. Using this method we can avoid presences of unwanted colours of object in the target image. The proposed system mainly consist three main stages. Colour transfer stage, segmentation stage, and replacement of the extracted object. In the colour transfer stage, an iterative probabilistic colour mapping with self-learning filtering scheme and multiscale detail manipulation scheme is used. Next, the segmentation stage is based on speed up robust feature (SURF) algorithm. For finding point correspondences between two images of the same scene or object we can use SURF algorithm. In this stage the object that the user wants to preserve gets extracted. Finally, the extracted object will replaced to target image without any colour change. PSNR and SSIM shows that the proposed method will produce better result than the previous methods.

Keywords—Colour transfer, Example based colour transfer ,Segmentation, SURF, Object Preservation, PSNR, SSIM, Self-learning filtering

1. INTRODUCTION

Colour is the one of the most essential feature of an image. Colour manipulation has very large application in film industry. Example-based colour transfer is an automatic method of colour manipulation. Which aims at copying the colour from a given reference image to a target. It has various applications in movie post production, artistic and photo enhancement. A normal colour transfer algorithm should keep the scene of the source image and apply colour to the target. As no colour transfer algorithms are ultimate, most of them produce some unsatisfactory result.

Quick development has been witnessed in the last decade in the field of color transfer. Representative approaches include classical histogram matching, Statistical transfer [2], N-dimensional probability density function transfer [3], Gradient-preserving transfer [4], non-rigid dense correspondence transfer [5] and progressive transfer [6]. Even though these approaches are effective in transferring the color information, they would occasionally produce visual artifacts, due to the big difference in the intensity distribution between the reference and the target, an unsatisfactory transferred result was produced, with remarkable artifacts .Corruptive artifacts suppression for example based color transfer [1] specify the corruptive artifacts suppression in example- based colour transfer using self-learning filtering scheme. Based on the application of colour transfer, we want to develop a new colour transfer algorithm using user interaction.

In this paper, a colour transfer framework is proposed which aims at corruptive artifacts suppression along with object preservation. First using iterative probabilistic colour mapping the colour transfer is performed. Next, the object in the target image which the user wishes to preserve, without any colour transfer effect is extracted. This is done by segmentation using speeded up robust features (SURF). Finally, the extracted object is replaced to the colour transferred image. As a result the object retains its colour even after colour transfer.

2. RELATED WORKS

In this section we have analyzed different techniques for transferring colour among images. We have reviewed various methods for colour transfer between images. And also analyzing some colour transfer method with object preservation is also discussed. And finally summarize their advantages and defects.

The histogram matching [9] is able to specify the shape of the referred histogram that we expect the target image to have. However, histogram matching can only process the color components of the color image independently. Since the relationship of the color components are separated, this approach would produce the unsatisfactory look, e.g. grain effect, color distortion. Reinhard *et al.* [2] firstly proposed a way to match the means and variances between the target and the reference in the low correlated color space. This approach was efficient enough, but the simple means and variances matching were likely to produce slight grain effect and serious color distortion. Abadpour *et al.* [12] proposed the exploited principal component analysis (PCA) and created a low correlated and independent color space to reduce the color correlation. Pitié *et al.* [3],[11] proposed an N-dimensional probability density function transfer approach to reduce the high-dimensional PDF matching problem to the one-dimensional PDF matching by Radon Transform [9]. This operation can reduce the color correlation and keep the color distribution of the transferred result consistent with that of the reference. However, it would lead to the variance of image contents as the pixel intensity changed.

Corruptive artifacts suppression for example-based color transfer [1], discuss the corruptive artifacts suppression in example based color transfer, which suppress the corruptive artifacts like color distortion, grain effect and loss of details. This method is an automatic colour transfer approach. Some applications of example-based colour transfer needs a user interactive example based colour transfer that preserve objects in the target. In this proposed a speeded up robust features (SURF) based colour transfer framework with object preservation, using this user can select the object he likes to get preserved. PSNR and SSIM show that the system has good performance than the previous methods.

3. PROPOSED SYSTEM

The proposed system mainly consists of three main stages. Colour transfer stage, Segmentation stage, Replacement of the extracted object. In the colour transfer stage, transfer the colour of the reference to the target using an iterative probabilistic colour mapping with self- learning filtering scheme and multiscale detail manipulation scheme is used.

In the segmentation stage we extract the object in the target without any colour transfer. For that first we want to create ground truth segments of all objects in the target images and store it as a SURF database .Then after colour transfer user needs to input the object in the target image that he wants to preserve. For segmentation we use speeded up robust feature (SURF) algorithm. The object and target image without colour transfer is passed to the SURF function for extracting the object from the target image. SURF mainly consist three stages. First, the interest point detection: in this stage we extract the feature point of target and the corresponding ground truth segment of the object. Next, the local neighborhood descriptor: in this stage finding feature points in the neighborhood of the point of interest of the target and the ground truth segment. Last, matching: by comparing the descriptors obtained from target and the ground truth segment, matching pair can be found. After all these stages the required objects get extracted. Finally, the extracted object will replaced to the corresponding location of the colour transferred image. In this project we can also preserve multiple objects in the target image based on user needs

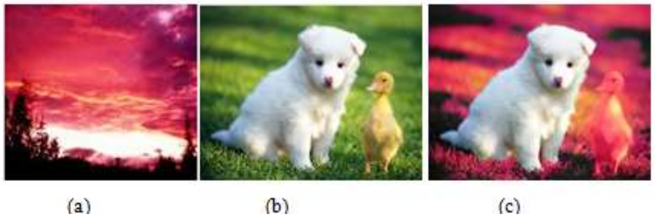

Figure 1. Interactive Example based colour transfer with object preservation (a) Reference. (b) Target. (c) After colour transfer, colour of the puppy is preserved

Figure 2. Interactive Example based colour transfer with multiple object preservation (a) Reference. (b) Target. (c) Boat gets preserved after colour transfer. (d) Boat and sea are preserved after colour transfer

The proposed system mainly consist two methods. First, for colour transfer we use an iterative probabilistic colour mapping with self-learning filtering scheme and multiscale detail manipulation scheme is used. Next, for segmentation we use speeded up robust feature (SUFR) algorithm.

3.1. Colour transfer method

The colour transfer is achieved using three stages: probabilistic colour mapping along with self learning filtering, and multi-scale detail manipulation as in [1]. In probabilistic colour mapping, N-Dimensional colour vector pairs are transformed to 1-Dimensional distribution. This matches colour distribution of target image to that of reference. Correlated property of colour results in colour distortion. So decorrelation can be used to solve this issue using homographic transformation (iterative). Then channel quantization is performed and afterwards 1-Dimensional probability density distribution is calculated. The colour mapping can be calculated through no of equations in various steps [1] as follows: Projection with randomized orthogonal transform is defined as,

$$H = [I|R]^{*} Qn \ldots\ldots\ldots\ldots (1)$$

Where I is a 3*3 identity matrix, R is homography coefficient, Qn is randomized orthogonal matrix (n times iteration). Channel quantization

$$G = H^{*}g \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$R = H^{*}\ r \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$Smin = \min (G, R) \ldots\ldots\ldots (4)$$

$$Smax = \max (G, R) \ldots\ldots\ldots (5)$$

$$S = (Smax - Smin)/q \ldots\ldots (6)$$

Where g is a transferred result, r is reference image, q is steps of quantization. 1D probability density distribution:

$$(g) = Hist(S,G) \ldots\ldots\ldots\ldots (7)$$

$$\rho\ (r) = Hist(S,R) \ldots\ldots\ldots (8)$$

$$\tau = \text{HistMatch}\ (\rho(g),\ \rho(r))\ldots\ldots..(9)$$

Where Hist is the function for histogram generation. Then the histogram of target is matched with reference using the HistMatch function. The color mapping is iteratively updated until the target color atmosphere gets closely matched to that of reference. In self-learning filtering, an edge-preserving smoothing operation is done with reference image. It is incorporated it into the probabilistic color mapping. Output from color mapping produces grain effects. In order to solve this we are introducing a filter. It is an edge preserving filter. Based on mean and variance linear coefficients are calculated. In Multiscale Detail Manipulation, details in the original target should be preserved after the transfer. Since the self-learning filtering scheme is added into the color mapping, its property of edge-preserving decomposition to extract the details while preserving or enhancing them in the transferred output can be exploited.

Figure 5. Example based Colour transfer with Self- learning filtering (a) Reference. (b) Target. (c) Colour transferred

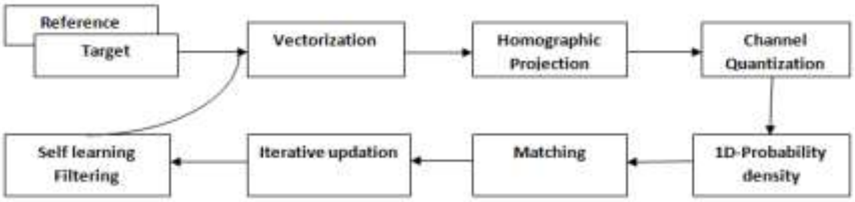

Figure 4. Block diagram for example based colour transfer with corruptive artifacts suppression

3.2 Segmentation method

For segmentation we use speeded up robust feature (SUFR) algorithm [2]. For finding point correspondences between two images of the same scene or object we can use SURF algorithm. The algorithm has three main parts interest point detection, local neighborhood description, and matching.

3.2.1 Interest point detection

SURF uses a blob detector based on the Hessian matrix to find points of interest. The determinant of the Hessian matrix is used as a measure of local change around the point and points are chosen where this determinant is maximal. In contrast to the HessianLaplacian detector by Mikolajczyk and Schmid, SURF also uses the determinant of the Hessian for selecting the scale, as it is done by Lindeberg. Given a point p=(x, y) in an image I, the Hessian matrix H(p, σ) at point p and scale σ, is defined as follows:

$$H(p,\sigma) = \begin{pmatrix} L_{xx}(p,\sigma) & L_{xy}(p,\sigma) \\ L_{xy}(p,\sigma) & L_{yy}(p,\sigma) \end{pmatrix}$$

Where $L_{xx}(p,\sigma)$etc. are the second order derivatives of the grayscale image.

3.2.2 Local neighborhood descriptor

The goal of a descriptor is to provide a unique and robust description of an image feature, e.g., by describing the intensity distribution of the pixels within the neighborhood of the point of interest. Most descriptors are thus computed in a local manner; hence a description is obtained for every point of interest identified previously. The first step consists of fixing a reproducible orientation based on information from a circular region around the interest point. .Then we construct a square region aligned to the selected orientation, and extract the SURF descriptor from it.

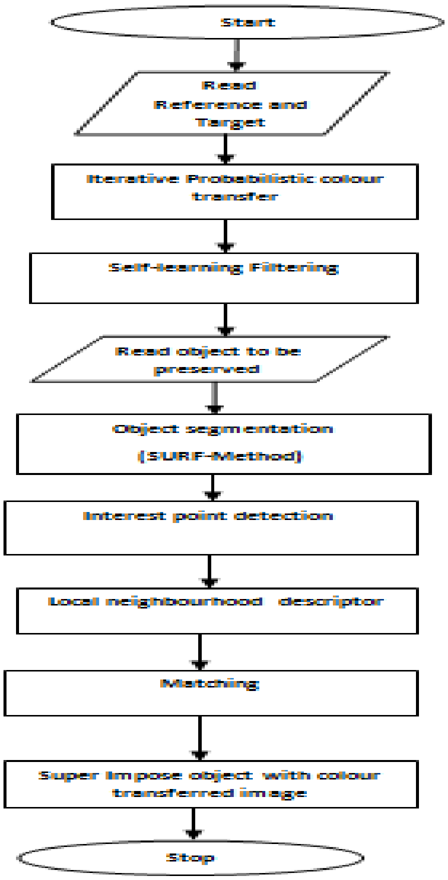

Figure 3. The flow chart of the proposed method

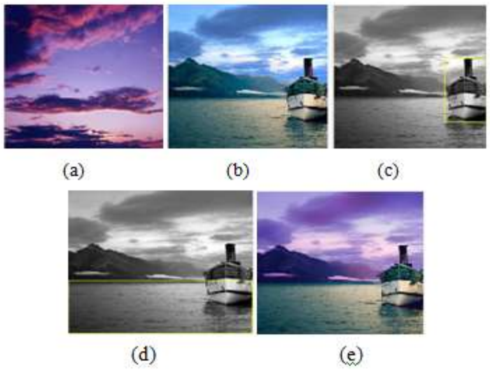

Figure 7. SURF based image segmentation for object preservation colour transfer .(a) Reference (b) Target.(c) Detecting boat in the target using SURF (d) Detecting sea in the target. (e) Boat and Sea get preserved

3.3.3 Matching

By comparing the descriptors obtained from target and ground truth segments, matching pairs can be found.

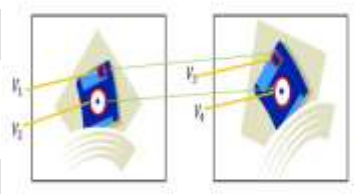

Figure 6.SURF summary

4. RESULTS

In the proposed method, PSNR and SSIM are used as a parameter to compare the system with existing methods. The peak signal-to-noise ratio or PSNR is the ratio between the maximum value of a signal and the power of disturbing noise. Performance evaluation using PSNR was conducted on a group of colour images to verify the effectiveness of the proposed scheme. Several set of images like the white puppy, house, and Camel etc. where chosen as test images. Two conditions was checked, one without structure preservation and the other with structure preservation. For both cases the values noted where different. The colour transferred images with structure preservation yielded the higher PSNR value. Higher the PSNR value, lesser will be the noise and the colour atmosphere of structure preserved target image will look more similar to the colour of the target. The proposed system with structure preservation yielded higher PSNR value, thus the structure is more correctly preserved than in colour transfer without structure preservation. The reference and target images where randomly chosen by the user. And the results from images proved that the proposed system has a better result compared the existed systems and yielded the higher PSNR value. The comparison of PSNR values is shown in Table 1.

The other parameter for performance evaluation is, Structural Similarity (SSIM).SSIM is used for measuring the similarity between two images. The SSIM index is a full reference metric; in other words, the measurement or prediction of image quality is based on an initial uncompressed or distortion-free image as references. SSIM is designed to improve on traditional methods such as peak signal-to-noise ratio (PSNR) and mean squared error (MSE), which have proven to be inconsistent with human visual perception. As same as that of PSNR performance evaluation using SSIM was conducted on a group of colour images to verify the effectiveness of the proposed scheme. SSIM of without structure preservation and with structure preservation is tested. For both cases the values noted where different. The colour transferred images with structure preservation yielded the higher SSIM value. Higher the SSIM value, structure is more similar to that of target. The proposed system with structure preservation yielded higher SSIM value, thus the structure is more correctly preserved than in colour transfer without structure preservation. The comparison of SSIM values is shown in Table 1.

Figure 8.Performance evaluvation of sample image

Target Image	Reference Image	PSNR		SSIM	
		Without Preservation	With Preservation	Without Preservation	With Preservation
Boat	Sunset	5.117	8.366	0.0090336	3.0075
Camel	Sunset	4.1588	7.0708	0.0069848	3.0068
Puppy	Sunset	5.0176	7.9524	0.0097518	3.0093

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7. CONCLUSION

In this proposed method an interactive example based colour transfer with object preservation is introduced. This framework proposes a speeded up robust features (SURF) based colour transfer framework with object preservation, using this user can select the object he likes to get preserved. The proposed system mainly consist three stages, first an iterative probabilistic colour transfer with self learning filtering and multiscale details manipulation scheme. Next, a SURF based object segmentation, in this stage we extract the object that the user wants to preserve. Finally the extracted object is superimposed on the colour transferred image. Multiple objects can also be preserved in this method. In addition, to evaluate the quality of colour, transfer, propose a series of objective and subjective measurements including PSSNR and SSIM. In this project we can also preserve multiple objects. By the experimental analyses in the objective and subjective data, we found that this framework had better performance than the state-of –the art approaches, especially in dealing with the object preservation. This framework can achieve colour reliability, grain inhibition and also object preservation. An interactive example based colour transfer with object preservation has very large applications in film industry, graphics design and photo enhancement. In the future, we will extend our framework to video editing.

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A Brief Review: Compressed Sensing of ECG Signal For Wireless System

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ABSTRACT

CS, as a new compression paradigm, relies on three main requirements: sparsity representation, incoherence measurement, and nonlinear reconstruction, which pertain to the signals of interest, the encoding modality, and the decoding method, respectively. The main goal of the CS is to accurately reconstruct a high dimensional sparse vector using a small number of linear measurements. As in wireless sensor networks they have used battery back-up for transmission of data to base stations and considerable energy has been lost during transmission of data packets. As in intra-hospital environment there is need of automated data collection system from different ECG acquisition nodes wirelessly handled by nurses/doctors, they send data to a single hub for further processing and by this they provide easiness of handling of ECG equipment's as there are no wires in this communications process. They send the acquired ECG signal by Zigbee etc. to nearest point. As ECG signals have repetitive pattern, they can be compressed and transmitted at the transmitter end and hence can save energy of the battery back-up of transmitters, there is need to explore compressed sensing for ECG signals. In this work we have studied the existed methods especially the better from all called DWT based compressed sensing techniques for ECG signals. Our aim is to propose further enhancements in the existed system. We have taken as objective for DWT and DCT combination which can be applied for getting better performance. In this work, we have reviewed some existed methods along with explanation of compressed sensing based on sparse matrices.

Keywords: Wireless sensor Networks, compressed sensing, Health monitoring, ECG signals, DWT AND DCT.

1. INTRODUCTION

Wireless body area networks (WBANs) and cellular network provides support for telemedicine. To facilitate early diagnosis and treatment the WBANs collect and transmit the crucial biomedical data to provide a continuous health monitoring by using various biomedical wireless sensors used for the human body. And then, collected signals are sent to a remote data center via cellular network. One of the features of WBAN is that its power consumption and sampling rate should be minimum. Compressed sensing (CS) is an signal acquisition/compression methodology which gives an alternative to traditional signal acquisition. Medical monitoring system helps doctors to remotely monitor the patient's medical condition and feedback in time. The whole system of hybrid wireless sensor network model contains the WBAN and cellular network is shown in Figure 1.

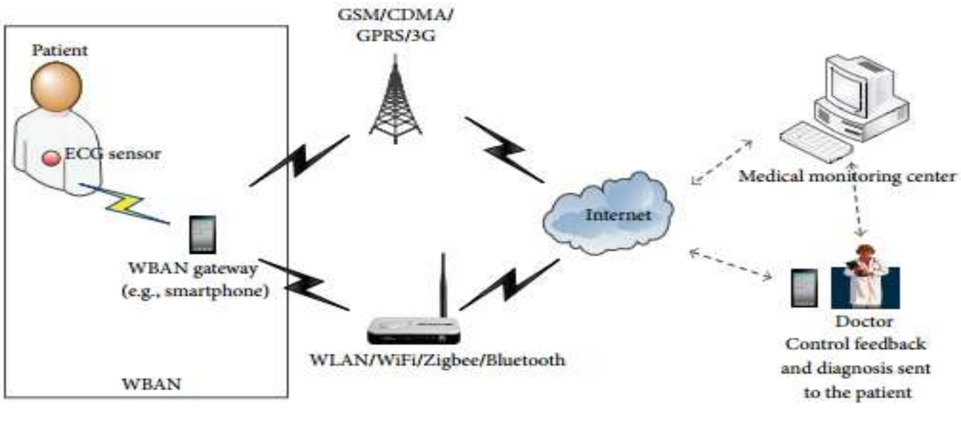

Figure 1: The whole system of hybrid wireless sensor network model.

For real-time health monitoring, devices must integrate into the patient's body which do not interfere with the daily activities of the patient. For continuously sensing, processing, and detection of signal and ECG sensor is used. The real-time ECG data are sent to a personal terminal by Wi-Fi, CDMA, 3G, or other cellular networks used for transmitting the ECG data to a remote data center. In the terminal, the original ECG signals are recovered by computers for diagnosis. By continuous remote heart monitoring, it can enhance ability of prevention and early diagnosis, improve patient condition, mobility, and security. The power in an ECG sensor is mostly consumed when the RF power amplifier transmits the signal to the personal terminal. A large amount of real-time ECG data is collected, stored, and transmitted to the terminal. Therefore it required to decrease the amount of data to be transmitted for reducing the energy consumption

2. COMPRESSIVE SENSING OF ECG SIGNAL

Compressive sensing is signal processing framework where the sparse signal is used and reconstructs it from the incomplete measurements, which contain insufficient amount of information. And can be achieved if the signal is in sparse representation with an orthonormal basis. , CS is given to the to electrocardiogram (ECG) signal for data compression in WBN network. Wavelet compressed signal is used for multi-lead ECG signal. Compressed Sensing based data collection system with wireless bio-sensors is used for bio-signals like ECG and EEG etc. In an ECG signal, essential diagnostic information such as P-wave, QRS-complex and T-wave. These components may carry pathological information. CS based signal processing is not change these information. Sparse representation is an very important compressed sensing of signal. Compression is required for reducing the storage space and transmission times. Thus, ECG data compression is required for efficient storage and transmission of signal for telemedicine applications. CS has some important advantages:

1. It provide simpler hardware implementations for the encoder;
2. The location of the largest not needs to be encoded.
3. It enables to reconstruct sparse or compressible signals from a small number of linear projections

2.1 APPLICATION OF COMPRESSIVE SENSING

CS is used in the linear-systems, sparse coding, multiplexing, sparse sampling,. Because of Its scope it uses in the several innovative CS-enhanced approaches in signal processing. it gives the solution of inverse problems in design of radiating systems, radar and antenna characterization compressive sensing Imaging techniques include coded aperture and computational photography

Photography

Compressed sensing used in the mobile phone camera to give acquire the image efficiently.

Holographysss

Compressed sensing is used in the image reconstruction and image retrieval from sampled signal in many form of holography in the improved form.

Facial recognition

Facial recognition application also uses the compressed sensing.

Magnetic resonance imaging

Magnetic resonance imaging scanning can also used compressed sensing for sessions on conventional hardware

- ISTA
- FISTA

- SISTA.

Network tomography

Compressed sensing gives best result in network tomography to network management.

Shortwave-infrared cameras

Compressed sensing based Commercial shortwave-infrared cameras are avaivalable which contain light sensitivity from 0.9 µm to 1.7 µm those wavelengths invisible to the human eye.

2.2 ALGORITHMS OF COMPRESSIVE SENSING

The algorithms are used reconstruction signal and give better performance.

Matching Pursuit

Matching pursuit is an iterative algorithm that decomposes a signal into a linear expansion of functions to form a dictionary. At each iteration, matching pursuit chooses dictionary elements in a greedy fashion that gives best approximate of the signal

Orthogonal Matching Pursuit

Orthogonal matching pursuit (OMP) is an improvement on matching pursuit. Same principle is used in it. However rather than simply taking the scalar product of the residual and the new dictionary element to get the coefficient weight, we use the original function to all the already selected dictionary elements via least squares, hence it term as orthogonal matching pursuit. Orthogonal matching pursuit has been successfully used for signal recovery, however many problems regarding the performance in compressive sensing

Stage wise Orthogonal Matching Pursuit

Stage wise orthogonal matching pursuit or STOMP, is an improvement on the OMP algorithm. In contrast to OMP it allows multiple coefficients to be added to the model in a single iteration and runs for a fixed number of iteration

Gradient Pursuit

Gradient pursuit (GP) is yet another type of matching pursuit. Instead of taking the update by the scalar-product of the residual and dictionary element, in this the update occurs in a particular direction

CoSaMP

An extension to orthogonal matching pursuit algorithms is the CoSaMP (Compressive Sampling Matching Pursuit) algorithm published in (Need ell and Troop 2008). The basis of this algorithm is OMP but CoSaMP,

3. DWT (DISCRETWAVELET TRANSFORM)

Discrete wavelet transform (DWT) is the wavelet transform in which the wavelets are sampled discretely. A key advantage of DWT over DFT is temporal resolution: it means it captures both frequency and location information

3.1APPLICATION OF DWT

The discrete wavelet transform has a many applications in science, engineering, and mathematics and computer science. Mostly, it is used for signal coding, to represent a discrete signal in a more redundant form, which is further used for data compression. Practical applications of DWT is found in signal processing of accelerations for gait analysis, in digital communications and many others

In this work we will use one form of dwt i.e. daubechies wavelet for better performance. in compressed sensing of ECG signal.
Daubechies wavelets

The most commonly used set of discrete wavelet transforms was explore by the Belgian mathematician Ingrid Daubechies in 1988. This formulation is based on the use of recurrence relations to generate the progressively better discrete samplings of an implicit wavelet function; each resolution is twice than of the previous scale. Daubechies derives a family of wavelets, and many variations of Daubechies' original wavelets were developed

4. DISCRETE COSINE TRANSFORM (DCT)

A **discrete cosine transform** (**DCT**)is the finite sequence of data points in form of cosine function oscillating at different frequencies. DCT used in no of application like science and engineering, in the form of lossy compression of audio (e.g. MP3)and images (e.g. JPEG).spectral method is used for numerical solution of partial differential equation. DCT used to separate the images in segments according to required information. The DCT is same as DFT that it will transforms a signal from the spatial domain to the frequency domain. In this work we will explore IDCT (inverse DCT) on the each segments of the signal .and then find the result difference of the signal compared to previous work.

We will use the combination of the DWT and IDCT. In the inverse form and then evaluation results show that combining the two transforms improved the performance of the compressed sensing algorithms that are based solely on the DWT transform.

5. RELATED WORK

In this section, existed work has been surveyed.

Donoho et al. [1] in (2006) introduce a technique to construct the fast and efficient sensing matrices for practical compressive sensing, called Structurally Random Matrix (SRM). In this, they used the flipping of sensing signal sample sign and done fast-transform the randomized samples and then subsample the obtained transform coefficients to give the final sensing measurements.

Bounoufos et al. [2] (2007) explore the behavior of cross validation to determine the stopping conditions for the optimization algorithms. They demonstrate that by designating the small set of measurements as a validation set to optimize these algorithms and reduce the reconstruction error. Furthermore we use the trade-off between additional measurements for cross validation instead of reconstruction.

Née dell et al. [3] (2009) describe a new iterative recovery algorithm called CoSaMP that delivers the best optimization-based approaches. Moreover, this algorithm tells the bounds on the computational cost and storage.

Cai et al. [4] (2010) consider sparse signal recovery in the presence of noise. A mutual incoherence condition which was previously used for exact recovery in the noiseless case is shown to be sufficient for stable recovery in the noisy case..

lieu et al. [5] (2011). Take a generalized sparse signal model, which simultaneously considers the sampling and representation matrix uncertainties. Based on the new signal model, a new optimization model for robust sparse signal reconstruction is proposed. This optimization model can be deduced with stochastic robust approximation analysis

Polania et al. [6] (2014) explore the structure of the wavelet of the ECG signal to boost the performance of CS-based methods for compression and reconstruction of ECG signals. They use the information about the wavelet dependencies across scales into the reconstruction algorithms and give the high fraction of common support of the wavelet coefficients of consecutive ECG segments

Gu et al. [7] (2015) present an energy-efficient compressed sensing (CS)-based approach for on-node ECG compression. At first, an algorithm called minimal mutual coherence pursuit is proposed to construct sparse binary measurement matrices, which can be used to encode the ECG signals with superior performance and extremely low complexity. Second, in order to minimize the data rate required for faithful reconstruction, a weighted minimization model is derived by exploring the multisource prior knowledge in wavelet domain

6. CONCLUSIONS

In previous works, a new fast greedy pursuit technique named Least Support Orthogonal Matching Pursuit (LS-OMP) and Least Support De-noising OMP (LSD-OMP) has been suggested in which a new method has been proposed for segmentation the signal too many parts. Methods uses discrete wavelet transform for this purposes in which noisy signal is also considered for reconstruction. Our goal is to first implement the provided algorithm and explore the comparison of results using different types of wavelets as base paper has not provide any about the used wavelet type.

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Low Cost Uninterruptible Power Supply (UPS) With Pure Sine Wave Inverter Using Lithium Ion Battery Backup

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Abstract- Due to the power crisis in Pakistan, we had an issue in the growing market of inverters ranging from 500W to 5000W for household and different industrial applications. In household these inverters were normally used for short interval of time when the power from grid station is unavailable. Normally the inverters being sold in the market were based on square wave or modified sine wave output and the inverters having pure sine wave output were quiet expensive but in order to run the appliances quieter, cooler and safer we always require pure and clean sine wave output. So these cheap modified sine wave inverters reduce the life of our equipment. The idea of building this inverter is to provide clean and pure sine wave to our appliances as we receive from our grid stations and to increase the life of our appliances. In this inverter we have also used lithium-ion battery instead of conventional lead acetate batteries which have less charge density, less life and are less efficient than lithium-ion batteries. So this system would be less expensive and would be more reliable as compared to the systems which are being sold in the markets. The quantity of components in the circuits are kept as minimum as possible in order to increase reliability of this system.

Index Terms- Inverter, Micro-controller, Lithium ion, Converter, PWM, UPS and Charger

1. INTRODUCTION

THIS section describes different parts of Uninterruptable Power Supply (UPS) and builds the background for implementing pure sine wave inverter and charger for lithium-ion batteries.

A. Pure Sine Wave Inverter

First of all it is necessary to understand the concept of inverter. Basically the function of inverter is to convert DC power into AC power. The simple inverter is shown in Fig 1.

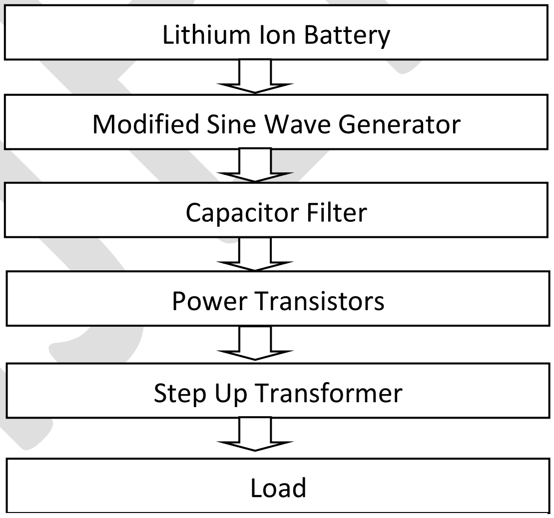

Figure 12: Modified Sine Wave Inverter Block Diagram

Fig. 1 shows the block diagram of a basic inverter which gives modified sine wave or square wave output at load. In these inverters first of all DC power is drawn from battery which is converted to pulsating DC by use of bridge rectifier than it is converted to modified AC sine wave by capacitor filter and finally by the use of power transistors and step transformer we get 220V output at load.

The inverter which we have designed consists of a programmable microcontroller (PIC 16F628A) whose function is to modulate the width of the pulses by using PWM technique to achieve clean and pure sine wave at output. The design of our inverter is shown in Fig 2.

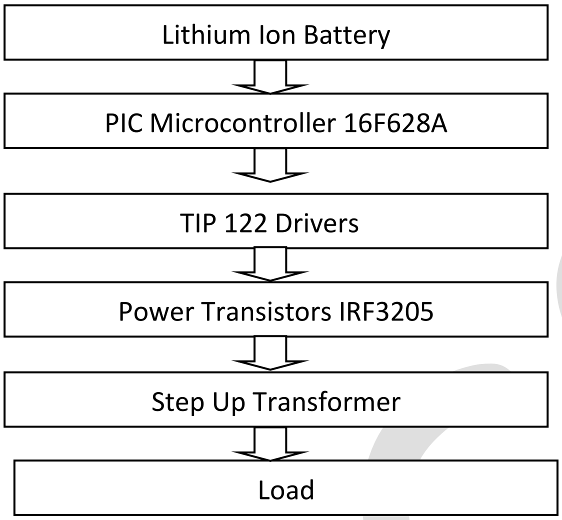

Figure 13: Block Diagram of Pure Sine Wave Inverter

In this design PWM pulse train output form the microcontroller gets amplified by the use of TIP 122 Driver and then they feed the power stage for driving the transformer.

B. Charging Circuit (Converter)

In order to charge the Lithium-ion Batteries this system need efficient charger because lithium-ion batteries are quite sensitive as far as charging is concerned. Keeping in mind the plan to reduce charging time of our battery, we designed a charger with “Boost Charging” option. The designed charger will charge the battery at C/5 till 80% charge than it will switch to slow charging and will charge at C/10. A comparator circuit is used to monitor the voltages of the battery and as the voltage reaches 80% of the rated voltage the charger switch to slow charging mode.

The block diagram of the charger/converter is shown in figure 3.

The charger takes the 220V AC input from the socket which is step down by the transformer into 16V AC then these 16V are converted to pulsating DC by the use of bridge rectifier which is further smoothen by use of capacitor filter. Then LM317 voltage regulator regulates the voltage which is parallel to TIP2955 MOS transistors which is used for current amplification because LM317 can handle 1A current but our requirement is 40A which is fulfilled by TIP2955 which is used in such configuration that it will give 5A current. The comparator circuit will monitor that when to have fast charging and when to have slow, when our battery is at 80% charge it will switch to slow charging else fast charging and this all process will be done with the help of the control circuitry which will switch our current between C/10 and C/5 and hence this charger will be smart charger with boost charging capability.

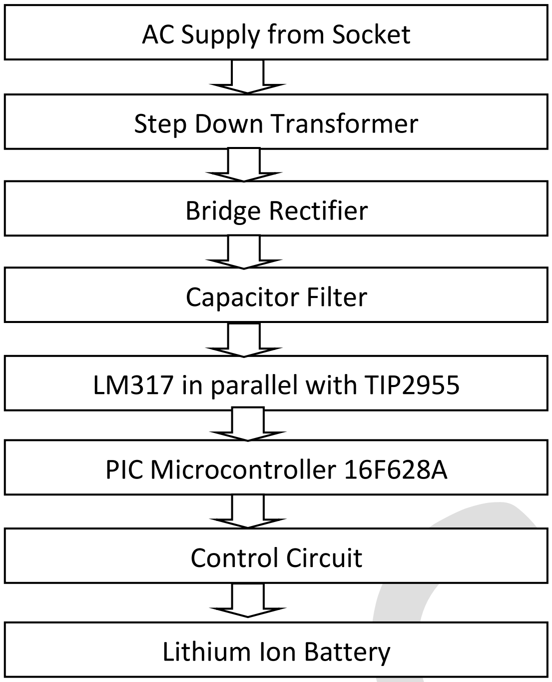

Figure 14: Block diagram of Charging Circuit

In our today's world the most common batteries that are being used commercially are Lead Acid Batteries because they are cheap and can be used to fulfil low load requirements but these batteries have a lot of disadvantages like they are heavy weight, have less charge density, less efficient and most importantly have less life of about 500charge and discharge cycles. The use of lithium ion batteries will enhance the performance of this project because lithium batteries are up to 90% efficient and give more backup than lead acid batteries. Most importantly lithium batteries have charge ad discharge cycles of 10 times as lead acid batteries, so they can last longer. And also lithium batteries charge faster than lead acid batteries and give much longer backup over heavy current requirements, so the use of lithium ion batteries in this project will show the alternate for conventional lead acid batteries and will improve the performance of battery backup over heavy loads.

2. Implementation:

A. Pure Sine Wave Inverter:

The design of pure sine wave inverter is pretty simple in which most of the working is done by PIC Microcontroller which generates our desired PWM at pin no 9 and 10. Than this PWM is fed to TIP122 driver where we provide PWM with current gain because PIC directly cannot meet the requirement of power stage which consists of IRF 3205 in low side push pull configuration where they sink the current. At a time only one IRF 3205 is on, so IRF 3205 in pair continuously alters the direction of the current which result in change in flux at primary side of transformer. Hence EMF is generated at the secondary side which is still not a pure sine wave than this wave is filtered with the help of RC filter in which 2.2µF capacitor and 1k resistance is used to give clean and pure sine wave at the output. This design is very much simple and component level is kept less a possible which will increase the reliability of the system. This also gives us the advantage of less cost and easy trouble-shooting of the circuit of inverter as shown in figure 4.

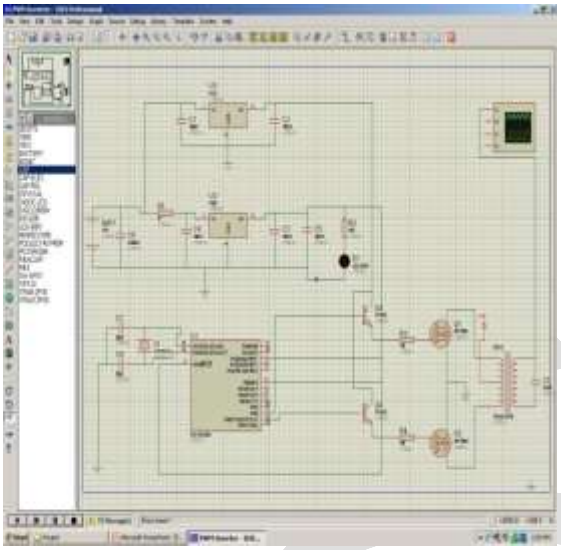

Figure 15: Inverter Schematic

B. Smart Charger:

The smart charger was really easy to implement because it is concept based on simple regulated power supply with a modification that TIP2955 increase the current capability of this supply to 40amp as shown in figure 5.

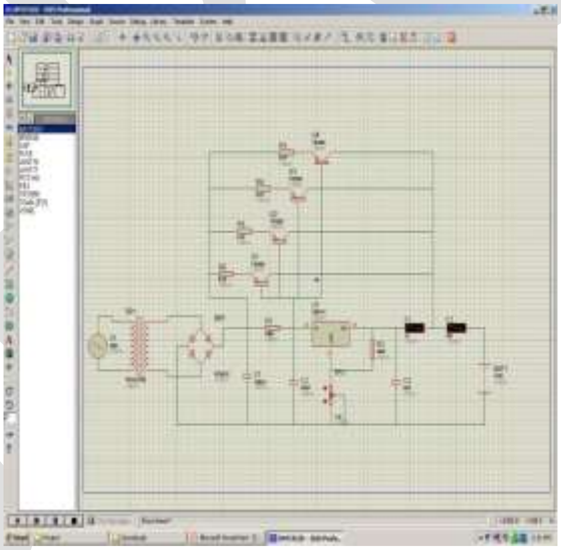

Figure 16: Charger Schematic

3. RESULTS

The low cost pure sine wave inverter was successfully implemented and tested. The photograph of implemented inverter is shown in figure 6, 7 and 8.

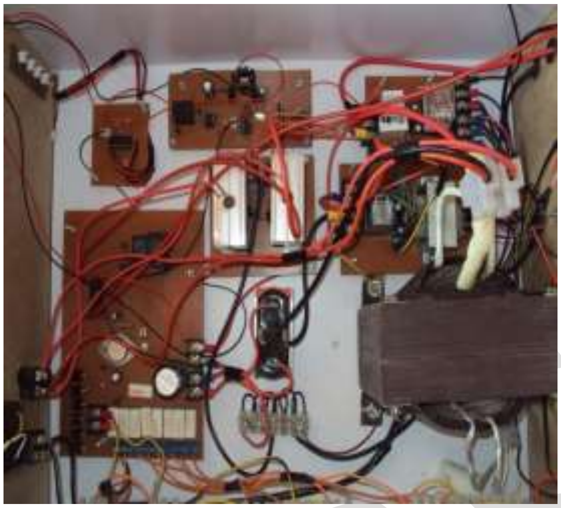

Figure 17: Picture of the Implemented UPS

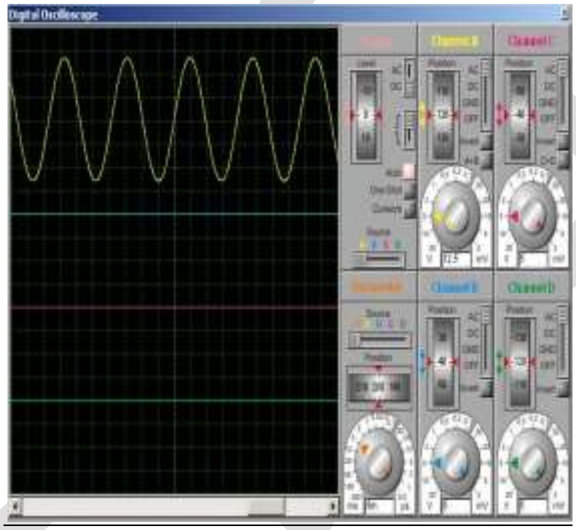

Figure 18: Inverter Output (Simulated)

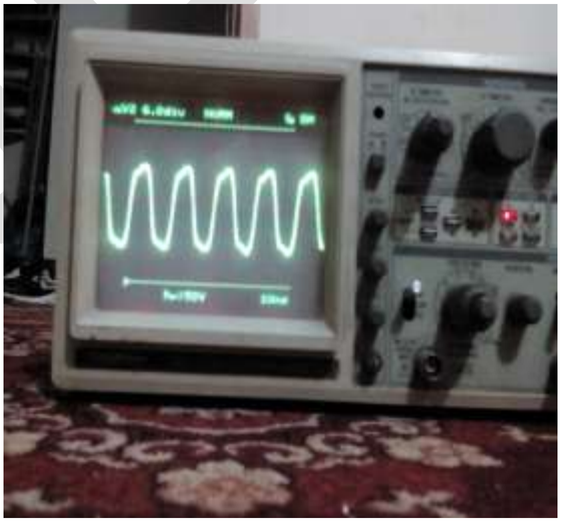

Figure 19: Inverter Output (Real Time)

4. CONCLUSION

In this paper low cost uninterruptible power supply with pure sine wave inverter has been implemented successfully which is in reach of a common man and can be made in cost of modified sine wave inverter.

5. FUTURE RECOMMENDATIONS

1. Tune the filter as finer as possible.
2. Improve the appearance of the package.
3. Attempt to reduce costs.
4. Closed Loop feedback system in order to monitor PWM and output voltages continuously can greatly improve performance of the system.

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7. PCB LAYOUTS:

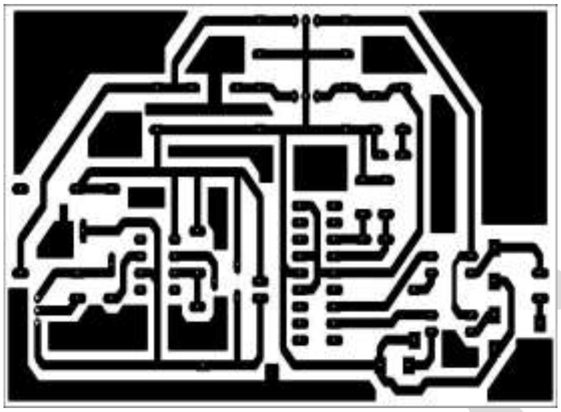

Figure 20: Inverter Driver Stage Layout

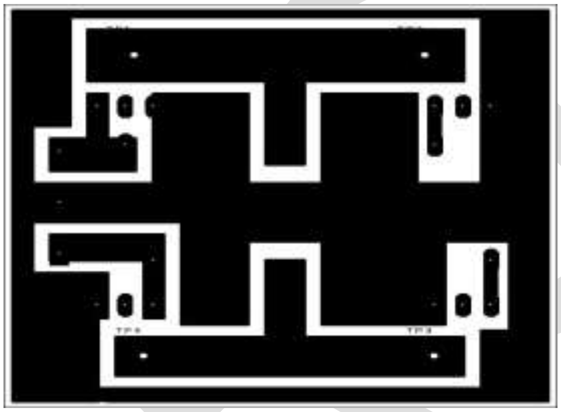

Figure 21: Inverter Power Stage Layout

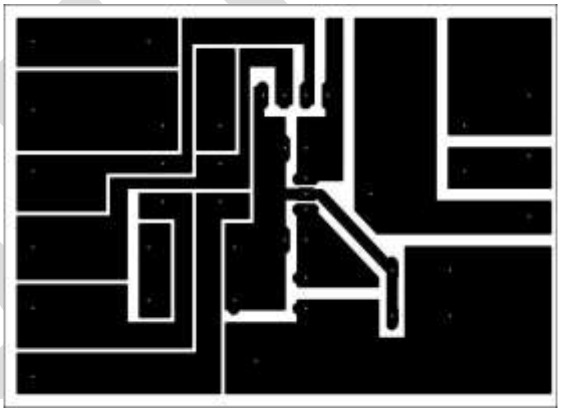

Figure 22: UPS Change-over Circuit Layout

COMMTRUST SURVEY: Multidimensional Trust Computing

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Abstract*:* Reputation-based trust models are widely used in e-commerce applications, and feedback ratings are aggregated to compute sellers' reputation trust scores. The “all good reputation" problem however is prevalent in current reputation systems reputation scores are universally high for sellers and it is difficult for potential buyers to select trustworthy sellers. In this thesis, based on the observation that buyers often express opinions openly in free text feedback comments, we have proposed CommTrust, a multi-dimensional trust evaluation model, for computing comprehensive trust profiles for sellers in e-commerce applications. Different from existing multi-dimensional trust models, we compute dimension trust scores and dimension weights automatically via extracting dimension ratings from feedback comments. Based on the dependency relation parsing technique, we have proposed Lexical-LDA (Lexical Topic Modelling based approach) and DR-mining (Lexical Knowledge based approach) approaches to mine feedback comments for dimension rating profiles.

Keywords: E-commerce, CommTrust, text mining, Repudiation based models, Sentiment Analysis, Trust evaluation , Parse.

1. Introduction

We have proposed CommTrust, a multi-dimensional trust evaluation model, for computing comprehensive trust profiles for sellers in e-commerce applications. Our work aims to provide a comprehensive trust profiles for sellers that allows buyers to conduct their online shopping based on past experience. Our focus is on extracting dimension ratings from feedback comments and further aggregating these dimension ratings to compute dimension trust scores. The motivation of our research is that online feedback comments contain distinct information for users to rank sellers; therefore content of comments can be used to reliably evaluate the trustworthiness of seller.

The contributions of this thesis are:

- We propose to use Comment-based Multi-dimensional trust (CommTrust), a fine-grained multi-dimension evaluation model, to calculate the trust for e-commerce applications. While the model is potentially extensible to target item-specific trust, in this study we focus on computing comprehensive trust profile for sellers.
- We propose an algorithm to identify dimension rating expresses from feedback comments by applying lexicon-based opinion mining techniques in combination with dependency relation analysis, a tool recently developed in natural language processing.

We tackle the four research questions by two approaches:

1. The topic modeling approach is applied to develop the Lexical-LDA algorithm for grouping dimension rating extraction and trust computation. Lexical LDA makes use of two types of lexical knowledge based on dependency relations for clustering dimension expressions into dimensions so as to produce meaningful cluster. first lexical knowledge is that the co-occurrence of dimension expressions with respect to a same modifier across comments can provide more meaningful contexts for dimension expressions, compare to add on counts of dimension expressions by comments. The second knowledge is that the dimension expressions extracted from the same comment are very unlikely about the same topic. Based on these two types of lexical knowledge, we revised Latent Dirichlet Allocation (LDA) to develop the Lexical-LDA algorithm.
2. With the seed dimension words we propose Dimension Rating mining (DR-mining), a knowledge-based approach that incorporates domain knowledge, meta-data, and general grammatical patterns to accurately identifying dimension rating expressions from feedback comments. The matrix factorization technique applied to automatically compute trust weights. To

the best of our knowledge, CommTrust is the first piece of work that computes fine grained multidimensional trust profiles automatically by mining feedback comments.

we propose a knowledge-based approach that incorporates domain knowledge, meta-data, and general grammatical patterns to mining feedback comments for dimension rating profiles. By analyzing the wealth of information in feedback comments we can uncover buyers' embedded opinions towards different aspects of transactions, and compute comprehensive reputation profiles for sellers. Specifically using the positive and negative subjectivity of opinions towards aspects of transactions as *dimension ratings*, we propose *Comment-based Multi-dimensional trust (CommTrust)*, a fine-grained multi-dimension trust evaluation model for e-commerce application.

2.Survey COMMTRUST

A fine-grained multi-dimensional trust evaluation model by mining e-commerce feedback comments is projected; it is called as Comment-based Multi-dimensional trust (CommTrust). Comprehensive trust profiles are computed for sellers using CommTrust. It includes dimension reputation scores and weights and overall trust scores by aggregating dimension scores of reputation. The first system which calculates fine-grained multidimensional trust profiles automatically by mining feedback comments is CommTrust. Later, we use the terms reputation score and trust score interchangeably.

a) **Representation of Stanford typed dependencies**

To have a simple description of the grammatical relationships in a sentence which could very easily be understood and effectively used by people without linguistic expertise who wanted to extract textual relations, The representation of the Stanford typed dependencies was deliberated. As explained in , the representation was not designed for the intention of parser evaluation; Researchers agree that with the widespread sentiment that dependency-based evaluation of parsers avoids many of the problems of the traditional Perceval measures. Also to the extent that the Stanford dependency representation is an efficient representation for the tasks envisioned. It is perhaps closer to an appropriate task based evaluation than some of the alternative dependency representations available.

b) **Analysis**

Restraining mining is also means the Sentiment. It is the turf of study which examines and analyzes beliefs, emotions, and assessments of people towards entities like products, services, associations, persons, questions, events, subjects, and their attributes. A large problem space is represented by it. There are various names and slightly diverse tasks, e.g., feeling analysis, view mining, view extraction, emotion mining, partisanship analysis, influence analysis, sentiment analysis, appraisal mining, etc.

c) **Sentiment Analysis Applications**

As the opinions are key influencers of human behaviours, they are central. Whenever someone needs to take some decision, he/she wants to know the opinions of others. The products and services are always found by businesses and organizations all over the world by the opinions of consumer or public. Individual consumers also desire to know the opinions of users of a product before purchasing it. Even voters want to know others' opinions about political candidates before making a voting decision in election. In the past years, when someone needed opinions, he/she used to ask friends and family. When an organization or a business wanted public or consumer opinions, it performed surveys, view polls, and spotlight groups. Acquiring public and consumer opinions has long been a huge business itself for advertising, community relationships, and political movement companies.

Related work divided into three main areas:

1) Computational approaches to trust, especially reputation based trust evaluation and recent developments in fine grained trust evaluation;
2) E-commerce feedback comments analysis and
3) Aspect opinion extraction and summarization on movie reviews, product reviews and other forms of free text.

1) Trust Evaluation

In literature [8]-[10], the effective rating bias in the eBay reputation system is well documentation. As proposed in [10], to examine feedback comments to bring seller reputation scores down to a rational scale. There comments that do not demonstrate explicit positive ratings are deemed negative ratings on transactions. Similar to that buyers and sellers are referred to as individuals in e-commerce applications. Peers and agents are terms always used to indicate the individuals in open systems in various applications in the trust evaluation literature. The comprehensive overview of trust model is provided in [11]. Individual level trust models aims to compute the reliability of peers and assist buyers in their work of decision making [12]–[14]. To regulate the behaviour of peers, avoid fraudsters and ensure system security was the system level models aim [11].

2) Feedback Comment Analysis

[10], [15], [16], [17] examined analyzing feedback comments in e-commerce applications. It says that their focus was not albeit the comprehensive trust evaluation. The main focus of [10] and [16] was sentiment classification of feedback comments. It is proved that feedback comments feedback comments. It is proved that feedback comments are noisy and hence analyzing them is a challenge. [10] States that the missing aspect comments are deemed negative. Models built from aspect ratings are used to classify comments into positive or negative. [16] Proposed a technique for summarizing feedback. It aims at to filter out courteous comments that do not provide real feedback. Lu. Et al. [15] elaborates on producing “rated aspect summary” from eBay feedback comments. Its statistical generative model has basis on regression on the overall transaction rating.

3. Model Analysis

We view feedback comments as a source where buyers express their opinions more honestly and openly. Our analysis of feedback comments on eBay and Amazon reveals that even if a buyer gives a positive rating for a transaction, s/he still leaves comments of mixed opinions regarding different aspects of transactions in feedback comments. Table 3.1 lists some sample comments, together with their rating from eBay. For example for comment c2, a buyer gave a positive feedback rating for a transaction, but left the following comment: \bad communication, will not buy from again. super slow ship(ping). item as described.". Obviously the buyer has negative opinion towards the communication and delivery aspects of the transaction, despite an overall positive feedback rating towards the transaction. We call these salient aspects dimensions of e-commerce transactions. Comment-based trust evaluation is therefore multi-dimensional. Hereafter we will use the terms opinion and rating interchangeably to express the positive, negative and neutral polarities toward entities that expressed in natural language text.

The CommTrust framework defines the working of proposed system. Unlike existing trust models (including the one used on eBay) where explicit transaction feedback ratings (positive or negative) are used to compute overall trust scores for sellers. Aspect opinion expressions, and their associated ratings (positive or negative) are first extracted from feedback comments. Dimension trust scores together with their weights are further computed by aggregating dimension ratings.

No	Comment	eBay rating
c_1	beautiful item! highly recommend using this seller!	1
c_2	bad communication, will not buy from again. super slow ship(ping). item as described.	1
c_3	quick response	1
c_4	looks good, nice product, slow delivery though.	1
c_5	top seller. many thanks. A+	1
c_6	great price and awesome service! thank you!	1
c_7	product arrived swiftly! great seller.	1
c_8	great item. best seller of ebay	1
c_9	slow postage, didn't have the product asked for, but seller was friendly.	1
c_{10}	wrong color was sent, item was damaged, did not even fit phone.	1

Note: 1 = Positive, 0 = Neutral, -1 = Negative

Table 3.1 : Sample Comment On EBay

The algorithm for mining feedback comments for dimension ratings and the technique for computing dimension weights. CommTrust can significantly reduce the strong positive bias in eBay reputation systems, and solve the \all good sellers" problem. With CommTrust, seller ratings are regulated to a more reasonable level and truly reputable sellers are effectively differentiated from irreputable sellers.

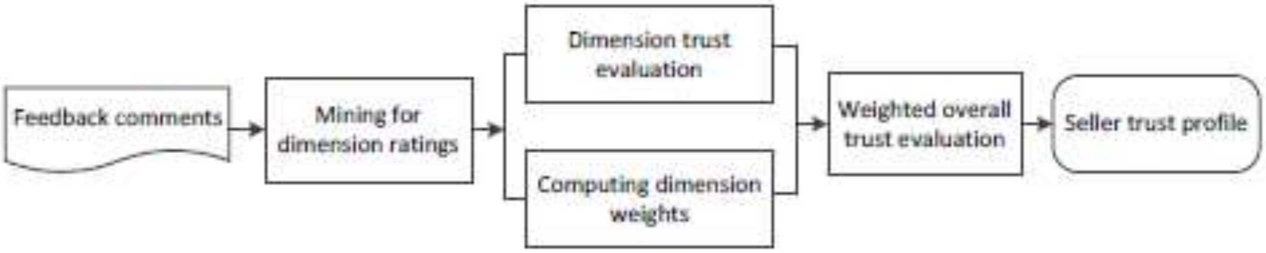

Figure 1: CommTrust Framework

The trust score for a dimension is the degree or probability that buyers express positive opinion towards the dimension, and roughly is positively correlated with the proportion of positive ratings towards the dimension. However, buyers only express limited positive or negative opinions towards some dimensions in feedback comments. Computing the trust score from a limited number of samples has a high chance of over estimate. The trust score on a dimension for a seller is the probability that buyers expect the seller to carry out transactions on this dimension satisfactorily. The trust score for a dimension can be estimated from the number of observed positive and negative ratings towards the dimension.

4. Lexical-LDA

We proposed an algorithm based on popular topic modelling method that Latent Dirichlet Allocation for grouping dimension expressions into dimensions and computing dimension weights. This approach can achieve stable performance across domains, and the features used are more transparent to a human user. This system based on the typed dependency analysis to extracting dimension expressions and identifying their associated ratings.

We propose the Lexical-LDA algorithm to group aspect expressions into semantically coherent categories, which we call dimensions. Different from the conventional topic modelling approach, which takes the document by term matrix as input, Lexical-LDA makes use of shallow lexical knowledge of dependency relations for topic modelling to achieve more effective clustering.
Figure depicts the Lexical-LDA framework.

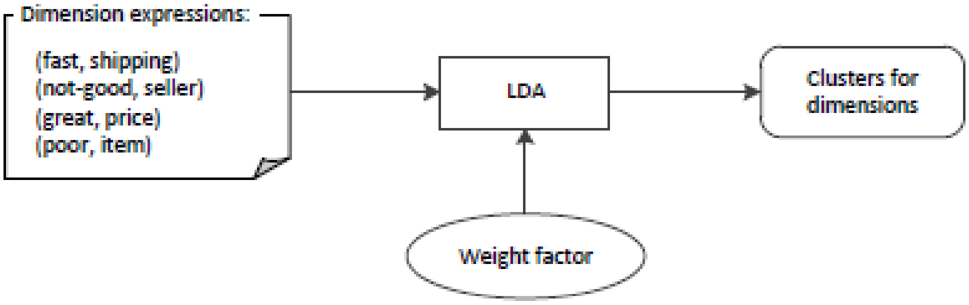

Figure 2: Lexical LDA

We make use of two types of lexical knowledge to \supervise" grouping dimension expressions
into dimensions so as to produce meaningful clusters.

- Comments are short and therefore co-occurrence of head terms in comments is not very informative. We instead use the co-occurrence of dimension expressions with respect to a same modifier across comments, which potentially can provide more meaningful contexts for dimension expressions.
- We observe that it is very rare that the same aspect of e-commerce transactions is commented more than once in the same feedback comment. In other words, it is very unlikely that the dimensions expressions extracted from the same comment are about the same topic.

5. DR-Mining

We will first describe our approach based on the typed dependency analysis to extracting dimension opinion expressions and identifying their associated ratings. We then propose a matrix factorisation technique to automatically compute weights for dimensions from the sparse and noisy dimension rating matrix.
To more accurately identify dimensions, we further extract meta-data on the product hierarchy from eBay to
identify ratings on the product dimension.
Based on eBay Detailed Seller Ratings on four aspects, we define five dimensions:

- Product: the quality or condition (new or used) of the product bought.
- Delivery: delivery is on time or not.
- Communication: how the seller communicates with buyers.
- Cost: item price, handling charges, and other associated cost.
- Transaction: the overall satisfaction of the transaction.

The complete dimension-rating mining (DR-mining) algorithm for identifying dimensions and associated ratings from free text comments is shown in below figure. Each comment is first analysed using the Stanford dependency relation parser. To identify dimensions in sentences, the dependency relations resulted from parsing are first matched.

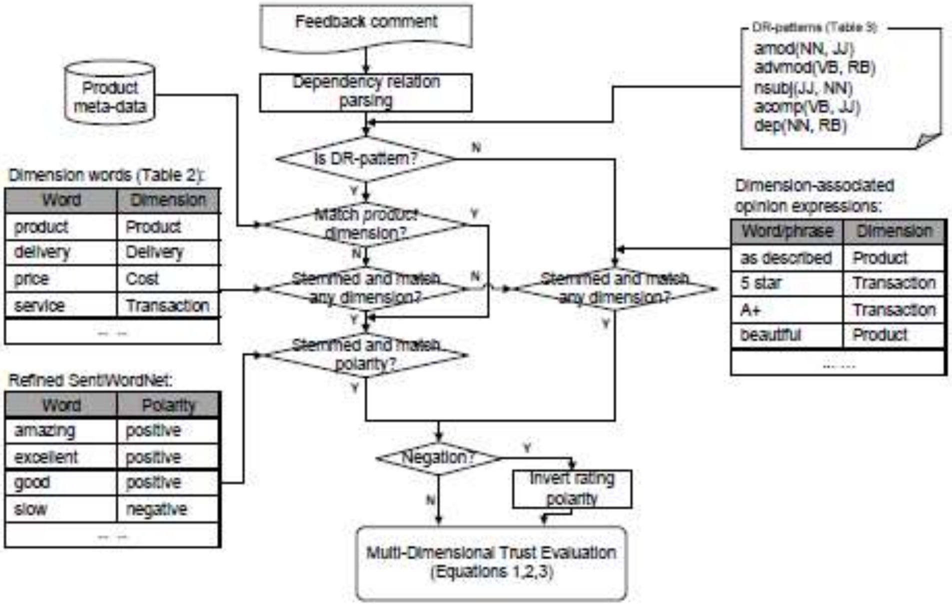

Figure 3: CommTrust DR-Mining Algorithm

Transaction dimension is not considered in the trust model of CommTrust ,identifying ratings on the transaction dimension is important for analysing feedback comments. The accuracy of DR-mining algorithm is conducted

to evaluate the dimension accuracy and the dimension rating accuracy on eBay and Amazon datasets. This shows our algorithm can achieve reasonable results on identifying dimension and dimension ratings.

6. Conclusion

We have proposed a multi-dimensional trust evaluation model CommTrust for computing comprehensive trust profiles for sellers in e-commerce applications. Different from existing multi-dimensional trust models, we compute dimension trust scores and dimension weights automatically via extracting dimension ratings from feedback comments.

The reputation systems used in commercial and online applications are prone to vulnerabilities. Thus the

reliability is being questioned. When the area of ecommerce is taken into consideration [6], the sellers need to be ranked accurately so that the customers could find it easy to choose between trustworthy sellers in e-commerce

applications. This ranking can be done with the help of the feedback given by the buyers. There are different models to put forward the reputation of the sellers. But the methods adopted by them in reputation score calculation are different. Depending on such methods the rankings given to each seller also vary. The ranking which relate more closely to the manual ranking is the most effective and efficient method i.e. if the correlation between manual and automated rankings is strong enough, then it can be concluded that the corresponding automated ranking is much efficient and effective in ranking sellers and can be used widely as reputation systems in e-commerce applications.

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Processing Techniques of Polymer Matrix Composites – A Review

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Abstract— In the present scenario development of suitable processing techniques for polymer matrix composites is one of the major challenges with respect to the energy efficient criterion of natural and synthetic fibers with the compatibilization of reinforcements in a matrix polymer. Over the last decade, intensive research and development has been carried out in order to establish suitable processing techniques for the fabrication of high performance polymer matrix composites. This article highlights the brief overview on classifications, properties, applications and various techniques adapted to manufacture polymer matrix composites.

Keywords—Processing technique, Polymer Matrix Composites (PMCs), fiber, reinforcement.

INTRODUCTION

Materials have become a symbol of the progress of human civilization, and have become milestones for dividing eras of human history [1]. The relative importance of the structural materials most commonly used, i.e. metals, polymers, composites, and ceramics, to various societies throughout history has fluctuated. Ashby M.F. [2] presents a chronological variation of the relative importance of each group from 10,000 B.C. and extrapolates their importance through the year 2020. The information contained in Ashby's article has been partially reproduced in Figure 1. With the enlargement of modern industry, the production of light materials with high strength is required for our day-to-day applications [3, 4]. For some applications composite materials are considered to be more suitable than conventional materials as they have desirable mechanical, thermal and wear properties. [5-7]. Polymer matrix composite material is the one that uses organic polymer as matrix and fiber as reinforcement. Strength and modulus of fiber are much higher than the matrix material normally. PMCs are very popular due to their low cost and simple fabrication methods [8]. In this paper an attempt is made to through light on various techniques adopted by researches across the globe to manufacture PMCs.

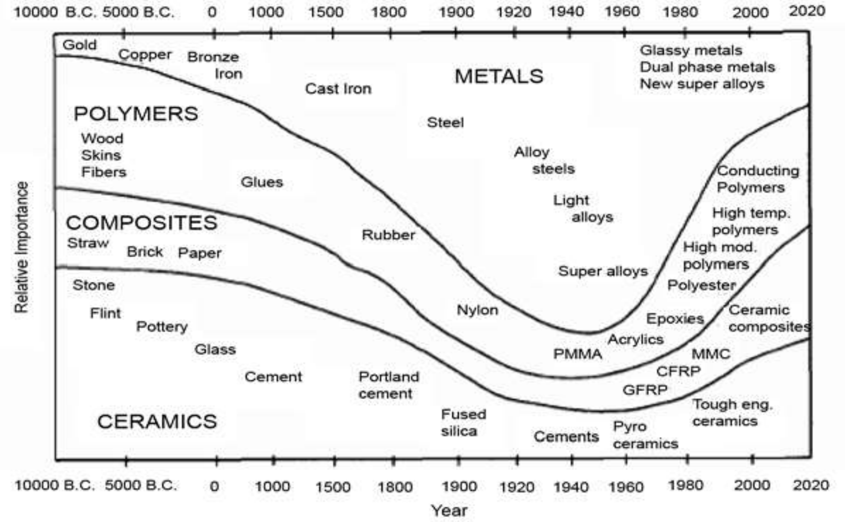

Fig. 1. Relative importance of material development through history.

OVERVIEW ON PMCs

The classification of polymer materials is very large and these materials can be grouped into: thermoplastic and thermosetting materials (polyethylene, polypropylene, polyvinyl chloride, polystyrene, phenolics, polyester etc.); elastomers (natural rubber, butadiene styrene, silicone etc.); polymeric fibers (fabric polymeric fibers, aramid fibers); coating materials (paints, lacquers, enamels etc.); adhesives (polymeric adhesives, natural-glu adhesive, casein, rosin); films (polypropylene, polyethylene, cellophane, cellulose acetate films); sponge or foam (polyurethane, rubber, polystyrene, sponge polyvinyl chloride) [9] [19] [20].

The properties of the PMC depend on the matrix, the reinforcement, and the interphase. Consequently, there are many variables to consider when designing a PMC. These include not only the types of matrix and reinforcement but also their relative proportions, the geometry of the reinforcement, and the nature of the interphase. Each of these variables must be carefully controlled to produce a structural material optimized for the conditions for which it is to be used [10]. Some of the typically properties exhibited by PMCs are high strength at low weight ; ability to tailor properties to meet wide-ranging performance specifications; moulding to close dimensional tolerances, with their retention under in-service conditions ;good impact, compression, fatigue and electrical properties; ability to markedly reduce part assembly; excellent environmental resistance; ability to fabricate massive one-piece mouldings; low-to-moderate tooling costs; cost-effective manufacturing processes; ability to build in, ex-mould, both colour and texture; excellent chemical and corrosion resistance.

PROCESSING TECHNIQUES FOR PMCs

The basic steps for processing of PMCs include:
1) Impregnation of the fiber with the resin,
2) Forming of the structure,
3) Curing (thermoset matrices) or thermal processing (thermoplastic matrices), and
4) Finishing.

Commonly used processing techniques of polymer-based composites are described in table 1.

Table 1. Processing Techniques for Polymer Composites

Technique	Type of polymer composite processed/manufactured
Resin transfer molding	sisal fiber reinforced polyester composites [12]
	carbon fiber reinforced composites [13]
	phenoxy nanocomposite[14]
	carbon nanotubes reinforced glass fiber epoxy composites[15]
	benzoxazine– epoxy blend [16]
	carbon fabric hybrid multiscale composites [17]
	plain woven carbon fiber reinforced plastics[18]
Injection molding	hybrid composites of jute and man-made cellulose fibers with polypropylene[21]
	cellulosic fiber composite foams [22]
	sisal-glass fiber hybrid biocomposites[23]
	cellulose fiber-reinforced polylactide (PLA) composites [24]
	glass fiber reinforced mixed plastics composites[25]
	polypropylene single-polymer composites with sandwiched woven fabric [26]
	carbon nanotube filled polymer [27]
	polypropylene single-polymer composites [28]
	crayfish protein-PCL biocomposite material [29]
	cork-polymer composites[30]
	polypropylene-based cork–polymer composites [41]
Extrusion	cellulose fiber reinforced composites [32]
	polycaprolactone/multi-walled carbon nanotube composites [35]
	polyethylene/short glass fiber composites [36]
	kenaf fiber/high-density polyethylene (HDPE) composites[38]
	sugarcane bagasse cellulose/HDPE composites [39]
	polypropylene/polyamide-6 composites [40]
	polypropylene-based cork–polymer composites [41]
	functionalized cork-polymer composites [42]

Pultrusion	chemically modified soy-based epoxy resins [31]
	thermoplastic composites[33]
	natural fiber reinforced composites [34]
	a foam/glass fiber reinforced polymer (GFRP) sandwich panel [37]
	glass/UV cured polyester composites [43]
	carbon reinforced polypropylene (CF/PP) pre-impregnated materials [44]
	glass reinforced polypropylene (GF/PP) towpregs [44]
Compression molding	sugarcane bagasse cellulose/HDPE composites [39]
	polypropylene-based cork–polymer composites[41]
	multiscale carbon fiber/epoxy composites[45]
	carbon/PEEK Randomly-Oriented Strands composites [55]
	bioresorbable phosphate glass fiber reinforced composites [56]
Filament winding	E-glass fiber epoxy tubes [46]
	liquid-like multiwalled carbon nanotube (MWCNT) reinforced composites[47]
	glass fiber reinforced polymer and Carbon fiber reinforced polymer composite tubes [48]
	kevlar fiber monofilament/epoxy composite [49]
	epoxy matrix for T800 carbon fiber [50]
Prepreg tape lay-up	carbon fiber/Triple-A polyimide composites [51]
	glass fiber/polypropylene composite laminates [52]
	glass / carbon fiber reinforced thermoset polymer [53] [54] [59]

APPLICATIONS OF PMCs

Just as with most new materials, the development of high performance polymer composites has driven by military and later aerospace, marine, automotive and many more. PMCs are used for manufacturing;

i) Aerospace structures: The military aircraft industry has mainly led the use of polymer composites. In commercial airlines, the use of composites is gradually increasing. Space shuttle and satellite systems use graphite/ epoxy for many structural parts.
ii) Marine: Boat bodies, canoes, kayaks, and so on.
iii) Automotive: Body panels, leaf springs, drive shaft, bumpers, doors, racing car bodies, and so on.
iv) Sports goods: Golf clubs, skis, fishing rods, tennis rackets, and so on.
v) Bulletproof vests and other armor parts.
vi) Chemical storage tanks, pressure vessels, piping, pump body, valves, and so on.
vii) Biomedical applications: Medical implants, orthopedic devices, X-ray tables.
viii) Bridges made of polymer composite materials are gaining wide acceptance due to their lower weight, corrosion resistance, longer life cycle, and limited earthquake damage.
ix) Electrical: Panels, housing, switchgear, insulators, and connectors [11] [57], and many more.

CONCLUSION

The more efficient processing methods for manufacturing PMCs are important in order to obtain more commercially viable products. Further the researchers are introducing and investigating a hybrid processes (merging manufacturing technologies into a single continuous process) as an efficient solution for shortening process chains and improving performance of processed materials [58]. The merging manufacturing technologies to process composite materials will have to face a lot of changes within the next decades and it certainly will remain as an interesting field of activity.

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Best Match Selection with Preference Priority using Hunt's algorithm

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Abstract— Now-a-days there are several marital status websites that don't seem to be used properly because of the issues like they're business oriented and not reliable. The proposed system, Best Match Selection with Preference Priority, that is a marital website developed to boost responsibility with less issues. This helps in checking out data reality of brides and grooms related to concerned registration done with reference and is termed Lifemate. The system permits to make the mind upon to stay honest in efforts of married and deliver the foremost effective results whereas not commercial. The seriousness concerning the priority is finding the acceptable right life partner basing on preferences. Finally, marital status matchmaking isn't simply a business, however additionally a social cause. This perspective makes Lifemate distinctive amongst many alternative Matrimony and marital internet sites. Reliable matches are electing by drawing decision tree by victimization Hunt's algorithm. A decision tree is considered to be a structure that encompasses a root node, branches, and leaf nodes. Each internal node denotes a check on degree attribute, each branch denotes the tip results of a check, and every leaf node holds a class label. The highest node at intervals the tree is that the basis node. The choice creating victimization Hunt's algorithm is reliable and therefore the preferences don't seem to be hindered.

Keywords— Best Match Selection with Preference priority(BMSPP), Data Reality, Lifemate, Reliable matches, decision tree, node, Hunt's algorithm

1. INTRODUCTION

Match creating forms in lead role in choosing the bride or groom as per the preferences. Earlier days there were middlemen who rapidly worked on helping people choose best matches as per their status and requirements. The middlemen act consequently in showing the main points and pictures of the bride or groom as outlined. Their roles are listed as follows.

(1) Assortment of profiles.
(2) Reveal profiles to acceptable match.
(3) Easy search for match.
(4) Horoscope checking if desired.
(5) Convince both sides
(6) Help them in searching better match

However over and over the world is confined to geographical and that they physically fail to point out the appropriate match. This on-line wedding web site provides the means that to pick best match for brides and grooms. It provides decision tree implementation mistreatment Hunt's formula, formula to decide on right person. Manually choosing best match take longer and that they search solely in restricted area. Currently there are several marital status internet sites however they're industrial not reliable in nature. It should contain a lot of pretend profiles. Projected system provides best match choice and it will hold vast quantity of information and solely the reference persons will register during this system and it involves certificate cross validation what the user transfer.

2.LITERATURE REVIEW

Esposito mentioned comparative analysis of ways for pruning decision tree[1]. Niuniu mentioned notice of retraction review of decision trees[5]. The choice tree formula could be a hot purpose within the field of information mining, that is typically accustomed type classifiers and prediction models. Quinlan, J.R mentioned decision trees and decision-making[6]. Sethi, I.K mentioned Entropy nets From decision trees to neural networks[8]. A multiple-layer artificial network (ANN) structure is capable of implementing discretional input-output mappings. Tsang mentioned decision tree for unsure knowledge[12]. Ancient decision tree classifiers work with knowledge whose values are a unit identified and precise.

Thangaparvathi,B.,Anandhavalli,D.andShalini,S.M. mentioned ahighspeed decision treeclassifier formula forvast knowledge[11].

Information discovery is a crucial tool for the intelligent business to rework knowledge intohelpful data whichwill increase the business revenue. Takahashi,F mentioned decision tree based multicategory support vector machines that area unit termed as Decision-tree-based multiclass support vector machines[10]. In work, at the very best node, we tend to confirm the hyper plane that separates a class (or some classes) from the others. Sheng,Y mentioned decision tree based mostly methodology for top electrical phenomenon fault detection[9]. Paper presents a high electrical phenomenon fault (HIF) detection technique supported decision trees (DTs).

Patel S.B mentioned a totally distinctive approach victimization transformation techniques and decision tree formula on pictures for acting Digital Water Marking[7]. Digital Watermarking is related to rising copyright protection technology. The paper presents a replacement durable watermarking technique supported combining the power of transform domain technique, the separate trigonometric function transform (DCT) and thus the information process technique like decision Tree Induction (ID3). we tend to train the image blocks for account the classification. Friedl M.A mentioned decision tree classification of land cowl from remotely detected knowledge [4].

M.A.Friedl aforesaid his views concerning decision tree classification algorithms have important potential for land cowlmapping issues and haven't been tested thoroughly by the remote sensing community relative to additionaltypical pattern recognition techniques like most probability classification. Janikow C.Z mentioned fuzzy calltrees: problems and ways[3]. Sun,J. mentioned Application of information Mining for decision Tree Model of Multi choice separate Production and Manufacture[2]. During this paper, taking the choice attributes, along sideorder selection, product selection, person hour and comprehensive analysis into thought, the choice tree model of separate production and manufacture has been bestowed.

3. BEST MATCH SELECTION WITH PREFERENCE PRIORITY USING HUNT’S ALGORITHM

First, preferences are gathered at the time of registration and basing on this next best match selection is done. Match creating exploitation Hunt’s algorithm.Match creating is finished by exploitation decision trees supported Hunt’s algorithm. The system has the following advantages.

1. Less time overwhelming
2. Covers massive space
3. Suitable match suggestions

3.1 Decision tree Induction

A decision tree could be a structure that features a root node, branches, and leaf nodes. Every internal node denotes a look at on AN attribute, every branch denotes the result of a take a look at, and every leaf node holds a category label. The uppermost node within the tree is that the root node.

1. A root node, that has no incoming edges and zero or further outgoing edges
2. Internal nodes maintain exactly one incoming edge and a pair of or further outgoing edges
3. Leaf nodes maintain exactly one incoming edge and no outgoing edges. Each leaf node conjointly contains a class label attached thereto.

A decision tree with preferences is drawn as shown in Figure 1.

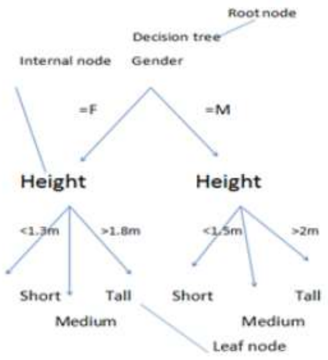

Figure 1 : Decision tree on a chosen sample set

The benefits of obtaining a selection tree area unit as follows:

- This does not would like any domain info.
- This is easy to understand.
- The classification steps of a selection tree area are straightforward and fast.

3.2 Decision Tree Induction Algorithm

Decision tree Induction algorithm is a machine investigator named J. Ross Quinlan in 1980 developed a selection tree rule known as ID3 (Iterative Dichotomies). Later, he bestowed C4.5 that was the successor of ID3. ID3 and C4.5 adopted a greedy approach. During this rule, there's no back tracking; the trees area unit created during a top-down algorithmic divide-and-conquer manner. Tree pruning is performed therefore on get eliminate anomalies inside the employment info because of noise or outliers. The cropped trees area unit smaller and fewer advanced. Tree Pruning Approaches

Here is that the Tree Pruning Approaches listed below :

- Pre-pruning − The tree is cropped by halting its construction early.
- Post-pruning - This approach removes a sub-tree from a completely mature tree.

Cost quality The price quality is measured by the following two parameters :

- vary of leaves inside the tree and
- Error rate of the tree.

3.3. Hunt's Rule

Most of the selection tree induction algorithms are supported original ideas planned in Hunt's algorithm. Let Dt be the coaching job set and y be the set of sophistication labels.

1. If Dt contains records that belong to an analogous class yk, then its decision tree consists of leaf node tagged as yk.
2. If Dt is degree empty set, then its decision tree may well be a leaf node whose class label is ready from variousdata such as a result of the bulk class of the records.
3. If Dt contains records that belong to several classes, then a take a glance at condition, supported one of the attributes of Dt, is applied to separate the information in to plenty of consistent subsets.

3.4Match creating exploitation Hunt's rule

- Consider preferences.
- Generate decision tree.
- Apply Hunt's rule for choosing best match

4. RESULTS

The projected methodology is developed and tested exploitation the coaching and testing sets as input.

4.1 Training and Test Set

The training set may consists of Name, Marital status, age, caste, job, income, property, horoscope, family background, class label as attributes.

Table 1: Training Set

Name	Marital Status	Age	Caste	Job	Income	Property	Horoscope	Family Background	Class Label
Venky	Unmarried	24	B	Yes	>5.5	Yes	Matched	Good	No
Murali	Unmarried	22	B	Yes	<5.5	Yes	Unmatched	Good	No
Nani	Unmarried	26	F	No	No	Yes	Matched	Good	No

Indu	Divorced	22	F	No	No	No	Unmatched	Good	No
Keerthana	Unmarried	21	B	No	No	No	Unmatched	Good	Yes
Niharika	Unmarried	25	F	No	No	No	Matched	Bad	No
Suneetha	Divorced	22	B	Yes	>5.5	Yes	Matched	Bad	
Gayatri	Unmarried	20	F	No	No	No	Unmatched	Bad	Yes

The sample test set is as given in Table 2.

Table 2 : Test Set

Name	**Marital Status**	**Age**	**Caste**	**Job**	**Income**	**Property**	**Horoscope**	**Family Background**	**Class Label**
Ram	Unmarried	25	B	yes	7lakhs	Yes	Matched	Good	Yes

4.2 Performance Analysis

The performance analysis of the proposed algorithm is done by mistreatment the False Acceptance Rate (FAR) and False Rejection Rate(FRR). For a given threshold, FAR is the consolidated number with in the classes in the training set whose distance with completely different class test sample is larger than the threshold and FRR is the number of classes in the training set whose distance with the equivalent class test sample is larger than the threshold.

Table 3 : Performanse Analysis based on FAR and FRR

Set	No. of Samples	FAR%	FRR%
1	50	96	98
2	150	99	99
3	30	100	97
4	10	90	100
5	60	97	99
6	40	98	95

5. CONCLUSION

The proposed match making website is Reliable and not commercial and eliminates all the problems in existing system. This will generate 100% genuine profile matching. Finally, matrimonial matchmaking is not just a business, but also a social cause. Decision trees are rapidly used in decision making preferences and are always secure and reliable. These methods are used for both prediction and classification as they are easily converted to classification rules. Best matches are selected by drawing decision tree by using Hunt's algorithm using preference parameters. This system is developed and tested on sample dataset and is found to be reliable and assists in making better decisions.

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Cloud With Third Party Auditor

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Abstract– Today individual and organization data is created in a rapid rate. The demand is very high to maintain the growing of data. Datasets are generated by various organization, government or business industry to centralize the information and it is managed by an external storage provider called Cloud Storage Service. The CSS provide the facility of distributed data center and data on demand service for data virtualization.
Here TPA (Third party Auditor) controlled communication between cloud storage service and the cloud user. TPA is an external agent, it also manipulate the user data stored on cloud. So this paper focuses of checking the authenticity to TPA

Index Terms– For this process we use Cloud computing, big data, authorized auditing and fine-grained data updates.

I. INTRODUCTION

Today world is moving on digitization and cloud computing is best concept to handled big datasets. Here we are focused on nature, origin and security related issues of big datasets. From various domains data are originated are follows education, industry etc.

The Public audit ability is used to ensure data integrity. Public audit ability allows an external party, in addition to the user to verify the correctness of remotely stored data. As third party auditor is used for verifying integrity of data.

The data generated features of different sources are different and definitions are also different like velocity, value, volume etc. new infrastructure and tools are used to support the big data.

For managing the features of big data cloud use better infrastructure, storage, network, high computing performance. New data infrastructure trusted on centric security modules and proposed purpose for processing and storage of data.

A cloud dynamically provision and through dialogue between service provider and consumer of the service level agreement or more integrated computing resources that are presented as consisting of a collection of interconnected and virtualized computers parallelism type of distributed system.

Our research cloud users and cloud service provider is certified to authenticate the TPA. Another purpose is to allow the CSS-grained dynamic data updates and its benefits, efficiency calculations will be analyzed in our paper.

II. LITERATURE SURVEY

On basis of its features cloud computing is hype on its demand to store the big data. Features are scalability, elasticity and efficiency are supporting dynamic data. As according to current need with service interruption and management effort cloud users are able to conveniently scale up/down on their virtual allocation of resources. Data security and privacy is the most existing problem on cloud computing.

Main area of today's research is integrity verification for outsourced data storage. Jules et al. [1] is applied to static data storage is based on a model proposed POR. Atomiesetal. Theyhomogenous verifiable tags (HVT) callto confirm previously calculated through a combination of file tag ratio of out sourced confirm the integrity of the file based on the PDP proposed a similar model. . Basis of BLS signature scheme proposed another model. BLS signature is shorter then RAS signature as compare both of them. Elway, et al. proposed the first PDP scheme based on skip list that support full dynamic data updates.

Privacy& security issues of cloud storage:

Secure cloud and privacy is of most important thing for cloud, Privacy issues include protection of identity information, transaction histories and sensitive data, authentication, Idea of cloud computing is store user data on shared Infrastructure. So, there is risk of unauthorized access.

III. IMPLEMENTATION DETAILS

Different techniques were used to provide security to cloud data but there are some disadvantages of these system. Generally Common methods is used to protecting user data include encryption prior to storage, user authentication procedures prior to storage or retrieval, and building secure channels for data transmission.
These protection methods normally require cryptography algorithms and digital signature techniques.

Public audit ability in is used for Ensuring possession of files on untrusted storages. In this model RSA based holomorphic tags are used for the security. To achieve the public audit ability.

Cloud data storage consists of 3 entities –

1] User – who has large amount of data which is to be Stored on cloud.
2] Cloud Server – which has computing resources to
Manage cloud data.
3] Third party auditor – to challenge cloud server to
Check correctness of data on behalf of user.

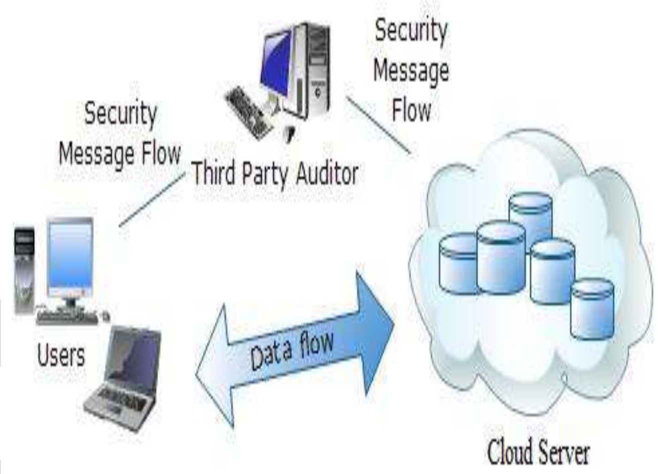

Fig -Architecture of cloud

Public Auditing of Dynamic Big Data Scheme:

When third party auditor is used for verification purpose privacy should be preserved. In public auditing scheme, third party auditor does not have any knowledge about data. Public auditing scheme has following advantages –
1] Public Auditability – Public auditability allows TPA to check integrity of data without retrieving it.
2] Storage Correctness – User's data should be stored
Correctly on cloud.
3] Privacy Preserving – This ensures that TPA cannot
Derive any data content.
4] Lightweight – To allow TPA to perform auditing
With minimum overhead.
5] Batch auditing – To allow TPA to challenge server
for checking integrity of data for multiple clients at the
Same time.

Fine-grained Update Verification: - This process occurs between client and CSS. The client send fine-grained update request to CSS via Perform Update and client runs verify Update algorithm to check whether CSS has performed the update correctly on the data block as well as in corresponding authenticator.

Fine-Grained Data Updates

The second major concern of our research work is to be able to do fine-grained updates in contrast to coarse-grained updates. Fine-grained update in dynamic data is the provision of doing small changes in the corresponding data block instead of accessing and changing the whole block. This method can reduce the communication overhead as occurring in previous methods.

IV.RESULTS

A. Software and hardware requirements

Hardware Configuration
- Processor - Pentium 2.6 ghz
- RAM - 512 mb ram
- Monitor - 15" color
- Hard Disk - 20 GB
- Key Board - Standard Windows Keyboard

Software Configuration

- Operating System - Windows XP/7
- Programming Language - Java
- Database - MySQL
- Tool - NetBeans

V. CONCLUSION AND FUTURE WORK

Today the example of big computing paradigm in cloud computing to store the big datasets. Important aspect for cloud user is cloud data security. For security and integrity of data cloud user ensure only the trusted third party. How to ensure trusting a third party we present an overview in this paper. TPA cannot derive user's data during the process of public data auditing because it focused on privacy-preserving for datasets.The proposed system is that it will prevent malicious TPA cannot be forged, which uses a better signature scheme. For increases the efficiency of update process it provides a feature of fine-grained dynamic data update.we uses third party auditor which achieves public auditability, stateless verification and also data dynamics. Third party auditor verifies integrity of user data as well as privacy is preserved.

In future we have to more improve the security issues of data storage on cloud storage service. On cloud computing this topic is not negotiable to improve. For implementing that process we increases the layers of authentications to TPA.

Proposed System:
Disadvantage of HLA is linear combination of block can reveal user data information. To achieve privacy Preserving public auditing HLA with random masking is used. TPA cannot retrieve information if random Masking is used. Public key based HLA is used to achieve public auditability.
Data content, no matter how many linear combinations of the same set of file blocks can be collected .Due to TPA the relationship between the cloud user and cloud service provider is transparent.

We also provide the server-side protection methods for efficient data security with effective data confidentiality and availability .Along with other metrics such as storage and computation, a highly efficient security-aware scheduling scheme will play an essential role under most cloud computing.

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DETERMINATION OF PLANT GROWTH PROMOTING ACTIVITIES OF FLUORESCENT *PSEUDOMONAS*

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ABSTRACT- Plant growth promoting rhizobacteria (PGPR) are a group of microorganisms beneficial to plant. In the present study Fluorescent *Pseudomonas* were isolated from vishnupuri region of Nanded. These isolates were characterized by morphological and biochemical characters. They were studied for their different plant growth promoting activities such as IAA production, GA production and phosphate solubilization. It was observed that all the isolates were positive for IAA and GA production. Maximum IAA production was observed by PS6. Maximum GA production was observed by PS3. The isolates PS1,PS2,PS5,PS7,PS8 were positive for phosphate solubilization.

Keywords: PGPR, Fluorescent *Pseudomonas*,*IAA* production, GA production,Phosphate solibilization, plant growth promoting activities, Nanded

INTRODUCTION

Fluorescent *Pseudomonas* is very widely studied group of microbes among the Plant growth promoting rhizobacteria (PGPR). They are able to produce water-soluble yellow-green pigments. They are P. *aeruginosa* , *P. aureofaciens* , *P. chlororaphis* , *P. fluorescens* , *P. putida* , and the plant pathogenic species such as *P. cichorii* and *P. syringae* [1,2]. Plant growth promoting rhizobacteria (PGPR) are able to rapidly colonize roots of many plant species and provide beneficial effects in terms of increased plant growth and suppress plant pathogens [3]. PGPR affect the plant growth by direct or indirect mechanisms. In direct mechanism, PGPR promote plant growth by nutrient acquisition and alter the physiological signaling by synthesizing bioactive constituents [4] while in indirect mechanism, These PGPR produce antagonistic metabolites such as antibiotics [5], siderophores [6], HCN . PGPR have also been known to produce plant hormones such as IAA, cytokinin, and gibberellins which are synthesized through plant-secreted precursors [7].In the present study attempts were made to isolate and determine plant growth promoting activities of such PGPR i.e. fluorescent *Pseudomonas* which will be useful to increase crop yield.

MATERIALS AND METHODS

Isolation of fluorescent *Pseudomonas: Fluorescent Pseudomonads* were isolated by using King's B (KB) agar medium [8] The plates were incubated at 30^0 C for 24 h. Colonies were observed under UV light on a transilluminator. The fluorescent colonies under UV light were sub-cultured and used for further studies.

IAA production

All Isolates were inoculated in 50 ml King's B broth supplemented 0.1mg/ml tryptophan and incubated at 27 ± 2 °C for 4 days. Supernatant was centrifuged, acidified to pH 2.5 and extracted with 10 ml of ethyl acetate. Ethyl acetate fraction was evaporated at 40 °C under vacuum and residue was suspended in 2 ml ethanol and mixed with Fe-$HClO_4$ reagent. The absorbance was measured at 530nm after 25 min [9].

Estimation of GA

Twenty-five ml of the culture filtrate was taken in a test tube to which two ml of zinc acetate was added. After two minutes, two ml of potassium ferrocyanide was added and centrifuged at 1000 rpm for 15 minutes. To five ml of this supernatant, five ml of 30 per cent HCl was added and incubated at 20^0 C for 75 minutes. The blank sample was treated with five per cent HCl and the absorbance of the samples as well as blank was measured at 254 nm in a UV-vis spectrophotometer. The amount of GA present in the extract was calculated from the standard curve and expressed as µg/ml of the medium. The standard curves of GA were prepared by using graded concentrations of GA [10].

Phosphate Solubilization

The active bacterial cultures were spot inoculated on pikovaskay's media plate and incubated at 30^0c for 5 days. The colonies showing clear zone of solubilization were taken as P solubilizers.

RESULTS AND DISCUSSION.

The present study focused on isolation, morphological and biochemical characterization of plant growth promoting *Pseudomonas* of Banana plants form Nanded region. The study also focused on plant growth promoting activities the isolated *Pseudomonas* strains .A total of 8 strains were isolated and identified by morphological and biochemical characterization. *Pseudomonas* were gram negative short rods and colonies were fluorescent under UV-light. All the isolates were positive for oxidase.PS2, PS3, PS4, PS6, PS8 were negative for starch hydrolysis. All the isolates were positive for gelatin liquefaction and arginine hydrolysis.All the isolates were positive for IAA production.IAA production ranged from 68 µg/ml to 89 µg/ml. Maximum IAA production was observed by PS6. The auxin type phytohormone known as indole-3-acetic acid (IAA) is the main type produced by plant growth promoting bacteria (PGPB) [11]. All the isolates were positive for GA production. GA production ranged from 56 µg/ml to 78 µg/ml. Maximum GA production was observed by PS3. The isolates PS1,PS2,PS5,PS7,PS8 were positive for phosphate solubilization. Many agricultural soils have large amounts of inorganic, these phosphates are unavailable to plants. Several microorganisms including *Pseudomonas* are able to convert this phosphate and make it available to plants [6]. It was evident from the study that Fluorescent *Pseudomonas* are common in the rhisosphere of Banana. Many of the isolates were having multiple beneficial functions like Phosphate-solubilization, production of plant growth promoting substances like IAA and GA. Such isolates could be useful in agriculture.

Table 1: Morphological and biochemical characters of the isolates

Isolate Code	Morphology	Gram's nature	Fluorescent pigmentation	Oxidase test	Arginine hydrolysis	Starch hydrolysis	Gelatin liquifaction
PS1	Rod shaped	Gram negative	Pink	+	+	_	+
PS2	Rod shaped	Gram negative	Pink	+	+	_	+
PS3	Rod shaped	Gram negative	White	+	+	_	+
PS4	Rod shaped	Gram negative	Pink	+	+	_	+
PS5	Rod shaped	Gram negative	Green	+	+	_	+
PS6	Rod shaped	Gram negative	Green	+	+	_	+
PS7	Rod shaped	Gram negative	White	+	+	_	+
PS8	Rod shaped	Gram negative	Pink	+	+	_	+

Table 2: Plant growth promoting activities of the isolates

Isolate code	IAA Production(µg/ml)	GA Production(µg/ml)	Phosphate solubilization
PS1	74	70	+
PS2	82	68	+
PS3	81	78	_
PS4	68	74	_
PS5	75	56	+
PS6	89	73	_
PS7	76	69	+
PS8	81	71	+

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Fuzzy Logic Based Modified Stable Election Protocol: F-SEP

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Abstract— The Wireless Sensors based Networks are being widely used nowadays in many applications where the accessibility is remote or terrain is not approachable. Such fields include nuclear reactors, forest monitoring, farm surveillance, military surveillance etc. The electronic circuitry employed in designing these sensors has fixed power source mostly in the form of batteries. Thus, efficient use of the power source is an important concern in Wireless Sensor Networks. And it is no surprise that most of the research work going on these days, is focused at achieving an efficient energy usage, and thus to increase the usability of the network and its longevity. In this research work, the various heterogeneous network clustering algorithms have been studied and it is found that the computational intelligence if used in selecting the cluster heads in various rounds, can lead to a significant rise in the network longevity. This paper proposes fuzzy logic based clustering and routing algorithm to deal with the above mentioned problems. It has been implemented on MATLAB and results are compared against the Stable election Protocol (SEP) which is enhanced version of the standard Low Energy Adaptive Clustering Hierarchy (LEACH)protocol. The results confirm our belief that our proposed algorithm has better performance than SEP.

Keywords— Wireless Sensor Network, Energy efficiency, Network Lifetime, Fuzzy Logic, Sensor Node, Residual Energy, SEP.

I. INTRODUCTION

A typical wireless sensor network (WSN) consists of a large number of distributed embedded devices which can be used are to collect data of various kinds like temperature, pressure, humidity, pest count etc. depending on what kind of sensor they are embedded with. The development of electronics and the availability of less costly on-chip devices has led to the development of various kinds of exclusive sensor network paradigms, environmental or physical conditions [1-2]. In WSN, however due to the kind of areas where they are employed and the task they perform, such kinds of sensors are always constrained to various kinds of limitations in energy supply, computational capabilities and bandwidth. The energy limitation is the most important of them all because it is directly related to the lifetime of the whole network. A network lifetime is simply the measure of how long the sensors sustain. The longer the battery sustains, the better the network lifetime. Thus conserving power is always an important factor while designing any wireless sensor network protocol. In this paper a novel approach using fuzzy logic has been implemented for a heterogeneous network. The upcoming sections include a discussion on various methods proposed erstwhile by various researchers on methods for clustering, followed by a brief description of the proposed method and finally followed by analyzing the various results obtained after the simulation.

II. RELATED WORK

The typical representative dynamic clustering protocol is Low Energy Adaptive Clustering Hierarchy (LEACH) protocol, where randomized rotation of Cluster Head(CH) is done to distribute the energy dissipation evenly over the network [1], [7-8]. The main feature is that LEACH is fully distributed, which prolongs the network lifetime. However, it has also some drawbacks. One of the most important weaknesses of LEACH is load unbalance, i.e. as the CHs are selected randomly, some nodes may be selected as CHs, which are in close proximity of each other [1], [4]. This specifies the fact that the CHs are not evenly distributed over the network, which constrains to maximize the energy efficiency. . HEED [2] proposes a novel distributed clustering approach for long-lived ad hoc sensor networks. The proposed approach does not make any assumptions about the presence of infrastructure or about node capabilities, other than the availability of multiple power levels in sensor nodes. The protocol abbreviated as HEED i.e. Hybrid Energy-Efficient Distributed clustering, is a novel clustering based protocol that periodically selects cluster heads according to a hybrid of the node residual energy and a secondary parameter, such as node proximity to its neighbors or node degree. The authors have shown that the HEED protocol a significant increase in network scalability and lifetime. The protocol SEP improves the stable region of the clustering hierarchy process using the characteristic parameters of heterogeneity, namely the fraction of advanced nodes (m) and the additional energy factor between advanced and normal nodes (α). To increase the stable region, SEP attempts to maintain the constraint of a well, balanced energy consumption. Advanced nodes have to become cluster heads more often than the normal nodes.

The new heterogeneous setting (with advanced and normal nodes) has no effect on the spatial density of the network [5]. The network energy distribution however changes considerably and it is found to show higher energy efficiency and network lifetime than the existing protocols.

A 2nd order radio model is as shown below in figure 1:

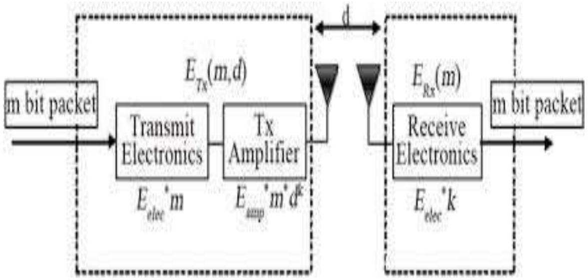

Figure 1: Radio Model [17]

The energy modeling of the above radio model is given by the following equations. The network being studied here is a two- level heterogeneous network, where we have two categories of nodes, a mN advanced nodes with initial energy Eo(1+a) and a (1 + m) N normal nodes, where the initial energy is equal to Eo.

The total initial energy of the heterogeneous networks is given by:

$$Etotal=N(1+m)Eo+NmEo(1+a)=NEo(1+am) \qquad (1)$$

According to the radio energy dissipation model illustrated in figure and in order to achieve an acceptable Signal-to-Noise Ratio (SNR) in transmitting an L-bit message over a distance d, the energy expended by the radio is given by:

$$Etx(L,d) = \begin{array}{ll} LE_{elec} + LE_{fs}d^2 & \text{if } d < do \\ LE_{elec} + LE_{mp}d^4 & \text{if } d > do \end{array} \qquad (2)$$

Where Eelec is the energy dissipated per bit to run the transmitter (ETX) or the receiver circuit (ERX).

The value of Eelec depends on many factors such as the digital coding, the modulation, the filtering, and the spreading of the signal. Efs and Emp depend on the transmitter amplifier model used, and d is the distance between the sender and the receiver. For the experiments described here, both the free space (d^2 power loss) and the multi path fading (d^4 power loss) channel models were used, depending on the distance between the transmitter and the receiver. If the distance is less than a threshold, the free space (fs) model is used; otherwise, the multi path (mp) model is used, we have fixed the value of $d_{0.}$

The various equations for estimating average energy of networks and the cluster head selection algorithm which is based on residual energy where:

The average energy of rth round is set as follow

$$E(t) = \frac{1}{N} Etotal\left(1 - \frac{r}{R}\right) \qquad (3)$$

where R denote the total rounds of the network lifetime and is defined as:

$$R = \frac{Etotal}{Eround} \qquad (4)$$

E_{round} is the total energy dissipated in the network during a round, is equal to:

$$E_{Round} = L(2NE_{elec} + NE_{DA} + kE_{mp}\, d^4_{toBS} + NE_{fs}\, d^2_{toCH}) \qquad (5)$$

where k is the number of clusters, E_{DA} is the data aggregation cost expended in the cluster heads, d_{toBS} is the average distance between the cluster head and the base station, and d_{toCH} is the average distance between the cluster members and the cluster head.

III. FSEP PROTOCOL

In this research work, we have used the fuzzy logic technology to enhance the performance of the Stable Election Protocol. The fuzzy logic rule base is made up taking two input parameters and one output parameter as shown in the below table 1:

Table 1: Fuzzy Logic Parameters

Parameter	**Type**
Residual Energy	Input
Distance to Base Station	Input
Selection Probability	Output

The method extends the capability of the SEP protocol by using the fuzzy logic architecture to improve the decision making in selection of an optimal cluster head. The residual energy and the distance of various nodes from the base station is evaluated at each round and based on it the fuzzy logic engine comes to a decision of whether a particular nodes qualifies for becoming a cluster head or not. The use of fuzzy logic makes the decision more exclusive by clearly defining the relationship between the inputs and output as given in table 1. These rules are known as fuzzy inference rules, on the basis of which the fuzzy engine makes its decision.

IV. THE FUZZY MODEL

The Fuzzy logic Toolbox, in MATLAB software tool has been used to model the fuzzy logic inference engine for this research work. The Fuzzy Logic Toolbox contains several functions, which can be used to model the fuzzy inference engine. As described earlier, we have taken two input functions, the membership graphs show the relationship between these functions and the degree of membership. The Figure 2 shows the Fuzzy Inference System used in this paper, followed by the membership function plots of input and output functions in figure 3, 4 and 5.

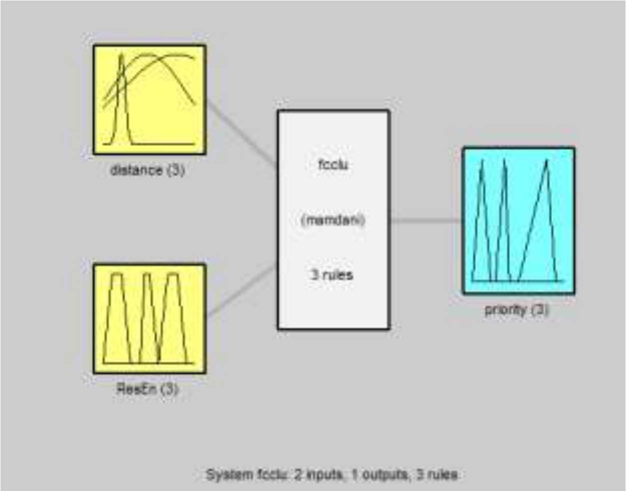

Figure 2: The Fuzzy Inference System Plot

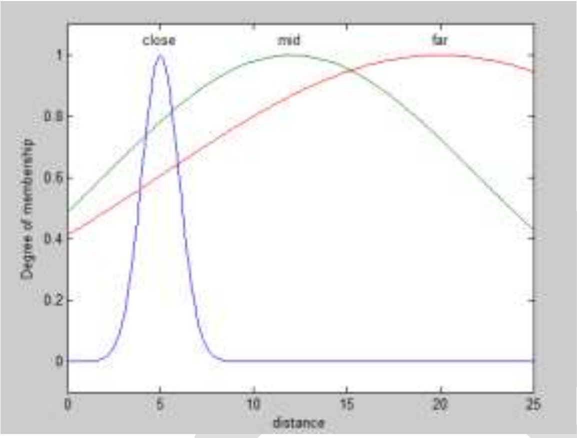

Figure 3: Degree of membership for Input 1(Distance)

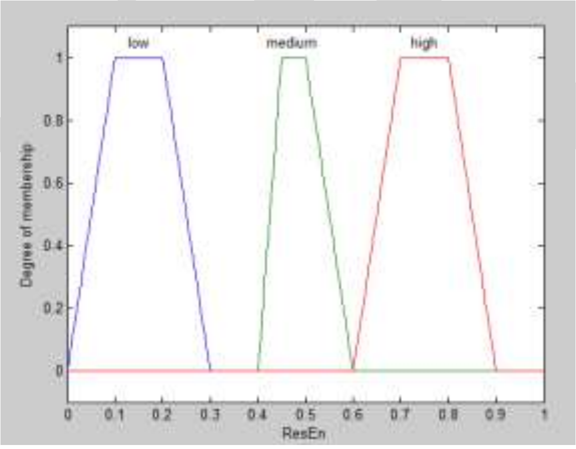

Figure 4: Degree of membership for Input 2 (Residual Energy)

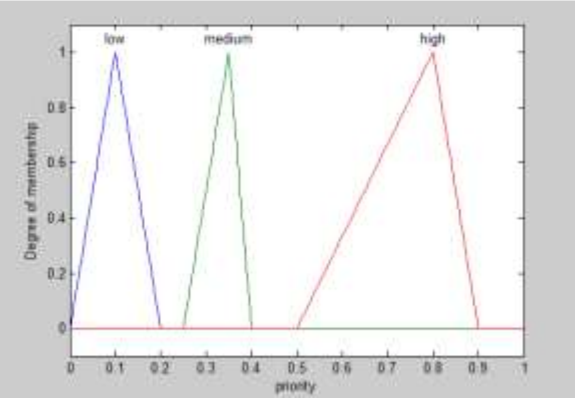

Figure 5: Degree of Membership for Output (Selection Probability)

The cluster head selection is based on the values of the residual energy and the distance of the nodes from base station. The threshold value for the selection is given by:

$$T(n)\begin{cases} \frac{P}{1-P*(r mod \frac{1}{P})} & If\ n\epsilon G \\ 0 & Otherwise \end{cases} \qquad (6)$$

where P is the optimal selection probability to become cluster head.

V. SIMULATION AND ANALYSIS

The network environment has been simulated using the simulation parameters in table 2:

Table 2: Simulation Parameters

Parameters	Values
Energy consumed in the electronics circuit to transmit in or receive the signal, E_{elec}	50 nJ/bit
Energy consumed by the amplifier to transmit at a short distance, E_{fs}	10 pJ/bit/m_2
Energy consumed by the amplifier to transmit at a longer distance, Emp	0.0013 pJ/bit/m_4
Data Aggregation Energy, EDA	5 nJ/bit/signal
Message Size	4000 bits
Initial Energy, E0	0.5 J

The following graphs show a comparison between the proposed work and SEP protocol.

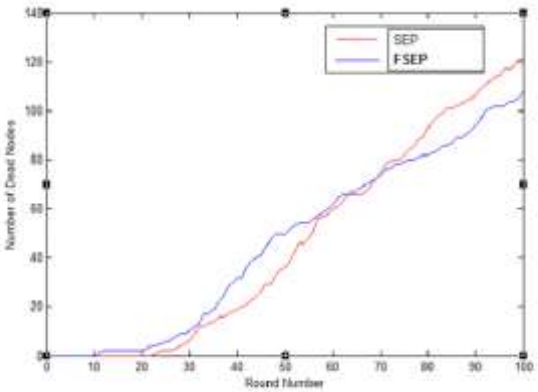

Figure 6: Number of Dead Nodes

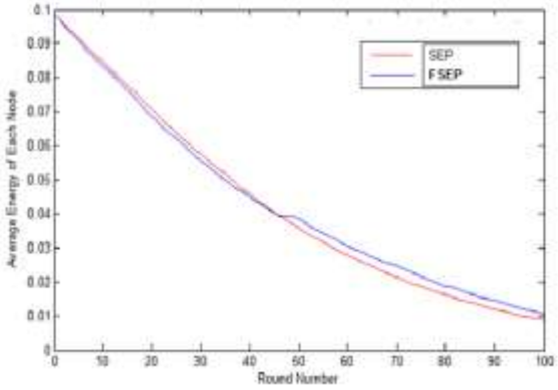

Figure 7: Average Energy of Nodes

Figure 6 and Figure 7 show the comparison between the SEP protocol and the fuzzy logic based SEP protocol, which we have proposed in this research work. The improvement in our method is clearly visible with lesser number of dead nodes and a better average energy as compared to SEP. the improvement leads to an increased network lifetime.

CONCLUSION & FUTURE SCOPE

The fuzzy logic optimization in the selection of cluster heads, improves the performance of the SEP protocol, as is clear in the simulation result. The residual energy of the nodes after each round and the distance from the base station are taken as the two input parameters for the fuzzy logic inference engine, while the output parameter is the selection probability to become a cluster head. The network radio model has been implemented using the MATLAB software tools and graphics environment.

The proposed fuzzy logic approach can be used further with other standard protocols. The feasibility of the proposed protocol can also be studied with varying network parameters to study its suitability in different network environments.

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GAME CONTROL USING EYE GAZE

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Abstract: Human Computer Interaction (HCI) is an uprising technology and Eye gaze technique is one of the very significant techniques of HCI. Eye tracking is a technique that allows deciding where an user is constantly staring at a given time. The gaze direction indicates where people fix their attention. The aim of this paper is to develop a desktop based Game for physically impaired users who cannot handle the traditional input devices such as keyboard, mouse. Eye movements or blinks are the only way for the person to communicate .For this eye-gaze is an input mode for the system which has the potential of an efficient computer interface and assumes that the camera and the head position are fixed. It controls mouse-moving by automatically moving the position where eyesight concentrates on and imitates mouse-click by affecting blinking action.

Keywords: Human–computer interface; Eye-blink detection ; Face detection; *Haar classifier; image processing; AdaBoost;Eye Gaze*

INTRODUCTION:

As Human-Computer-Interface is need for developing alternative methods of communication between human and computer that would be suitable for the persons with impairments and would give them the opportunity to become a part of the Information Society. HCI based systems are being developed for easy, effective, efficient, safe and enjoyable learning usage.

FACE DETECTION

Face detection techniques include the facial extraction features like forehead, chin, eyebrows, eyes, nose, mouth and hair line etc.

The face detection method can be organized in two categories:

FACE DETECTION TECHNIQUES:

FEATURE BASED TECHNIQUES:

A feature based approach to face detection in which the features are derived from the intensity data without assuming any knowledge of the face structure is shown. The feature extraction model is biologically motivated, and the location often corresponds to salient facial feature such as eyes, nose etc. This analysis will eventually lead to localization of the face and the features that it contains [1].

IMAGE-BASED TECHNIQUES:

The second method is based on scanning the image of interest with a window that looks for faces at all scales and locations. This category of face detection implies pattern recognition, and achieves it with simple methods such as template matching or with more advanced techniques such as neural networks and support vector machines [1].

LITERATURE SURVEY

An eye-gaze interface seems to be a favorable prospect for a new interface technique, which may be more convenient than the ones we use. Commonly, disarmed people who cannot move anything except their eyes use eye gaze interaction. These entity is designed to direct the computer merely by the eyes. Such systems work well and are a great help for the people who required them, but for others they are inconvenient and less efficient than keyboard and mouse. This contradicts the fact that viewing is an easy task and that eye movements are fast.

Consequently, eye-gaze interfaces for the masses need a different representation to bring benefit to the average user.

1.ELECTROOCULOGRAM:

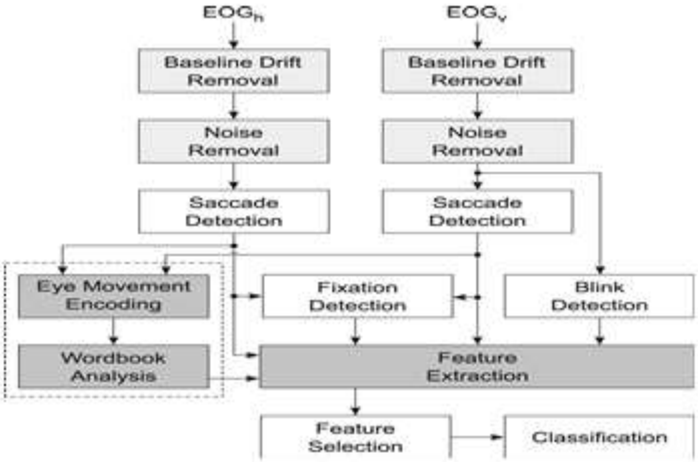
First is a biological measurement technique called an Electro-Oculogram (EOG). The device consists of pairs of electrodes attached around the eye (often either right and left or top and bottom). Inside of the eye is an area called the retina, which carries an electric charge gradient.In this method, sensors are attached at the skin around the eyes to measure an electric field exists when eyes rotate. By recording small differences in the skin potential around the eye, the position of the eye can be estimated. By carefully placing electrodes, it is possible to separately record horizontal and vertical movements. However, the signal can change when there is no eye movement[2].

ALGORITHMS:

1.EOG Signal Categorization.

The proposed algorithm has two advantages as compared to other publication algorithms for a classification of eight-directional movements based on EOG signals. Firstly, the proposed algorithm provided a high accuracy. The algorithm was not affected by various noises and involuntary movements, that is, single blinking (SB), double blinking (DB) and involuntary eye closing (IEC).

ARCHITECTURE:



2.INFRARED LIGHT

An IR image of the human face presents its unique heat-signature and can be used for recognition. The characteristics of IR images maintain advantages over visible light images, and can be used to improve algorithms of human face recognition in several aspects. The main findings of this research are that IR face images are less effected by changes of pose or facial expression and enable a simple method for detection of facialfeatures. In this paper we explore several aspects of face recognition in IRimages[3]. First, we compare the effect of varying environment conditions over IR and visible light images through a case study. Finally, we propose a method for automatic face recognition in IR images, through which we use a preprocessing algorithm for detecting facial elements, and show the applicability of commonly used face recognition methods in the visible light domain[6].

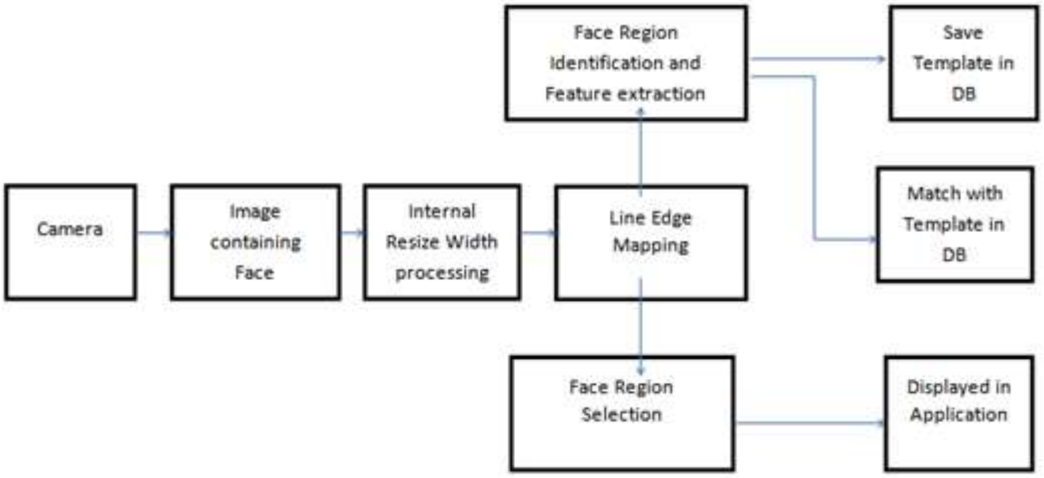
ALGORITHMS:

1.Adaboost

Boosting is an approach to machine learning based on the idea of creating a highly accurate prediction rule by combining many relatively weak and inaccurate rules.

AdaBoost is adaptive in the sense that subsequent weak learners are tweaked in favor of those instances misclassified by previous classifiers. AdaBoost is sensitive to noisy data and outliers. In some problems, however, it can be less susceptible to the overfitting problem than other learning algorithms.

ARCHITECTURE:



PROPOSED SYSTEM:

Previously there was need of heavy wearable pointing device, like head mounting device, sensors where used to track the location of eyes, electronic method like placing skin electrodes around the eyes and measuring the potential differences in the eyes, mechanical method like placing the contact lenses in the eyes, single point video based methods like placing video camera in the front of the eye and two point method which includes infrared light placed in front of eyes. This system aims to introduce an application that would replace the traditional mouse with the human face as a new approach to connect with the computer. The user operates the computer with the help of Eye Gesture and place the mouse pointer simply by looking at the desired position with an eye blink or by staring at the webcam for some time[4]. User who is disabled cannot use hand but can easily operate the computer with the help of Eye Gaze.

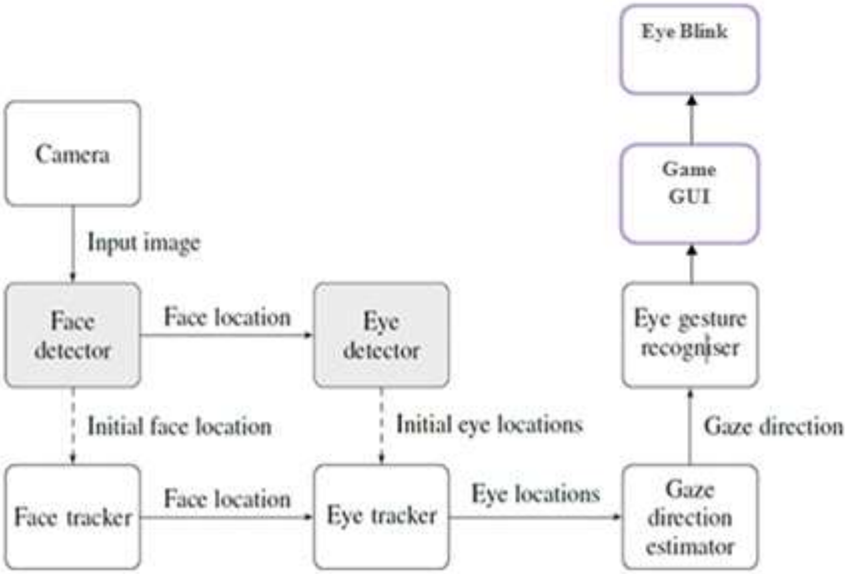


fig:System Architecture

ALGORITHM: Viola- Jones Algorithm

The **Viola–Jones object detection framework** is the first object detection framework to provide competitive object detection rates in real-time proposed in 2001 by Paul Viola and Michael Jones.

The algorithm has four stages:

Haar Feature Selection

Creating an Integral Image

Adaboost Training

Cascading Classifiers

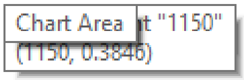
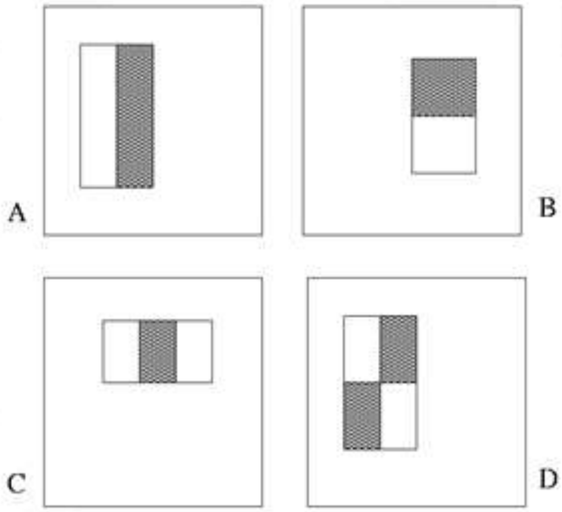


Chart Area t "1150"
(1150, 0.3846)

"Haar-Like" feature representation:

"Rectangle Feature"



$$Value = \sum (pixels\ in\ white\ area) - \sum (pixels\ in\ black\ area)$$

2.Fast computation with integral images:

The *integral image* computes a value at each pixel (*x,y*) that is the sum of the pixel values above and to the left of (*x,y*)[5].

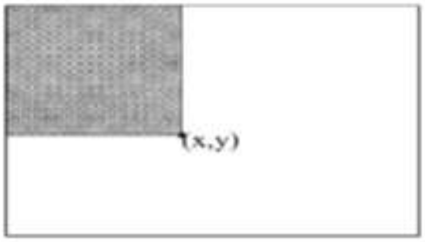
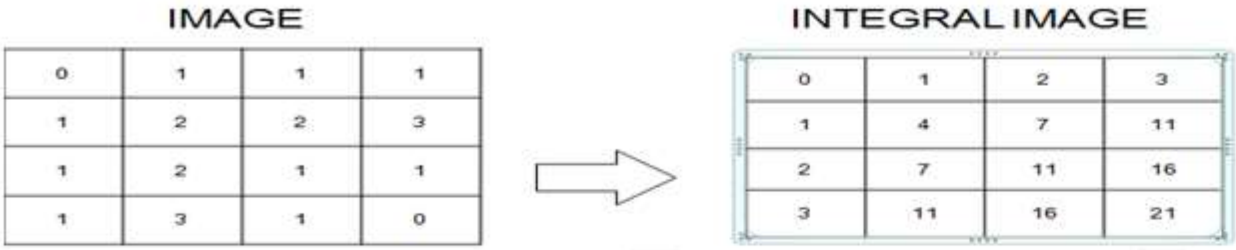


Fig: Integral Image



IMAGE

0	1	1	1
1	2	2	3
1	2	1	1
1	3	1	0

INTEGRAL IMAGE

0	1	2	3
1	4	7	11
2	7	11	16
3	11	16	21

Integral image allows for the calculation of sum of all pixels inside any given rectangle using only four values at the corner of the rectangles.

The sum of the pixels within rectangle D can be computed as 4 + 1 - (2 + 3), where 1-4 are values of the integral image.

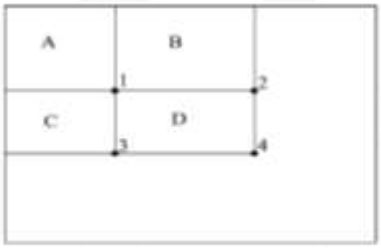
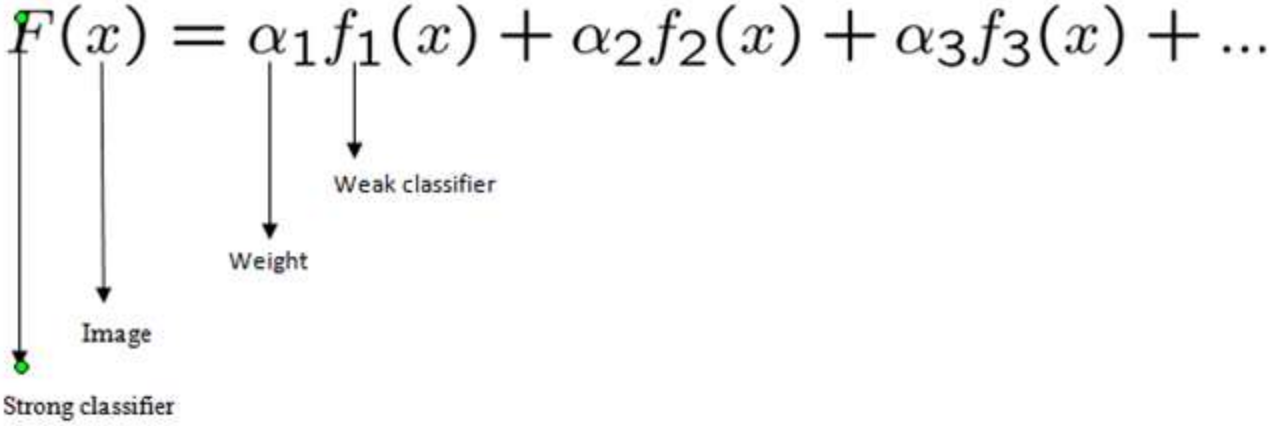


Fig:Calculation example

3.AdaBoost learning algorithm:

The AdaBoost algorithm was introduced in 1995 by Freund and Schapire.AdaBoost is used to improve classification results of a learning algorithm by combining a collection of weak classifiers to form a strong classifier. The algorithm starts with equal weights for all examples. In each round, the weight are updated so that the misclassified examples receive more weight.



$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$

4.Training the cascade:-

- Set target detection and false positive rates for each stage
- Keep adding features to the current stage until its target rates have been met
    - Need to lower AdaBoost threshold to maximize detection (as opposed to minimizing total classification error)
    - Test on a *validation set*
- If the overall false positive rate is not low enough, then add another stage
- Use false positives from current stage as the negative training examples for the next stage

The key advantage of the AdaBoost over its competitors is the speed of learning. For each feature, the examples are sorted based on a feature value. The optimal threshold for that feature can be then computed in a single pass over this sorted list.

EXPECTED OUTPUT

Priorly, the image is captured through the webcam and then the face and eyes are detected using Viola Jones algorithm and stored in the database. A game is created on which there is the interaction of eyes where, user can play game through his eyes.

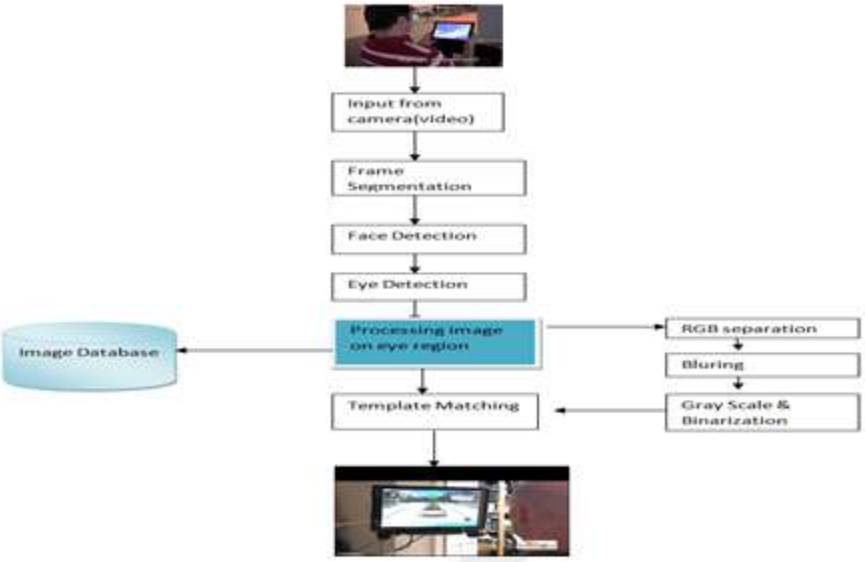


Fig Expected Outcome

FUTURE SCOPE:

- The eye-tracking equipment should be able to identify the tracked persons, most likely by iris pattern recognition.
- Somewhat Remote control devices for Home appliances like TV sets, Refrigerator, washing machine etc which is controlled through eye.
- GUI which is totally controlled by Eye Blink of player.

ACKNOWLEDGMENT:

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CONCLUSION:

The Game Control Using Eye Gaze system is designed for physically impaired people, to easily interact with the desktop based game without any external hardware like (mouse, keyboard, joystick, trackball).This game has the feature of moving in all directions having left, right, up, down movement control which increase independency of physically impaired people. This system is cost effective (not using external devices) so it can also be used by the Regular user.

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Model Based Design of Injection Mould For Charge Air Cooling Inlet Tank

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Abstract—

A variety of industrial parts are manufactured by injection moulding using different materials. This research work is focused on design and fabrication of an injection mould for production of charge air cooling inlet tank is used in automobile for reducing NO_x emission to improve fuel economy and power output. Here a Polyamide 66 30% glass filled is used. The moulding tool consists of top plate, cavity plate, core plate, spacer block, ejector plate and the bottom plate. An angular lifting mechanism is also developed to achieve the easy removal of part by maintaining the undercut radius which allows easy flow to media.. The ejector mechanism plays a pivotal role for optimum time allocation for parts ejection from mould. So the ejector mechanism is one of the important criteria in mould design. The scope of this research paper is to investigate the influence on the balance reachable flow length, stresses developed, shrinkage which affects smooth ejection of part from mould.

Keywords: Injection Mould, angular lifting mechanism, ejection of part.Mould flow analysis, Clamping tonnage, shot weight

INTRODUCTION

Plastic is a material that can produce many shapes that can be used by human in routine life. All of plastic products are produce from various type of operation or process. All of product Produces with different type of plastic material depend to needed. Plastics are divided into two distinct groups' thermoplastics and thermo sets.

Plastics can be moulded into various forms and hardened for commercial use. Plastic is perfect for this modern age. It is light, strong, easily moulded and durable. Although plastics are thought of as a modem invention, there have always been "natural polymers" such as amber, tortoise shells and animal horns. These materials behaved very much like today's manufactured plastics and were often used similar to the way manufactured plastics are currently applied.

The plastic product can make from the several processes like injection moulding, blow moulding, compression molding, film insert mounding, gas assist moulding, rotational moulding, structural foam moulding, extrusion and Thermoforming. This work will explain and study more about injection moulding. Injection moulding is a process in which the plastic material is injected into a mould forming a plastic product. Injection moulding is a manufacturing technique for making parts from thermoplastic material. The solid plastic material is fed into an injection moulding machine, heated and then pressed into the mould. In injection moulding, plastic pellets or granules are fed from a hopper into a heating Chamber. A plunger or screw pushes the plastic through the heating chamber, where the material is softened into a fluid state. At the end of this chamber, the resin is forced into a cooled, closed mould. Once the plastic cools to a solid state, the mould opens and the finished part is ejected. Standard Two Plate Mold Injection moulding is very widely used for manufacturing a variety of parts, from the smallest component to entire body panel. It is the most common method of production, with some commonly made items including bottle caps and outdoor furniture. Plastic moulding products can be seen everywhere such as plastic tubes, grips, toys, bottles, cases, accessories, kitchen utensils and a lot more. The mould is made by a mould maker from tool steel, usually either steel or aluminum, and precision machined to form the features of the desired part. Mould is used to produce desire product that we needed. Many elements are involved in mould such as feeding, cooling and injector system. In modern technology, CAD software can be used to design mould and after that perfiune machining raw material to produce complete mould. Feeding system is important element for plastic flow in injection mould.The component inlet tank is made of (PA66 GF-30) polyamide 30 % glass filled have high mechanical strength and superior resistance to wear and organic chemicals.

Charge air cooling is an important technology for reducing N0x emission which also has a number of other benefits. Fuel economy, power output and the maximum injection rates an engine can sustain are improved through charge air cooling. In order to design a mould, many important designing factors must be taken into consideration. These factors are mould size, number of cavity, cavity layouts, runner systems, gating systems, shrinkage and ejection system. In addition to runners and gates, there are many other design issues that must be considered in the design of the molds. Firstly, the mold must allow the molten plastic to flow easily into all of the cavities. Equally important is the removal of the solidified part from the mold, so a draft angle must be applied to the mold walls. Design should be in such a way that it must also accommodate any complex features on the part, such as undercuts or threads, which will require additional mold pieces. Most of these devices slide into the part cavity through the side of the mold, and are therefore known as slides, or side-actions. The most common type of side-action is a side-core which enables an external undercut to be molded.

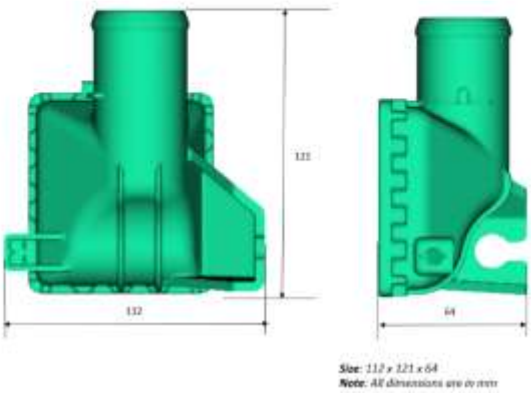

Fig. 1. Component Details

Fig .2 Angular lifter

Fig. 3 Mould view

DETAILS OF INJECTION MOULDING TOOL:

MOULD OR DIE ARE THE COMMON TERMS USED TO DESCRIBE THE TOOLING USED TO PRODUCE PLASTIC PARTS IN MOULDING. THE VARIOUS TYPES OF INJECTION MOULDSARE TWO PLATE MOULD, THREE PLATE MOULD, SPLIT CAVITY MOULD, STRIPPER PLATE MOULD AND HOT RUNNER MOULD. HERE FOR THESE COMPONENT TWO PLATE MOULDS IS SELECTED BY CONSIDERING COST AND ECONOMICAL FACTORS. THE DIFFERENT PARTS OF INJECTION MOULDING TOOL WITH MATERIALS IS LISTEDIN TABLE 1.

Sr.No.	*MouldElement*	*Material*
1	*CAVITY PLATE*	*1.2738(special P20)*
2	*CORE PLATE*	*1.2738(special P20)*
3	*CORE BACK PLATE*	*EN31*
4	*EJECTOR PLATE*	*EN31*
5	*EJECTOR BACK PLATE*	*EN31*
6	*SPACER BLOCKS*	*EN31*
7	*TOP PLATE*	*EN31*
8	*BOTTOM PLATE*	*EN31*
9	*GUIDE PILLAR*	*EN31*
10	*GUIDE BUSH*	*EN31*
11	*SPRUE BUSH*	*EN31*
12	*LOCATOR RING*	*EN31*

Table No. 1

DESIGN OF INJECTION MOULDING TOOL FOR **CAC INLET TANK :**

2.1. Modelling and design mouldof CAC inlet tank. It is decided to design and Simulate Injection moulding tool with ejectors assembly, baffle cooling channel and angular lifting mechanism..Based upon the model of CAC inlet tank, the different parts of the injection moulding tool is identified and a model of injection moulding tool is created in Creo parametric 2. For design of injection moulding tool for CAC inlet tank, the following steps are used.

Part details :

Name of the component : CAC Inlet Tank
Material: Material : PA 66 with 30% glass fibers (Durethan AKV 30 H2.0 901510)
Shrinkage 0.2- 1.1%
Volume of the component 71.48 cm3 (From CAD model)
Density of the material : 1.39 g/cm3
Projected area of component: 114.12 cm2 (From CAD model)
Weight of the component (W)= Volume X Density

W= V X p= 71.48 X 1.383 = 98.931 gm.

Total weight = W X Number of Cavities = 98.931 X 01 = 98.931 gm.
Shot Weight = Total weight of the component + Total weight of the feed system

Total weight of the feed system = 10% of component weight= 0.1 X 98.931= 9.893 gm.
Shot Weight = 98.931+ 9.893= 108.824 gm.

Clamping Tonnage :

Clamping tonnage required = Total projected area of the mould X Cavity pressure X no. of cavities
Injection pressure required for processing polyamide 66 with 30% glass filled to produce an engineering part is 1000 gm/ cm ^{3} maximum.
½ of injection pressure, as cavity pressure for easy flow materials as polyamide 66 with 30% glass filled has good flow ability hence ½ of injection pressure may be assumed as the cavity pressure.
Clamping tonnage required = Total projected area of the mould X Cavity pressure X no. of cavities
= 114.12 X (1/2 X 1000) X 1 = 57060 kg
Factor of safety of 1.3 (30% of actual tonnage) = 57060 X 1.3 = 74178 kg.
Minimum machine tonnage required = 74. 178 tonne.

Plasticizing Capacity (p_s)

Plasticizing capacity of the machine is calculated as follows:
Rated Plasticizing capacity of the material is:

Plasticizing rate = with material PS X $\frac{q_a}{q_b}$

Plasticizing rate of polystyrene = PS = 16.6 g/sec
q_a= 57 cal/g (total heat of polystyrene)
q_b= 135 cal/g (total heat of polyamide66)
P_s = 16.6 X 57 / 135
P_s= 7.00 g/s = 25.2 kg/hr
Plasticizing capacity of the machine for polyamide 66 with 30% glass filled is 25.2 kg/hr.
Machine available with capacity of 52 g/s = 187.2 kg/hr.

Shrinkage allowance: Shrinkage is inherent in the injection moulding process. Shrinkage occurs because the density of polymer varies from the processing temperature to the ambient temperature. The shrinkage factor will depends on Plastic material, Processing condition, Product design, Mould design. Shrinkage allowance of Nylon 66 is 0.5% considered. The dimensions of the cam bush has been modified with considering shrinkage allowance as shown in Table 2. This total dimensions are incorporated in the mould designing of core and cavity plate.

Sr.No.	Actual Dimension in mm	0.5% Shrinkage allowance in mm	Total Dimension in mm
1	78.7	0.393	70.093
2	85.5	0.4275	85.927
3	36	0.18	36.18
4	35	0.175	35.175
5	40	0.2	40.20
6	42	0.21	42.21
7	89.4	0.447	89.847
8	15	0.075	15.075
9	49	0.245	49.245
10	22	0.11	22.11
11	68	0.34	68.34
12	23.7	0.1185	23.8185

Table No. 2

Calculation for wall thickness of core /cavity Inserts :

Insert wall thickness, δ,

$$\delta = \sqrt[3]{\frac{CPd^4}{Ey}} \text{ mm}$$

c = constant based on ratio of cavity length to depth = 0.111

P =maxi.Cavity pressure = 630kg/cm^2
d= Depth of cavity wall = 6.4cm
E = Modulus of elasticity = 2.1× 10^{6}kg/cm^2
Y = Permissible deflection for the insert = 0.005cm

$$\delta = \sqrt[3]{\frac{0.111 X 630 X 6.4^4}{2.1 X 10^6 X 0.005}} = 2.235\text{cm} = 22.35 \text{ mm}$$

Design of guide pillar :

Guiding diameter of the guide pillar, d_p

$$d_p = \sqrt{\frac{4 X Q}{\pi X N_p X f_s}}$$

Q = side thrust
N_p = Number of guide pillars = 4 numbers
f_s=Working shear stress for the guide pillar material, kg/mm^2
Side thrust,
$Q = d_i \text{ X } h \text{ X } P_c$
d_i=Height of the core, mm
h = Maximum side of the core, mm
P_c = Pressure in the cavity, kg/cm^2
Q = [6.4 X 12.1 X 630] = 48787.20kg
Substituting the value of the side thrust induced, we get the minimum diameter of the guide pillar,d,

$$d_p = \sqrt{\frac{4 X 48787.20}{\pi X 4 X 1600}} = 3.11\text{cm} = 31.1\text{mm}$$

Feeding system Design:

Runner design :

The runner diameter is calculated by the following formulae

$D = \sqrt{W} X \sqrt[4]{L} / 3.7 -$ Where, W = weight of the component =108.82gm

L = Length of the runner =121 mm
Substituting the values in equation
Diameter of the runner.

$$D = \sqrt{98.931} X \sqrt[4]{121} / 3.7$$

D= 8.91 mm
Therefore diameter of the runner =8.91mm

Gate Design :-

According to the size and shape in the design, Edge gate is employed to feed the component.
To find gate width

$$W = \frac{n X \sqrt{A}}{30}$$

Where, n = constant = 0.9 for polyamide 66 with 30 % glass filled material.
A= Total surface area of the cavity = 14800mm^2

$$W = \frac{0.9 X \sqrt{14800}}{30} = 3.64\text{mm}$$

To find Gate depth
Gate depth, h_g = Avg width of gate/Avg thickness of component = 3.64/2.5=1.45mm

Mould cooling calculations:

Calculations are done based on coolant required and heat transfer rate, as follows.

Heat to be transferred from mould per hour (Q):

Q = n X m X qb
Where,
Q = Heat to be transferred per hour (cal/hr)
m =Mass of the plastic material injected into the mould per shot (g) = 108.824 g
n = number of shots per hour (72shots/hr)
qb = Heat content of plastic material,
for polyamide 66 with 30% glass filled =130 cal/g
Q = 60X 108.824X 130
Q = 1018.555KCal /hr
But in practice heat is removed by three ways Conduction, Radiation, Convection.
It is found in practice, that approximately 50 % of the total heat input is carried away by the water cooling systems in moulds.
Therefore amount of heat removed by cooling water is
Qd = 0.5 X Q = 0.5 X 1018.555= 509.277 K Cal/hr

Amount of water to be circulated per hour to dissipate heat (mw) :
Amount of water to be circulated to remove 50% of Heat is calculated as,

$$m_w = \frac{QX0.5XS}{K(T_{out}-T_{in})} = \frac{1018555.2X0.5X4.186}{0.64X5} = 666.198 \text{ Kg/hr}$$

m_w= 666.198 Lits/hr = 11.1033 lits/min
Where, K = Thermal conductivity of water
K = 0.64 for Cooling channels bored in cavity plate or male core
K = 0.5 for Cooling channels bored in back plate
K = 0.1 for Cooling channels in copper pipe
Tout = Outgoing water temperature ^{0}C
Tin = Incoming water temperature ^{o}C
S_W =Specific heat of water=4.186 J/gm^{o}C
m_w =Amount of water required to remove 50% of heat.
Assuming a reasonable temperature difference of Tout-Tin = 5 ^{0}C for water

CONCLUSION:

The work, deals with the designing of injection mould tool of a CAC inlet tank. The designing was carried out with Creo parametric 2. Throughout the project, an attempt has been made to understand the variables associated with the design of an injection mould. The designing process started with a basic tool layout. Core and cavity extraction helped in understanding of the manufacturing process Themould designed, has made it possible to produce high quality product at minimum cost. Defects can be minimized through improved design of the mold with the study of simulation of flow through the mold. Product was produced with less number of defects and according to specifications mentioned, keeping in notice the economy factor.

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Anonymous Validation of Cloud Data and Distributed Entry Management

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Abstract— We propose a new localised access management theme for secure knowledge storage in clouds that supports anonymous authentication. In the proposed theme, the cloud verifies the authenticity of the series while not knowing the users identity before storing data. Our scheme additionally has the additional feature of access management in that solely valid users are able to decode the keep info. The scheme prevents replay attacks and supports creation, modification, and reading data keep in the cloud. We additionally address user revocation. Moreover, our authentication and access control theme is localised and sturdy, unlike alternative access management schemes designed for clouds which are centralized. The communication, computation, and storage overheads are comparable to centralized approaches.

Keywords— Access control, authentication, attribute-based sig- natures, attribute-based encryption, cloud storage

INTRODUCTION

Research in cloud computing is receiving a lot of attention from both tutorial and industrial worlds. In cloud computing, users can source their computation and storage to servers (also called clouds) victimisation net. This frees users from the hassles of maintaining resources on-site. Clouds can offer many varieties of services like applications (e.g., Google Apps, Microsoft online), infrastructures (e.g., Amazons EC2, Eucalyptus, Nimbus), and platforms to help developers write applications (e.g., Amazons S3, Windows Azure). Much of the information hold on in clouds is extremely sensitive, for example, medical records and social networks. Security and privacy are, thus, very vital problems in cloud computing. In one hand, the user should attest itself before initiating any transaction, and on the other hand, it must be ensured that the cloud does not tamper with the info that's outsourced. User privacy is also needed in order that the cloud or other users do not recognize the identity of the user. The cloud can hold the user account able 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 additionally verified. Apart from the technical solutions to ensure security and privacy, there is also a requirement for law enforcement. Recently, Wang et al. [2] addressed secure and dependable cloud storage. Cloud servers prone to Byzantine failure, where a storage server will fail in absolute ways in which [2]. The cloud is also susceptible to information modification and server colluding attacks. In server colluding attack, the adversary can compromise storage servers, so that it will modify information files as long as they are internally consistent. To provide secure data storage, the data must be en- crypted. However, the data is usually changed and this dynamic property needs to be taken into consideration whereas coming up with efficient secure storage techniques. Efficient search on encrypted information is additionally a crucial concern in clouds. The clouds should not recognize the question but ought to be ready to come the records that satisfy the query. This is achieved by means of searchable encoding [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 info records should have keywords associated with them to enable the search. The correct records are came solely when searched with the actual 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 cryptologic techniques has been studied in [5]. Many homomorphic encryption techniques have been prompt [6], [7] to ensure that the cloud isn't able to browse the info whereas 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 decipher the result, but the cloud will not recognize what information it's operated on. In such circumstances, it must be attainable for the user to verify that the cloud returns correct results. Accountability of clouds is a terribly difficult task and involves technical issues and law social control. Neither clouds nor users should deny any operations performed or requested. It is important to possess log of the transactions performed; however, it is a crucial concern to determine how a lot of data to stay within the log. Accountability has been addressed in TrustCloud [8]. Secure provenance has been studied in [9]. Considering the following situation: A pupil, Alice, wants to send a series of reports regarding some malpractices by authorities of University X. to all the professors of University X, research chairs of universities in the country, and students belonging to Law department in all universities in the province. She wants to stay anonymous while publication all proof of malpractice. She stores the information within the cloud. Access control is important in such case, so that solely licensed users will access the data. It is also vital to verify that the information comes from a reliable supply. The problems of access control, authentication, and privacy protection should be resolved at the same time. We address this drawback in its entirety in this paper. Access control in clouds is gaining attention as a result of it is important that solely licensed users have access to valid service. A huge quantity of data is being hold on within the cloud, and much of this can be sensitive data. Care should be taken to guarantee access management of this sensitive information that will typically be associated with health, important documents (as in Google Docs or Dropbox) or even personal information (as in social networking). There are broadly 3 varieties of access management: user-based access control (UBAC), role-based access control (RBAC), and attribute-based access control (ABAC). In UBAC, the access control list contains the list of users who ar licensed to access information. This is not feasible in clouds wherever there are several users. In RBAC (introduced by Ferraiolo and Kuhn [10]), users are classified based on their individual roles. Data will be accessed by users who have matching roles. The roles are defined by the system. For example, only school members and senior secretaries might have access to information however not the junior secretaries. ABAC is more extended in scope, in which users are given attributes, and the data has hooked up access policy. Only users with valid set of attributes, satisfying the access policy, can access the information. For instance, in the above example bound records could be accessible by faculty members with a lot of than ten years of research expertise or by senior secretaries with a lot of than 8 years expertise. The pros and cons of RBAC and ABAC are mentioned in [11]. There has been some work on ABAC in clouds (for example, [12], [13], [14], [15], [16]). All these work use a cryptographic primitive famed as attributebased encryption (ABE). The eXtensible access management markup language [17] has been proposed for ABAC in clouds [18]. An space wherever access management is wide being employed is health care. Clouds are being used to store sensitive information regarding patients to change access to medical professionals, hospital staff, researchers, and policy makers. It is important to regulate the access of knowledge in order that solely authorized users will access the information. Using ABE, the records are encrypted underneath some access policy and hold on in the cloud. Users are given sets of attributes and corresponding keys. Only once the users have matching set of attributes, can they rewrite the data hold on in the cloud. Access control in health care has been studied in [12] and [13]. Access control is additionally gaining importance in on-line social networking where users (members) store their personal information, pictures, videos and share them with selected groups of users or communities they belong to. Access control in on-line social networking has been studied in [19]. Such data are being hold on in clouds. It is vital that only the licensed users are given access to those information. A similar situation arises once information is hold on in clouds, for example, in Dropbox, and shared with certain groups of individuals. It is just not enough to store the contents firmly within the cloud but it would possibly even be necessary to confirm obscurity of the user. For example, a user would like to store some sensitive information however will not need to be recognized. The user might need to post a comment on a piece, but does not need his/her identity to be disclosed. However, the user should be ready to persuade the opposite users that he/ she is a valid user who hold on the data while not revealing the identity. There are cryptologic protocols like ring signatures[20], mesh signatures [21], group signatures [22], which will be employed in these things. Ring signature is not a feasible choice for clouds wherever there are a large range of users. Group signatures assume the existence of a group which could not be attainable in clouds. Mesh signatures do not ensure if the message is from a single user or many users colluding along. For these reasons, a new protocol referred to as attribute-based signature (ABS) has been applied. ABS was proposed by Maji et al. [23]. In ABS, users have a claim predicate associated with a message. The claim predicate helps to identify the user as an licensed one, without revealing its identity. Other users or the cloud can verify the user and the validity of the message stored. ABS can be combined with ABE to attain authenticated access management while not revealing the identity of the user to the cloud. Existing work [12], [13], [14], 15], [16], [18], [38] on access control in cloud are centralized in nature. Except [38] and [18], all other schemes use ABE. The scheme in [38] uses a symmetric key approach and will not support authentication. The schemes [12], [13], [16] do not support authentication as well. Earlier work by Zhao et al. [15] provides privacy preserving attested access management 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 purpose of failure however tough to keep up because of the big range of users that are supported in an exceedingly cloud environment. We, therefore, emphasize that clouds should take a localised approach whereas distributing secret keys and attributes to users. It is also quite natural for clouds to have many KDCs in numerous locations within the world. Although rule et al. [34] proposed a localised approach, their technique does not attest users, who want to stay anonymous whereas accessing the cloud. In an earlier work, Ruj et al. [16] proposed a distributed access control mechanism in clouds. However, the scheme did not provide user authentication. The other disadvantage was that a user will produce and store a file and different users can solely browse the file. Write access was not permitted to users apart from the creator. In the preliminary version of this paper [1], we extend our previous work with added options that allows to authenticate the validity of the message while not revealing the identity of the user who has hold on data in the cloud. In this version we additionally address user revocation, that was not addressed in [1]. We use ABS scheme [24] to attain believability and privacy. Unlike [24], our scheme is resistant to replay attacks, in which a user can replace contemporary information with stale information from a previous write, even if it now not has valid claim policy. This is an important property as a result of a user, revoked of its attributes, might no longer be able to write to the cloud. We, therefore, add this extra feature in our theme and modify [24] appropriately. Our scheme additionally permits writing multiple times which was not allowable in our earlier work [16].

Our Contributions

The main contributions of this paper are the following:

1. Distributed access control of information hold on in cloud therefore that only licensed users with valid attributes will access them.
2. Authentication of users who store and modify their data on the cloud.
3. The identity of the user is protected from the cloud during authentication.
4. The architecture is localised, meaning that there can be many KDCs for key management.
5. The access control and authentication are each collusion resistant, meaning that no 2 users will collude and access information or attest themselves, if they are on an individual basis not licensed.
6. Revoked users cannot access data once they have been revoked.
7. The proposed theme is resilient to replay attacks. A writer whose attributes and keys have been revoked cannot write back stale information.
8. The protocol supports multiple read and write on the data hold on within the cloud.
9. The costs are cherish the present centralized approaches, and the expensive operations are largely done by the cloud

RELATED WORK

Related work ABE was proposed by Sahai and Waters [26]. In ABE, a user has a set of attributes additionally to its unique ID. There are two categories of ABEs. In key- policy ABE or KP-ABE (Goyal et al. [27]), the sender has an access policy to write in code knowledge. A writer whose attributes and keys have been revoked cannot write back stale information. The receiver receives attributes and secret keys from the attribute authority and is able to decrypt info if it has matching attributes.In Ciphertext-policy, CP-ABE ([28], [29]), the receiver has the access policy in the type of a tree, with attributes as leaves and monotonic access structure with AND, OR and other threshold gates. All the approaches take a centralized approach and allow solely one KDC, which is a single purpose of failure. Chase [30] proposed a multi authority ABE, in which there are many KDC authorities (coordinated by a sure authority) which distribute attributes and secret keys to users. Multi authority ABE protocol was studied in [31] and [32], that needed no sure authority which needs every user to have attributes from in any respect the KDCs. Recently, Lewko and Waters [35] proposed a totally sub urbanised ABE where users might have zero or additional attributes from every authority and did not require a sure server. In all these cases, decryption at users finish is computation intensive. So, this technique can be inefficient when users access victimization their mobile devices. To get over this problem, Green et al. [33] proposed to source the decipherment task to a proxy server, so that the user will cipher with minimum resources (for example, hand held devices). However, the presence of one proxy and one KDC makes it less robust than decentralized approaches. Both these approaches had no way to manifest users, anonymously. Yang et al. [34] presented a modification of [33], authenticate users, who want to stay anonymous whereas accessing the cloud. To ensure anonymous user authentication ABSs were introduced by Maji et al. [23]. This was also a centralized approach. A recent scheme by Maji et al. [24] takes a decentralized approach and provides authentication while not disclosing the identity of the users. However, as mentioned earlier in the previous section it’s at risk of replay attack.

PROPOSED PRIVACY PRESERVING AUTHENTICATED ACCESS CONTROL SCHEME

In this section, we propose our privacy preserving authen- ticated access control scheme. According to our scheme a user can create a file and store it securely in the cloud. This scheme consists of use of the two protocols ABE and ABS. We will first discuss our scheme in details and then provide a concrete example to demonstrate how it works. We refer to the Fig. 1. There are three users, a creator, a reader, and writer. Creator Alice receives a token from the trustee, who is assumed to be honest. A trustee can be someone like the federal government who manages social insurance numbers etc. On presenting her id (like health/social insurance number), the trustee gives her a token . There are multiple KDCs (here 2), which can be scattered. For example, these can be servers in different parts of the world. A creator on presenting the token to one or more KDCs receives keys for encryption/decryption and signing. In the Fig. 1, SKs are secret keys given for decryption, K are keys for signing. The message MSG is encrypted under the access policy X . The access policy decides who can access the data stored in the cloud. The creator decides on a claim policy Y, to prove her authenticity and signs the message under this claim. The ciphertext C with signature is c, and is sent to the cloud. The cloud verifies the signature and stores the ciphertext C When a reader wants to read, the cloud sends C. If the user has attributes matching with access policy, it can decrypt and get back original message. Write proceeds in the same way as file creation. By designating the verification process to the cloud, it relieves the individual users from time consuming verifications. When a reader wants to read some data stored in the cloud, it tries to decrypt it using the secret keys it receives from the KDCs. If it has enough attributes matching with the access policy, then it decrypts the information stored in the cloud.

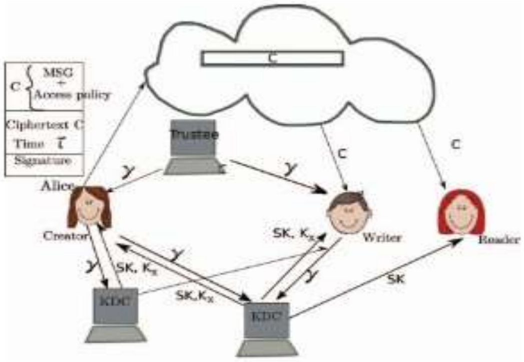

Fig. 1. Our secure cloud storage model

COMPARISON WITH OTHER ACCESS CONTROL SCHEMES IN CLOUD

We compare our theme with different access management schemes and show that our scheme supports several features that the different schemes didn’t support. 1-W-M-R means that just one user will write whereas several users will read. M-W-M-R means that several users will write and browse. We see that most schemes don’t support several writes which is supported by our theme. Our scheme is strong and de- centralized ,most of the others are centralized. Our scheme additionally supports privacy protective authentication, which is not supported by others. Most of the schemes do not support user revocation, which our theme will. We compare the computation and communication costs incurred by the users and clouds and show that our distributed approach has comparable costs to centralized approaches. The most expensive operations involving pairings and is done by the cloud. If we compare the computation load of user during scan we have a tendency to see that our scheme has comparable prices. Our scheme additionally compares well with the other echt theme of [15].

CONCLUSION

We have bestowed a decentralized access management technique with anonymous authentication, which provides user revocation and prevents replay attacks. The cloud does not know the identity of the user United Nations agency stores info, but solely verifies the users credentials. Key distribution is done in a decentralized manner. One limitation is that the cloud knows the access policy for every record keep within the cloud. In future, we would wish to hide the attributes and access policy of a user.

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ADAPTIVE FIR FILTER USING DLMS FOR AREA EFFICIENT DESIGN

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Abstract— least mean square (LMS) adaptive filter is the most popular and most widely used adaptive filter. It is simple and also its convergence performance is satisfactory. The structure can be modified to support pipelining is called delayed least mean square (DLMS) algorithm. From the structure of the DLMS adaptive filter, it is clear that there is a scope for reducing the area and delay in the existing structure of DLMS filter. This work uses a novel partial product generator for achieving lower adaptation-delay and area. Based on this efficient architecture for the implementation of a delayed least mean square adaptive filter have been developed and compared with the existing structure. These works propose a strategy for optimized balanced pipelining across the time-consuming combinational blocks of the structure. We find that the proposed design offers nearly less area and delay than the best of the existing systolic structures on seeing synthesis results.

Keywords— LMS adaptive filter, DLMS adaptive filter, AOC AND/OR cell, PPG partial product generator, ESM electronic support measure, MAC multiply and accumulate.

I. INTRODUCTION

Least mean square (LMS) adaptive filter is the most desired and most widely used adaptive filter. It is simple and also its convergence performance is satisfactory. In direct-form adaptive filter, pipelined implementation is needed to reduce the long critical path which arises due to inner-product computation. Critical path as to be reduced by pipelined implementation when it exceeds the selected sampling period. Because of its recursive behavior conventional LMS algorithm does not support pipelined implementation .Algorithm as to be modified to a form called the delayed LMS (DLMS) algorithm, which allows pipelined implementation of the filter.

Impulse response of a FIR filter is finite because it becomes zero in finite duration. IIR (infinite impulse response) filter continue to respond indefinitely, it as internal feedback. For Nth-order FIR filter it lasts for N+ 1 sample, and then settles to zero. FIR filters can be discrete-time or continuous-time, and digital or analog.FIR filters are the digital filters whose impulse response reaches zero in finite number of steps .FIR filter is implemented by convolving its impulse response with the time data sequence it is filtering. FIR filters are simpler than IIR filters, which contain one or more feedback terms. Difference equations are used to implement FIR filter. Recursive techniques are also used to implement FIR filter.

One of the simplest implementation of FIR is “linear Phase” design. Here phase is not disturbed, input signal is delayed. They are simple to implement.FIR calculation is done by looping a single instruction on DSP processors. They are suited to multi-rate applications. By multi-rate, we can reduce the sampling rate by “decimation” and we can increase the sampling, or both. By both the process some of the values are excluded thus providing an important computational efficiency.

Whereas in IIR filters are used, each outputs are individually calculated (therefore feedback is combined into the filter). They have desirable numeric properties. DSP filters must be implemented using "finite-precision" arithmetic, that is, a limited number of bits. But certain significant problems occur when feedback is used. But using fewer bits fir filters can be implemented, because they have no feedback. But lesser problems will arise to solve related to non-ideal arithmetic. Fractional arithmetic is also used to implement. FIR filter is also implemented with coefficients less than 1.0. To make implementation simpler this is an important factor to consider.

IMPULSE RESPONSE – It is a set of FIR coefficients. (For example impulse response of a FIR filter which consists of a "1" sample following “0" samples, the output will be the set of coefficients, as a sample moves past each coefficient following to form the output.)

TAP - "Tap" is simply a coefficient or delay pair. The amount of FIR taps, (denominated as "N") is an illustration of 1) the number of memory required to implement the filter, 2) the number of computations required, and 3) the amount of "filtering" the filter can do; in effect, more taps means more narrower filters, less ripple, stop band attenuation etc.)

MULTIPLY-ACCUMULATE (MAC) – MAC operation is done by delaying the data sample, multiply it with the coefficient and accumulate the result. FIRs usually require one MAC per tap. In DSP microprocessors MAC operation is implemented in a single instruction cycle.

TRANSITION BAND – It is the band of frequencies present in between pass band edges and stop band edges. More of taps are needed for narrow band. (“small” transition band -“sharp” filter.)

DELAY LINE – Delay line is the set of memory elements that implement the "Z^(-1)" delay elements of the FIR calculation.

CIRCULAR BUFFER – It is a buffer which wrap to the origin when it is incremented and wraps to the terminus when it is decremented. DSP microprocessors provides circular buffer not by literally moving in a memory but simply replacing it.

II. LITERATURE SURVEY

“A Systolic Array Realization Of An LMS Adaptive Filter And The Effects Of Delayed Adaptation”,Hanan Herzberg, Raziel Haimi_cohen.

Description -This paper presents a design of a systolic array of an adaptive filter. Filter with LMS algorithm creates problem in implementation, therefore a modified algorithm, a special case of the delayed LMS (DLMS) algorithm introduces a delay in the restoring of the filter coefficients. The steady state and convergence behavior of the systolic array are analyzed. But in practical systolic array and conventional LMS implementation is similar.

Disadvantages of Existing System

The structure involves high adaptation delay for large order filters and so the convergence performance degrades considerably for high adaptation delay.

“An Efficient Systolic Architecture For The DLMS Adaptive Filter And Its Applications”,Lan-Da Van, and Wu-Shiung Feng

Description-This paper presents an efficient systolic architecture for the delay least-mean-square (DLMS) adaptive FIR digital filter. It is based on a processing element (PE) tree- systolic and an optimized tree-level rule. Applying our processing element, a higher convergence rate than that of the conventional DLMS structures can be obtained . No need to sacrifice the properties of the systolic-array architecture It operates at the highest throughput in the word-level and also considers finite driving or update of the feedback error signal.

Furthermore, based on our proposed optimized tree-level rule that takes account of minimum delay and high regularity, an efficient N -tap systolic adaptive FIR digital filter can be easily determined under the constraint of maximum driving of the feedback error signal.

Disadvantages of Existing System

The systolic architecture uses relatively large processing elements for inner product computation .This achieves lower adaptation delay but involves critical path.

“Virtex FPGA Implementation of a Pipelined Adaptive LMS Predictor for Electronic Support Measures Receivers”,**Lok-Kee Ting, Roger Woods and Colin. F. N. Cowan.**

Description

In this paper FPGA of an LMS filter along with ESM digital receiver is implemented. Here “fine-grained” pipelining is used which is nothing but pipelining is done within the processor. Finally the result is there is an increase in output latency when we use in LMS system. Main challenge in this paper is there should be an increase in pipelining but output latency as to be low in order to have high speed. In this paper DLMS algorithm is implemented in direct form as well as in transposed form using fine-grained pipelined FPGA. Results are compared. Among both the implementations, direct form LMS filter consumes more FPGA resources effectively with a sampling rate of 120 MHz .A high-speed implementation features and flexibility of a COTS platform is seen in FPGA. Nowadays in FPGA’s various classes of adaptive algorithms were implemented on a single FPGA device. Since adaptive filter as error feedback signal in the recursive structure one cannot design adaptive filter using direct implementation. At this point FPGA proves to be slower in performance. most of the DSP algorithm improves its system throughput rate by accomplishing concurrency in the form of parallelism and pipelining. But pipelining of adaptive recursive structures will inevitably destroy the adaptive filtering stability and performance due to the increased latency in the feedback structure. One way to stabilize the filter is to employ a smaller step size, but this hampers the adaptive filtering performance. FPGA implementations of pipelined LMS filters are presented in this paper. “Fine-grained” pipelining application within the filter processors and careful selection of the filter architecture, results in a high speed, low latency design. Comparison of area, latency and speed is been done using DLMS implementation in both direct as well transposed structure. All designs implemented using the Xilinx Virtex FPGA technology.

Disadvantages of Existing System

Critical path is limited to the maximum of one addition time and it also supports high sampling frequency, but main disadvantage higher power consumption and lot of area overhead for pipelining due to its large number of pipeline latches.

“A High-Speed FIR Adaptive Filter Architecture using a Modified Delayed LMS Algorithm”,**Pramod K. Meher, Megha Maheshwari.**

Description

This paper presents a modified DLMS algorithm and a new architecture for high-speed adaptive filtering with very low adaptation-delay. The proposed architecture involves two pipelined blocks: (i) one for the computation of error, (ii) and the other for weight-updating. The final subtraction to compute error is merged with the computation of filter output, and realized by a pipelined inner-product unit. Similarly, the multiplications and additions involved in weight updating are merged and performed by N pipelined units in parallel for Nth order filter. The critical-path is restricted to one addition time using carry-save chain in both these units and introducing feed-forward cut-sets at desired locations.It is more efficient in terms of power-delay product and area delay product compared with the existing structures, since it involves very less number of pipelining latches. Besides, it is easily scalable for higher order filters, since the number of pipeline stages and so also the adaptation-delay do not change significantly with the filter order.

Disadvantages of Existing System

This structure involves several stages of carry save unit to produce final product result and this structure does not support pipelining hence involves delay.

III. ADAPTIVE FIR FILTER

3.1 MODULES

- AOC Block.
- PPG unit.
- Error-computation block.
- Weight-update block.
- LMS adaptive filter.

3.2 MODULE DESCRIPTION

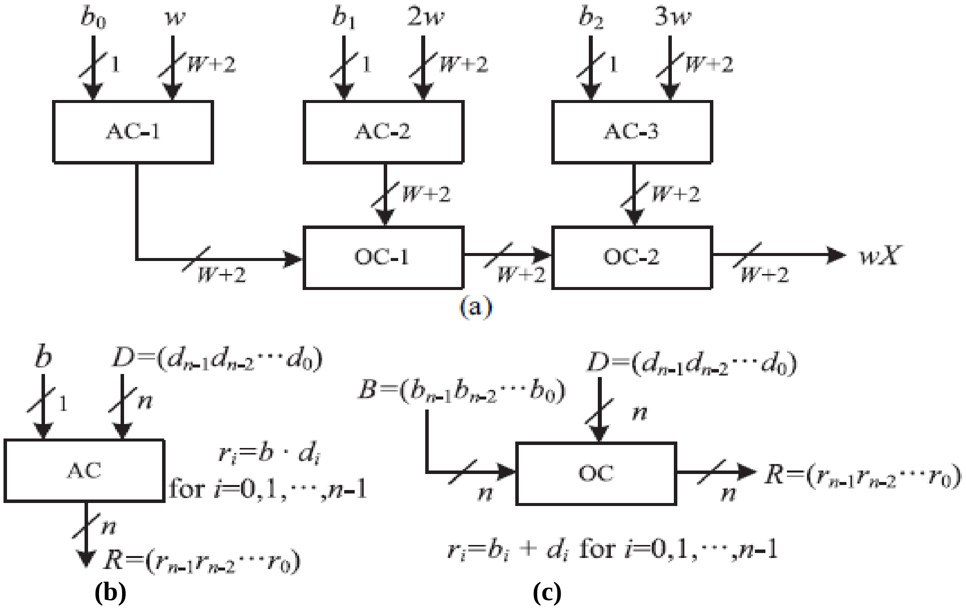
There are two main computing blocks in the adaptive filter architecture:

- The error-computation block
- weight-update block.

In this Section, in the error computation block the adaption delay is minimized which is followed by the weight-update block.

3.2.1 AOC Block

The structure and function of an AOC is depicted in Figure 3.1.Each AOC consists of three AND cells and two OR cells. Each AND cell takes an input D(n-bit) and input b (a single bit), and consists of n AND gates. It distributes all the n bits of input D to its n AND gates as one of the inputs.



(b) **(c)**

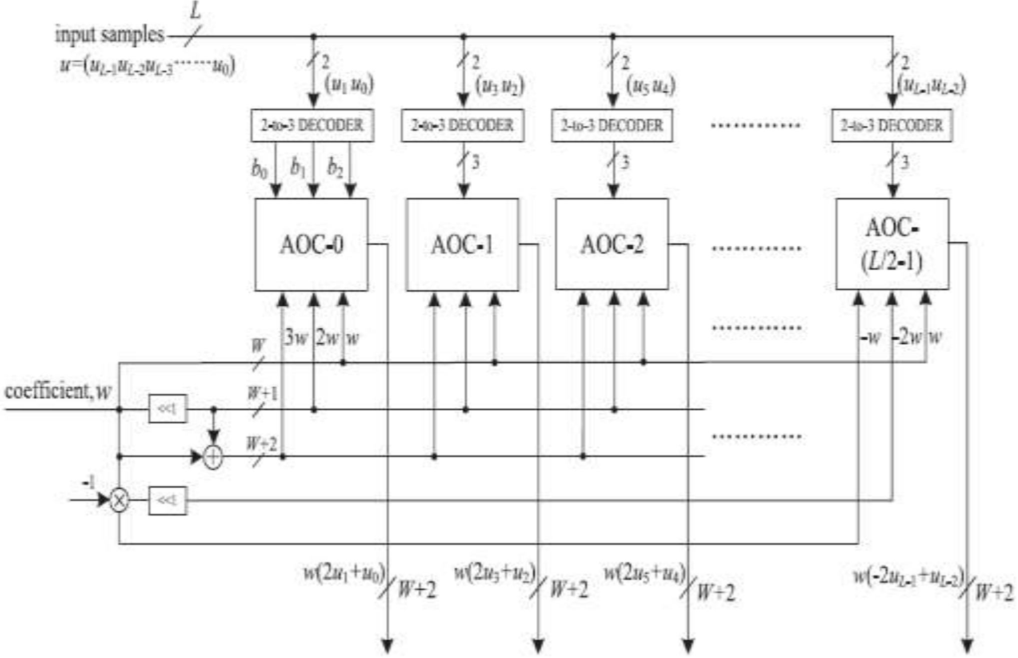
Figure 3.1 Structure and function of AND/OR cell

Other inputs of all the n AND gates are fed with the input b (single-bit), each OR cell similarly takes a pair of input (n-bit) words and has OR (n) gates. A pair of bits in the same bit position in B and D is fed to the same OR gate. w, 2w, and 3w are the output of an AOC corresponding to the decimal values 1, 2, and 3 of the 2-b input (u_1u_0). A multiplication of w (input operand) with a 2-b digit (u_1u_0) is performed by decoder along with the AOC, such that the PPG of Figure.3.2. performs L/2 parallel multiplications of input word w with a 2-b digit to produce L/2 partial products of the product word wu.

3.2.2 PPG UNIT

The structure of each PPG is shown in Figure3.2.It as L/2 number of 2-to-3 decoders and the same number of AND or(AOC) OR cells. All 2-to-3 decoders takes a 2-b digit (u_1u_0) as input and produces three outputs as given in equations (3.1),(3.2)and (3.3) such that $b_0 = 1$ for (u_1u_0) = 1, $b_1 = 1$ for (u_1u_0) = 2, and $b_2 = 1$ for (u_1u_0) = 3.

$$b_0 = u_0 \cdot \bar{u}_1 \tag{3.1}$$
$$b_1 = \bar{u}_0 \cdot u_1 \tag{3.2}$$
$$b_2 = u_0 \cdot u_1 \tag{3.3}$$



- **Figure 3.2** Proposed structure of PPG

b_0, b_1 and b_2 which is the decoded output fed with w, 2w, and 3w to an AOC. w, 2w, and 3w are sign extended so that each may have (W + 2) bits & they are in two's complement representation . w, −2w, and –w are fed as input to AOC (L/2 − 1) . so that (u_{L-1} u_{L-2}) can have four possible values 0, 1, −2, and −1.This is done to consider the sign of the input samples during the computation of partial product corresponding to (MSD) most significant digit (u_{L-1} u_{L-2}) of the input sample.

3.2.3 PPG and A Normal Multiplier

Normal multiplier performs bit by bit multiplication whereas in case of partial product generator, multiplication can be done by 2 bits parallelly.Hence the computation made simpler and also reduces the delay in generating the partial products. This makes PPG to be more efficient than the multiplier.

Manual Example

Multiplier

```
    U    00000010
    W    00000011
         00000010
        00000010
       00000000
      00000000
     00000000
    00000000
   00000000
  00000000
 000000000000110
```

PPG
Let U=00000010 W=00000011
Decoder output

$u_0 = 0$ $u_1 = 1$

Substitute the above values in equations (3.1), (3.2) and (3.3) we get,

$b_0 = 0.0 = 0$

$b_1 = 1.1 = 1$

$b_2 = 1.0 = 0$

$W_1 = 00000011$

$W_2 = 000000110$ (<<1)

$W_3 = 0000001001$ ($W_2 + W_1$)

$b_0.W_1 = 0$,

$b_1.W_2 = 0000000110$,

$b_2.W_3 = 0$

AOC output=0000000110. Other three AOC outputs are 0.

In the above example multiplier generates 8 partial products but PPG generates only 4 partial products and hence reduces the delay and computation complexity.

3.2.4 Structure of Adder Tree

In practice we perform shift-add operations on partial products of PCG in order to get product value. And inner product is obtained by adding all the N product values. But word length increases due to shift-add operation to get product value. Due to that adder size of N − 1 additions of the product values also increases. N partial products with the same place value from all the PPGs(N) is been added by one adder tree to overcome such an increase in word size of adders. (L/2) binary adder trees are added with all the L/2 partial products generated by each of the N PPGs.

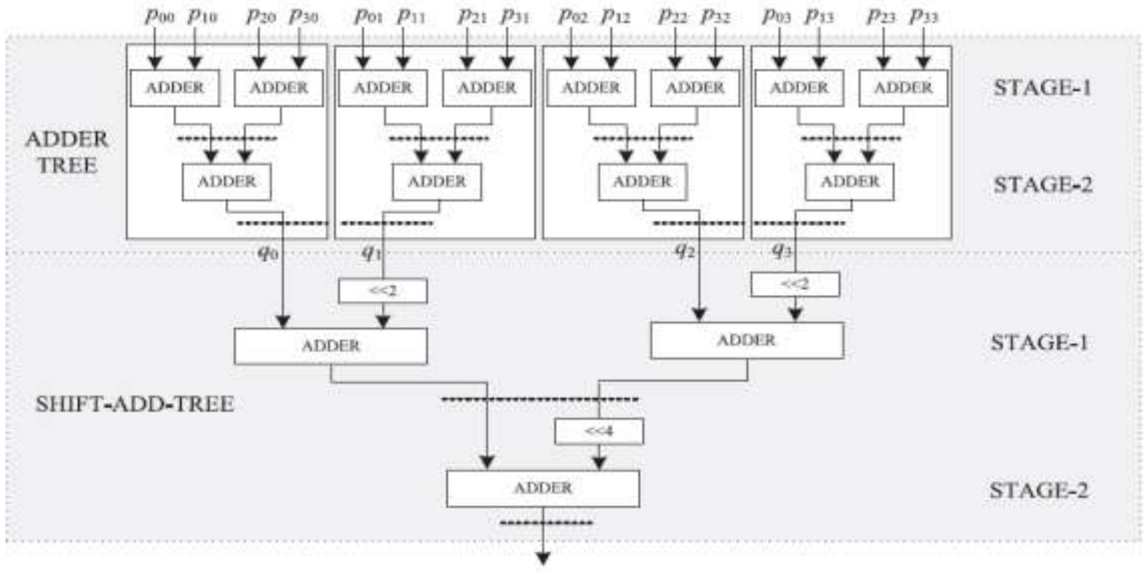


Figure 3.3 Adder structure of the filtering unit for N=4 and L=8

According to their place values the outputs of the L/2 adder trees are then added by a shift-add tree. To add N partial product each of the binary adder trees require log2 N stages of adders, and to add L/2 output of L/2 binary adder trees the shift–add tree requires log2 L − 1 stages of adders. The addition scheme for the error-computation block for a four-tap filter and input word size L = 8. The adder network requires 4 binary adder trees of 2 stages each and a 2-stage shift–add tree for N = 4 and L = 8. In the Figure3.3, we have shown all possible locations of pipeline latches by dashed lines.

3.2.5 Error-Computation Block

The proposed structure for error-computation unit of an N-tap DLMS adaptive filter is shown in Figure3.4
Outputs are generated using equations (3.4) and (3.5) for error and the filter.

$$e_{n-n1} = d_{n-n1} - y_{n-n1} \qquad (3.4)$$

$$y_n = w^T_{n-n2} \cdot x_n \qquad (3.5)$$

This block consists of

1)2-bit PPG equal to N multipliers
2) A cluster of L/2 binary adder trees
3)A single shift–add tree

Each sub block is described in detail in previous sections.

