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Table of Content

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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 sixth Issue of the Third Volume of International Journal of Engineering Research and General Science. A total of 118 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 theGlobal challenges and its innovative solutions. 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,

AssociateEditor-in-Chief, P&REC,

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Calculating Drag Coefficient of Different Submerged Vegetation Densities in Open Channel

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ABSTRACT - In this paper, the effect of submerged vegetation resistance using movable bed surface were studied. Rigid linear cylindrical artificial vegetation of three different densities of 40 stem/m^2, 80 stem/m^2 and 100 stem/m^2 were used. Three discharges of 15 l/s., as a maximum obtained flow, 13 l/s and 8 l/s with three water depths of 14 cm, 16 cm and 18 cm were applied. According to Kleinhans (2008), for submerged vegetation case, the used stem height is 4 cm to give h/k (water depth-stem height ratio less than 5. Water velocities were measured using Acoustic Doppler Velocimeter (ADV) instrument in the centerline of channel along the vegetation zone (8.0 m long). The vegetation drag coefficient as the major flow resistance was computed. Comparative study was done in this research between Huthoff (2007) model and the obtained experimental results. Klopstra et al. (1997) model was used to compute the average water depth velocity. Baptist et al. (2006) approach was modified to give an empirical equation using the experimental data that gives an agreement with Huthoff (2007) model. Then, the apparent drag (CD) was computed using Huthoff (2007) model and compared with the obtained drag from the deduced empirical equation from the experimental work.

Key words: Flow resistance, Submerged vegetation, Drag coefficient, Water velocity.

1. INTRODUCTION

For simulation of ecological functions through rivers and flood management; it's important to predict the flow resistance caused by the presence of vegetation. The presence of vegetation causes many affects such as decreasing the velocity of water and consequently the corresponding bed shear stress, then the quantity of sediment transport could be decreased. In general, vegetation resistance decreases the local scour as increasing the global hydraulic roughness (Tsujimoto and Kitamura, 1990 and Bennett et al., 2008 and Galema, 2009).

According to Kleinhans (2008), there were three known categories for vegetation according to its height; first, if h>>> 5k, where, the depth of water h and the height of vegetation k, this type called well submerged vegetation. In this case, the vegetation height does not affect clearly the upper part of water velocity (surface velocity). So, Manning equation could be used to express the vegetation part as rough surface (Augustijn et al., 2008).

Second, submerged vegetation case, if k<h<5k. In this case, the water velocity column could be separated into two zones, the upper water zone (free flow) and the lower vegetation zone. The water velocity through the vegetation zone was uniform and a transition profile was found between near the top of vegetation depth and the surface water (free upper water zone).

The third category, If - h<k, emerged vegetation case. In this case, the water depth was covered by vegetation. The velocity profile in this case seems to be uniform and the roughness of bed could be neglected. The second category was studied in this research experimentally (Baptist et al., 2006).

The effect of vegetation resistance on the flow conditions was described by several approaches. For emerged vegetation case, there were three important approaches used for describing it. The deduced equation given by Petryk and Bosmaijan (1975) was considered the most important one. Also, new approaches such as Stone and Shen (2002) and Hoffmann (2004) models were developed to describe the emerged case.

For submerged vegetation category, most models and approaches based on the theory of two layers, distinguished between the velocity profile through the vegetation part and through the upper free water zone. These approaches described the water velocity through the upper part by a logarithmic profile except the description of Stone and Shen (2002).

Results of 173 runs obtained from five different authors by Galema (2009) used to evaluate the different vegetation approaches to find the suitable model that could be applied to describe the vegetation resistance.

A comprehensive study by Vargas-Luna et al. (2016) was done to evaluate the effect of vegetation on the rate of sediment transport. Also, they introduced a comparative study between many descriptors and models by calculating the vegetation drag.

2. DESCRIPTION OF RESISTANCE EQUATIONS

Several approaches are presented to describe the resistance of vegetation zone.

2.1 Roughness Equations

There were different equations had been used to describe the roughness of any channel. Also, these equations could be used for modeling the vegetation zone resistance.

2.1.1. For constant roughness

Chezy (1769): In this approach, the bottom and side walls roughness for uniform flow (Chow, 1959) could be described as:

$$U = C\sqrt{R\ i}$$ where, U = flow velocity, R = hydraulic radius and i= slope of channel.   (1)

Darcy-Weisbach (1845): The derived equation of Julius Weisbach in 1945 accompanied with the derived formula of Henry Darcy in 1858 gave the Darcy- Weisbach equation

$$U = \sqrt{\frac{8g}{f}}\sqrt{R\ i}$$ (2)

where, g = gravitational acceleration, f= Weisbach roughness coefficient (from Moody diagram). Effect of inlets, elbows and other fittings (shape drag) were not represented in this approach (Brown, 2002).

Manning (1889): Manning developed formula used to describe the roughness based on experimental data verified by 1170 observations (chow, 1959).

$$U = \frac{1}{n}\ R^{\frac{2}{3}}\sqrt{i}$$ where, n = Manning's coefficient.   (3)

Strickler (1923) derived an equation reflects the size of irregularities and roughness height.

$$n = 0.04\ k_s^{\frac{1}{6}}$$ In which, k_s = Strickler roughness height (chow, 1959).   (4)

For wide channels, it is assumed R= h, then equations (1), (2) and (3) could be expressed as:

$$\frac{U}{\sqrt{h\ i}} = C = \sqrt{\frac{8g}{f}} = \frac{1}{n}R^{\frac{1}{6}}$$ (5)

2.1.2. For roughness affected by flow characteristics

Strickler (1923): the final deduced model could be described as:

$$C = 25\left[\frac{R}{k_s}\right]^{\frac{1}{6}}$$ (6)

Keulegan (1938): gave an equation associated with the effect of irregularities on the channel as:

$$C = 18^{10}\ \log\left(\frac{12R}{k_N}\right)$$ (7)

where, k_N = Nikuradse sand grain roughness and reflects the size of irregularities on the channel bed (Brown, 2002).

Manning's coefficient used in software

De Bos and Bijkerk (1963) derived and equation of Manning's coefficient depends only on the water depth and neglecting the size of roughness.

$$n = \frac{h^{\frac{1}{3}}}{\gamma}$$
where, $\gamma = 33.79$ for winter and $\gamma = 22.53$ for summer (De Bos and Bijkerk, 1963).

(8)

2.2 Submerged Vegetation Approaches

The most important approaches for submerged vegetation could be listed as:

Final deduced equation given by Borovkov and Yurchuk (1994) as:

$$U = \sqrt{\frac{8g\,h\,i}{f}}$$
(9)

In which, = Darcy - Weisbach's friction factor. They computed this factor as:

$$\frac{1}{\sqrt{f}} = K \left(\frac{h}{k}\right)^{\sqrt{f}} \sqrt{\frac{s}{k\,d\,CD}}$$
in which, d = diameter of vegetation (stem), CD =Drage coefficient of vegetation, K = Von

Karman constant and k = vegetation height (10)

Borovkov and Yurchuk (1994) presented K = 0.4 is the same as Von Karman constant which is used to describe the profile of velocity in case of turbulent steady and uniform flow.
Klopstra et al. (1997)

In this approach, the mean velocity for the total depth inside and above the vegetation is combined to yield the following equation:

$$U = \frac{k}{h}\,U_v + \frac{h-k}{h}U_s$$
In which, U_s = surface free water velocity of the upper part. (11)

Stone and Shen (2002): it's the most important model used for submerged vegetation case and includes the most effective parameters as:

$$l^* = \frac{k}{h}$$, in which l^* = stem - water depth ratio

The apparent velocity could be given as: $U = \dfrac{U_v}{\sqrt{l^*}}$ (12)

$$U = \sqrt{\frac{2g}{CD\,m\,d}}\,\sqrt{i}\,\left(1 - d\sqrt{m}\right)\sqrt{\left(\frac{h}{k} - \frac{1}{4}\,\pi\,d^2\,m\right)}\,\frac{1}{l^*}$$
(13)

Van Velzen et al. (2003) approach could be described as:

$$U_v = \sqrt{\frac{2g}{CD\,m\,d}}\,\sqrt{i}$$, as the water velocity through the vegetation layer is unaffected by the surface water velocity of the upper

part. He described the upper velocity part as logarithmic equation as:

$$U_s = U_v + 18\sqrt{(h-k)\,i}\,\log\frac{12(h-k)}{k_N}$$
(14)

In which, k_N = roughness height = $1.6k^{0.7}$. Combination of vegetation velocity and surface velocity yields:

$$U = \sqrt{\frac{2g}{CD\,m\,d}}\,\sqrt{i} + 18\,(h-k)^{\frac{3}{2}}\,\frac{\sqrt{i}}{h}\,\log\frac{12(h-k)}{k_N}$$
(15)

Baptist et al. (2006) approach is considered the easier model for application for the submerged vegetation case

$$U_v = \sqrt{\frac{2g}{CD\ m\ d}}\ \sqrt{i}\ \sqrt{\frac{h}{k}} \qquad (16)$$

Baptist et al. (2006) did a simulation of wide variety of cylinders and water flow depths, 990 model results from simulation to find the equation of mean velocity as:

$$U = \left(\sqrt{\frac{2g}{CD\ m\ d\ k}} + \frac{\sqrt{g}}{k}\ \ln\left(\frac{h}{k}\right)\right)\sqrt{hi}$$

$$(17)$$

Huthoff (2007) model: he derived an analytical equation for water velocity through and above the vegetation zone.

$$U_s = \sqrt{\frac{2\ g\ i}{CD\ m\ d}}\ \left(\frac{h-k}{s}\right)^{\frac{2}{3}} \text{with,} \ s = \frac{1}{\sqrt{m}} - d$$

$$(18)$$

$$U = \sqrt{\frac{2gi}{CD\ m\ d}}\ \left(\sqrt{\frac{k}{h}} + \frac{h-k}{h}\ \left(\frac{h-k}{s}\right)^{\frac{2}{3}}\right)$$

$$(19)$$

3. EXPERIMENTAL WORK

All experimental runs were exerted in a rectangular flume with a mild slope. The channel dimensions are 40cm× 40cm ×1200 cm long, with 200 m long Perspex sides, **Fig. (1).** This work was done in irrigation and hydraulics lab. - Faculty of engineering - El-Mansoura University.