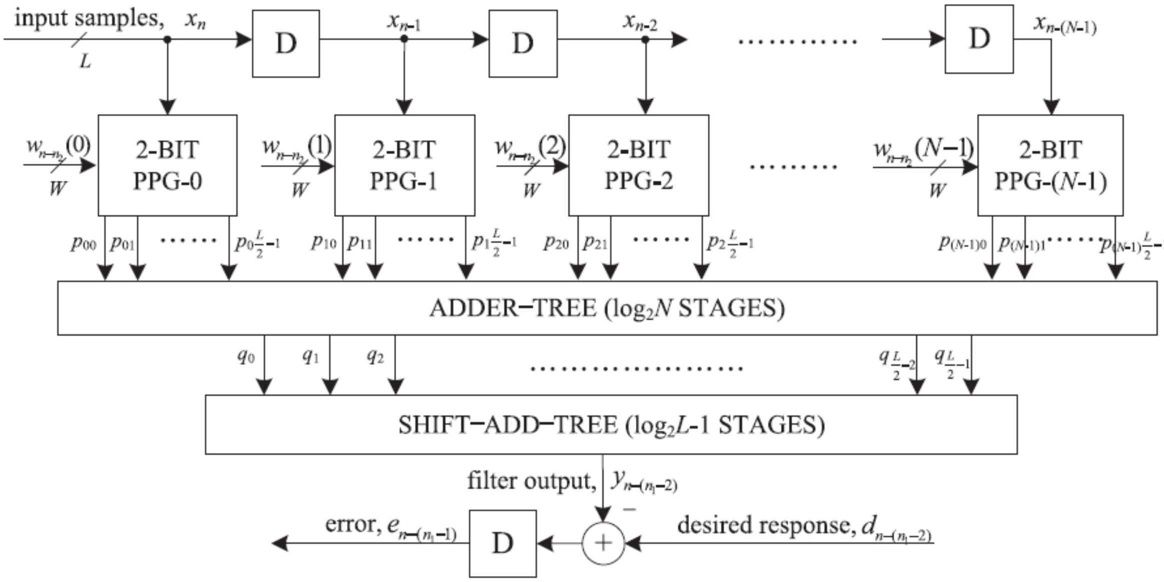


Figure 3.4 Proposed structure of error computation block

3.2.6 Weight-Update Block

Figure 3.5 represents the proposed structure for the weight-update block is shown in. It performs (μ × e) × xi + wi operation which is N multiply-accumulate operations to update N filter weights. μ, the step size is taken as power of negative of 2 to realize the multiplication with recently available error. Shift operation is done to perform this process. So every MAC units performs the multiplication of xi (delayed input samples) with the the shifted value of error. After that addition is performed with the corresponding old weight values wi.

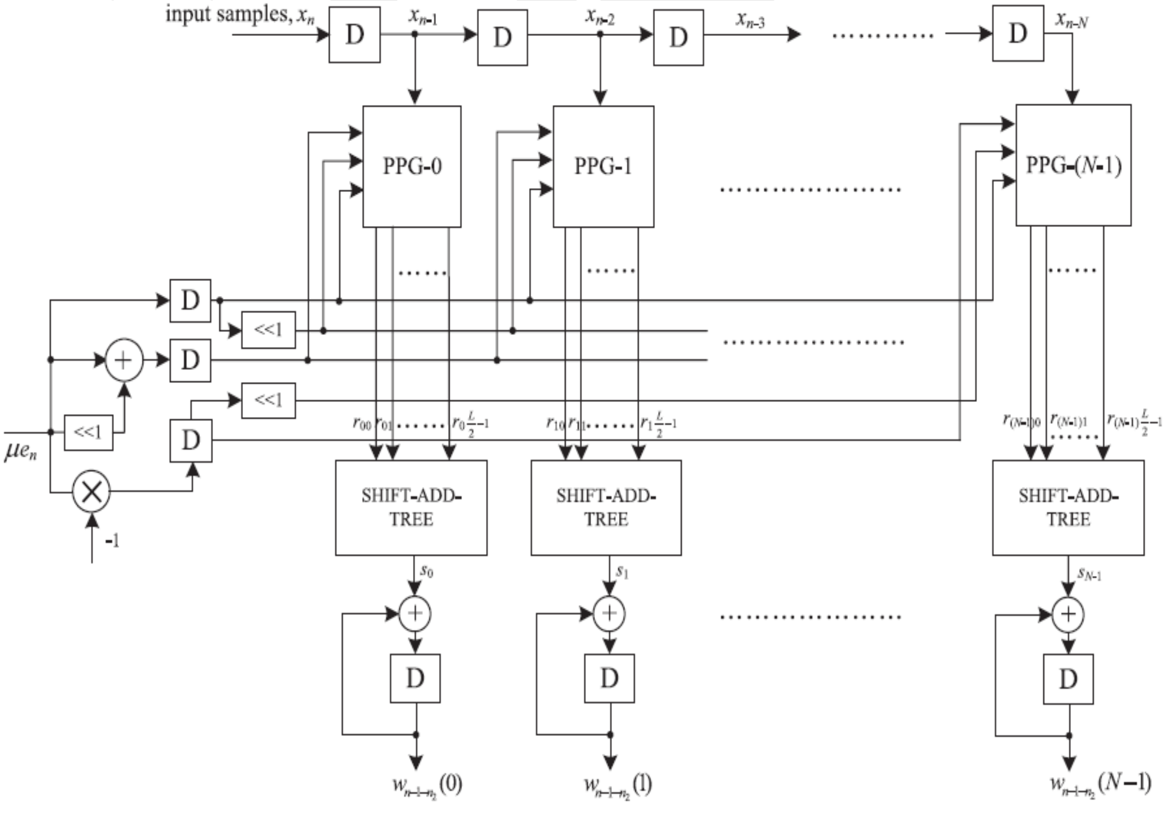


Figure 3.5 Proposed structure of the weight update block

N PPGs performs all the N multiplications for the MAC operations which are followed by N shift– add trees. Every PPGs generates L/2 partial products. These products are equal to the product of the recently shifted error value μ × e with L/2, the number of input word xi (2-bit digits), where the sub expression 3μ×e is shared within the multiplier. The μ×e(scaled error) is multiplied with all N delayed input values in the weight-update block. Therefore this sub expression can be allotted across all the multipliers. Due to this there is a substantial reduction of the adder complexity. For the next iteration error- computation block and weight-update block is loaded with the inputs coming from MAC units. MAC units generate the desired updated weights.

3.2.7 LMS Adaptive Filter

Adaptation delay of conventional LMS is dissolved into two parts 1) delay in pipeline stages during FIR filtering 2) due to the delay involved in pipelining the weight update process. Based on such a decomposition of delay, the LMS adaptive filter can be implemented by a structure shown in Figure3.6**.**

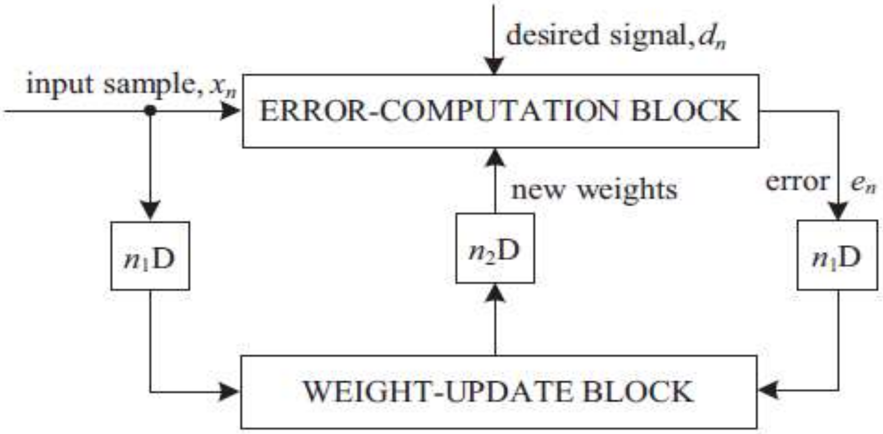


Figure 3.6 Structure of modified delayed LMS adaptive filter

3.2.8 Adder-Tree Optimization

For the computation of yn the adder tree and shift–add tree can be pruned for further optimization of power complexity, delay and area. For the computation of filter output with that the proposed pruning optimization of adder tree and shift–add tree is illustrated , a simple example is taken with the filter length N = 4 ,L=8 &W=8(word length). The dot diagram of the adder tree is shown in figure3.7. Each row of the dot diagram denotes partial products generated by the PPG unit, for W = 8. Each row contains 10 dots. We have taken L value as 8.therefore we will get four sets of partial products corresponding to four partial products of each multiplier. Each set of partial products of the same weight values contains four terms, since N = 4. The final sum without truncation should be 18 b. However, we use only 8 b in the final sum, and the rest 10 b are finally discarded. Computational complexities are reduced by truncating some of the LSBs of inputs of the adder tree. Truncation impact on the error performance of the adaptive filter can be minimized by the use of guard bits. In figure 3.7, four bits are taken as the guard bits and the rest six LSBs are truncated. PPGs do not generate the truncated bits in order to have more hardware saving, in addition to that the complexity of PPGs also gets reduced.

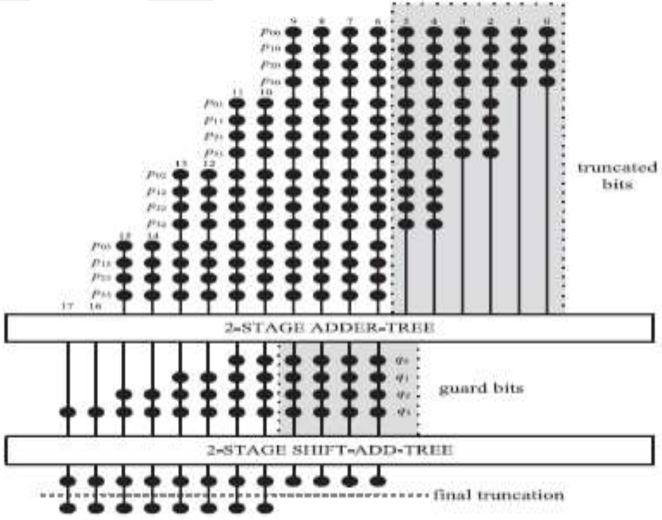


Figure 3.7 Dot diagram for optimization of the adder tree

IV. SOFTWARE REQUIREMENTS

4.2.1 Verification Tool

- ModelSim 6.4c

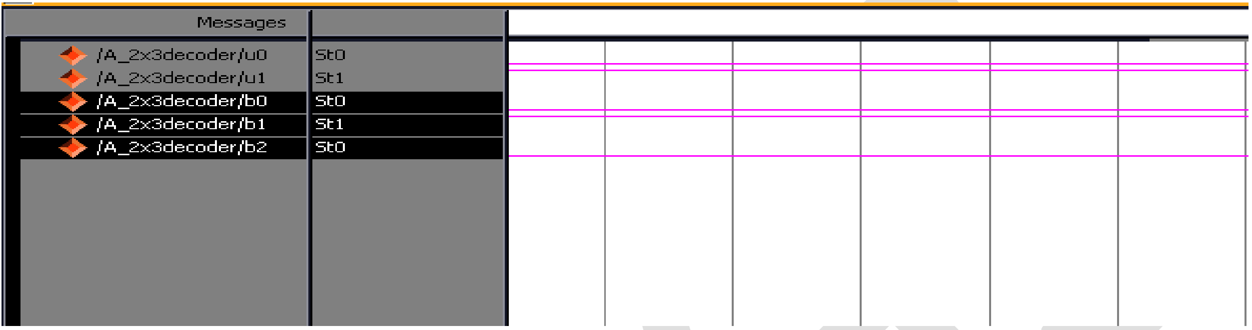
4.2.2 Synthesis Tool

- Xilinx ISE 13.2

V. RESULTS AND DISCUSSION

5.1 PROPOSED SYSTEM SIMULATION RESULT:

The figure 5.1 shows the simulation result of 2x3 decoder for inputs u0=0 and u1=1

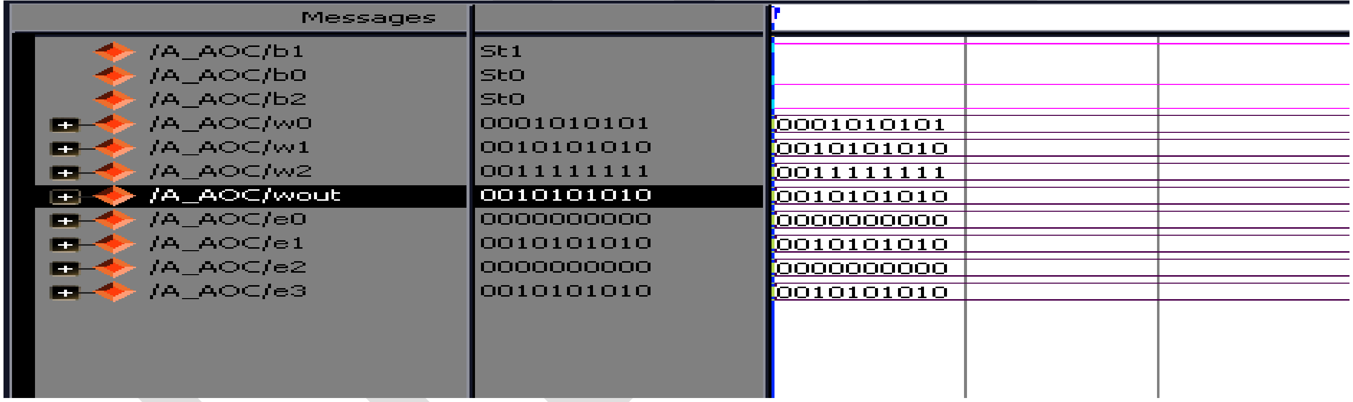


```
Messages
/A_2x3decoder/u0   St0
/A_2x3decoder/u1   St1
/A_2x3decoder/b0   St0
/A_2x3decoder/b1   St1
/A_2x3decoder/b2   St0
```

Figure 5.1 2x3 decoder

The input to the decoder is 2 bit and produces 3 bit output. Decoder is used to reduce computation complexity since even both the input bits are set to be 1,only one bit in the output is 1.

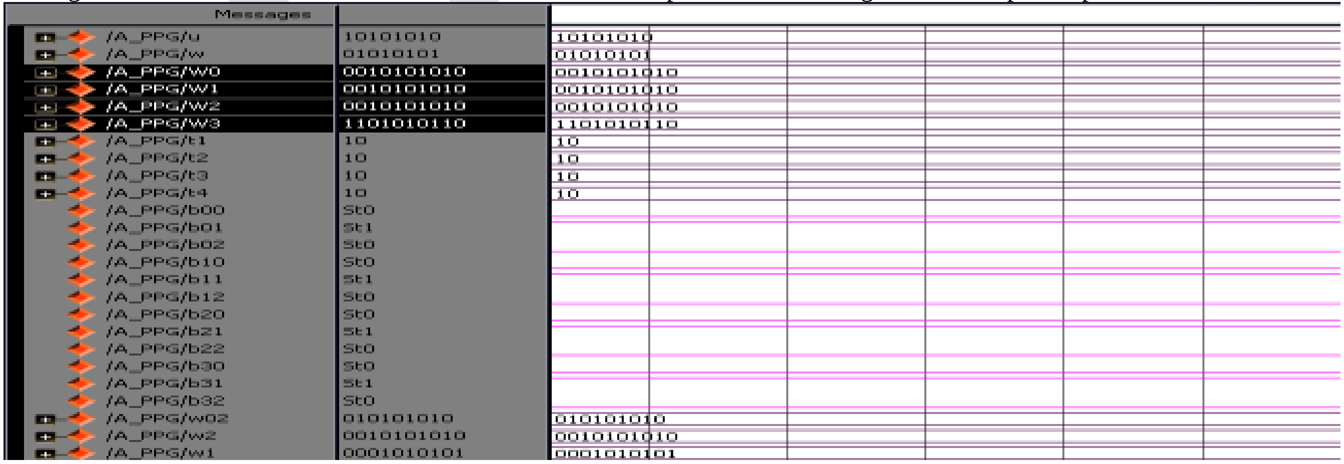
The figure 5.2 shows the simulation result of AOC block with inputs b0,b1,b2 , w0,w1and w2.Corres ponding b and w bit get multiplied and at the end all products are added to get wout.



```
Messages
/A_AOC/b1     St1
/A_AOC/b0     St0
/A_AOC/b2     St0
/A_AOC/w0     0001010101    0001010101
/A_AOC/w1     0010101010    0010101010
/A_AOC/w2     0011111111    0011111111
/A_AOC/wout   0010101010    0010101010
/A_AOC/e0     0000000000    0000000000
/A_AOC/e1     0010101010    0010101010
/A_AOC/e2     0000000000    0000000000
/A_AOC/e3     0010101010    0010101010
```

Figure 5.2 AOC block

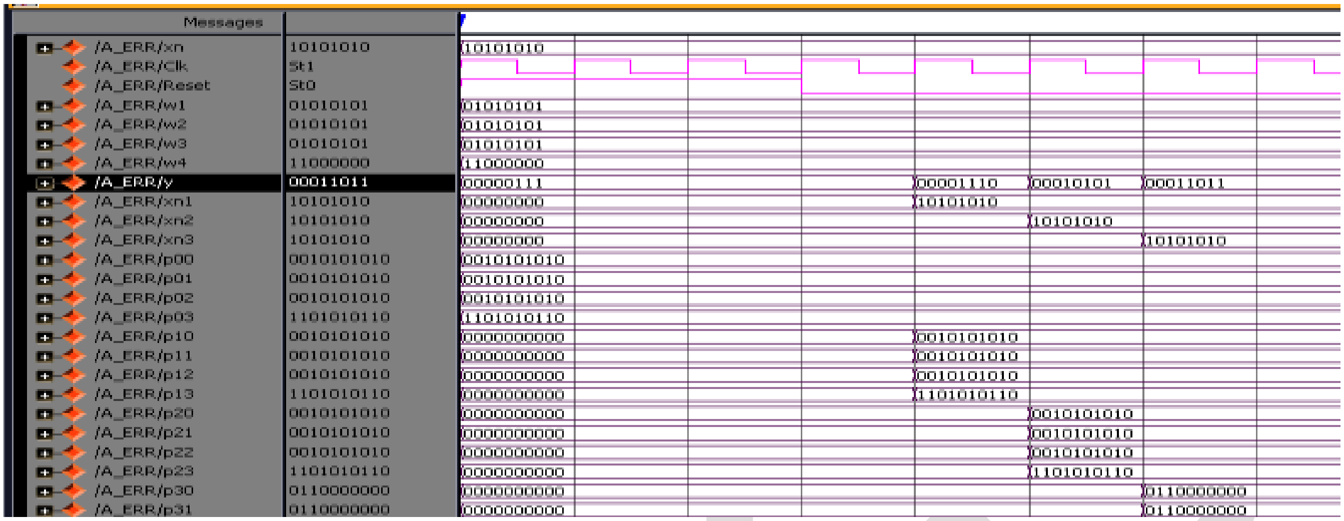
The figure 5.3 shows the simulation result of PPG unit with inputs u and w and generates the partial products w0,w1,w2 and w3.



```
Messages
/A_PPG/u     10101010      10101010
/A_PPG/w     01010101      01010101
/A_PPG/W0    0010101010    0010101010
/A_PPG/W1    0010101010    0010101010
/A_PPG/W2    0010101010    0010101010
/A_PPG/W3    1101010110    1101010110
/A_PPG/t1    10            10
/A_PPG/t2    10            10
/A_PPG/t3    10            10
/A_PPG/t4    10            10
/A_PPG/b00   St0
/A_PPG/b01   St1
/A_PPG/b02   St0
/A_PPG/b10   St0
/A_PPG/b11   St1
/A_PPG/b12   St0
/A_PPG/b20   St0
/A_PPG/b21   St1
/A_PPG/b22   St0
/A_PPG/b30   St0
/A_PPG/b31   St1
/A_PPG/b32   St0
/A_PPG/w02   010101010     010101010
/A_PPG/w2    0010101010    0010101010
/A_PPG/w1    0001010101    0001010101
```

Figure 5.3 PPG unit

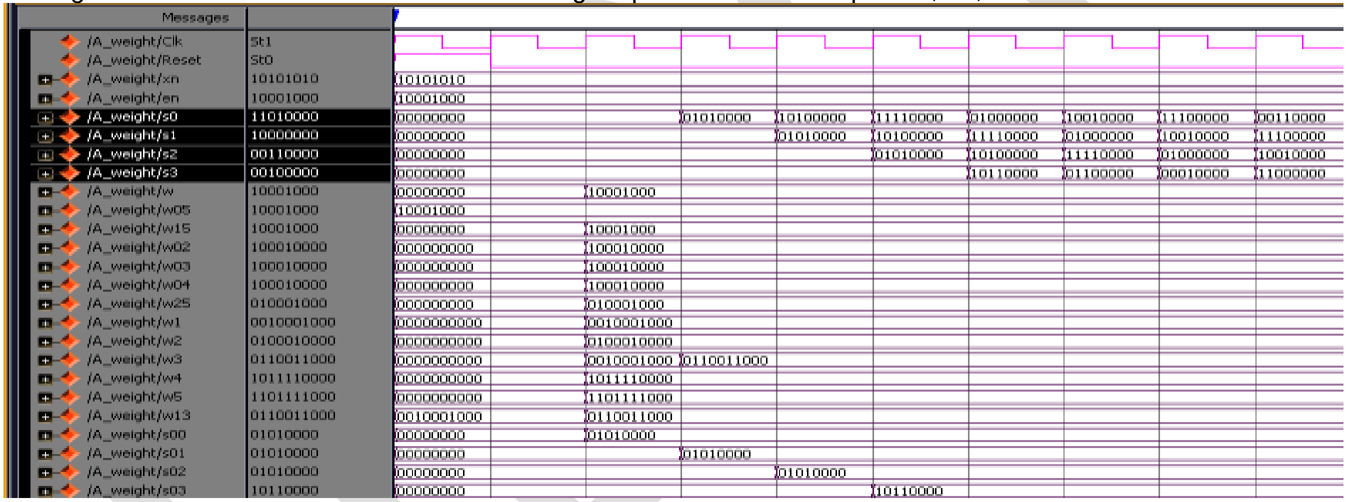
The figure 5.4 shows the simulation result of error computation block with inputs u, w, clock and reset and generates the filter output y and error en.



```
Messages
/A_ERR/xn       10101010
/A_ERR/Clk      St1
/A_ERR/Reset    St0
/A_ERR/w1       01010101
/A_ERR/w2       01010101
/A_ERR/w3       01010101
/A_ERR/w4       11000000
/A_ERR/y        00011011
/A_ERR/xn1      10101010
/A_ERR/xn2      10101010
/A_ERR/xn3      10101010
/A_ERR/p00      0010101010
/A_ERR/p01      0010101010
/A_ERR/p02      0010101010
/A_ERR/p03      1101010110
/A_ERR/p10      0010101010
/A_ERR/p11      0010101010
/A_ERR/p12      0010101010
/A_ERR/p13      1101010110
/A_ERR/p20      0010101010
/A_ERR/p21      0010101010
/A_ERR/p22      0010101010
/A_ERR/p23      1101010110
/A_ERR/p30      0110000000
/A_ERR/p31      0110000000
```

Figure 5.4 Error computation block

The figure 5.5 shows the simulation result of weight update block with inputs u ,en ,clock and reset.



```
Messages
/A_weight/Clk      St1
/A_weight/Reset    St0
/A_weight/xn       10101010
/A_weight/en       10001000
/A_weight/s0       11010000
/A_weight/s1       10000000
/A_weight/s2       00110000
/A_weight/s3       00100000
/A_weight/w        10001000
/A_weight/w05      10001000
/A_weight/w15      10001000
/A_weight/w02      100010000
/A_weight/w03      100010000
/A_weight/w04      100010000
/A_weight/w25      010001000
/A_weight/w1       0010001000
/A_weight/w2       0100010000
/A_weight/w3       0110011000
/A_weight/w4       1011110000
/A_weight/w5       1101111000
/A_weight/w13      0110011000
/A_weight/s00      01010000
/A_weight/s01      01010000
/A_weight/s02      01010000
/A_weight/s03      10110000
```

Figure 5.5 Weight update block

The figure 5.6 shows the simulation result of filter with inputs xn ,dn,clock and reset.

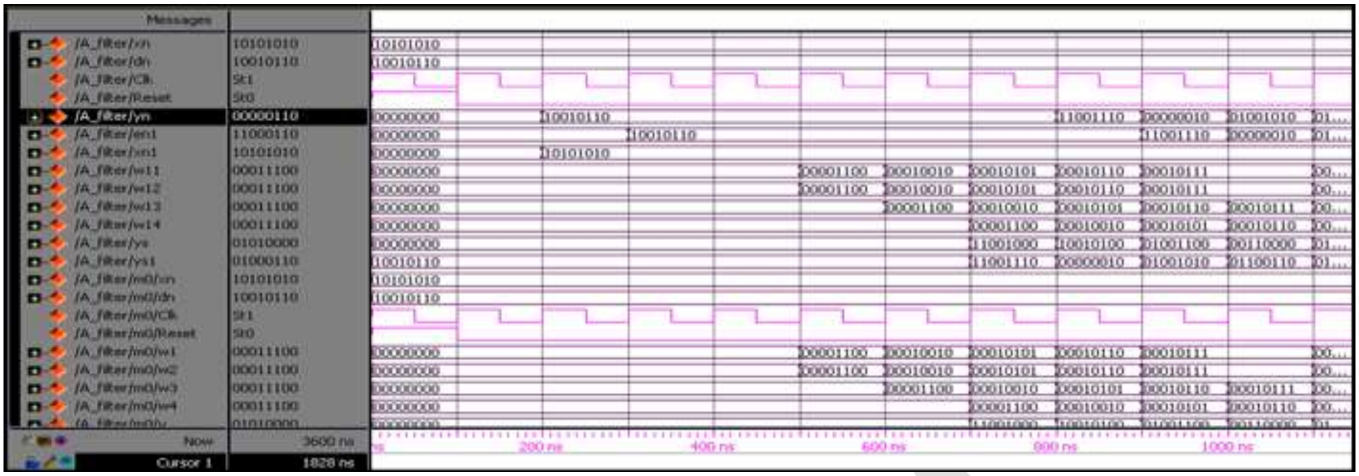


Figure 5.6 Filter

5.2 SYNTHESIS REPORT

5.2.1 AREA CALCULATION

Table 5.1 Comparison of area

FOR L=8 ,N=4	Total Equivalent Gate Count
Existing	5295
Proposed	4990
Modified	4970

The table 5.1 compares the number of gates used in existing, proposed and modified structure. The existing system does not include truncation and so the gate required is high. The proposed system uses truncation and reduces the number of gates required to 4990.Further the structure is modified by using adders instead of subtractor and hence the gate count is reduced to 4970.

5.2.2 DELAY CALCULATION

Table 5.2 Comparison of delay

FOR L=8 N=4	Delay
Existing	19.949
Proposed	7.241
Modified	7.241

The table 5.2 compares the delay involved in existing, proposed and modified structures. The existing system involves more delay that can be reduced by implementing truncation in proposed system.

5.3 RTL SCHEMATIC

The figure 5.7 shows the rtl schematic structure of adaptive filter. It has four inputs dn,xn with clock and reset and generates the output yn.

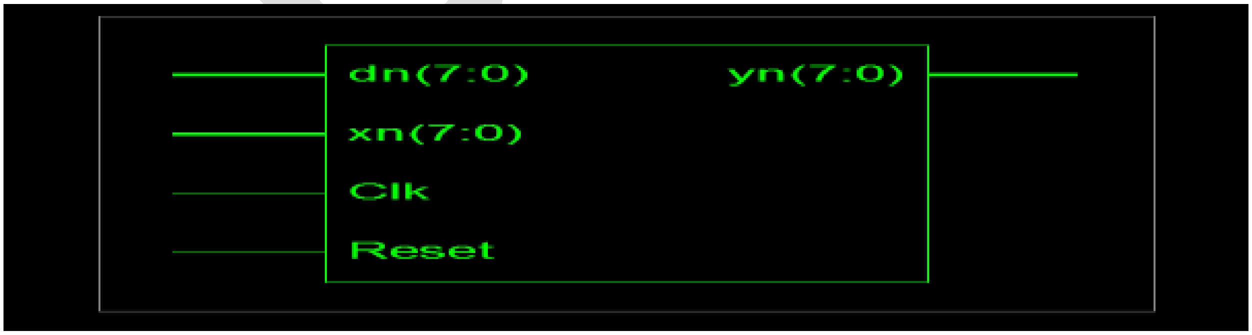


Figure 5.7 Schematic diagram of adaptive filter

The figure 5.8 shows the rtl schematic structure of partial product generator in which the inputs are xn,wn with clock and reset .

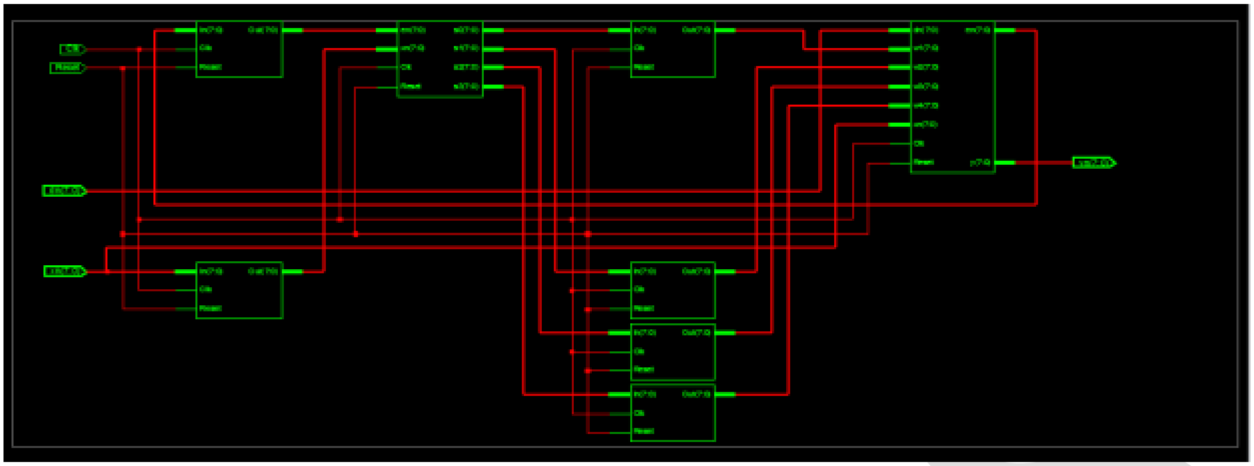


Figure 5.8 Schematic diagram of partial product generator

The figure 5.9 shows the rtl schematic structure of error computation block in which the inputs are xn,wn with clock and reset and generate the outputs yn and en.

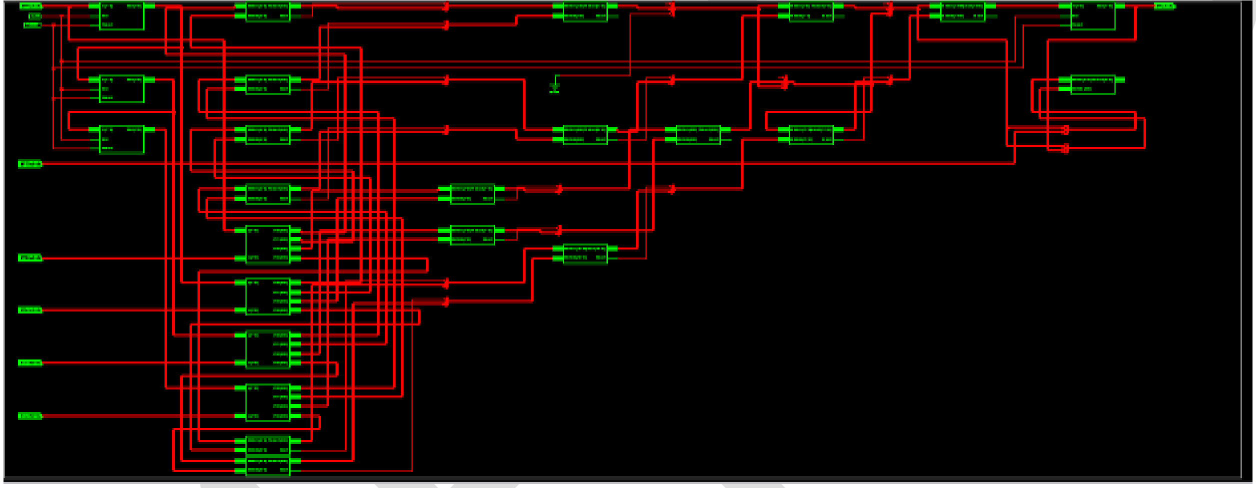


Figure 5.9 Schematic diagram of error computation block

The figure 5.10 shows the rtl schematic structure of weight update block with inputs xn and en and generates the output wn.

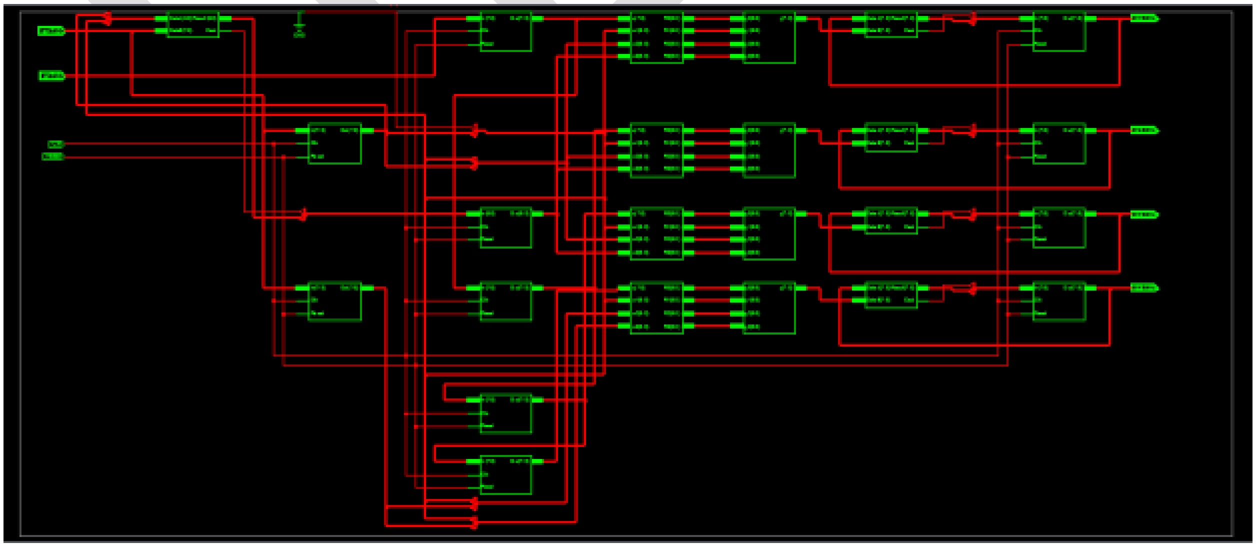


Figure 5.10 Schematic diagram of weight update block

VI.CONCLUSION

An architecture for fixed-point implementation of LMS adaptive filter is been implemented which offers an area–delay-power efficient low adaptation delay. A new PPG which computes general multiplications and inner-product computation by common sub expression sharing is been implemented. An efficient addition scheme is been proposed for inner-product computation in order to reduce the adaptation delay. So that critical path is been reduced which supports high sampling rates & convergence performance is faster. Power consumption & adaption delay as been reduced by optimizing balanced pipeline across the time-consuming blocks of the structure. On comparing with the existing structures area, adaption delay is been reduced in the proposed structure. The delay and area can be reduced to the level of 63.7% and 5.76% when compared to existing structures.

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DEVELOPMENT AND STUDY ON DIFFERENT PROPERTIES OF ALUMINIUM- CRYSTALLINE SILICA CERAMIC MATRIX COMPOSITES AT DIFFERENT SINTERING TEMPERATURES

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Abstract— Ceramic based composites are widely used around the world in demanding thermal, structural and electrical insulating applications. This present study aims to develop aluminium-crystalline silica ceramic based composites at different sintering temperatures with average particle sizes ranging from -150 to -200 micron. Crystalline silica matrix composites with 2.5, 5, 10, 40 Wt. % of aluminium were developed through powder metallurgy techniques. This research focus on the development of aluminium-crystalline silica ceramic based composites with optimizing its sintering temperature based on its physical as well as mechanical properties. The surface morphology of the composites were observed by optical microscopy (OM) and scanning electron microscopy (SEM). Physical property like density, porosity, shrinkage, and mechanical property like hardness were analyzed and reported for various sintering temperatures.

Keywords— Aluminium- Crystalline silica, Ceramic matrix, Powder Metallurgy, Microstructure, SEM, Shrinkage, Density, Porosity, Hardness.

INTRODUCTION

The requirement for new materials are increased to fulfill the modern engineering demands and has led to the development of composite materials. Ceramic based composites are the oldest and newest materials used in structural and high temperature applications due to its attractive properties such as high melting points, high compressive strength, and good strength at elevated temperature. Ceramic based composites are also used in power sectors as insulating materials for its excellent resistance to oxidation, good dielectric properties. These properties make it suitable for using in harsh environment applications [1-3]. But ceramic materials suffer due to lack of fracture toughness, tensile strength and brittleness. These properties can be improved by incorporating suitable ductile material as second phase [4].

Aluminium metal matrix composites are preferred and widely used in automobile industry for making engine parts. Aluminium has advantages over other metals such as good casting abilities, high corrosion resistance, low thermal expansion, wear resistant, and low density [5-9]. But low strength and low melting point are the problems for using aluminium matrix composites and its alloys [10] and makes them unable to use in high temperature applications. Metal matrix composites are also not suitable for harsh environment applications due to its chemical reactivity. These problems can be solved by using ceramic matrix composites binder with aluminium. The selection of the second phase material depends upon the application of the fabricated composites and its compatibility between matrix and reinforcement. Load carrying capacity of composites depend on the nature of matrix and reinforcement, the fabrication technique, and the sintering temperature. If the bonding between matrix and second phase is strong then crack propagation will be restricted.

In the past research have been carried out on aluminium metal matrix composites with SiC, Al_2O_3, TiC, B_4C, Ti-Aluminide, Si or SiO_2 as reinforcement [5, 11-17]. Aluminium makes good bonding with crystalline silica and as a result better adhesion takes place between matrix and reinforcement in crystalline silica aluminium composites [17]. But the selection of crystalline silica as matrix material and aluminium as second phase is rare. Here, aluminium will acts as a binder in the ceramic matrix and will overcome the excessive brittleness and lack of mechanical reliability of monolithic ceramics [4].

This paper describes about the development of Aluminium- Crystalline silica ceramic based composites by varying the Wt. % of aluminium into crystalline silica matrix for various sintering temperatures and finally optimize this sintering temperature based on its various physical and mechanical properties.

EXPERIMENTAL PROCEDURE

2.1 Development of Aluminium- Crystalline Silica Ceramic Based Composite by Powder Metallurgy Technique

The matrix material used in the present study was crystalline silica (SiO_2), extracted from natural sand and commercially pure aluminium (Al) powder (99.7 %) procured from LOBA Chemie, India. Sand was collected from the river side of Damodar at Burdwan district in West Bengal, India for producing silica. Silica was extracted by heating the natural sand at 1200^0C for 1 hour in muffle furnace (made by Nascor Technologies Private Limited, Howrah, West Bengal, India) at open atmosphere.

Then the mixture of aluminium- crystalline silica powder with composition 2.5%, 5%, 10% and 40% of aluminium (based on Wt. %) were mixed in hand driven mortar parcel until very fine powder was produced, mesh size in the range between -150 µm to -200 µm. The compact powder was uniaxially hard-pressed using a steel mold having an internal diameter of 10 mm at a pressure of 150 MPa, with a 2-ton press for 4 min from PEECO hydraulic pressing machine (PEECO Pvt Ltd, M/C NO.-3/PR-2/HP-1/07-08). Finally the samples were sintered in the same muffle furnace at temperature 1000 ºC, 1100 ºC, 1150ºC and 1200 ºC for 2 hours at a constant heating rate of 5ºC/min. After heating, samples were cooled slowly in the same furnace.

2.2 Testing and Characterization

2.2.1 XRD Analysis

X-ray diffraction (XRD) patterns were obtained for aluminium- crystalline silica composites using RigakuUltima III analytical difractometer (with Cu-Kα radiation, λ = 1.54059 Å) at 30 kV and 15 mA. Intensity data were plotted by the step-counting method between 10˚ and 80˚ (2θ) for each sample. The presence of various phases were selected and identified by comparing with standard JCPDS files.

2.2.2 Microstructure

For observing microstructure, the ceramic based samples were mirror polished and then microstructures were observed at 20 X magnification by LEICA Optical Microscopy model no DM-2700M Image Analyzer.

2.2.4 SEM and EDX Analysis

SEM and EDX analysis were performed for each sample using JEOL MAKE SEM model JSM 6360, operated by PCSEM software.

2.2.5 Density, Apparent Porosity and Shrinkage Measurement

Weight and dimension were measured for each sample before and after sintering. From the dimension measurement both green and sintered densities and shrinkage were calculated. Apparent Porosity was measured using the universal porosity measurement technique.

2.2.6 Micro-hardness Survey

Micro-hardness survey was carried out by using 200 gf loads with 15 sec dwell time. The hardness was measured in five different positions for each sample and finally average the hardness numbers them for getting more accuracy by using Leco Micro Hardness tester (Model LM248SAT).

3. RESULTS AND DISCURSION

3.1 XRD Analysis

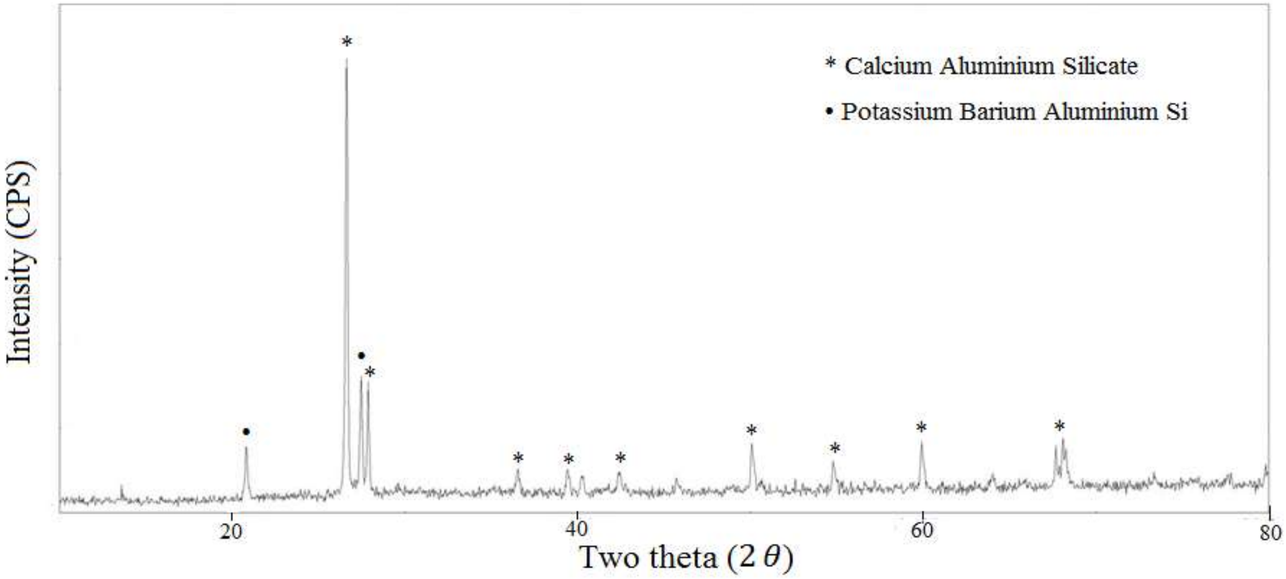


Fig. 1 XRD analysis of natural sand

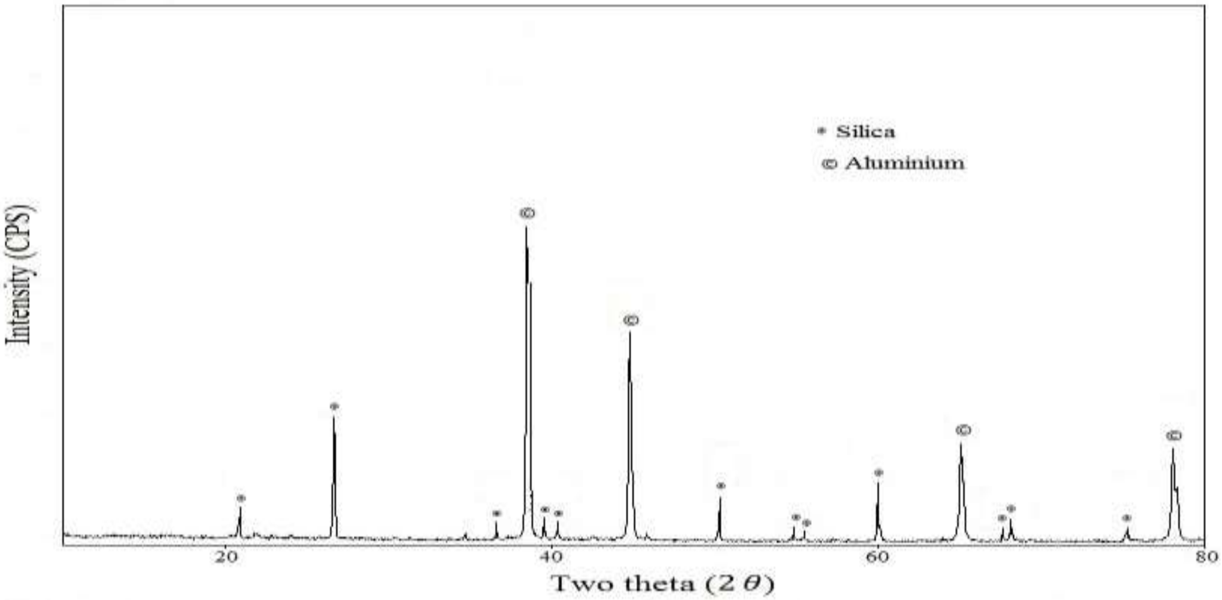


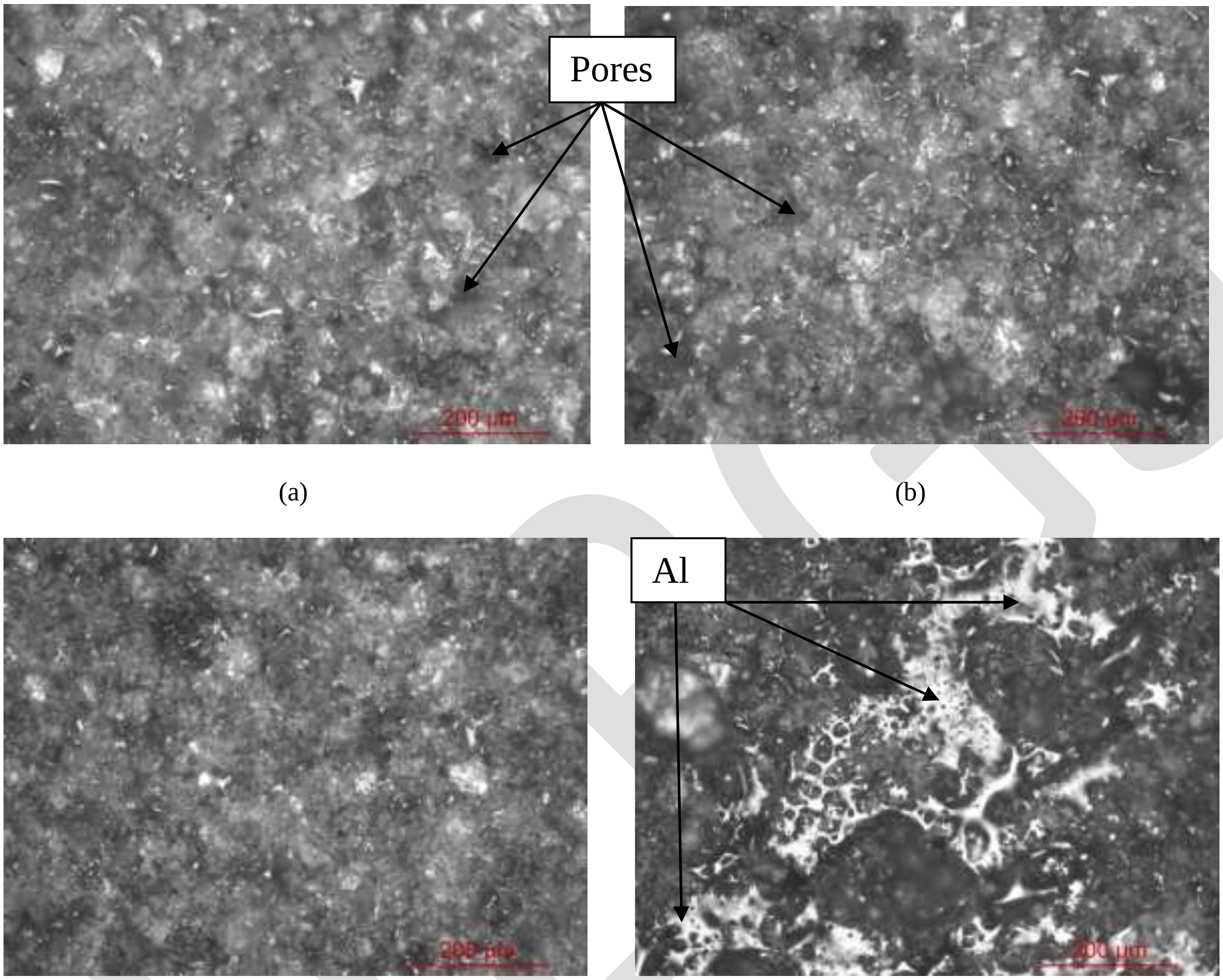
Fig. 2 XRD analysis of Aluminium- Crystalline silica composites after sintering

In the present study, here silica was extracted from natural sand. The XRD pattern for the natural sand is shown in fig.1. Calcium Aluminium Silicate was the main constituent component in this sand, present at 2θ= 26.600 (d= 3.3482), 27.880 (d= 3.1973), 36.520 (d= 2.4583), 39.400 (d= 2.2850), 42.360 (d= 2.1319), 50.080 (1.8199), 54.800 (d= 1.6737), 59.920 (d= 1.5424), 71.440 (d= 1.3193), 71.600 (d= 1.3168). A crystalline phase of Potassium Barium Aluminium Si is present at 2θ= 20.800 (d= 4.2669) and 27.440 (d= 3.2476) in the same sand as shown in fig.1.

The XRD patterns of sintered aluminium- crystalline silica composites at 1150 °C temperature are shown in Fig. 2. The composite sample contains two crystalline phases – Aluminium and Crystalline silica; the characteristic peaks of Aluminium were observed at 2θ= 38.493° (d= 2.3369), 44.739° (d= 2.0240), 65.012° (d= 1.4334) and 78.019° (d= 1.2238); and crystalline silica was present at 2θ= 20.802° (d= 4.2668), 26.622° (d= 3.3456), 36.551° (d= 2.4564), 39.482° (d= 2.2805), 40.291° (d= 2.2366), 50.152°

(d= 1.8175), 54.902^{o} (d= 1.6710), 55.244^{o} (d= 1.6614), 59.918^{o} (d= 1.5425), 67.567^{o} (d= 1.3853), 68.091^{o} (d= 1.3759) and 75.5^{o} (d= 1.2582) as shown in fig. 2. Figure 2 shows nearly same peak for the composites sintered at 600^0C [17]. As aluminium and silica gives individual peak and they form no compound, there was no reaction between aluminium and crystalline silica in this sintering environment.

3.2 Microstructure



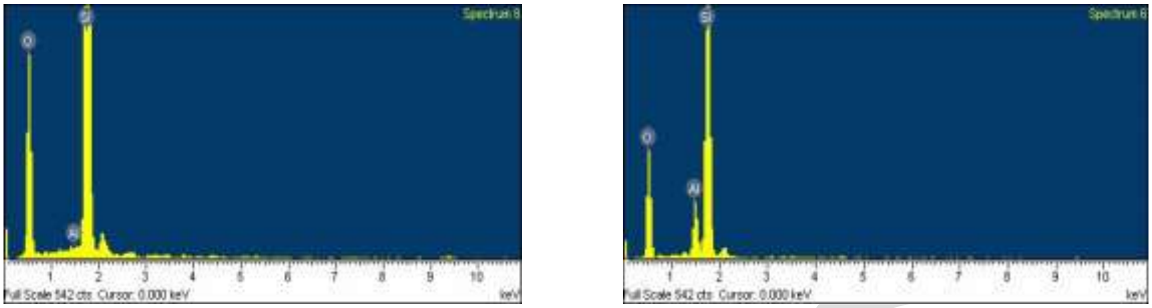
(a) (b)

(c) (d)

Fig. 3 Aluminium- crystalline silica composites sintered at 1150^0C for (a) 2.5 Wt. % Al (b) 5 Wt.% Al, (c) 10 Wt.% Al, (d) 40 Wt.% Al

In the fig. 3, black portion indicates crystalline silica while white portion represents aluminium. Aluminium is well distributed throughout the matrix. Here, aluminium acts as binder and helps to reduce porosity hence improves strength of the material.

4.3 EDX Analysis

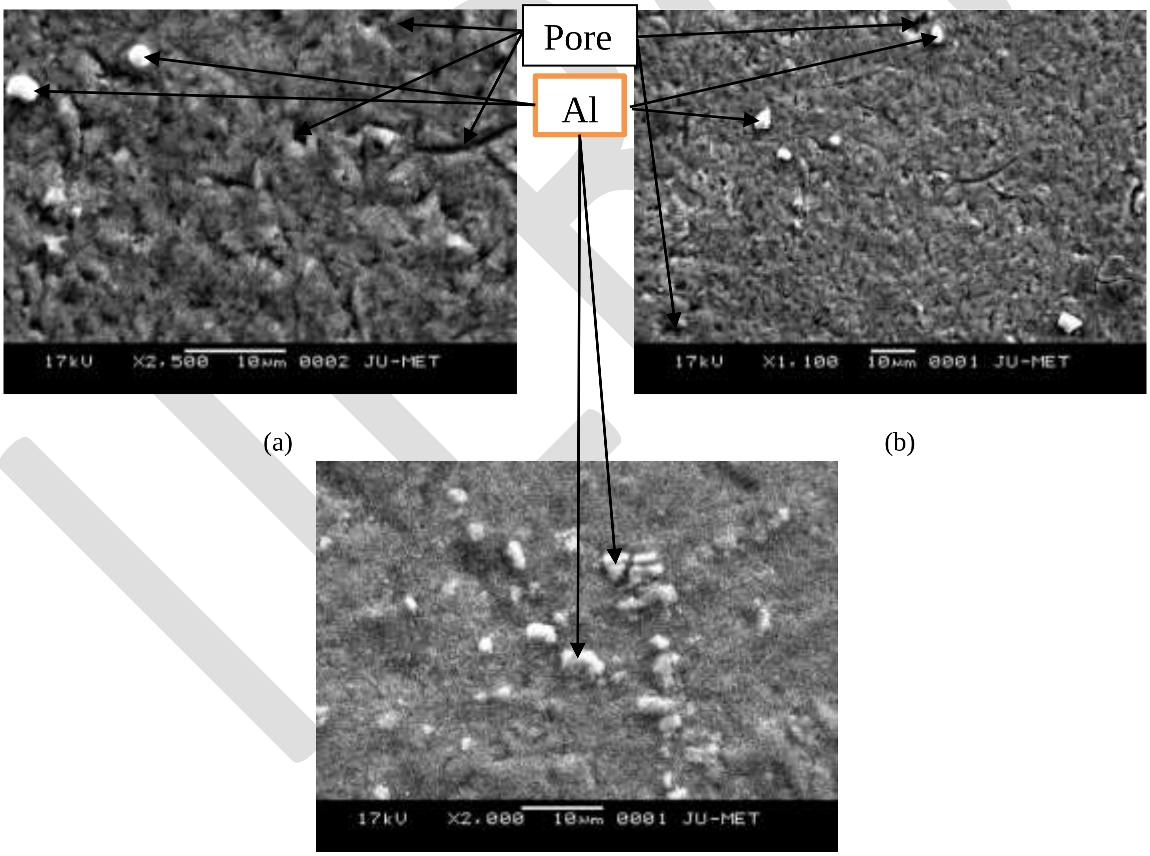


(a) (b)

Fig. 4 Aluminium- crystalline silica composites sintered at 1150^{0}C for (a) 2.5 Wt. % Al, and (b) 40 Wt.% Al

From EDX analysis, there is 2.24 % and 38.9 % Al (based on Wt. %) for 2.5 % and 40 % aluminium- crystalline silica composites respectively as shown in fig. 4. Here, EDX analysis was carried on each composite sample for understanding the contamination, purity of the element, and about the reaction between ceramic matrix and second phase. EDX data show that there are no other element produced other than Si, O, and Al.

4.4 SEM Analysis

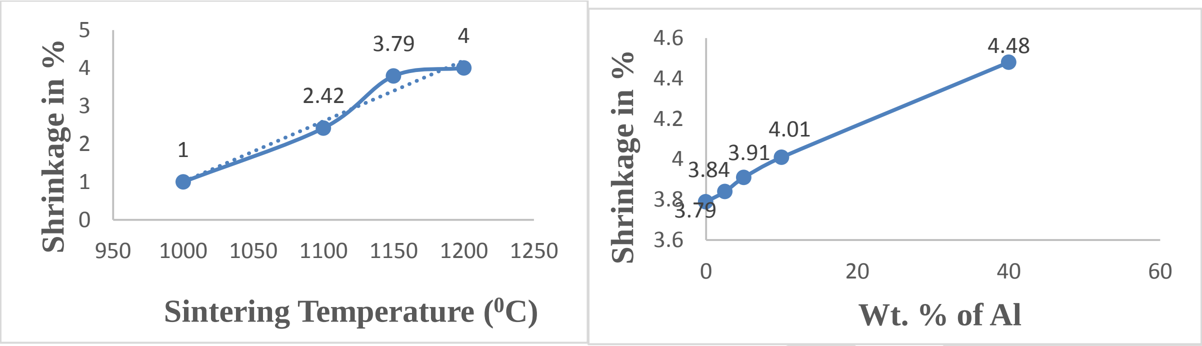


(c)

Fig. 5 Aluminium- Crystalline silica composite sintered at 1150^{0}C for (a) 2.5 Wt.% Al, (b) 5 Wt. % Al and (c) 40 Wt.% Al

SEM was done for each sample for observing the surface morphology like the distribution of aluminium into crystalline silica, presence of pore, and nature of crystal formation. Fig. 5 shows that aluminium is distributed throughout the entire ceramic matrix. The tendency of pore formation decreases with increment of aluminium percentage and better adhesion occurs between ceramic matrix and second phase.

4.5 Shrinkage Measurement



(a) (b)

Fig. 6 Shrinkage for (a) crystalline silica sintered at different temperature, and (b)Aluminium- Crystalline silica composites

From fig. 6 (a), it is observed that maximum shrinkage value obtained at temperature 1200^{0}C, and which is almost same for the sample sintered at temperature 1150^{0}C. From fig. 6 (b), it is shown that the shrinkage value increases gradually with the increment of aluminium percentage in aluminium-crystalline composites.

4.5 Density Measurement

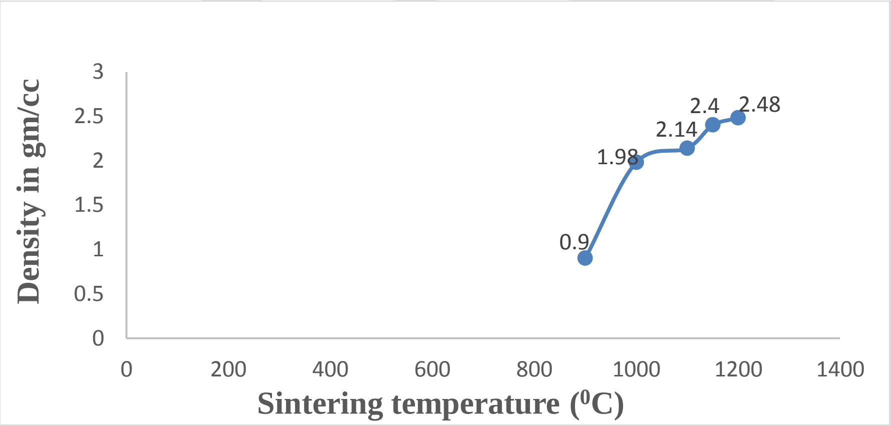


Fig.7 Density of crystalline silica at different sintering temperature

Figure 7 shows that density of crystalline silica increases with the sintering temperature and crystalline silica sintered at 1200^{0}C shows maximum density. It is also observed that the sample sintered at 1150^{0}C shows nearly same density with the sample sintered at 1200^{0}C.

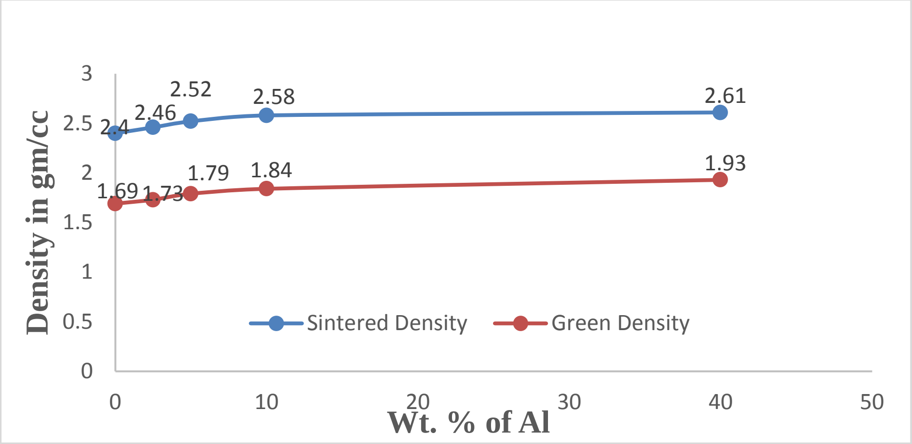
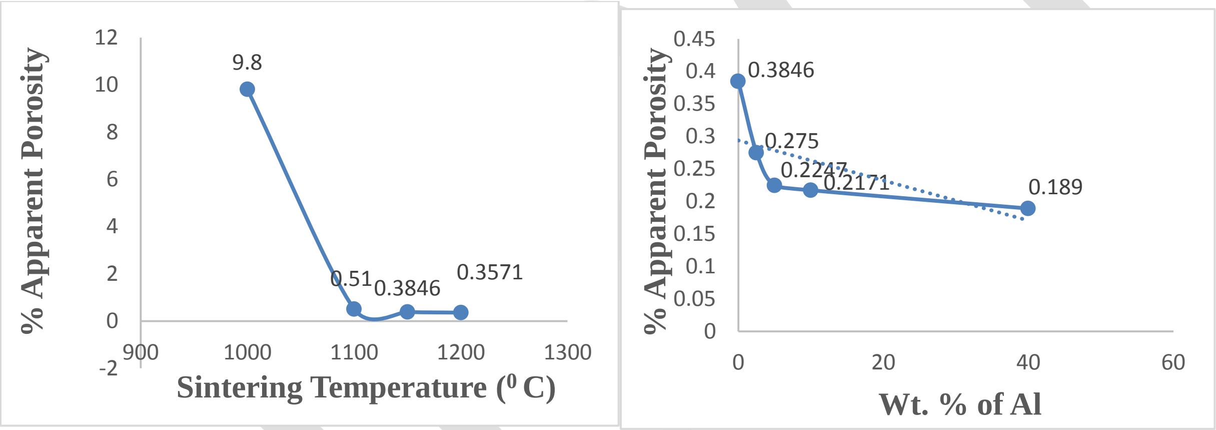


Fig. 8 Sintered &Green density of aluminium- crystalline SiO_2 composites

Figure 8 shows both green and sintered density of aluminium- crystalline silica composites. From fig.8, density is increased significantly after sintering for all samples. On the other, density, hence weight of the composites are increased slightly with increment of aluminium percentage into crystalline silica matrix.

4.6 Apparent Porosity



(a) (b)

Fig.9 Apparent Porosity for (a) crystalline silica sintered at different temperature, (b) Aluminium-Crystalline silica composites

Now from the apparent porosity data obtained, it is seen that apparent porosity value decreases with the increasing of sintering temperature as shown in fig. 9 (a). Sintering was carried on number of steps with crystalline silica and the sample which was sintered at temperature 900^0C, gives 20.98 % porosity while the sample sintered at temperature 1200^0C gives minimum porosity. From fig 9 (a), it is also seen that the sample sintered at temperature 1200^0C gives almost same apparent porosity as that of the sample sintered at temperature 1150^0C.

From fig. 9 (b), the apparent porosity value decreases with increment of Wt. % of aluminium and hence 40 Wt. % aluminium-crystalline silica composite shows minimum porosity.

4.7 Hardness

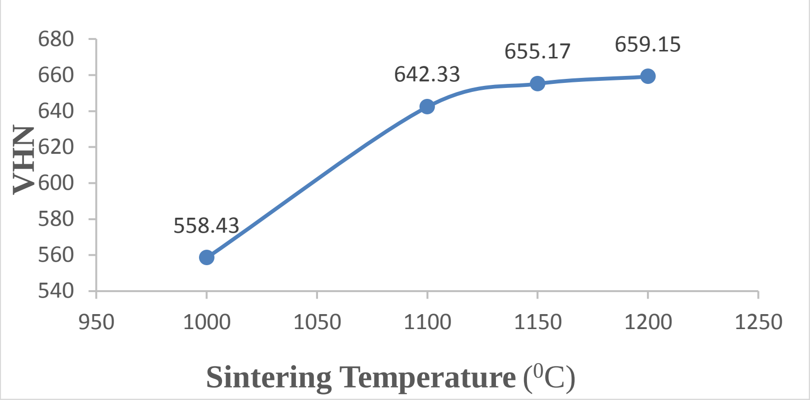


Fig. 10 Micro-Hardness Graph for silica sintered at different temperatures

From the micro – hardness data obtained, it is seen that hardness value increases with the increasing of sintering temperature as shown in fig. 10. Sintering was done on number steps with same composition of crystalline silica, i.e. at temperatures 900^{0}C, 1000^{0}C, 1100^{0}C, 1150^{0}C and 1200^{0}C. But due to high porosity and brittleness of the sample which was sintered at 900^{0}C, micro hardness test could not be performed. From fig. 10, it can be seen that the sample which was sintered at temperature 1200^{0}C gave almost same hardness as that of the sample sintered at temperature 1150^{0}C.

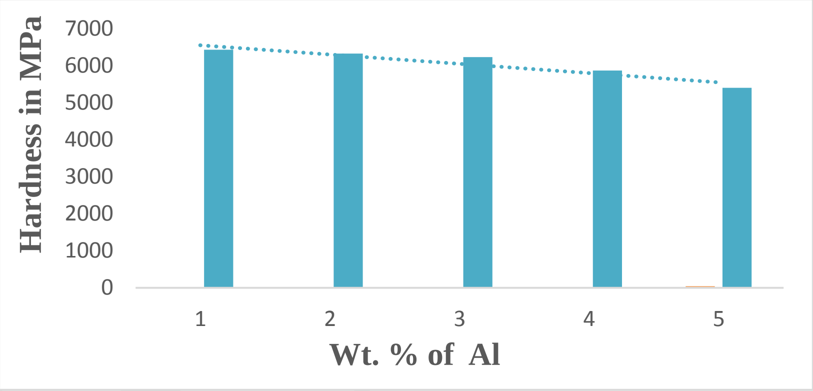


Fig. 11 Micro-Hardness Graph for Aluminium-Crystalline silica composites

Fig. 11 shows the variation of micro-hardness with the variation of the percentage of aluminium in aluminium- crystalline silica composites sintered at 1150^{o}C for 2 hours. As the aluminium is a ductile material, when it is mixed with the crystalline silica, reduces the micro-hardness value. Hence, hardness value decreases gradually with aluminium content.

CONCLUSION

The significant conclusions of the studies on aluminium- crystalline silica composites are as follows:

- From all the experimental data obtained, it is found that by analyzing different parameters like hardness, shrinkage, apparent porosity, etc. optimum sintering temperature for aluminium-crystalline silica composite is obtained which is 1150^{0}C.
- It is seen that hardness value of crystalline silica increases with the increasing of sintering temperature.
- For aluminium- crystalline silica composites micro – hardness value decreases with the increase of aluminium percentage. This indicates the improvement of ductility.
- Due to increment of shrinkage, apparent porosity decreases with the increase of aluminium percentage.

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Research in Communication Mechanism between PC's Bluetooth and Android Bluetooth

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Abstract— Cellphones and computers have become integral part of our life. Today, mobile phone is more than a communication tool, but an intelligent terminal which is used for various purposes. New technologies are arriving every year to make the operations much faster and simpler. In this regard new communication mechanism between Android and PC has been proposed. This paper describes the new Bluetooth communication mechanism between PC and Android and gives the detailed explanation about the implementation process through workflows. In other words, through .NET serial port communication realizing serial port communication from PC to an Android App and Android mobile delivers bytes of data to the PC's serial port through socket communication using RFCOMM.

Keywords— Cellphones; serial port; Socket; communication; Android; RFCOMM; Personal Computer; .NET; Bluetooth;

I. INTRODUCTION

In the recent years, with the development of mobile communication and mobile terminal, especially with the release of Android smart phone platform has enclosed or added the new vitality to the mobile space. Android is a open source mobile operating system based on LINUX which is completely open and interconnected platform for mobile devices. Android platform consists of user interface, middleware and application software. Bluetooth technology is a modified short range wireless communication technology. Around the globe the working frequency band of Bluetooth do not need a license. The benefits of Bluetooth are reflected in low price, easy to control, non-visual distance limitations. Bluetooth is the important feature of the smart phone, which is embedded in android platform, as android mobile network communication module. Bluetooth technology supports short range wireless transmission in universal way, by using unlicensed 2.4GHz short-range radio frequency bandwidth. Using Bluetooth, users can form the clusters of 8 maximum devices that form a star shaped network called piconet. Master is the main device and all other are slaves. Data between two Bluetooth devices can exchange data with the maximum speed of 2.1Mbps. Bluetooth uses radio technology called frequency hopping spread spectrum (FHSS), in order to lessen the interference between different piconet structures.

Bluetooth technology is used for number of purposes for example file transferring form one Bluetooth enabled device to another. Bluetooth chatting between two androids has also existing. This paper introduces a new concept for cross domain communication using Bluetooth where different devices that work on different platforms will be able to communicate with each other in real time. The two domains implemented here are Android JAVA and .NET. The main intention of this paper is to create channel for communication between Android and PC through Bluetooth, where Android phone will be able to communicate with PC in real time using simplest mechanism. The Physical structure of the proposed communication mechanism is as shown in the Figure 1, there are 2 applications in this mechanism one is running on the PC i.e., .NET application which uses virtual serial port of PC for communication and other is Android application running on Smartphone which will convey the bytes of data to the PC through Socket communication using RFCOMM protocol.

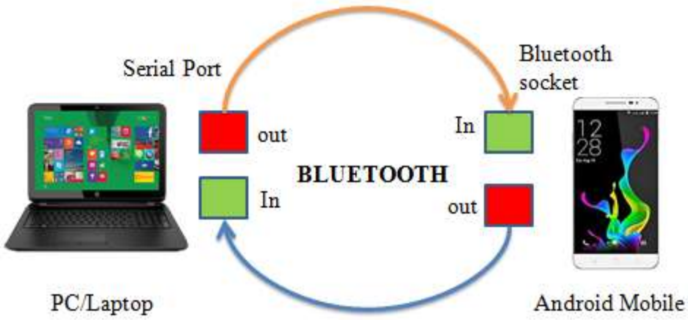


Fig 1. Physical structure of the communication mechanism

II. ANDROID BLUETOOTH[1]

Android can communicate with Bluetooth devices using Bluetooth protocol. If Bluetooth API were used, a variety of tasks like other Bluetooth device searching, local Bluetooth adaptor query for paired Bluetooth devices, setting RFCOMM channel, etc. could be performed.

The Android platform incorporates support for the Bluetooth network stack, which permits a device to remotely exchange data with other Bluetooth devices. The application framework offers access to the Bluetooth functionality through the Android Bluetooth APIs. These APIs let applications to remotely connect to other Bluetooth devices, empowering point-to-point and multi-point remote features.

Utilizing the Bluetooth APIs, an Android application can perform the following:

- Scan for the Bluetooth devices.
- Query the nearby Bluetooth adapter for paired Bluetooth devices.
- Establish Radio Frequency Communication channels.
- Connect to other devices through service discovery.
- Transfer data to and from devices.

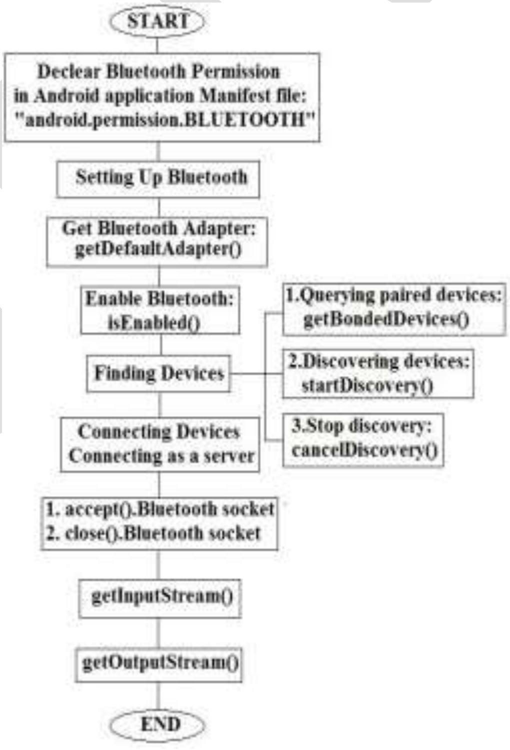


Fig 2. Program Flowchart for establishing Bluetooth Connection

The program flowchart that illustrates discovering for Bluetooth devices, establish a connection and then sends data to Bluetooth enabled PC is shown in the figure 2. As shown in the flowchart, we first get hold of the local Bluetooth adapter installed in the Android phone and establish a connection with PC's Bluetooth module. Once the connection is successfully established we then send data from Android to the PC.

To begin communication with Bluetooth, Android first looks for a permission which is required for requesting a connection, accepting a connection, and exchanging information. To discover local Bluetooth devices this permission is required. The Bluetooth Adapter is essential for all Bluetooth activity and it is called by the static getDefaultAdapter() method. This returns a Bluetooth Adapter that signifies the device's own Bluetooth adapter (the Bluetooth radio). If getDefaultAdapter() results null, then the Bluetooth is not upheld by the device. Now isEnabled () is called to check whether Bluetooth is right now enabled. The false output originating from this method makes the Bluetooth disable and to enable the Bluetooth once more, startActivityForResult() is called with the ACTION_REQUEST_ENABLE action intent which will sends a command request to enable Bluetooth in the system settings. Although the upcoming operation is to perform nearby device discovery, before that it is better to query the set of paired devices to see if the desired device is already known by calling getBondedDevices(). startDiscovery() method is used to start searching devices in the surrounding. This asynchronous method and can immediately return with a Boolean value, indicating whether discovering has successfully initiated. The window for selecting the paired devices to connect is illustrated in the figure 3.

Performing device searching is a power consuming procedure. With cancelDiscovery() method the search for another device can be terminated immediately, once a device is identified to connect. For connection establishment between two devices (PC and Android), one device must act as a server by holding an open BluetoothServerSocket. In this case PC acts as a server by creating virtual COM port. The goal of the server socket is to listen for incoming connection requests and when one is granted the request, give a connected BluetoothSocket. Now connection requests can be granted by calling accept() method which is a blocking call that will return when a connection has been established or an error has occurred. The approval of a connection request is depended on a correct UUID (Universally Unique Identifier) matching, the one which is registered with this listening server socket and for a successful matching, accept() will return a connected BluetoothSocket. Now for preventing other connections, call close() method which detaches the server socket and all its resources, but does not terminate the connected BluetoothSocket that's been returned by accept(). As the accept() method is a blocking, it should not be running in the main activity UI thread because it will prevent any other communication with the application. Using the BluetoothSocket, sending arbitrary data can be established by calling the InputStream and OutputStream which controls the transmissions via the socket, through getInputStream() and getOutputStream(), respectively.


select a device to connect
Paired Devices
Micromax A35
00:7B:0F:B8:F8:00
SANTHOSHBK-PC
5C:AC:4C:E5:CC:D1
BMH1029286
0C:84:DC:D9:8F:C3
CP8676_I02
EC:5A:86:37:87:6F

Fig 3. Window for selected device

Bluetooth Communication is based on unique MAC [6]. For the security before any Bluetooth communication, the devices must be paired. In order to create a connection between the two devices, both the server-side and client-side mechanisms must be implemented, because one device must open a server socket and the other one must initiate the connection (using the server device's MAC address to initiate a connection). The server and client are considered connected to each other when they each have a connected Bluetooth Socket on the same channel. At this point, each device can obtain input and out-put streams and data transfer can begin.

III. COMMUNICATION VIA BLUETOOTH

A. .NET SERIAL PORT[2]:

.NET platform is a powerful, collection of a wide assortment of programming environments, high productive application improvement platform outlined by Microsoft Corporation. Creators effortlessly understand the particular application advancement as per their own well known programming language by calling rich class libraries of .NET platform. To acknowledge serial port communication in between PC and gear in .NET platform, we require just use communication control gave by .NET. Through programming for the relating control's properties and events, we can execute serial port communications without much complexity.

B. ANDROID MOBILE SENDS BYTES OF DATA TO THE PC SERIAL PORT THROUGH SOCKET COMMUNICATION WAYS[3]

Socket is a sort of communication mechanism taking into account TCP/IP convention in PC in computer network communication. The application sends and gets information through an socket, similar to open a file handle for the application, to read and compose information to stable storage. By socket applications can be added to the network, and speaks with alternate applications which are in the same network. The information composed by the client program on android to the socket is fit for being perused by service application on PC.

Android is a mobile system based on Java platform, full support to socket communication mechanisms depends upon TCP and UDP for JDK environments. Since .NET platform not just with advantages in serial port communications not accessible in the Java platform, but also with intense features on the socket communication mechanism. We select Android as a socket client, and .NET platform as a socket server to build a communication between the Android mobile and the PC, accomplishing Android mobile to send bytes of data to PC serial port.

C. INITIALIZING BLUETOOTH COMMUNICATION BETWEEN ANDROID AND PC[2]

For Bluetooth communication between android and PC, it is advantageous to make serial Bluetooth connections between an android phone and a .NET application on a PC. This section depicts how to connect from an Android mobile to a .NET application running on Windows 7. The methodology of connecting an Android app to PC is as shown in Figure 4.

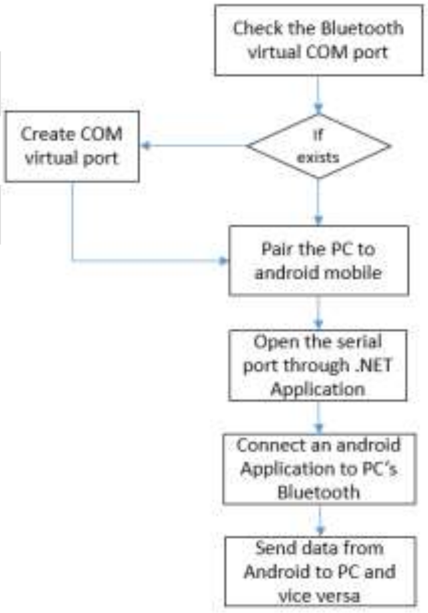


Fig 4. Initializing Bluetooth Communication between Android and PC

Below are the steps to connect Android to PC

1) Enable Bluetooth on PC
2) Find Assigned COM Port
3) Check the COM port Baud Rate

4) Pair the Mobile Bluetooth to PC
5) Run the .NET application on PC
6) Connecting Android App to .NET Application
7) Send data from Android to PC over Bluetooth.

Discovery
☑ Allow Bluetooth devices to find this computer

To protect your privacy, select this check box only when you want a Bluetooth device to find this computer.

Connections
☑ Allow Bluetooth devices to connect to this computer
☑ Alert me when a new Bluetooth device wants to connect

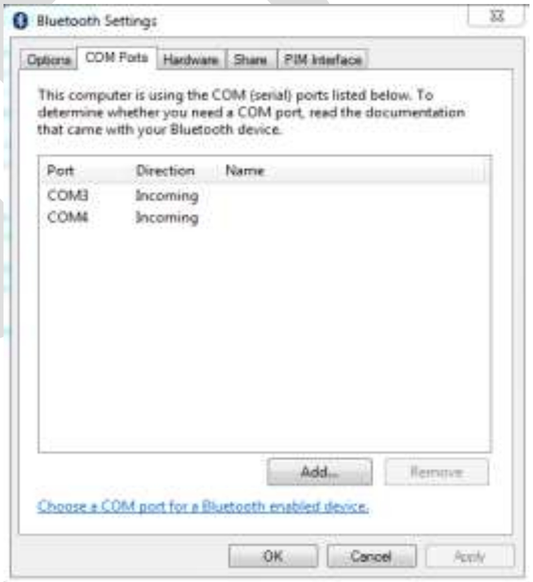
☐ Show the Bluetooth icon in the notification area
☐ Turn off the Bluetooth adapter

Change settings for a Bluetooth enabled device.

Fig 5. Bluetooth settings in PC

- **How to Find Assigned COM Port:**

a. To find out which COM port has been assigned to the Bluetooth serial link, click on the Windows Start button and search for "Bluetooth settings" and select "Change Bluetooth settings". The window opened for Bluetooth settings is shown in Figure 5.
b. Click on the "COM Ports" tab to see which port has been assigned to a Bluetooth serial link. If No COM port displayed, then add new incoming COM port to the Bluetooth serial link which is shown in Figure 6.



This computer is using the COM (serial) ports listed below. To determine whether you need a COM port, read the documentation that came with your Bluetooth device.

Port	Direction	Name
COM3	Incoming	
COM4	Incoming	

Choose a COM port for a Bluetooth enabled device.

Fig 6: Adding new COM ports for Bluetooth

D. RFCOMM [4]

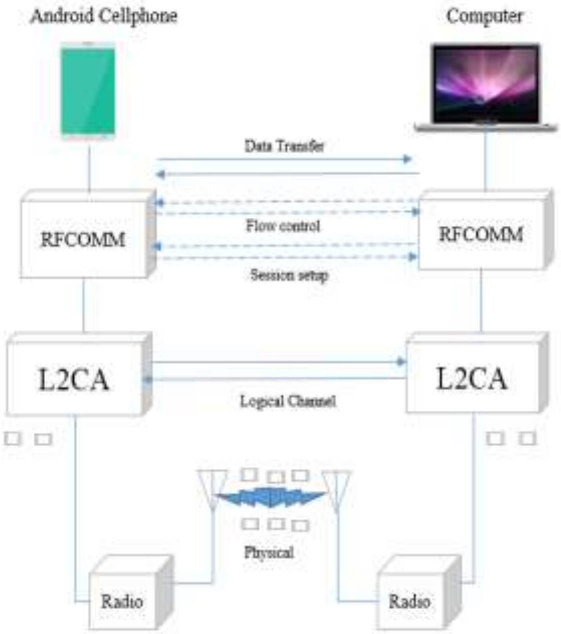


Fig 7. RFCOMM Communication

The Bluetooth protocol called RFCOMM is a simple set of transport protocols, made on top of the L2CAP protocol, giving emulated serial ports (up to sixty concurrent connections to a Bluetooth device at a time). The protocol is depends on the ETSI standard TS 07.10. RFCOMM is commonly called serial port emulation. The Bluetooth serial port profile is based on this protocol. Figure 7 showing the process to process communication using RFCOMM.

E. .NET CONSOLE APPLICATION TO READ BYTES OF DATA FROM SERIAL PORT [5]:

a. Serial Port class:

This class is used for controlling a serial port file resource. This class gives event-driven and synchronous I/O, and break states, and access to serial driver properties. Moreover, the functionality of this class can be hided in an internal Stream object, accessible through the BaseStream property, and send to classes that wrap or use streams. Figure 8 shows the data flow of .Net Console Application which reads the data from serial port.

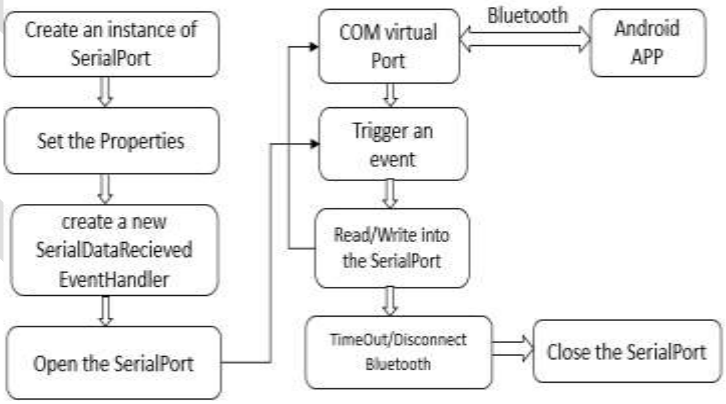


Fig 8. Data Flow Diagram for .NET Application

- **Algorithm for .NET Application:**

STEP1: As shown in Figure 8, first create an object of the serialPort.
STEP2: Set the properties of serial port like Baud rate, Parity,Data Bits, StopBits etc.,
STEP3: Create a new SerialDataRecieved EventHandler and assign it for the created SerialPort.
STEP4: Open the Serial Port and connect the Android App to PC through Bluetooth.
STEP5: When the App sends the bytes of data to PC’s Serial port, it triggers the SerialDataRecieved Handler event and Reads the data.

Below is the code for reading Bytes of data from a serial port:

```
// PortName = "COM3", Baud Rate = 9600, Parity = None,
// Data Bits = 8, Stop Bits = One, Handshake = None

    SerialPort serialobj = new SerialPort("COM8", 9600, Parity.None, 8, StopBits.One);
    //To receive data, create an EventHandler for the "Serial Port"
    serialobj.DataReceived += new SerialDataReceivedEventHandler(DataReceivedHandler);
    serialobj.Handshake = Handshake.None;
    serialobj.Open();    //Opens serial port
    //logic for write data;
    Serialobj.Write(“Hello from PC”);//Read the data from console and send to Android
    serialobj.close();    //Closes the serial port
    private static void DataReceivedHandler(object sender, SerialDataReceivedEventArgs e)
    {
    SerialPort obj = (SerialPort)sender;
    string buf = obj.ReadExisting();  //Read Serial Port Data
    }
```

The DataReceived event is raised on a optional thread when data is gotten from the SerialPort object. Since this event is called on a secondary thread, and not the main thread, attempting to change some components in the main thread, such as UI components, could raise a threading exception. When the Android App sends data to PC’s Serial port, it triggers an SerialDataEventHandler Event and reads the serial port data.

IV. BENEFITS AND USE CASES

1. This mechanism does not need any extra hardware like Arduino board or HC-05 Bluetooth module, TTL serial converter which are used in the existing mechanisms.
2. As we are using Bluetooth as a transmission medium, it’s very much secured and easy to connect and operate.
3. This mechanism is more reliable, costless.
4. Two way communications is possible over a single port.
5. It allows multiple connections simultaneously.

V. RESULTS

```
Connecting...
Connected to SANTHOSHBK-PC - 5C:AC:
4C:E5:CC:D1
You: Hi from Android
SANTHOSHBK-PC: Hello from PC
```

Fig 9. Screenshot of Android App sending data to PC and showing received data from PC

```
Hi from Android
 Hello from PC
```

Fig 10. Screenshot of PC sending data to Android and showing received data from Android

VI. CONCLUSION

The implementation of communication mechanism between 2 different platforms i.e., Android and .NET is achieved successfully. Further two ways communication is also proposed and completely tested with different Baud rates. For efficiency of the power and other resource usages, use the default Baud rate (9600). Ultimately this technology is useful for people across various industries. Requirements of people will be met efficiently.

VII. FUTURE WORK

1. In future, this mechanism can be extended to develop remote desktop connection from Android mobile using Bluetooth.
2. This mechanism can be enhanced by using advanced technologies for faster data transmission, like Wi-Fi, NFC or data network.
3. We can use this mechanism for developing Offline Chatting Applications using Bluetooth.

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Design and Analysis of Welding Fixture for Inlet Header of Shell and Tube Heat Exchanger

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Abstract— The welding fixture is a special tool for locating, holding and supporting a work piece in during welding operation**.** In welding fixture positioning of a workpiece achieved through locators to maintain the dimensional accuracy. This can be achieved by selecting the optimal location of fixturing elements such as locators and clamps. Design, modeling and analysis of welding fixture components for inlet header of shell and tube heat exchanger. The V locators, Clamp Wheel, Side Bracket and supporting plates are used for locating, clamping the inlet header and to get dimensional accuracy and constrain Degree of Freedom (DOF) completely. Modeling of fixture is done by using Creo 2.0 software. OptiStruct solver software is used to perform FEA simulation and to calculate vibration characteristics which are validated by FFT Analyser. Multiple mode shapes with natural frequencies are plot by using FFT Analyser.

Keywords— Welding Fixture Clamping, Creo 2.0, OptiStruct, FFT Analyser.

INTRODUCTION

Generally Fixture is used in various industries according to their application Fixture will provide dimensional accuracy of welded component and hold exceptional in manufacturing manner. This also increase productiveness and reduce operation time. The welding fixture is extensively used within the enterprise realistic production due to feature and blessings. A fixture includes a set of locators and clamps. Locators are used to decide the location and orientation of a workpiece, while clamps exert clamping forces so that the workpiece is pressed firmly in opposition to locators. Clamping has to be as it should be planned at the level of machining fixture layout. The design of a fixture is an incredibly complex and intuitive technique, which require information. Fixture design performs a critical position at the setup making plans segment. Proper fixture design is important for developing product quality in extra ordinary phrases of accuracy, surface finish and precision of the machined elements. [4]

1. Design Methodology

• 3D Parametric Model of Inlet Header:

Firstly we have developed 3D parametric model by using Creo 2.0 parametric software as per the drawing and model of inlet header of shell and tube heat exchanger as shown in fig.1

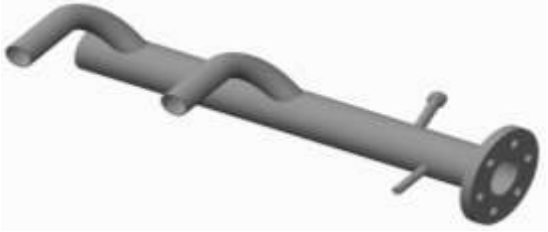


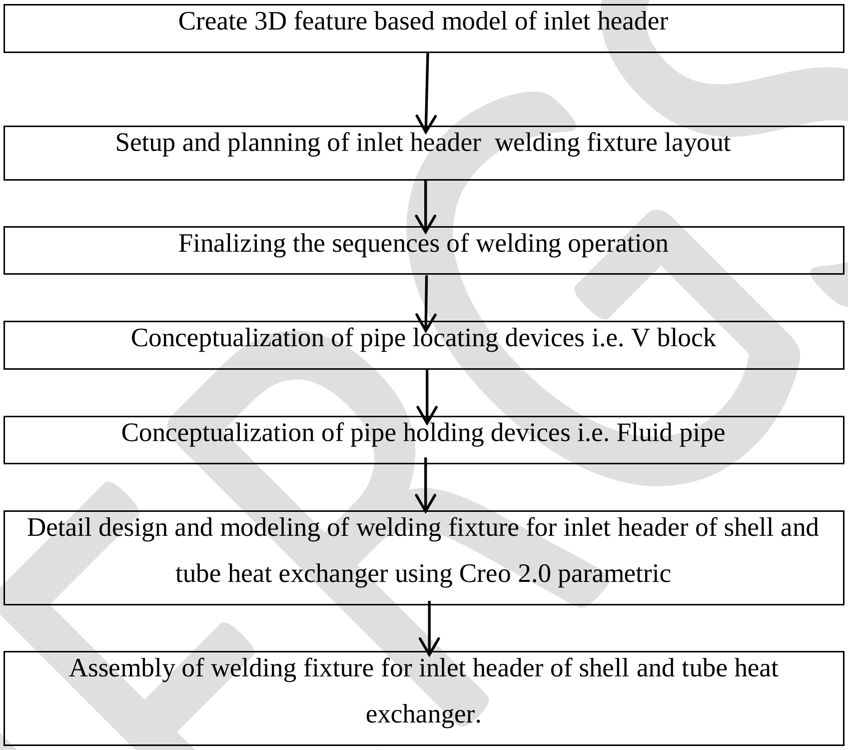
Fig. 1: 3D Parametric Model of Inlet Header

- **Finalized Sequence of Welding Operations**

Welding sequence is very important consideration before going for fixture layout.

1. First fluid pipe welding
2. Second fluid pipe welding
3. Pressure gauge welding
4. Thermowell welding
5. Flange welding

- **Setup and Planning of Inlet Header Welding Fixture Layout**



From a layout point of view, welding fixture fulfills five basic functional requirements:

1. strong resting
2. correct localization
3. support reinforcement
4. stable clamping
5. Accurate welding.

- **Selection and 3D Modeling of Locating and Clamping Devices**

The Following locators and clamps are selected for inlet header welding fixture:

V Locator: V locator is used to locate inlet header because it ideal and extensively cylindrical surfacees from outside.V block is fixed to base plate. Inlet header main pipe is place on V block. Four DOF i.e. UY, UZ, (ROT Y) and (ROT Z) are fixed.

End Bracket: It is used to restrict the UX DOF and locate the pipe at exact dimension. It also used as a support during welding of end plate to main pipe. It is having a half circulate cut to rest the end plate. It is screwed to the base plate.

Side Bracket: The main function is to locate the Fluid pipes to main pipe at exact position so that we get dimensional accuracy during welding. It also used as a support during welding. It is screwed to the base plate. The last DOF i.e. (ROT X) is also constrained.

Screw Clamps: They are used to firmly hold the header pipe during the welding process. It screwed to V block and operates by clamping wheel mounted on stud. Y axis (ROT Y) and translation in Z axis UX direction.[9]

- ### Assembly of Inlet Header Welding Fixture Using Creo 2.0 Parametric:

Top down design approach is used to design fixture in Creo 2.0 software where all parts are design in consideration with inlet header welding process as shown in Fig 2

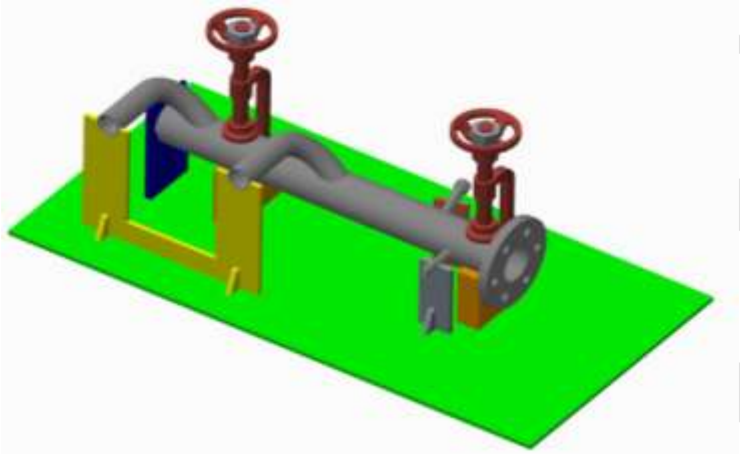


Fig 2: Assembly Design of Inlet Header Welding Fixture

2. Modal Analysis

Modes are inherent residences of a shape, and determined by material property like mass, damping, and stiffness and boundary situations of the shape each mode is described by using a natural (modal) frequency, modal damping, and a method form.

HyperMesh 12.0 and OptiStruct solver software are used for meshing and modal analysis simulation. Assembly model of creo 2.0 parametric is exported in .iges format and imported in the HyperMesh 12.0. Meshing was done with appropriate mesh size and quality parameters then imported in OptiStruct for vibration analysis. In OptiStruct software use the material properties like Young's modulus, Poisson ratio, density and fixed support boundary condition are given. Multiple modes are extracted to simulate realistic modes as shown in Fig 3.

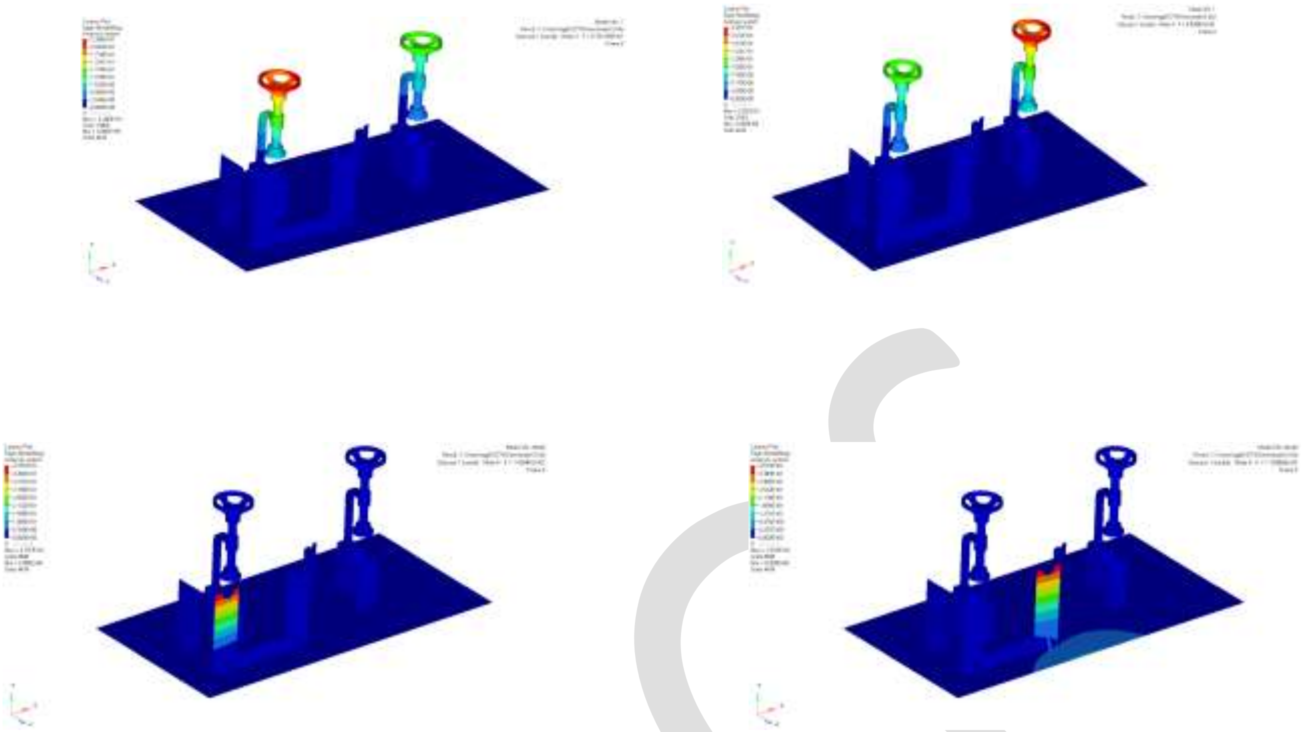


Fig 3: Multiple Mode Shapes with respective Natural Frequencies

3. Experimental Setup

Welding fixture parts are manufactured in the workshop according to dimensions of model which show in fig. 4. Base plate with 10 mm thickness is cut into 1200 X 600 mm size which is mounted on table. V block and other supporting brackets are manufactured as per design. The actual welding process was done with the set up to check dimensional accuracy.[3]

The instrument used in this study are the SVAN 958- A made 4-channel FFT Analyser with 1Hz to 20 kHz Frequency range and accelerometer with magnetic based.

Fig 4: Experimental Testing Setup

Table No.1 Welding Fixture Part List

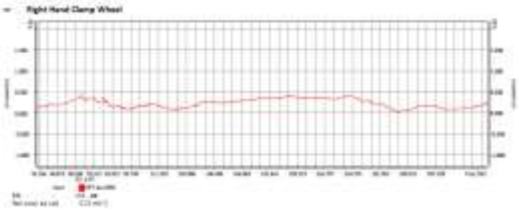
Sr. No	Part Name
1	Clamping wheel
2	End plate
3	Side bracket
4	Accelerometer
5	Thermowell support bracket
6	V block
7	Pressure tube support bracket
8	FFT
9	Base plate

1. In this graph shows that frequency of vibrating body right hand clamp wheel. In this FFT analysis shows frequency 62.145Hz.

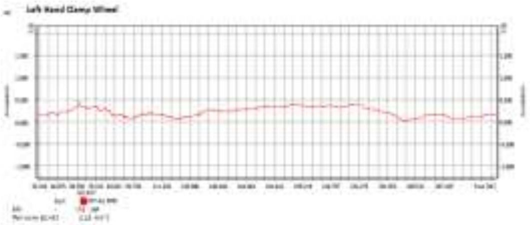
2. In this graph shows that frequency of vibrating body left hand clamp wheel. In this FFT analysis shows frequency 60.457 Hz.

3. In this graph shows that frequency of vibrating body right hand side bracket. In this FFT analysis shows frequency 149.923Hz.

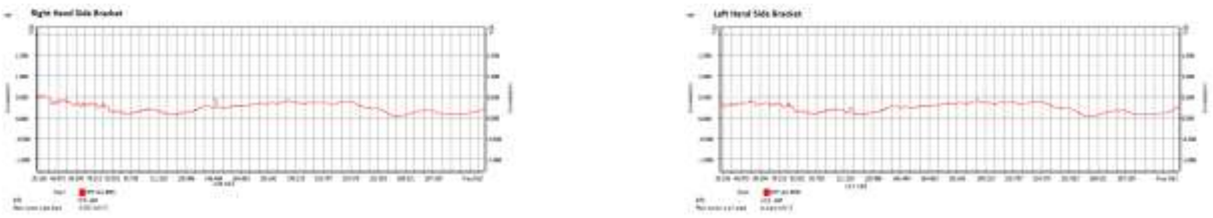
4. In this graph shows that frequency of vibrating body left hand side bracket. In this FFT analysis shows frequency 117.159 Hz.



Graph. 1



Graph. 2



Graph. 3 **Graph. 4**

Fig. 5: FFT Testing Graphs.

4. Result and Discussion

The results are listed in the Table 2 and variation in results is 3.986 to 9.793 %.

Table 2: Result Comparison

Sr.no	Welding fixture part name	FFT Experimental results (Hz)	Modal analysis result (Hz)	Error (%)
1	Right hand clamp wheel	62.145	68.308	9.022
2	Left hand clamp wheel	60.457	67.021	9.793
3	Right hand side bracket	149.923	143.946	3.986
4	Left hand side bracket	117.159	110.006	6.105

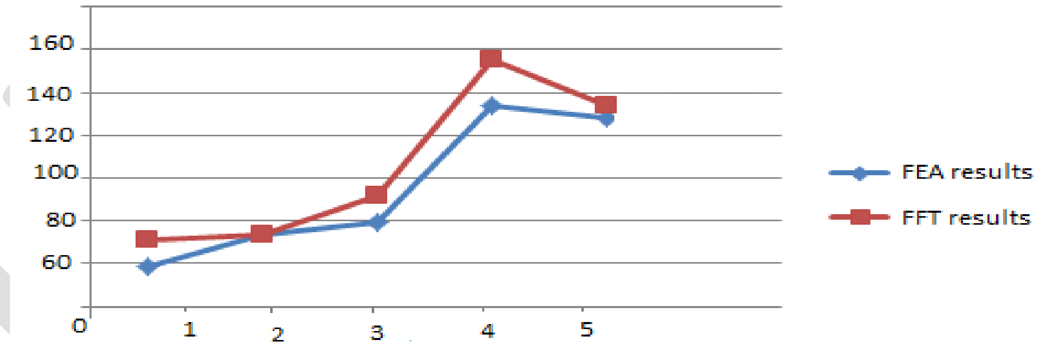


Fig. 6: Variation in FFT and FEA Results

Conclusion

The welding fixture design procedure is validated by actually manufacturing the welding of inlet header which reduces the welding time and increase dimensional accuracy which subsequently help for mass production of inlet header of shell and tube heat exchanger. As compare with manual welding process, Fixture Welding Process for inlet header reduces 75% less time for welding and it also shows that accuracy of fixture welding is higher than manual welding.

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POWER QUALITY IMPROVEMENT BY COMPENSATED LED LIGHTING SYSTEM

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Abstract: In this project we are designing a led lightning system such that It could consume less power, but in desirable cost at flexible range of Specification. A part from led lightning system, we are providing led lightning System with compensation, such that where ever this light was used This product was capable of saving about 15 to 20 watts of power Consumed by other loads where it is used per light. In this project power factor compensation was provided in a such way Using static compensators, it will adjust the power factor to unity, To reduce effective apparent power drawn by the source. It has a wide scope of applications for industrial sectors, where reactive Loads are more, also small scale industries. It has an adverse effect on industries, because industries are charged for KVA Tariff system (i.e.), so if the reactive power compensation was not done correctly then it leads to consumption of excessive apparent power as a result more electricity bill.

Keywords: Power quality improvement (PQI), Light emitting diode (LED), Power factor (PF), Alternating current (AC), Direct current (DC), Volt ampere reactor (VAR).

1. Introduction

One of the important consideration of electrical energy was consumption of active power and compensation of reactive power, in this power quality improvement project we are improving power factor of the load. As we know that most of the industries are capable of compensating reactive power in range of KVAR i.e. they were unable to compensate reactive power exactly.

Apart from exact compensation , most of the small scale industries are operating their industries during morning session and they shutdown in night session, i.e. during night session the transformer was operating for lightning load ,at that condition transformer has power factor range from 0.15-0.25 (lpf) .

During this condition additional reactive power consumption was required, this compensation was provided with led light as a result , when light was turned on compensation also turned on, so as to reduce the electricity bill.

Power factor:

Power factor may be defined as the ratio of active power and apparent power. In an AC circuit, there is generally a phase difference between voltage and current is called the power factor of the ac circuit.

It is a measure of how the current is being capable to convert into useful work output and a good indicator on the effect of the load current on the efficiency of the supply system.

Power Factor gives a measure of how effective the real power utilization of the system is. It is a measure of distortion of the line voltage and the line current and the phase shift between them . Power factors range from zero (0) to unity (1). With a typical power factor being between 0.8 and also equal to unity. The power factor can also be leading or lagging depending on whether the load is usually capacitive or inductive in nature

Effect of electric loads on power factor :

There are three types of electric loads on power factor such as Resistive, capacitive, Inductive loads. In resistive load the voltage and current peaks coincide with each other and therefore in phase and the power factor is unity.

Inductive loads require a magnetic field to operate with an inductive load the current waveform is lagging behind the voltage waveform. Therefore, the voltage and current peaks are not in phase.

The capacitor current leads (instead of lags) the voltage because of the time , It takes for the dielectric material to charge up to full voltage from the charging current. Therefore, it is said that the current in a capacitor leads the voltage.

2. Rectifier unit

Definition:

A rectifier is a circuit that is used for converting AC supply into unidirectional DC supply. This process of converting alternating current (AC) to direct current (DC) is also called as rectification. These bridge rectifiers are available in different packages as modules ranging from few amperes to several hundred amperes. Mostly in bridge rectifier circuits, semiconductor diode is used for converting AC since it allows the current flow in one direction only (Unidirectional device).

Types of Rectifiers:

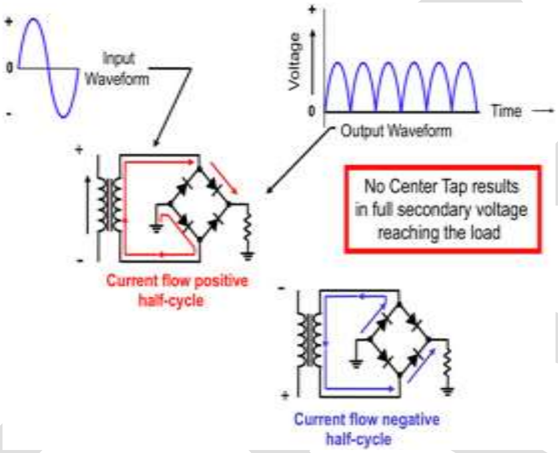
Rectifiers are classified into a variety of configurations as shown in below figure. Depends on factors like type of supply, bridge configuration, control nature, components used, etc these rectifiers are classified. Majorly rectifiers are classified into single phase and three phase rectifier and these are further classified into uncontrolled, half controlled and full controlled rectifiers. Let us see in brief about some of these types of rectifiers.

Single Phase Uncontrolled Rectifiers

This type of rectifiers uses the uncontrolled diode for rectifying the input AC supply. At the output terminals of this rectifier, power becomes constant and changes of its magnitude or value depend on load requirement is not possible.

Full Wave Bridge Rectifier

Using the same secondary voltage, this bridge rectifier can produce almost double the output voltage as compared with full wave center-tapped transformer rectifier. During the positive half of the input AC diodes D1 and D2 are forward biased and D3 and D4 are reverse biased. Thus load current flows through D1 and D2 diodes. During the negative half cycle of the input diodes D3&D4 are forward biased and D1&D2 are reverse biased. Therefore load current flows through D3&D4 diodes.



Transformers:

Electrical power transformer is a static device which transforms electrical energy from one circuit to another without any direct electrical connection and with the help of mutual induction between two windings. It transforms power from one circuit to another without changing its frequency but may be in different voltage level.

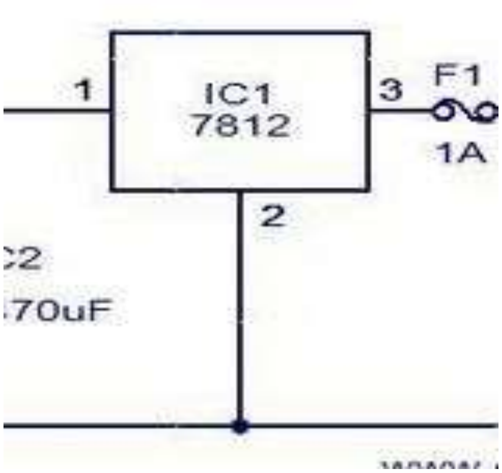
Working Principle of Transformer

The working principle of transformer is very simple depends upon Faraday’s law of electromagnetic induction. Actually, mutual induction between two or more winding is responsible for transformation action in an electric transformer.

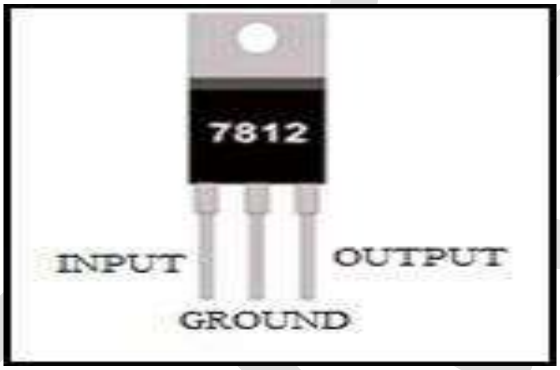
Voltage regulator:

7812 is a famous IC which is being widely used in 12V voltage regulator circuits. Truly speaking it is a complete standalone voltage regulator. We only need to use two capacitors, one on the input and second one on the output of 7812 in order to achieve clean voltage output and even these capacitors are optional to use.

To achieve 12V, 1A current, 7812 should be mounted on a good heat sink plate. Thanks to the transistor like shape of 7812 which makes it easy to mount on a heat sink plate. 7812 has built in over heat and short circuit protection which makes it a good choice for making power supplies.



In electronics markets, 7812 is sold under various names such as 7812a, 7812act, 7812t and lm7812. All of them are almost identical with a little to no differences at all. 7812 input voltage range is 14V to 35V. Exceeding the voltage range may damage the IC. Given bellow is 7812 pin diagram to make the pin out connections clear in case you want to do some experiments.

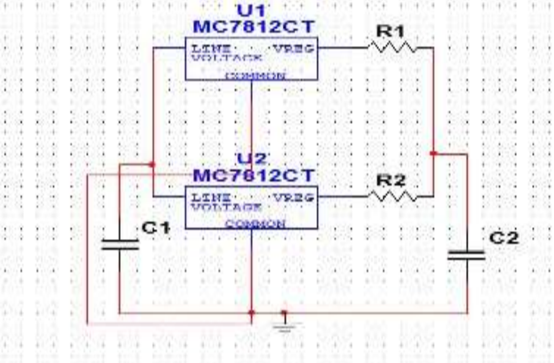


If you hold upside down (pins up) and the IC number is facing you then the left pin will be the voltage regulator output, the center pin will be ground and the right pin will be the voltage input pin. Under my experience, the maximum safe current you can get from one 7812 IC is 1A.

If you need more power then there are a few ways

More than one 7812 can be used in parallel in order to achieve more than 1A current but output voltage of each 7812 can slightly vary resulting in unbalanced load on all of them. This can result in load balancing issues and can damage the IC carrying most current.

However there is a way to overcome this problem. I have given bellow a schematic diagram in which two 7812 ICs are attached together and both of them are carrying almost equal load. At least the current difference is not too much to damage any IC.



Please note that in this circuit diagram, I have used resistors for load balancing purpose so the output of this voltage regulator circuit may slightly inaccurate. Both resistors should be minimum 15 Watt or above.

If you don’t find such resistors in your area then you can make them using 32 gauge or thinner copper wire. This parallel 7812 circuit will provide 12V and approximately 2A current. You can increase number of 7812 but each additional 7812 will require a resistor on its output.

Where this voltage regulator was most widely used integrated circuit in most of electronics circuits, because of more versatile and easy to incorporate in printed circuit board.

Electrical Characteristics (LM7812)

Refer to the test circuit, -40°C < T_J < 125°C, I_O = 500 mA, V_I = 19 V, C_I = 0.33 μF, C_O = 0.1 μF, unless otherwise specified.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = +25°C		11.5	12.0	12.5	V
		I_O = 5 mA to 1 A, $P_O \leq 15$ W, V_I = 14.5 V to 27 V		11.4	12.0	12.6	
Regline	Line Regulation(12)	T_J = +25°C	V_I = 14.5 V to 30 V		10	240	mV
			V_I = 16 V to 22 V		3	120	
Regload	Load Regulation(12)	T_J = +25°C	I_O = 5 mA to 1.5 A		11	240	mV
			I_O = 250 mA to 750 mA		5	120	
I_Q	Quiescent Current	T_J = +25°C			5.1	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5 mA to 1 A			0.1	0.5	mA
		V_I = 14.5 V to 30 V			0.5	1.0	
$\Delta V_O/\Delta T$	Output Voltage Drift(13)	I_O = 5 mA			-1		mV/°C
V_N	Output Noise Voltage	f = 10 Hz to 100 kHz, T_A = +25°C			76		μV
RR	Ripple Rejection(13)	f = 120 Hz, V_I = 15 V to 25 V		55	71		dB
V_{DROP}	Dropout Voltage	I_O = 1 A, T_J = +25°C			2		V
R_O	Output Resistance(13)	f = 1 kHz			18		mΩ
I_{SC}	Short-Circuit Current	V_I = 35 V, T_J = +25°C			230		mA
I_{PK}	Peak Current(13)	T_J = +25°C			2.2		A

3. LED lighting module

Led lightning system:

Energy-saving solutions have been becoming increasing essential in recent years because of environmental issues such as climate change and global warming. Environmental problems are very important issues and these problems are largely caused by the excessive use of energy.

A light accounts for approximately20 percent of the world's total energy consumption; thus the related studies of an energy efficient lighting system have been done by various researchers around the world.

The invention of a light emitting diode (LED) is expected to significantly alleviate the energy consumption of a light, because the LED lighting device consumes 50 percent of the energy consumption compared to the fluorescent lighting device.

Recently, an intelligent lighting control system using various sensors and communication modules are actively studied and developed in both university and industry. The intelligent lighting control system can reduce energy consumption as automatically controlling the intensity of illumination through situation awareness, such as awareness of user movement or brightness of surroundings. The technical report from the U.S. Department of Energy shows that about 15 percent of total energy consumption can be reduced through light control according to user's living pattern.

Light emitting diode:

A light emitting diode (LED) is a two lead semiconductor light source. It is ap-n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

Light emitting diode:

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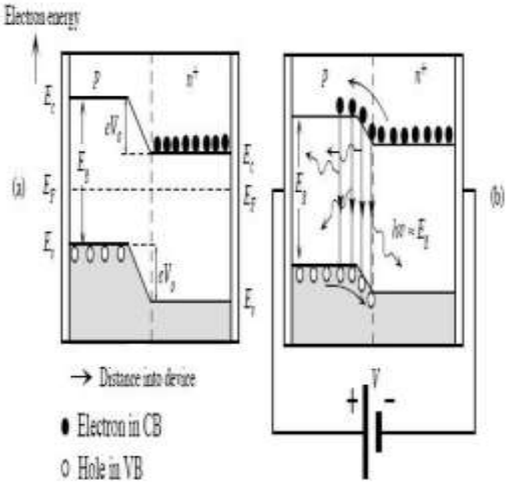
Theory:

A Light emitting diode (LED) is essentially a p-n junction diode. When carriers are injected across a forward-biased junction, it emits incoherent light. Most of the commercial LEDs are realized using a highly doped n and a p Junction.



To understand the principle, let’s consider an unbiased p-n junction (Figure1 shows thep-n energy band diagram). The depletion region extends mainly into the p-side. There isa potential barrier from Ec on the n-side to the Ec on the p-side, called the built-in voltage,V0.

This potential barrier prevents the excess free electrons on the n+ side from diffusing into the p side. When a Voltage V is applied across the junction, the built-in potential is reduced from V0to V0 – V.

This allows the electrons from the n+ side to get injected into the p-side. Since electrons are the minority carriers in the p-side, this process is called minority carrier injection. But the hole injection from the p side to n+ side is very less and so the current is primarily due to the flow of electrons into the p-side. These electrons injected into the p-side recombine with the holes. This recombination results in spontaneous emission of photons (light). This effect is calledinjection electroluminescence. These photons should be allowed to escape from the device with out being reabsorbed.

LED Materials:

An important class of commercial LEDs that cover the visible spectrum are the III-V ternary alloys based on alloying GaAs and GaP which are denoted by GaAs1-yPy. In GaAlP is an example of a quaternary III-V alloy with a direct band gap.

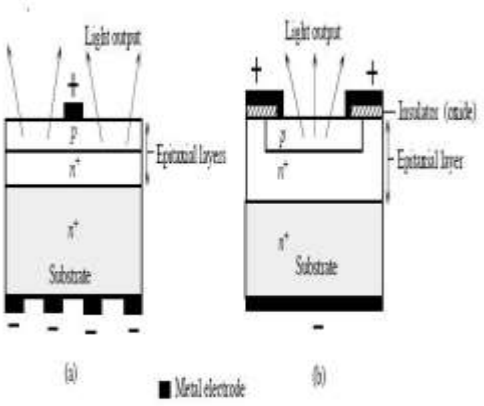
The LEDs realized using two differently doped semiconductors that are the same materials called a homo junction. When they are realized using different band gap materials they are called . A hetero structure LED is brighter than a homo Junction LED.

LED Structure:

The LED structure plays a crucial role in emitting light from the LED surface. The LEDs are structured to ensure most of the recombination takes place on the surface by the following two ways.

- By increasing the doping concentration of the substrate, so that additional Free Minority charge carriers electrons move to the top, recombine and emit light at the surface.
- By increasing the diffusion length L = √ Dτ, where D is the diffusion coefficient and τ is the carrier life time. But when increased beyond a critical length there is a chance of re-absorption of the photons into the device.

The LED has to be structured so that the photons generated from the device are emitted without being reabsorbed. One solution is to make the p layer on the top thin, enough to create a depletion layer. Following picture shows the layered structure. There are different ways to structure the dome for efficient emitting.



Lifetime and failure:

Solid state devices such as LEDs are subject to very limited wear and tear if operated at low currents and at low temperatures. Many of the LEDs made in the 1970s and 1980s are still in service in the early 21st century. Typical lifetimes quoted are25,000 to 100,000 hours, but heat and current settings can extend or shorten this time significantly.

The most common symptom of LED (and diode laser) failure is the gradual lowering of light output and loss of efficiency. Sudden failures, although rare, can also occur. Early red LEDs were notable for their short service life. With the development of high power LEDs the devices are subjected to higher junction temperatures and higher current densities than traditional devices. This causes stress on the material and may cause early light Output degradation. To quantitatively classify useful lifetime in a standardized manner it has been suggested to use the terms L70 and L50, which is the time it will take a given LED to reach 70% and 50% light output respectively.

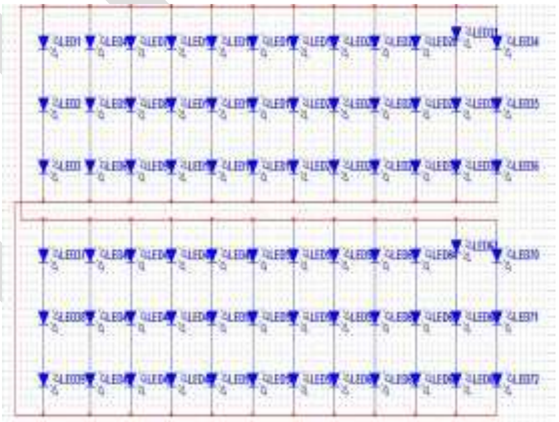
LED performance is temperature dependent. Most manufacturers' published ratings of LEDs are for an operating temperature of 25 °C (77 °F). LEDs used outdoors, such as traffic signals or in pavement signal lights, and that are utilized in climates where the temperature within the light fixture gets very high, could result in low signal intensities or even failure.

Lightning network module design:

The important aspect of design of network module was to make a model in which these led's are connected in a such topology ,it should satisfy the input voltage specifications.

Since the led diode are practically conducted ,if the applied voltage was greater then the forward cut in voltage , so when these diodes are connected in series, the cut in voltages are the sum of connected diodes.

LED's are practically modeled as a resistor and voltage source in series with resistor and, the magnitude of voltage source acts as the forward cut in voltage for the diode.



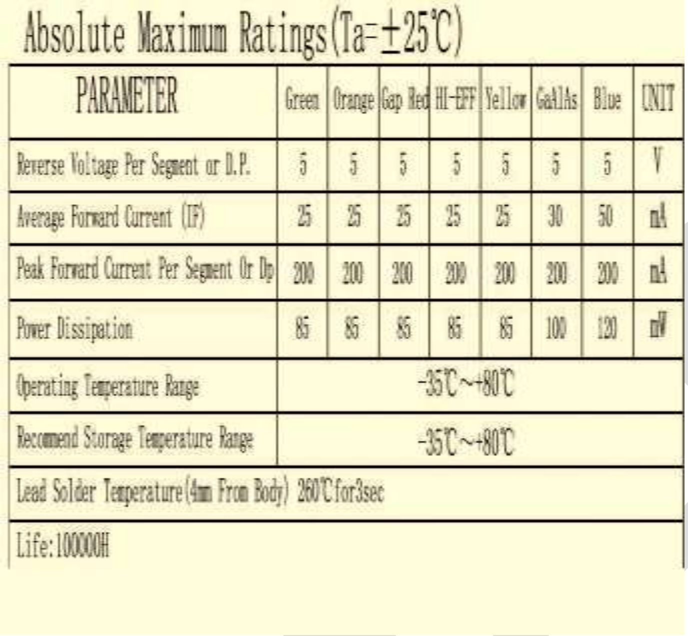
Schematic of 3 diodes are connected in series

As shown in the above figure , the diodes are connected in series ,the forward cut in voltage of diode was ~3v i.e when 3 diodes are connected in series ,then the total cut in voltage was ~9v.

When ever the voltage applied to the branch of 3 series connected diodes are supplied the input voltage greater then the equivalent forward cut in voltage~9v the branch of diode conducts.

Here in this lightning module design ,we are applying 12v as input to a branch of diodes ,total 24 parallel branches are connected in series to achieve a good lightning and with less quantity of power.

Lightning module data sheet



Absolute Maximum Ratings(Ta=±25℃)

PARAMETER	Green	Orange	Gap Red	HI-EFF	Yellow	GaAlAs	Blue	UNIT
Reverse Voltage Per Segment or D.P.	5	5	5	5	5	5	5	V
Average Forward Current (IF)	25	25	25	25	25	30	50	mA
Peak Forward Current Per Segment Or Dp	200	200	200	200	200	200	200	mA
Power Dissipation	85	85	85	85	85	100	120	mW
Operating Temperature Range	-35℃~+80℃							
Recomend Storage Temperature Range	-35℃~+80℃							
Lead Solder Temperature(4mm From Body) 260℃for3sec								
Life:100000H								

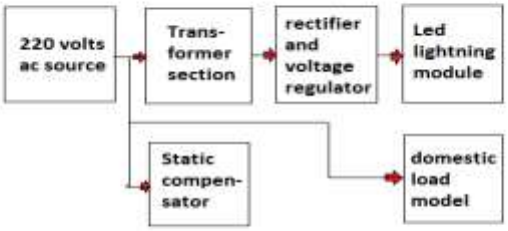
4. Power quality improvement

Power quality:

Power quality improvement is a process in which the effective power drawn by the load was been reduced by using some sort of methods like power factor improvement, maximum efficiency operation. While dealing with maximum efficiency operation, if the electrical load was operated in maximum efficiency so that load was utilized fully When dealing with the power factor improvement, in this process the excessive reactive power required was been supplied by an alternative source called as capacitor.

When capacitor was used such that reactive power required by inductive load was equal to reactive power supplied by capacitor then , load does not consumes reactive power from supply so the effective apparent power required was reduces.

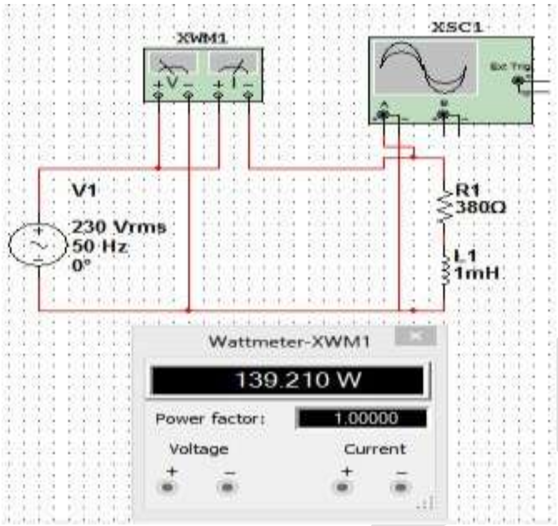
It has an adverse effect on industries, because industries are charge for KVA Tariff system (i.e.), so if the reactive power compensation was not done correctly then it leads to consumption of excessive apparent power as a result more electricity bill.



Block Diagram

Before proceeding to practical circuit implementation, a simulated model was been developed and analysis was done, this analysis was made by using MULTI-SIM simulation tool by NATIONAL INSTRUMENTS.

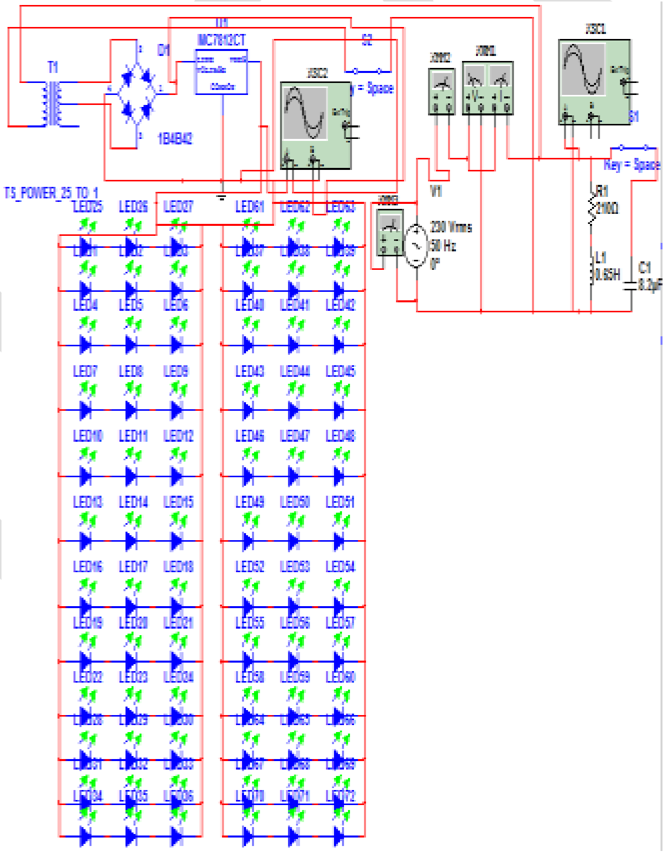
Induction motor load model:



Single phase induction motor model :

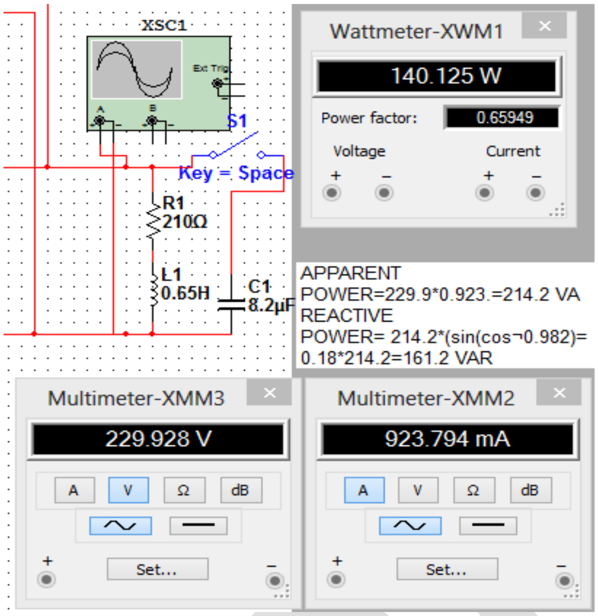
In this simulated model the simulation model of load was analyzed by an R-L circuit neglecting shunt branch parameters and resistance and inductance values are brought with practical methods.
The electrical model of single phase induction motor was replaced with obtained values from practical method of voltmeter ammeter and wattmeter.

Project model:



5. Results

Output project model with only load:



Wattmeter-XWM1: 140.125 W
Power factor: 0.65949

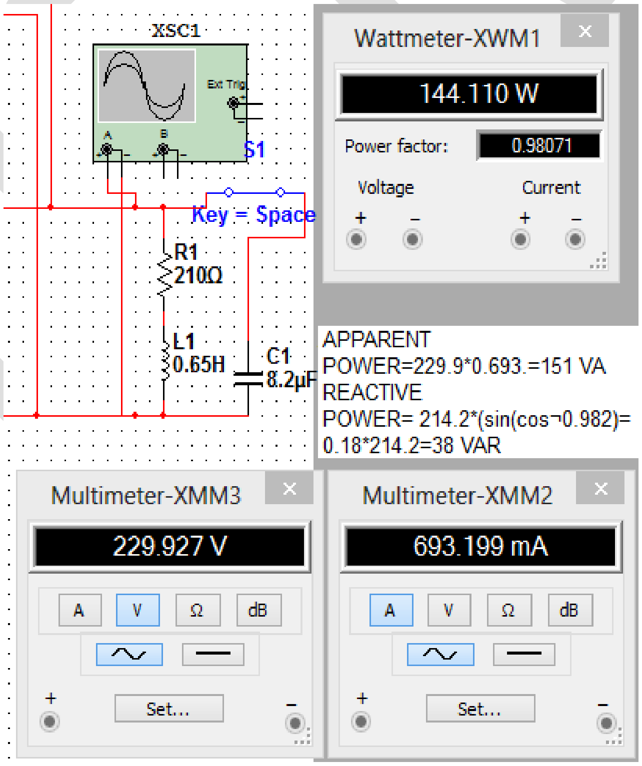
APPARENT
POWER=229.9*0.923.=214.2 VA
REACTIVE
POWER= 214.2*(sin(cos¬0.982)=
0.18*214.2=161.2 VAR

Multimeter-XMM3: 229.928 V

Multimeter-XMM2: 923.794 mA

This above figure shows when the model was simulated and the results were shown, as shown the apparent power required for model was 214.2 VA

Output with project model with compensator :



Wattmeter-XWM1: 144.110 W
Power factor: 0.98071

APPARENT
POWER=229.9*0.693.=151 VA
REACTIVE
POWER= 214.2*(sin(cos¬0.982)=
0.18*214.2=38 VAR

Multimeter-XMM3: 229.927 V

Multimeter-XMM2: 693.199 mA

The above figure shows when compensator was switched with LED the apparent power reduces.

Conclusion:

The above model results show the output of compensated led lightning system, the difference between with and without compensation we can save about for one led light. The use of led lightning was increased but if it was used with compensation then it saves about 20% of our energy charges as proved above. Even it was more convenient for industrial sectors since; the tariff system used was KVA tariff. As shown above, as increase the number of light , we can save more energy, apart from energy charges is also decreases the cost of equipment required for applications as effective current required reduces. As stated above ,if current required reduces then heat generation in conductor also reduces as a result, the conductor size reduces i.e. cost reduces and also increases in life spam of conductors.

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Brief Study of LISP

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Abstract: Artificial Intelligence (AI) is a broad field, and means different things to different people. It is concerned with getting computers to do tasks that require human intelligence. Lisp is used in AI programming, because it supports the implementation of software that computes with symbols very well. Symbols, symbolic expressions and computing with those are at the core of Lisp. Lisp is the second-oldest high-level programming language. This paper is totally based on the list programming (LISP).In this paper we will discuss about history of lisp, types of lisp, features of lisp, applications of lisp, Connection to artificial intelligence via lisp, Basic functions of lisp, user define function in lisp and scope of the lisp in AI field. And finally this paper will conclude about the importance of lisp in AI field. In other words we can say that this paper will introduce you with List Programming (LISP).

Keywords: AI Programming, functional language ,high-level programming language**,** object-oriented programming, symbolic expressions, SHRDLU, natural language understanding computer program, Prolog, flexibility, edit-test-debug cycle.

History:

Lisp is the second-oldest high-level programming language after Fort edit-test-debug cycle ran and has changed a great deal since its early days, and a number of dialects have existed over its history. Today, the most widely known general-purpose Lisp dialects are Common Lisp and Scheme. Lisp was invented by John McCarthy in 1958 while he was at the Massachusetts Institute of Technology (MIT). [1]

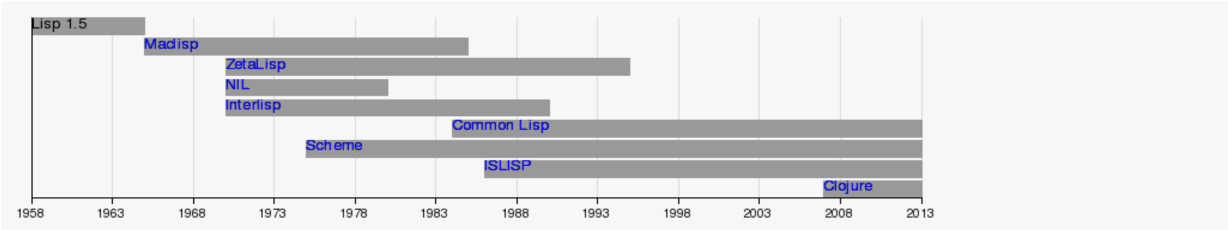


Figure 1: Types of LISP

Features of Common LISP

- It is machine-independent.
- It is a dynamic language*:* editing changes take effect immediately, without the need for recompilation
- Lisp is the second-oldest high-level programming language after Fortran
- It is primarily a functional language*:* all work can be done via function.

- It provides advanced object-oriented programming.
- It provides convenient macro system.
- LISP expressions are called symbolic expressions or s-expressions. The s-expressions are composed of three valid objects, atoms, lists and strings.
- It provides an object-oriented condition system.
- It provides complete I/O library.
- It provides extensive control structures.
- LISP programs run either on an interpreter or as compiled code. [2]

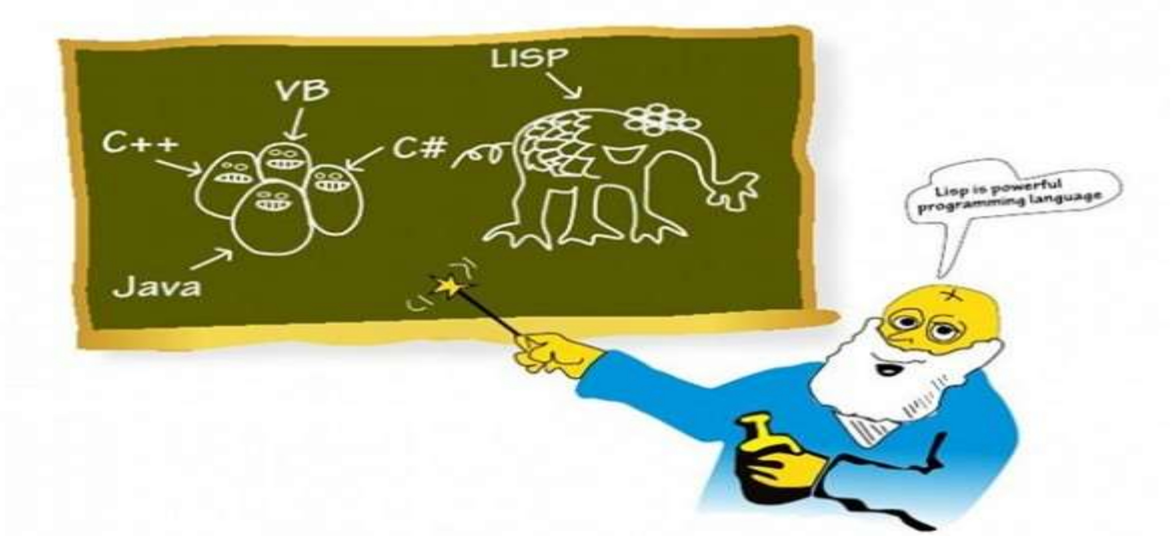


Figure 2: Flexibility of LISP

Applications Built in LISP

Large successful applications built in Lisp.

- Emacs
- G2
- AutoCad
- Igor Engraver
- Yahoo Store [2]

Connection to artificial intelligence

Since its inception, Lisp was closely connected with the artificial intelligence research community, Lisp was used as the implementation of the programming language Micro Planner which was used in the famous AI system SHRDLU. In the 1970s, as AI research spawned commercial offshoots, the performance of existing Lisp systems became a growing issue. [3]

SHRDLU was an early natural language understanding computer program, developed by Terry Winograd at MIT in 1968–1970. In it, the user carries on a conversation with the computer, moving objects, naming collections and querying the state of a simplified "blocks world". [4]

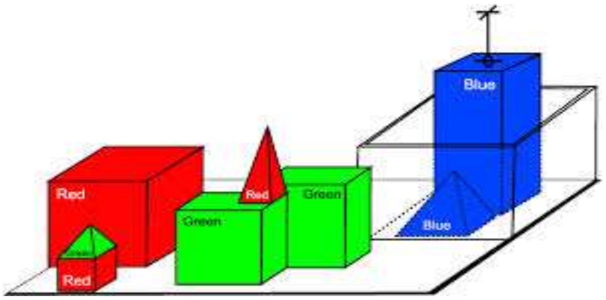


Figure 3: SHRDLU, an early natural language understanding computer program

Basic functions of lisp:

- (LIST *S1 S2* ...)

  Form a list of the (evaluated) arguments *S1*, *S2* ...

- (MEMBER *S L*)

  Test whether *S* is a top-level (i.e. not embedded in a sublist) element of *L*.

- (APPEND *L1 L2* ...)

  Make a new list from the elements of *L1*, *L2*, ..., in order.

- (REVERSE *L*)

  Return a list containing the same elements as *L* but in reverse order.

- (LENGTH *L*)

  Returns the length of *L*, that is, the number of top-level elements in *L*.

```
[1]> (reverse '(1 2 3 4 5 6))

(6 5 4 3 2 1)
[2]> (append '(1 2 3 4 (5 6 7) 8 9) '( 1 2 (3) 4))

(1 2 3 4 (5 6 7) 8 9 1 2 (3) 4)
[3]> (list '(1 2 3 4 (5 6 7) 8 9) '( 1 2 (3) 4))

((1 2 3 4 (5 6 7) 8 9) (1 2 (3) 4))
[4]> (member 'f '(a b c f g h j))

(F G H J)
[5]> (length '("ab" "bc" "kfg"))

3
[6]>
```

Figure 4: Implemetation of Basic functions of LISP

Predicates (tests):

- (LISTP *S*)

  True if *S* is a list.

- (NUMBERP *S*)

  True if *S* is a number.

- (NOT *S*)

  True if *S* is false, and false if *S* is true. Same as (NULL *S*).

- (EQUAL *S1 S2*)

  True if *S1* and *S2* are equal. Like EQ, but may be used for anything.

- (ZEROP *N*)

  True if number *N* is zero.

- (PLUSP *N*)

  True if number *N* is positive.

- (MINUSP *N*)

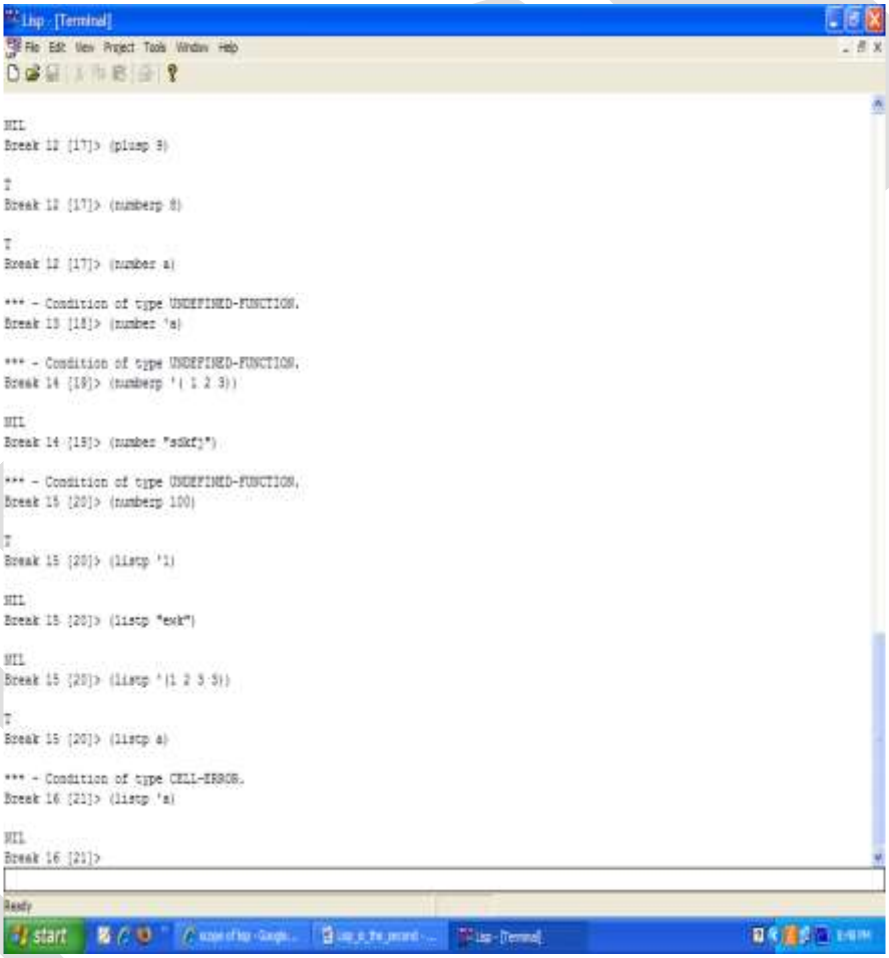
  True if number *N* is negative.

- (EVENP *N*)

  True if integer *N* is even.

- (ODDP *N*)

  True if integer *N* is odd.



```
NIL
Break 12 [17]> (plusp 3)

T
Break 12 [17]> (numberp 8)

T
Break 12 [17]> (number a)

*** - Condition of type UNDEFINED-FUNCTION.
Break 13 [18]> (number 'a)

*** - Condition of type UNDEFINED-FUNCTION.
Break 14 [19]> (numberp '( 1 2 3))

NIL
Break 14 [19]> (number "sdkfj")

*** - Condition of type UNDEFINED-FUNCTION.
Break 15 [20]> (numberp 100)

T
Break 15 [20]> (listp '1)

NIL
Break 15 [20]> (listp "ewk")

NIL
Break 15 [20]> (listp '(1 2 3 5))

T
Break 15 [20]> (listp a)

*** - Condition of type CELL-ERROR.
Break 16 [21]> (listp 'a)

NIL
Break 16 [21]>
```

Figure 5: Predicates of LISP

Arithmetic functions:

- (+ *N1 N2* ...)

Returns the sum of the numbers.

- (- *N1 N2* ...)

Returns the result of subtracting all subsequent numbers from *N1* .

- (* *N1 N2* ...)

Returns the product of all the numbers.

- (/ *N1 N2* ...)

Returns the result of dividing *N1* by all subsequent numbers.

- (1+ *N*)

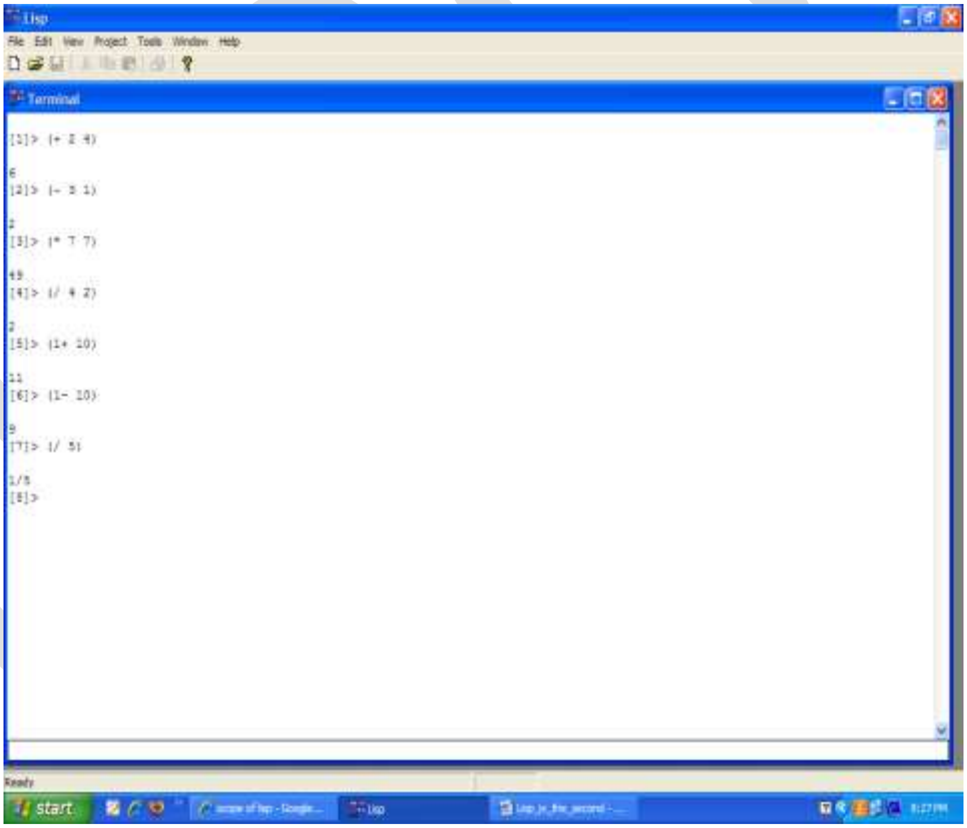
Returns *N* plus one. (Note that there is no space between the "1" and the "+".)

- *N*)

Returns *N* minus one. (Note that there is no space between the "1" and the "-".)

- (/ *N*)

Return the reciprocal of *N*.



```
[1]> (+ 2 4)

6
[2]> (- 3 1)

2
[3]> (* 7 7)

49
[4]> (/ 4 2)

2
[5]> (1+ 10)

11
[6]> (1- 10)

9
[7]> (/ 5)

1/5
[8]>
```

Figure 6: Arithmetic functions of LISP

Input/output functions:

- (LOAD *F*)

Load the source file whose name (without extensions) is *F*.

- (DRIBBLE *F*)

  Causes the current session to be recorded file whose name (without extensions) is *F* . To stop recording, call (DRIBBLE) with no parameters. *Not available on all systems.*

- (PRIN1 *S*)

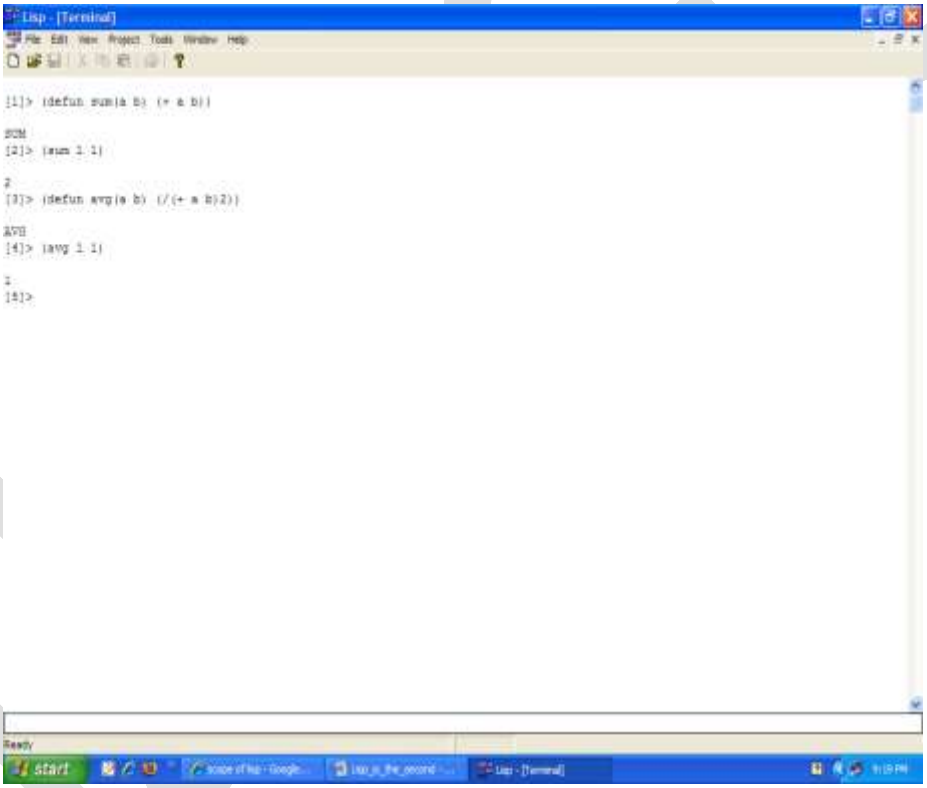
  Print, on the current line, the result of evaluating the S-expression *S*.

- (TERPRI)

  Print a newline. [5]

How to create user defines function:

(DEFUN function name parameter list function body)
Where function name is an identifier, parameter list is a list (possibly empty) of identifiers, and Function body is an S-expression. [6]



```
[1]> (defun sum(a b) (+ a b))

SUM
[2]> (sum 1 1)

2
[3]> (defun avg(a b) (/(+ a b)2))

AVG
[4]> (avg 1 1)

1
[5]>
```

Figure 7: Creation of user defines function by defun.

Scope of Lisp in AI programming:

The main programming languages used in AI are Lisp and Prolog. Both have features which make them suitable for AI programming, such as support for list processing, pattern matching and exploratory programming. [7]

Lisp can be viewed as the grandfather of functional programming

Case Studies of Lisp tell us that Lisp's flexibility allows it to adapt as programming styles change, but more importantly, Lisp can adapt to your particular programming problem. In other languages you fit your problem to the language; with Lisp you extend the language to fit your problem. A lot of AI programs deals with symbols and their manipulation, and Lisp are great for that because of its fast prototyping and the macro utility that helps you extend the language in a great way. Because of its flexibility, Lisp has been successful as a high-level language for rapid prototyping in such areas as AI, graphics, and user interfaces. Lisp makes it easy to define new languages especially targeted to the problem at hand. Programmers love lisp because of the increased productivity it provides. The edit-test-debug cycle is so fast in Lisp. It made complex programs easy and fast to write. In Europe and Japan Prolog is the preferred choice while in America LISP is usually the way to go. [8]

Any programmer wants a simple, flexible language for programming, if we have a logic reasoning problem then go for Prolog. If on the other hand you have a space search problem that fits perfectly to Lisp list and symbols, go for Lisp.

Conclusion:

Lisp has been hailed as the world's most powerful programming language. But only a few programmers use it because of its cryptic syntax .In this paper we have discussed several points related to lisp, On the basis of those points we can conclude that in AI field we can use LISP as a programming language. The task which is not fully logic based and instead of they are based on list and symbol can be programmed in LISP. This paper has discussed basic functions of LISP, with its application, features and scope. Hence we can conclude that LISP can be assumed as an important language in AI field.

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Review of Software Testing

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Abstract: In general, testing is finding out how well something (software) works. In terms of human beings, testing tells what level of knowledge or skill has been acquired. In computer hardware and software development, testing is used at key checkpoints in the overall process to determine whether objectives are being met. When the design is complete, coding follows and the finished code is then tested. This paper will focus on the main points of testing like why we need testing, Software testing Life Cycle, types of software testing, **How testing is carried out in practical environment and finally at the last this paper will conclude about every point which will discuss in this paper.**

Figure1: Testing

Keyword: SDLC (Software Development Life Cycle), STLC (Software Testing Life Cycle), Project life cycle, testing, static testing, dynamic testing, **Black box testing (behavioral testing), White box testing (Structural or Glass box testing), Unit testing, Incremental integration testing, Integration testing, Functional testing, System testing, End-to-end testing, Sanity testing (**confidence testing, smoke testing**), Regression testing, Acceptance testing, Load testing, Performance testing, Stress testing, Usability testing ,Install/uninstall testing, Recovery testing ,Security testing ,Compatibility testing, Comparison testing, Alpha testing, Beta testing** ,SRS (software requirement specification), bug, tool, Test Case.

Why we need testing:

Testing is the process with the intention to find errors/bugs to analyze the actual results with expected results. The need of testing is as follows:

* to meet the customer requirements

* to check the efficiency & effectiveness of the product

* to produce quality product. [1]

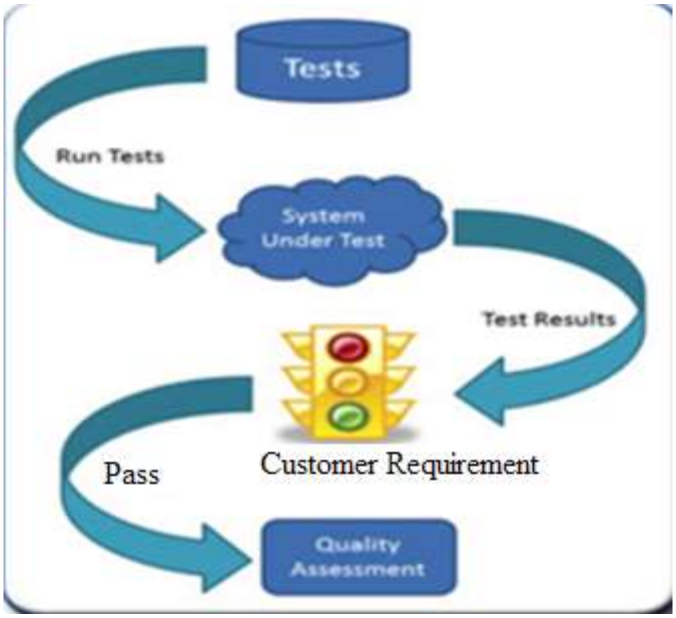

Figure2: We need testing to satisfy customer need.

SOFTWARE TESTING LIFE CYCLE (STLC):

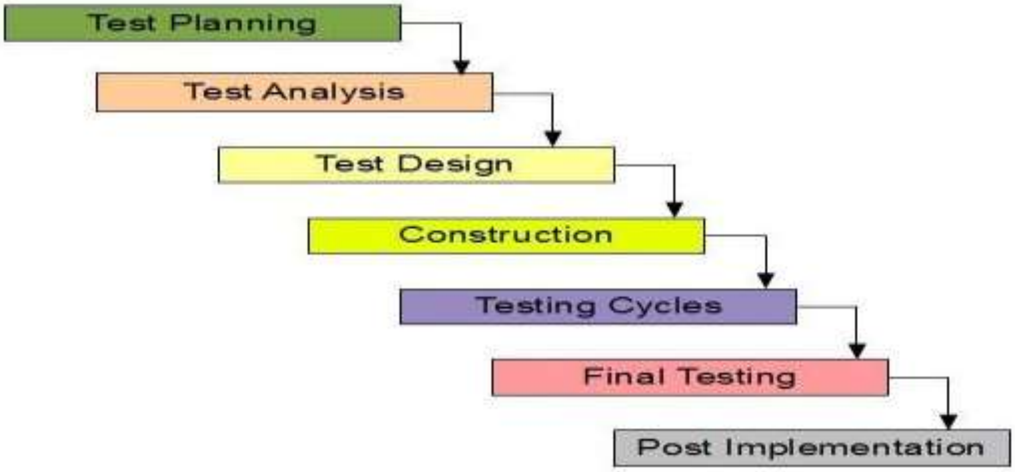

Figure 3: STLC (Software Testing Life Cycle)

- Requirements Analysis
- Test Planning,
- Test Analysis,
- Test Design,
- Construction and verification,
- Testing Cycles
- Final Testing and Implementation and

- Post Implementation.

Software testing has its own life cycle that intersects with every stage of the **SDLC**. The basic requirements in software testing life cycle are to deal with software testing methodologies like Manual, Automated and Performance testing. [2]

1. Requirements Analysis

In this phase Software testers analyze the customer requirements and work with developers during the design phase to see which requirements are testable and how they are going to test those requirements. [2]

2. Test Planning

In this phase all the planning about testing is done like what needs to be tested, how the testing will be done, test strategy to be followed, what will be the test environment, what test methodologies will be followed, hardware and software availability, resources, risks etc.[2]

3. Test Analysis

After test planning phase is over test analysis phase starts, in this phase we need to dig deeper into project and figure out what testing needs to be carried out in each SDLC phase. [2]

4. Test Design

In this phase various black-box and white-box test design techniques are used to design the test cases for testing, testers start writing test cases by following those design techniques, if automation testing needs to be done then automation scripts also needs to written in this phase.[2]

5. Test Construction and Verification

In this phase testers prepare more test cases by keeping in mind the positive and negative scenarios, end user scenarios etc. All the test cases and automation scripts need to be completed in this phase and got reviewed by the stakeholders. The test plan document should also be finalized and verified by reviewers. [2]

6. Testing Cycles: Test Execution and Bug Reporting

Testing is an iterative process i.e. If defect is found and fixed, testing needs to be done after every defect fix. After tester assures that defects have been fixed and no more critical defects remain in software the build is given for final testing. [2]

7. Final Testing and Implementation

In this phase the final testing is done for the software, non functional testing like stress, load and performance testing are performed in this phase. The software is also verified in the production kind of environment. Final test execution reports and documents are prepared in this phase. [2]

8. Post Implementation

In this phase the test environment is cleaned up and restored to default state, the process review meetings are done and lessons learns are documented. A document is prepared to cope up similar problems in future releases. [2]

Software Testing Types:

Software testing is a method of assessing the functionality of a software program. There are many different types of software testing but the two main categories are dynamic testing and testing. Dynamic testing is an assessment that is conducted while the program is executed; static testing, on the other hand, is an examination of the program's code and associated documentation. Dynamic and static methods are often used together. [3].Main types of testing are discussing below.

Black box testing – Internal system design is not considered in this type of testing. Tests are based on requirements and functionality. The term **'behavioral testing'** is also used for black box testing. Behavioral test design is slightly different from black-box test design because the use of internal knowledge isn't strictly forbidden, but it's still discouraged. [4]

White box testing – This testing is based on knowledge of the internal logic of an application's code. Also known as Glass box Testing. Internal software and code working should be known for this type of testing. Tests are based on coverage of code statements, branches, paths, conditions. White box testing (WBT) is also called **Structural or Glass box testing.** [4]

Unit testing – Testing of individual software components or modules. Typically done by the programmer and not by testers, as it requires detailed knowledge of the internal program design and code. may require developing test driver modules or test harnesses. [4]

Incremental integration testing – Bottom up approach for testing i.e. continuous testing of an application as new functionality is added; Application functionality and modules should be independent enough to test separately. Done by programmers or by testers. [4]

Integration testing – Testing of integrated modules to verify combined functionality after integration. Modules are typically code modules, individual applications, client and server applications on a network, etc. This type of testing is especially relevant to client/server and distributed systems. [4]

Functional testing – This type of testing ignores the internal parts and focus on the output is as per requirement or not. Black-box type testing geared to functional requirements of an application. [4]

System testing – Entire system is tested as per the requirements. Black-box type testing that is based on overall requirements specifications, covers all combined parts of a system. [4]

End-to-end testing – Similar to system testing, involves testing of a complete application environment in a situation that mimics real-world use, such as interacting with a database, using network communications, or interacting with other hardware, applications, or systems if appropriate. [4]

Sanity testing - Testing to determine if a new software version is performing well enough to accept it for a major testing effort. If application is crashing for initial use then system is not stable enough for further testing and build or application is assigned to fix. (Also **confidence tests, smoke testing**). [4]

Regression testing – Testing the application as a whole for the modification in any module or functionality. Difficult to cover all the system in regression testing so typically automation tools are used for these testing types. [4]

Acceptance testing -Normally this type of testing is done to verify if system meets the customer specified requirements. User or customer does this testing to determine whether to accept application. [4]

Load testing – It's a performance testing to check system behavior under load. Testing an application under heavy loads, such as testing of a web site under a range of loads to determine at what point the system's response time degrades or fails. [4]

Stress testing – System is stressed beyond its specifications to check how and when it fails. Performed under heavy load like putting large number beyond storage capacity, complex database queries, continuous input to system or database load. [4]

Performance testing – Term often used interchangeably with 'stresses and 'load' testing. To check whether system meets performance requirements. Used different performance and load tools to do this. [4]

Usability testing – User-friendliness check. Application flow is tested, Can new user understand the application easily, Proper help documented whenever user stuck at any point. Basically system navigation is checked in this testing. [4]

Install/uninstall testing - Tested for full, partial, or upgrade install/uninstall processes on different operating systems under different hardware, software environment. [4]

Recovery testing – Testing how well a system recovers from crashes, hardware failures, or other catastrophic problems. [4]

Security testing – Can system be penetrated by any hacking way? Testing how well the system protects against unauthorized internal or external access. Checked if system, database is safe from external attacks. [4]

Compatibility testing – Testing how well software performs in a particular hardware/software/operating system/network environment and different combinations of above. [4]

Comparison testing – Comparison of product strengths and weaknesses with previous versions or other similar products. [4]

Alpha testing – In house virtual user environment can be created for this type of testing. Testing is done at the end of development. Still minor design changes may be made as a result of such testing. [4]

Beta testing – Testing typically done by end-users or others. Final testing before releasing application for commercial purpose. [4]

How testing is carried out in practical environment?

Whenever we get any new project there is initial project familiarity meeting. In this meeting we basically discuss on who is client? What is project duration and when is delivery? Who is involved in project i.e. manager, Tech leads, QA leads, developers, testers etc..?

First we should know about the SRS- "The SRS fully describes what the software will do and how it will be expected to perform". [5]

From the SRS (software requirement specification) project plan is developed. The responsibility of testers is to create project plan from this SRS and. Developers start coding from the design. The project work is divided into different modules and these project modules are distributed among the developers. In meantime testers responsibility is to create test scenario and write test cases according to assigned modules. When developers finish individual modules, those modules are assigned to testers. Smoke testing is performed on these modules and if they fail this test, modules are reassigned to respective developers for fix. For passed modules manual testing is carried out from the written test cases. If any bug (A **software bug** is an error, flaw, failure, or fault in a computer program or system that causes it to produce an incorrect or unexpected result .[6])is found that get assigned to module developer and get logged in bug tracking tool (A **bug tracking system** or **defect tracking system** is a software application that keeps track of reported software bugs in software development projects. [7]). on bug fix tester do bug verification and regression testing of all related modules. If bug passes the verification it is marked as verified and marked as closed. Otherwise above mentioned bug cycle gets repeated. [8]

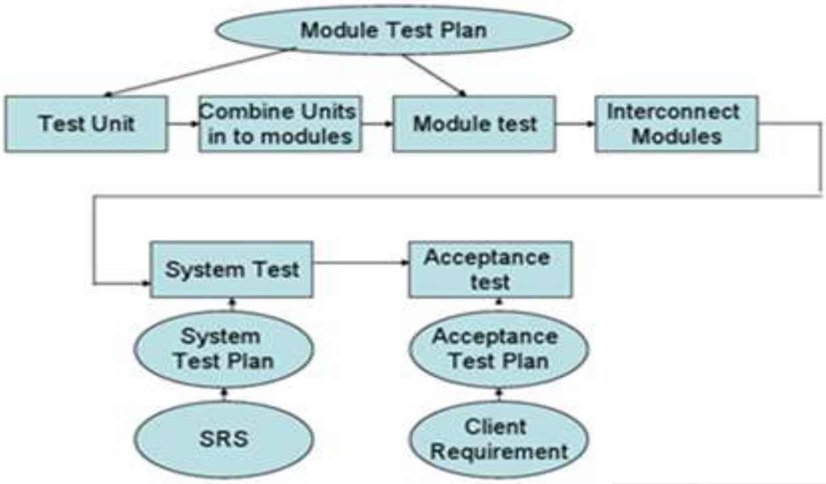

Figure 5: testing process

Different tests are performed on individual modules and integration testing on module integration. These tests include Compatibility testing i.e. testing application on different hardware, OS versions, software platform, different browsers etc. Load and stress testing is also carried out according to SRS. Finally system testing is performed by creating virtual client environment. On passing all the test cases test report is prepared and decision is taken to release the product! So this was a brief outline of process of project life cycle. [8]

Conclusion-

On the basis of overall discussion of software testing in this paper, we can conclude that testing is a method which finds how well a system (software) works, then we discussed about some points based on why we need testing, after this we have different steps of software testing life cycle and different types of software testing, and at last this paper revealed process of software testing in practical environment. Hence we can conclude that software testing is very important process while developing software, and for this we should have deep knowledge about the every point discussed in this paper.

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Analysis and Comparison of R.C.C. Structure Using CLC Block With Burnt Clay Bricks

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Abstract :- A building can be defined as an enclosed structure intended for human occupancy. Constructions work can be seen in almost all the developing countries. With the increases in material cost in the construction work, there is a need to find more cost saving alternatives so as to maintain the cost of construction houses , multistory etc, which can be affordable to people. In the manufacturing of burnt clay bricks, smoke evolved at a great extent and also some toxic gases which can harm an enviornment. So as to overcome with all these problem, Cellular lightweight concrete blocks are used which is more economical and eco-friendly. This project present analysis and comparison of building for G+12 residential building by using Cellular lightweight concrete blocks at the replacement of burnt clay bricks. Analysis is made by using burnt clay bricks and Cellular lightweight concrete blocks for different densities Overall modeling and analysis is done by using STAAD-Pro software. By using cellular lightweight blocks the overall cost of construction is reduce and it will be safe and economical in earthquake forces also.

Keywords:- Cellular lightweight blocks(CLC blocks), Burnt Clay Bricks, Steel , Concrete, Coarse Sand

1. Introduction :-

Bricks can be of different types such as burnt clay bricks, cellular light weight concrete blocks, autoclave aerated concrete blocks etc. The bricks which is used in this project is of cellular light weight concrete blocks (CLC blocks). Cellular lightweight concrete blocks further classified in 3 grades such as Grade A, Grade B, Grade C. The density of cellular light weight concrete blocks are less as compared to conventional burnt clay bricks and it is porous, non toxic, reusable, renewable and recycled. Therefore cellular lightweight concrete blocks are used in the high rise residential building at the replacement of the conventional burnt clay bricks. And the comparison has been made between cellular light weight concrete blocks and the conventional red bricks by analysis a G+12 residential building. Due to lightweight of these blocks there will be less dead load will act on the structure , therefore the structure became lighter. If the structure will be lighter than there will be reduction in the reinforcement, reduction in the size of the member , reduction in the concrete and also by using these blocks there will be no use of coarse sand for the plastering purpose. And the building should be constructed in a most economical way.

2. Review

In order to contextualize the current work, related works from literature is discussed and gives a comprehensive review of the work carried out by various researches in the field of cellular light weight concrete blocks at the replacement of conventional burnt clay bricks.

K.Krishna Bhavani Siram (2012) made an attempt to compare CLC blocks and Clay bricks and recommend a replacement material to red bricks in construction industry. Burnt clay Brick is the prdominant construction material in the country . The CO2 emissions in the brick manufacture process have been acknowledged as a significant factor to global warning and also focus on the environment solution for greener environment because red bricks requires high energy to burn in kiln to produce it. This study has also shown that the use of fly ash in foamed concrete, can improve the properties of CLC blocks.

Dr. B G Naresh kumar and at all (2013) in this experimental study the feasibility of using aerated concrete block as an alternative to the conventional masonry units has been investigated. The preliminary studies focused on the estimating physical, strength and elastic properties of light weight concrete blocks i.e. Autoclaved aerated concrete blocks(AAC). These include initial rate of absorption, density test, water absorption test etc. The compressive strength, modulus of elasticity and the flexural strength of the units were obtained.

Prakash T M and at all (2013) investigated the feasibility of using lightweight concrete block as an alternative to the conventional masonry units. The preliminary studies focused on estimating physical and elastic properties of cellular lightweight block units. These included initial rate of absorption, density test, water absorption test etc. The compressive strength, stress-strain characteristics and the flexural strength of the units were obtained. And the results are comparing with that of conventional masonry units

Nagesh. Mustapure and At all (2014) made an attempt to study on cellular lightweight concrete blocks, and following experiment has done to check the properties of CLC blocks of Grade B, such as compressive strength, water absorption, thermal conductivity of CLC blocks for 800 kg/m3, 900 kg/m3, 1000 kg/m3, 1100 kg/m3. The excellent insulatig property of foam concrete is due to the great number of closed cavities forming the multi-cellular structure.And the study shows that ClC blocks may be used for construction purpose, which is advantageous in terms of general construction properties as well as eco-freindliness.

A.K. Marunmale and At all (2014) focus on the reduction of the construction cost, time and labor by using Cellular lightweight brick wall in a Rat-trap bond for building masonary over the conventional brick work system. Construction industry boom can be seen in almost all the developing countries. With the increase in material costs in the construction industry, there is need to find more cost saving alternatives so as to maintain the cost of constructing houses at prices affordable to people. There is need to develop an alternative system of building component which would impart more benefits and are multifunctional with optimum use of labor and material. Therefore cellular lightweight bricks wall in rattrap bond ia an innovative technique for building masonary unit which reduces the construction cost , time and labor considerably.

Ali J. Hamad (2014) this paper is attention to classified of aerated lightweight concrete into foamed concrete and autoclaved concrete. The literature review of aerated lightweight concrete on material, production, properties and its applications. The aerated lightweight properties is focusses on the porosity, permeability, compressive strength and splitting strength. It posses many beneficial such as low density with higher strength compred with conventional concrete, enhanced in thermal and sound insulation, reduced dead load in the could result several advantages in decrease structural elements and reduce the transferred load to the foundations and bearing capacity. Aerated concrete is consider economy in materials and consumptions of by-product and wastes materials such as fly ash.

P.S. Bhandari and and at all (2014) investigated the performance of cellular lightweight concrete in terms of density and compressive strength. The Compressive strength for cellular lightweight concrete is low for lower density mixture. The compressive strength also decreases with the increment of voids. Compressive strength of 53 grade cement is slightly higher than 43 grade cement , but as strength increases its density also increases. Cellular lightweight concrete is acceptable for framed structure. Cellular lightweight concrete can be suitable for earthquake areas.

A.S. Mahajer and at all (2014) investigate the production of lightweight refractory insulation panels on the basis of perlite. For saving energy in industrial furnaces, various forms of insulation are used as bricks, blocks, castable and fibers. Lightweight refactory insulation panels on the basis of perlite (~30 wt.%) with chemical bonding were successfully prpared by extruding technique after sintering at 900-1100 degree centigrade. Properties such as density, sintering shrinkage percent, permanent linear change and cold crushing strength are measured.

Sohani N. Jani and at all (2014) shows the comparison between the cellular lightweight concrete blocks, autoclved aerated concrete and burnt clay bricks with there physical properties, thermal conductivity, density etc. and main focuses on the analysis of microstructure and properties of autoclaved aerated concrete (AAC) block with its manufacturing process. There are two types of AAC production method which are chemical and mechanical process. In the chemical process, some metallic compounds would be added to react and generate tremendous amount of air bubbles in concrete texture while in mechanical process expansive foaming agent is normally employed. Additionally , AAC has excellent properties of acoustic insulation, fire resistance and allergy-free while it tends to suffer edge damage or breakage if it s subjected to abrasion or collision.

Soumini A K and at all (2015) in this study they shows that the burnt clay bricks are commonly used for the building construction works. By the central pollution control board is focused on pursuing enviornmental pollution, global warming, reduce time and reduce manpower for the building construction. Cellular lightweight concrete block result the low enviornmental pollution compared to the burnt clay bricks and other materials. So as to minimize the enviornmental issues related and also to reduce time and manpower required in the conventional process which is the need of the construction industry. Therefore cellular lightweight concrete blocks are more eco freindliness as compared to conventional clay brick and require less man power, saving in time, reduction in the dead load in the building ultimately lead to reduce the cost of project.

Sagar W. Dhengare And At All (2015) concluded that the cellular lightweight concrete has a desirable strength to be an alternative construction material for the industrialized building system. It was made using natural aggregates of volcanic origin such as pumice, scoria etc. Lightweight concrete can be defined as a type of concrete which includes an expanding agent in that it increases the volume of the mixture while giving additional qualities such as inability and lessened the dead weight. This study has shown that the use of fly as in foamed concrete, either can greatly improve its properties and the usage of lightweight concrete blocks gives a prospective solution to building construction industry along with enviornmental preservation.

Mr. Ashish S. Moon and at all (2015) concluded that the foam concrete can be used for sustainable construction as a building material because foam concrete is a type aerated lightweight concrete. Foam concrete does not contain any coarse aggregate. It require no compaction , but it will flow readily from an outlet to fill restricted and irregullar cavities. Lightweight foamed concrete is use in low strength capacity for building and civil construction purposes as a result of its peculiar features such as low thermal conductivity, low selfweight and self-compacting features hence its high workability.

HjhKamsiah Mohd.Ismail and at all (2014)in this paper the low density and thermal conductivity of light weight concrete has focused and its advantages, disadvantages and application were studied thoroughly.

Satyendra Kumar Meena and at all (2014) studied that the cellular lightweight concrete possesses high flow ability, low self-weight, minimal consumption of aggregate, controlled low strength and excellent thermal insulation properties. It has excellent resistance to water and frost, and provides a high level of both sound and thermal insulation.

3. Conclusion

1) Reduces the reinforcement in the structure.
2) Reduces the size of the member.
3) Reduces the quantity of concrete.
4) No use of coarse sand for plaster.
5) Saving of cement due to no use of coarse sand plaster.
6) The building can be design in a economical way.

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Implementation of Custom Peripheral Interfaces on Linux Ported Embedded Processor in FPGA

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Abstract— Linux has made steady progress in the embedded area as it is open source and supports various kinds of processor architectures. The Virtex-5 XC5VLX50T development board provides an advanced hardware platform that consists of a high performance FPGA. MicroBlaze soft core processor present in FPGA along with interfacing peripherals can be used to create a complex system to meet various embedded applications. This paper mainly discuss about porting Linux operating system to an Xilinx Virtex5 FPGA XC5VLX50T by configuring MicroBlaze soft processor inside it and its peripherals and implement various peripheral interfaces for communication between embedded systems. Hardware environment for standard interfaces namely UART and Ethernet is created using Xilinx ISE 13.1 tool and the embedded processor in Virtex5 FPGA is configured to have Linux with Memory Management Unit support for processor applications.