Fig. (1): The selected apparatus

A wooden sheet with 8.0 m long and 0.40 m width, this sheet used for fixing the cylindrical stems. A coarse sand sample was put in the flume bed with 2 cm height, $d_{50} = 0.620$ mm, used for the whole length of channel. A cylindrical plastic stem of 1.0 cm (d) diameter with lengths (k) of 4.0 cm was used. The used number of stems was 128 for $m_1 = 40$ stem/m^2, 256 stems for $m_2 = 80$ stem/m^2 and 320 stems for $m_3 = 100$ stem/m^2, **Fig. (2)**
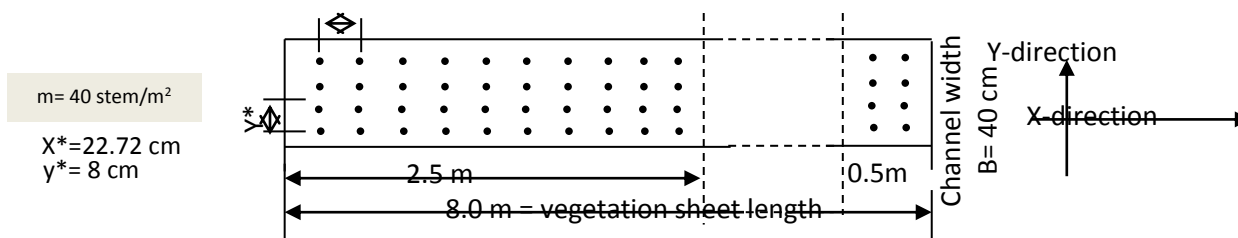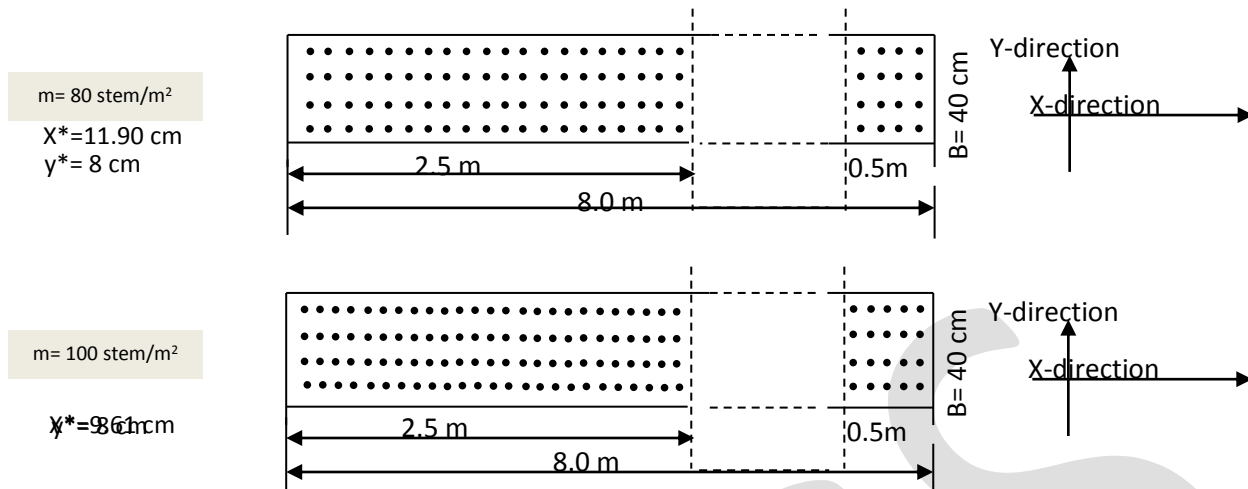
Fig. (2): Plane of the models for the selected different densities.

According to Huthoff (2007) (equation 18) for submerged vegetation; $s_1 = 0.1481$, $s_2 = 0.101$ and $s_3 = 0.09$ for the three stem densities respectively. The channel slope (i) is found to be 0.00053.

Thirty (30) runs were done as; 27 runs for submerged case and 3 runs for the case of no vegetation. Three flow depths of 14 cm, 16 cm and 18 cm were applied for flow rate 15 l/s., as maximum, 13 l/s and 8 l/s.

For each run, the water velocity through the vegetation zone was measured using ADV instrument at four points at the centerline of channel at distances of 1.6m (P_1), 3.2m (P_2), 4.8m (P_3) and 6.4m (P_4) from the inlet of the wooden plate. The average values of water velocities through the vegetation zone (U_v) and though the upper free zones (Us) were measured at the selected four points for each run.

4. RESULTS AND ANALYSIS

In submerged vegetation case, (*k=4 cm & k<h<5k*) , the velocities through the vegetation zone are larger than that in emergent case due to the higher velocities in the upper free part (up to the vegetation part) affects greatly on it and causing shear in the vegetation layer to increase. A two-layer approach could be used for description this case because of the difference in velocity through the two layers, velocity vegetation layer and the upper free layer. In this approach, the velocity inside vegetation zone is separately described from the upper zone part (surface zone). All approaches in this case assumed the velocity distribution through vegetation zone is uniform but the velocity in the surface layer could be described by logarithmic profile.

Using the experimental results, an empirical equation was deduced using SPSS program and dimensionless method by modification equation (17), modified Baptist et al. (2006) approach.

This equation is:

$$U = \left(\sqrt{\frac{2g}{CD\ K}} + \frac{\sqrt{g}}{K}\ \ln\left(\frac{h}{k}\right) \right)\sqrt{0.7\ h\ i} \qquad (R^2=0.85) \qquad (20)$$

where, K = 0.4, Von Karman constant, which is used to describe the profile of velocity in case of turbulent steady and uniform flow. (Borovkov and Yurchuk, 1994)
The average velocity through the vegetation layer (U_v) and through the surface layer (U_s) were measured for each run, then equation (17) of Klopstra et al. (1997) approach is applied to compute the average velocity (U) through the whole depth (the apparent velocity). After that, a comparison between the deduced empirical equation and Huthoff (2007) approach given in equation (19) was done. Huthoff (2007) was chosen because he gives an analytical expression for bulk flow through and over vegetation.