Keywords— Linux, Kernel, MicroBlaze, FPGA, Linux porting, Xilinx, Ethernet, UART

INTRODUCTION

The Field Programmable Gate Array (FPGA) is a general-purpose device which is filled with digital logic building blocks. As FPGAs become more powerful in terms of available reconfigurable hardware resources, they are increasingly used as accelerator devices because of their inherent ability to process more data in parallel. A common trend is to connect FPGA based board to a general purpose processor usually a general purpose computer, for offloading computationally intensive part or functions of an application to FPGA. The FPGA is characterized with its reconfiguration ability to implement new hardware modules in it. A processor built from dedicated silicon is referred to as a hard processor. Another category of processor is soft processor. A soft processor is built using the FPGAs general-purpose logic. The soft processor is typically described in a Hardware Description Language (HDL) or netlist.

This paper introduces steps to port Linux kernel on the soft core processor and implement the peripheral interfaces. The soft processor intended to be used is MicroBlaze configured on Xilinx Virtex5 FPGA XC5VLX50T evaluation module ML505. Porting the Linux kernel on MicroBlaze integrates the hardware and software. As embedded system improves the performance and the Linux provides portability and flexibility to support most processor architectures, a combination of both can make a considerable difference. Linux platform is used to build cross compiler as well as Linux kernel image required to run Linux operating system on MicroBlaze processor.

SYSTEM DESCRIPTION

The MicroBlaze embedded processor soft core is a reduced instruction set computer optimized for implementation in Xilinx Field Programmable Gate Arrays. Porting of Linux kernel on MicroBlaze is based on both hardware and software design. On software side board compatible kernel image is required and Base System Package of board is used to support the hardware. Five operating systems are available with Xilinx virtex5 ML505 board: Xilinx standalone, Xilinx Xilkernel, Linux_2_6 and VxWorks_6_5, VxWorks_6_3. Xilinx ISE 13.1 is used to create the hardware environment of the system. The linux-2.6-xlnx kernel used in this project supports MicroBlaze processor architecture. The Linux kernel is configured and cross-compiled using the Cross compiler (microblaze-unknownlinux-gnu-gcc-) and finally the kernel image is transferred to the target development board. The Virtex5 development board is shown in Figure1. MicroBlaze soft processor is configured on this XC5VLX50T FPGA present in the development board.

Figure 1: Virtex5 Development Board

BUILDING HARDWARE ENVIRONMENT

The Block Diagram of the MicroBlaze soft processor configured with peripheral interfaces is shown in the Figure 2. The peripherals used are UART, Ethernet, 8 bit LED and an xps_timer interface. While configuring UART interface, RS232_Uart interface type is selected as xps_uartlite with Buad rate 9600 bits per second. Data bit width is selected as 8 and Interrupt option is selected. Parity is selected as none. Ethernet Interface is configured to have Hard_Ethernet_MAC. Here also interrupt option is selected.

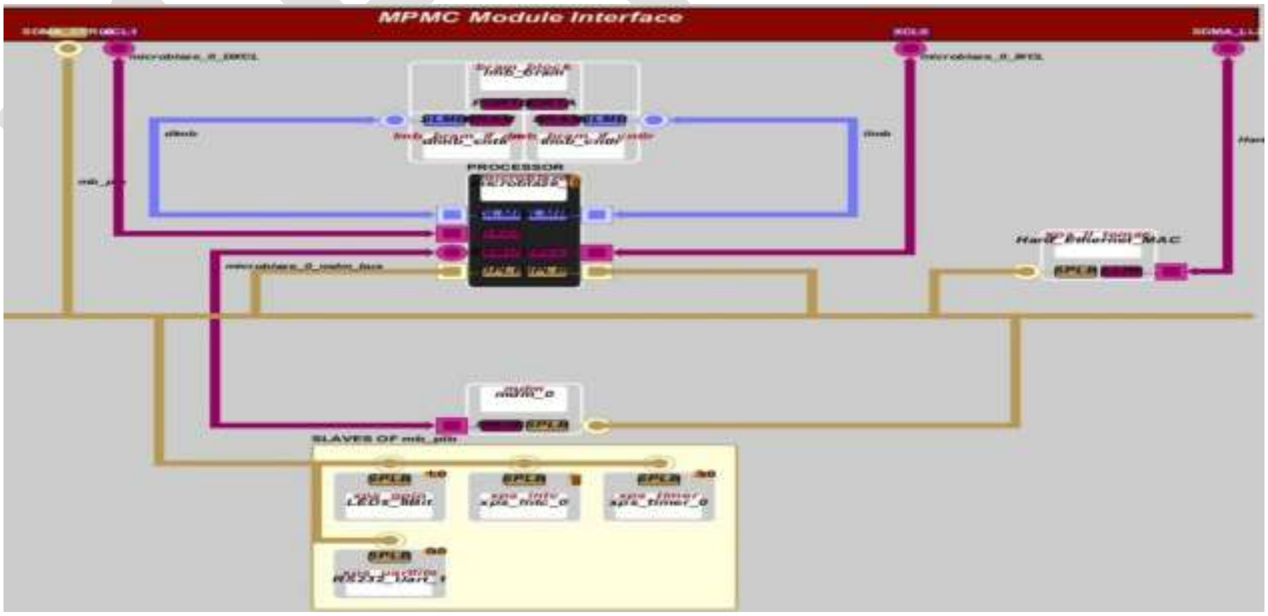
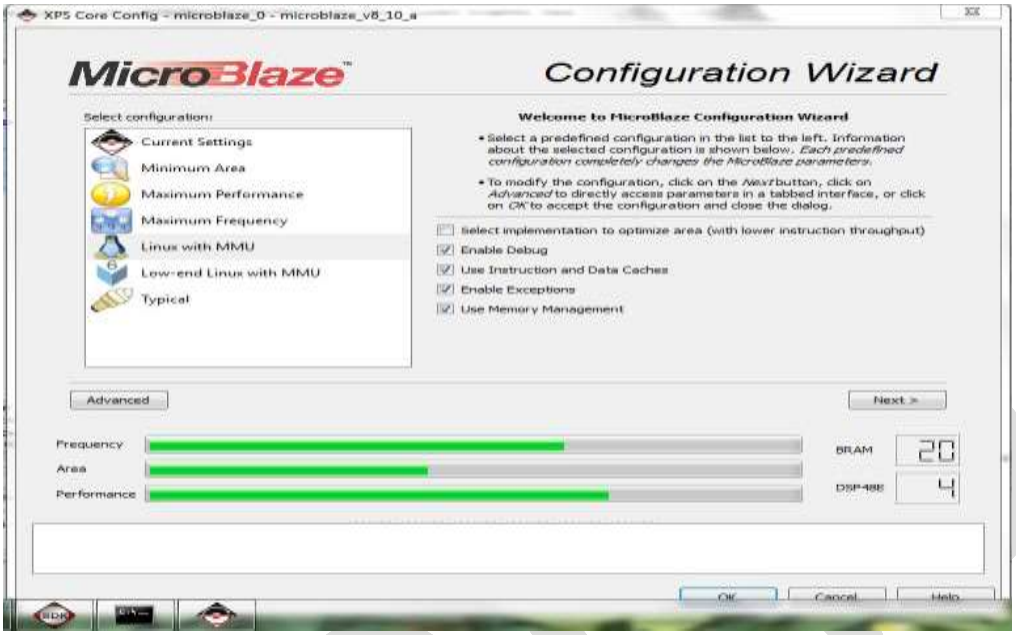


Figure 2: Block Diagram

Configure MicroBlaze processor to have Linux with MMU option as in Figure 3. Other essential options like Enable Floating Point Unit, Enable Barrel Shifter, Enable Integer Multiplier, Enable Integer Divider etc are enabled. Memory Management option is selected as VIRTUAL. A ucf file for the system is also added.



Welcome to MicroBlaze Configuration Wizard

- Select a predefined configuration in the list to the left. Information about the selected configuration is shown below. *Each predefined configuration completely changes the MicroBlaze parameters.*
- To modify the configuration, click on the *Next* button, click on *Advanced* to directly access parameters in a tabbed interface, or click on *OK* to accept the configuration and close the dialog.

☐ Select implementation to optimize area (with lower instruction throughput)
☑ Enable Debug
☑ Use Instruction and Data Caches
☑ Enable Exceptions
☑ Use Memory Management

BRAM 20
DSP48E 4

Figure 3: MicroBlaze Configuration Wizard

BUILDING BSP

Linux BSB is created using Xilinx tool by selecting OS platform as device-tree_v0_00_x using Xilinx SDK tool. Bootargs value is given as console=ttyUL0 and console device is selected as RS232_Uart_1. Xilinx.dts and system.mhs files are created using Xilinx EDK tool. These two files are required in configuring the Linux kernel

CONFIGURING AND BUILDING LINUX KERNEL

Cross-compiler, Linux kernel source code and Root File system are required for building the Linux kernel image. The tool chain used in the entire kernel building process is microblaze-unknown-linux-gnu-. For getting hardware details, Xilinx.dts file formed under implementation folder in EDK is copied to *linux-2.6-xlnx/arch/microblaze/boot/dts* folder.

```
$ cp source_dir_of_Xilinx_dts_file/Xilinx.dts linux-2.6- xlnx/arch/microblaze/boot/dts/ Xilinx.dts
```

Configuring Linux Kernel

The Linux kernel supports a large number of processor architectures. The Linux Kernel is configured using the tool chain for MicroBlaze architecture. The parameters used in the configuration steps are taken from the system.mhs file formed under implementation in EDK. The parameters include, USE _BARREL_ SHIFT, USE_FPU, the kernel base address, etc.

For customizing the kernel according to our requirement, commands like make xconfig, make defconfig, make menuconfig are used. The default kernel images require a RAM disk to be present in the kernel source tree to act as the root file system. Finally the kernel is configured according to the values in system.mhs file using the following commands on terminal.

```
$make ARCH=microblaze CROSS_COMPILE= Source_dir_of_toolchain/microblaze-unknownlinux-gnu-gcc- mmu_defconfig
```

```
$make ARCH=microblaze CROSS_COMPILE= Source_dir_of_toolchain/microblaze-unknownlinux-gnu-gcc- menuconfig
```

Compiling Linux Kernel

To cross-compile the Linux kernel the following command is used.

$make ARCH=microblaze CROSS_COMPILE= Source_dir_of_toolchain/microblaze-unknownlinux-gnu-gcc- simpleImage.xilinx

This will take 15-20 minutes depending upon the functionalities selected. The Linux Kernel Image named as simpleImage.xilinx is formed in kernel source directory ie, at arch/microblaze/boot. Its file size will be in MB.

DOWNLOADING LINUX KERNEL IMAGE

To download bitstream to FPGA system, the virtex5 evaluation board is connected to PC using JTAG interface. The kernel image is downloaded through this debugging interface tool. For downloading kernel image from EDK shell, Xilinx Microprocessor Debugger (XMD) is used with the necessary commands as shown.

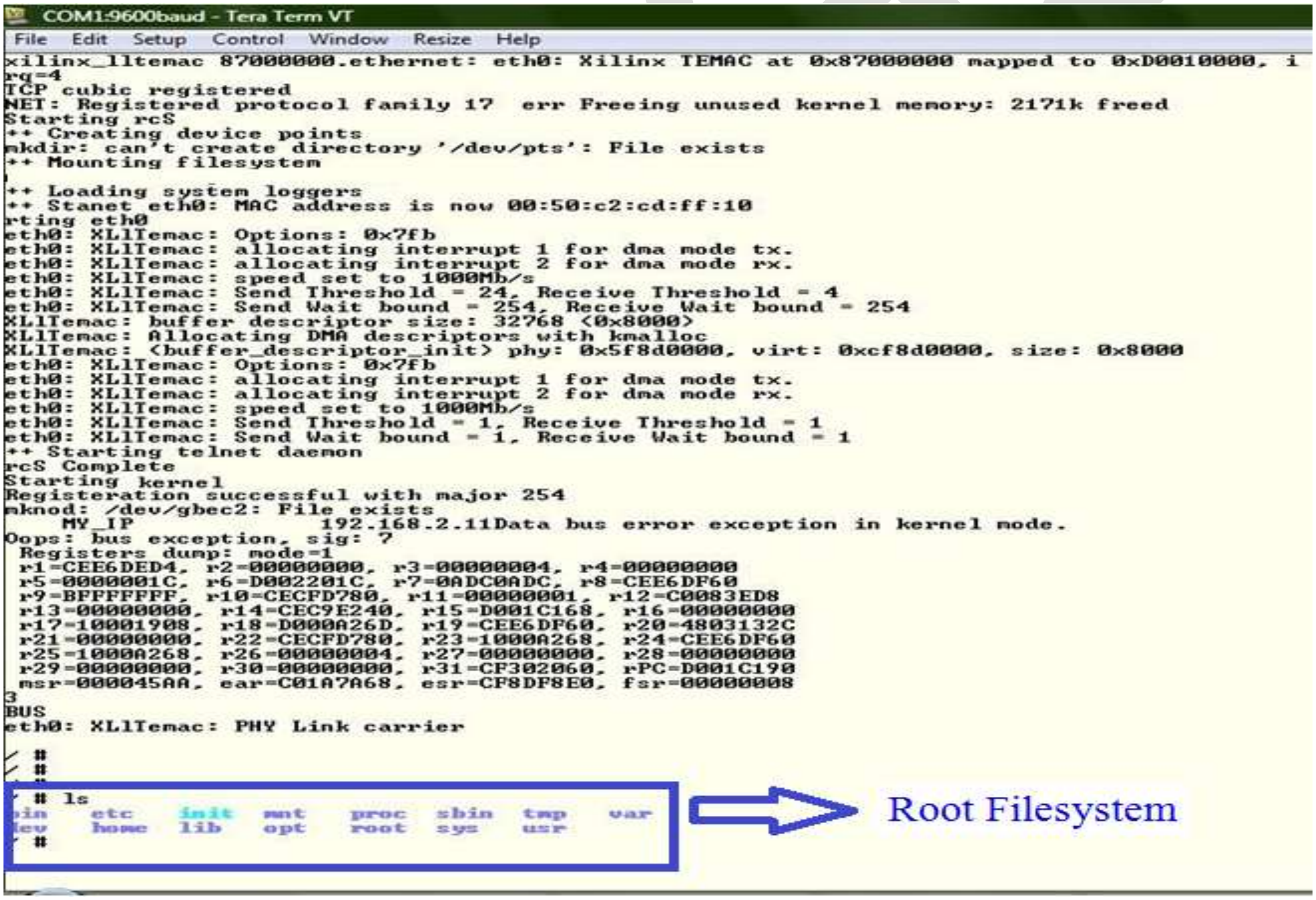
```
$xmd

XMD% connect mb mdm

XMD% dow simpleImage.xilinx

XMD% run
```

The Linux booted on MicroBlaze processor with filesystem listed can be viewed using Teraterm window. It is shown in the Figure 4. The root filesystem created for Linux is listed with its different directories.



```
xilinx_lltemac 87000000.ethernet: eth0: Xilinx TEMAC at 0x87000000 mapped to 0xD0010000, i
rq=4
TCP cubic registered
NET: Registered protocol family 17  err Freeing unused kernel memory: 2171k freed
Starting rcS
++ Creating device points
mkdir: can't create directory '/dev/pts': File exists
++ Mounting filesystem

++ Loading system loggers
++ Stanet eth0: MAC address is now 00:50:c2:cd:ff:10
rting eth0
eth0: XLlTemac: Options: 0x7fb
eth0: XLlTemac: allocating interrupt 1 for dma mode tx.
eth0: XLlTemac: allocating interrupt 2 for dma mode rx.
eth0: XLlTemac: speed set to 1000Mb/s
eth0: XLlTemac: Send Threshold = 24, Receive Threshold = 4
eth0: XLlTemac: Send Wait bound = 254, Receive Wait bound = 254
XLlTemac: buffer descriptor size: 32768 (0x8000)
XLlTemac: Allocating DMA descriptors with kmalloc
XLlTemac: (buffer_descriptor_init) phy: 0x5f8d0000, virt: 0xcf8d0000, size: 0x8000
eth0: XLlTemac: Options: 0x7fb
eth0: XLlTemac: allocating interrupt 1 for dma mode tx.
eth0: XLlTemac: allocating interrupt 2 for dma mode rx.
eth0: XLlTemac: speed set to 1000Mb/s
eth0: XLlTemac: Send Threshold = 1, Receive Threshold = 1
eth0: XLlTemac: Send Wait bound = 1, Receive Wait bound = 1
++ Starting telnet daemon
rcS Complete
Starting kernel
Registeration successful with major 254
mknod: /dev/gbec2: File exists
    MY_IP            192.168.2.11Data bus error exception in kernel mode.
Oops: bus exception, sig: 7
 Registers dump: mode=1
 r1=CEE6DED4, r2=00000000, r3=00000004, r4=00000000
 r5=0000001C, r6=D002201C, r7=0ADC0ADC, r8=CEE6DF60
 r9=BFFFFFFF, r10=CECFD780, r11=00000001, r12=C0083ED8
 r13=00000000, r14=CEC9E240, r15=D001C168, r16=00000000
 r17=10001908, r18=D000A26D, r19=CEE6DF60, r20=4803132C
 r21=00000000, r22=CECFD780, r23=1000A268, r24=CEE6DF60
 r25=1000A268, r26=00000004, r27=00000000, r28=00000000
 r29=00000000, r30=00000000, r31=CF302060, rPC=D001C190
 msr=000045AA, ear=C01A7A68, esr=CF8DF8E0, fsr=00000008
3
BUS
eth0: XLlTemac: PHY Link carrier

/ #
/ #
/ #
/ # ls
in     etc     init    mnt     proc    sbin    tmp     var
ev     home    lib     opt     root    sys     usr
/ #
```

Root Filesystem

Figure 4: Booted Linux Kernel Image

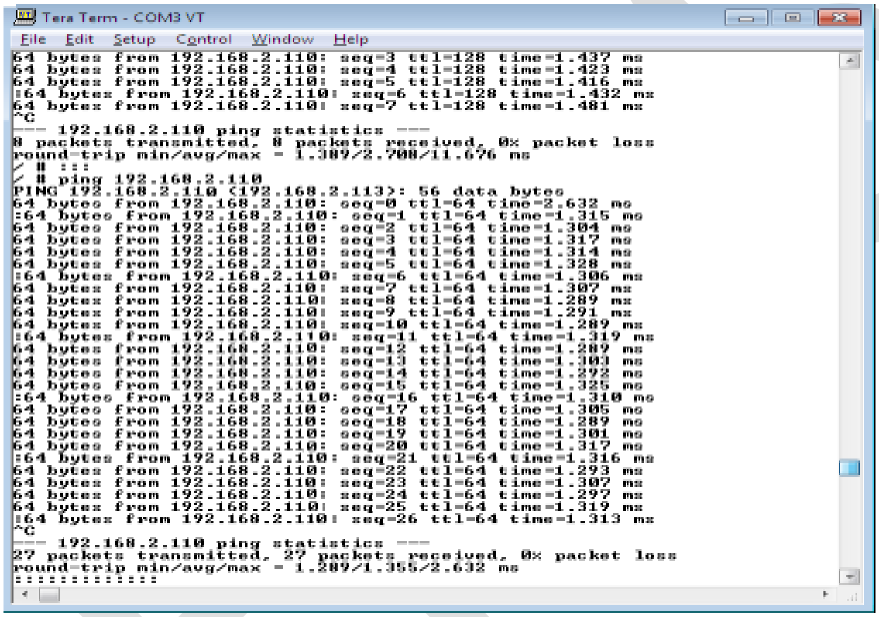
PERIPHERAL INTERFACE IMPLEMENTATION

UART

After porting Linux on MicroBlaze processor on Virtex5 evaluation platform, for implementing and testing the UART interface, connect the Virtex5 board to PC using serial cable. Open Teraterm pro tool and establish a new serial port connection between development board and t he PC. Teraterm is configured to have a serial connection with baud rate of 9600 bits per second and data bit width as 8 bits. As the UART interface is up and working, booting of Linux Image is viewed through the Teraterm window. Verification of serial interface is successfully carried out through the process.

ETHERNET

After porting Linux image, connect the development board and the PC through Ethernet cable. The PC is assigned an IP address in the same network as the target development Board. The connection between these devices is tested using ping command as given in the Figure 5.



```
64 bytes from 192.168.2.110: seq=3 ttl=128 time=1.437 ms
64 bytes from 192.168.2.110: seq=4 ttl=128 time=1.423 ms
64 bytes from 192.168.2.110: seq=5 ttl=128 time=1.416 ms
:64 bytes from 192.168.2.110: seq=6 ttl=128 time=1.432 ms
64 bytes from 192.168.2.110: seq=7 ttl=128 time=1.481 ms
^C
--- 192.168.2.110 ping statistics ---
8 packets transmitted, 8 packets received, 0% packet loss
round-trip min/avg/max = 1.309/2.700/11.676 ms
/ # :::
/ # ping 192.168.2.110
PING 192.168.2.110 (192.168.2.113): 56 data bytes
64 bytes from 192.168.2.110: seq=0 ttl=64 time=2.632 ms
:64 bytes from 192.168.2.110: seq=1 ttl=64 time=1.315 ms
64 bytes from 192.168.2.110: seq=2 ttl=64 time=1.304 ms
64 bytes from 192.168.2.110: seq=3 ttl=64 time=1.317 ms
64 bytes from 192.168.2.110: seq=4 ttl=64 time=1.314 ms
64 bytes from 192.168.2.110: seq=5 ttl=64 time=1.328 ms
:64 bytes from 192.168.2.110: seq=6 ttl=64 time=1.306 ms
64 bytes from 192.168.2.110: seq=7 ttl=64 time=1.307 ms
64 bytes from 192.168.2.110: seq=8 ttl=64 time=1.289 ms
64 bytes from 192.168.2.110: seq=9 ttl=64 time=1.291 ms
64 bytes from 192.168.2.110: seq=10 ttl=64 time=1.289 ms
:64 bytes from 192.168.2.110: seq=11 ttl=64 time=1.319 ms
64 bytes from 192.168.2.110: seq=12 ttl=64 time=1.289 ms
64 bytes from 192.168.2.110: seq=13 ttl=64 time=1.303 ms
64 bytes from 192.168.2.110: seq=14 ttl=64 time=1.292 ms
64 bytes from 192.168.2.110: seq=15 ttl=64 time=1.325 ms
:64 bytes from 192.168.2.110: seq=16 ttl=64 time=1.310 ms
64 bytes from 192.168.2.110: seq=17 ttl=64 time=1.305 ms
64 bytes from 192.168.2.110: seq=18 ttl=64 time=1.289 ms
64 bytes from 192.168.2.110: seq=19 ttl=64 time=1.301 ms
64 bytes from 192.168.2.110: seq=20 ttl=64 time=1.317 ms
:64 bytes from 192.168.2.110: seq=21 ttl=64 time=1.316 ms
64 bytes from 192.168.2.110: seq=22 ttl=64 time=1.293 ms
64 bytes from 192.168.2.110: seq=23 ttl=64 time=1.307 ms
64 bytes from 192.168.2.110: seq=24 ttl=64 time=1.297 ms
64 bytes from 192.168.2.110: seq=25 ttl=64 time=1.319 ms
:64 bytes from 192.168.2.110: seq=26 ttl=64 time=1.313 ms
^C
--- 192.168.2.110 ping statistics ---
27 packets transmitted, 27 packets received, 0% packet loss
round-trip min/avg/max = 1.289/1.355/2.632 ms
::::::::::::::
```

Figure 5: Ethernet Connection

ACKNOWLEDGMENT

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CONCLUSION

Embedded Linux operating system is configured and compiled for MicroBlaze soft core processor architecture and ported to Xilinx Virtex5 XC5VLX50T FPGA on evaluation board ML505. UART and Ethernet interfaces are implemented on FPGA for communication between various embedded systems.

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Variation of tropospheric radio wave refractivities across northern Nigeria – the Savannah

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Abstract— The variations of tropospheric radio wave refractivities in eleven (11) cities across the savannah climatic belts in Nigeria has been examined. Data abstracted from Weather API (Weather2), Yr. no and NIMET (Nigeria meteorological agency) websites has been analyzed. Generally, there was a decrease in the average atmospheric radio wave refractivities as one travels towards the borderline of the Sahara desert. This indicates that to some slight degree step by step, the tropospheric radio wave propagation betters towards the Sahara desert. The correlation between the average tropospheric radio wave refractivities and the perpendicular distances away frosm the Sahara desert was 0.53 with an approximate model of y = 0.1009x + 265.21. The correlation was not unity because of the non-uniformity of the weather patterns across the savannah. Reliefs and rivers account for some of the variations in the non-uniform trends. In addition, isotherms and isohumes in the weather map are non-linear and can cut across the different vegetative climatic zones of the savannah. By and large, results registered that the Sahel savannah will favour radio signal propagation through the troposphere better than the two other savannah belts, and the dry will favour radio signal propagation through the troposphere better than the wet; due to reduction in mean monthly relative humidities which is the most significant component in tropospheric radio wave refractivity.

Keywords— Troposphere, radio-wave, Weather, Savannah, Desert, isohume, isotherm and variations.

INTRODUCTION

The atmosphere is a vital channel for communication. Unlike other channels in the control of the communication scientists, the atmosphere to a vast extent is vulnerable to weather. However for telecommunications and satellite communications, it is almost impossible at one point or the other not to employ the tropospheric channel.

The weather of a place is the state of the atmosphere at a particular time [19], while the climate of a place is the general weather conditions prevailing in that place over a very long period [11]. It has been shown that weather components: atmospheric pressure, atmospheric temperature, atmospheric humidity varies inversely proportional to radio signal strength provided that wind speed and direction remains constant [4] [5] [6] [9]. Also, wind (if direction is contrary to a travelling radio wave) bears negatively on radio waves as it travels through the atmosphere (troposphere) [3].

Mathematically, tropospheric radio wave refractivity is a function of atmospheric pressure, atmospheric temperature and relative humidity [7]. The atmospheric temperature, atmospheric pressure and relative humidity vary inversely as the tropospheric radio wave refractivity. Hence, the tropospheric radio wave refractivity varies inversely as radio signal or wave [8]. However, research has also shown that the wind direction has a slight negative impact on the association between Radio signals and troposheric refractivity [8].

It will be near impossible for radio waves or signals to travel round the globe without the help of the troposphere and its refractivity [10] [15] [17] [18]. The atmosphere as a channel bends the radio wave back to the earth after being transmitted into space from an earth station [10] [15] [17] [18]. The atmosphere is not homogeneous. Every atmospheric channel has a characteristic resistance or impedance on radio wave that depends upon the conditions of the atmosphere of a place and/or climate.

Northern Nigeria is divided into three (3) major climatic belts depending on their vegetations [1]. The vegetation of a place is a reflection of the state of the atmosphere or troposphere of that place and invariably the weather or climate of that place. The different vegetative climatic belts in Northern Nigeria are: Sahel savannah, Sudan savannah, Guinea savannah and Montane [1].

Northern Nigeria falls on the tropical plate of Africa and lies between longitudes $4^0 00' 00''$ E and $14^0 00' 00''$ E and latitudes $7^0 00' 00''$ N and $14^0 00' 00''$ N respectively: a location slightly above the equator [1].

The focus of this research narrows on the variance of the tropospheric radio wave refractivities across Northern Nigeria; from the Sahel savannah, through the Sudan savannah to the Guinea savannah belts and the relatively striking montane regions. Also, the relevance of the work is to establish the best belt(s) suitable for tropospheric radio wave propagation and the worse. More so, it intends to probe and draw a verdict on which tropospheric or climatic conditions are favourable for radio wave propagation through the troposphere, since generally Nigeria has predominantly two seasons: the wet and the dry and the both have characteristic different atmospheric conditions or characteristics.

A LITERATURE REVIEW OF THE CLIMATE OF NORTHERN NIGERIA

The Tropical savannah climate or Tropical wet and dry climate is extensive in area and covers most of central Nigeria (Part of Northern Nigeria) beginning from the Tropical rainforest climate boundary in southern Nigeria to the central part of Nigeria, where it exerts enormous influence on the region [13].

The tropical savannah climate exhibits a well marked rainy season and a dry season with a single peak known as the summer maximum due to its distance from the equator. Temperatures are above 18 °C (64 °F) throughout the year. Central Nigeria (Part of Northern Nigeria) has a temperature range of 18.45 °C (65.21 °F) to 36.9 °C (98.4 °F) and an annual rainfall of about 1,500 mm (59.1 in) with a single rainfall maxima in September [13].

The single Dry season experienced in this climate, the tropical savannah climate in central Nigeria (Northern Nigeria) beginning from December to march. It is hot and dry with the Harmattan or North East trade wind, a continental tropical air-mass laden with dust from the Sahara Desert prevailing throughout this period [13].

With the Inter-tropical Convergence Zone swinging northward over West Africa from the Southern Hemisphere in April, heavy showers coming from pre-monsoonal convective clouds mainly in the form of squall lines also known as the north easterlies formed mostly as a result of the interactions of the two dominant air-masses in Nigeria known as the Maritime tropical (south western-lies) and the Continental tropical (north easterlies) begins in central Nigeria (Part of Nothern Nigeria) while the Monsoons from the South Atlantic Ocean arrives in central Nigeria in July bringing with it high humidity, heavy cloud cover and heavy rainfall which can be daily occurrence lasting till September when the monsoons gradually begin retreating southward to the southern part of Nigeria [13]. Rainfall amount in central Nigeria varies from 1,100 mm (43.3 in) in the lowlands of the river Niger Benue trough to over 2,000 mm (78.7 in) along the south western escarpment of the Jos Plateau [13].

The Sahel Climate or Tropical dry climate is the predominant climate type in the northern part of Nigeria. Annual rainfall amount are lower compared to the southern and central part of Nigeria. The Rainy season in the northern region of Nigeria lasts for only three to four months (June - September). The rest of the year is hot and dry with temperatures climbing as high as 40 °C (104.0 °F) [13].

Montane Climate or Alpine climate or highland climate or mountain climate are found on highlands regions in Nigeria generally. Highlands with the montane climate in Nigeria are well over 1,520 metres (4,987 ft) above sea level. Due to their location in the tropics, this elevation is high enough to reach the temperate climate line in the tropics thereby giving the highlands, mountains and the plateau regions standing above this height, a cool mountain climate. One of the Northern Nigeria cities with such a climate as mentioned above is Jos [13].

Northern Nigeria, like the rest of Nigeria and other tropical lands, has only two seasons. These are the Dry season and the Rainy season. The dry season is accompanied by a dust laden air-mass from the Sahara Desert, locally known as Harmattan, or by its main name, the Tropical Continental air-mass or North East trade wind, while the rainy season is heavily influenced by an air-mass originating from the South Atlantic Ocean, locally known as the South West wind, or by its main name, the Tropical Maritime air-mass. These two major wind systems in Nigeria are known as the trade winds [13].

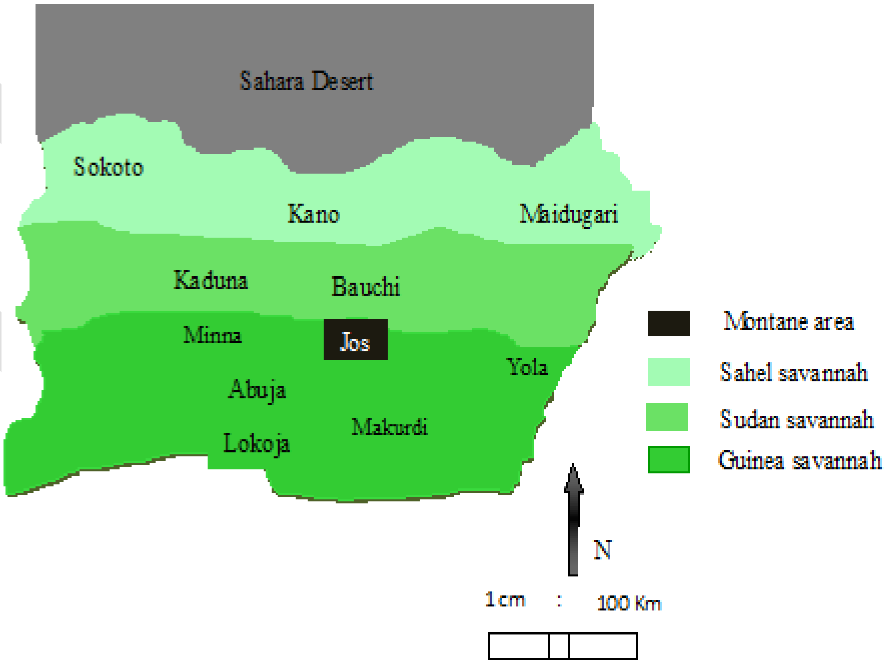

Fig. 1. The map of Northern Nigeria showing the locations of the various cities on the different savannah belts.

METHODOLOGY

Relevant data for mean monthly weather parameters was accessed from Yr. no, Weather2 and NIMET (Nigeria Meteorological Agency) websites. The radio wave refractivity was computed using the Eqn. 1 below [7].

$$N = K \times P^2 \times \sqrt{T} \times \sqrt[3]{H} \qquad (1)$$

Where K = Constant = 0.01064097915

P = Atmospheric pressure in inHg

T = Atmospheric temperature in ^{0}F

H = Relative humidity in %

N = Radio refractivity

The above formulation has an accuracy of ±5 in comparison with the existing International Telecommunication Union (ITU) expression for calculating Radio refractivity. The ITU expression may be used for all radio frequencies: for frequencies up to 100 GHz, the error is less than 0.5 % [16].

RESULTS AND ANALYSIS

The Figs. 2, 3, 4, 5 and 6 show the comparison between the average monthly tropospheric radio wave refractivities of all cities; comparison between average monthly tropospheric radio wave refractivities of the cities in the wet; comparison between the average monthly tropospheric radio wave refractivities of the cities in the dry, relationship between perpendicular distance away from the Sahara Desert and average tropospheric radio wave refractivity and line of best fit between perpendicular distance away from the Sahara Desert and average tropospheric radio wave refractivity respectively. The legend series of the cities in the figures below are in order of increasing magnitude of average tropospheric radio wave refractivity.

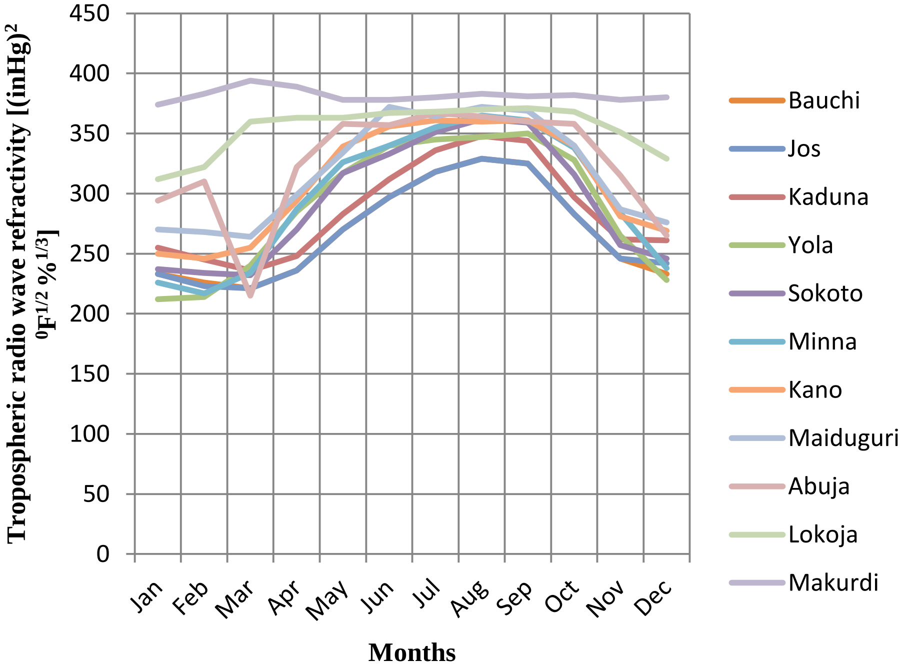

Fig. 2: Tropospheric radio wave refractivities of the cities throughout the year

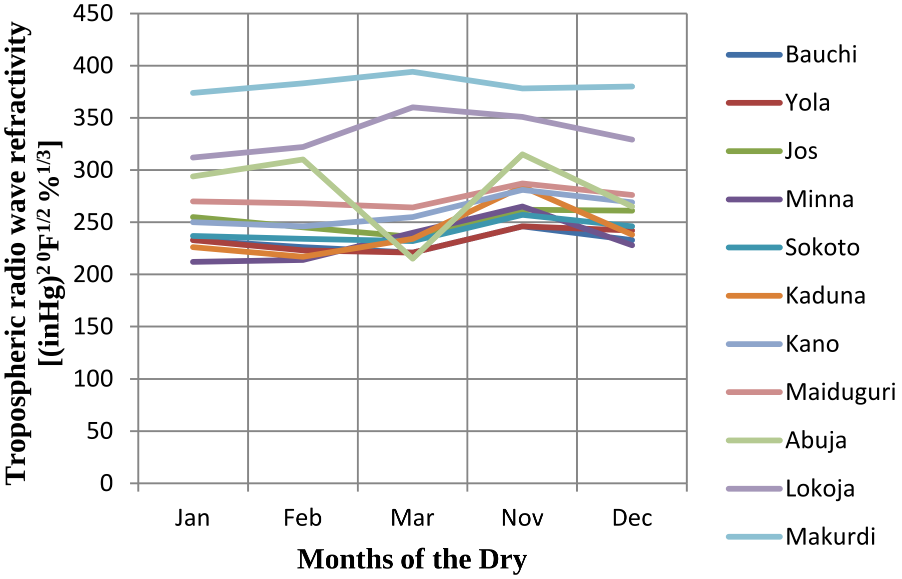

Fig. 3: Tropospheric radio wave refractivities of the cities in the dry

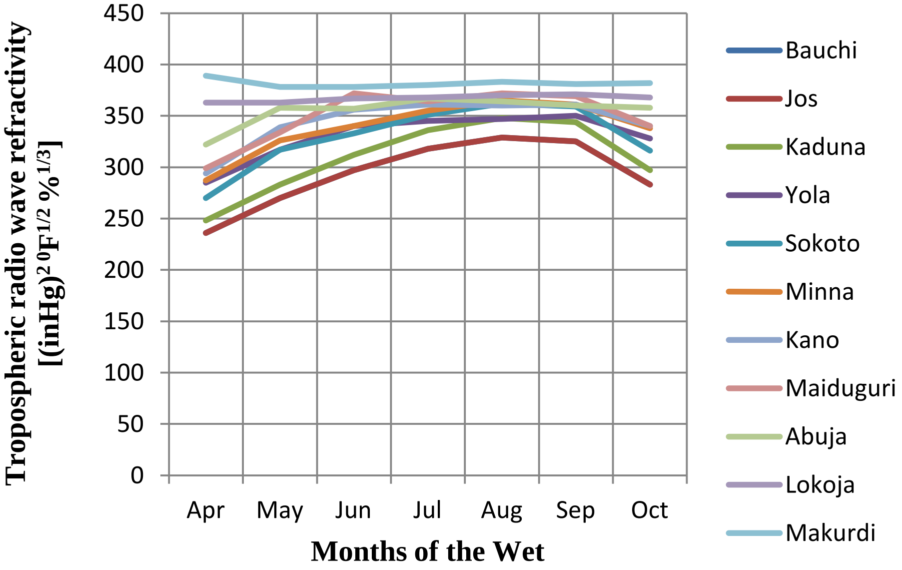

Fig. 4: Tropospheric radio wave refractivities of the cities in the wet

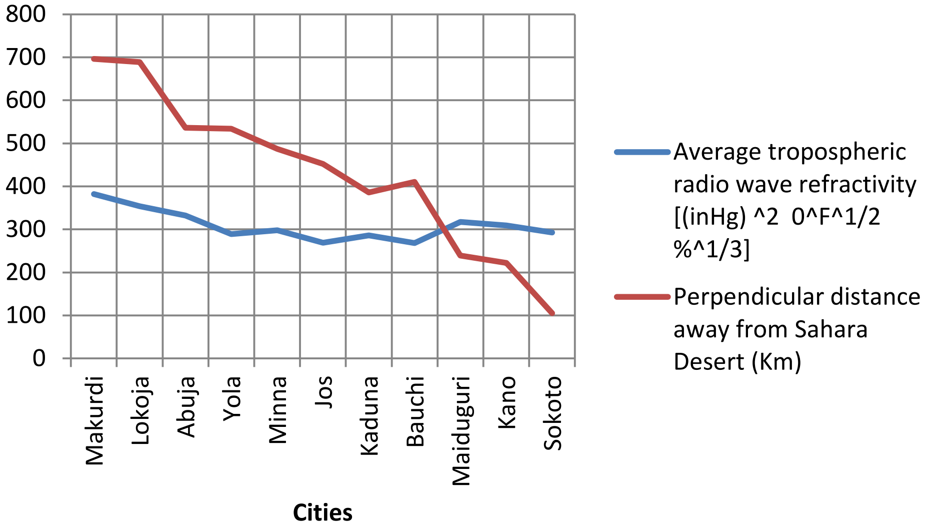

Fig. 5: Average tropopsheric radio wave refractivity and distance away from the coastline of the Atlantic Ocean

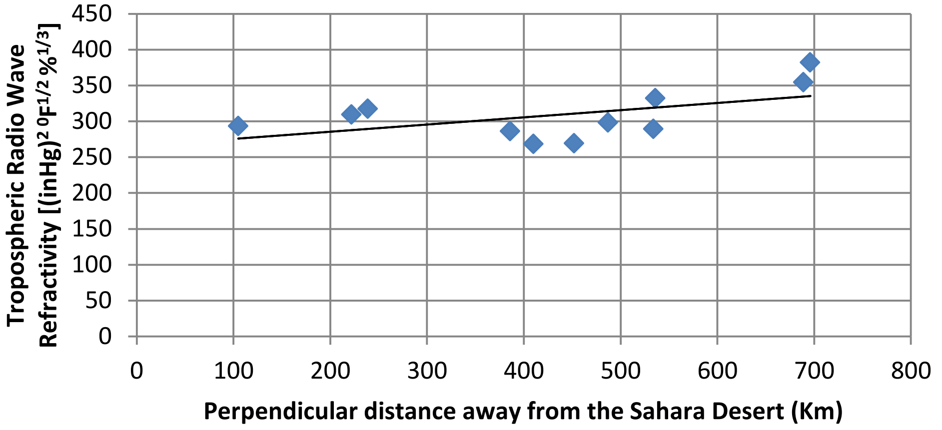

Fig. 6: Line of best fit between Average tropospheric radio wave refractivity and distance away from the coastline of the Atlantic Ocean

In a peck order of increasing magnitude of average tropospheric radio wave refractivities, the cities are arranged thus: Bauchi, Jos, Kaduna, Yola, Sokoto, Minna, Kano, Maiduguri, Abuja, Lokoja and Makurdi.

In Fig. 1 shows the map of Northern Nigeria showing the locations of the various cities on the different savannah belts. Northern Nigeria borders the Sahara desert as captured.

Fig. 2 shows the tropospheric radio wave refractivities of the cities throughout the year. Bauchi has the least average tropospheric radio wave refractivity seconded by Jos since it a continuation of the Jos plateau and resides in the Sudan savannah. Hence, it shares the same average monthly relative humidities with Jos (Isohume) but has a slightly higher average monthly temperature by virtue of its location in the Sudan Savannah. Average temperature tends to increase as one confronts the Sahara desert except with the presence of reliefs and rivers. Temperatures around mountain or alpine or montane climate are usually low. Kaduna trails these two cities with low average tropospheric radio wave refractivity since it is also located on the high plains of Northern Nigeria and made up undulating plateau and hills [12]. It shares similar average monthly relative humidities with Bauchi and Jos, but has the highest average monthly temperatures. It rests on the Sudan Savannah, but is closer to the Sahara Desert than Bauchi. With the exception of Yola and Minna, there is a gradual increase in average tropospheric radio wave refractivity as one move away from the Sahara desert or southwards. Yola lies close to one of the highest plateaus and escarpments in Nigeria with it having some of the highest mountain ranges in Nigeria. There are the Mandara Mountains which lie to the north of the city, the Shebshi Mountains which lie to the south and hold the title of the second highest point in Nigeria. Yola lies on the banks of the Yola River which is the main tributary to the Benue River. Despite its location down south of Northern Nigeria, its relief and rivers are responsible for its abnormal fall in average tropospheric radio wave refractivity. Minna is situated on the Guinea Savannah belt and lies on the escarpment of the Northern highlands with higher atmospheric temperature. This is responsible for its slight difference in refractivity from the trend.

Fig. 3 shows the tropospheric radio wave refractivities of the cities in the dry. Makurdi and Lokoja have very distinct high tropospheric radio wave refractivity by virtue of their close proximity to the rainforest and presence of huge rivers. Generally, there is a marked drop of tropospheric radio wave refractivity in all the cities of the savannah, most especially those of the Sahel close to the Sahara desert. Hence, better signal strength will be recorded, because of low relative humidity and clearer sky, even with a huge range of temperature: very low night temperature and very high daylight temperature.

Fig. 4 shows average tropospheric radio wave refractivities of the cities in the wet. Here, there is a noticeable rise in temperature in average tropospheric radio wave refractivity generally. To a very large degree, the refractivities are near steady in June, July, August and September when the humidities of the cities are at their peak except Jos and Bauchi which are a mountain climate and quasi-mountain climate respectively. Tropospheric signal propagation will be poor in the wet because of very high relative humidity. Relative humidity is a huge weight against radio signal propagation in the troposphere in comparison with other tropospheric radio wave refractivity parameters [7]. However, with the exception of other weather parameters like rain and wind, there is generally a stable signal due to steady temperatures (night and daylight) and relative humidity.

Fig. 5 shows average tropospheric radio wave refractivity and distance away from the coastline of the Atlantic Ocean. To a slight extent there is a gradual decrease in tropospheric rafractivitiy towards the Sahara Desert. Relief and rivers played a significant effect in the change in weather pattern across the same belt [2].

Fig. 6 shows line of best fit between average tropospheric radio wave refractivity and distance away from the borderine of the Atlantic Sahara Desert. The correlation between the average tropospheric radio wave refractivities and the perpendicular distances away from the Sahara desert was 0.53 with an approximate model of $y = 0.1009x + 265.21$. The correlation was not unity because of the non-uniformity of the weather patterns across the country. Reliefs and rivers account for some of the variations in the non-uniform trends [2].

CONCLUSION

Generally, there was a decrease in the average tropospheric radio wave refractivities as one heads towards the borderline of the Sahara desert. Hence the atmospheric radio wave propagation via the troposphere step by step, betters towards the Sahara desert.

The correlation between the perpendicular distances away from the borderline of the Sahara desert and the average atmospheric radio wave refractivities is 0.53. Also, the approximate model of average atmospheric radio wave refractivity away from the Sahara desert borderline is $y = 0.1009x + 265.21$: where y is the average atmospheric radio wave refractivity and x is the perpendicular distance away from the Sahara desert borderline. The above correlation was not unity because of the irregularities of the weather or climate nature across the country. The reliefs and rivers account for some of the anomalies in the irregular trend towards the desert borderline. In addition, isotherm and isohumes but not isobars were brought into account because these lines are non-linear and can cut across the vegetative climatic zones, for example is Kaduna, which shares similar mean monthly temperatures with cities in the Sudan savannah but has common mean monthly humidities as Jos in the Guinea savannah and a montane climate.

By and large in Northern Nigeria, the most favourable belt for radio signal propagation through the troposphere is the Sahel savannah belt with low mean monthly relative humidities, while the least favourable is the Sudan belt with comparable higher mean monthly relative humidities, in view of the fact that, the variation in mean monthly temperatures between the two belts is not comparable to their relative humidities and the variance in the mean monthly atmospheric pressure is near uniform. A point of fact as afore-stated is that: relative humidity bears more weight in the expression for calculating radio wave refractivity, seconded by atmospheric temperature and the least is the atmospheric pressure [1]. This is to some extent due to their ranges of variations.

With the exception of winds and may be rainfall that affect communications [66] [67], radio signal propagation through the troposphere in the Sahel Savanna will be less stable than the Guinea Savannah owing to the fact that there is less variation in the atmospheric parameters: atmospheric temperature, pressure and humidity in the former belt than the latter belt.

Finally, radio signal propagation will generally propagate better throughout Northern Nigeria in the troposphere during the dry than the wet. This is on the account that the mean monthly relative humidities generally falls during the dry, but rises in the wet.

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Impact of Weather Components on (UHF) Radio Signal

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Abstract— This work probes the impact of major weather components on UHF radio signal. Measurements of the radio signal strength from Cross River State Broadcasting Co-operation (CRBC), ($4^0$57'54.7"N, $8^0$19'43.7"E) transmitted at 35mdB and 519.25 MHz (UHF) were done in a residence along Etta-abgor, Calabar ($4^0$57'31.7"N, $8^0$20'49.7"E) to ascertain the impact of the weather components: atmospheric temperature, pressure, humidity and wind on radio signals. The components: atmospheric temperature, pressure, humidity and wind speed and direction with signal strength were measured half hourly from the residence in Etta-agbor to draw a justifiable inference on the impact of the aforementioned quartet on UHF radio signal. Results indicated that radio signal strength is inversely proportional to atmospheric temperature, pressure and humidity; provided that for any of the giving components, others were observed constant, including the wind speed and direction, since it has been erected that wind has a marked effect on radio signal. The correlation of the signal strength and atmospheric temperature, pressure and humidity were respectively r = -0.94, -0.99 and -0.93 and the equation $S = \frac{K}{TPH}$ at constant wind speed and direction was postulated, where S, T, P, H and K are Signal strength, Atmospheric temperature, Atmospheric pressure, Relative humidity and Constant respectively.

Keywords— Weather components, Radio signal, Signal strength, Ultra High Frequency (UHF), Atmospheric temperature, Atmospheric pressure, Relative humidity (Atmospheric humidity) and Wind.

INTRODUCTION

Basically, weather is the state or condition of the atmosphere [1]. In meteorology, the atmosphere is studied within the compass of the troposphere which is the sphere that governs our weather. In other words, the troposphere is of utmost concern to the weather scientist or meteorologist [5].

The way that radio signals propagate from the radio transmitter to the radio receiver is of great importance when planning a radio communications network or system. This is controlled to a great degree by the regions of the atmosphere through which they pass. Without the action of the atmosphere, it would not be possible for radio communications signals to propagate around the globe on the short wave bands or propagate greater than only the line of sight distance at high frequencies [5].

The atmosphere is one of the factors responsible for signal path loss depending upon its condition or the weather [4] [10]. The conditions produced by different weather components have an impact on the quality of radio signal in our environment. Radio signal paths are affected by the condition of the atmosphere [13]. The atmosphere may refract and return the signals to the earth in consequence of its varying refractivity index owing to its temperature, pressure, humidity and wind which are components of weather or meteorology [2] [3] [6] [8] [9] [14]. The coverage of broadcast can stretch to the neighborhood of beyond three times the horizon for UHF (Ultra high frequency) [9].

There is a marked improvement in propagation signal strength corresponding to clear sky condition. The dependence of refractivity on the physical structure of the atmosphere implies that changing metrological or weather conditions can lead to changes in radio wave propagation [14].

Wind, air temperature, and water content of the atmosphere can combine in many ways. Certain combinations can cause radio signals to be heard hundreds of miles beyond the ordinary range of radio communications. Conversely, a different combination of factors can cause such attenuation of the signal that it may not be heard even over a normally satisfactory path. Unfortunately, there are no hard and fast rules on the effects of weather on radio transmissions since the weather is extremely complex and subject to frequent change [13].

Weather is a factor that affects the propagation of radio waves [7] [13]. Wind and rain can impose an additional attenuation on the propagation of signal within a forest environment. The additional attenuation increases as the strength of the wind and rain increases [7].

A research shows that the strength of radio signals on the ground is a reliable indicator of temperature change above. The research team used a simple radio antennae on the ground to measure radio waves broadcast by navigational transmitters around the globe, and then compared information on the strength of these radio signals with data on temperature fluctuations in the upper atmosphere. They discovered that climate change in the upper atmosphere -- caused by an abundance of greenhouse gases -- may lead to a greater absorption of radio waves. Weaker signals could therefore be indicative of greater climate change [1].

Many wireless sensor networks operating outdoors are exposed to changing weather conditions, which may cause severe degradation in system performance. Therefore, it is essential to explore the factors affecting radio link quality in order to mitigate their impact and to adapt to varying conditions. Experimental measurements were performed using Atmel ZigBit 2.4GHz wireless modules, both in summer and wintertime and employing all the radio channels specified by IEEE 802.15.4 for 2.4GHz ISM frequency band with two transmit power levels. Results show that changes in weather conditions affect received signal strength. Of the studied weather variables: temperature and humidity; variation in signal strength can be best explained by the variation in temperature [6].

Wind, air temperature, and water content of the atmosphere can combine in many ways. Radio signals can be heard hundreds of miles beyond the ordinary range of radio communications at certain atmospherical combinations as earlier sated [5] [9] [13]. Conversely, a different combination of factors can cause such attenuation of the signal that it may not be heard even over a normally satisfactory path. Unfortunately, since the weather is extremely complex and subject to frequent change there are no hard and fast rules on the effects of weather on radio transmissions [13]. Therefore our discussion shall be limited to the effects of weather on radio waves to general terms.

Weather is made up of multiple parameters, including the temperature, pressure, humidity of the atmosphere, solar radiation and wind [12]. This research work condenses attention on the impact of the weather components: atmospheric temperature, pressure and humidity and wind from a residence at Etta-agbor in the Calabar metropolis on radio signal of about 519.25 MHz (UHF), which is the frequency of transmission for the Cross River Broadcasting Corporation Television (CRBC-TV), Calabar, Cross River State, Nigeria. In this work, study was made of how and to what extent the various weather phenomena affect wave propagation.

To strike the object of this work, signal strength evaluations in the Etta-agbor residence were made simultaneously with the weather components (atmospheric or tropospheric temperature and pressure, relative humidity and wind speed and direction) to investigate the atmospheric temperature, pressure and humidity and wind bearing on radio waves or signal.

MATERIALS AND METHOD

The campaign was carried out in a residential area (Etta-abgor) within the Calabar metropolis in Cross River State, Nigeria. The object of the experiments was to obtain statistical data of signal strengths and weather components in the aforementioned residential area. Signal strengths measurements were obtained half hourly at the residential area for over 24 hrs and simultaneously, the weather components: atmospheric temperature and pressure and relative humidity and wind direction and speed were recorded to probe the impact of the weather components on radio signal. The measurement of the signal strength was made using the Digital community – Access (Cable) Television (CATV) analyzer with 24 channels, spectrum 46 – 870 MHz, connected to a domestic receiver antenna of height 4.23 m.

Majorly, four meteorological components define our weather, that is: atmospheric temperature, atmospheric pressure, relative humidity (atmospheric humidity) and wind. To ascertain the actual impact of the individual meteorological component: each of the other parameters that will have an effect on the inference on the result of that individual component was observed constant. Hence only some of the data were utilized. Find in appendix, the detail results of measurement

RESULTS AND ANALYSIS

If acknowledgement is there wishing thanks to the people who helped in work than it must come before the conclusion and must be same as other section like introduction and other sub section.

The results of each of the experiments are analyzed separately. To determine the impact of the atmospheric temperature, pressure and humidity and wind on radio signal. Some data or measurements extracted from the whole were used to determine the impact of each weather parameter mentioned above on the signal strength, through the curves that were produced from the data or measurements excerpted. In the Appendix is the detail of the results obtained that was used to ascertain the impact of the weather components on radio signals.

a. Analysis of effects of meteorological components (or weather parameters) (atmospheric temperature and pressure, relative humidity and wind) on radio waves or signal strength.

The four meteorological components (or weather components) that govern our weather are the atmospheric temperature, pressure, humidity and wind speed and direction.

Figures 1, 2 and 3 below show the graphical relationships between signal strength and atmospheric temperature and pressure and relative humidity respectively. Before each figure or graph is its table. Also, figure 4 shows the direction of the residence where the receiver (CATV Analyzer) was stationed away from the CRBC-TV transmitter and figures 5, 6, 7 and 8 show the graphical relationships of the signal strength and wind at different constant atmospheric components. Just before the figures 5, 6, 7 and 8 are their tables.

TABLE 1

Measurement of Signal strength (mdB) at different atmospheric temperature, at uniform relative humidity of 94 %, near uniform atmospheric pressure of 29.93 (± 0.02) inHg and uniform wind speed and direction of 0 mph NA

Atmospheric temperature (^{0}F)	**Signal strength (mdB)**	**Relative humidity (%)**	**Atmospheric pressure (inHg)**	**Wind (mph) N**	**Time (hour)**
77.0	9.4	94	29.91	0 NA	22:30
78.5	9.0	94	29.94	0 NA	8:00
78.0	9.3	94	29.94	0 NA	8:30
79.5	7.8	94	29.94	0 NA	11:30
79.0	8.0	94	29.94	0 NA	12:00

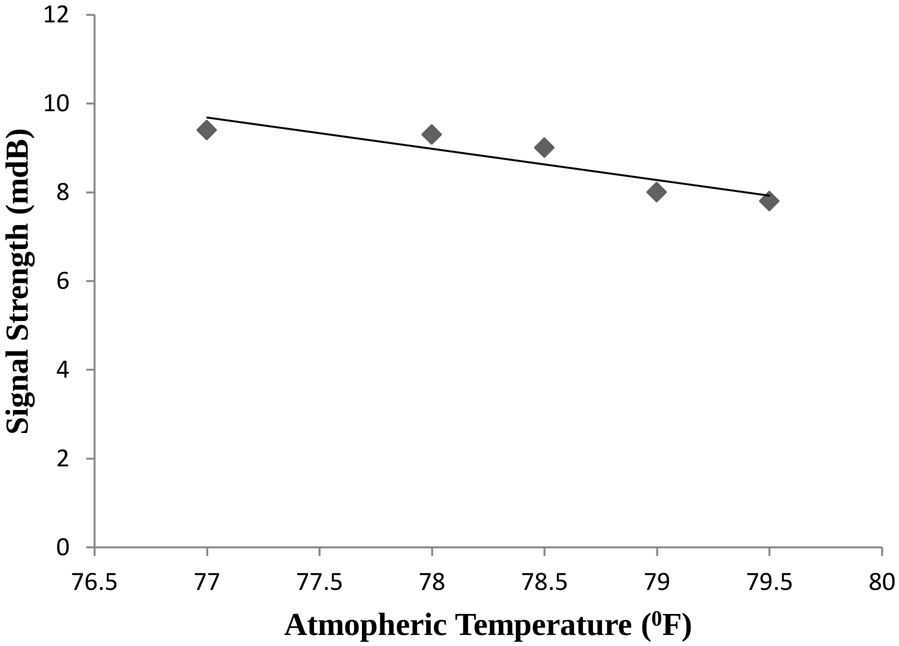

Figure 1: Relationship between signal strength (mdB) and atmospheric temperature (^{0}F), at uniform atmospheric pressure of 29.93 (± 0.02) inHg, uniform relative humidity of 94 % and uniform wind speed and direction of 0 mph NA

TABLE 2
Measurement of signal strength (mdB) at different relative humidity (%), uniform atmospheric temperature of 77 ^{0}F and pressure of 29.91 inHg and uniform wind speed and direction of 0 mph NA

Relative humidity (%)	**Signal strength (mdB)**	**Atmospheric temperature (^{0}F)**	**Atmospheric pressure (inHg)**	**Wind (mph) N**	**Time (hour)**
94	9.5	77	29.91	0 NA	5:30

100	8.5	77	29.91	0 NA	13:30
89	9.7	77	29.91	0 NA	7:30
90	9.6	77	29.91	0 NA	0:30
82	10.0	77	29.91	0 NA	24:00

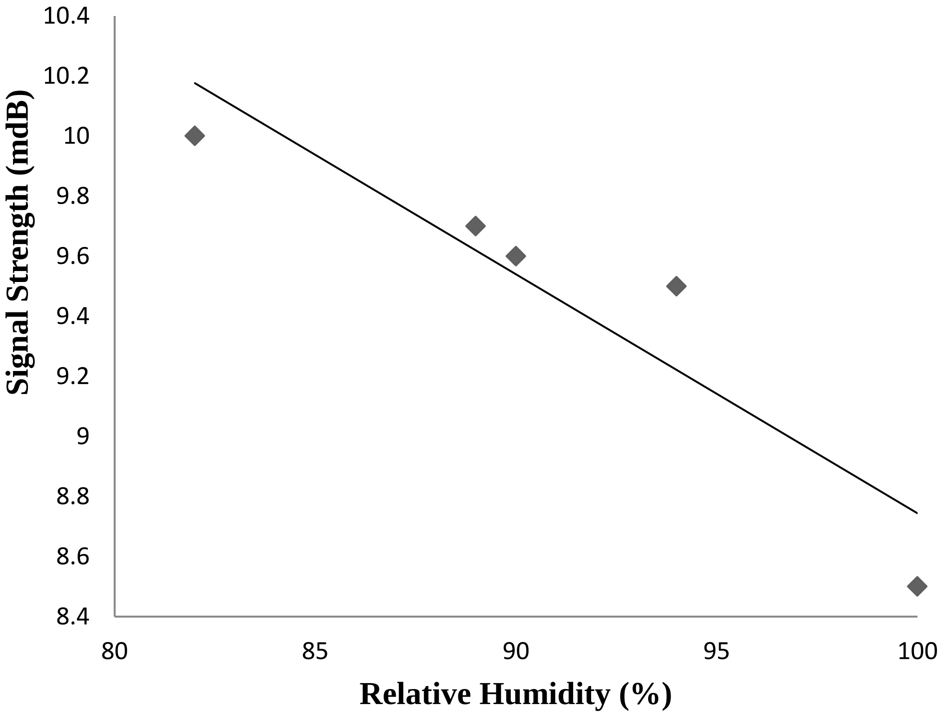

Figure 2: Relationship between signal strength (mdB) and relative humidity (%), at uniform atmospheric temperature of 77 ^{0}F and pressure of 29.91 inHg and uniform wind speed and direction of 0 mph NA

TABLE 3

Measurement of signal strength (mdB) and atmospheric pressure (inHg) at uniform temperature of 77 ^{0}F, uniform relative humidity of 94 % and wind speed and direction of 0 mph NA

Atmospheric pressure (inHg)	**Signal strength (mdB)**	**Atmospheric temperature (^{0}F)**	**Relative humidity (%)**	**Wind (mph) N**	**Time (hour)**
29.91	9.4	77	29.91	0 NA	22:30
29.94	9.3	77	29.91	0 NA	12:30
29.88	9.7	77	29.91	0 NA	24:00
29.85	9.8	77	29.91	0 NA	6:00
29.81	10.0	77	29.91	0 NA	21:00

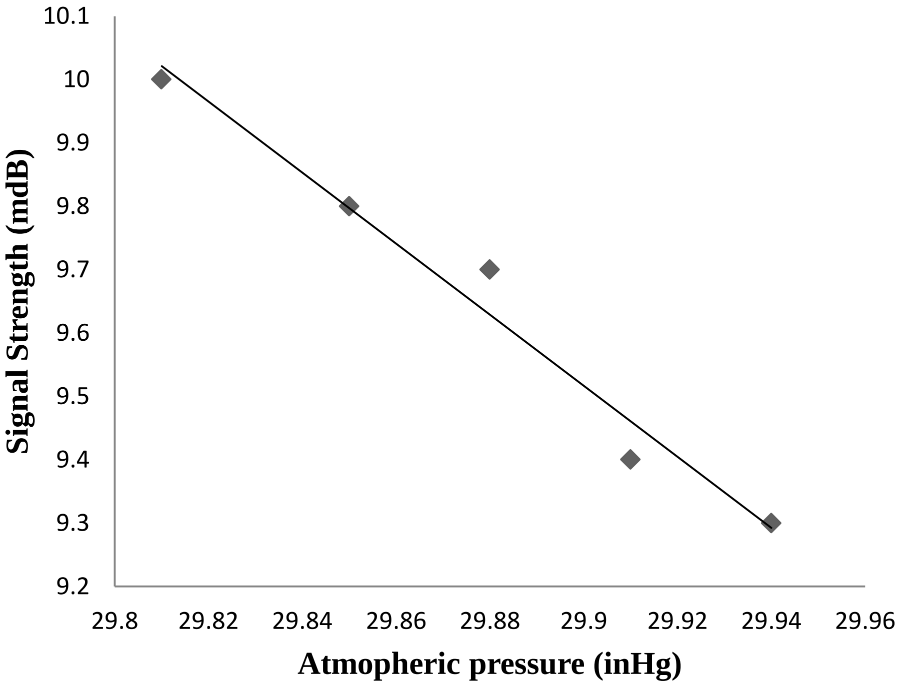

Figure 3: Relationship between signal strength (mdB) and atmospheric pressure (inHg), at uniform atmospheric temperature of 77 ^{0}F, relative humidity of 94 % and uniform wind speed and direction of 0 mph N.

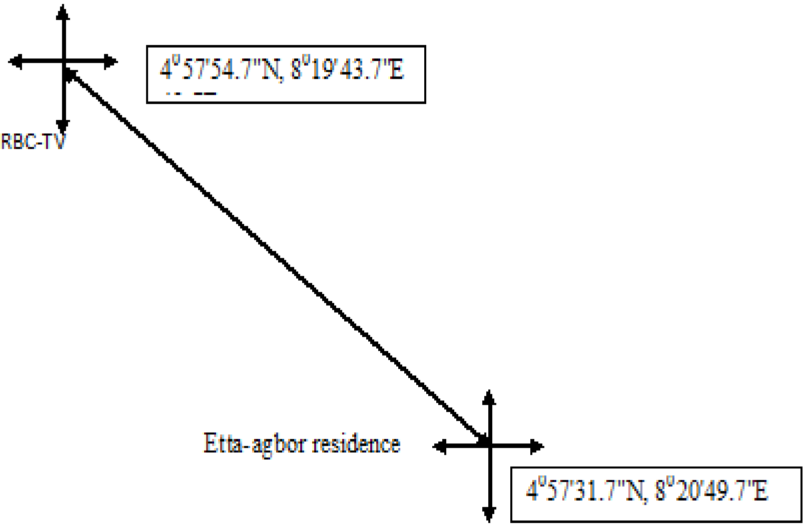

Figure 4: Diagram showing the direction of CRBC-TV away from the Etta-abgor residence.

TABLE 4
Signal strength and wind speed and direction measurements at uniform temperature of 77 ^{0}F, uniform pressure of 29.88 (± 0.03) inHg and uniform humidity of 94 %

Signal strength (mdB)	**Wind speed and direction (mph)** **N** ✥	**Atmospheric temperature (^{0}F)**	**Atmospheric pressure (inHg)**	**Relative humidity (%)**
9.5	0 NA	77	29.91	94
8.5	7 WSW	77	29.91	94
8.5	7 WSW	77	29.91	94
8.6	5 WSW	77	29.91	94
8.7	5 WSW	77	29.91	94
9.3	0 NA	77	29.91	94
9.1	3 S	77	29.85	94
9.2	3 S	77	29.85	94
9.5	0 NA	77	29.91	94
9.4	0 NA	77	29.91	94
9.4	0 NA	77	29.91	94
9.4	0 NA	77	29.91	94
9.7	0 NA	77	29.88	94
9.8	0 NA	77	29.85	94
9.8	0 NA	77	29.85	94

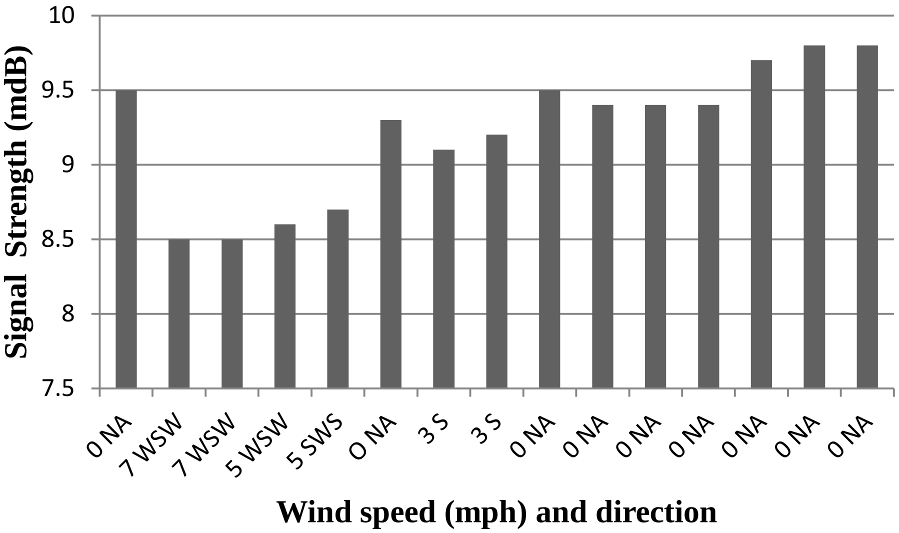

Figure 5: Signal strength versus wind speed and direction at uniform temperature of 77 ^{0}F, uniform pressure of 29.88 (± 0.03) inHg and uniform humidity of 94%.

TABLE 5
Signal strength and wind speed measurement and direction at uniform temperature of 79 ^{0}F uniform pressure of 29.68 (± 0.24) inHg and uniform humidity of 94 %

Signal strength (mdB)	**Wind speed and direction (mph) N**	**Atmospheric temperature (^{0}F)**	**Atmospheric pressure (inHg)**	**Relative humidity (%)**
8.8	9 W	79	29.88	94
8.8	9 W	79	29.88	94
8.9	5 WSW	79	29.91	94
8.9	5 WSW	79	29.91	94
9.0	2 E	79	29.44	94
9.0	2 E	79	29.44	94

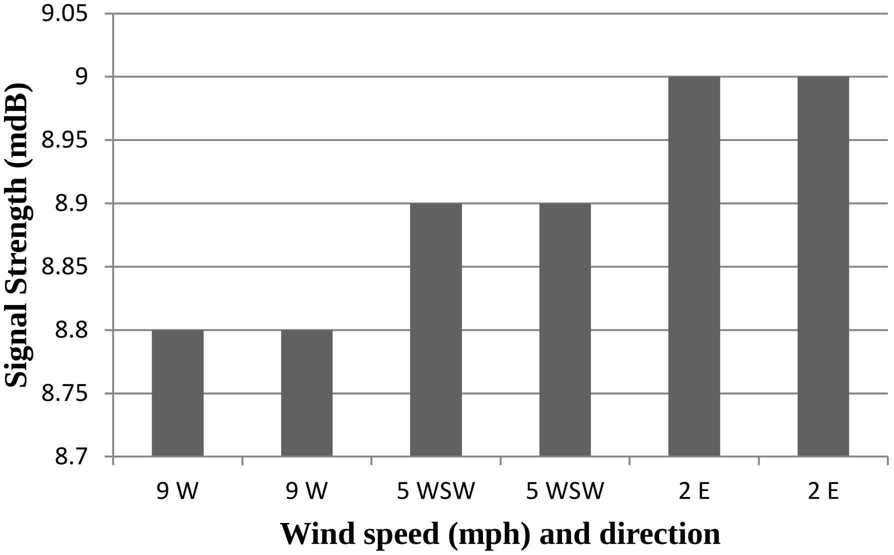

Figure 6: Signal strength versus wind speed and direction at uniform temperature of 79 ^{0}F, uniform pressure of 29.68 (± 0.24) inHg and uniform humidity of 94 %

TABLE 6
Signal strength versus wind speed and direction at uniform temperature of 80 (± 1.0) ^{0}F, uniform pressure of 29.85 inHg and uniform humidity of 89 %

Signal strength (mdB)	**Wind speed and direction (mph) N**	**Atmospheric temperature (^{0}F)**	**Atmospheric pressure (inHg)**	**Relative humidity (%)**
9.1	3 SW	79.5	29.85	89
8.7	3 SW	79.0	29.85	89
8.6	2 NA	79.5	29.85	89
8.6	2 NA	79.0	29.85	89
8.8	9 SSW	81.0	29.85	89
8.8	9 SSW	81.0	29.85	89
8.8	7 SW	79.0	29.85	89
8.8	7 SW	79.0	29.85	89

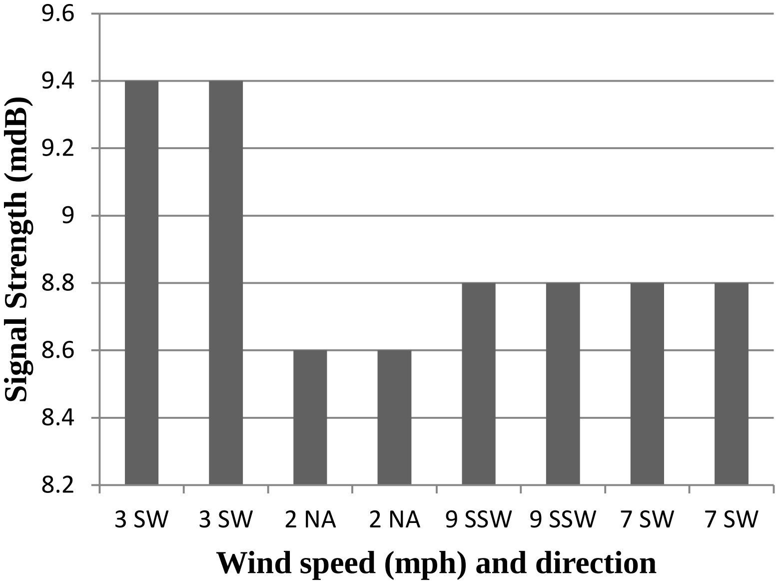

Figure 7: Signal strength versus wind speed and direction at uniform temperature of 80 (± 1.0) ^{0}F, uniform pressure of 29.85 inHg and uniform humidity of 89 %.

TABLE 7
Signal strength versus wind speed and direction at uniform temperature of 77 ^{0}F, at uniform pressure of 29.91 inHg and humidity of 100 %

Signal strength (mdB)	**Wind speed and direction (mph) N**	**Atmospheric temperature (^{0}F)**	**Atmospheric pressure (inHg)**	**Reiative humidity (%)**
8.6	2 WW	77	29.91	100
8.6	2 WW	77	29.91	100
8.8	0 NA	77	29.91	100
8.8	0 NA	77	29.91	100

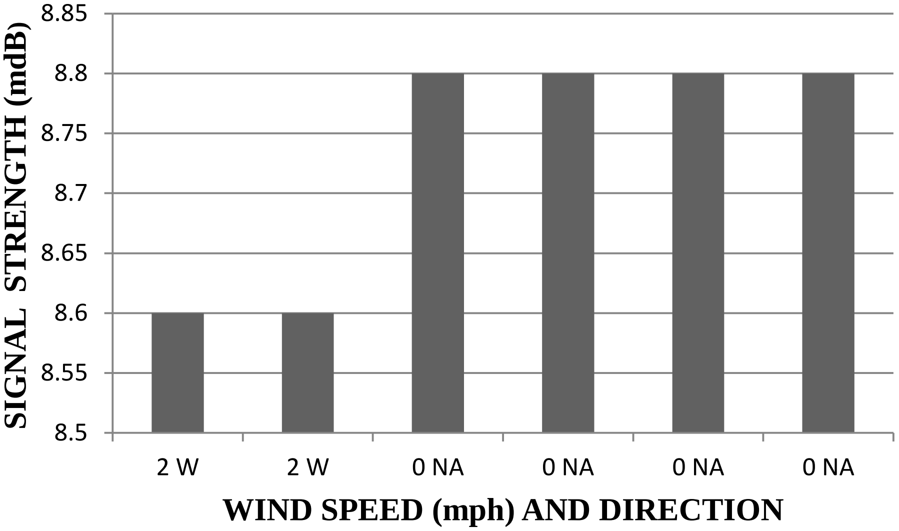

Figure 8: Signal strength versus wind speed and direction at uniform temperature of 77 ^{0}F, at uniform pressure of 29.91 inHg and humidity of 100 %.

Figure 1 shows the relationship between signal strength and atmospheric temperature, at a uniform humidity of 94%, uniform atmospheric pressure of 29.93 (± 0.02) inHg and uniform wind speed and direction of 0 mph NA. The signal strength decreased with a slight rise in temperature. Mathematically, the correlation between the two parameters is -0.94 in value. Hence, the higher the temperature: the lower the signal strength. In other words, the signal strength is inversely proportional to temperature, provided that other weather components, atmospheric pressure, relative humidity and wind speed and direction are observed constant.

Figure 2 shows the relationship between signal strength and relative humidity, at a uniform atmospheric temperature of 77^{o}F, uniform atmospheric pressure of 29.91inHg and uniform wind speed and direction of 0 mph NA. The signal strength decreased with increase in relative humidity. Mathematically, the correlation between the parameters is -0.93. Therefore, the higher the humidity: the lower the signal strength. Hence, the signal strength is inversely proportional to relative humidity, provided atmospheric pressure and temperature and wind speed and direction are observed constant.

Figure 3 shows the relationship between signal strength and atmospheric pressure, at uniform atmospheric temperature and relative humidity of 77 ^{o}F and94 % respectively and wind speed and direction of 0 mph NA. The signal strength decreased with increase in pressure. The numerical value of the correlation between the parameters is -0.99. Hence, the higher the atmospheric or air pressure: the lower the signal strength. Paraphrasing, the signal strength has a mathematical inverse relationship with pressure, assuming other weather or metrological parameters: atmospheric temperature, relative humidity and wind speed and direction are constant.

Figure 4 shows the location diagram of the residential area (Etta-abgor) and the CRBC-TV where the signal was transmitted. It is obvious from their longitudes and latitudes; the residence is lying to the south east of the TV station. Also, they are 2 km apart in a direct or line of sight direction.

Figure 5 shows a graphical representation of the signal strength against the wind in the residence at uniform temperature, pressure and humidity of 77 ^{0}F, 29.88 (± 0.03) inHg and 94% respectively. It was observed that the maximum reading of the signal strength were recorded when there was no impact from the wind, which is 0 NA mph. There is a degradation of the signal strength as the wind speed increased. The signal degradation was lesser at 3 S mph, higher at 5 WSW mph and highest at 7 WSW mph. This is owing to the fact that the speed of the wind in the southern direction is 3 mph, lesser than that of the west south western directions which are 5 mph and 7 mph respectively. Also, the southern direction is close or next to the south east, this is the direction where the receiver was positioned. For the 5 mph WSW and 7 mph WSW, the degradation was higher in the latter because the former has a lower wind speed.

Figure 6 shows a graphical representation of the signal strength against the wind in the residence at uniform atmospheric temperature, pressure and humidity of 79 ^{0}F, 29.68 (± 0.24) inHg and 94% respectively. The maximum signal strength captured was at 2 E mph. This is due to the signal transmitted, propagating in a near similar direction as the wind, since the receiver lied south east of the transmitter. The signal degraded at 5 WSW mph and 9 W mph since the direction of the wind is near opposite the direction of the propagating signal. None the less, the degradation of the signal was similar, despite the difference in the speed of the latter from the former where the latter is higher, even though the western direction is farther from the west south western direction.

Figure 7 shows a graphical representation of the signal strength against the wind in the residence at uniform temperature, pressure and humidity of 80 (± 1.0) ^{0}F, 29.85 inHg and 89 % respectively. Here, the signal strength was a maximum at 3 SW mph since it was close to the direction of propagation of the wave which is in the south eastern direction. There is an equal degradation of the signal at 9 SSW mph and 7 SW mph despite the difference in speed and direction. This is in consequence of the former running close to the direction of the traveling signal path to the transmitter than the latter, but latter possessing a lesser speed. However, the maximum signal degradation was registered at 2 NA mph by virtue of omni-directional transmission of the wind and there was heavy fluctuation.

Figure 8 shows a graphical representation of the signal strength against the wind in the residence at uniform temperature, pressure and humidity of 77 ^{0}F, 29.91 inHg and 100 % respectively. The Cable analyzer registered the highest value at 0 NA mph, but less at 2 W mph which is near opposite the propagating path of the radio wave i.e. south eastern direction.

If S, P, T and H symbolize signal strength, atmospheric pressure, atmospheric temperature and relative humidity respectively, it can be postulated that $S \propto \frac{1}{PTH}$ or SPTH=K or $S_1P_1T_1H_1=S_2P_2T_2H_2$ for the same wind direction and speed, where K is a constant and $S_1P_1T_1H_1$ and $S_2P_2T_2H_2$ are the initial and final state weather or atmospheric conditions.

SUMMARY AND CONCLUSION

a. Summary

Increase in atmospheric temperature results in the degradation of signal strength, observing other weather components constant. The correlation between the signal strength and atmospheric temperature was found to be r = -0.94. The phenomenon that explains this is that there is a collision between increasing raining particles of light from the sun as temperature increases with the radio signals (since both waves are electromagnetic waves), this attenuates the signal strength.

More so, increase in relative humidity affects the signal strength negatively. In other words, signal strength is inversely proportional to relative humidity, provided that other weather componets are observed constant, here r =-0.93. The phenomenon that explains this is that the water particulate content of the atmosphere can cause diffraction, reflection and scattering of radio waves and hence attenuation [8].

And, the atmospheric pressure impacts negatively on signal strength provided that other weather parameters are observed constant and the correlation between them is r = -0.99. Pressure is a negative influence against the signal. In other words, pressure is a force per unit area that the signal must overcome as it travels through the atmospheric channel.

Finally, it has been erected that wind has a marked effect on radio signal. The signal transmits better if the wind propagates in a similar path as the signal, but worse in the contrary directions. Also, the speed of the wind aids signal travel to some little extent if it is coursing parallel to the signal, but becomes detrimental when tangential or anti-parallel.

b. Conclusion

In conclusion, it was observed from the residential area in Etta-agbor, Calabar-Nigeria, that the atmospheric temperature, atmospheric pressure and relative humidity were inversely proportional to the signal strength, provided for any of the aforementioned weather components, the others were observed constant including wind speed and direction, since it has been erected that wind has a marked negative effect on UHF radio signal.

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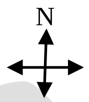
Appendix

Half-hourly measurement of Signal strength and Weather components in the residential area in Calabar metropolis (Etta-abgor)

Signal strength (mdB)	Temperature (^{o}F)	Pressure (inHg)	Humidity (%)	Wind (Mph)  	Time (hrs)
9.5	77.0	29.91	94	0 NA	5:30
8.5	77.0	29.91	94	7 WSW	6:00
8.5	77.0	29.91	94	7 WSW	6:30
8.6	77.0	29.91	94	5 WSW	7:00
8.7	77.0	29.91	94	5 WSW	7:30
9.0	78.5	29.94	94	0 NA	8:00
9.3	78.0	29.94	94	0 NA	9:30
8:4	78.0	29.94	94	2 W	9:00
8.1	78.0	29.94	94	2 W	9:30
8.3	78.0	29.94	94	0 NA	10:00
8.3	78.0	29.94	94	0 NA	10:30
7.8	79.5	29.94	94	0 NA	11:00
7.8	79.5	29.94	94	0 NA	11:30
8.0	79.0	29.94	94	0 NA	12:00
9.3	77.0	29.94	94	0 NA	12:30
8.5	77.0	29.91	100	0 NA	13:00
8.5	77.0	29.91	100	0 NA	13:30
8.6	77.0	29.91	100	2 W	14:00
8.6	77.0	29.91	100	2 W	14:30
9.1	78.0	29.91	88	5 WSW	15:00
9.1	78.0	29.91	88	5 WSW	15:30
9.1	77.0	29.85	85	6 SSW	16:00
9.4	77.0	29.85	85	6 SSW	16:30
9.1	77.0	29.85	94	3 S	17:00
9.2	77.0	29.85	94	3 S	17:30

9.1	79.5	29.85	89	3 SW	18:00
8.7	79.0	29.85	89	3 SW	18:30
8.6	79.5	29.85	89	2 NA	19:00
8.6	79.0	29.85	89	2 NA	19:30
9.4	79.5	29.85	80	0 NA	20:00
9.2	79.0	29.85	80	0 NA	20:30
9.3	77.0	29.84	100	0 NA	21:00
9.4	77.0	29.84	100	0 NA	21:00
9.5	77.0	29.91	94	0 NA	22:00
9.4	77.0	29.91	94	0 NA	22:30
9.4	77.0	29.91	94	0 NA	23:00
9.4	77.0	29.91	94	0 NA	23:30
9.7	77.0	29.88	94	0 NA	24:00
9.6	77.0	29.91	90	0 NA	0:30
9.8	77.0	29.85	94	0 NA	6:00
9.8	77.0	29.85	94	0 NA	6:30
9.7	77.0	29.88	89	0 NA	7:00
9.7	77.0	29.91	89	0 NA	7:30
9.4	79.0	29.81	89	0 NA	8:00
9.4	79.0	29.81	89	0 NA	8:30
8.5	79.0	29.94	84	0 NA	9:00
8.5	81.0	29.94	84	0 NA	9:30
10.0	81.0	29.81	94	0 NA	5:30
9.5	77.0	29.85	74	12 SW	15:00
9.5	86.0	29.85	74	12 SW	15:30
9.4	86.0	29.85	74	12 SW	16:00
9.4	84.0	29.85	74	12 SW	16:30
8.7	82.0	29.85	79	9 SW	17:00
8.7	82.0	29.85	79	9 SW	17:30
8.8	81.0	29.85	89	9 SSW	18:00
8.8	81.0	29.85	89	9 SSW	18:30

8.8	79.0	29.85	89	7 SW	19:00
8.8	79.0	29.85	89	7 SW	19:30
8.8	79.0	29.88	94	9 W	20.00
8.8	79.0	29.88	94	9 W	20.30
8.8	79.0	29.91	94	5 WSW	21.00
8.8	79.0	29.91	94	5 WSW	21.30
8.8	77.0	29.91	100	0 NA	22.00
8.8	77.0	29.91	100	0 NA	22.30
9.0	79.0	29.44	94	2 E	23.00
9.0	79.0	29.44	94	2 E	23.30
10.0	77	29.91	82	0 NA	24.00

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Resistance change for different piezoresistive cantilever geometries

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Abstract— Cantilever beams are one of the basic microelectromechanical systems (MEMS) structures. They are used for sensing and actuation purposes. Piezoresistive readout is one of the most promising methods to find out the mechanical displacements of these cantilever beams. In this paper the resistance change of various cantilever geometries is found out. By using simulations done by COMSOL multiphysics the mechanical displacement of these cantilever beams is found out and a virtual instrumentation program is used to process the COMSOL data. The fractional change in resistance is found out by Stoney's equation and the real change in resistance has been found out by using VLSI equations..

Keywords— Cantilever beam, MEMS, piezoresitive readout, Stoney's equation.

INTRODUCTION

MEMS are gaining wide spread acknowledgement in the field of VLSI as sensors and actuators. Cantilever beams are being used in a variety of applications like sensing of gases, explosives, fluids and various physical parameters such as stress, temperature, pressure etc. In Piezoresistive readout method a piezoresistive layer is deposited on the cantilever surface. Due to the adsorption of target molecules on the sensing layer of the cantilever stress is developed at the fixed end of the cantilever and the cantilever bends [1]. This changes the resistance of the piezoresistive layer. In order to measure this small change in resistance a Wheatstone bridge network can be used. Various geometries of cantilever beams have been proposed. In order to find the actual change in resistance of these geometries it is necessary to find out their individual displacements for a given value of stress.

CANTILEVER GEOMETRIES

Cantilever geometries are shown from figure 1 to 5. These geometries were subjected to load varying from 0 to 42 micrograms in COMSOL multiphysics and their displacements were found out. Gravity was applied to all these geometries and very fine meshing was done. The result is shown in figure 6. [2]

Table 1: Geometry parameters of rectangular Cantilever beam

Length of cantilever	200 [um]
Breadth of cantilever	50 [um]
Thickness of cantilever	1 [um]
Length of piezoresistive layer	80 [um]
Breadth of piezoresistive layer	5 [um]
Thickness of piezoresistive layer	0.5 [um]
Length of functionalized layer	50 [um]
Breadth of functionalized layer	50 [um]
Thickness of functionalized layer	1 [um]

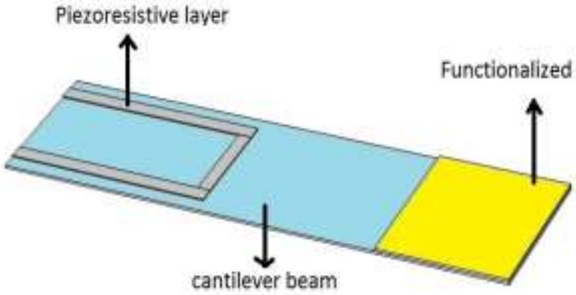


Fig. 1. Rectangular cantilever beam

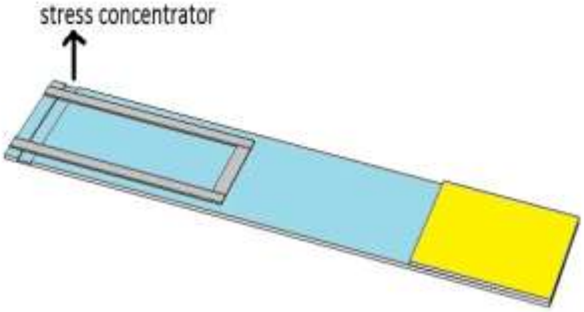


Fig. 2. Rectangular cantilever beam with stress concentrator

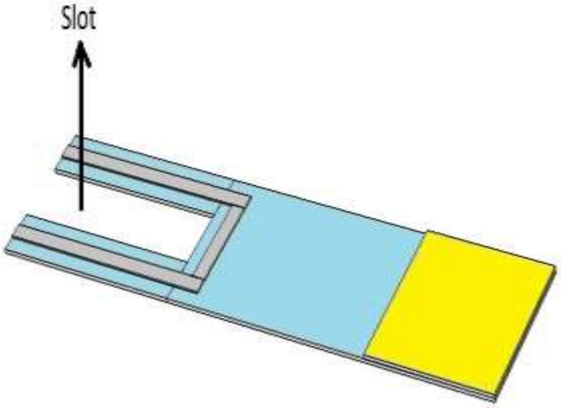


Fig. 3. Rectangular cantilever beam with slot

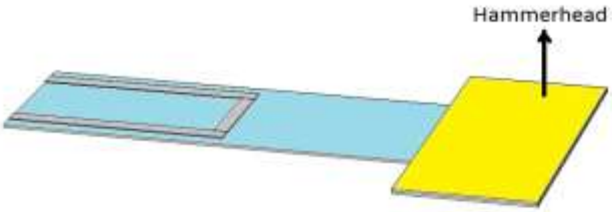


Fig. 4. Rectangular cantilever beam with hammerhead

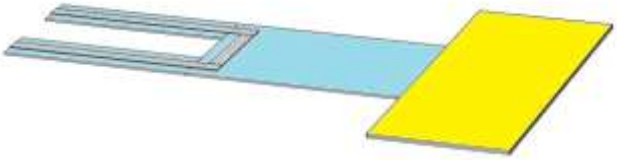


Fig. 5. Rectangular cantilever beam with hammerhead and slot

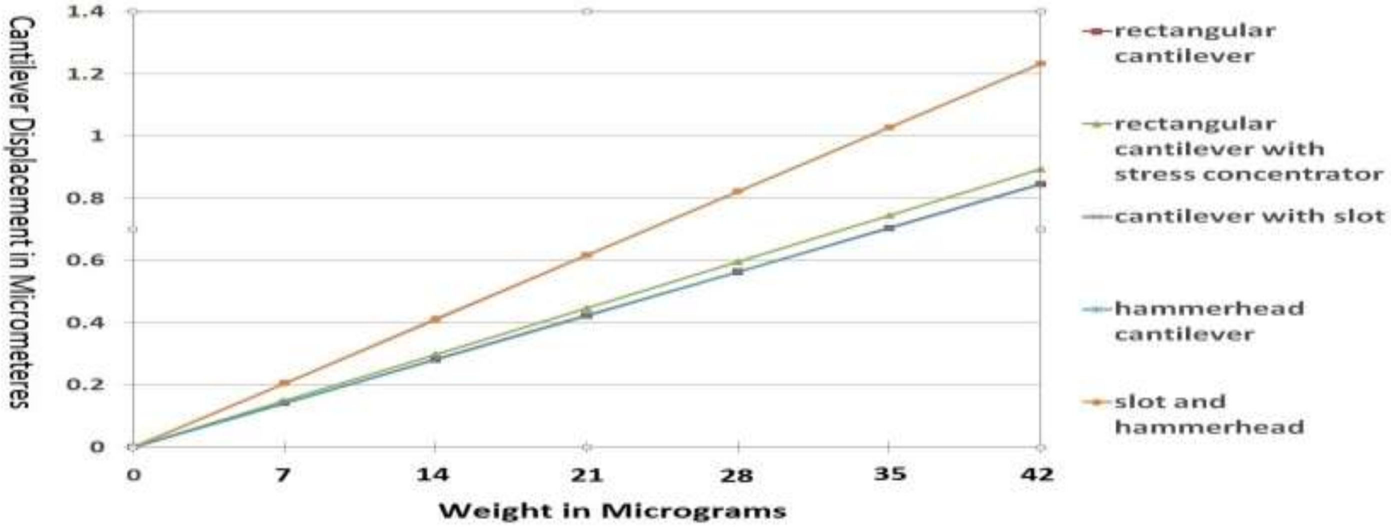


Fig. 6. Weight in micrograms vs. Cantilever deflection

STONEY'S EQUATION:

Deflection is a mechanical parameter which needs to be converted to electrical parameters. In order to this a piezoresistive thin film is deposited on the silicon substrate. As the mass of the target molecules gets added to the functionalized layer the cantilever bends and so does the piezoresistive thin film. This changes the resistance of the thin film.

In order to calculate the change in resistance Stoney's Equation is used. Stoney had derived a relation between adsorption induced stress and the radius of curvature of a thin substrate. It is given as

$1/R = 6*(1-\upsilon)*\sigma / E*t^2$

Where

R is the radius of curvature

υ is the poison's ratio

σ is the differential stress i.e. stress between the top and bottom surface of the thin film

E is the young's modulus

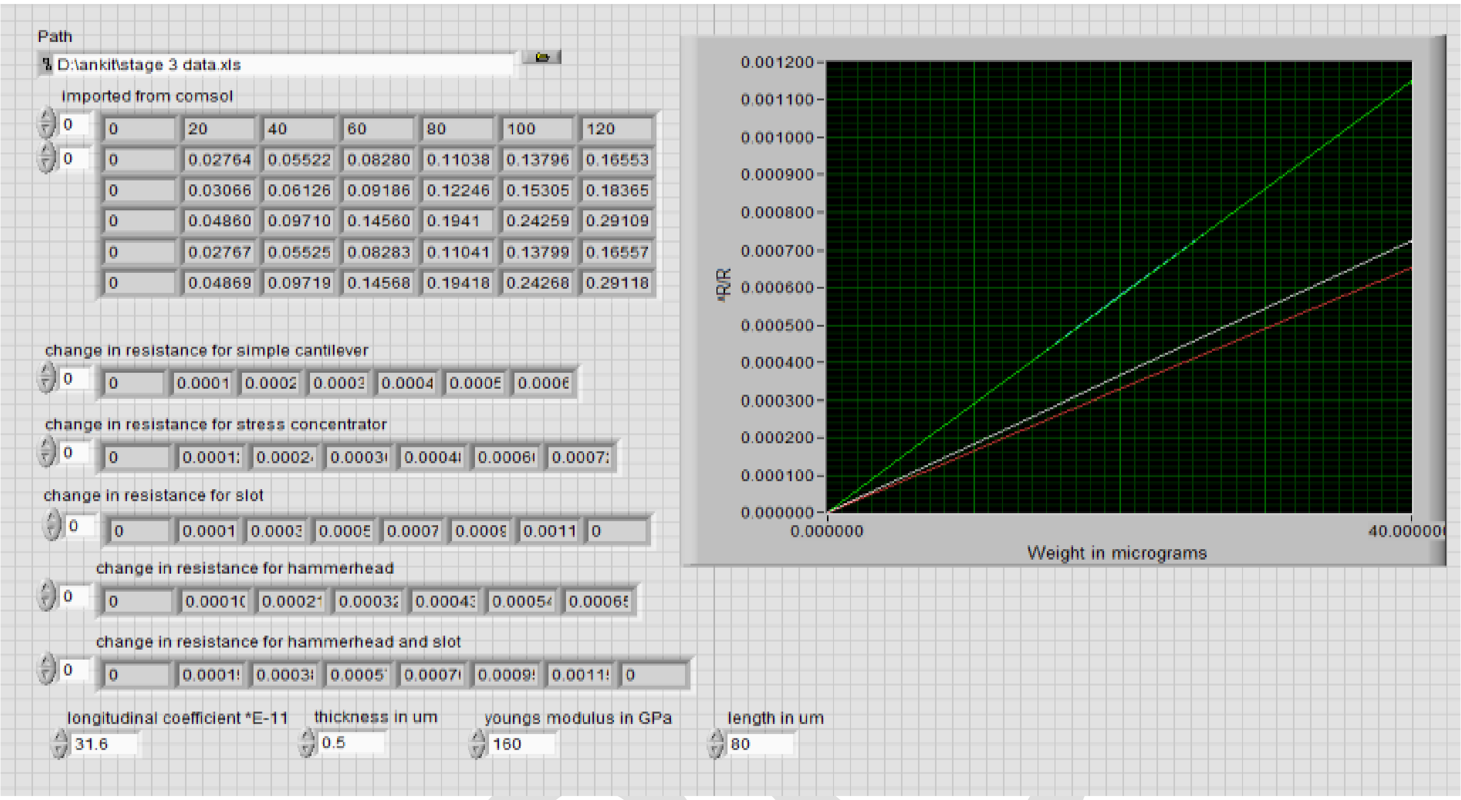
And t is the thickness of the film.

From geometry the radius of curvature is related to the displacement of the free end of the cantilever and to its length as $1/R=2*\delta/L^2$ where δ is the displacement and L is the length of the cantilever. The resulting fractional change is given by piezoresistive relation $\Delta R/R=\beta*3*E*t*\pi_l*\delta/2*L^2$. Where πl is called the longitudinal coefficient and for the <110> crystallographic axis of silicon its value is $71.8*10^{-11}$. The co-efficient β is called as correction factor and its value is between 0 and 1. The above given equation can be modified to

$\Delta R/R= \delta *E*T* \pi_l* \beta/L^2$. [3]

DATA PROCESSING

The above equations were used to find the change in fractional resistance of the piezoresistive layer. In order to process the data quickly and efficiently LABVIEW is used. The displacement data of the various cantilever designs is exported from COMSOL into text or spreadsheet application. LABVIEW can import data from this text or spreadsheet file for further processing. The front panel and block diagram of the designed software is shown in figure. The final results are displayed on the front panel. The front panel and block diagram are shown in figures 7 and 8 respectively. The results are shown separately in figure 9.



Path

D:\ankit\stage 3 data.xls

imported from comsol

0	20	40	60	80	100	120
0	0.02764	0.05522	0.08280	0.11038	0.13796	0.16553
0	0.03066	0.06126	0.09186	0.12246	0.15305	0.18365
0	0.04860	0.09710	0.14560	0.1941	0.24259	0.29109
0	0.02767	0.05525	0.08283	0.11041	0.13799	0.16557
0	0.04869	0.09719	0.14568	0.19418	0.24268	0.29118

change in resistance for simple cantilever

0	0.0001	0.0002	0.0003	0.0004	0.000	0.000

change in resistance for stress concentrator

0	0.0001	0.0002	0.0003	0.0004	0.0006	0.0007

change in resistance for slot

0	0.0001	0.000	0.000	0.0007	0.000	0.0011	0

change in resistance for hammerhead

0	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006

change in resistance for hammerhead and slot

0	0.0001	0.0003	0.0005	0.0007	0.0009	0.0011	0

longitudinal coefficient *E-11: 31.6
thickness in um: 0.5
youngs modulus in GPa: 160
length in um: 80

Fig. 7. Front panel

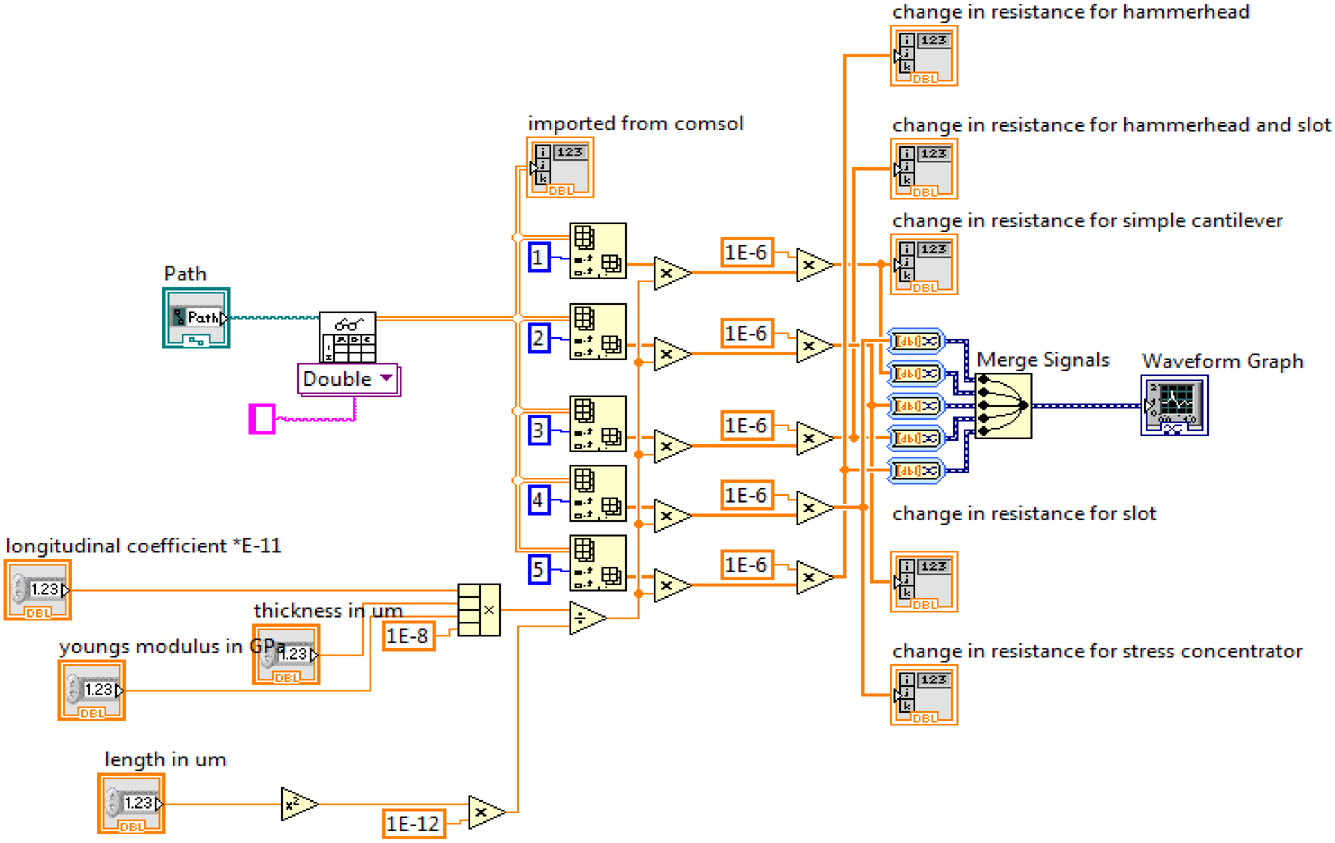


Fig. 8. Block Diagram

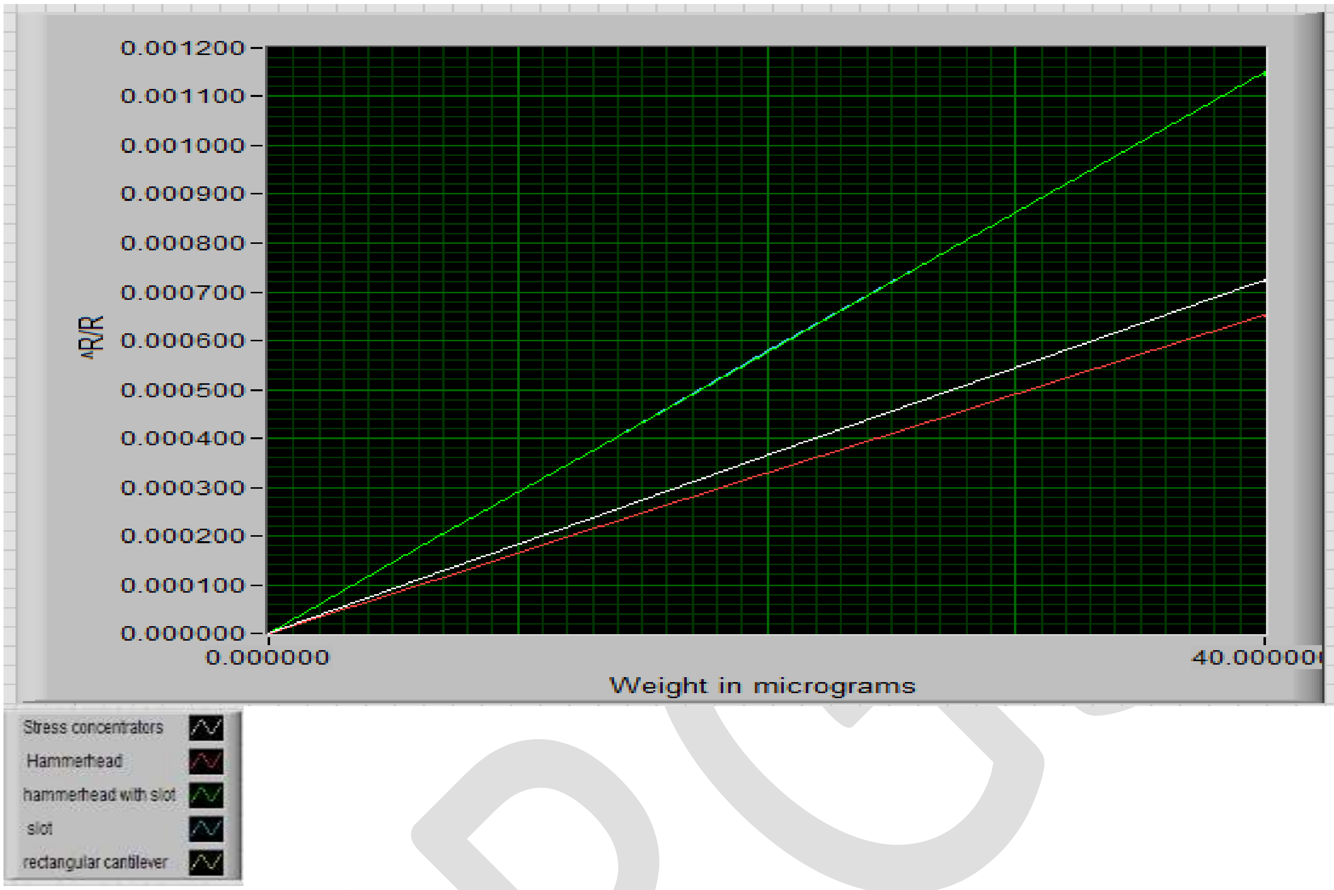


Fig. 9. Fractional change in resistance vs. weight in micrograms

REAL RESISTANCE CHANGE

In order to calculate the real change in resistance it is necessary to calculate the original value of the piezoresistive layer without stress. For this the basic formula of resistivity (ρ) and resistance (R) is used which is given as R= ρ*L/A

In order to calculate resistivity we first need to calculate the conductivity and take its reciprocal. The conductivity of a semiconductor is given as

$\sigma = qn\mu_n + qp\mu_p$

Where σ is the conductivity
q is the charge on electron
μ_n is electron mobility
μ_p is the hole mobility
n is the electron concentration and
p is the hole concentration.

The above formula gets modified when doping is used. For n type of silicon as a piezoresistor hence the formula gets modified to

$\sigma = qn\mu_n$

The typical values of the various quantities is as follows
μ= 1360 cm^2/v-sec
q= $1.6*10E^{-19}$
n= 10^{-14} [4].

On putting this values in the above equation we get σ= 2.176 hence the value of resistivity becomes 0.45 Ωm. The length of the Piezoresistor is 200 micrometer, its breadth is 5 micrometer and thickness is 0.5 micrometer. On putting the above values in equation 1 we get the actual resistance as 32.76 MΩ.

From the above graph we can find any weight added and multiply it with the y axis value to get real change in resistance. For example the value of change in real resistance is 9828 Ω for weight added as 10 microgram. This change is 0.03% of the original resistance.

CONCLUSION

Hammerhead cantilever with slot provided the most change in the resistance of the piezoresistive layer. Hence it the most sensitive geometry from the above discussed geometries. The change in resistance is linear with respect to the deflection or the weight added to the cantilever beam. The actual change in resistance gives a very good estimate of the voltage changes across the Wheatstone bridge and it will be useful in actual hardware development.

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Overcurrent and Earth fault Relay Coordination for Microgrids with Modern Numerical Relay Features

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Abstract - Capability of Microgrids to operate in both grid connected mode and islanded mode results in drastic change in the fault current results in complicated protection requirements. This paper proposes a new approach for setting all overcurrent (OC) relays and Earth fault relays in substations, process industries with cogeneration, distribution system with Embedded Renewable Generation and micro grid using modern numerical relay features. This approach is more suitable where there is a drastic change in the fault current based on the network topology and configuration This technique is used in setting the OC relays of a IEEE 30 Bus system, Real time steel industry and a Microgrid system. There is a Significant reduction in fault clearing time which reduces the damage and enhance the stability. In addition it also prevent all the mal operation of relays and nuisance tripping.

Index Terms - Micro Grid, Relay Setting, Numerical Relays with Multiple settings, Adaptive setting, self-tuning relays, Cogeneration

I. INTRODUCTION

Conventionally Over Current (OC) relaysettings are provided based on full load current of power system components. Time Dial Setting (TDS) and Type of curve are chosen to ensure that the coordination with the downstream relays. This conventional procedure for setting the relays went well for a long time. However introduction of Embedded Renewable Generation, Cogeneration in plants in process industries and islanding from the grids, Introdcution of micro grids, Change in the Grid Topology etc. results in the drastic change in the fault current. This leads to problems like nuisance tripping of relays, improper coordination or longer time taken to operate the relays for a fault. Situation got worse in the continuous addition of renewable generation, most sophisticated grid islanding schemes, Energy efficient motors which draws high starting current, technological advancements in controlled switching for transformer and reactor to reduce the inrush current etc made the conventional of relay setting obsolete. These technological advancements along with new feature in the modern numerical relays provide a better platform to coordinate the relays to reduce the operating time of relay, prevent the nuisance tripping and ensure the coordination between the relays in all the grid topologies[1].

Overcurrent Relays utilized in power systems protection as economical protective devices. Overcurrent relays are used as main protection devices in Low Voltage Radial systems and as backup relays to distance and differential in High voltage interconnected transmission and sub-transmission system.

Over current Relays are categorized as Instantaneous, definite time and inverse time relays. Modern numerical relays from famous manufacturers like ABB, Areva, GE, Siemens etc has minimum three stages of Protection. Stage 1 & 2 shall be either Inverse curve or Definite time whereas Stage 3 is Instantaneous without any time delay. In addition these relays have additional feature of multiple setting depending the digital input to the relay which may corresponds to particular topology of grid conditions. In addition these relays have inrush or starting multipliers which may be effectively used to prevent the mal-operation of relays during motor starting or transformer charging. In addition to conventional curves such as Normal Inverse (NI), Very Inverse (VI), Extremely Inverse (EI), Long Time Inverse (LTI), Standard Inverse (SI) etc. relays also have the feature of developing user defined curves based on the user requirements. All these features available in the modern relay are effectively utilized with sophisticated software program to reduce the fault clearing time and prevent the nuisance tripping of the relays[2],[3].

II. OVERCURRENT RELAYS COORDINATION

CT Selection:

Proper selection and sizing of Current Transformers are first important step in overcurrent relay coordination. [1]proposes full adaptive technique to optimal coordination of relays, however the CT ratio selected is not correct. CT ratio should be selected based on the Full load current of component with the overload margin. However the Primary CT rating is less than the full load current of the components in many Cases [1] - [2]

Stage : 1/2 (Inverse Definite Minimum Time Delay – IDMT Relay – 51)

a. Pickup up setting or Plug Setting

Plug setting for inverse relays shall be selected based on the maximum possible load current and over load margin. In HV substation this depends on the worst case power-flow current with some future margin.

b. Time Dial Setting (TDS) or Time Multiplier Setting (TMS)

Choosing TDS is more involved task which provides the necessary coordination with downstream relays[6]–[8]. This depends on many factors including maximum fault current, minimum fault cureent, Starting Current, Inrush Current, Through fault current, Type of curve selected etc.,

c. Curve Selection:

Selection of curve for the relay is also involved task. Conventionally Normal Inverse or Stand Inverse is selected for plain feeders and Extremely Inverse is used for Transformer Feeders and Motor Feeders.

Stage : 2 (Definite Time Delay – DT Relay – 50)

a. Pickup up setting or Plug Setting

Plug setting for Definite Time relays depends upon whether time discrimination is adopted or not. If time discrimination is not used i.e Definite Time is set as minimum time then the pickup setting shall be higher than the starting or inrush or through fault current. However present modern numerical relays provides many options related to starting and inrush and hence pickup setting can be lowered in normal operating condition which reduces the damage. i.e Even when there is fault with minimum short circuit current this options enable to fall in the Definite Time region of the relay characteristics which falls in Inverse characteristics of the relay in conventional setting. This result in significant reduction of fault clearing time and hence the damage.

b. Time Setting (TS)

Proper Time discrimination is used if the relay is used to coordinate with the downstream relays. Otherwise the minimum time delay available in the relay has been used.

Stage : 3 (Instantaneous stage – 50)

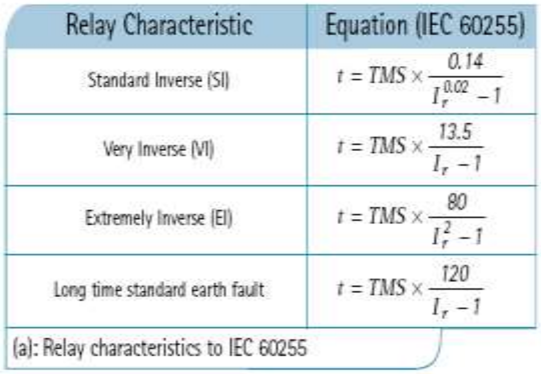
a. Pickup up setting

Pickup setting shall be higher than the starting or inrush or through fault current. However present modern numerical relays provides many options related to starting and inrush and hence pickup setting can be lowered in normal operating condition which reduces the damage. i.e Even when there is fault with minimum short circuit current this options enable to fall in the instantenous region of the relay characteristics which falls in Inverse characteristics of the relay in conventional setting. This result in significant reduction of fault clearing time and hence the damage [4].

Earth fault settings also Similar to the overcurrent relay setting except the below facts

a. Plug settings are based on the unbalanced current in residual connected type current transformers and minimum possible setting shall be adopted in Core Balancing Current Transformers

b. Earth fault current depends on the type of earthing (Solid, Resistance Earthed) and hence care shall be taken to ensure the fault current available.
c. Earth fault current also depends on the winding configuration. For an example of fault on the star side of the Delta – Star transformer, the same will not be reflected in the Delta side and hence the same need not be coordinated.



Relay Characteristic	Equation (IEC 60255)
Standard Inverse (SI)	$t = TMS \times \frac{0.14}{I_r^{0.02} - 1}$
Very Inverse (VI)	$t = TMS \times \frac{13.5}{I_r - 1}$
Extremely Inverse (EI)	$t = TMS \times \frac{80}{I_r^2 - 1}$
Long time standard earth fault	$t = TMS \times \frac{120}{I_r - 1}$

(a): Relay characteristics to IEC 60255

Grading Margin

The current and time settings selection shall start at the load end and worked back towards the power source. Grading margins between protection relays shall be typically as follows: The grading margin shall be 0.4 to 0.5s but can be reduced such that the total minimum time at any level does not exceed 2.5s. However as microprocessor based numerical relays are used. The grading margin considered is 0.25s to the extent possible [5], [6].

Grading Margin :

(Er1 + Er2 + Ect) x T/100 + Tcb + T0 +Ts

=(5 + 5 + 5) x 0.25/100 + 0.1 + 0.02 + 0.03

= 0.2175 = 0.25s

Where,

Er1, Er2 = Relay Timing Errors

Ect = CT Error

T = Nominal Operating time of relay nearest to the fault

Tcb = Circuit Breaker Opening time

T0 = Relay Overshoot time

Ts = Safety Margin

III. MODELING OF THE SYSTEM

IEEE 30 Bus system and Micro grid system are modeled based on the data available in the [9]. All power system components are modeled for steady state analysis. Nominal pi model is used for cables and transmission lines. Transformer are modeled with their leakage reactance. Generators are modeled with capability curve for load flow analysis and direct axis sub transient reactance for short circuit studies [7], [8].

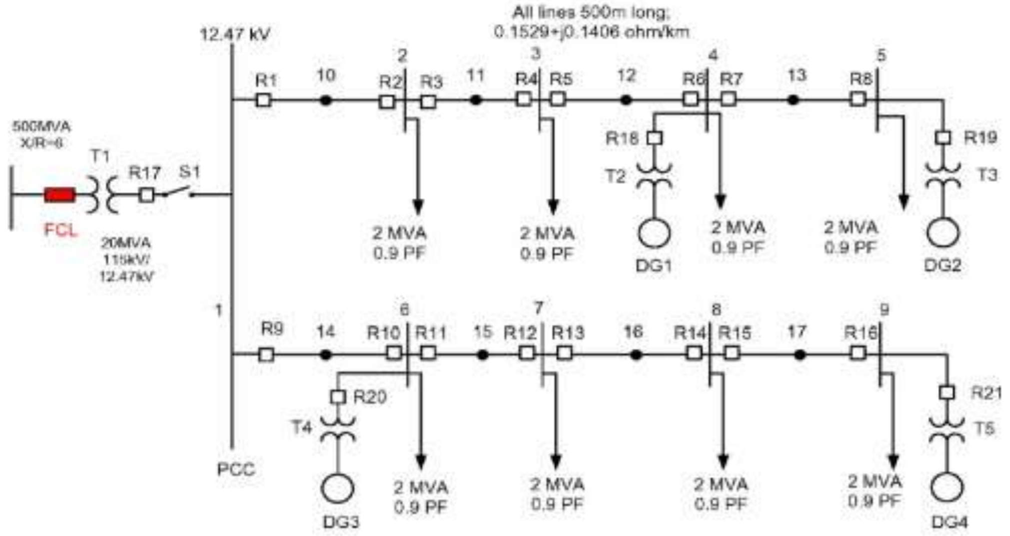


Fig 1 Single Line Diagram of Real Time Distribution System with Embedded Renewable generation

Distributed generation is modeled in two categories. One is based on the synchronous generator and other is based on the inverter based renewable resources their fault current is decided based on the power electronic switching capability. Modern numerical relays with all features are captures and modeled in detail which has not be done in any of the papers uptoauthors knowledge. Multi group setting, Analog and digital input, Multiplier settings during inrush and motor starting, communication with other relays etc are modeled in depth to find out the best possible solution. Change in the capacity of renewable resource and their impact on relay setting is also studied. 4 Nos of each 2 MVA is considered of base case which is increased to 3MVA, 4MVA and 5 MVA for subsequent cases. In addition different capacity renewables at different location also tried out.

IV. LOAD FLOW AND SHORT CIRCUIT STUDIES

Load flow analysis is performed to find out the maximum full load current at all branches which is the base for selecting the CT ratio and pickup setting Short Circuit study is carried out based on IEC 60909 with the C factor 1.0. Short Circuit study have been carried out with various operating conditions, Grid Topologies and With and Without Cogeneration, With cogeneration alone, with and Without Embeded Renewable Generation. There is significant change in the fault current in various cases. Maximum Fault Current, Minimum Fault Current and other significant case short circuit results alone indicated in the Table 1, 2 & 3

Table 1 Load Flow Results

	Without DG		With 2 MVA DG		Islanded mode operation	
Bus	Voltage in pu	Power in kW X 0.1	Voltage in pu	Power in kW X 0.1	Voltage in pu	Power in kW X 0.1
Bus 1	0.9564	146	0.98	-14.6	0.964	1.34
Bus 2	0.951	72.66	0.9793	-7.28	0.9645	1.34
Bus 3	0.9469	54.31	0.9799	-25.32	0.9657	-16.6
Bus 4	0.9442	36.11	0.9819	-43.2	0.9681	-34.7
Bus 5	0.9429	18.02	0.9829	-21.72	0.9693	-17.2
Bus 6	0.951	72.66	0.9795	-7.37	0.9649	-1.34
Bus 7	0.9469	54.31	0.978	14.34	0.9636	17.33

Bus 8	0.9442	36.11	0.9778	-3.69	0.9637	-0.68
Bus 9	0.9429	18.02	0.9789	-21.71	0.9651	-18.71
Grid	1.00	-	1.00		-	-

Table 2Short Circuit results

	Without DG		With 2 MVA DG		Islanded mode operation	
Bus	Symmetrical Fault Current	Peak Current	Symmetrical Fault Current	Peak Current	Symmetrical Fault Current	Peak Current
Bus 1	7.2	14.3	10.9	23	2.8	7.2
Bus 2	6.7	13.8	10.2	22.7	2.8	7.1
Bus 3	6.3	13.2	9.5	19.8	2.9	7.2
Bus 4	5.9	12.6	8.9	19.6	2.9	7.3
Bus 5	5.5	11.4	8.3	17.8	2.9	7.5
Bus 6	6.7	13.8	10.2	22.2	2.8	7.2
Bus 7	6.3	13.2	9.4	20.4	2.7	7.2
Bus 8	5.9	12.6	8.6	19.1	2.6	7.0
Bus 9	5.5	11.4	8.0	17.5	2.6	6.9
Grid	2.5	5.6	2.8	6.3	-	-

V. CONCLUSION

New approach of modeling numerical rela features provide significant advantage over the conventional way of relay settings. This technique is more suitable where there is a drastic change in the fault current based on the network topology and configuration. This technique is verified for setting the OC relays in IEEE 30 Bus system, Real time steel industry and a micro grid. There is a Significant reduction in fault clearing time which reduces the damage and enhance the stability. In addition it also prevent all the mal operation of relays and nuisance tripping. Based on the above conclusions it is recommended to review all the relay settings of existing system while retrofitting or Annual maintenance.

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Survey of Quantum Suicide or Quantum Immortality

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Abstract*:* In quantum mechanics, quantum suicide is a thought experiment, originally published independently by Hans Moravec in 1987 and Bruno Marchal in 1988, and independently developed further by Max Tegmark in 1998. It attempts to distinguish between the Copenhagen interpretation of quantum mechanics and the Everett many-worlds interpretation by means of a variation of the Schrödinger's cat thought experiment, from the cat's point of view. Quantum immortality refers to the subjective experience of surviving quantum suicide regardless of the odds. The paper is a survey of the experiment of quantum suicide.

Keyword: Quantum Mechanics, Immortality, Survey

I. INTRODUCTION

The Many Worlds interpretation (MWI), proposed by Everett in 1957 but virtually unnoticed for about a decade, has survived 25 years of fierce criticism and occasional ridicule to become the number one challenger to the leading orthodoxy, ahead of the Bohm [6], Consistent Histories and GRW interpretations. Why has this happened? The purpose of the present paper is to briefly summarize the appeal of the MWI in the light of recent experimental and theoretical progress, and why much of the traditional criticism of it is being brushed aside.

The "quantum suicide" thing really just says that your experience always continues, that there's always a next-moment. You are "a conscious perspective having a particular experience", currently a being-a-person-in-a-world experience, moment by moment. That consciousness cannot end. The theory doesn't specify the content of any next-moment though.

II. THE EXPERIMENT

A. HOW THE EXPERIMENT WAS PROPOSED?

One cat goes into a box; this cat is Schrödinger's cat.

He proposed a scenario with a cat in a sealed box, wherein the cat's life or death depended on the state of a subatomic particle. According to Schrödinger, the Copenhagen interpretation implies that the cat remains both alive and dead (to the universe outside the box) until the box is opened.

The reason "the cat's life or death depended on the state of a subatomic particle," is because of the Copenhagen interpretation of Quantum Mechanics. The correct theory is:

It holds that quantum mechanics does not yield a description of an objective reality but deals only with probabilities... According to the interpretation, the act of measurement causes the set of probabilities to immediately and randomly assume only one of the possible values.

So, how are these related? The cat in the box only dies when the state of the subatomic particle is known to you. Until then, it's both alive and dead.

Why is this important? Because another theory says every possible outcome happens in one universe or another. This means every time you open the box, the universe "splits." In one universe, the cat dies. In another, the cat lives.

So if you repeat the experiment a billion times, in one universe, you've got an immortal cat. Perhaps that cat's consciousness is, in itself, immortal in its own universe. I mean, living a billion times seems pretty unlikely, right? That's more of a philosophical position than scientific one, though.

The apparatus is a "quantum gun" which each time its trigger is pulled measures the z-spin of a particle in the state $(|\uparrow i + |\downarrow i)/\sqrt{2}$. It is connected to a machine gun that fires a single bullet if the result is "down" and merely makes an audible click if the result is "up". The details of the trigger mechanism are irrelevant (an experiment with photons and a half-silvered mirror would probably be cheaper to implement) as long as the timescale between the quantum bit generation and the actual firing is much shorter than that characteristic of human perception, say 10^{-2} seconds. The experimenter first places a sand bag in front of the gun and tells her assistant to pull the trigger ten times.

Since there is exactly one observer having perceptions both before and after the trigger event, and since it occurred

too fast to notice, the MWI prediction is that I will hear “click” with 100% certainty. When her assistant has completed his unenviable assignment, she will have heard ten clicks, and concluded that collapse interpretations of quantum mechanics are ruled out at a confidence level of $1-0.5n \approx 99.9\%$. If she wants to rule them out at “ten sigma”, she need merely increase n by continuing the experiment a while longer. Occasionally, to verify that the apparatus is working, she can move her head away from the gun and suddenly hear it going off intermittently. Note, however, that almost all terms in the final superposition will have her assistant perceiving that he has killed his boss.

What we've done here is tie the survival of the experimenter to a quantum state, meaning she now exists in a superposition of being both alive and dead. There's a 50% chance she survived the initial round, and she has the same chance for every subsequent repetition of the experiment. No matter how many times she repeats the experiment, half the time, she survives.

Of course, her overall survival chances are way less than 50%. The version of her that died in the initial experiment doesn't have a 50% chance of coming back to life in the next experiment. But each living version of the experimenter retains that chance at survival, even if the overall chance of survival keeps falling to 25%, then 12.5%, then 6.25%, and so on. Let's say that in one universe, an experimenter eventually emerges having survived 50 such tests in a row — something she has less than a one in quadrillion chance of surviving, which is way more than is needed to meet the 5-sigma level of certainty needed for an official discovery.

What makes this interesting, is that if the many-worlds interpretation of quantum mechanics is true, then at the point at which a decay might happen, the universe splits in two — into one universe in which it decays and I die, and another in which it does not decay and I live. Assuming there is no afterlife, I will cease to exist in one universe but not in another. So, the argument goes, although there will be others who will exist in the universes in which I die, I will only ever exist in the universes in which I survive, so I will only ever observe the universes in which I survive. From my perspective, I will never die, I will always be saved from death by quantum indeterminacy.

Connected to this is the theory of quantum immortality, which posits that no one ever dies, they only appear to. Whenever I might die, there will be another universe in which I still live, some quantum event (however remotely unlikely) which saves me from death. Hence, it is argued, I will never actually experience my own death, but from my own perspective will live forever, even as countless others will witness me die countless times. Life however will get very lonely, since everyone I know will eventually die (from my perspective), and it will seem I am the only one who is living forever — in fact, everyone else is living forever also, but in different universes from me.

B. THE DIFFERENCE

Normal suicide: the act of suicide is governed by Newtonian physics. The result is predetermined, and there is no "chance". You may not know what that result is, but that is simply because we don't have the time or resources to compute it.

Quantum suicide: the act of suicide is governed by Quantum physics, and the result is determined by chance. Under certain interpretations, both results can occur at the same time by existing in different parallel universes resulting in a universe where no matter how many times you try to kill yourself, you survive**.**

C. THE QUESTION REMAINS

Many physicists would undoubtedly rejoice if an omniscient genie appeared at their death bed, and as a reward for life-long curiosity granted them the answer to a physics question of their choice. But would they be as happy if the genie forbade them from telling anybody else? Perhaps the greatest irony of quantum mechanics is that if the MWI is correct, then the situation is quite analogous if once you feel ready to die, you repeatedly attempt quantum suicide: you will experimentally convince yourself that the MWI is correct, but you can never convince anyone else!

III. CONCLUSION

The Quantum mechanics says objective reality doesn't exist, that instead all we see are probabilities collapsing into one particular configuration... and all other possible realities might just exist together in a quantum multiverse.

Quantum suicide is a thought experiment that was suggested as a way to determine experimentally, at least in principle, whether the many-worlds interpretation of quantum mechanics is correct.

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Image Restoration Using Progressive Image Denoising and Blind Image Deblurring

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Abstract— The purpose of image restoration is to remove the defects which degraded an image. Degradation can be caused by many factors such as blur, noise. In this paper we propose a combined approach of denoising and deblurring to restore a sharp image from the degraded one. Denoising is done by Progressive image denoising followed by image sharpening and deblurring.Spectral properties of convolution operators are used for image deblurring.

Keywords— Image Restoration,Robust noise estimation,Deterministic annealing, Image deblurring,Blind deconvolution, Blur kernel estimation,Spectral methods.

INTRODUCTION

Blur and noise are the two problems that exist in digital image processing. Image restoration deals with the reconstruction of the uncorrupted image from a blurred and noisy one. Blurring of an image can be caused by many factors. Movement during the capture process and using long exposure times are the main causes. A blurry image, denoted as B , is generated by the convolution of a sharp image I_0, and a generic blur kernel, denoted as K_0

$$B \approx I_0 * K_0$$

Blind deconvolution is to recover the sharp image I_0 when the blur kernel K_0 is unknown. In this work Image deblurring is done by using spectral properties of convolution operators. In this work, we derive an effective regularizer for the blur kernel. This regularizer is based on a well-known observation. Blurry images are usually low-pass and sharp images are often high-pass.That is blurring can decrease the image frequencies in Fourier domain. For a given image consider its convolution with any other matrix. The spectrum (Fourier frequencies) of the linear operator for a blurry image should be significantly smaller than that for its sharp part.

Based on this observation, we can derive convex regularizer which tends to be minimal at the blur kernel of desired, K_0. Given an image B represented by a certain image feature L. A convex function denoted as $h^{L(B)(}K)$ can be derived from the image. Desired kernel K_0 can be approximately retrieved by minimizing $h^{L(B)(}K)$ This convex kernel significantly benefit the solution of the blind deconvolution problem.

In addition to these blurring effects, noise always affect the image. Noise may be introduced at the time of capturing or transmission of the image. Progressive method of image denoising[2] is used in this work. Progressive image denoising (PID) is based on deterministic annealing and robust noise estimation. Deterministic annealing (DA) is a method that solves the complex optimization problems where many local extrema exist. Progressive image denoising combine deterministic annealing with redescending M-estimators.

In this paper we propose an efficient method for image denoising and image deblurring.Denoising is done by progressive image denoising. Then we use spectral properties of convolution opeartors for blind image deblurring.[1].

We describe the method in three parts.In the first section we present progressive image denoising.Then in the second section we present the image deblurring method. Processing blocks of this image restoration method is given below.

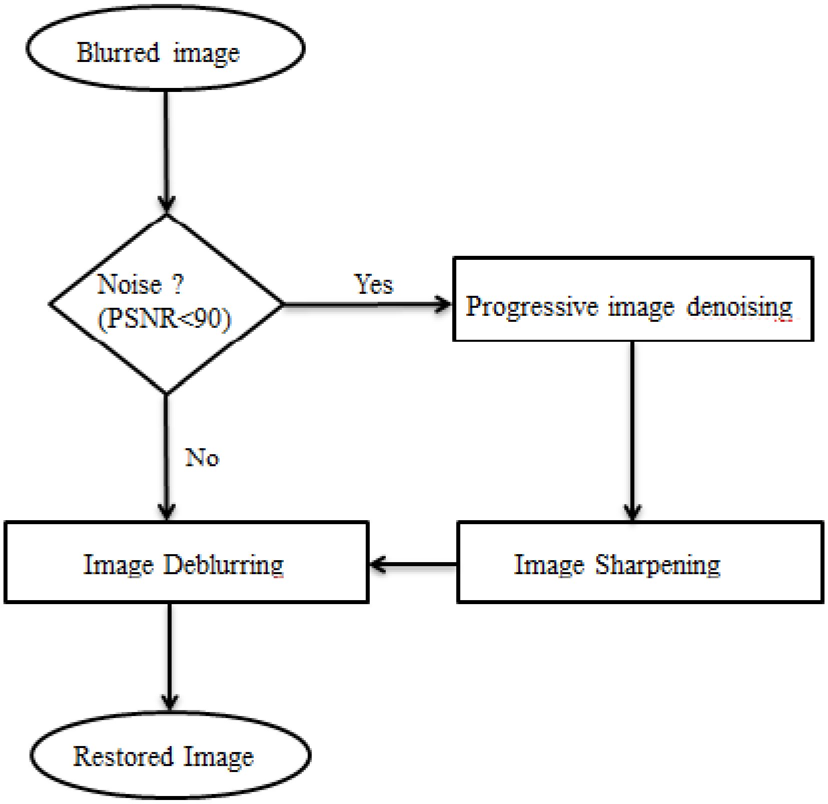


Figure 1: Processing blocks of the image restoration

Progressive Noise Removal

A signal x has been contaminated with additive white Gaussian noise n and variance σ^2. The task is to decompose the degraded signal y into original signal x and noise n.

$$y=x+n \tag{1}$$

In practice, we can only estimate decomposition. Thus, we formulate denoising as a gradient descent with

$$x_{i+1} = x_i - \lambda \nabla E(x_i) \tag{2}$$

The scale factor λ controls the step size in the direction of the gradient descent .Gradient of this energy, $\nabla E(xi)$, can be estimated as a noise estimate n_i . Substituting $\nabla E(x_i) \rightarrow n_i$, we get

$$x_{i+1} = x_i - \lambda\, n_i \qquad (3)$$

Robust Noise Estimation

To compute the noise estimate n_i for iteration *i* ,distinguish signal from noise. Noisy signal can be classified into three types. Large amplitude signals and medium amplitude signals and small amplitude noise. Large amplitude signals can be detected in the spatial domain. When the amplitude of the signal is smaller it is more similar to the noise. Signal is auto-correlated and noise is uncorrelated. Robust estimators reject large amplitude gradients in the spatial domain .Medium amplitude signals are rejected in the frequency domain, Then we can estimate the small amplitude noise.

In the spatial domain, where we remove large amplitude signals. We consider pixel p and pixels q in a neighbourhood window Np with window radius r. Then subtract the center pixel value $x_{i,p}$ from all the neighboring pixels $x_{i,q}$ yielding a “gradient” $d_{i,p,q}$ as

$$\boldsymbol{Di,p,f = \sum d_{i,p,q} k_r\left(\frac{\left|d_{i,p,q}\right|^2}{T_i}\right) * k_s\left(\frac{|q-p|^2}{Si}\right) e^{-j\,\frac{2\prod}{2r+1} f.(q-p)}} \qquad (4)$$

Similar procedure is performed in the frequency domain. Remove medium amplitude signals in the frequency domain to obtain the remaining small amplitude noise. Thus, we use another range kernel *K* to mask out large Fourier coefficients $D_{i,p,f}$ .Then estimate the noise by taking the center pixel after inverse Fourier transforming the signal.

$$\boldsymbol{n_{i,p} = \frac{1}{(2r+1)^2} \sum_{f \varepsilon F_p} D_{i,p,f} K\left(\frac{|D_{i,p,f}|^2}{V_i}\right)} \qquad (5)$$

Image Deblurring

Blind deconvolution is to recover the sharp image I_0 when the blur kernel K_0 is unknown. Image gradient based regularizers generally favor a blurry solution over a sharp one. Hence regularize the kernel variable K. we can derive a novel convex regularizer, denoted as $h^{L(B)(}K)$. This regularizer tends to be minimal at the desired blur kernel, K_0. This regularizer is based on a well-known observation.Blurry images are usually low-pass and sharp images are often high-pass.That is blurring of an image can largely decrease the image frequencies in Fourier domain.

For a given image ,that is matrix consider its convolution with any other matrix. Then the classical observation suggests that the spectrum (the set of eigenvalues, that is , the Fourier frequencies of the blurry image should be significantly smaller than sharp image.

Given an observed image B,which is represented by an image feature *L*, we derive a convex function, denoted as $h^{L(B)(}K)$.

$$h^{L(B)(}K): R^{m1\times m2} \rightarrow R \qquad (6)$$

The desired kernel K_0 can be approximately retrieved by minimizing $h^{L(B)(}K)$ directly. Experimental performance of deblurring algorithm is surprising. This algorithm can restore a sharp version,even when the observed image is blurred to the extent where human eyes cannot recognize its details. Convex kernel regularizer is effective for various blurs such as motion blur and de-focus.

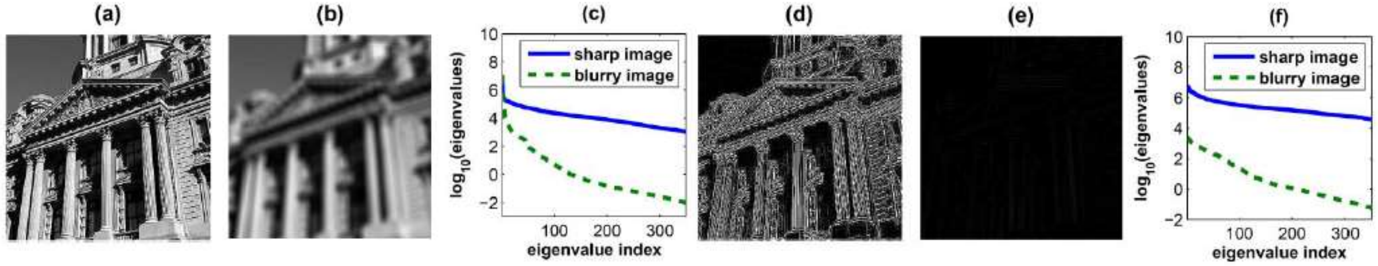


Figure 2: (a) Sharp image (b)The blurry image created by the convolution of sharp image with a Gaussian kernel. (c) Plots of all convolution eigenvalues of the sharp and blurry images, using L = δ. (d) Edges of sharp image, using L = LoG. (e) The edges of the blurry image (f) Plots of convolution eigenvalues of the sharp and blurry images, choosing L = LoG.

Figure 2 shows that blurring could significantly reduce the image frequencies or convolution eigenvalues. obtain an approximate estimate of the desired blur kernel K_0 by

$$K_0 = \text{argmin}_k \, h^{L(B)(}K) \qquad (7)$$

Where S denotes the $(m_1m_2 - 1)$-dimensional simplex, and $\{m_1,m_2\}$ are the sizes of the blur kernel. Where $h^{L(B)(}K) = (\nu(K))^T H\nu(K)$ with the Hessian matrix H given by

$$H = \sum_{i=1}^{s1s2} \frac{(A_{m1,m2}\left(k_i^L(B)\right))^T A_{m1,m2}\left(k_i^L(B)\right)}{(\sigma_i^L(B))^2} \qquad (8)$$

Algorithm for Computing the Hessian Matrix H is given below.Then fixing the blur kernel *K*, the estimate of the image is updated by $\min\|B-I*k\|_F^2 + \lambda\|\nabla I\|$ which can be solved by any of the many non-blind deconvolution algorithms. We use Fast image deconvolution using hyper-Laplacian priors[3].

Algorithm

Input:Blurry image

Parameters:Kernel sizes$\{k_1,k_2\}$ and Sampling sizes$\{s_1,s_2\}$

1.Compute the edge map of B by L(B)=B*LoG.

2.Compute the convolution matrix $A_{s1,s2}(L(B))$.

3.Let $M=(A_{s1,s2}(L(B)))^T A_{s1,s2}(L(B))$. Then obtain the convolution eigenvalues $\boldsymbol{\sigma_i^L(B)}$ and eigenvectors $\boldsymbol{k_i^L(B)}$.

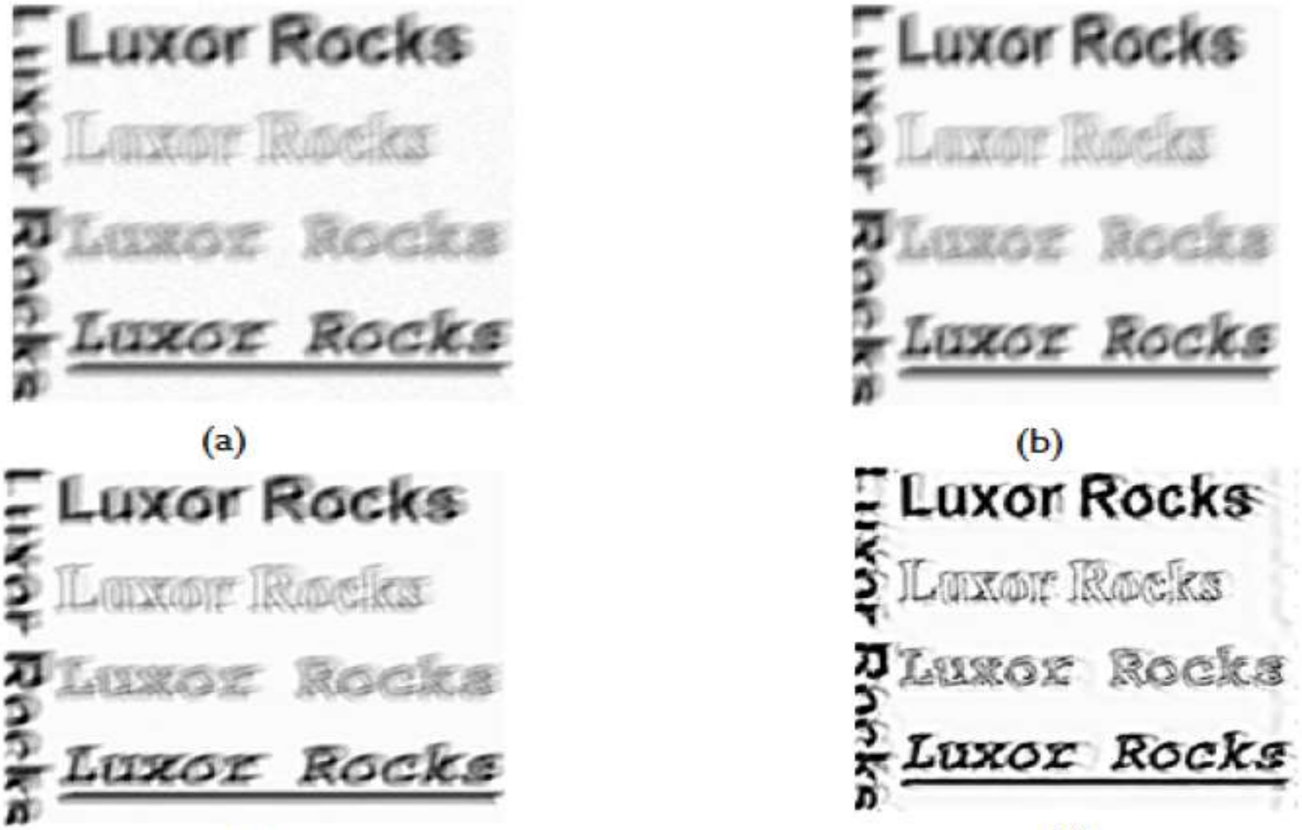
4. For each $\boldsymbol{k_i^L(B)}$., compute its convolution matrix $A_{k1,k2}(\boldsymbol{k_i^L(B)})$.

5. Compute the Hessian matrix H using equation 8.

Output:H

Experimental Results

We present the results of our algorithm. We analyze the denoising and deblurring process for the given text image. Figure 3 shows the results.



(a) (b)

(c) (d)

Figure 3: (a) Image degraded by blur and noise (b) Denoised image (c) Sharpened image (d) deblurred image

CONCLUSION

An efficient method for image restoration is presented in our paper. Restoration is done by denoising followed by deblurring.In progressive denoising first, we perform a gradient descent by progressively estimating noise differentials and subtracting them iteratively from the noisy image. Second, the noise differentials are estimated using robust kernels in two spatial domains. Third, the kernel scale parameters are modified according to an annealing schedule.In deblurring process,by studying spectral properties of convolution operator, we have derived a convex regularizer on the blur kernel. For the blind deconvolution problem, this convex regularizer can deal with various types of blurs.

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MODEL TO MITIGATE VISUAL POLLUTION BY ADS AND SIGNAGE FOR URBAN UNISON

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Abstract— Generally neglected Visual Pollution is important part of urban studies. It is often left out in policy as it is quite difficult to measure visual pollution and aesthetics depend on people's tastes. Unlike other types of pollutions it is also a subject to fewer regulations. Architects and façade designers complete their job and are out of the scene. Layman unaware of importance of visual quality needs to be sensitized, educated or enforced regarding the matter. Major market places or urban tourist attraction spots in our country are suffering from the ill that is visual imbalance due to advertisements of brands. Will people of India take the support of *Brandalism* for the urban aesthetics or the jurisdiction will take a smart step with emergence of smart cities. The aim of the paper is to discuss the various aspects of ill visual urban design in the context of advertisement boards & signage and the need of a strong policy against market visual pollution. The main argument that is focused on is that, these aspects of visual pollutions are shaped not only by the individual's perspective, experience, need or values, but essential consideration should also count objective attributes of marketplaces, buildings and commercial signs and advertisements such as typography, order, complexity, and contrast. Importance of both visual uniformity and variance with objective approach is discussed. Everything is considered and brought up in Indian context, with various examples from different cities.

Keywords— Visual Pollution, Urban Aesthetics, Urban Design, Typography, Vandalism, Advertisements, Signage, Visual Rhythm.

INTRODUCTION:

Markets are integral part of streets system in any urban setup. Marketing plays a functional role in all economic or uneconomic areas of business and advertisement is the necessity of markets. Economic and industrial development includes a lot of advertisement and is often paired with visual pollution. Signage, posters, billboards, banners that are not properly designed, arranged, located and planned are the main reasons behind visual pollution and hence markets are blamed. In this paper we have discussed a model that can be useful in mitigating visual pollution by advertisements and how jurisdiction can play vital role in the process.

LITERATURE STUDY:

Streets and their Urban Importance

Streets in any typical city, occupy an approximate area of 18-20 percent. They are considered most important, integral and ubiquitous form of all the public space in any city like markets, plazas parks etc. Streets in some or other way play a role as stage on which the drama or features of urban life are performed every day. The phenomenon and the characteristics of streets are not new to the society—streets have played the same role since the evolution of cities and towns. Streets amongst all the most valuable assets in any city rank on top. Along with ensuring residents' mobility and commute the also are a place for people to interact, to do business, to meet or have fun. Streets can make any city more livable. [1]

What is Visual Pollution?

Urban space is a fundamental component of the city. Usually, being located between the buildings and parcels, the term urban space is referred to streets, squares and other public places owned by a municipality. Residing on the property border, urban spaces possess complex properties, which are regulated by the multiple urban factors. This enormous complexity of the urban space and wide range of its users makes it vulnerable to the impact of different kinds of pollution. Not counted among physical or chemical pollution, Visual pollution is a mental aspect. Visual contaminants look less harmful, but according to numerous researchers, visual pollution offends our vision, spatial orientation, and psychological state, damaging many aspects of human lifestyles and economic health of the communities. [2]

What is the measure of Visual pollution?

In recent years, there has been considerable interest in the problems that public spaces face because of the design of commercial signs. The negative consequences that commercial signs can have on the visual quality of urban areas and furthermore, on people's quality of life, has been studied from both architectural, planning and psychological perspectives. While the issue of visual pollution, as this phenomenon is commonly described, has been widely debated, there is as yet no clear conclusion as to how it can be measured and checked. The issue is very subjective as different urban contexts and people from different backgrounds and cultures have universal or distinct visual preferences. Several different commercial signage approaches are currently applied to different historic cities, but these initiatives are not based on principles derived from the perception and evaluation of users. Advertising and commercial signage definitely needs to be measured, controlled and managed. [3]

Figure 23 Example of Visual Pollution due to advertisements in New Delhi.

What is *Brandalism*?

Brandalism is a term came from phrase brand-vandalism, it is an anti-advertising movement founded in July 2012 in London. Twenty-six British artists ran a "subvertising" campaign, whereby they covered billboard adverts in five English cities with art pieces. In May 2014, 40 Brandalism activists replaced 365 outdoor advertisements in 10 British cities [4], at bus stops and elsewhere, with monochrome art. The posters were intended to evoke an anti-advertising sentiment. Over the weekend, several gangs of guerilla artists asked no one's permission to replace hundreds of corporate ads with giant artwork in cities all over the United Kingdom. This large-scale exercise in culture jamming is the work of Brandalism, a group whose mission is to "revolt against corporate control of the visual realm. Ad-busting crews organized by Brandalism swapped out ads in public spaces in 10 UK cities with "lovingly hand printed" black-and-white posters made by international artists. [5]

DESIGN AS A TOOL TO BRING "ELEMENT-OF-INTEREST" ON STREET

To achieve the setup on street that boosts the environment on street and make it more livable and an interesting commodity, design can be used as tool. If the street was to be considered as canvas to do experiments the adjacent features of streets can be taken in consideration as background and foreground can be worked out by trial and error or even behavioral studies. Three different aspects of design can be used to bring aesthetics and life to streets. The combination of Urban Design, Visual Design Product Design can be used to bring among very essential, simple, monotonous or bold elements of street some interest, with use of some emphasis, balance, contrast, repetition, movement harmony, unity or such principle of design.

PSYCHOLOGICAL IMPORTANCE OF STREETS WITH BEST VISUAL QUALITIES:

Psychologists say that streets foster socio-economic bonds among people who share streets at the same time, bringing people together. The mentally pleasing system around streets and street collectively is called streetscape, elements in such environment improve psychological well-being by reducing stress, restoring attention, and increasing positive emotions and aesthetic values. [6] Studies have demonstrated that increasing the amount of pleasing elements in an urban environment improved individuals' well-being In particular, natural elements in urban landscapes can help people pay attention or restore their capacity to pay attention. Kaplan and

Kaplan's Attention Restoration Theory (ART) proposes that individuals' directed attention has limited capacity which becomes depleted when processing non-fascinating information about one's environment or performing attention demanding tasks. [7]
It is generally the visual entity of space that sets its perception of a human as an urban place. We perceive our urban environment as collage of image. According to Lynch, the readability of urban space is the easy perception of the urban space and the facility of organization of it as a certain texture. An orderly and readable urban space can be a concrete reference system, or activity and information regulator. He lists the paths, edges, districts, nodes and landmarks as the readability elements of the urban space. He states that harmony, arrangement, and simplicity are the necessary features for readability of an environment [8]. The quality of visual environment is noticed on the sub-conscious level. Images we see become more or less obstructed by the 'visual garbage' observed in the contemporary city. [9]

HOW BAD VISUALS OR SIGNAGE AFFECT ONES MEMORY:

Memories of pleasing visuals have a persistence and vividness that other memories from other stimulus seem to lack. Abundant examples for this are found in the literature, similarly, we all have intense and detailed memories of events such as the birth of a child or the death of a loved one, visuals of events that create emotions. [10] The psychologist William James wrote that "an impression may be so exciting emotionally as almost to leave a scar upon the cerebral tissues" [11]. The term memory itself refers to a whole class of images, thoughts, and feeling, which when we experience them, have the quality of coming back to us from the past. Bad visual from anywhere can bring back bad memories or also can settle itself as a bad memory in one's mind. Sights are important in stimulating memories, as so much of settings' features are perceived by seeing. Settings that have a strong identity and prominent features call back more memories of previous experiences in them than do those with few recognizable features, a fact that seems to have been overlooked in the majority of development project in our country over the past. The effectiveness of identifiable feature is one reason why historic sites with strong traces of the past are often so evocative.

Figure 24 Bad Memory setting in Market in Kolkata (South)

HOW URBAN UNISON CAN BE ACHIEVED

It can be done with help of user perception surveys, public voting trial and error, etc. as far as practical methods are concerned.
On the other hand, theoretically, an environment behavior approach can be taken in consideration for the purpose. Concepts and methodologies related to architecture, urban design and planning, environmental psychology.
Methodology of A sample of tool to mitigate visual pollution and achieve urban unison.

1. **Mapping the sources of visual pollution.**

Major market visual pollution sources or reasons can be classified as:
Negligence of Municipal Authorities
With a considerable period of time maximum local authorities related to development of cities in India lose the track and control over what is being built or clustered or assembles in public spaces. Major factor behind this is the change of government or people in power. Authority have very little knowledge of what and where is displayed and it becomes difficult to mend the visual aesthetics no matter who owns the property.

Business oriented Development:
Logic, rhythm, architecture, organization, cleanliness and space harmony must be kept while working in an urban jungle but the business interest and profit greed overcomes it all but they are all suffering because of the business interests and the greed of obtaining the profit.

Lack of Planning:

Other ills in the visual environment are the result of location of all kinds of urban elements like transport stations, waste disposal services, huge advertisement panels that are so powerfully illuminated that they not just photo-pollute the area but also can blind drivers at night. Shops, booths, kiosks are other such examples.

Excessive Advertising:

The existence of suffocating giant display boards, general display boards outside the shops of a very busy market like Sarojini Nagar, New Delhi are examples of area affected by excessive advertising. The much noted complaint against such advertising is that it is too much of advertising and that is very annoying.

Vandalism:

May it be in the from the Graffiti mentioned in law as disturbing or offensive messages, dirty content or obscenities, street presence as markings of different cultural or even criminal groups, all created, painted or installed without the owner's consent of course or in the form of ads or display on shops, it is visual pollution and just like graffiti illegal ads shall also be considered crime.

Figure 25 A combination of political posters and painted ad on wall as an example of Vandalism, New Delhi.

2. **Collecting information on the history and cultural morphology of the city.**
   This will help us to keep in mind the points while designing visuals for the city, like culture, history, beliefs and customs of the people living in the city, as these are important aspect of design as far as India is concerned**.**

3. **Studying the evolution of city's planning.**
   Starting from the first development plan, all plans must be studied that are made up to current date this will help in identifying the land-use shits and expansion of the city and dada related to demographics to make future projections.

4. **Studying elements that have become identity of city over time.**
   This can be anything, a place, a thing a food item, an animal as mascot or the planning itself as in the case of Chandigarh.
5. **Synthesis**
   Of the visual needs or finding the scope of design alteration as far as urban visuals and advertisements are considered.
6. **Amendments**
   In the rules and regulation associated with advertisements and signage.
7. **Evaluation and assessment.**
   In the form of survey and comments from experts from related fields in exclusive seminars and conferences.

EXAMPLES OF URBAN AREAS WITH AUTHORITIES INVOLVEMENT IN THE VISUAL POLLUTION ISSUE

1. International Examples

- **Beijing:** When it comes to regulate the advertising to check visual pollution, the city of Beijing is considered as pioneer. In the city there is a special commission to review the layout of any street advertisement. The considerations and rules of this commission includes polluting or beneficial role of advertisement, may it be social aspect of consent or the design as in visual aspect, the harmonization with a particular urban area and how possibly the ad can distract the driver and up to what degree.
- **United States of America:** A limitation on the size and number of panels according to various criteria, such as the number of houses on a street or location of market is witnessed in USA. In certain areas there are allowed only small panels, the large ones being history. States such as Alaska, Vermont, and Maine have partially or totally banned them and in about 1500 cities, the outdoor advertising is prohibited.
- **The Czech Republic**: took a number of measures on the visual pollution caused by the excessive use of neon.
- **Moscow**: Has a regulation about small size of the outdoor advertising.
- **Brazil:** The most radical response was recorded in Sao Paulo, where the population has exceeded 11 million. The outdoor advertising is considered illegal here. The metropolitan local council decided it in September 2007, which triggered strong reactions from firm's discontent. For example, lawyers from America `s Clear Channel Outdoor, the largest firm in the world, considers this decision as unconstitutional, saying that it would lead to the destruction of business and, therefore, they sued the government. The „Clean City" Law prohibits advertising on public transport and strictly regulates what can appear on the frontispiece of the shop signs. The residents have noted that Sao Paulo became a more beautiful and clean city after this demarche. Taking the example of the city which became free in terms of advertising and being inspired by its success, the authorities in Rio de Janeiro, Porto Alegre and Brasilia discussed similar measures. [12]

2. Indian Example

Jaipur: Shopkeepers of Markets like Badi Chopad, Bapu market and many others on the grid of city, have signed a MoU with the municipal authority that they will not use any other color or size of the pane that displays the name of the shop and will always be hand painted to maintain the authenticity and rhythm with the urban design identity of these markets in Jaipur.

Figure 26 Visual Pleasure in advertisement in Bapu Market, Jaipur

CONCLUSION

It is a very obvious fact that no one will give up the trend of advertising. Why would one, when public spaces are best means to convey information and earning by renting such places. In the paper we discussed about a methodology as solution to the problem. The aim was to keep the solution on the mid track considering both the aspects. Along with the solution discussed, the rapid introduction to the new communication technologies can also help in reducing this criticism. Every expert related to both the sides of discussion agree that advertising does play an important role in providing information to the mass products, shop locations, product prices and different markets. These are the basic and economic functions of the idea of advertising. But subjective approach to the matter can help creating better visual environments on Indian streets.

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Emission of acoustic sources of noise in the industrial plants

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Abstract- Reviewing legal and normative acts that have been put into practice in recent years, it can be observed that the issue of acoustic emissions is more and more emphasized as a negative effect of anthropogenic activity. Monitoring of acoustic threats showed that there are sectors in the industry having high influence on the components of environment due to non-adjustment to EU standards. This situation creates a huge research space that should help to keep emission rates through selecting appropriate protection measures (also

through constructional changes of newly designed devices and industrial systems)

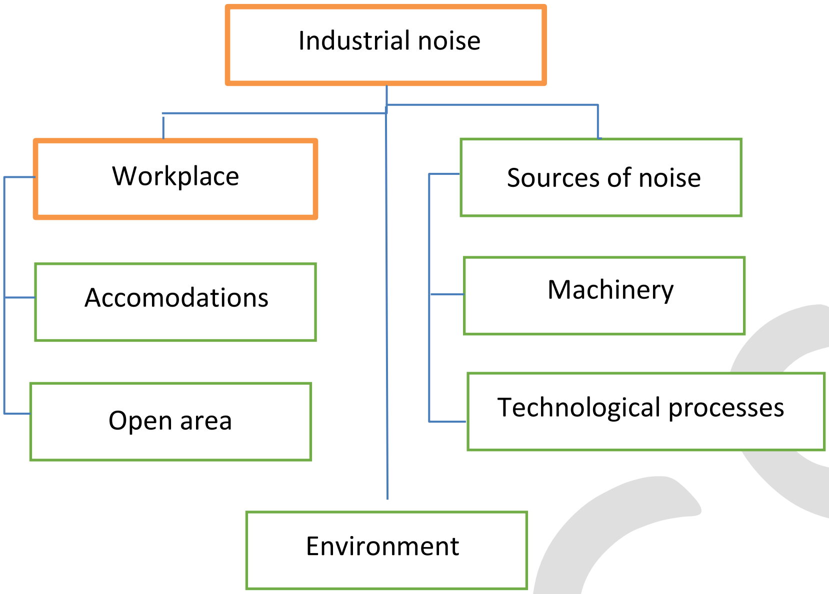
Keywords: noise, industry

Introduction

Noise is defined as every sound, which is unwanted, bothersome or even harmful to health. Harmfulness or nuisance of noise depends on its volume, frequency, character of changes in time and inaudible components, as well as such traits as health state, age, mental condition and individual sensitivity to sounds of every human.

One of the main sources of noise are technical installations and industrial plants [2, 4, 6, 8, 21]. Regardless of the technological process conducted in a plant, its machines are often based on elementary devices and apparatuses configured in different ways and belonging to different series of types.[22] As a result, different technological processes can be realized by the same devices, for example, bending brakes, laser cutters, stoves or fans having different parameters of work and various locations in a technological cycle. (Fig. 1) Level of sound emitted by the sum of these production means of industrial products depends on:

- type of technological process realized in an industrial plant,
- degree of mechanization and automation,
- type and configuration of machines,
- technical state of machines,
- form of operation of machines.



Rys. 1 Industrial noise

Limiting the danger of environment noise and vibrations depends on many factors. As a result, it is necessary to:

- conduct research and implementation works related to reduction of emission form sources of noise,
- create mechanisms forcing quick implementation of new, less noisy, but more reliable means of production and transport,
- introduce mandatory common attestation of devices emitting vibroacoustic energy to environment (permanent supervision of new products, periodic supervision of exploited means of production and transport),
- eliminate the use of means of production and transport which are based on too noisy technologies and implementing quiet technologies, automation and robotization – in order to minimize noisy processes,
- attestation and control bodies must become fully independent from producers and users of means of production and transport,
- working out and implementing legal acts (working out new ones, amendments to regulations and norms), regulating these issues [5,6,7],
- working out a system of circulation of information about the state of acoustic climate,

Above factors depend on creating an appropriate legal and economic system that will stimulate taking various activities. A basic threat for a human – a threat for civilization – can be reduced.

1. Classification of source types (point, line, area)

The industrial sources are of very variable dimensions. They can be large industrial plants as well as small concentrated sources like small tools or operating machines used in factories. Therefore, it is necessary to use an appropriate modelling technique for the specific source under assessment. Depending on the dimensions and the way several single sources extend over an area, with each belonging to the same industrial site, these may be modelled as point sources, source lines or area sources. In practice, the calculations of the noise effect are always based on point sources, but several point sources can be used to represent a real complex source, which mainly extends over a line or an area.

The real sound sources are modelled by means of equivalent sound sources represented by one or more point sources so that the total sound power of the real source corresponds to the sum of the single sound powers attributed to the different point sources.

The general rules to be applied in defining the number of point sources to be used are:

- line or surface sources where the largest dimension is less than 1/2 of the distance between the source and the receiver can be modelled as single point sources,
- sources where the largest dimension is more than 1/2 of the distance between the source and the receiver should be modelled as a series of incoherent point sources in a line or as a series of incoherent point sources over an area, such that for each of these sources the condition of 1/2 is fulfilled. The distribution over an area can include vertical distribution of point sources,
- for sources where the largest dimensions in height are over 2 m or near the ground, special care should be administered to the height of the source. Doubling the number of sources, redistributing them only in the z-component, may not lead to a significantly better result for this source,
- in the case of any source, doubling the number of sources over the source area (in all dimensions) may not lead to a significantly better result. The position of the equivalent sound sources cannot be fixed, given the large number of configurations that an industrial site can have [9]

2. Sound power emission

You must have information on the input data shown below to calculate the propagation of sound:

- Emitted sound power level spectrum in octave bands
- Working hours (day, evening, night, on a yearly averaged basis)
- Location (coordinates x, y) and elevation (z) of the noise source
- Type of source (point, line, area)
- Dimensions and orientation
- Operating conditions of the source
- Directivity of the source.

The point, line and area source sound power are required to be defined as:

- For a point source, sound power L_W and directivity as a function of the three orthogonal coordinates *(x, y, z)*,
- Two types of source lines can be defined:
- source lines representing conveyor belts, pipe lines, etc., sound power per metre length $L_{W'}$, and directivity as a function of the two orthogonal coordinates to the axis of the source line,
- source lines representing moving vehicles, each associated with sound power L_W and directivity as a function of the two orthogonal coordinates to the axis of the source line and sound power per metre $L_{W'}$, derived by means of the speed and number of vehicles travelling along this line during day, evening and night; The correction for the working hours, to be added to the source sound power to define the corrected sound power that is to be used for calculations over each time period, C_W, in dB, is calculated as follows:

$$C_W = 10 \times \lg\left(\frac{T}{T_{ref}}\right) \qquad (2.1)$$

where:

V Speed of the vehicle [km/h];

n Number of vehicles passages per period [-];

l Total length of the source [m],

- For an area source, sound power per square metreL_W/m^2, and no directivity (may be horizontal or vertical). The working hours are an essential input for the calculation of noise levels. The working hours shall be given for the day, evening and night period and, if the propagation is using different meteorological classes defined during each of the day, night and evening periods, then a finer distribution of the working hours shall be given in sub-periods matching the distribution of meteorological classes. This information shall be based on a yearly average. The correction for the working hours, to be added to the source sound power to define the corrected sound power that shall be used for calculations over each time period, C_W in dB, is calculated as follows:

$$C_W = 10 \times \lg(\frac{T}{T_{ref}}) \qquad (2.2)$$

where:

T is the active source time per period based on a yearly averaged situation, in hours;

T_{ref} is the reference period of time in hours (e.g. day is 12 hours, evening is 4 hours, night is 8 hours).

For the more dominant sources, the yearly average working hours correction shall be estimated at least within 0,5 dB tolerance in order to achieve an acceptable accuracy (this is equivalent to an uncertainty of less than 10 % in the definition of the active period of the source).[9]

3. Source directivity

The source directivity is strongly related to the position of the equivalent sound source next to nearby surfaces. Because the propagation method considers the reflection of the nearby surface as well its sound absorption, it is necessary to consider carefully the location of the nearby surfaces. In general, these two cases will always be distinguished:

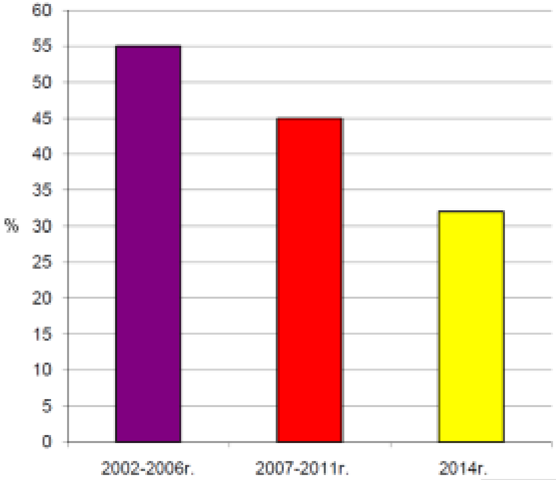
- a source sound power and directivity is determined and given relative to a certain real source when this is in free field (excluding the terrain effect). This is in agreement with the definitions concerning the propagation, if it is assumed that there is no nearby surface less than 0,01 m from the source and surfaces at 0,01 m or more are included in the calculation of the propagation,
- a source sound power and directivity is determined and given relative to a certain real source when this is placed in a specific location and therefore the source sound power and directivity is in fact an 'equivalent' one, since it includes the modelling of the effect of the nearby surfaces. This is defined in 'semi-free field' according to the definitions concerning the propagation. In this case, the nearby surfaces modelled shall be excluded from the calculation of propagation.

The directivity shall be expressed in the calculation as a factor $\Delta L_{W,dir,xyz}(x, y, z)$ to be added to the sound power to obtain the right directional sound power of a reference sound source seen by the sound propagation in the direction given. The factor can be given as a function of the direction vector defined by (x,y,z) with $\sqrt{x^2 + y^2 + z^2} = 1$ This directivity can also be expressed by means of other coordinate systems such as angular coordinate systems. [9]

4. Industrial noise in Poland

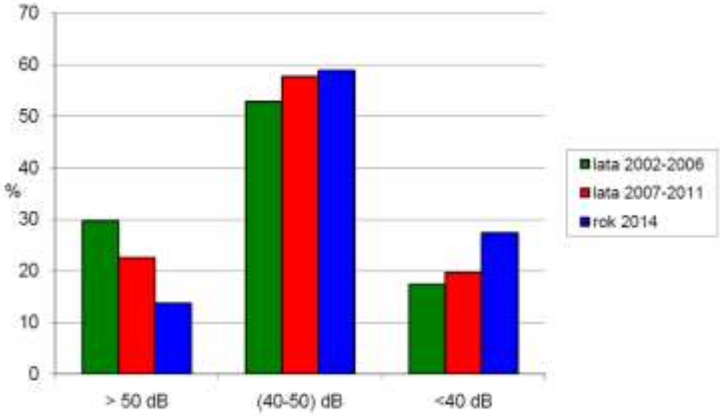
Assessment of the state of acoustic climate in Poland within industrial noise showed considerable decrease in number of plants that exceed permissible noise levels.

According to summary of previous five-year cycle (2007 – 2011), 45 % of examined plants exceeded permissible levels of noise. Whereas, on December 31, 2014, this percentage was only 32. (Fig. 2)

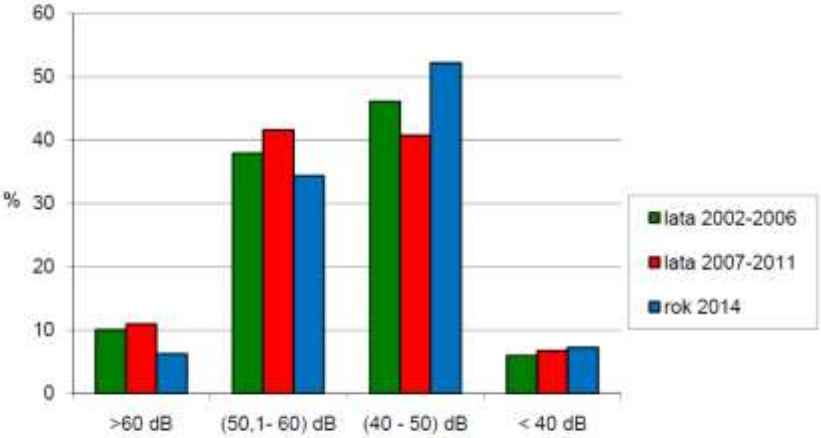


Rys. 2 Downward trend of measurements with exceeded permissible noise levels in the years 2007 – 2014 [2]

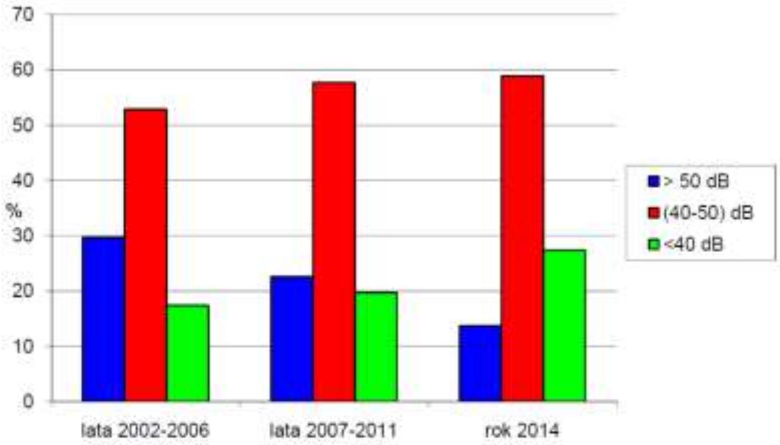
Discussed downward trend of measurements with exceeded permissible noise levels for industrial noise can be seen in the summaries below (Fig. 3- Fig. 7), which are the lists of results from 2014 with results for previous five-year cycles:



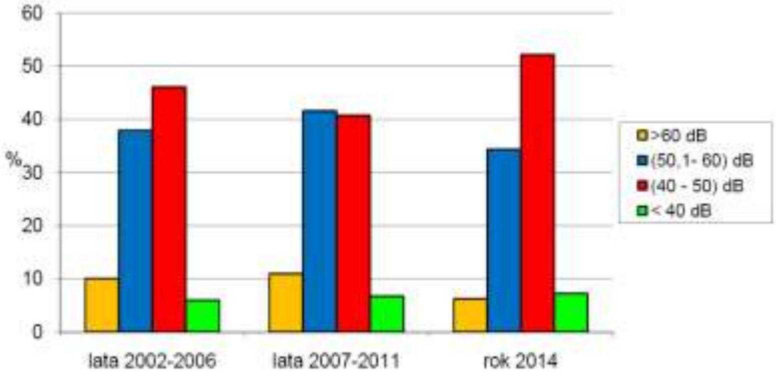
Rys. 3. Levels of noise emission of the plants in particular classes – night-time. Summary of the reporting year (2014) with results for previous five-year cycles *(lata-years, rok- year)* [2]



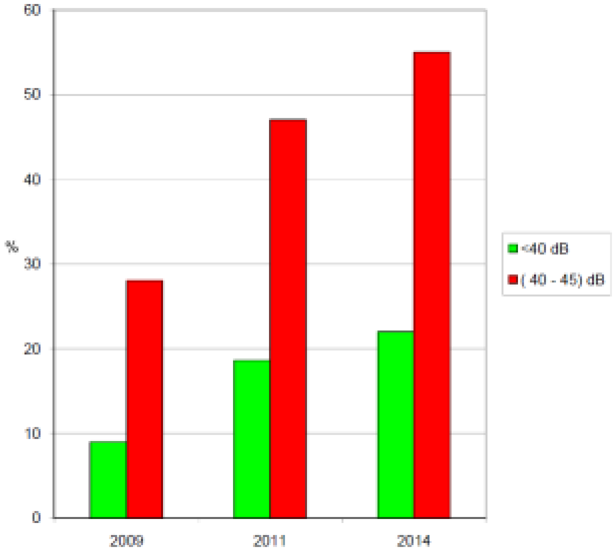
Rys. 4 Levels of noise emission of the plants in particular classes – daytime. Summary of the reporting year (2014) with results for previous five-year cycles *(lata-years, rok- year)* [2]



Rys. 5 Summary of the reporting year (2014) with levels of noise emission of the plants in particular decibel classes for previous five-year cycles – night-time *(lata-years, rok- year)* [2]



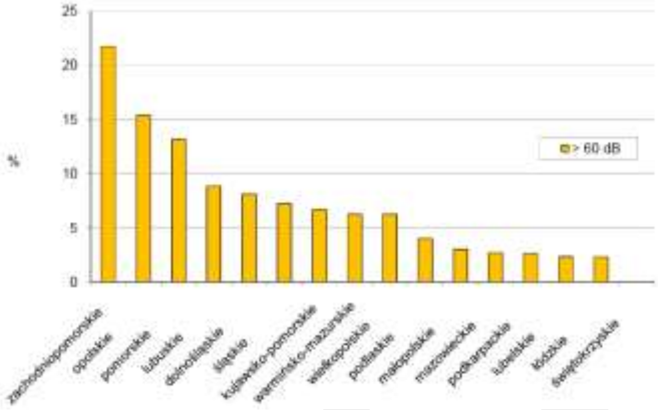
Rys. 6. Summary of the reporting year (2014) with levels of noise emission of the plants in particular decibel classes for previous five-year cycles – daytime *(lata-years, rok- year)* [2]



Rys.7. "Quiet" measurements of industrial noise in general number of measurements of industrial noise. [2]

The summaries (Fig. 3- Fig. 7) shows significant reduction of noise emission of the plants, in which measurements were performed in the last decade. It was achieved, on the one hand, by implementing protective measures. On the other hand, until the end of 2007, analysis of the state of acoustic climate within industrial noise was based only on measurements performed by wioś. On January 1, 2008, change of Environmental Protection Law was put in force and analyses were carried out both in „quiet" plants (in which measurements must be performed in accordance with art. 147 of Environmental Protection Law) and "noisy" plants.

Overall statistics concerning the noisiness of controlled plants in particular voivodeships and across the whole country can be seen on Fig. 8 below:



Rys.8 The percentage of number of controlled plants with high levels of emission (above 60 dB) in total number of examined plants – daytime [2]

Voivodeships with high percentage of measurements from art. 147 of Environmental Protection Law (Świętokrzyskie, Łódź, Mazovia, Subcarpathian) can be seen in the final part of Fig. 8. It should be added that on the Polish scale, almost half of recorded plants are measurements performed within art. 147 of Environmental Protection Law.