Figures (3) through (5) illustrate the difference between the computed drag by the experimental work and Hothoff (2007) model for the vegetation density of 100 stem /m², 80 stem /m² , 40 stem /m² respectively at flow depths of 18 cm and 14 cm.
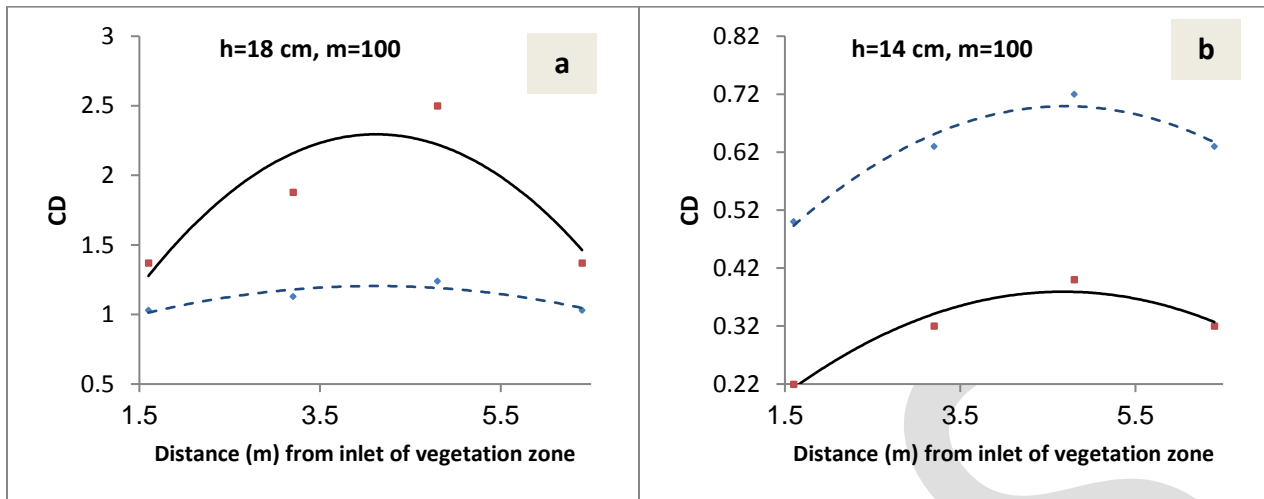
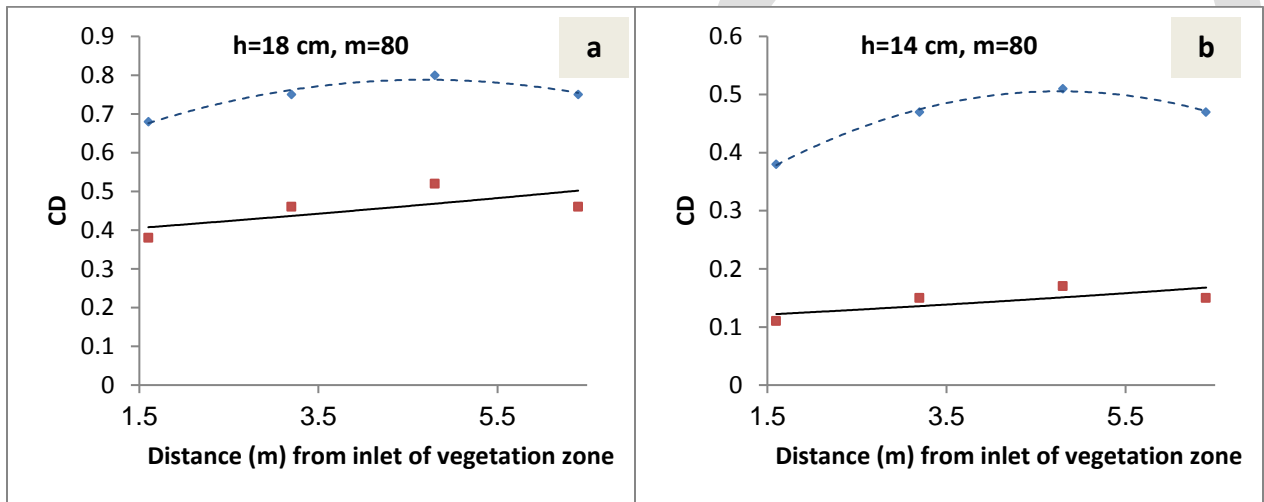**Fig. (3):** Difference between Hothoff (2007) and the experimental work for m=100 stem /m^2

Fig. (4): Difference between Hothoff (2007) and the experimental work for m=80 stem /m^2.
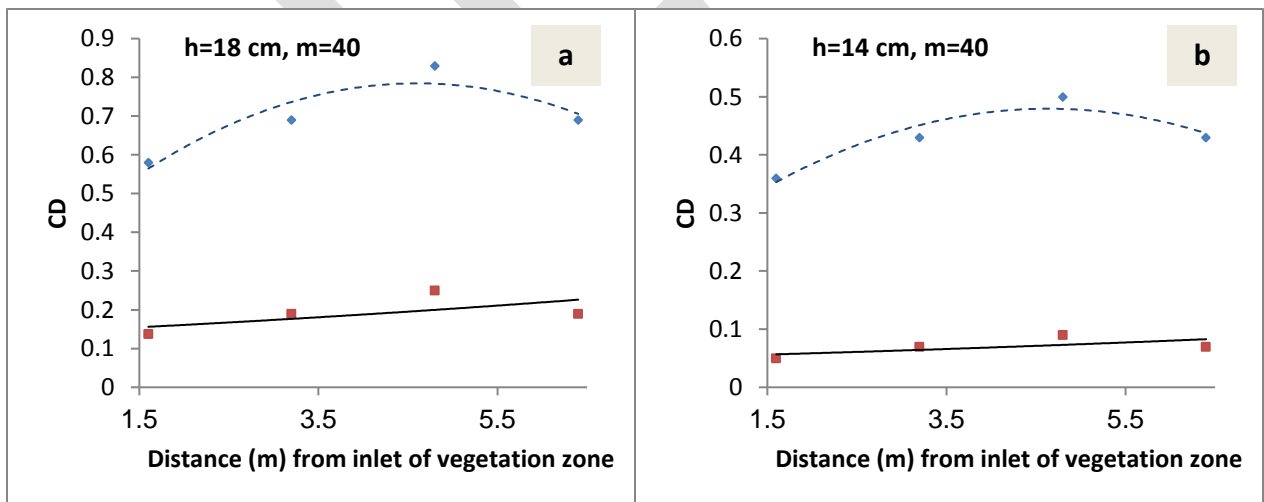

Fig. (5): Difference between Hothoff (2007) and the experimental work for m=40 stem /m^2.

From these figures, it's noticed that, in large water depths, the computed drag values using Hothoff (2007) model were less than the corresponding drag values using the deduced empirical equation from the experimental work because these are more parameters included in Hothoff model and not concluded in the empirical deduced equation.

- Effect of flow depth on drag coefficient

Figures (6a) and (6b) illustrate the effect of flow water depth (h) on the vegetation drag (CD) for m=100 stem /m^2 and 40 stem /m^2. The maximum and minimum vegetation densities were chosen. From these figures, with the increase of water depths (h), drag coefficient values increases, because the corresponding water velocity decreases gradually.

From this figure, it is concluded that, the deduced empirical equation, (equation 20), by modification Baptist et al. (2006) approach gives a very good agreement with Hothoff (2007) approach for submerged case, only at higher vegetation densities (m) and large water depths (h).

In figure (6a) at flow depth of 16 cm for vegetation density of 100 stem/m^2, the computed drag using both Hothoff model and the deduced empirical equation is the same value. This means that the deduced empirical equation number (20) could be modified to give agreement at low depths and lower vegetation densities.
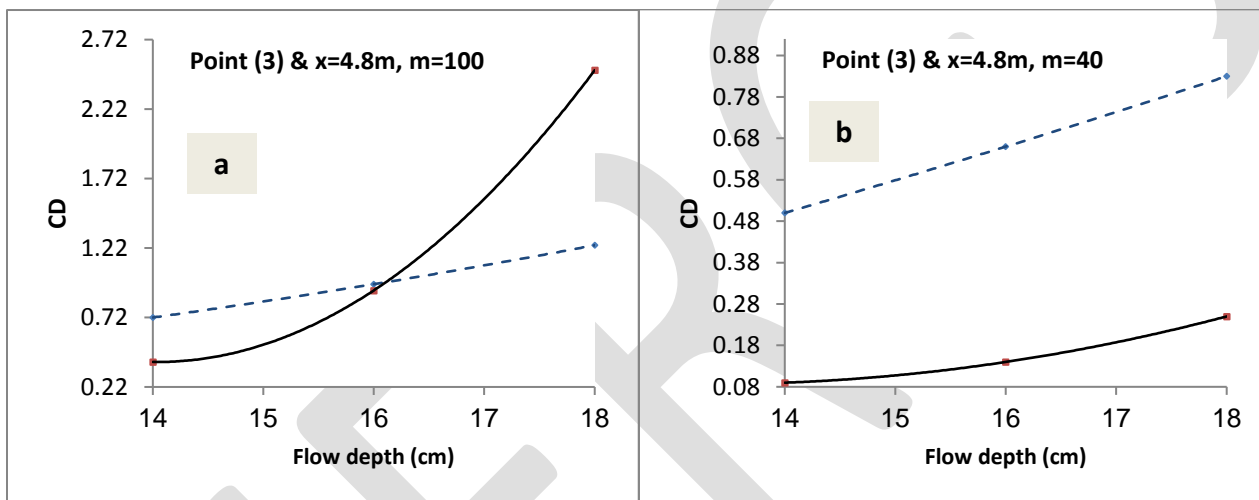
Fig. (6): Effect of flow water depth (h) on the drag coefficient (CD).

The average drag using Hothoff model and the deduced experimental equation for all runs at the three used flow depths is about 0.80 and 1.275 respectively, to give a difference of about 37% between them. So, it is recommended modifying the deduced equation by adding more affecting parameters to minimize this difference.