Conclusions

An attempt, in both European Union and Poland, to coordinate the fight with noise is one the development phase. It includes defining and standardizing methodology of measurement of noise across the European Union, checking current state of acoustic climate and building databases and implementing instruments limiting noise or protecting areas not exposed to this pollution.

Developing strategies of limiting noise should be made in two directions. On the one hand, through administrative regulations, setting and control of permissible noise levels. On the other hand, long-term educating of society about health effects of exposing to noise and changing individual and collective behaviours.

According to the measurements performed in 2014, only 32 % of plants exceeded permissible noise levels. The highest percentage of plants bad for environment was in the voivodeships: Pomeranian, Lower Silesia, Lublin, Opole, West Pomeranian, Lesser Poland. In 2014, the most noisy objects included mills, heating plants, as well as air conditioners and sound systems. Delivery transport at night is also a nuisance for a neighbourhood.

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Content Based Image Retrieval Using Color Histogram and Wavelet Based Color Histogram (WBCH) Algorithms

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Abstract: Content Based Image Retrieval (CBIR), also known as Query By Image Content (QBIC) uses low level features of an image such as color, shape and texture to search images from large image databases based on user's interests for a given input query image. In this paper two algorithms Color Histogram and Wavelet Based Color Histogram (WBCH) have been implemented. Color Histogram algorithm is used for color feature extraction using Color Histogram and WBCH algorithm is used for both color and texture feature extraction using dwt2 wavelet transformation from both query image and images in the image database for retrieving the similar images from the large image database to the user's input query image. The images which are retrieved as result in both algorithms are then compared on the basis of values of the parameters which shows that Wavelet-Based Color Histogram algorithm is better than Color Histogram algorithm in terms of retrieval time as it takes less time in retrieving the images.

Keywords: CBIR, Color Histogram, WBCH

1. INTRODUCTION

Content Based Image Retrieval (CBIR) was first introduced in the early 1980s. It uses low level features of an image such as color, shape and texture to search images from large image databases based on user's interests for a given input query image. CBIR is used in crime prevention, medical profession, architectural and engineering design, publishing and advertising, historical research, commerce, government, fashion, weather forecasting, remote sensing etc. [4]. One of the main task for CBIR is similarity comparison, extracting feature of every image based on its pixel values and devising rules for comparing images. The various components of CBIR are query image, image database, similarity matching and feature extraction [2]. Query image is the image submitted by the user to the retrieval system in search of desired images in the image database of digital images. The various query formations are category browsing, query by concept, query by sketch, query by example. Image database consists of all the images present in the database such as COREL database, Caltech database, Oliva database, Outex database etc. Similarity matching means comparing the values of the pixels of the image. There are various methods for similarity matching like histogram intersection distance, Euclidean distance, relative standard derivation, Bhattacharya distance, Mahalanobis distance etc. Feature extraction means extracting unique and valuable information from the image. Features of an image are also called signature of image. Features are classified into low level features (color, texture), middle level features (shape) and high level features (semantic gap of objects). The various methods for color and texture feature extraction are Color Histogram, Color Correlogram, Color Moments, Gabor Filter, Haar Discrete Wavelet Transform, Tamura Feature and Gray Level Co-occurrence Matrix (GLCM).

2. LITERATURE REVIEW

Manimala Singha et al. [6] presented an approach called Wavelet-Based Color Histogram (WBCH) which uses Color histogram for color feature extraction and Haar discrete wavelet transform for both texture and shape feature extraction efficiently. **K. Haridas et al. [8]** implemented and tested three content based image retrieval methods- RGB color histogram, Tamura texture and Gabor feature on the basis of three parameters- precision value, recall value and accuracy rate which shows that Gabor texture feature gives better performance than other two methods. **Swati Thakur et al. [3]** discussed and analysed the techniques of content based image retrieval and proposed a new method Line Edge Singular Value Pattern (LESVP) in detail. **S. Chidambaranathan [5]** introduced image mining techniques using color, texture and shape image content descriptors and relevance feedback technique for improving the system performance. **Nitin Jain et al. [4]** briefly described two color and texture based extraction algorithms- Color histogram and Gabor filter. **Saurav Seth et al. [2]** introduced a simple content based image retrieval system and it's few techniques- conventional system, relevance feedback system and a fuzzy logic system. **Ms. Pragati Ashok Deole et al. [1]** introduced three techniques color correlogram, color moment, HSV histogram for color feature extraction with KNN classification. **Dr. K. Velmurugan [10]** introduced Scale-Invariant Feature Transform (SIFT) algorithm for color based and shape based image retrieval in content based image retrieval system. **Ammar Huneiti et al. [9]** introduced a CBIR method using the Discrete Wavelet Transform (DWT) and the Self Organizing Map (SOM) artificial neural networks for extracting both color and texture feature vectors. **Shanmugapriya, N. et al. [11]** presented a new CBIR system using Gaussian Mixture Models (GMM) to retrieve texture based images, auto color correlogram to retrieve color based images and then combining GMM and auto color correlogram algorithms to retrieve color and texture-based images. **Keyuri M. Zinzuvadia et al. [7]** described and compared various color based, texture based and shape based feature extraction techniques using classification and relevance feedback. **Zainab Ibrahim Abood et al. [12]** presented content based image retrieval using hybrid technique which is better for image retrieval with 100% higher match performance for each type of similarity measure.

3. PROPOSED COLOR HISTOGRAM and WBCH

The system framework is as follows:

Step 1: The user submits a query image to the system for getting the similar images to the input query image from the image database which consists of all the images belonging to different categories.

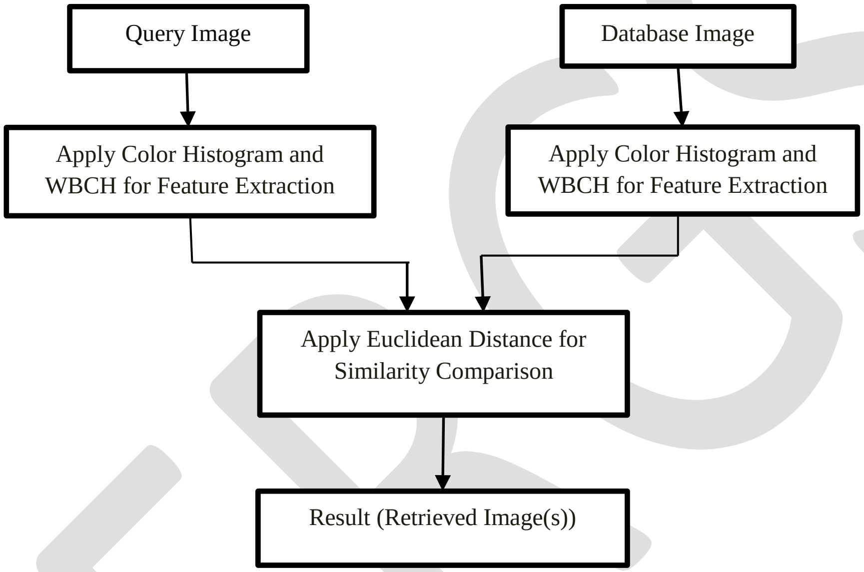


Fig. 1. System Framework

Step 2: Color Histogram and WBCH algorithms are applied to both query image and images in the image database for extracting color and texture features. Color Histogram algorithm extracts only color feature using color histogram whereas WBCH algorithm extracts both color and texture features using dwt2 wavelet transformation.

Step 3: In the last for similarity comparison between the images, Euclidean distance is applied in order to retrieve similar images with the user's input query image as result from the image database.

4. RESULT AND DISCUSSION

The image database being used here is formed by making six classes "Human Faces (50)", "Horses and Elephants (100)", "Airplanes and Motorbikes (100)", "Mountains and Buildings (100)", "Lamps and Grand_pianos (100)" and "Hedgehog and Crocodile (100)" from Caltech Image Database where each class is a combination of two categories except Human Faces class. Each category consists of 50 images. Figure 2. represents the main working window consisting of two columns Color Histogram and WBCH which can be compared by the values of seven parameters and the six similar images to the input query image being obtained as result in both cases.

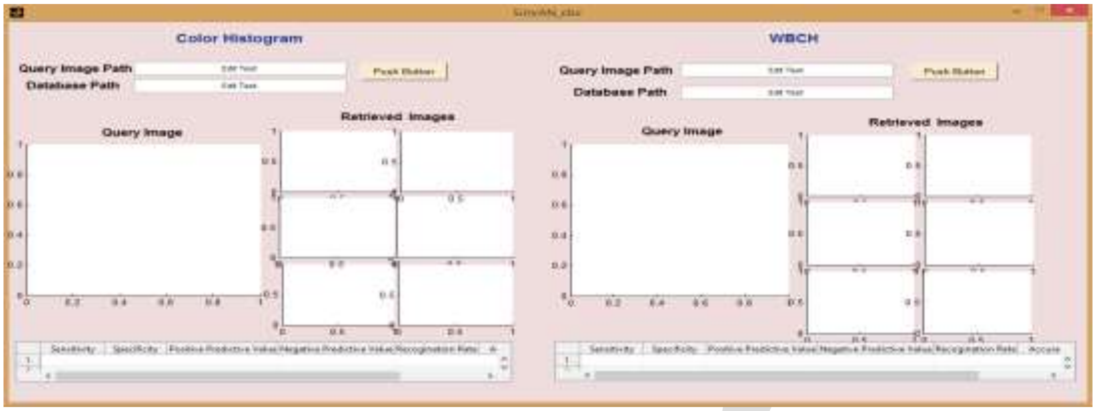


Figure 2. Main Working Window

The user will input a query image and then provide the image database path for getting the similar images to the input query image. Only the results for two classes “Horses and Elephants” and “Lamps and Grand_pianos” are shown here and the results for other classes can also be obtained in the same way. The following figures Figure 3, Figure 4, Figure 5 and Figure 6 show the Retrieved Images for category Horse from “Horses and Elephants” class and category Lamp from “Lamps and Grand_pianos” class along with graphs on the basis of the values obtained for seven parameters Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value(NPV), Recogination Rate (RR), Accuracy and Execution Time .

Figure 3. Retrieved Images for Horse category

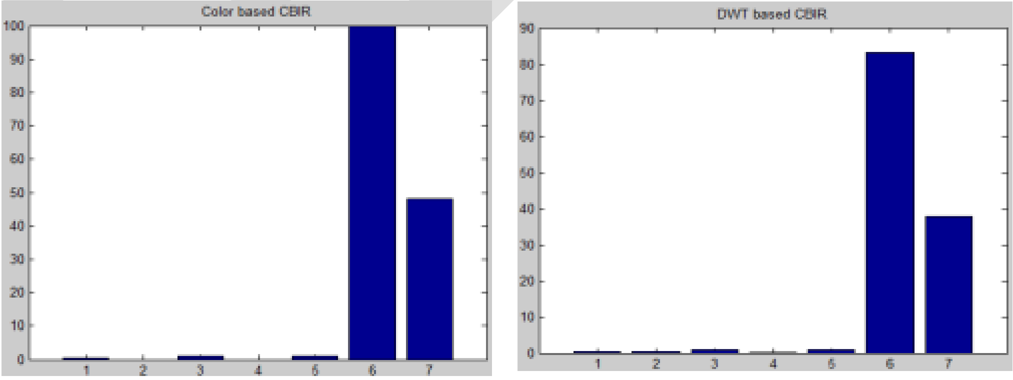


Figure 4. Graphs obtained for Horse category

Figure 5. Retrieved Images for Lamp category

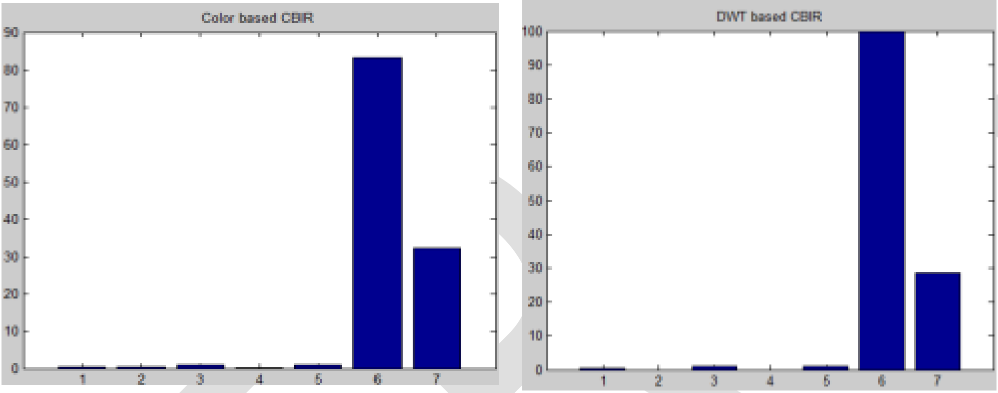
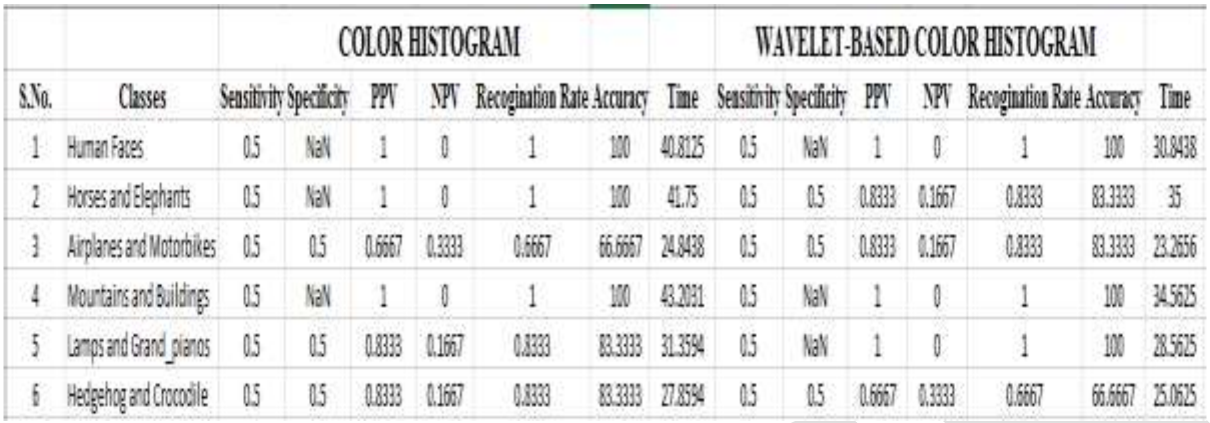


Figure 6. Graphs obtained for Lamp category

The performance of content based image retrieval is measured by seven parameters sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), recogination rate, accuracy and execution time. Sensitivity tells how likely the test is come back positive in someone who has the characteristic. It is calculated as TP/(TP+FN). Specificity tells how likely the test is come back negative in someone who does not have the characteristic. It is calculated as TN/(TN+FP). PPV is defined as the ratio of the number of the relevant images retrieved to the total number of images retrieved. NPV is defined as the ratio of the number of relevant images retrieved to the total number of the relevant images in the database. Recogination rate is calculated as TP/(TP+FP). Accuracy is calculated as AC=RR*100. Execution time is the total time taken in retrieving the similar images from the image database related to the user's input query image. The values of these parameters for each class for Color Histogram and Wavelet Based Color Histogram (WBCH) algorithms are shown in the table below:

Table 1. Values of Sensitivity, Specificity, PPV, NPV, Recogination Rate, Accuracy and Execution Time for Color Histogram and Wavelet-Based Color Histogram (WBCH) algorithms



		COLOR HISTOGRAM							WAVELET-BASED COLOR HISTOGRAM						
S.No.	Classes	Sensitivity	Specificity	PPV	NPV	Recogination Rate	Accuracy	Time	Sensitivity	Specificity	PPV	NPV	Recogination Rate	Accuracy	Time
1	Human Faces	0.5	NaN	1	0	1	100	40.8125	0.5	NaN	1	0	1	100	30.8438
2	Horses and Elephants	0.5	NaN	1	0	1	100	41.75	0.5	0.5	0.8333	0.1667	0.8333	83.3333	35
3	Airplanes and Motorbikes	0.5	0.5	0.6667	0.3333	0.6667	66.6667	24.8438	0.5	0.5	0.8333	0.1667	0.8333	83.3333	23.2656
4	Mountains and Buildings	0.5	NaN	1	0	1	100	43.2031	0.5	NaN	1	0	1	100	34.5625
5	Lamps and Grand_pianos	0.5	0.5	0.8333	0.1667	0.8333	83.3333	31.3594	0.5	NaN	1	0	1	100	28.5625
6	Hedgehog and Crocodile	0.5	0.5	0.8333	0.1667	0.8333	83.3333	27.8594	0.5	0.5	0.6667	0.3333	0.6667	66.6667	25.0625

5. CONCLUSION AND FUTURE SCOPE

Content based image retrieval (CBIR) is a challenging problem due to large size of the image database, difficulty in recognizing images, computational load to manage large data files and overall retrieval time. Number of approaches were used; they were trying to make more efficient content based image retrieval. This research work has implemented the proposed techniques for content based image retrieval which are Color Histogram and Wavelet-Based Color Histogram Image Retrieval approaches with some changes in while considering some parameters like sensitivity, specificity, positive predictive value (PPV), negative predictive value(NPV), recogination rate, accuracy and execution time. The values so obtained for these parameters show that both algorithms are best from their point of view as one retrieves images on the basis of color feature only and the other on the basis of both color and texture features but Wavelet-Based Color Histogram algorithm is better than Color Histogram algorithm in terms of retrieval time as it takes less time in retrieving the images. The future work to be conducted under the current research work could include taking more features of an image for more accurate retrieval of images with the combination of other different techniques like relevance feedback for content based image retrieval.

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Identification and Analysis of infection information in Dairy Products using Electronics Modeling

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Abstract-In human life, milk and milk products are important, necessary and vital food element without which the daily meal is not completed. Milk borne disease is caused by consuming contaminated milk products. Rapid pathogens detection is an urgent necessity in order to ascertain contamination and diseases caused by pathogens. The prime intention of this research was to developed electronics model to study the behavior of infection which are widely occur in milk .This research is used to design an electronics models for the detection of infection. Highly efficient pathogen separation, extraction strategies are needed to achieve successful detection of infection. Therefore electronic system has proposed which is used to study infection information, infection trajectories and its extraction in milk and milk product. The quality of the milk samples is tested by checking the pH level by using the electronics ph model.

The response of sensor system is compared with the response of the same sample in the dairy form. The result of this analysis is used to analysis the milk product and predict the infection present in food.

Keywords*:* milk infection; pH value; milk; IR sensor; contamination; milk safety

I.INTRODUCTION

Food and milk borne diseases are a worldwide growing health problem involving a wide spectrum of illnesses caused by microbial, viral, parasitic or chemical contamination of food. Risk assessment and public health control measure could be greatly enhanced by establishing an accurate relationship between ingested dose and infection probability and defining minimum infection doses.

Although the safety of food has dramatically improved overall, the progress is uneven and food borne outbreaks from microbial contamination, chemicals and toxins are common in many countries. Food and Drug Administration (FDA) developed a comprehensive ‘Food Protection Plan’, in which it was outlined that food must be considered as a potential vehicle for intentional contamination.

This model should consider the discrete nature of impurities and should be based on the concept of infection which varies in population with respect to initial stage. The rapid detection and identification of infection in milk product is a preliminary issue in fields of monitoring of milk-safety. As milk infection is a growing cause for human illness and death. There is continually increasing demands to maintain the safe milk supply. The quality of milk is essential component for the survival of living beings on earth. As The infection of milk increases depending on the number of parameters such as life of milk, the atmospheric condition of the milk storage, ingredients used in the manufacturing processing of milk, and most important is the actual initial condition of the milk.

In this research, the known milk samples are used as initial dose to the system. The performance and behavioral parameters are varied under the different testing condition, with respect the time and also with the pH value.

The model system is designed to detect the impurity, analyze the behavior of infection with respect to time. The response of sensor system is compare with the response of the same sample in the dairy form. The result of this analysis is used to study the milk and predict the different parameters of testing material. This model is used to compare the behavioral response of infection in milk, so that the milk safety is maintained.

II.OBJECTIVE OF RESEARCH

As the milk is the basic food material, so this research work is carried out to study the infection behaviour in various milk samples using infrared signal and by measuring the pH value. The milk samples are tested with respect to time and analyze the increase in population of bacteria, various types of contamination in milk product. This work is used to achieve the quality testing of milk and milk material.

III. MATERIALS

The number of milk samples are tested e.g. Amul Taja Milk +RST,Amul Taja Milk +STI,Amul Taja Milk +CHN,Raw Cow Milk,Amul Taja Curd,Home made Curd etc.This samples kept at different atmospheric condition i.e. at 0^0 Celsius , 20^0 Celsius, 40^0 Celsius, 60^0 Celsius, 80^0 Celsius, 100^0 Celsius etc for seven days of a week.

IV. METHODOLOGY

A.IR Sensing Model for Detection Technology

Fig.1. Experimental setup of IR sensing Model

Fig.2. Block Diagram of IR sensing Model

This model is designed to analyze the behavior of infection by varying the input frequencies.

- Function Generator: It is used to provide the various ranges of frequencies which are necessary to study the behavior of infection in milk material.

- Infra Red Transmitter Section and Infrared receiver Section:

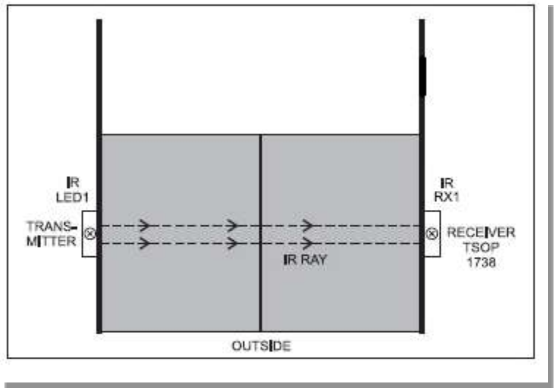

Fig. 3. Mounting arrangement for transmitter and receiver units

- This infrared transmitter is intended for use with this infrared receiver. The circuit comprises a transmitter unit and a receiver unit, which are mounted face to face on the opposite pillars of the gate such that the IR beam gets passing through it. The transmitter and receiver units are aligned such that the IR beam falls directly on the IR sensor. The 100µF capacitor (C1) is used to reduce ripples in the power supply.

- Milk sample under test: In the experimentation six samples was take under testing. Out of these only two samples consider here for testing and analyze the behavior of infection. First sample is the Amul Taza milk containing RST and the second sample is the raw milk i.e. fresh cow milk. The testing sample always placed in between the IR transmitter and IR receiver Assembly such that the transmitted IR signal directly penetrates through the milk sample. The receiver unit collects the transmitted signal which is plotted on the Digital Signal Oscilloscope.
- Digital Signal Oscilloscope: It is used to plot the received signal at various range of frequency.

B. EXPERIMENTAL SETUP FOR PH TESTING

In this project, the pH sensor system that provides a direct and convenient means to monitor milk quality to address food safety and waste issues. Here system of pH sensor is designed with microcontroller, which would receive the data signals from sensor for that we have to place the sensor in the surface of the food material to sense the pH level. The status will be sent through zigbee transceiver to the PC section which connected with the zigbee . This analysis of milk is used to maintain the safety of milk in milk industries.

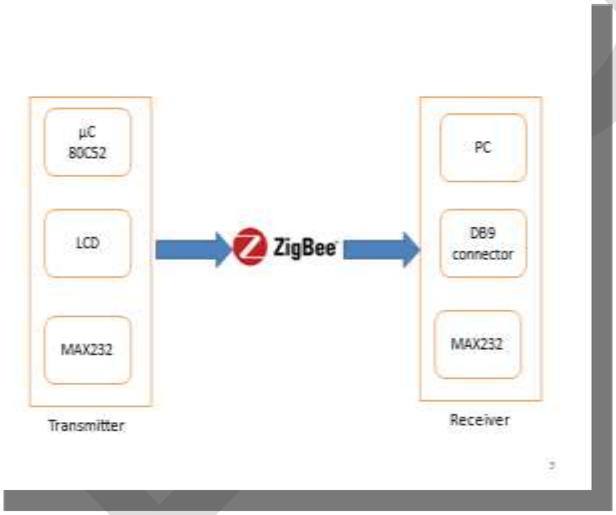

Fig.5. Block diagram of pH resting model

a) Experimental Setup

- The hardware setup is designed by using measurement panel, sensing panel, and Control panel and display unit.
- A pH measurement loop is made up of three components, the pH sensor, which includes a measuring electrode, a reference electrode, and a temperature sensor; a preamplifier; and an analyzer or transmitter. The reference electrode provides a stable potential against which the measuring electrode can be compared.
- The humidity sensor is made of a film usually made of either glass or ceramics. The material which is generally insulator absorbs the liquidis made out of a polymer which takes in and releases water based on the relative humidity of the given material. This phenomenon is used to changes the level of charge in the capacitor of the on board electrical circuit. These modules convert the relative humidity to the respective output voltage.

Fig.6. Experimental Setup of pH resting model

C. OUTPUT RESPONSE OF PH TESTING MODEL

The milk sample is checked under the different atmospheric condition. The impurity is added in the testing material to analyze at the different interval of time of a day and day of a a week. The increase in atmospheric condition of milk sample, increases the pH value response. As the sample kept by changing the atmospheric condition, after 24 hours the bacteria population increases, so that pH level decreases.

TABLE I:pH value of sample

Sr.No.	Milk Sample	Days	pH Value
1	Amul Taja Milk+RST	Day 1	6.12
		Day 2	5.47
		Day 3	4.89
		Day 4	4.3
2	Raw Cow milk	Day 1	6.84
		Day 2	5.82
		Day 3	4.83
		Day 4	4.08

E. DETECTION TECHNOLOGY IN DAIRY FORM:

To process the milk product,the contamination checking and population of bacteria counting in the milk product is the necessary steps in the milk manufacturing process.So that the milk is either consumable or non consumable is decided and passes for the further process.

This basic experiment of infection detction and extraction technology mainly consists of following two process.

1.Contamination testing in milk sample

2.Bacteria population counting

The following various steps are needed to check the above two test.

a) Dilution process: In dilution process, 9ml sample of each milk sample used for testing was prepared. Here we has considered the two sample of milk ,1st Amul Taja milk +RST,2nd Cow raw milk.
b) Agar preparation :Two types of Agar solution was prepared for contamination testing and bacteria population counting.First Agar of VRB(8.4gm)+Tergital-7(0.2ml) for Contamination testing in milk sample(Red solution) and SPC Agar for Bacteria population counting(yellow solution)
c) Heating the sample upto boiling point.
d) Preparation of sample for testing the contamination and bacteria population.

F. ANALYSIS OF MILK SAMPLE

Prepared sample keep in the laboratory for the 24 hours and after that the result was collected and recorded for the comparative testing of the various samples with IR system response.

Sample 1: Sample Amul Taja +RST

Fig.7.Contamination not present

Fig.8.50*10^4 Clooney/gm

Sample 2: Sample Cow Milk

Fig.9. Contamination (Coli form bacteria) present

Fig.10.40*10^4 Clooney/gm

In the first testing, as the both sample prepared by using the same steps which was required for sample testing. In both the sample, the lactic acid bacteria population was counted which decided either the milk in safety range or the milk exceed the consumable range.

Second testing is used to check that the milk is contaminated by the infection or not. In this experiment, the 2nd sample i. e. Cow milk contains the coli form bacteria which is harmful to human beings**.**

V. CONCLUSION

This research work is used to study the behaviour of infection in milk by analyzing the IR system output and by checking the pH value of sample under test.

As number of sample are tested by using both the method for number of days, the pH value response of the sample decreases with respect to time. Similarly the IR system response increases with respect to number of days increasing. This IR sensor model is very beneficial for the society in various application of milk processing.

The response of the system are compared with the response of the same sample in laboratory .The Second sample is contaminated and there are E.Coli bacteria occurs.

VI. LIMITATIONS

As the research is to be in continuation, so there is no such limitations can occur in the designing of the electronics model.

VII. JUSTIFICATION OF RESEARCH

Milk and milk product is the main potential vehicle for health of human beings. Asmilk safety is a global health goal and the milk infection take a major crisis on human health. So the system is required to test the quality of milk material. This electronics model is used to analyze the infection behaviour, generation and regeneration in the milk and milk products.

VIII. FUTURE SCOPE

As the milk safety is prime requirement of society, portable and cheaper system is required to test the quality of food materials.

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High Speed Data Transfer Using FPGA

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Abstract— Field-programmable gate arrays (FPGAs) are reprogrammable silicon chips. Reprogrammable silicon also has the same flexibility of software running on a processor based system, but it is not limited by the number of processing cores available. Unlike processors, FPGAs are truly parallel in nature, so different processing operations do not have to compete for the same resources. With its highly reconfigurable logic they can be used to implement a real time Ethernet communication system using the existing backbone. This project is aimed to study and implement data transmission and reception using the embedded processor in FPGA. The Xilinx Evaluation Board ML505 is used for the purpose. The embedded processor like MicroBlaze is to be configured and accessed through FPGA. The OS intended to be used is Xilkernel. DDR and MAC are configured as the peripherals for the MicroBlaze. A block of data is received, modified and transmitted using the embedded processor in FPGA. The data extracted can then be interfaced to peripherals such as LCD. After realization of the functions on the Xilinx Evaluation Board it can be extended to custom hardware for specific application.

Keywords— FPGA, MicroBlaze, Virtex-5, EDK, SDK, XPS, Xilkernel.

INTRODUCTION

FPGAs are programmable semiconductor devices that are based around a matrix of Configurable Logic Blocks (CLBs) connected through programmable interconnects. That is, any portion of the system can be reconfigured at any time while the rest of the design is still working. With the advancement of Field Programmable Gate Arrays (FPGAs) a new trend of implementing the microprocessors on the FPGAs has emerged in the design community [2]. Nowadays FPGA Boards are connected to PC for function offloading. This can speed up the execution of scientific code for instance.

In Ethernet communication data is transmitted in the form of frames. It contains a header part and after that the data is placed, so that we can retrieve actual data from the Ethernet data. If a processor is used, this can be done easily. The ML505 board supports the embedded processor MicroBlaze, which is a soft processor. By configuring the MicroBlaze, it is able to achieve reception, modification and transmission of GbE packets with a speed of 1Gbps. For better performance MicroBlaze is loaded with Xilkernel as the Operating System (OS).

This paper describes how the GbE transmission and reception are achieved on the Virtex-5 FPGA using MicroBlaze with Xilkernel as OS.

DESIGN APPROACH

A) Why FPGA?

Due to the difference in the arrival time of the data packets there will be gap between the packets. This gap is called Jitter. The jitter must be of the order of few microseconds for the proper functioning of the system. This becomes a huge burden for the ordinary used processor where the entire network stack is implemented in software. FPGA is a better solution for this problem. With its highly reconfigurable logic they can be used to implement a real time Ethernet communication system using the existing backbone [1].

B) Xilkernel

Typical embedded control applications are comprised of various tasks that need to be completed in a particular schedule. As the number of tasks increases it is very hard to manually organize the tasks. Thus the responsiveness and the capability of the application decrease with the complexity. So breaking down the tasks into simple applications and it can be implemented on an OS. Xilkernel is a small, robust and modular kernel. It is highly integrated with platform studio framework and is free software library that is available with Xilinx EDK kit [11]. The main advantage of Xilkernel OS is multithreading functionality.

RELATED WORKS DONE

Gigabit data transmission and reception can be done using the Trimode Ethernet wrapper modules which can be instantiated using the core generator tool available in the Xilinx ISE. It is a prameterizable core ideally suited for use in networking equipment such as routers. It is suited for high density Gigabit Ethernet communication and storage equipment. It works on 10Mbps, 100Mbps and 1000Mbps speed. During the instantiation of the TEMAC, an example design is automatically generated

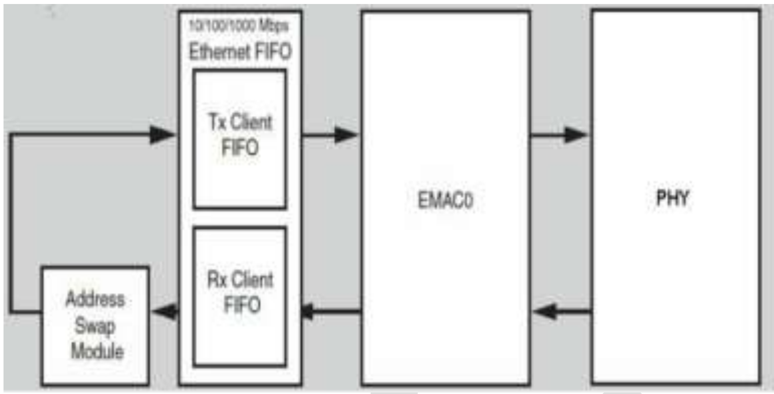


Figure 1 : Example design generated[10]

Here the data is received through the PHY interface .the data is passed through EMAC module and then through the Ethernet FIFO. The EMAC module forms the data link layer for data transmission. Ethernet FIFO is a 4Kb RAM which stores the data.The address swap module will swap the source and destination addresses and it is transmitted through the PHY interface.

The address swap module can be modified such that it can receive a block of data, modify the received data and then it can be transmitted to other location for further processing. Here data is transmitted or received using certain timing diagram.

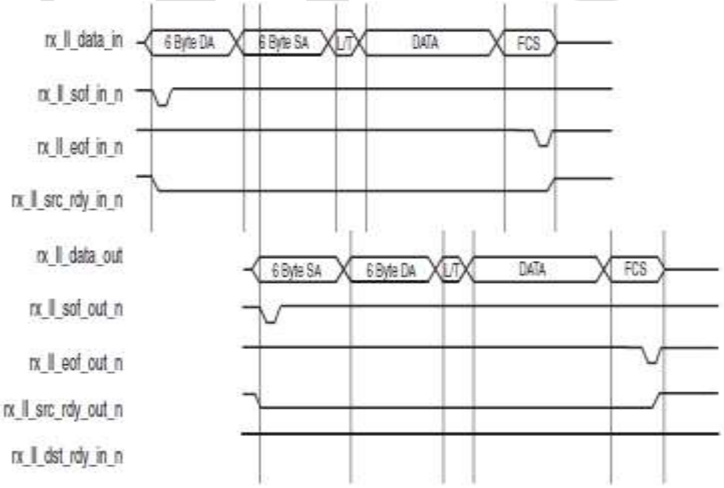


Figure 2: Timing Diagram [10]

Data is received or transmitted only when the falling edge of start of frame (RX_LL_SOF_IN_N) and falling edge of source ready (RX_LL_SRC_RDY_IN_N). Similarly data reception and transmission stops on the rising edge of end of frame (RX_LL_EOF_IN_N) and rising edge of source ready(RX_LL_SRC_RDY_IN_N).

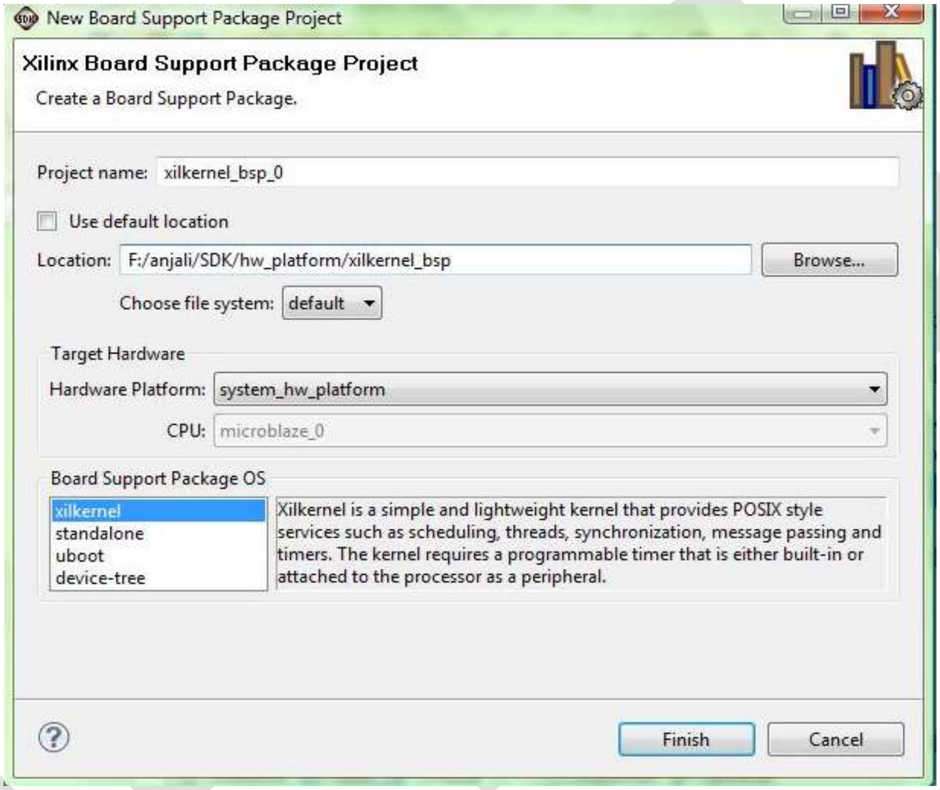
SYSTEM DESIGN

A) Hardware Design

The embedded hardware is developed in the BSB (Base System Builder) Wizard inside Xilinx Platform Studio (XPS) by instantiating the embedded processor MicroBlaze soft processor that is supported on the ML505 board with peripherals GPIO LEDs, SDRAM, UART, Ethernet and timer. The MicroBlaze processor accesses its peripherals using Processor Local Bus (PLB) and is selected with clock of 125MHz and local memory of 64KB. UART and Ethernet are the Human Machine Interfaces. The Ethernet which is selected here is hard Ethernet MAC which supports a speed range of 10mbps to 1000mbps and it is configured in SGMII mode. A block RAM is instantiated using the core generator tool which is available in the Xilinx ISE kit is used as the memory block for storing data packets. The Bock RAM has 32 bit width and 1024 bit depth. The control signals are first written into the bock RAM and then it is transmitted as per the use.

B) Software Design

The software part is designed using the Xilinx SDK tool. The embedded hardware with bit file is exported to the SDK for embedded programming. Here Board Support Package is available. The BSP is changed such that the MicroBlaze processor is loaded with Xilkernel as Operating System. For that standalone mode is changed to Xilkernel 5.01.a and selected lwip 130 and xilflash such that the Ethernet MAC inside the ML505 board can receive and transmit UDP packets.


New Board Support Package Project

Xilinx Board Support Package Project

Create a Board Support Package.

Project name: xilkernel_bsp_0

☐ Use default location

Location: F:/anjali/SDK/hw_platform/xilkernel_bsp

Choose file system: default

Target Hardware

Hardware Platform: system_hw_platform

CPU: microblaze_0

Board Support Package OS

xilkernel
standalone
uboot
device-tree

Xilkernel is a simple and lightweight kernel that provides POSIX style services such as scheduling, threads, synchronization, message passing and timers. The kernel requires a programmable timer that is either built-in or attached to the processor as a peripheral.

Figure 3: Selecting Xilkernel as OS

After configuring the Xilkernel select the Xilinx c project. There will be a number of project templates provided by the Xilinx SDK tool. Here lwip is configured in socket mode. So select the empty application template and write the client-server C- program for UDP packet reception and transmission. After developing this, debug the program and bit file is generated. Then that bit stream is downloaded to FPGA.

Figure 4 shows the embedded design flow that is the hardware and software design flow.

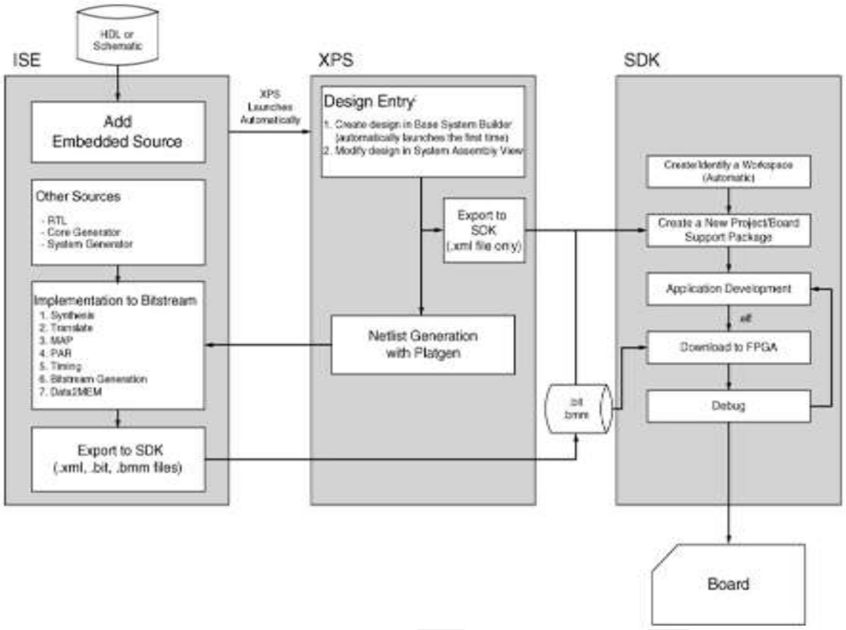
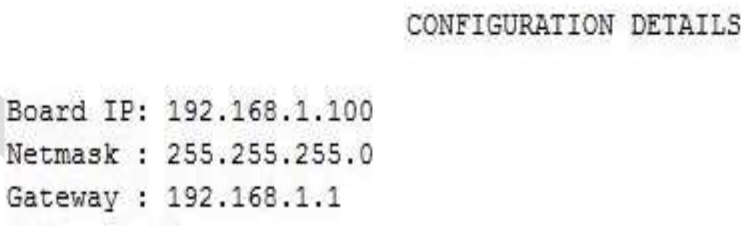


Figure 4: Embedded Design flow [4]

.

IMPLEMENTATION

The FPGA board is connected to a computer using Ethernet cable, RS232 and JTAG cable. Then IP address is assigned to the Ethernet interface of the computer. The IP address of the FPGA board and the computer must be in the same subnet. In the application program the board IP address is set to 192.168.1.100. Now the IP address of the computer is changed in the adapter settings to 192.168.1.1.



```
                    CONFIGURATION DETAILS

Board IP: 192.168.1.100
Netmask : 255.255.255.0
Gateway : 192.168.1.1
```

Figure 5: Output at serial port

The C-program which is written in the software design is compiled and an executable file is generated and it is downloaded to the FPGA. We use a LABVIEW program which can transmit UDP packets to FPGA board with IP 192.168.1.100. After running the LABVIEW program the Ethernet connection LED, transmit LED, receive LED and Ethernet speed indicating LED with 1Gbps speed lights up showing that reception and transmission are in progress. GPIO LEDs are connected so that received data can be shown in LED.

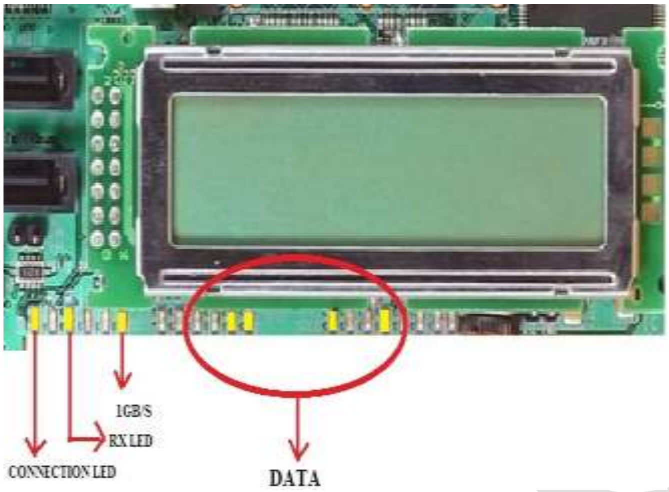
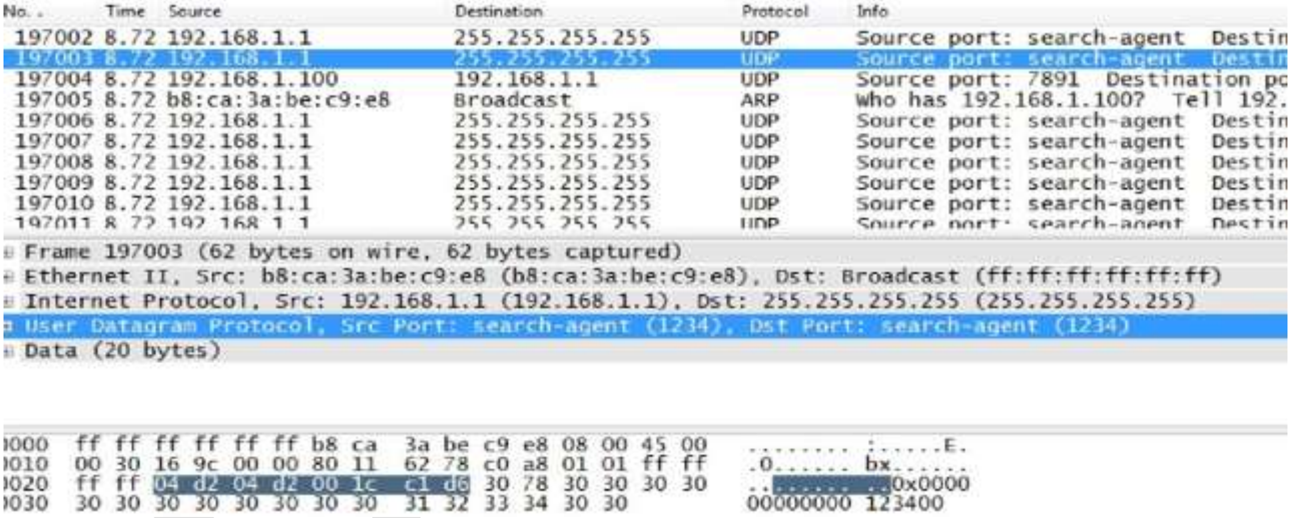


Figure 6: Interfacing with LED

.

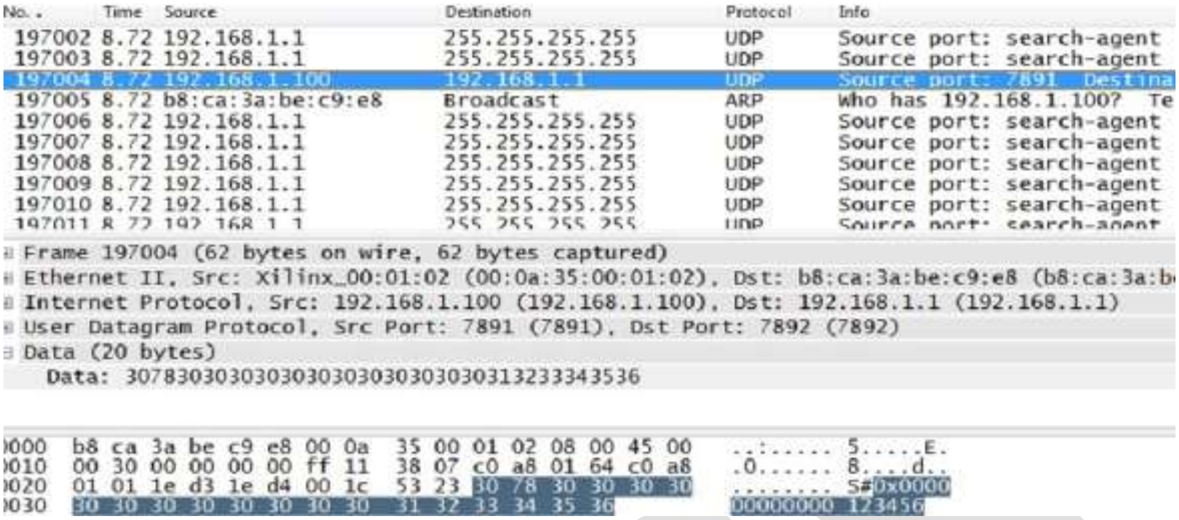
The data that is transmitted using LABVIEW is received at the board. In figure5, ‘9’ is received and the ASCII value corresponding to ‘9’ ie ‘39’ is shown on the data LEDS. Similarly a 20 byte data is transmitted using the LABVIEW and it is received at the board. Then the received data is modified and then it is transmitted from the FPGA board. The data which is transmitted is 1, 2, 3, 4, 0, 0 corresponding ASCII values are also shown in the figure. This data is received and modified by adding a constant ‘56’ and the result is 1, 2, 3, 4, 5, 6 and then it is transmitted. These can be analyzed by capturing these packets in Wireshark.



```
No. .      Time  Source              Destination        Protocol  Info
 197002 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197003 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197004 8.72 192.168.1.100          192.168.1.1        UDP       Source port: 7891  Destination po
 197005 8.72 b8:ca:3a:be:c9:e8      Broadcast          ARP       Who has 192.168.1.100?  Tell 192.
 197006 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197007 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197008 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197009 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197010 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
 197011 8.72 192.168.1.1            255.255.255.255    UDP       Source port: search-agent  Destin
⊞ Frame 197003 (62 bytes on wire, 62 bytes captured)
⊞ Ethernet II, Src: b8:ca:3a:be:c9:e8 (b8:ca:3a:be:c9:e8), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
⊞ Internet Protocol, Src: 192.168.1.1 (192.168.1.1), Dst: 255.255.255.255 (255.255.255.255)
⊞ User Datagram Protocol, Src Port: search-agent (1234), Dst Port: search-agent (1234)
⊞ Data (20 bytes)

000   ff ff ff ff ff ff b8 ca  3a be c9 e8 08 00 45 00   ........ :.....E.
010   00 30 16 9c 00 00 80 11  62 78 c0 a8 01 01 ff ff   .0...... bx......
020   ff ff 04 d2 04 d2 00 1c  c1 d6 30 78 30 30 30 30   ........ ..0x0000
030   30 30 30 30 30 30 30 30  31 32 33 34 30 30         00000000 123400
```

Figure 7: Received frames captured in Wireshark



```
No. .   Time Source             Destination         Protocol  Info
 197002 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197003 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197004 8.72 192.168.1.100      192.168.1.1         UDP       Source port: 7891  Destina
 197005 8.72 b8:ca:3a:be:c9:e8  Broadcast           ARP       Who has 192.168.1.100?  Te
 197006 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197007 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197008 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197009 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197010 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
 197011 8.72 192.168.1.1        255.255.255.255     UDP       Source port: search-agent
⊞ Frame 197004 (62 bytes on wire, 62 bytes captured)
⊞ Ethernet II, Src: Xilinx_00:01:02 (00:0a:35:00:01:02), Dst: b8:ca:3a:be:c9:e8 (b8:ca:3a:b
⊞ Internet Protocol, Src: 192.168.1.100 (192.168.1.100), Dst: 192.168.1.1 (192.168.1.1)
⊞ User Datagram Protocol, Src Port: 7891 (7891), Dst Port: 7892 (7892)
⊟ Data (20 bytes)
    Data: 3078303030303030303030303031323334353 6

000  b8 ca 3a be c9 e8 00 0a  35 00 01 02 08 00 45 00   ..:..... 5.....E.
010  00 30 00 00 00 00 ff 11  38 07 c0 a8 01 64 c0 a8   .0...... 8....d..
020  01 01 1e d3 1e d4 00 1c  53 23 30 78 30 30 30 30   ........ S#0x0000
030  30 30 30 30 30 30 30 30  31 32 33 34 35 36         00000000 123456
```

Figure 8: Modified frame which is transmitted is captured

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CONCLUSION

MicroBlaze soft processor with Hard Ethernet MAC was configured using the EDK tool. Using SDK, Xilkernel was loaded inside the processor as the Operating System. This configuration is capable of receiving packets sent to the board’s IP address. Then processor will modify the data accordingly and will display it on the data LEDs. Then the modified data is transmitted to other locations for further processing

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Empirical Study of Different Multi-Label Classification Methods

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<u>1.Abstract</u> – Multi-label learning is a form of learning where unlike traditional single label learning the instances can have more than one label.label.Here the classification algorithm is required to learn from a set of instances, each instance can belong to multiple classes and so after be able to predict a set of class labels for a new instance. This is a generalized version of most popular multi-class problems where each instances is restricted to have only one class label. It is gaining widespread attention due to its applicability in various areas such as semantic image analysis, text categorisation, gene functionality classification, etc. In this paper various multi-label methods are summarised and analysed. We have also presented the evaluation metrics used in the MLL setting. We have also mentioned the benchmark datasets used in the literature.

Abbreviations used –

MLL – Multi Label Learning

BR- Binary Relevance

CC- Classifier Chains

LP- Label Powerset

RAkEL - Random k-Labelsets

RPC- Ranking by pairwise comparison

CLR - Calibrated Label Ranking

ECC-ECC is ensemble of classifier chains

SVM - Support Vector Machine

PSVM- Parallel-SVM

2.Introduction –

In traditional single-label classification, the goal is to learn a classifier h : X →Y from the training set D = {(x_i, y_i) , $1 \leq i \leq n$} where $x_i \in X$ (set of training instances) associated with corresponding single label $y_i \in Y$ (set of disjoint labels).Based on size of label set |Y|, it is called binary classification (when |Y| = 2) or multi-class classification (|Y| > 2).

Even though multi-label classification was primarily motivated by the emerging need for automatic text-categorization and medical diagnosis, recent realization of the omnipresence of multi-label prediction tasks in real world problems drawn more and more research attention to this domain. For example, a text document that talks about scientific contributions in medical science can belong to both science and health category, genes may have multiple functionalities (e.g. diseases) causing them to be associated with multiple classes, an image that captures a field and fall colored trees can belong to both field and fall foliage categories, a movie can simultaneously belong to action, crime, thriller, and drama categories, an email message can be tagged as both work and research project; such examples are numerous.Hence, there is widespread rise in application of this method in different areas such as images[14,15], text[16], music[17], medical[18] and so on.

Traditional binary and multi-class problems both can be posed as specific cases of multi-label problem. However, the generality of multi-label problems makes it more difficult than the others. As opposed to single-label classification, in multi-label classification each instance is associated with set of labels Y_i where Y_i is a subset of Y. Hence, the goal is to learn a classifier h : $X \rightarrow 2^Y$ from the training set $D = \{(x_i, y_i), 1 \leq i \leq n\}$.

3. Methods –

The two popular methods in multi-label learning are - I Problem transformation method.

II. Algorithm adaptation method.

Problem transformation method transforms the learning task into single-label learning task by fitting the data to single-label algorithms, while algorithm adaptation method extends the existing algorithm for handling multi-label data directly by fitting the algorithm to given data.

I. ProblemTransformation

fit data to algorithm - transform data such that existing algorithms for binary classifier can be used.

1. The following are the simplest transformations[1][3] -

I. **Copy transformation-**The copy transformation replaces each example (x_i, y_i) with $|Y_i|$ examples (x_i, y_i), where $y_i \epsilon Y_i$. An extension to this is to use a weight of $1/|Y_i|$ to each of these newly created examples. This is called **copy-weight** method.

II. **Select** transformations- For each instance, the select family of transformation methods replaces Y_i by one of its members. There are several versions of this depending on how this one member is selected -

a. **Select-max** : Label set Y_i is replaced by most frequent label y_k in training set D, where $y_k \epsilon Y_i$.

b.**Select-min** :The least frequent label is selected for replacement.

c.**Select-random** : Here the label set is selected randomly for replacement.

III. **Ignore** transformation : - This simply ignores the multi-label instances and runs the training with single label instances only. None of these methods is likely to retain the actual data distribution and therefore is likely to have lower prediction performance.

2. **Binary Relevance (BR)**: It is one of the most popular approaches as a transformation method that actually creates k datasets (k = |Y|, total number of classes), each for one class label containing all examples of the original data set, labelled positively if the label set of the original example contained this label and negatively otherwise.
For any new instance x, BR outputs the union of the labels yj that are positively predicted by the k classifiers.
Though Binary Relevance is simple, intuitive, extremely straightforward way of handling multi-label data with low computational complexity, it ignores potential correlations among labels.Depicted in figure 1 (a).

3. **Classifier chains (CC)[3]**: This solves the above issue of label independence in BR. The basic idea of this algorithm is to transform the multi-label learning problem into a chain of binary classification problems by augmenting the input space of the next binary classifiers by the predictions of previous classifiers. This had advantage over BR methods, but the order of chaining of classifiers is still an issue here. Depicted in Figure 1 (b).

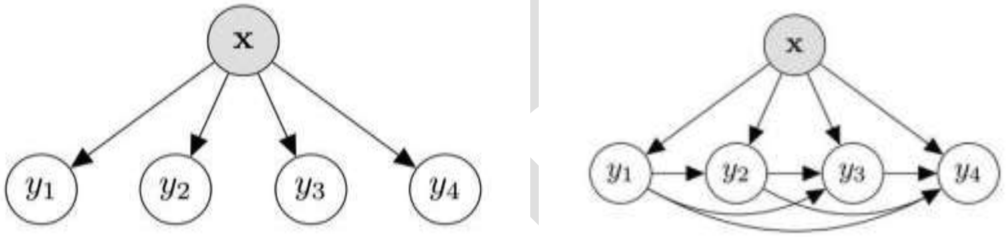
4.Label Powerset (LP)[4]- In BR and other related methods, the correlation among labels are ignored. This method preserves the correlation among labels during the transformation by considering each unique set of labels in a multi-label training data as one class in the new transformed data. Given a new instance, the single-label classifier of LP outputs the most probable class, which actually represents a set of labels.The computational complexity of LP is upper bounded by min(n, 2^m), where n is the total number of data instances and m is the total number of classes in the training data (before transformation) .Though the complexity may be high the number of actual label sets is usually much smaller in practice.The second problem with this approach is that, a large number of classes would be associated with very few examples and that would also pose extreme class imbalance problem for learning. Depicted in Figure 1 (c).

5.Random k-Labelsets(RAkEL)[5]: It solves the computational complexity and class imbalance problem of LP method .The basic idea is to randomly partition the large labelset into k smaller labelsets and for each of them train a multilabel classifier using the LP method.During prediction the output of all LP classifiers are gathered and combined. It has two variations –

(1) **RAkEL**d where the partitioned labelsets are disjoined.
(2) RAkEL_0 where the partitioned labelsets are overlapping.

RAkEL_0 has slightly better performance due to fusion of labels across different labelsets. Depicted in Figure 1 (d).

6. **Ranking by pairwise comparison (RPC[6])** : This is a ranking based method were multi-label prediction is done by first ranking the labels and then selecting the top few labels as the predicted label-set. It follows one-versus-one(OVA) approach . It transforms the multi-label data set into (m(m-1))/2 binary label data sets, one for each pair of label (y_i, y_j) where $1 \leq i \leq j \leq m$. Each dataset retains the instances from the original dataset that belong to atleast one of the corresponding labels but not both.A binary classifier is then trained on each of these datasets and ranking of labels is obtained by counting their votes for each label. Though RPC provides a relative order of the labels, but how to partition these ranked labels into relevant and irrelevant sets still remains as a challenge.



(a)Binary Relevance

(b)Chain Classifier

(c) Label Powerset

(d) Random kLabelsets(RAkEL)

Figure 1. Graphical representation of different Problem Transformation methods

II. Algorithm Adaptation –

fit algorithm to data: transform existing algorithm to use it on multi label data.

(a) **SVM-HF[7]** : It uses binary relevance method twice in two stages and uses SVMs as its base classifier. In the first stage SVMs are used as binary classifiers and in the second stage, the input space is augmented by |Y| new features. The output of first stage which are above some threshold t are marked as 1 and others as 0 in the new features assignment. Then, new set of classifiers are learnt on these new augmented training instances.For classification, similar two stage procedure is followed for the unknown test instance.

(b) **Parallel-SVM(PSVM)[8]**: It is proposed for two class multi label data and it is based on the assumption that the mixed class lies in between the two pure classes. Hence, two parallel hyperplanes are used to separate the three possible classes(class1,mixed,class2). The drawback is the number of binary classifier will increase significantly with increase in labels in training set.

(c) **Rank-SVM[9]**: It is based on ranking by support vector method. The ranking of labels is obtained by the m linear classifiers by minimizing the ranking loss. Ranking loss corresponds to average of number of label pairs from relevant set(set of the labels which belongs to the instance) and irrelevant set , which are wrongly ranked , i.e. relevant label ranked lower than irrelevant one. After ranking the output set is found using a threshold value to divide the ranked labels into relevant and irrelevant sets.

(d)**ML-*K*NN[9]** - It was one of the first instance based algorithm proposed for multi-label learning . It uses the

Bayesian inference as base classifier along with kNN to predict the labels.

$$Yt = \arg\max_{b\,\epsilon\{0,1\}} \max P\,(H_b^{l} \mid E^{l}_{ct(l)}\ ,)$$

Here H_1^{l} is the event that test data **t** has label **l** and H_0^{l} corresponds to absence of the label. Event **$\underline{E_{ct(l)}}$** denote the event that there are exactly $c_{t(l)}$ instances in N(t)(neighbourhood of t) which have label l. It uses uses the information such as membership count($c_{t(l)}$)) from kNN for prior and likelihood calculation .

(e) **Multi-label pairwise perceptron (MLPP)[11] -** It is based on a pairwise approach(RPC), i.e., it incrementally train a perceptron for each pair of classes. The classification is done based on voting method. It also suffers from quadratic complexity issue during training and testing.

(f)Backpropagation for Multilabel Learning (BP-MLL)[12][13]- This is an adaptation of the traditional multilayer feed-forward neural network under multi-label framework. The key idea is the definition of an error function, closely related to the ranking loss. The error function is minimised with gradient descent combined with the error back-propagation. The input feature, one output unit per label, and the hidden layer is fully connected with weights to the input and output layers. Its computational complexity in the training phase is high, but the time cost of predictions is quite better .

4.COMPARISON – Comparison of computational complexity . Here we compare the computational complexity of training the model of different methods mentioned above with respect to number of class labels m. We can see the label transformation methods such as **BR** and **CC** performs better in terms computational complexity but **BR** ignores the label dependencies and **CC** depends on its chaining order for better performance, hence making these two methods suboptimal. While **LP** considers all label dependencies its exponential complexity makes its unsuitable for task with high number of labels. Theoretically **RA*k*EL** has exponential complexity but in practise it is quite computationally inexpensive. **RPC, PSVM** and **ML-kNN** can be placed in between other methods in terms of computationally complexity as well as efficiency.

Methods	Complexity
BR	O(m)
CC	O(m)
LP	O(2^m)
RPC	O(m^2)
PSVM	O(m^2)
SVM-HF	O(m)
RA*k*EL	O(2^m)
ML-kNN	O(m^2)

5. Experimental Results-

5.1 Evaluation metrics

In multi-label classification, predictions for an instance is a set of labels and, therefore, the prediction can be fully correct, partially correct(with different levels of correctness) or fully incorrect. Evaluation metrics of single label classification does not capture the partial correctness of a model as their isa single output. Hence we need a method to capture such prediction with different levels of correctness. The following are the metrics used in our experimentation. $\mathbf{Y_i}$ and $\mathbf{Z_i}$ are given and predicted label sets, respectively and **n** is the number of instances.

(a)**Accuracy(A)**: Accuracy is defined as average proportion of the predicted correct labels to the total number

(predicted and actual) of labels.

(b) **Recall (R):** Recall is the proportion of predicted correct labels to the total number of predicted labels, averaged over all instances.

(c) **F1-Measure (F):** F1-Measure is the harmonic mean of precision and recall, as followed from single-label classification.

5.2 Datasets

1.Scene Dataset Scene dataset was created to address the problem of emerging demand for semantic image categorization. Each instance in this dataset is an image that can belong to multiple classes This dataset has 2407 images each associated with some of the six available semantic classes (beach, sunset, fall foliage, field, mountain, and urban).

:

(a) Beach and Urban (b) Field and Fall Foliage (c) Beach and Mountain

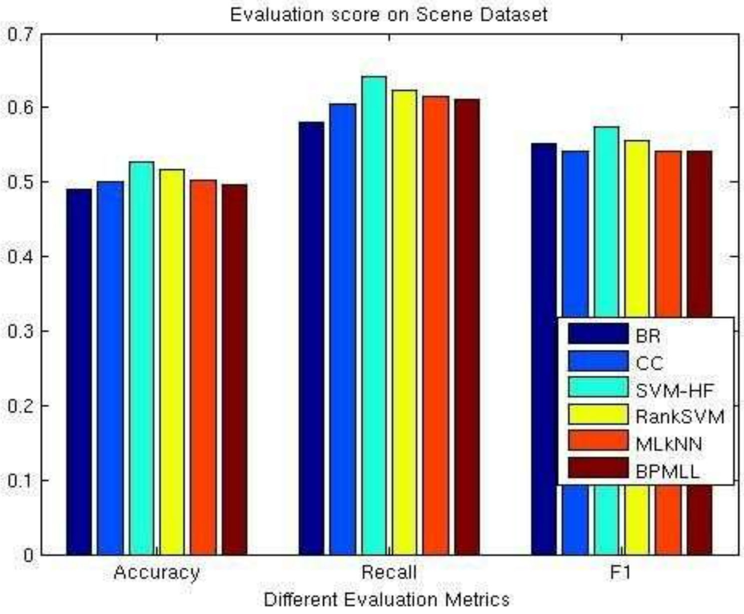
Figure 2 : Example multi-label images from Scene Dataset

2. **Yeast Dataset** In yeast data, each instance is a yeast gene described by the concatenation of micro-array expression data and phylogenetic profile. Each of these 2417 genes is associated with one or more of 14 different functional classes.

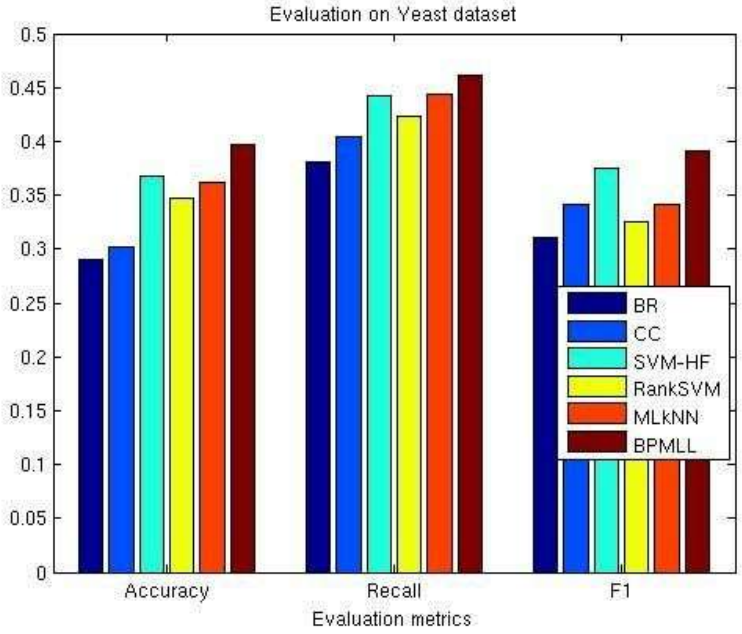
5.3 Results

We implemented some of the methods discussed above for empirical analysis. We used Matlab platform for our task. We can observe that overall accuracy of Scene dataset is more than Yeast datasets as the number of class labels in Scene is less than Yeast and hence in Yeast our classifiers makes more error than Scene.Also we can observe that different methods perform better to different datasets as evident from the results below.

We used the above two mentioned datasets(Scene and Yeast) for our experiments. We used various multi-label classification methods and compared their performance using the three evaluation metrics mentioned above. The evaluations scores are plotted against different methods for easy comparison. We used Matlab's Bar plot tool to plot these graphs.



(a)Evaluation results on Scene Datasets



(b)Evaluation results on Yeast Datasets

7.FUTURE WORK AND CONCLUSION

In this paper, an empirical study of different multi-label algorithms, their applications and evaluation metrics has been presented. A sparse set of existing algorithms has been organized based on their working principle and a comparative performance analysis has been reported. This study provides useful insights on the relationships among different algorithms and directs light for future research. A few possible future challenges have also been identified:-

i) While it has been established that exploiting the label correlations is an important factor for improving the performance, this idea in most cases has been used intuitively; a future challenge, therefore, is to theoretically explore the conditional and unconditional dependencies and correlate the performance improvement with each kind of dependence modelling.

ii) A number of methods have been quite successful to model small and medium sparse data with reasonably good performances, however, further research attention is needed especially to deal with complicated and large data

iii) The computational complexities of most of the algorithms suggest that more efficient algorithms would be needed to achieve scale independence.

iv) Although it has been established that the data properties such as label cardinality can strongly affect the performance of a multi-label algorithm, there is no systematic study on how and why the performance varies over different data properties; any such study would be helpful to decide on multi-label algorithms for any particular domain.

v) With emerging needs for online algorithms, an important future direction would be to design efficient online multi-label approaches that scale with large and sparse domains.

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A Review on Lubrication System Used For Machining Process

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Abstract— The enormous reduction in the quantity of lubricant compared to the circulated quantities of conventional metalworking fluid systems is the key feature of MQL. In contrast to conventional flood lubrication, minimum quantity lubrication uses only a few milliliters (ml) of lubrication per hour for the machining process. Minimum quantity lubrication today uses such precise metering that the lubricant is nearly completely used up. Typical dosage quantities range from 5 ml to 50 ml per process hour (tool cutting time).This review paper explores the research study on the use of MQL and flooded lubrication system used for machine process by using natural lubricants like Jatropha. The used of lubrication is necessary for dissipated the maximum heat generated from the machining process, the analysis of this heat generated is proposed to carry out by using ANSYS software.

Keywords— Lubrications, MQL, Flooded, Machining, Jatropha, Vegetable oil, Tool life.

1. INTRODUCTION

Machining is one of the most essential processes in the manufacturing industry which involve a controlled elimination of material from the substrate by using a cutting tool. In the machining operation plastic deformation of the work piece material and friction between tool-chip and tool-work piece interface, lots of energy abounding is converted into heat. During this machining of low strength alloys, this heat generation is less but when ferrous and other high strength alloys are machined, lot of heat is generated which increases with a consequent increase in the cutting speed. The distribution of heat generated during machining is shown in Fig. 1.1.This heat generate, if not dissipated successfully, may affect the surface finished quality and reduce the life of tool and hence generally affected performance of the process. Thus, though high speed machining is popular in many operations for higher production output, the consequences of heat generation during machining operation needs to be minimized. Different techniques were evolved for the effective elimination of heat generated from the surrounding area of the machining. One of those techniques evolves the used of coolant in the form of fluid during the process.

For last some decade’s years, coolants, commonly known as metal working fluids (MWF) continued to be profitably for the heat removal until it was realize that these fluids are a hazardous to the environment and to the health of the operator person working with it. Some researchers had created a waste disposal problem and add to the cost of the mechanized. These negative consequences of the flood cooling promoted the researchers to change to those technologies which involve least usage of the cutting fluids [2].

Many alternatives options were developed to reduce the quantity of cutting fluid used. Some such techniques that came into focus were:

A. Dry Machining
B. Cryogenic Cooling
C. Coated Tools
D. Minimum Quantity Lubrication
E.

1.1.1 Dry Machining

The use of cutting fluids is harmful to environmental and also health effects, machining in many situations is carried out without using any cutting fluid. This is probable only at low cutting speeds and easily machine able materials like aluminium. Generally, dry machining is not appropriate in cases where superb surface finish and high dimensional accuracy is needed. This is so because dry machining involves generation high heat from the cutting surface and this built up layer of chips over the tools due to its unstable nature breaking of chips and takes away a bit of tool material due to its high adhesive nature leads to tool wear. The broken segments of machine tool when stick to the machined surface deteriorates the surface finish. Thus, dry machining devoid of any lubricating and cooling improvement is not preferred in general cases of machining.

1.1.2 Cryogenic cooling

Cryogenics is defined as work with materials at temperatures minus than -150ºC (123K). Mainly fluid nitrogen is used as for cryogen material. It is an odourless, nontoxic gas and colourless, It constituting about four-fifth of the atmospheric gases. Its boiling point -198.79ºC and melting point is -210.01ºC. These characteristics make liquid nitrogen (LN2) as the most suitable gas for the cryogenics applications [3]. During machining, the cryogenic coolant is supplied to the machining area (cutting zone) where heat generation is prone to be maximum. The coolant absorbs heat and lowers down the maximum temperature reached thus contributing in tool life enhancement.

1.1.3 Coated Tools

In order to avoid the practice of cutting fluids during machining process, currently coated or layered tools are attainment popularity. In this process the tool insert are provided with a coating which can serve the following purposes. It should possess low thermal conductivity so that it does not allow heat to enter into the bulk material of the tool. Mostly titanium based coating materials are used for coating. Generally the, materials are used are like TiAlN, TiN, TiAlCrN etc.

1.1.4 Minimum Quantity Lubrication

The main intend of minimum quantity lubrication (MQL) is to gather the benefits of cutting fluids without getting hazardous effects to the human being and affected the life of the cutting tools. It included the use of least quantity of cutting fluid with a typical mass flow rate of cutting fluids is between 50-500 ml/h which is directly applied to the cutting zone thereby avoiding the need of fluid disposal as it happens in flood cooling. Since MQL involves significantly lesser amount of cutting fluid, this phenomenon is popularly referred to as ‘near dry machining’ or ‘micro lubrication’ or ‘spatter lubrication’ [2].

2. LITERATURE REVIEW

Imtiaz Ahmed Choudhury et.al. Investigated for a critical Assessment of lubrication techniques used for the machining processes. The critical assessment during the used of lubrication is deeply studied during the machining operation. The machining operation needed the lubrication for its proper working; the vegetable oil is used as lubrication in the machining operation, also the factors affecting the performance of machining processes is studied [1].

Dr.S.S.Chaudhari et.al. carried out research work on the role of MQL in the tool wears during the machining work. The experimental study is presented for the finding the role of minimum quantity of lubrication during the machining operations. The results of study show that the use of MQL can improve life of tool [2].

Lincoln Cardoso Brandao et.al. made the experimental study on the temperature and heat flow during the taping process. The study presented the different types of cooling system included flooded and minimum quantity of fluid. The thermocouple is embedded for measuring the temperature of cooling system on the surface of work piece and convective heat transfer rate is studied for different two lubrication systems [3].

Sunday Albert Lawal et.al. presented review on the use of MQL lubrication system for machining processes. The machining performance of various types of vegetable oil based lubrication system is study for conclusion. The study of result established that vegetable oil-based cutting fluids as a good metalworking fluid [4]

Carlos Henrique Lauro, et.al.carried out the experimental work for define the heat flow in the drilling operation by using the finite element approaches. The heat generated in the high speed cutting zone causes the damaged the cutting tool. A flooded lubricant system and the minimal quantity of lubricant (MQL) were applied to investigate the ability to remove heat from the cutting zone and to compare with dry tests. The results of study concluded that, MQL is best suited lubrication system [5].

Youssef Iskandar carried out the investigative work on the MQL lubrication system used in the machining of composites. Minimum Quantity Cooling Lubrication (MQCL) is used for the carried the experimentation on the machining. The air and lubrication is used for the machining operation. The injected nozzle is used to impinging air and lubrication. The experimental results are validated with the computational results for concluding [6].

S. Kathiresan investigated on the experimental investigation on the milling operation of aluminium alloy 6060lubrication system. The main objective of research work is to find out performance of MQL and wet machining performance for aluminium alloy. The results of study concluded that the MQL is best suited techniques for lubrication system [7].

Mohd Saad Saleem et.al. Investigated on the use of vegetable oil for lathe turning machining operations. In this study the vegetable oil is used for as coolant for lathe turning operations. The MQL technique is adopted for the carried out the machining operation. The results of study concluded that MQL with vegetables oil is best than other conventional lubrications [8].

Emel Kuram, investigated on the environmentally friendly vegetable oil based lubrication used for the machining operations. The results of the study shows the improvement in the performance of machining operation with used of MQL techniques [9].

Anjana Srivastava presented a review on the vegetable oils as lube base-stocks. The different chemical properties of the vegetables oil is study for different types of applications. The different cultivations techniques were proposed for vegetables oil productions [10].

Andreas Willing investigated on the renewable lubricants used for machining operations. In this study the renewable lubricants are studied for ecological fitness. The used of ecological friendly lubricants are good to use as lubricants, also the recycling of this types of lubrication is presented [11].

3. PROPOSED EXPERIMENTAL WORK

The proposed experimental work is carried out for finding out the optimum solution for used lubrications for machine operations. The different researchers have been presented their study for optimizing the performance and the behavior of machine process. The machine process concluded when it is carried without affecting to tool and operators health. The proposed work used the three different lubrications techniques included dry lubrication, MQL and flooded lubrication techniques with vegetables oils such as Jatropha. The objective of the proposed work is to carry the experimentations for drilling process with the two different lubricating fluids. The results which are obtained with lubrication are compared with dry lubrications system. The validations of proposed work are carried by using ANSYS and numerical model is also presented for finding the heat generation during the machining operation.

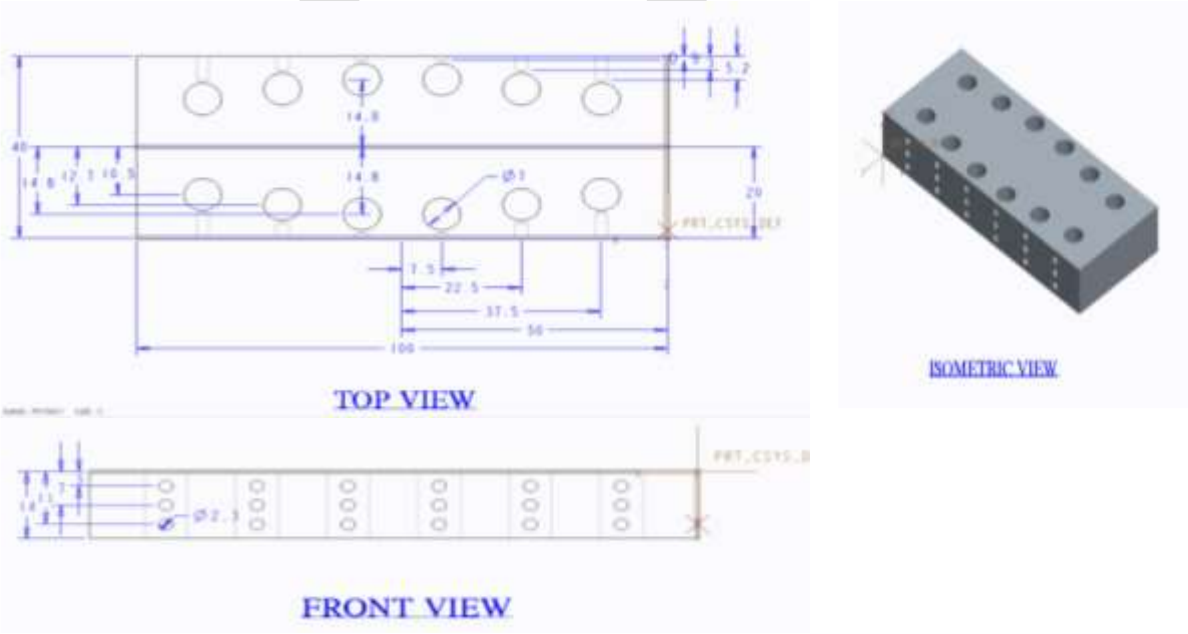

Fig.1.1.Proposed Model for Machining Operation

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5. CONCLUSION

Lubrications plays very vital role during the machine process. The machine process needs very proper lubrication otherwise then it affected the tool life and workpeice. The dry lubrication is not suitable for high speed operation. This review papers presented the review study on the lubrication study based on the use previous experimental studies.

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Data Mining of Genomic Data using Classification Algorithms on MapReduce Framework: A Survey

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Abstract-The advancement of Next Generation Sequencing (NGS) technology has led to a huge deluge of genomic data. In order to classify this data, the algorithms that are in use are struggling because of the enormity of the datasets. Hence parallelization of these classification algorithms using a MapReduce implementation is an efficient solution that tackles these issues such as computational cost, spatial complexity and running time. In this survey paper we have presented the various DNA sequence alignment algorithms that are most commonly used. Then we have discussed the various classification algorithms that are used in data mining genomic databases and presented a relative study of their merits and demerits. And finally we have focused on Big Data and MapReduce which helps in the increasing the efficiency of the classification algorithms mentioned in this survey paper.

Keywords- NGS, kNN, SVM, Naïve Bayes, C4.5, HDFS, Big Data, MapReduce, Data Mining, Classification

1. INTRODUCTION

Using data obtained from sequence alignment of DNA we can obtain a lot of information about a person's heath and makeup. This is critical in cases such as detection of diseases as well as targeted and personalized drug delivery mechanisms. After this information is obtained, it has to be classified. Classification algorithms are essentially utilized to predict which class a data point would lie based on the training dataset given to the supervised algorithm. Classification algorithms are useful in mining biological database and genomic data and classifying patients or organisms according to risk of developing certain diseases, hereditary or otherwise. An example would be one which divides patients into classes according to diseases that they may be susceptible to. When checking for lung cancer in a group of patients, we can divide them into two classes. One class will contain the patients that have a high risk for developing cancer. The other is a low cancer risk class. If we are dealing with more than one type of cancer then we can have multiple classes like 'low lung cancer risk', 'high lung cancer risk', 'low pancreatic cancer risk', 'high pancreatic cancer risk'. If we have medium risk patients, we can also create a class and set its parameters such that patients with medium risk will be classified into it. Now the datasets that will be supplied for processing are of two kinds. There is a training dataset in case the algorithm is supervised. There are also test datasets that check the accuracy and precision that is being generated by the classification algorithm. Some of the shortcomings of standard implementations of these algorithms are inaccurate predictions when datasets are large as well as slow running time. The issue of high computational cost is also significant. We can alleviate these problems by parallelizing these algorithms using MapReduce. Thus a Big Data approach can make our task much faster and more reliable and with a greater degree of accuracy.

2. DNA SEQUENCE ALIGNMENT ALGORITHMS

2.1 Burrows-Wheeler Alignment (BWA)

According to Li, H. et al. [1] the Burrows–Wheeler transform is used to modify a character string and produce rows of repeated characters. This becomes a very useful method for compressing a text. There is also no need to store the data and it can be reversed without any issues if required. It greatly improves the accuracy of text compression algorithms. The output string has various instances where a single character is repeated multiple times in a row when the original string contains repeated substrings. The use of Burrows–Wheeler transformation in NGS is when DNA is broken down into small pieces and the initial pieces are sequenced. This leads to the formation of reads which are around 30 to 500 base pairs long. The results obtained by this process were accurate but not very fast. These reads are then aligned to a reference genome. The memory requirement of this algorithm is also not high. The slow speed of this algorithm can be overcome by parallelizing the method by a MapReduce implementation that will help in overcoming this problem.

2.2 Smith-Waterman (SW) Algorithm

As stated in Farrar, M. [2], the Smith–Waterman (SW) algorithm is used for obtaining local alignment of sequences. Here the entire sequence is not compared; only the local segments of small but variable sizes are compared. It utilizes dynamic programming and is a modification of the Needleman–Wunsch algorithm. Since it uses DP it finds the optimal alignment with 100% accuracy. But because of this it is also very time consuming and for two sequences of length x and y it takes O(xy) magnitude of time. In order to execute faster but with less accuracy, heuristic methods like BLAST and FASTA can be used. This algorithm can be sped up using graphics processing units (GPUs). This slow speed of this algorithm can be remedied by parallelizing the method by a MapReduce implementation that will help in overcoming this problem. Nvidia's CUDA platform supports programs that can provide further speedup. It is usually accurate for smaller sequences but less so for larger ones.

2.3 BLAST Algorithm

Schatz, M. [3] states that BLAST stands for Basic Local Alignment Search Tool. It is also a local alignment algorithm. This alignment occurs by assigning scores to each alignment and only retaining scores that cross a certain threshold while at the same time eliminating scores that don't. BLAST is not a full alignment algorithm but a heuristic one and hence is much faster but less accurate than the Smith–Waterman algorithm. The query and database sequences thus are not optimally aligned. BLAST is also less time consuming than FASTA because it considers regions of higher significance. BLAST misses matches which are outliers and hence are harder to locate. BLAST also offer space requirement advantages over Smith-Waterman. And even when SW is sped up using GPUs, a parallel implementation of BLAST on MapReduce such as BlastReduce is significantly faster. This processing speed of this algorithm can be remedied by parallelizing the method by a MapReduce implementation that will help in overcoming this problem.

3. CLASSIFICATION ALGORITHMS USED IN DATA MINING

Classification algorithms help in predicting which class a data point would lie based on the training dataset given to the supervised algorithm. Classification algorithms are used in mining biological database and genomic data and classifying patients or organisms according to risk of developing certain diseases. If we wish to divide patients into classes according to diseases that they may be susceptible to. When checking for pancreatic cancer in a group of patients, we can divide them into two classes. One class will contain the patients that have a high risk for developing pancreatic cancer. The other is a low pancreatic cancer risk class. If we are dealing with more than one type of cancer then we can have multiple classes like 'low breast cancer risk', 'high breast cancer risk', 'low pancreatic cancer risk', 'high pancreatic cancer risk'. If we have medium risk patients, we can also create a class and set its parameters such that patients with medium risk will be classified into it. There are two types of datasets – a training dataset in case the algorithm is supervised and test datasets that check the accuracy and precision that is being generated by the classification algorithm. The disadvantages of standard implementations of these algorithms are inaccurate predictions when datasets are large as well as slow running time. High computational cost is also a significant disadvantage. We can alleviate these problems by parallelizing these algorithms using MapReduce framework.

3.1 K Nearest Neighbor

According to Ayma, V.A. et al. [4], K Nearest Neighbor is a supervised algorithm that uses an analogical model. However it is a lazy classifier. This means that when we supply it with a labelled training set, it only stores the data but makes no attempt to classify it. It starts classification only when we provide the test dataset. kNN is most comfortable when the neighbours all belong to the same class. When that is not the case, either a vote is taken with the new data point going to the class with most votes or else nearer neighbours are given more weightage and further neighbours less and a weighted vote is polled. The value of the user defined constant k is not very high usually in order of 10. A MapReduce implementation of kNN improves its performance. The method of implementation is not complicated. Also speed of the training phase is high. However space complexity is significant. It is also highly noise sensitive. Testing phase is time consuming. The shortcomings of standard implementation are various. First the dimension of k determines the quality of prediction. Also large datasets are not dealt with efficiently. Moreover it is sensitive to noisy data and is expensive from a computational standpoint. The advantages of parallelization via MapReduce is multiple like communication cost which is greatly decremented. Also accuracy and speed is improved significantly.

3.2 Support Vector Machine

As stated in He, Q. et al. [5], Support Vector Machine is perhaps the most accurate algorithm in general but the training phase of this supervised algorithm is considerable. SVM finds a separating hyper plane between classes by maximizing the margin between the two classes. This optimal classification can then be generalized for unknown datasets. The time and spatial complexity of SVM is directly proportional to the size of the dataset. SVM is a binary linear classifier. It uses a probabilistic model and when new data is supplied to it outputs the class to which the data point belongs. The hyper plane providing optimal separation gives maximum distances to the closest data point of any class in the training set. This helps in the most accurate generalization when new data points are supplied. This method is also robust at handling a limited number of outliers. A kernel trick can be used in cases where the data is projected to higher dimensions when the hyper plane cannot be efficiently generated in lower dimensions and then translated back. In case of very large datasets this method is not very efficient because when the number of outliers is high, the hyper planes may be not be easily generated. The computation can be sped up using parallel implementation via MapReduce. This also allows us to decrease the requirement of memory. The results provided are the most accurate. Nonlinear data points can be tackled. The issue of over-fitting has less of an impact on the results. These disadvantages can be overcome by the process of parallel implementation on MapReduce.

According to Chu, F. et al. [6], support vector machines help in detection of carcinoma inferring from genomic data and protein prediction. Results produced by this algorithm were highly accurate with a smaller gene pool in comparison with currently prevalent processes of detection. But protein prediction with SVMs did not achieve any advantages. Here the SVMs helped in eliminating redundant genes. The disadvantages are that overhead of computation is high. The results obtained were such that choice of the right kernel function is pivotal to the quality of results obtained. The training phase is also critically time consuming. The results from SVM are useful when there are two classes. But when the number of classes is greater, it requires modification. The shortcomings of standard implementation are space complexity is high when large number of data points are present. Also processing time is significant including training time for large number of data points. The results obtained by parallelization which helped were such that less time required for training phase. Also the processing time decreases. Finally accuracy increases because of fault tolerance in HDFS.

3.3 Naive Bayes classifier

According to Pakize, S. et al. [7] Naïve Bayes theorem is based on Bayes' theorem. It is called naïve because it assumes that the attributes or the variable are independent. This is not always the case and can lead to problems. The theorem probabilistically predicts which class a data point belongs to. It is used to process strings such as words in a document and hence can also be used to classify mapped reads. It deals with joint probability distribution of these words and helps us in classifying them. But because the order of the words or the sequences is ignored, it may sometimes give less than satisfactory results. But in certain cases like spam filtering the method works surprisingly well. It works well with large datasets and where attributes are several in number. It is also very simple and easy to implement. The method can also be parallelized without hassle. The two stages are training and prediction respectively. After this supervised algorithm has passed through the training phase, its output can then be utilized to analyze data in the prediction phase. A parallelized implementation of Naïve Bayes is both accurate and fast. The advantage is that computation process is simple. Also when datasets are large, the accuracy and speed of this algorithm is higher than others. Since it assumes independence among the variables, it gives less accurate results when the attributes are dependent. The shortcomings are such that the variables are assumed to be independent. Also sometimes problems occur in large datasets when the variable are strongly correlated. We can remedy these shortcomings by parallelizing via MapReduce. This process leads to a state such that less time required for training phase. Accuracy increases because of fault tolerance in HDFS. Also parallelized Naïve Bayes is able to handle large sets of data points better than other classification algorithms.

3.4 C4.5 (Decision Tree)

As elaborated in Nandakumar, A. et al. [8], C4.5 is used to classify data points by constructing a decision tree. The tree is incremented by using a divide and conquer approach. The advantage that C4.5 provides is in cases where it is not a binary classification problem but there are more than two sets of data. If we are dealing with a data set on cancer then we can have multiple classes like 'low lung cancer risk', 'high lung cancer risk', 'low pancreatic cancer risk', 'high pancreatic cancer risk'. Since we are dealing with more than two classes, here the standard decision tree algorithm is not applicable. In such cases we require C4.5. A shortcoming is that with large data sets this method becomes very slow. A parallelized implementation of this algorithm is also not as efficient as parallelized versions of the other algorithms as each subtree will need to be combined in the final decision tree. Decision trees are also much easier to interpret as the output is user readable and can be instinctively understood by people lacking in technical knowledge. The advantage of this method is that it can be constructed when availability of information about the dataset is low. Also the outcomes of the decisions are assigned exact numerical values and this reduces ambiguity of interpretation. Also higher dimensional data can be handled with ease. Moreover non-technical people can interpret it as the output is user readable. Finally besides numerical data, categorical data can also be handled. The major disadvantage is that the process can be considerably time consuming. Similar to other methods this can also be remedied by a parallelized approach on MapReduce which allows us to attain better speedup as well as accuracy.

According to Dai, W. et al. [9], the C4.5 algorithm is converted to mapper and reducer programs. The communication overhead is also reduced. In this algorithm the ratio of information gain was selected rather than the value of information gain in order to choose which branch to select at a decision point. Both discrete and continuous data can be utilized. Missing data points can be accounted for with a certain degree of robustness. Also over fitting can be managed through a process of pruning. The utilization of specialized data structures helped in the reduction of communication overhead. The mapping and reducing programs were pipelined for efficient processing. The results obtained via output can contain only one attribute. The output is also categorical. It is not very stable and is dependent on the input dataset. The tree generated becomes very complex in case the dataset is numeric in nature. Outcomes of the tree are based on expectation and hence actual outcomes may vary. With more decisions, the complexity increases and the accuracy decreases. All these can be fixed by parallelization. By this method the algorithm becomes highly scalable. The method is more robust against outliers and wrong/missing values. It can handle numerical data as well as categorical data points.

4. AN INTRODUCTION TO BIG DATA, MAPREDUCE AND HDFS

According to Grolinger, K et al. [10] Big Data consists of datasets so large in size that they cannot be efficiently stored, processed and analyzed by existing standardized practices. The data can be both numerical and categorical in nature. Biological data, especially human genetics generates a huge deluge of data. Some of these databases can contain around 20 petabytes of data including redundant copies for backup. More importantly this data is at least doubling every year and very soon the existing storage capacity will be exhausted. So this data needs to be reduced in sized and then analyzed and this is the essence of MapReduce. Apache Hadoop is the open-source implementation of MapReduce. The cluster of machines provides us with a highly available system. Because such a large cluster leads to higher probability of failure, there is redundancy in terms of backup nodes. These nodes are also monitored in the application layer. The advantages are that it is faster, more reliable. The shortcoming seen in the results is that there is some overhead due to network latency. This can be remedied by reducing the latency so that optimal speedup can be obtained.

As elaborated in Dean, J. et al. [11], MapReduce is a technique that allows us to ‘map’ a large dataset into key-value pairs and then reduce the volume of data into sorted sets which allow us to infer about and reach certain conclusions regarding the original set of data. The programmer has to supply a map function consisting of a key/value pair as an input and that is converted to a set of intermediate key/value-pairs. The reducer function then merges the intermediate values associated with the same intermediate key. In the mapping phase the dataset is divided among and processed by mappers that operate on different nodes of a cluster or maybe multiple processing cores of the same computer. The intermediate (key, value) pairs are then passed on the reducers. The data having the same key are sorted into the same classes by the reducers and then they combine different values with the same key and sum them up and the resultant values of the different classes are generated. The results are then written to the HDFS i.e. the Hadoop Distributed File System. The mappers and reducers operate in parallel by dividing the large dataset and hence we can achieve significant parallelism in terms of processing. The overhead that is generated by network latency and other issues prevents the attainment of optimal speedup.

According to Shvachko, K. et al. [12], The Hadoop Distributed File System is a distributed file system. It allows us to divide and store large datasets over several nodes in a cluster which is an essential requirement of any MapReduce program. It uses commodity hardware and hence occurrences of failure is large. Hence backup nodes provide support in cases of failure. This introduces redundancy but is essential in such cases. The results obtained in this method are obtained much faster. They can reduce runtimes from around 2-3 days to even 2-3 hours. The throughput is also significant because of the parallelization of the task. The advantages are that it is faster, more reliable. The shortcoming seen in the results is that there is some overhead due to network latency. This can be remedied by reducing the latency so that optimal speedup can be obtained. The speedup depends on the number of parallelizing machines which can be the number of nodes in the cluster or maybe even the number of cores in the CPU. If there are 4 cores the ideal speedup should be 4x. But network latency is such that it is usually less than 4x. The fix for this is to use a greater bandwidth between the machines.

As mentioned in Kishor, D. [13] the user sends a key value pair to the mapper. This consists of one line of input from the HDFS file. This usually consists of strings of data like log files where there is a store and the value of a transaction or a website and the number of hits to the website. Every such line leads to the intermediate generation of new key/value pairs by dividing the line after each token. The token is assigned to a word and defines a new value. As a key the store name or the website is used. All values for a particular log file or document are sent to the reducer after the mapping phase. An inverted index may be used to provide a list of terms with all files in which they are present. Then it produces separate classes and according to the class in which each item belongs we assign it accordingly. We iterate over the entire set of values and they are added up into a list that corresponds to that class. The ultimate output consists of keys and their corresponding lists. The output is then written to the Hadoop Distributed File System. The advantages are that it is faster, more reliable. The shortcoming seen in the results is that there is some overhead due to network latency. This can be remedied by reducing the latency so that optimal speedup can be obtained.

5. CONCLUSION

Some of the significant points we have noted after surveying the papers are that to make sure the processing is not slowed down we have to remove the outliers and inappropriate attributes. In order to select the appropriate attributes we can utilize feature selection methods. Also it has been seen after studying the papers that there is no single method that gives best results for every set of data. Thus before selecting a particular method we use small test datasets and compare their performances. It has been seen that better results are obtained when the same data sets are used for both training and testing phases. We also see that classification algorithms fail when little to no information is present about the datasets since training phase cannot be initiated. In such cases clustering algorithms are the only option. Classification algorithms suffer from a shortcoming that they do not report the degree of association among the attributes. Hence a combination of classification and association algorithms can be used in a hybridized manner to achieve desired outcomes We have seen that out of the 4 classification algorithms in general SVM was the most accurate and efficient. It only suffered when the dataset grew very large. In those cases Naïve Bayes gave better results. kNN was the worst performing algorithm in most cases. C 4.5 was useful when user readability of output was critical which was achieved through the generation of a decision tree.

After analyzing all existing work we come to the conclusion that the use of SVM leads to the most efficient and elegant solutions to this class of problems. But classifying data from the genomic databases by non-parallel implementations is a very time consuming process. So we are suggesting a method in which we are utilizing the MapReduce paradigm to implement SVM via SciKit using python code. We have identified that by mapping the data to higher dimensions using a kernel trick and modifying the C value accordingly we can obtain a hyper plane in those instances where generating one would be impossible in two dimensions. After the generation of the hyper plane we are retranslating the data back to two dimensions. This would enable us to attain optimal speedup as well as reliability that is obtained from the fail-safe backup nodes in the cluster. We will also try to use higher bandwidth between the nodes in the cluster so that in case N machines are used we can attain results with up to Nx speedup or at least very close to it.

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DUALITY OF ITERATIVE SOFT EROSION IN MULTI SCALE SOFT MORPHOLOGICAL ENVIRONMENT

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ABSTRACT: In this paper, duality is discussed in soft erosion in multi scale as well as iterative environment. Soft erosion and soft dilation will exist for various thresholds. So soft open and soft close also exist for various thresholds. If definition for soft erosion and soft dilation are studied (5), then some type of equalities are viewed among soft morphological operations. So equality may be established in between soft erosion and soft dilation in multi scale environment. open and close are composite operations. So soft open and soft close are also composite operations which will exist at various thresholds. Equality may be viewed among all soft morphological operations. In the same way duality also will exist for all soft morphological operations because duality will exist for all morphological operatons,for example dual of erosion is dilation ,dual of dilation is erosion,dual of open is close and dual of close is open. In this paper, duality is discussed in soft erosion operations,in multi scale as well as iterative environment.. A very important point is that equality does not exist in mathematical morphology but will exist in soft mathematical morphology. So various duals will occur for each soft morphological operation.

KEY WORDS: Mathematical morphology, Mathematical soft morphology, Soft morphology, Erosion, Dilation, Soft erosion, Soft dilation, Primitive morphological operation, equality, threshold , Multi scale morphology, soft open, soft close.

1 INTRODUCTION TO IMAGE PROCESSING:

IMAGE: If we observe carefully, the human beings have the desire of recording incidents, through images. Their view may be for the purpose of future generation. Images also, played the role of symbols of languages, for communication purpose.

The early cavemen documented some of the incidents through images in the caves. They documented some of the incidents of their routine life, on stones, by using primitive tools. Important incidents such as battles, routine incidents such as food habits were recorded by them, on stones. These provide record, which is historically very important, of early human civilization. The images drawn by primitive tools by Egyptians, Indians, have provided a lot of valuable information, for historians, about civilizations.

After this, paints or inks were invented. The human beings started to record scenes, incidents through these paints and inks. Letter on J. B. Porta, an Italian Philosopher, during the II half of 18th century, by mean of an accidental discovery, was able to assemble a camera like equipment by mirrors and lens, which is the first step towards the modern day photography. At the same time a France scientist observed silver chloride characteristics with respect to light. After two centuries Alexander Charles extended above concept, and produced simple photo graphs.

After one century, at around 1835 Henry Fox Talbot extended above concepts, using silver nitrate, extended the design of camera, and modern photography was born from this experiment, which is presented in royal society.

This technology is used to record incidents of U.S. civil war, or, to record incidents of wealthy people, but not reached to a common man, due to complex chemical process, for the development of photographs till “KODAK” has entered in 1884.. Later on research is done on motion pictures by Thomas A. Edison & William Kennedy Laurie Dickson, which is foundation for modern movie technology. Actually the first step for images processing was laid during Second World War. Technical experts, who are trained specially, are used to improve quality of image. They are specially trained in object recognition, they used to identity targets, manually. So, it is first step in image processing. After invention of digital computer, digital image processing came into existence. NASA, in early 1960’s, got images from Space Crafts, Ranger 7, of the Lunar Surface, in thousands. These images were processed to minimize distortions. This is initial digital I.P. work, using a computer. This work was done in NASA’s JET propulsion laboratory (JPL), in California.

This initial digital images processing work was very satisfactory. So, NASA continued it’s funding, resulting in the development of digital image processing area.

The reduction in Hardware cost, mass production of chips, reduction in memory cost, reduction in size of computers , boosted the development of Digital Image Processing area.

So, researches in general have been showing interest and developed algorithms for image smoothening, edge enhancement, image compression, image segmentation, 2D to 3D conversion etc., Now a day, it is having applications from entertainment area to medical area. The detailed explanation of image processing is available in the author's other papers.

2. INTRODUCTION TO MATHEMATICAL MORPHOLOGY

At the same time mathematical morphology emerged and developed separately, with some other interests and motivations. The purpose of this area is different. But later on, it is identified that the mathematical morphology is having very important applications in image processing. So, mathematical morphology is considered now, a very important branch of image processing.

Actually J. SERRA (1) and MATHERON (2) are founders of mathematical morphology. They have explained all the fundamentals of mathematical morphology in their books.

Actually the primitive operations are EROSION & DILATION. The composite operations are open and close. All these are explained in chapters 1 and 2. There are some more composite operations, like thinning, skeletenization etc. But the work is limited to erosion, dilation, open, close.

Mr. H.J.A.M. HEIJMANS has given a detailed discussion of these operations in 4. Till now the light is thrown on the fundamentals of mathematical morphology (1,……. 4).

The morphological operations are suitable to apply on binary images only. Actually, applications of morphological operations were extended by SERRA also. Later STERNBERG concentrated in this area. In depth study was done (the theoretical analysis) by J.A.M HEIGMANS in this area. PETROS MARAGOS has discussed about morphology also. PETROS MARAGOS has discussed about morphology and given theoretical analysis.

For elimination or minimization of noise in the images a lot of research is done. The researchers developed algorithms for smoothening with detail preservation and for edge enhancement also. some resesrchers developed morphological algorithms for elimination of salt and pepper noise ,and impulse noise also. It has entered into medical area also

the detailed references are available in the other papers of author.(6 to 15).

3 SOFT MORPHOLOGY

The soft morphological definitions are taken from 5.

In mathematical morphology, some type of the concept “All” will play major role.In Erosion, the O.P. will be “1”, if all elements of the sub image are equal to 1, otherwise, the output will be “0”. In dilation, the O.P. will be “0”, if all elements of the sub image are equal to “0”. Otherwise the output will be “1”. This "All” concept, will cause some type of inconvenience. So some type of flexibility is introduced, in the form of threshold value. So, this morphology with threshold is defined as soft morphology. So, this soft morphology is having a few advantages, which the mathematical morphology operations don’t have.

So, the Soft Morphology can be considered as extension to mathematical morphology. Even though mathematical morphological operators are efficient, they suffer with a few drawbacks as specified above. In addition to above, some more comments are………. In primitive morphological operations, erosion, one or two mismatched pixels of image prevent the structuring element from fitting perfectly. It is the basic morphological operation, quantifies the way in which, the structuring element fits into the image. Erosion is an “All or nothing” transformation, implemented using bitwise “and”. So, erosion will be sensitive to noise.

In primitive morphological operations, dilation, isolated pixels, even though, they are irrelevant to the image’s content, significantly affect the output of the transformation. The net effect is an increased number of large spurious particles, increasing the confusion in the dilated image. So, noise will be added, which may be named as additive noise.

But, many applications require more tolerance to noise than is provided by erosion and dilation. Soft morphological operators possess many of the characteristics, which are desirable, perform better in noisy environments.

So, the soft morphological filters, improve the behavior of standard morphological filters, in noisy environment. The soft morphological filters are better compared to mathematical morphology in small detail preservation and impulse noise. In soft morphology, it preserves details, by adjusting its parameters). It can be designed in such a way that, it performs well in removal of salt – and – pepper noise as well as Gaussian noise, simultaneously.

The idea of soft morphological operations is to relax, the standard morphological definition, a little, in such a way that, a degree of Robustness is achieved, While, most of the desirable properties of standard morphological operations are maintained. The soft morphology was introduced by KOSKINEN etc, and developed by researchers.

Many researchers developed soft morphology like extending to gray tone images, statistical soft morphological filters, recursive soft morphological filters etc.and developed applications in various areas like(in addition to above mentioned applications) periodic noise reduction, elimination of disturbance, caused by solar cosmic rays, in the images obtained by astronomy base. [Solar]. Soft morphology is having advantage of designing filters in frequency domain in a very simple way. Some of the researchers go ahead one step and integrated soft morphology as well as laplacian filter and designed adaptive soft morphological laplacian filter, for smoothening as well as edge detection. adaptive soft morphological laplacian filter, for smoothening as well as edge detection.

Some more researchers designed algorithms using soft multi – scale operations for edge enhancement in noisy environment, soft segmentation ,character identification with out generating any noise. In this way even though soft morphology is very simple, its development and applications are enormous.The detailed explanation is available in the author's other papers.

4 ITERATIVE SOFT MORPHOLOGY

It can be defined as, applying a morphological operation on an image, a few number of times.

4.1 CONVENTION: symbolically, $(X\ominus Y)$ means applying erosion by S.E. Y, on image X.$(X\ominus 2Y)$ means, applying Erosion by S.E. Y, on image X, twice. $(X\ominus 3Y)$ means, applying Erosion by S.E. Y, on image X, thrice. $(X\ominus NY)$ means, applying Erosion by S.E. Y, on image "X", "N" number of times ,in the same way.

$(X\oplus NY)$ means, applying dilation by S.E. Y, on image "X" ,N no of times.(X O NY) means, applying open by S.E. Y, on image "X", N numbers if times. [But it is idempotent operation.] $(X \bullet NY)$ means applying close by S.E. Y, on image "X", N number of times. [But it is also idempotent operation.] This iterative morphology will have applications in the design of composite morphological operations (Morphological Algorithms) skeletenization, thinning, thickening etc.

The applications may also be seen in structuring element Decomposition, segmentation, etc.

Iterative morphology may be extended to iterative soft morphological environment also. In iterative soft morphological environment, the following convention may be used.

$(E_{(1)})^2$: Soft Erosion, with threshold value = 1 applied, 2 times on the image.
$(E_{(1)})^5$: Soft Erosion, with threshold value = 1 applied, 5 times on the image.
$(E_{(x)})^y$: Soft Erosion, with threshold value "x", applied "y" times on the image.
$E_{(1),} E_{(2),} E_{(3),}$: Soft Erosion, applied with threshold values, 1,2,3 on the image.
$E_{(x),} E_{(y),} E_{(z),}$: Soft Erosion, applied with threshold values, x,y,z on the image.
$(D_{(1)})^3$: Soft Dilation, with threshold value "1" applied "3" times on the image.
$(D_{(2)})^4$: Soft Dilation, with threshold value = 2, applied, "4" times on the image.
$(E_{(x)})^y$: Soft Dilation, with threshold value = x, applied "y" times on the image.
$D_{(1),} D_{(2),} D_{(3):}$ Soft Dilation, applied with threshold values, 1, 2, 3 on the image.
$D_{(x),} D_{(y),} D_{(z):}$ Soft Dilation, applied with threshold values x, y, z on the image.
$(O\ (1, 2))^3$: Soft open applied thrice on the image, with thresholds 1,2
[Soft Erosion threshold value =1, Soft Dilation threshold value =2]

$(O\ (x, y))^n$: Soft open, applied 'n" times, on the image, with thresholds x, y
[Soft Erosion threshold value = x, Soft Dilation threshold value = y]
O(p, q) O(x, y): Soft Open applied twice on the image, with different thresholds.
O (p, q) O (r, s) O (x, y): Soft open, applied thrice on the image, with different thresholds.
$(C\ (1, 2))^{4:}$ Soft close applied four number of times on the image, with Soft dilation threshold value = 1, Soft Erosion threshold value = 2.
$[C\ (1, 2)]^n$: Soft close applied "n" number of times, on the image with thresholds 1, 2.
$(C(x, y))^n$: Soft close applied "n" times, on the image, with thresholds x, y.
C(p, q) C(r, s) C(t, u): Soft close applied on the image, thrice, with different thresholds.

4.2 BRIEF DISCUSSION ON ITERATIVE SOFT MORPHOLOGY:

Iterative morphology means, applying one morphological operator, on an image a few no of times. These morphological operators may have same S.E or different S.E's or same S.E with different dimensions. Iterative morphology is having its own importance. It is having so many applications in so many areas.

Iterative morphology appears in skeletonization process. In an algorithm for skeletonization erosion has to be applied, a few no of times. In thinning also, iterative morphology will appear. A Structuring Element has to be applied so many times, on an image; [Each time the Structuring Element, will be rotated]. Same case in thickening also. Thickening also uses iterative morphological concept.

In some situations, multi scale iterative concept will appear. In multi scale skeletonization
S.E. will be applied at various dimensions, each time upon an image, to get skeletons at various dimensions.

There is an area in mathematical morphology , called S.E. decomposition. A S.E. will be divided into series of mini S.E,'s. All these S.E.'s will be applied on the image one after the other as a series or these can be applied on the image simultaneously in parallel computing environment. Any way structuring element decomposition deal with iterative morphology. The S.E. may be decomposed into mini S.E's, with dimensions in increasing order. So, S.E decomposition can be in iterative environment and multi scale environment also.

This iterative morphology can be applied for segmentation also.a few researchers proposed an algorithm for handverification also. A few researchers discussed methodology for segmentation technique, which is suitable to apply on sequence of images of traffic scene using this iterative morphology.AUPIGITER. R. also discussed segmentation using iterative watershed algorithm in 3D environment, which is suitable for medical image processing. A few researchers discussed segmentation using watershed algorithm, to be applied in medical area, using iterative erosion technique.another set of researchers discussed methodology for smoothing (for the treatment of impulse Gaussian noises) using iterative close – open technique. A researcher proposed algorithm for determination of centroids using iterative morphology. It has entered in to cluster analysis also. A few researchers discussed about applications of iterative morphology in medical image processing, regarding neurological analysis which is very important. There are so many applications, where iterative morphology may be applied. All the above works are explained in the author's other papers which are given in reference.

5 DUALITY.

Duality is a general mathematical definition which can be defined in so many ways. one way of defining is
Two operations *, . are duals to each other if $(A*B)=(A^C.B)^C$ or $(A.B)=(A^C*B)^C$
In M.M. $\oplus$ and $\ominus$ are duals. i.e. $(I\oplus S) = (I^C\ominus S)^C$ or $(I\ominus S) = (I^C\oplus S)^C$
In this discussion the following convention is followed. If dual of "X" is "Y" then it is represented as $X^d = Y$ or $(X)^d = Y$
In Soft morphology, the duality will exist in a different ways because depending upon threshold values, many soft morphological operations will exist.
Duality will exist for each and every soft morphological operation.
Dual of E(1) is E(9) where E(1) is soft erosion at threshold 1 and E(9) is soft erosion at threshold 9.
in the same way dual of E(3) will be E(7) &. dual of D(1) will be D(9).
in the same way dual of D(1) will be D(9) & dual of D(3) will be D(7).
These concepts are explained in the author's paper 13 and 15.
In the same way multiple duals also will exist.
Multiple duals of D(1) are D(9),E(1) in 3/3 window environment.
Multiple duals of D(1) are D(25),E(1) in 5/5 window environment.
Multiple duals of D(1) are D(49),E(1) in 7/7 window environment.
Multiple duals of D(1) are D(81),E(1) in 9/9 window environment.
In the same way multiple duals of D(4) are D(6),E(4) in 3/3 window environment.
Multiple duals of D(4) are D(6),E(4) in 3/3 window environment.
Multiple duals of D(4) are D(22),E(4) in 5/5 window environment .
Multiple duals of D(4) are D(46),E(4) in 7/7 window environment.
Multiple duals of D(4) are D(78),E(4) in 9/9 window environment.
IN GENERAL

$(D(1))^d = D(w^2), E(1)$ $\qquad$ $(D(2))^d = D(w^2-1), E(2)$
$(D(3))^d = D(w^2-2), E(3)$ $\qquad$ $(D(4))^d = D(w^2-3), E(4)$
$(D(5))^d = D(w^2-4), E(5)$ $\qquad$ $(D(6))^d = D(w^2-5), E(6)$
$(D(7))^d = D(w^2-6), E(7)$ $\qquad$ … … …
… … …
$(D(w^2-6))^d = D(7), E(w^2-6)$ $\qquad$ $(D(w^2-5))^d = D(6), E(w^2-5)$
$(D(w^2-4))^d = D(5), E(w^2-4)$ $\qquad$ $(D(w^2-3))^d = D(4), E(w^2-3)$
$(D(w^2-2))^d = D(3), E(w^2-2)$ $\qquad$ $(D(w^2-1))^d = D(2), E(w^2-1)$
$(D(w^2))^d = D(1), E(w^2)$

In general the formula for multiple duality is

$(D(m))^d = D(w^2+1-m), E(m)$ Where $m = 1$ to w^2

The above concepts are explained in the author's paper 10.
In the same way duals of soft erosion also will exist.
The dual of soft erosion E(1) is E(9) in 3/3 window environment.
The dual of soft erosion E(1) is E(25) in 5/5 window environment.
The dual of soft erosion E(1) is E(49) in 7/7 window environment.
The dual of soft erosion E(1) is E(81) in 9/9 window environment.
The dual of soft erosion E(1) is E(121) in 11/11 window environment.
In the same way the dual of soft erosion E(5) is E(5) in 3/3 window environment.
The dual of soft erosion E(5) is E(21) in 5/5 window environment.
The dual of soft erosion E(5) is E (45) in 7/7 window environment.
The dual of soft erosion E(5) is E(77) in 9/9 window environment.
The dual of soft erosion E(5) is E(116) in 11/11 window environment.
These concepts are eloborated in paper 13.
Multiple duals of E(1) are E(9),D(1) in 3/3 window environment.
Multiple duals of E(1) are E(25),D(1) in 5/5 window environment.
Multiple duals of E(1) are E(49),D(1) in 7/7 window environment.
Multiple duals of E(1) are E(81),D(1) in 9/9 window environment.
In the same way multiple duals of E(4) are E(6),D(4) in 3/3 window environment.
Multiple duals of E(4) are E(6),D(4) in 3/3 window environment
Multiple duals of E(4) are E(22),D(4) in 5/5 window environment
Multiple duals of E(4) are E(46),D(4) in 7/7 window environment
Multiple duals of E(4) are E(78),D(4) in 9/9 window environment
IN GENERAL

$(E(1))^d = E(w^2), D(1)$ $\qquad$ $(E(2))^d = E(w^2-1), D(2)$

$(E(3))^d = E(w^2-2), D(3)$ $\quad$ $(E(4))^d = E(w^2-3), D(4)$
$(E(5))^d = E(w^2-4), D(5)$ $\quad$ $(E(6))^d = E(w^2-5), D(6)$
$(E(7))^d = E(w^2-6), D(7)$

……………

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$(E(w^2-6))^d = E(7), D(w^2-6)$ $\quad$ $(E(w^2-5))^d = E(6), D(w^2-5)$
$(E(w^2-4))^d = E(5), D(w^2-4)$ $\quad$ $(E(w^2-3))^d = E(4), D(w^2-3)$
$(E(w^2-2))^d = E(3), D(w^2-2)$ $\quad$ $(E(w^2-1))^d = E(2), D(w^2-1)$
$(E(w^2))^d = E(1), D(w^2)$

In general, $\quad (E(m))^d = E(w^2+1-m), D(m)$ $\quad$ Where $m = 1$ to w^2

The above concepts are explained in the author's paper 16 .

6. DUALITY OF ITERATIVE SOFT EROSION IN MULTI SCALE SOFT MORPHOLOGICAL ENVIRONMENT

In this section the duality of iterative soft erosion is discussed, with various cases like same thresholds, different thresholds, and with various duals.

6.1. Duality of iterative soft erosion with same threshold and with one type of dual.

$(E(m))^d = D(m).$

$(E(m)E(m))^d = (E(m))^d(E(m))^d = D(m)D(m)$

$$((E(m))^4)^d = (E(m)E(m)E(m)E(m))^d = (E(m))^d(E(m))^d(E(m))^d(E(m))^d$$
$$= D(m)D(m)D(m)D(m) = (D(m))^4$$
$$\therefore\ ((E(m))^4)^d = (D(m))^4$$

$$\left((E(m))^5\right)^d = \left(E(m)E(m)E(m)E(m)E(m)\right)^d$$
$$= (E(m))^d(E(m))^d(E(m))^d(E(m))^d(E(m))^d$$
$$= D(m)D(m)D(m)D(m)D(m) = (D(m))^5$$
$$\therefore\ ((E(m))^5)^d = (D(m))^5$$

$$\left((E(m))^6\right)^d = \left(E(m)E(m)E(m)E(m)E(m)E(m)\right)^d$$
$$= (E(m))^d(E(m))^d(E(m))^d(E(m))^d(E(m))^d(E(m))^d$$
$$= D(m)D(m)D(m)D(m)D(m)D(m) = (D(m))^6$$
$$\therefore\ ((E(m))^6)^d = (D(m))^6$$

$$\left((E(m))^n\right)^d = \left(E(m)E(m)E(m)E(m)E(m)\dots\dots E(m)\right)^d$$
$$= (E(m))^d(E(m))^d(E(m))^d(E(m))^d(E(m))^d\dots\dots(E(m))^d$$
$$= D(m)D(m)D(m)D(m)D(m)\dots\dots D(m) = (D(m))^n$$
$$\therefore\ ((E(m))^n)^d = (D(m))^n$$

6.2. Duality of iterative soft erosion with same threshold and with another type of dual.

$(E(m))^d = E(w^2+1-m).$

$(E(m)E(m))^d = (E(m))^d(E(m))^d = E(w^2+1-m)E(w^2+1-m)$

$$((E(m))^4)^d = (E(m)E(m)E(m)E(m))^d = (E(m))^d(E(m))^d(E(m))^d(E(m))^d$$
$$= E(w^2+1-m)E(w^2+1-m)E(w^2+1-m)E(w^2+1-m)$$
$$= (E(w^2+1-m))^4$$
$$\therefore\ ((E(m))^4)^d = (E(w^2+1-m))^4$$

$$((E(m))^n)^d = (E(m)E(m)E(m)\dots\dots E(m))^d = (E(m))^d(E(m))^d(E(m))^d\dots\dots(E(m))^d$$
$$= E(w^2+1-m)E(w^2+1-m)E(w^2+1-m)\dots\dots E(w^2+1-m)$$
$$= (E(w^2+1-m))^n$$
$$\therefore\ ((E(m))^n)^d = (E(w^2+1-m))^n$$

6.3. Duality of iterative soft erosion with different thresholds and with one type of dual.

$(E(m))^d = D(m).$

$(E(m)E(n))^d = (E(m))^d(E(n))^d = D(m)D(n)$

$$(E(m)E(n)E(o))^d = (E(m))^d(E(n))^d(E(o))^d$$
$$= D(m)D(n)D(o)$$
$$\therefore\ \left(E(m)E(n)E(o)\right)^d = D(m)D(n)D(o)$$

$$\left(\underset{1}{E(m)}\underset{2}{E(n)}\underset{3}{E(o)}\underset{4}{E(p)}\dots\dots\underset{n}{E(z)}\right)^{d} = \underset{1}{(E(m))^{d}}\underset{2}{(E(n))^{d}}\underset{3}{(E(o))^{d}}\underset{4}{(E(p))^{d}}\dots\dots\underset{n}{(E(z))^{d}}$$

$$= \underset{1}{D(m)}\underset{2}{D(n)}\underset{3}{D(o)}\underset{4}{D(p)}\dots\dots\underset{n}{D(z)}$$

$$\left(\underset{1}{E(m)}\underset{2}{E(n)}\underset{3}{E(o)}\underset{4}{E(p)}\dots\dots\underset{n}{E(z)}\right)^{d} = \underset{1}{D(m)}\underset{2}{D(n)}\underset{3}{D(o)}\underset{4}{D(p)}\dots\dots\underset{n}{D(z)}$$

6.4. Duality of iterative soft erosion with different thresholds and with another type of dual.

$(E(m))^d = E(w^2+1-m)$.

$(E(m)E(n))^d = (E(m))^d(E(n))^d = E(w^2+1-m)E(w^2+1-n)$

$$(E(m)E(n)E(o))^d = (E(m))^d(E(n))^d(E(o))^d$$
$$= E(w^2+1-m)E(w^2+1-n)E(w^2+1-o)$$
$$\therefore\ \left(E(m)E(n)E(o)\right)^d = E(w^2+1-m)E(w^2+1-n)E(w^2+1-o)$$

$$\left(\underset{1}{E(m)}\underset{2}{E(n)}\underset{3}{E(o)}\underset{4}{E(p)}\dots\dots\underset{n}{E(z)}\right)^{d} = \underset{1}{(E(m))^{d}}\underset{2}{(E(n))^{d}}\underset{3}{(E(o))^{d}}\underset{4}{(E(p))^{d}}\dots\dots\underset{n}{(E(z))^{d}}$$

$$= \underset{1}{E(w^2+1-m)}\underset{2}{E(w^2+1-n)}\underset{3}{E(w^2+1-o)}\underset{4}{E(w^2+1-p)}\dots\dots\underset{n}{E(w^2+1-z)}$$

6.5. Duality of iterative soft erosion with same threshold and with two duals

(a) $((E(m))^2)^d = (E(w^2+1-m), D(m))(E(w^2+1-m), D(m))$

$= \left(E(w^2+1-m)\ E(w^2+1-m)\right)$ or $(E(w^2+1-m)D(m))$
or $\left(D(m)E(w^2+1-m)\right)$ or $D(m)D(m$

$((E(m))^2)^d \ = \left(E(w^2+1-m)\ E(w^2+1-m)\right)$ or $O(w^2+1-m, m)$
or $C(m, w^2+1-m$
or $(D(m)D(m))$

= Double soft erosion or soft open or soft close or double soft dilation

(b) $\left(\left(E(m)\right)^4\right)^d = \left(E(w^2+1-m), D(m)\right)\ \left(E(w^2+1-m), D(m)\right)$
$(E(w^2+1-m), D(m))\ \ (E(w^2+1-m), D(m))$
$= (E(k), D(m))\ (E(k), D(m))\ (E(k), D(m))\ (E(k), D(m))$
(by putting $w^2+1-m = k$)
$= (E(k)E(k)E(k)E(k))$ or $(E(k)E(k)E(k)D(m))$ or $\left(E(k)E(k)D(m)E(k)\right)$
or $(E(k)E(k)D(m)D(m))$ or$\left(E(k)D(m)E(k)E(k)\right)$ or
$(E(k)D(m)E(k)D(m))$ or $\left(E(k)D(m)D(m)E(k)\right)$ or
$(E(k)D(m)D(m)D(m))$ or
$(D(m)E(k)E(k)E(k))$ or $(D(m)E(k)E(k)D(m))$ or $\left(D(m)E(k)D(m)E(k)\right)$
or $(D(m)E(k)D(m)D(m))$ or$\left(D(m)D(m)E(k)E(k)\right)$ or
$(D(m)D(m)E(k)D(m))$ or $\left(D(m)D(m)D(m)E(k)\right)$ or
$(D(m)D(m)D(m)D(m))$

= Iterative soft erosion four times or iterative soft erosion three times followed by soft dilation or iterative soft erosion two times followed by soft close or iterative soft erosion two times followed by soft dilation two times or soft open followed by iterative soft erosion two times or soft open two times or soft open soft close or soft open followed soft dilation two times or soft close followed by soft erosion two times or soft close followed by soft open or soft close followed by soft close or soft close followed by soft dilation two times or soft dilation two time followed soft erosion two times or soft dilation two times followed by soft open or soft dilation two times followed soft close or soft dilation four times.

In the same way formulae for

$\left(\left(E(m)\right)^6\right)^d$, $\left(\left(E(m)\right)^8\right)^d$, $\left(\left(E(m)\right)^{10}\right)^d$, $\left(\left(E(m)\right)^{12}\right)^d$ … … … may developed by above methodology.

6.6. Duality of iterative of soft erosion with different thresholds and with two duals.

$$(E(m)E(n))^d = \left(E(m)\right)^d\left(E(n)\right)^d = \left(E(w^2+1-m), D(m)\right)\left(E(w^2+1-n), D(n)\right)$$

$= \left(E(w^2+1-m)\ E(w^2+1-n)\right)$ or $(E(w^2+1-m)D(n))$ or $\left(D(m)E(w^2+1-\ n)\right)$
or $\ D(m)D(n)$

$= \big(E(w^2+1-m)\,E(w^2+1-n)\big)$ or $\big(O(w^2+1-m,n)\big)$ or $\big(C(m,w^2+1-n)\big)$
or $D(m)D(n)$
= soft erosion twice or soft open or soft close or soft dilation twice.

6.7. Duality of iterative of soft erosion with different thresholds and with three duals.

$$\boldsymbol{(E(m)E(n)E(p))^d = (E(m))^d(E(n))^d(E(p))^d}$$

$= \big(E(w^2+1-m),D(m)\big)\,\big(E(w^2+1-n),D(n)\big)\,\big(E(w^2+1-p),D(p)\big)$

(by substituting x for w^2+1-m, y for w^2+1-n, z for w^2+1-p)

$= (E(x),D(m))\ (E(y),D(n))\ (E(z),D(p))$

$= (E(x)E(Y)E(z))$ or $(E(x)E(Y)D(p))$ or $(E(x)D(n)E(z))$ or $(E(x)D(n)D(p))$ or
$(D(m)E(Y)E(z))$ or $(D(m)E(Y)D(p))$ or $(D(m)D(n)E(z))$ or $(D(m)D(n)D(p))$

$= (E(w^2+1-m)E(w^2+1-n)E(w^2+1-p))$ or
$(E(w^2+1-m)E(w^2+1-n)D(p))$ or
$(E(w^2+1-m)D(n)E(w^2+1-p))$ or
$(E(w^2+1-m)D(n)D(p))$ or
$(D(m)E(w^2+1-n)E(w^2+1-p))$ or
$(D(m)E(w^2+1-n)D(p))$ or
$(D(m)D(n)E(w^2+1-p))$ or $(D(m)D(n)D(p))$

= soft erosion thrice with different thresholds or soft erosion followed by soft open or soft erosion followed by soft close or soft open followed by soft dilation or soft close followed by soft erosion or soft close followed by soft dilation or soft dilation followed by soft close or soft dilation thrice with different thresholds.

6.8. Duality of iterative of soft erosion with different thresholds and with four duals.

$$\mathbf{(E(m)E(n)E(p)E(q))^d = (E(m))^d(E(n))^d(E(p))^d(E(q))^d}$$

$= \big(E(w^2+1-m),D(m)\big)\,\big(E(w^2+1-n),D(n)\big)$
$\big(E(w^2+1-p),D(p)\big)\big(E(w^2+1-q),D(q)\big)$

(by substituting a for $E(w^2+1-m)$, b for $D(m)$ c for $E(w^2+1-n)$, d for $D(n)$ e for $E(w^2+1-p)$, f for $D(p)$
g for $E(w^2+1-q)$, h for $D(q)$)

$= (a,b)\ (c,d)(e,f)(g,h) = aceg$ or $aceh$ or $acfg$ or $acfh$ or $adeg$ or $adeh$ or $adfg$ or $adfh$ or $bceg$ or $bceh$ or $bcfg$ or $bcfh$ or $bdeg$ or $bdeh$ or $bdfg$ or $bdfh$

$= (E(w^2+1-m))(E(w^2+1-n))(E(w^2+1-p))(E(w^2+1-q))$ or
$(E(w^2+1-m))(E(w^2+1-n))(E(w^2+1-p))(D(q))$ or
$\big(E(w^2+1-m)\big)\big(E(w^2+1-n)\big)(D(p))(E(w^2+1-q))$ or
$(E(w^2+1-m))(E(w^2+1-n))(D(p))(D(q))$ or
$(E(w^2+1-m))(D(n))(E(w^2+1-p))(E(w^2+1-q))$ or
$(E(w^2+1-m))(D(n))(E(w^2+1-p))(D(q))$ or
$(E(w^2+1-m))(D(n))(D(p))(E(w^2+1-q))$ or
$(E(w^2+1-m))(D(n))(D(p))(D(q))$ or
$(D(m))(E(w^2+1-n))(E(w^2+1-p))(E(w^2+1-q))$ or
$(D(m))(E(w^2+1-n))(E(w^2+1-p))(D(q))$ or
$(D(m))\big(E(w^2+1-n)\big)(D(p))(E(w^2+1-q))$ or
$(D(m))(E(w^2+1-n))(D(p))(D(q))$ or
$(D(m))(D(n))(E(w^2+1-p))(E(w^2+1-q))$ or
$(D(m))(D(n))(E(w^2+1-p))(D(q))$ or
$(D(m))(D(n))(D(p))(E(w^2+1-q))$ or
$(D(m))(D(n))(D(p))(D(q))$

= soft erosion four times with four different thresholds or soft erosion twice and soft open once with different thresholds or soft erosion twice and soft close once with different thresholds or soft erosion twice and soft dilation twice with different thresholds or soft open once and soft erosion twice or soft open twice with different thresholds or soft open and soft close with different thresholds or soft open once and soft dilation twice with different thresholds or soft close once and soft erosion twice with different thresholds or soft close once and soft open once with different thresholds or soft close twice with different thresholds or soft close once and soft dilation twice with different thresholds or soft dilation twice and soft erosion twice with different thresholds or soft dilation twice and soft open once with different thresholds or soft dilation twice and soft close once with different thresholds or soft dilation four times with different thresholds.

6. CONCLUSION: In this paper a fundamental property called DUALITY is discussed in multi scale as well as iterative environment. It will fill up gap, on the fundamentals of mathematical soft morphology. Till now applications are discussed in various papers by various researchers, but fundamental properties are not touched. More over DUALITY is having broad applications. so discussion and understanding of fundamental property in this context, will lead to development and expansion of this area, which will lead to excellent applications.

In this paper duality of iterative soft erosion is discussed thouroughly and the corresponding mathematical formulae are also given which will help for further theoratical development .

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A Survey Paper On Program Restructuring And Component Reuse With Data Mining Techniques

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Abstract—Software engineering is the study and an application of engineering to the design, development and maintenance of software. It is a disputation for the technical person, as it is difficult for them to produce software which is very cheap, fast functions better. The benefit of Software resembles in the growth of the computer hardware. Component based software system is reuse based method. By the reusability the component can have better qualified, cheaper cost, improved performance. The reusable software component works better than the existing software as they are created with overcoming of the existing software module. Provide more standardized system. The objective is to estimate high reusability of component because it decrease the cost and implementation time as compared to develop new system. These papers present a brief study about a process or method through which we will classify the reusable component in proper way to get the full benefits of reusability. The output is a set of highly cohesive component.

Keywords— software component , hierarchical clustering, fuzzy logic, nueral network, xnor similarity function, fuzzy clustering .

INTRODUCTION

Software reuse is the process of repeated use of the software designed for reuse. Due to the benefits of reusability like reduction in time, cost, maintenance or work as compared to develop a new system. If we apply reusability into software component then reusable component are maintaining easily and usually have a higher quality value. There is a need to organize and classify collection of component so that we can identify the suitable component for potential reuse. Classify the reusable components according to their cluster. Clustering is mainly the process of making the group of similar type of component. The benefit of grouping over categorization is that, it is flexible for modification as well as assist distinct feature that illustrate dissimilar group. Software reuse consists of two approaches that are development of code from abrasion and extraction of reusable code from the existing code. Code reuse is extracting the partial or complete written programming code from the application software system and reuses it to write a new code in order to adopt in the existing application software system. Reusing limits the development time and reduces the energy to develop the code by reusing the programming code.

Researchers have proposed various methods for reuse the component. [1] Design and define an algorithm for clustering the document. Authors have discussed a clustering of components on the basis of XNOR similarity function to find degree of similarity between two document sets or software component. [2] Proposed a method through which classify the reusable components in proper way to get full benefits of reusability. [3] Adaptive fuzzy clustering technique proposed based on possibility clustering algorithms to address the issue of single metric. [4] Compares the sensitivity analysis of the two models depending upon different parameters: Modularity, Interface Complexity, Maintainability, Flexibility and Adaptability for accessing Software Reusability level using Soft computing techniques. [5] Reusable component technology is used in order to improve the efficiency and quality of management information system. [6] Proposed program restructuring at the functional level based on the clustering technique with cohesion. [8] Proposed various algorithms and techniques for efficiently retrieval of components from the component repository. [10] Define how to collect useful information on software component reusability and the factors on which reusability of the component is highly dependent. [15] Quantitatively compare two clustering techniques for clustering a repository of classes from a Java API for building mobile system. [17] Cluster the software components and form a subset of libraries from the available repository.

The rest of the paper is organized as follows: Section II the problem of software reusability is described. Section III presents a brief overview of clustering technique. Section IV presents the results analysis. Section V presents conclusions and future scope.

PROBLEM DEFINITION

Software development self addressed challenges of increasing complexity and dependence on external software by that specialize in one system at a time and on delivery deadlines and budgets, whereas ignoring the evolutionary needs of the system. This has led to a number of problems: the failure of the majority of projects to fulfill their deadline, budget, and quality requirements and the continued increase within the costs related to software maintenance. If new software products are each time to be developed from scratch, these goals can't be achieved. The key to the solution to this problem is Reusability. From this perspective Component-Based Software Development (CBSD) appears to be the correct approach. In CBSD software systems are built by grouping components already developed and prepared for integration. [13] CBSD are the provision of support for the development of systems as assemblies of components, the development of components as reusable entities, and also the maintenance and upgrading of systems by customizing and replacing their components. [10] The main objective of CBSD is to write once and reuse any number of times with no or minor modification .CBSD has several benefits. These include more effective management of complexity, reduced time to market, increased productivity, improved quality, a greater degree of consistency, and a wider range of usability.

METHODOLOGY

Program restructuring or code reusability can be used to transform such programs or poorly-designed ones to another form that is better organized and easier to understand, without changing the behaviour of the programs. For that, the input data set is a component-attribute data matrix. Components are the entities that we want to group based on their similarities. The components could be software modules; the attributes, a set of features.The Program restructuring and component reuse approach is based on clustering analysis for the entities and their attributes extracted from source code. It also keeps software maintenance cost under control. Following different clustering techniques for component reuse and program restructuring are-

A. Hierarchical Agglomerative Clustering (HAC)

To assign each component to a cluster we use HAC algorithm. This algorithm merges the two closest similar clusters. It will be repeated until; there is only one cluster left. Weighted Pair-Group Method using Arithmetic Averages (WPGMA), Complete Linkage Algorithm (CLINK), and Single Linkage Algorithm (SLINK) are the three commonly used HAC algorithms. The distance between two clusters in WPGMA is finding by taking the average of distance between all pairs of components in the two clusters. CLINK takes the distance between the most distant pair of components, one from each cluster SLINK find by measuring the distances between the closest pair of components, taking one component from each cluster. There are many problem with HAC algorithm that are when large amount of data is provided then its perform it very slowly and it is highly sensitive with halting criterion that is by mistakes it can merge valuable clusters into one cluster and also it not scale well. Previously done things can never be undo by using HAC algorithm. It has to recalculate over and again at each repetition in order to find similarity between clusters.

B. Fuzzy logic

Fuzzy logic is a methodology that deals with uncertain and imprecise data. Fuzzy logic system can be modeled with little data or without any data. Fuzzy logic technique has many advantages over other soft computing techniques. One of them is that it is less reliant on previous values. It may also work without data. So it will result in better understanding the reuse task. It considers factors like customizability, interaction complexity, understand ability, commonality and portability as input while reusability of component is considered as output. This model can be used to predict the reusability of CBSD, which will help in estimating development efforts and quality for the application.

C. Nueral Network

Neural Network (NN) can be used to represent the complex non-linear associations (input-output relationship) and functions. NN is used to predict the reusability levels of software by establishing the relationship between the inputs and outputs based on its training. It produces the correct output from its training data or incomplete data. NN model is more stable then the fuzzy model for building most of the software and application. It is also used to represent the software reusability functionality.

D. XNOR Similarity Function

To design a clustering algorithm firstly we will have to make the similarity function which is the core part of any clustering algorithm. Generally we use Hybrid XNOR function as a similarity function, which is used to calculate the similar features between any pair of entities which may be software components or documents. The documents may be a software product document or a code fragments or it may be text files to be classified. The input for components clustering algorithms are software components with properties predefines and the output for components clustering algorithms is a set of highly cohesive components with low coupling feature. According to the XNOR similarity function we find out the similarity between the two documents and it will produce value Z (worst case) when the feature is absence in one of the documents and it will produce value zero when the feature is absence in both documents and it will produce value one if the feature is present in both the documents. It normalize the documents highly cohesive software component is produce by the use this algorithm.

E. Fuzzy Clustering

One challenge in clustering is to identify the cluster for some components that do not reveal strong relationship with a particular cluster or any clusters, or have high coupling with multiple clusters. It has been proposed to identify those “fuzzy” components by showing explicit membership values that a component is associated within all prospective clusters. The membership values are an indication of which cluster a component belongs to. The component belongs to the cluster with which it has the highest membership value. Fuzzy clustering has three requirements that is Membership value or degree, Total Membership, No empty clusters are allowed and no cluster may contain all the data. Compared with different clustering technique, Fuzzy clustering is more flexible and practical for real world complicated uneven distributed data, because during the clustering iteration, data instances can belong to more than one cluster with different membership values. Fuzzy clustering obtains the optimal result.

RESULT

After studying and analyzing different clustering techniques in order to address the issue of software component reuse and program reusability we conclude that fuzzy clustering is more robust to data distribution and more flexible to number of clusters as compared to other techniques. This technique can efficiently group data into cohesive clustering. The overall effort is reduced here. Effort includes number of lines of codes, effort of development and development time. The graphical representation of effort of development and development time before and after clustering technique is shown below

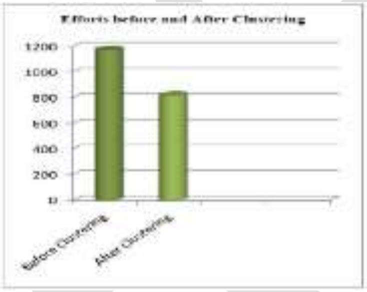

Fig.1. Comparison of Development Effort before and after clustering.

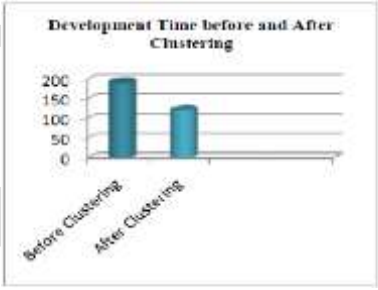

Fig.2. Comparison of Development Time before and after clustering.

CONCLUSION

In this paper a wide survey has been done on different clustering technique for reusability of software component and program restructuring. The results provided by Fuzzy Clustering are valuable and objective information. These results obtained are effective in handling the two common challenges for clustering technique the first one being the determination of number of clusters and the other one is determination of a software module for some highly coupled components.

In future, fuzzy clustering is used to estimate high reusability of component and program restructuring.

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An Analysis and Survey on Future Trends of Data Mining in Prediction and Recurrence of Lung, Breast and Liver Cancer

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Abstract— The healthcare industry collects immense amounts of medical data. These data are collected from the patients who have undergone any kind of medical treatment or tests. By mining into these data, hidden patterns and relationships can be discovered for efficient analysis, diagnosis and prognosis. If this information gathered is aptly utilised then a system can be generated to assist the medical practitioner to take medical decisions. The apparent relationships that has been discovered with respect to cancer does not give accurate results when applied to prediction models. Thus we need to discover new relationships and patterns which will help set up a more accurate decision support system. Data mining is a process of getting hidden patterns from the dataset. Various data mining techniques are clustering, classification, association analysis, regression, summarization, time series analysis and sequence analysis, etc. The objective of this paper is to review the past work done on the prediction of lung, breast and liver cancer, three of the most fatal diseases. The aim of this work is to provide a succinct and concise overview of the work done in this field.

Keywords—Breast Cancer, Lung Cancer, Liver Cancer, WEKA, Data Mining, GA, Fuzzy clustering , ANN, ROCO, Classification Rules.

INTRODUCTION

Cancer is the name given to a collection of related diseases. In all types of cancer, some of the body's cells begin to divide without stopping and spread into surrounding tissues. Cancer can start almost anywhere in the human body, which is made up of trillions of cells. Normally, human cells grow and divide to form new cells as the body needs them. When cells grow old or become damaged, they die, and new cells take their place. When cancer develops, however, this orderly process breaks down. As cells become more and more abnormal, old or damaged cells survive when they should die, and new cells form when they are not needed. These extra cells can divide without stopping and may form growths called tumors. Lung cancer is the second most common cancer, accounting for about one out of five malignancies in men and one out of nine in women and the leading cause of cancer death among both men and women where about 1 out of 4 cancer deaths are from lung cancer. Each year, more people die of lung cancer than of colon, breast, and prostate cancers combined. Liver cancer is the sixth most common cancer in the world. Globally, hepatocellular carcinoma (HCC) is among the most prevalent malignant tumors. Worldwide, over a million deaths per year (about 10% of all deaths in the adult age range) can be attributed to hepatocellular carcinoma. Liver cancer is usually a life-threatening condition. However, like lung cancer, it may be effectively treated if found early. Breast cancer is cancer that develops from breast tissue.Signs of breast cancer include a lump in the breast, a change in breast shape, dimpling of the skin, fluid coming from the nipple, or a red scaly patch of skin. In those with large spread of the disease, there may be any of the following: bone pain, swollen lymph nodes, shortness of breath, or yellow skin. Over the years, many researchers have been trying to create a model which can help efficiently diagnose the possibility of cancer, as the earlier it is diagnosed the better are the chances of survival. This paper aims to explore the many recent works published on the matter and provide a coherent and collected summary of such work that is based on the prediction of possibilty of cancer based on features of the patient which can be known without any invasive medical procedures. The various papers that we have reviewed here basically make use of either of the following algorithms in various combinations: genetic algorithm, artificial neural network and fuzzy c means. The father of the original Genetic Algorithm was John Holland who invented it in the early 1970's. Genetic Algorithms are adaptive heuristic search *algorithms* based on the evolutionary ideas of natural selection and genetics. Genetic algorithms harness the power of evolution to solve optimization problems. So different processes of natural selection like recombination and mutation are incorporated into the algorithm. The father of the original Genetic Algorithm was John Holland who invented it in the early 1970's. Artificial neural networks are computer programs designed to simulate the way in which the human brain processes information.

ANNs gather their knowledge by detecting the patterns and relationships in data and learn over time through experience and not from programming. It basically refers to a large network of processing elements, which behave like neurons, arranged in multiple layers. Fuzzy c-means (FCM) is a method of clustering which allows one piece of data to be a part of two or more clusters. This method (developed by Dunn in 1973and improved by Bezdek in 1981) is frequently used in pattern recognition. This sort of clustering is most apt for fuzzy datasets. We believe these three methods are few of the most efficient techniques to be applied in the prediction of the possibility of cancer.

ANALYSIS OF VARIOUS PAPERS IN THIS FIELD OF RESEARCHERS

REVIEW OF PAPERS REGARDING LUNG CANCER

K.Balachandaran et al.[1] have an interesting approach towards prediction of lung cancer. In this paper, the given dataset's dimensionality is reduced using Artificial Bee Colony (ABC) algorithm and the reduced dataset containing just the high risk factors and symptoms which cause lung cancer are fed into the Feed Forward Back Propagation Neural Network (FFBNN). While training, the FFBNN parameters are optimized using ABC algorithm. During the testing process, more number of patient's data is given to well trained FFBNN-ABC to validate whether the given testing data predict the lung disease perfectly or not. The accuracy of the proposed technique is 90% and the sensitivity of the same is 88% while the specificity is 100%.

K. Polat et al. [2] have detected lung cancer using principles component analysis (PCA), fuzzy weighting preprocessing and artificial immune recognition system (AIRS). The system has three stages. First, dimensionality of lung cancer dataset that has 57 features was reduced to four features using principles component analysis. Second, a weighting scheme based on fuzzy weighting pre- processing was utilized as a pre-processing step before the main classifier. Third, artificial immune recognition system was used classifier. Experiments were conducted on the lung cancer dataset to diagnose lung cancer in a fully automatic manner. The obtained classification accuracy of system was 100% and it was very promising with regard to the other classification applications.

V. Krishnaiah et al.[3] discusses the statistically significant effect of symptoms and risk factors in pre-diagnosis stage. A prototype lung cancer disease prediction system has been developed using data mining classification techniques which extracts hidden knowledge from a historical lung cancer disease database. The healthcare industry amasses large amounts of medical data which are rarely properly exploited to discover hidden patterns and relationships. For data preprocessing and effective decision making. One Dependency Augmented Naïve Bayes classifier, also known as ODANB, and Naive Creedal Classifier 2, also known as NCC2, are used. This appears to be an extension of Naïve Bayes to imprecise probabilities that aims at delivering robust classifications also when dealing with small or incomplete data sets. According to the authors' experimental results, the most effective model to predict patients with lung cancer disease appears to be Naïve Bayes followed by IF-THEN rule, Decision Trees and Neural Network.

Parag Deoskar, et al. [4] proposes to combine data mining and ant colony optimization techniques for appropriate rule generation and classification, which can lead to to accurate cancer classification. In addition to this, it provides basic framework for further improvement in medical diagnosis. This paper is divided into sections which handle the following topics each: medical data mining; ant colony optimization; related works; theoretical extraction. It is seen that ant colony optimization helps in increasing the prediction (of the disease) value significantly. The authors provided future suggestions like application of neural network and Fuzzy based technique to train cancer data set for finding better classification, applying optimization techniques like ACO to improving the detection, use of machine learning environment or Support Vector machine and the use of homogeneity based algorithm to find overfitting and over generalization Characteristics.

P. Ramachandaran et al. [5] uses data mining technology such as classification, clustering and prediction to identify potential cancer patients. The gathered data is preprocessed to yield significant patterns using decision tree algorithm which is then clustered using K-means clustering algorithm to separate cancer and non cancer patient data. The cancer cluster is further subdivided into six clusters. Finally a prediction system is developed to analyze risk levels which help in prognosis. This research helps in detection of a person's predisposition for cancer before going for clinical and lab tests which is cost and time consuming. The model shows an accuracy of 99.87%.

Thangaraju P et al. [6] proposed a system is to find out the medical issues of Lung cancer and find out the stages of the lung cancer patients by using the data of Patients Details and risk factors of lung cancer which are collected from the hospital database.Mainly decision tree is used for predicting the Lung Cancer Disease from the given dataset instances. In the proposed method mainly decision tree is used for predicting the Lung Cancer Disease from the given data set instances and the proposed model contains three different types of decision tree algorithms such as Naive Bayes, Decision Table and j48 are applied on type Lung Cancer Disease dataset in the WEKA tool and the performance is calculated.In this paper, the Naive Bayes classified 253 instances and produce the 83.4% of accuracy for prediction of lung cancer while the Decision table classified 231 instances and produced 76.2% of accuracy and the J48 classified 235 instances and produced 77.5% of accuracy.

Kawsar Ahmed1, et al. [7] proposed to significant pattern prediction tools for a lung cancer prediction system were developed. The lung cancer risk prediction system should prove helpful in detection of a person's predisposition for lung cancer. The early prediction of lung cancer should play a pivotal role in the diagnosis process and for an effective preventive strategy.In the initial stages, 400 cancer and non-cancer patients' data were collected from different diagnostic centres, pre-processed and clustered using a K-means clustering algorithm for identifying relevant and non-relevant data. Next the significant frequent patterns are discovered using AprioriTid and a decision tree algorithm. Next the experimental results are separated into two sections where one is the discovery of significant frequent patterns and another is the representation of prediction tools for Lung Cancer.Using the data from data warehouse, the significant patterns are extracted for Lung cancer prediction. The collected data are pre-processed by deleting the duplicate records and adding the missing values. Then pre-processed data is clustered using K-means cluster algorithm with k equal to 2.

T. Sowmiya et al [8] speaks of the urgent need for early detection of the cancer that can save the life and help the survivability of the patients who affected by this diseases. This paper surveys several aspects of data mining procedures which canbe used for lung cancer prediction of the patients. It reiterates the importance of data mining concepts in lung cancer classification. It also reviews the aspects of ant colony optimization (ACO) technique in data mining.The paper examines the compromises in selection and dimensionality reduction and showed that acceptable plans could be obtained in approximately 30 minutes. ROCO strategies satisfy all of the clinical restrictions that were satisfied by the planner's plans; with the same PTV D95, there were no significant differences between the OAR sparing achieved by ROCO and the organ sparing achieved by the medical plans. The paper assures that ROCO will be flexible enough for general external beam radiation remedy preparation, and is not confined to simpler treatments such as prostate cancer. A major improvement made to ROCO in the current work is the incorporation of ROCO into MSKCC's clinical treatment scheduling system. ROCO noe seems to be capable of evaluationand inscription beam and dose information directly to/from the treatment scheduling systemThis case study assorted data mining and antcolony optimization techniques for appropriate rule generation and classifications on diseases, which pilot to exact Lung cancer classifications. In additionally to, it provides basic framework for further improvement in medical diagnosis on lung cancer.

REVIEW OF PAPERS REGARDING BREAST CANCER

Using Data Mining Techniques

Miss Jahanvi Joshi et al. [9] developed a new sample model for diagonosis breast cancer patients. there are thirty seven classification rules are used.By comparing the rules the model has been developed. Using this model,it is seen that the patterns of the dataset can be made efficiently.Dataset is figured by using WEKA mining tool. After that,those classification algorithms are used on that dataset. then the sample evaluation is done on the healthy and sick patients and the results are given to the predictive classfier to discover the pattern. Web mining can be classified into three categories which are structure,usage,andcontrol. Above mentioned three categories the usage is used for these model,classification rules are applied on these dataset. some of them of those classifier rules are BayesNet, SGD, Decision table, Decision Stump, SMO, Multi-Scheme, LMT, Voted, Random-Committee, Random-Forest, IBK etc, then prototype is evaluated in order to determine healthy and sick people. By this approach it is seen that discovery of patterns can be efficient. This method is useful to discover the hidden patterns and helps the doctors and medical practioners to take the medical decision. The proposed model can identify the the type of the breast cancer. This model can make the generic model for different areas like commercial model,electricity model.

Ibrahim M. El-Hasnony et al. [10] presented a system to classify the breast cancer.This system is combined of three methods.In order to pre-process the data FRFS(fuzzy rough feature selection) is used to handle the data which are missed.To make the data cluster clustering algorithmis used and features are reduced by the fuzzy rough feature selection and also the features which are reduced is merged.The classification of data is done by the D-KNN(discernibility nearest neighbor)classifier. At last the performance is evaluated.The data set is taken from the UCI repository and this model is examined under that dataset.By using K-means clustering algorithm with k-value 2 the dataset are pre-processed for noise containing data and missing data,for this process WEKA tool and miner(rapid) is used for clustering utilization.The reduction of the clustered data is done by that selection algorithm.The reduced features are combined together to form the new dataset.Atlast,the classification is achieved by the classifier(D-KNN).This model can classify the instances of the new dataset with accuracy up to 98%.The classification accuracy can be increased efficiently by this model.

RonakSumbaly et al. [11] developed the model by using data mining methods for the diagnosis of breast cancer patients to apply the treatment and three other methods like mammography(digital),Naive bayesmodel,Neural networks are presented to make the comparision with the proposed model.Bythis,the decision tree model is constructed.The dataset applied in this proposed model is Wisconsin Breast cancer datasets which are taken from UCI.Thepreprocessing of data is done by J48 decision tree data mining method and after that the data is given to WEKA datamining tool for analysis.k-fold cross validation(where the value of k is 10) method is applied to form the training data.the tree is constructed and the leaf nodes of the tree determine whether the cancer is malignant or benign. The tree is represented level-wise when WEKA mining tool is applied on that preprocesseddataset.Fourteen leaves(leaf nodes) are generated by that tree and the number of total tree was twenty four.This model is tested over 699cases and it gives high accuracy and significant result in most of the cases.The accuracy of prediction of this model is 98%.

Using Genetic Algorithm and Gene Profile Expresion

Nagendra Kumar Singh [12] proposed a model which includes mutation of genes,symptoms of breast cancer and other risk factors causing breast cancer.13 factors are taken under consideration to form the dataset.First the datasets are assigned into class then Genetic algorithm is used to label those classes whether a class is unsafe or safe.The basic rule in order to apply the genetic algorithm was IF-THEN rules.it distinguishes the abnormal and normal genes,if these genes match to each other then the protein sequence is formed and allignment is done.Chromosomeselection,crossover between two genes,generating the offspring,fitness calculation and mutation is performed efficiently.GA has used variable gene encoding mechanisms for chromosomes encoding.By this encoding each gene is assigned to a particular value.this assignment of the gene value is done according to the domains in which that attribute belongs to.17 breast cancer causing genes along with symptoms of breast cancer and risk factors has been included by this proposed model.It is seen that 98% identify and 99% positivity can be observed between normal and patient protein sequence.The 2% dissimilarity is because of mutation in BRCA1 protein, which causes the risk of breast cancer.

C.H. Ooi et al. [13] took the help of Genetic Algorithm to the for resolving the multi-class predictionproblems.This technique detects the the predictive group and the group size of that(optimal).Sixty four lines of cancer cell is contained by the gene expression dataset.The measurement of the gene expression dataset is done by the cDNAmicroarray.That array had nine thousands seven hundreds and three cDNA sequences. Spots where data is missed ,control, and empty spots were excluded, leaving 6167 genes during preprocessing of the dataset.In order to make the gene selection they have used the parallel searching scheme.by this gene selection process is made efficiently.This can be obtained with minimum no of error also the maximal size of the set can be determined.High predictive accuracy can be made by this Genetic algorithm approach.and one classifier is used to classify the data.14 attributes are taken for each dataset but if anything missing then the dataset is rejected.String representation is done and cross over is happened randomly in between the genes.This GA-based gene methods is tested on a gene expression dataset containing nine classes by performing multiple runs in which the size of the population is N and the optimum number of generations, G, have the initial value to 100.Highly accurate classification results can be observed using this method.The accuracy achieved (95% for NCI60) .

Rosa Irene Alvarez Goyanes et al. [14] determined the Hormone Receptor Expression and relates with other digonostic factors(such as age, tumour size,nuclear grade and histological grade etc) based on the 1509 tumours from cuban women and Estrogen receptor(ER) expression was associated with the low nuclear grade and histological grade. Among the 1509 cases, if information was incomplete, In the case of missing information that case is added and that is marked as a ‘’missing’’ case. Tumour size is an effective factor in this study to determine whether a cell is having metastatic or not metastatic. If the cell is non-metastatic then the probability of the getting the cancer in large level is very less. Thisproposed model showed expressions of Hormone Receptor in 38% of breast cancers in Cuban women, among them 34% show minimum one receptor,and it indicates that 73% of victims can get the benefit from this hormone therapy. In this paper it has been determined that the possibility of presence of white tissue in Cuban woman is very high and corresponding hormone receptor expression can be determined for those breast cancer tissue.In the case of the aged women the Estrogen Receptor expression is highly seen and if the age is higher and equal to 50 then the chances of getting that expression is high compare to the young women.

REVIEW OF PAPERS REGARDING LIVER CANCER

Fabio Bagarell et al[15] examined if an Artificial Neural Network is capable in detection ofhepatobiliary disease amongst certain patients with knownhepatobiliary diseases, using only medical and few laboratory findings, to construct a tool for early and “pre-imaging” diagnosis of patients. Medical records of 270 patients was considered. ANN can extract most similar case from database in order to deal with new problems. Each neuron has multiple input layer but only one output layer. Software used is EasyNN-Plus. The end result showed an accuracy of 96%. This method reduced diagnostic errors and built a cost efficient way of handling medical resources.

Herng-Chia Chiu et al[16] constructed prediction models based on medical records for disease free survival using a database for hepatocellular carcinoma (HCC) patients who had received hepatic resection.Survival was defined as disease-free survival after 1, 3, or 5 years. The presence of an event (death or recurrence) was coded as 1, and absence of an event (disease-free survival) was coded as 0. The input layer in each of the three models comprised of 17 neurons: age, gender, liver cirrhosis, chronic hepatitis, AST, ALT, total bilirubin, albumin, creatinine, ASA classification, Child-Pugh classification, TNM stage, tumor number, portal vein invasion, biliary invasion, surgical procedure, and post-operative complication. In the hidden layers, the numbers of neurons were optimized by training and validating data in a trial-and-error process to maximize predictive accuracy. Only one neuron was obtained as an output in all the three cases representing the disease-free survival. The ANN model overpowered the LR and DT models in terms of prediction accuracy.

Md. Osman GoniNayeem et al[17]suggested that ANN turns out to be the most vital classification approach on consideringthree different diseases (heart disease, liver disorder, lung cancer). Feed-forward back propagation neural network algorithm with Multi-Layer Perceptron (MLP) is used as a classifier to distinguish between infected or non-infected person. MLP is a feed forward artificial neural network model used to maps input data onto appropriate outputs. A MLP consists of multiple layers of nodes in a directed graph, each layer is entirely connected to the next one. The results of applying the ANNs methodology to diagnosis of these diseases based upon selected symptoms show abilities of the network to learn the patterns corresponding to symptoms of the person. Here in case of liver disorder prediction patients are classified into four categories: normal condition, abnormal condition (initial), abnormal condition and severe condition. ANN has the ability to learn complex and nonlinear relationships including noisy or less precise information.For liver disorder and lung cancer prediction networks shows an accuracy of 82% and 91% respectively.

Zhang et al[18]explored the factors affecting liver cancer recurrence after hepatectomy.The BP algorithm was used to perform the prognosis on the selected statistical informations.Eighteen factors were selected by uni-factor analysis out of which nine factors were selected by multi-factor analysis. The nine factors selected can be as important indexes to evaluate the recurrence of liver cancer.The ANN is a better approach to evaluate clinical data.The study can provide the basis with scientific and objective datafor analyzing prognosis of liver cancer. The statistic method used in this paper is maximum likelihood estimate. This research was supported by NSFC.

Joseph A. Cruz et al[19] intended to identify the types of machine learning methods being used, the types of training data being constructed, the kinds of cancers being studied and the overall performance of these methods in predicting cancer susceptibility . Although in the recent studies it has been noted that ANN has outperformed most of the machine learning languages yet there are still other alternative strategies to be developed. When dealing with cancer three primary factors need to be examined namely it's prediction, recurrence and survivability. It is clear that machine learning methods tend to improve the performance or predictive accuracy of most prognosis, especially when compared to conventional statistical or expert-based systems. The only limitation being that the whole study is based on assumptions and cross examination so the initial validation has to be done with utter care and has to be crucially examined.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

There is no scope for learning and improvement unless one makes mistakes. We take this opportunity to express our profound gratitude to everyone who has extended a helping hand to us in this endeavour, no matter what their contribution has been. We shall keep working on this topic to further the cause of cancer prediction in the early stages so as to save lives that need not be lost unnecessarily.

CONCLUSION

In conclusion, the current compilation of several paper works can be described as a preliminary study. It will need further validation in a separate cohort of patients with lung, breast and liver problems. In fact, it is clear that a similar ANN can be organized for different kind of diseases, so many possibilities were opened by our analysis. Our proposed method is using a hybrid Artificial Neural Network and Genetic Algorithm for classification which works on the clusters of Fuzzy C Means. In this review, the focus is on the current research being carried out using the data mining techniques to enhance the disease(s) forecasting process.

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Simulation Environments

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Abstract: This research paper provides information about simulation and its enviornments. They are mainly used for the creation of dynamic models which supports different types of modeling like discrete, physics based modeling. The development of these tools enable users to visualize real world system that depicts the behavior and the associated methodology. The majority of simulation environments encompass its own programming language and rest of them relies on graphical approach. Different simulation environments are discussed on the basis of their usability, reliability provided by simulation model.

Keywords:-Simulation; environment;modeling;

I. INTRODUCTION

This research paper deals with the simulation and the simulation environment. The document discusses about the characterstics of various environments. The main aim of the document is to pen down the uses of simulation environments. Simulation aims at drawing conclusions which are meaningful , correct and statistically sound. It allows the study of complex systems and evaluation more convenient and accurate. It is very difficult to keep pace with ever increasing demands of companies by using old paradigms. In the real world time and cost involved in the direct experiments is very high and the results are not satisfactory. Companies are facing lot of problems in designing, evaluating and testing of product or system. But simulation environment reduces these overheads .Innovative, fast and agile scheme is needed to increase the productivity . Simulation provides cost effective modeling of system . It forecasts the behavior of the system[1]. User can look into different properties of the system. Design, Diagnose of existing system problem, Testing of designed system based on different parameters can be easily performed with the help of these environments. Fig 1 represents that development of simulation model. It undergoes through various stages of preprocessing and evaluation.

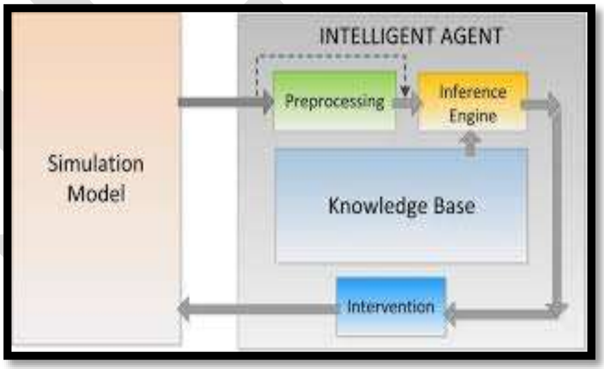

Figure 1: overview of simulation

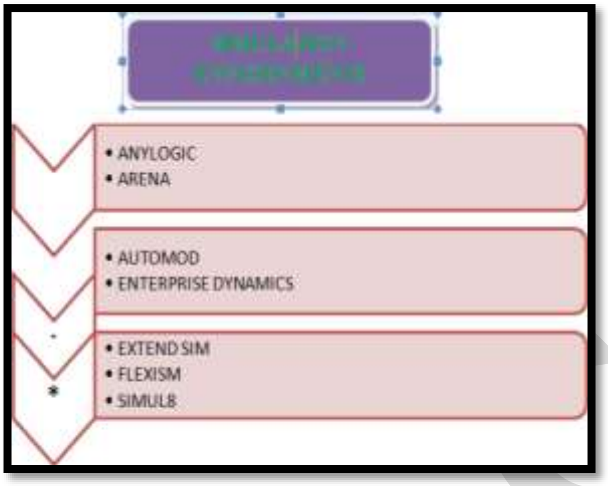

Figure 2: Simulation Enviornments

II. SIMULATION ENVIORNMENTS

The period from 1987 till today is notable with emergence of various enviornment tools which supports features like graphical user interface and advanced visualization tools.These enviornments includes input and output analyzers.The majority of simulation environments encompasses its own programming language and rest of them relies on graphical approach. Fig 2 shows some of the simulation environments discussed in this paper[2].

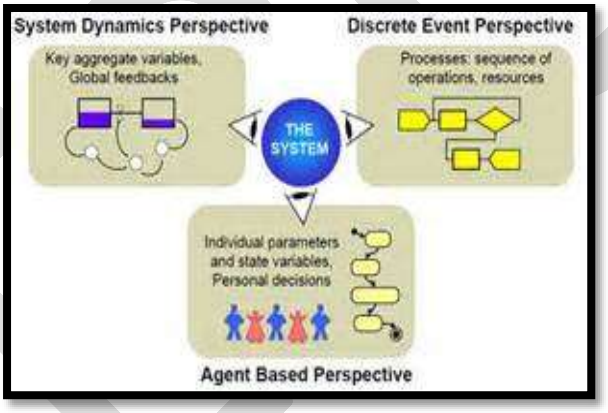

Figure 3: Perspectives supported by AnyLogic

A) Anylogic

Anylogic is a simulation software that supports multi-method simulation in fields like discrete event modeling, agent based modeling & system dynamics. It consists of objects for modelling of a process.It supports all the known modeling approaches. Fig 3 displays these perspectives and the associated variables supported by AnyLogic.This software is based on Java and is platformindependent[3].Source,Queue,Delay,Resource Pool,etc. are the objects in software. It is easy to build model in AnyLogic.It provides good visualization to the developer. Flexibility is another important feature. Drag &Drop capabilities are present. The model can expand limitlessly. Debugger is present in it. The user can save the state and restore the state at later stage. Supply chain logistics, Health care ,Transportation & Warehousing ,Airports, Stations are the applications of Any Logic. AnyLogic has two versions Advanced& Professional are two versions .Business Tools are present in Advanced AnyLogic.New version was released in 2014.It has major updates. Libraries are renewed with less reduced need of coding. Open street maps and Google maps are part of AnyLogic 7.1.AnyLogic is a simulation software that works on different platforms like Windows, Linux and Mac OS.

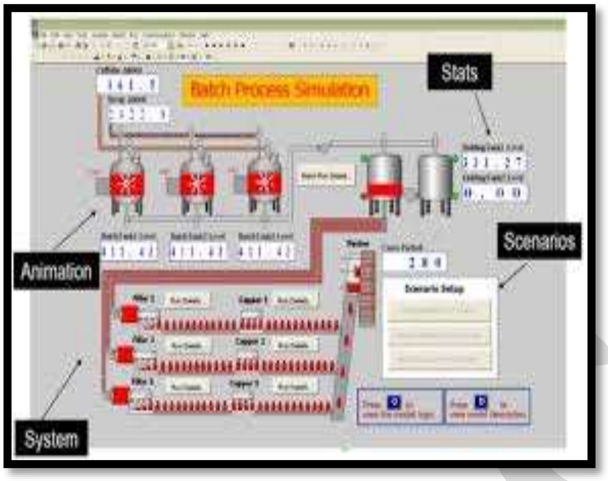

Figure 4: Batch processing Simulation in Arena

B) ARENA

Rockwell Automation offered Arena Basic & Professional Editions. Discrete and Continous systems are simulated using ARENA. It uses entity based ,flowcharting methodology. Graphical Objects are used to build simulation model called modules. Modules can be used to build experimental model. Templates are the collection of organized modules.IconPlus is used to represent the modules.Siman Language is the heart of ARENA. The Professional Edition Of Arena is flexible and has additional functionalities. It measures and tracks performance metrics. The Standard version of Arena is versatile and solve many problems related to simulation. It contains advanced templates.It has student version which is mainly used for academic purpose. It has runtime features.Visioflowcharting is part of it. It provides ODBC data compatibility and real time modeling. Validation, Verification& Debugging is easier in this software. Arena made the communication possible between complex processes. Input Analyzer automates the selection of proper distribution. There is an integration of Opt Quest optimization. It can import files flowcharts of Microsoft Visio and can read from and output to Excel sheets and Access databases. It hosts ActiveX controls. Fig 4 demonstrates the batch processing simulation in ARENA [4].

Figure 5: Representation of real world system modeling in AutoMod

C) AUTOMOD

Applied Materials offers AutoMod. AutoMod comprises of simulation package, AutoStat for Experimentation & Analysis. The largest manufacturing system is modeled in AutoMod. It deploys material handling templates.Full Simulation language is present in AutoMod. It comprises of one or more System.Flow & Control Logic is based on material handling. Fig 5 represents the real world material handling simulation .3D virtual reality,animation graphics,detailed,Stastics&Optimization,interactive modeling are prominent attributes of AutoMod. Reductiom of risk of operation ,highest degree precision are features of Automod. It increases work fecundity. Automod presents Optimization on the basis of Evolution Strategies,characterizationofscenarios,detemination of warm-is done in the environment of Autostat. It supports operational analysis ,evaluate strategies, revamp existing facilities and helps in decision making.Automod is known for its performance, scalability and accuracy[5]**.** Fig.6 throws light on the areas which uses Automod as simulation tool.

Figure 6: Areas of Automod application

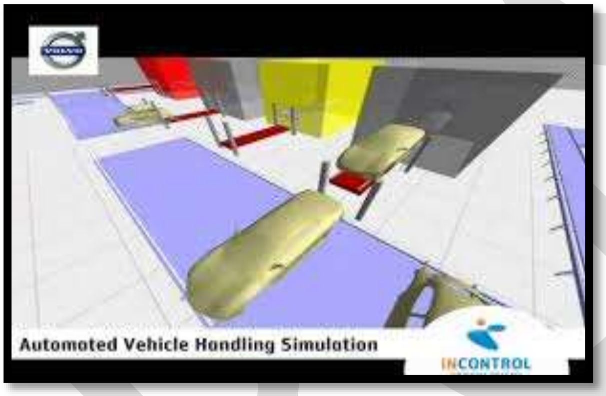

Figure7:Automated Vehicle handling Simulation in Enterprise Dynamics

D) Enterprise Dynamics

Enterprise Dynamics is a simulation software & is a product of Incontrol Simulation Software. It has its own simulation language, 4DScript.4D Script is a functional programming language that supports object oriented scheduling based on events. Enterprise dynamics contains collection of predefined & user defined rules. It supports 2D & 3D animation. It allows the developer to model the problem virtually and then provide the solution for the same. Objects called Atoms are selected from library which captures real world behavior and creates a model. At early design stage, it detects the problem. Rough Cut Capacity planning, transportation planning, equipment planning are performed to optimize and safeguard the investment. There is an availability of 1500 functions. It has drag & drop facility. It allows provision for additional libraries and extension of object libraries.The libraries are designed to comploy with the customers demands. These libraries are: ED Airport,ED Educational, PD Pedestrian Dynamics and Showflow. Fig7 shows the automated vehicle handling simulation. It is intelligent management system to improve efficiency and is cost effective [6].

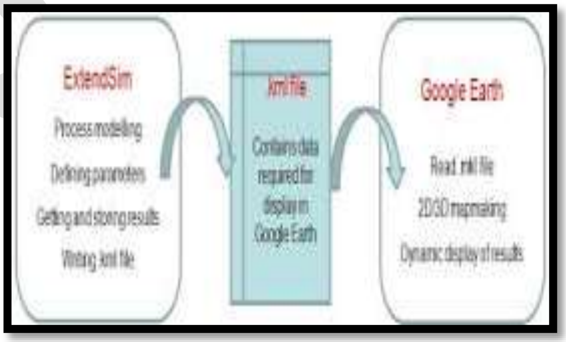

Figure 8: Processing In Extend Sim

E) Extend Sim

Extend Sim is the product of Imagine That Inc. Extend Sim is simulation environment for discrete event & mixed discrete continous systems. This can model continous ,dynamic , linear, non- linear ,agent based systems. It provides drag & drop facilities to the user. This environment has graphical objects which can show logical as well as physical elements. New models can be developed by the connection of various blocks. Each block has its dialog box in which parameters are entered. This block consists of icon, user interface& animation, precompiled code.Create, Queue, Activity, Resource & Pool are present in elemental blocks.It creates logical representation of any process in a simple format.It has customized graphical interface that identifies the relationships in the developed system.Models can be decomposed hierarchically which makes modeling easy and flexible. It has Open Database Connectivity(ODBC) & File Transfer Protocol support. Relational Database ,an Optimizer are also present in the software. Supply chain dynamics ,communication systems , Pulp & Paper process are its applications. Fig 8 shows the steps involved in producing dynamic display of results .The first step shows the process modeling, defining parameters. These results are then written in .kml file which stores data required in Google Earth. After that there is 20/30 mapmaking and finally results are displayed [7].

Figure 9: Airport Security Simulation in Flexism

F) Flexism

Flexism software was the creation of Flexism Software Products ,Inc Of Orem , Utah. This software uses the Open GL technology to simulate discrete, object oriented . 3D virtual reality is used for animation. FlexScript is a precompiled language which is present in Flexism .Complex Algorithms Are modeled by Using Flexscript and C++.It uses object oriented approach .Four classes namely node class, fixed resource class, task executer class and visual object class are used to define objects.It has drag and drop capabilities which drag ahe abstracted 3D objects from different classes and link I n the model. Modification of objects can be done and then saved and shared with other users. There can be an interconnection of many computers .Collaboration of multi users is possible in the software. It allows the modelers to work together from different areas to develop model and run different experiments and analyze the results. Fig 9 represents the application of Flexism in airport security checking.It covers all facets of business and optimize the system by making necessary changes [8].

G) Promodel

ProModel is the product of ProModel Corporation in 1988. It provides opportunity to developers to evaluate new trends for designing system.It is mainly used to model the non-manufacturing systems. It offers various products like MedModel for healthservices, Service Model for service system simulation,Emergency Department for estimating resources..It has Certified Partner Microsoft Gold.It models continous processes. It creates animated layout automatically and uses graphics from user defined or inbuilt libraries. It enables you to represent interdependencies in real world processes [9].

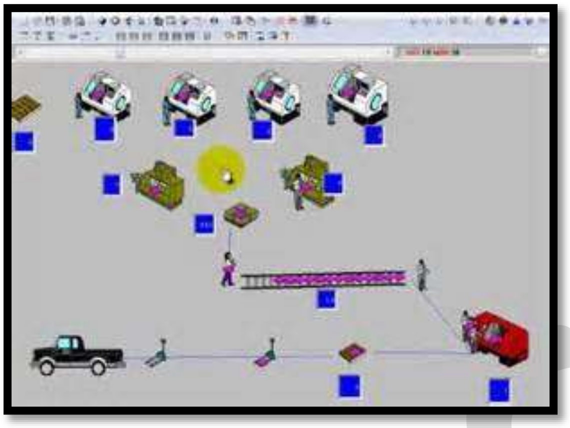

Figure 10: ProModel simulation

The ProModel methodology follows three steps:1. Visualize the real world system and note down all the processes in action.2. Analyze the model to identify the shortcomings and make necessary changes to improve it.3. Optimize it . It gave estimation cost on the basis of information entered by user pertaining labour, equipmrent. Individual's models are built and kept which are collaborated to run as a whole when desired. It easily transfers data to Microsoft Excel and MiniTab to create charts and interactive diagrams. OptQuest Engine is a part of ProModel. It generates standard output reportsIt compares different experimented scenarios for same system. It works on evolution based strategy algorithm. It is used in warehousing, US department fo planning resource capacity logistics. ProModel helps the business analysts in decision making and to incorporate new ideas to improve the model.

III Conclusion:

Simulation is used in now a days in every field. So, it has become a need for every research area. To create virtual environments simulation software's has been developed. The development of simulation software's is quite difficult with programming languages like java and many more. Simulation environments provide the essential features of virtual environment development which are not provided by programming languages. Arena, Automod, Extendsim *etc* has provides the ease of development with various features which reduces the overhead of user.

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A Literature Review on FDD and Reliability calculation for Refrigeration and dynamic systems

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Abstract- Fault detection and diagnosis (FDD) and Reliability engineering are very important tools to access the performance of any dynamic system.. The FDD and reliability concept provide a direct idea about the performance of designed system. For reliability calculation of one or more components of a system, number of theories exists in literatures. But to calculate the reliability of a system for its modification, it is important to apply a general feasible theory of reliability which can be easily applicable to all running systems. Therefore a general and flexible theory will be more applicable to calculate the reliability of a dynamic system with fault detection. In this paper different approaches are elaborated for reliability calculation and hence it gives idea to select more easy method for calculating the reliability of a dynamic system.

Key Words: VCRS, failures, reliability, component and modeling, dynamic system, Fault detection, diagnosis, flexible theory

INTRODUCTION

Fault detection and diagnosis (FDD) is a technique to detect and diagnosis the faults rapidly and intelligently in very short interval of time.

Reliability is the attribute of any dynamic system or machine to perform it consistently according to its specification.