5. SAMPLES OF THE EXPERIMENTAL RESULTS

Table (1): Experimental data for submerged case at m=100 stem/m^2

		Submerged case & m =100 stem/m^2							
Point No.		\multicolumn{4}{c}{h=18 cm}	\multicolumn{4}{c}{h= 16 cm}	\multicolumn{4}{c}{h=14 cm}
		Cm/sec	U cm/s	CD$_1$	CD$_2$	Cm/sec	U cm/s	CD$_1$	CD$_2$	Cm/sec	U cm/s	CD$_1$	CD$_2$
1.0 (x=1.60 m)	us	15.21				16.9				19.36			
	u$_v$	12.0	14.5	1.03	1.37	13.2	16.0	0.73	0.50	14.6	18.0	0.50	0.22

		us	14.57				14.73				17.0			
2.0 (x=3.20 m)		u_v	11.1	13.8	1.13	1.88	12.6	14.2	0.94	0.85	13.4	16.0	0.63	0.32
		us	14.11				14.90				15.89			
3.0 (x=4.80 m)		u_v	10	13.2	1.24	2.50	11.3	14.00	0.96	0.915	12.8	15.0	0.72	0.40
		us	15.53				14.86				17.10			
4.0 (x=6.40 m)		u_v	11.5	14.50	1.03	1.37	12.2	14.20	0.94	0.85	13.6	16.1	0.63	0.32

Table (2): Experimental data for submerged case at m=80 stem/m^2.

Submerged case & m =80 stem/m^2														
		h=18 cm				h= 16 cm				h=14 cm				
Point No.		Cm/sec	U cm/s	CD$_1$	CD$_2$	Cm/sec	U cm/s	CD$_1$	CD$_2$	Cm/sec	U cm/s	CD$_1$	CD$_2$	
	us	20.57				21.97				24.68				
1.0 (x=1.60 m)	u_v	16.2	19	0.68	0.38	17.3	21	0.48	0.18	19.44	22	0.38	0.11	
	us	19.17				20.95				22.86				
2.0 (x=3.20 m)	u_v	15.1	18	0.75	0.46	16.5	19.5	0.56	0.23	18.0	20	0.47	0.15	
	us	19.17				19.99				21.72				
3.0 (x=4.80 m)	u_v	14.2	17.5	0.80	0.52	15.7	18.9	0.60	0.26	17.11	19.2	0.51	0.17	
	us	19.43				20.73				22.2				
4.0 (x=6.40 m)	u_v	15.3	18	0.75	0.46	16.33	19.5	0.56	0.23	18.0	20	0.47	0.15	

CD$_1$ = Hothoff (2007) and CD$_2$ = Experimental deduced equation

Table (3): Experimental data for submerged case at m=40 stem/m^2.

Submerged case & m =40 stem/m^2														
		h=18 cm				h= 16 cm				h=14 cm				
Point No.		Cm/sec	U cm/s	CD$_1$	CD$_2$	Cm/sec	U cm/s	CD$_1$	CD$_2$	Cm/sec	U cm/s	CD$_1$	CD$_2$	
	us	26.59				28				31.2				

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1.0 (x=1.60 m)	u_v	19.7	25	0.58	0.138	22	27	0.45	0.08	24.7	28.5	0.36	0.05
2.0 (x=3.20 m)	us	24.2				27.05				28.2			
	u_v	18.8	23	0.69	0.19	21.3	24.5	0.54	0.11	22.2	25.8	0.43	0.07
3.0 (x=4.80 m)	us	22.79				24.13				25.53			
	u_v	17.95	21	0.83	0.25	19.0	22.3	0.66	0.14	20.11	24.2	0.50	0.09
4.0 (x=6.40 m)	us	24.13				26.67				28.105			
	u_v	19.0	23	0.69	0.19	21.0	23.8	0.58	0.123	22.13	25.8	0.43	0.07

CD_1 = Hothoff (2007) and CD_2 = Experimental deduced equation

6. CONCLUSIONS

In this paper, the submerged vegetation resistance using movable bed surface were studied. Three different densities of linear cylindrical artificial vegetation of were used. According to the condition of Kleinhans (2008), for submerged vegetation case, the used stem height is 4 cm to give h/k (water depth-stem height ratio less than 5 for all used flow depths. Acoustic Doppler Velocimeter (ADV) instrument was used to measure water velocities at the centerline of channel along the vegetation zone.

A comparative study was done between Hothoff (2007) and the experimental results. An empirical equation was deduced using SPSS program and dimensionless method by modification Baptist et al. (2006) approach as:

$$U = \left(\sqrt{\frac{2g}{CD\ K}} + \frac{\sqrt{g}}{K}\ \ln\left(\frac{h}{k}\right) \right) \sqrt{0.7\ h\ i} \qquad (R^2=0.85)$$

Measuring the average vegetation velocity (U_v) and the surface velocity (U_s), Klopstra et al. (1997) model was used to compute the average water depth velocity. The deduced empirical equation gives a very good agreement with Hothoff (2007) approach for submerged case, only at higher vegetation densities (m) and large water depths (h). The average drag value using Hothoff model and the deduced equation is about 0.80 and 1.275 respectively, to give a difference of about 37% between them. So, it is recommended modifying the deduced equation by adding more affecting parameters to minimize this percentage.

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The relationship between Self-efficacy and Employee Readiness for Organizational Change

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ABSTRACT - During the past decade, the banking sector had under gone rapid and striking changes like policy changes due to globalization and liberalization, increased competition due to the entrance of more private sector banks, downsizing, introduction of new technologies, etc. The readiness of employees for an intended organizational change is paramount important. Ensuring continuous and active support from the employee is critical and more complex in the context of competitive and dynamic nature of environment. In order to implement successful organizational change, organization needs to develop a mechanism to obtain employees support. The objectives of this study is: to identify the relationship between change self- efficacy and employee readiness for organizational change in the private banks, to analyze the level of self- efficacy that exists in banks and to find out the ways and means to enhance self- efficacy in private banks. The research questions are: what is the level of self- efficacy in the private banks? What extent that impact on employee readiness for organizational change in the private banks? This study tests self- efficacy and employee readiness for organizational change by administering questionnaires to 100 employees selected as random sampling. As a result, the findings suggest that the managers to enhance employee knowledge, skills and confidence in the assigned task to increase employee readiness for organizational change to get higher productivity and continued performance improvement. .

Key Words: Organizational change, self- efficacy, employee readiness.

1. Introduction

The economic performance of a country mainly depends on its financial system as rightly said that they are the back-bone of an economy (Vivek and Janakiraman, 2013). Over the last decade, the finance sector underwent major changes in terms of system, structure, facilities, management techniques operational environment, regulatory system, and etc. led to severe concern such as excessive work demands, increased time pressure, role conflict, and extended working hours.

As a result of the end of thirty years of war, in the country especially in the North and Eastern Province many business sectors have begun to move and expanded their business operations in larger scale to these provinces. Financial institutions large in numbers have entered into all types of financial service activities made more competition to the banks. In order to compete in the current environment, banks targeted to make huge profits for their survival. This led to increased working hours, meeting high business targets, etc. Moreover, banking business in the recent times has transformed tremendously due to various factors such as technological innovation in terms of communication and information processing, increase in multi-dimensional operations ultimately results in change in the stress level employees in the bank every time.

1.1 Background and Scope of the Study

In the present dynamic world, change in the workplace is a crucial topic, because change is seen primarily as an adaptive response by the system, acting as a whole or through subsystems with specific functions, to maintain itself in balance with a shifting environment (Ian Beeson and Chris Davis, 2000, 178). In all cases change impacts employee motivation and studying to which extent it does so, is important.

After the completion of the war in Sri Lanka like organization in the other sectors, the banking sector too had under gone rapid and striking changes like policy changes due to globalization and liberalization, increased competition due to the entrance of more private sector banks, downsizing, introduction of new technologies, etc. Due to these changes, the employees in the banking sector are experiencing a high level of work overload, fear of failing target achievement, etc.

The advent of technological revolution in all walks of life coupled with globalization, privatization policies has drastically changed conventional patterns in all sectors. The banking sector is of no exemption. Globalization and privatization led policies compelled the banking sector to reform and adjust to have a competitive edge to cope with multinationals led environment. The advent of technological changes, especially extensive use of computers in the sector has changed the work patterns of the bank employees and has made it inevitable to downsize the work force in the sector.

The implications of the above said transformations have affected the social, economic and psychological domains of the bank employees and their relations. Evidence from existing literature states that more than 60% of the bank employees have one or other problem directly or indirectly related to these drastic changes. Along with other sectors the banking sector also leaning towards the policy of appointing contract labours while various compulsive as well as rewarding options etc.

All the factors discussed above are prospective attributes to cause the level of employee readiness and related disorders among the employees. Although a lot of studies have been conducted on the psychosocial side of the new policy regime in many sectors, there are only few studies, as far as the banking sector is concerned, while the same sector has been drastically impacted by the new policies. Therefore a research study necessitated to ascertain the level self-efficacy among the employees and their level of readiness for successful change process.

1.2 Problem statement

The world is always changing with time, and managers face complex and challenging pressures and opportunities. Faced with stiffer competition and dizzying technological advances, companies often must change course to stay competitive. The changes must inevitably improve employees performance, however in order to achieve high performance through employees, the organization must consider them as assets and must treat them with attention so that they become productive (Harington, 2003). Hence, this research is focused on finding the level of self-efficacy and its impact on the employee readiness for organizational change in the banking sector.

1.   3 Research Question

This study examines Influence of self-efficacy on Employee readiness for organizational change.

1. What is the level of self-efficacy in the banks in Manmunai Patru, Divisional Secretariat in Batticaloa, Sri Lanka?

2. What is the level of Employee readiness for organizational change in the banks in Manmunai Patru, Divisional Secretariat in Batticaloa Sri Lanka?

3. What is the relationship between self-efficacy and Employee readiness for Organizational change in the banks in Manmunai Patru, Divisional Secretariat in Batticaloa Sri Lanka?

1. 4 Objective of the Study

This study focuses on exploring the impact of self-efficacy on employee readiness for organizational change related to the banks in Manmunai Patru, Divisional Secretariat in Batticaloa Sri Lanka as the main objective of this study.

☐☐To study on how self-efficacy effect on employee readiness for organizational change.
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Further, this study also aims to achieve the following as the secondary objectives.

1. To find out the level of self-efficacy in the banks in Manmunai Patru, Divisional Secretariat in Batticaloa Sri Lanka.
2. To find out the level of Employee readiness for organizational change in the banks in Manmunai Patru, Divisional Secretariat in Batticaloa Sri Lanka.

2. Literature Review

2.1 Employee readiness

The readiness of employees for an intended organizational change is paramount important. Ensuring continuous and active support from the employee is critical and more complex in the context of competitive and dynamic nature of environment. In order to implement successful organizational change, organization needs to develop a mechanism to obtain employees support. Importantly, predictive employee readiness factors for organizational change to be identified. To investigate the predictive factors for employee readiness towards organizational change and their different levels of influence, considerable number of research has been conducted in the domain of change management over the past few decades (Armenakis *et al.,* 1993; Cunningham *et al.,* 2002; Vokala *et al.,* 2004; Chawla and Kelloway, 2004; Peach *et al.,* 2005; Madsen *et al.,* 2005; Rafferty and Simon, 2006; Holt *et al.,* 2007; Erturk, 2008; Cinite *et al.,* 2009,). Different theories, conceptual models and empirical studies have been applied to observe and analyse many aspects of organizational change. Accordingly literature supports that for a successful implementation of organizational change programme, employee readiness factor has been found more effective (Eby *et al.,* 2000; Armenakis and Harris, 2002; Cunningham *et al.,* 2002; Madsen *et al.,* 2005; Rafferty and Simon, 2006). Many authors have highlighted that consistent support of the employee for successful implementation of organizational change will lead the organization to become vital change (Armenakis *et al.,* 1993; 1999; Chawla and Kelloway, 2004; Jones *et al.,* 2005; Cinite *et al.,* 2009). But, the literature also emphasis that, employee in an organization has been found to be more sensitive and complex, hence, their perceptions, beliefs, and attitudes become critical and competitive in successfully implementing change programmes (Armenakis *et al.,* 1993; Weber and Weber, 2001). Therefore, change agents, practitioners, and experts are working on finding out possible different combination of positive employee readiness factors to