FAULT DIAGNOSIS AND DETECTION

For the first time, the concept of fault library was given by Bailey et al]in year 2000. According to him one can analyse the condition of faulty data using fault analysis in Vapour Compression Refrigeration System (VCRS). He himself collected the data and also included the data already collected in library of Kreiden et al in 1999. Kreiden et al had gathered several data of same area and purpose. These data were all taken in full scale heating, ventilation and air-conditioning.

In 1937 Beruker [3] was the first who got the literature published about the fault conditions in VCRS. In this literature it was explained about the effect of leak of appropriate refrigerant. He found out the results of being less refrigerants in condenser or fouling of heat exchanger .Later on in the same guideline of Beruker, another research in 2006 was done by Kim et al .They also published an important result of fault analysis on 2009.Originally a technologist LeRoy searched and gave the detoriation performance of vapour compression in 1997.Depending upon this research Shen did modeling and provided a technical shape in 2006.

Previously exciting simulation data were unable to give fast diagnosis .So Yuill and Barun again collected the real data to find out the fast diagnosis in 2012.Using these data fast simulation results became available. In 2006 Shen told experimentally about the condition of optimal refrigerant charge level. If in any compressor refrigerant is filled more than it needed or it is over charged then performance of compressor becomes lesser[4],[5].

In 2009 Kim proved that after long running of heat exchangers which are used in condenser becomes faulty at the point where air flows. There the way of that place becomes narrow, and due to less air flow rate , the performance of the system goes to weak. He told that if compressor valve was leaking then refrigerant would also leak .Here the way of discharge will also be narrow and due to failure of complete discharge, the performance of the system will go down.

Rosen in 1951, Thomas in 2002 and Sten in 2006 tried to simulate the faulted condition of VCRS .In this fault detection using simulation they considered the input as the amount of charge, condenser air flow, liquid line pressure and expansion valve condition etc [2]. In 1997, Breuker also published a research paper regarding the leakage of refrigerant and other concerning problems in compressor.

In 2012 Cheung and Barun fixed the orifice inside the packaged unit of 3-Ton R410A and proposed a model relating different components of VCRS. Later in 2006 Shen experimentally tested it .In this field of modeling and testing Shen investigated a lot of facts about VCRS.In 2006 Shen developed ‘Charge tuning equation’ which is very helpful for charging and filling of compressor. In the same year 2006 Yang et al did modeling and got the solution of the problem of air flow and fouling in evaporator. He published the special symptoms of fault detection in evaporator.

In the same way in 2012 Bell et al studied the effect of fouling in condenser and found that due to increase of fouling in heat exchanger pressure drop goes up and because of slow speed of fan which results the decrease of air flow rate (Heating Problem).

Though there is no more literature available for fault detection and its diagnosis but during the survey some common literatures are available as guide line. In 1989 Stouppe and Lau made a detailed study of HVAC-FR and researched out 15716 failures in that. It was done because of being some practical problems to an insurance company in giving claims . The insurance company wanted to know the reality whether defect claim could be given or not. In the study of Stouppe and Lau . It was found that maximum failure comes from Hermite Air-conditioning unit. Out of this 76% failure by electrical components, 19% failure by mechanical components and 5% failure by refrigeration circuit occur [3].

Mostly failure occurs in electrical components so it was essential to take notice about the causes why electrical components were failing so much? After a long continuous search it was found that failures were due to fault motor winding. In lack of proper insulation in motor winding the chances of deterioration were increasing .So in single phase operation or in short circulating motor goes to burn and flame of fire generates [3].

If we talk about mechanical failures then we find that faults are in compressor, valves, bearing and in connecting rods. These said parts are mostly damaged due to fluctuation of power and un- reliable products. Main causes of mechanical failure are due to fatigue in valve and disturbances in valve springs.

In the same way in 1998 Breuker and Braun analysed some collected database of HVAC servicing company. This database was prepared by a servicing company. From 1989 to 1995 about 6000 repair causes were recorded separately in this database .There was clear information about the repairs of several parts and their failures . During the analysis of Breuker and Braun it was found that 60% problems were raised by electrical and control failure according to database. In database 40% problems was mechanical. It is matter of wonder that failure in compressor was only 5% and it was caused by mechanical problems. Compressor is the most important part of the refrigeration and air-conditioning system. If compressor fails the repair cost increases and it also takes much waste of time in repairing. In detailed analysis of literatures it was found that in the cost of total servicing about 25% servicing amount is of compressor servicing. Breuker and braun again searched and also found the causes of failure in compressor during the year 1998 . They got the cause of failure in compressor is mostly due to motor failure. Lack if insulation or overloading are the causes of failure in motor windings. For the failure of positive displacement type compressor it was found that most failure occurs due to flood back of refrigerant. If there is the flood back of water refrigerant then evaporator coils and condenser coil become choking. Due to overcharging of refrigerants, fault arises in the thermal expansion valve also. There are other causes of compressor failures also as low voltage, fluctuation in voltage and overheating of compressor. When there becomes failure in the fan of condenser or fouling in condenser or down charging of refrigerant or low flow rate of refrigerant then theses failures are the main cause of overheating of compressor. Sometimes the leakage of refrigerant also makes the compressor heat up [5].

After compressor this also came in notice that 20-25% of total service cost is of evaporator and condenser.

In 1997 Rossi and Broun [30] found out that the restriction in liquid line was generally due to closure of valves, which are fixed before expansion device. In 1996 Stylianou and Nikanpour also worked in the same direction and found that the choke in liquid line was due to slow mass flow rate also.

In 1995,Grimmelius et al experimentally simulated and got a result that Fouling in condenser and evaporator can be rectified by down water flow rate.

In 1997 Mckellar identified some faults in domestic refrigerators. Some common faults which he identified were the leakage of valve in compressor, much ice formation due to more cooling in evaporator which mostly choked the capillary tube, failure in fan of heat exchanger and false in the charging of refrigerant. Mckellar found the above due to above said faults, three changes occur in vapour compression refrigeration system. First type of change is in suction pressure or temperature, Second change in discharge pressure and temperature and third change in the change in ratio of discharge to suction pressure. We can very easily detect the fault by monitoring these three changes [8] .

Stallard was very much influenced by the above said research of Mckellar in 1989 he developed an automated system for refrigerator. He studied separately the evaporating temperature , suction temperature , ratio of discharge to suction pressure ,Condenser temperature and condensing temperature etc. and formed a tabulated chart to diagnose the faults in different conditions [3].

In 1991 Kumamaru et al plotted some characteristic curves which were showing the performance of heat pump at different cooling water temperature and various cooling loads. Using this chart, it became very easy to diagnose to various parameters of faults and the combination of variables at that exciting fault.

Similarly according to above study Yoshimura and Ito did another experiment in 1989.In this experiment they took reading of different pressures and temperatures and used it to detect the faults of Air-conditioners.

Entirely separate from all these studies in 1992 Inatsu et al searched the mechanism to detect the defect of refrigerant leak in automatic Air-conditioner. It was not of that kind as Previous models were based. It was experimentally observed data in which liquid to gas flow ratio in liquid line was measured and proposed a new method to diagnose the leakage of refrigerant. Not only the loss of refrigerant could be detected by this method but also the performance of the sensitivity of the system on charging of refrigerant can be known.

In 1995 Gordon and Ng developed a thermodynamic model in which the COP and performance of chiller were made the base of fault detection and diagnosis (FDD).

In 1996 Oeitsman and Bakker developed a black box model which they applied on laboratory chiller for fault detection and diagnosis [24,25].

RELIABILITY

The quality of a product at any time of its life span can be defined and improved by applying the reliability management. It is directly associated to the probability theory of success and failure.

First time the word reliability was used in 1950 by united state defense organization. Later on this word became more popular for military purpose. Basically this term was used for the successful projection of missiles. After 1960 new researches were started by mathematicians to find different theories and approaches for calculation of reliability of any running system[1].

In year 2004 a research paper was presented by H.Karadeniz in 23rd international conference on topic offshore mechanics and aretic engineering in Canada. The main focus of this research paper was to calculate the fatigue reliability with uncertainty modeling of off shore structures with deteriorated members. In this paper the reliability of structures are calculated by computer based modeling on stiffness matrices and load vector variables.

A research paper about the alert level calculation for reliability was published in 2006 by Jan Amborski at Poland. In this paper a new technique is presented for the forecasting of the failure of a system. In this technique the simulation for many group of statistical data is used for calculation. In this coding technique the components are decided by different codes and the reliability is calculated accordingly[1-5].

To decide the proper maintenance schedule and to enhance the reliability of the components of electric transformers a technique was published in journal of electrical system in 2006 by M.Mirzai, A. Gholani and F.Amirifar. In this research paper some extra considerations of effects like insulation problem and environmental effects are also considered to evaluate and enhance the reliability of transformers [8,10].

In year 2010 , a research paper was published by Lin Huang et.al. and members of IEEE. This paper was focused to enhance the reliability of load sharing redundant systems with arbitrary failure distributions. To enhance the reliability of system for life time , the idea is to distribute load from n active to m in- active components of the system(n>m). The re-distribution of load to enhance the reliability of the system has price constraint also [23].

A research paper was published in 2012 by Baired at al. This paper was focused of the conceptual details to describe the probability of success or un success of a component at any time interval of its application. That is the calculation of reliability of a component is possible at any stage of its application with the help of large statistical data[8].

In 2013 a technique using fault tree analysis to calculate the reliability of any system was published by Ahmed Ali Baig, Risza Ruzl and Azizul B. Buang[6]. This method is based on the logical diagram. This method can be applied for any industrial system to enhance its reliability and safety. Using fault tree analysis the cause of failure for an event can easily be traced out by a visual model. In the logical diagram variable symbols like AND Gate , OR Gate , Inhibit Event , Undeveloped event and so on [19,12].

A research paper by B.Abdi, R. Ghasami and Smm Mirtalaei [7], on reliability calculation was published in 2013. This paper includes the calculation of reliability of switch mode power supplies of personal computer. This reliability calculation is based on the basic reliability theory where the failure rate is calculated by multiplying the various factors like quality factor, stress factor, temperature factor environment factor etc. these above factors are calculated separately and after then multiplied to get the desired result [13-17].

CONCLUSION

The concepts of FDD are showing their importance for which they are derived and tremendous development in this field is seen since 1937 to till now. Increasing automation in all types of devices either mechanical or electronic need different powerful theories to find the faults in various components of a dynamic device so that the fault removal action can be applied quickly to deny any further losses.

The reliability theories are providing the multidimensional concepts to enhance the mean time between failure (MTBF) and also to increase the life the working device.

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Design and Implementation of Smart Car with Self-Navigation and Self-Parking Systems using Sensors and RFID Technology

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Abstract - In this paper it is proposed to do the research on making a smart car prototype which includes some functions like self-navigation, space detection for parking, self-parking, obstacle detection, alcohol detection. AVR microcontroller is used for achieving these tasks. Radio Frequency Identification technology helps for making self-navigation, with the help of Radio Frequency Identification cards. On-board Radio Frequency Identification module is to locate Radio Frequency Identification tags embedded in the path in the form of a grid. IR sensors are placed into the car in different directions for sensing the obstacles. Alcohol detection module detects that the driver has consumed alcohol or not, if it detects that, then the car will not get turn on for driving. This smart car is having two modes of operation, one is manual mode and other is automatic mode. Automatic mode consists of features like self-navigation, self-parking and obstacle detection and manual mode consists of alcohol detection. The goal of this research is that to make smart car like Google's self-driving car project. Some of the features of Google car are achieved here by making self-navigation and obstacle detection with the help of Radio Frequency Identification module and Infra-Red sensor module in very low cost and for small purpose.

Keywords - AVR microcontroller, RFID, GPS, IR, ADC.

INTRODUCTION

We used here RFID module for navigation from one place to other place automatically. Instead of using RFID technology, we can use GPS module also for navigation from source point to destination point [1]. But the costing for that is very high and one more disadvantage is that the latitude, longitude information from satellites can have errors up to 3 meters. But the small prototype cannot withstand with this much tolerance as compare to real cars. RFID cards are inserted into the path of the car. So that it can be sensed by the RFID receiver module. Each card is having its unique code and that code contains information of moving in particular direction. While moving in any direction it detects the obstacles coming in front of it. At that time car executes the routine for obstacle detection, which performs the braking task. Once the destination is reached then if user wants to park the car, then he can put the car into auto-parking mode. In this mode smart car moves in forward direction with space detection for parking. If the required space is detected then it will start moving for parking the car. In alcohol detection module, if it senses alcohol from the driver then it will not get turn ON the car. The supply for turning on is getting isolated in this case.

LITERATURE SURVEY

RFID TECHNOLOGY IN CARS

A. There are many applications of RFID technology which can be used in cars. Now-a-days, for toll collection, RFID technology is implemented somewhere. [2] This is done with the help of a RFID tag and a RFID receiver module i.e. RFID reader as shown in fig. 1. The RFID tags are installed on the cars and a server having a RFID reader that collects information from these tags. As the cars passes from the gateway, these readers read the RFID tags placed on cars. In this way the system is can identify the car and the charges for that.

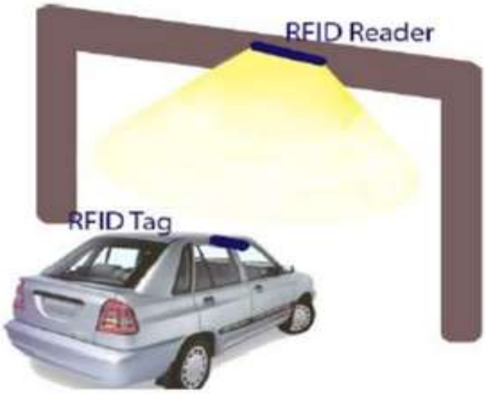

Fig. 1 RFID Toll Road Payment System

B. A lane level navigation is another application area where this RFID technology is used. In this the car having a RFID reader is passing along a road on which RFID tags are installed[2].When car is changing lane suddenly the transport department may also be able to design such a system by reviewing RFID readings. This is an effective system in avoiding collision between vehicles with the help of RFID readers. And also helpful to the driver to know the position of other vehicle and adjust the position of his vehicle relative to other vehicle. Map free lane following solution is also invented which is based on low-cost 2D laser scanners for Autonomous Vehicle to fill the gap between driverless car and the lane keeping assistant [3].

METHODOLOGY

The overall system block diagram is shown in fig. 2, which also shows the algorithm type procedure for navigation of smart car.

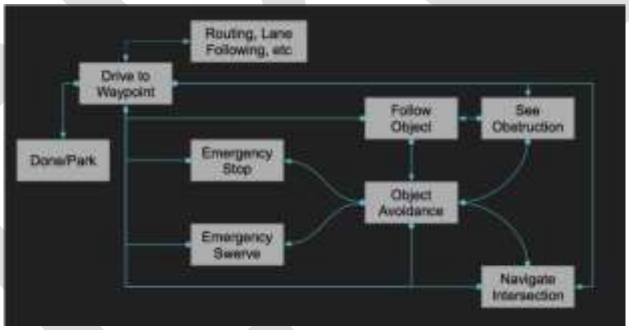

Fig. 2 Block Diagram

The different cars are able to have communication between themselves with the help of IEEE 802.11 and RFID [2]. A car transmits packets to the nearby car using IEEE 802.11 radio. At the same time, the data can also be exchanged between the two cars using RFID tag and reader as shown in fig. 3.

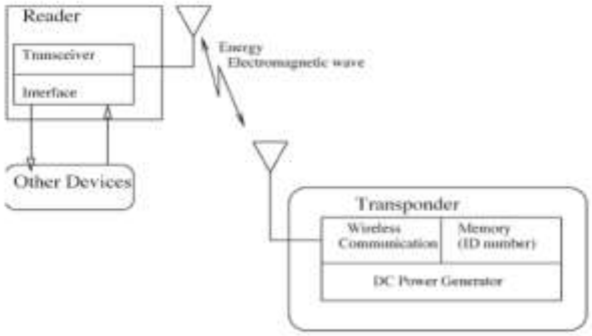

Fig. 3 Simplified RFID System Architecture

Almost every car is having RFID reader and tag but only some cars are having GPS receivers. The RFID tags are put at selected roadside units e.g., speed advisory signs. The fig. 4 shown below shows a localization system. This RFID cards is having the unique code. Whenever this code is read by the RFID reader, it identifies the action written in the program for that unique code and performed accordingly.

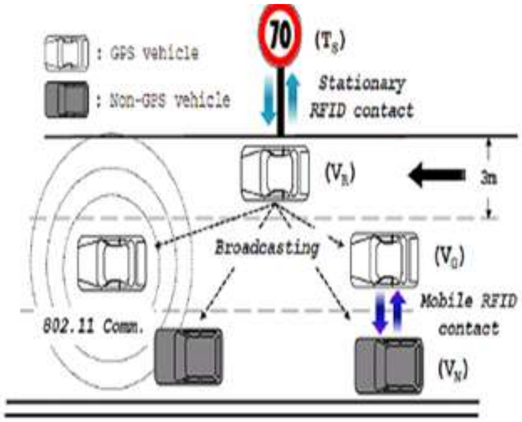

Fig. 4 RFID Localization System

For e.g. if the card have the action as movement to the right hand side, then the smart car do that action by giving excitation to the motors connected to the wheels by the controller. So the objective of self-navigation is achieved by this RFID technology. Fig. 5 shows the action wise block diagram of RFID self-navigation system.

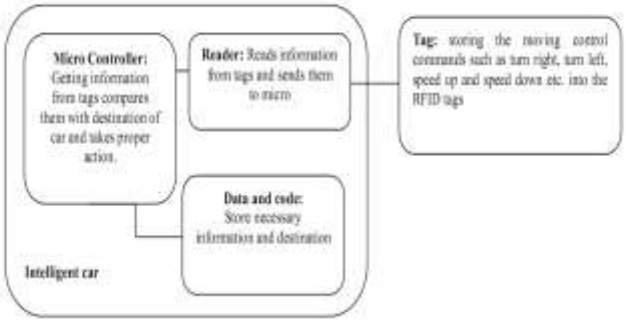

Fig. 5Block Diagram of RFID System

The feature of obstacle detection is achieved with the help of IR sensors which detects the obstacle coming in the way and it is informed to the controller [8], so controller takes the action of braking with the help of code written behind that. The IR transmitter emits continuously infrared radiation in a direction of IR LED placement which reflects back on IR receiver from the surface of an obstacle which is shown in fig. 6.

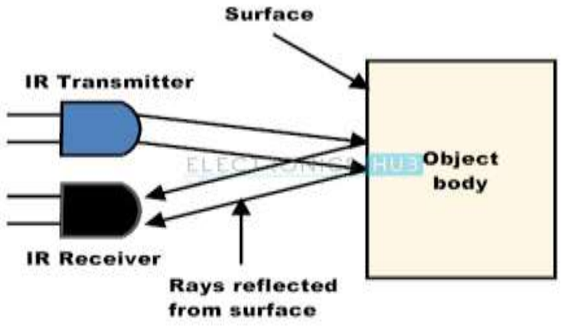

Fig. 6 IR Transmitter and IR Receiver

This IR receiver is connected to the port of controller having internal ADC. This ADC compares the received voltage with the threshold voltage which is set by the programmer and generates the output accordingly.

Self-Parking feature is also achieved by the Infrared sensors which are mounted at the three different directions around the car. The fig. 7 shows self-parking car concept.

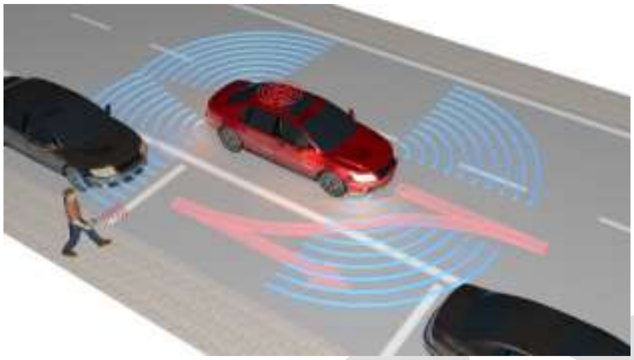

Fig.7 Self-Parking Car

These sensors emit the IR light and reflect back from the surface of the object in front of it. The intensity of the reflected light rays is totally depends on the distance between object and the car. If we want to park the car, then user has to turn ON auto-park mode of the car. Whenever it starts functioning, first algorithm is to start the count for sufficient space detection for parking. When this algorithm is executed successfully, then only car starts the algorithm for movement to park in that space safely. This is done with the help of wheel's motors by moving in left, right, front and back directions. While moving in any direction all sensors data are observed and compare by the controller to park the car safely without dashing anywhere.

CONCLUSION

In this paper the research is done on smart car having various features. Here the self-navigation feature is achieved with the help of RFID technology because when we perform this feature into small prototypes or for small models which will be used in industrial campus, college campus, society premises or on the highway also, it is desired to move our smart car very precisely. So if we use GPS module for self-navigation it will receive latitude, longitude points from various satellites which may have error up to 3 meters and it is not that much accurate for small models. So to overcome this type of error RFID technology is very much useful in this case. This paper includes various features of smart car like self-parking, obstacle detection and braking, alcohol detection. These are achieved by using different types of sensors attached to the AVR microcontroller.

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Ethics and values: The need for student awareness of workplace value systems

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ABSTRACT - Increasingly the literature highlights the importance of having ethics and values taught at all levels of the education system. Governments, such as those of India, New Zealand and Australia, are increasingly focused on introducing curricular requirements for values education and ethics, and some universities in India have already introduced 'core generic papers' across all degree programmes, including ethics. Co-operative education provides a unique learning environment which leans towards exploring the practice of professional values and ethics. In the workplace, decisions are often made through consideration of adherence to a particular value system or ethical code. A co-operative education student, situated in a workplace environment, observes, explores, and practices the workplace value systems and codes. Such a conclusion presents several challenging issues for co-operative education practitioners. Firstly, there presents a need to investigate what core values are held as important within the workplaces that students will be placed within and, secondly, students need to be provided with learning opportunities to practice their ethical decision making before being exposed to the workplace. Co-operative education programmes need to scaffold opportunities to allow students to advance their understanding of ethical behavior and identify skills required to engage with ethical issues. In addition, we need to consider that

Graduates should not just be prepared to become acquirers of existing practice, but also become critical agents in the development and advancement of ethical workplace practice. Thus the aim of this presentation will be to explore considerations around workplace value systems, development towards a generic framework, and the opportunities work placements presents towards developing students to be critical moral agents**.**

Keywords: Legalistic Moralism, Ethical Hierarcicalism, Ethical Hierarcicalism, Legalistic Moralism, Engineering ethics, Morality, Ethical Realism, Goals.

I.INTRODUCTION

Nine theories of ethics that rule the world

1. **Consequentialism maintains that the majority of an action depends on the non moral consequences that the action brings about.**
Morality of an action consists of the ratio of good to evil that the action produces. We should perform right and only right action in terms of good and evil, as each individual defines good and evil, and right and wrong. There is no objective right and wrong or good and evil. The person defines these. You jump into a car at the mall. You could leave a note, but since there were no witnesses and the owner is not around, you decide not to because you recognize that the damage is low (probably only a couple of hundred dollars). The car owner probably has insurance, and it would be such a hassle for the owner to contact you and your insurance company. You may have to end up paying higher premium, the owner may think ill of you all of which are non moral reasons that may be unpleasant for you. Ethical egoism state that you should always act so that your actions produce what is in your own best long-term interests. Personal egoism states that an individual should always act in his or her own best long-term interests, but that does not say how others should act. Impersonal egoism states that an individual should always act in his or her own best long-term interest.
2. **Values Clarification (Philosophical Relativism) teaches that the most important aspect is not what one believes, but being aware one's own feelings, beliefs, and values systems. People thus consider alternative models of thinking and acting. By acting thusly and making one's own choices, one develops one's own values.**
In this setting, a value is what a person likes to do. It is NOT an ought-to-do, but Rather a want-to-do. Values clarification puts a heavy emphasis on feelings so much so that it virtually equates values with feelings. It also reflects a philosophical relativism the

belief that there are no moral or ethical absolutes everything is relative. Concluding what is right or wrong is basically anybody's guess. Proponents of these systems say that they use the Socratic Method every ethical question is a question of either this or that choice. Unfortunately, Socrates and Plato had distinct beliefs about truth and ethics which the proponents of this methodology do not possess

3. Utilitarianism states that the moral standard should be promotion of the best long-term interests of everyone concerned. Much utilitarianism says that which is intrinsically good is pleasure and happiness (known as the hedonistic calculus).

Others say there are other things which are intrinsically good such as beauty, power, knowledge, etc.

Act Utilitarianism states that the right utilitarian act is the one that produces the greatest ratio of good to evil for all concerned. Rule utilitarianism teaches us that certain actions almost always have a great utilitarian value and thus general rules are formulated to help us see that we follow these rules of action. A few doctors decide that a number of experiments on a few people, even if most of them died, would be worth it if they could find a cure for a disease that would relieve the suffering of millions of people. Utilitarianism would give the approval for such because it produces the greatest good for the greatest number of people.

4. Legalistic Moralism (Moral Absolutism) states that there are pluralities of absolutes (or norms) with each one covering an area of human experience. These absolutes never conflict with each other. An action that is evil under one absolute is evil under every other absolute and could never be seen as good under any absolute.

Some call this the ethic of absolute ends because we do what is right and trust god or fate or destiny or the forces of good to work things out. There is no personal responsibility for the consequences of morally right acts. We do them, not because they bring us pleasure, but because they are "right"…this is called the "categorical Imperative". A madman shows up at your door with a weapon raving, asking where your loved one is, that he intends to kill the person. You answer truthfully because it would be wrong to lie. You trust that since you have told the truth, things will work out. Perhaps the neighbors have called the police, or someone will intervene, or something will happen.

5. Situation Ethics shows that since legalistic Moralism is encumbered with a bundle of predetermined rules and regulations and while antinomianism says that there are no absolutes, then decision making must be based on a "middle ground". That middle ground then says the guidelines for decision-making must be 1) absolute love (agape) 2) general guidelines of helpfulness (Sophia)

3) Particular moment (kairos).

Love and justice are the same. If love is the end result, then the ends justify the Means. This is not a selfish love, but a love that desires the neighbor's best good at all times. There are four working principles involved) Pragmatism (love gives concrete practical, workable answers) b) Relativism (everything is relative to love) c) Emotivism (each person desires his or her own values) and d) Personalism (persons are the ultimate value). A man finds himself in an unfulfilled marriage, looking for a person with whom
He can deeply connect. A woman is trapped in a marriage that is abusive and filled with
Pain. They find each other and after a while one things lead to another until they are in love. Love being the ultimate goal, they being consenting adults, then they are morally right in having an affair

6. Ethical Realism (as espoused by Reinhold Niebuhr) (the lesser of two evils) states that when absolute norms come into conflict (as they will eventually do) one must decide which to follow. Each solution offers limited alternatives, so the solution which produces the less of two evils is the one to be chosen.

Unavoidable moral dilemmas occur because our world is not perfect. Niebuhr's theory, The Origin of Moral Dilemma, comes from a Christian perspective stating that we live in a "fallen" world since sin entered it. Thus there is an excusable and pardonable sin because people did not cause that dilemma by their own acts. Every decision will have some sinful consequence of which God will forgive. Thus people must make the choice that is the lesser sin and then ask God's forgiveness

Niebuhr talked of a world. War. The Soviet Union was an evil and brutish .Dictatorship over millions of people, forcing them into horrific, hellish conditions. Yet to oppose them in an outright war would bring massive destruction through nuclear weapons. Instead of direct opposition, we chose indirect opposition (the cold war) through economics and alternative means.

7. Ethical Hierarcicalism (Graded Absolutism) is the view that there are many Universal norms, but they are not all intrinsically equal. Thus when a conflict takes place, we must obey the "higher" norm…we choose the greater of the two goods.

Geisler Hierarchical Calculus is:

- Persons are more valuable than things
- God is more valuable than an incomplete person
- A complete person is more valuable than an incomplete person

- An actual person is more valuable than a potential person
- Potential persons are more valuable than actual things (fetus vs. appendage)
- Many persons are more valuable than a few persons
- Personal acts which promote personhood are better than those which don't

Why a person should be held responsible for committing a crime if the crime was a lesser norm .Is it wrong for a man to steal money to purchase a life-saving medicine for?

His child who is dying? Perhaps the system is at fault and not the person.

8. Principle Ethics states that principles are merely value states or guidelines to actions (as opposed to rules or laws). Thus when principles encounter each other in conflict it is not a conflict of norms, but rather an exercise in reasoning and logic.

Principle ethics is the most difficult to study because it demands the area test study and the most incisive analysis of principles and cases with the goal of determining which principles apply to which case. The decision that is made is based upon test of Logic, reasoning, and rationale.

9. Cognitive Moral Development (as espoused by Lawrence Kohlberg) states that ethics education is possible. Just as people develop mentally, physically, and emotionally, they develop a moral cognizance. Using critical thinking tactics such as the Socratic Method, people can solve their ethical dilemmas.

Kohlberg taught that there were six stages of ethical thinking, each stage being of Greater maturity than the previous one. By delineating these levels, we are allowed to

Know and test each our own thinking. This helps us know ourselves better and challenges us to move on to a higher level of thinking. This assumes a sort of natural goodness and integrity in the child whereby he or she will always want to do the right thing if only they had the time to reason things out. This is the idea that people suffer from a character defect if they are void of logical thinking

II. C**ode of ethics for student teachers**

Mandate:

A joint subcommittee consisting of members from two standing committees of the Faculty of Education (Faculty of Education Ethical Review Board and Student Standing) was created to develop a Code of Ethics for Student Teachers and to examine the ways in which this Code will be communicated to students, faculty members and educational partners.

Goals and rationale:

The interests of the two Standing Committees of the Faculty of Education in promoting appropriate ethical and professional conduct have led us to develop the following Code of Ethics for Student Teachers. This code seeks to respond to, and address the following needs:

- The Code addresses the interdependent duties, rights and responsibilities of student teachers, faculty members and educational partners. By addressing common issues and needs, the Code seeks to articulate and make explicit ethical principles that transcend disciplinary boundaries. These principles reflect the fundamental values that are expressed in the duties, rights and responsibilities of all involved in Teacher Education.
- The Code requires a reasonable flexibility in the implementation of common principles. It is designed to help those involved in Teacher Education, as a matter of sound ethical reasoning, to understand and respect the contexts in which they work and accommodate the needs of others.
- The Code seeks to encourage continued reflection and thoughtful response to ethical issues. It does not seek definitive answers to all ethical questions or situations. Rather, it seeks to outline the guiding principles to ethical conduct and to identify major issues which are essential to the development and implementation of this Code

Context of an ethics framework for student teachers

The principles and norms guiding ethical conduct are developed within an ever-evolving complex societal context, elements of which include the need for reflective action and ethical principles.

Education is premised on a fundamental moral commitment to advance and construct knowledge and to ensure human understanding and respect for individual and collective well being and integrity. The moral imperative of respect translates into the following ethical principles that assume a student-centered perspective as articulated in the Quebec Curriculum Reform and Competencies outlined for Teacher Education.

B. Academic freedom and responsibilities

Teachers enjoy, and should continue to enjoy important freedoms and privileges. However, with freedoms come responsibilities and ethical challenges. This Code of Ethics is in keeping with the philosophy and spirit of the New Directions that are embedded in the document Teacher Training: Orientations, Professional Competencies (Ministère de l'Éducation 2001) and the reflective practice literature.

The role of the teacher and the contexts of teaching have changed. Thus, new resources (knowledge, skills, and attitudes) are required to practice the profession and meet the challenges of teaching and learning in whatever contexts student teachers may find themselves and to engage in professional development individually and with others.

C. Ethics and law

"Teaching is governed by a legal and regulatory framework" (MEQ p. 120). The law affects and regulates the standards and norms of teaching behaviors in a variety of ways such as respecting privacy, confidentiality, intellectual property, competence. Human rights legislation prohibits discrimination and recognizes equal treatment as fundamental to human dignity and well being. Teachers should respect the spirit of the Canadian Charter of Rights and Freedoms particularly the sections dealing with life, liberty and the security of the person as well as those involving equality and discrimination and the Education Act that sets out the obligations and rights of teachers.

D. Guiding ethical principles

III. Student teachers should respect the following guiding ethical principles:

1. Respect for human dignity * Speaks and acts towards all students with respect and dignity; and deals judiciously with them at all times, always mindful of their individual rights and personal sensibilities.
    - Respects the dignity and responsibilities of cooperating teachers, peers, principals, parents and other professionals or para-professionals within the school, school board and community.
2. Respect for vulnerable persons
    - Respects and recognizes ethical obligation towards vulnerable persons. This principle recognizes that students are in a vulnerable position and that student teachers are in a privileged relationship with students and their families and will always refrain from exploiting that relationship in any form or manner.
3. Respect for confidentiality and privacy
    - Respects the confidential nature of all information related to students and their families and will share such information in an appropriate manner only with those directly concerned with their welfare.
    - Respects the confidential nature of all information related to all school personnel and will share such information in an appropriate manner.
4. Respect for justice
    - Respects and recognizes the right of individuals to be treated with fairness and equity and the importance of avoiding conflicts of interest.
5. Respect for safety of students
    - Respects the right of individuals to expect that student teachers will engage in practices that aim to ensure the physical, psychological and emotional safety of students.
6. Respect for existing ethical codes and professional standards

- Respects the authority, roles and responsibilities of the cooperating teacher and agrees to adhere to the responsibilities and obligations for teachers as outlined in the Education Act, Faculty and University handbooks as well as all local agreements by host school boards and schools.

7. Balancing harm and benefits

- Acknowledges that any potentially harmful practices (eg. Science Labs and Physical Education Activities) must be balanced with anticipated benefits and conducted in a prudent informed manner

IV.Ethical Issues Facing Engineers and their Profession

We celebrate the engineering profession because of the great good that it can produce in solving a myriad of pressing problems affecting the happiness and well-being of society. The technological advances which engineers have contributed to generating advances that have significantly improved our quality of life in ways so numerous that we cannot imagine the modern world without them. Engineering is the profession that provides the technical solutions necessary for contributing to a better and more efficient world. It takes what we know and applies it to solving society's problems. And while the education of engineers focuses almost exclusively on developing the technical capacities of aspiring engineers for solving a host of technical problems facing society, it has not also sufficiently advanced the moral character of those who call themselves "Engineers." In this paper we wish to call attention to the important contribution that engineering education can make to enhance the ethical sensibilities of engineers. Such efforts are crucial to ensuring that the trust we invest in engineering as a profession and critical to the future well-being of society and the profession is justified.

What is ethics?

"Ethics" or "morals"—we regularly use these two terms interchangeably—mean those habits or Customs that are standards of good conduct or character. To be ethical is to do the right thing; to consider the well-being of others as equal to your own; and to act in ways that aim to maximize the good. To be ethical is to be righteous, in the sense that our conduct and character are grounded on principle and commitment to doing our duty regardless of narrow self-interest. To be moral is to be fair and considerate of others, particularly to show them the respect we ourselves demand that acknowledges rights to life, liberty and property. Ethics is a discipline we freely embrace that regulates our baser instincts so as to promote a harmonious community and thereby reduce conflict and disorder. We expect others to order their behavior so as to not harm things of value and being ethical is the principal method for protecting and sustaining those values. In short, the choices we make and the habits we maintain as a result should be ethical, for such a life is a good life, one that enhances our happiness and promotes the good of society. Unfortunately, too often people consider ethics in a negative light; they seem to think that doing what's right is an unnecessary limitation of their freedom, requiring them to do things they don't want to do. In some way this is true but not totally true. While submitting to the discipline of an ethical life means we will not choose to do certain things that may be harmful to others or undermine our principles, such a discipline does not inherently imply either a restriction or a reduction of our personal freedom. Being ethical involves a free choice that commits one to doing what's right and because it is freely chosen it is misleading to think our freedom is in any way restricted or compromised. Nor is it the case that being an ethical individual reduces our freedom; in fact, like the rules of the highway, ethical rules bring order tour experience and enhance our ability to achieve our ends. When we pass each other on the highway, I know what to expect from you as you approach me which enables us to pass each other safely and efficiently. Simply stated, if we all observe the rules of the road this is the best way to avoid a collision, Thereby insuring our safety and protecting our property as well as enabling each of us to reach our destinations effectively. It is in our interest to be ethical just as it is in our interest to observe the rules of the road. to put it bluntly, to play "the blame game." While there is an expectation that an ethical person *be* accountable for their behavior, accountability and the assignment of blame for unethical behavior are not the main purpose of ethics. This negative concept of ethics unfortunately predominates in the public's mind, especially reinforced by the media's hypercritical stance towards those who violate ethical norms; it likes to point the finger of blame and shout "You're immoral; that's unethical!" No doubt we censure behavior that contradicts social mores because to do otherwise exposes us all to harm with the consequent threat to our human rights, just as we express our outrage whenever another driver veers over to the wrong side of the road and endangers our life and property.

But this only a part of what ethics is about. There is a more positive and enriching concept of ethics derived from ancient Greek philosophy that suggests that being ethical involves a vision of an orderly and harmonious community, freely choosing to regulate their behavior in accordance with standards that promote the common good and the rights of others. Ethics, in this positive sense, involves a vision of the good life and a harmonious community wherein each of us can live life to our fullest potential. It is a vision of an orderly society where each person is entitled to freely pursue their goals and desires, so long

As doing so does no harm to others. We all have an interest in avoiding harm and the moral point of views precisely that stance in which we commit ourselves to doing what's right, of striving to be good, and dedicating ourselves to live excellently. Ethics is the practice of being the best we can be, where pursuing excellence is our goal. This is the positive concept of ethics that has been obscured by the negative view that too often predominates when issues of ethics are discussed. To be ethical is to try to do the best we possibly can simply because there is no other better reason for doing anything except to do it well. An ethical individual is inspired by a vision of excellence, and being ethical and adopting the moral points of view define the essence of a good and happy life.

Can ethics be taught?

Given this enriched view of ethics, many have wondered: Can ethics be taught? There can be no
Doubt but the answer is certainly yes! Each generation recognizes the need to prepare the next one for the responsibilities it must assume in protecting critical human values, in maintaining order and in reducing conflict. We cannot idly stand by and watch as undisciplined individuals who have no regard for the welfare or interests of others act recklessly, destroying that which society values and has built with so much labor. Thus we must prepare each generation to assume the mantle of responsibility that is implicit in being ethical. As Isaac Newton is oft-quoted as saying "If I have achieved greatness it's because I have stood on the shoulders of giants" The issue is not whether ethics can be taught but more importantly what is the method that will best result in teaching the young what they need to know that ensures they will be ethical and act morally. That is the real issue. In the professions, especially in engineering, preparing aspiring professionals to assume the mantle of responsibility that is central to professional ethics is crucial. Without training in professional ethics society cannot be expected to trust those who act as professionals will use their expertise and power they possess for the welfare of society. Since we cannot resolve many of our difficulties without professional. Assistance we are at the mercy of those who possess esoteric knowledge because we are vulnerable to its abuse. We need assurance that professionals will not take advantage of their unique expertise and power to cause harm to things we value or undermine significant societal interests. Thus the teaching of professional ethics is a critical part of the curriculum we ignore at our own risk. Put more strongly, teaching professional ethics may be equally important as the technical competence we instill in our students, as recent scandals of the unethical activities of a wide variety of professionals have so clearly demonstrated. It is axiomatic that ethical behavior is mandatory in all professions but it is of particular importance in engineering because safety of many people and that of the environment depend on the quality of the design that engineers render. This by itself, in addition to the concern for the value of the property that can suffer destruction and/or damage places a heavy responsibility on engineers. High visibility cases provide simultaneously tragic and excellent tools for teaching engineering ethics. The list of cases to study is long: The Pinto case that clearly indicated the callousness of the corporation in willingness to sacrifice human life for increased profit, the walkway case at the Hyatt Regency hotel in Kansas City that killed many and injured many more, the explosion of the Space Shuttle Challenger, the Bart case in San Francisco, the DC-10 aircraft case in Paris that killed 346 people, the Bhopal case that killed and poisoned many, the most recent case of the Columbia shuttle that killed the crew of astronauts, numerous. Environmental disasters of the Exxon Valdez type and many product liability cases which could have been prevented had the proper engineering scrutiny been in place. These and many other cases amply demonstrate the need to infuse heightened awareness of ethical issues into the education of engineering professionals and to analyze how these could have been avoided had ethical engineering due processes been engaged. Engineering ethics is a part of professional ethics namely the study of moral values and issues in the professions. Professional organizations such as IEEE, ASCE, ASME, NSPE and many other ones have addressed the complexity of moral issues in their fields by developing codes of ethics. These codes delineate the importance that the profession attributes to ethical behavior but they do not encompass the full domain of professional engineering ethics. There is much more that needs to be engaged. In his memoirs Herbert Hoover, the only true engineer who was the president of the US compares engineers with other professionals: "His acts, step by step, are in hard substance. "His acts, step by step, are in hard substance. He cannot bury his mistakes in the graves like the doctors. He cannot argue them into thin air or blame
The judge like the lawyers. He cannot, like the architects, cover his failures with trees and vines. He cannot, like the politicians, screen his shortcomings by blaming his opponents and hope that the people will forget. The engineer simply cannot deny that he did it. If his works do not work, he is damned."The importance of this responsibility has been readily acknowledged by the professional societies that oversee the activities and training of new entrants to the engineering profession and which are tied to the accreditation process. A strong impetus towards study of ethics issues originated from the ABET 2000Criteria for accreditation as there is an outcome requirement of "understanding of professional and ethical responsibility". Accreditation Board for Engineering and Technology is the principal accreditation agency attesting as to the quality of the engineering programs in the USA. Criterion 3(f) states that "Engineering programs must demonstrate that their graduates have an understanding of professional and ethical responsibility". It

should be noted that this criterion requires and “understanding of” rather than, as it is the case with most other criteria, that require an “ability to”. This alleviates the requirement being actually demonstrable yet it is still the goal of engineering educator to imbue the students with solid background of a road map for ethical and professional behavior and ability to navigate the complexities of the modern world. One way of introducing ethical issues to engineers is through case studies. This method frequently illustrates some issues but it has both strengths and weaknesses. The strength of this approach is that usually a one dimensional case may be explained and ethical dilemmas illustrated. However, real life seldom presents issues in a one-dimensional context. More often than not, there are varieties of parameters that enter the fray hence the totality of the issues does not enter the considerations. Simplistic situations lead to simplistic solutions. The more difficult issue perceives the moral dilemmas and determining the rules and principles to guide the engineer’s actions. The responsibility to perform the “right” decision is not always quite clear as are the possible consequences for the career of the engineer. History of engineering should be a major topic for the introduction of the coverage of the subject matter. Engineering as a profession must be presented to the students. A key concept is that one of the “professional responsibility’ that represents moral responsibility based on the engineer’s professional training and specialized knowledge. In their book Martin and Schinzinger note that the goal of responsible engineers is “the creation of useful and safe technological products”. ABET criterion 3(h) states that “Engineering programs must demonstrate that their graduates have the broad education necessary to understand the impact of engineering solutions in a global and societal context.” This criterion clearly emphasizes the role attributed to understanding not only of the correct choices made by engineering professional but also the importance of right choices made by societies where these engineers practice their skills. Obviously there will be variations in interpreting the choices deemed correct in different cultures but it is clear that the responsibilities are broad and that the decisions may have to change as the technology and societies evolve ABET has correctly insisted that engineers through their professional training assume more responsibility for the society they serve. In the criterion 4 the requirement stipulates that “… a major design experience … that includes most of the following considerations: economic, environmental, sustainability, manufacturability, *ethical*, health and safety, social, and political”. This criterion mandates that students design effort present them with situations in which they have to make ethical decisions and choices that affect the outcomes. Students are to be faced with situations to consider their actions and the consequences of those as well as provided with choices which affect the society with respect to safety, environmental consequences, ability to rationally explain the choices made with respect to different decisions, indicate that they anticipated possibilities of failures of given hardware and/or software and the consequences of these not excluding liability for these, and the ability to cogently explain the genesis of the design, fabrication methods, maintenance and operations of the product in a regional and global context. Engineering students are interested in ethical issues as was demonstrated with a high level of questions every single time the authors presented ethics in an engineering context as well as product liability issues .All engineering codes of ethics give a very prominent place to safety, stating that engineers must hold paramount the safety, health and welfare of the public. Of course, there is an implicit recognition that every design, every product developed by humans carries a certain degree of risk with it. And the relationship between risk and safety is an obvious one. If designs, products, techniques and materials used are in some manner unsafe they expose humans and the environment to undue risk. Engineers are the people who are responsible for the safety of the general public, they are responsible for making engineering decisions consistent with the safety, health and welfare and these decisions must be made in terms of accepted engineering approaches, they must conform to codes and standards and approved practices. Engineers are to be held responsible for disclosing anything that would subject the public or environment to dangers. In order to perform their functions properly engineers must maintain and improve their competency and engage in continuous learning. Furthermore, engineers must practice their profession only in the areas in which they possess the requisite knowledge and expertise until the nineteenth century manufacturers were generally shielded from liability resulting from fabricating defective or dangerous products as the society and the courts avoided in getting into the disputes. Caveat emptor was the guiding legal principle. The evolution of the laws governing behavior of the industry brought about a number of legal theories on which actions against anyone in the chain of commerce can be brought: negligence, breach of warranty or strict liability. All three are predicated on the fault system namely, that whoever caused injury to take place is required to fully and fairly compensate the injured party. While the legal aspects of product liability are very complex and interesting areas where engineering and law complement one another, the most significant consequence here is that engineers may be responsible and may be held liable for the damages and/or injuries. A huge number of cases exist where engineers were held responsible for the consequences of their actions or inactions, for violating safety principles, for ignoring the state of the art approaches, for selecting the wrong materials, for utilizing erroneous design approaches, for not incorporating the appropriate maintenance, and for not anticipating what may take place under given conditions. Ethical behavior mandates that engineers engage fault tree analysis or a like approaches and anticipate what may go wrong and the consequences of that. Conflict of interest situations take place where engineer’s loyalties and obligations may be compromised due to self-interest or other obligations and commitments which lead to biased judgments. Situations in which the proper conduct may be questioned requires that the engineer avoid being put in the position of making decisions which could be challenged later on. Whistle blowing is a situation in which engineers who are aware of a harmful, illegal and dangerous mode of behavior decide to go public with that information. This may take place in a number of methods the information may be reported to the appropriate authorities (city, county, state or federal), released to media or a combination of these may be employed. An engineer who is engaged in revealing the information has a serious conflict of interest. The engineer has an obligation to the employer but also to protect the society. Clearly, the protection of the public is paramount and must be held as such. But the consequences may be extreme: the engineer may lose the job and destroy a career, finding a new job may prove to be difficult as employers could be unwilling to hire a potential whistleblower. The effects of such actions may prove very damaging to the family of the engineer and cause a financial disaster. The engineer who engaged in whistle-blowing may be ostracized by the colleagues in the company and in the profession. One must carefully weigh potential consequences of such actions. Still, the gratification of doing the right thing should be a powerful motivator to do just that. Concern for the environment is an integral part of ethical practices of engineering. Humanity can no longer be the adversary of nature; it must be its ally, its guardian. Careless practices of engineering may destroy complete ecosystems, pollute the air, water and soil, bring about the change in the weather pattern and destroy varieties of life species. We must also be aware of the impact on the protective ozone layer which safeguards plants and animals from the deleterious ultraviolet light. The concept of sustainable development incorporates the requirement of people to live well and improve their standard of living while at the same time protecting the environment. Emphasis on conservation of resources, recycling and nonpolluting technologies are a required mode to reach the sustainable development while reducing our dependence on fossil fuels. Engineers are the only profession that can make efficient usage of renewable energy sources such as solar, wind, biomass, tidal or fission breather reactors. Engineers must develop energy efficient resources and minimize waste and inefficiency.

V.CONCLUSIONS

It is evident that the engineering ethics is the very essence of the engineering profession. It is the Roadmap of behavior of engineers and points out the values and traditions of the profession in leading humanity to make crucial choices and confront the challenges necessary for a better and more meaningful life. The academic engineering community has the difficult and responsible task and challenge of ensuring that future practitioners of the profession are educated and equipped with the skills of confronting the ethical problems, examining the standards of conduct with critical thinking and the competence and ability that are illustrated and taught in engineering classes. This challenge can be met only by making a conscious effort to acquire the understanding of ethical issues by following the test cases which appear on the regular basis in the courts of law, recalls by companies, discussions and seminars presented by professional societies and exercising the utmost dedication and commitment to professional integrity.

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Classification And Adaptive Novel Class Detection Of Feature – Evolving Data Streams

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Abstract*:* —Data stream Classification poses many challenges to the data mining community. Most existing data mining classifiers cannot detect and classify the novel class instances in real-time data stream mining problems like weather conditions, economical changes, and intrusion detection etc., until the classification models are trained with the labelled instances of the novel class. In this thesis, a new approach for detecting "Multiple Novel Class" in data stream mining using "Decision Tree Classifier" that can determine whether an unseen or new instance belongs to a novel class and detection of more than one novel class at a time are proposed. Arrival of a novel class in "Concept-Drift "occurs in data stream mining when new data introduce the new concept classes or remove the old Ones. We have proposed a general Framework for mining concept-drifting data streams using weighted ensemble classifiers is used for this study. We compute Classification model is trained using these weighted ensemble classifiers. Deals with Classification technique for Feature-Evolving Data Stream, thereby helping the users to construct more secure information system. We have proposed immense quantities of high-dimensional data renew the challenges to the state-of-the-art data mining techniques. Analysis of Large (Big) Data and Data mining has become an important study in the field of E-commerce. Data Stream Classification may pose many challenges in the area of Data Mining community. Multiple Novel Class and Decision Tree Classifier approaches to mine feedback comments for Classification.

Keywords: Data stream, concept-evolution, novel class, Outlier, Decision Tree Classifier, Concept drift, data stream mining, Simultaneous multiple novel class.

Introduction

We have proposed the dynamic and evolving nature of data streams requires efficient and effective techniques that are significantly different from static data classification techniques. Two of the most challenging and well-studied characteristics of data streams. Since a data stream is a fast and continuous phenomenon, it is assumed to have infinite length. Therefore, it is impractical to store and use all the historical data for training. The most obvious alternative is an incremental learning technique. Several incremental learners have been proposed to address this problem. In addition, concept-drift occurs in the stream when the underlying concepts of the stream change over time. A variety of techniques have also been proposed in the literature for addressing concept-drift in data stream classification.

The contributions of this thesis are:

- We propose to use Concept-evolution occurs when new classes evolve in the data. For example, consider the problem of intrusion detection in a network traffic stream. If we consider each type of attack as a class label, then concept-evolution occurs when a completely new kind of attack occurs in the traffic.
- We propose a superior technique for both outlier detection and novel class detection to reduce both false alarm rate and increase detection rate. Our framework also allows for methods to distinguish among two or more novel classes. We claim four major contributions algorithm to identify dimension rating expresses from feedback comments by applying Data Mining techniques in combination with the Naive Bayes classifier.

We tackle the four research questions by two approaches:

6. Data stream classification techniques address only the first two challenges namely infinite length and concept-drift. The dynamic and evolving nature of data streams requires efficient and effective techniques that are significantly different from

static data classification techniques. Important of data streams are infinite length and concept-drift. It is impractical to store and use all the historical data for training. Each classifier is equipped with a novel class detector, to address concept-drift and concept-evolution. A decision boundary is built during training then test points falling outside the decision boundary are declared as outliers.

7. Data streams, namely, concept-evolution and feature-evolution that are ignored by most of the traditional method technique. Concept-evolution occurs when new classes evolve in the data. The problem of concept-evolution is addressed in only a very limited way by the currently available data stream classification techniques. Address the novel class detection problem in the presence of concept-drift and infinite length. An ensemble of models is used to classify the unlabelled data, and detect novel classes. The new classes will be detected as novel, because our SVM class detection technique detects. If it is found in the unused feature spaces. Our new SVM method including to effectively retrieving data from input data content. In this method using effectively and less timely to retrieve the document.

We propose Superior technique for both outlier detection and novel class detection to reduce both false alarm rate and increase detection rate. A flexible decision boundary for outlier detection by allowing a slack space outside the decision boundary. Improved technique for outlier detection by defining a slack space outside the decision boundary of each classification model. Enabling it to detect more than one novel class at a time. Each classifier is equipped with a novel class detector, to address concept-drift and concept-evolution. We propose a graph-based approach for distinguishing among multiple novel classes. We apply our technique on several real data streams that experience concept-drift and concept-evolution, and achieve significant performance improvements over the existing techniques.

2. Survey CLASSIFICATION

The dynamic and evolving nature of data streams pose special challenges to the development of effective and efficient algorithms. Two of the most challenging characteristics of data streams are its infinite length and concept-drift. Since a data stream is a high volume phenomenon, which can be considered infinite in length, it is impractical to store and use all the historical data for training. Several incremental learners have been proposed to address this problem. In addition, concept-drift occurs in the stream when the underlying concepts of the stream change over time.

a) Addressing Concept-Evolution in Concept-Drifting Data Streams

To have an existing classification and novel class detection technique. First, we pro-pose an improved technique for outlier detection by defining a dynamic slack s pace outside the decision boundary of each classification model. Second, we propose a better alternative for identifying novel class instances using discrete Gini Coefficient. Finally, we propose a graph-based approach for distinguishing among multiple novel classes. We apply our technique on several real data streams that experience concept-drift and concept-evolution, and achieve significant performance improvements over the existing techniques. In the future, we would like to extend our technique to text and multi-label stream classification problems.

b) A Framework for O n-Demand Classification of Evolving Data Streams

An interesting frame-work for online classification of dynamically evolving data streams. The new framework has been designed carefully based on our analysis and reasoning and has been tested based on our experiments on a real intrusion detection data set. As evidenced by the empirical results, the system developed here is able to provide significantly better results than a static classification model on classification accuracy. In addition, it is efficient and scalable at handling large data stream.

C) **Classification an d Novel C lass Detection of Data Streams in a Dynamic Feature Space**

A novel technique to detect new classes in concept-drifting data streams having dynamic feature space. Most of the existing data stream classification techniques either cannot detect novel class, or does not consider the dynamic nature of feature spaces. We have analytically demonstrated the effectiveness of our approach, and empirically shown that our approach outperforms the state-of-the art data stream classification techniques in both classification accuracy and processing speed. In the future, we would like to address the multi-label classification problem in data streams.

Related work divided into three main areas:

1) Data Classification

2) Outlier detection and filtering

3) Enhance data Detection

1) Data Classification

In literature [8]-[10], The classification process can enable searches based on values that go much further than standard attributes such as filename or creation date. Information can aid in compliance or business intelligence searches. As proposed in [10], In our process select document to classification .Classification is based on document size wise classified. In this method data classification two or three split document .Split process document size calculation after split. Model is provided in [11] to create a document structure create process. The comprehensive overview of trust model is provided in [11]. Individual level trust models aims to compute the reliability of peers and assist buyers in their work of decision making [12]–[14]. To regulate the behaviour of peers, avoid fraudsters and ensure system security was the system level models aim [11].

2) Data verify and Detection

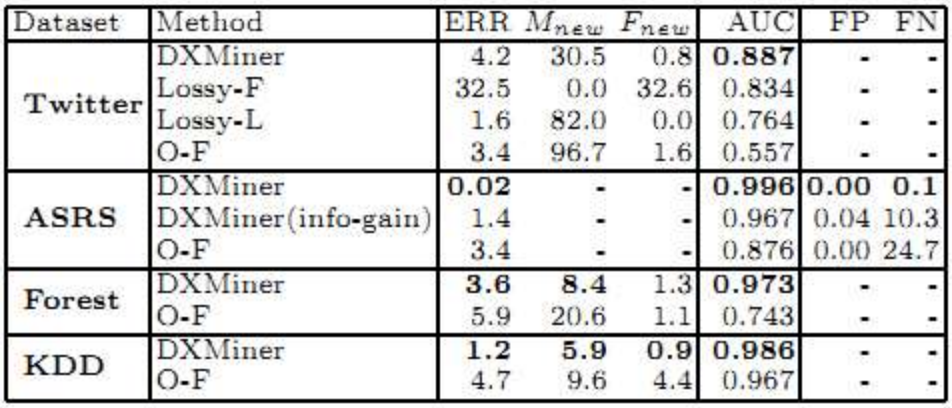
[10], [15], [16], [17] examined analysing feedback the historical data for training since it would require infinite storage and running time. In our data document increasing line and also unwanted symbols are detecting for this process. The data stream is divided into equal sized. The latest chunk, which is unlabelled, is provided to the algorithm as input. Unwanted symbols search method split out all data searching symbols .In this process using to decrees document size. This modules main object for symbols remove to data size automatically decreases. The main focus of [10] and [16] was sentiment classification of feedback comments. It is proved that feedback comments feedback comments. It is proved that feedback comments are noisy and hence analysing them is a challenge. [10] States that the missing aspect comments are deemed negative. Models built from aspect ratings are used to classify comments into positive or negative. [16] Proposed a technique for summarizing feedback. It aims at to filter out courteous comments that do not provide real feedback.

8. Model Analysis

We view feedback comments to use the same feature set for the entire stream, which had been selected for the first data chunk .This will make the feature set fixed, and therefore all the instances in the stream, whether training or testing, will be mapped to this feature set. We call this a loss conversion because future models and instances may lose important features due to this conversion.

Attest instance x is to be classified using a model MI, both the model and the instance will convert their feature sets to the union of their feature sets. We call this conversion “loss-less homogenizing” since both the model and the test instance preserve their dimensions, and the converted feature space becomes homogeneous for both the model and the test instance. Therefore, no useful features are lost as a result of the conversion.

Our experimental results, which show that Loss-L conversion misclassifies most of the novel class instances as existing class. It might appear to the reader that increasing the dimension of the models and the test instances may have an undesirable side effect due to curse of dimensionality. However, it is reasonable to assume that the feature set of the test instances is not dramatically different from the feature sets of the classification models because the models usually represent the most recent concept. Therefore, the converted dimension of the feature space should be almost the same as the original feature spaces. Furthermore, this type of conversion has been proved to be successful in other popular classification techniques such as Support Vector Machines.



Dataset	Method	ERR	M_{new}	F_{new}	AUC	FP	FN
Twitter	DXMiner	4.2	30.5	0.8	**0.887**	-	-
	Lossy-F	32.5	0.0	32.6	0.834	-	-
	Lossy-L	1.6	82.0	0.0	0.764	-	-
	O-F	3.4	96.7	1.6	0.557	-	-
ASRS	DXMiner	**0.02**	-	-	**0.996**	**0.00**	**0.1**
	DXMiner(info-gain)	1.4	-	-	0.967	0.04	10.3
	O-F	3.4	-	-	0.876	0.00	24.7
Forest	DXMiner	**3.6**	**8.4**	1.3	**0.973**	-	-
	O-F	5.9	20.6	1.1	0.743	-	-
KDD	DXMiner	**1.2**	**5.9**	**0.9**	**0.986**	-	-
	O-F	4.7	9.6	4.4	0.967	-	-

Most of the existing data stream classification techniques either cannot detect novel class, or does not consider the dynamic nature of feature spaces. We have analytically demonstrated the effectiveness of our approach, and empirically shown that our approach outperforms the state-of-the art data stream classification techniques in both classification accuracy and processing speed. In the future, we would like to address the multi-label classification problem in data streams. We make use of two types of lexical knowledge to \supervise" grouping dimension expressions to dimensions so roduningful clusters.

- Comments are short and therefore co-occurrence of head terms in comments is not very informative. We instead use the co-occurrence of dimension expressions with respect to a same modifier across comments, which potentially can provide more meaningful contexts

Support vector machines are considered a must try it offers one of the most robust and accurate methods among all well-known algorithms. In addition efficient methods for training SVM are also being developed at a fast pace. The aim of SVM is to find the best classification function to distinguish between members of the two classes in the training data.

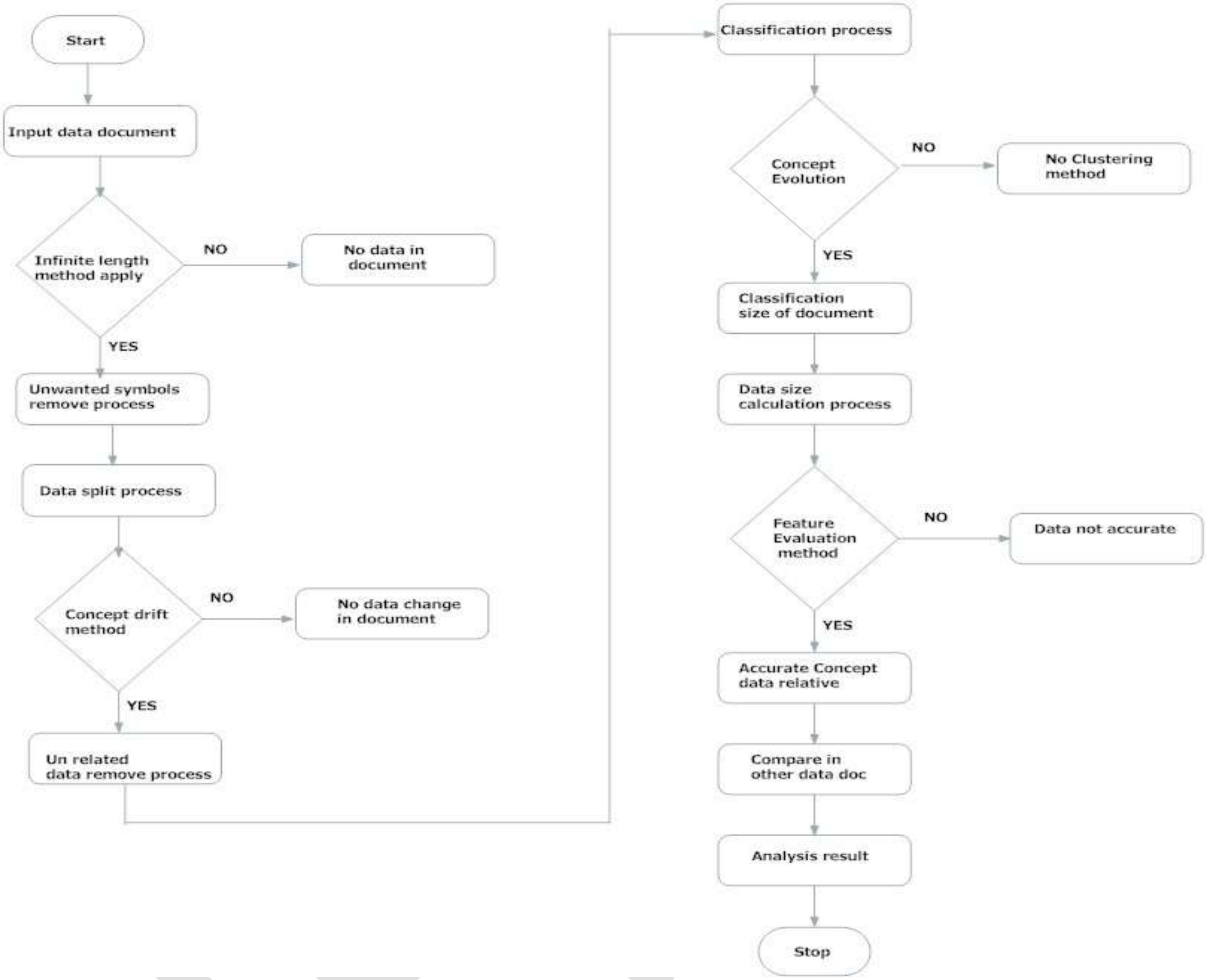


Figure 27: Classification Framework

The metric for the concept of the best classification function can be realized geometrically. A linear classification function corresponds to a separating hyper plane that passes through the middle of the two classes, separating the two.

4) **Outlier detection**

A test instance is identified as an F -outlier if it is outside the

Radius of all the pseudo points in the ensemble of models. Therefore, if a test instance is outside the hyper sphere of a pseudo point, but very close to its surface, it will still be an outlier. However, this case might be frequent due to concept-drift or noise; existing class instances may be outside and near to the surface of the hyper sphere. As a result, the false alarm rate detecting existing classes as novel would be high. In order to solve this problem, we follow an adaptive approach for detecting

The outliers. We allow a slack space beyond the surface of each hyper sphere. If any test instance falls within this slack space, it is considered as existing class instance. This slack space is defined by a threshold, OUTTH. We apply an adaptive technique to adjust the threshold. First, we explain how the threshold is used.

4. Outlier Detection

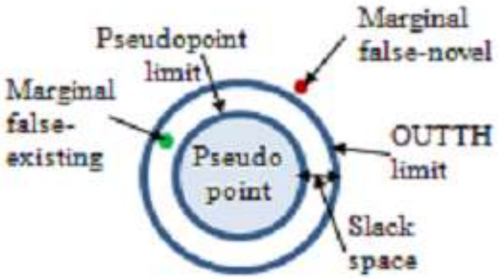


Figure 2: Outlier Phase

The F -outliers detected during the outlier detection phase may occur because of one or more of the three different reasons: noise, concept-drift, or concept-evolution. In order to distinguish the F -outliers that occur because of concept-evolution only, we compute a metric called discrete Gini Coefficient of the F -outlier instances. We show that if the Gina Coefficient is higher than a particular threshold, then we can be confident of the concept-evolution scenario.

It is possible that more than one novel class may arrive at the same time in the same chunk. This is a common scenario in text streams, such as Twitter messages. The number of connected components determines the number of novel classes. The basic assumption in determining the multiple novel classes follows from the cohesion and separation property. For example, if there are two novel classes, then the separation among the different novel class instances should be higher than the cohesion among the same-class instances.

5. Conclusion

We have proposed a novel technique to detect new classes in concept-drifting data streams having dynamic feature space. Most of the existing data stream classification techniques either cannot detect novel class, or does not consider the dynamic nature of feature spaces. We have analytically demonstrated the effectiveness of our approach, and empirically shown that our approach outperforms the state-of-the art data stream classification techniques in both classification accuracy and processing. Data streams, namely, concept-evolution and feature-evolution that are ignored by most of the traditional method technique. Concept-evolution occurs when new classes evolve in the data. The problem of concept-evolution is addressed in only a very limited way by the currently available data stream classification techniques. Address the novel class detection problem in the presence of concept-drift and infinite length. An ensemble of models is used to classify the unlabeled data, and detect novel classes. The new classes will be detected as novel, because our SVM class detection technique detects. If it is found in the unused feature spaces. Our new SVM method including to effectively retrieving data from input data content. In this method using effectively and less timely to retrieve the document.

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Inter Symbol Interference Reduction Using OFDM in Data Transmission

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Abstract— This paper studies reduction of Inter Symbol Interference (ISI) using Orthogonal Frequency Division Multiplexing (OFDM).OFDM is multicarrier data transmission modulation scheme. In multipath data transmission ISI is introduces. Therefore, in OFDM to separate the multisymbols guard bands are added. For reduction of ISI Cyclic prefix (CP) are introduced. CP uses the padding of bit symbols in the system and eliminate the ISI. Peak to average power ratio (PAPR) is also reduce by using clipping.

Keywords— OFDM, ISI,CP,PAPR,Clipping,Guard Band, Padding.

INTRODUCTION

Orthogonal Frequency Division Modulation (OFDM) is very efficient multicarrier method. Conventional transmission uses single carrier, which is modulated with all the data to be sent. In OFDM first break the data into small portions then use a no of orthogonal subcarriers to transmit the data. OFDM have no of advantages like low implementation complexity, high spectral efficiency, low Inter symbol interference(ISI) .Therefore it has been widely used in many systems like, wireless communication systems, Digital audio Broadcasting (DAB) systems, Digital Video Broadcasting(DVB) systems, Wireless Local Area Networks (WLANs) [1].

The basic principle of OFDM is gaining a popularity in wireless transmission systems. OFDM is one of the technique employed in fourth generation wireless systems. In serial data transmission systems data send one by one with frequency spectrum and each symbol occupies its bandwidth , but in high rate data transmission symbol occupies very short duration and there is a chance to introduce ISI[3]. In conventional OFDM, the transmitted signals are Bipolar or Complex. OFDM improves the ISI while communication via multiple transmitting antennas improve the Bit Error Rate (BER) performance of transmission. In OFDM systems Cyclic Prefix (CP) are used to filling the guard space. This scheme utilizes to minimize the ISI and Inter Carrier Interference (ICI), other method is also used which is called Zero-Padding (ZP) and it is proposed where CP is replaced by non-zero padding. In ZP-OFDM zero samples are used to equalization performance [2]. While in CP-OFDM improve the performance of transmission by reducing the ISI and Inter Block Interference (IBI).

OFDM is used in both time domain and frequency domain.

In Time Domain:

$$\int_{-\infty}^{\infty} Xi(t)X_j^*(t)dt = \begin{cases}1, & i=j\\ 0, & i\neq j\end{cases} \qquad (1)$$

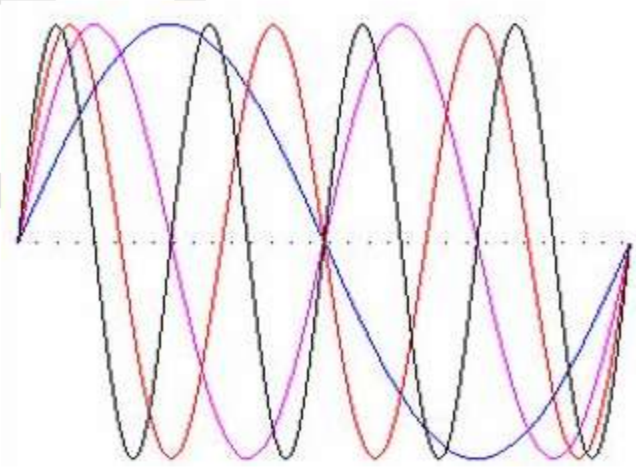

Fig. 1 The four subcarriers within one OFDM symbol

Frequency Domain:

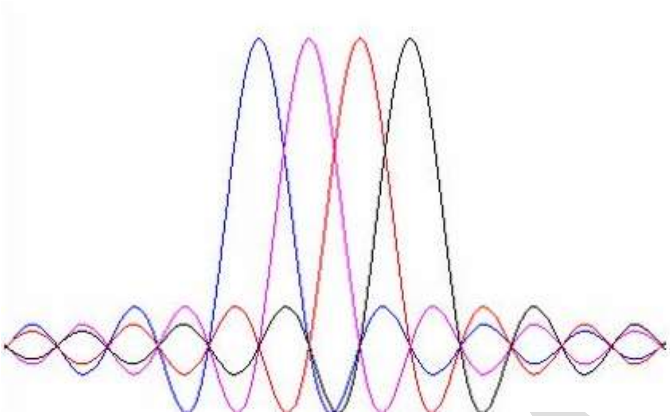

Fig. 2 Spectra of individual subcarriers

$$\int_{-\infty}^{\infty} Xi\,(f)X_j^*(f)df = \begin{cases} 1, & i = j \\ 0, & i \neq j \end{cases} \qquad (2)$$

The major drawback of OFDM is Peak to Average Power Ratio (PAPR), So PAPR reduction is required in OFDM. There are no of methods used like clipping, Digital amplitude Predistortion and Residue number method.

BLOCK DIAGRAM OF OFDM

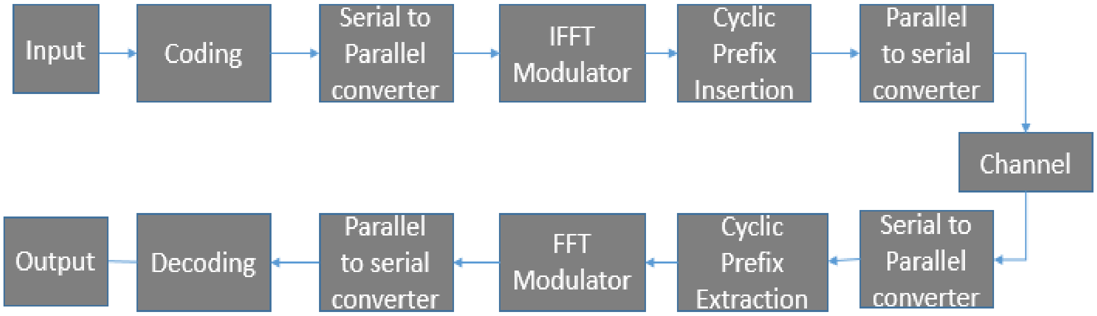

Fig. 3 Data transmission method of OFDM

Transmitter:

Input data signal is baseband modulated signal. Various modulation schemes are used like, BPSK, QAM, DPSK. Data encoded in the form of frame and this frame is called Discrete Fourier Transform (DFT) frame. Modulation is performed at each parallel substream, that is one symbol belonging to adjacent DFT frames. The serial data symbol is converted inti parallel by using serial to parallel converter that is into N different substreams. Each substream will modulate by IFFT modulator. Cyclic prefix is added to eliminate IBI and ISI. The data again converted into serial to form the OFDM symbol. Then OFDM will modulate the high rate data before transmission through the channel. Data is transmitted through the channel, channel may be the single wire cable, Twisted- pair cable or Fiber optic cable.

Receiver:

The data are down converted to the baseband and cyclic prefix are removed. FFT is used to retrieve the exact form of transmitted symbols. The data are then serially converted by parallel to serial converter. Demodulation is done to estimate the transmitted symbols.

FFT and IFFT:

FFT and IFFT are two linear transformations on signals and they are inverse to each other and it is needed for modulation in digital form .In OFDM each channel should modulate by 1 different frequency. Suppose we need 32 frequency then we should implement the system using 32 oscillator and it is expensive , hard to implement and need more space , but by using IFFT and FFT in digital form just 1 oscillator required.

IFFT performs N point IFFT operations . IFFT transform a spectrum into time domain signal. Therefore, output is N point samples. That is IFFT is used to multiplex data stream onto orthogonal subcarriers. According to the mathematical distributions IDFT forming the following equation:

$$x(n) = \sum_{k=0}^{N-1} X[k].e^{jk2\pi n/N}, \quad n = 0,1,.,N-1 \tag{3}$$

$$x(n) = \sum_{k=0}^{N-1} X[k].\left(cosk\frac{2\pi}{N}n\right) + j(sink\frac{2\pi}{N}n)) \tag{4}$$

The received signal in time domain, FFT converts this signal into frequency domain. That is demultiplex data into single stream. The FFT demodulator takes the N time domain transmitted signal and determine the amplitude and phases of sine and cosine waves forming the following equation:

$$X[k] = \frac{1}{N}\sum_{n=0}^{N-1} x[n].e^{-\frac{jn2\pi}{N}k} \qquad {\scriptstyle k=0,1.,N-1} \tag{5}$$

$$X[k] = \frac{1}{N}\sum_{n=0}^{N-1} x[n].((\cos k\frac{2\pi}{N}n) - j\ (\sin k\frac{2\pi}{N}n)) \tag{6}$$

Cyclic Prefix:

OFDM transmits data in blocks. For transmission any channel can be used and this will spread the OFDM symbol they causes the signal blocks interfere to each other. This interference is called Inter Block Interference (IBI) and this leads to ISI. In ISI two symbols will overlap and causes distortion. So to minimize this silence period is added between two transmitted frames, this is known as zero prefix and zero prefix consist of zero samples added to front of each symbol. The effect of before transmitted frame will affect on zero padding portion of frames. Then this samples discarded to receiver and unaffected samples used for demodulation of the signal transmission. But the zero padding is not the permanent solution because zero padding can destroy the periodicity of the carriers and this periodicity is needed for demodulation which is done by FFT.

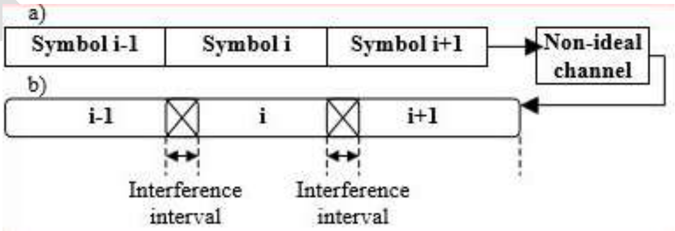

Fig.4 a) The transmitted symbols frame structure
b) The received symbols are overlapping during interference interval

So , instead of zero padding the cyclic prefix are used .CP is use at the beginning of the each symbol and it consist of L samples of the OFDM symbols that are copied in front of the data block. If CP duration span is large than the multipath delay the residual contribution is absorbed by the cyclic prefix samples that are thrown up to the receiver. This is also happen when using zero prefix but by using cyclic prefix receiver carrier synchronization is done. Since some signals are without silence period transmitted and also maintain the carrier periodicity, because periodicity is important to simplify the proper reconstruction of the signal using DFT.

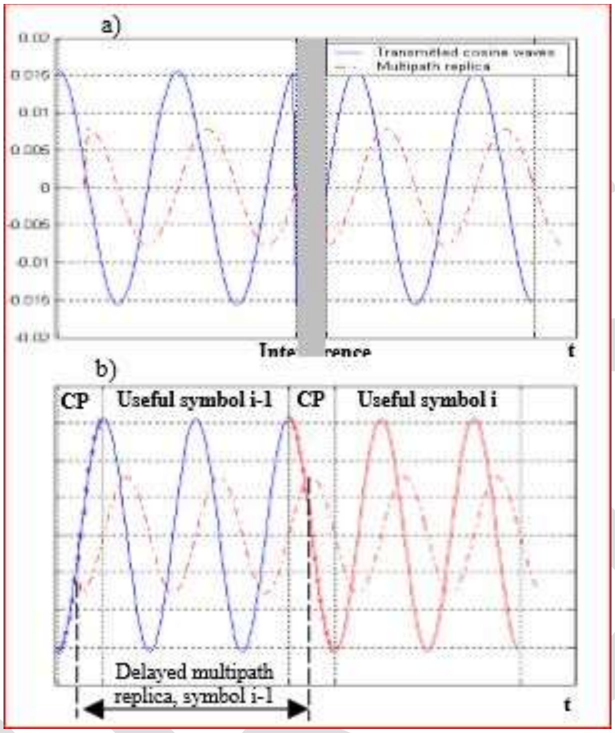

Fig. 5 a)Symbol interference ,b) Cyclic prefix eliminates the ISI

If the guard interval is longer than multipath delay ,the useful content is not discarded to the receiver by the delayed replica shown in fig. b).The delayed replica is affect on the next received signal. It is shown in fig (a) labeled as interference. If a cyclic extension is ,Tg=T/4 (Time duration) Inserted in front of the data the delayed replica of the first symbol will affect the cyclic prefix portion of the second symbol and this is discarded at the receiver. the channel effect on the transmitted signal can be totally eliminated by a simple , frequency domain equalizer.

CONCLUSION

OFDM uses orthogonal frequency subcarriers to transfer the data. Inter symbol interference is minimized by using cyclic prefix by adding multipath delay.

ACKNOWLEDGMENT

Author would like to thanks the Guide and Head of the Departments.

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COMPUTATIONAL FLUID DYNAMIC ANALYSIS OF INLET AIR SYSTEM

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Abstract—The inlet air system of a compressor appear as a simple component but it is actually very critical component. The inlet air system consist of the ducting and the silencer section which is responsible for filtering the air before it enters into the compressor. The silencer section performs the function of keeping the sound levels within the permissible limits. The major problems encountered in the inlet ducting are major losses in the silencer section and the elbow duct, and also there are swirl formations in the elbow which needs to be eliminated. To eliminate these losses and swirl formations a through a (CFD) Computational Fluid Dynamic Analysis of the duct is to be done and the areas of major pressure losses are to be highlighted. For this optimization the design of the duct is modified. All designs are done with respect to their cost and efficiency of operation.

Keywords— CFD analysis, Compressor, Duct, Pressure drop, Silencer, Swirl, Design, Optimization.

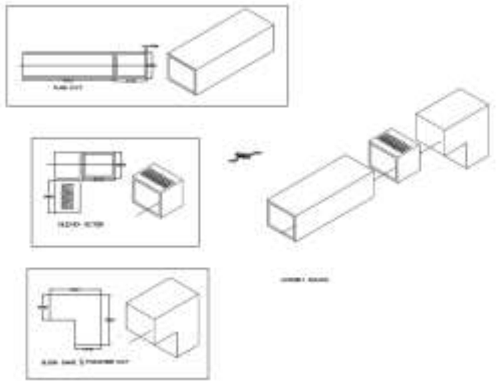
1. INTRODUCTION

This project title deals with the design and optimization of an inlet air duct of a compressor that is going be the inlet to the gas turbine plant. Here I have analyzed the flow of the air through the duct, the points are highlighted where the pressure losses are taken place. Design of the duct also optimized for acoustic analysis. So accordingly redesign the system to reduce the pressure losses and sound levels. Air from the duct passes to the compressor, here the air is compressed in the combustion chamber. When the compressed air is supplied from the compressor, the burnt high temperature gases are passed through the turbine where its high pressure and temperature energy is used to develop work. The power developed by the turbine is used to run the compressor and remaining energy can be used to generate electrical energy.

1.1 Problem Statement

The problem of pressure drop in duct which is taken from one of the industry, analysis which was done in that industry, and some of the common problems were arises,1) Pressure losses in Duct. 2) Another major problem in the duct is the sound levels as a result of air flow through the ducts.3) Elbow section of the duct is the part in which pressure loss is occurring.4) Due to sharp bend of 90° turn the swirl of air is formed.5) Material selection for duct.

Following Figure shows the 2 dimensional drawing of existing duct. This drawing prepared in AutoCad software.



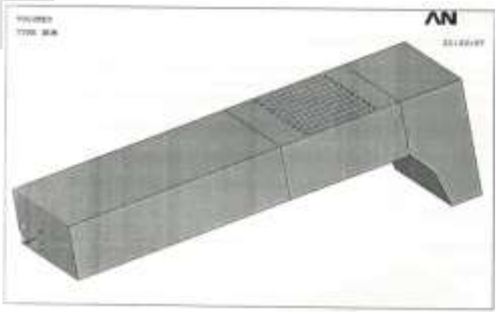


Fig 1.1 shows 2D drawing of the duct

Fig 1.2 shows 3D Model of the duct

1.2 Detail Description of the Design:

The components of the duct are:

1. Plain duct: The plain duct is of rectangular hollow cross section. Its dimensions are 8.33ft height and 10.75ft width. The purpose of the plain duct is to act passage for the air coming from the filter section. The plain duct length is 29 ft. long

2. The silencer section: Connecting to the plain duct is the silencer section of 8.33 ft long, this is also a rectangular shell of walls with mineral wool padding inside, in addition to this total 10 panels are arranged side by side each with mineral wool padding. The purpose of this is to provide a absorbent surface to absorb the sound produced due to the flow of air through the ducting. The panels are 150mm thick and span the entire length of the silencer section. The construction of the panels is such that the mineral wool padding comes in between two sheets of stainless steel.

3. The elbow duct: The ducting takes 90 degree turn after the silencer section. To facilitate this an elbow section is provided.

4. The transition duct: The transition duct is the one that connects the elbow to the inlet plenum of the compressor. This is a converging part as it goes down to the plenum covers.

1.3 Aims and Objectives:

Aims: The Inlet duct which is connected to the compressor and compressor is the inlet component to the gas turbine. As we already know that the compressor consumes almost two thirds of the power developed by the turbine any loss in compressor section could effect on overall efficiency of the gas turbine power plant. Another major problem in the duct is the elevated sound level as a result of air flow through the duct. This causes inconvenience to the operator so it should be reduced to permissible levels without causing any increase in the pressure loss.

Objectives: To achieve the aim a complete Fluid Dynamic Analysis of the duct is required, the flow pattern need to be mapped and pressure drop calculated from above mapping, the following things should have to be achieved,

To develop 3D model of an intake system.

To observe the pressure drop inside the air intake system.

To develop new design for optimization of an air intake system.

2.LITERATURE REVIEW

2.1 Literature No.1

The second part Numerical Investigation on The effect of Angle of Attack on the Square Ducting Design 2007 by Mohd Hafiz Mohd Noh1, a, Ahmad Hussein Abdul Hamid2,b, Helmi Rashid3,c, Muhammad Izzuddin Ahmad Sfhafi4, This research is focus on the effect of increasing the angle of attack and increasing the bend radius for the square area duct. To further minimize the pressure drop CFD Analysis And Simulation is done.

2.2 Literature No.2

Design And Optimization of industrial duct using CFD Analysis. By Dr.Neihad AL-khalidy 2011.The main objective of this work is to improve flow condition along the duct. 3D CFD model is studied. The following modifications were investigated-1. changing the length of the duct2. changing the pressure drop3. proposing a new design.

2.3 Literature No.3

Swirling Airflow Influence on Turbocharger Compressor Performance by Department of Applied Mechanics Division of Combustion CHALMERS UNIVERSITY OF TECHNOLOGY, Göteborg, Sweden 2014, Literature review showed many possible ways to improve air intake system performance for compressor. Three paths were suggested for Air Induction System that could be further investigated. Swirl investigation 90 bend improvement Investigation of different duct shapes.

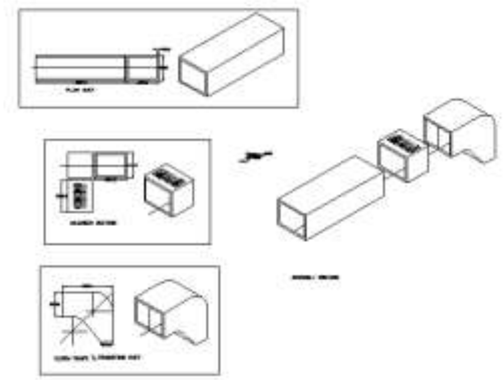
3. METHODOLOGY:

Problem Solving Steps:

1. Create the Model geometry
2. Drawing appropriate 2D and 3D modeling.
3. Discretization
4. Apply Boundary Condition and Generation of grid
5. Select the basic equation to be solved: Laminar or Turbulent
6. Specify Laminar/Turbulent flow
7. Mach No. less than 0.3.

8. Specify the algorithm and perform simulation
9. Run command in Fluent
10. Result analysis and post process the simulation to get the result.

Following fig. shows improved design of duct.



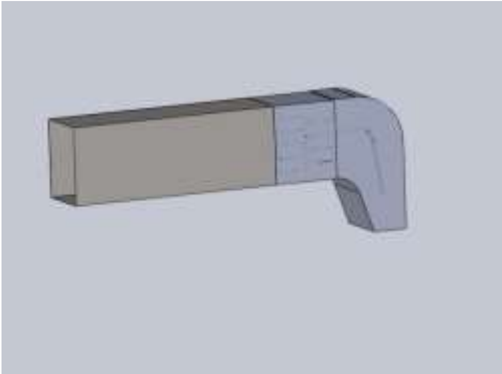


Fig No. 3.1 Shows the improved 2D drawing of the duct system   Fig No. 3.2 Shows the improved 3D model of duct system.

3.1 Discretization :

A mathematical model Is discretized by dividing it into a mesh of finite elements. Thus a fully continuous field I represented by a piecewise continuous field defined by a finite number of nodal quantities and simple interpolation within each element.

3.2 Apply Boundary Condition and Generation of grid

Once the meshing is complete the next step is to apply the loads and specifying the boundary conditions. according to the design data provided the mass flow rate at the inlet of duct is 112.1 kg/sec. According to formula:

Discharge= Density*A*V

Discharge= Density*A*V

$112.1 kg/s = 1.1272 kg/m^3 *(2.540m*3.278m)*V$

$112.1 = 9.38520 *V$

$V = 11.94 m/s$ From the above equation the velocity was found to be 11.94 m/sec

3.3 The Role Of Reynolds Number

Pipe flow may be either laminar flow or turbulent flow. Laminar flow is characterized by low flow velocity and high viscosity. Turbulent flow is characterized by high flow velocity and low viscosity.

For Reynolds number < 2100, flow is laminar. For Reynolds number > 4000, flow is turbulent**.**

Reynolds Number = Inertial force/Viscous force $Re = \rho VL/\mu$
Where,
V is the velocity of the fluid, ρ is the density of fluid, μ is the viscosity of fluid, L is the length or diameter of the fluid.

$Re = \rho VL/\mu$

$$= \frac{1.1272 kg/m^3 * 11.94 m/s * 8.993m}{1.983*10^{-5} kg/m.s}$$

= 5853132 this value r that standard value so the flow is turbulent.

3.6 Calculation For Mach No.

If the velocity of gas flow is larger than Ma 0,3 it must be regarded as compressible. In air, this corresponds to approximately 100m/s at 1bar and 0°C. The dynamic pressures occurring in the flow here are equal to a maximum of 60bar.Below this limit, a gas flow can be considered as incompressible fluid with good approximation. In most flows of liquids, and of gases at low Mach number, the density of a fluid can be considered to be constant, regardless of pressure variations in the flow. Therefore, the fluid can be considered to be incompressible and these flows are called incompressible flow.

3.8 Turbulence Models

We need to be aware that when an analysis begins the effective viscosity initializes as a multiple of the laminar value. This initialization occurs whether a model is active or not. The default value of this multiple (also called the turbulence ratio is 1000).

FLUENT(CFD) offers six turbulence models, Normally the standard k-epsilon model is the first model to apply. It usually provides a realistic picture of the flow in a converging nozzle.

3.9 Specify The Algorithm

Once the problem is defined the next step is to specify the algorithm. There are two types of algorithm SIMLEF, SIMPLEN

SIMPLEN algorithm generally used for the turbulent analysis. Thus the problem is turbulent, incompressible flow with no heat flow.

3.10 Result Analysis

Once all these have been completed the analysis started by giving the RUN command in Fluent. After the analysis is complete the result can be viewed in the post processor. In the post processor first the vector plot of the flow is made to see the nature of the flow and to check the velocities at various points in the flow regime. After this a contour plot of the pressure is made to plot the pressure variation thought the duct.

4 PRELIMINARY ANALYSIS AND OBSERVATION

Before going to start out to make changes in the design we need to make a fluid dynamic analysis of the original design and find out the pressure distribution. From this we need to calculate the total loss in the duct. The original model has been prepared and control volume is to be generated. After this the meshing is done the next step is to apply the boundary condition. Here in this the inlet velocity is 11.94 m/sec. and suction pressure at the exit of the duct as 19,305.83 N/m².

According to the given data

1. Mass flow rate at the inlet of the duct= 112.1 kg/sec.

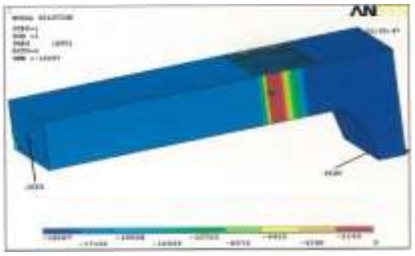
2. the suction pressure at the exit of the duct= 19,305.83 N/m²

3. Pressure loss in the silencer section= 2596 N/m²

4. pressure loss in elbow section= 498N/m²

5. power consumed by compressor = 34.714 MW

Following Fig shows the pressure plot, it is clear that the majority of the **pressure loss is taking place in the silencer section the total loss is 2966 N/M²**



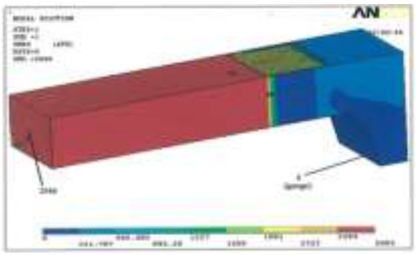


Fig No.4.1 Pressure distribution in duct

Fig no. 4.2 Total back pressure in the duct

The inlet velocity in the previous section case as 11.94 m/sec. But The exit pressure instead of defining it as suction pressure keep it as **open to atmosphere**, that is specify the exit pressure as 0 N/m². by this method the this fig shows the total back pressure 2986 N/M²

5 RECOMMENDATIONS FOR THE DESIGN CHANGE

5.1 Deign No 1

Since the main pressure loss was taking place in the silencer section so that should be the main area for design change. one of the main reason for the loss was found that the panels was closely tight and so there causing a sudden contraction of the flowing fluid resulting in pressure loss. one way to reduce this effect was to provide more gap between two panels. The shape of the panel has to be changed in aerodynamic shape.

Fig No 5.1 New Shape (Design No 1)

5.2 Design No. 1

Following diagram shows the arrangement of panels and the thickness of the panel is 150mm.

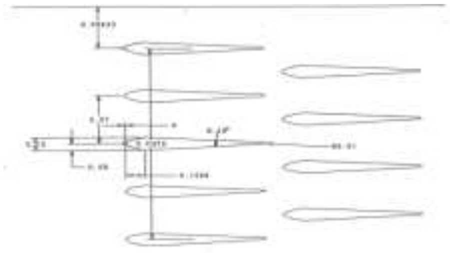


Fig no 5.2 Shows the arrangement of panels

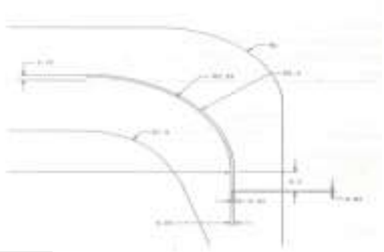


Fig No. 5.3 The Modified Elbow Duct

5.3 The modified elbow duct

Following fig. shows the Elbow section which also modified with panels so as to guide the air through the bend with as less turbulence as possible. The thickness of the turning panel is kept at 50mm.

Fig No 5.4 Shows 3D Model of the design No.1

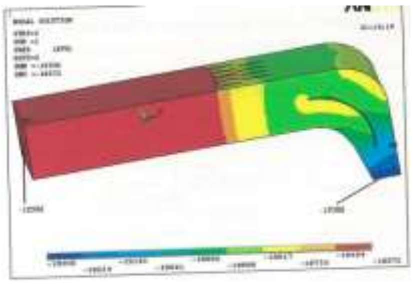


Fig No.5.5 shows the Pressure plot Result

5.4 Result of design No 1

Now after the model Is ready the meshing is done and the loads are applied as before. Then the solution options and the execution controls are given and the analysis started. After the analysis is complete the pressure distribution plot are shown. Fig No.5.4.2 shows the total pressure loss in the duct that has been reduced from the original **value of 2986 N/m² to a value of 710 N/m².**

Calculated power from Fig No.5.5

The following are the design values of the compressor.

Atmospheric pressure=101.32KN/m², Discharge pressure=936.27KN/m², Pressure ratio=9.4279, Ambient Temperature=40°C=313K

Loss in the conventional design=2900N/m² , Loss in the new design=710N/m² , Power Consumed by the compressor= m*Cv*(T2-T1)

Ideal power required by the compressor assuming no loss in the duct=34.086MW,

Actual power required by the compressor=34.714MW, Power required when using the new design=34.188MW

Therefore Power saved by the new design=526KW

Power Consumed by the compressor= m*Cv*(T2-T1)

Where,

m= mass flow rate= 112.1 kg/sec

Cv= Ideal gas specific heat capacities of air =0.721 kj/kg.k

T2 = Temperature at the exit of duct =736K

T1 = Initial Temperature = 313K

= 112.1*0.721*(736-313) (Kj/Sec=KW)

= 34188 KW = 34.188 MW

Calculation for Material Selection

Weight of duct **in mild steel** material, Density of mild steel = 8000Kg/m³, Wt of duct = L*B*density*thickness

= 16613*3278*0.00000785*3, = 1306.97793 Kg (60Rs.*1282.47) = **76,948Rs,** Wt of transition duct = 2540*2540*0.00000785*3

= **151.93518 Kg * 60 = 9115.8Rs.** Mild steel bars = 1.2*2.5 (qty 10) = 30m², 60*30= **1800 Rs**.

Total cost of mineral wool = 3.278*2.540 = 8.32612 m²

(250 Rs./Sq M * 8.32612) = **2081.53 Rs**

Total cost of duct =89,945Rs.

Weight of duct in **stainless steel** material ,Density of mild steel = 8000Kg/m³ Wt of duct = L*B*density*thickness

= 16613*3278*0.00000800*3,= 1306.97793 Kg (300Rs.*1306.977) = **39,2093Rs,**Wt of transition duct = 2540*2540*0.00000800*3

= **154.83518 Kg * 300 = 46440 Rs.,**stainless steel bars = 1.2*2.5 (qty 10) = 30m²,300*30=900**Rs**.

Total cost of mineral wool = 3.278*2.540 = 8.32612 m^2

(250 Rs./Sq M * 8.32612) = **2081.53 Rs**

Total cost of duct = 4, 41,514 Rs.

Weight of duct in **Aluminum 6061** grade material ,Density of mild steel = 2790Kg/m^3,Wt of duct = L*B*density*thickness

= 16.613*3.278*2790*3^-3,= 455.8085552 Kg (102Rs.* 455.8085552) = **46,492Rs,**Wt of transition duct = 2.540*2.540*2790*3^-3

= **54 Kg * 102 = 5507.988Rs.,**stainless steel bars = 1.2*2.5 (qty 10) = 30m^2

102*30=3060 **Rs**.

Total cost of mineral wool = 3.278*2.540 = 8.32612 m^2

(250 Rs./Sq M * 8.32612) = **2081.53 Rs**

Total cost of duct = 57,140Rs.

Table No 5.1 The cost Analysis of the design No.1

Material	Total Cost
Mild Steel 60 Rs/Kg	89,945Rs.
Stainless steel 304 300 Rs./Kg	4, 41,514 Rs.
Aluminum grade 6061 series 102 Rs/Kg	57,140Rs.

5.5 Design N0 2

In the next design the position of the panel was arranged horizontally instead of vertically and having two turning panels in the elbow instead of one.

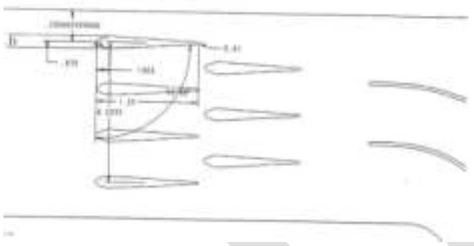


Fig No.5.6 shows the arrangement of panels

Fig No.5.7 shows the 3D model

5.6 Result of design no.2

The Pressure plot result is shown in below figure, which shows that the pressure loss further reduced to 426N/m^2.

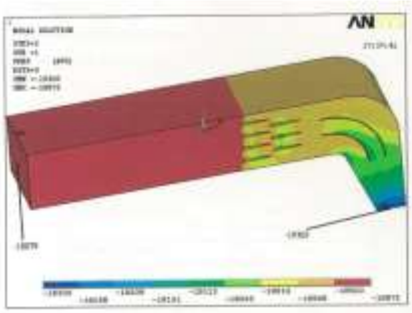


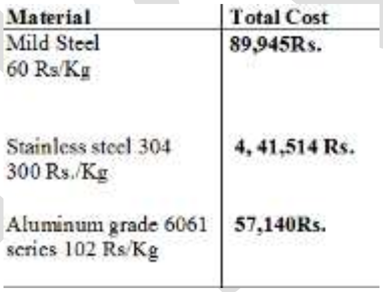
Fig No.5.8 Pressure Result of design 2

By using new design Power Consumed by the compressor is =34.179 MW (1MW = 1000KW)

Actual power required by the compressor = 34.714 MW

Therefore the power saved by change in the design = 534.38KW

Table No 5.2 The cost Analysis of the design No.2



Material	Total Cost
Mild Steel 60 Rs/Kg	**89,945Rs.**
Stainless steel 304 300 Rs./Kg	**4, 41,514 Rs.**
Aluminum grade 6061 series 102 Rs/Kg	**57,140Rs.**

5.7 Design No.3

Another possibility in the design changes is that the thickness of the panels be reduced so as to gap in between each of the panel is increased. thickness of the panel reduced by 100mm.

Fig No 5.9 Shows 3D Model Of the design No.3

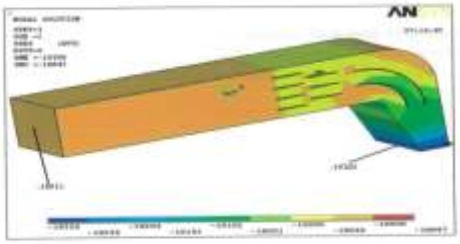


Fig No 5.10 Shows the pressure plot result of design no. 3

5.6 Result of design no.3

After modeling meshing is done and the load is applied. The pressure distribution plot is done. Following figure shows that the design comes out with the result of **394 N/m²**, this is the less than previous design.

Power saved by design no.3 is 540.95KW

Total cost of duct in mild steel material is =89,005Rs. ,Total cost of duct in stainless steel material= 4, 45,114 Rs.

Total cost of duct in Aluminum 6061 grade material = 55,611Rs. ,

Table No 5.3 The cost Analysis of Design No.3

Material	Total Cost
Mild Steel 60 Rs/Kg	80,945Rs.
Stainless steel 304 300 Rs./Kg	3, 99,794 Rs.
Aluminum grade 6061 series 102 Rs/Kg	56,140Rs.

5.8 Design No.4

In design no 4 the new arrangement of panel was designed. Which is shown in figure.

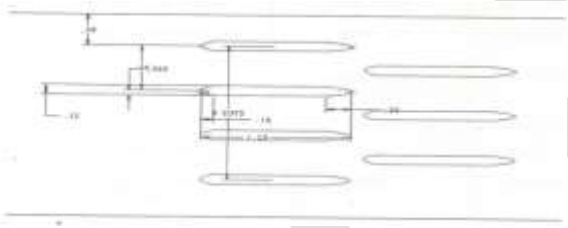


Fig No. 5.11 New Arrangement of panels

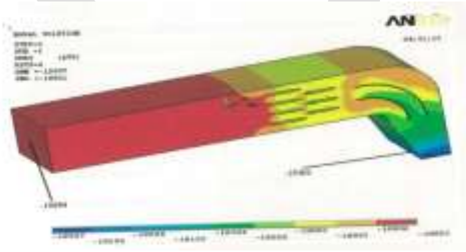
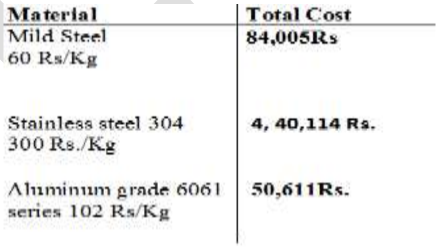


Fig No. 5.12shows the pressure plot result

Table No 5.4 The cost Analysis of Design No.4



Material	Total Cost
Mild Steel 60 Rs/Kg	84,005Rs
Stainless steel 304 300 Rs./Kg	4, 40,114 Rs.
Aluminum grade 6061 series 102 Rs/Kg	50,611Rs.

5.9 Design No.5

The losses in the silencer section could not be reduced anymore it was decided to concentrate on reading the losses in the elbow. to achieve this it was decided to reduce the panel size so that the losses due to friction in the elbow section will be come down.

Following Fig shows the new shape of the panel and the pressure plot result

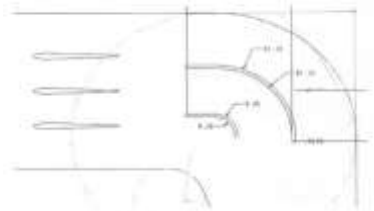


Fig No. 5.13 New shape of panels in the elbow

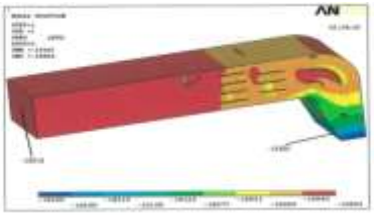


Fig No. 5.14 New shape of panels in the elbow

As the power loss in the new design = 387 N/m^2

Therefore Power saved by the new design=543.46 KW

Total cost of duct in mild steel material =89,005Rs.

Weight of duct in stainless steel material

Total cost of duct in stainless steel material is = 4, 45,114 Rs.

Total cost of duct in **Aluminum 6061** grade material **= 55,611Rs.**

Table No 5.5 The cost Analysis of Design No.4

Material	Total Cost
Mild Steel 60 Rs/Kg	89,005Rs
Stainless steel 304 300 Rs./Kg	4, 45,114 Rs.
Aluminum grade 6061 series 102 Rs/Kg	55,611Rs.

Analysis is done by changing the design of panels, and their arrangement. From below table it is clear that the least loss occurs in design no. 5 with aluminum Material and total pressure loss is 387 N/m^{22}.

Design	Material Cost	Total Pressure Loss	Power Saved
Old Design	5,50,999 Rs(in MS)	2986 N/m^2	628 Kw
Design No.1	57,140Rs	710 N/m^2	475.9Kw
Design No.2	57,140 Rs	426 N/m^2	534.38 Kw
Design No. 3	55,611Rs	394 N/m^2	540.95 Kw
Design No.4	57,140Rs	411 N/m^2	537.46 Kw
Design No. 5	55,611Rs	387 N/m^2	543.6 Kw

From the above table it can be clearly seen that the minimum pressure losses occurs in design no. 5 cost of the material in mild steel is also very less than other design according simplification of the design no 5 the mineral wool in that shape of the panels can be cut, and attach with the panels.

6 Conclusion:

This design proposed to the company and they have decided to manufacture, Before the company can start manufacturing and marketing this designs they have to build prototype model of the design.

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Boosting The Performance Of Color Image Denoising

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Abstract— Spatial domain and transform domain image filters have achieved great success in denoising. The transform domain image filters is the leading one when compared to spatial domain image filters. The reason is that fine tuning of denoising strength can be done efficiently using shrinkage operators but not easy to do in spatial domain filters. Here Spatially adaptive iterative filtering in short SAIF to control the denoising strength locally for both gray images and color images for any spatial domain filters is implemented. Using this approach we iteratively filter the local image content using the given base filter, and with respect to the estimated risk using plug in estimator, and the type of iteration and iteration number are automatically optimized. Finally it is extended with bilateral image filtering. Experimental results prove that the SAIF plus Iterative Bilateral filtering improves the denoising performance.

Keywords— Image Denoising, Spatial Domain filters, Risk estimators, Pixel aggregation, SURE, Plug-In-Risk Estimators , Iterative Bilateral Filtering.

INTRODUCTION

With the rapid growth of the Internet now a days, the number of image data is increasing exponentially. In all these digital images there carries noise of some degree. Image denoising is an important image processing task, both as a process itself, and as a component in other processes. Image denoising plays a crucial job in a wide range of applications such as image restoration, visual tracking, image registration, image segmentation, and image classification, where acquiring the original image content is important for robust performance. Image Denoising is an important pre-processing task before further processing of image like segmentation, feature extraction, texture analysis, etc. As a result, there is degradation in visual quality of an image. So for removing these noises image denoising algorithms are used.

In general, denoising algorithms are divided into two main categories namely Transform Domain Methods and Spatial Domain Methods. Transform Domain Methods or Frequency Domain techniques are based on modifying the Fourier transform of the image. This technique is mainly suited for processing the image based on frequency content. Spatial domain techniques are based on direct manipulation of pixels in an image. In many cases spatial domain methods produce undesirable results because usually it enhances the whole image in a uniform manner. It’s not possible to effectively and selectively enhance the edges and other required information. In this method, it first estimates the pixel value as weighted average of other pixels where the higher weights are assigned to similar pixels.

Practically,determining denoising strength is difficult as it contains some tuning parameters that affect the performance. A larger smoothing parameter causes over smoothed output which erase some information. A less smoothing makes little denoising which cause suppression of noise. So for boosting the spatial domain filters , an alternative approach is iterative filtering. Using this iterative approach, by applying the same filter several times we can make a well estimated output which is considered as bad with that filter. For this the iteration number and the best iteration method should be found out using the SAIF[1] strategy. Then the bilateral iterative filtering is applied to the SAIF output. This can be implemented for both gray images and color images.

RELATED WORK

There were a number of algorithms exists in the category of spatial domain filters and Transform domain filters . The spatial domain filters directly deal with the pixel values and transform domain filters deal with the frequency content of an image. Spatial domain filters are further divided into two linear and non linear filters. The main two classifications of transform domain filters are adaptive and non adaptive transforms. Transform domain method have the ability to represent both low frequency component such as image backgrounds and the high frequency transients such as image edges. Wavelet , DCT etc are different methods in adaptive transform domain criteria. They are easy to calculate but representing the natural image content using the sparse coefficient distribution may not be effective. Non adaptive transforms can also be applied. Principle component analysis (PCA) is an example. When compared with the adaptive transforms PCA effectively represents the natural image content using sparse coefficient distribution and are sensitive to noise. Another methods K-SVD[6] and K-LLD[11] which is computationally expensive but they are more robust to noise because they use over complete dictionaries that are generated from training methods.

Spatial domain consists of different methods such as Bilateral filtering[7], NLM[12], LARK [5]etc. In bilateral filtering the pixel similarity is calculate by using the photometric and geometric distance between the pixels. Another method is Locally Adaptive Regression Kernel in short LARK, in which pixel similarity is calculated based on the geodesic distances and the approach is very simple. A further and one of the most successful method is Non Local Means (NLM). Actually NLM is an improvement of Bilateral filtering. NLM is implemented in our proposed system's prefiltering phase. NLM is more robust to noise. The difference of NLM with bilateral filtering is that it replaces the point wise photometric distance of bilateral filtering with patch distance. Practically, determining denoising strength is difficult as it contains some tuning parameters that affect the performance. A larger smoothing parameter causes over smoothed output which erase some information. A less smoothing makes little denoising which cause suppression of noise. So for boosting the spatial domain filters, an alternative denoising strength of spatial domain methods according to the calculated local SNR. The proposed method consists of SAIF strategy which is able to control the denoising strength of spatial domain methods by choosing the best iteration method and iteration number with respect to the calculated MSE using plug-in risk estimator. Then it iteratively filters using NLM upto the iteration number and using the least risk iteration number chosen. To make the output more vivid then applies the iterative bilateral filtering to the SAIF output.

PROPOSED METHOD

This method is proposed for boosting the performance of any spatial method. In this method a denoising strategy is described by employing an optimized iteration method. The proposed method is implemented for both gray images and color images. For a gray image, starting from the original image and add noise to the corresponding grayscale image in a controlled fashion. Then the corrupted image was obtained and the corrupted image can be subjected to all available filters in spatial domain methods. The corrupted image is then splitted into different overlapping patches and each patch is denoised separately. In order to calculate the local filter, first estimates the image using a standard kernel baseline. Here NLM is used . Boosting and Diffusion are the two iteration approaches used here. We then calculate the MSE for two different iteration approaches for each patch. By comparing the values method with least risk is chosen and consequently the iteration number is selected and the filtered patch is generated. The last step of the SAIF strategy is to aggregate these overlapping patches. Then a iterative bilateral filtering is also employed to make the output more vivid. The system architecture as follows. Each step is described briefly in below sections.

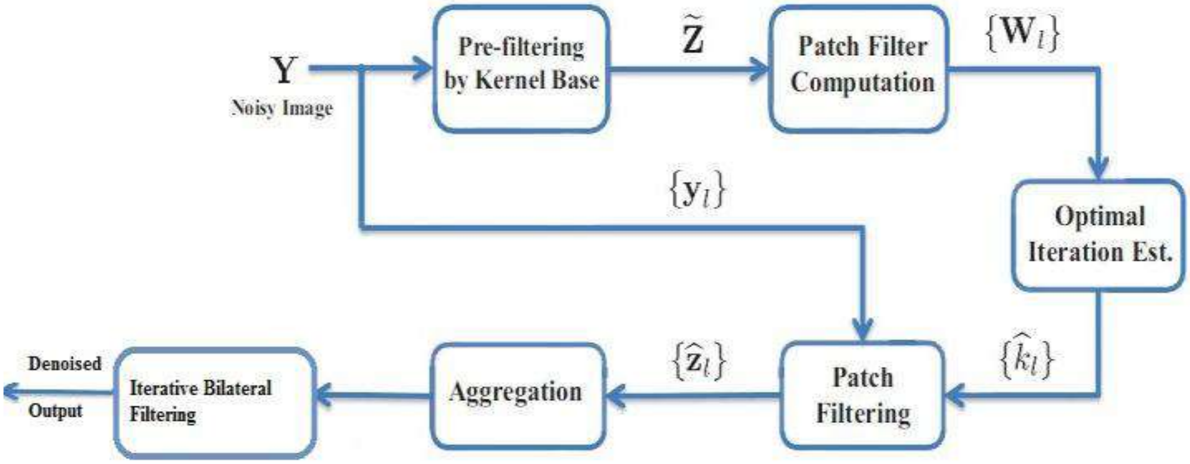


Figure A: Block Diagram of the Proposed System

From the figure itself, the proposed system consists of six steps.

1. Prefiltering
2. Patch Filter Computation
3. Optimal iteration estimation
4. Patch Filtering
5. Aggregation
6. Iterative Bilateral Filtering

1) Pre filtering

Before prefiltering noise is added to the original image and make it corrupted. Noise is added by changing the value of the variable sigma. For prefiltering we propose kernel methods. The kernel methods used in this works are Non-Local Means (NLM), Bilateral filter, LARK. The NLM is a very popular data-dependent filter which closely resembles the bilateral filter except that the photometric similarity is captured in a patch-wise manner that is average of all the pixels in the image. Non local means filter not only compares the grey level in a single point but also the geometrical configuration in a whole neighborhood and it is more robust than neighborhood filter. The general equation is:

$$K_{ij} = \exp\left\{\frac{-\|\mathbf{x}_i - \mathbf{x}_j\|^2}{h_x^2} + \frac{\|\mathbf{y}_i - \mathbf{y}_j\|^2}{h_y^2}\right\} \qquad (1)$$

The second filter used is Bilateral (BL) filter, its a non-linear filtering technique concept of Gaussian smoothing by weighting the filter coefficients with their corresponding relative pixel intensities. Pixels that are very different in intensity from the central pixel are weighted less even though they may be in close proximity to the central pixel. BL filter smoothes images by means of a nonlinear combination of nearby image values. This kernel can be expressed in a separable fashion as follows:

$$K_{ij} = \exp\left\{\frac{-\|\mathbf{x}_i - \mathbf{x}_j\|^2}{h_x^2} + \frac{-(y_i - y_j)^2}{h_y^2}\right\} \qquad (2)$$

in which hx and hy are the smoothing parameters. The next method used here is LARK.. The LARK, also called Steering Kernel exploits the geodesic distance based on estimated gradients.

$$K_{ij} = \exp\left\{-(\mathbf{x}_i - \mathbf{x}_j)^T \mathbf{C}_{ij} (\mathbf{x}_i - \mathbf{x}_j)\right\} \qquad (3)$$

2) Patch filter Computation

As per SAIF strategy to calculate the local filter, use an estimated image which is filtered by any of the standard kernel baseline. The pixels are represented through a matrix-vector multiplication form, by stacking the weight vectors together. Here the image is split into different overlapping patches, in which each patch is of same size. And the next step is make two different patches such as prefiltered projected patches and the noisy projected patches.

3) Optimal Iteration Method

Diffusion and Boosting are the two different possible iteration methods.

3.1) Diffusion

The idea of diffusion in image filtering was originally motivated by the physical principles of heat propagation and described using a partial differential equation:

$$\widehat{\mathbf{z}}_k = \mathbf{W}\widehat{\mathbf{z}}_{k-1} = \mathbf{W}^k \mathbf{y}. \qquad (4)$$

Each application of **W** can be interpreted as one step of anisotropic diffusion with the filter **W**. Choosing a small iteration number *k* preserves the underlying structure, but also does little denoising. Minimization of MSE determines when is the best time to stop filtering. The overall MSE can be expressed by this equation:

$$\mathrm{MSE}_k = \|\mathrm{bias}_k\|^2 + \mathrm{var}(\widehat{\mathbf{z}}_k) = \sum_{i=1}^{n} (1 - \lambda_i^k)^2 b_i^2 + \sigma^2 \lambda_i^{2k} \qquad (5)$$

3.2) Boosting

Although the classic diffusion filtering has been used widely, this method often fails in denoising image regions with low SNR. This is due to the fact that each diffusion iteration is essentially one step of low-pass filtering. In other words, diffusion always removes some components of the noise and signal, concurrently. The overall MSE can be calculated by this equation:

$$\mathrm{MSE}_k = \sum_{i=1}^{n} (1 - \lambda_i)^{2k+2} b_i^2 + \sigma^2 \left(1 - (1 - \lambda_i)^{k+1}\right)^2 \qquad (6)$$

4) Patch filtering

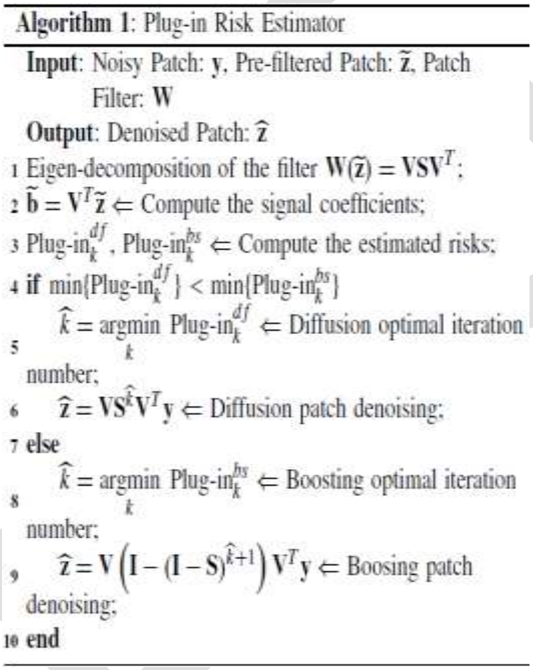
In this method, risk estimators for diffusion and boosting are computed based on the prefiltered patch z, computed using the base filter with arbitrary parameters. More explicitly, the signal coefficients can be estimated. The optimized per-patch filtering can be expressed as choosing between one of these two iterations: Either Diffusion Plug-in Risk Estimator:

$$\text{Plug-in}_k^{df} = \sum_{i=1}^{n} (1-\lambda_i^k)^2 \overline{b}_i^2 + \sigma^2 \lambda_i^{2k}. \tag{7}$$

Or Boosting Plug-in Risk Estimator :

$$\text{Plug-in}_k^{bs} = \sum_{i=1}^{n} (1-\lambda_i)^{2k+2} \widetilde{b}_i^2 + \sigma^2 \left(1-(1-\lambda_i)^{k+1}\right)^2 \tag{8}$$

After calculating this, which will be implemented in Plug-in Risk estimator algorithm.
Based on this algorithm if the minimum value of plug-in risk estimator for diffusion is less than that of the minimum value of Plug in risk estimator of boosting and diffusion will be selected and vice versa. The algorithm is discussed below:



```
Algorithm 1: Plug-in Risk Estimator
  Input: Noisy Patch: y, Pre-filtered Patch: $\widetilde{\mathbf{z}}$, Patch
         Filter: W
  Output: Denoised Patch: $\widehat{\mathbf{z}}$
  Eigen-decomposition of the filter $\mathbf{W}(\widetilde{\mathbf{z}}) = \mathbf{VSV}^T$;
  $\widetilde{\mathbf{b}} = \mathbf{V}^T\widetilde{\mathbf{z}}$ ⇐ Compute the signal coefficients;
  $\text{Plug-in}_k^{df}$, $\text{Plug-in}_k^{bs}$ ⇐ Compute the estimated risks;
  if $\min\{\text{Plug-in}_k^{df}\} < \min\{\text{Plug-in}_k^{bs}\}$
      $\widehat{k} = \arg\min_k \text{Plug-in}_k^{df}$ ⇐ Diffusion optimal iteration number;
      $\widehat{\mathbf{z}} = \mathbf{VS}^{\widehat{k}}\mathbf{V}^T\mathbf{y}$ ⇐ Diffusion patch denoising;
  else
      $\widehat{k} = \arg\min_k \text{Plug-in}_k^{bs}$ ⇐ Boosting optimal iteration number;
      $\widehat{\mathbf{z}} = \mathbf{V}\left(\mathbf{I}-(\mathbf{I}-\mathbf{S})^{\widehat{k}+1}\right)\mathbf{V}^T\mathbf{y}$ ⇐ Boosing patch denoising;
  end
```

Figure 2: Plug in risk algorithm

5) Aggregation

As a result of the overlapped patches, multiple estimates are obtained for each pixel. It need to aggregate all of these estimates to compute the final estimate for each pixel. An exponentially weighted averaging is used for the plug-in estimator. The weighted averaging can improve the aggregation especially when the weights are estimated on the risk estimated with each estimate. In this framework a variance-based frame. aggregation is employed in SURE and an exponentially weighted averaging is used for the plug-in estimator.

6) Iterative Bilateral Filtering

Bilateral filtering smoothes images while preserving edges, by means of a nonlinear combination of nearby image values. The method is noniterative, local, and simple. It combines gray levels or colors based on both their geometric closeness and their photometric similarity, and prefers near values to distant values in both domain and range.

RESULTS

Figure 3: Implementation using SAIF and Bilateral Filtering.

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CONCLUSION

Denoising is considered as one of the fundamental challenges in the field of image processing. For engineers and scientists, it has been permanent research topic. Here an improved denoising by data-dependent kernels is presented. Patch wise iterative filtering is carried out here. The plug-in risk estimator used estimated local SNR as empirical prior knowledge of latent signal. Plug-in estimator outperforms the already existing SURE method in most of the cases. Better estimate of local SNR is the added feature of this method. To make the output more robust iterative bilateral filtering is employed. The performance of the output is determined based on Quality parameter of the image. It is a good and promising method. This can be effectively applied in the field of image processing since a promising improved result is guaranteed.

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Cost Analysis of Trips in Chemical Industry due to Line Faults with flexible controller

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Abstract— This paper presents a method for the assessment of voltage sags caused by short-circuit faults in a large chemical industry. The supply arrangement for the industry is discussed. The connected equipment of the industry is fed from the 6.6-kV bus. The voltage sag analysis is performed for faults at different voltage levels in the power supply network. For every voltage level, the critical distance and expected number of voltage sags have been calculated**.** Predication of number of voltage sags seen by a sensitive load requires a sag calculation for every possible fault on the distribution system. The overall estimated number of voltage sags then is the sum of the individual instances. Calculation demonstrates how the author estimated the number of trips seen by a sensitive load in a distribution system.

Keywords— Critical distance, industrial power supply, power quality, voltage sag, distribution system, short-circuit faults, industry, sensitive load

1. Introduction

Voltage Sags are defined as a sudden reduction of the supply root-mean-square voltage between 10% and 90% of the nominal voltage at the power frequency [1]. Voltage sags are the most frequent among various types of power-quality disturbances (e.g., voltage sag, voltage swells, over voltages, interruptions, transients, voltage unbalance, volt age flickers, and harmonics) [1]. The ability of modern industrial process equipment to ride through voltage sags is becoming more and more important as never before. As plant operation and process are becoming more automated, the need to keep equipment operation running is of utmost importance. Any downtime can be directly correlated to lost production, revenue, and profits. The equipment used in modern industrial process (e.g., programmable logic controllers (PLCs), adjustable-speed drives (ASDs), computers, and motor contactors) is highly sensitive to voltage sags. When the number of voltage sags at a plant bus is too large, mitigation methods are needed. Several methods of mitigation have been proposed in the literature [2]-[16], [18] mainly emphasizing on the improvement of equipment ride through and installation of mitigation devices. Before making a decision about which mitigation method to choose, the information is needed about the actual number of voltage sags experienced at the load point of interest, and then, the study about the effectiveness of various mitigation methods can be performed. It is therefore essential to estimate the expected number of voltage sags that will cause tripping of the sensitive equipment. In this paper, a method for the assessment of the number of voltage sags experienced by a large chemical industry in India is described. In chemical industry systems, customers are often classified as small with 0–2-MW power requirement, medium with 2–15-MW power requirement, and large industrial customers with power requirement more than 15 MW

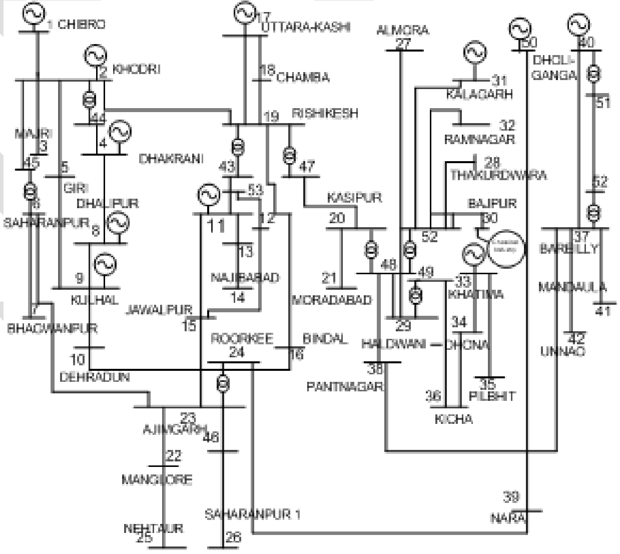

Figure 1.1 Uttarakhand State Transmission Systems

The industry is located in the north of New Delhi, India, and is fed from the 132-kV Bajpur substation of Uttarakhand Power Corporation Ltd. as in Fig.1.1 (UPCL) [17]. The industry is manufacturing chemicals (like bio-glycols, bio-ethoxylates, bio-glycol ethens, and acetates), spirits (extra neutral alcohol (ENA)/potable alcohol), gases [cryogenic gases (O2, N2)], food-grade CO2, and herbal products which are widely used in the industry. The industry is working toward the reduction of greenhouse-gas emission by thermal energy generation from a biomass-fired boiler (cane juice unit) which produces 25000 MT of CO2 emission reductions per annum. Also, the utilization of effluent/waste (spent wash) in the boiler as fuel after evaporation produces 100 000 MT of CO2 emission reduction per annum. The industry has its own captive power plant consisting of two diesel generators of 4MWeach, which are using the by-product of the industry as fuel as shown in Fig. 1.2. The total power requirement of the plant is 19 MW, so the rest of the 11 MW is supplied by UPCL. Authority of the chemical industry complained about the frequent tripping of their sensitive equipment like PLCs, ASDs, and compressors which caused the automatic plant to trip. They have 50 HT motors of various capacities ranging from 160 kW to 4.1 MW. HT motors which are basically centrifugal process compressors trip 3–4 times in a week and cause the whole plant to trip. It takes approximately 1 to 3 h, depending upon the nature of the problem, to restart the plant. At present, the production capacity is approximately 50 MT per hour, and the cost of the 50 MT output would be approximately 3.5 million rupees (0.07 million US $). Therefore, if the production is stopped for an average of 4 h in a week, it costs around 14 million rupees (0.28 million US $) to the industry in a week [13]. Everything led to the conclusion that the assessment of voltage sag (i.e., magnitude and number of voltage sag) at the equipment terminal is necessary. Therefore, in this paper, a voltage sag assessment study has been done for the large chemical industry. The influence of local generation on voltage sag is discussed.

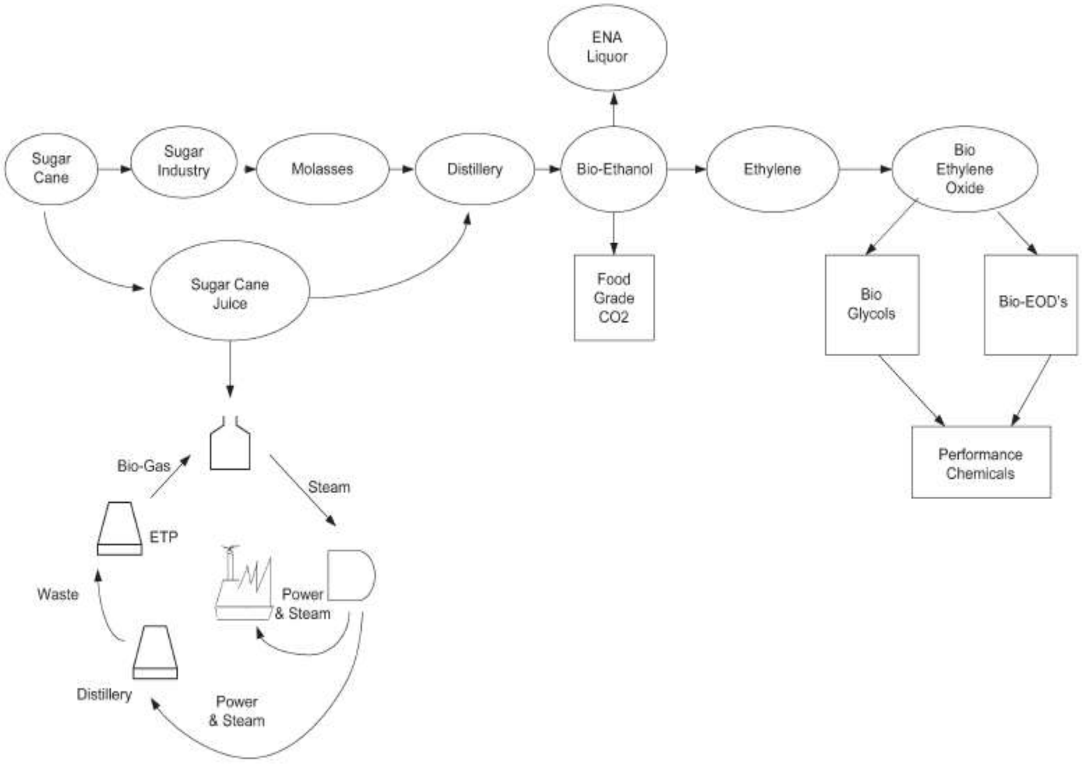

Fig. 1.2 Process Methodology and Captive Power Generation for Chemical Industry [13].

2. PROCESS METHODOLOGY

Today, potable alcohol, glycol [mono ethylene glycol (MEG), die ethylene glycol (DEG), tri ethylene glycol (TEG)], a range of ethylene oxide derivatives, and specialty performance chemicals find application in various industries. For example, potable alcohols are used as a solvent by the paint and printing industry and liquor industry after being denatured. Glycol (MEG, DEG, and TEG) are used in manufacturing polyester yarn/staple fiber which is ultimately used by the textile industry. Ethylene oxide derivatives and specialty performance chemicals find application in textile, paint, oil field, jute, emulsion polymerization, lubricant, explosives, pharmaceuticals, cosmetics industry, etc. The production process consists mainly of four steps as shown in Fig. 1.2 Molasses, which is the by-product of sugar mill, is converted into ethyl alcohol by fermentation with the help of yeast. Then, ethyl alcohol is converted into ethylene by dehydration process with the help of a catalyst. Finally, ethylene oxide is produced by oxidation process with the help of oxygen from ethylene. From ethylene oxide glycols, guar gum, glycol ether acetates, potable alcohol, ethoxylate poly ethylene glycol, and performance chemical are produced. The industry has collaboration with Scientific Design, Inc., USA, and is operating through fully automated distributed control system (DCS) controlled system. Voltage sags play a very damaging role in the production because the DCS control system is very sensitive to voltage sags and causes the whole plant to trip, resulting in production loss [13].

3. METHOD OF CRITICAL DISTANCES

Often, there is a need for a simple/fast method to estimate the number of sags causing the equipment to trip. A way forward would be to calculate the sag magnitude and duration for many fault positions and add the fault rates for those that cause a sag that is too long and/or too deep which would trip the customer equipment. The method used for this purpose is the method of critical distances [1]. However, the method of critical distances is applicable for a radial system only. To quantify the sag magnitude in a radial system, the voltage divider model as shown in Fig.3.1 is used.

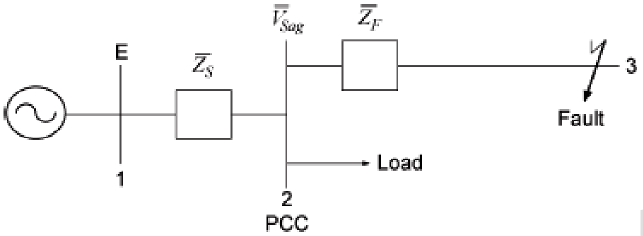

Fig.3.1 Voltage Divider Model

The expression for voltage sag at the PCC can be expressed as

$$\boldsymbol{V_{sag}} = \mathbf{E} * \frac{\mathbf{Z_F}}{\mathbf{Z_F + Z_S}} \tag{3.1}$$

where

Z_s is the source impedance

Z_F=z*l

z is the feeder impedance per unit length

l is the distance of fault position from the point of common coupling (PCC).

Assuming the pre-fault voltage (E) is assumed to be 1.0 per unit.

The voltage sag magnitude in (p.u) as per Eqn. (3.1) is

$$\boldsymbol{V_{sag}} = \frac{\mathbf{Z_F}}{\mathbf{Z_F + Z_S}} \tag{3.2}$$

The above equation is the voltage magnitude as a function of the distance. From this equation we obtained the distance at which a fault will lead to voltage sag of certain magnitude. The PCC is the point from which both fault and the load are fed. In case the voltage at PCC drops below the critical voltage V_{crit} over a particular duration, the equipment will trip for all faults within a critical distance L_{crit} from the PCC.

The expression for the magnitude voltage at PCC (V)

$$\mathbf{V} = \frac{\leftthreetimes}{\mathbf{1+\leftthreetimes}} * \frac{\mathbf{1}}{\sqrt{\mathbf{1-\frac{2\leftthreetimes(1-\cos\alpha)}{(1+\leftthreetimes^2)}}}} \tag{3.3}$$

where

$$\leftthreetimes = \frac{\mathbf{Z_F}}{\mathbf{Z_S}} = \frac{\mathbf{z*l}}{\mathbf{Z_S}} \tag{3.4}$$

To obtain an expression for the critical distance, $\leftthreetimes$ needs to be solved from Eqn.3.4 for known V. therefore, Eqn.3.3 is rewritten into the second order polynomial equation

$$\leftthreetimes^{\mathbf{2}}\,(\mathbf{V^2-1}) + \mathbf{2}\leftthreetimes\,\mathbf{V^2\cos\alpha} + \mathbf{V^2} = \mathbf{0} \tag{3.5}$$

The positive solution of Eqn.3.5 can be written as

$$\leftthreetimes = \frac{V}{1-V}\left[\frac{V\cos\alpha+\sqrt{1-v^2\sin^2\alpha}}{v-1}\right] \qquad (3.6)$$

on putting the value of $\leftthreetimes$ from Eqn.3.4 in Eqn.3.6, the desired expression for the critical distance L_{crit} is given by

$$\mathbf{L_{crit}} = \frac{Z_s}{z} * \frac{V_{crit}}{1-v_{crit}} * \left[\frac{V_{crit}\cos\alpha+\sqrt{1-v_{crit}^2\sin^2\alpha}}{V_{crit}+1}\right] \qquad (3.7)$$

where

$\alpha = \boldsymbol{tan^{-1}}\left(\frac{X_F}{R_F}\right) - \boldsymbol{tan^{-1}}\left(\frac{X_S}{R_S}\right)$ is the impedance angle between the source impedance Z_s and the feeder impedance Z_f as shown in Fig.3.2

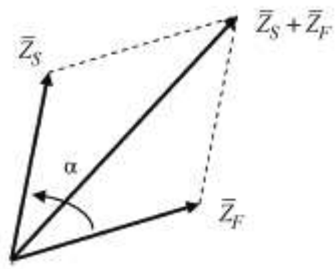

Fig. 3.2 Impedance Angle.

Assuming that the X/R ratio of the source and the feeder are equal, therefore a simplified expression can be obtained as

$$\mathbf{L_{crit}} = \frac{Z_s}{z} * \frac{V_{crit}}{1-v_{crit}} \qquad (3.8)$$

4. CALCULATION OF NUMBER OF TRIPS FOR DIFFERENT LINE FAULTS

4.1 Calculation of Number of Trips for Single Line to Ground Faults

For single phase fault, source impedance is the sum of positive, negative and zero sequence impedances. The feeder impedance is the combination of feeder length of F_2 which is 12km long with impedance (z, i.e. feeder) of per unit per km. The average number of faults event per year is considered as the fault rate(r) and this is given from the industry.

For a voltage sag level (V_{sag}) at the feeder bus, the feeder length of exposure L (critical distance) can be determined by Eqn. (3.1).

The data collected from the chemical industry are given below.

Source impedance Z_{s1} (p.u) = (4.94 + j65.9) + (787 + j220)

$|Z_{s1}|$ = (841.966)

Feeder impedance Z_{f1} (p.u) = z*L = (9.7 + j26) + (18.4 + j112)

$|Z_{f1}|$ = (140.831)

Fault rate(r) = 0.645 faults/km/year

$$\mathbf{L_{crit}} = \frac{V_{sag} * Z_s}{(1-V_{sag}) * Z_f} \qquad (3.9)$$

where

L_{crit} is critical distance

V_{sag} is given sag voltage

Z_s is per unit source impedance to the feeder

Z_f = feeder impedance=z*L

z is feeder impedance per unit per km.

L is feeder length in km

The number of trips per year for given fault rate (r) is given by Eqn. 3.2

$$\textbf{Trips} = \mathbf{L_{crit}} * r \qquad (3.10)$$

Now using Eqn.3.9 and Eqn.3.10 the length of exposure (L_{crit}) and total number of trips for single line to ground fault(SLG) for given sag voltage (V_{sag}) has been calculated as shown in Table 4.2

Table 4.1Data Collected from the Chemical Industry

IMPEDANCE	SLG FAULT	DLG FAULT	TPG FAULT
SOURCE(Z_S)	(4.94 + j65.9) + (787 + j220)	(4.94 + j65.9)	(787 + j220)
FEEDER(Z_F)	(9.7 + j26) + (18.4+ j112)	(9.7 + j26)	(18.4 + j112)

Table 4.2 Values of the Length of Line Exposure and Number of Trips for SLG Fault

FAULT POINT	SAG VOLTAGE (V_{SAG}) %	LENGTH OF LINE EXPOSURE L_{CRIT}(KM)	TRIPS FOR SLG FAULTS PER YEAR
f_1	0.1	0.6948	0.4481
f_2	0.2	1.5633	1.0083
f_3	0.3	2.6799	1.7285
f_4	0.4	4.1687	2.6888
f_5	0.5	6.2531	4.0332
f_6	0.6	9.3796	6.0499
f_7	0.7	14.5906	9.4109
f_8	0.8	25.0124	16.1330
f_9	0.9	56.2779	36.2992
TOTAL TRIPS PER YEAR (T1)			77.7999

4.2 CALCULATION OF NUMBER OF TRIPS FOR PHASE TO PHASE FAULT

For phase to phase faults, source and feeder impedance is the sum of positive and negative sequence impedances

The data collected from the industry are given below.

Source impedance Z_{s2} (p.u) = (4.94 + j65.9)

$|Z_{s2}|$ (p.u) = (65.1873)

Feeder impedance Z_{f2} (p.u) = (9.7 + j26)

$|Z_{f2}|$ (p.u) = (27.75)

Failure rate = 0.645faults/km/year

Now using Eqn. 5.1and Eqn. 5.2 the length of exposure (L_{crit}) and total number of trips per year for phase to phase fault for given sag voltage (V_{sag}) has been calculated as shown in Table 4.3

Table 4.3 Values of the length of Line Exposure and Number of Trips for Phase to Phase Fault

FAULT POINT	SAG VOLTAGE (V_{SAG}) %	LENGTH OF LINE EXPOSURE L_{CRIT}(KM)	TRIPS FOR PHASE TO PHASE FAULTS PER YEAR
f_1	0.10	0.2646	0.1707
f_2	0.20	0.5953	0.3840
f_3	0.30	1.0205	0.6582
f_4	0.40	1.5875	1.0239
f_5	0.50	2.3813	1.5359
f_6	0.60	3.5719	2.3039
f_7	0.70	5.5563	3.5838
f_8	0.80	9.5250	6.1437
f_9	0.90	21.4314	13.828
TOTAL TRIPS PER YEAR (T2)			29.6273

4.3 CALCULATION OF NUMBER OF TRIPS FOR THREE PHASE FAULT

For three phase fault, source and feeder impedances are positive sequence impedances since this fault is symmetrical and the values are given below.

Z_{s3} (p.u) = (787 + j220)

$|Z_{s3}|$ (p.u) = (817.17)

Z_{f3} (p.u) = (18.4 + j112)

$|Z_{f3}|$ (p.u) = (113.50)

Failure rate = 0.645faults/km/year

The length of line exposure (L_{crit}) and total number of trips for three phase fault for a given sag voltage (V_{sag}) has been calculated by using Eqn.5.1and Eqn.5.2 and is shown in Table 4.4.

Table 4.4 Values of the length of Line Exposure and Number of Trips for Three Phase Fault

FAULT POINT	SAG VOLTAGE (V_{SAG}) %	LENGTH OF LINE EXPOSURE L_{CRIT}(KM)	TRIPS FOR THREE PHASE FAULTS PER YEAR
f_1	0.10	0.800	0.5160
f_2	0.20	1.7999	1.1610
f_3	0.30	3.0856	1.9902
f_4	0.40	4.7998	3.0959
f_5	0.50	7.1997	4.6438
f_6	0.60	10.7996	4.9657
f_7	0.70	16.7994	10.8356
f_8	0.80	28.7989	18.5753
f_9	0.90	64.7976	41.7945
TOTAL TRIPS PER YEAR (T3)			89.5780

Table 4.2, Table 4.3, Table 4.4 shows the expected number of trips per year caused by single line to ground fault, phase to phase fault, and three-phase faults on different fault locations for the above system. The overall number of voltage sags that may be experienced

by the sensitive loads can then be calculated by summing up the number of voltage sags caused by each individual fault. Therefore the total number of trips for all three types of faults are T1+T2+T3=197.0052 per year.

5. CALCULATION OF FINANCIAL LOSSES

As the number of trips with all three type of faults per year are very high which affect the productivity and also financial loss associated with trips of the industry. Therefore it is very necessary to calculate and find the solution to reduce it.

5.1 COST ANALYSIS WITHOUT INCORPORATING ANY MITIGATION DEVICES

The financial loss for one process trip is approximately 0.02 million rupees/year as per the record of industry and the total number of process trips is calculated as 197.0052 for all the three types of faults in previous section by the author.
Therefore the approximate financial loss for that much number of trips = 197.0052*0.02 = 3.9401 million rupees/ year.
This is a huge financial loss due to process trip and also it affects the production and cost the industry. Therefore it is very necessary to reduce this loss.
The two FACTS devices named D-STATCOM and SVC are proposed to reduce the electrical and economic losses and also improve the power quality.

5.2 COST ANALYSIS OF MITIGATION STRATEGIES

The expected annual financial losses due to voltage sags are too high. Therefore for the minimization of financial losses, managements have a choice to install one of two types of mitigation devices D-STATCOM or SVC with respect to cost.
The approximate load at industry bus is 11MW, power factor of 0.95. So the reactive power requirement is 3.6 MVAR.
As per the data[19], after installation of a mitigation device DSTATCOM or SVC, the expected number of process trips is reduced to 26.55% with D-STATCOM i.e. 46.85 trips/year then the calculated value of 197.0062 trips per year similarly with SVC, the expected number of process trips is reduce to 36.45% i.e. 64.32 trips/year.
Therefore the associated financial losses due to voltage sags are also reduced with the reduction of the process trips.

Therefore the associated financial loss with the use of D-STATCOM and SVC is calculated below.
The approximate loss for one process trip is = 0.02 million rupees/year (collected from industry).
The financial losses with D-STATCOM = 46.85 trips/year*0.02 million rupees/year
= 0.937 million rupees/year
Similarly financial losses with SV = 64.32*0.02million rupees/year
=1.2864million rupees/year
Saving in losses on using D-STATCOM = 3.9401-0.937
=3.0031million rupees/year
Similarly
Saving in losses for SVC = 3.9401-1.2864
= 2.6537 million rupees/year
The maintenance cost of D-STATCOM = 1.032 million rupees/year (collected from industry) and the maintenance cost of SVC = 0.83 million rupees/year (collected from industry)
Therefore,
Net saving for DSTATCOM = 3.0031-1.032 = 1.9711 million rupees/year
Net saving for SVC = 2.6537 - 0.83 = 1.8237 million rupees/year
Hence it is observed that DSTATCOM is more beneficial then SVC.

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CONCLUSION

This paper presents a method for the assessment of voltage sags caused by short-circuits line faults in a large chemical industry. The expected annual financial losses due to voltage sags are too high when no compensation is used, and the no of trips and the financial losses associated with trips is also very much reduced when compensation is used . Therefore for the minimization of financial losses, industry has a choice to install one of two types of mitigation devices D-STATCOM or SVC with respect to cost. The DSTATCOM is found a better option to reduce the losses due to sag.

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DEVELOPMENT OF AN ELECTRO CHEMICAL MACHINE SET-UP AND EXPERIMENTATIONS

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Abstract:- Electro chemical machining (ECM) process is a non-traditional machining process. The material which is difficult to cut by conventional machining process, such kind of materials also machined by ECM. Electro chemical machine can also machine the complex shapes easily. The few common applications of Electro chemical machining are- machining fuel injection system components, aerospace components, dies, moulds etc. The paper is based on the set up development. The modeling of different components required for the set-up, preparation of manufacturing diagrams and actual manufacturing of components. The experiments are performed for the confirmation. The experimentations carried out under different pressure and feed rate. The results are physically observed. The maximum overcut observed is 0.80mm when the tool diameter is 4 mm and minimum overcut produced is 0.61mm.

Key words:- New ECM set-up, mechanical system, electric system, hydraulic system, overcut.

Introduction:

Machining of the hard material is the big challenge in the manufacturing processes. The material, which is difficult to machine under conventional machining processes, such materials are machined by non-conventional machining processes and also the ECM is most frequently used when shaped cavities are machined in to alloys that are difficult to shape by conventional methods. Electrochemical machining process is one of the most potential non- conventional machining processes. Tool and work piece are free of stress. It doesn't have any physical contact during the machining process. So the soft material can be used as the tool material compare to work-piece material. Only the electrically conductive materials are machined in ECM. So both the tool and work piece should be electrically conductive. There is no any thermal damage during machining because electrolyte carries the heat from the machining area under continuous circulation. ECM have a major advantages compare to other like no tool wear, not thermal stress, unaffected by hardness of the material [1].

Electrochemical machining process is based on the principle of electrolysis for material removal. The ECM is a process of material removal by anodic dissolution under controlled process parameters. The tool is connected to the negative terminal known as cathode and work piece is connected to the positive terminal is known as anode. Both the cathode and anode are keep separate by the small gap is known as inter electrode gap (IEG). IEG is filled by the electrolyte under continuous circulation. The metal is removed in the form of sludge and precipitates by electro-chemical and chemical reactions. This is occurred in the electrolytic cell. The material from the work piece is removed due to the continuous tool feed.

This study is related to the set-up development and practically observes the effect of the pressure and feed rate variation under constant voltage on the overcut and analyzes the circular profile of the machined component.

Working principle:

ECM removes the material under controlled anodic dissolution in the electrolyte. The dissolution starts, when the current flows between tool (cathode) and work piece (anode) through electrolyte. On the basis of Faraday's law of electrolysis, the materials get removed (dissolved) from the work piece. Faraday's two laws govern the electrolysis process [2, 3].

1. The amount of chemical change produced by an electric current, that is, the amount of any material removed, is proportional to the quantity of electricity passed[2,3].

2. The amounts of different substances dissolved by the same quantity of electricity are proportional to their chemical equivalent weights [2,3].

During the electro chemical machining, as potential difference is applied across the electrodes. The electrolyte and water undergoes ionic dissociation and different chemical reactions take place, ultimately removing some metal from anode surface. Let us consider a work piece of ferrous material which contains lower percentage of carbon and Sodium chloride is used as an electrolyte, when the potential difference is applied between the work piece and tool.

$$NaCl \leftrightarrow Na^{+} + Cl^{-}$$

$$H_2O \leftrightarrow H^{+} + (OH)^{-}$$

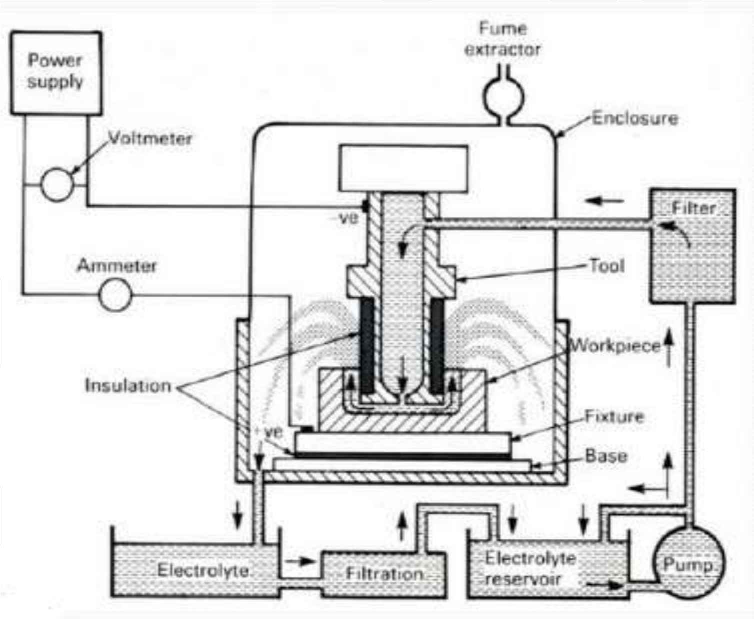


Figure 1. Schematic set-up of ECM [6]

The positively charged ions get attracted (move) towards the tool ad negatively charged ions move towards the work piece, Thus the hydrogen ions will take away electrons from the cathode (tool) and from hydrogen gas as:

$$2H^{+} + 2e^{-} = H_2\uparrow \text{ at cathode}$$

Similarly, the iron atoms will come out of the anode (work piece) as:

$$Fe = Fe^{++} + 2e^{-}$$

Within the electrolyte iron ions would combine with chloride ions to form iron chloride and similarly sodium ions would combine with hydroxyl ions to form sodium hydroxide

$$Na^{+} + OH^{-} = NaOH$$

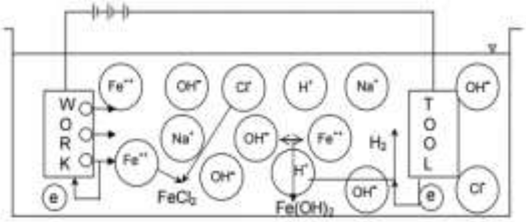


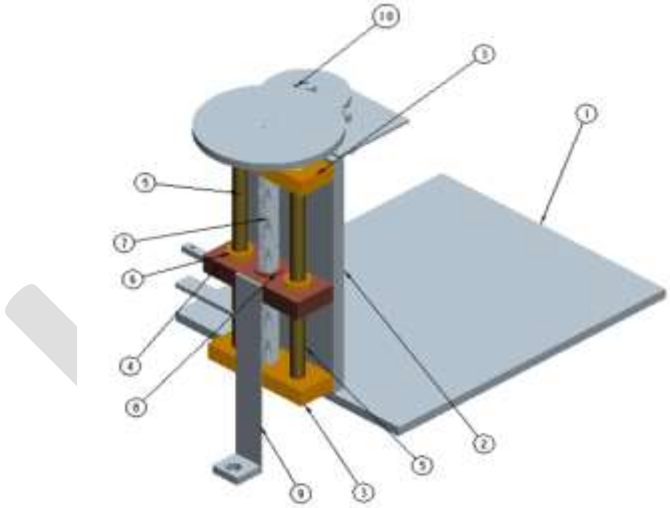
Figure 2: Representation of chemical reaction in ECM[4]

In practice $FeCl_2$ and $Fe(OH)_2$ would form and get precipitated in the form of sludge. In this manner it can be noted that the work piece gets gradually machined and gets precipitated as the sludge. There is no coating on the tool, only hydrogen gas evolves at the tool or cathode [4,5].

NEWLY DEVELOPED ECM SET-UP:

INTRODUCTION

The papers suggested that the response of a system is affected by the process parameters. The voltage, feed rate, pressure, flow rate, inter electrode gap, concentration of electrolyte and type of electrolyte etc. need to be control for good performance of process. So the important consideration during the setup development is to control the process parameters during machining and study the effect on the response of a system. To control the linear movement of a tool and tool feed rate is most important task while developing the mechanical system. 3D CAD model of mechanical system is prepared by using pro-e wildfire 5.0. The manufacturing drawings are prepared for manufacturing the components and the standard components are drought from the market. Mechanical system is made by assembling the manufactured and standard components. The three different systems get combined for the ECM set-up. Three systems are hydraulic, electrical and mechanical system. Electrolyte flow rate is controlled by hydraulic system. The voltage and tool feed rate is controlled by electric system. For better aesthetic look, all machined components were blackodized.

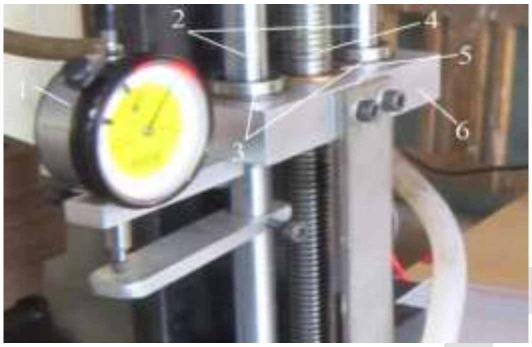


Sr. no.	Part name	Quantity
1	Base plate	1
2	Vertical plate	1
3	Holding blocks	2
4	Movable block	1
5	Guide bar	2
6	Linear ball bearing	2
7	Screw	1
8	Collar nut	1
9	Tool holder	1
10	Plastic gear	4

Figure3. CAD model of ECM set-up

Linear tool movement arrangement:

Movement of the tool during machining process is most important. It should move linearly up and down. Linear tool movement and tool shape decides the face profile of machined component. Proper guiding is required to get the linear tool movement. The aluminium block with two linear ball bearing and collar nut is properly guided by the guide bars. Collar nut moves up and down when the square threaded screw rotates by means of external device (DC motor). Ultimately aluminium block starts to move up and down. Dial gauge is attached with movable block by means of aluminium plate. Dial probe touches the plate and plate moves up and down over the guide bar and clamp at required place by using bolt. Dial gauge shows the distance travelled by the tool or aluminium block.



1. Dial gauge. 2. Guide bars, 3. Linear ball bearings, 4. Square threaded screw, 5. Collar nut, 6.Aluminium block

Figure4. Guiding and moving arrangement for tool

Tool holding arrangement:

Tool actually holds inside the machining chamber. So for that we required one aluminium plate whose one side is attached to movable block and at other end horizontal aluminium plate is attached. Tool is actually holds inside acrylic plate and finally acrylic plate is mount on the horizontal aluminium plate. Due to this the leakage of current is avoided.

1. Electrolyte inlet, 2. Electrolyte outlet

Figure5. Tool holder

Speed reduction arrangement:

Speed reduction arrangement is required to reduce the speed for achieving the required tool feed rate. DC motor of speed 10RPM is used to achieve the linear speed of 0.7mm/min. Two spur gear pairs are used for the speed reduction. The four gears are used having teeth of 10, 60, 15, and 100. First gear pair having teeth of 10 and 60. Second gear pair having teeth of 15 and 100

Figure6. Gear arrangement for speed reduction.

Machining chamber:

Machining chamber made up of plastic material. It occupies the tool and work piece. Plastic vice is used to clamp the work piece and is placed inside the machining chamber. Plastic material is used because the electrolyte is a corrosive material.

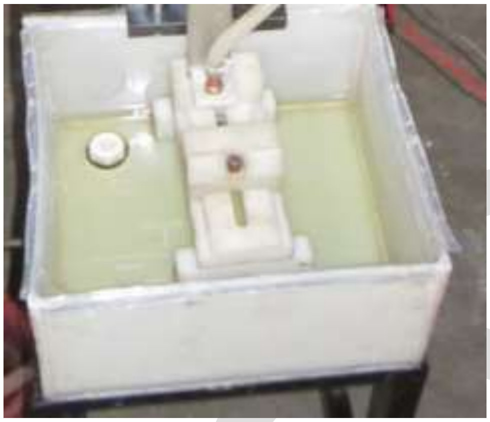


Figure7. Machining chamber

DC motor:

DC motor is used to provide a required rotary motion. Dc motor gives 10 rpm speed at 12V. But practically it gives more speed as the current varies. 12V, 1A DC adapter is used to run the motor. So, required DC motor speed is achieved by providing electric circuit.

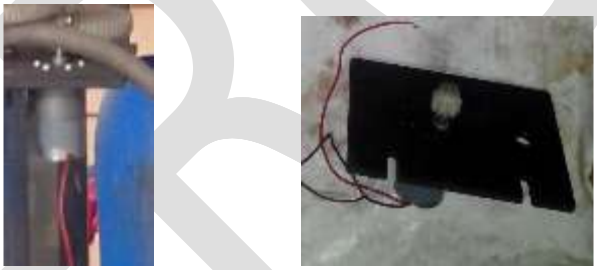


Figure8. DC motor

Electrical system:

DC power supply of 0-30V and 0-20A is used. The positive and negative output of DC power supply is connected to the work piece and tool respectively. Power from the adapter is supplied to DC motor through an electric circuit. The electric circuit is used to vary the speed of dc motor. The input current of a DC motor is varied by using the potentiometer.. The following figure shows electric circuit control panel.

1. ON/OFF switch 2.forward/reverse switch 3.auto/manual switch
4. Current setting pot 5. Speed control pot
Figure10. Actual electric circuit for speed control

Hydraulic system:

Hydraulic system is used to control the flow rate of electrolyte in electro chemical machining. The flow rate is varied by varying the electrolyte pressure. Electrolyte tank stores the electrolyte solution under sufficient quantity. The centrifugal pump is used to supply the electrolyte from the tank to machining area through the pipes. The bypass connection with flow control valve is used to control the input electrolyte pressure. Pressure gauge shows the electrolyte inlet pressure. Outlet of the hydraulic system is connected to the tool inlet through the centre hole of tool it passes to machining area. Plastic pipes are used for the system.

1. Electrolyte tank, 2.Pump, 3.Bypass connection, 4.Bypass valve, 5.ON/OFF valve
6. Pressure gauge, 7. Input pipe
Figure11. Hydraulic system

Tool and work piece:

Tool is made up of brass material and stainless steel material is used as a work piece material. Following table shows the chemical composition of selected work piece material

Table1. Chemical composition of work piece

Sample	Chemical composition %							
	C	Mn	Si	S	P	Cr	Ni	N
SS	0.08	2.0	0.75	0.030	0.045	18	8	0.10

Figure12. Tool and work piece

Experimentation:

The tool and work piece are placed inside the machining chamber. Both are separated by small gap (0.3mm) is known as inter electrode gap. The power supply is connected to the tool (cathode) and work piece (anode). $NaNO_3$ electrolyte is used to fill a inter electrode gap under continuous circulation. The electrolyte is supplied to the machining area through hole which is at the centre of the tool. It carries current between tool and work piece when the voltage applied across the two electrodes. After that start the tool feed under controlled action. Tool movement towards work piece actually removes the material. The material is removed in the form of sludge and electrolyte removes the sludge from the machining area. The experimentations are performed for the set up validation and check the overcut produced under the feed rete and pressure variation by keeping the voltage constant.

Table2. Parameters and its levels

Parameters	Unit	Nomenclature	Low(-1)	High(+1)
Voltage	V	A	12	14
Feed rate	mm /min	B	0.4	0.6
Pressure	Bar (kg/cm^2)	C	2.0	2.5

Experimental results:

All the possible experiments are performed under controlled process parameters. Observe and note down the response.

Table3. Experimental results

Experiment no	Voltage	Feed rate	Pressure (bar)	Overcut (mm)
1	12	0.4	2.0	0.67
2	12	0.4	2.5	0.80
3	12	0.6	2.0	0.61
4	12	0.6	2.5	0.75

Figure13. work piece after machining

Conclusion:

A setup has been developed for the electro chemical machining process investigation. The validation experiment is done on 1 mm stainless steel plate. The maximum overcut produced is 0.80 mm when the parameters set as voltage 12V, feed rate 0.4mm and electrolyte pressure 2.5 bars. The overcut is increased as the pressure increases and feed rate decrease. The minimum overcut (0.61mm) is produced when the parameters set as voltage 12V, feed rate 0.6mm and electrolyte pressure 2.0 bars.

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Evaluating Fresh & hardened Properties of self-compacting concrete using waste plastic fabrics

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Abstract— Self-Compacting Concrete (SCC) is an innovative concrete that does not require vibration process to its placing. SCC has proven advantages enhancing construction productivity, reducing the overall cost of the structure, improving the work environment, achieving sustainable characteristics, increasing the practically allowable reinforcement rate, and increasing the construction rate and overall quality of the cast structures, SCC is able to flow under its own weight, enables it to meet or filling formwork and reached its highest density. Self-Compacting Concrete (SCC) mixed with fibre is the expected to be a concrete with good performance in fresh state and more enhancement in hardened concrete.This work examines the possibility of using plastic fabrics as a partial replacement of fine aggregate for new concrete. [1] Plastic fabrics are partially replaced as 0.5%, 1.0%, 1.5% and 2.0% and Compressive, Split tensile and flexural strength test are conducted to compare with those of conventional concrete

Keywords —Waste plastic fabric, Workability, Compressive strength test, Split tensile strength test.

INTRODUCTION

The Self Compacting Concrete is an innovative concrete that does not require vibration for placing and compaction. It is able to flow under its own weight, completely filling formwork and achieving full compaction, even in the presence of congested reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as traditional vibrated concrete. It is environmental-friendly, as industrial wastes are used .It reduces equipment and labour cost and concrete is not free. Now a days, the ecological trend aims at limiting the use of natural raw materials in the field of building materials and hence there is an increased interest in the use of alternative materials (waste) from industrial activities, [1] which presents significant advantages in economic, energetic and environmental terms.

1.1 Characteristics of Fresh SCC:

Passing ability, Filling ability, Resistance to Segregation. [2]

1.2 Objective of study :

In this research work an extensive study using Plastic fabrics has been carried out to investigate the following

- To find the optimum proportion of plastic fabrics that can be used as a Percentage substiute material for fine aggregate in concrete
- To evaluate workability of fresh concrete by giving various percentage of Plastic fabrics.
- For Hardned concrete to find out Compressive strength,split tensile strength and flexural strength.

II REIVEW OF LITERATURE:

2.1 Sholihin As 'ad, (2011)[1] has investigated that Fresh state behavior of self compacting concrete containing waste material fibres self compacting Concrete (SCC) mixed with fibre is the expected to be a concrete with good performance in fresh state and more enhancement in hardened concrete.

2.2 K.S. Johnsirani (2014 [2] has investigated Experimental Study of Fiber reinforced self compacting concrete research that Self Compacting concrete gets compacted due to its own weight without any external vibration.

2.3 K.C Denesh et al (2014)[3] Experimental Study on Fiber reinforced self compacting concrete research that Self-compacting concrete (SCC) represents one of the most outstanding advances in concrete technology during the last decade.

III. EXPERIMENTAL PROGRAMME:

In this work an attempt has been made to study the various properties of self-compacting concrete when fine aggregate is replaced by different proportions of Plastic waste fibers which can act as binding & ductile material. The flow characteristics of SCC are measured from slump flow, L-box, V-funnel test &J-Ring apparatus. [4] Also the strength characteristics of SCC like compressive strength, split tensile strength, flexural strength are found.

3.1 Materials

3.1.1 Cement

In this experimental study, Ordinary Portland Cement (OPC 53 Grade) Conforming to IS: 8112-1989 was used.

The physical and mechanical properties of the cement used are shown in Table 1.

Table. 1: Properties of Cement

Physical property	Result
Fineness (retained on 4.75 mm) sieve	2.40%
Vicat initial setting time (minute)	95
Vicat final setting time (minute)	395
Specific gravity	3.12

3.1.2 Aggregates

Table No 2: Physical Properties of Coarse and Fine Aggregates

Property	Fine Aggregate	Coarse Aggregate
Specific Gravity	3.11	2.80
Fineness Modulus	2.59	7.69
Surface Texture	Smooth	Irregular
Particle Shape,size	Rounded,4.75 mm	Angular 20 mm

3.1.3 Plastic waste fibers (PP):

plastic waste fibers are used with replacing varying % of fine aggregate.

Fig.1 (a) Waste plastic Grinder,

Fig 2 (b)Crushed waste plastic fabrics

Plastic has many beneficial properties, these include:-

- Lighter weight than other materials.
- Durability and not easy to fail.
- Resistance to chemicals, water and impact.
- Excellent thermal and electrical insulation properties.

Mix Design And Methodology

The mix design has been prepared according to IS 10262-2009 & EFNARC 2005 for M35 grade of concrete. about of waste plastic fabrics as fine aggregate replacement by mass. Waste plastic fibers are added with various % of fine aggregate as likewise 0.5%, 1.0%, 1.5% and 2.0%, 2.5%, 3.0%. .

Mix design: The Concrete mix design has been carried out for various proportions as per and arrived at final mix proportion after mixing the initial materials in the rotating mixer and adding the fibers. In this research the concrete samples were prepared with fiber ratios of 0, 0.5, 1.0, 1.5 and 2.0, 2.5, 3.0 % by adding in concrete replaced to the fine aggregate. In order to have a proper mixture design as well as the least penetration,

Moulds and Equipment

a) Cubes: Standard cube moulds of 150 × 150 × 150 mm made of cast iron were used for casting and testing the specimens in compression.

b) Cylinders: Standard cast iron moulds of size 150mm diameter and 300mm height were used for casting and testing the specimen to determine the split tensile strength of concrete.

c) Beams: Standard cast iron moulds of size 100 × 100 × 500mm were used for casting and testing to determine the Dynamic Characteristics of concrete

- Beam specimens were used to determine flexural strength
- Cubes of 150 mm size were used to find the compressive strength, bond strength.
- Cylinder specimens were used to determine the split tensile strength.

IV.DETAILS OF EXPERIMENTAL TESTS:

Fresh characteristics of SCC were evaluated based on the four main measurements; passing ability, flowability, viscosity, and segregation resistance. Those characteristics were measured using following instruments; J-ring Test, Slump flow, L-Box, V-funnel. [4] For the investigation of hardened concrete properties, the compressive, splitting tensile strength, and flexural strength test of SCC were investigated. Concrete specimens were cured with water. Compressive strength tests for all the variants of concrete mixes with different fiber contents. The cubes were cast in steel moulds of inner dimensions of 150 x 150 x 150mm and the cylinders with 150 mm x 300 mm height. Compression test and split tensile tests were performed on cube and cylinder Respectively at uniform rate using the 2000 kN Compression Testing machine.

4.1 Workability Test Methods for Self-Compacting Concrete

Self-compacting concrete presents new challenges for the measurement of workability. Since self-compacting concrete is capable of flowing readily under its own weight,

- **Slump Flow Test** : The simplest and most widely used test method for self-compacting concrete is the slump flow test .
- **V-Funnel Test :**The V-funnel test (EFNARC 2002; Bartos, Sonebi, and Tamimi 2002) is used to measure the filling ability of self-compacting concrete and can also be used to judge segregation resistance.
- **L-Box Test :** The L-box test (EFNARC 2002; Bartos, Sonebi, and Tamimi 2002) measures the filling and passing ability of self-compacting concrete.
- **J-Ring Test**: The J-ring test (EFNARC 2002; Bartos, Sonebi, and Tamimi 2002) extends common filling ability test methods to also characterize passing ability.

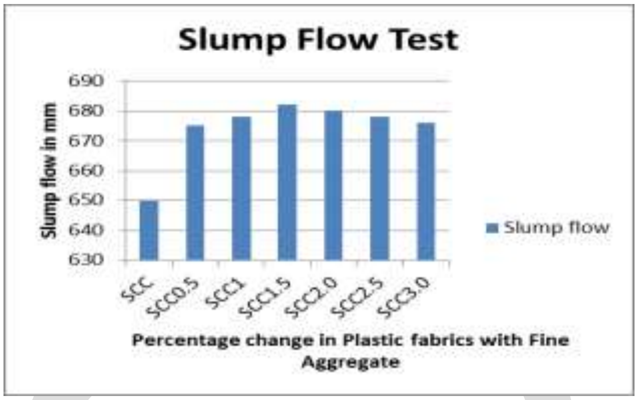
Slump flow value:

Table 3 Denotes Self Compacting concrete (SCC) with % incremental additions plastic fibre as 0, 0.5, 1.0, 1.5 ,2.0, 2.5 & 3.0% were taken and designated as SCC-0.0, SCC-0.5, SCC-1.0, SCC-1.5, SCC-2.0, SCC-2.5, SCC-3.0

Table No :3 Slump Flow Test Result in mm

Sr.no	**% of waste Plastic Fabrics**	**Slump flow**
		mm
1	SCC	650
2	SCC-0.5	675
3	SCC-1.0	678
4	SCC-1.5	682
5	SCC-2.0	680
6	SCC-2.5	678
7	SCC-3.0	676

Graph No: 1 % change in plastic fabrics Vs Slump flow



4.2 Strength Investigations

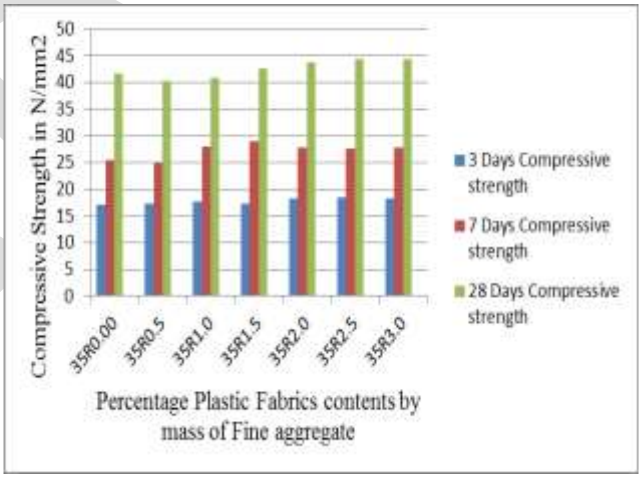
4.2.1 Compressive strength : The result of the variation of compressive strength of concrete with respect to age of concrete for different percentages of Plastic Fabrics is shown in Table 4.2. It is observed that all the mixes achieved the target strength of 43.25 MPa. The results indicate a decreasing trend in the compressive strength towards the high level of the Plastic Fabrics content.

Table 4. Denotes 35R 0,0.5, 1.0, 1.5 ,2.0, 2.5 & 3.0 with % incremental additions plastic fibre as 0, 0.5, 1.0, 1.5 ,2.0, 2.5 & 3.0% were taken and designated as 35 grade of concrete.R means revision.

Table No: 4 Compressive Test Result

Concrete type	**% change in Comp.strength N/mm^2**		
	3 Days	**7 Days**	**28 Days**
35R0.0	17.03	25.56	41.67
35R0.5	17.32	24.85	40.32
35R1.0	17.72	27.98	40.95
35R1.5	17.39	29.06	42.67
35R2.0	18.33	27.77	43.81
35R2.5	18.51	27.69	44.29
35R3.0	18.37	27.77	44.31

Graph No :2 % change in plastic fabrics Vs Compressive strength



4.2.2 Split tensile strength : The cylinder specimens were of size 150mm diameter and 300mm height were tested on compression testing machine of capacity 2000KN. The compression testing machine for split tensile strength and the axis of the specimen was carefully aligned at the center of loading frame.

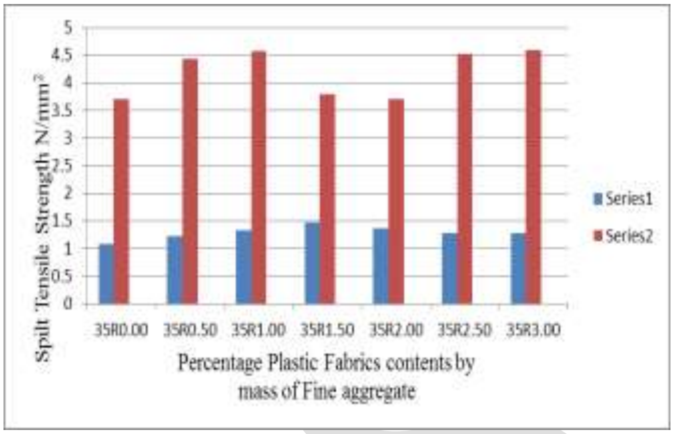
$$\mathbf{fst} = \frac{2P}{\pi \, X \, LD}$$

Where, P is the load on the cylinder is the length of the cylinder is the diameter

Table No:5 Split Tensile Test Result :

Mix Type	Spilt Tensile Strength N/mm^2	
	7 Days	**28Days**
35R0.00	1.08	3.70
35R0.50	1.23	4.43
35R1.00	1.34	4.57
35R1.50	1.47	3.8
35R2.00	1.36	3.7
35R2.50	1.28	4.53
35R3.00	1.28	4.60

Graph No: 3 % change in plastic fabrics Vs Split tensile strength



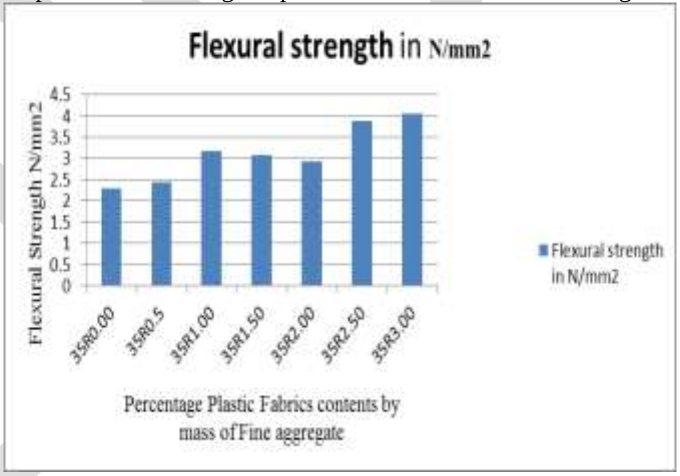
4.2.3 Flexural strength :Testing Machine is digitally control universal testing machine of 1000 KN capacity and +80mm stroke (displacement) was used for testing the beams.. The method used in testing is two point loading .The test specimen should be turned its sides with respect to its portion moulded and centered on bearing blades.

$$\mathbf{F} = \mathbf{P}\ \mathbf{X}\ \frac{\mathbf{L}}{\mathbf{b}}\ \mathbf{x}\ \mathbf{d2}$$

Table No:6 Flexural Strength Test Result :

Mix Type	Flexural Strength N/mm^2
	28 Days
35R0.00	2.30
35R0.50	2.43
35R1.00	3.17
35R1.50	3.08
35R2.00	2.93
35R2.50	3.89
35R3.00	4.05

Graph No: 4 % change in plastic fabrics Vs Flexural strength



V. RESULTS AND DISCUSSION

Fresh Characteristics:

Effects of waste plastic fibers addition on the fresh characteristics of Self-Consolidating Concrete need to be measured to evaluate its workability performance criteria. Comparison of the measured flow ability, viscosity, passing ability and segregation ratio of the fresh SCC mixes can be observed in the following Table.

Table No :7 Effects of Waste plastic Fiber Addition on Fresh Characteristics of SCC

Test Result on Fresh SCC Mixes				
Sr.no	**Method**	**Unit**	**Conventional Concrete**	**SCC with plastic fabrics**
1.	Slump flow test	mm	675	650
2.	V-funnel test	Sec	7	9
3.	L-Box test	H2/H1	0.8	0.9
4.	J-Ring	mm	7	9

Hardened Characteristics:

The compressive strength of self compacting concrete with waste plastic fabrics increases upto 0.264% fiber content by mass of fine aggregate and then reduces.The split tensile of self compacting concrete with waste plastic fabrics increses their split tensile with 0.12 % fiber content by mass of fine aggregate similarly to compressive strength of self compacting with plastic fabrics,it is observed that the flexural strength increases upto 0.25 % fiber content by mass of fine aggregate and then reduces their flexural strength.

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CONCLUSION:

Recycling is a critical issue in these environmental conscious times. It aims to:-

- Preserve natural resources also Minimize transportation & its associated cost.
- Reduce the environmental load caused by waste material especially land requirement.
- It was observed according Workability test results, that more plastic waste fabrics content increases the fluidity of concrete improves, that is favorable for concretes.
- This improvement can be attributed to the fact that plastic particles have an outer smoother surface than that of the sand. The plastic cannot absorb water, therefore an excess of water which improves the workability
- By using waste plastic fabrics at 2.5% the hardned concrete (compressive strength) is improved.

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Design and Implementation of Pseudo-carry Compensation Truncation (PCT) Multiplier

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Abstract — The paper is about the implementation of pseudo-carry compensation truncation (PCT) multiplier, which is derived for the multiplexer based array multiplier. Multiplication is a computation intensive and core operation in many algorithms used in scientific computations. Designing an eminence multiplier is always a need to electronics industry. Multiplier is an important element from the point of power consumption and area in the system. Multiplication using truncated scheme provides an efficient method for reducing the power and area as compared to that of full-width multipliers. There are many schemes for truncation in multiplier among them an adaptive pseudo-carry compensation truncation (PCT) scheme gives result with low error. The designed truncated multipliers occupy about 50% less area compared to that of full width multiplier. The designed 64x64bit PCT multiplier occupies same area with approximately 8% less power consumption with low error probability.

Keywords — Xilinx ISE Design Suite 14.5, Verilog, Multiplier, PCT Multiplier, Truncated Multiplier. CCT, VCT, Braun, Vedic

INTRODUCTION

Multiplier is a device which is used to perform the multiplication operation. An eminence multiplier is always being a need of electronics industry for applications in DSP, image processing. A system's performance is generally depending on the performance of the multiplier because the multiplier operation is time consuming which makes it slowest element in the system and it is generally the large area consuming. So optimizing both the speed and area of the multiplier is a key design issue.

The problem of more area and power consumption with fast operation can be overcome using truncation schemes for multiplier. Truncation means cut short. In Mathematics, truncation is to shorten (a number) by dropping a digit or digits. Use of truncation schemes gives significant reduction in complexities of design. Truncation is best suited where exact result is not always required and a rounded product is used for further computation. Multiplication using truncated scheme provides an efficient method for reducing the power and area as compared to that of full width multipliers.

Truncated Multiplier is an array multiplier. A truncated multiplier is a $p \times p$ multiplier with p bits output. In a truncated multiplier the p less significant bits of the full-width product are discarded and to compensate it some of the partial products are removed and replaced by a suitable compensation function, to trade-off accuracy with hardware cost.

Many truncation schemes for array multipliers

- Constant Correction Truncation (CCT)
- Variable Correction Truncation (VCT)
- Pseudo-carry Compensation Truncation (PCT)

In constant correction truncation (CCT) the correction constant is fixed for specific values of n and k regardless of the value of the multiplicand and multiplier. A non-zero DC component of the resulting product is incurred by this fixed correction constant. A non-zero dc component is added based on specific values of n and k to Columns (n-1) to (k-1) of the pp matrix.

To adapt the correction to the input values, a variable correction truncation (VCT) scheme was proposed. A data-dependent variable correction truncation scheme (VCT) is proposed where the most significant pp bits from the (n-k-1)th column are stacked over the (n-k)th column and a constant bias of 'C' is added in Columns (n-1) to (n-k).

The PCT technique takes account of correction to the input values and carries generated in each stage. This scheme is suitable to array multiplier. In this paper pseudo-carry compensation truncation (PCT) scheme is used and the architecture of a multiplier is designed in Verilog HDL language and simulated on Xilinx.

FULL WIDTH MULTIPLIERS

Full width multiplier is a *p x p* multiplier with *2p* bits output. Some examples of full width multipliers are Braun and Vedic multipliers.

Braun Multiplier: It is a simple parallel multiplier generally called as carry save array multiplier. It has been restricted to perform signed bits. The structure consists of array of AND gates and adders arranged in the iterative manner and no need of logic registers. This can be called as non –addictive multipliers. An n*n bit Braun multiplier is constructed with n (n-1) adders and n2 AND gates as shown in the fig.1. In this paper, designed for 8x8 bit and 64x64 bit Braun multiplier.

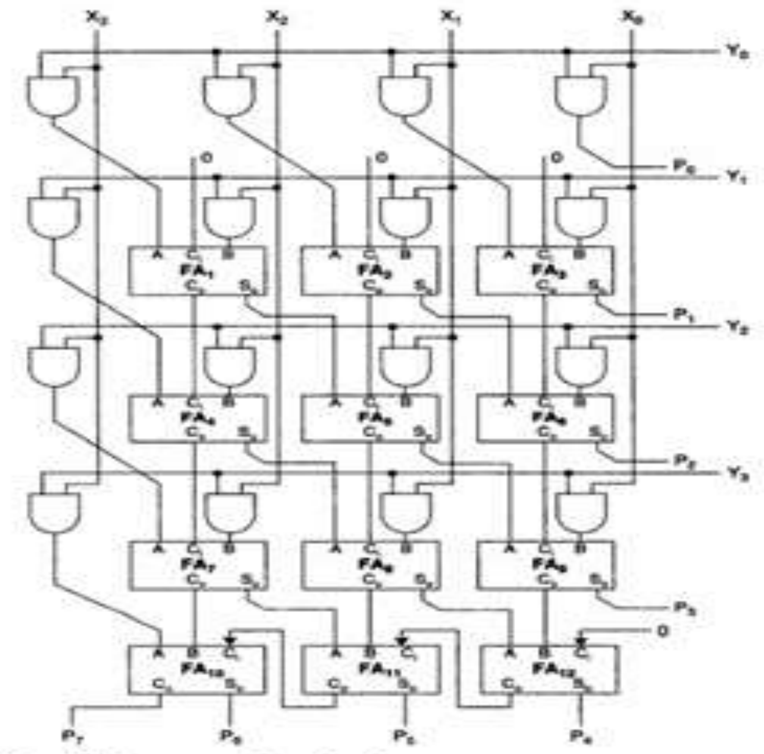


fig. 1 Braun Muliplier

Vedic Multiplier: Vedic mathematics is the name given to the ancient system of mathematics. The use of Vedic mathematics lies in the fact that it reduces the typical calculations in conventional mathematics to very simple one. The proposed Vedic multiplier is based on the "Urdhva Tiryagbhyam" sutra (algorithm). These Sutras have been traditionally used for the multiplication of two numbers in the decimal number system. In this work, we apply the same ideas to the binary number system to make the proposed algorithm compatible with the digital hardware. It is a general multiplication formula applicable to all cases of multiplication. It literally means "*Vertically and Crosswise".* The beauty of Vedic multiplier is that here partial product generation and additions are done concurrently. Hence, it is well adapted to parallel processing. The feature makes it more attractive for binary multiplications. This in turn reduces delay.

The 2X2 Vedic multiplier module is implemented using four input AND gates & two half-adders which is displayed in its block diagram in fig 2.

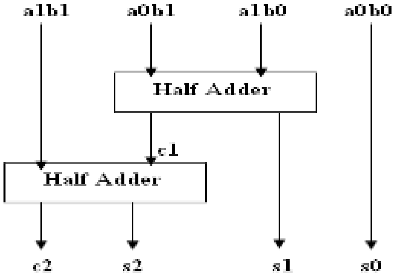


Fig 2: Block diagram of 2x2 Vedic multiplier

The implementation of 4x4 bit Vedic multiplier which uses the 2x2 bit multiplier as a basic building block. The same method can be extended for input bits 4 & 8. In this paper designed for 8x8 bit and 64x64 bit Vedic multiplier.

TRUNCATED MULTIPLIERS

Use of truncations schemes gives significant reduction in complexities of design. Truncation is best suited where exact result is not always required and a rounded product is used for further computation.

***Truncated Multiplier*:** The truncated multiplier is an array multiplier, whose design is based on multiplexer.

The product of two n-bit positive integers X=x_{n-1} , x_{n-2} ,….

, x_1 , x_0 And Y= y_{n-1} , y_{n-2} ,…. , y_1 , y_0 is a 2n-bit product P=XY. The numbers are assumed to be fractional in their error

analysis and the inputs and output are scaled by a factor of 2^{-n} and 2^{-2n} , respectively.

$$P = \{X_{n-1} + 2^{n-1} x_{n-1}\} \{Y_{n-1} + 2^{n-1} y_{n-1}\}$$

$$P = \sum_{i=0}^{n-1} (x_i \ . \ y_i)\, 2^{2i} + \sum_{i=1}^{n-1} M_i \ 2^{2i}$$

Where $M_i = X_i * y_i + x_i * Y_i$, M_i can be implemented as a multiplexer With x_i and y_i as select signals. $M_i = 0$, X_i, Y_i and $X_i + Y_i$ when x_i , y_i = 00 ", "01", "10" and "11",respectively. Without loss of generality, our proposed truncated scheme can be explained with the help of a truncated multiplexer matrix of Fig. 1 with n = 8 and k = 2, where k is the number of partial product (pp) columns to be kept beyond the width, n of the truncated product.

The architecture of truncated multiplier is shown in fig 3. It consists of AND gates and two types of fixed input multiplexers. One is with inputs 0, 0, 0, Ci, where Ci is carry bit input of multiplexer which will take care of carry generated in the previous column in architecture or from inputs by ANDing them and other with 0, xi, yi, si where xi,yi are the input bits of 8 bit numbers and si is the sum bit taking summation result coming from the previous column of multiplexer. In this paper, designed for 8x8 bit and 64x64 bit truncated multiplier.

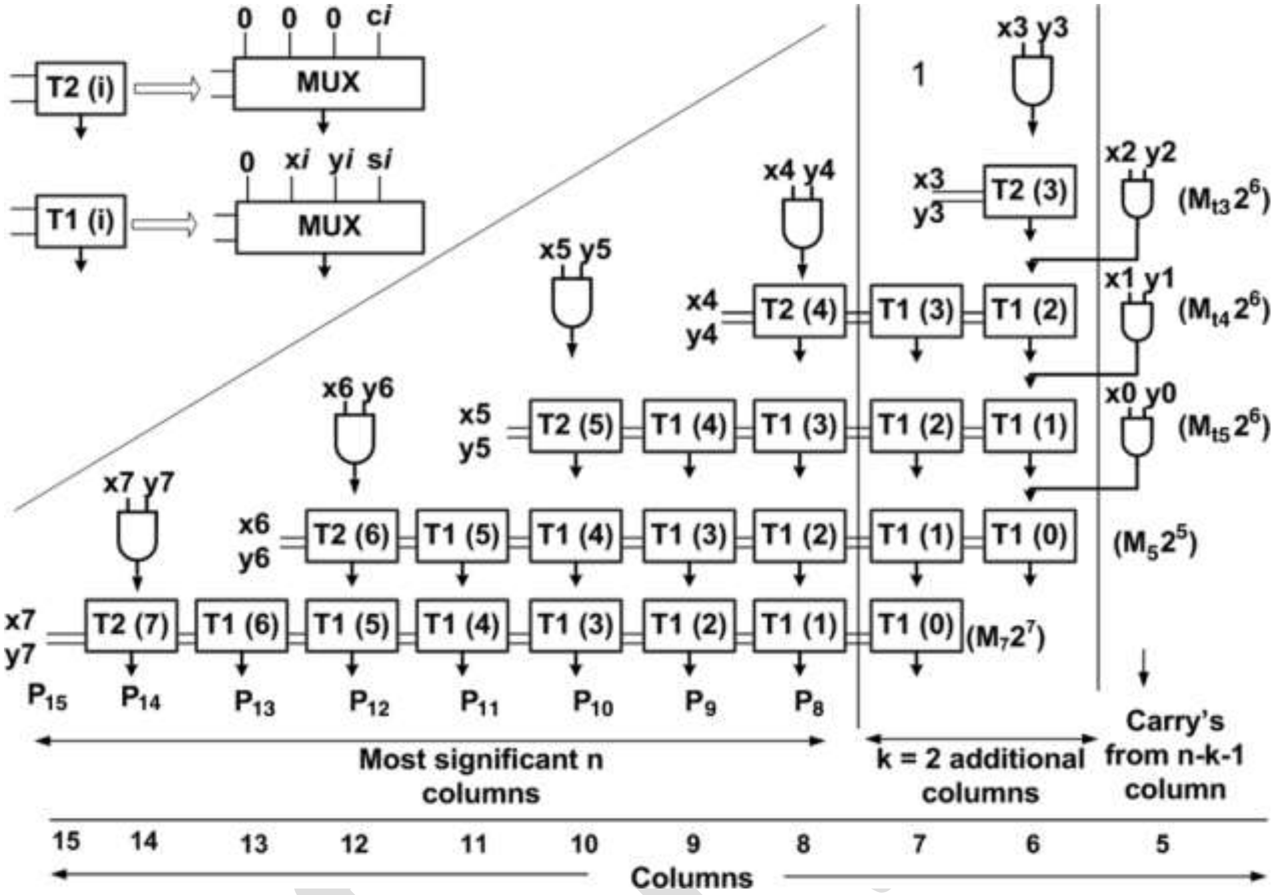


Fig 3: Truncated multiplexer matrix multiplier for an 8*8 bit multiplier; n=8 most significant columns and k=2 additional columns of multiplexers.

***Pseudo–carry Compensation Truncation (PCT) Multiplier*:** By exploiting the symmetry of the multiplexer based array multiplier, the partial product bits generated by the multiplexers in our truncated multiplier can be accumulated in a carry-save format to further reduce the area and improve the speed over other truncated array multipliers.

To minimize the truncation error for an unsigned integer multiplication, a new pseudo-carry compensated truncation (PCT) scheme consisting of an adaptive compensation circuit and a fixed bias is proposed.

The architecture consists of two main blocks. First block is designed with full adder and AND gates which produces two outputs, one for sum and other for carry. Second block is designed using two 4-to-1 multiplexers, in which one multiplexer to generate sum output and other multiplexer to generate carry output. These two blocks are arranged in such a fashion as shown in figure 4.2 to get the final 8 bit truncated product. The first block cells are placed in boundary and the second block cells are placed in the interior of the carry- save architecture, because they receive an additional sum signal from the preceding block.

The adaptive error compensation is realized by the AND cells on the top right, and the fixed correction bias is realized with an input "1" placed on the leftmost first block in the first row. The ripple carry adders (RCA) are used at the bottom of the array to add the outputs and to get the final product bit. In this project, 8x8 bit and 64x64 bit Pseudo-carry Compensation Truncation (PCT) multiplier are designed.

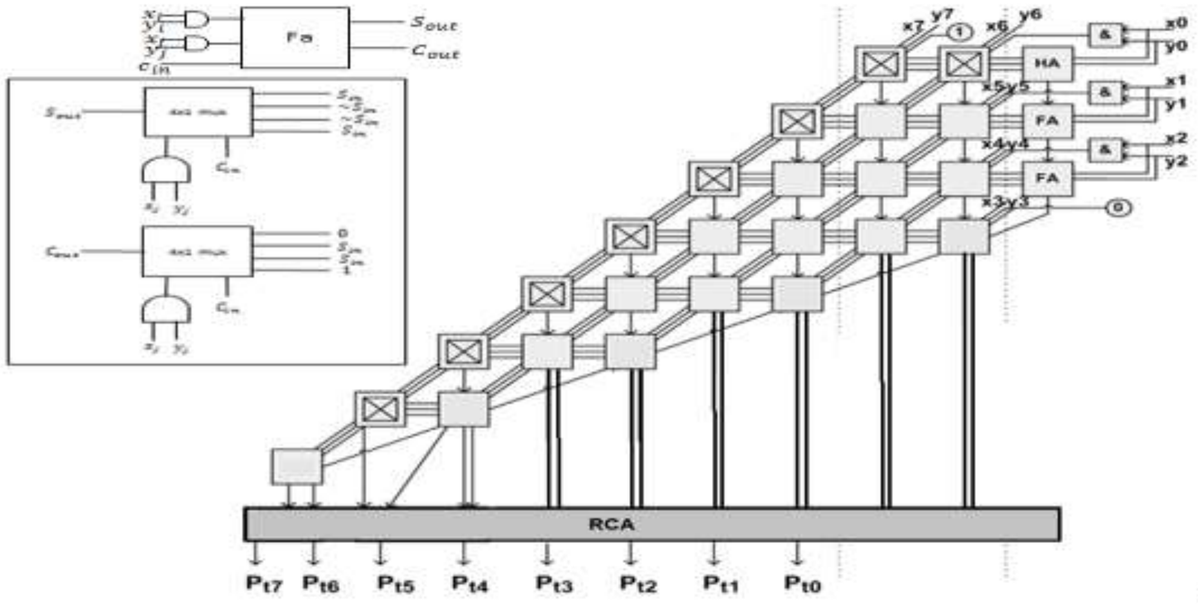


Fig 4: PCT multiplier architecture for n = 8 and k =2

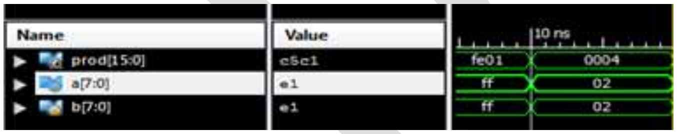
RESULTS

SIMULATION RESULTS:

In this work, the Xilinx ISE is used. Here shows the outputs taken after the simulation and synthesis.

```
Name          Value   0 ns        10 ns
prod[15:0]    0004    fe01        0004
a[7:0]        02      ff          02
b[7:0]        02      ff          02
```

Fig 5: 8x8 Braun multiplier



```
Name          Value          10 ns
prod[15:0]    c5c1    fe01   0004
a[7:0]        e1      ff     02
b[7:0]        e1      ff     02
```

Fig 6: 8x8 Vedic multiplier

```
Name          Value        10 ns
prod[7:0]     c6      fe   00
x[7:0]        e1      ff   02
y[7:0]        e1      ff   02
```

Fig 7: 8x8 Truncated multiplier

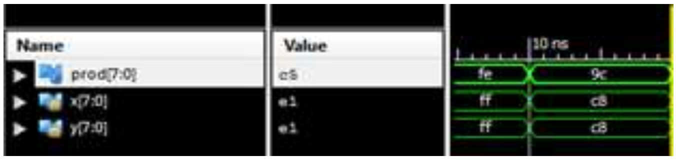


Fig 8: 8x8 PCT multiplier

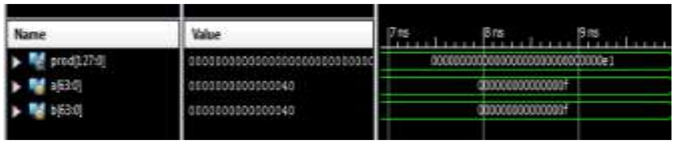


Fig 9: 64x64 Braun multiplier

Fig 10: 64x64 Vedic multiplier

Fig 11: 64x64 Truncated multiplier

Fig 12: 64x64 PCT multiplier

Synthesis Output:

		Full Width Multipliers		Truncated Multipliers	
	Available	Braun	Vedic	CCT	PCT
No. of slices occupied	4656	65	108	43	43
% Area	100%	1%	2%	0%	0%

Table 1: Area Comparison of 8x8 bit

Synthesis Output:

		Full Width Multipliers		**Truncated Multipliers**	
	Available	**Braun**	**Vedic**	**CCT**	**PCT**
No. of slices occupied	**13132**	**4672**	**7588**	**2427**	**2427**
% Area	**100%**	**35%**	**57%**	**18%**	**18%**

Table 2: Area Comparison of 64x64 bit

	Truncated	**PCT**
Power (W)	**0.150**	**0.138**

TABLE 3: POWER CONSUMPTION

CONCLUSION

A conclusion from the results obtained clearly shows that Truncated multipliers occupy very less area compared to full width multipliers. Among truncated multipliers, PCT multiplier is occupying same area, provides low error rate, and power consumption is less. The future work on this is to implement this multiplier for the application of image compression.

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An Alternative Approach to Big Data Computation

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Abstract— The advancements in the field of Information Technology and Sensor Devices have significantly increased the amount of data being captured, stored and processed every day. Moreover, social networking and faster internet access from mobile devices have further accelerated the speed with which the data is captured and transmitted. The computation of this vast amount of complex data is currently one of the biggest challenges faced by the IT industry.

Heterogeneous Computing and In-Memory Databases have emerged as two famous high performance computing (HPC) solution for big data computation. This paper discusses both In-Memory databases and heterogeneous computing and proposes a solution by combining the best features of the same.

Keywords— Big data, big data analytics, big data computation, cloud computing , in-Memory databases, distributed computing, parallel processing .

INTRODUCTION

The amount of data [2] in our world has been increasing day by day and analyzing this huge amount of data is bringing forth new challenges apart from providing new arenas of productivity growth, innovation, and consumer surplus. Besides the data-oriented workers, business personnel in every sector will have to deal with the implications of big data. The rapid increase in the volume and detail of information being captured by enterprises, the rise of multimedia, social Medias and vast exploration of things will lead to exponential growth in data for the coming future.

WHAT IS BIG DATA?

Big data [1] refers to a large collection of data whose size and volume renders it difficult to be processed using traditional data processing systems. The various problems encountered with big data are its storage, searching, analysis, processing as well as its sharing and transfer. Big data is formed from the analysis of a single large data set which leads to even bigger data set as compared to separate smaller sets with the same total amount of data, allowing correlations to be found to establish business trends. According to [2] companies gather a huge amount of data about their customers, operations and suppliers. It is becoming evident that besides from other factors, data is a quintessential part for growth and development of an enterprise.

THE NEED FOR BIG DATA COMPUTATION

Big data [1] refers to a large collection of complex data whose size and volume renders it difficult to be processed using traditional data processing systems. The various problems encountered with this vast amount of data are its storage, analysis, replication, processing and transfer. Big data is formed from the analysis of a single large data set which leads to even bigger data set allowing correlations to establish leading business trends.

Today, companies gather and analyse this huge amount of data about their customers, operations and suppliers by means of ERP or CRM systems. These information systems enable companies to understand customer demand, mitigate market risk and enhance its business operations [2]. Therefore, it is evident that processing data into valuable information has become an integral and inseparable part of every business enterprise and industry for growth and development in today’s globally competitive world. Following are benefits of big data and its computation [3].

- Big Data computation makes information observable at a much higher rate.

- With business intelligence, big data analytics can substantially improve decision making process of a company as it can provide more accurate forecasting information and spotting trends.

- Big data enables focus strategy by aiming 'narrow segment' of customer with precisely built products and services.

- Big data can be used to improve the next generation of products and services.

CHALLENGES IN BIG DATA COMPUTATION

There has been a significant increase in computing power and storage capabilities of IT systems. However, the need to store and process big data has outpaced the computing capabilities of existing IT systems. Furthermore, big data sizes are rapidly and constantly increasing over the past few years, ranging from a few dozen terabytes to many petabytes of data in a single data set. It is expected that by 2020, there would be around 50 billion networking devices on the internet (such as smart phones, Laptops, RFIDs, Intelligent Appliances etc) [4]. Therefore, computation of big data becomes a real challenge for IT industry today.

SOLUTIONS

The possible solution in order to address the big data challenge can be the combination of In-Memory databases and computation of big data on cloud. These have been discussed in details as below:

1. IN-MEMORY DATABASES (IMDB)

In-Memory Database is one of the most efficient ways to address the big data computation requirements [10]. It is different from traditional database in a way that it stores data directly into computer's memory. Therefore, when data is needed, it is already available in memory and can be accessed quickly. Regular falling price of random access memory (RAM) has made it possible for big companies to now afford In-Memory Databases with very large RAMs. In-Memory database platforms such as SAP HANA, Oracle's TimesTen can support up to 100 TB of uncompressed data [9].

In case of In-Memory Databases, the execution algorithms are simpler and execute fewer instructions as compared to the old disk storage approach. In addition, seek time also gets eliminated. Hence, in-memory databases provide better performance, which is around 100 times faster in comparison to traditional databases [10]. By using In-Memory Databases, real time applications, such as telecommunications network equipments or location based mobile advertising networks, can get many benefits. Moreover, In-Memory Databases have gained a lot of significance in the data analytics field.

2. HETEROGENEOUS CLOUD COMPUTING

Cloud computing or distributed computing is another way to compute big data. In cloud computing [7] a large number of inter connected computers, share the load and run the same program simultaneously (parallel processing). Therefore, with high computing power, which is generated from interconnected computers mesh, it becomes possible to manage vast amount of both structured and unstructured data [8]. Moreover, mesh structure of cloud computing provides scalability, which makes it suitable to handle increasing rate of data generation. Depending upon the budget, infrastructure and software requirements cloud computing provides three types of service models: Software as a service (SaaS), Infrastructure as a service (Iaas) and Platform as a service (PaaS)[11].

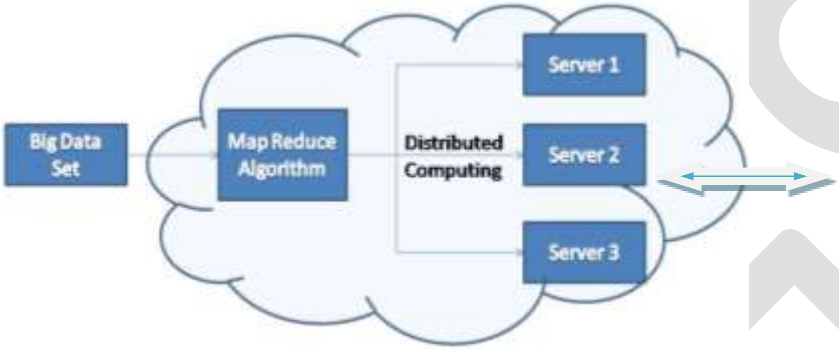
To achieve scalability as well as performance, big data computation needs to efficiently utilize both parallel processing and algorithm [8]. The current popular big data processing models are General Purpose GPU and Map Reduce Algorithm.

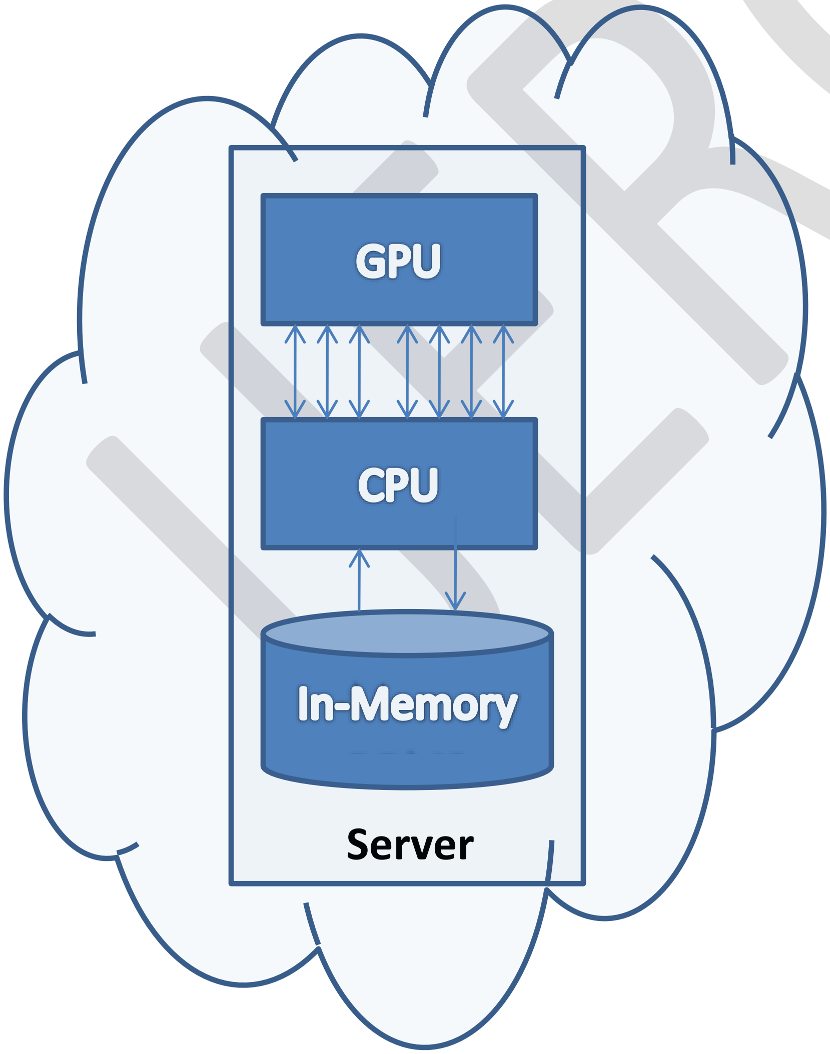
2.1 GPU Computing: GPU computing is a very powerful combination of CPU with application intensive Graphics Processing Unit, to accelerate general purpose engineering computations. A CPU consists of multi cores which are optimized for serial processing whereas a GPU consists of thousands of more efficient small cores which are designed for parallel processing [5]. The main code runs on CPU with computer intensive load being offloaded to more dedicated GPU.

2.2 Map Reduce Algorithm: Heterogeneous cloud computing combines computing solutions offers by different vendors, varying in their computing powers and even algorithms, to achieve a more effective big data computation. However for successful implementation of heterogeneous computing different vendor's need to use a common standard. MapReduce algorithm, proposed by Google, is one of the most efficient and widely accepted programming model for big data computation. It not only optimizes the processing algorithm, but also hides the complex details related to data distribution, storage and load balancing [12]. Therefore, industry wide programmers are successfully able to use this algorithm for big data computation.

Also, MapReduce algorithm does not use any index or schema, hence its integration with DBMS to retain for performance is one of the major challenge. However, many leading industry vendors are able to overcome this challenge. For example, Apache HadoopDB combines scalability feature of Map reduce algorithm with performance of DBMS to provide efficient hybrid solution [8].

CONCLUSION





As shown in the figure, a combination of GPU based parallel processing, map reduce algorithm and In-Memory databases can be a possible solution for big data computation. This will combine the scalability, performance and cost effectiveness of heterogeneous cloud computing with extremely fast processing speed of In-Memory Databases. However, integration of these separate systems might be a challenge and therefore top players of the industry (such as Intel, SAP and Apache Software Foundation) might collaborate to collectively develop big data computation solutions.

In the era of big data, the exposure and problem solving approach that I have gained through this research paper will serve as foundation to face big data challenges in upcoming IT industry.

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Effect of cryogenic treatment on corrosion resistance of hybrid Aluminium-7075 metal matrix composites

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Abstract— Metal matrix composites are important class of materials, which contain metal or alloy as matrix and a ceramic particulate or fiber or whiskers as reinforcements. Aluminium based Metal Matrix Composites exhibit enhanced corrosion resistance, wear and mechanical properties. Corrosion can affect the metal matrix composite in a variety of ways which depend on its nature and the environmental conditions prevailing. Studying corrosion resistance of Al-based materials is important especially for automotive and aircraft applications. The main aim of the work is to study the corrosion resistance(with and without cryogenic condition) of Al-sic-Gr hybrid metal matrix composites of aluminium grade 7075 with addition of various percentage compositions of silicon carbide particles and graphite made by stir casting technique. The specimens were prepared according to ASTM standards. Tensile and hardness tests were performed and the properties were investigated. Result showed that as percentage of reinforcement increases corrosion resistance has improved for cryogenic condition.

Keywords — Corrosion Resistance, silicon carbide, graphite, Al 7075, cryogenic condition, stir Casting, Metal matrix composites, Scanning Electron Microscopy

1. INTRODUCTION

Aluminum alloys reinforced with ceramic particulates have significant potential for structural applications due to their high specific strength and stiffness as well as low density. These properties have made particle-reinforced metal matrix composites (MMCs) an attractive candidate for the use in weight-sensitive and stiffness-critical components in aerospace, Transportation and industrial sectors. Corrosion behavior is very important parameter for assessing the application potential of composites as structural materials. Aluminum alloys reinforced with ceramic particulates have significant potential for structural applications due to their high specific strength and stiffness as well as low density. These properties have made particle-reinforced metal matrix composites (MMCs) an attractive candidate for the use in weight-sensitive and stiffness-critical components in aerospace, Transportation and industrial sectors. Corrosion behavior is very important parameter for assessing the application potential of composites as structural materials. Table 1 shows the composition of aluminium 7075.

Aluminium	87.4-91.4%
Silicon	0.40%
Iron	0.50%
Manganese	0.30%
Magnesium	2.1-2.9%
Zinc	5.1-6.1%
Chromium	0.18-2.8%
Titanium	0.20 %
Others, each	0.05%
Others ,Total	0.15

Table.1 Composition of Al-7075 alloy

2. OBJECTIVE

The main objective of this work is to fabricate Al7075-Sic-Gr metal matrix composite by stir casting process, to prepare specimens according to ASTM standards. To investigate tensile and hardness properties and to evaluate corrosion resistance (with and without cryogenic condition) by suitable magnification using SEM.

3. MATERIAL AND METHODS

From literature survey it was cleared that, there is wide scope to studies on corrosion behavior of Al-Si-Gr hybrid metal matrix composites, so aluminium-7075 is chosen as matrix material, silicon carbide and graphite as reinforcement materials.

Table.2 shows Composition of Al 7075, Sic and Gr for specimen preparation. The quantities of silicon carbide and graphite were taken in a crucible and were heated to a temperature of 400^o C for 15 mins. Al 7075 was heated in the furnace at a temperature of 900^{o}C.The molten material was stirred with a stirrer speed of 220 rpm to create vortex, then the heated reinforcements were added and stirred. The composites were cast using conventional methods. The specimens are casted in 5 different combinations and it is shown below in table 2. Fig 1 shows the stir casting apparatus required to fabricate specimens.

Sl.No	Reinforcement %
Specimen 1	As Cast Al 7075
Specimen 2	1.25%
Specimen 3	2.5%
Specimen 4	3.75%
Specimen 5	5%

Table.2 Composition of Al 7075 & Sic and Gr for specimen preparation

Fig.1 Stir Casting Apparatus

4. TESTING

1. TENSILE TEST

Tensile Test was carried out on a computerized UTM according to ASTM E8. Fig 2 shows the tensile test specimens.

Fig.2Tensile Test Specimens

2. HARDNESS TEST

Hardness test was done with standard Brinell Hardness Testing Machine. Test was performed according to ASTM E10. Fig 3 shows the specimens prepared for hardness test.

Fig.3 Hardness Test Specimens

3. CORROSION TEST

Corrosion test is carried out according to ASTM standard G110.Solutions are prepared in the ratio of 1:4. Fig 4 shows the specimens required for corrosion test.

Fig.4 Corrosion Test Specimens

4. MICROSTRUCTURE STUDY AND ANALYSIS

The corrosion and fracture analysis of composites were established by scan electron microscopic (SEM) analysis of the surface morphology of the test samples.

TESTING PROCEDURE:

1. Preparation of solutions to conduct corrosion test:
2. **Etching cleaner** shall be prepared as follows: To 945 mL of reagent water add 50 mL of nitric acid (70 %) + 5 mL of hydrofluoric acid
3. **Test solution** shall be prepared as follows: 57 grams of sodium chloride +10 mL of hydrogen peroxide (30 %—add just prior to initiation of exposure) diluted to 1.0 L with reagent water.
4. The etched specimens in the test solution are immersed for a period of at least 6 h.
5. After exposure, rinse each specimen with reagent water and allowed to dry.
6. Examine each exposed specimen at various magnifications to locate areas of corrosion attack.

5. RESULTS AND DISCUSSION

1. TENSILE TEST RESULTS

Specimen	Tensile Strength in N/mm^2	Yield Strength N/mm^2
As cast Al 7075	113.119	105.617
1.25%	137.250	115.364
2.5%	113.379	106.772
3.75%	135.159	114.102
5%	99.569	81.28

Table.3 output data after tensile test

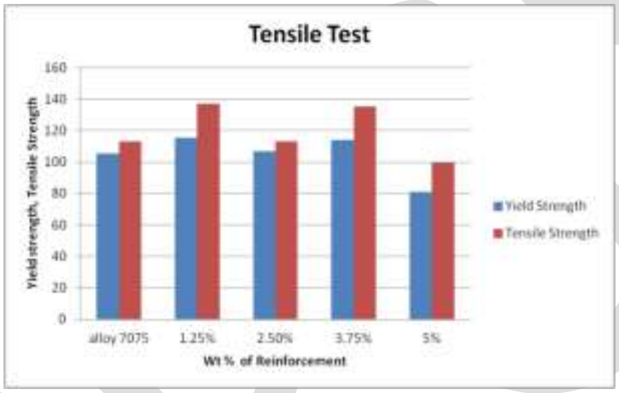


Fig.5 Variation of Tensile and Yield Strength for different composition of Sic and Gr

Table .3 shows the output data obtained after tensile test. From fig.5 it can be seen that as the percentage of silicon carbide increases the tensile strength and yield strength increases this is due to the good bonding between matrix phase and reinforcement phase, as silicon carbide dispersed with matrix phase the specimen will become harder and stronger and hence strength increases. But in the case of Al7075+ 2.5% (Sic + Gr) both tensile and yield strength decreases this is due to poor wettability. In the case of Al7075+ 5% (Sic + Gr) both tensile and yield strength decreases, as the percentage of graphite increases the specimen will become more brittle this because graphite has added in free State , In free state the carbon content in the graphite will not make good bonding with matrix phase hence the strength decreases.

2. HARDNESS TEST RESULTS

Specimen	Brinell Hardness Number
As Cast	86.8
1.25%	104
2.5%	112
3.75%	86.8
5%	95

Table.4 output data after hardness test

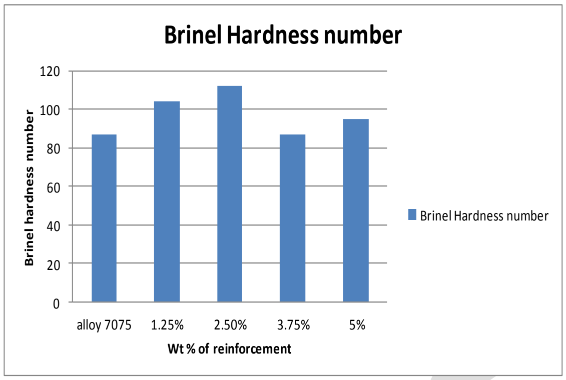


Fig.6 Variation of Brinell Hardness Number for different composition of Sic and Gr

Table.4 shows the output data obtained after hardness test. From fig.6, it can be seen that as the percentage of reinforcement increases Brinell hardness number also increases and reaches its maximum at 2.5% of reinforcement. As the percentage of graphite increases, it nullifies the property of silicon carbide and hence the specimen will become less hard.

3. CORROSION TEST RESULT

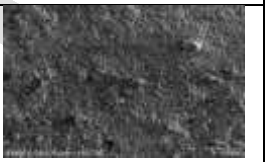
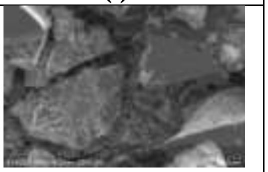
Wt.% of reinforce--ment	Without cryogenic condition	With cryogenic condition
As cast Al-7075	 **(a)**	 **(b)**
1.25% (Sic + Gr)	 **(c)**	 **(d)**
2.5% (Sic + Gr)	 **(e)**	 **(f)**
3.75% (Sic + Gr)	 **(g)**	 **(h)**
5% (Sic + Gr)	 **(i)**	 **(j)**

Table .5 comparisons between surface of specimens after corrosion test (with and without cryogenic condition)

Table .5 shows comparison between surface of specimens after corrosion test (with and without cryogenic condition). Comparing images (a) & (b). In image (a) small pits are more on the surface of the specimen and corrosion resistance has reduced. In image (b) pits are reduced and corrosion resistance has been improved.

Comparing images (c) & (d). In image (c) pits and cracks are observed more on the surface of the specimen. But in image (d) it can be observed that cracks are not found and less porosity when compared to image (c).

Comparing images (e) & (f).both small and larger pits are observed in image (e). No larger pits are observed in image (f). Therefore corrosion resistance has been improved in cryogenic condition when it is compared with non cryogenic condition.

Comparing both the images (g) & (f).in image (g) pits are observed and uneven surface is shown by arrow this is due to casting defect. Due to this defect the surface has been damaged in image (h) that is the presence of cryogenic condition.

Comparing both the images (i) & (j).in image (i) more pits and corrosion initiation near grain boundaries are observed. But in image (j) no pits are observed and rough surface can be seen.

4. MICROSTRUCTURE ANALYSIS

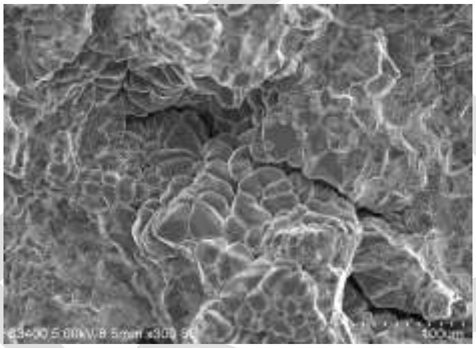


Fig.7 Microstructure of Al 7075 as cast

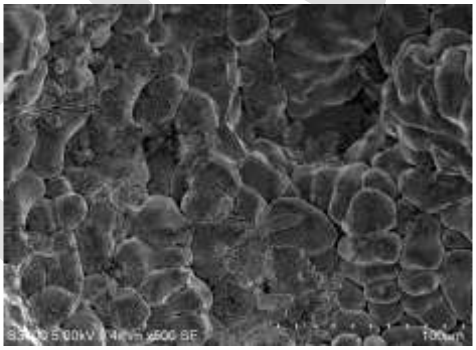


Fig.8 Microstructure of 3.75% Sic and Gr

Fig 7 shows the microstructure of as cast aluminium 7075 specimen. Fig.8 manifests the homogenity of the composites. The homogenous distribution is achieved by the shearing force caused by stirring which leads to better wear and mechanical properties. Additionally, tiny pores can be witnessed along the grain boundaries this is due to air entrapment during casting process.

6. CONCLUSION

Aluminum alloys reinforced with ceramic particulates have significant potential for structural applications due to their high specific strength and stiffness as well as low density. Studying corrosion resistance of Al-based materials is important especially for automotive aircraft and marine applications. Al 7075 matrix composites reinforced with silicon carbide and graphite has been successfully produced by the stir casting method.

1. The result from tensile test shows, increase in tensile strength and yield strength from Wt.% 1.25 to 3.75 of reinforcement over as cast Al-7075. After 3.75% both tensile strength and yield strength Has decreased. This is because as Gr has been added in free state it will not be having good bonding with matrix phase. Hence strength decreases.

2. The result of hardness test shows increase in hardness of specimen till Wt. 2.5% of reinforcement. After Wt.2.5% of reinforcement hardness decreases.

3. Without cryogenic condition, as the Wt.% of Sic and Gr increases number of pits and cracks has increased.hence corrosion resistance has decreased.

4. With cryogenic condition, as the Wt% of Sic and Gr increases, corrosion resistance has increased this is due to precipitating microfine eta carbides on the surface of the specimen.

5. Comparing with and without cryogenic condition, it can be concluded that corrosion resistance has improved for all Wt% of reinforcement for cryogenic condition except 3.75% of reinforcement because of casting defect.

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Design of 32-Bit Carry Skip Adder Using Binary to Excess-1 Converter

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Abstract— Adders are fundamental arithmetic component in many computer systems, since most of the research in the last few decades has concentrated on reducing the delay of addition. One of the most efficient adder architectures in terms of delay and power dissipation is the carry-skip adder. The existing CSKA structure uses concatenation and incrementation schemes to improve the speed and AOI (AND OR Invert) and OAI (OR AND Invert) compound gates are used instead of mux. From the structure of the CSKA, it is clear that there is scope for reducing the area and power consumption significantly from the existing structure. In this project, an area efficient 32-bit carry-skip adder to achieve lower power consumption is designed. This work uses a simple and efficient gate-level modification to lower the power and area of the CSKA. The optimum sizes for the skip logic blocks are decided by considering the delay of critical path. Based on this modification CSKA architecture have been developed and compared with the conventional CSKA architecture. The proposed design has reduced area and power by 18.7% and 87% respectively as compared with the regular CSKA with only a slight increase in the delay (0.5%). The proposed CSKA can be applied to any application where the adder is needed. In this project, the proposed CSKA was applied in FIR filter to reduce the area and the power. This work evaluates the performance using TANNER 0.25μm CMOS process technology.

Keywords— Carry Skip Adder(CSKA), CI-CSKA, Area-Efficient, Low Power, BEC, TANNER tool

INTRODUCTION

Adders are a key building block in arithmetic and logic units (ALUs) and hence increasing their speed and reducing their power/energy consumption strongly affect the speed and power consumption of processors. Obviously, it is highly desirable to achieve higher speeds at low-power/energy consumptions, which is a challenge for the designers of general purpose processors.

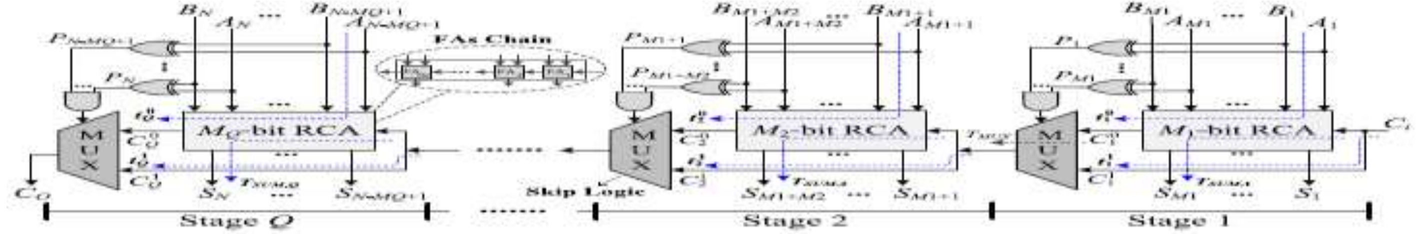
one may choose between different adder structures/families for optimizing power and speed. There are many adder families with different delays, power consumptions, and area usages. Examples include ripple carry adder (RCA), carry increment adder (CIA), carry skip adder (CSKA), carry select adder (CSLA), and parallel prefix adders (PPAs). The RCA has the simplest structure with the smallest area and power consumption but with the worst critical path delay. In the CSLA, the speed, power consumption, and area usages are considerably larger than those of the RCA. The PPAs, which are also called carry look-ahead adders, exploit direct parallel prefix structures to generate the carry as fast as possible. There are different types of the parallel prefix algorithms that lead to different PPA structures with different performances. As an example, the Kogge–Stone adder (KSA) is one of the fastest structures but results in large power consumption and area usage. It should be noted that the structure complexities of PPAs are more than those of other adder schemes.

The CSKA is an efficient adder in terms of power consumption and area usage. The critical path delay of the CSKA is much smaller than the one in the RCA, whereas its area and power consumption are similar to those of the RCA. In addition, the power-delay product (PDP) of the CSKA is smaller than those of the CSLA and PPA structures. In addition, due to the small number of transistors, the CSKA benefits from relatively short wiring lengths as well as a regular and simple layout. The comparatively lower speed of this adder structure, however, limits its use for high-speed applications.

In this paper, given the attractive features of the CSKA structure, we have focused on reducing its delay by modifying its implementation based on the static CMOS logic. The proposed modification increases the speed considerably while maintaining the low area and power consumption features of the CSKA. In addition, an adjustment of the structure, based on the variable latency technique, which in turn lowers the power consumption without considerably impacting the CSKA speed, is also presented. The design of (hybrid) variable latency CSKA structures have been reported in the literature. Hence, the contributions of this paper can be summarized as follows.
1) Proposing a modified CSKA structure by combining the concatenation and the incrementation schemes to the conventional CSKA (Conv-CSKA) structure for enhancing the speed and power efficiency of the adder. The modification provides us with the ability to use simpler carry skip logics based on the AOI/OAI compound gates instead of the multiplexer.
2) Providing a design strategy for constructing an efficient CSKA structure based on analytically expressions presented for the critical path delay.
3) Proposing a hybrid variable latency CSKA structure based on the extension of the suggested CSKA, by replacing some of the middle stages in its structure with a PPA, which is modified in this paper.

2.CONVENTIONAL CARRY SKIP ADDER

The structure of an *N*-bit Conv-CSKA, which is based on blocks of the RCA (RCA blocks), is shown in Fig. 1



\\ **Fig -1**: Conventional structure of the CSKA

In addition to the chain of FAs in each stage, there is a carry skip logic. For an RCA that contains *N* cascaded FAs, the worst propagation delay of the summation of two *N*-bit numbers, *A* and *B*, belongs to the case where all the FAs are in the propagation mode. It means that the worst case delay belongs to the case where

$Pi = Ai \oplus Bi = 1$ for $i = 1, \ldots, N$

where Pi is the propagation signal related to Ai and Bi. This shows that the delay of the RCA is linearly related to N [1].

In the case, where a group of cascaded FAs are in the propagate mode, the carry output of the chain is equal to the carry input. In the CSKA, the carry skip logic detects this situation, and makes the carry ready for the next stage without waiting for the operation of the FA chain to be completed. The skip operation is performed using the gates and the multiplexer shown in the figure. Based on this explanation, the *N* FAs of the CSKA are grouped in *Q* stages. Each stage contains an RCA block with Mj FAs ($j = 1, \ldots, Q$) and a skip logic. In each stage, the inputs of the multiplexer (skip logic) are the carry input of the stage and the carry output of its RCA block (FA chain). In addition, the product of the propagation signals (*P*) of the stage is used as the selector signal of the multiplexer. The CSKA may be implemented using FSS and VSS where the highest speed may be obtained for the VSS structure [2].

3. MODIFIED CSKA STRUCTURE

Based on the discussion presented in Section 2, it is concluded that by reducing the delay of the skip logic, one may lower the propagation delay of the CSKA significantly. Hence, in this paper, we present a modified CSKA structure that reduces this delay.

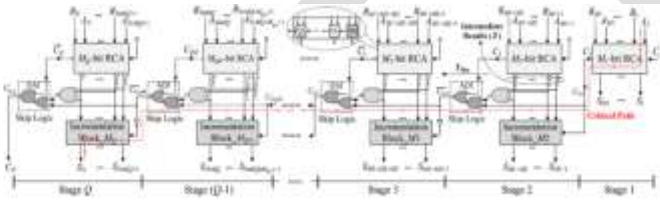


Fig -2: Proposed CI-CSKA Structure

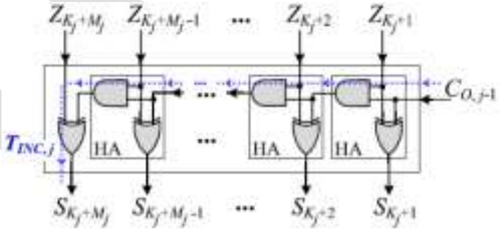


Fig-3: Internal structure of the *j* th incrementation block

3.1 General Description of the Proposed Structure

The structure is based on combining the concatenation and the incrementation schemes with the Conv-CSKA structure, and hence, is denoted by CI-CSKA. It provides us with the ability to use simpler carry skip logics. The logic replaces 2:1 multiplexers by AOI/OAI compound gates (Fig- 2). The gates, which consist of fewer transistors, have lower delay, area, and smaller power consumption compared with those of the 2:1 multiplexer [3]. The structure has a considerable lower propagation delay with a slightly smaller area compared with those of the conventional one. Note that while the power consumptions of the AOI (or OAI) gate are smaller than that of the multiplexer, the power consumption of the proposed CI-CSKA is a little more than that of the conventional one. This is due to the increase in the number of the gates, which imposes a higher wiring capacitance (in the noncritical paths).

Now, we describe the internal structure of the proposed CI-CSKA shown in Fig-2 in more detail. The adder contains two *N* bits inputs, *A* and *B*, and *Q* stages. Each stage consists of an RCA block with the size of Mj ($j = 1, \ldots, Q$). In this structure, the carry input of all the RCA blocks, except for the first block which is Ci , is zero (concatenation of the RCA blocks). Therefore, all the blocks execute their jobs simultaneously. In the proposed structure, the first stage has only one block, which is RCA. The stages 2 to *Q* consist of two blocks of RCA and incrementation. The incrementation block uses the intermediate results generated by the RCA block and the carry output of the previous stage to calculate the final summation of the stage. The internal structure of the incrementation block, which contains a chain of half-adders (HAs), is shown in Fig-3. In addition, note that, to reduce the delay considerably, for computing the carry output of the stage, the carry output of the incrementation block is not used.

As shown in Fig-2, if an AOI is used as the skip logic, the next skip logic should use OAI gate. In addition, in the Conv-CSKA, the skip logic (AOI or OAI compound gates) is not able to bypass the zero carry input until the zero carry input propagates from the corresponding RCA block. To solve this problem, in the proposed structure, we have used an RCA block with a carry input of zero (using the concatenation approach). This way, since the RCA block of the stage does not need to wait for the carry output of the previous stage, the output carries of the blocks are calculated in parallel.

3.2 Area and Delay of the Proposed Structure

As mentioned before, the use of the static AOI and OAI gates (six transistors) compared with the static 2:1 multiplexer (12 transistors), leads to decreases in the area usage and delay of the skip logic[3],[4]. In addition, except for the first RCA block, this means that $(Q - 1)$ FAs in the conventional structure are replaced with the same number of HAs in the suggested structure decreasing the area usage (Fig-2). In addition, note that the proposed structure utilizes incrementation blocks that do not exist in the conventional one. Therefore, the area usage of the proposed CI-CSKA structure is decreased compared with that of the conventional one.

3.3. Stage Sizes Consideration

Similar to the Conv-CSKA structure, the proposed CI-CSKA structure may be implemented with either FSS or VSS. Here, the stage size is the same as the RCA and incrementation blocks size. In the case of the FSS (FSS-CI-CSKA), there are $Q = N/M$ stages with the size of M. The optimum value of M, which may be obtained using (1), is given by

$$M_{opt}=\sqrt{\frac{N(T_{\mathrm{AOI}}+T_{\mathrm{OAI}})}{2(T_{\mathrm{CARRY}}+T_{\mathrm{AND}}}} \qquad (1)$$

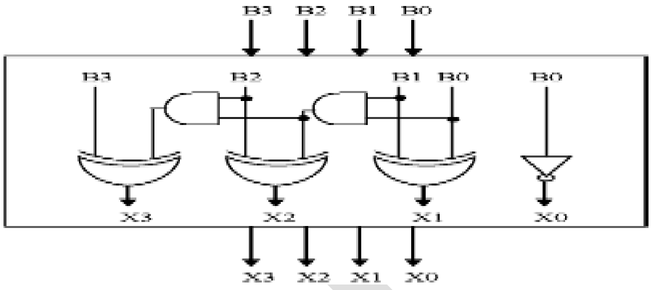
In the case of the VSS (VSS-CI-CSKA), the sizes of the stages obtained using some steps.

The size of the RCA block of the first stage is one. From the second stage to the nucleus stage, the size of stage is increased. The increase in the size is continued until the summation of all the sizes up to this stage becomes larger than $N/2$. The size of the last stage is one, and its RCA block contains a HA.

4. Proposed Area Efficient CSKA Structure

The basic work is to use Binary to Excess-1 Converter (BEC) in the CI-CSKA to get lower area and improved speed of operation. This logic is replaced in RCA with Cin=1. This logic can be implemented for different bits which are used in the modified design. The major advantage of this BEC logic comes from the fact that it uses lesser number of logic gates than the n-bit Full Adder (FA) structure. As stated above the main idea of this work is to use BEC instead of the RCA with Cin=1 in order to decrease the area and increase the speed of operation in the regular CSKA to obtain modified CSKA. To replace the n-bit RCA, an n+1 bit BEC logic is required. The structure and the function table of a 4-bit BEC are shown in Figure 4 respectively.

Fig-4: Structure of the 4-Bit BEC



B[3:0]	X[3:0]
0000	0001
0001	0010
.	.
.	.
1110	1111
1111	0000

Fig-5: Function Table of 4-Bit BEC

Figure 5 shows the CI-CSKA structure with the modified ripple carry adder which consists of BEC. It is used instead of the RCA with Cin=1.

5. RESULT

5.1 Comparison of Different Parameters

Simulation was performed using the TANNER tool. Power and delay were directly obtained from software and area was measured in terms of number of transistors used in design.

Table -1: Comparison among different structures

Different structure/ Parameter	**Conv- CSKA**	**CI-CSKA**	**Hybrid Variable Latency CSKA**
Power(mW)	0.50	0.49	0.48
Delay(ns)	30.5	29.3	27.3
Area(transistor count)	1624	1762	1752

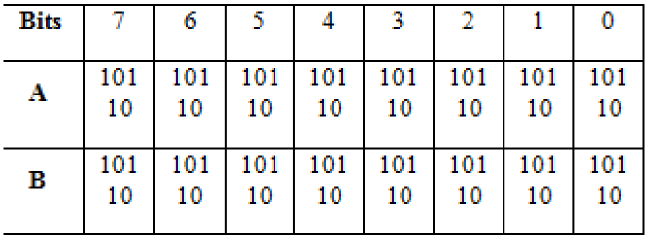
From this table we can conclude that the proposed area efficient CSKA consumes less power when compared to the other structures. The analysis also shows that the area is minimized.

5.2 Simulation Results

Using tanner software the output analysis for various structures of carry skip adder was obtained and it is shown in figure.

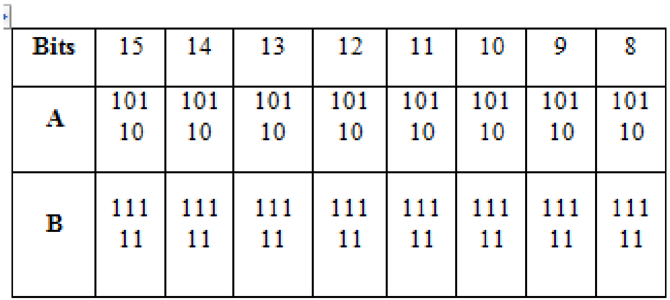
The input patterns applied to the carry skip adder structures are tabulated in table -2, 3, 4 and 5. By using these inputs the sum and carry values are generated.

Table-2: Input pattern of A and B



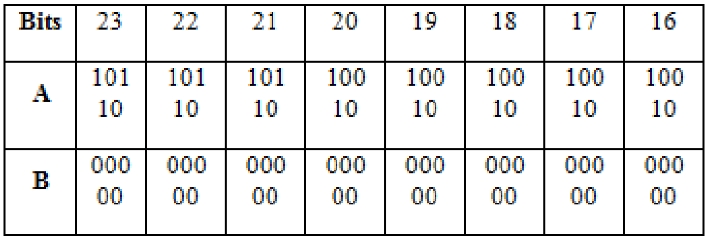
Bits	7	6	5	4	3	2	1	0
A	10110	10110	10110	10110	10110	10110	10110	10110
B	10110	10110	10110	10110	10110	10110	10110	10110

Table-3: Input pattern of A and B



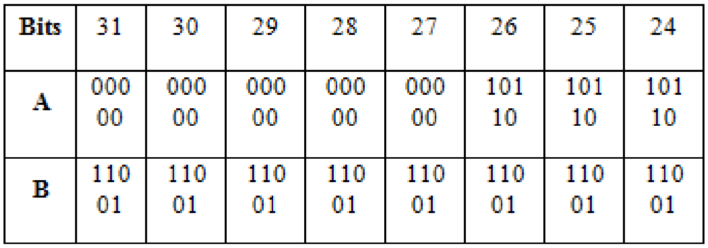
Bits	15	14	13	12	11	10	9	8
A	10110	10110	10110	10110	10110	10110	10110	10110
B	11111	11111	11111	11111	11111	11111	11111	11111

Table-4: Input pattern of A and B



Bits	23	22	21	20	19	18	17	16
A	10110	10110	10110	10010	10010	10010	10010	10010
B	00000	00000	00000	00000	00000	00000	00000	00000

Table 7.4: Input pattern of A and B



Bits	31	30	29	28	27	26	25	24
A	00000	00000	00000	00000	00000	10110	10110	10110
B	11001	11001	11001	11001	11001	11001	11001	11001

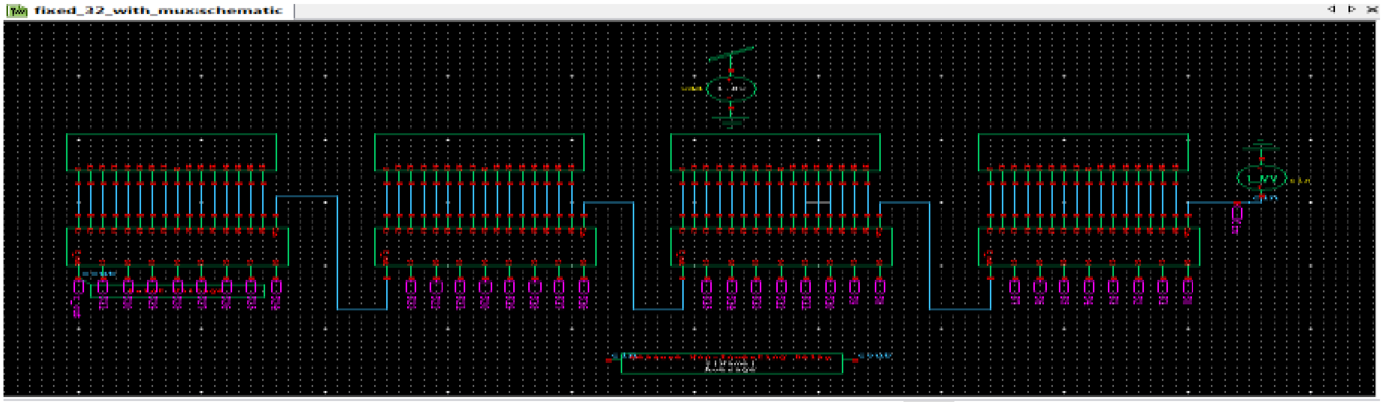


Fig -6: Conventional CSKA

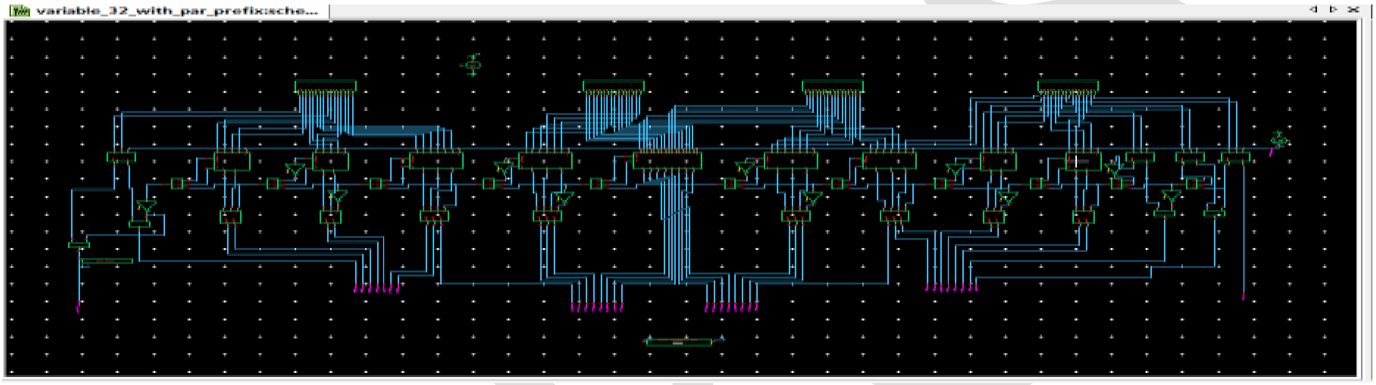


Fig -7: CI-CSKA. Stage size LSB to MSB {1,1,1,2,2,3,3,8,2,2,1}

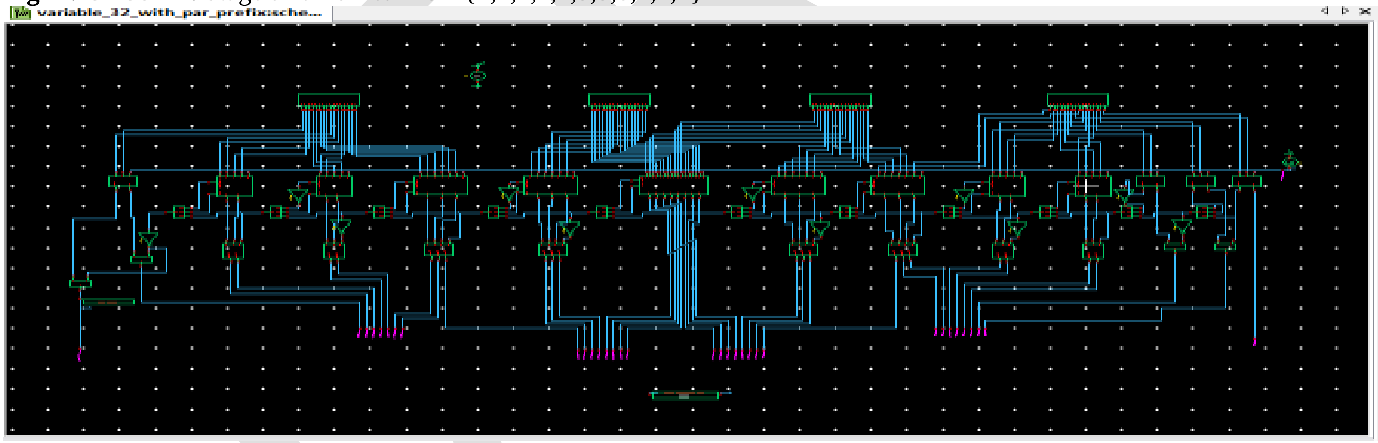


Fig -8: Proposed Area Efficient 32-bit CSKA

CONCLUSION

A simple approach is proposed in this paper to reduce the area and power of CSKA architecture. The reduced number of gates of this work offers the great advantage in the reduction of area and also the total power. The compared results show that the modified CSKA has a slightly larger delay (only 0.5%), but the area and power of the 32-bit modified CSKA are significantly reduced by 18.7% and 87% respectively. The modified CSKA architecture is therefore, low area, low power, simple and efficient for VLSI hardware implementation.

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INSTALLATION & CONFIGURATION – SSO

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Abstract— This paper is a case study on a project to provide the installation and configuration to Single Sign On **(SSO**) solution to web based **application**s that use the mainframe as the data store.

It is a session/user **authentication** process that permits a user to enter one name and **password** in order to access multiple **application**s. Conversely it is the property whereby a single action of signing out may terminates access to multiple software systems.

This paper begins with a thorough description of the high level business requirements project to provide the installation and configuration to Single Sign On **(SSO**) solution to web based **application**s that use the mainframe as the data store.

Keywords— **SSO**, **password**, **authentication**, **replication**, **application**, **installer, Admin**

INTRODUCTION

Single sign-on (**SSO**) is a method of access control that enables a user to log in once and gain access to the resources of multiple software systems without being prompted to log in again (enter Id and **password**) thus this may consume less time.[1] "Single sign-on (**SSO**) is a session/user **authentication** process that permits a user to enter one name and **password** in order to access multiple **applications**. The process authenticates the user for all the **application**s they have been given rights to and eliminates further prompts when they switch **application**s during a particular session."[2]

Single Sign-On (**SSO**) is a key feature of the Enterprise Portal that eases user interaction with the many component systems available to the user in a portal environment. Once the user is authenticated to the enterprise portal, he/she can use the portal, to access external **application**s. With **SSO** in the Enterprise Portal, the user can access different systems and **application**s without having to repeatedly enter his or her user information for **authentication**.

RELATED WORK

- Configuring Single Sign-On using fusion middleware **Admin**istrator's guide for oracle WebCenter. [15]
- Setting up ADFS and enabling Single Sign-On to office 365
- Identity and access management solution
- Identify infrastructure for development
- Protocol and **SSO** client/server architecture [16]

WHY SHOULD WE USE SSO

- A Typical net user needs at least nine **password**s.[3]
- 30% never change **password**s, 29% less than once a year.

- 70% have forgotten a **password** at least once[4]
- 35% of people use the same **password** for multiple apps.
- 60% of people cycle two **password**s across all applications.

INSTALLATION &CONFIGURATION OF CA SITEMINDER ADMINISTRATIVE UI(WAMUI)

Administrative UI Prerequisite Installation

The installation is done using a generic account i.e "**smuser**". The "**root**" user privilege is used to unzip the **Admin**istrative UI Prerequisite **Installer** and WAM UI binaries.[5]

Login to Linux server and copy **Admin**istrative UI Prerequisite **installer** under the path say :

root@spado # /var/WAMUI_Installable

Change the permission of the files as shown in the below screenshot:

root@spado # chmod 755 adminui-pre-req-12.52-sp01-cr02-linux.bin

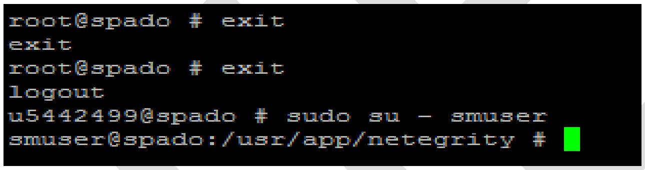
root@spado # chmod 755 ca-adminui-12.52-sp01-cr02-linux.bin

```
root@spado # chmod 755 adminui-pre-req-12.52-sp01-cr02-linux.bin
root@spado #
```

Screen1: Change permission of the files

Exit from the current user and switch to "smuser" as shown in the screenshot:

u5127488@spado # sudo su - smuser

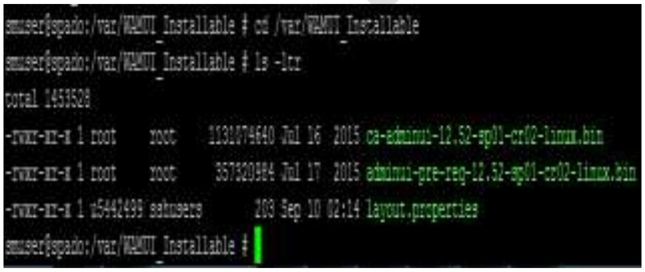


```
root@spado # exit
exit
root@spado # exit
logout
u5442499@spado # sudo su - smuser
smuser@spado:/usr/app/netegrity #
```

Screen2: Exit from the current user and switch to "smuser"

Navigate to the installation path

smuser@spado: /var/WAMUI_Installable

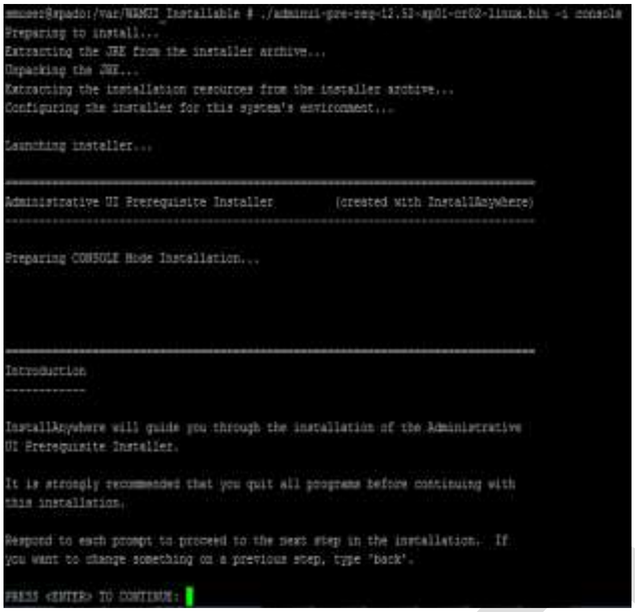


```
smuser@spado:/var/WAMUI_Installable # cd /var/WAMUI_Installable
smuser@spado:/var/WAMUI_Installable # ls -ltr
total 1453528
-rwxr-xr-x 1 root     root     1131074640 Jul 16  2015 ca-adminui-12.52-sp01-cr02-linux.bin
-rwxr-xr-x 1 root     root      357320984 Jul 17  2015 adminui-pre-req-12.52-sp01-cr02-linux.bin
-rwxr-xr-x 1 u5442499 smusers         203 Sep 10 02:14 layout.properties
smuser@spado:/var/WAMUI_Installable #
```

Screen3: Navigation to the installation path

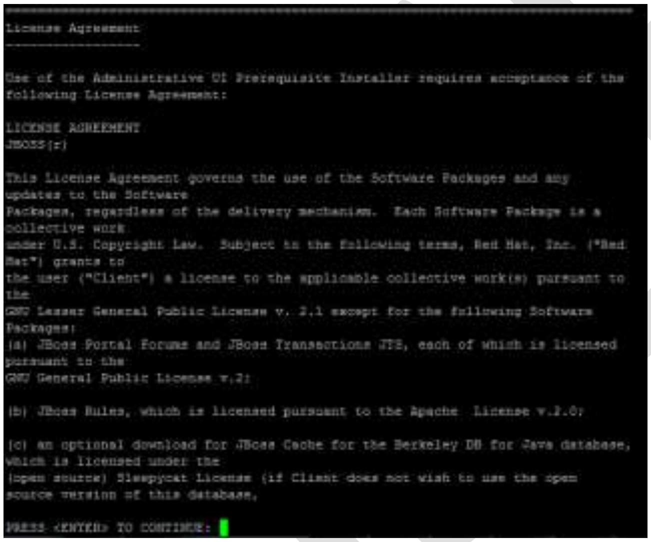
Run the following command from /var/WAMUI_Installable as shown in the below screenshot to start the **Admin**istrative UI Prerequisite installation[6]

./**admin**ui-pre-req-12.52-sp01-cr02-linux.bin -i console



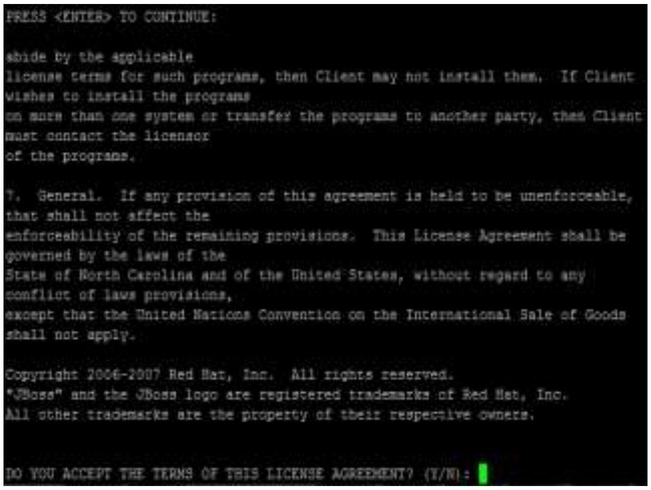
```
smuser@spado:/var/WAMUI_Installable # ./adminui-pre-req-12.52-sp01-cr02-linux.bin -i console
Preparing to install...
Extracting the JRE from the installer archive...
Unpacking the JRE...
Extracting the installation resources from the installer archive...
Configuring the installer for this system's environment...

Launching installer...

===============================================================================
Administrative UI Prerequisite Installer         (created with InstallAnywhere)
-------------------------------------------------------------------------------

Preparing CONSOLE Mode Installation...




===============================================================================
Introduction
------------

InstallAnywhere will guide you through the installation of the Administrative
UI Prerequisite Installer.

It is strongly recommended that you quit all programs before continuing with
this installation.

Respond to each prompt to proceed to the next step in the installation.  If
you want to change something on a previous step, type 'back'.

PRESS <ENTER> TO CONTINUE:
```

Press enter to accept the License Agreement and continue with the installation as shown in the below screenshot



```
===============================================================================
License Agreement
-----------------

Use of the Administrative UI Prerequisite Installer requires acceptance of the
following License Agreement:

LICENSE AGREEMENT
JBOSS(r)

This License Agreement governs the use of the Software Packages and any
updates to the Software
Packages, regardless of the delivery mechanism.  Each Software Package is a
collective work
under U.S. Copyright Law.  Subject to the following terms, Red Hat, Inc. ("Red
Hat") grants to
the user ("Client") a license to the applicable collective work(s) pursuant to
the
GNU Lesser General Public License v. 2.1 except for the following Software
Packages:
(a) JBoss Portal Forums and JBoss Transactions JTS, each of which is licensed
pursuant to the
GNU General Public License v.2;

(b) JBoss Rules, which is licensed pursuant to the Apache  License v.2.0;

(c) an optional download for JBoss Cache for the Berkeley DB for Java database,
which is licensed under the
(open source) Sleepycat License (if Client does not wish to use the open
source version of this database,

PRESS <ENTER> TO CONTINUE:
```

Screen4: acceptance License Agreement



```
PRESS <ENTER> TO CONTINUE:

abide by the applicable
license terms for such programs, then Client may not install them.  If Client
wishes to install the programs
on more than one system or transfer the programs to another party, then Client
must contact the licensor
of the programs.

7.  General.  If any provision of this agreement is held to be unenforceable,
that shall not affect the
enforceability of the remaining provisions.  This License Agreement shall be
governed by the laws of the
State of North Carolina and of the United States, without regard to any
conflict of laws provisions,
except that the United Nations Convention on the International Sale of Goods
shall not apply.

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All other trademarks are the property of their respective owners.


DO YOU ACCEPT THE TERMS OF THIS LICENSE AGREEMENT? (Y/N):
```
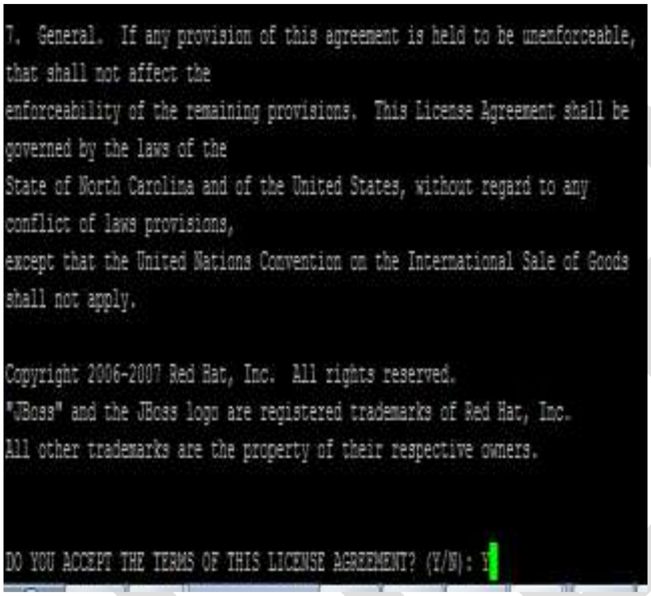

Screen5: accept the License Agreement

Type the command: **Y** under the license agreement page to accept the License Agreement and continue further. See below the below screenshot



```
7.  General.  If any provision of this agreement is held to be unenforceable,
that shall not affect the
enforceability of the remaining provisions.  This License Agreement shall be
governed by the laws of the
State of North Carolina and of the United States, without regard to any
conflict of laws provisions,
except that the United Nations Convention on the International Sale of Goods
shall not apply.

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"JBoss" and the JBoss logo are registered trademarks of Red Hat, Inc.
All other trademarks are the property of their respective owners.


DO YOU ACCEPT THE TERMS OF THIS LICENSE AGREEMENT? (Y/N): Y
```

Screen6: the command: Y under the license agreement page to accept the License Agreement

Select the default Installation Folder /usr/app/netegrity/CA location for installing the **Admin**istrative UI Server as shown in the below screenshot.[7]

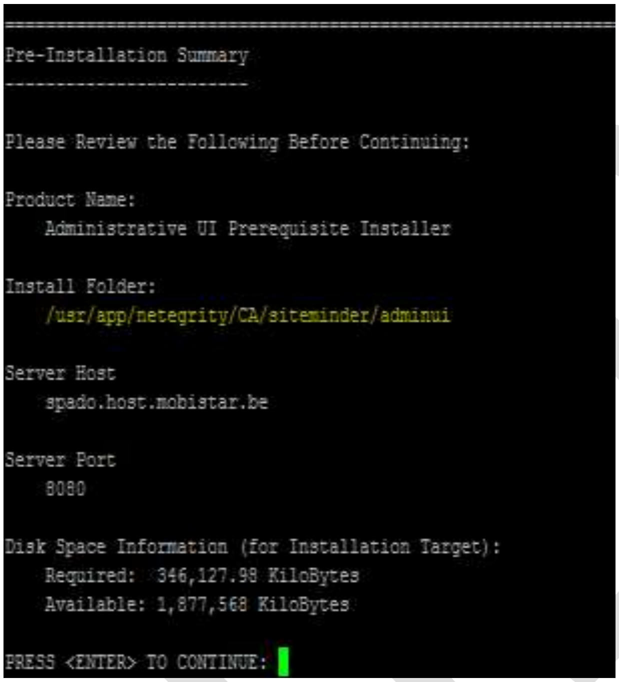
```
===============================================================================
Supply Installation Parameters
------------------------------

Please supply the installation folder, fully qualified host name and port
number to be used for installing the Administrative UI Server.
For example: servername.domain

Where would you like to install? (Default: /usr/app/netegrity/CA): /usr/app/netegrity/CA
```

Screen7: the default Installation Folder location for installing the Administrative UI Server

```
===============================================================================

Supply Installation Parameters
------------------------------


Please supply the installation folder, fully qualified host name and port
number to be used for installing the Administrative UI Server.
For example: servername.domain

Where would you like to install? (Default: /usr/app/netegrity/CA): /usr/app/netegrity/CA

Server Name: (Default: spado.host.mobistar.be):

JBoss Port: (Default: 8080):
```

Screen8: Supply Installation formalities

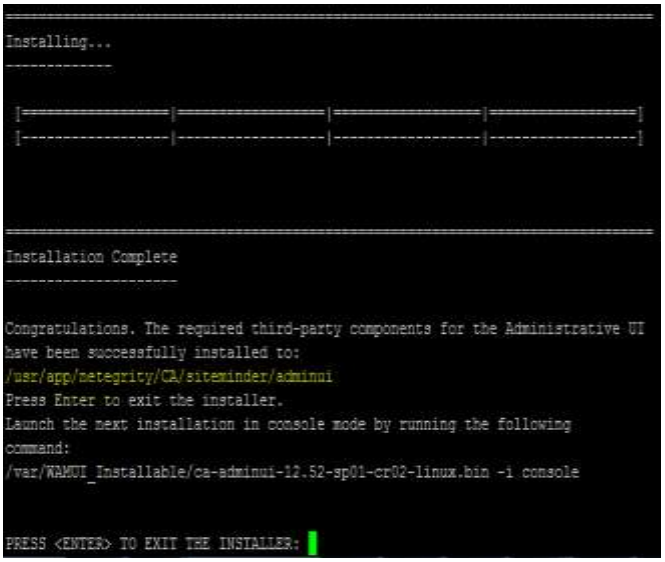
Check the Pre-Installation Summary and press <**Enter**> to continue as shown in the below screenshot.



```
===============================================================================
Pre-Installation Summary
------------------------

Please Review the Following Before Continuing:

Product Name:
    Administrative UI Prerequisite Installer

Install Folder:
    /usr/app/netegrity/CA/siteminder/adminui

Server Host
    spado.host.mobistar.be

Server Port
    8080

Disk Space Information (for Installation Target):
    Required:  346,127.98 KiloBytes
    Available: 1,877,568 KiloBytes

PRESS <ENTER> TO CONTINUE:
```

Screen9: Pre-Installation Summary

The **Admin** UI Prerequisite installation is completed successfully under the path **/usr/app/netegrity/CA/siteminder/adminui**



```
===============================================================================
Installing...
-------------

 [==================|==================|==================|==================]
 [------------------|------------------|------------------|------------------]



===============================================================================
Installation Complete
---------------------

Congratulations. The required third-party components for the Administrative UI
have been successfully installed to:
/usr/app/netegrity/CA/siteminder/adminui
Press Enter to exit the installer.
Launch the next installation in console mode by running the following
command:
/var/WAMUI_Installable/ca-adminui-12.52-sp01-cr02-linux.bin -i console


PRESS <ENTER> TO EXIT THE INSTALLER:
```

Screen10: The Admin UI Prerequisite installation is completed as shown above

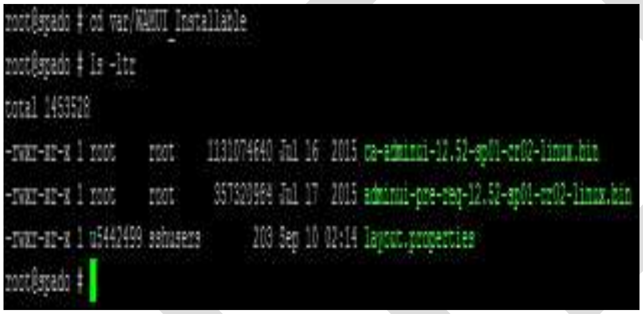
Administrative UI (WAM) Installation

Login to Linux server and copy **Admini** UI **installer** under the path say [8]

root@spado # cd /var/WAMUI_Installable

Change the permission of the files as shown in the below screenshot.

root@spado # chmod 755 ca-adminui-12.52-sp01-cr02-linux.bin

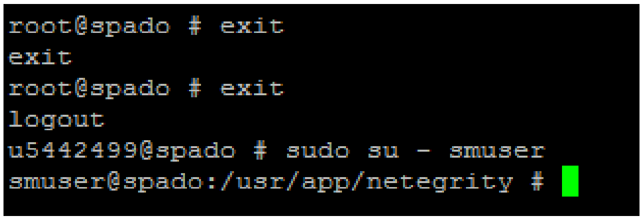


```
root@spado # cd var/WAMUI_Installable
root@spado # ls -ltr
total 1453528
-rwxr-xr-x 1 root     root     1131074640 Jul 16  2015 ca-adminui-12.52-sp01-cr02-linux.bin
-rwxr-xr-x 1 root     root      357320984 Jul 17  2015 adminui-pre-req-12.52-sp01-cr02-linux.bin
-rwxr-xr-x 1 u5442499 smusers         203 Sep 10 02:14 layout.properties
root@spado #
```

Screen11: Change the permission of the files as shown in the below screenshot.

Exit from the current user and switch to "**smuser**" as shown in the screenshot

u5127488@spado # sudo su - smuser

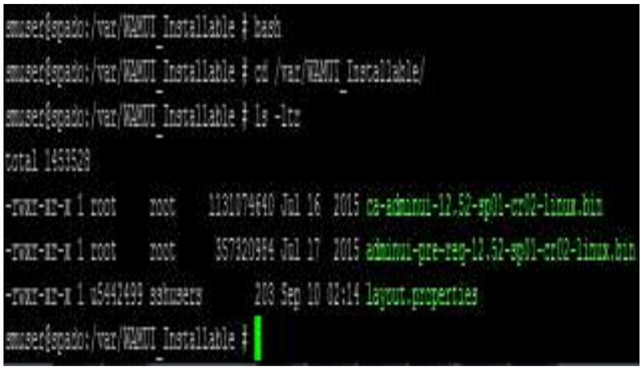


```
root@spado # exit
exit
root@spado # exit
logout
u5442499@spado # sudo su - smuser
smuser@spado:/usr/app/netegrity #
```

Screen12: Exit from the current user and switch to "smuser" as shown

Navigate to the installation path

smuser@spado: cd /usr/app/CA_WAMUI_Installable

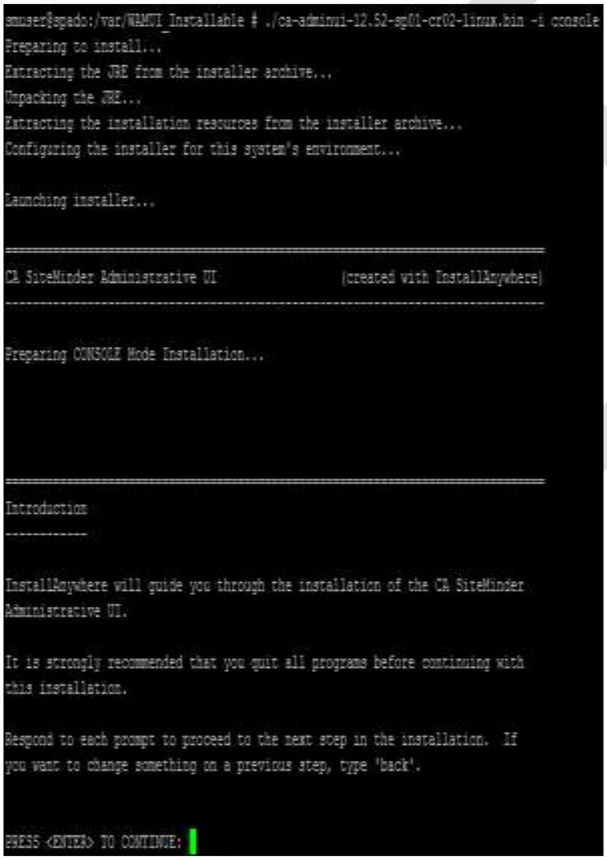


```
smuser@spado:/var/WAMUI_Installable # bash
smuser@spado:/var/WAMUI_Installable # cd /var/WAMUI_Installable/
smuser@spado:/var/WAMUI_Installable # ls -ltr
total 1453528
-rwxr-xr-x 1 root    root    1131074640 Jul 16  2015 ca-adminui-12.52-sp01-cr02-linux.bin
-rwxr-xr-x 1 root    root     357320984 Jul 17  2015 adminui-pre-req-12.52-sp01-cr02-linux.bin
-rwxr-xr-x 1 u5442499 sshusers       203 Sep 10 02:14 layout.properties
smuser@spado:/var/WAMUI_Installable #
```

Screen13: Navigate to the installation path

Run the following command from /var/WAMUI_Installable as shown in the below screenshot to start the CA Siteminder **Admin**istrative UI (WAM UI) installation.[9]

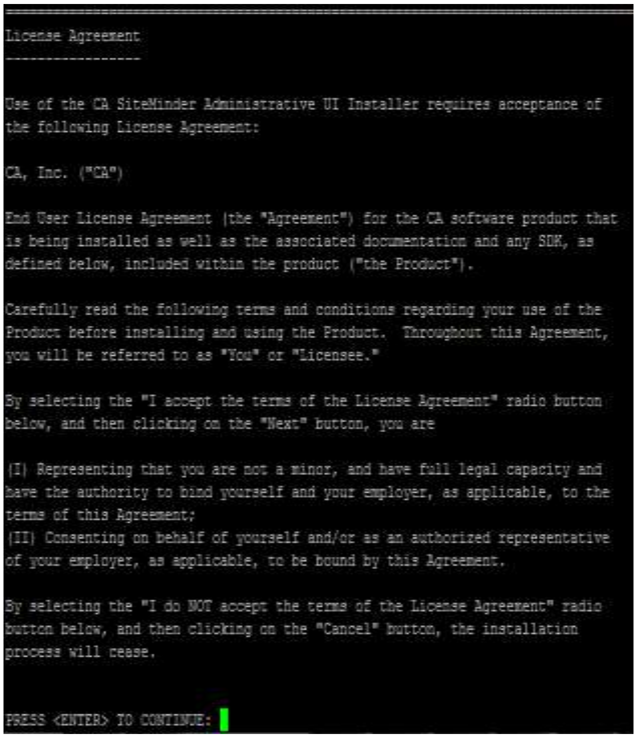
./ca-adminui-12.52-sp01-cr02-linux.bin -i console



```
smuser@spado:/var/WAMUI_Installable # ./ca-adminui-12.52-sp01-cr02-linux.bin -i console
Preparing to install...
Extracting the JRE from the installer archive...
Unpacking the JRE...
Extracting the installation resources from the installer archive...
Configuring the installer for this system's environment...

Launching installer...

===============================================================================
CA SiteMinder Administrative UI                  (created with InstallAnywhere)
-------------------------------------------------------------------------------

Preparing CONSOLE Mode Installation...




===============================================================================
Introduction
------------

InstallAnywhere will guide you through the installation of the CA SiteMinder
Administrative UI.

It is strongly recommended that you quit all programs before continuing with
this installation.

Respond to each prompt to proceed to the next step in the installation.  If
you want to change something on a previous step, type 'back'.


PRESS <ENTER> TO CONTINUE:
```

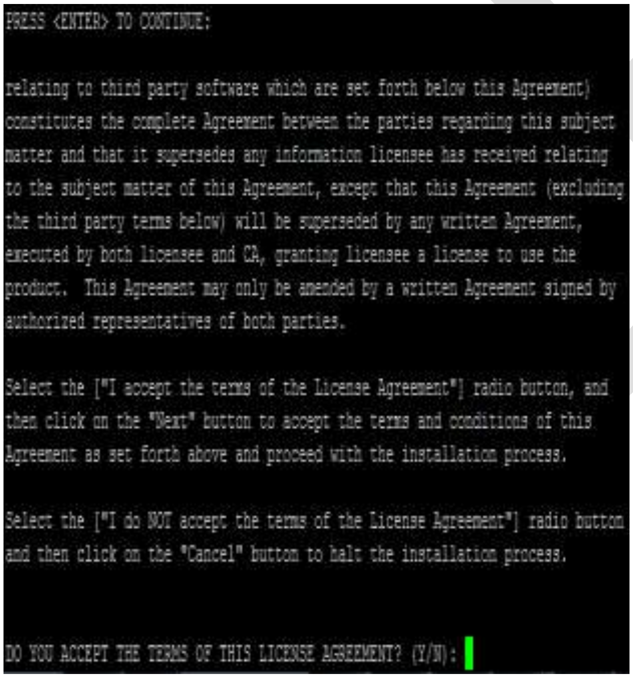
Screen14: start the CA Siteminder Administrative UI (WAM UI) installation

Press enter to accept the License Agreement and continue with the installation as shown in the below screenshot



```
===============================================================================
License Agreement
-----------------

Use of the CA SiteMinder Administrative UI Installer requires acceptance of
the following License Agreement:

CA, Inc. ("CA")

End User License Agreement (the "Agreement") for the CA software product that
is being installed as well as the associated documentation and any SDK, as
defined below, included within the product ("the Product").

Carefully read the following terms and conditions regarding your use of the
Product before installing and using the Product.  Throughout this Agreement,
you will be referred to as "You" or "Licensee."

By selecting the "I accept the terms of the License Agreement" radio button
below, and then clicking on the "Next" button, you are

(I) Representing that you are not a minor, and have full legal capacity and
have the authority to bind yourself and your employer, as applicable, to the
terms of this Agreement;
(II) Consenting on behalf of yourself and/or as an authorized representative
of your employer, as applicable, to be bound by this Agreement.

By selecting the "I do NOT accept the terms of the License Agreement" radio
button below, and then clicking on the "Cancel" button, the installation
process will cease.


PRESS <ENTER> TO CONTINUE:
```

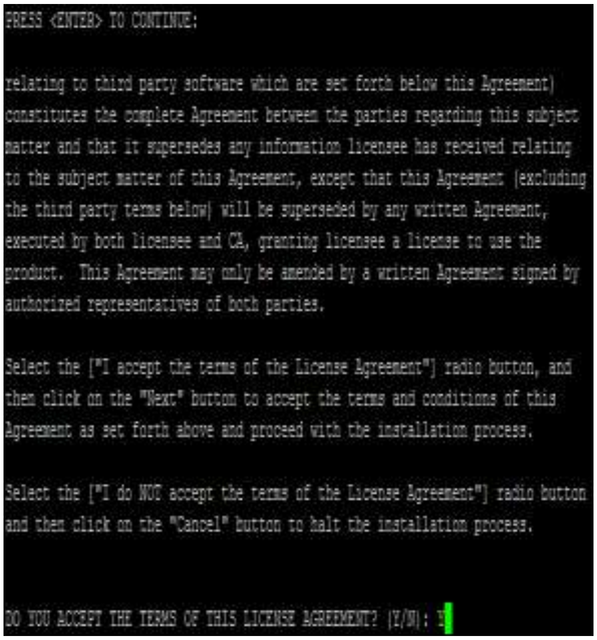
Screen15: acceptance License Agreement



```
PRESS <ENTER> TO CONTINUE:

relating to third party software which are set forth below this Agreement)
constitutes the complete Agreement between the parties regarding this subject
matter and that it supersedes any information licensee has received relating
to the subject matter of this Agreement, except that this Agreement (excluding
the third party terms below) will be superseded by any written Agreement,
executed by both licensee and CA, granting licensee a license to use the
product.  This Agreement may only be amended by a written Agreement signed by
authorized representatives of both parties.

Select the ["I accept the terms of the License Agreement"] radio button, and
then click on the "Next" button to accept the terms and conditions of this
Agreement as set forth above and proceed with the installation process.

Select the ["I do NOT accept the terms of the License Agreement"] radio button
and then click on the "Cancel" button to halt the installation process.


DO YOU ACCEPT THE TERMS OF THIS LICENSE AGREEMENT? (Y/N):
```

Screen16: accept the License Agreement

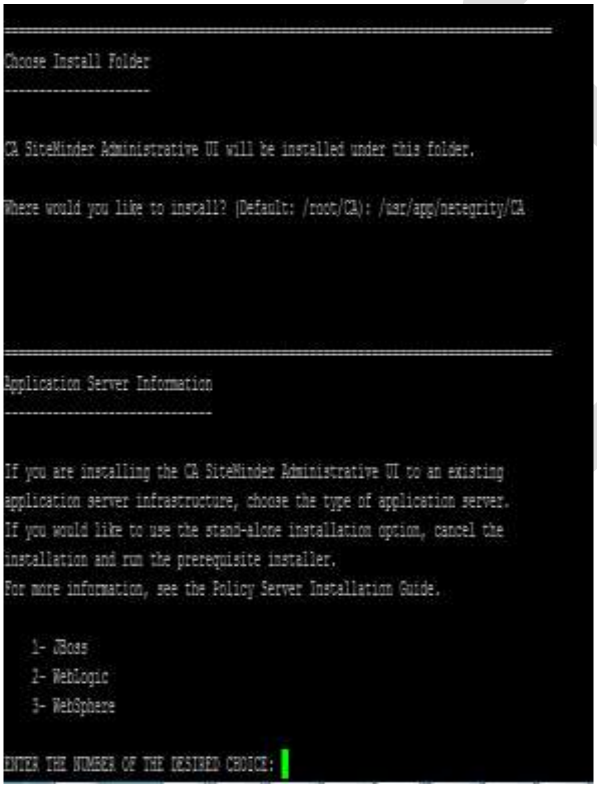
Type the command: **Y** under the license agreement page to accept the License Agreement and continue further. See below the below screenshot.



```
PRESS <ENTER> TO CONTINUE:

relating to third party software which are set forth below this Agreement)
constitutes the complete Agreement between the parties regarding this subject
matter and that it supersedes any information licensee has received relating
to the subject matter of this Agreement, except that this Agreement (excluding
the third party terms below) will be superseded by any written Agreement,
executed by both licensee and CA, granting licensee a license to use the
product.  This Agreement may only be amended by a written Agreement signed by
authorized representatives of both parties.

Select the ["I accept the terms of the License Agreement"] radio button, and
then click on the "Next" button to accept the terms and conditions of this
Agreement as set forth above and proceed with the installation process.

Select the ["I do NOT accept the terms of the License Agreement"] radio button
and then click on the "Cancel" button to halt the installation process.


DO YOU ACCEPT THE TERMS OF THIS LICENSE AGREEMENT? (Y/N): Y
```

Screen17: accept the License Agreement and continue

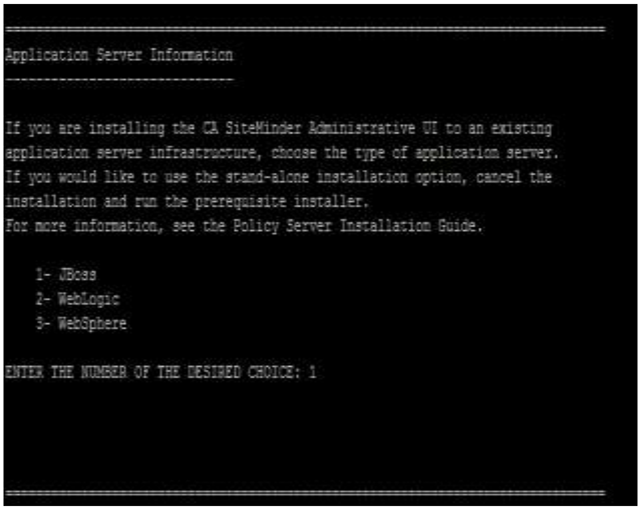
Choose the installation path /usr/app/netegrity/CA for CA Siteminder Aministrative UI installation.



```
===============================================================================
Choose Install Folder
--------------------


CA SiteMinder Administrative UI will be installed under this folder.

Where would you like to install? (Default: /root/CA): /usr/app/netegrity/CA





===============================================================================
Application Server Information
------------------------------


If you are installing the CA SiteMinder Administrative UI to an existing
application server infrastructure, choose the type of application server.
If you would like to use the stand-alone installation option, cancel the
installation and run the prerequisite installer.
For more information, see the Policy Server Installation Guide.


    1- JBoss
    2- WebLogic
    3- WebSphere

ENTER THE NUMBER OF THE DESIRED CHOICE:
```

Screen18: the installation path for CA Siteminder Aministrative UI installation

Select JBOSS as the **Application** Server by pressing 1 and continue with the installation.



```
===============================================================================
Application Server Information
------------------------------

If you are installing the CA SiteMinder Administrative UI to an existing
application server infrastructure, choose the type of application server.
If you would like to use the stand-alone installation option, cancel the
installation and run the prerequisite installer.
For more information, see the Policy Server Installation Guide.

    1- JBoss
    2- WebLogic
    3- WebSphere

ENTER THE NUMBER OF THE DESIRED CHOICE: 1



===============================================================================
```

Screen19: Select JBOSS as the Application Server by pressing 1 and continue with the installation

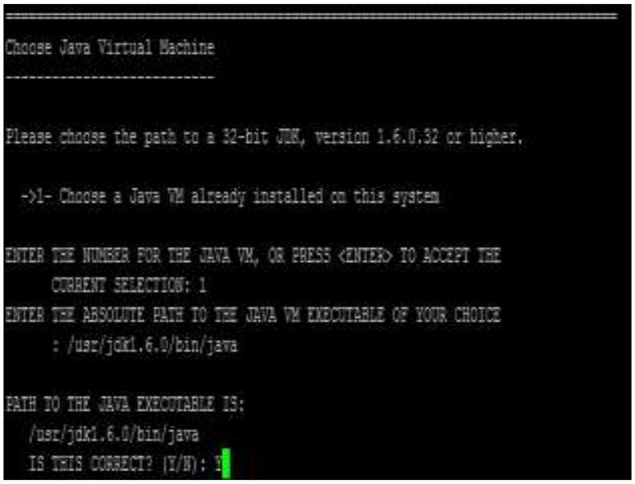
Check the **Application** Server Information as shown in the below screenshot. Select the JBoss Folder path **/usr/app/netegrity/CA/siteminder/adminui**

```
===============================================================================
Application Server Information
------------------------------

Please enter the following information:
- JBoss Folder: Full path to the directory where a supported JBoss application
server is installed
- App Server URL: Complete URL.
  For example: http://servername.domain:port

JBoss Folder (no spaces): (Default: /root/jboss-5.1.0): /usr/app/netegrity/CA/siteminder/adminui

App Server URL (including port): (Default: http://spado.host.mobistar.
  be:8080):
```

Screen20: Check the Application Server Information as shown

.

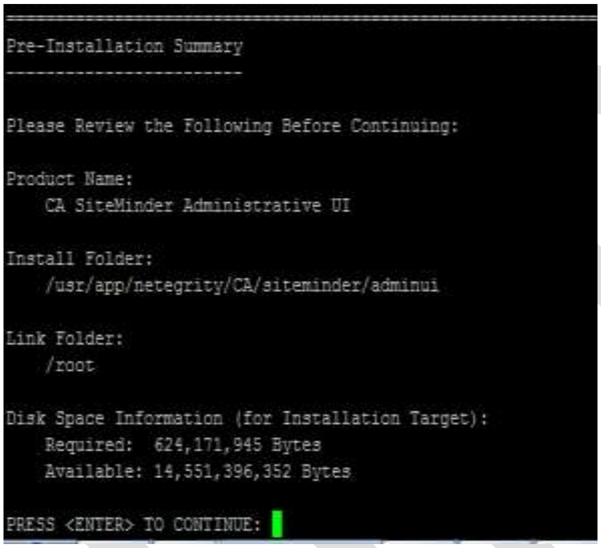
Choose the Java virtual Machine already installed on the system by selecting 1 as shown in the below screenshot.



```
===============================================================================
Choose Java Virtual Machine
-------------------------

Please choose the path to a 32-bit JDK, version 1.6.0.32 or higher.

  ->1- Choose a Java VM already installed on this system

ENTER THE NUMBER FOR THE JAVA VM, OR PRESS <ENTER> TO ACCEPT THE
      CURRENT SELECTION: 1
ENTER THE ABSOLUTE PATH TO THE JAVA VM EXECUTABLE OF YOUR CHOICE
      : /usr/jdk1.6.0/bin/java

PATH TO THE JAVA EXECUTABLE IS:
   /usr/jdk1.6.0/bin/java
   IS THIS CORRECT? (Y/N): Y
```

Screen21: Choose the Java virtual Machine already installed on the system by selecting 1 as shown

Check the Pre-Installation Summary and press <**Enter**> to continue as shown in the below screenshot.



```
===============================================================================
Pre-Installation Summary
------------------------

Please Review the Following Before Continuing:

Product Name:
    CA SiteMinder Administrative UI

Install Folder:
    /usr/app/netegrity/CA/siteminder/adminui

Link Folder:
    /root

Disk Space Information (for Installation Target):
    Required:  624,171,945 Bytes
    Available: 14,551,396,352 Bytes

PRESS <ENTER> TO CONTINUE:
```

Screen22: Check the Pre-Installation Summary and press <Enter> to continue as shown

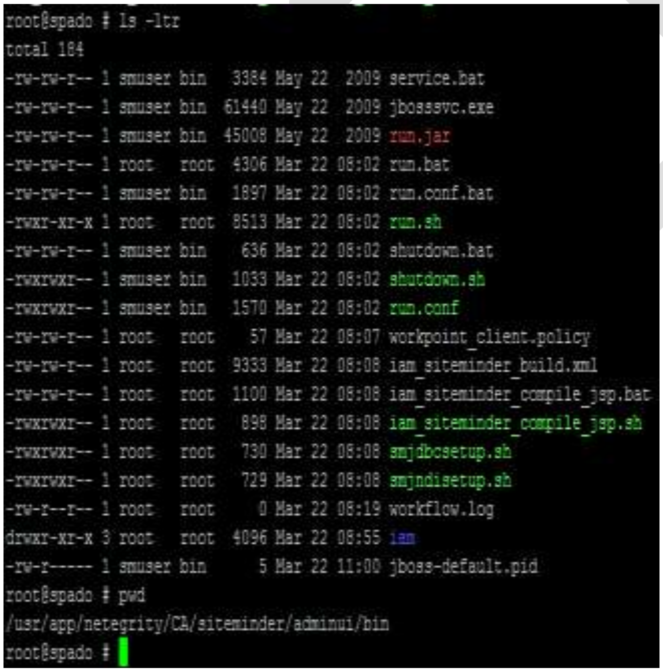
The **Admin** UI Prerequisite installation is completed successfully under the path **/usr/app/netegrity/CA/siteminder/adminui**

```
===============================================================================
Installing...
------------


 [==================|==================|==================|==================]
 [------------------|------------------|------------------|------------------]




===============================================================================
Installation Complete
---------------------


Congratulations. CA SiteMinder Administrative UI has been successfully
installed.

Install information and uninstaller can be found in
/usr/app/netegrity/CA/siteminder/adminui/install_config_info


PRESS <ENTER> TO EXIT THE INSTALLER:
```

Screen23: The Admin UI Prerequisite installation is completed successfully under the path

Run the above command. Start the JBOSS Server from /usr/app/netegrity/CA/siteminder/**admin**ui/bin by running the below command. [10]

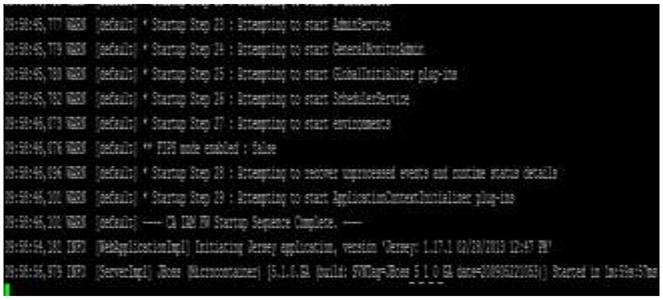
root@spado #./run.sh -b spado.host.mobistar.be



```
root@spado # ls -ltr
total 184
-rw-rw-r-- 1 smuser bin   3384 May 22  2009 service.bat
-rw-rw-r-- 1 smuser bin  61440 May 22  2009 jbosssvc.exe
-rw-rw-r-- 1 smuser bin  45008 May 22  2009 run.jar
-rw-rw-r-- 1 root   root  4306 Mar 22 08:02 run.bat
-rw-rw-r-- 1 smuser bin   1897 Mar 22 08:02 run.conf.bat
-rwxr-xr-x 1 root   root  8513 Mar 22 08:02 run.sh
-rw-rw-r-- 1 smuser bin    636 Mar 22 08:02 shutdown.bat
-rwxrwxr-- 1 smuser bin   1033 Mar 22 08:02 shutdown.sh
-rwxrwxr-- 1 smuser bin   1570 Mar 22 08:02 run.conf
-rw-rw-r-- 1 root   root    57 Mar 22 08:07 workpoint_client.policy
-rw-rw-r-- 1 root   root  9333 Mar 22 08:08 iam_siteminder_build.xml
-rw-rw-r-- 1 root   root  1100 Mar 22 08:08 iam_siteminder_compile_jsp.bat
-rwxrwxr-- 1 root   root   898 Mar 22 08:08 iam_siteminder_compile_jsp.sh
-rwxrwxr-- 1 root   root   730 Mar 22 08:08 smjdbcsetup.sh
-rwxrwxr-- 1 root   root   729 Mar 22 08:08 smjndisetup.sh
-rw-r--r-- 1 root   root     0 Mar 22 08:19 workflow.log
drwxr-xr-x 3 root   root  4096 Mar 22 08:55 iam
-rw-r----- 1 smuser bin      5 Mar 22 11:00 jboss-default.pid
root@spado # pwd
/usr/app/netegrity/CA/siteminder/adminui/bin
root@spado #
```

Screen24: Start the JBOSS Server

The below screenshot shows that JBOSS Server is up and running.



Screen25: that JBOSS Server is up and running.

Execute the below script from the CA Siteminder installation directory

root@sorel:/usr/app/netegrity/CA/siteminder#./ca_ps_env.ksh

Screen26: Execute the below script from the CA Siteminder installation directory

Check the policy server is up and running under the path **/usr/app/netegrity/CA/siteminder**

We can also check the Policy Server process by using the below command :

root@sorel: ps –ef | grep smexec

```
root@sorel # ps -ef | grep smexec
root     10641     1  0 11:54 ?        00:00:00 /usr/app/netegrity/CA/siteminder/bin/smexec
root     28345 11737  0 17:04 pts/0    00:00:00 grep smexec
root@sorel # pwd
/usr/app/netegrity/CA/siteminder/bin
root@sorel #
```

Screen27: Check the policy server is up and running under the path

Execute the XPSRegClient utility from **/usr/app/netegrity/CA/siteminder/bin** to supply the super user account name (siteminder) and **password** (*********). The Policy Server uses these credentials to verify that the registration request is valid and that the trusted relationship can be established.[11]

root@sorel: # ./XPSRegClient siteminder:******* -adminui-setup -vT**

```
root@sorel # ./XPSRegClient siteminder:********* -adminui-setup -vT
```

Screen28: Policy Server uses these credentials to verify that the registration request is valid and that the trusted relationship can be established

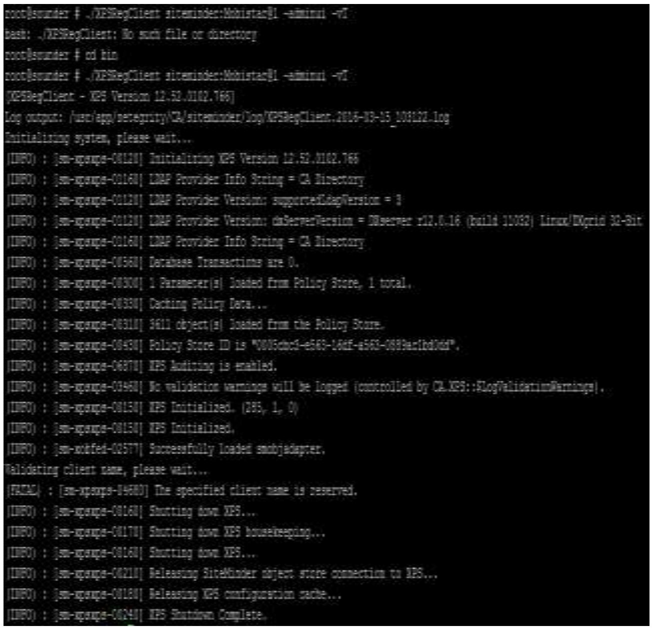
The below screenshot shows the successful execution of XPSRegClient utility.

Screen29: shows the successful execution of XPSRegClient utility

If we have run the

./XPSRegClient siteminder:******* -adminui-setup –vT** on one Policy Server and we want to register other Policy Server with the same WAMUI then run the below command on the second Policy Server :

./XPSRegClient siteminder:******* -adminui -vT**



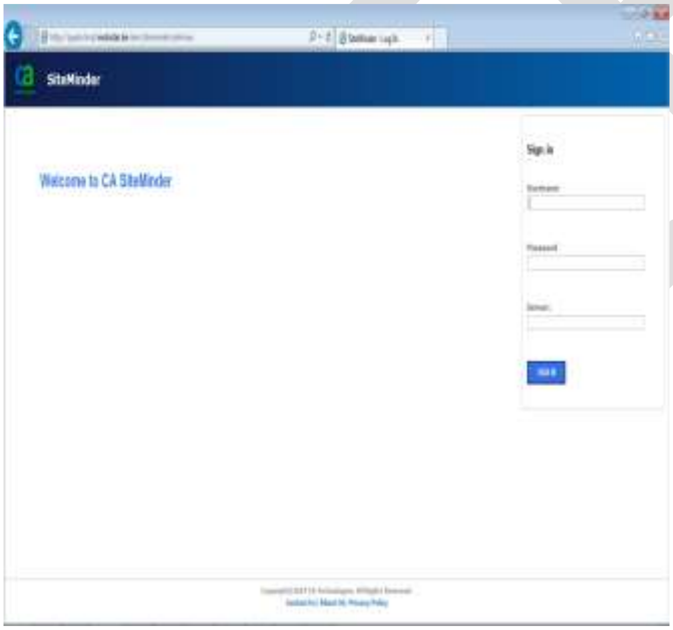
```
root@sunder # ./XPSRegClient siteminder:Mobistar@1 -adminui -vT
bash: ./XPSRegClient: No such file or directory
root@sunder # cd bin
root@sunder # ./XPSRegClient siteminder:Mobistar@1 -adminui -vT
[XPSRegClient - XPS Version 12.52.0102.766]
Log output: /usr/app/netegrity/CA/siteminder/log/XPSRegClient.2016-03-15_103122.log
Initializing system, please wait...
[INFO) : [sm-xpsxps-00120] Initializing XPS Version 12.52.0102.766
[INFO) : [sm-xpsxps-00160] LDAP Provider Info String = CA Directory
[INFO) : [sm-xpsxps-00120] LDAP Provider Version: supportedLdapVersion = 3
[INFO) : [sm-xpsxps-00120] LDAP Provider Version: dsServerVersion = DSserver r12.0.16 (build 11032) Linux/DXgrid 32-Bit
[INFO) : [sm-xpsxps-00160] LDAP Provider Info String = CA Directory
[INFO) : [sm-xpsxps-00560] Database Transactions are 0.
[INFO) : [sm-xpsxps-00300] 1 Parameter(s) loaded from Policy Store, 1 total.
[INFO) : [sm-xpsxps-00330] Caching Policy Data...
[INFO) : [sm-xpsxps-00310] 3611 object(s) loaded from the Policy Store.
[INFO) : [sm-xpsxps-00430] Policy Store ID is "0005cbc5-e563-16df-a563-0889acfbd0df".
[INFO) : [sm-xpsxps-06870] XPS Auditing is enabled.
[INFO) : [sm-xpsxps-03460] No validation warnings will be logged (controlled by CA.XPS::$LogValidationWarnings).
[INFO) : [sm-xpsxps-00150] XPS Initialized. (285, 1, 0)
[INFO) : [sm-xpsxps-00150] XPS Initialized.
[INFO) : [sm-xobfed-02577] Successfully loaded smobjadapter.
Validating client name, please wait...
[FATAL) : [sm-xpsxps-04680] The specified client name is reserved.
[INFO) : [sm-xpsxps-00160] Shutting down XPS...
[INFO) : [sm-xpsxps-00170] Shutting down XPS housekeeping...
[INFO) : [sm-xpsxps-00160] Shutting down XPS...
[INFO) : [sm-xpsxps-00210] Releasing SiteMinder object store connection to XPS...
[INFO) : [sm-xpsxps-00180] Releasing XPS configuration cache...
[INFO) : [sm-xpsxps-00240] XPS Shutdown Complete.
```

Screen30: Policy Server with the same WAMUI

LOGIN TO WAM UI BY USING URL

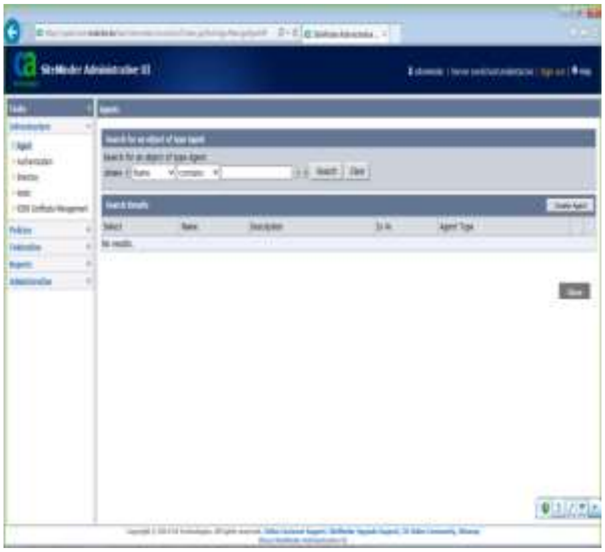
Login to WAM UI by using the URL: http://spado.host.mobistar.be/iam/siteminder/**admin**ui

Provide the username, **Password** and Server information to login to WAM UI.



Screen31: Wecome to CA siteminder

The WAM UI is shown below:



Screen32: WAM UI

Steps to configure Additional Policy Server Connections for the Administrative UI

By default, the **Admin**istrative UI is configured with a single Policy Server. You can configure additional Policy Server connections and can **admin**ister these servers from the **Admin**istrative UI.

For the **Admin**istrative UI to connect to multiple Policy Servers, use an external **admin**istrator store. An external user store is a requirement for extra Policy Server connections. Create the **admin**istrator accounts for the **admin**istrator identities in the store. The accounts enable the **Admin**istrative UI to locate **admin**istrator records in the external store.[12][13]

Follow these steps:

Configure a connection from the **Admin**istrative UI to an external **admin**istrator user store.

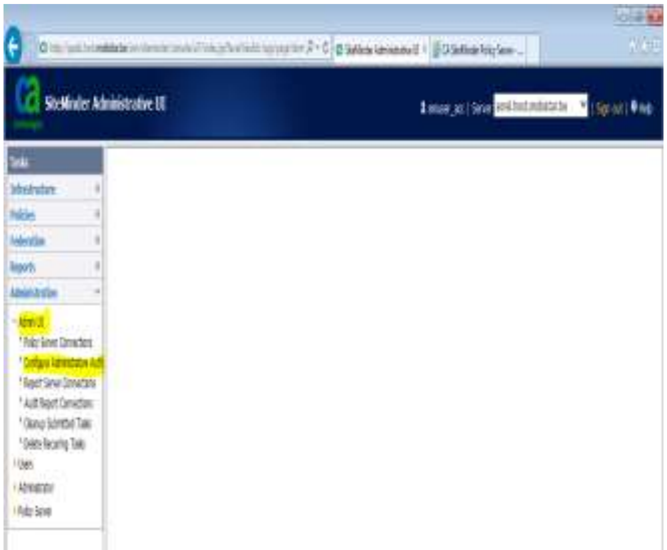
Note: If the **Admin**istrative UI is using the policy store as its source of **admin**istrator identities, you cannot configure extra Policy Server connections.

Run the registration tool.

Configure the connection to the Policy Server.

Configure a connection from the **Admin** UI to an external **admin**istrative user store

Login to WAM UI and click on Configure **Admin**istrative **Authentication** as mentioned in the screenshot:



Screen33: Adminstrator page

Click on Start the Configuration Wizard as shown in screenshot.

The Administrative UI is currently configured to authenticate administrators from an external user store. You can change these settings by starting the configuration wizard using the button below. If you wish to keep the current settings, click "Keep these settings".

Type: OpenLDAP
Secure: No

Screen34: configuration setup

Follow the steps and click on Next.

It does not appear that you are accessing the Administrative UI through a SiteMinder protected reverse proxy. If you would like to enable SiteMinder authentication, you must configure a SiteMinder Web Agent to protect a reverse proxy server which must then be used to access the Administrative UI.

Screen35: Follow steps for configuration

Select the Directory Type as **OpenLDAP.**

Screen36: directory type OpenLDAP

Enter the Connection Details as shown below.

Username: uid=smuser_acc,ou=production,ou=system,o=mobistar.be

Password : *******

Host : sounder.host.mobistar.be

Port: 389

Screen37: Assgning host no

Provide the rest of the details and you will get the Policy Server Connection listed under **Admin** UI as shown in the below screenshot.

Screen38: the Policy Server Connection listed under Admin UI

REGISTRATION TOOL

Run the registration tool

To run the registration use the below command:

./XPSRegClient smuser_acc:******* -adminui –vT**

```
root@sconder $ ./XPSRegClient smuser acc:Nnbistar@1 -adminui -vT
[XPSRegClient - XPS Version 12.52.0102.766]
Log output: /usr/app/netegrity/CA/siteminder/log/XPSRegClient.2016-04-11_082519.log
Initializing system, please wait...
[INFO] : [sm-xpsxps-00120] Initializing XPS Version 12.52.0102.766
[INFO] : [sm-xpsxps-01160] LDAP Provider Info String = CA Directory
[INFO] : [sm-xpsxps-01120] LDAP Provider Version: supportedLdapVersion = 3
[INFO] : [sm-xpsxps-01120] LDAP Provider Version: dxServerVersion = DXserver r12.0.16 (build 11032) Linux/DXgrid 32-Bit
[INFO] : [sm-xpsxps-01160] LDAP Provider Info String = CA Directory
[INFO] : [sm-xpsxps-00560] Database Transactions are 0.
[INFO] : [sm-xpsxps-00300] 1 Parameter(s) loaded from Policy Store, 1 total.
[INFO] : [sm-xpsxps-00030] Caching Policy Data...
[INFO] : [sm-xpsxps-00310] 3662 object(s) loaded from the Policy Store.
[INFO] : [sm-xpsxps-00430] Policy Store ID is "0005cbc3-e563-16df-a563-0889ac0bd0dd".
[INFO] : [sm-xpsxps-06670] XPS Auditing is enabled.
[INFO] : [sm-xpsxps-03460] No validation warnings will be logged (controlled by CA.XPS::$LogValidationWarnings).
[INFO] : [sm-xpsxps-00150] XPS Initialized. (331, 1, 0)
[INFO] : [sm-xpsxps-00150] XPS Initialized.
[INFO] : [sm-xobfed-02577] Successfully loaded smobjadapter.
Validating client name, please wait...
Preparing registration information, please wait...
Processing complete. Thank you for waiting.
[INFO] : [sm-xpsxps-00160] Shutting down XPS...
[INFO] : [sm-xpsxps-00170] Shutting down XPS housekeeping...
[INFO] : [sm-xpsxps-00160] Shutting down XPS...
[INFO] : [sm-xpsxps-00210] Releasing SiteMinder object store connection to XPS...
[INFO] : [sm-xpsxps-00180] Releasing XPS configuration cache...
[INFO] : [sm-xpsxps-00240] XPS Shutdown Complete.
root@sconder $
```

Screen39: registration under registory tool

Configure the Connection to the Policy Server

You configure the connection so the **Admin**istrative UI can be used to manage CA SiteMinder objects.

To configure a Policy Server connection

Log into the **Admin**istrative UI with an account that has super user permissions.

Click **Admin**istration, **Admin** UI.

Click Policy Server Connections, Register Policy Server Connection.

Screen40: Policy Server Connections

Type a connection name in the Name field.

Type the Policy Server host name or IP address in the Policy Server Host field.

Type the Policy Server **authentication** port in the Policy Server Port field.

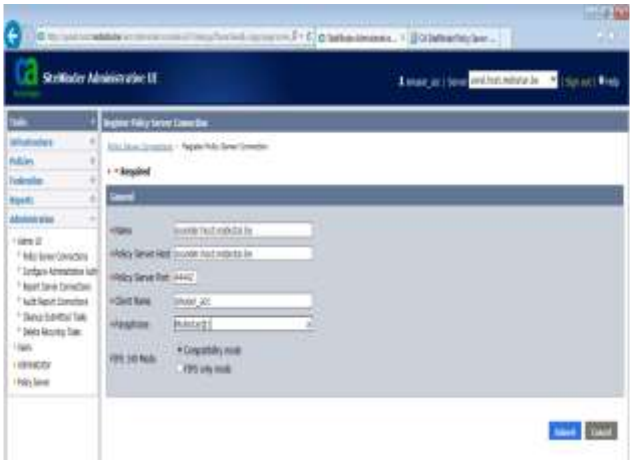
Note: This value must match the value in the **Authentication** port (TCP) field on the Settings tab in the Policy Server Management Console. The default **authentication** port is 44442. To determine the port number, open the Settings tab in the Policy Server Management Console.

Type the client name and passphrase you created using the registration tool in the respective fields.

Select a FIPS mode:

If you installed the Policy Server in FIPS-compatibility mode, select Compatibility mode.

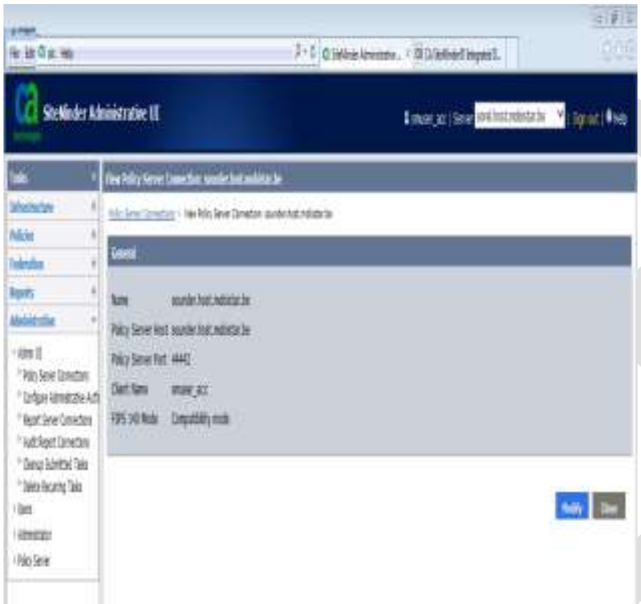
If you installed the Policy Server in FIPS-only mode, select FIPS only mode.



Screen41: Policy Server in FIPS-compatibility mode

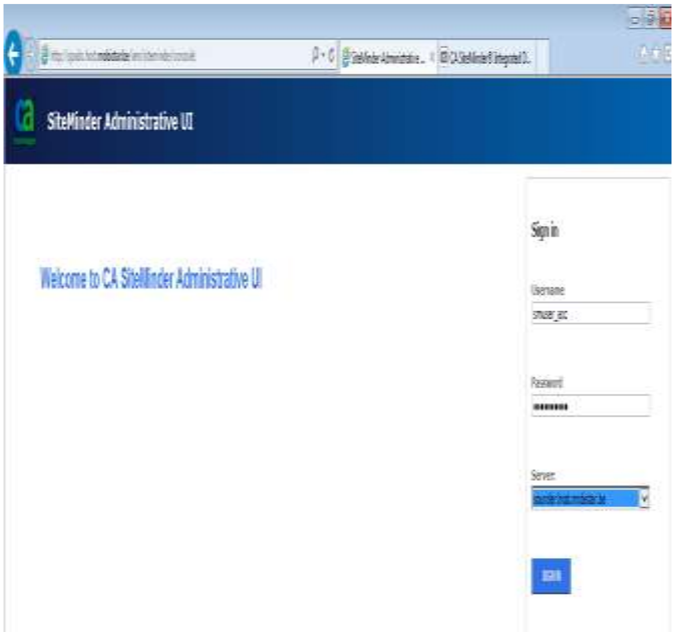
Click Submit.

The values should match the entries as mentioned in the screenshot.



Screen42: The values should match the entries as shown

The connection between the **Admin**istrative UI and the Policy Server is configured. The **Admin**istrative UI login screen contains a list of Policy Servers to which the **Admin**istrative UI is registered. By default, the Policy Server that was registered first is the default connection.



Screen43: Administrative UI login screen

Screen44:Switching policy server

If the primary policy server is down, you can switch to the secondary policy server at the time of login.

If you want to switch to another policy server connection, you can use the drop down menu for the same as shown in the below screenshot.

Screen45: use the drop down menu to switch policy

Note: You need to set the **replication** between the Policy Store to see the same set of objects under different Policy Server connections.

CONCLUSION

Decentralized systems are so common and authentication is an important aspect of them. Using SSO a big problem is solved: Managing large population across the globe of applications and services. When implementing authentication for a new application, consider integration it with the SSO. The results of the analysis conducted for this paper indicate that technology issues are the main factors implementing SSO and MFA within organisations; this is partly due to complexities of existing technical infrastructures and workflow processes. SSO is here to stay. [14]

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CHARACTERISATION OF ALUMINIUM CARBON-NANO TUBE NANO COMPOSITE

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Abstract: In recent years, carbon nanotubes (CNTs) reinforced aluminium matrix composites have attracted increasing attention. The quality of dispersion, however, is a crucial factor which determines the homogeneity and final mechanical properties of these composites. Various amounts of well-dispersed multi-walled carbon nanotubes (MWCNTs) were used to reinforce an Al using powder metallurgy technique. The microstructures of the nanocomposites are observed in the optical metallurgical microscope. Pin-on-disk wear tests were performed under different loading conditions of 10N, 20N and 30N, to evaluate the wear and tribological properties of the different weight ratios of Al –MWCNT nanocomposites. In comparison with the Al, the addition of MWCNTs decreased the coefficient of friction in Al –MWCNT nanocomposites. The results show that additions of MWCNTs can upgrade the Al and convert it into a wear resistance material. The MWCNTs played dual roles in improving the tribological performance of the nanocomposites, indirectly by influencing the microstructure and mechanical properties of nanocomposites and directly by acting as a lubricating medium

Keywords: Carbon Nanotubes (CNTs), Aluminium, Microstructure, Nanocomposites, Powder Metallurgy, Wear.

1. Introduction

Composite materials (or composites for short) are engineering materials made from two or more constituent materials that remain separate and distinct on a macroscopic level while forming a single component. There are two categories of constituent materials: matrix and reinforcement. At least one portion of each type is required. The matrix material surrounds and supports the reinforcement materials by maintaining their relative positions. The reinforcements impart their special mechanical and physical properties to enhance the matrix properties. The primary functions of the matrix are to transfer stresses between the reinforcing fibers/particles and to protect them from mechanical and/or environmental damage whereas the presence of fibers/particles in a composite improves its mechanical properties such as strength, stiffness etc.

A composite is therefore a synergistic combination of two or more micro-constituents that differ in physical form and chemical composition and which are insoluble in each other. The objective is to take advantage of the superior properties of both materials. The synergism produces material properties unavailable from the individual constituent materials. Due to the wide variety of matrix and reinforcement materials available, the design potentials are incredible. Composite materials have successfully substituted the traditional materials in several light weight and high strength applications. The reasons why composites are selected for such applications are mainly their high strength-to weight ratio, high tensile strength at elevated temperatures, high creep resistance and high toughness.

Here the lightweight material, aluminium is taken as matrix and multi walled carbon nanotubes are taken as reinforcement. Aluminium is less wear resistant whereas MWCNTs are highly wear resistant. So in order to increase the wear resistance of the aluminium matrix, it is being reinforced with the MWCNTs. Pure aluminium powder is reinforced with different proportions of 0.5%, 1% and 2% MWCNTs using powder metallurgy technology. The microstructure of the different specimens were studied using optical metallurgical microscope. And the specimens were tested for the wear properties using pin on disc arrangement.

2. Experimental Details

2.1 Material selection

Aluminium**:** Aluminium is chosen as a base material. Aluminium is the world's third most abundant metal. Pure aluminium is soft, ductile, and corrosion resistant and has a high electrical conductivity. It is widely used for foil and conductor cables, but alloying with other elements is necessary to provide the higher strengths needed for other applications.

Multi-walled Nanotubes: MWCNTs are chosen as reinforcement material. MWCNTs have excellent properties and are being employed in a large number of commercial applications. MWNTs include several tubes in concentric cylinders. The number of these concentric walls may vary from 6 to 25 or more. The diameter of MWNTs may be 30 nm when compared to 0.7–2.0 nm for typical SWNTs.

Table1. Properties of Aluminium and MWCNTs

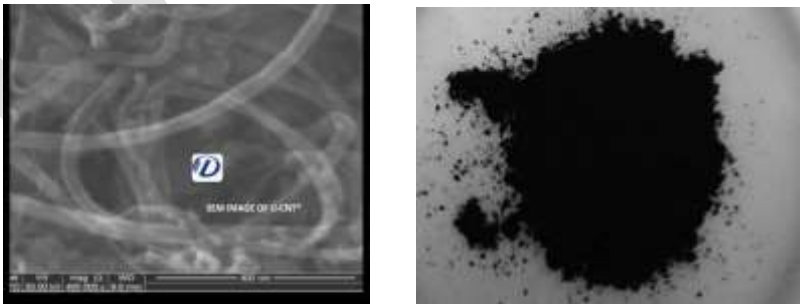
Properties	Aluminium	MWCNTs
Density	2.7 g/cm^3	1.6-2 g/cm^3
Young's modulus	70 GPa	1.7-2.4 Tpa
Thermal conductivity	204.3 W/m K	>3000 W/m K
Melting point	660^{o}C	35000^{o}C

2.2 Methodology

Fabrication of Nanocomposites:

Based on the ASTM standards the fabrication of nanocomposites was done at room temperature by powder metallurgy technique and a nanocomposite was sintered at 450^{o}C temperature for 1 hour and cooled to room temperature.

Synthesis of Carbon Nanotubes: The United Nanotech Innovations Pvt. LTD as produced the MWCNTs by Chemical Vapour Deposition Technique. CVD is the most widely used method for the production of carbon nanotubes. For this purpose, the metal nanoparticles are mixed with a catalyst support increase the surface area for higher yield of the catalytic reaction of the carbon feedstock with the metal particles. One issue in this synthesis route is the removal of the catalyst support via an acid treatment, which sometimes could destroy the original structure of the carbon nanotubes. However, alternative catalyst supports that are soluble in water have proven effective for nanotube growth. The packed carbon nanotubes are more than 20µm long and have a carbon purity of 98% or higher; they also retain the desirable alignment properties of the nanotubes.



(a) (b)

Fig 2.1(a) SEM image of U-MWCNT

(b) Powder form of U-MWCNT of outer diameter 20nm and length 20µm

2.3 Powder Metallurgy Technique

Powder metallurgy (PM) is a term covering a wide range of ways in which materials or components are made from metal powders. The PM press and sinter process generally consists of three basic steps: powder blending, Die compaction, and sintering. Compaction is generally performed at room temperature, and the elevated-temperature process of sintering is usually conducted at atmospheric pressure and under carefully controlled atmosphere. Optional secondary processing such as coining or heat treatment often follows to obtain special properties or enhanced precision. All PM processes avoid, or greatly reduce, the need to use metal removal processes, thereby drastically reducing yield losses in manufacture and often resulting in lower costs.

In the present work three variations of the reinforcement material Pure Al and MWCNT, 0.5 wt%, 1 wt%, and 3wt%, were added to the Aluminium and blended. The homogeneously blended powders with different variations of MWCNTs were compacted into cylindrical billets of 20mm diameter. Compacted specimens of Al and Al-MWCNT composites were sintered at 450 ° C for 1h in electrical sintering furnace. The sintered billets were machined in lathe and the pin specimens were prepared with flat ends, a diameter of 10 mm, and length of 25 mm.

Fig 2.2 Powder Metallurgy process for structural press and sintered process

2.4 Sintering Process: Sintering is a heat treatment applied to a powder compact in order to impart strength and integrity. The temperature used for sintering is below the melting point of the major constituent of the Powder Metallurgy material. After compaction, neighbouring powder particles are held together by cold welds, which give the compact sufficient “green strength” to be handled. At sintering temperature, diffusion processes cause necks to form and grow at these contact points.

In the present work the nanocomposites are sintered at temperature of 450^{o}C for 1 hour in the electrical furnace. Upon sintering, the metallic bonding between the powder particles is formed mainly by diffusion.

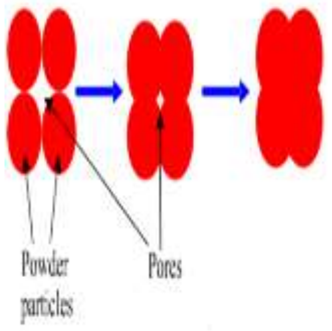


Fig 2.3 Sintering Process

Fig 2.4 Electrical Furnace

3. Microstructure of nanocomposites

In this present work the microstructure of the nanocomposites were tested at Raghavendra Spectro Metallurgical Laboratory.

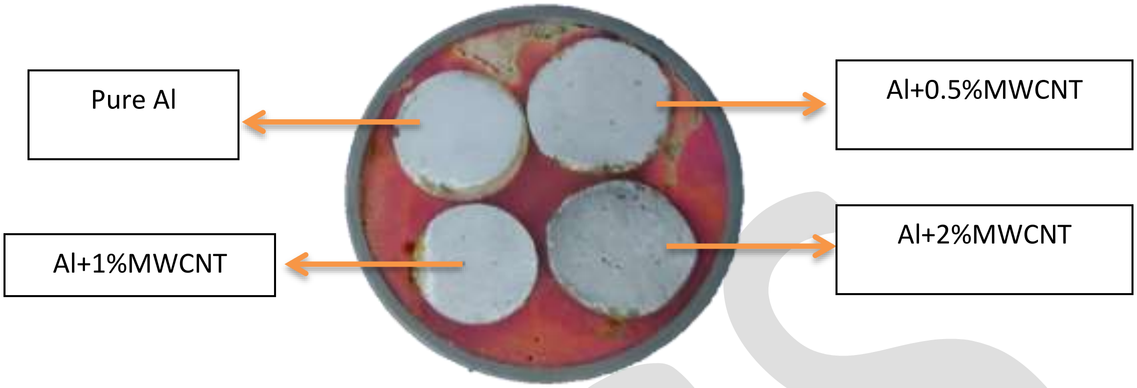


Fig 3.1: Microstructure Test specimens

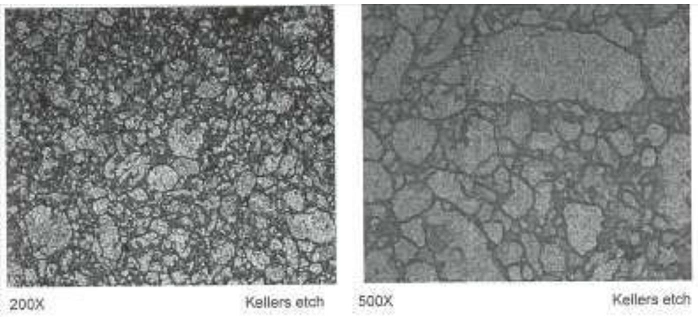


Fig 3.2: Microstructure of Pure Aluminium Specimen

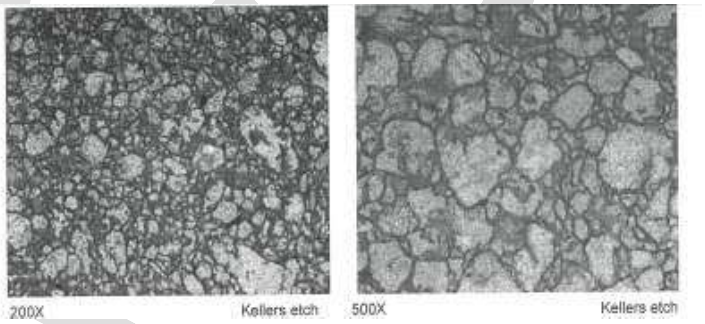


Fig 3.3: Microstructure of Al+0.5%MWCNT Specimen

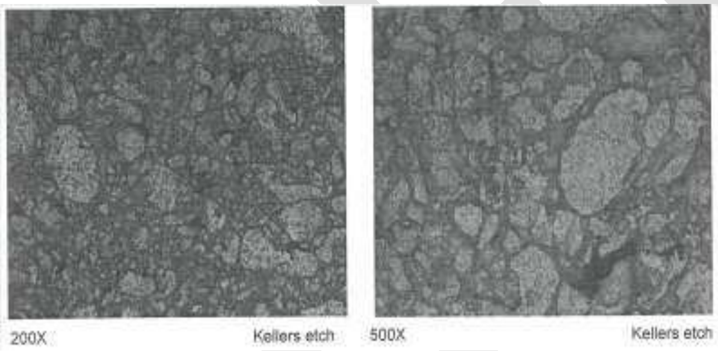


Fig 3.4: Microstructure of Al+1%MWCNT Specimen

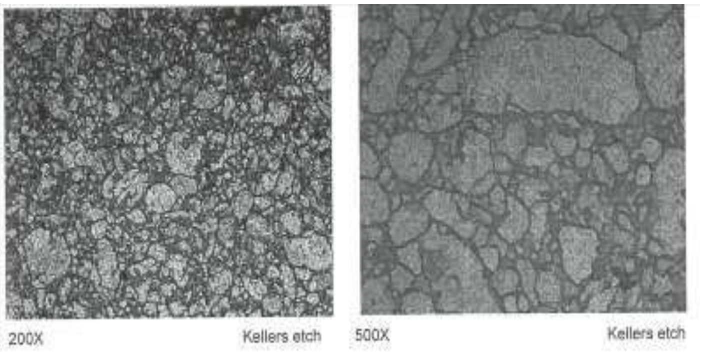


Fig 3.5: Microstructure of Al+2%MWCNT Specimen

4. Results and Discussion:

The following are the tabulated wear test results according to ASTM standard G99 obtained under varying load and speed conditions.

1. Sintering: 450^{o}C for 1 hour, air cooling in room temperature.
2. Specimen: dia. = 10mm and length = 25mm
3. Track diameter: 100mm

Table 2. wear test results

Specimen Type	Load (kg)	Speed (rpm)	Time (min)	Wear (µm)	Frictional Force (N)	Weight Loss (gm)	
Pure Al	1	150	10	. 19	6.7	Before	5.5100
						After	5.4900
						Diff. = 0.0200	
	2	150	10	20	9.5	Before	5.4900
						After	5.4400
						Diff. = 0.0500	
	3	150	10	22	15	Before	5.4400
						After	5.3700
						Diff. = 0.0700	
Al + 0.5%MWCNT	1	150	10	16	5.4	Before	4.7200
						After	4.7100
						Diff. = 0.0100	
	2	150	10	17	9.5	Before	4.7100
						After	4.6900
						Diff. = 0.0200	
	3	150	10	19	16	Before	4.6900
						After	4.6600
						Diff. = 0.0300	

Table 3. Wear Coefficient results

Specimen Type	Load (N)	Speed (rpm)	Time (min)	Wear coefficient, K (x 10^{-4})
Pure Al	9.81	150	10	3.397
	19.62	150	10	2.548
	29.43	150	10	2.265

Al+0.5%MWCNT	9.81	150	10	1.698
	19.62	150	10	1.698
	29.43	150	10	1.698

$$\textbf{Wear coefficient, K=}\frac{\text{volume} \quad (mm^3)}{\text{load} \times \text{sliding distance} \qquad (\text{Nm})}$$

Where,

$$\text{Volume} = \frac{\pi d^2}{4} \times L$$

d- Diameter of the specimen

L- Wear out length of the specimen

Sliding distance = Speed of disc × time

$$\text{Speed of disc} = \frac{\pi DNT}{60000}$$

Where, D – diameter of the track, mm

N – Speed in rpm

T – Time in seconds

5.Conclusion:

It is concluded that the homogeneous distribution of CNTs with sound interface in Al matrix is an important technological issue to enhance the mechanical behaviour and wear resistance of CNT/Al nanocomposite. Oxidation wear is the main wear mechanism for the CNT/Al composite under dry sliding conditions. The formation of carbon film can reduce the friction and wear rate. Compared with pure Al composite, the CNT/Al nanocomposite has a lower coefficient of friction and reduced weight loss. Increasing the nanotube volume fraction can significantly decrease both the coefficient of friction and wear rate of the composite.

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Flow Volume Graph: Diagnostic Use

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Abstract— In the present document, the flow volume curve obtained from spirometer is studied and used for diagnosis of lung disorders. A Spirometer is the ideal instrument to allow the analysis, determination and monitoring of diverse human respiratory diseases like asthma, pulmonary embolism, respiratory bronchitis and others deficiencies. The flow-volume graphs are displayed by means of a virtual instrument developed in Labview. Flow volume curve is a graphic plot that provides useful information about lung functions and the relation-ship between lung volume and maximal rate of airflow. This is achieved during inspiration and expiration using maximum effort against relevant lung volumes. The test is simple, reproducible and objective.

Keywords— airflow, flow volume curve, forced vital capacity, forced expiratory flow, lung disorders, LabVIEW, spirometry.

INTRODUCTION

Spirometry is a method of assessing lung function by measuring the volume of air that the patient can expel from the lungs after a maximal inspiration. The flow-volume loop is the most important graph in spirometry [1]. A Flow-Volume loop begins at the intersection of the X-axis (volume) and Y-axis (flow). At the start of the test both flow and volume are equal to zero. Directly after this starting point the curve rapidly mounts to a peak: Peak (Expiratory) Flow. The Peak Flow is a measure for the air expired from the large upper airways (trachea-bronchi). After the PEF the curve descends (the flow decreases) as more air is expired. After 25% of the total expired volume, the parameter FEF25 is reached. Halfway the curve (when the patient has expired half of the volume) the FEF50 is reached: Forced Expiratory Flow at 50% of the FVC. After 75% the parameter FEF75 is reached. It is important to realize that there is no time axis on the flow-volume loop so one cannot interpret time intervals. A healthy patient will expire between 70 and 90% of the FVC in the first second of the test. This means that he takes roughly about 5 seconds to expire the last 10 to 30 % of the FVC. When the flow reaches zero, the FVC is reached (Force Vital Capacity): the patient has blown out as much air as he can.

VIRTUAL INSTRUMENTATION

A digital spirometer is designed in LabVIEW which contains three modules one of them is flow volume loop module.The model is constructed in LabVIEW which is graphical programming environment, a Graphical User Interface. It has advantage of fast processing and high detection rate [2]. In flow volume loop module, when LabVIEW runs, it asks to enter information. Database collected in spreadsheet is given as an input to read spreadsheet file. Database collected from patients having different lung disorders is compared with database of normal lung. A popup window is flashed on screen showing type of disease. Front panel of flow volume module is shown in figure 1. Various types of lung diseases which are detected are discussed below:

NORMAL LUNG

In normal flow volume loop, inspiratory limb of loop is symmetric and convex. Expiratory limb is linear. Airflow at the midpoint of inspiratory capacity and airflow at the midpoint of expiratory capacity are often measured and compared. Maximal inspiratory airflow at 50% of forced vital capacity (MIF 50% FVC) is greater than maximal expiratory airflow at 50% FVC (MEF 50% FVC) because dynamic compression of the airways occurs during exhalation [6]. Flow volume graph for normal lung is shown in fig. 2.

OBSTRUCTIVE DISORDER

In patients with obstructive lung disease, the small airways are partially obstructed by a pathological condition. The most common forms are asthma and COPD. A patient with obstructive lung disease typically has a concave F/V loop. The air in the large airways usually can be expired without problems, so PEF may be normal. When all the air is expired from the large airways, air from the smaller airways will be expired. With obstructive lung disease, these airways are partially blocked, so the air will come out slower. This will result in a lower flow and a (more or less) sharp fall in the flow-volume. FEV1 and FEF25-75 will be too low. Typically the patient will have a normal FVC at the early stages of his condition. Although all airflow is diminished, expiratory prolongation predominates, and MEF < MIF. Peak expiratory flow is sometimes used to estimate degree of airway obstruction but depends on patient effort [5]. Flow volume graph for obstructive disorder is shown in fig. 3.

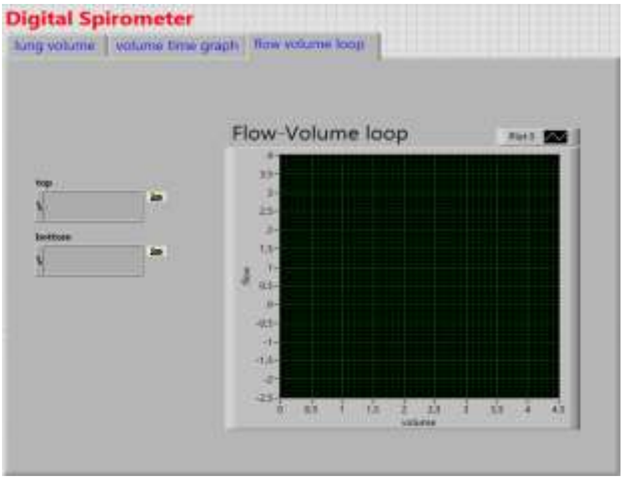


Fig 1: Front panel of flow volume loop

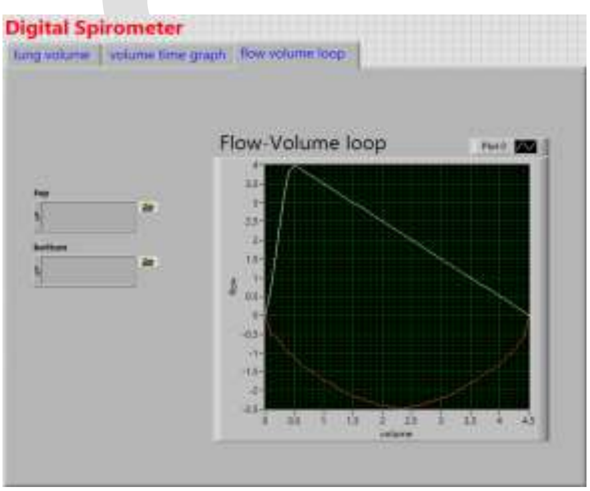
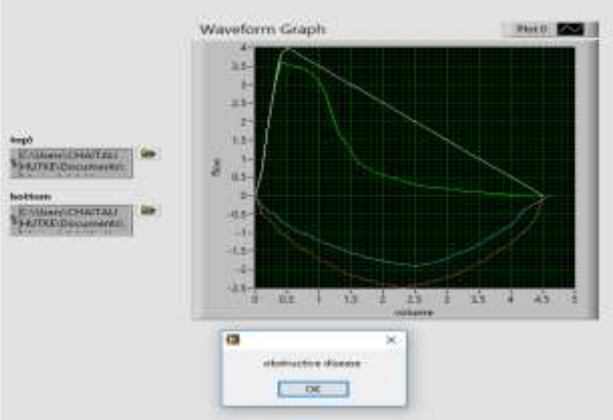


Fig 2: normal flow volume loop



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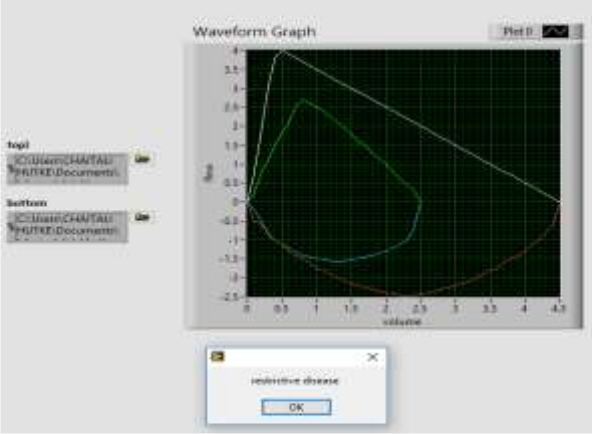
obstructive disease

Fig 3: Flow-volume loop in obstructive lung disease



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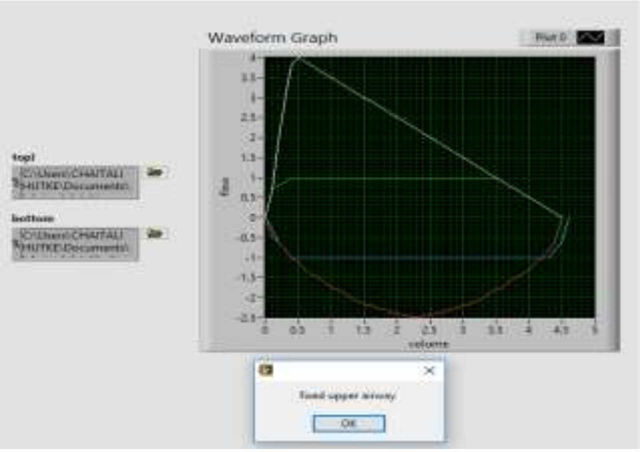
restrictive disease

Fig 4: Flow-volume in restrictive lung disease



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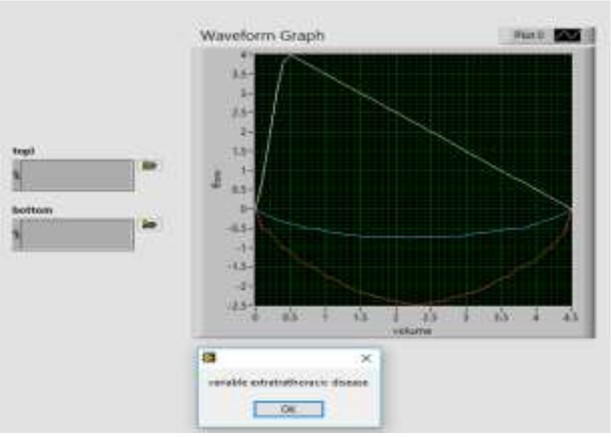
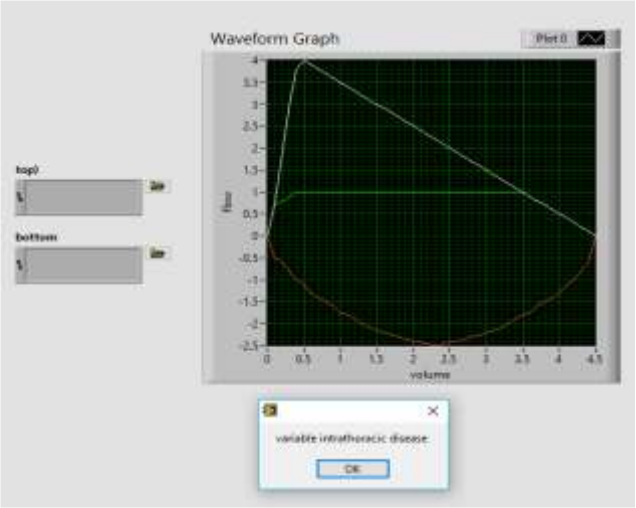
fixed upper airway

Fig 5: Typical flattening of flow-volume loop in fixed airway obstruction



variable extrathoracic disease

Fig 6: flow volume loop in variable extrathoracic obstruction



variable intrathoracic disease

Fig 7: flow volume loop in variable intrathoracic obstruction

RESTRICTIVE DISORDER

Restrictive lung disease means that the total lung volume is too low. Although an accurate diagnosis of total lung volume is not possible with spirometry (residual lung volume cannot be measured with a spirometer) spirometry results can be very suggestive for a restrictive lung disease. Since the airways are normal, the flow volume loop will have a normal shape: the curve will descend in a straight line from the PEF to the X-axis. Total lung volume is low, which results in a low FVC. PEF can be normal or low. The loop is narrowed because of diminished lung volumes. Airflow is greater than normal at comparable lung volumes because the increased elastic recoil of lungs holds the airways open (e.g. interstitial lung disease, kyphoscoliosis) (fig. 4).

FIXED OBSTRUCTION OF THE UPPER AIRWAY

This can be both intrathoracic as extrathoracic. The flow-volume loop is typically flattened during inspiration and expiration. Examples are tracheal stenosis caused by intubation and a circular tracheal tumor. The top and bottom of the loops are flattened so that the configuration approaches that of a rectangle. Fixed obstruction limits flow equally during inspiration and expiration, and MEF = MIF (e.g. tracheal stenosis, goiter) (fig 5).

VARIABLE EXTRATHORACIC OBSTRUCTION

Typically the expiratory part of the F/V-loop is normal: the obstruction is pushed outwards by the force of the expiration. During inspiration the obstruction is sucked into the trachea with partial obstruction and flattening of the inspiratory part of the flow-volume loop. When a single vocal cord is paralyzed, it moves passively with pressure gradients across the glottis. During forced inspiration, it is drawn inward, resulting in a plateau of decreased inspiratory flow. During forced expiration, it is passively blown aside, and expiratory flow is unimpaired. Therefore MIF 50% FVC < MEF 50% FVC (e.g. unilateral vocal cord paralysis, vocal cord dysfunction) (fig. 6).

VARIABLE INTRATHORACIC OBSTRUCTION

This is the opposite situation of the extrathoracic obstruction. A tumor located near the intrathoracic part of the trachea is sucked outwards during inspiration with a normal morphology of the inspiratory part of F/V-loop. During expiration the tumor is pushed into the trachea with partial obstruction and flattening of the expiratory part of the F/V loop. During a forced inspiration, negative pleural pressure holds the floppy trachea open. With forced expiration, loss of structural support results in tracheal narrowing and a plateau of diminished flow. Airflow is maintained briefly before airway compression occurs (e.g. tracheomalacia) (fig. 7).

LIMITATIONS

Because each person's flow volume curve is different and also because disease or drugs may produce changes in the size and shape of the curve, it is extremely difficult to compare flow volume curves between individuals or even within the same individual on different occasions. Although various techniques have been proposed , any form of comparison of flow volume curve is difficult; such measurements from FV curves cannot be routinely recommended for use in lung function laboratories. But the shape of FV curves gives extremely useful information with regard to identification of the cause of airway obstruction and detection of early changes. Lung function studies should be used independently, but should be interpreted in conjection with other clinical parameters. The variability of the curves at low lung volumes has made it difficult to interpret individual curves even in studies with large population [4].

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CONCLUSION

Pulmonary function tests including flow-volume curves are now an essential part of clinical practice as any function tests of other organ systems. But pulmonary function has to be supplemented with other diagnostic procedures. Pulmonary function indicates only how disease has altered the function of lungs. They can-not make a specific pathologic diagnosis and they can reveal alterations only when the lesion disturbs function sufficiently in order to detect the deviation from normal values. Therefore pulmonary function tests supplement a good history, physical examination, radiologic, bacteriologic, bronchoscopic and pathologic studies in arriving at an achievable diagnosis. The results obtained in carrying out the simulation with normal conditions show that data and insights in the literature are validated.

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AN EFFICIENT JOINT DATA HIDING AND COMPRESSION TECHNIQUE

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Abstract — In this paper an improved joint data-hiding and compression scheme for digital images is proposed. This technique use vector quantization and side match. In both techniques data hiding and image compression, can be performed in a single module. In this method VQ or side match is used for compression. Indicator bits are used for segmenting the image compressed codes into a series of sections. The receiver can achieve the mining of secret bits and image decompression productively according to the index values in the segmented sections. Experimental results reveal the efficiency of the proposed schemes.

Keywords— Data hiding, image compression, vector quantization (VQ), side match vector quantization (SMVQ), image inpainting, side match and hiding capacity.

INTRODUCTION

Nowadays people transmit and share digital contents conveniently due to the advancement in the information and internet technology. To ensure communication efficiency and save network bandwidth in such scenarios, compression techniques can be implemented on digital content. In many applications digital images and videos are converted into the compressed forms for transmission. Large numbers of privacy related issues are there in an open network environment regarding how to transmit secret or private data securely. Information hiding techniques contributes many exceptional solutions for this problem which embeds secret data into the cover image indiscernibly.

Researches conducted in the field of data hiding for digital images [2]-[5] where data hiding and image compression process are performed as two independent modules on the sender side. Under this condition, there may have many likelihood for an attacker to tear down or take advantage of the compressed image without the watermark information embedded. Performing data hiding and image compression independently may direct to lower efficiency in the applications.

The proposed work focuses on improving the high hiding capacity and compression ratio and integrates the data hiding and the image compression into a single module seamlessly. It evades the risk of the attack from interceptors and increases the implementation efficiency. The image compression in these schemes is based largely on the VQ and horizontal and vertical side match. Huffman encoding is performed among the resulting compressed code streams.

RELATED WORKS

Researches are being made in the field of data hiding and compression for digital images which conceal secret facts into the compression code of the image. VQ is one of the mainly accepted and extensively used compression techniques for digital images owing to its simplicity, i.e. simple encoding and decoding, and cost effectiveness in execution. The Euclidean distance is utilized as a measure to assess the match between each image block and the codewords in the VQ codebook during the vector quantization compression procedure. The index of the codeword with the minimum distance is used include a mention to symbolize the block. Thus, VQ encoding process consequences in a VQ index table. As an alternative of pixel values, index values are stored, therefore, the compression is achieved successfully. The VQ decompression method can be implemented easily and efficiently since each received index can be recovered by effortless table lookup procedure.

Numerous vector quantization based data hiding methods have been proposed to date. As an enhanced version of VQ, SMVQ has been introduced which create use of original VQ codebook and a sub-codebook to carry out compression of digital images. Lately, several researchers have studied on embedding secret information by SMVQ [3]-[5], [7]. In 2006 Chin-Chen Chang et.al planned a reversible data hiding based on side match vector quantization [3]. During this effort each block in the SMVQ compressed cover image was represented by fitting codeword in the sub-codebook.

In the majority of these schemes data hiding and image compression are conducted as two separate modules which imply the two processes, image compression and the data hidings are two free modules on the sender side. This will direct to some security harms and make it effortless for an attacker to compromise the compressed image devoid of the watermark data embedded. Moreover performing these two functions separately leads to incompetence in applications. To explain this problem Chuan Qin et.al proposed joint data hiding and compression scheme based on SMVQ and image inpainting [1] which incorporate the two process, data hiding and image compression, into a single module impeccably.

In [1] all image block apart from for the non residual blocks (blocks in the leftmost and topmost of the image), each of the further residual blocks in raster-scanning order can be used for embedding secret data and compressed concurrently by SMVQ or image inpainting. The compression methods vary adaptively according to the recent embedding bit. To manage the visual misrepresentation and error diffusion caused by the progressive compression of several residual blocks, vector quantization was used. The receiver can attain the extraction of secret bits and image decompression productively after segmenting the image compressed codes into a sequence of sections by the indicator bits, according to the index values in the segmented sections. The trouble with this system is that, it was a threshold depended approach. i.e. the amount of SMVQ blocks and inpainting blocks increases with T. The secret bits are simply embedded in the SMVQ and inpainting blocks. Hence, the hiding capacity of the future scheme is equal to the total number of SMVQ and inpainting blocks.

PROPOSED METHOD

The improved data hiding and compression scheme can be primarily divided into two phases. First phase is the image compression and secret data embedding and the second phase is the image decompression and secret data extraction.

In image compression and secret data embedding phase or at sender side, the original uncompressed input image I, is divided into the non-overlapping n×n blocks. The blocks in the leftmost and topmost of the input image I called as non residual blocks. These non-residual blocks are encoded by standard VQ method and these VQ encoded blocks are not used to embed secret bits. When the encoding process is complete, each non-residual blocks is simply represented by the index of the codeword with smallest distance.

A. Image Compression and Secret Data Encryption

Vector quantization (VQ) has widely been used for signal processing due to its excellent compression performance. Data hiding techniques in the VQ-compressed domain can relish advantages of both data hiding and compression for a multimedia distribution, achieving a secure channel and bandwidth/space saving for data transmission/storage. In this scheme, along with VQ, redundancy between current encoding block and neighboring block is utilized for better compression performance. This method is known as horizontal and vertical side match.

In this work, the sender performs image compression with the help of VQ code book containing codewords of length n^2.Denote the original uncompressed input image I of size M×N. The image I is divided into the non-overlapping blocks of size n×n. In this scheme, it is assumed that M and N can be divided by n with no remainder. Denote all k divided blocks in raster scanning order as $X_{(i,j)}$, where k= M×N/n^2, i= 1, 2. . . M/n, and j = 1, 2. . . N/n. The blocks in the leftmost and topmost of the image I called non-residual blocks, i.e.,$X_{(i,1)}$ (i = 1, 2,.....,M/n) and $X_{(1,j)}$ (j = 2, 3,......,N/n), are encoded by direct VQ method and these VQ encoded blocks are not used to embed secret bits. Euclidean distance used to measure the similarity between a block, X= (X_1, $X_{2,}$............,X_k) and a codeword, C_{tk}(C_{t1}, C_{t2},..........,C_{tk}) is defined as Eq (1), where C_t denotes the codeword in the codebook.

$$D_{(X,C_t)} = \sqrt{\sum_{i=1}^{k}(X_i - C_{(t,i)})^2} \qquad (1)$$

At the end of the encoding process, each image block X is represented by the index of the codeword having smallest distance i.e. index of the neighboring codeword in the codebook. In the decoder process, with the same codebook as that used in the encoder, the original image is restored from the indices using a table-lookup operation.

The residual blocks are encoded sequentially in raster scanning order i.e. from left to right and top to bottom. The encoding methods of these residual blocks are related to the whether current block has any similarity between its top or left block or not. Figure 1 shows the compression and secret data embedding in the residual block.

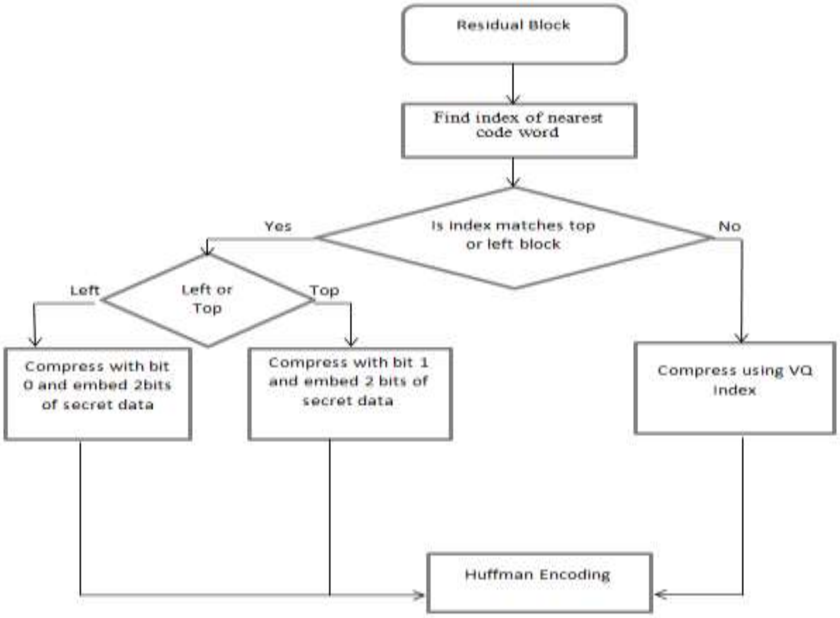


Figure.1. Flow Chart of the Compression and Secret Data Embedding in the Residual Block.

After the current block $X_{(i,j)}$ is processed, the above same procedure is repeated for the remaining residual blocks until the last residual block is processed. Then, the compressed codes of all image blocks (residual and non-residual) are concatenated. For improving the compression performance the concatenated compressed code are again decoded with Huffman coding, which will further reduce the size of transmitting data thereby saving space for data transmission/storage.

B. Image Decompression and Secret Data Extraction

The decompression and secret bit extraction of each residual block is performed at the receiver side. For that the received compressed codes are first decompressed using Huffman decoding. Huffman decoding is accomplished by a simple table look up operation.

Figure 2 shows the decompression and secret bit extraction for residual blocks. Then in order to recover the cover image and extracting secret bits, compression code stream, which is the result of Huffman decoding, are divided into a number of sections according to the indicator bits.

If the current indicator bit in the compressed codes is 0, this indicator bit and the following $\log_2 T$ bits are partitioned as a section and this section corresponds to a VQ compressed block with no embedded secret bit. The decimal value of the last $\log_2 T$ bits in this section is exactly the VQ index and the block is recovered with respect to this decimal value. Otherwise, if the current indicator bit is 1, this indicator bit and the following $\log_2(2n)$ bits are then segmented as a section, which means this section corresponds to horizontal or vertical side match. If the indicator bit is 1 then read next bit in this section. If next indicator bit is 1 then this block similar to its upper block and is replaced with the VQ index of up block index that can be used directly to recover the block. If next indicator bit is 0 then this block similar to its left block and is replaced with the VQ index of left block index that can be used directly to recover the block. In both this case remaining bits in the section represent secret bits. The original secret message can be extracted by performing decryption on the received secret bits by the security key.

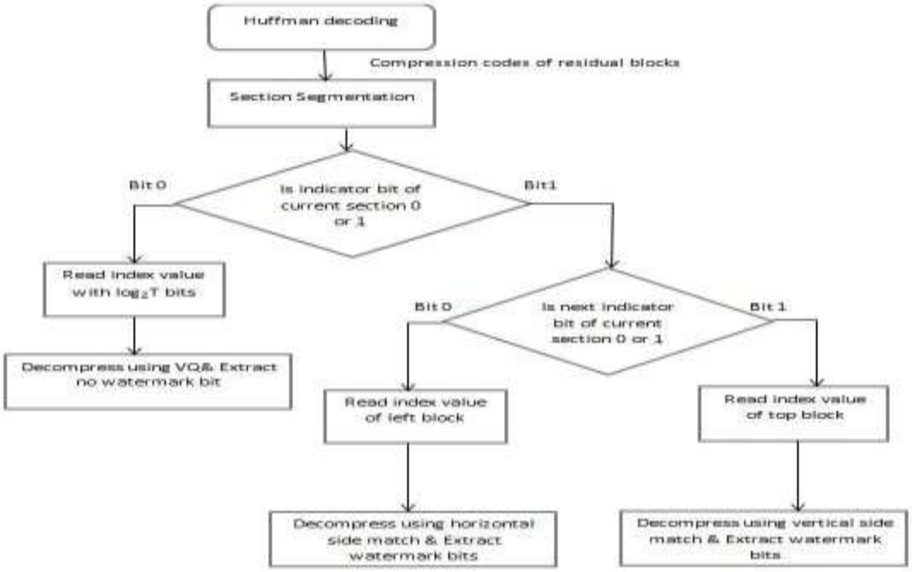
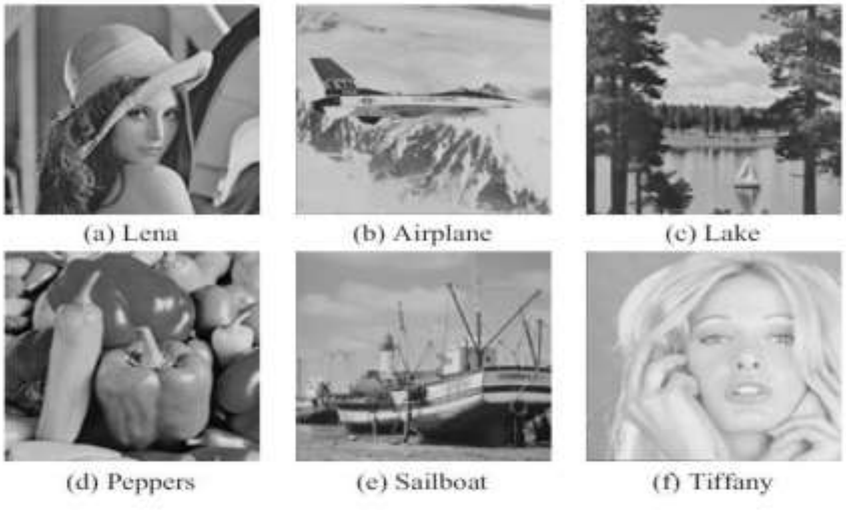


Figure. 2. Flow Chart of the Decompression and Secret Data Extraction in the Residual Block

This method is repeated for each segmented section until all sections are processed. After all the segmented sections in the compressed codes complete the above described procedure, the embedded secret bits can be extracted correctly, and the decompressed image can be obtained successfully. The final decompressed image does not contain the embedded secret bits any longer.

EXPERIMENTAL RESULTS

The experiment was conducted on a set of gray-level images of size 512×512. Six standard test images, as shown in Figure 3, are used for evaluating the presentation of the proposed system. In addition to these six standard images, the uncompressed color image database (UCID) was also considered for evaluation process.


(a) Lena (b) Airplane (c) Lake
(d) Peppers (e) Sailboat (f) Tiffany

The execution of the system is done using MATLAB R2010a programming environment. In the evaluation process, the input images are divided into non-overlapping 4×4 blocks. With respect to the size of image blocks, the length of codewords containing in the codebook was 16. The VQ codebook size T used for evaluation was 256, and secret bits for embedding were generated by RC4 encryption algorithm. After dividing the images into non- overlapping blocks, the blocks in the topmost row and the leftmost column were compressed by VQ. The VQ encoded blocks are not used for embedding secret bit. These blocks are used as a reference for encoding residual blocks. The secret bits are only embedded in the vertical or horizontal side match encoded blocks. Thus, the hiding capacity of the proposed scheme is equal to the sum of the numbers of vertical or horizontal side match encoded blocks. Figure 4 shows the input image and output image after decompression by VQ and side match. Tables 1- 7 show the comparison results for six standard test images such as Lena, Airplane, Lake, Peppers, Sailboat, Tiffany and UCID data set.

Figure.4.(a) Original Uncompressed Input Image, (b) Decompression Result

Table 1: Comparison of performance measures for Lena

Schemes	CR	PSNR	SSIM	HC
JDHC	14.2523	29.2923	0.8347	33
Proposed	19.3316	29.2935	0.8349	5522

Table 2: Comparison of performance measures for Airplane

Schemes	CR	PSNR	SSIM	HC
JDHC	14.2554	27.6578	0.8644	397
Proposed	22.5069	27.6594	0.8647	7268

Table 3: Comparison of performance measures for Lake

Schemes	CR	PSNR	SSIM	HC
JDHC	14.2616	24.6629	0.8649	543
Proposed	19.6007	26.5247	0.8692	5742

Table 4: Comparison of performance measures for Sailboat

Schemes	CR	PSNR	SSIM	HC
JDHC	14.2616	28.7814	0.8625	594
Proposed	19.2824	29.3231	0.8645	5435

Table 5: Comparison of performance measures for Tiffany

Schemes	CR	PSNR	SSIM	HC
JDHC	14.2492	25.3505	0.7724	15
Proposed	19.3587	26.4376	0.7739	5449

Table 6: Comparison of performance measures for Peppers

Schemes	CR	PSNR	SSIM	HC
JDHC	14.2522	28.8759	0.7861	32
Proposed	20.355	28.783	0.7864	6287

PERFORMANCE EVALUATION

The performance of the proposed system is presented in terms of hiding capacity, compression ratio, PSNR and SSIM value. The hiding capacity of the proposed scheme was compared against the hiding capacity of Chuan Qin.et.al method [1]. In Chuan

Qin.et.al method [1] the secret data hiding was performed depending up on the threshold and distortion value. In this method the total hiding capacity is equal to the number of SMNQ and inpainted blocks.

Denote the length of the compressed codes for the image as L. The compression ratio CR [1] can be calculated according to eq. (2). Peak signal-to-noise ratio (PSNR) [1] was utilized to measure the visual quality of the decompressed images Id, see eq. (3).

$$CR = \frac{8 \times M \times N}{L} \qquad (2)$$

$$PSNR = 10 \times \log_{10} \frac{255^2 \times M \times N}{\sum_{x=1}^{M} \sum_{y=1}^{N} [I(x,y) - I_d(x,y)]^2} \qquad (3)$$

where M and N represent image size I(x, y) and $I_d(x, y)$ represent the pixel values at (x, y) of the uncompressed image I and the decompressed image I_d respectively. For image quality assessment both PSNR value and the structural similarity (SSIM) value was used.

CONCLUSION

This work proposes an improved integrated data-hiding and compression scheme using VQ and side match. The blocks, except for non residual blocks (those in the leftmost and topmost of the image), can be embedded with secret data. Here compression and data hiding is performed simultaneously and the compression method switches between VQ and side match according to redundancy among the neighbouring blocks. If the current encoding residual block is same as its upper block then vertical side match is used. If the current encoding block is same as its left block then horizontal side match is used. Secret data is scrambled by secret key to ensure the security. These encrypted secret data is placed on the vertical and horizontal side match blocks. To further improve the compression performance Huffman encoding is applied on the secret embedded compression codes of the image. The receiver can extract the original secret data and obtain the input cover image successfully after segmenting the Huffman decoded code stream into various sections during the decompression phase.

Since the proposed method utilizes the redundancy between the blocks it is capable of embedding two bits of secret data with each side match encoded blocks. Also the proposed system follows a threshold independent procedure for integrated data hiding and compression. The experimental results show that this scheme has the better performances for hiding capacity, compression ratio, and decompression quality.

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Mobile Learning: Revolutionizing education

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Abstract—Advancements in mobile industry have affected many fields including education. Even though the traditional classroom environment still exists, recent technological advancements are dramatically transforming the face of traditional teaching-learning process (Martin). Advancements such as e-learning, m-learning have made education more accessible, more personalized, and more meaningful than ever before. Educational institutions around the world are constantly under pressure to remain competitive and effective due to expectations of their stakeholders. They are quickly embracing these developments as opportunities to improve the effectiveness of education.

Keywords— mobile learning, mLearning, student motivation, ubiquitous learning, pedagogical impact, any time learning, anywhere learning

INTRODUCTION

Recent revolutions in mobile industry have made mobile devices accessible and affordable to masses. Mobile phones, tablets, smart phones have become more prevalent. This has resulted into ever increasing penetration of mobile phones. Today, there are around 4.6 billion mobile users around the world and this number is only going to increase in future. There has also been remarkable development in mobile and wireless communication technology leading to 3G, 4G, Wi-Fi services becoming easily available on mobile devices. The convergence of these two fastest growing technologies have opened many new opportunities in the form of mobile web and mobile applications. In today's world mobile phones have become ubiquitous. Mobile apps have gained huge popularity because of their simplicity, user friendliness, speed, and portability. Mobile web sites are becoming equally popular because the can be accessed anywhere on the go. They make the required information available anytime, anywhere to the user, wherever and whenever required. Mobile Apps have influenced many areas including m-commerce, entertainment, advertisement, education, as well as healthcare.

In today's world smart phones have become ubiquitous and an integral part of our lives. They have been adapted so readily by everybody because of their ability to perform a variety of tasks that normally a desktop computer will do. Smart phones of this era are equipped with multi-core processors providing massive onboard processing power and are equipped with large storage capacity, and open operating systems. Due to their attributes such as mobility, instant connectivity, convenience, personalization, location awareness, smart phones have gained huge acceptance from all over the world. The integration of technologies such as mobile phones and wireless communication has added new dimensions and capabilities and has revolutionized many areas such as m-commerce, healthcare, advertising, entertainment as well as education.

WHAT IS MOBILE LEARNING?

The advancements in mobile industry have affected many fields including education. Even though the traditional classroom environment still exists, recent technological advancements are dramatically transforming the face of traditional teaching-learning process (Martin). Advancements such as e-learning, m-learning have made education more accessible, more personalized, and more meaningful than ever before. Educational institutions around the world are constantly under pressure to remain competitive and effective due to expectations of their stakeholders. They are quickly embracing these developments as opportunities to improve the effectiveness of education.

In recent years, statistics have shown that the highest number of mobile users are in the age group of 18-34. This coincides with the age group of students seeking education at various levels from undergraduate, post-graduate, or even higher. This age group amounts to almost half of total mobile phone users. For most youths their phones are never further than 1 meter away 24/7. This fact makes mobile learning a very effective method to impart education. Mobile learning can be defined as Stevens and Kitchenham (Stevens) "meaningful learning that occurs through the use of wireless handheld devices such as cell phone, personal digital assistant, mini-computer, or iPod". In general terms mobile learning can be defined as when the learner is not at a fixed predetermined location and when the learner takes advantage of learning opportunities offered by mobile devices Kukulska-Hulme, A. (Kukulska-Hulme).

Mobile learning cannot be viewed as a replacement to the traditional classroom environment but it can certainly complement the current teaching-learning process. The young generation today seems to be straying away from the classrooms. At the same time, they are showing a huge interest in mobile phones and are spending more and more time on phones. This addiction of theirs can be leveraged to deliver the knowledge. One more strong argument towards this mode of learning is the pervasive nature of mobile phones. Even though it is true that educational institutions have done huge investment in establishing well equipped computer labs for students and students may also have desktop computers at home, the fact remains that the students are away from their homes most of the times and the access to the college labs facilities is only for restricted time. Hence, this "anywhere, anytime" mode of learning is more appealing to the students.

RELATED WORK

There are a few case studies available to assess the factors such as sustained interest of students in this novel method of learning, scalability and efficacy of the medium, etc. In the study conducted by Florence Martin and Jeffrey Ertzberger, they have tried to address various issues such as to access effect of mobile learning on achievements of students, the attitude of students towards this new medium of learning, and differences in delivering the content using various media, etc. Their studies have resulted in the students showing positive attitude towards this new method of learning. This new medium of learning has potential to engage students for longer durations and also have positive effects (Martin). Kai-Yi China, Yen-Lin Chen have created a mobile learning support system to model a ubiquitous learning. The study allows the students access study material with the help of 2D barcodes and GPS technology. The use of GPS adds feature of location-awareness to the system. In this study, the authors have observed that the ubiquitous learning environment in the form of mobile learning can greatly enhance the learning experience of the students and give them an opportunity to learn by interacting with their environment (Chin).

The authors Chee-Kit Looi et. al report an study conducted in a school in Singapore. This study was aimed to assess the effectiveness and sustainability of the mobile learning process at various levels. The authors findings have shown that both the teachers and students have shown sustained interest in the mobile learning methodology and have been able to obtain better academic results (Looi). Authors Sung Youl Park, Min-Woo Nam and Seung-Bong Cha have conducted a study to determine student's adaptation and use of mobile learning methodology. Their findings are based on various factors such as self-efficacy, system accessibility, relevance, usefulness, ease of use, etc. Their study has shown positive attitude of students towards adapting the mobile learning environment. The study also indicated that this methodology satisfactorily fulfill parameters such as efficacy, relevance, accessibility, and ease of use (Park).

In their paper, the authors Matthew Kearneya, Sandra Schucka, Kevin Burdenb and Peter Aubusson have tried to investigate the pedagogical framework for mobile learning. Their aim was to examine mobile learning form a pedagogical rather than technology perspective so that it will help researchers and developers to design mobile learning material more effectively. With the help of two studies conducted separately, the authors have suggested a pedagogical framework based on three distinct features namely, authenticity, collaboration, and personalization (Kearney). K. Ciampa has reported experiences of teachers and students who have used tablets in the regular school environment as a learning aide. The purpose of the evidence-based study was to measure motivation of students towards mobile learning. They have identified six categories that simulate intrinsic and extrinsic motivation of the participants. The categories they have identified are namely, challenge, curiosity, control, competition, co-operation, and recognition (Ciampa). There has also been some research of the learning applications that can recognize gestures and emotions of the user and can decide what further steps should be taken by the user (Ally).

BENEFITS OF MOBILE LEARNING

The traditional formal learning technique has some spatiotemporal constraints such as time and location. For example, both the teacher and students have to be physically present in the classroom in the formal education system. The time is also has constraints of predefined semesters and timetables. Mobile learning provides a more informal environment where these constraints can be relaxed providing a more flexible "anytime, anywhere" learning environment (Jacob). There are number of factors that motivate learners and educators to choose mobile learning. Some of the factors are given below.

1) Ubiquitous Access – Due to the pervasive nature mobile phones and with the help of wireless networks, learning material can be available to the students from anywhere and can be delivered on demand. The student is not restricted to be physically present on the campus (Jacob). This is proving to be the strongest benefit of this mode of learning.
2) Self-regulated learning - Mobile learning gives learners more opportunity to be in control of their own learning and offers the flexibility to learning at their own pace.
3) Personalized feedback – Assessment tools can be designed to generate accurate and personalized feedback (Bidin).
4) Collaborative learning - Mobile learning environments may encourage the peer review process and may result in improved learning experience. Learners that are having a common goal can benefit with more participation in collaborative learning (Bidin).
5) Affordability of tool - Mobile phones, tablets, and other connected devices have become more prevalent and affordable than their desktop counterparts. They also provide a more convenient and less expensive method to access Internet. This can dramatically improve learning and bring digital content to students (Martin).

Mobile learning can also prove to be beneficial in the fast paced business world. This offers convenience to the corporate to complete their training at their own convenience without taking out time from their already busy workday. It also allows the employees of an organization to collaboratively share resources. It also offers the advantage of productively filling the dead time of the employee such as waiting for a printing job to complete or commuting home on train.

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CONCLUSION

Mobile learning is a revolution in e-learning. Integration of rapidly growing wireless communication technologies such as 3G, 4G, Wi-Fi and affordability of mobile devices has provided an “anytime, anywhere” computing platform. This has enabled accessing web content from anywhere at any time very easy. This has attracted a vast majority of young population. Today’s youth spends majority of the time on their mobile phones browsing the web, updating social status, or playing games. This addiction of theirs can be utilized constructively through the medium of mobile learning. There are many factors of mobile learning such as ubiquitous access, self regularized learning, personalization of content, collaborative learning that can attract the younger generation back to learning who are found to be straying away from traditional methods of classroom teaching. Even though mobile learning cannot replace traditional method of classroom learning, it can definitely provide a viable medium that can complement the traditional way of learning in many ways. It has been observed that applications of mobile learning are increasing rapidly in formal and informal education. Even though there have been some studies conducted, a thorough investigation should be performed to access the efficacy and impact of this technology-enhanced learning methodology (Hwang). At the same time, it also becomes important to review negative effects and limitations of mobile learning.

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Short Channel Effects in Conventional MOSFETs and their Suppression

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Abstract— The paper discusses short channel effects (SCEs), a major issue faced by the nano-scale devices and as a result of which the device performance degrades. As indicated by the Moore's law the number of transistors inside the chip doubles every two years mainly attributed to downscaling of the MOSFET size. As the channel length is reduced, departures from the long channel behavior occur. These departures, which are called Short Channel Effects, arise as the results of a two-dimensional potential distribution and high electric fields in the channel region. The phenomenon of Charge sharing, Sub-surface punch through and DIBL in conventional MOSFETs along with some important remedies have been discussed in the paper.

Keywords— Charge Sharing, Sub-Surface Punchthrough , DIBL, High-K dielectrics, Pocket Implants, SOI

INTRODUCTION

For a given channel doping concentration when the channel length is reduced the depletion layer widths of source and drain junctions become comparable to channel length. The potential distribution in the channel now depends on both the transverse field Ex (controlled by the gate voltage and back-surface bias) and the longitudinal field Ey (controlled by the drain bias). In other words, the potential distribution becomes two dimensional, and the gradual channel approximation (i.e. Ex >> Ey) is no longer valid.

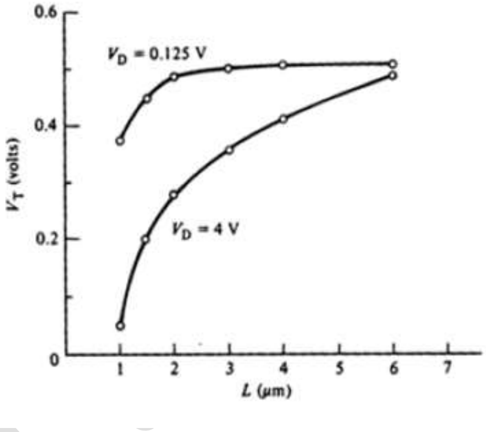

Fig 1: Threshold voltage (V_T) decreases with the decrease in channel length (L) [1]

This two dimensional potential results in degradation of the threshold behavior and dependence of threshold voltage on the channel length & biasing voltages. This can be understood with the help of Fig 1. The threshold voltage decreases with the decrease in the technology [2] (L: channel length) or scaling [8]. This is highly undesirable because circuit designers would like V_T to be invariant with transistor dimensions and biasing conditions [9].

SHORT CHANNEL EFFECTS: The short-channel effects are attributed to two physical phenomena:

- The limitation imposed on electron drift characteristics in the channel,
- The modification of the threshold voltage due to the shortening channel length.

Following are some distinguished SCEs:

1. Charge sharing: In Long channel devices, the influence of source-drain regions is negligible since the source and drain regions form small fraction of the channel region [5]-[7]. For small channel devices, the source-drain ends up taking a

large portion of the depletion region and consequently shares a major portion of this body effect. We therefore usually identify this effect as "charge sharing". In charge sharing, the area and charge under the gate is reduced and hence the threshold voltage.

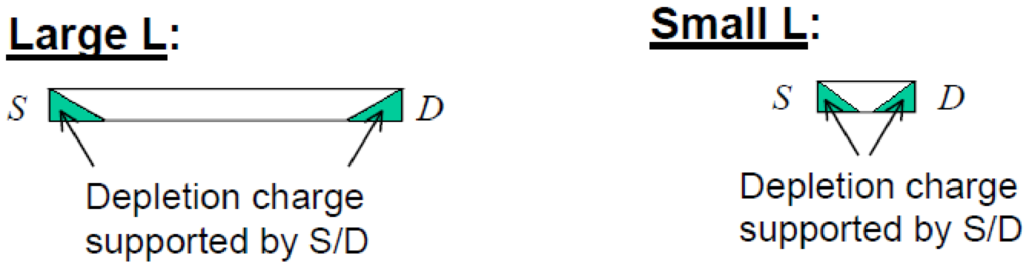

Fig 2: Charge Sharing in long channel and short channel MOSFETs.

2. Sub-Surface Punchthrough

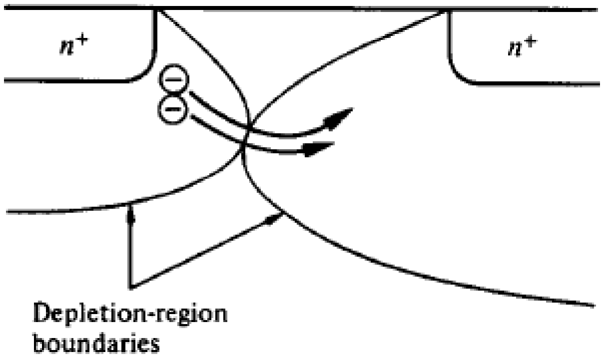

Fig 3: Sub-surface punchthrough

When the drain is at high enough voltage with respect to the source, the depletion region around the drain may extend to the source, causing current to flow irrespective of gate voltage (i.e. even if gate voltage is zero). This is known as Sub-surface Punchthrough as it takes place away from the gate oxide and substrate interface. So when channel length L decreases (i.e. short channel length case), punch through voltage rapidly decreases. In short-channel devices, due to the proximity of the drain and the source, the depletion regions at the drain-substrate and source-substrate junctions extend into the channel. As the channel length is reduced, if the doping is kept constant, the separation between the depletion region boundaries decreases. An increase in the reverse bias across the junctions also pushes the junctions nearer to each other. When the combination of channel length and reverse bias leads to the merging of the depletion regions, punchthrough is said to have occurred.

3. DIBL: There exists a potential barrier between source and drain which is to be lowered by applying gate voltage. In short channel devices in addition to the gate voltage, drain voltage also has a significant effect on reducing this barrier. As the source & drain get closer, they become electrostatically coupled, so that the drain bias can affect the potential barrier to carrier flow at the source junction. As a result, subthreshold current increases. As the drain depletion region continues to increase with the bias, it can actually interact with the source to channel junction and hence lowers the potential barrier. This problem is known as Drain Induced Barrier Lowering (DIBL) [10]. When the source junction barrier is reduced, electrons are easily injected into the channel and the gate voltage has no longer any control over the drain current. In long-channel devices, the source and drain are separated far enough that their depletion regions have no effect on the potential or field pattern in most part of the device. Hence, for such devices, the threshold voltage is virtually independent of the channel length and drain bias. DIBL is enhanced at high drain voltages and shorter channel lengths.

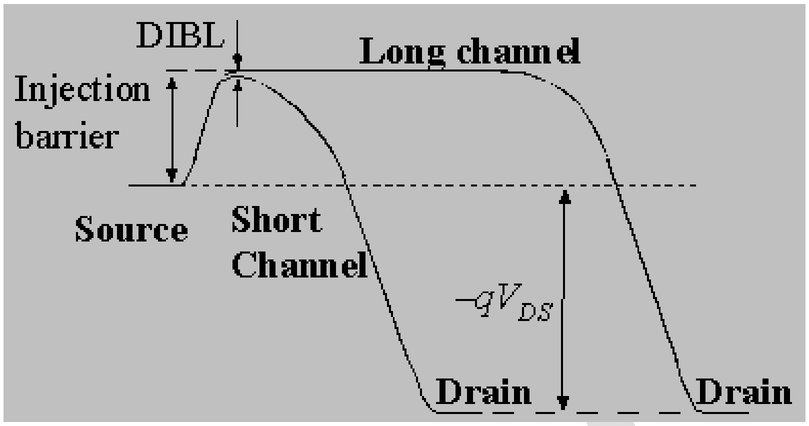

Fig 4: Drain-Induced Barrier Lowering (DIBL)

Remedies [4]:

1. High K dielectric [12]: “High-k" stands for high dielectric constant, a measure of how much charge a material can hold. Different materials similarly have different abilities to hold charge. The higher "K" increases the transistor capacitance so that the transistor can switch properly between "ON" and "OFF" states, with very low current when OFF yet very high current when ON. Because high-k gate dielectrics can be several times thicker, they reduce gate leakage by over 100 times. As a result, these devices run cooler. Replacing the silicon dioxide gate dielectric with a high-k material allows increased gate capacitance without the increasing leakage effects.

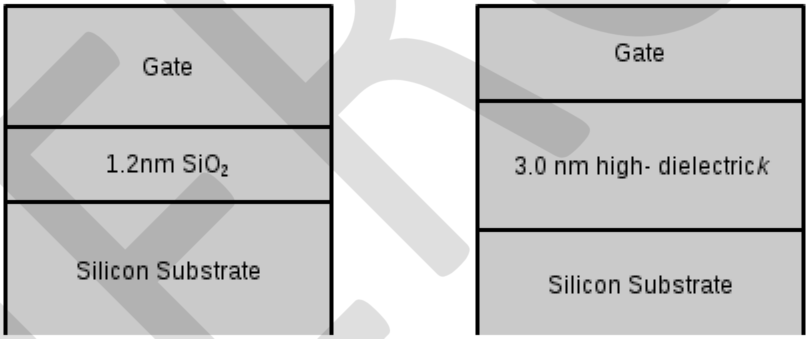

Fig 5: High-K dielectrics

2. Pocket Implants: In submicrometer MOSFETs, an adjust implant is used to have a higher doping at the surface than that in the bulk. This causes a greater expansion of the depletion region below the surface (due to smaller doping there) as compared to the surface.

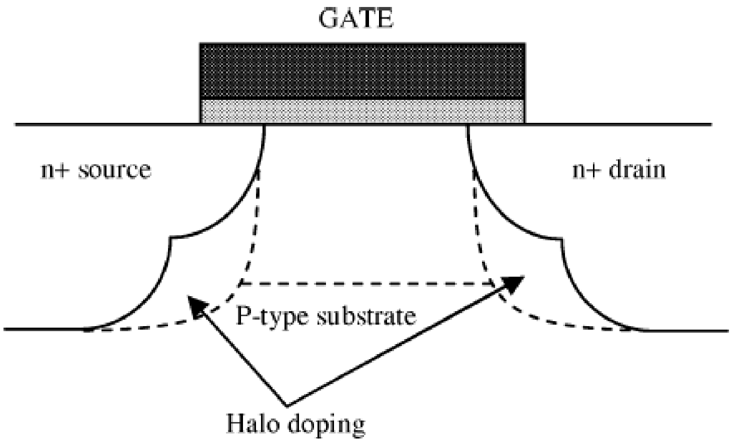

Fig 6: Pocket Implants: Halo Doping

Halo doping [1] or non uniform channel profile in a lateral direction was introduced below 0.25- m technology node to provide another way to control the dependence of threshold voltage on channel length. For n-channel MOSFETs, more highly p-type doped regions are introduced near the two ends of the channel. Under the edges of the gate, in the vicinity of what will eventually become the end of the channel, point defects are injected during sidewall oxidation. These point defects gather doping impurities from the substrate, thereby increasing the doping concentration near the source and drain end of the channel. More highly doped p-type substrate near the edges of the channel reduces the charge-sharing effects from the source and drain fields, thus reducing the width of the depletion region in the drain-substrate and source-substrate regions [11]. As the channel length is reduced, these highly doped regions consume a larger fraction of the total channel. Reduction of charge-sharing effects reduces the threshold voltage degradation due to channel length reduction. Thus, threshold voltage dependence on channel length becomes more flat. With the reduction in drain and source junction depletion region width also reduces the barrier lowering in the channel, thus reducing DIBL.

3. Shallow source and drain

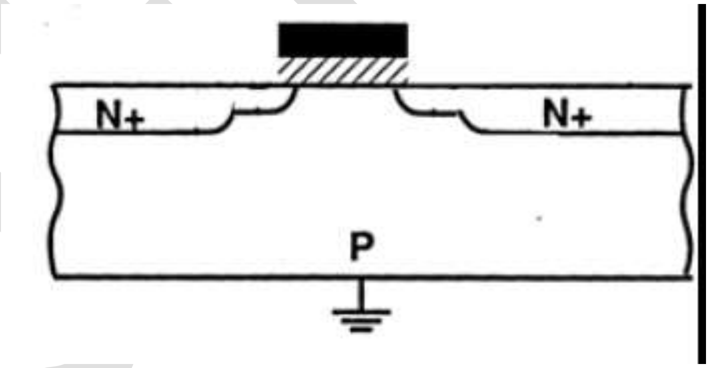

Fig 7: Shallow source and drain regions

- To minimize SCE, we want shallow (small junction resistance *r*j) S/D regions but the parasitic resistance of these regions will increase when *r*j is reduced.
- Shallow S/D "extensions" may be used to effectively reduce *r*j without increasing the S/D sheet resistance too much. Higher surface and channel doping and shallow source/drain junction depths reduce the DIBL effect on the subthreshold leakage current.

4. SOI (Silicon on Insulator) **: SOI** technology [3] refers to the use of a layered silicon–insulator–silicon substrate in place of conventional silicon substrates in semiconductor manufacturing, especially microelectronics, to reduce parasitic device capacitance, thereby improving performance.

- The fully depleted thin film SOI transistors are considered to have smaller SCEs.
- Today we are settling everything in small area .When scaling down the device dimensions the doping densities must be increased to maintain proper device behavior which is hard to manage when the device dimensions reach 50 nm and below. However, for thin film devices, such as fully depleted SOI, the doping densities required are lower. This is one reason for why SOI may be more suitable for the future processes in comparison to bulk CMOS.
- Speed in bulk devices is much determined by the relative magnitude of the parasitic drain and source junction capacitances compared with the gate capacitance, which is increasing as the devices are scaled down and doping levels are increased. Parasitic capacitances of the devices are thereby much smaller in SOI technologies than in bulk technologies.
- The active volume of silicon is smaller in SOI devices than in bulk technology. The SOI devices are therefore less sensitive to high energy particles and make them suitable for use in radiation hard applications.
- The increases of battery powered equipment strongly increase the demand for integrated circuits operating at a low supply voltage and with minimum power consumption .This is also a reason for choosing SOI instead of bulk in the future, since it is more suited to low voltage applications.
- In addition, the current drive capability of SOI devices is higher than for bulk devices, which increases the speed of the device. It also makes it possible to trade speed/power, to get a device with the same speed performance as the bulk device, but at lower power consumption.
- In SOI MOSFETS to enhance the immunity against short channel effects, a number of solutions have been proposed in literature such as (i) thin body SOI with raised source and rain, (ii) buried insulator engineering, (iii) graded channel SOI, (iv) halo doped SOI, (v) ground plane SOI, and (vi) multiple gate SOI.

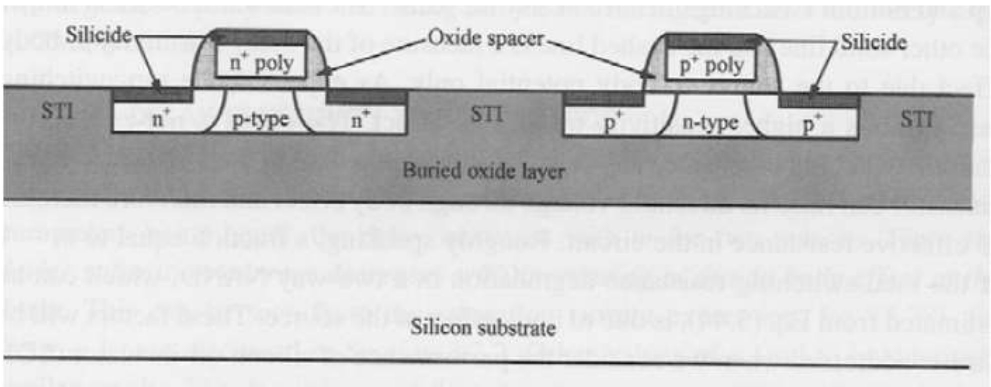

Fig 8: SOI Device

CONCLUSION

When the gate directly couples with the drain or source rather than the channel, it losses some control over the charge in the channel and SCEs are said to have occurred. Better reduction of SCEs and an improvement in the device reliability have been observed with techniques like using properly designed high k material stacks, pocket implants, channel engineering, creating shallow source and drain junctions and SOI technique.

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An effective algorithm to detect vehicles in real time

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Abstract— With the development of technology, automated vehicle detection in aerial surveillance keeps on improving and plays an important role in modern wars, transport system and industries. Due to significant importance in many fields such as terrorist activities monitoring, traffic accidents avoidance, congestion avoidance, toll collection, military, police, security and surveillance system, it has become an important field to study. Different technologies have been proposed and implemented for detection of vehicles and aerial view is considered, which gives better appearance of area being covered. In this paper an efficient algorithm for detection of vehicles in aerial surveillance is proposed. The proposed algorithm first isolates channels from the input video, applies morphological operations on each channel and performs background subtraction in identifying the foreground objects followed by vehicle detection method. Vehicle detection is based on low level feature extraction like edges, shape and detection of grouped objects. Finally system performs post processing for the detection of vehicles. Experiments were conducted on different types of aerial videos. The results illustrate flexibility and accuracy of the proposed algorithm on different aerial videos taken under different camera angles and heights.

Keywords— aerial surveillance, congestion, toll collection, morphological operations, background subtraction, foreground objects, grouped objects.

1. INTRODUCTION

Many different kinds of techniques have been proposed, but very effective and novel technique has been introduced in this paper. Surveillance of traffic area is leading nowadays, it is because of rapid increase in the number of vehicles but roads area remains the same causing congestion. Determining the density of the vehicles in the road and analysis of the surveillance of the video will help a lot in traffic management systems.

An organization named intelligent transport systems (ITS) has invested a huge amount in traffic surveillance. The technology has replaced the surveillance system of sensors with the video camera and computer vision techniques. Number of vehicles can be detected as well as tracked with the features of vehicles in the video. Also the detected vehicles can be classified into heavy vehicles, light vehicles etc. This kind of video surveillance systems holds good for different traffic and environmental conditions.

Hinz and Baumgartner [1] proposed hierarchical model which describes vehicle features at distinct levels. There is no explicit vehicle models are assumed, which defines the flexibility of the model. With the influence of neighboring objects that is present and by the weak contrast the system has disadvantage of many of false detection. Cheng and Butler [2] considered many clues and used mixture of experts to combine the clues for vehicle detection in aerial surveillance. Mean shift algorithm is considered for performing color segmentation and motion analysis is done by change detection. In inclusion, for enforcement of contextual information and multisacale analysis they consider a trainable sequential maximum and posterior method. However, the system cannot deal with complex background changes and previously mentioned camera motions, when motion analysis algorithm is applied. Further, there is high dependency on the results of color segmentation in information fusion step.

Lin et al. [3] utilized a background subtraction method which performs subtraction of static background color of each frame then refines the foreground vehicle regions by imposing size constraints of vehicles. However, too many parameters are assumed such as the smallest and largest sizes of vehicles, and the focus and the height of the airborne camera. Assuming these parameters the known priors are not realistic in real applications In [4], the authors described a moving-vehicle detection method which is based on cascade classifiers.

The system is trained with large number of positive and negative samples. Furthermore, the detection stage generates multiscale sliding windows. This method has the disadvantage of lot of miss detections on the rotated vehicles. If the system is trained with only frontal faces, then the faces with poses are missed absolutely. However, the positive samples of faces with poses are considered, it results in increase number of false alarms.

Choi and Yang [5] suggested a vehicle detection algorithm based on symmetric property of car shapes. However, this indication is prostrate to miss detections such as road markings or symmetrical details of buildings. So, log-polar histogram shape descriptor is applied to verify the shape of the candidates. But, the fixed vehicle Model defines the shape descriptor which makes the algorithm inflexible. Moreover, identical to [2], the algorithm in [5] depends on mean-shift clustering for image color segmentation. Since vehicle has different colors of roofs and windshields, it results in separating vehicle as many regions which is the major disadvantage of this method. Furthermore, adjacent vehicles may be joined as one region if they have identical colors. The mean-shift segmentation which has high computational complexity is included in this algorithm.

In this paper, we propose an efficient and novel vehicle detection method which preserves the advantages of existing systems and avoid their defects. The proposed system design is illustrated in Fig. 1. The proposed algorithm is purely based on morphological operations, it extracts frames from the given video, convert it into HSV format and the channels of the frames are split into separate channels. Each channel is processed separately with the series of morphological operation such as erosion and dilation succeeded by tophat and bottomhat transformation. Frames are converted from HSV to grayscale color model, so that low level feature can be extracted easily. Moving foreground region is separated from the static background by using background subtraction method, followed by low level feature extraction by canny edge detection. The proposed algorithm considers shape and size as low level feature and detects grouped object which results in blob detection followed by post processing such as drawing bounded rectangle on the detected vehicle and counting the number of vehicles. Section II elaborates the proposed vehicle detection mechanism in detail. Section III comprises of experimental results. Finally, conclusions and future works are made in Section IV.

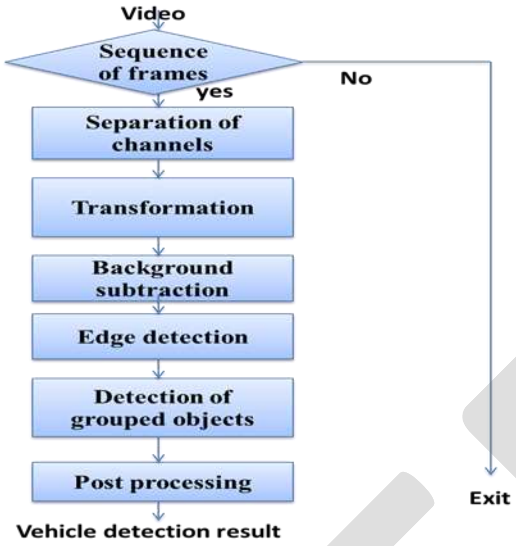


Figure 1 Proposed system Framework

Here, we explain each module of the proposed method in detail.

2. PROPOSED METHODOLOGY

2.1 Separation of channels

HSV formats are most suitable for detection, since HSV provide absolute color space of each vehicle. Hence we convert we convert from RGB to HSV where Hue (H) and Saturation (S) has only color information and Value(V) has only intensity information. And the intensities of the channels are processed without altering the color information. After processing, intensity information is recombined with the color information. We want to extract color information from the image so we split the colored image of HSV color space to three different channels and process the pixel intensity value in each channel. Splitting an image in its color channel decreases the time complexity of algorithm.

2.2 Transformation

Morphological processing is basically collection of non-linear operations related to the shape or features of an image. It depends on relative ordering of pixel values and not on their numerical values. Morphological operations are usually performed to remove noise, isolating the individual elements and joining separate elements in an image and also for finding intensity bumps or holes in an image. Morphological techniques examine an image with a pattern or small shape called structuring element.

The structuring element is located at all possible positions in an image and it is analyzed with the corresponding proximity of the pixels. Morphological operation differs in how we carry out this comparison. Structuring element is also called as kernel and consists of a template specified as the co-ordinates of a number of distinct points. Consider an example of 8X8 image as shown in the fig below where the structuring element is of 2X2. White color box represents zero pixel value and grey color box represents non zero pixel value. The structuring element is slide across the image and examines the image with the structuring element values. The label 'A' indicates the structuring element not fitting in the image, 'B' indicates structuring element intersecting the image and 'c' indicates structuring element fitting in the image.

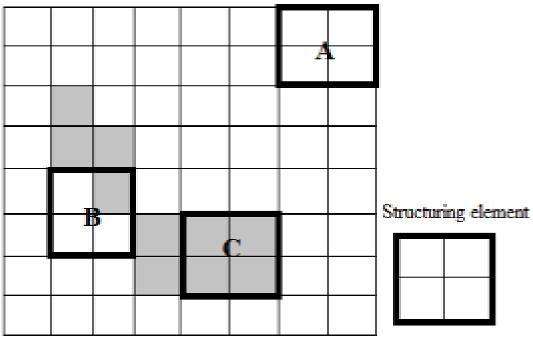


Figure 2 Illustration of structuring element

The fundamental morphological operations are erosion and dilation.

2.2.1 Erosion

Erosion operation is to gradually decrease the boundaries of region of foreground pixel, the area of foreground pixels shrink in size and strips away a layer of pixels from an object where the holes within those areas become larger.

It considers two pieces of data, one is the input image and other is structuring element. For each of the foreground pixel, structuring element is superimposed on the top of the input image. So that origin of structuring element coincides with the input pixel co-ordinates and the pixels which are not completely enclosed by other foreground pixels are removed, these pixels lay at the edges of foreground regions. So it results in shrinking of foreground region where holes inside a region grows. It results in removal of small spurious bright spots in images.

2.2.2 Dilation

Dilation operation gradually enlarges the boundaries of regions of foreground pixels, thus area of foreground pixels grow in size where holes within these region become smaller.

This operation considers two input data sets, one is the input image and other is structuring element, it considers the background pixel in the input image as input pixel, structuring element is superimposed on the top of the input image. So that structuring element coincides with the input pixel co-ordinates and if there is an intersection of at least one pixel between structuring element and foreground pixel then the input pixel is set to foreground. This operation sets the background pixels to the foreground pixel value if it has a neighbor foreground pixel and these pixels lay at the edges of foreground regions. So it results in in growing of foreground regions where the holes inside a region shrink and erosion is used in filling the small spurious holes in images.

2.2.3 Opening and closing

An opening is defined as erosion succeeded by dilation with the same structuring element. It considers two input data sets, one is the input image and other is structuring element.

Let 'f' be the input image and 'õ' be the structuring element. 'Ó' indicates opening operator, 'Ê' indicates erosion and 'Đ' indicates dilation. The opening operation is represented in equation (1).

Ó (f, õ) = Đ (Ê (f, õ), õ) --------------(1)

This operation retains foreground regions that have identical shape of structuring element and eliminates other regions of foreground pixels.

Closing operation is performed in revere of opening. It is defined as dilation succeeded by erosion with the same structuring element. It considers two input data sets, one is the input image and other is structuring element.

'Ç' indicates closing operator. The closing operation is represented in equation (2).

$$\text{Ç}\,(f, \tilde{o}) = \hat{E}\,(\text{Đ}\,(f, -\tilde{o}), -\tilde{o}) \quad \text{--------------}(2)$$

This operation retains background regions that have identical shape of structuring element and eliminates other regions of background pixels.

2.2.4 Tophat and Bottomhat Transformation

Tophat transformation is performed by subtracting the original frame from the opening operator. The tophat transformation is represented in equation (3). Let I(x,y) be the original frame. 'Ť' indicates tophat transformation.

$$\check{T}(x,y) = \acute{O}\,(f, \tilde{o}) - I(x,y) \quad \text{---------------}(3)$$

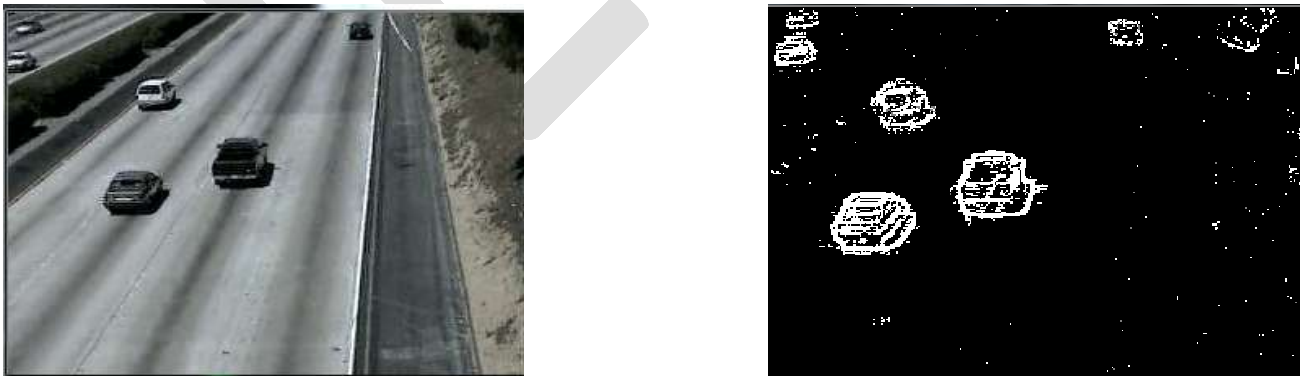
Bottomhat transformation is performed by subtracting the closing operator frame from the original frame. The bottomhat transformation is represented in equation (3). 'Ḃ' indicates bottomhat transformation.

$$\dot{B}(x,y) = I(x,y) - \text{Ç}\,(f, \tilde{o}) \quad \text{----------------}(4)$$

After the transformation method, channels are merged and further processed with the combined channels.

2.3 Background subtraction

Moving foreground objects are isolated from the static noisy background using background subtraction method [6]. It is the most important technique used to extract foreground objects from the image. It performs frame by frame subtraction which results in the removal of static noise in the video. The objects are segmented using Gaussian mixture model of background subtraction method. The proposed system extracts the foreground region by background subtraction [7] which gives the region where the vehicle exists in the scene. A mask is created for this region, convolved over the input image to obtain the vehicle and subtracts the background. Figure 3 shows the result of foreground object extraction.



(a) (b)

Figure 3: (a) Input image (b) Object extraction

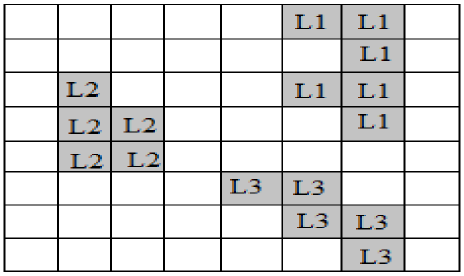
2.4 Edge detection

For extracting low level feature edge, classical canny edge detection is used which is less sensitive to noise and reduce the noise by smoothing. Two thresholds T_{high} and T_{low} are set and avoid streaking problem. It provides good localization by considering gradient orientation. Once the edges are extracted from the object, blurring of the extracted object is performed so that superfluous interior edges are not considered in further processing.

2.5 Blob detection

Grouped object which is called as blob can be identified by using eight way connectivity. In this method the pixels are scanned across the image and foreground pixel is checked with the eight neighboring pixels, whenever the input pixel is connected with the foreground pixel it checks for the label of that pixel if the neighboring foreground pixel is already labeled, then it assigns the same label to the input pixel or it assigns unique label to the input pixel. This process is carried out till it reaches the last pixel of the frame.

Consider an image of 8X8 as shown in the figure below, which consist of three objects which are uniquely labeled as L1,L2,L3. Gray color indicates the foreground pixel i.e ‘0’ and white color indicates background pixel i.e ‘1’.



					L1	L1	
						L1	
	L2				L1	L1	
	L2	L2				L1	
	L2	L2					
				L3	L3		
					L3	L3	
						L3	

Figure 4 Blob detection

Since the grouped object identified has irregular shape convex hull is used to define a regular shape. It considers the exterior points of the blob and polygon is constructed from these points.

2.6 Post processing

Size of the blobs are calculated which is based on the calculating the number of occurrence of the foreground pixel in the blob. Size constraint is enforced on the object so that small objects which can act as noise can be removed. Bounded rectangle is drawn on the objects which confines the detected vehicle and a virtual line is drawn to count the number of vehicles, the centroid of the bounded rectangle is calculated. When the centroid intersects the virtual line, count is incremented.

3. EXPERIMENTAL RESULTS

Experimental results of the proposed algorithm is demonstrated in this section which is conducted on different datasets of aerial videos which is taken under different camera angles and heights, the frame rate of the input video considered is 25 frames per second and video is of length 15 minutes. Figures in this section demonstrate the detected vehicles with the bounded rectangle on the vehicles and the red color line in the figure is a virtual line which is drawn to count the number of vehicles. Fig (6) shows the detection of all the vehicles in the complex environment which confines the accuracy of the proposed algorithm in the complex environment. Fig (9) shows that the bounded rectangle on the detected vehicle remains until the vehicle goes out of the frame which confines the stability of the algorithm. Red color circle in the Fig (11) shows the total number of vehicles in the video and the blue color circle indicates the vehicles coordinates intersecting the virtual line. Time complexity of the algorithm for processing each frame is less which is 15 frames frames per second since the numbers of instructions used are less and the computational complexity of the algorithm is less which makes use of basic techniques like morphological operations, etc. Table (1) shows the results of the algorithm with number of vehicles detected by the system, number of vehicles not detected and the vehicles detected manually, precision is calculated using the equation (5)

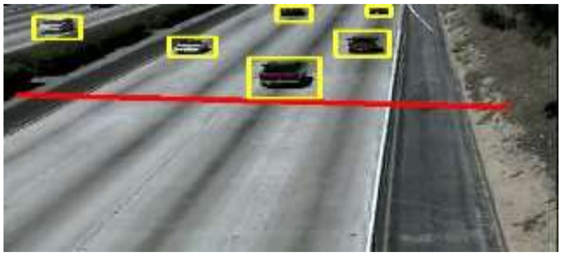


Figure 5

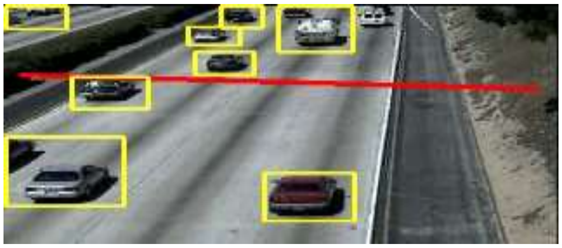


Figure 6

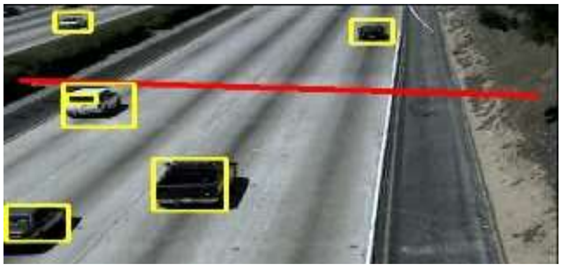


Figure 7

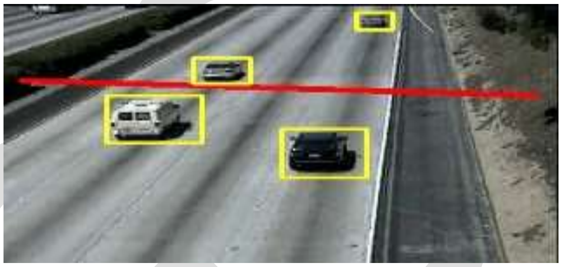


Figure 8

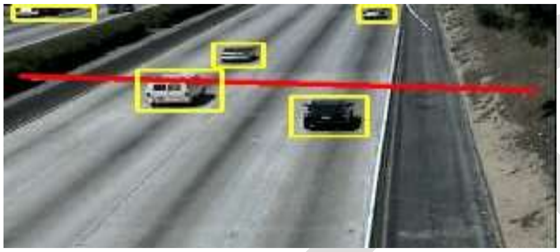


Figure 9

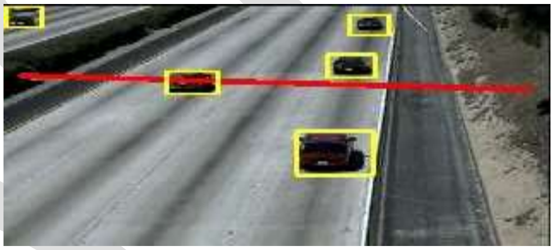
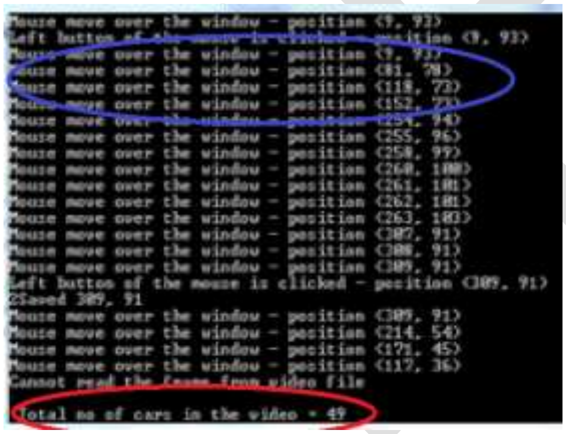


Figure 10



```
Mouse move over the window - position (9, 93)
Left button of the mouse is clicked - position (9, 93)
Mouse move over the window - position (9, 93)
Mouse move over the window - position (81, 78)
Mouse move over the window - position (118, 73)
Mouse move over the window - position (152, 73)
Mouse move over the window - position (254, 94)
Mouse move over the window - position (255, 96)
Mouse move over the window - position (258, 99)
Mouse move over the window - position (260, 100)
Mouse move over the window - position (261, 101)
Mouse move over the window - position (262, 101)
Mouse move over the window - position (263, 103)
Mouse move over the window - position (307, 91)
Mouse move over the window - position (308, 91)
Mouse move over the window - position (309, 91)
Left button of the mouse is clicked - position (309, 91)
Saved 309, 91
Mouse move over the window - position (309, 91)
Mouse move over the window - position (214, 54)
Mouse move over the window - position (171, 45)
Mouse move over the window - position (117, 36)
Cannot read the frame from video file
Total no of cars in the video = 49
```

Figure 11: command prompt of vehicle count shown with red color circle.

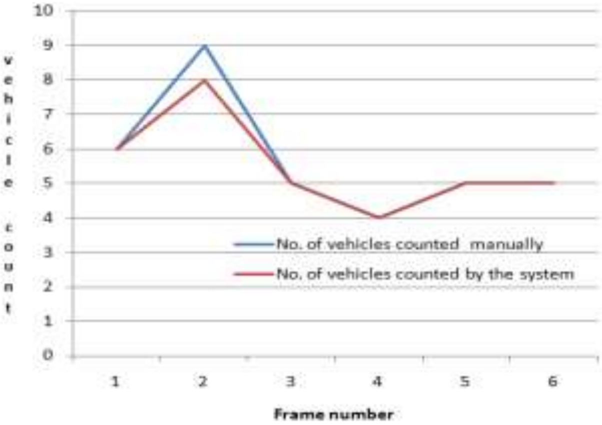


Figure 12: Analysis of vehicle detection

$$\mathbf{P} = \frac{\mathfrak{m}}{\mathfrak{w}} \quad \text{----------------------------------} \quad \mathbf{(5)}$$

'𝔐' indicates the number of vehicles detected manually and '𝔴' indicates number of vehicles detected by the system.

Precision value close to '1' indicates the accuracy of the algorithm. Graph in the fig (12) with x-axis frame number and y-axis vehicle count demonstrates the algorithm pictorially with line graph, blue line indicates the number of vehicles counted by the system and the red line indicates number of vehicles counted by the system with implementing the proposed algorithm. Overlapping of the two lines defines the feasibility of the algorithm in the complex environment even when the vehicles are close enough.

Scene	No. of vehicles counted manually	No. of vehicles counted by the system	No. of vehicles not detected	Precision
1	6	6	0	1
2	9	8	1	0.89
3	5	5	0	1
4	4	4	0	1
5	5	5	0	1
6	5	5	0	1

Table 1: Tabular representation of video frame results

4. CONCLUSION AND FUTURE WORK

The proposed algorithm provides efficient and novel methodology for vehicle detection in aerial surveillance without assuming any details of camera heights, views and vehicle sizes. Canny edge detection is used which increase the accuracy and adaptability of detection in aerial images. Proposed algorithm has less computation complexity which increases the efficiency of the algorithm. The experimental result illustrates flexibility and accuracy of the proposed algorithm on different aerial videos taken under different camera angles and heights. The proposed method can be extended to perform tracking on the detected vehicle which stabilizes the results. It can also be improved in solving merging problem and working on shadows.

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Design and analysis of Power hack Saw attachment to a Center Lathe

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Abstract— This work provides a simple and economical Hacksaw attachment on a Centre Lathe. The conventional hacksaw machines which are available in the market cost around 30,000 to 40,000 Indian Rupees where as our hacksaw attachment on Lathe costs around 10,000 to 15,000 Indian Rupees only. In this attachment we can obtain various cutting speeds from the Lathe and also variable cutting forces with the help of a movable dead weight where as in the conventional hacksaw machines variable cutting speeds and variable cutting forces are not possible. This attachment is most useful for small workshops where there is not enough space for accommodating both Lathe and Hacksaw machines. This Hacksaw attachment on a Centre Lathe uses a simple four-bar mechanism where the link adjacent to the smallest link is fixed and we get a Crank-Rocker mechanism. We can use the coolant mechanism available on the Lathe for cooling and lubrication. We can cut a variety of materials using this hacksaw attachment as variable cutting forces are available. We have designed each of the components in Unigraphics Nx-8.5, assembled and simulated the motion. We have manufactured the required components and purchased the standard components available in the market. We have calculated the cutting force and the force obtained from the attachment is more than sufficient for cutting. We have also found out the temperatures during cutting of different materials such as Aluminum and Mild-Steel bar stocks using a Laser gun temperature measuring device.

Keywords— Center Lathe, Power Hack Saw, Designing, Manufacturing, Force Analysis, Tests performed, Cutting force.

INTRODUCTION

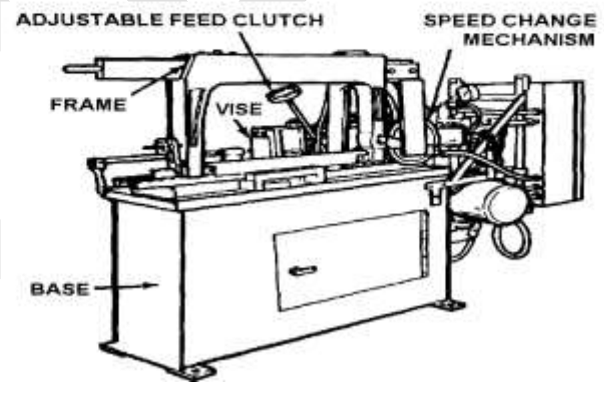
1. Sawing Machines:

Purpose:

The sawing machine is a tool designed to cut material to a desired length or contour. It functions by drawing a blade containing cutting teeth through the workpiece. The sawing machine is faster and easier than hand sawing and is used principally to produce an accurate square or mitered cut on the workpiece.

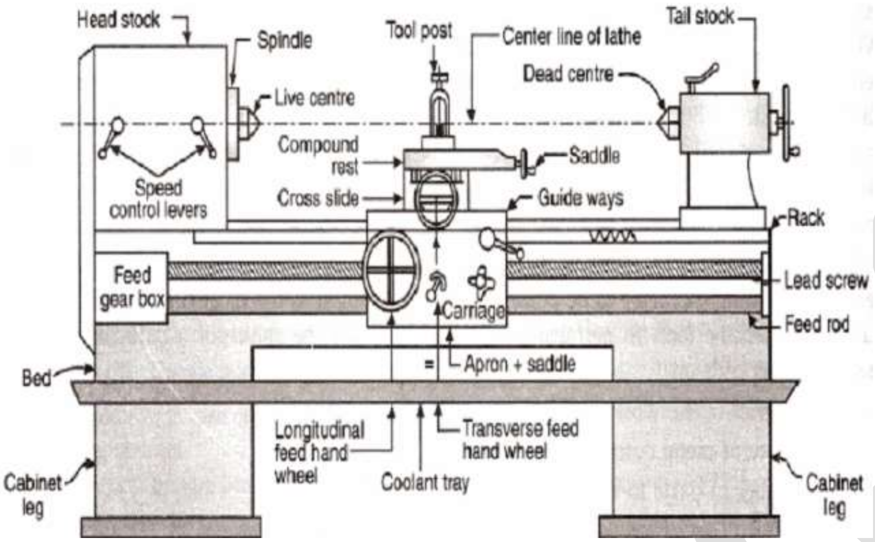
Types:

The power hacksaw and the bandsaw are two common types of sawing machines used to cut metal in the machine shop. The power hacksaw uses a reciprocating (back and forth) cutting action similar to the one used in a hand hacksaw. The power hacksaw is used for square or angle cutting of stock. The band saw uses a continuous band blade. A drive wheel and an idler wheel support and drive the blade



2. Lathe

The lathe is a machine tool used principally for shaping articles of metal (and sometimes wood or other materials) by causing the workpiece to be held and rotated by the lathe while a tool bit is advanced into the work causing the cutting action. The basic lathe that was designed to cut cylindrical metal stock has been developed further to produce screw threads, tapered work, drilled holes, knurled surfaces and crankshafts. The typical lathe provides a variety of rotating speeds and a means to manually and automatically move the cutting tool into the work piece. Machinists and maintenance shop personnel must be thoroughly familiar with the lathe and its operations to accomplish the repair and fabrication of needed parts.



MECHANISMS USED IN POWER HACK SAW ATTACHMENT

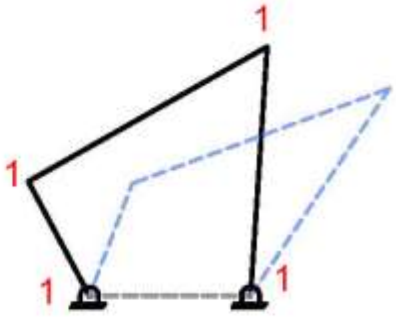
We use a Crank-Rocker mechanism for the Power Hacksaw Attachment on a Center Lathe.
Gruebler's equation
This equation is used to find the Degrees of freedom of a mechanism.

N= Number of Links (including ground link).

P = Number of Joints (pivot connections between links).

- Each link has 3 degrees of freedom.
- Each pivot subtracts 2 degrees of freedom.

DOF = 3 (N-1) - 2P



N = 4
P = 4
DOF = 3X (4-1)-(2X4) =1

WHAT IS TO BE ACHIEVED

A. Objective

- To design and fabricate a Power Hack saw attachment on a Heavy Duty Lathe.
- NX software shall be used to design the power saw. Analysis of links will be carried out using ANSYS.
- Design of the mechanism will be carried out based on the forces acting on the links.
- To make the Power Hack saw machine affordable for small workshops.
- To utilize Lathe even for cutting bar stocks.

B. Specifications of Heavy Duty Center Lathe

- Admits between centers = 1035 mm.
- Centre height = 235 mm.
- Swing over Cross slide = 255 mm.
- Lead screw = TPI: 4
- Motor details: 3HP at 1440 RPM AC. 50 Hz, 3 phase.

C. Problem Definition

- Generally the conventional Power Hack Saw costs about Rs 60,000.
- Space is very important criteria for the small workshop. The conventional Power Hack Saw needs more space for its installation.
- Variable cutting speeds and variety of cutting speeds cannot be attained from the conventional Power Hack Saw.
- Variable cutting strokes cannot be attained in conventional Power Hack Saw.

D. Problem Solution

- This attachment costs around Rs15, 000-20,000 only.
- Already available Lathe can be used for cutting of bar stocks by using this attachment thereby saving the space.
- Variable cutting speeds can be obtained.
- Variable cutting strokes can be obtained.

E. Procedure Followed

- Designing of each component in Unigraphics NX8.5 software.
- Obtaining the dimensions of each component based on the available space limitations.
- Assembling the designed components in NX8.5 software.
- Giving motion to the assembly in NX8.5 software and obtaining the simulation.
- Calculation of force required for cutting.
- Calculation of force obtained from the Lathe and checking whether it is sufficient to cot or not.
- Manufacturing the components.
- Purchasing the standard components.
- Assembling of the manufactured components.
- Performing certain tests such as Finding the temperature in the cutting zone for different materials, Finding the cutting time for different materials.

WORKING

The mechanism is similar to the Crank-Rocker mechanism. The Face plate is connected to the chuck in the Head stock with the help of Spindle and draws the power from the Lathe. This rotatory motion of the Face plate is converted to the angular motion of the Rocker arm.

From here the angular motion is converted to the translatory motion of the frame with the help of an extension from the Rocker arm and the connected to the Hacksaw frame.

The feed is provided with the help of a movable dead weight which is provided on the top of the frame whit the help of Screw rod and Dead weight.

With the help of this movable dead weight we can get variable cutting forces for different materials. This dead weight can be moved along the frame length from the pivot point to the end of the frame on a screw rod, its position can be locked at any position with the help of lock nuts, and hence different forces can be obtained.

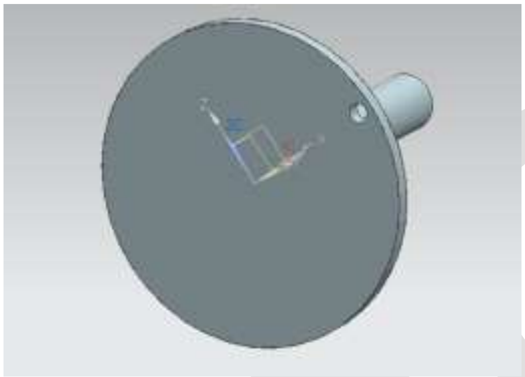
PARTS

- Face plate or Crank.
- Connecting rod.
- Rocker arm.
- Hack saw frame.
- Hacksaw Blade
- Vice for holding the work piece.

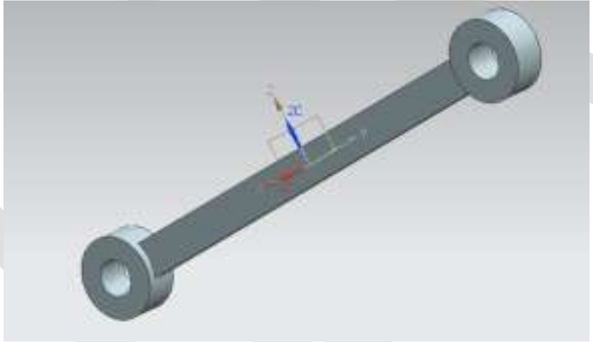
- Carriage.
- Bearings used in all joints (I.D = 10mm, O.D = 30mm)..
- Clamps for holding Carriage.
- Movable Dead Weight along with Screw rod.

A. Parts Description

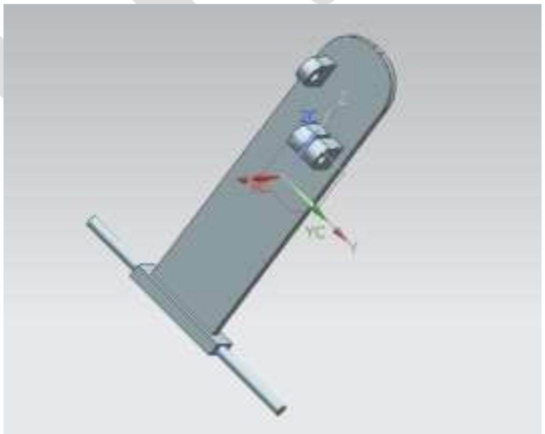
i. Face Plate or Crank



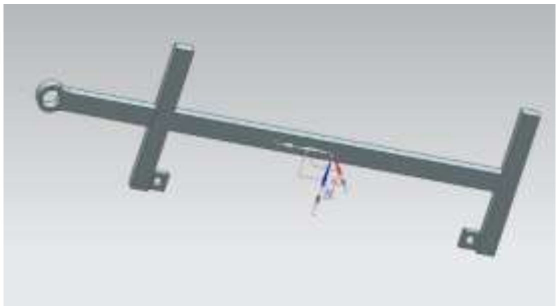
ii. Connecting rod



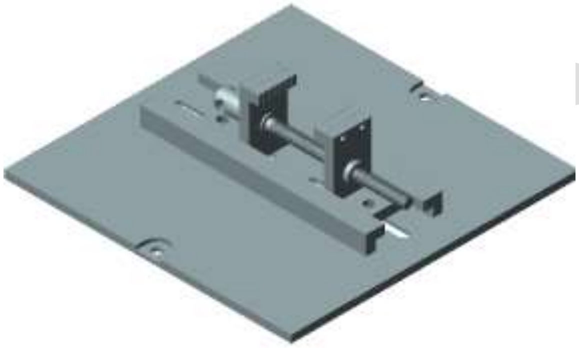
iii. Rocker Arm



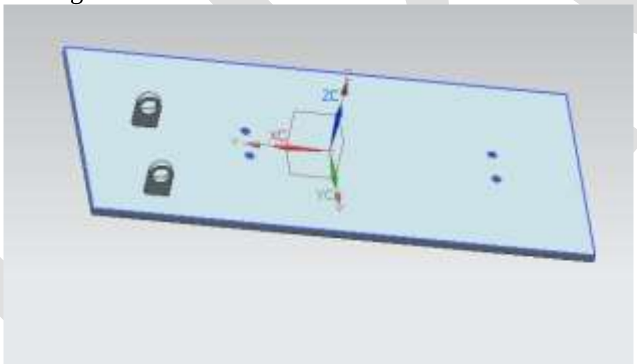
iv. Hacksaw frame



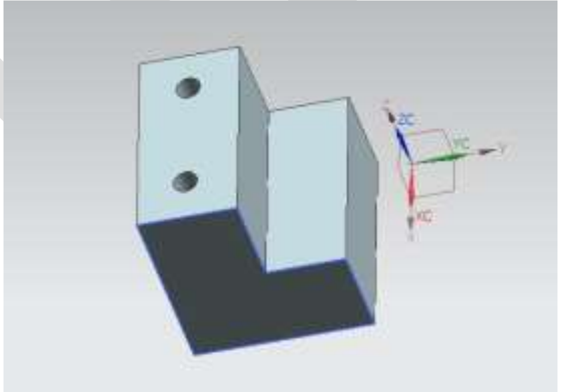
v. Vice For Holding The Work Piece



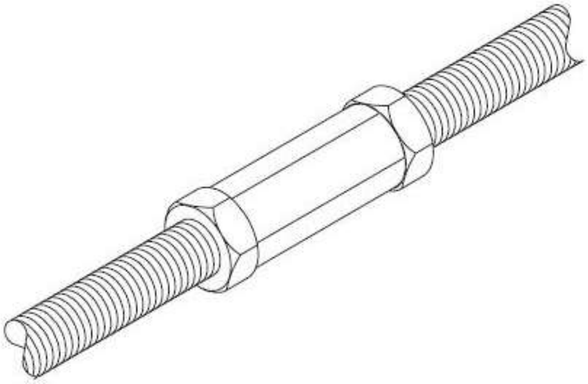
vi. Carriage



vii. Clamp

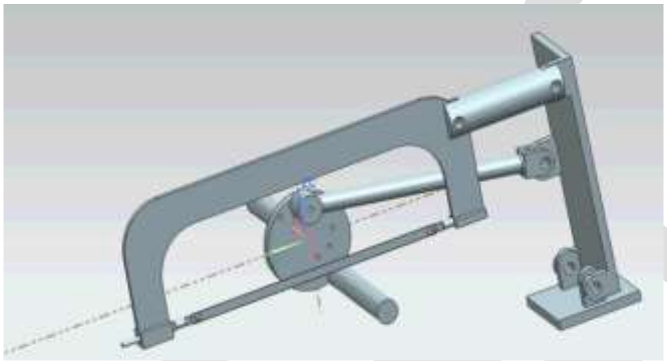


viii. Movable Dead Weight Along With Screw Rod

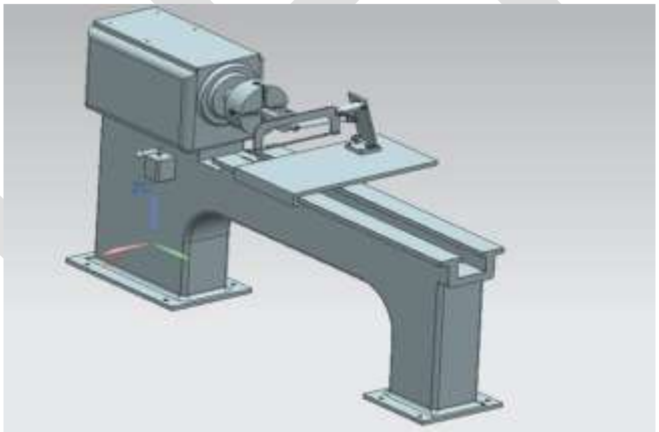


ASSEMBLY

The following figure shows the assembly of the designed parts



The final Assembly is as follows



CALCULATIONS

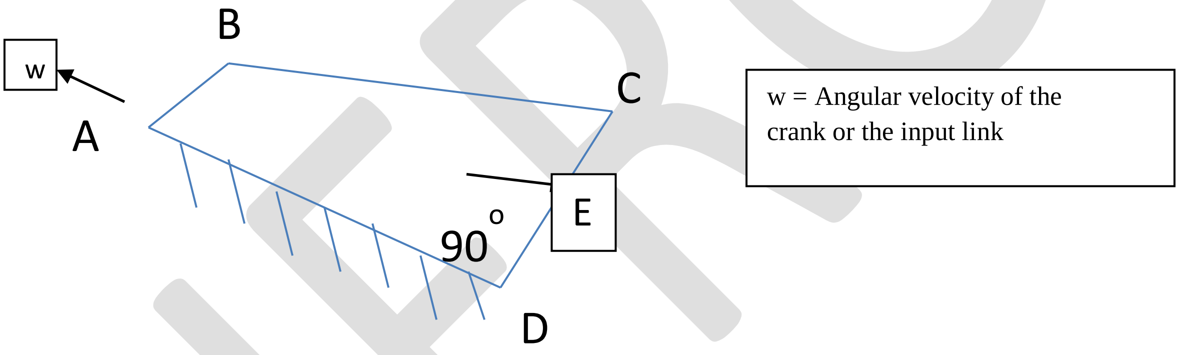
1. **Link Lengths:**

- Diameter of the Face Plate= 200 mm (Obtained from the space limitations)
- Connecting rod length= 295 mm (Obtained from the limitation of the space between Rocker Arm and Face Plate)
- Rocker Arm length= 195 (Based on the length constrain of the standard Hacksaw Blade of 10 TPI)
- Carriage Dimensions= 640mm x 330mm x 10mm (Based on space required to accommodate all the parts and the work piece).

2. **Velocity Analysis:**

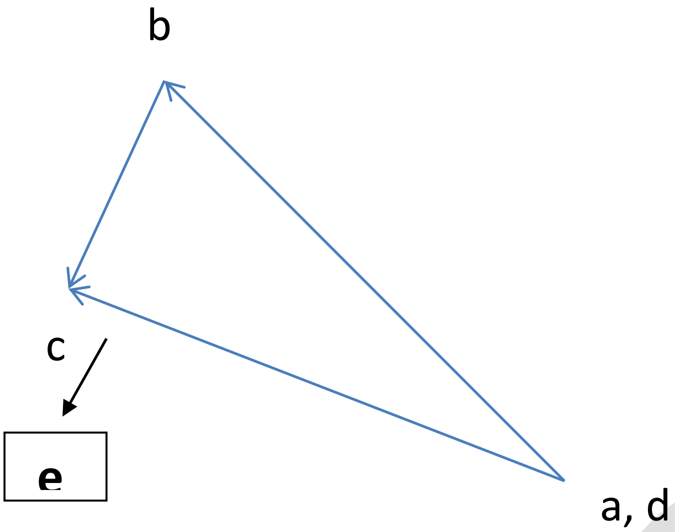
- Optimum speed for cutting from the lathe for cutting mild steel = 75 Rpm.
- Speed of the crank w= 7.85 rad/sec v= 0.746 m/sec.
- Using Graphical method velocity of the rocker arm where the frame is pivoted = 0.346 m/sec. Consider for the position shown below

Position Diagram



Where Link lengths

AB = 95 mm, AD = 320 mm, BC = 295 mm, CD = 195 mm.



Velocity Diagram

From the above velocity diagram

dc = 500,

We know that 'dc' and 'de' are in the same ratio of lengths DC and DE

Therefore $^{de}/_{135} = {}^{500}/_{195}$, then we get de = 346.15 $^{mm}/_{sec}$.

Hence 'de' = Velocity of the pivoted point of frame on the Rocker = 0.346 $^{m}/_{sec}$.

3. Calculation of Cutting Force Required:

From the modified second law of cutting force,

$$P_Z = (p_o \div a^m) \times A$$

Now,

$$A = a \times (\textstyle\sum^{Z} b)$$

And **a** = rise per tooth

$$\sum^{Z} b = b \times Z_c$$

Where Z_c= Number of Cutting Teeth.

and **b** = Width of the teeth in 'mm'.

The value of $K_s = (p_o/a^m)$ is shown in the following figure 13.3.1 from which the force is evaluated.

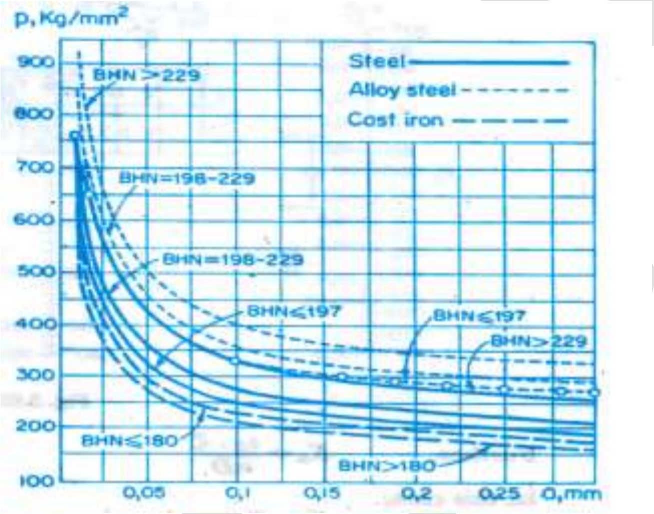


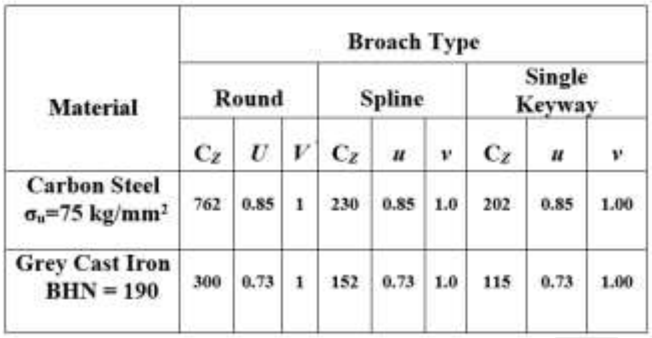
Fig3.1

$$P_Z = K_s \times a \times \left(\sum^{Z} b\right)$$

The force P_z can be expressed in Granovsky's form derived from First Law of Cutting Force, then

$$P_Z = C_Z \times s^u \times \left(\sum b\right) \times K_H \times K_\gamma \times K_\alpha \times K_\omega \times K_c \text{, Kg.}$$

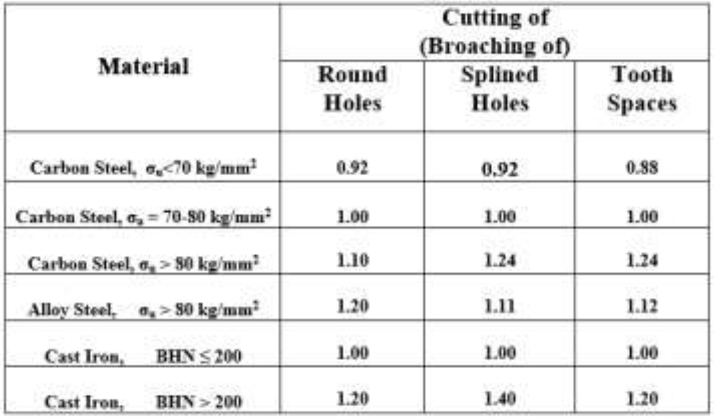
The values of constants **C_z, u, v** can be determined from the Table 3.1 and the values of K_H, K_γ, **K**, K_w and K_c can be determined from the tables 3.2, 3.3, 3.4, 3.5 and 3.6.



Material	Broach Type								
	Round			Spline			Single Keyway		
	C_Z	U	V	C_Z	u	v	C_Z	u	v
Carbon Steel σ_u=75 kg/mm²	762	0.85	1	230	0.85	1.0	202	0.85	1.00
Grey Cast Iron BHN = 190	300	0.73	1	152	0.73	1.0	115	0.73	1.00

Table 3.1

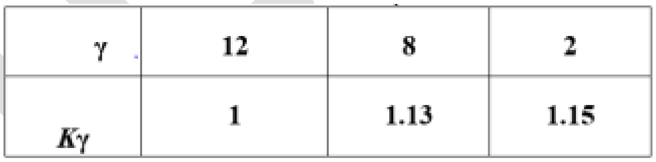
Values of K_H



Material	Cutting of (Broaching of)		
	Round Holes	Splined Holes	Tooth Spaces
Carbon Steel, σ_u<70 kg/mm²	0.92	0.92	0.88
Carbon Steel, σ_u = 70-80 kg/mm²	1.00	1.00	1.00
Carbon Steel, σ_u > 80 kg/mm²	1.10	1.24	1.24
Alloy Steel, σ_u > 80 kg/mm²	1.20	1.11	1.12
Cast Iron, BHN ≤ 200	1.00	1.00	1.00
Cast Iron, BHN > 200	1.20	1.40	1.20

Table 3.2

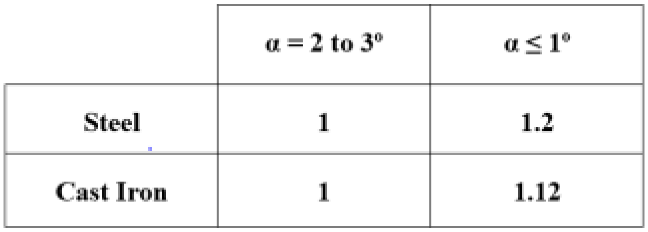
Values of $K\gamma$



γ	12	8	2
$K\gamma$	1	1.13	1.15

Table 3.3

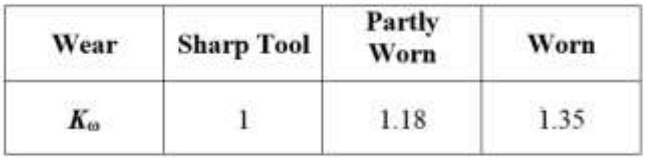
Values of K_α



	α = 2 to 3°	α ≤ 1°
Steel	1	1.2
Cast Iron	1	1.12

Table 3.4

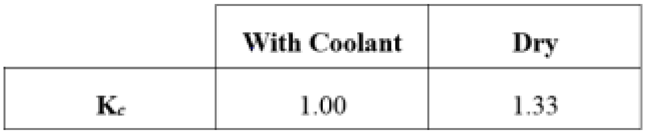
Values of K_ω



Wear	Sharp Tool	Partly Worn	Worn
K_ω	1	1.18	1.35

Table 3.5

Values of K_c



	With Coolant	Dry
K_c	1.00	1.33

Table 3.6

Here $C_z = 202$, $u = 0.85$, $v = 1$

$K_H = 1$, $K_\gamma = 1$, $K_a = 1$, $K_w = 1$ and $K_c = 1.33$

Feed S = 0.34615 m/sec = 5.769×10^{-3} m/min

(From cutting speed obtained in Velocity Analysis).

Required Cutting Force $P_z = 170.609$ kg

$P_z = 1671.88$ N.

4. Force Obtained from the Lathe

Power of the Lathe = 3 H.P

We know that 1 H.P = 750 W.

Hence the power obtained from the Lathe **P** = 2250 W.

Optimum speed **N** = 75 R.P.M

We know that power **P** = 2 x π x N x T/60 watts.

Where **T** = Torque in N-m.

At **P** = 2250 W, **N** = 75 R.P.M

We get Torque **T** = 286.487 N-m.

We know that Torque **T** = F x r N-m.

where **F** = Force in newton, **r** = Radius from the pivot in metre.

At **T** = 286.487 N-m and **r** = radius of the crank = 0.095 m.

We get Force **F** = 3015.55789 N.

Considering the Overall Efficiency (Including Transmission and Mechanical losses) = 90 %

Total Force available for cutting from the Lathe to the Hacksaw = 0.9 x 3015 N

$\mathbf{F_t}$ = 2714 N.

This Force $\mathbf{F_t}$ = 2714 N is greater than the required force for cutting $\mathbf{P_z}$ = 1671.88 N.

Hence the Lathe can provide the cutting force and we can use the Power -Hacksaw attachment on the Lathe.

TESTS PERFORMED

To find out the Temperature in the cutting zone during cutting for different materials:

An Infrared Thermometer is used to find out the Temperature in the cutting zone
Temperature obtained while cutting Aluminium pipe T1 = 260^{o}C
Temperature obtained while cutting Mild Steel Stock T2 = 560^{o} C.

RESULT

- Designed each component and the dimensions were obtained successfully according to the Lathe specifications.
- Simulated the motion to the assembly in the Nx software and the design was correct.
- Identified which parts are to be manufactured and which parts are standard parts.
- Fabricated the Face Plate, Connecting rod, Carriage, Rocker-Arm, Clamps and assembled them.
- Bought the standard parts such as nuts and bolts, vice etc. and assembled them. Fabricated the Power Hacksaw Attachment for a Heavy Duty Centre Lathe and the motion is successful. The entire assembly is shown in the following figure.

ACKNOWLEDGMENT

Thanks to Dr. K. Kishore for providing technical assistance in calculating the cutting force and also for providing help in researching on Power Hack Saw.

CONCLUSION

- The Gruebler's criterion for the Linkages is satisfied.
- Granovsky's equation is satisfied and used to find the cutting force.
- Lathe is able to provide the required cutting force to cut the work piece.
- Found the temperature in the cutting zone for different materials during cutting.
- Able to obtain the required motion of the Hacksaw frame after fabrication.
- Able to get variable cutting forces with the help of a movable dead weight.
- Design, Manufacturing and Analysis of Power hacksaw attachment is completed successfully.

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A Novel Approach for Dynamic Authentication by combining Captcha, Graphical Password and OTP in a Web Enabled System

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Abstract— Password authentication is the major issue in implementing any access control. In general, a text comprising of alphanumeric characters of a minimum length will be the password to enter into a system. When the user enters the correct sequence of characters, it will be considered as a valid password and he/she will be allowed to access the system. However, when the password is not correct, the access will be refused. Software applications such as Internet bot or the web robot are used to execute simple and repetitive tasks automatically over the Internet at a much higher speed than human beings. They imitate the real user and continuously try for different combinations of password to break the authentication process.

Captcha is mainly applied to prevent automated execution of actions by the Internet bots on behalf of authenticated humans. The aim of Captcha is to make difficult for automated programs to break the authentication by asking them to pass an assessment that is simple for human beings and is rigid for computer programs. The combination of Captcha, graphical password and OTP is applied to ensure a higher level of authentication.

Keywords– Captcha, Graphical password, OTP, internet bot, challenge-response test, HIP, clickable point, click fraud.

1. INTRODUCTION

CAPTCHA is a backronym for "Completely Automated Public Turing tests to tell Computers and Humans Apart". It is the category of Turing test namely challenge-response test and a part of Human Interaction Proof system (HIP) [1]. A backronym is created by generating an innovative phrase to fit an already existing word, name, or acronym.

Luis von Ahn, Manuel Blum, Nicholas J. Hopper, and John Langford were proposed the term captcha in the year 2003 [2]. It is pronounced as cap-ch-uh. The intention of using a captcha is to assure that the response has been generated by a human being and not by a computer.

Some of the significant malicious problems of internet bots are Denial-of-service attack. DoS attack is enforced to make a server or a network resource unavailable to users. A temporary suspension or interruption may happen because of the oversupply of a service.

The other problem of internet bots is click fraud. In some online marketing, a kind of scam called a click fraud reproduces a legal user of a web browser by clicking on an advertisement to make a charge per click without having a real concern. They are used to get money from advertisers or publishers. In addition to that, they are also used to increase the hit count of a service supported by a particular website such as YouTube videos.

2. RELATED WORK

Different types of captcha are used for authentication.

2.1. Types of Captcha

i. Text-based Captcha

The text based Captcha may consist of either simple questions that are easy to answer or some distorted image of a word [3]. Some Captcha designs follow the principle of hard to separate text from background [4].

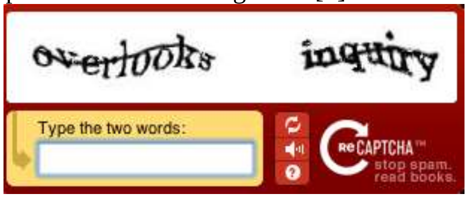


Fig. I A Text-based Captcha

ii. Audio-based Captcha

Audio based Captcha is developed for visually disabled users. After listening to the spoken word, the user has to enter the captcha.

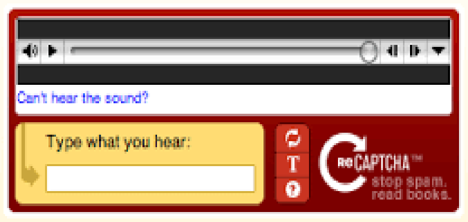


Fig. II An Audio-based Captcha

iii. Image-based Captcha

In the picture based captcha, the images of objects, animals, flowers, persons, places and fruits or birds are given for authentication. The human being can easily identify the correct picture from the visual puzzle. The important characteristics of images namely edge detection with thresholding, shape matching and random guessing have played an important role in picture based captcha mechanism [5].

Fig. III A Picture-based Captcha

iv. Video-based Captcha

VidoopCAPTCHA is a verification solution that uses Video based CAPTCHA. It will show a video, and then ask the user to enter some tags related to the video [6]. The user's tag must match with the set of automatically created tags. Then only the test is said to be accepted [12].

Fig. IV A Video-based Captcha

v. Mathematical-based Captcha

In this type, some simple mathematical problem has to be solved. Example,
What is two plus seven? The user should not type 2+7. Instead he/she has to enter the solution 9.

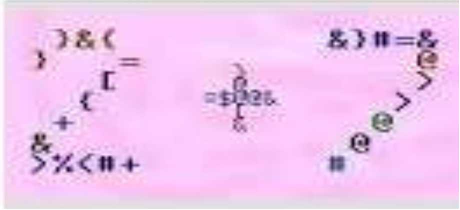


Fig. V A Math-based Captcha

vi. 3D Captcha

3D captcha works based on human imagination and ability to distinguish between different types of objects. The assumption is that a computer program cannot identify 3D content as it is an inherent part of human visual system. Hence, a high level of resistance against attacks can be assured [7].

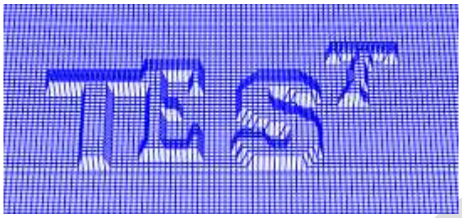


Fig. VI A 3D Captcha

vii. Ad-Injected Captcha

Ad-injected captcha is also known as commercial captcha. It is used to earn some money when the ad has been clicked. It is normally used for promoting and recognizing a brand.

Though the text based captcha is very simple, it is easy for the bots to identify and reproduce the same by making different combinations of characters randomly. For the automated software programmes, picture captcha is quite complex to identify the correct password. It is difficult for them to differentiate the type of objects given in an image, whether it is a flower or animal or fruit etc [8].

There are three categories of a graphical based password schemes namely recognition-based system, pure recall based system and cued recall based system [9]. Recognition-Based Captcha as a graphical password includes ClickText, ClickAnimal and AnimalGrid techniques [10] [11].

In general, Captcha satisfies three properties namely, easy for the human being to pass, flexible for the tester machine to grade it and rigid enough for a bot to pass [12]. Captcha with graphical password is used in visual cryptography [13].

3. MODULES OF PROPOSED SYSTEM

A high level security has been given to the proposed system namely Web Enabled System for Petrol Bunk Dealership Management. The system is used for automating the various activities that have been carried out in the petrol bunk. In the proposed system, a graphical picture is used as a captcha. Instead of selecting an entire image as a password, now the user has to register a particular pixel of the image as a password. After a clickable point in an image is selected, an image of n × n grid will be created internally, with the grid-cell size equaling the bounding rectangle of the selected image. The corresponding pixel of that clickable point will be stored in the authentication database for future verification. Also, the user has to enter his/her mobile number.

When the user wants to access the web system, first he/she has to identify the corresponding clickable password point on the image. Then the server will try to check whether this point is same as already stored in the database. If so, the user will be allowed to access the system. Otherwise, the system will give chance to the user to find the correct nearest clickable point for maximum of three times. Within that threshold (three) times, the user has to identify the correct pixel (a location closest to the pixel) as the captcha to access the system.

If still it is not possible to identify the correct pixel, the system will deny the access to the user. In addition to this security level, an OTP will be automatically generated to the user mobile. This correct OTP has to be entered in order to access the system. Thus, a two level authentication has been provided.

The major modules of the system are listed below.

3.1 Adding captcha images

The admin uploads the image for the client. By using this image, client can set the image password for security.

3.2 Add product info

The admin adds information about the availability of a stock to the client. It consists of how much amount of petrol, diesel they have. It also specifies the rate of petrol, diesel and the capacity of the tanker.

3.3 View Product Information

The admin maintains the record for determining how many liters of petrol and diesel were sold. Date wise transaction detail will be displayed.

3.4 View Client Information

The admin can view the profile of the registered client. After the admin activated the client, the client will be able to login to the particular account.

3.5 View Order Information

The admin will see the client's order. The client can purchase the specified petrol and diesel through online after getting the approval from the admin.

3.6 Export Petrol and Diesel

The client can purchase the petrol and diesel. The client has to specify the requirement. The amount will be automatically calculated.

3.7 View order status

The client can see whether his/her requests are accepted by admin or not. Initially, the order will be in pending state until the admin accept the request.

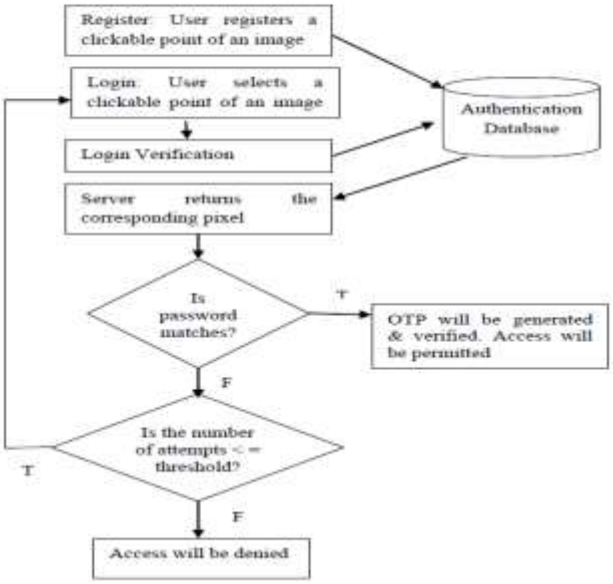


Fig. VII Overall module diagram of Proposed System

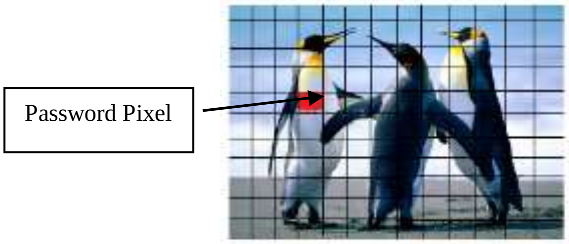
The figure VII shows the overall module diagram of the proposed system.

4. WORKING PRINCIPLE OF PROPOSED SYSTEM

The original image used for authentication is:

Fig. VIII Original Image

Now, the user has to register a particular clickable point (pixel) in this image. The red color shows the selected pixel. The corresponding position will be stored in the database for future verification.



During the login, when the user selects pixel, the corresponding location will be retrieved and sent to database for verification. Once both are matched, an One Time Password will be generated to the user to ensure higher level authentication. An user may select alternative pixel only for the given threshold (three times). Thus, click fraud can be eliminated.

5. CONCLUSION

Users normally choose passwords that can be easily guessed. On the other hand, if a password is hard to guess, then it is often difficult to recollect. Graphical password and Captcha are the alternative solution for the above problem. As the picture is more attractive for the human beings than text, it can be easily remembered by them. Unlike the static passwords, the OTP is non vulnerable to replay attacks. Hence the combination of using Captcha, Graphical password and OTP leads to more security to the Web application. It is also the most applicable safety method on touch-screen devices.

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Case Study: ASIC Implementation of Digital Multipliers

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Abstract— Multiplication is an important fundamental function in arithmetic operations. In fact, multiplication based operations such as Multiply and Accumulate (MAC) and inner product are among some of the frequently used computation –intensive arithmetic functions currently implemented in many Digital signal processing (DSP) applications (such as convolution , Fast Fourier Transform (FFT), filtering and others. In this paper, we present the analysis, design and implementation of various Digital Multipliers such as serial multiplier, parallel multipliers and serial – parallel multipliers. In day to day life VLSI field being very prominent to acquire very low area, low power and high accuracy. To obtain these factors various digital multipliers are implemented in ASIC CADENCE by using 45 nano meter technology with subsequent TSMC libraries. By using CADENCE VIRTUOSO tool, can obtain schematics of design and its test bench, power analysis of the design and its simulation wave form.

Keywords— Multiplication, Digital Multiplier, Serial multiplier, Non –additive (Braun) Multiplier, Booth Multiplier, Baugh – Wooley Multiplier, Wallace Tree Multiplier, and Serial – Parallel Multiplier.

INTRODUCTION

Multiplication can be considered as a series of repeated additions. The number to be added is called the multiplicand, the number of times it is added is called the multiplier, and the result obtained is called the product. The basic operations involved in multiplication include generating and accumulating or adding the partial products. The multiplier architecture [11] can be generally classified into the following categories: serial, parallel and serial – parallel. The paper contains following topics (1) Serial Multiplier (2) Parallel Multipliers (3) Serial – Parallel Multiplier. The following figure 1.1 shows the various digital multiplier and its types.

(1) SERIAL MULTIPLIERS

It uses a successive addition algorithm. Simple in structure because both the operands are entered in a serial manner [12]. It requires less hardware and a minimum amount of chip area. The accuracy is poor due to operands being entered sequentially.

(2) PARALLEL MULTIPLIERS

Most advanced digital systems incorporate a parallel multiplication unit to carry out high speed mathematical operations. Today, high speed parallel multipliers with much larger areas and higher complexity are used extensively in RISC, DSP and graphics accelerators. Some examples of parallel multipliers are the array multipliers such as Braun multiplier, Baugh –Wooley multiplier and Tree multipliers like Wallace Tree multiplier etc., these multipliers have regular layout, although tree multipliers are generally faster. The drawback is relatively larger chip area consumption. It presents high speed performance, but it is expensive in term of silicon area and power consumption due to both operands are input to the multiplier in a parallel manner and it is more complex as compared to serial multipliers.

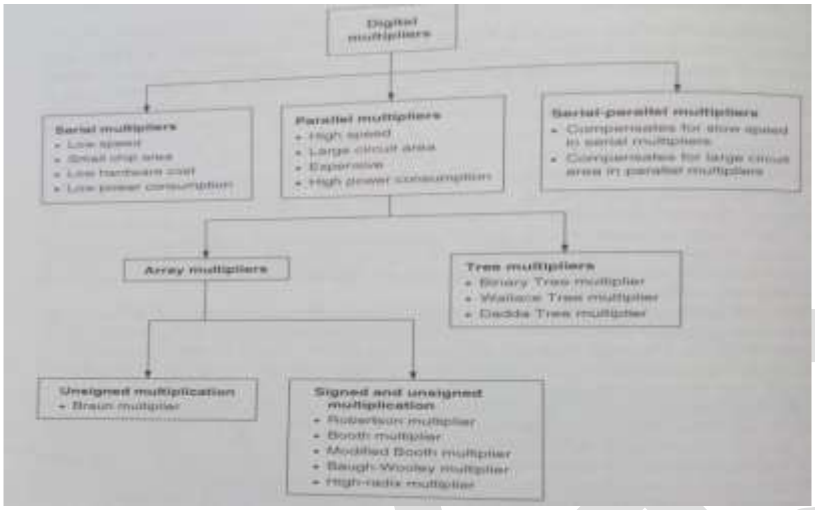


Figure 1.1: Classification of Digital Multiplier

(a) BRAUN MULTIPLIER

Braun Edward Louis first proposed the Braun multiplier in 1963 [1].It is commonly known as the Carry Save Array Multiplier and Non – Additive Multiplier. It consists of an array of AND gates and adders arranged in an iterative structure that does not require logic registers. An n*n Braun multiplier requires n (n-1) adders & n^2 AND gates [2,3]. The efficient implementation of multiplier is shown in the figure 1.2.

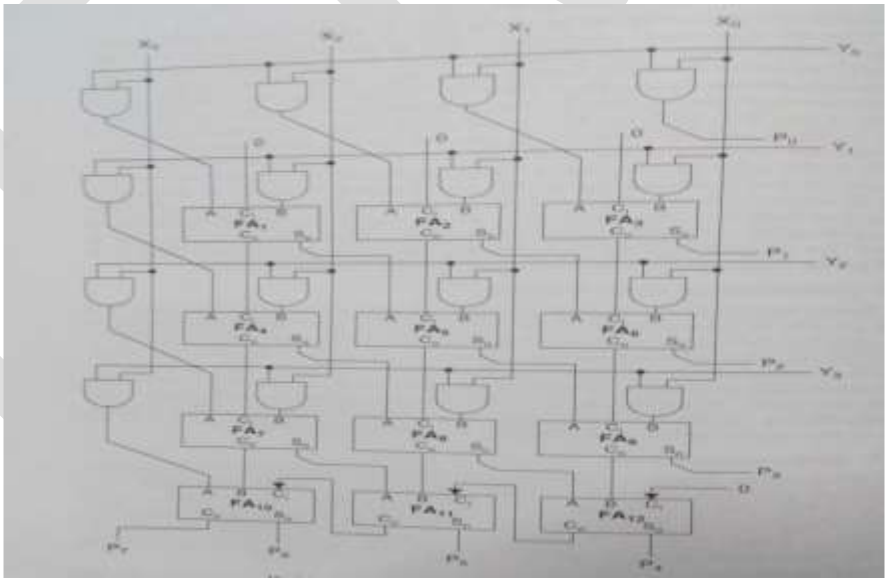


Figure 1.2: Schematic Diagram of a 4*4-bit Braun Multiplier

It makes ideal for VLSI and ASIC realization. Each of the X_iY_j product bits is generated in parallel with the AND gates [2]. Each partial product can be added to the previous sum of partial products by using a row of adders. The carry out signals are shifted 1 bit to the left & are then added to the sums of the first adder and the new partial product. The shifting of the carry out bits to the left is done by a CSA. Instead, the respective carry bit is saved for the subsequent adder stage. RCA are used at the final stage of the array to output the final result. The worst-case multiplication time of a Braun Multiplier can be expressed as [3]

$$t_{Braun} = (n-1)\, t_{carry\text{-}save} + t_{AND} + (n-1)\, t_{ripple\text{-}carry}$$

$t_{carry\text{-}save}$ = time required to generate Carry – out (C_{out})

$t_{ripple\text{-}carry}$ = time taken for the Carry –out (C_{out})

t_{AND} = delay of an AND gate.

It well performs for unsigned operands that are less than 16 bits, in terms of speed, power and area. Replacing the full adders FA1, FA2, FA3… FA12 in figure 1.2 with half adders can enhance the performance of the multiplier. Each replacement will result in a savings of 3 logic gates, even though performance is improved. Optimizing the interconnections between the adders, so that the delay throughput each adders path s is approximately the obtained by optimally interconnecting 2 full adders with fast input and same, can enhance the performance of Braun Multiplier. Figure 1.3 shows a modified Braun multiplier [4] in which two optimally interconnected full adders.

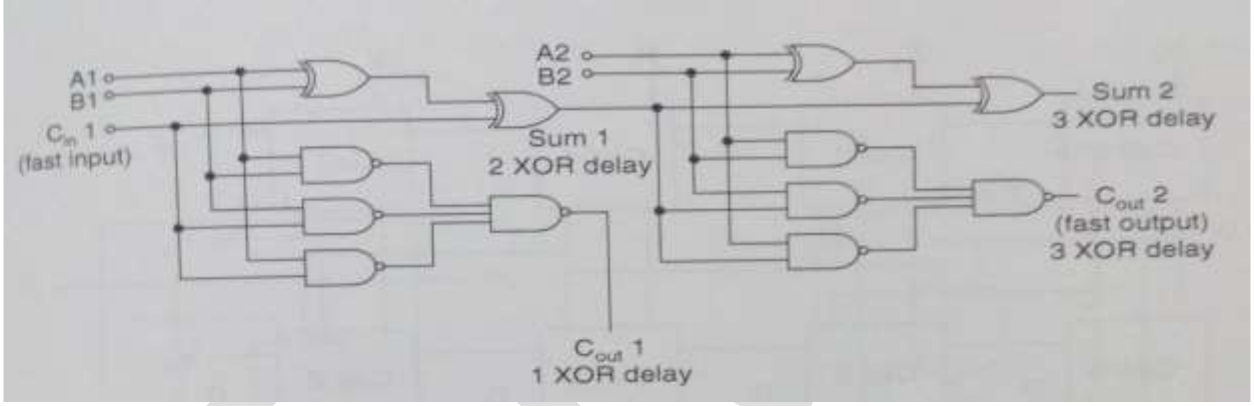


Figure 1.3: Two Optimally Interconnected Full Adders

(b) BAUGH WOOLEY MULTIPLIER

It is enhanced version of Braun multiplier. It is designed to cater to multiplication of both signed and unsigned operands [5], which are represented in the 2’s complement number system. The algorithm is also based on the carry-save algorithm. The structure of a 4*4 –bit 2’s complement multiplier is shown in the figure 1.4, with the cell number representing the type of the basic cell. The macroscopic views of these basic cells are shown in the figure 1.5. [2,6]

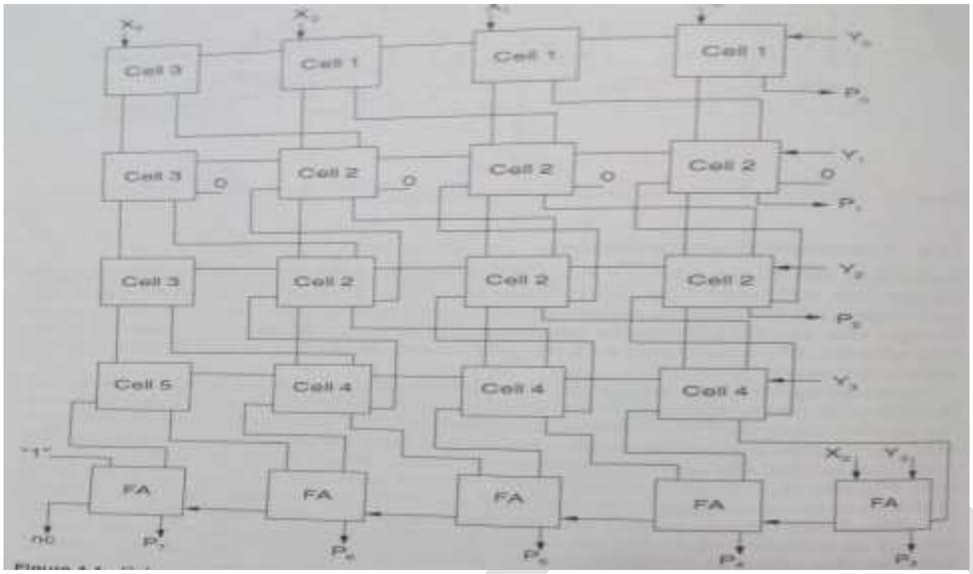


Figure 1.4: Schematic Circuit of a 4*4-bit Baugh-Wooley Multiplier

It operates on signed operands with 2's complement representation to make sure that the signs of all the 2's complement numbers X and Y. The product of X and Y is expressed as P=XY.

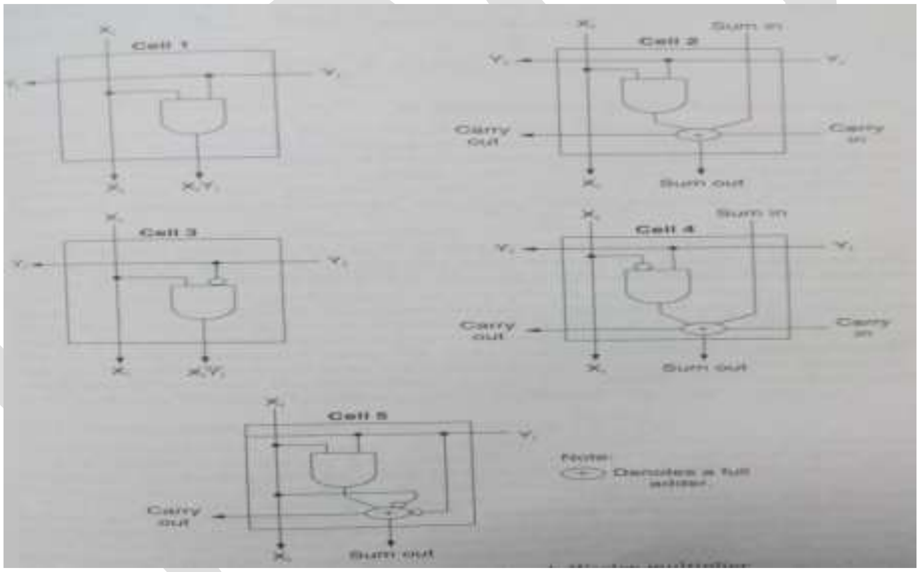


Figure 1.5: The Five Basic Building of the Baugh-Wooley Multiplier

Using a step by step approach, this 2's complement multiplication algorithm can be converted into an equivalent parallel array expression, as adopted by the Baugh – Wooley multiplier. Each partial product bit is the result of an AND gate of a multiplier. Each column represents the addition in accordance with the respective weight of the product term. In this scheme, a total of n (n-1) +3 full adders are required. Hence, for the case of n=4, the array requires 15 adders. Signed multiplicands must first be converted into their 2's complement representation before multiplication. A 2's complement generator is shown in the figure 1.6.

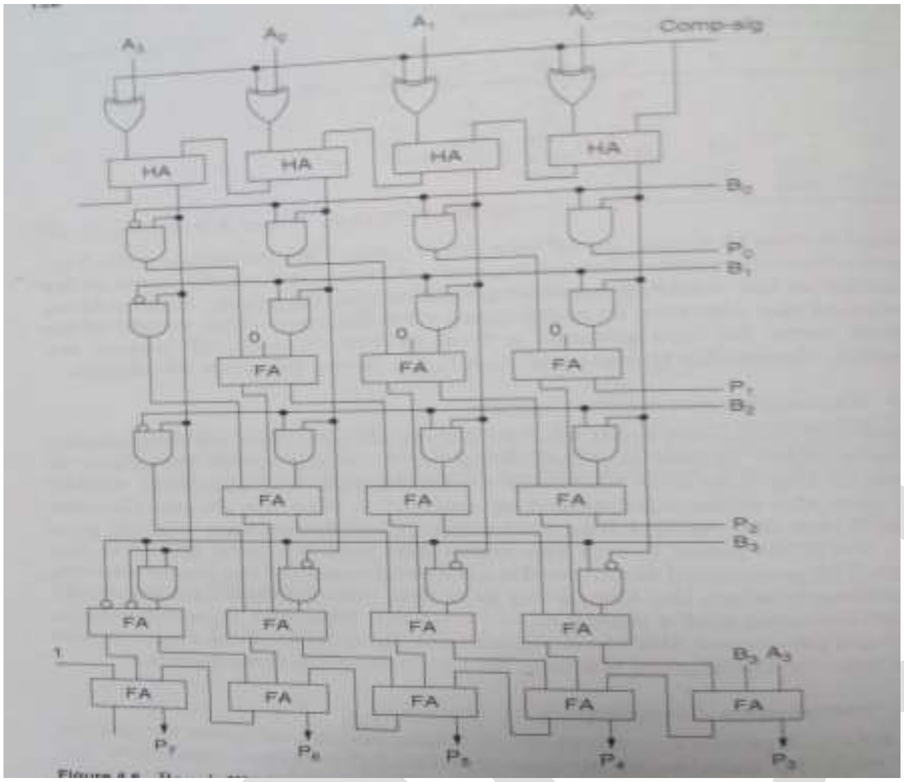


Figure 1.6: Baugh –Wooley Multiplier with 2’s Complement Generator

It is basically a combinational circuit that will either pass the input unchanged or convert it into 2’s complement form. When the control line comp-sig goes high, the XOR gates invert the input bits and a 1 gets added to the result. The generated result is the 2’s complement of the input bits. When the comp-sig goes low, the multiplicand inputs do not get inverted and a 0 gets added to them. The area & power consumption of a number of multiplier structures vary with the number of bit operands and the layout [7] strategies. Since the Baugh-Wooley multiplier is an evolvement of the Braun multiplier, its performance can also be improved by using the earliest mentioned optimized interconnections as shown in the figure 1.6.

(c) BOOTH MULTIPLIER

Area efficient and fast multipliers are the essential blocks for high performance computing. Therefore, multipliers should be small enough so that a larger number of them may be integrated on a single chip. Conventional array multipliers, like the Braun multiplier and the Baugh –Wooley multiplier, achieve comparatively good performance [8] , but they require large areas of silicon, unlike the add shift algorithms, which require less hardware and exhibit poorer performance. This algorithm makes use of the booth encoding algorithm in order to reduce the number of partial products by considering 2 bits of the multiplier at a time, thereby achieving a speed advantage over other bit. The block diagram of an n*n bit modified booth multiplier is shown in the figure 1.7.

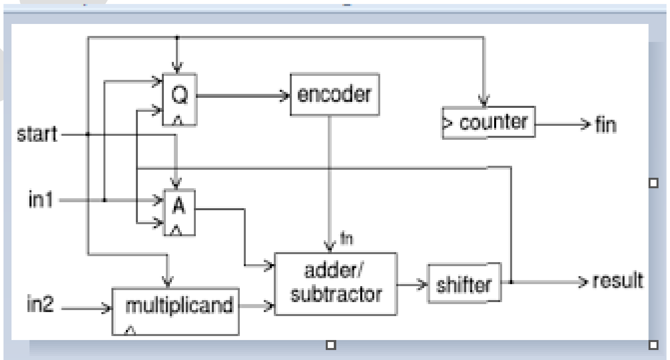


Figure 1.7: Block Diagram of an n*n –bit modified Booth Multiplier

The Booth encoder implements Booth encoding of the three multiplier bits and also handles the sign extension logic. Each encoder is dedicated to one partial product in the array. Since there is a circuit for each of the five possible generated partial product signals, one and only one signal is high during the steady state operation. The carry propagation circuits [4] are independent of the partial product circuits and they do not share any inputs. The structure of the Booth encoder is shown in figure 1.8.

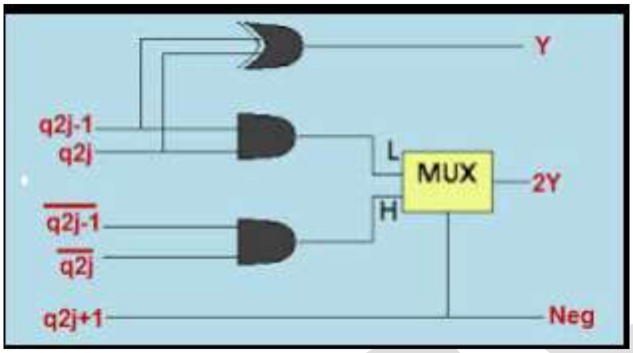


Figure 1.8: Structure of Booth Encoder

An extra output signal PL_j is also provided to represent the selection of the positive partial product. The sign – select Booth encoder is given in figure. Using this Booth encoder, the partial product generator can also be simplified, as shown in the figure 1.9. The simplicity of this circuit leads to smaller area usage and low-power consumption.

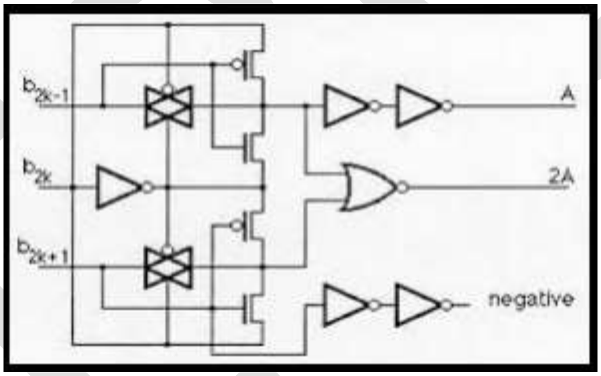


Figure 1.9: Sign-Select Booth encoder

(d) WALLACE TREE MULTIPLIER

Booth's algorithm effectively reduces the number of partial products by half. The Wallace tree multiplication algorithm, however, can reduce the number of partial products by employing multiple input compressors capable of accumulating several partial products concurrently. In 1964, C.S. Wallace proposed the multiplier [9], which can handle the multiplication process for large operands. This is achieved by minimizing the number of partial product bits in a fast and efficient way by means of a CSA tree constructed from 1-bit full adders. This algorithm uses pseudo adders to add 3 inputs and then produces 2 outputs whose sum is equivalent to the sum of the 3 inputs. The main advantage of using these pseudo adders comes from having the ability to avoid carry propagation, which then increases the speed of multiplication. Using several pseudo adders concurrently can reduce the number of partial products, in parallel, with a resulting overall delay proportional to log3/2 n [10], for n number of rows. The main disadvantage of the Wallace tree algorithm is that the architecture exhibits some irregularities in the layout because it has a relatively complicated interconnection scheme. In general, its multiplication process can be summarized as follows:

a) After generating the partial products, a set of counters reduces the partial product matrix but it does not propagate the carries.

b) The resulting matrix is composed of the sums and carries of the counters.

c) Another set of counters then reduces this matrix and the whole process continues until a two row matrix is generated.

The two rows get summed up with a final adder, preferably by a carry propagate adder. This method takes advantage of the carry save architecture in order to avoid the carry propagation until the final adder. In this scheme, the number of levels is crucial since they determine the speed of the multiplier. The conventional Wallace Tree algorithm reduces the propagation stages by incorporating 3:2 compressors [9]. The following figure 1.10 shows the Schematic of Wallace tree multiplier.

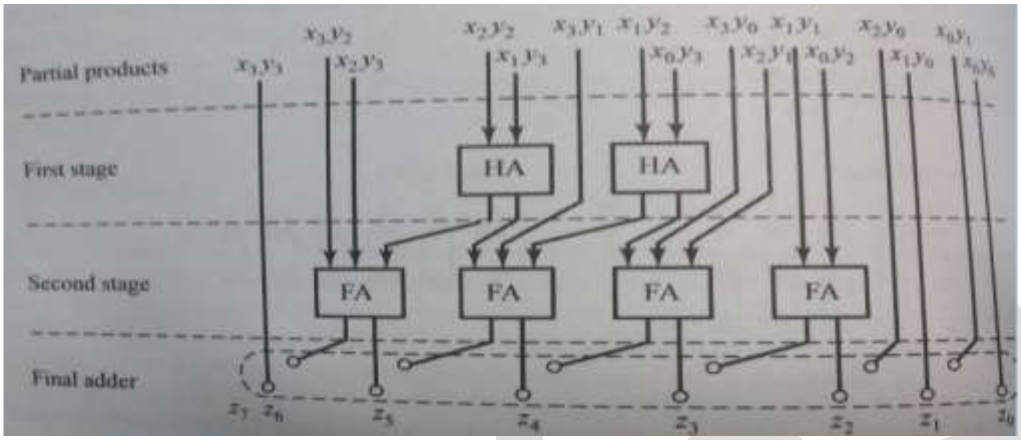


Figure 1.10: Schematic of 4-bit Wallace tree Multiplier

3) SERIAL PARALLEL MULTIPLIERS

It serves as a good tradeoff between the time consuming serial multiplier and the area consuming parallel multipliers. In a device using the serial – parallel multiplier, one operand is entered serially and the other is stored in parallel with a fixed number of bits. The resultant enhancement in the processing speed and the chip area will become more significant when a large number of independent operations are performed.

SIMULATION RESULTS

As mentioned above all the various digital multipliers such as serial multiplier, parallel multiplier (Braun multiplier, Baugh –Wooley multiplier, Wallace tree multiplier), serial parallel multiplier. Here TSMC 45 micro meter technology libraries are used for gates creations, VIRTUOSO schematic editor is used for drawing of schematics and VIRTUOSO symbol editor is used for drawing of symbol. The transient analyses with the time period of 100ns are taken for various digital multipliers. The following figure 1.11 shows the Schematics of digital multipliers.

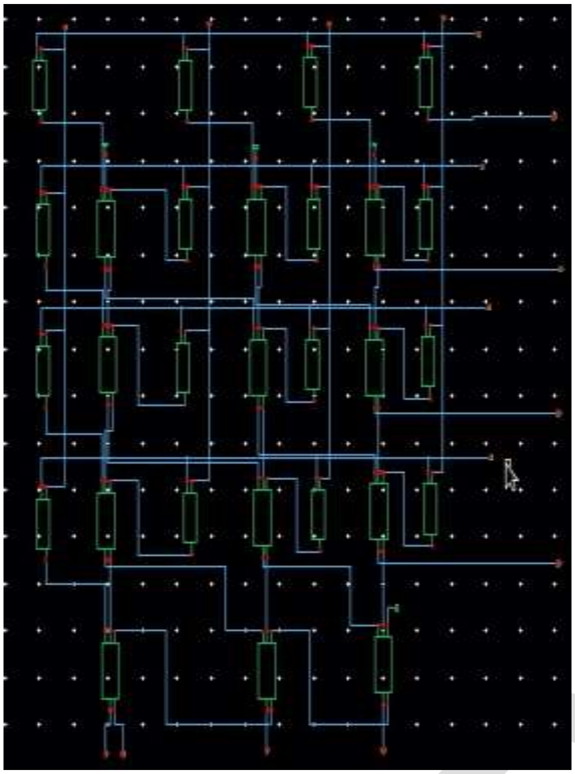


Figure a) Schematic of Braun Multiplier

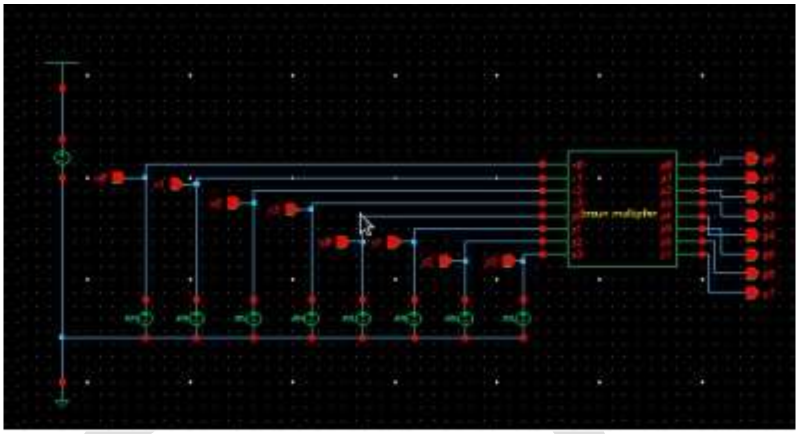


Figure b) Test Bench Schematic of Braun Multiplier

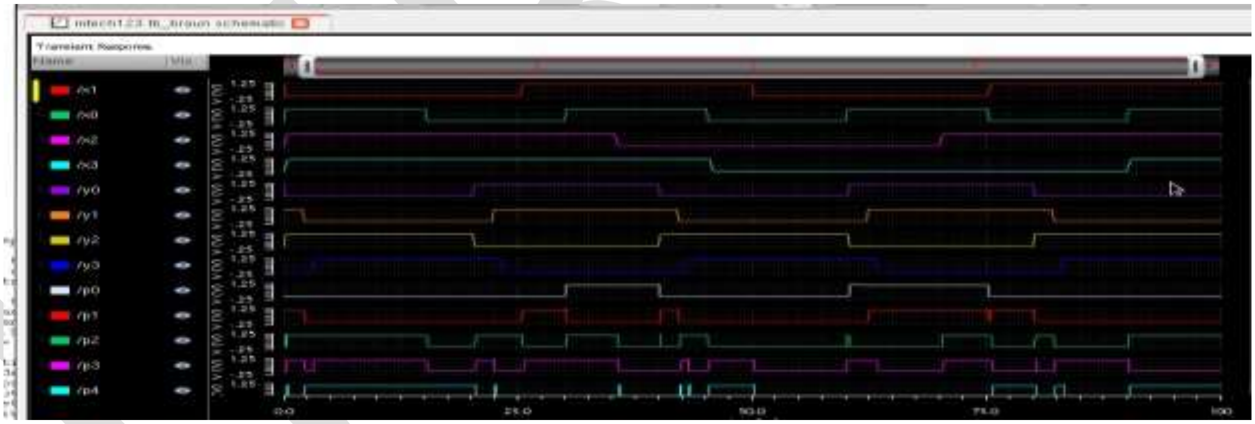


Figure c) Simulation Wave form of Braun Multiplier

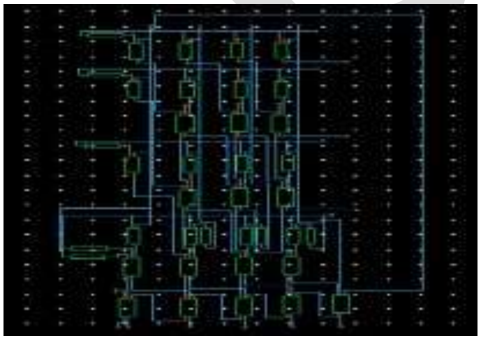


Figure d) Schematic of Baugh-Wooley Multiplier

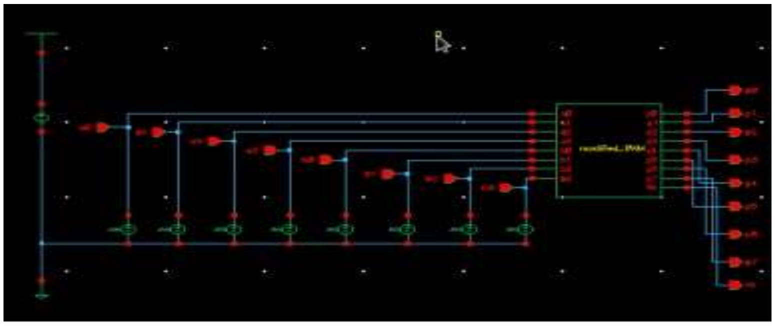


Figure e) Test Bench Schematic of Baugh-Wooley Multiplier

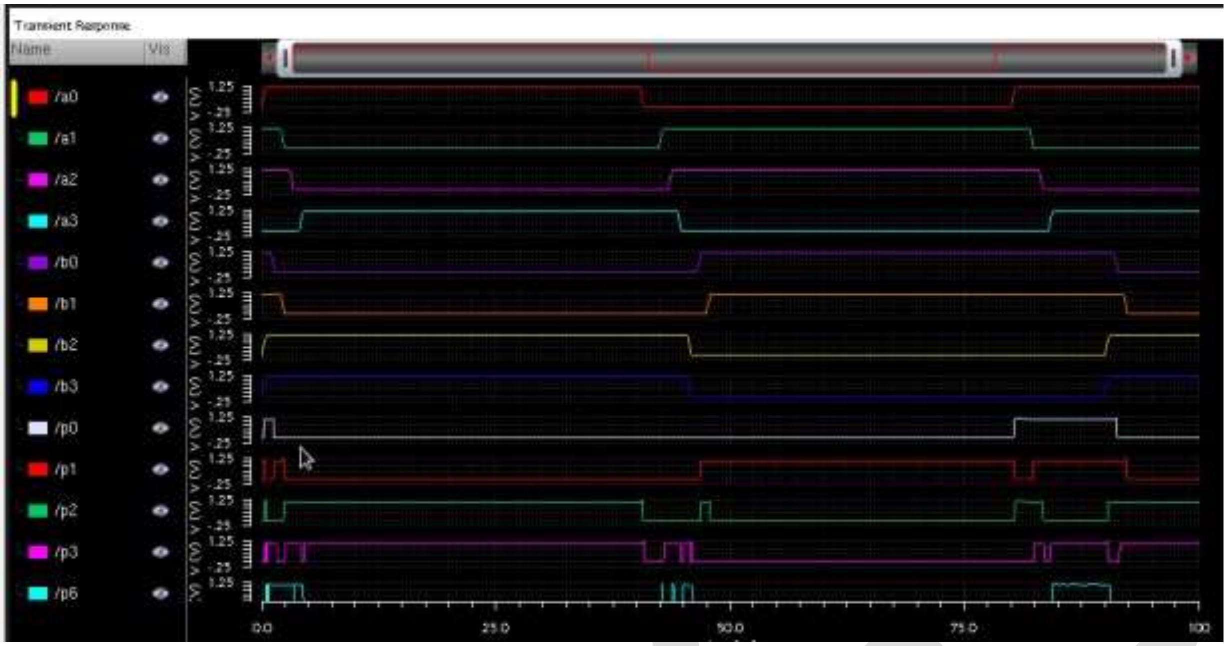
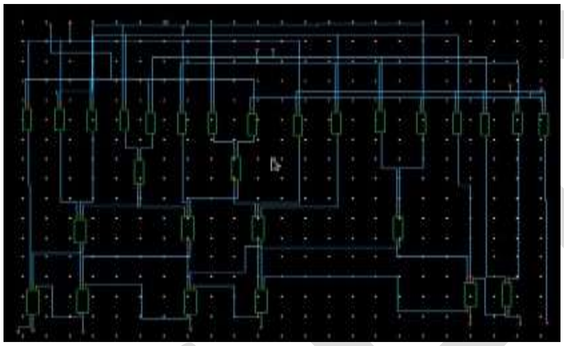


Figure f) Simulation Wave form of Baugh-Wooley Multiplier



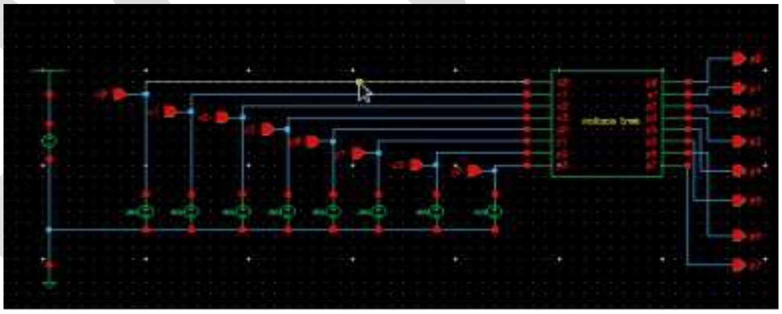


Figure g) Schematic of Wallace Tree Multiplier

Figure h) Test Bench Schematic of Wallace Tree Multiplier

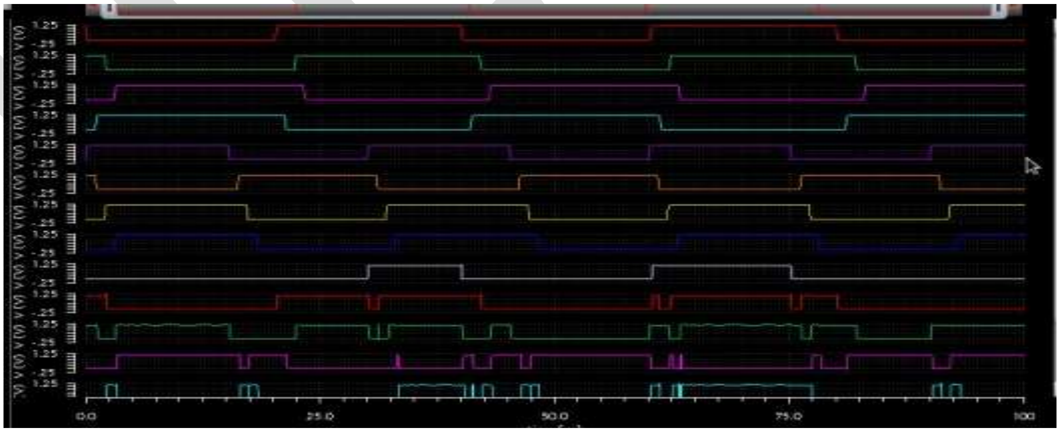


Figure i) Simulation Wave form of Wallace Tree Multiplier

CONCLUSION

This paper gives a glimpse of the multiplication techniques, types of multiplier architectures and a wide ranging review of the different multiplication algorithms. A myriad of eminent architectures of multipliers, including Braun multiplier, Baugh Wooley multiplier, Booth's multiplier and Wallace Tree multiplier have been covered. This paper presents all the schematics and simulation of various digital filters and in all the multipliers Braun multiplier will consumes less power.

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Internet of Things: Challenges and impact

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Abstract— IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS), microservices and the Internet. The convergence has helped tear down the silo walls between operational technology (OT) and information technology (IT), allowing unstructured machine-generated data to be analyzed for insights that will drive improvements.

Practical applications of IoT technology can be found in many industries today, including precision agriculture, building management, healthcare, energy and transportation.

Keywords— internet of things, hype cycle, embedded software, big data, accurate computation, IoT business solution, real time analytics .

INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

Kevin Ashton, cofounder and executive director of the Auto-ID Centre at MIT, first mentioned the Internet of Things in a presentation he made to Procter & Gamble in 1999. Here's how Ashton explains the potential of the Internet of Things "Today computers -- and, therefore, the Internet -- are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the Internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture or scanning a bar code.

The problem is, people have limited time, attention and accuracy -- all of which means they are not very good at capturing data about things in the real world. If we had computers that knew everything there was to know about things -- using data they gathered without any help from us -- we would be able to track and count everything and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling and whether they were fresh or past their best."

Humans could easily assign an IP address to every "thing" on the planet because of new Internet Protocol version 6 IPv6. According to Steve Leibson, with IPv6 address space expansion we could assign an IPV6 address to every atom on the surface of the earth, and still have enough addresses left to do another 100+ earths. An increase in the number of smart nodes, as well as the amount of upstream data the nodes generate, is expected to raise new concerns about data privacy, data sovereignty and security.

Although the concept wasn't named until 1999, the Internet of Things has been in development for decades. The first Internet appliance, for example, was a Coke machine at Carnegie Melon University in the early 1980s. The programmers could connect to the machine over the Internet, check the status of the machine and determine whether or not there would be a cold drink awaiting them, should they decide to make the trip down to the machine.

THE HYPE CYCLE OF INTERNET OF THINGS (IOT)

According to Gartner, revenue generated from IoT products and services will exceed $300 billion in 2020, and that probably is just the tip of the iceberg. Given the massive amount of revenue and data that the IoT will generate, its impact will be felt across the entire big data universe, forcing companies to upgrade current tools and processes, and technology to evolve to accommodate this additional data volume and take advantage of the insights all this new data undoubtedly will deliver.

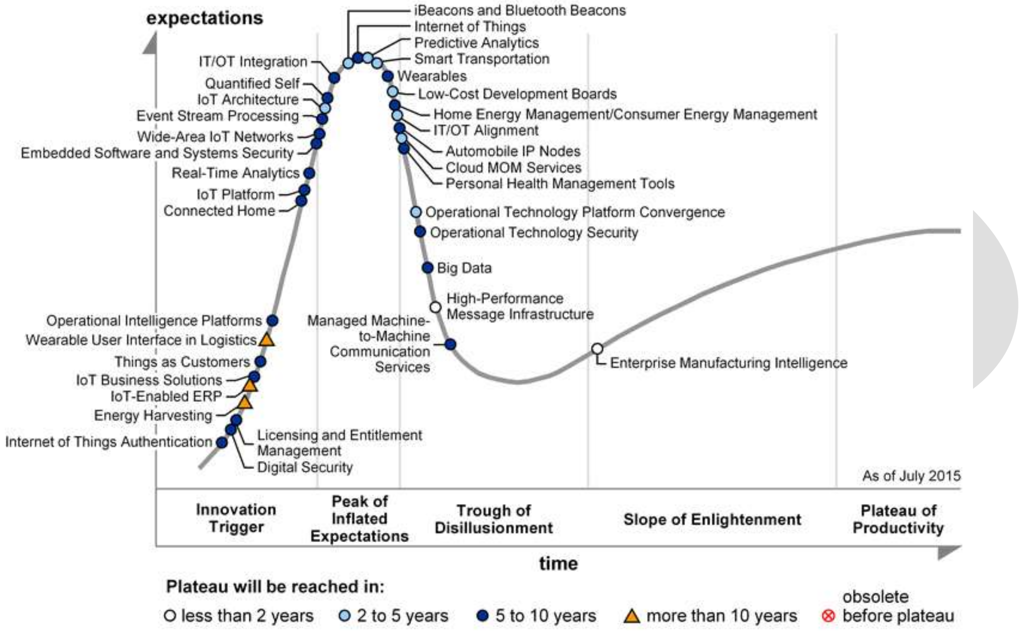

Figure 1. Hype Cycle for the Internet of Things, 2015

Organizations are connecting a broad variety of things to use their data to help build a digital business. Business objectives for IoT projects range from improved asset optimization to new business models, such as assets as a service. The IoT is a concept that is, in itself, transformational, and it will take five to 10 years to gain mainstream adoption. It remains on the Peak of Inflated Expectations again, as hype has continued to build even higher than last year — even as end users are not only building proof-of-concept projects, but encountering issues related to immature technologies, ecosystems and standards. Adoption of relevant IoT technologies and IoT-enabled business models varies on an industry-by-industry basis, so we have representative IoT technology profiles for specific markets (such as government, insurance and manufacturing operations) on the appropriate Hype Cycles.

Key building blocks for IoT projects include the following:

1. Have a Clear Objective
2. Connect to Your Things
3. Assemble and Integrate Your IoT Business Solution
4. Drive Value via Real Time Analytics

Some of the key near-term technology profiles for the IoT include:

- Big Data
- Embedded Software and Systems Security
- High-Performance Message Infrastructure
- IoT Architecture
- IoT Business Solutions

- IoT Platform
- IT/OT Alignment
- Low-Cost Development Boards
- Managed Machine-to-Machine Communication Services

KEY CHALLENGES

Like many evolving IT and networking technologies, the Internet of Things will encounter multiple barriers to adoption. Traditional inertia, budget priorities, risk aversion and other factors will prevent some companies from adopting IoT in the near future. Expect to see early adopters led by innovative CIOs or by business leaders identify and pursue specific opportunities to better serve their customers, open new businesses reduce costs and provide new value that results in increased revenues.

In addition to the technical challenges around power, latency, integration and storage, there are a number of other issues critical to IoT adoption. These challenges will also provide new business opportunities for technology companies, middleware and tools developers, system integrators, device builders and cross-platform integration companies. The main such key challenges are mentioned below:

1. Security: As the IoT connects more devices together, it provides more decentralized entry points for malware. Less expensive devices that are in physically compromised locales are more subject to tampering. More layers of software, integration middleware, APIs, machine-to-machine communication, etc. create more complexity and new security risks. Expect to see many different techniques and vendors addressing these issues with policy-driven approaches to security and provisioning.

2. Trust and Privacy: With remote sensors and monitoring a core use case for the IoT, there will be heightened sensitivity to controlling access and ownership of data. (Note that two recent high-profile security breaches at Target and Home Depot were both achieved by going through third-party vendors' stolen credentials to gain access to payment systems. Partner vetting will become ever more critical.) Compliance will continue to be a major issue in medical and assisted-living applications, which could have life and death ramifications. New compliance frameworks to address the IoT's unique issues will evolve. Social and political concerns in this area may also hinder IoT adoption.

3. Complexity, confusion and integration issues: With multiple platforms, numerous protocols and large numbers of APIs, IoT systems integration and testing will be a challenge to say the least. The confusion around evolving standards is almost sure to slow adoption. The rapid evolution of APIs will likely consume unanticipated development resources that will diminish project teams' abilities to add core new functionality. Slower adoption and unanticipated development resource requirements will likely slip schedules and slow time to revenues, which will require additional funding for IoT projects and longer "runways" for startups.

4. Evolving architectures, protocol wars and competing standards: With so many players involved with the IoT, there are bound to be ongoing turf wars as legacy companies seek to protect their proprietary systems advantages and open systems proponents try to set new standards. There may be multiple standards that evolve based on different requirements determined by device class, power requirements, capabilities and uses. This presents opportunities for platform vendors and open source advocates to contribute and influence future standards.

5. Concrete use cases and compelling value propositions: Lack of clear use cases or strong ROI examples will slow down adoption of the IoT. Although technical specifications, theoretical uses and future concepts may suffice for some early adopters, mainstream adoption of IoT will require well-grounded, customer-oriented communications and messaging around "what's in it for me." Detailed explanations of a specific device or technical details of a component won't cut it when buyers are looking for a "whole solution" or complete value-added service. IoT providers will have to explain the key benefits of their services or face the proverbial "so what."

6. High Level of required precision: "Both involve connecting devices and systems all across the globe, but the IoT add stricter requirements to its local networks for latency, determinism and bandwidth," the NI report notes. "When dealing with precision machines that can fail if timing is off by a millisecond, adhering to strict requirements become pivotal to the health and safety of the machine operators, the machines and the business."

Industry consortiums are working to address this challenge using standards originally developed for Audio/Video Bridging — the deceptively complex task of synchronizing video and audio in a stream.

7. Adaptability and Scalability: Adopting the Industrial Internet of Things will require a change in the way organizations design and augment their industrial systems. IoT systems must be adaptive and scalable through software or added functionality that integrates with the overall solution. As soon as an update is required, the engineer faces the dilemma of tacking on a solution that may not communicate well with the whole system or of starting the process over and creating a new end-to-end solution

INTERNET OF THINGS AND ITS IMPACT ON BIG DATA

The Internet of Things (IoT) is on its way to becoming the next technological revolution. Given the massive amount of revenue and data that the IoT will generate, its impact will be felt across the entire big data universe, forcing companies to upgrade current tools and processes, and technology to evolve to accommodate this additional data volume and take advantage of the insights all this new data undoubtedly will deliver.

A. Data Storage: One of the first things associated with IoT is a huge, continuous stream of data hitting companies' data storage. Data centers must be equipped to handle this additional load of heterogeneous data. In response to this direct impact on big data storage infrastructure, many organizations are moving toward the Platform as a Service (PaaS) model instead of keeping their own storage infrastructure, which would require continuous expansion to handle the load of big data. PaaS is a cloud-based, managed solution that provides scalability, flexibility, compliance, and a sophisticated architecture to store valuable IoT data. Cloud storage options include private, public, and hybrid models. If companies have sensitive data or data that is subject to regulatory compliance requirements that require heightened security, a private cloud model might be the best fit. Otherwise, a public or hybrid model can be chosen as storage for IoT data.

B. Big Data Technologies: When selecting the technology stack for big data processing, the tremendous influx of data that the IoT will deliver must be kept in mind. Organizations will have to adapt technologies to map with IoT data. Network, disk, and compute power all will be impacted and should be planned to take care of this new type of data. From a technology perspective, the most important thing is to receive events from IoT-connected devices. The devices can be connected to the network using Wi-Fi, Bluetooth, or another technology, but must be able to send messages to a broker using some well-defined protocol. One of the most popular and widely used protocols is Message Queue Telemetry Transport (MQTT). Mosquitto is a popular open-source MQTT broker. Moreover, for IoT data, NoSQL document databases like Apache CouchDB are more suitable as they offer high throughput and very low latency. These types of databases are schema-less, which supports the flexibility to add new event types easily. Other popular IoT tools are Apache Kafka for intermediate message brokering and Apache Storm for real-time stream processing.

C. Data Security: The types of devices that make up the IoT and the data they generate will vary in nature - raw devices, varied types of data, and communication protocol – and this carries inherent data security risks. This heterogeneous IoT world is new to security professionals, and that lack of experience increases security risks. Any attack could threaten more than just the data – it also could damage the connected devices themselves. IoT data will require organizations to make some fundamental changes to their security landscape. As the IoT evolves, an unmanaged number of IoT devices will be connected to the network. These devices will be of different shapes and sizes and located outside the network, capable of communicating with corporate applications. Therefore, each device should have a non-repudiable identification for authentication purposes. Enterprises should be able to get all the details about these connected devices and store them for audit purposes. All internal and external core routers/switches should be instrumented with X.509 certificates for creating trusted connectivity between public and private networks. A multi-layered security system and proper network segmentation will help prevent attacks and keep them from spreading to other parts of the network. A properly configured IoT system should follow fine-grained network access control policies to check which IoT devices are allowed to connect. Software-defined networking (SDN) technologies, in combination with network identity and access policies, should be used to create dynamic network segmentation. SDN-based network segmentation also should be used for point-to-point and point-to-multipoint encryption based on some SDN/PKI amalgamation.

D. Big Data Analytics: IoT and big data basically are two sides of the same coin. Managing and extracting value from IoT data is the biggest challenge that companies face. Organizations should set up a proper analytics platform/infrastructure to analyze the IoT data. And they should remember that not all IoT data is important. A proper analytics platform should be based on three parameters: performance, right-size infrastructure, and future growth. For performance, a bare-metal server, a single-tenant physical server dedicated to a single customer, is the best fit. For infrastructure and future growth, hybrid is the best approach. Hybrid deployments, which consist of cloud, managed hosting, colocation, and dedicated hosting, combine the best features from multiple platforms into a single optimal environment. Managed Service Providers (MSPs) are also working on their platforms to handle IoT data. MSP vendors are typically working on the infrastructure, performance, and tools side to cover the entire IoT domain.

An IoT device generates continuous streams of data in a scalable way, and companies must handle the high volume of stream data and perform actions on that data. The actions can be event correlation, metric calculation, statistics preparation, and analytics. In a normal big data scenario, the data is not always stream data, and the actions are different. Building an analytics solution to manage the scale of IoT data should be done with these differences in mind.

The growth of the IoT heralds a new age of technology, and organizations that wish to participate in this new era will have to change the way they do things to accommodate new data types and data sources. And these changes likely are just the beginning. As the IoT grows and businesses grow with IoT, they will have many more challenges to solve.

CONCLUSION

The Internet of Things is a new wave of technology advancement in the early stages of market development. Like many preceding waves of technology evolution it is characterized by innovation, fragmentation, confusion, competitive jostling and emerging standards. Startups are shaking up the status quo as established technology companies react and adjust.

The IoT will leverage, embrace, extend and enhance cloud, big data, personal/mobile devices and social networks to provide more granular sensors and devices closer to the “edge.” As it does so, it will provide entirely new applications and use cases that will drive new business models and revenue opportunities. It will also threaten many existing industries, markets and products.

It will likely collide and impact adjacent disrupting trends and markets. For example, the IoT has the potential to further accelerate the “sharing economy.” By providing new ways to track and manage smaller things, it will enable the sharing of new, smaller and less expensive items beyond houses, planes, cars and bikes. In some ways the IoT is the next logical extension of the “long tail” concept. It pushes devices and sensors to more granular levels and enables the creation of new uses, new applications, new services and new business models that were not previously economically viable.

As the IoT evolves, much of the value will migrate from devices and components into “whole solutions” and services. Therein lie the opportunities for new value creation, new business models and new revenue streams for market participants. A bigger challenge than developing technology breakthroughs may be in answering the question “What problems can be solved with the IoT and what new value can be provided to customers?”

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Document Clustering Using Improved K-Means Algorithm

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Abstract: Clustering is the process where similar documents are grouped under a single cluster. K-means clustering is a common approach based on selecting initial centroids randomly. In this paper, improved k-means clustering algorithm is used for document clustering by predicting centres manually. The algorithm uses Euclidean similarity measures to place similar documents in proper clusters. Experimental results showed that accuracy of proposed algorithm is high compare to existing algorithm in terms of F-Measure and time complexity.

Keywords: Document Clustering, k-means, Cosine Similarity, Tf-Idf.

I. INTRODUCTION

Nowadays, Documents on web are increasing with a huge speed. Similar documents are required in various purposes like statics, marketing, engineering, medical and other social science. So it is important to group similar documents together. For this purpose document clustering is used. Clustering is the process where similar objects are grouped under a cluster and dissimilar objects under another cluster.

Document clustering process consists of various steps. First off all pre-processing is performed on datasets which provide e set of tokens to vector space model (VSM). [1] VSM is a retrieval process which works on Tf-Idf model. Similarity measures are used for calculating the distance between various clusters.

The Experimental results showed that the proposed algorithm takes less time for clustering compare to existing K-means algorithm and the F-measure score is also very high than existing algorithm.

In this paper there is brief overview of the document clustering process using improved k-means. Section 1 gives the introduction, section 2 explores related work of various researchers, section 3 presents the proposed work, section 4 show experimental results, section 5 concludes the paper.

II. RELATED WORK

Improved k-means clustering comes under partition based algorithm. It is a method which is used to initialize centroids [2]. Several other clustering algorithm are proposed to cluster the documents including Bisecting K Means Methods [3] which splits the set of all points into two clusters, select one of them and split and repeat process until k clusters have been produced. Hybrid bisects k-means [7] clustering is used as a combination of bisects k-means and divisive hierarchical algorithm for optimal clusters. Novel algorithm [8] is used for automatic clustering and eliminates the drawbacks of K-Means algorithm.

This paper [4] uses a tree based document similarity for clustering the documents which extract the phrases and words sequence from documents. An inter passage approach [5] with k-means is used for clustering the segments based on similarity. Genetic clustering algorithm [6] is used to deal with clustering aggregation problem.

III. PROPOSED WORK

K-means algorithm work well for certain documents. As the number of documents increases, k-means algorithm doesn’t cluster the documents well. The results of clusters formed depends on initial centroids values which are selected randomly and it work well with global clusters only. [10] k-means is based on selection of predefined clusters only. To cope up with these issues, we started to cluster the documents with improved k-means algorithm for improving the value of F-measure.

The flow of our existing work is shown in Figure1. The process consists of various steps such as:

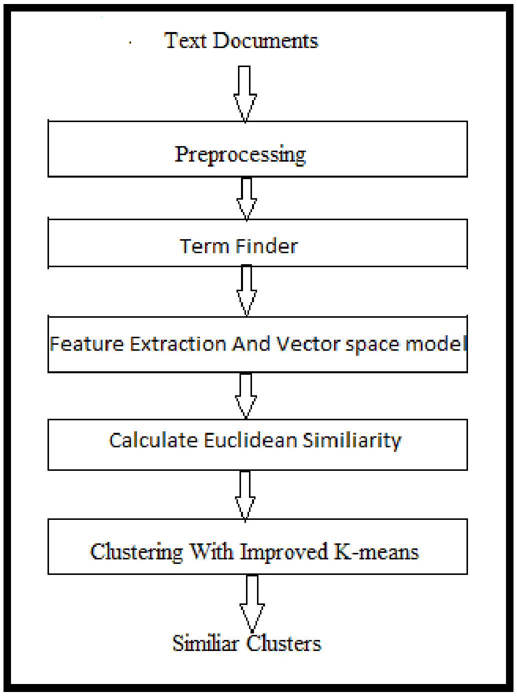

Figure1. Document Clustering Process

1. PREPROCESSING

Pre-processing is performed on plain text documents and it generates a set of tokens as output to VSM. This technique provides optimal quality of clusters. Main steps of pre-processing are as follows:

1. *Filtering: for removing punctuation marks and special characters.*
2. *Tokenization: for splitting tokens into individual words and tokens.*
3. *Stop word removal: words with no meanings are removed.*
4. *Stemming: base form of words is formed.*
5. *Pruning: for removal of low frequency words.*

2. *Term finder*

Term finder selects/finds exclusive terms from each available category. The proposed work assigns a threshold value as a weight to each term. If the term frequency is greater than threshold than value is added, else rejected.

```
For all words in term sets
  If (tf (i) > threshold)
        Add to set
End
```

3. *Feature extraction and Vector Space Model*

Feature extraction is used to extract a set of keywords from documents. VSM is a retrieval technique in data mining and is also known as Term Frequency Inverse Document Frequency model i.e. TF-IDF model. It is the standard algebraic model for representing text. Each document is represented as an n-dimensional vector using the feature vector. The value of each element in the vector reflects the importance of the corresponding feature in the document. With this model the similarity between documents can be *measured by calculating the distance between document vectors. If the Documents contain the same keywords they are similar. Term frequency tf (i, j), is the number of times a term i occurs in a document. [9]Compared with tf and Boolean feature selection scheme, results show that tf-idf is best for producing clusters. The term frequency is normalized with respect to the maximal frequency of all terms occurring in a document.*

$$Tf\ (i, j) = freq\ (i, j) / (max\ \{f(x, j) : w€j\})$$

Where,

i=term in document j.

X=any term with maximum frequency.

Similarly document frequency of a term is the number of documents in which term i occurs.

It is calculated as,

$$Idf\ (i, j) = \log\ (D/dfi)$$

Euclidean similarity is the most commonly used similarity measure for calculating the similarity between two documents. It is calculated as:

$$S=S+ ((a\ (t)-b\ (k))^{*1/2})$$

4. Performance Matrix

Performance evaluation in clustering is measured in terms of F-measure. F-measure is used to compare how similar two clusters are. It is a combination of Precision (P) and Recall measure. It is given by:

$$F\text{-measure}= (2*PR)/ (P+R)$$

Precision (P) is defined as the number of true positives (T_P) over the number of true positives plus the number of false positives (F_P).

$$P=(T_P)/(T_P + F_P).$$

Recall (R) is defined as the number of true positives (T_P) over the number of true positives plus the number of false negatives (F_N).

$$R=(T_P) / (T_P + F_N).$$

5. Improved k-means

Suppose a vector of documents [x_1,x_2,.........x_n] is given. Improved K-Means clustering algorithm will partition the n documents into k clusters in such a way that euclidean distance between them is minimum. It initially predicts centre manually and them perform k-means on datasets.

6. The Proposed Algorithm

The work is performed on a mini_newsgroups dataset. we proceeds with the following algorithm.

Algorithm: Improved k-means

```
INPUT:  X={X_1,X_2......X_i........X_n}
            // set of n data points
    K   // Number of clusters.
```

OUTPUT: Set of K clusters.

Phase1. Determine the initial centroids of clusters using algorithm2.

Phase2. Assign each data point to the nearest clusters.

The algorithm works in two phases. First phase calculates the initial centroids for improving accuracy and second phase assign data points to clusters by calculating Euclidean distance between them.

Algorithm2: Initial Center Prediction

Input: VSM, K, n, terms, w

Output: centres

Steps:

```
1. Create initial centre matrix for clusters and set default to zero.
2. $\begin{array}{c} 1 \\ 2 \\ . \\ . \\ K \end{array} \left( \begin{array}{ccc} 0\ 0\ 0 & \ldots\ldots\ldots\ldots & 0\ 0 \\ 0\ 0\ 0 & \ldots\ldots\ldots\ldots & 0\ 0 \\ .\ .\ .\ . & & .\ . \\ .\ .\ .\ . & & .\ . \\ 0\ 0\ 0 & \ldots\ldots\ldots\ldots & 0\ 0 \end{array} \right)_{K*\,numTerms}$ ,
3. For ki=1 to k
        Center (ki: t: t+n-1) =w
          t =t + n
   End
```

Algorithm 3: Assign Data Points to Clusters.

Input: $X=\{X_1,X_2......X_i........X_n\}$

$C=\{c_1,c_2..................c_k\}$

Output: set of clusters.

Steps:

```
1. Compute the Euclidean distance for each data point in X to all centroids.
2. For each data point in X, find the closest centroid and assign the cluster.
3. For each data point Xi
   3.1. Compute its distance from centroid to present nearest cluster
           If
```

```
                Distance <= present nearest distance
        Then
                Cluster remain same
                Set clusteredID (i) =j.
                Set near_dist=d (Xi, cj).
    Else
        For every centroid, compute the distance and assign cluster to nearest centroid.
            Set clusteredID (i) =j.
            Set near_dist=d (Xi, cj).

        End

End

4.  Recalculate the centroids until the results remain same.
```

IV. EXPERIMENTAL RESULT

The algorithm is tested on mini_Newsgroup datasets. The work is implemented complete system including all models discussed in sectionIII in MATLAB. Following three categories were taken.

Table1. mini_newsgroup

Categories
Alt.atheism
Comp.graphics
Comp.os.ms-window.misc

For analysis of our result, we have applied k-means and improved k-means algorithm on 300 documents from mini_Newsgroup. The k-means clustering algorithm provides different result as the centroids are selected randomly where as in improved k-means value is same for every execution as the centres are predicted manually.

Figure2. Shows the value of precision, recall and f-measure for both existing and proposed algorithm. F-measure has greater value for proposed algorithm as compared to existing algorithm. Also value of precision and recall is better for proposed algorithm compared with existing algorithm.

Table2: Value of Accuracy for Existing and Proposed Algorithm

	Precision	Recall	f-measure
k-means	0.54474	0.47201	0.42317
ik-means	0.8177	0.82	0.818

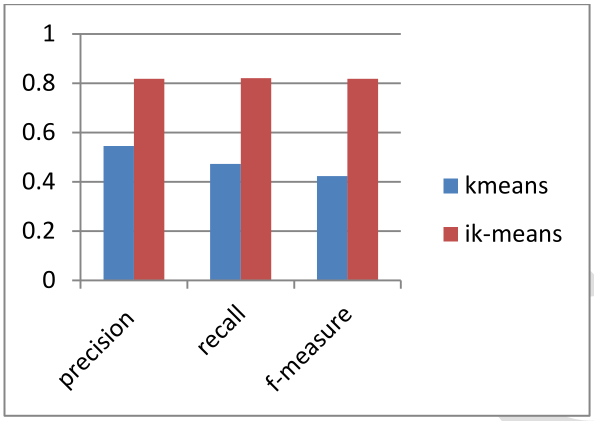

Figure2.accuracy measure

Figure3. Shows the comparison of both the algorithm with respect to time. Existing algorithm takes more time then proposed algorithm.

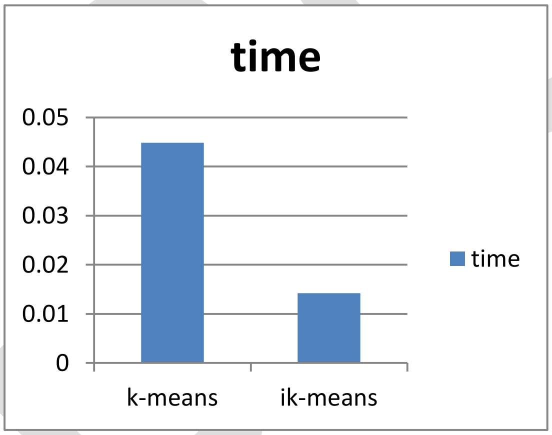

figure3. Time comparison for mini_newsgroup

V. CONCLUSION

Documents clustering are widely used to segregate the similar documents together and dissimilar together. Traditional k-means algorithm work well with certain documents and centroids are selected randomly. With proposed algorithm centroids are predicted manually. Every time results are same. The experimental results have shown that the improved k-means performs better than existing algorithm in terms of accuracy, f-measure and time.

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Breast cancer detection in Mammographic Images using Watershed and Thresholding Technique

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Abstract— Breast Cancer is the utmost usual cancer among the women and is also leading cause of deaths in women all over the world. However, with timely diagnosis its treatment is possible. So, mammography is the most common method for diagnosis through which we can have knowledge about its abnormalities, symptoms and different modalities that are used by the medical professionals to diagnose abnormal conditions. In this paper, a Computer Aided Design (CAD) system is developed that can detect the abnormalities from the input image. Firstly, the image is cropped to extract the ROI from the input image, and then it is pre-processed to enhance the details of ROI and then the masses are extracted from the input images using watershed transform as well as thresholding technique. The database taken is Mammographic Image Analysis Society (MIAS) that is an organization of UK research groups interested in the understanding of mammograms and has generated a database of digital mammograms.

Keywords— CAD,CADx, MIAS, Mammography, Watershed Transform, Dilation, Erosion, and Thresholding.

1. INTRODUCTION

Breast cancer is a potentially fatal disease that is growing in frequency in developed countries [1] and is becoming a major public health problem among women. Early detection of this disease can aid in decreasing the number of patients dying by 20%to 30% [2] because the earlier the detection is made, the better treatment works. It is very common among women while rare among men [1]. Breast cancer most commonly affects women after the age of 40, however younger women can also be affected especially with genetic predisposition that is a genetic characteristic that affects the development of an organism under the influence of environmental conditions[16].Breast cancer is the result of abnormal cells that spread beyond the ducts or lobules, invading the surrounding tissue and lymph nodes or blood stream. Diagnoses can be done by several types of biopsy: fine needle aspiration cytology (with sensitivity of90% - 95%); excision biopsy; frozen section biopsy; and by ultrasound; and mammography [3].

Mammography is the widely used technique for detection and characterization of breast cancer. It uses an X-ray system of a low-dose to look inside the breasts. Even small tumors and micro calcifications can be detected using mammograms [5]. By providing an independent second opinion, Computer Aided Detection (CAD) or Computer Aided diagnosis (CADx) systems [4] could help radiologists in the early detection of breast cancer. On the other hand, it is important for future studies to distinguish between computer-aided detection and computer-aided diagnosis systems[17]. The latter CAD system could help radiologists to classify the abnormalities as benign or malignant, which would provide specificity [5]. There are basic viewing and image enhancement systems that provide simple tools such as the ability to zoom in on a digital mammogram image, inverting between black and white on the image and increase/decrease the grey shades; so that a radiologist could have a clearer look of certain areas, or regions, of interest[18].

2. DATABASE RESOURCES

The source of the mammograms used in this work is the MIAS database [11]. The Mammography Image Analysis Society (MIAS) is an organization of UK research groups interested in the understanding of mammograms who have produced a digital mammography database for research purposes[19]. The X-ray films in the database have been carefully selected from the United Kingdom National Breast Screening Programme and digitized with a Joyce-Lobel scanning microdensitometer to a resolution of 200 µm × 200 µm, a device linear in the optical density range 0-3.2 and representing each pixel with an 8-bit word. Every image is 1024 X 1024 pixels in size. The database contains left and right breast images for 161 patients. Its quantity consists of 322 images, which belong to three classes such as normal, benign and malignant. There are 208 normal, 63 benign and 51 malignant (cancerous) images [6].

3. PROPOSED METHOD

This section presents the techniques that are used to detect the mass lesions in the mammogram images and the process flow is shown as in Figure1.

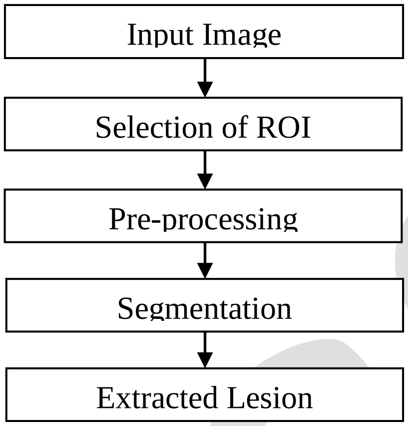


Figure 1: Block Diagram of CAD System

3.1 DETECTION OF REGION INTEREST

The original image size in MIAS database is 1024 × 1024 pixels and in this work, using the locations of abnormalities supplied by the MIAS for each mammogram, a size of 650 × 550 pixels is extracted. A *region of interest* is a portion of an image that you want to filter or perform some other operation on[6]. You define an ROI by creating a *binary mask*, which is a binary image that is the same size as the image you want to process. In the mask image, the pixels that define the ROI are set to 1 and all other pixels set to 0.You can define more than one ROI in an image[15]. The regions can be geographic in nature, such as polygons that encompass contiguous pixels, or defined by a range of intensities. In the latter case, the pixels are not necessarily contiguous. Extraction of the required ROI reduces the calculation overhead and so increases the speed.

3.2 PRE-PROCESSING

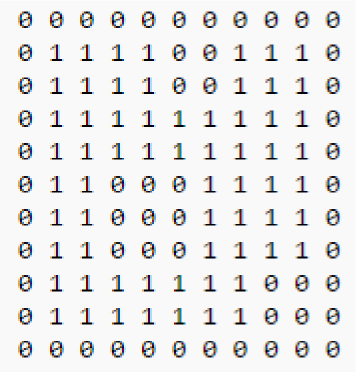
The purpose of pre-processing is to improve the quality of the image being processed. There are reasons for the need of image pre-processing:

- improvement of image quality to meet the requirements of physician
- noise reduction
- contrast enhancement
- correction of missing or wrong pixel values
- elimination of acquisition-specific artifacts

Here in preprocessing some morphological operations are performed which are as follows:

3.2.1 DILATION

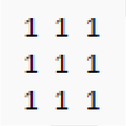
Dilation is an operation that “grows” or “thickens” objects in a binary image. The specific manner and extent of this thickening is controlled by a shape referred to as structuring element [1]. The basic effect of the operator on a binary image is to gradually enlarge the boundaries of regions of foreground pixels (*i.e.* white pixels, typically). Thus areas of foreground pixels grow in size while holes within those regions become smaller .Suppose A is a 11x11 matrix and B is a 3x3 matrix[3][4].



```
0 0 0 0 0 0 0 0 0 0 0
0 1 1 1 1 0 0 1 1 1 0
0 1 1 1 1 0 0 1 1 1 0
0 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 0
0 1 1 0 0 0 1 1 1 1 0
0 1 1 0 0 0 1 1 1 1 0
0 1 1 0 0 0 1 1 1 1 0
0 1 1 1 1 1 1 1 0 0 0
0 1 1 1 1 1 1 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0
```

Figure 2: A (11x11 matrix)

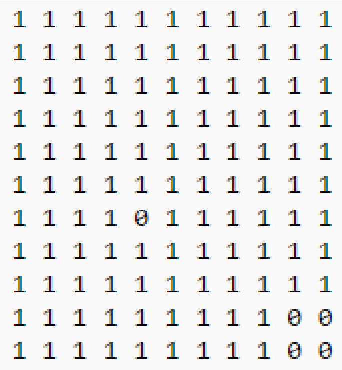
For each pixel in A, superimpose the centre of B. Each pixel of every superimposed B is included in the dilation of A by B. Dilation can be performed using toolbox function imdilate[3][4].



```
1 1 1
1 1 1
1 1 1
```

Figure 3: B (3x3 matrix)

The dilation of A by B is given by C that is 11x11 matrix.



```
1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1 1
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1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 0 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0 0
1 1 1 1 1 1 1 1 1 0 0
```
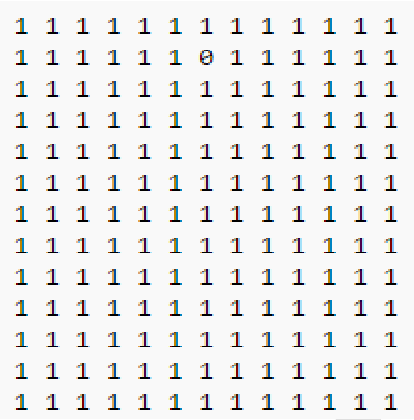

Figure 4: C (11x11 matrix)

3.2.2 EROSION

Erosion “shrinks” or “thins” objects in a binary image. As in dilation, the manner and extent of shrinking is controlled by structuring element [1]. The basic effect of the operator on a binary image is to erode away the boundaries of regions of foreground pixels (*i.e.* white pixels, typically).Suppose A is a 13x13 matrix and B is a 3x3 matrix[5][7].



```
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1 1 1 1 1 1 0 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1
```

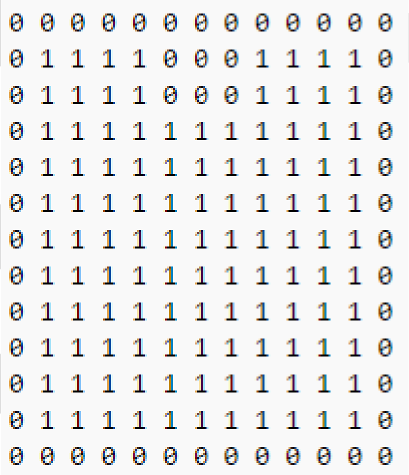
Figure 5: A (13x13 matrix)

Thus areas of foreground pixels shrink in size, and holes within those areas become larger. Erosion can be performed using toolbox function imerode[5][7].

```
1 1 1
1 1 1
1 1 1
```

Figure 6: B (3x3 matrix)

The erosion of A by B is given by C that is 13x13 matrix.



```
0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 1 1 1 0 0 0 1 1 1 1 0
0 1 1 1 1 0 0 0 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 1 1 1 1 1 1 1 1 1 1 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0
```

Figure 7: C (13x13 matrix)

3.3 SEGMENTATION

Segmentation refers to the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify the representation of an image into something that is more meaningful and easier to analyze[19]. Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image[22]. Each of the pixels in a region is similar with respect to some characteristic or computed property, such as colour, intensity, or texture[21].

3.3.1 THRESHOLDING

In many vision applications, it is useful to be able to separate out the regions of the image corresponding to objects in which we are interested, from the regions of the image that correspond to background. Thresholding often provides an easy and convenient way to perform this segmentation on the basis of the different intensities or colours in the foreground and background regions of an image

[20].In addition, it is often useful to be able to see what areas of an image consist of pixels whose values lie within a specified range, or band of intensities (or colours). Thresholding can be used for this as well. The input to a thresholding operation is typically a gray scale or colour image. In the simplest implementation, the output is a binary image representing the segmentation. Black pixels correspond to background and white pixels correspond to foreground (or *vice versa*). In simple implementations, the segmentation is determined by a single parameter known as the *intensity threshold*. In a single pass, each pixel in the image is compared with this threshold. If the pixel's intensity is higher than the threshold, the pixel is set to, say, white in the output. If it is less than the threshold, it is set to black[8].

In more sophisticated implementations, multiple thresholds can be specified, so that a *band* of intensity values can be set to white while everything else is set to black. For colour or multi-spectral images, it may be possible to set different thresholds for each colour channel, and so select just those pixels within a specified cuboid in RGB space. Another common variant is to set to black all those pixels corresponding to background, but leave foreground pixels at their original colour/intensity (as opposed to forcing them to white), so that that information is not lost[1][2]..

3.3.2 WATERSHED SEGMENTATION

The watershed transform is the method of image segmentation in the field of mathematical morphology. Image segmentation is the process of isolating objects in the image from the background, i.e., partitioning the image into disjoint regions such that each region is homogeneous with respect to some property such as gray value or texture [15].The watershed transform can be classified as a region based segmentation approach. The intuitive idea underlying this method comes from geography: it is that of a landscape or topographic relief which is flooded by water, watersheds being divide lines of the domains of attraction of rain falling over the region. Direct application of watershed transform to a gradient image can result in over segmentation due to noise[11]. Over segmentation means a large number of segmented regions. An approach used to control over segmentation is based on the concept of markers.

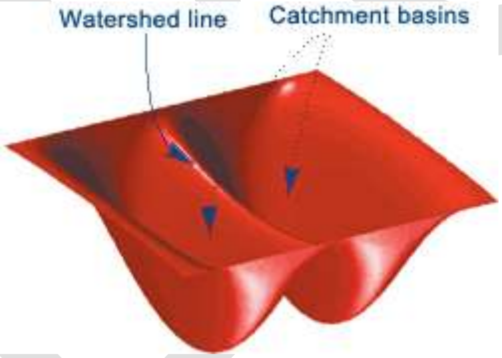


Figure 8: General Concept of Watershed Algorithm

A marker is a connected component belonging to an image. Markers are used to modify the gradient image. Markers are of two types internal and external, internal for object and external for boundary[7]. The marker-controlled watershed segmentation has been shown to be a robust and flexible method for segmentation of objects with closed contours, where the boundaries are expressed as ridges. Markers are placed inside an object of interest; internal markers associate with objects of interest, and external markers associate with the background[13]. After segmentation, the boundaries of the watershed regions are arranged on the desired ridges, thus separating each object from its neighbors [9][11][12]

4. EXPERIMENTAL RESULTS

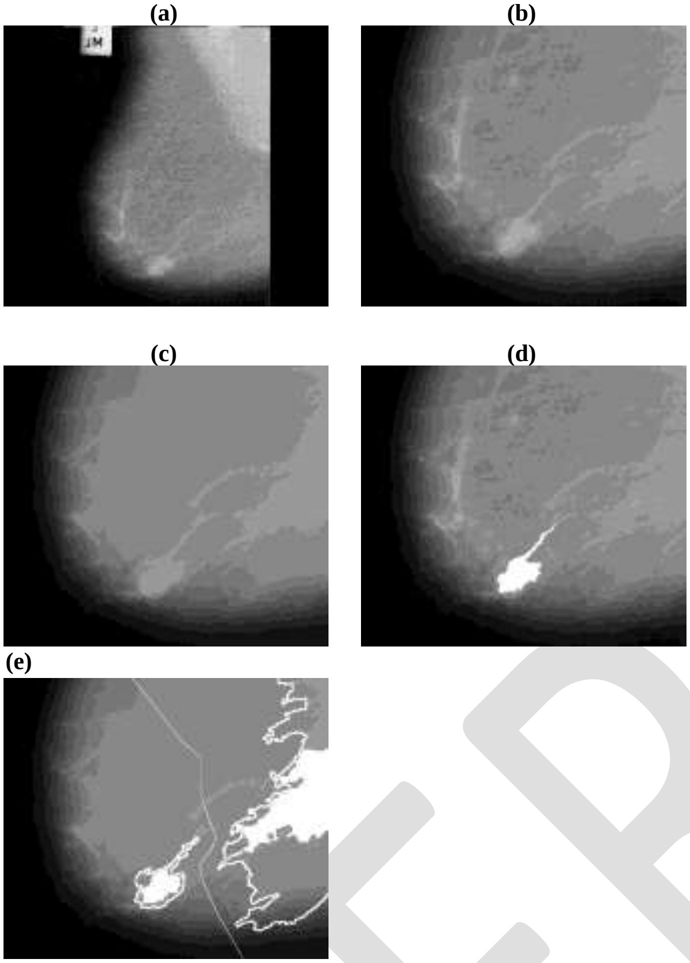


Figure 9: (a) Original Image (mdb005) taken from MIAS database (1024 × 1024 pixels). (b) Cropped Image (650 × 550 pixels). (c) Pre-processed image after Morphological operations. (d) Thresholding Output Image. (e) Final result of Marker based Watershed Algorithm

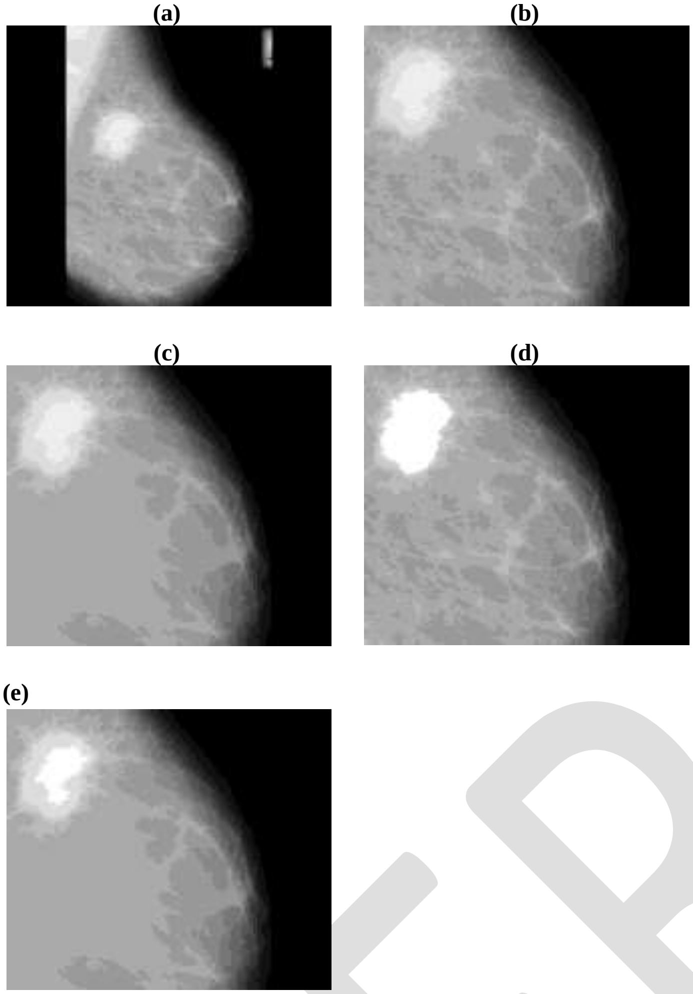


Figure 10: (a) Original Image (mdb184) taken from MIAS database (1024 × 1024 pixels). (b) Cropped Image (650 × 550 pixels). (c) Pre-processed image after Morphological operations. (d) Thresholding Output Image. (e) Final result of Marker based Watershed Algorithm

5. CONCLUSION

In this paper, a novel method for detecting the mass lesions in the mammogram images is presented. The proposed method is designed using three main stages, detection region of interest, pre-processing, and segmentation. Here, thresholding technique gives optimal result but the only issue with this technique is the selection of threshold value. Selection of correct threshold value is utmost important for optimal image segmentation. While watershed transform is an efficient segmentation tool with marker based approach as it automatically detects the mass in the image. Also it draws ridge lines if more than one region is detected in an image as shown in the above results. These proposed methods are successfully able to segment the image effectively and mass lesions were clearly visible.

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[22] http://homepages.inf.ed.ac.uk/rbf/HIPR2/erode.html

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WIND POWER FORECASTING: A SURVEY

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Abstract: A number of wind power prediction techniques are available in order to forecast the uncertainty of the wind, which is used to estimate the wind power generation probability for the grid. It is receiving more attention with the recent advancement of smart grid, which provides a challenge of integrating wind power into the grid. Several methods are proposed to provide wind power prediction. In the recent years there is a lot of research happening to predict wind power with several mathematical methods and biologically inspired computing models to reduce the prediction error. In this paper a detailed review of the wind power forecasting techniques have been provided.

Keywords:foraging,intermittent,autoregressive,stochastic, liberalized,ram

INTRODUCTION

The use of wind energy has been developed significantly throughout the world, in order to get the ideal for a future with electricity without pollution. But the integration of wind farms in the power networks has become an important problem for the unity of commitment and control of power plants in electric power systems. Wind is considered one of the weather variables which more difficult to be predicted. Intermittent in nature, the electricity produced in a wind farm is difficult to be short-term forecasted. It is even difficult in the next few hours and, in general, any benefits obtained from the wind farms is not optimal, and may be necessary to increase the power plant spinning reserve. Hence, the need to administer energy resources and the advent of alternative energy, particularly wind power, necessitate the use of advanced tools for short-term prediction of wind speed or what is the same thing, the wind production. End-users (independent power producers, electrical companies, system operator distribution, etc.) which recognize the contribution of wind forecast for a safe and economic operation of the network. Especially, in a liberalized electricity market, forecasting tools improve the position of wind energy compared with other available forms of generation.

Wind power forecasts do not provide the solution by themselves. However, being used as a key input to various decision making processes related to power system operations and participation in electricity markets, they comprise a necessary and cost-effective element required for the optimal integration of wind power into energy systems. Quality of the forecasts is very important and thus improving prediction systems' performance has been set as one of the priorities in wind energy research needs for the period 2000-2020.

In this paper we have presented a review of many wind power forecasting methods which have been successfully proved efficient by researchers. Wind power forecasting is divided into categories depending upon the time duration and methods are analysed as per that

LITERATURE REVIEW

The stochastic nature of wind makes it difficult to develop models which accurately predicts future wind speed and direction, thus also the future power output from a wind turbine. As a result, many different approaches have been tried to find the ideal power prediction model. This is especially seen in the work by [1] which gives an extensive literature overview of the state of the art short-term wind power prediction models, based on review of more than 380 journal and conference papers. [3] divides the prediction horizon into the following categories:

1. Immediate-short-term: From seconds up to 8 hours ahead forecasts,

2. Short-term: A day ahead forecasts,

3. Long-term: Multiple days ahead forecasts,

with the applications for each time horizon given in Table 2.1.

Table 2.1: Time scale of forecast models and their applications [3].

Time scale	**Range**	**Application**
Immediate Short Term	8 hours ahead	- Real-time grid operations -Regulation actions
Short Term	Day Ahead	- Economic load dispatch Planning -Load reasonable decisions -Operational security in electricity marked
Long Term	Multiple Days Ahead	-Maintenance planning -Operation management - Optimal operating cost

There are mainly two approaches used to when developing wind power prediction models: (i) a physical approach and (ii) a statistical approach [1]. The former is a deterministic method which use physical considerations and input data to make predictions of the future power output [2]. These physical models are based on predictions of the lower atmosphere or numerical weather predictions (NWP) using input data such as temperature, pressure, surface roughness and obstacles obtained from weather forecasts [3]. The statistical approach predicts the future power output using historical obtained data, which could also include NWP results, and is a pure mathematical approach which does not consider any of the physical processes of wind [2]. The main idea is use these vast amounts of historical data to find a relationship to the power output. This typically involves time series analysis [3] and artificial neural networks, which often include the use of recursive techniques. For look-ahead times above 3-6 hours, models using a time series approach are usually outperformed by models involving a NWP [1]. In order to get the best from each approach, a hybrid approach is typically used in most operational and commercial models today [1]. Table 2.2 shows an overview of some of the wind forecasting models described by [3], with their corresponding time horizon and approach.

Table 2.2: Some forecasting models for wind speed and power with their respective time horizon and approach used [3].

Model	Time horizon	Approach
WPMS	Immediate short term	Statistical
ANEMOS	Immediate-short-term, short-term	Statistical & Physical
ARMINES	Immediate-short-term, short-term	Statistical & Physical
WPPT	Short-term	Statistical
Prediktor	Short-term	Physical
Previento	Long-term	Statistical & Physical
WEPROG	Long-term	Statistical & Physical

Forecast models used to predict more specific events or scenarios of power production are also being developed. In a recent study [4] notes the lack of ability of current forecasting models to properly handle extreme situations related to wind generation, being a result of either extreme weather phenomena or critical periods for power system operation. A ramp is one such event, defined in the study as a steep and high increase or drop in power production from a wind farm within a time period of a few hours. The study proposes a methodology, which used together with numerical weather prediction ensembles, provides reliable forecasts with greater accuracy regarding climatology Due to its simplicity and because many natural processes are considered as Markov processes [5], Markov chains have become a popular tool for developing wind power prediction models based on time series analysis. A Markov chain represents a system which, based on the input data, calculates the probability of going from one state to another. The order of the Markov chain decides how many previous time steps influencing the probability distribution of the current state. Such states could for instance represent a given power output, wind direction or wind speed. Another advantage using Markov chain is the possibility of not only making point predictions, but also probabilistic forecasts, , i. e. give information about how likely it is for a given prediction to occur. A study by [5] discuss how first and second order Markov chain models can be used for generating synthetic wind speed time series, which may further be used as input to a wind energy system. [2] recommends instead to use wind power measurements directly as input to a Markov chain model in making a immediate term forecast of the power . Argument being that for wind speed forecasts, the forecast would have to model the wind farm power curve of interest, take into account individual turbine curves, site orographic characteristics and wake effects, before finally converting the wind speed forecast into a power forecast. A process which could amplify the prediction error and which would be avoided using power data directly. Instead of giving a specific wind speed forecast or power forecast [6] suggest using Markov chain models for predicting the 1 hour ahead categorical change in the wind power. In this case the power change in the last hour, the current wind power and the 20-minute power trend are used to provide a probabilistic forecast of three states, -1: a negative trend, 0: no change is expected and 1: a positive trend is predicted.

According to [7] wind speed prediction can be clustered into two main categories, that is, physical methods and statistical methods.

Physical methods, which take into account physical factors, that is, temperature, pressure, wind farm layout, and local terrain, are based on numerical weather prediction (NWP) tools that provide weather forecasts by utilizing mathematical models of the; these models require long operation times and large amounts of computational resources. Landberg initially proposed the concept of applying NWP tools as an input; tools such as the wind atlas analysis and application program (WAsP) and PARK are now used for wind prediction correction [8]. Statistical methods that are used to determine the relation between historical wind speeds by generally recursive techniques can be utilized for short-term wind speed forecasting. Many models have been developed to improve wind speed forecasting accuracy, including autoregression (AR), autoregressive moving average (ARMA), autoregressive integrated moving average (ARIMA), artifiial neural networks (ANN), fuzzy logic (FL), support vector machine (SVM), and spatial temporal models [9]. Torres et al. [10] used ARMA and persistence models to forecast the hourly wind speed up to 10 h ahead. Th ARIMA and ANN approaches have been used for wind speed time series forecasting on the south coast of the state of Oaxaca, Mexico [11]. Three types of ANN models, namely, adaptive linear element, back propagation, and radial basis function, were investigated for hourly mean wind speed forecasting at two observational sites in North Dakota [12]. A fuzzy model was proposed for wind speed prediction and provided wind speed forecasts from 30 min to 2 h ahead [13]. Zhou et al. [14] suggested a systematic study on fie-tuning least-squares support vector machines (LS-SVM) model parameters for one-step-ahead wind speed forecasting for the fist time. A methodology to characterize the stochastic processes applied for wind speed at different geographical locations via scenarios was provided [15]. Moreover, hybrid models that hybridize multiple features of diffrent predictive models are usually adopted for wind speed forecasting because this type of model can comprehensively capture the intricate characteristics of wind speed series. Combining several forecasting methodologies is another strategy that can signifiantly improve predictive performance by taking advantage of each method’s performance with respect to data sets, capability of describing nonlinearity and linearity, as well as prediction horizons; these combined models can be superior to individual models [12]. Li et al. proposed a hybrid model consisting of the ANN and Bayesian approaches, and the results indicated that the hybrid approaches produced forecasting errors that were always smaller than those produced by ANN [16]. Monfared et al. [17] developed an ANN and FL hybrid model to predict actual wind speed time series sampled in Rostamabad from 2002 to 2005, which demonstrated that this approach requires less computational time and provides better prediction performance. Salcedo-Sanz et al. [18] combined a hybridized ANN with a mesoscale model, and this combined strategy produced superior forecasting results. Additionally, Cadenas and Rivera investigated hybrid models that consisted of ANN and ARIMA and concluded that the hybrid models outperformed the individual ANN and ARIMA approaches [19].

Conclusion: Different approach for wind power forecasting method are discussed in briefly. And development of some forecasting technic improvement in wind power generation.ARIMA,ARMA,ANN are different methods to forecast wind power.

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Portable Health Monitoring Device

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Abstract — With meticulous and quick development in Medical industry, the task of detecting irregularity in convalescent is very easy. The vital signs are useful in detecting or monitoring medical problems. The vital parameters routinely monitored by the medical professionals and healthcare providers comprises of body temperature, pulse rate, respiration rate and blood pressure. In environments such as multispecialty hospitals, most of the healthcare issues can be taken cared of under one roof. But with busy life styles and changing priorities visiting medical consultants at regular intervals has become time, money and more of productivity consuming for which, the reason lies in exponentially increasing number of patients and scarcity of specialists. Now with ever increasing growth in medical cost as well as the population, has led to need for cut priced and compact health gadget that help convalescent to determine the amount of various vital parameters in industrialize nation. In order to solve this problem, portable health monitoring device can act as preliminary assistants to notify the patient the actual need of visiting the hospital. In this paper, a cost effective, smart and portable health assistant's design and work flow in accordance is discussed along with suitable results. Manual probing IO and schematic/layout driven approach is considered for system design while sensing itself is handled using integrated on-chip-multi-functionality-sensors. The logic is to be governed by suitable ARM controller but for prototyping purpose, BeagleBone Black is used.

Keywords—*ECG, Portability, Pulse Oximetry, Chronic disease, ECG, Biomedical Embedded system, BeagleBone Black*

INTRODUCTION

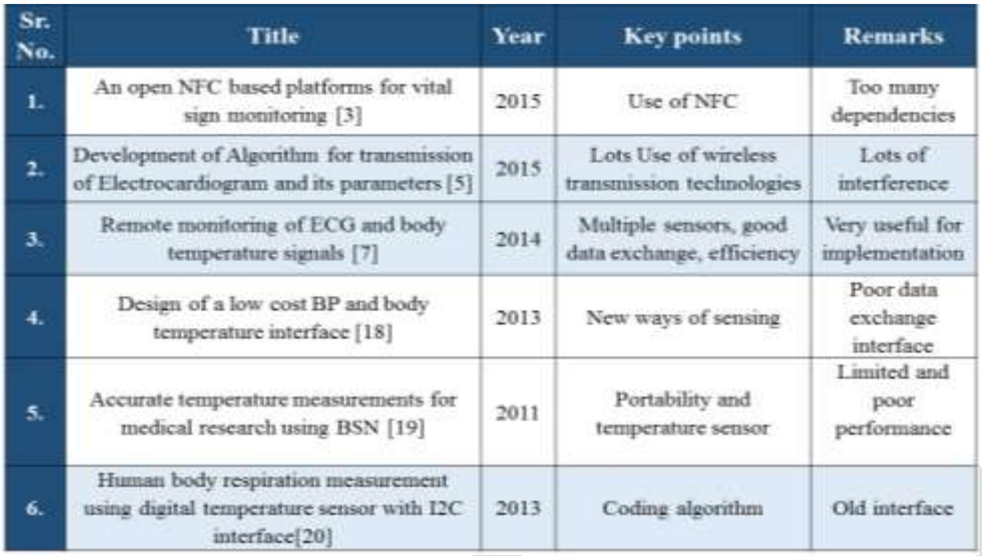
With advancement in VLSI technologies and circuits becoming denser and smaller with time integration of analog components on chip itself has allowed mankind to experience many of the unseen paradigms and one of them is biomedical sensing frontend [16][17]. Advancement in the electronics and communication field has helped a lot in having great life, no problem is big enough to deal with. Despite of these advantages, human lives are getting busier. They do not have time for regular health check-up. In past 50 years at least 100 new diseases have been either triggered or identified. Chronic diseases are the prime cause of death [1]. According to a survey done by WHO (World Health Organization), it has been concluded that not only the chronic diseases are the prime cause of death but also for the disability worldwide [2]. But the good news is, timely diagnosis and proper treatment can still save patients' life. One of the healthy habits to remain physically fit is to keep track of our health on regular basis which generally involves attention of a medical consultant. Now the doctors have so many patients to be taken care of and this leads to an atrocious time load on the doctors. So in such case the patient who might actually require doctor's attention, might not get the attention that they require. In this case wearables help a lot for tracking the health parameters like heart beats. They also help in controlling our dietary. Moreover there are availability of glucometers which help to keep eye on the sugar content in the blood and so helps patients to take decisive steps to control the blood sugar. Now-a-days small blood pressure measuring devices are also available, so that patient can keep track of his blood pressure. While wearables can just notify with heart rates, for other so important parameters like ECG, blood oxygen saturation etc. one has to still visit the hospitals for their tests. But in this generation with people having busy schedule on going and the distance between their residential area to the hospital and of course the money are the main three causes that people fail to keep track of their health. One of the most highly proposed and buzzed solution is a portable health monitoring device which can act as an assistant and bridge the gap between doctor and patient without them having to see each other personally. The reason why such devices have not gained a bright view from the market window and pervasive acceptance is either high cost, poor performance or complicated user interface.

In this paper design and working of such a system is discussed elaborately. Section II describes brief literature review, section III discusses the design and specifications while section IV explains its working and section IV concludes the article. A brief introduction to such vital parameters is also given in tabular format.

LITERATURE SURVEY

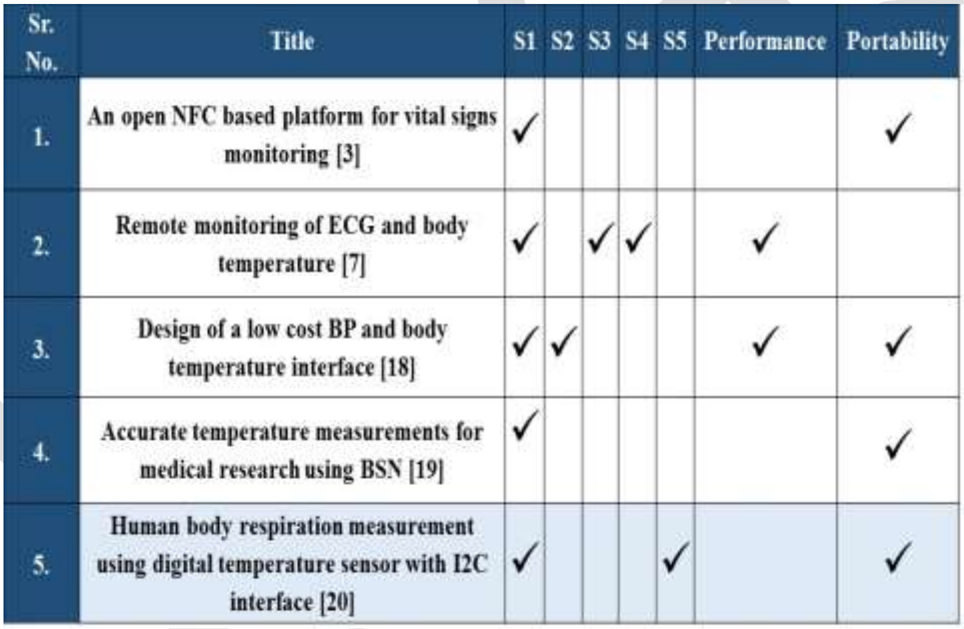
Literature related to the research topic has been summarized in tabular form. The table 1 shows literature survey in tabular form. The table 2 shows checklist table of the review paper. The S in the table shows Sensors where S1 is temperature sensor, S2 is Blood pressure sensor, S3 is Heart rate sensor, S4 is ECG and S5 is Pulse Oximetry sensor.

Table 1. Summary table of Literature survey



Sr. No.	Title	Year	Key points	Remarks
1.	An open NFC based platforms for vital sign monitoring [3]	2015	Use of NFC	Too many dependencies
2.	Development of Algorithm for transmission of Electrocardiogram and its parameters [5]	2015	Lots Use of wireless transmission technologies	Lots of interference
3.	Remote monitoring of ECG and body temperature signals [7]	2014	Multiple sensors, good data exchange, efficiency	Very useful for implementation
4.	Design of a low cost BP and body temperature interface [18]	2013	New ways of sensing	Poor data exchange interface
5.	Accurate temperature measurements for medical research using BSN [19]	2011	Portability and temperature sensor	Limited and poor performance
6.	Human body respiration measurement using digital temperature sensor with I2C interface[20]	2013	Coding algorithm	Old interface

Table 2. Sensor availability in the Review paper



Sr. No.	Title	S1	S2	S3	S4	S5	Performance	Portability
1.	An open NFC based platform for vital signs monitoring [3]	✓						✓
2.	Remote monitoring of ECG and body temperature [7]	✓		✓	✓		✓	
3.	Design of a low cost BP and body temperature interface [18]	✓	✓				✓	✓
4.	Accurate temperature measurements for medical research using BSN [19]	✓						✓
5.	Human body respiration measurement using digital temperature sensor with I2C interface [20]	✓				✓		✓

SYSTEM DESIGN

This section discusses the block diagram of portable health monitoring device, its internal schematic and the program flow. The following figure shows the block diagram of the system. Here the controller used is BBB and the sensors are interfaced with BBB [13].

BBB comprises of 64 GPIOs which are more in number compared to that of Raspberry Pi. The 1GHz ARM Cortex A8 is sufficiently capable of collecting all of the patient's data, having a smooth user interface and transport the data over a communication channel that is secure and reliable. Furthermore the large amount of GPIOs make sensor interfacing easier and the inbuilt Debian is almost a full-fledged OS having a complete wiring library for direct terminal access, sophisticated compiler collection (GCC) which makes building, installation and running of any module easier and full network stack which allows programmer to exploit any kind of connectivity he desires in form of wired (Ethernet, SPI etc.) or wireless protocol. The built-in flash is what ultimately makes it the reason behind achieving portability and the USB interface is also very handy as it also provides secure shell communication from it thus laptop can be used as a display without having HDMI or networked interface like Raspberry Pi. As for the display, technically any display and any wireless module can be used but for the sake of simple prototyping 16x2 LCD as well as Bluetooth module to send abnormality report to host’s cell phone.

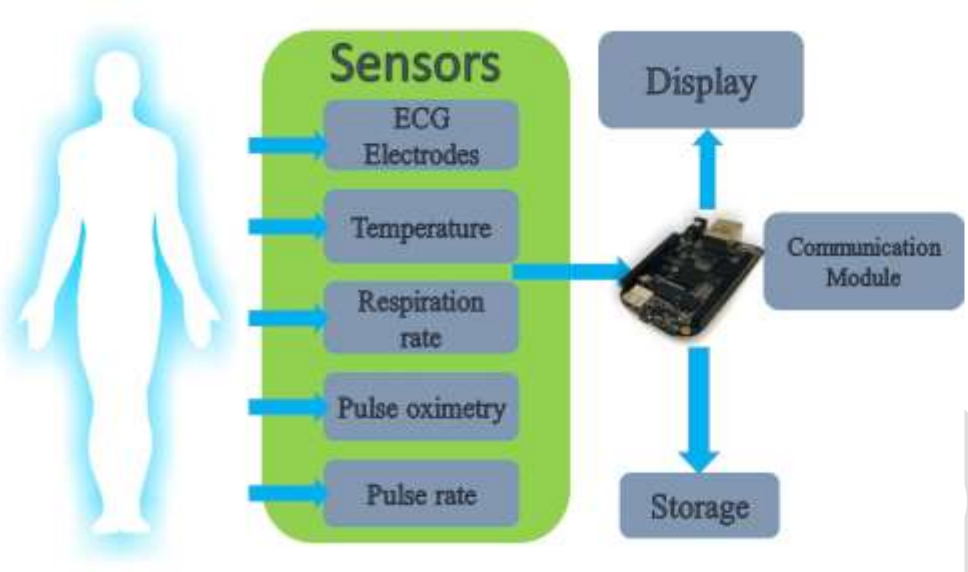


Figure 1. Block diagram of the portable health monitoring device

The interface of sensor ICs involves design of a single, small and expandable module which encompasses both the ICs in such a way that sensing and signal communication can be done without any hindrance. For achieving so, both SMD sensors ADAS1000-4 (ECG Sensor) and Max30100 (Pulse Oximetry sensor) are mounted on a custom designed PCB which is then expanded to be connected to GPIO of BBB [14] [15]. In the following figures customized Eagle symbols and the schematic is presented.

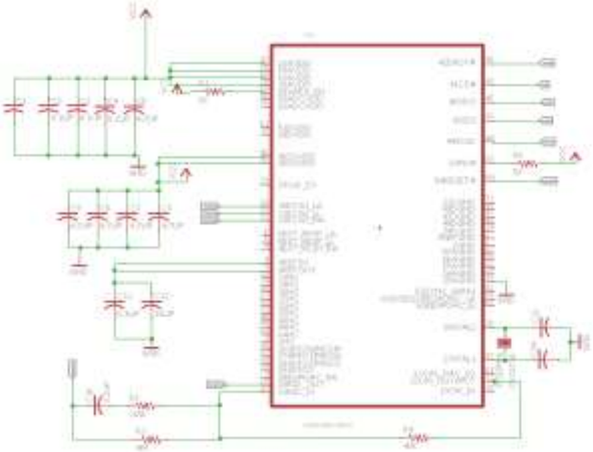


Figure 2. Schematic of ADAS1000-4

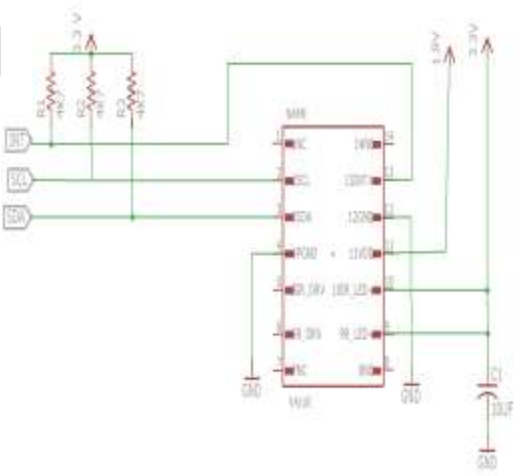
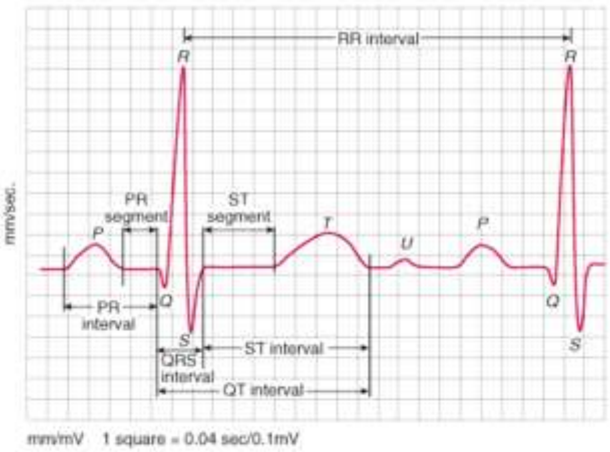
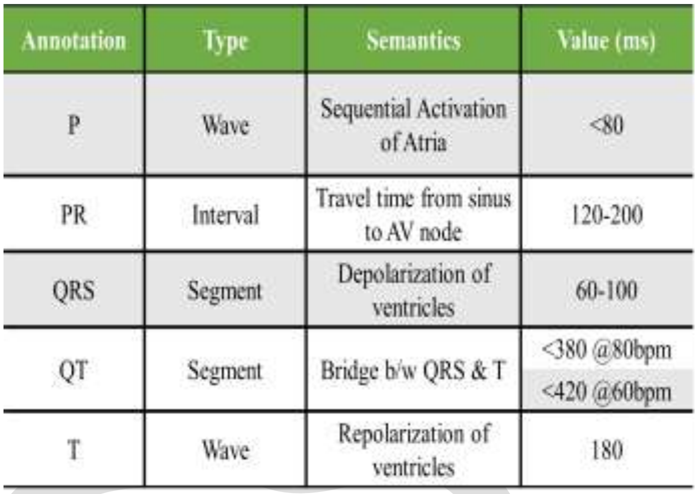


Figure 3. Schematic of Max30100

THE WORKING





Annotation	Type	Semantics	Value (ms)
P	Wave	Sequential Activation of Atria	<80
PR	Interval	Travel time from sinus to AV node	120-200
QRS	Segment	Depolarization of ventricles	60-100
QT	Segment	Bridge b/w QRS & T	<380 @80bpm <420 @60bpm
T	Wave	Repolarization of ventricles	180

Figure 4. ECG waveform

Table 1. ECG Waveform explanation [7] [8]

To comprehend the working of any system, one must understand the functionalities, parameters and logic lying within. Figure is a typical graph of ECG. ECG also known as EKG is a process that records the activity of heart when the electrodes are placed over a patient's body for a given period of time. ECG can be measured through 12 lead, 5 lead and with recent advancements, with 3 lead as well. And from 3 or 5 lead one can recover the values that can be obtained via 12 lead ECG. The leads measure the tiny changes on the skin that are electrical in nature due to heart polarization and depolarization. Through 12 lead ECG, 10 leads are placed on patient's hands and legs and also on chest surface. This is recorded for 10 seconds to get the heart's electrical potential measured from 12 different leads. ECG is a repetitive cycle that comprises of 2 electrical quantities. One is the P wave that denotes atrial depolarization, QRS segment that denotes the ventricular depolarization and T wave that shows ventricular repolarization [4]. Table 1 shows various sections of ECG and their interpretation along with value in time. It is important to note that the monitor's task is just to ensure that there is no critical condition. In other work it will not act like a full-fledged ECG measuring machine but will only serve the warning purpose. The flowchart describes ECG abnormality detection in terms of process in the BBB.

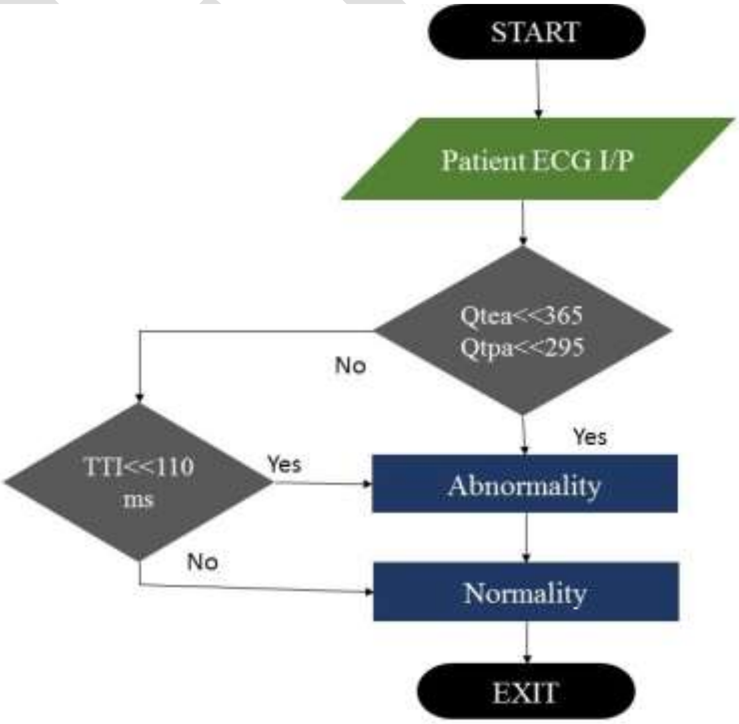


Figure 5. Flowchart of ECG Peak detection

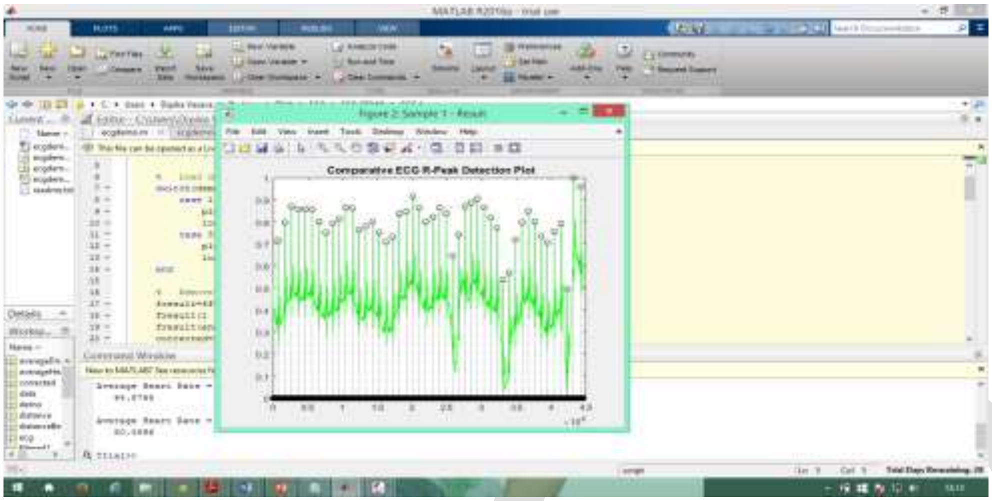
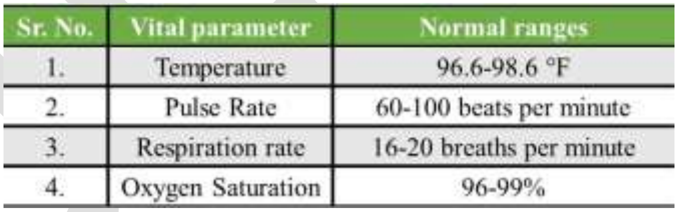


Figure 6. R-peak detection plot

Figure 6 shows graphical representation of ECG peak detection in MatLab. The trick here is simple. Physicians measure abnormalities in ECG by looking at the graph because different waveforms suggest different values and rationally apart from the disease the patient is suffering from, rest of the possibilities are least of his concern unless eitheer he himself is a medico or the diseases are inter-related[6] [12]. Thus, for a patient, just knowing whether he is having a regular cardiogram or not is enough of a signal to get serious. This is exactly what this device achieves. Detecting Quarturnery abnormality and letting the user know if he is doing well or not (if not, then how well is not the evice's issue because it is not designed to replace physicians in the first place). To ensure that the abnormalities signalled by the device are actually abnormalities, the waveforms are created as a matter of verification. This approach keeps the portability parameter to on utmost priority and on a sufficiently satisfactory level. The device also measures other parameters which are descriebed below.

The table 2 shows various vital parameters and their normal ranges. If the parameter values are lesser than or higher than this range then it shows that there is abnormality.

Table 2. Normal ranges of vital parameters [3] [9] [10]



Sr. No.	Vital parameter	Normal ranges
1.	Temperature	96.6-98.6 °F
2.	Pulse Rate	60-100 beats per minute
3.	Respiration rate	16-20 breaths per minute
4.	Oxygen Saturation	96-99%

The figure 5 shows the flowchart of the program. Qtea and Qtpa are the values already stored in the memory. The input ECG wave values that are the QT peak time and QT amplitude are compared with the stored values. If the values exceed the stored quantity then it shows the abnormality in the display.

The device uses MAX30100 for measuring the heart rate and pulse oxygen saturation values, ADAS1000-4 for measuring the ECG and respiration rate and TMP36 for body temperature measurement. By pressing the push button of the related parameter to be measured, the process starts accordingly. The related parameter value is shown on the display. If the parameter value exceeds the limit then red LED gets ON. For ECG parameter, the value is not shown on the display. Anyway he is not able to understand it. It just shows that if it is normal or not on the display. The data can be shared via blue-tooth or also through the BBB's USB [5] [11].

CONCLUSION

From the design, algorithm and results mentioned in this paper we can conclude that the portable health assistant serves its purpose as a cost effective, time saving and easy to use interface between biomedical technology and patients and can simplify their lives in cardiovascular and respiratory diseases.

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An improved image denoising method based on Gradient Histogram Preservation

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Abstract — Digital Image Processing is an evergreen problem of computational scientists. Among, noise reduction and preservation of finer features of image is fundamental. Wide variety of applications starting from digital photography to medical image processing makes image denoising a key problem. Large number of method has been published so far in the journals and the effort to develop a sophisticated method is continuing. Digital Image Processing has broad spectrum of applications ranging from radars, medical images to the digital photographs of day to day life. The present study aims to develop an improved denoising method based on Gradient Histogram Estimation and preservation. The method gives better results for the Gaussian Noise. The noise level of input image is estimated and then denoised by using the improved method. The Edge enhancement and denosing by preserving gradient histogram gives better accuracy than the existing method.

Keywords— Image Processing; Denoising; Gradient Histogram; Histogram Estimation; Gaussian noise, Fuzzy, Edge detection,

INTRODUCTION

Digital Image Processing is an interdisciplinary area of research where computer scientists, data analysts, statisticians and mathematicians look together to solve problems. Also the Digital Image Processing has broad spectrum of applications ranging from radars, medical images to the digital photographs of day to day life. One of the grand challenge of Digital Image Processing is to separate noise from the image. Noises, the unwanted component of the image are crawled into various stages of imaging that ranges from during acquisition to image processing [1]. In the digital photography noise can be developed because of low light or wrong exposure. In the Digital Image Processing Domain, by and large deals with removal of such noise from image [2].

Denoising of an image involves the manipulation of the image data to produce a visually high quality image. There are numerous models that has been published so far which are used for denoising an image[3]. Sparse representation for image restoration[4,5,6],Total variation model [6], Wavelet based model [7], BM3D [8] model, Nonlinear total variation based noise removal[9], and histogram preservation algorithm [10] are some of them. Each method has its own characteristics, benefit and also demerit [5]. Two major classes of denoising methods are (i) model based and (ii) Learning based method. In model based method, a statistical/mathematical model will be used for the denoising [6]. Whereas in Learning based method, an algorithm will be trained by using sufficient parameters and then the model is allowed to work based on its weightage function [7,9].

METHODS

In the present work the denoising is done in more realistic way as in practical situations, only the noisy image will be available. A noisy image is taken as input to the algorithm. We have adopted patch-based noise level estimation algorithm by Xinhao Liu et al [11]. Patches are generated from single noisy image and its weak textured patches are identified. Then Noise level is estimated from the Principal Component Analysis [12].

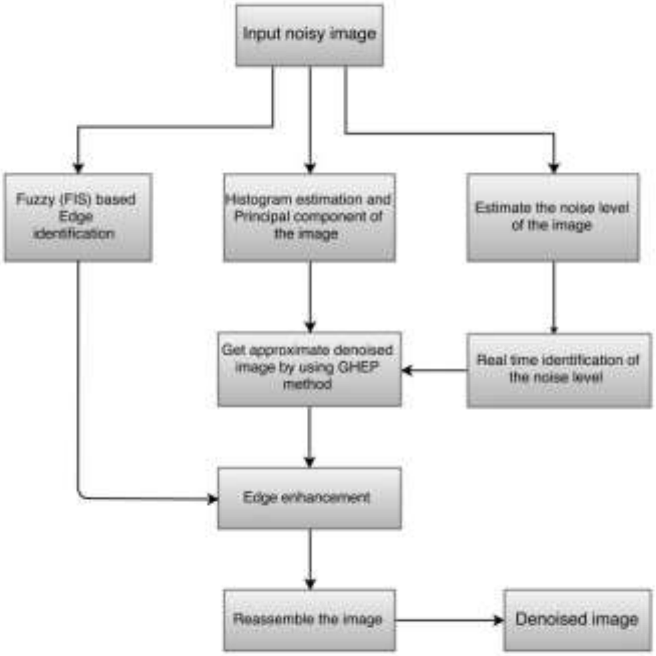

Figure1. Flowchart of the proposed algorithm.

In most of the denoising method, it is seen that, after its implementation, the image will be blurred than that of the original image. Also the edge of the denoised image gets smoothened and will have lesser details than that of the original image. A study has been conducted to find edge of the original and noisy image by using sample data. In this study it is found that there less details of edges in the denoised image. To address this issue we have employed fuzzy based edge detection and then the edge is enhanced in the denoised image that we have received by using our method.

Now the denoising is performed based on the Gradient Histogram Preservation (GHP) adopted from WangmengZuo, et al. [9] focus on texture enhanced image denoising method implementing the gradient histogram preservation.

NOISE ESTIMATION

Input image is decomposed into overlapping patches by

$$y_i = z_i + n_i \ , \qquad (1)$$

Where $\mathbf{z}_i$ represents the original image patch with the i-th pixel at its center and $\mathbf{y}_i$ is the observed vectorized patch corrupted by i.i.d zero-mean Gaussian noise vector $\mathbf{n}_i$.

Aim of the noise level estimation is to find the standard deviation σ_n when only the observed noisy image is given. In this method the Horizontal and vertical derivative ($\mathbf{D}_h\mathbf{y}$ and $\mathbf{D}_v\mathbf{y}$ are calculated and then the gradient vector $\mathbf{G}_y$ *is* obtained by taking [$\mathbf{D}_h\mathbf{y}$ $\mathbf{D}_v\mathbf{y}$]

Now the covariance matrix Cov_y is calculated by

$$Cov_y = G_y{}^T G_y \ ; \qquad (2)$$

The Directional Derivative in both Horizontal Direction and Vertical Direction is calculated and trace of Gradient Matrix is calculated by

$$D = tr(D_h \times D_h + D_v \times D_v) \ ; \qquad (3)$$

Now the initial noise level is estimated by computing the First component of Eigen value of the covariant matrix. This is taken as the initial value for calculating noise level by using iterative noise estimation.

$$\tau_0 = \Gamma_{inv}(\delta, \alpha, \beta)\ ; \qquad (4)$$

Now the noise level estimation form weak textured patch is performed. For this Inverse gamma function $\tau_0 = \Gamma_{inv}(\delta, \alpha, \beta)$ with the shape parameter α and scale parameter β is used

$$\tau = \sigma(k-1) \times \tau_0\ ; \qquad (5)$$

If the selected patch size is less than tau then the patch is selected as a Weak Texture Patch. To measure the texture strength of the image patches maximum eigenvalue of the gradient covariance is calculated.

Now the Noise Level of Weak Texture Patch is found by using the Eigen Value of Covariance Matrix of weak textured patch and its principal component. The iteration is continued until the difference between sigma in step n-1 and n is less than 10^{-4}

EDGE DETECTION AND ENHANCEMENT

Use In the present work, fuzzy based edge detection is employed. In the fuzzy based edge detection method, the intensity differences between the neighboring pixels are found. The membership function used here defines the degree to which a pixel belongs to an edge or a uniform region. The image gradients along x-axis and y-axis is (Ix and Iy) are obtained from the noisy image. A Fuzzy Inference System (FIS) is created for the edge detection and input is defined as image gradient.
Membership function with a zero-mean Gaussian function is defined for each input. The input is classified in such a way that it belongs to the zero membership function with a degree of 1 if the gradient value is zero

Now, the rules for the edge detection is defined as If Ix is zero and Iy is zero then Iout is white and If Ix is not zero or Iy is not zero then Iout is black. This defines whether a pixel is whether included as edge or not.

GHP BASED DENOISING

Gradient histogram preservation model is used for getting the reference denoised image.

Let $y = x + v$, where **x** is the desired estimation, **v** is additive white Gaussian noise, **y** is noisy observation

Firstly input image is converted into patches and clustered by using K- means clustering. Let $\mathbf{x}_i = \mathbf{R}_i\mathbf{x}$ be a patch extracted at position *i*. Patches are grouped into a dictionary D. For the dictionary D, patch xi over D defined as α_i .
The whole image is reconstructed by using

$$x = D \circ \alpha \overset{\Delta}{=} \left(\sum_{i=1}^{N} R_i^T R_i \right)^{-1} \sum_{i=1}^{N} R_i^T D \alpha_i \qquad (6)$$

Where . Regularization term R(x) is defined as

$$R(x) = \sum_i \left\| \alpha_i - \beta_i \right\|_1 \ , \quad s.\ t.\ \ x = D \circ \alpha \qquad (7)$$

$$\beta_i = \sum_q w_i^q \alpha_i^q \qquad (8)$$

Now the histogram preservation method uses the model

$$\hat{x} = \arg\min_{x,F} \left\{ \frac{1}{2\sigma^2} \left\| y - x \right\|^2 + \lambda . R(x) + \mu \left\| F(\nabla x) - \nabla x \right\|^2 \right\} \qquad (9)$$

Such that $h_F = h_r$. Where h_F is the histogram of transformed gradient image, hr is the Gradient histogram, F is monotonically non-descending odd function, λ- positive constant. The reference histogram estimated is used for the denoising.

The denoised image by using GHP method is then taken to the algorithm the final output is defined as

$$I_{out} = I_{ref} \oplus I_{edge} \qquad (10)$$

Results

One of the main advantage of the present work is, it uses only the noisy image and estimates the noise. Noise level estimated is converted to the standard deviation (sigma) and then it is used for the downstream analysis. The method doesn't uses the PSNR values because reference image is need to calculate it. In the present work, Gradient histogram preservation and denoising is performed. The Edges of the noisy image is identified and then the edges were enhanced. The edge enhancement has resulted the better the denoised image.

Noise level (sigma)	**ENL**	**ENL denoised**	**ENL final**
5	3.3190	2.6018	2.2336
10	3.4247	2.1402	1.8430
15	3.7456	1.8734	1.6039
20	3.9537	1.5548	1.2788
25	4.3785	1.5250	1.2908

Table 1: Result of the proposed method

The present method is evaluated with images with addictive white gaussian noise of different standard deviation and results were analysed. Results are given in Table 1.

Figure 2. Results of Proposed method

The result in Figure 1 when an image with noise $\sigma = 25$ is given as input shows that the present method gives better denoised image. Also the image looks more natural.

DISCUSSION

Merits of improved method for denoising over other existing method are (i) it uses only noisy image as input and doesn't need a reference image. (ii) It enhances edges by preserving the gradient histogram. Both these results better result and the image looks more natural. Sample set of Addictive White Gaussian Noise (AWGN) with different noise standard deviation is tested and found to be promising results. The method reduces noise upto 95% in different cases. Also the performance of the algorithm also improved 40% than that of WangmengZuo et al [9]

ACKNOWLEDGMENT

We wish to thank HOD of CS department, Project Coordinator and all friends of College of Engineering, Chengannur, for their immense support and encouragement for the fulfillment of this work

CONCLUSION

The present method can be used for denoising image which is mixed with AWGN. The algorithm is best suited for practical applications as it doesn't need any reference image. Fuzzy based edge enhancement improves the quality of the image.

The result can be improved by introducing more statistical analysis and parameter refinement. The current method is best suited for AWGN. However any other type of noise can be converted to AWGN and the method can be employed. Accuracy and fine tuning of the algorithm may also be done for better accuracy. In the present work Fuzzy based edge detection and fuzzy triangular membership function is used. Instead Gaussian or any other membership function can be used. Also edge detection can be improved to get the finer results.

Even though in the present work, most of the parameters were selected from the image itself, some are fixed based on statistical inference. This is a hurdle for denoising a different kind of image. Real-time parameter estimation can solve this even though it compromise on the performance time.

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Exploring the Malicious Android Applications and Mitigating Risk using Static Analysis

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Abstract— Android is a most prevalent OS for smart phones, which 84.4% of people use it as a part of life for both personal and commercial use. The usage of the android phones increases day by day, in which making the world connected through a worldwide. The android bring a drastic change in a today's modern world. As a part of it, Android was designed with much security to which malware, adware and other security issues cause a great problem in the system. Hence we propose a system to protect against these vulnerable issues and to protect our private data and to use the trusted system. Hence, it involving the two main phases consisting of detection phase and prevention phase. The detection phase involving the identifying the vulnerable issues such as identifying malware and risk based on different permission. The prevention phase involving the removal of security issues and reduced usage of permission.

Keywords—Malicious application, Android, detection, prevention, Android security, vulnerabilities, static analysis and permission

INTRODUCTION

Android operating system (OS) is mainly familiarized with lot of encroachment and its diverged features which make people towards the smarter and revolutionized world. The growth of android usage increases day by day, in which the android mobile operating system (OS) is Google's open and free software stack that finds includes middleware, and also crucial applications for the mobile devices, including smartphones [19]. The increase in the sale of android in the global market as per on 2016 statistics resulted to 83.4%when compared all other OS. It's no doubt that the apps are extremely acquainted in the market for their astonishing features and the wonderful benefits of android apps makes the users to get it. When concerned about security, malware protection is a major issue in which Android has been a major mark which a great threat leading to malicious applications (malapps).

In today's modern world android play a crucial role .The people gets moved to android for its amazing features such as portability and mobility. In android permission control is the essential point in which it restricts the access of an application. The defensive layers of security are shown in the Figure1 [20].

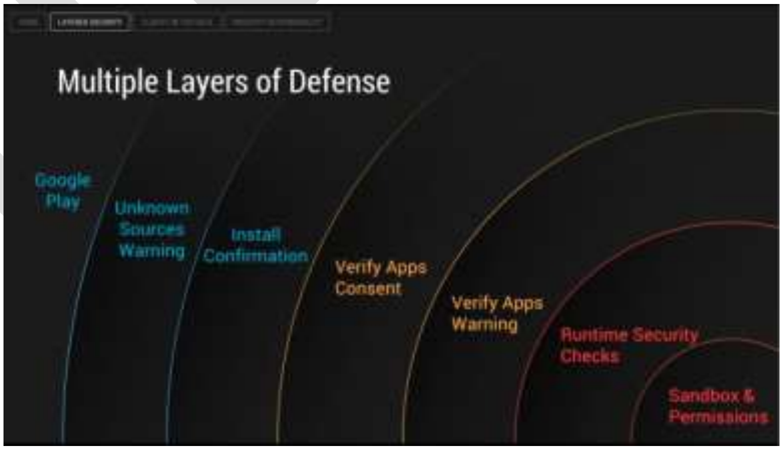


Figure1-Multiple Layer Of Defense

The main area focused here is the sandbox and permission. Generally, a sandbox is a security mechanism which is isolated from running programs. It is often used for testing the system for third parties to use authentication
Therefore, when an app needs to install the user has to check the permission and need to mount. Thus the people attracted to the amazing features of an app and app users unaware about an EULA [End Users License Agreement] .In order, to provide security and to make private information from leaking the system is designed with these robust security architectures and rigorous security programs.

II. RELATED WORKS

In this section, it intends a survey about the android security, how the malicious application is detected and its various classifications. The main areas focus on the analysis of malware application and risk detection rates.

On a survey analysis, the android users increase day by day and till date the development of android is faster which reached the N series with attractive features.

The survey [17] reported that increase in usage of the application, the attackers cause great threat to the users, which results in the number of vulnerable activities resulting the adware ,malware, spyware, etc..,

The maliciousness of android can be identified by using the static analysis, which involves the identification and detection of malapps .It also includes the classification of risk according to the vulnerabilities present in it [1].In another work, it involves the analyzing the malicious application by examining the source code that is by dynamic analysis, which is processed by vetting the behaviors of apps [2].

In includes a methodology, adding the metadata feature of creator information [6] of which along with static analysis .It also helps in distinctive the malapps and benign apps easily.

The automatic taint propagation [5] involving the automated testing of android which produces better effectiveness and performance .It is a more effective performance in detection of testing, which results with behavior analysis with the emulator.

A technique involving the permlyzer [7], which comprises the combination of runtime analysis and static to obtain automatically analyzes of permission. It provides the characteristic of each application involving all types of application. With a deep investigation of a various work, an idea to overcome the drawbacks in the proposed work.

III. PROPOSED FRAMEWORK

Our proposed work is introduced in order to minimize the risk permission which preventing the private data from leakage. It also includes the detection rate of risk and reduction of permissions in which limiting the leakage of information. Hence, in considering upon an installation of the app, permissions play a key role in it. Many users unaware of installation permission where users ignorant of the malicious threats. Lots of unnecessary permission leaks to the unauthorized users where leading a malicious activity. So, it involves a framework of detection of malicious application and prevention of data (minimization of risk).The proposed architecture is as follows:

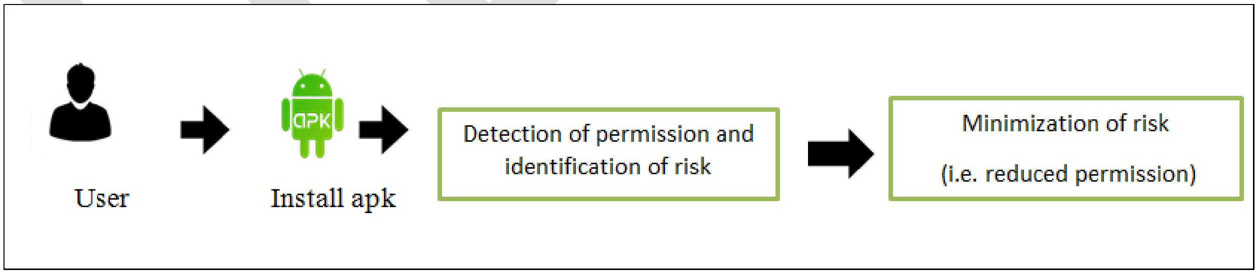


Figure 2- Architectural Design of proposed work

Here we describe the stepwise description of each module. The modules involved:

1. Installation and Initialization phase
2. Detection of risk
3. Minimization of risk
4. Result analysis with reduced risk.

1) Installation and Initialization phase

This is the first step of the proposed work in which user has to install all the necessary files where the app can be processed and initiated. It process involved is explained below.

User: User is the first access point in which enters the login IDs during the fixing particular app. The User has to check the account details of every app, and read the footings and settings of an app before entering the credentials. To protect that value the platform proposing an application atmosphere that should safeguard the security of users, data, applications, the device, and the network.

Installation of an app:

Next stage involving the installation of an app in which for an downloaded application (.apk file) the user has to verify the EULA of a particular app to be downloaded. Every app requires an permission. The permission inquiring the private info's leaks the data protruding to the vulnerable attacks. After verification, the app can be installed.

2) Detection of risk

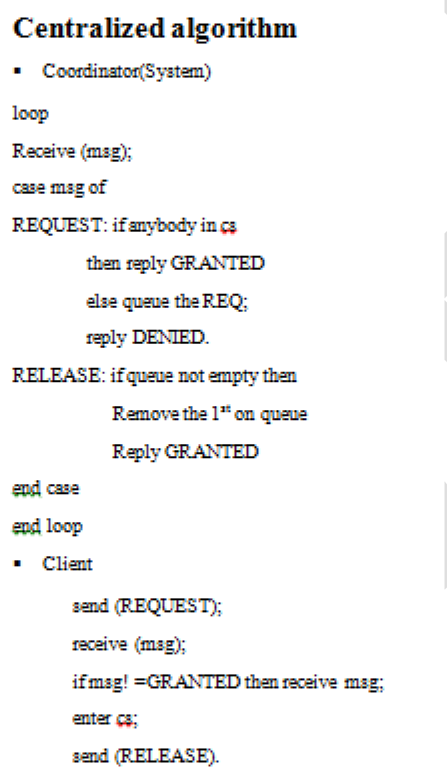
In this module it detects the permissions of an installed app. If the user installed app, the user accepts the permission it which approved to the terms and conditions of an app. Once installed app granted permission cannot deny. So it enumerates the permissions of an installed app[19].

Detection permission Identification

Once the permission is listed it recognizes the private risk permission and examines it .Here the credentials of the permission are grouped according to type of permission. It categorizes the type of permission and list the malicious app detection.

3) Minimization of risk

In order to lessen the risk permission (i.e.) preclusion of private leakage we use the centralized algorithm which is used for better effectiveness performance. The algorithm used for reducing the risk is defined as follows:



Centralized algorithm

```
▪ Coordinator(System)
loop
Receive (msg);
case msg of
REQUEST: if anybody in cs
          then reply GRANTED
          else queue the REQ;
          reply DENIED.
RELEASE: if queue not empty then
             Remove the 1st on queue
             Reply GRANTED
end case
end loop
▪ Client
        send (REQUEST);
        receive (msg);
        if msg! =GRANTED then receive msg;
        enter cs;
        send (RELEASE).
```

4) Result analysis with reduced risk

From the above systems the users isolate unwanted permission and shorten the risk permission which to attain a trusted permission avoiding the leakage of data. In this it yields a lesser amount of permission of an each app inhibiting the leakage of data evading over privileged permission.

From our analysis, a substantial number of apps request access the permissions in which the users get the maximum number of trusted apps which free from vulnerable threats and issues.

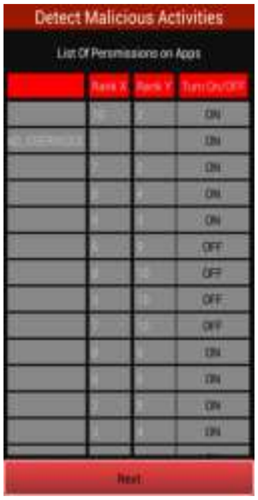
IV. EXPERIMENTAL RESULTS AND DISCUSSION

In this, it displays the snapshots on the mobile view showing an overall menu of the app.in which displays set of all menus. It identifies the all list of installed apps where if the application gets selected it identifies the list of permissions.

Then, it shows the menu of a risk app displaying the menu of an app. It contains the menu button of apps, overall risk, info and graphical view .In the menu, select apps button it shows the list of installed apps. This is displayed in the following figure.

Then the selection of app is performed .For checking the permission of an app, it has been selected .The permission of an app is analyzed by tapping the icon twice. The selection of an app shown and the list off permissions to be performed is shown in the figure.

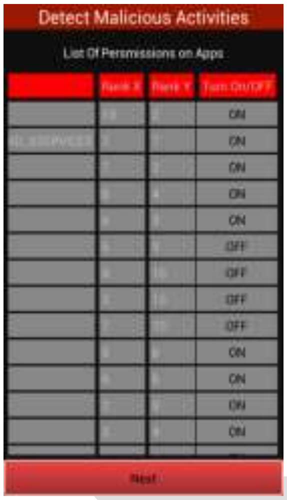
Next involves the button creation in which selection of permission based on user request which also involving the ranking of permission which includes the grouping of permissions. The centralized algorithm involves the permission control and access of the permission. The display of the controlled permission is displayed in the Figure



Detect Malicious Activities

List Of Persmissions on Apps

	Rank X	Rank Y	Turn On/OFF
	[illegible]	[illegible]	ON
[illegible]	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON

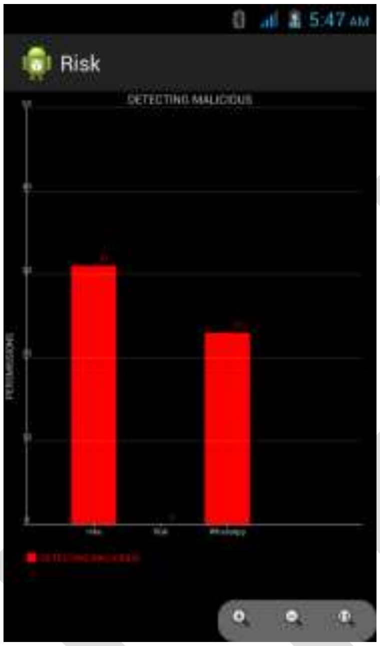


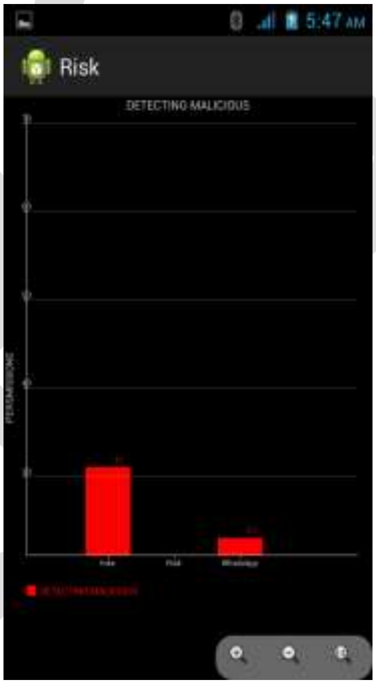
Detect Malicious Activities

List Of Persmissions on Apps

	Rank X	Rank Y	Turn On/OFF
	[illegible]	[illegible]	ON
[illegible]	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	OFF
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON
	[illegible]	[illegible]	ON

Then , the comparative results of the overall permission with high risk and the low risk shown in below figure.





The graph for each algorithm on each permission comparing the values with the below graph shows categorical view on algorithm where the graph of each app analyzed and retrieved risk of an each app showing the detection algorithm of each app and results.

V. EVALUATION METRICS

The performance of the proposed framework is measured in terms of the quality measures namely Accuracy, F-score and T-value[19]. Therefore the metrics are categorized as follows:

1. Accuracy
2. F-Score&
3. T-value

1. Accuracy:

Accuracy is also defined as the fraction of risk permission that is relevant. Accuracy is also defined as the proportion of correctly classified data objects both True positives (TP) and True negatives (TN) in the population (sum of TP, TN, as well as false positives (FP) and False Negatives (FN)):

$$ACC = \frac{TP+TN}{TP+TN+FP+FN}$$

2. F-Score is defined as the fraction of lies between precision and recall where, Precision is positive predictive (fraction of retrieved permissions that are relevant).Recall is also defined as fraction of the permission that is relevant to the query that is successfully retrieved.

$$Precision = \frac{TP}{(TP+FP)}$$

And, Recall is defined as

$$Recall = \frac{TP}{TP+FN}$$

$$F - Score = 2.\frac{Precision.Recall}{Precision+Recall}$$

3. **T-value:** T-value is mainly used for better accuracy results in which highly to reduce false positives. It can be calculated using the formula,

$$t = \frac{\mu_0 - \mu_1}{\sigma_{01}\sqrt{\frac{1}{N_0}+\frac{1}{N_1}}}$$

Where, N0, µ0 and σ0 be the number, the mean and the standard deviation of X in benign samples.N1, µ1 and σ1 be the number, the mean and the standard deviation of X in malicious samples.


Pixlr
Risk Factor:3%
Low
Permission Ranking T-Value:0.87

Finally, the results are shown the above graph and Evaluation metrics is calculated. The experiments are conducted to assess the performance of each app. The Table 5.1 showing the Accuracy value for different set of inputs.

METHODS	SAMPLE INPUTS	TP	TN	FP	FN	ACCURACY
T-TEST	1-10	4	2	2	2	.6
	11-20	5	2	1	2	.7
	21-30	4	3	1	2	.7

TABLE 5.1 Accuracy Results for T-Test

Next, the following Table 5.2 shows the assumed values for inputs calculating the shows the precision [True positive rate (TPR)] and recall [False Positive Rate [FPR]] in which calculating the F-score value for finding the performance.

SL NO	METHOD	PRECISION	RECALL	F-SCORE
1	MI	.9228	.0059	0.7
2	Corr.Coeff	.9232	.0060	0.71
3	T-Test	.9230	.0060	0.69
4	SFS	.9226	.0059	0.86
5	PCA	.9258	.0056	0.8
6	RF	.9281	.0059	0.87
7	D-tree	.9462	.0060	0.85
8	Centralized	.9520	.0062	0.9

TABLE 5.2 Comparative Detection Results

.Then includes the graphical view of F-score of different methods which is displayed below.

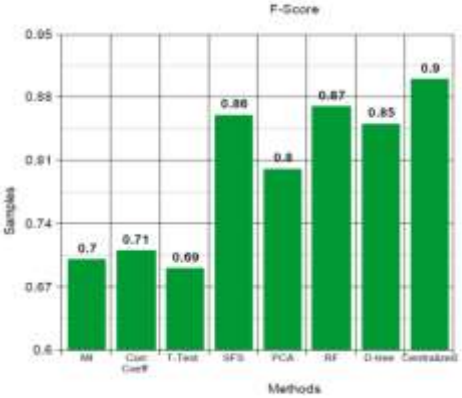


Table 5.3 F-Score Comparison

Then includes the key features of the proposed work in which analyzing the different qualities to get an overall description of various methods. This table analyzes the permission, algorithms, techniques involved and performance analysis this is displayed in the Table 5.4

Topic	Features
1.PERMISSION	Detection of permission of an app and Reduction of permission
2..SECURITY	It only identifies the risk and it provides security, which prevents the leakage of information
3.ALGORITHMS	Centralized Algorithm
4.TRUSTNESS	It indicates the risk level and its more trusted where no rooting is necessary
5.ACCURACY	Accuracy is high when compared to other

Table 5.4 Key Features with the proposed work

ACKNOWLEDGMENT

I express the sincere thanks to our Institution for extending the infrastructural facilities to carry our work successful.

CONCLUSION

This paper, involving the exploration of the malicious application and identifying the risk level which help in reducing the risk level, which help users to use the trusted app. The app makes the users protected app where the private information is not leaked.

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SMART RATION DISTRIBUTION SYSTEM USING RFID

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Abstract- Public distribution system also known as ration distribution system is considered a gaping contentious issue that involves corruption and illegal smuggling of commodities. With no distinctive technology concerned for automation of the task, all the tasks are hand-operated by FPS (Fair Price shop) agent and hence inviting irregularities in the system. There might result in the situation where a beneficiary is sold partial commodity entitled to him with the undistributed commodity directed to open market by FPS agent for his personal profit. In this paper, we propose a system that substitute the hand-operated tasks in ration distributed system with automated system that requires an installation at all the FPS which can be done with simplicity. In the proposed system we replace ration card with smart card. RFID tag holds a unique ID that is issued for all the BPL bearers. For authentication we use RFID (Radio Frequency Identification) based Smart Card and the Biometrics (R303A). To keep the government incorporated in the process, we suggest connecting the system installed at FPS to the centralized database supervised by the government and hence establishing direct communication between beneficiary and government.

Keywords - RFID Reader, Smart Card, Biometrics (R303A), Public Distribution System, Fair Price Shops, BPL Card, AAY Card.

INTRODUCTION

Prasanna Balaji.R[1] says, the history behind introduction of the PDS in India is rooted in famines and food scarcities during the entire period of British colonial rule in India. S.Sukhumar, K.Gopinathan, S.Kalpanadevi, P.Naveenkumar, N.Suthanthira Vanitha[2] Says, India's Public Distribution System (PDS) with a network of 4.78 Lakh Fair Price Shops (FPS) is perhaps the largest retail system in the world. Major problems due to this system are the inefficiency in the targeting of beneficiaries and the resulting leakage of subsidies.

In this division, we present a concise introduction to Ration distributed system using Smart Card. Ration distribution an initiative by the Government of India under Ministry of Consumer Affairs, Food and Public Distribution intend for the distribution of commodities to destitute at fair price. In the projected system we use RFID Technology. One of its parts, a RFID tags hold a unique ID is issued to all the BPL card bearers. Here RFID tag (Smart Card) and the biometrics serves the purpose of authentication. Information and the fingerprint impression of the head of the family and one of the family members are cached in the centralized database whose access is only legitimized for a government authority. The first of the two authentication steps needs the beneficiary to swipe the Smart Card against RFID Reader installed at the FPS and the second step towards an authentication is that he/she should scan the fingerprint of his/her thumb against biometric. On matching his/her fingerprint with the id stored in the device, an appropriate fingerprint id interface with database to checks for valid beneficiary's information. Once authenticated, updated information is obtained by automated ration system concerning the existing subsidies for the beneficiary onto the main interface. A beneficiary is permitted to take only those subsidies on products apportioned to him/her by government according to the available database inventory. After every transaction made by the beneficiary, centralized database is immediately updated and he/she will be sent a SMS (Short Message Service) specifying the quantity of commodity bought by him/her. With implementation of the projected system prime issues like bribery, uneven distribution and other difficulties faced by beneficiary can be terminated.

EXISTING SYSTEM

The present PDS works in a multiple level where the responsibilities are shared between centre and state. The task of procuring or buying food grains such as wheat and rice at minimal cost is the responsibilities of centre. Allocation of the grains to each state in carried out by centre. While the state government are responsible for the identification of household eligible to avail the facilities. The process runs as follows, the grains are transported by the centre to every state's central depot, after which the allocated food grains are delivered to respective FPS through state government. Finally FPS being the end point sells the entitled commodities to beneficiaries.

In the existing system, tasks like product distribution, Ration Card entry, product weighing and delivery of the product are carried out manually by FPS agent. However a present system has diverse drawbacks involved, developing irregularities in the system. Some of the irregularities include replacing actual products dispensed by the government with meager quality products and supplying the same for the beneficiaries, diverting food grains to open market to make profit, false entries in the stock registers that FPS agent needs to maintain and false announcement of deceit in food grains.

PROPOSED SYSTEM

Rahul J. Jadhav and Dr.Pralhad K. Mudalkar[3] proposed, the smart card based system in which report integrates the idea to automation instead of manually manage public distribution system. The manual preservation of records for issuance of food grains at the Fair Price Shops aids in creating an encouraging environment for the FPS owners to disclose in malpractice. As a result, this new e-PDS system can reduce the possible errors created by human and provide accurate information of public distribution system at any point.

The proposed system replaces the manual work in FPS. The prime objective of the designed system is the automation of FPS to provide transparency. The proposed automatic FPS for public distribution system is based on RFID technology and biometric authentication technology that replaces conventional ration cards. The RFID tags are issued to a beneficiary instead of conventional Ration Cards. Beneficiary's information along with the finger print impression of the head of the family and one of the family members is stored in the centralized database which is only updated or accessed by the government authority. Beneficiaries have to scan the RFID Smart Card against RFID reader after which he/she should scan the fingerprint of his/her thumb against biometric, and then an appropriate fingerprint id checks for valid beneficiary's information in the database, after successful verification of the beneficiary, information is fetched onto the main interface, and beneficiary needs to enter type of commodity as well as quantity of commodity using keypad. After delivering proper commodity to him/her, the beneficiary is sent the SMS (Short Message Service) about the commodities bought by him. The below mentioned figure 1 demonstrate the flow of the system.

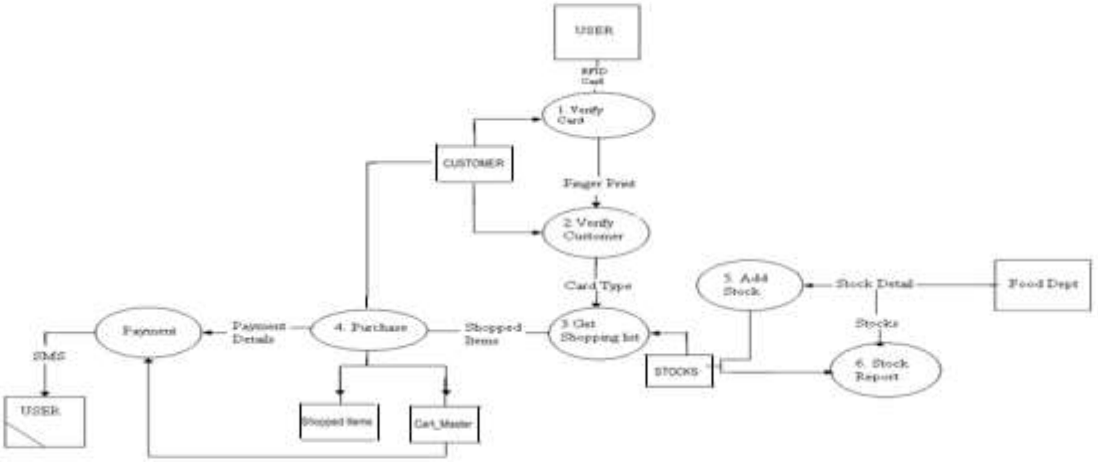

Figure 1: Dataflow diagram

ARCHITECTURAL DESIGN

Architectural design consists of six components such as beneficiary, RFID reader, biometric verification, monitor and database. On arriving to FPS with the valid Smart Card entitled to him/her, a beneficiary is validated using two ways authentication, that is, first step includes swiping the smart card against RFID reader. And scanning the thumb against a glass plate of a biometric device is the second way of authentication. The corresponding Finger print id functions fetching the beneficiary's data from the database. The figure 2 represents architectural diagram of smart ration distribution system.

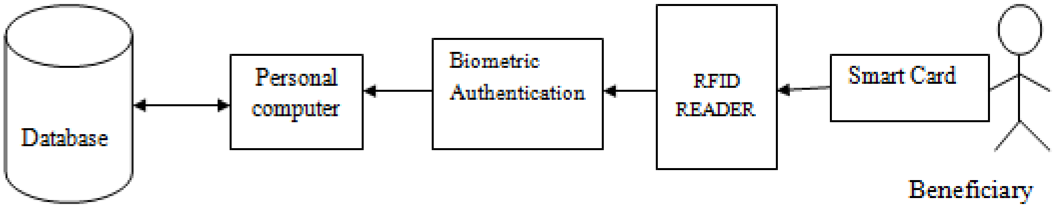

Figure 2: Architectural Diagram

METHODOLOGY

Following are the modules used by the system

I. Login Module

A. Conklin, G. Dietrich, D. Walz[4] says, The concept of a user id and password is a cost effective and efficient method of maintaining a shared secret between a user and a computer system.

In this module, the system registers beneficiaries details that includes their name, address, fingerprint, date of birth, age, contact number for sending SMS alerts, count of family members and category of the card to which the family belong, with all the information being uploaded in the database.

II. RFID Card Verification Module

Mandeep Kaur, Manjeet Sandhu, Neeraj Mohan and Parvinder S. Sandhu[5] says, Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. Kashinath Wakade, Pankaj Chidrawar, Dinesh Aitwade [6] proposed a system in which a simple PDA device with RFID tag used as an e-ration card in place of a standard ration card. This PDA device is similar to the ticketing machine used by bus conductor and the e - ration card is similar to swipe card. The user has to use this card instead of a book of ration card to get ration from the dealer.

RFID being a part of Automatic Identification and Data Capture (AIDC) technologies is considered to be a fast and reliable means of identifying objects. RFID based Smart Card verification module consists of two prime components, they are interrogator and transponder. The interrogator (RFID Reader) is needed to broadcast the signals through its antenna and the transponder (tag) will be activated after it receives the signals from the interrogator. Figure 3 gives the pictorial representation of RFID technology.

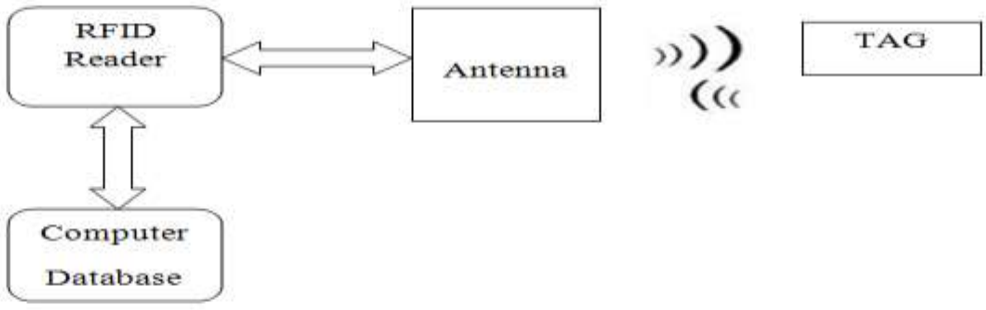

Figure 3: RFID based Smart Card verification

It operates as follows:

- The RFID reader sends a broadcast signal to detect the RFID tag (Smart Card).
- Data stored within an RFID tag's microchip is read.
- RFID reader’s electromagnetic energy should be received by tag’s antenna.
- Using the power harvested from the reader's electromagnetic field, the radio waves are sent back to the reader by tag.
- The reader picks up the tag's radio waves and interprets the frequencies as meaningful data.
- This data is then matched with the database and then beneficiary’s information is displayed on the screen.

III. Biometric Verification Module

Anil K. Jain, Arun Ross and Salil Prabhakar[7] says, Biometric recognition or, simply, biometrics refers to the automatic recognition of individuals based on their physiological and/or behavioral characteristics. Prasanth. R, Balamurugan. V, Roubavaan. S, Suresh. E, Purushothaman. N[8] proposed, the system which is mainly focuses on security system which is provided by using fingerprints for a family card that has been used to the Civil Supply Corporation.

The fingerprint scanning system has two processing steps. Firstly, it enrolls the fingerprint, where it gets an image of the thumb, and finally performs matching, later it determines if the pattern of ridges and valleys in the image are matched with the pattern of ridges and valleys in pre-scanned images. The scanning process begins with a beneficiary placing his/her thumb on a glass plate, where a CCD camera takes a picture. The **charge coupled device (**CCD) system actually generates an **inverted image** of the finger, with darker areas representing light that is more reflected (the ridges of the finger) and lighter areas representing light that is less reflected (the valleys between the ridges). When the processor obtains the image that is crisp and properly exposed, it proceeds for comparing the captured fingerprint with fingerprints stored in database. After verifying the valid beneficiaries, the system will provide access to their ration account.

IV. Purchase Module

Dhanoj Mohan, Rathikarani Gopakumar [9] says, we are automizing the distribution system at the ration shop as well as we are maintaining the database at one main control station and updating the database so that the shopkeeper do not cheat the poor people. A.N. Madur, Sham Nayse[10] Says, User have to enter the amount of Kg he want to withdraw. System checks his account. If the user will have sufficient balance to withdraw the current amount, system will open the valve

Once authenticated, the beneficiary should select the list of commodity he/she wishes to purchase. The system displays the total quantity of the commodities and also the amount of quantity a beneficiary is permitted to buy. Once after he/she confirms the commodities, payment is done and beneficiaries are given a receipt in form of a SMS. A beneficiary is permitted to take only those subsidies on products apportioned to him/her by government according to the available database inventory.

V. Alert Module

Ka Ching Chan and David Tien[11] says, Direct interconnection with Mobile Network Operators (MNO) is a very high cost approach due to the high charges imposed by the MNOs. A GSM gateway provides mobile voice and SMS connectivity to the mobile carrier’s GSM network.

A SMS gateway API serves the purpose of sending bulk messages to its users; here in this project it plays a role for intimating the beneficiary about the recent transaction made by him/her by sending him/her the message on his/her registered number.

VI. Stock Module

Dhanashri Pingale, Sonali Patil[12] Says, In this system they are storing the grains in the tank, and when the ration is inserted into the shop then that quantity is updated in web server.

The food department will send the stock to the respective distribution centers and also automatically update the stocks of the respective distribution center in the database. In this module the system maintains the details of incoming stock, distribution and remaining stock.

RESULTS

In this section, the snapshots below demonstrate various modules suggested where figure (4) corresponds to the FPS Agent login, Every agent is issued a unique user id and the password to login into a system installed at FPS, similarly figure (5) relates to the swiping of beneficiary’s card against RFID Reader, Figure (6) represents biometric authentication which is fingerprint scanning, Figure (7) corresponds to the Main Interface which is displayed on user authentication. Figure (8), (9), (10) represents the website developed to serve the beneficiary where a beneficiary on logging in can obtain the shop details including the amount of stock remaining in the shop from the website with an additional option of administrator being able to add new shops details and update stocks in the shops.

PUBLIC DISTRIBUTION SYSTEM
USING
TWO WAY AUTHENTICATION

User ID : admin
Password : ******

Figure 4: Login Interface

PUBLIC DISTRIBUTION SYSTEM
USING
TWO WAY AUTHENTICATION

PLEASE SWIPE YOUR CARD FOR ACCESS

Figure 5: RFID Card Verification

PUBLIC DISTRIBUTION SYSTEM
USING
TWO WAY AUTHENTICATION

PLEASE PLACE YOUR THUMB AND CLICK SCAN

Figure 6: Fingerprint Verification

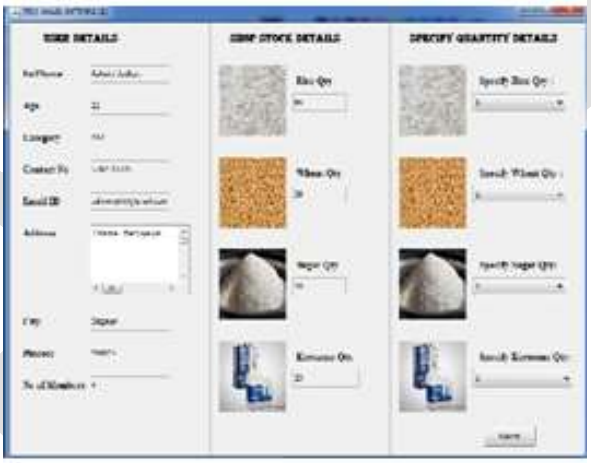

Figure 7: Main Interface

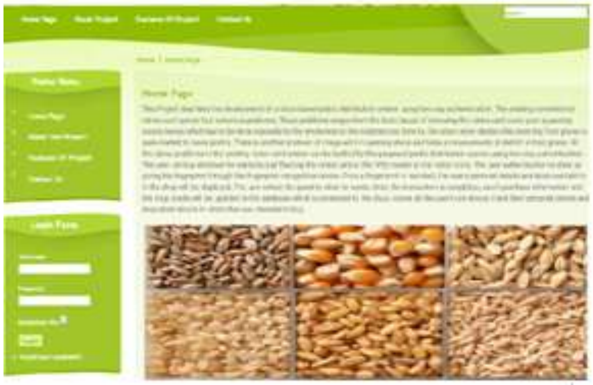

Figure 8: Home Page

Figure 9: Add shop Details

Figure 10: Add Shop details by beneficiary

CONCLUSION

Of the greatest challenges faced by the food distribution department is ration forgery. There are apparent chances that a FPS agent may involve in the process of ration forgery resulting in the various irregularities like fallacious entry of entry, partial distribution of the commodities entitled to beneficiary and directing the remainder to open market etc. The proposed system is more secure and transparent when compared with the normal existing system as the direct communication has been established between the beneficiary and government and hence forbidding the irregularities encountered. Using Smart Card one can avert entry of fallacious data in the ration database besides an auxiliary security is provided by the biometric authentication. In the proposed system, the FPS agent is only in charge of entering the quantity of the commodities, while updating and deducting is solely handled by the server (food department). Maintaining the database can be proven helpful in sending messages to the beneficiaries regarding the ration delivery. The proposed system is expected to be more guileless as it is anticipated to create transparency in public distribution system making the tasks automatic resulting in the system free from irregularities.

FUTURE WORK

- For better understanding, an interface and website can be made available in different languages (regional languages).
- For the ease of use, an application can be built for the same.
- Kiosk can be developed for the beneficiaries to check the commodities available.
- Automatic weighing system can be implemented at the FPS.

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Cognitive Computing ,Utilizing Big Data and Big Data Testing to deduce optimized result based decisions

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Abstract— This paper enrol the likelihood of merging three different aspects and trying to get the best out of them. It extract the various advantages that these technologies have as independent entities and the probability that they can grow rapidly better if put together to use. We will evaluate how Big Data, Cognitive Computing and Big Data Testing have their own power in general. We will later conclude how we can possibly exploit their pros. In today's world data plays a very key role in everyday conclusion making. The cons of these technologies can be reduce if they work in harmony. The outcome derived from such a combination would be better in accuracy, efficiency and quality

Keywords— Big Data, big data testing, cognitive computing, internet of things, big data architecture, jeopardy quiz show, watson**.**

Introduction- Background and Inspiration

In today's world capacity of unstructured information is growing at an vast rate.
Big Data as we call it is growing in leaps and bounds.This data if move to proper use could help us tackle the best results. If not utilized to its most favourable capability, it remains just another block of useless data.We really need effective technologies to make sense of it and make better conclusion. The data that is processed needs to be precise for it to be of any use. This is when Big Data Testing feature comes into picture. The data in which we are working in first needs to be the accurate data for us to even begin with. We're seeing a new age of computing starting with tabulating era, then to the programmable computer period and now cognitive computing systems which expand the boundaries of human cognate to become intelligent with use and have more natural interaction between the human and the computer. In the area of artificial intelligence there are a lot of stunning ideas but computational capabilities just weren't ready for them. Watson unexpectedly makes some of these crazy ideas achieved.

At the Central, we're trying to leverage knowledge the way humans record and exchange information it in natural human language, in particular text. It's initial introduction to the world was as a participant on the Jeopardy Quiz Show. In healthcare space we are speaking it as a support tool to expand the medical practitioner cognitive boundaries by giving them deeper access to much larger volumes of information. The history associated with the patient, the journal articles, clinical outcome, best practices, instruction etc. That capacity of content is doubling every 5 years. Physicians have precious small time to keep up with everything. A system like Watson can use the computer's ability to deal with huge volumes of data, understand the command that's contained within this data. Apply it to the problem that the practitioner is trying to solve, give them different choices to consider and in particular the underlying proof that supports those choices. That basic problem solving pattern applies to a extensive variety of industries. Any area where you have complex problems that you are trying to solve, where adapting the computer technology to perform better with the way humans want to work so that its more natural relationship between the human and the computer.

IBM's CEO and CHAIRMAN Ginni Rometty has called the coming times a new age in Computing, a new age in cognitive computing, a new age in cognitive systems. The phrase new age signifies not an incremental or a tactical shift, it signifies a fundamental,calculated and technological shift. In terms of the technology and what we do with it.

Cognitive computing draws innovation from the brain and yet honour the technological engineering constraints of the society. The combination of Big Data, Cognitive Computing and Big Data testing in turn will allow us to observe a new generation of computer and a new generation of services and solutions to make the work better.

Problem Definition

The foremost problem with usage of Big Data lies in the fact that there is no established way that the data would be associated to one another. Big data enclose related, unrelated, structured and unstructured data as well. The job of bringing the hidden diamond from a coal mine with nothing but a sliver of light is huge. Since, the data that we have at hand is in it's underdone form in the beginning, the major part of the hurdle is how to bring it or process it in a form where it could be pleasant to us in making conclusions.

The data that we have could be from various sources. The sources could be reliable or unreliable ones. Regardless of it's source the process that we use to modify the data into information should be strong enough to differentiate between data that needs to be used and the data that doesn't make any standard input. This is something that is reached using some form of validating and verifying. A filter of sorts which helps you separate the required data from the whole collection of data that you have.

One of the ideas is to get the computers to interact with us the way we want to interact with one another instead of us sitting downstairs and programming a computer someplace, then this belief of computers that deal with images the way we do or being able to imagine what we do in a way which is not a spreadsheet, it isn't a bar chart, it's really visual it's really the way humans interact with the world. I think that will modify how we do a lot of what we do in the occupation world as well as in our private lives. This is not something that is achieved using simple processing strategies.

Understanding Big Data[1]

Big data is a wide term for data sets so complex that traditional data processing applications are inadequate. Challenges include capture, analysis, search, data curation, storage, sharing, transfer, visualization, and information privacy. The word frequently refers simply to the use of predictive analytics or other certain advanced methods to extract value from data, and rarely to a particular size of data set. Accuracy in big data may lead to more confident decision making. And better conclusions can mean greater operational efficiency, cost reductions and reduced risk.

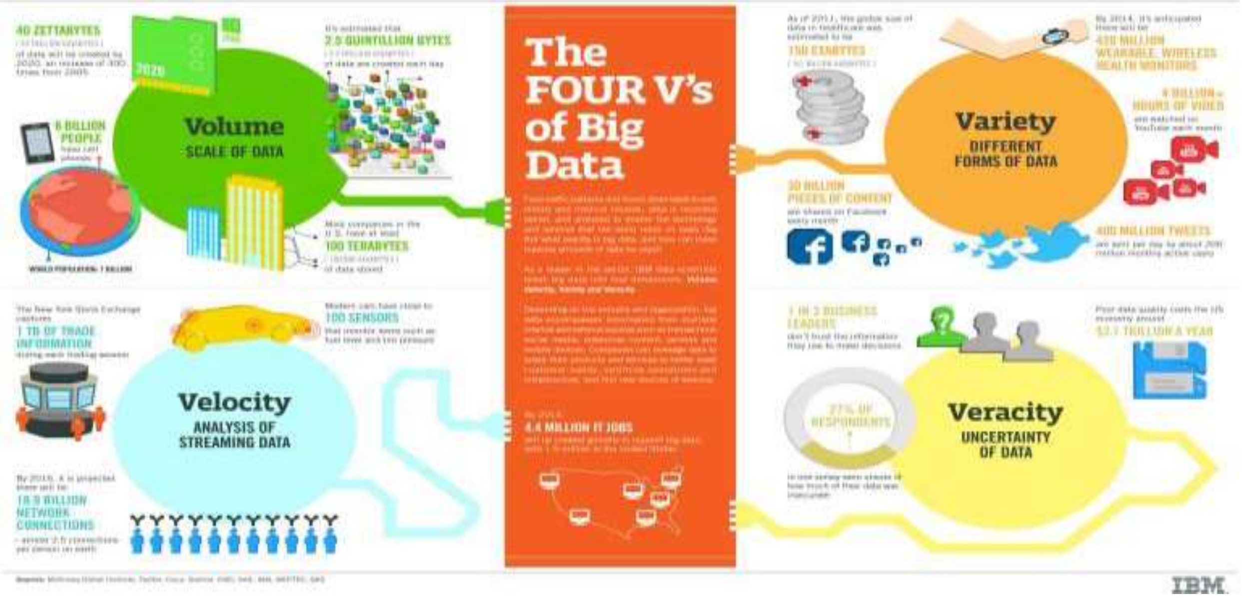

Figure 1. The four V's of Big Data[3]

Understanding Cognitive Computing

Cognitive computing in its simplest form is the way we get computers to behave and think and communicate the way humans do. If a computer can undergo it's environment then by definition it can act upon it to improve it and that is a distinctive capability compared to what we have today.

I)Touch

We will be able to connect through our telephone or computer systems.

How can we use technology to make us more aware. How can we utilize technology to make connect come to life. Within the next five years the phone will be such a ubiquitous part of our everyday experience of perception our world that we will be able to completely understand the feeling of touch through our phone. The phone will be able to assist you feel fabric. You will be able to share the texture of a basket woven by a woman in a remote village halfway beyond the universe. So if you think about buying a shirt online we can use distinct technology like vibration. The goal is to be able to manage vibration through an understood lexicon of texture.To be able to use vibration to express linen versus silk and how heavy or rough is the texture of the vibration as you hit your finger across your device screen. The device becomes just as instinctive as we understand touch in any other form today.

II)Sight

Computers will be free to not only look at images but also understand them.

In cognitive computing, systems are basically taught to interpret photos by being given examples and it basically learns the patterns that matter. So it's basically the computer that is learning to make this differentiation. It is learning what boundaries are. It is Studying what matters most. It could be for a beach site where the color is more important or where for another kind of site like the downtown city scene possibly it's edge information is something that is crucial.Pictures and videos have a lot of use in safety and reliability application. So when an event may occur it may be a severe storm where people can obtain photos today and share those in real time and then this can be useful for raising alerts. It can also help in guiding emergency personnel. It could be very useful for sharing experiences that others can benefit from. In the future the computer will be extremely powerful in the areas like medicine. We can consider one case of dermatology and skin cancer where usually it's too late when a patient may show up and already there might be a melanoma. A computer then can start to look for figure and situations where sometimes there is something that may have a pre-cancerous and a good indicator that something is probably to happen.Computers are great tool and cognitive computing they will understand contents in a way that will go far away human capacity.

III)Hearing

Computers will perceive what matters.

During the period of having a first born child in the house the parents often get distress as they often don't understand what the baby wants or what is the reason behind the baby's cries. In five years we assume such an application which in situation when a baby starts to talk to us, the system will be able to understand and explain to the parents what the baby wants. It would be able to let the parents or the doctors what the baby desire to convey. Cognitive computing when we talk about applications means that it tries to imitate how our brain works. It creates a much effective system that has much better results. As an example the big problem during mud slides and flooding state can have a solution where in sensors are located in nearby regions to hear the sound and alert the emergency squad in case if any vibration of mountains is heard. This is an example of how hearing sensors can prevent catastrophes too.

IV)Taste

Computer system will know what a person likes to consume better than him.

The way humans taste things, the way they perceive flavor is very chemical in nature. When we have something on our tongue and we notice and we understand the flavor by how their chemicals react with our nervous system. In the future the computer will be able to access wide depositories of data that tell us about the chemical constituent and structure of various ingredients. It will be able to tell us about what humans really grasp in terms of flavors and then be creative and be able to put together different recipes. So what 's to be done is figuring out what is good for humans and develop machines that can actually help us attain that. So what we would be looking is having a future where the new designed recipes that taste good to humans so people will be willing to eat it and is at the same time is healthy for them too. If we go to a school we see that children miss their nutritional needs when they start nit picking from their given lunchboxes. The aim in such a situation is to make recipes that are flavorful and at the same time are meeting the nutritional benefits required for their health and growth. In the future you might have a web application that does not only consider your personalized medical characteristics but also your personalized tastes. To take an example of a diabetic who isn’t allowed to eat much sugar can be in the future be able to eat recipe modeled in a way that satisfies his sweet tooth.

V)Smell

Computers will have a sense of smell.

If you smell a good wine it is a very interesting scientific question to actually understand what it is that you smell with your nose. A cognitive computing system will try to do similar things as your brain. It will try to merge the information of the smell with all the other information. In future it is considered that doctors will be able to identify a whole set of diseases based on your smell.An area which will be emerging will be in house care wherein smelling diseases remotely and then communicating to the doctor will be one of the techniques which will guarantee to reduce cost in the house care sector. For example your phone would know where you are, it could smell things around you, may be your breath and in turn your phone might know you have a cold before you do.

Understanding Big Data Testing[2]

Fetching relevant data from big data is of vital importancefor enterprises seeking to improve deliberate business decision making. Opportunities that were previouslynot available are now a reality, with new and more revealing perception extracted from sources such as facebook , google and devices that constitute the Internet of Things. Accordingly, emerging technologies are enabling organizations to gain valuable business insights from data that is growing increasingly in volume, velocity, variation of data formats and complexity. Leading industry analysts forecast the big data market to reach 25 billion by 2015. As a consequence, organizations will require newer data integration platforms, supply demand for QA processes that service new platforms, leading to the necessity of big data testing.

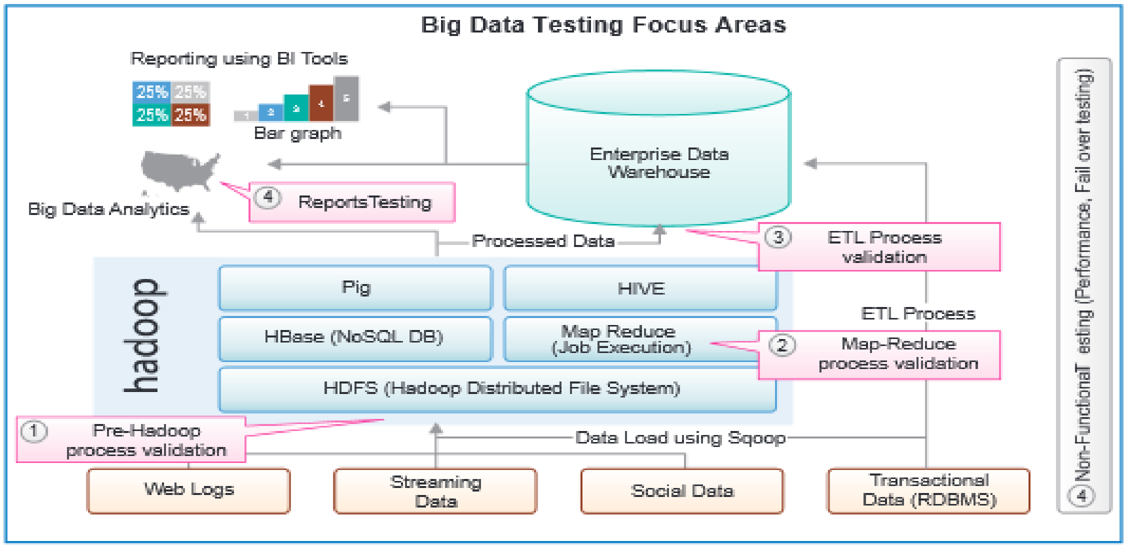

Figure 2. Big Data Architecture with Testing phases[4]

Proposed System

The proposed system basically initiates the usage of Big Data, Cognitive Computing and Big Data Testing so as to get the results in a better manner.

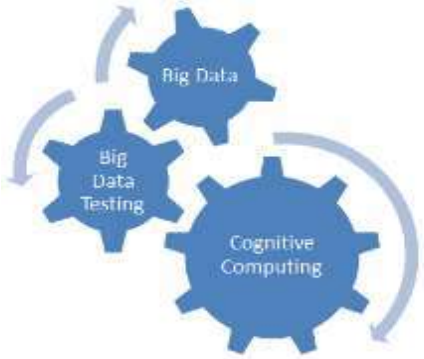

Figure 3. Correlation of Big Data, Big Data testing and Cognitive Computing

The companies that deal with consumers need to come up with improved strategies than they make if they intend on retaining their consumer base. The frequently changing nature of a consumer can't be stopped. Thus, companies need to understand their consumers better.

The role of Cognitive Computing is to help systems think in a similar fashion as humans. Big data allows us to collaborate all such information that are rallied through from the consumers. Similarly, to call that data legit, there needs to be some procedure followed to ensure the integrity of the data. This can be done using Big Data Testing.

When you look at what human brain can do, it's really amazing the way we can reason about things and think very deeply about things. But where we start to run into a wall is when we are faced with leveraging huge volumes of data, so looking through tones of documents, millions of books for instance is almost impossible for the human brain but in order to push the boundaries of human cognition we want to provide access to all that data so I think one of the 1st challenge or task of these cognitive systems along with Big Data and Big Data Testing is to enable human cognition beyond these barriers and it's exactly what this proposed system is all about. In fact it's about providing better access to huge volumes of literature, unstructured information and text, digesting it, evaluating it and providing efficient access for the humans to that information to help that human cognitive process.

With all due respect to current technology the computers today are just large calculators. They calculate very fast lots and lots of data but they really don't think.

In today's world we always provide imperfect answers because we don't have all the data. What this proposed systems allows us to do is to be able to collect that information from what is seen, from what is heard, from what is felt, from what is tasted an so on to provide a more accurate answer to the problem at hand.

ACKNOWLEDGEMENT

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CONCLUSION

The essence of this proposed system is to think of the difference between the way that most computers work now and the way that most sophisticated computers on the planet work and those computers are the things that we all carry around in our heads along with you know mammals and all the other little animals that run around and do these amazing feats. In real time taking in their environment, understanding, making decisions very fluidly and responding and how often have you looked at a computer while its little hourglass is spinning and it does the wrong thing. So we bring about the ability to bring a level of fluidity and appropriation to the way that we interact with computing. We put out effort into making computers actually more like biological systems, whether or not they've brains. Where they actually have that fluidity where they respond and react appropriately. So you feel like you're dealing with another living thing and not a machine.

Thus, they would act as much more that systems that are just another calculator like machine. It would actually help us come up with decisions that make a difference. Implementing all these 3 discussed facets of technology would not just strengthen the kind of information brought at the end of a Big Data Analysis process but would also one day go many steps ahead by coming up with corporate decisions that can be drawn using it.

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Improving and Optimizing Navigation on the Web with the help of Social Tagging

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Abstract - Social tagging on online(web) portals has become a trend these days. It has become an interesting approach to improve searching and navigation on the Web, since it aggregates the tags added by different users to the same resource in a collaborative way. We examine the use of different social bookmarking services to understand how social navigation is supported. Social bookmarking sites like del.icio.us and StumbleUpon have been growing rapidly. Both now have millions of users. These services combine personal tagging of information sources with browsing, which allows for improved social navigation.

Keywords— Tagging, social navigation, search, bookmarks, social bookmarking, tag-cloud.

The Web and the problem of search

People look up to the Internet frequently to gain information of any kind. Users of the web may only possess deficient prior knowledge and may lack proper view of relevant aspects. A user's knowledge may be critical for the search process and the information displayed on the Web. The Web offers heterogeneous information and products, and each user will have the option to select from different links and keywords for finding relevant resources. The mass and the diversity of resources available on the Web has the risk that people might select suboptimal information. In this paper we address how social tags, a new way of emerging collective information, can affect the individual process of navigation.

Introduction

Social navigation is generally used to describe navigation that is "**driven by the actions from one or more advice providers**".Social tagging is an interesting method to improve search and navigation over the actual Web. The success of many social bookmarking websites to name a few like Delicious and StumbleUpon has shown the usefulness of social tags to simplify the subsequent information retrieval and navigation.

At the individual level, tagging helps users to structure, arrange and find their own stored Web resources. Tags gives the opportunity to use other users' navigation links for search processes. Also social tagging systems can aggregate the tags of individual users.

When users share content and add their own tags with that content, it is possible they would be interested in additional content described by similar tags. The advantage of using social tags is that there is no need for users to create or update their profiles

Why do we need tags?

Two main reasons why people tag:-

1. People want to find information which is valueable at a later point in time
2. People want to share resources with each other.

If we take the example of Wikipedia(free encyclopedia), it provides the following navigation methods:-

1) **Search engine**: The search engine allows to search articles by using keywords, like in any search engine, example Google. This is a good approach to look for an unknown information or article. But the lack of many words in article may be difficult for retrieval.

2) **Category-driven**: Wikipedia allows to browse articles having the same category, and allows going through parent and child categories. Though this is very interesting to organize all the content, a taxonomy is always limited to the categories defined on the page and, on the other side, an article may only be present or but may not be in a category.

3)**Link-driven**: Wikipedia's articles has many links that provides exposure to good information. These links provide the way to navigate through related articles. Anyway, navigating this way depends on link availability, and the reality of not finding the desired article could make us think it does not exist.

There exists multiple ways to navigate Wikipedia and find desired resource, but could social tagging improve article search and optimize retrieval? We lay down some important points in this paper.

Social Bookmarking

If you have ever emailed a friend / family member and sent them a link to a website, you have participated in social bookmarking. Social Bookmarking is basically tagging a website and saving it on Web for future use. You can easily share them with anyone.You can look what other people's interest are and also explore some new sources of information. Instead of using a search engine, you can quickly narrow down the things to what you are looking for.

You might search for "education" and come up with two articles:one with 50 votes and one with 4 votes. It would be easy to predict that article with 50 votes will be the best choice. And it is a lot easier than putting "education" in a search engine and navigating many pages which may not even be useful.

Social Tags

Social tagging is the job of annotating digital resources, e.g. bookmarks, pictures or products, with keywords, the so called "tags". For most of the applications each user can choose individual tags for stored resources.A tagging system becomes social when these tags are visible to everyone, and profitable for anyone. A user could take advantage of tags described by others to retrieve a resource, e.g., a web site.

For example, a user could tag Wikipedia as free, encyclopedia whereas another user could use collaborative and information tags to annotate it.

A) *Two types of tagging:-*

- **Simple tagging:** Only the owners of the resource add tags to it. For instance, in Flickr 3 only the user uploading an image/photo tags it

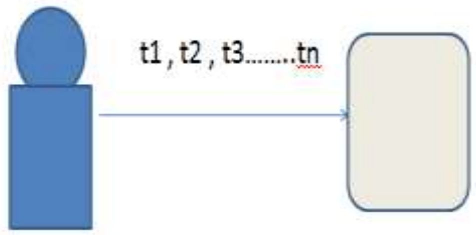


Figure 1: Simple Tagging

- **Collaborative tagging**: Not all a author but all the users can tag a resource. Generally, tags are defined by users on any resource, and as a result of many users tagging the same thing, a weighted set of tags is available for each resource. For example, Delicious, as a social bookmarking site, is a collaborative tagging system, where each resource (URL-Uniform Resource Locator) could be annotated (tagged) by a numerous users.

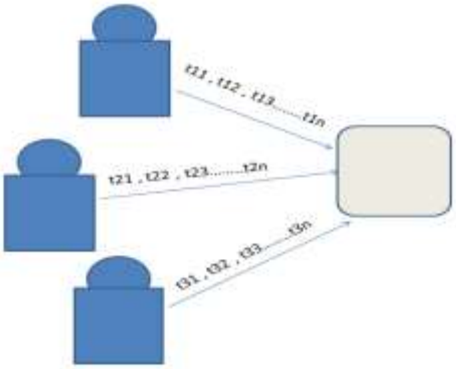


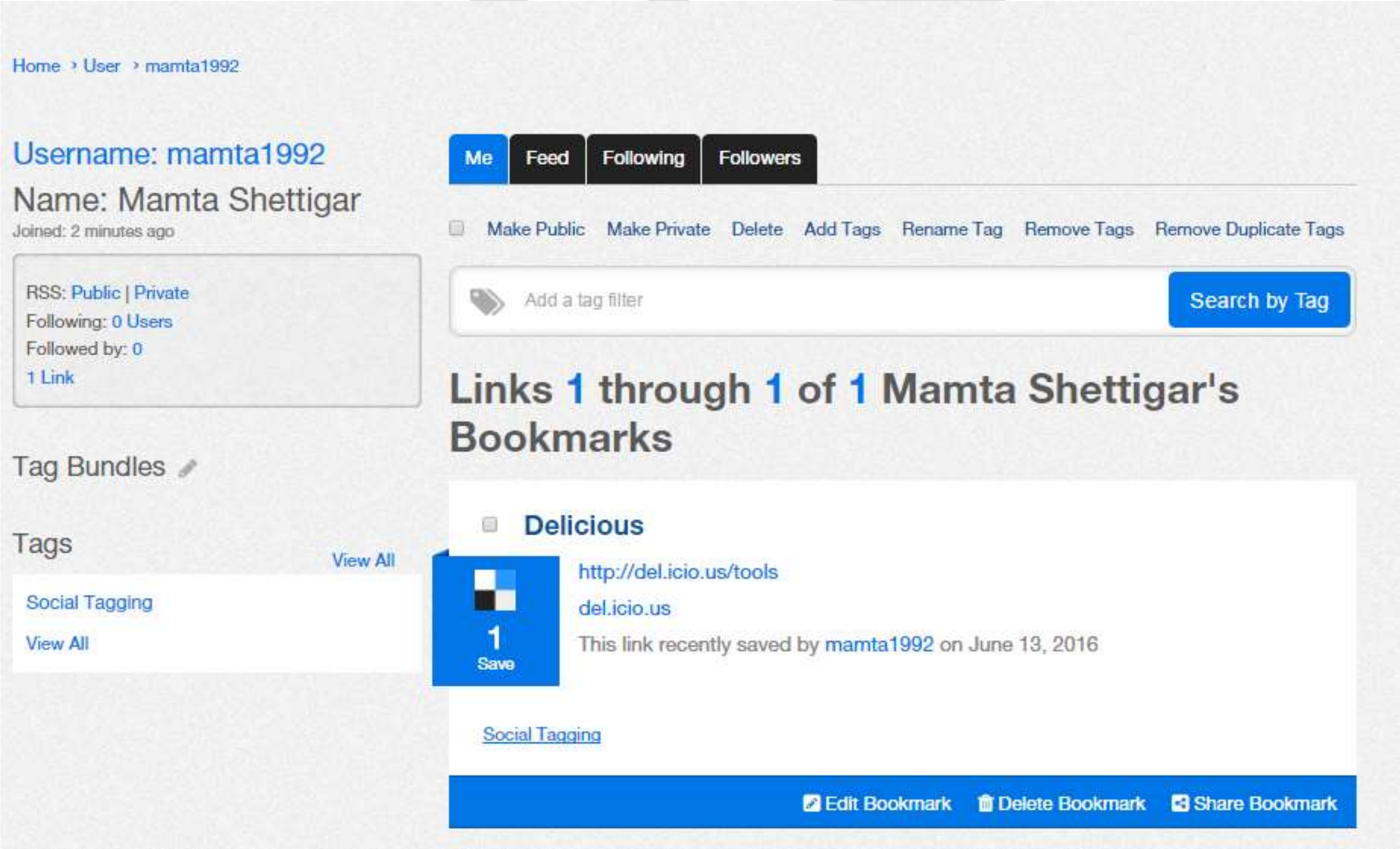
Figure 2: Collaborative tagging

B) Using a Social Bookmarking Website.

Delicious is the one of the world's largest social bookmarking site. Just like a usual bookmark, it allows you to save the address of a web page so that you can find it later whenever you need no matter where you had saved those bookmarks. Tags act like folders in which you can click on one tag and see all of the sites you have saved that have that tag. But you can put multiple tags to each site based on what categories it fits into.

Delicious also allows you connect with your friends. You can create a enormous network and see what bookmarks people in your network find interesting.

Another cool feature is that you can find websites that other people have tagged. If I am interested in websites about sports, I can type in "sports". I will get the most well liked websites tagged with "sports" by other Delicious users.



Username: mamta1992

Name: Mamta Shettigar

Joined: 2 minutes ago

RSS: Public | Private
Following: 0 Users
Followed by: 0
1 Link

Links 1 through 1 of 1 Mamta Shettigar's Bookmarks

☐ Delicious

1

http://del.icio.us/tools

del.icio.us

This link recently saved by mamta1992 on June 13, 2016

Social Tagging

Figure 3 Screenshot of del.icio.us social bookmarking website

C) Tag Mess

On the other hand, a tagging structure also has its disadvantages. The fact of depending on an open vocabulary could also be a drawback if it is not handled as it should. A user could use a tag like “science-fiction”, while other users could tag as “sci-fi” .If there was a system is able to merge all of these tags, and consider them as if they were the same, the results would be better

Social Tagging Analysis

Social navigation means users browse by means of tag-clouds-collection of keywords assigned to different online resources by different users. Tag clouds presents a visualization to show tags used for a resource. More frequently used tags are shown in larger font. If you select any of the tags, you can find all resources related with the selected tab

Figure 4 Example of a tag cloud

The occurrences of the tags present in the articles will vary depending on the number of tags that particular article has. The occurrence of a tag can be checked in an article’s content,also in the category names where the article is classified or even within the entire document. It was also seen that a lot of new terms occurred for each article, simple by using social tags.

According to studies, the years 2005, 2006 and 2007 had been taken into consideration and 20 most frequently assigned tags were found. There were some tags like science, games, technology that appeared among the top 20 tags for 2005 but were not seen in the top 20 tags of 2006 and 2007. New tags like webdesign, free and open source were introduced in 2007 pointing to the emergence of new trends . The tags introduced in 2006 and 2007 showed a great interest in free or open source resources.
The effect of tags on navigation can be proved by the fact by the number of times individuals looked at the bookmark collection of other people’s collections. According to a survey, 2545 of users using dogear service were found who looked at the bookmark collection of others.

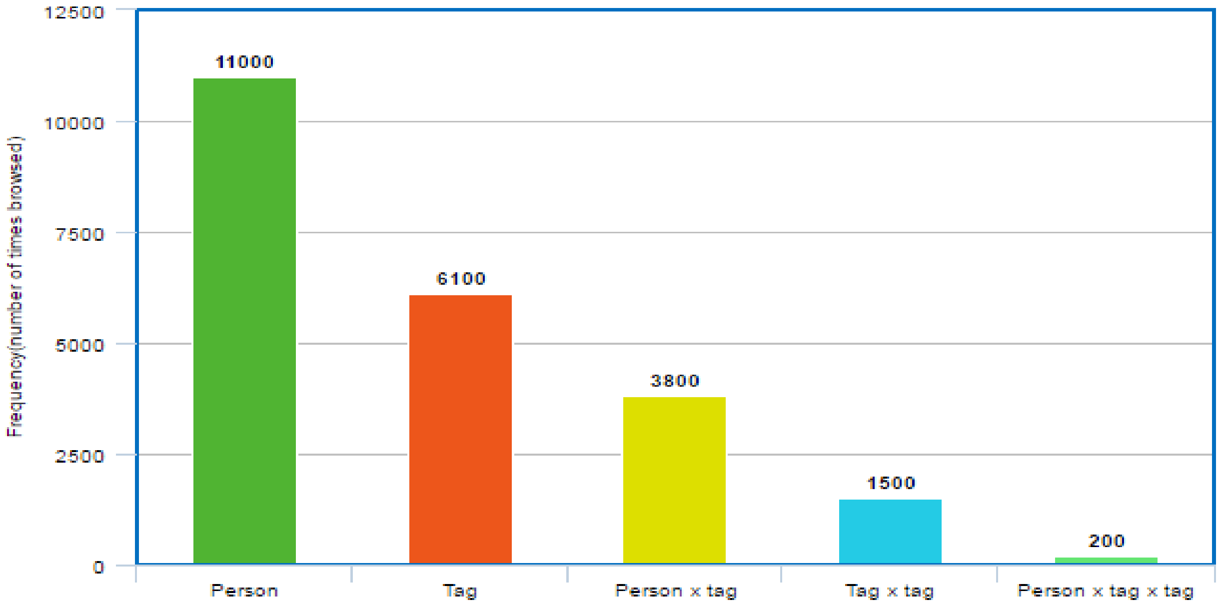


Figure 5 Number of times browsed by type

The above figure shows the number of times people looked at the bookmark of others as well as users who browsed in each particular manner. These results suggest widespread curiosity about what other people are doing.
A search engine needs to do two things:- 1) Find pages according to the query 2)Rank them accordingly to some criteria.Tags might be able to help a search engine if tags can be matched to a user's query.

ACKNOWLEDGMENT

I would like to take this opportunity to express my profound gratitude and deep regard to my *supervisor Mr ShivKumar Goel*, for his exemplary guidance, valuable feedback and constant encouragement . His valuable suggestions were of immense help throughout my project.Working under him was an extremely knowledgeable experience for me.

CONCLUSION

The use of social tagging plays a key role in finding useful information and also exploring new sources of information.It appears that every user who used a bookmark service clicked someone else's bookmark to look for more information. We suggest three main activities that are important for effective navigation systems: creating tags, using your own tags, and navigating other people's tags.

- **Creating tags:-**
  Use natural language to identify with the resource as close as possible.

- **Navigating your own tags:-**
  Tagging helps you to return to a resource later at any point in time.

- **Navigating other people's tags:-**
  You can explore current trends and topics in the navigation

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ASSESSMENT ON AIR QUALITY BY AIR POLLUTION MONITORING SYSTEM

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ABSTRACT- One of the basic needs for human beings is fresh and clean air. Air pollution has become a major issue in the environment now-a-days. Air pollution are caused due to some of the toxic gases such as Carbon monoxide (CO), Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2), Ammonia (NH_3) etc., Air monitoring is an important methodology to check whether the surrounded air is suitable for human beings to breath in or not. The Polluted air inhaled by the living organisms causes a serious issue in its health conditions. Majorly human beings are affected by the diseases like respiratory infections, cardio system diseases, lung diseases. The monitoring system which is put forwarded is based on the monitoring system using cloud which is used to evaluate the pollutant gases around the industrial area and thus make people aware on the concentration of clean air they breathe in. The sensing of toxic can be made by gas sensors. This survey helps in identifying the pollutants that are available around the atmosphere and monitoring methods for the toxic gases in the atmosphere.

Keywords – Toxic gases, Respiratory disorders, Gas Sensors, Industrial air quality monitoring, Cloud based monitoring system.

INTRODUCTION

The three basic needs of living organisms are food, water and air. The living organisms can be able to survey without water and food for about 3 to 5 days but not without air. Now-a-day's industries are rapidly growing in more number both in urban and in rural areas. Due to the effect of air pollution that is caused by the industries make a severe impact on change in climatic conditions depletion of ozone layer in the stratosphere. It also affects the fresh water sources which in turn affects the food production. The air pollution may also cause acid rain, globe warming. The air pollution may also cause changes in agriculture crops plantation etc. There are many organizations that provide the index value for air quality. Some of the organizations are World Health Organization (WHO), National Ambient Air Quality Standards (NAAQS), and Central Pollution Control Board (CPCB).

The causes of air pollution are mainly categorized as natural sources such as dust storm, forest fires, volcanoes, sea spray, plant pollen etc., and man-made sources such as domestic as well as industrial. The common air pollutants are Sulphur dioxide, carbon monoxide, nitrogen oxide, lead, Ammonia, Particulate Matter (PM).

Gregorio Andria et al., suggested that the assessment and forecasting variation for urban air pollution. Some modeling technics were used to validate the measured data and predict the toxic substances that are emitted in urban areas. Kalman filter and Kriging algorithms are used to improve the performance in examining them. Data filtering is done to estimate the analyzed quantity. The performance of the model is improved and the spatial relationship is identified in the monitoring network among the analyzed substances by Kriging technique [1].

Xiaofeng Liu et al., has put forward the monitoring system for air pollution near roadways. This system collects the quality of air near the roadways. Particulate matter sensors and exhaust gas sensors are used. Bluetooth is used as interface for the system and GPS as receiver. Aerosol sensor is put into operation to find the PM in the air while Figaro sensors are used to measure the quality of exhaust gases like CO_2, N_2, NOx, CO and others. The downside of this system is the monitoring done for the whole day and the measured data are uploaded to the server through Bluetooth at the end of the day [2].

Nihal Kularatna et al., has explained the IEEE 1451 based environmental air pollution system for low cost requirement. Pollutants like CO, NO_2, SO_2, O_3 can be measured in this system with the help of semiconductor sensor.ADuc812 micro convertor is used to implement the smart transducer interface module (STIM). The graphical user interface is provided with the help of Network Capable Application Processor. This system overcomes the short comes of analytical instruments. The gas sensors are used to measure the pollutant gases in the environment. The flaws of the system that there is no humility sensor and temperature sensor to improve uncertainties, the STIM has no LCD display unit and memory and the clock rate of STIM works under 1000kb/s. The clock rate to be improved by receiving the direct PC clock rates [3].

Vijay Sivaraman et al., has put forward the Haze watch which is used to monitor the air pollution in the urban area of Sydney. Crowd-source fine-grained spatial measurement is made to calculate the level of pollutants in the air of urban areas. In this paper, the sensor node like Metal Oxide , Electrochemical sensors measure the pollutants and transmits to mobile phones , then the mobile phones uploads the measured values to the server by using 3G network. Server stores the collected data then GIS maps and profile were generated by it. User can view the level pollutants from their personal device [4].

SCRUTINIZING METHOD

The survey can be made in three scenarios.

- Sensing Method.
- Processing Techniques.
- Monitoring Method.

SENSING METHOD

The sensing can be carried out in various emission sources like large industrial centers, oil refinement industries, steel plants, cement industries. This process can also be analyzed in traffic roads, small industries. The sensing system consists of recording stations which can analyze both meteorological parameters as well as chemical substance that are contained in air. The recording station can embedded with chemical substances analyzes and several sensors to sense the meteorological parameters. These parameters are used in regular calibration and pre- processing the data which is acquired [1].

The recognizing method can to perform by using Smart bike. It can act as a mobile sensor node with additional sensors that can sense the particulate matter (PM) and the exhaust gas. In this the pollutants are categories as exhaust gases like CO_2, N_2, NO_X, CO, and some other gases and particulate matters. Optical aerosol sensor, Shinyei PPD42NS, is used to measure Particulate Matter (PM), which outputs a digital (Lo Pulse) in proportion to PM concentration. TGS 2201 (Figaro Sensor, Japan) is used to measure the exhaust gases [2].

The semiconductor gas sensors are used to sense the toxic of air that present in. It can measure the major pollutants like CO, NO_2, O_3 and SO_2.This sensors are get connected with Smart Transducer Interface Module (STIM). These sensors have improved range, low power consumption and longer life time compare to analytical instruments [3].

The sensing system 'Haze Watch' is aims to crowd-source fine-grained spatial measurements of air pollution and to engage users in managing their pollution exposure through their personalized tools like mobile phones. The concept of 'crowd-sourcing' is also called as 'participatory sensing'. In this crowd- sourcing , the users collects and contribute data related air pollution which is obtained from personal sensing units, and the greater spatial density of data thus collected from several users in turn gives each user more accurate estimates of their pollution exposure [4].

PROCESSING TECHNIQUES

The processing techniques of [1] use two methods. They are Kalman filter and Kriging techniques. Kalman filter is a recursive process that allows noisy data to be filtered and provides the estimate of the analyzed quantities. The Kalman filter is a very powerful tool which can controls the noisy systems. This filter gives best estimate of required parameters, even though the characteristics of the observed phenomena are unknown. To enhance performances of the model, consider the measured pollutant values in other stations of the monitoring network and to identify the spatial relationships between the analyzed substances, the Kriging technique has employed.

The Processing system of Bi-cycle borne consists of a single-chip processor, a micro GPS receiver, a particulate detector, an exhaust gas sensor, a micro SD card, and a Bluetooth modulus. When the user rent the public bicycle, the monitor starts to collect the air pollution over roadway, and store these data in the SD card. After the user returns the bicycle at the dock station, the collected data are uploaded to the data center through the Bluetooth interface [2].

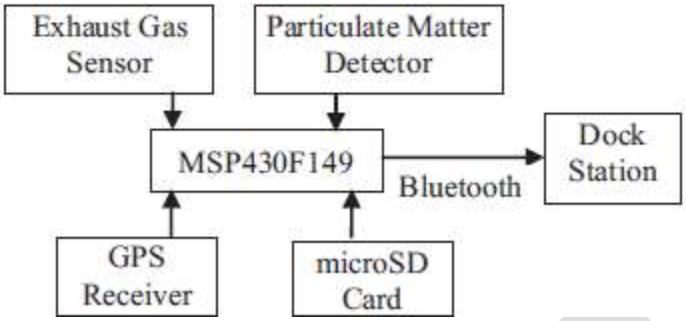

Figure 1: Processing Techniques of Bi-cycle Borne [3].

Micro Convertor-ADuC812 is used for processing method in [3]. The sensing data from sensor array are in analog form. To process the sensed containment data of analog signal to digital form ADuC812 micro convertor is employed. The ADuC812 is a completely integrated 12-bit data gathering system which provides high-performance self-calibrating multichannel ADC, dual DAC.

The sensor node measures the pollutants concentration and transmits to user mobile phones, and then the mobile phone uploads the measured values to the server by using 3G network. Server stores the collected data then GIS maps and profile were generated by it. The end user can view the level pollutants from their personal device [4].

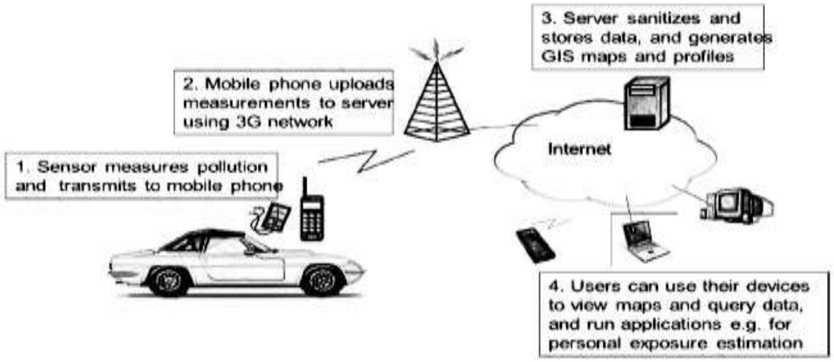

Figure 2: Processing Techniques of Haze Watch [4].

MONITORING METHOD

The monitoring strategy of [1] can provide the level of toxic gases that are present in traffic road can be analyzed from the monitoring stations. The monitoring has been done in hourly, daily, weekly and in yearly basis. From the monitoring station the level of carbon monoxide (CO), toluene and benzene can be determined. The unit of CO is noted as mg/m^3 whereas toluene and benzene were marking it as $\mu g/m^3$.

The air pollution monitoring system of [2] employees servers. In this model, the sensed data from near way road has been processed by uploading the gathered data throughout the day into the server. The monitoring can be made via the server of that particular organization.

Network Capable Application Processor (NACP) PC is connected to STIM through Transducer Independents Interface (TII). This NACP provides GUI and controlling power of STIM. The GUI is designed in Visual Basic 6.0 language. From the GUI of NACP PC the concentration of gases and current status of STIM [3].

The collected data from the sensor is uploading into the server using base station. The data processed in the server. The processed output of level of pollutants in the atmosphere can be viewed and monitored via the mobile application which is developed in android and in apple phones [4].

INDIA-AIR QUALITY INDEX (AQI)

The following table shows the air quality index of India.

AQI Category (Range)	**PM_{10} (24hr)**	**$PM_{2.5}$ (24hr)**	**NO_2 (24hr)**	**O_3 (8hr)**	**CO (8hr)**	**SO_2 (24hr)**	**NH_3 (24hr)**	**Pb (24hr)**
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5-1.0
Moderately Polluted (101-200)	101-250	61-90	81-180	101-168	2.1-10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very Poor (301-400)	351-430	121-250	281-400	209-748	17-37	801-1600	1200-1800	3.1-3.5
Severe (401-500)	430+	250+	400+	748+	34+	1600+	1800+	3.5+

Table 1: AQI of India

Method Comparison

The following comparison affords the clear view about the assessment.

Attribute	**Reference [1]**	**Reference [2]**	**Reference [3]**	**Reference [4]**
Gases	CO, toluene, benzene	PM, CO_2, N_2, NO_x, CO	CO,NO,SO_2,O_3	Haze
Units	Mg/m3, µg/m3	Mg/m^3, µg/m^3	PPM, PPB	PPM, µg/m^3
Technique	Kalman filter & Kriging technique	Smart Transducer	-	Crowd Sourcing
Equipment	Sensors	Aerosol sensor & Figaro sensor.	Semiconductor sensor	Gas sensor
Monitoring	Fixed Station	Mobile Station	GUI Interface	Android application

Table 2: Method comparison from the reference paper

CONCLUSION

Air pollution is a main and most complex issue in terms of toxicology and health risk assessment. It is the introduction of Biological Molecules, particulates or other harmful materials into our atmosphere, which may cause damage to other living organisms or death to humans. It may come from natural sources or anthropogenic. Now days, it's mainly due to industries and traffics. Many different types of pollutants which may give rise to combined effects. The survived methods are used to identify and to monitor the toxic gases in the environment. It analyses the concentration of gases various gases and compared with the recommended mean value to monitor the level of pollution and condition of environment. This assessment gives the higher understating of varied technique that square measure used to sense and monitor the standard of air within the atmosphere and additionally provide sweetening for additional watching system.

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EXPERIMENTAL INVESTIGATION INLIFE ENHANCEMENT OF ROTAVATOR BLADE AGAINST ABRASIVE WEAR BY HARD FACING

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Abstract— Rotavator blades are subjected to extreme abrasive wear when it cuts, pulverizes mixes and level the soil in single pass, which severely affects its working life. The objective of this study was to enhance the life of the rotavator blade made of EN-42J spring steel by means of hard facings. Four types of iron-based hard facing electrodes with range of Chromium (3.1 - 29% by weight) were used to deposit on the rotavator blade. Four different hard facings namely H-1, H-2, H-3, and H-4 were deposited by manual metal arc welding (MMAW) on rotavator blade. Pin-On-Disc (ASTM G99) test was done for the hard faced and un-hard faced samples of rotavator blades. Hard facings were examined by XRD analysis. The results showed that the hard faced EN-42J has shown comparatively high wear protection as compared to un-hard faced EN-42J. The wear rate was minimum in case of H-1 hard facing. The H-1–EN-42J hard facing-substrate combination showed maximum wear protection. The test result showed that the wear rate of the un-hard faced blade was 1.679 gm/hr, while those of the H-1, H-2, H-3, and H-4 hard facing alloys were 0.112, 0.239, 0.924 and 1.421 gm/hr respectively. The wear rates of H-2, H-3 and H-4 hard faced blades were also improved as compared to the un-hard faced blade. Examination showed that the life of rotavator blade improves approximately by 14.99 times as compared to un-hard faced blade.

Keywords— Rotavator, Hardfacing, MMAW, Pin-on-Disc, Wear

INTRODUCTION

Degradation of materials by wear results in very high losses in industries such as automobiles, agricultural, constructional, metal working etc. Industry tends to focus on the wearing surface that has the greatest impact on their economic situation. Wear is a surface phenomenon and occurs mostly at outer surfaces. Every part that is moving in service will be subjected to wear at the contact point between two parts. The consequence result of this wear is that the parts need to be replaced, which increase cost and downtime on the equipment. The surface characteristics of engineering materials have a significant effect on the serviceability and life of a component which cannot be neglected in design. The current challenge of engineers in these fields is to modify or design materials that are the most wear resistant, in order to enhance the life of the parts and to reduce the need of part replacement.

The rotavators do simultaneous ploughing and harrowing before and after rains. It can remove sugarcane stubbles or incorporate every kind of crop residue into soil mainly to improve soil organic health. It retains soil moisture, increases the soil porosity and aeration - a condition for enhanced germination and crop growth. It can be used for dry land and wetland cultivation. These features are attributed to the growing popularity of rotavators amongst Indian farmers. Critical components of agricultural machinery like rotavator blades are exposed to abrasive wear, the removal of material from solid metallic surface due to pressure exerted by continuous sliding of hard soil particles. The critical components are to be hardened against wear. This is achieved through the process of surface hardening.

Hardfacing is a low cost method of depositing wear resistant surfaces on metal components to extend service life. Among the surface modification techniques used in engineering applications, hardfacing probably is the most common one to improve the wear resistance of the components. It primarily involves deposition of a hard, wear-resistant material to the specific areas of the surface of the components by any of the techniques such as welding, thermal spraying, plasma spraying, etc. A number of hardfacing materials are available and the proper choice has to be made depending on the alloy chemistry, area of application and the cost factor.

The study of the surface characteristics of engineering materials is important because this affects on the serviceability and life of a component. The study of the published literature shows that there is still lack of understanding about the hardfacing techniques on rotavator, welding process used for hardfacing and alloys

Kocher et al. [1] made an effort to increase wear resistance properties of material while using in industry and agricultural work by the mean of hardfacing. A hard electrode was used for hardfacing by manual metal arc welding on material which had low hardness comparison to hard electrode. EN31 was material of tiller blade. A weld coating was applied on the surface of EN31 with the use of MR 3LH electrode in order to increase wear properties. The result was made on the basis on wear test by Pin on disc machine and SEM analysis. It was found that with the help of hardfacing the wear resistance property of EN-31 were increased. **Shibe et al. [2]** made an attempt to discuss the various types of wear, surface protection by hardfacing techniques, Manual Metal Arc Welding (MMAW) process and applications of hardfacing.It was concluded that the economic success of the hardfacing process depends onselective application of hardfacing material and its chemical composition for a particular application. It revealed that carbon and chromium are the major elements whichare used in hardfacing alloys. It was found that the by varying the percentage of carbon andchromium corrosion and wear resistance can be enhanced. **Arora et al. [3]** deposited a hard and wear resistant layer on metal components to reclaim or extend the service life of machine parts used for various applications in industries. The prime requirement of a metal is to have good resistance to wear, corrosion and high temperature. The study primarily focuses on the impact of Composition (in terms of C, Si, Cr and Mn), load applied and the time for which the tool is used on the weight loss of the tool and thereby analyzes the wear of the material. The results were optimized in an experimental study while using Design of Experiment, based on which it was concluded that the H-1 type hard-faced alloy provides us with least weight loss and thus least wear.

The aim of this paper is to increase the wear resistance of rotavator blade by selection of appropriate hard facing method and material.

EXPERIMENTATIONS

The scheme of experimentations have been setup to perform the experimental studies on the the wear resistance of rotavator blade by selection of appropriate hard facing method and material

The substrate material is the material from which the rotavator blades are made up of. Spectroscopy is done to determine the actual composition of the original blades. Spectroscopy was done at Munjal Castings, Ludhiana, Punjab (INDIA). From Spectroscopy analysis it was found that therotavator blades are made up ofhigh tensile steel EN-42J. The test pins are prepared of length 60mm and diameter 14mm originally and the final length of length 30mm and diameter 8mm is attained by the turning and grinding operations. These operations are performed after the hardfacing upon the one end of the pins. The other end of the pins does not hardfaced for the checking of un- hardfaced properties.

Selection of the hardfacing electrodes was done on the basis of the chemical composition of the rotavator blades. The actual chemical composition of the blades had been determined with the help of Optical Emission Spectrometer in the laboratory at Munjal Castings, Ludhiana. The result obtained from the spectroscopic analysis of original blades helped in the selection of various hardfacing electrodes like chromium rich, carbon rich electrodes etc. is shown in table-1

Table 1: Chemical composition (wt %) of Hardfacing Alloys

Hardfacing Alloy	**Chemical Composition (wt %)**	**Welding Technique used**
H-1	C – 4.5, Si – 0.8, Mn – 1.6, Cr – 29	MMAW
H-2	C – 4.8, Si – 2, Cr – 23, Mn – 0.7	MMAW
H-3	C – 3, Si – 0.6, Mn – 1.0, Cr – 6.25, Mo – 1.3, Nb – 0.6	MMAW
H-4	C – 0.69, Si – 0.4, Mn – 0.6, Cr – 3.1, P – 0.03, S – 0.03	MMAW

For laboratory tests, figure-1 shows the samples which were prepared in the form of cylindrical pins having final diameter of 8 mm and length of 30 mm with the help of lathe machine on the surface and cylindrical grinding machines.

Figure 1: Samples for Pin on disc test

Manual metal arc welding technique was used to deposit the hardfaced layers. Constant current type power source was used, the reason being that with this type of characteristics, the welding current remains constant, irrespective of small variation in arc length and consequent slight change in arc voltage, which are unavoidable even in the case of a skilled worker. As the welding current was fairly steady, the weld quality is consistent. The table-2 shows the welding parameters which are maintained while the welding operation. This is very important to achieve the proper hardness upon the base material. The parameters like the current, voltage or preheat conditions, are different for each electrode which are taken from the manufacturing companies of these electrodes.

Table 2: Welding parameters for each welding electrode

Type of Electrode	**Size = diameter x length of electrode (mm)**	**Current (amps)**	**Voltage (volts)**	**Preheat for 1 hour (°C)**
H-1	3.2 ×350	125	24	180°C
H-2	3.2 ×350	120	22	180°C
H-3	3.2 ×350	120	17	180°C
H-4	3.2 ×450	125	23	180°C

The specimens were then subjected to wear tests on a pin-on-disc test apparatus, which is shown in Figure-2(a).

Figure 2(a): Wear Testing Apparatus

The pin-on-disk test is generally used as a comparative test in which controlled wear is performed on the samples to study. The mass lost allows calculating the wear rate of the material. Since the action performed on all samples is identical, the wear rate can be used as a quantitative comparative value for wear resistance. The device used was "Wear and Friction Monitor Tester TR-201 of Make-M/S Ducom Instruments Pvt. Ltd., Bangalore-INDIA, conforming to ASTM G99 standard as shown in Figure-2(b).

Figure 2(b) Wear and Friction Monitor Tester TR-201

This testing apparatus is designed to study the wear and friction characteristics in sliding contacts. It is also used for evaluating the rate of wear and ranking of materials.

RESULTS AND DISCUSSIONS

The tables are formed for weight loss of material and graphs are made for the comparison of effect of different hard facing electrodes. Results of Laboratory tests have been reported and the following results are obtained after experimentation:

1. Visual Examination: The samples subjected under abrasive wear are visually examined during study. During lab tests of hardfaced samples on Pin on Disk wear testing machine, it has been found that the pins of samples having hardfaced deposits at their edges have got wearing as the time period of abrasive action increases and there is no other change in the pins were noticed. Similarly the un-hardfaced pins have got wearing more rapidly under abrasion as the time period of abrasive action goes on increasing.

2. Weight Loss Determination: The weight loss of all samples are calculated by subtracting the final weight of sample after abrasive wear from initial weight of samples before abrasive wear and on the basis of same, the rates of wear of samples per unit time have been determined both for hardfaced as well as un-hardfaced samples and comparison made among the different types of samples. The weight loss is measured three times in every cycle of 10-20-40 minutes for the proper determination of the readings. This makes the complete cycle of 60 minutes as discussed above. Same precision is followed for the each weight loss reading to measure. The following table shows the weight loss of hardfaced and un- hardfaced material which are tested upon the pin on disk machine in laboratory.

Table 3.1: Wear Loss of Hardfacing Electrode H-1

Hardfacing Type	Load (N)	Time (min)	Initial wt. (gms)	Final wt. (gms)	Cumm. Wt. Loss (gms)
H-1	30	10	3.8124	3.8120	.0004
		20	3.8120	3.8112	.0008
		40	3.8112	3.8096	.0016
	40	10	5.1049	5.1042	.0007
		20	5.1042	5.1031	.0011
		40	5.1031	5.1012	.0019
	50	10	4.3436	4.3429	.0007
		20	4.3429	4.3419	.0010
		40	4.3419	4.3397	.0022

Table 3.2: Wear Loss of Hardfacing Electrode H-2

Hardfacing Type	Load (N)	Time (min)	Initial wt. (gms)	Final wt. (gms)	Cumm. Wt. Loss (gms)
H-2	30	10	14.3404	14.3402	0.0021
		20	14.3402	14.3400	0.0023
		40	14.3400	14.3383	0.0040
	40	10	15.3560	15.3557	0.0027
		20	15.3557	15.3543	0.0041
		40	15.3543	15.3534	0.0050
	50	10	13.3356	13.3351	0.0027

		20	13.3351	13.3345	0.0033
		40	13.3345	13.3322	0.0056

Table 3.4: Wear Loss of Hardfacing Electrode H-4

Hard facing Type	**Load (N)**	**Time (min)**	**Initial wt. (gms)**	**Final wt. (gms)**	**Cumm. Wt. Loss (gms)**
H-4	30	10	13.8123	13.8120	0.0003
		20	13.8120	13.8119	0.0006
		40	13.8119	13.8107	0.0018
	40	10	15.4746	15.4682	0.0119
		20	15.4682	15.4530	0.0271
		40	15.4530	15.4242	0.0559
	50	10	13.6618	13.6432	0.0578
		20	13.6432	13.6112	0.0892
		40	13.6112	13.4553	0.1559

Table 3.5: Wear Loss of Un- Hard Faces Base Material EN-42J

Hard facing Type	**Load (N)**	**Time (min)**	**Initial wt. (gms)**	**Final wt. (gms)**	**Cumm. Wt. Loss (gms**
High Tensile Steel EN42J	30	10	11.8563	11.8477	0.0265
		20	11.8477	11.8346	0.0396
		40	11.8346	11.8014	0.0728
	40	10	10.9796	10.9657	0.0408
		20	10.9657	10.9393	0.0672
		40	10.9393	10.8942	0.1106
	50	10	11.1636	11.1446	0.0460
		20	11.1446	11.0986	0.0920

		40	11.0986	10.9533	0.1453

From the tables, it is shown that the wear of samples of hardfacing alloy is very low as compared to others. The sample of H-4 hardfacing are also undergone the greater weight loss as compared to the other hardfaced sample and it has shown the wear approximately similar to the un-hardfaced sample as the un-hardfaced sample has been subjected to greater wear as compared to hardfaced ones. At maximum load of wear test, it has been found that the weight losses of H-2 and H-3 hardfacing samples are approximately same.

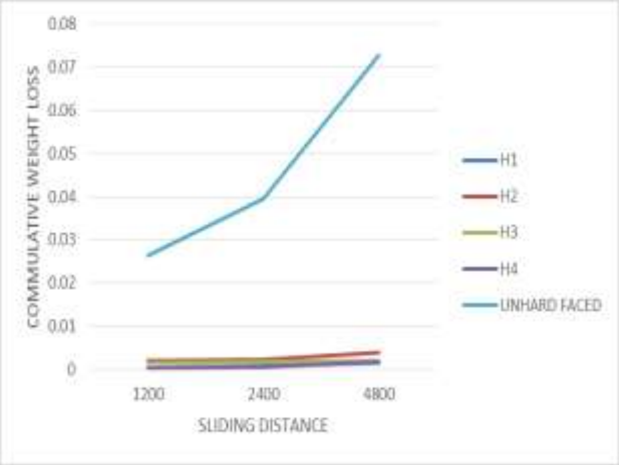

Figure 3.1: Cumulative weight loss at 30N

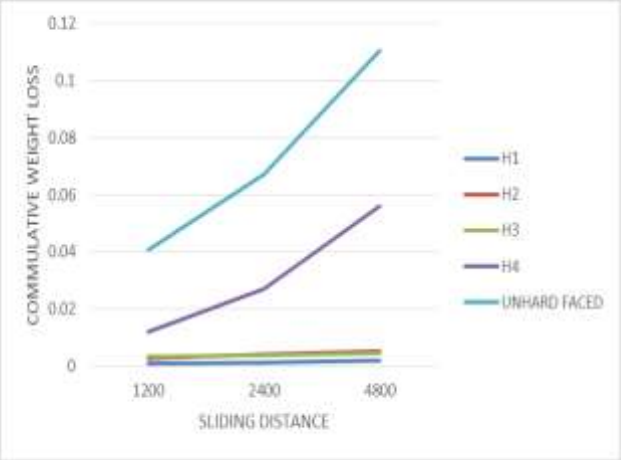

Figure 3.2: Cumulative weight loss at 40N

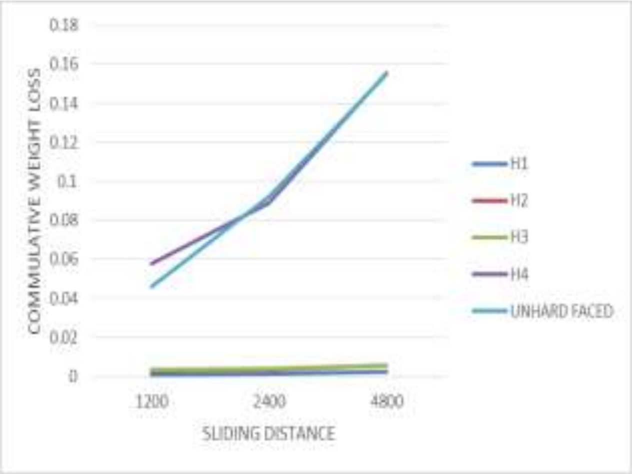

Figure 3.3: Cumulative weight loss at 50N

The following figures show the comparison between the hardfaced and un- hardfaced material in the graphical representation at 30N, 40N and 50N load. The graphs are plotted between cumulative weight loss and the sliding distance on the disk i.e. 1m/s. the vertical line shows the cumulative weight loss and horizontal line shows the sliding distance. All the hardfaced and un-hardfaced graphs plotted collectively at different loads for comparison**.**

As shown from the graphs, all the hardfaced as well as un-hardfaced samples have undergone increasing wear w.r.t. increase the load acting. The variation in the weigh losses with respect to increase in load has been plotted for the comparison of wear rate among the hardfaced as well as un-hardfaced samples. The overall order of increasing wear rates of hardfacing alloys deposited on EN-42J are given as below: H-1 < H-2 < H-3 < H-4 < Un-hardfaced.

The results shows that the H-4 hardfacing alloy cannot provide additional wear resistance for the blade due to the low fracture strength of hardfacing, causing continuous wear of the hardfacing on the leading edge. It shows only 1.31 times superiority over the un-hardfaced teeth as tabulated in Table 5.6. The H-3 hardfacing alloy shows only marginal increase in wear resistance. It exhibits 2.04 times superior wear resistance than the un-hardfaced blade. The H-1 and H-2 hardfacing alloy, on the other hand, exhibits superior wear resistances, at approximately 15.85 and 7.69 times better performance respectively than the un-hardfaced blade. For the H-1, the wear did not reach the blade metal, and the result shows a very small wear.

CONCLUSION

Based upon experimental results obtained in the present work, the following conclusions have been drawn:

1) H-1, H-2, H-3 and H-4 hardfacing alloys have successfully been deposited on EN-42Jsubstrate using MMAW process.
2) The specimen's hardfaced with H-1, H-2, H-3 and H-4 alloy on steelEN-42J showed significantly lower cumulative weight loss as compared to uncoated EN-42J substrate.
3) Cumulative weight loss for hardfaced and un-hardfaced (EN-42J) specimens increases with increase in load.
4) The cumulative weight loss for H-1 hardfacing alloy was observed to be minimum.
5) The wear resistances for EN-42J, hardfaced with H-1, H-2, H-3 and H-4 alloys followed a general trend as given below:H-1>H-2>H-3>H-4>EN-42J
6) The H-1 hardfacing alloy and substrate combination has shown minimum cumulative weight loss among all the four combinations. The wear resistance for hardfacing-substrate combinations in their decreasing order (at 30N, 40N & 50N) is H-1–EN-42J>H-2-EN-42J>H-3-EN-42J>H-4-EN-42J
7) It is observed that the life of teeth hardfaced with H1alloy is enhanced approximately by 15 times as compared to un-hardfaced teeth.

FUTURE WORK

1. Some other surfacing technique may also be evaluated to enhance the service life of the rotavator blades.
2. The effect of other alloying elements on microstructure and wear properties of hardfacing alloys for specific application may be studied.
3. Life of rotavator blades can be enhanced by optimizing the chromium and carbon percentage in the hardfacing alloy.
4. Some other hardfacing alloys with different compositions should be formulated and evaluated for wear behavior

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Functionality Based Software Packaging using Cuckoo Search

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Abstract— Modularity is an approach that subdivides a system into smaller parts that can be independently created and then used in different systems. Moreover modularity allows to dealing with changing customer demands, so modularity helps the developer for reusability of packages. There have been some attempts at automatic partitioning of the object-oriented classes into modules (i.e., packages) based on functionality. However, all these attempts are based on source code, they occur late in the development process at the implementation stage, which may need more efforts and cost. Moreover software packaging from survey we understand that values are based on cohesion and coupling at coding phase. Heuristic technique such as genetic algorithm is used to find an optimal package we observed that partitioning cohesion and coupling metric alone is not enough for quality packaging, at coding phase of software development life cycle. So as a solution, extracting a class from sequence diagram is very difficult .So in proposed work software packaging based on source code and also functionality based software packaging. In the proposed system we intend to use cohesion, coupling and overall packaging metric to improve quality of software packaging. In order to find the optimal package we use search based optimization technique such as cuckoo search algorithm.

Keywords— Heuristic algorithm, Source code, Functionality Based Partitioning, Cuckoo search algorithm, quality packaging, metrics, sequence diagram

INTRODUCTION

Modularity is an approach that subdivides a system into smaller parts that can be independently created and then used in different systems. Moreover, modularity allows to dealing with changing customer demands, so modularity helps the developer for reusability of packages. Thus, we propose functionality based software packaging at design phase. In the proposed system, we intend to use cohesion, coupling and overall packaging metric to improve quality of software packaging. In order to find the optimal package we use search based optimization technique such as cuckoo search algorithm.

For the software packaging either sequence diagram or source code can be used the proposed work, aims to use the source code as input and then classes are identified and they grouped using clustering techniques for which k means algorithm is used. It will select k clusters randomly as initial clustering centers and calculate the distance between each classes and initial clustering centers if any changes in the values means it will automatically updates the clustering centers otherwise the process will be stop. Cohesion and overall packaging metric values should be high .coupling values should be low based on these criteria classes will be packaging. Finally searching algorithm is applied to find a best optimal solution. Cuckoo search algorithm is used as a searching technique select random population of n host obtain cuckoo randomly by levy flight behavior select a nest among randomly from host nest. If fitness value is less than old solution, means replace with new solution. Finally, the output will be related classes.

RELATED WORK

Hani Abden, RMof(2011)[1]Modularization Metrics: Assessing package Organization in Legacy Large Object-Oriented Software. proposed cohesion and coupling metrics for problem accessing modularization for not API based object oriented software system .It should not valid for real large software system and validate their utility with independent metrics

Abdeen, H. Ducasse, S., Sahraouiy, H., & Allou(2009)Automatic Package Coupling and Cycle Minimization[2] developed Search based technique-Simulated Annealing for Optimizing existing modularizations by reducing the connectivity particularly the cyclic connectivity among packages some of the limitations, does not support indirect cyclic dependencies among packages Large application are usually complex Classes usually are not well distributed over packages

D.Doval, S.Manocrodis, B.S.Mitchell(2010)Automatic clustering of software system using genetic algorithm[3] to find good partition of a given software system using genetic algorithm. But It does not provide a mechanism to integrate a designer knowledge of the system.

Alkhalid, A.,Alshayeb, M., & Mahmoud,S(2011)Software refactoring at the package level using clustering technique [4] Clustering technique as a method to help software designers in refactoring activities in order to balance between software intra-package cohesion and inter package coupling Clustering algorithm to reduce the amount of computational in addition SLINK, CLINK and WPGMA AKNN compare its performance and computational complexity with those techniques. A-KNN algorithm initially considers each entity as a cluster; each entity is labeled with a unique identifier representing the cluster identity. But internal complexity is very difficult to maintain

Shouki, A. Ebad,Moartaz A.Ahmed(2015)[5]functionality software packaging using sequence diagram genetic algorithm is used to find an optimal package using cohesion , coupling and overall packaging metric to find a quality package .

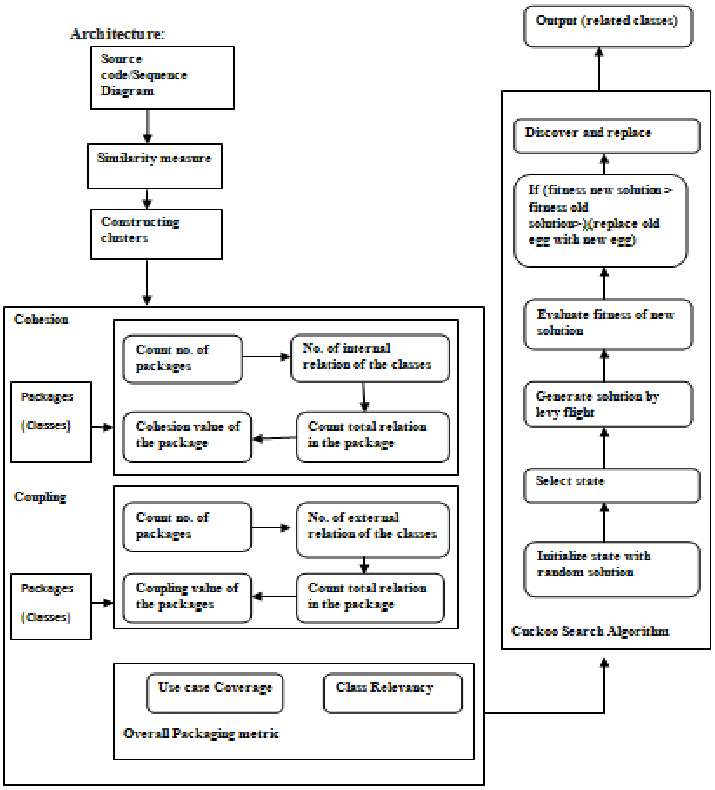
Lionel C. Briand, Senior Member, IEEE, Yvan Labiche, Member, IEEE, and Johanne Leduc(2006)[6] Toward the Reverse Engineering of UML Sequence Diagrams for Distributed Java Software work is the way we specified our reverse-engineering process by using meta models (as UML class diagrams) andtransformation rules (as constraints in the Object Constraint Language).

Debasish Kundu1, Debasis Samanta1, Rajib Mall2(2012)Automatic code generation from unified modeling language sequence diagrams[7] was an approach to generate the code within class methods from UML 2.x SDs. For this, we have built a novel graph model called SIG. In contrast to the conventional graph model (i.e. control flow graph), the SIG subsumes control flow graph and additionally contains method scope information of the interactions. The explicit method scope information present in our graph model helps to identify different class methods for which the code is to be generated.

Chiricota, Y., Jourdan, F., & Melancon, G. (2003)[9] Software components capture using graph clustering. We have presented a simple, fast computing and easy to implement method aiming at the capture of software components from a logical and physical point of view. Our method exploits a metric based clustering of graphs.

PROPOSED FRAMEWORK

Proposed system architecture consists of three modules such collecting a data set as source code or sequence diagram .Clustering technique is used for similarity measure. Cohesion, coupling and overall packaging metric is used for calculating quality packaging. Cuckoo searching algorithm is used to find an optimal solution.



MODULES

Clustering Technique:

K-means algorithm is used for clustering technique input for k-means is number of classes for clustering .Select k- classes randomly as initial clustering centers. Calculate the distance between each classes with initial clustering centers. If any changes in centers then update the clustering centers there is no changes means the process will get stoped.like that we have calculate distance for all classes until the classes package.

***K-means* clustering** is a method of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. *K-means* clustering aims to partition *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean, serving as prototype of the clusters.

Steps for K-means Algorithm:

- Randomly select *'c'* cluster centers.
- Calculate the distance between each data point and cluster centres.
- Assign the data point to the cluster center whose distance from the cluster centre is minimum of all the cluster centers.

Metric Calculation

Cohesion metric

Cohesion measures the degree of interaction and relationships among modules, such as classes, methods, attributes, and packages within classes.

Collecting the data set as a source code group the classes based on functionality.

1. Cohesion metric
2. Coupling metric

Cohesion metrics is used to find the average number of packages in internal dependency per class and it measure the connectivity of central classes of a given package.

$$\boldsymbol{CohesionQ(p) = \frac{|PInt.D|}{|PD|}}$$

Where,

PInt = no of internal dependencies within classes
PD = no of dependencies of classes

Coupling metric:
Efferent coupling (Ce): Coupling metrics provide coupling degree of the package.
Afferent Coupling (Ca): It provide degree package between client packages.

$$\mathbf{CoupligQ(p) = 1 - \frac{|PPro.P \cup PClt.P|}{|PD|}}$$

Where,

PPro = no of provider packages
PClt = no of client packages
PD = no of dependencies of classes

Overall Packaging Metric:

Use Case Coverage

The least number of packages offers use case. Preferably only one package. We divide the interactions into two type's direct and indirect interactions. The indirect interaction relation is the transitive closure of the direct interaction relation.

$$Ij(Pi) = WD * D + Wt * \frac{T}{wd} Td + wt * TT$$

WD and WT are the weights for the direct and indirect interactions

Class Relevancy:

Class relevancy is a combination of class functionality (CF) and class utilization (Util).CF is the extension of the method similarity principle at the class level. Class utilization measures the ratio of class method and interacts with other classes .

$$CF(C1, C2) = \frac{|UC1 \cap UC2|}{UC1} \cup UC2$$

Overall packaging quality calculated by packaging quality and average packaging quality.

Overall packaging = average (packaging quality (pj)

It is used to maximize the packaging effort to find optimal solution

Algorithm used:

- ✓ **Cuckoo Search Algorithm:** Cuckoo search algorithm is used to find new and potentially better optimal solution**.**
- ✓ It will search randomly high quality of solution will carry over to next generation

EVALUATION METRICS

To compare existing and proposed system using some metrics for software packaging they are as follows.

1. Function oriented metrics

Function Oriented Metrics:

Function-oriented software metrics use a measure of the functionality delivered by the application as a normalization value. Since 'functionality' cannot be measured directly, it must be derived indirectly using other direct measures. Function-oriented metrics measure called the function point. Function points are derived using an empirical relationship based on countable (direct) measures of software's information domain and assessments of software complexity.

FP= raw FP*[0.65+0.01*CAV]

Number of user inputs. Each user input that provides distinct application oriented data to the software is counted. Inputs should be distinguished from inquiries, which are counted separately.

Number of user outputs. Each user output that provides application oriented information to the user is counted. In this context output refers to reports, screens, error messages, etc. Individual data items within a report are not counted separately.

Number of user inquiries. An inquiry is defined as an on-line input that results in the generation of some immediate software response in the form of an on-line output. Each distinct inquiry is counted.

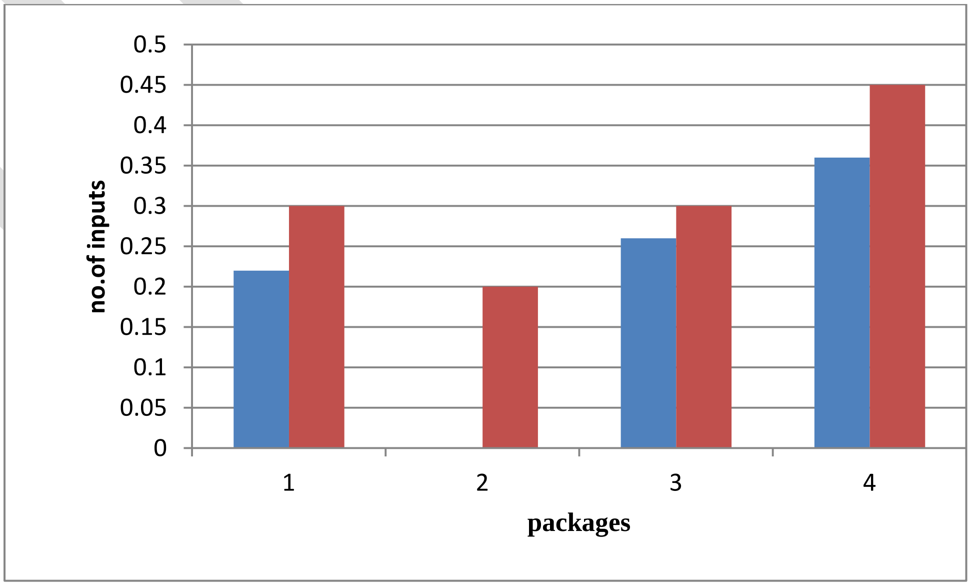
Number of files. Each logical master file (i.e., a logical grouping of data that may be one part of a large database or a separate file) is counted.

Number of external interfaces. All machine readable interfaces (e.g., data files on storage media) that are used to transmit information to another system are counted.

RESULT AND ANALYSIS

The experiments are conducted to compare both existing and proposed system result using evaluation metrics.In this, evaluation metrics has been taken as packaging quality will be analyze by some metrics here iam going to funtion point .Below table5.1 is mentioned for comparision work.

EXISTING SYSTEM		**PROPOSED SYSTEM**	
Technique Used	**No.of inputs**	**Technique Used**	**No.of inputs**
Genetic Alogirthm	0.62	**Cuckoo Search Algorithm**	0.70
	0.56		0.63
	0.63		0.66
	0.76		0.77



CONCLUSION

In our work it will be functionality based software packaging in design phase. It will provide effective modularization compared to previous method. Cuckoo Search Algorithm will be used to search for optimized solution. In future work it will be package using some other packaging metric to improve packaging quality and also to extract classes from some other clustering technique and also apply some other variation of heuristic technique for searching algorithm and also it will be used real world open source system.

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Real Time Gesture to Audio Conversion using FPGA Based System

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Abstract— Audio generation based on the real time video analysis is always been challenging and increasingly important task for embedded system design domain. Though it is the most effective way of communication, has still leftover many challenges. Dumb person make use of this system to communicate and express their opinions to the society. The intended system generates audio clip automatically with the help gestures captured in the image form from the CMOS camera module. The audio generation is carried out via three staged process: Image capture, Image comparison and audio generation. The realm of this paper is to portray the stage wise mechanism of audio generation and describing of various other features provided by this system.

Keywords— Audio Generation, Image Capture, Image Comparison, CMOS camera module, FPGA.

I.INTRODUCTION

Audio generation based on the real time video analysis is always been challenging and increasingly important task for embedded system design domain. Recently there has been a great deal of interest in the field of FPGA. Advances in field programmable gate array (FPGA) have resulted in the functionality of FPGA.For the video processing, various different technologies have been used. The software implementation of most of these technologies could not achieve the frame rate required for real time processing of video data. But FPGA provides the sufficient frame rate for the real time video processing. Hence this project uses the FPGA as a platform for the processing of real time gestures.

Main aim of this project is to design & construct an interface between the CMOS camera module i.e. OV7670 and speakers by using FPGA. In this project, we will convert the real time gesture into the audio clip by using CMOS camera module i.e. OV7670 and FPGA kit.

The design of the real time gesture to audio conversion system can be divided into 4 modules namely camera, image processing, camera control, audio generation through speaker. The hardware block diagram is shown in the Fig 2. In the hardware implementation CMOS camera module i.e. OV7670 is interfaced with the Zync Evaluation and Development Board. i.e. Zed Board using various protocols such as SCCB protocol, I^2C protocol to provide the fast image acquisition from the real time video. The camera is switched to the camera capture mode in order to capture images continuously. These picture images are stored into the inbuilt memory of the FPGA board. At the same time the captured images are subjected to analog as well as digital processing so as to obtain better resolution.A database is created as per the required application and is stored into inbuilt FPGA memory. Large no. of reference images are stored in the database. An audio clip is assigned to every image in the database.

The captured image from the camera is also stored into inbuilt memory of FPGA. This captured image is then compared with the reference image in the database. If both the images are identical then the audio assigned to the reference image is fed to speakers and this audio clip is generated by speakers.

II. IMPLEMENTATION OF SYSTEM

The diagram shows the design and construction of an interface between the CMOS camera module, FPGA, speakers. The input image is stored into the on board memory of FPGA kit.

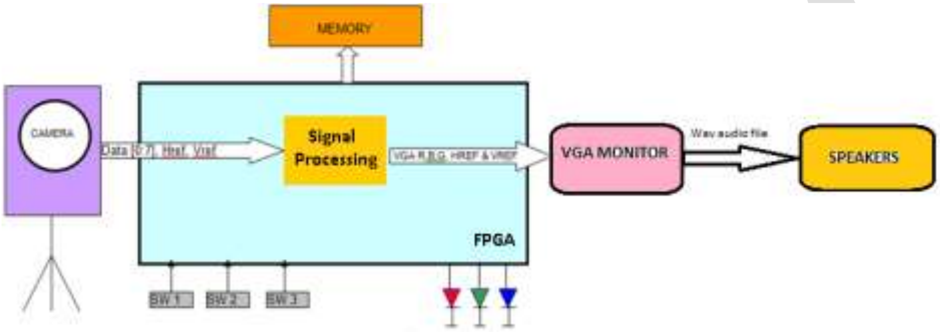


Fig. 2 System Block Diagram

The information flows in two ways: on one hand there are commands from the FPGA to the camera to change different characteristics of it, on the other hands images from the camera is processed and sent to the speakers.

A.CAMERA INTERFACING

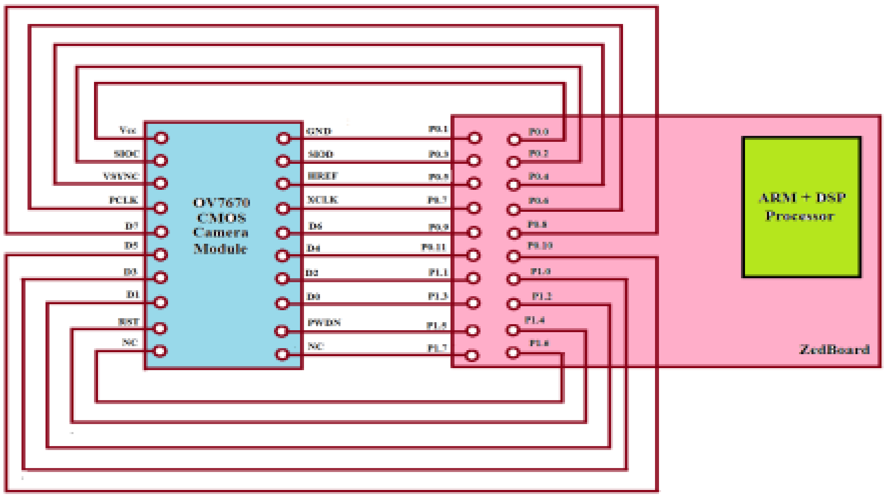


Fig. 4 Camera Interfacing

In this section we describe about the camera interfacing with the Zed Board which consisted the camera capture mode which helps to capture a gesture from real time video. We have used 2 ports of the Zed Board for camera interfacing. The interfacing diagram is shown in Fig. 4. We have used the port J_A and port J_B for this purpose. OV7670 has 20 pins, out of which first 12 pins are J_A and remaining 8 pins are assigned to J_B port. Fig. 5 shows how images are transmitted from CMOS camera module to the FPGA.

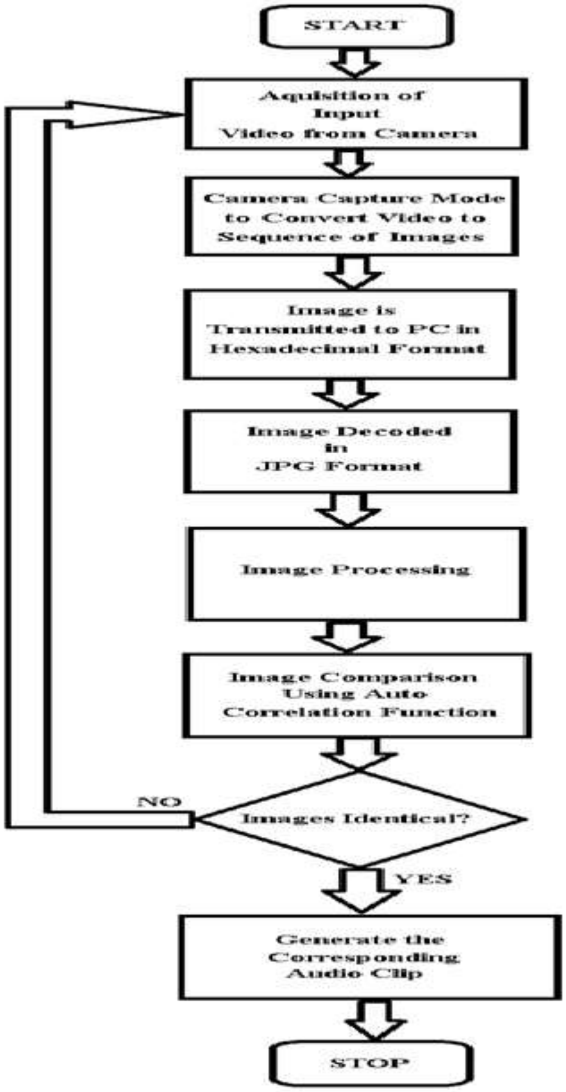


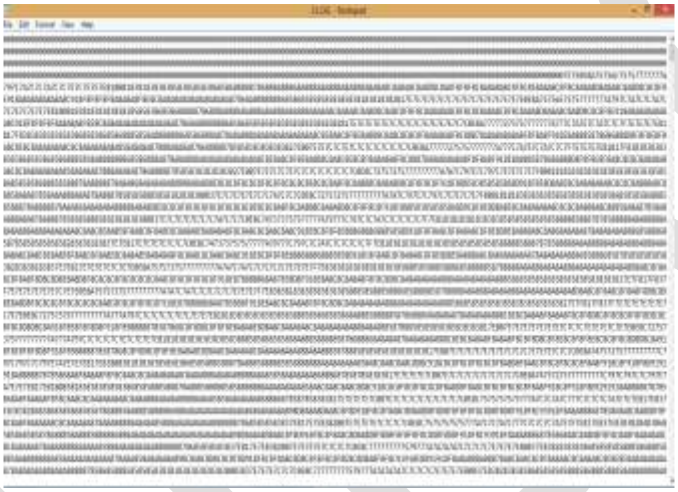
Fig. 3 System Flowchart

III. IMAGE PROCESSING

The image is received from camera on the Hyperterminal through serial communication using universal asynchronus reciever transmiter.It is in the hexadecimal format.The orignal image is reconstructed in MATLAB by decoding the log file.The decoded image is mirror image and is roatated by 270 degrees with respect to orignal one.So after decoding the mirroring and rotation of image is also carried out in MATLAB and the orignal image is extracted in MATLAB. The comparision of the extracted image and the stored image is carried out .If both the images are identical then the audio file corresponding to that gesture is generated through speakers.

IV. RESULTS:

1. **Received log file:** The image captured by camera is obtained on serial terminal of PC. The received log file is in the hexadecimal format.Each of the two nibbles corresponds to one byte of information. “00” represents the pure black level while “FF” represents the pure white level.



2. **Reconstruct image by decoding log file:** The decoding of the log file is done in MATLAB to reconstruct the orignal image shown. But this reconstructed image is the mirror image of the orignal one with rotation of -270 degrees

.

3. **270 degree rotation of decoded image:**

4. **Output of Mirroring using Matlab:** After rotating the image by 270 degrees , the mirror image of the image shown in fig.6 is taken .The algorithm for the same is built in MATLAB.

5. **Stored image:** The stored image is located in the memory of PC. It is read using MATLAB functions so as to compared with the capture image. When both the images are identical then the audio file with '.wav' extension is played through speakers.The MATLAB doer not support the .mp3 file format, hence .wav file format is used.

CONCLUSION

The end user is now moving towards a whole new path of human machine interaction. This is creating a demand for enabling gesture recognition in every facet of market. The proposed technique is simple, efficient and faster . This system has achieved its aim of fullfilling societal need by providing the assistance to the physically impaired people to express their opinion in front of the world.

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Determination of Groundwater Flow Pattern in Jombang Regency, East Java, Indonesia

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Abstract— Groundwater is a natural resource which moves following the hydrological cycle and its existence is hidden below the soil surface. In order to be beneficially used, the flow pattern of groundwater potential is an important aspect. Determination of groundwater flow patterns can be done by modeling. The objective of this study was to determinate the groundwater flow pattern in the study area. Modeling of groundwater flow pattern in the study area was based on the data of 70 wells scattered in Jombang regency, with variations in the depth of 50–127 m BGL on confined aquifer. Groundwater flow modeling was done using a computer program package Visual MODFLOW 2011.1 (demo version/a trial lisence). The output of the model was the groundwater flow pattern in the study area, has been calibrated by comparison of the ground water level measured by the groundwater level depiction of the model results based on criteria: correlation coefficient = 0.989, root mean square error = 2.97 m, and mean absolute percentage error = 4.75%. Groundwater flow pattern in the study area flows from areas with high topography in the Southeast section of the study area leading to an area with lower topography that is to the Northwest and to the North which is ended in the Brantas River as a natural hydrological boundaries of the study area.

Keywords— Flow pattern, groundwater, Jombang regency, modeling.

INTRODUCTION

Jombang regency, East Java province of Indonesia is one of the areas where the potential for groundwater has been developed for irrigation purposes [11]. The groundwater is a natural resource which moves following the hydrological cycle and its existence was hidden below the soil surface. The existence and potential of groundwater are important to determine in order to use its potential for irrigation. One important aspect of the existence and potential of groundwater is the flow pattern.

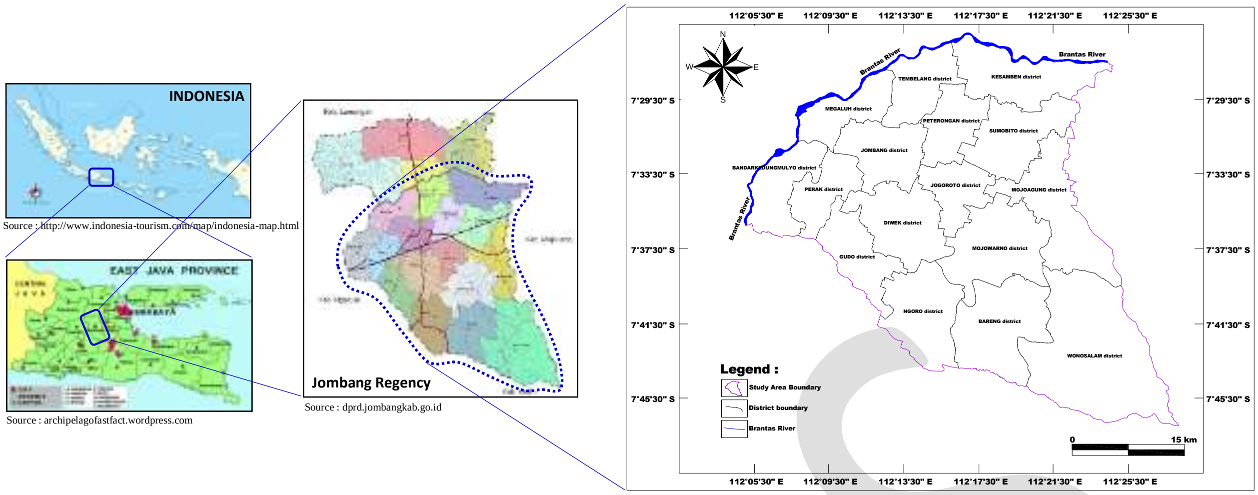
In effect of existence of groundwater is hidden under the ground surface, flow pattern is very difficult to trace when using a system analysis approach. Related to aspects of the presence of groundwater, the determination of groundwater flow pattern can be done in a way to model it. Several researchers used modeling techniques to analyze the flow of groundwater such as Amah and Agbebia [1], Jafar et al. [2], Kaviyarasan et al. [3], Okengwu and Nyenke [6], Oseji [7], Oseji and Ofomola [8], Tirtomohardjo and Setiawan [12], Waheedullah et al. [13], and Waspodo [14].

Generally, these studies basically showed the same results, that groundwater flows areas with high topography leads to the area with low topography. The difference from those studies is that the groundwater flow pattern in each study area are affected by the condition of the geomorphology of each study area.

The objective of this study was to determine the groundwater flow pattern in Jombang regency, East Java, Indonesia. The benefits expected from this study were to find out wheter the groundwater flow pattern is able to use as a source of irrigation water in the study area and it can be used as a guide in the management of groundwater in the future.

DESCRIPTION OF THE STUDY AREA

The study area falls in Jombang regency, East Java Province, Indonesia. The study area is located between latitudes of 7˚26'3.84" – 7˚46'58.08" S and longitudes of 112˚05'4.92" – 112˚28'11.28" E. The total region of the study area covers 803.06 km^2 and consists of 16 districts in Jombang regency. Map of the study area is given in Figure 1.



Source : http://www.indonesia-tourism.com/map/indonesia-map.html

Source : archipelagofastfact.wordpress.com

Source : dprd.jombangkab.go.id

Fig. 1: Map of the study area

Based on Systematic Geological Map Indonesia Kediri quadrangle (1508-3) and Mojokerto quadrangle (1508-6) [5, 10], the rock formations in the study area is dominated by young Anjasmara volcanics, laharic deposits, and alluvium. Young Anjasmara volcanic formation composed by volcanic breccia, tuff, lava and lahars. Laharic deposits formation composed by volcanic pabble-sand, tuff, clay and plant remains and archeological artefacts. Alluvium formation composed by pabble, gravel, sand, clay, and mud.

Based on Hydrogeological Map of Indonesia sheet X Kediri (Jawa) [9] and according to occurrence of groundwater and productivity of aquifers, the study area is devided into 6 sections. Those are: (1) extensive and highly productive aquifers in which flow is intergranular, (2) extensive and productive aquifers in which flow is intergranular, (3) extensive and highly productive aquifers in which flow is both through fissures and interstices, (4) extensive and mederately productive aquifers in which flow is both through fissures and interstices, (5) locally productive aquifers in which flow is both through fissures and interstices, and (6) regions without exploitable groundwater.

MATERIALS AND METHODS

Modeling of groundwater flow pattern in the study area was based on the data of 70 wells scattered in the study area, with variations in depth of 50–127 m BGL on confined aquifer. The information of wells were obtained from the Kegiatan Pendayagunaan Air Tanah BBWS Brantas, Kementerian Pekerjaan Umum dan Perumahan Rakyat. Coordinates of the location of each well latitudes and longitudes) along with the elevation of the land surface is determined directly in the field using GPS Garmin 60.

The following maps were used as the base maps. Digital Topographical Map Indonesia scale 1:25,000 (sheets: 1508-323, 1508-324, 1508-332, 1508-341, 1508-342, 1508-333, 1508-334, 1508-343, 1508-344, 1508-612, 1508-621, and 1508-622) (published by Coordinating Agency of National Surveying and Mapping) were used to delineate the limits of the study area. Systematic Geological Map Indonesia scale 1:100,000 (1508-3 quadrangle and 1508-6 quadrangle) (published by Geological Research and Development Centre) were used to determine the distribution of the rock formations in the study area, and Hydrogeological Map of Indonesia scale 1:250,000 (sheet X) (published by Directorate of Environmental Geology) was used to determine the presence of groundwater potential and regions without exploitable groundwater which describes the area of utilization and groundwater recharge areas.

The groundwater flow model for the study area was developed using Visual MODFLOW 2011.1 (demo version/a trial lisence). The study area was modeled by creating a spatial discretization of an aquifer system with a mesh of blocks called cells, the locations of which are described in terms of rows, columns, and layers [4] which represents the contents of the aquifer unit. Input data provided includes: hydraulic conductivity, pumping wells, dan initial head value. The boundary conditions imposed to simplify the modeling of groundwater flow includes: (1) the groundwater recharge area is located in the Southeast section of the study area is a mountainous region with the initial assumption of groundwater flow toward the Northwest and North where the river is a natural hydraulic boundary, (2) the groundwater movement that occurs due to the height differenandce press, dan (3) no leak in the aquifer system.

Model calibration was calibrated to check the accuracy of the parameters used in the model by comparing the groundwater level modeling results with static groundwater level measured [14] based on data of 70 wells that are used to build the model. The assessment criteria used in the calibration of the model were correlation coefficient (R), root mean square error (RMSE), and mean absolute percentage error (MAPE). Model verification was performed to assess the feasibility of the model that has been built before the model was used in accordance with the purpose of modeling. Verification of the model was done in the same way with the calibration but using data from 10 wells that aren't used to build the model. Application of the model was made to describe the model of groundwater flow pattern in the study area.

RESULTS AND DISCUSSION

The initial step in building the model is to import a map the study area that have been digitized into a computer program package Visual MODFLOW 2011.1 (demo version/a trial lisence). The map of the the study area was discretized into cells in the form of nets square 100 x 100 along the direction of the row and column directions in which each cell has a square area of 400 m x 400 m. The number of layers along the vertical direction of the ground surface to the bottom following the number of layers of rock in the study area. The map of the study area that has been digitized and discretized shown in Figure 2.

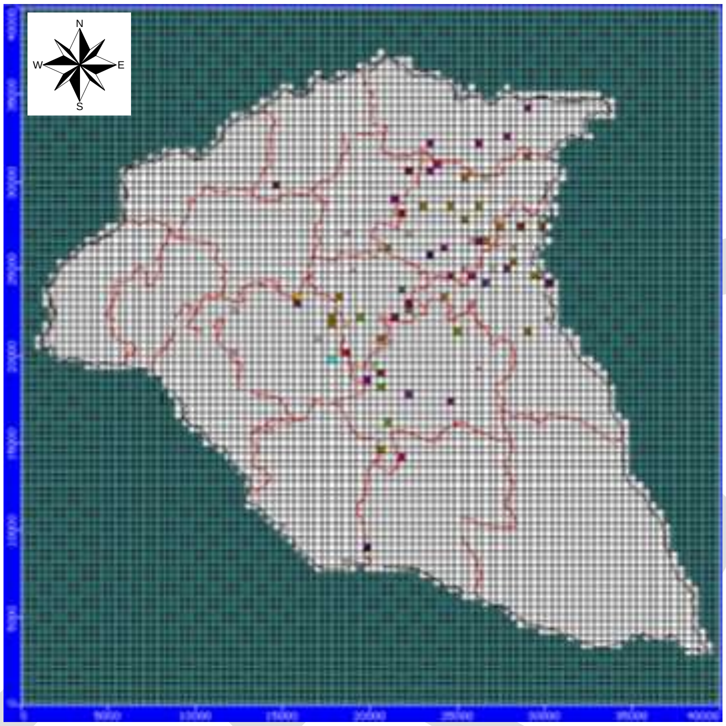


Fig. 2: A spatial discretization in the study area

After the process of data input and parameterization models reconstruction is then performed a study area in the form of a model three-dimensional (3-D). Reconstruction of the study area in the form of 3-D models performed as visual control of input data and parameters measured were modeled so that the model can be built closer to the real situation in the field. Based on the reconstruction as shown in Figure 3, it can be seen visually that the models built closely depicted the conditions in the field. Southeast section of the study area is the highland/mountainous assumed as a groundwater recharge area is located in the Wonosalam district and shape of the earth's surface relief sloping towards the Northwest and North to the boundary of the natural hydrological known as the Brantas River.

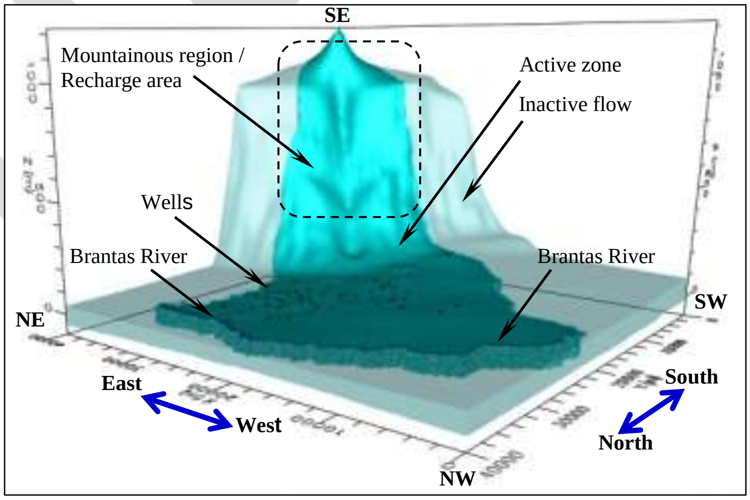


Fig. 3: 3-D model view of the study area

The output of the model shown is the pattern of groundwater flow. Level of reliability of models built was shown in the process of calibration and verification of the model. Calibration and verification of the model was done by comparing the groundwater level resulted from the model built with measured groundwater level. Measured groundwater level was determined based on the land surface elevation measured directly in the field using a GPS was reduced by the depth of the static groundwater level.

The results of model calibration showed the correlation coefficient between the groundwater level depiction of the model results with measured groundwater level (R) = 0.989, RMSE = 2.97 m, and MAPE = 4.75%. Verification of the model built showed the value of R = 0.977, RMSE = 3.26 m, and MAPE = 5.62%. The results of modeling of groundwater flow pattern in the study area is shown in Figure 4.

Noting the results of the reliability analysis of the model both at the stage of calibration and verification of the benchmark realibilty, then the constructed model to describe the groundwater flow pattern in the study area was considered having good reliability. In general, the groundwater flow pattern in the study area flows from areas with high topography (mountains) to areas with low topography (plains) and consistent with the results of previous studies. The groundwater flow pattern is controlled by geomorphological factors [1] and follow the topography [3].

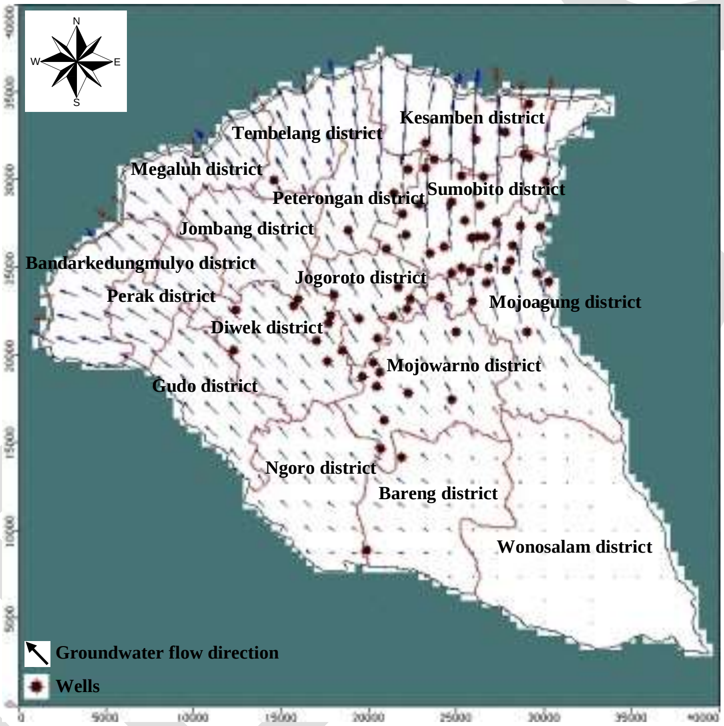


Fig. 4: The groundwater flow pattern model in the study area

Specifically in the area of study, groundwater flow pattern flows from the Southeast section of the study area (Wonosalam district) as a groundwater recharge area to the Northwest to the Bareng district, Mojowarno district, and Mojoagung district. From the Bareng district groundwater flow direction heading to the Northwest to the Ngoro district and Mojowarno district, continues to Gudo district and Diwek district, continues to Perak district and Jombang district, and then the flow directs towards Bandarkedungmulyo district and Megaluh district. Groundwater flow direction from Mojowarno district headed to the Northwest and to the North. From Mojowarno district, the groundwater flow leads to Northwestern pass Jogoroto district, then headed to the Jombang district and Peterongan district, and continues to the Megaluh district and Tembelang district. For groundwater flow is towards the North, from Mojowarno district the direction of flow towards the Western section of the Mojoagung district, next to the Sumobito district, Peterongan district, and headed to the Kesamben district. Groundwater flow direction from the Mojoagung district towards the North until in Sumobito district and continues to the Kesamben district. All of the flow direction ended in the Brantas River as a natural hydrological boundaries of the study area.

CONCLUSION

The pattern of groundwater flow in the study area is determined by topography study areas, flows from high topographic (mountains) to areas with low topographic (plains) areas. The groundwater flows from the Southeast section of the study area (Wonosalam district) toward the Northwest and North section of the study area. Both directions of the stream end in the Brantas River as a natural hydrological boundaries of the study area.

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