stimulate employee readiness for successfully implementing organizational change (Hanpachern *et al.,* 1998; Cunningham *et al.,* 2002; Madsen *et al.,* 2005; Rafferty and Simon, 2006; Erturk, 2008; Cinite *et al.,* 2009).

The literature portray predictors of employee readiness such that job satisfaction, change self-efficacy, job knowledge, communications, job demands, and skills, logistic and system support, organisational commitment, social relations at workplace, participation and many more factors prevail in support of change programmes (Eby *et al.,* 2000; Wanberg and Banas, 2000; Cunningham *et al.,* 2002; Chawla and Kelloway, 2004; Peach *et al.,* 2005; Madsen *etal.,* 2005; Rafferty and Simon, 2006).

In reality, in enhancing readiness and reducing employee resistance these factors have been positively implicated. Every employee in the organization is unique in their feeling, behavior, and attitude. Therefore, there is felt need to explore more factors that positively influence employee readiness with different correlations to determine successful implementation of organizational change (Armenakis *et al.,* 1993; Hanpachern *et al.,* 1998; Cunningham *et al.,* 2002; Bernerth, 2004; Madsen *et al.,* 2005; Rafferty and Simons, 2006; Cinite *et al.,* 2009).

2.2 Self Efficacy

Self-efficacy is defined as an individual's judgment of his or her ability to perform certain tasks. Collective efficacy is a group's judgment of its ability to perform. Meanwhile Self-efficacy is defined as a self-evaluation of one's competence to successfully execute a course of action that is necessary to reach desired outcomes (Bandura, 1993).There are a lot of organizations believe that human capital plays a crucial role in determining the organizational success hence reflect the value of the labour productivity. Organization with an active human capital, possess skilled worker and considered as income generators for organizations. Thus, Human capital lead to the competitive advantage as it contributes to the value of firms that enhance their performance than competitors (Priem & Butler, 2001). Many authors have termed self-efficacy as an important determinant for employee readiness. Self-efficacy is the "belief in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Bandura, 1997, p.77). According to Gist and Mitchell (1992), self-efficacy is a person's estimate of his or her capacity to orchestrate performance on a specific task. Individuals will perform activities that they believe they are capable of and avoid those activities that they judge to surpass their coping abilities (Bandura, 1997).

Some research has explored the development of individual self-efficacy It is important to note that both individual self-efficacy and collective efficacy has been shown to relate to the amount of effort and persistence employees are willing to put forth to reach particular outcomes (Bandura, 1982). In contextual terms, self-efficacy of change efforts is the belief that "we can do this." Change agents need to assure employees that they have the ability to succeed in the change process. Self-perceptions of efficacy influence thought patterns, actions, behaviors, and emotional reactions during taxing situations, and research has shown efficacy to account for differences in coping mechanisms, stress reactions, and goal achievement (Bandura, 1982). Additionally, self-appraisal of efficacy influences individual judgments and behaviors in such a manner that individuals avoid activities perceived to exceed capabilities while choosing to engage in activities in which they are assured of being successful.

Specifically, during stressful times, such as an organizational change, low self-efficacy presents a negative cyclical relationship in that individuals who judge themselves as incapable of coping with environmental demands will tend to dwell on personal deficiencies and magnify the severity and difficulty of the task/change at hand (Beck, 1976; Meichenbaum, 1977). Such self-doubt and worry elevate arousal, which in turn, creates stress and impairs performance by creating a preoccupation with personal ineffectiveness (Bandura,

1982). During times of change, focus is diverted away from ways to be successful, and doubt may consume the employee. In contrast, high self-efficacy will divert attention to the demands of the situation and incite greater effort to succeed.

Berneth (2004) identifies self-efficacy as an important factor for the success of change. One of the properties of self-efficacy is that it is domain related. A person can have high self-efficacy on one domain, and low self-efficacy on another (Bandura, 1982). For example, one can have high self-efficacy on carrying out academic tasks, but low self-efficacy of job skills (e.g. Zajacova *etal.*, 2005; Jex & Gudanowski, 1992). A relevant domain in this study concerns self-efficacy in terms of handling changes. That is, self-efficacy is the perception of one's capabilities to handle changes. In other words, self-efficacy is defined as the perceived ability to handle the rapidly changing situation due to a difficult situation. Self-efficacy will be referred to as self-efficacy of change.

According to Bandura (1997), there are three dimensions of efficacy beliefs; which are level, generality and strength. Firstly, efficacy beliefs of the individuals vary in level. Indeed, perceived personal efficacy of different people may be limited to simple task demands or difficult performance demands. Related to level dimension, Bandura (1997) stated that perceived capability of a person can be measured by considering the level of task demands having different degrees of challenge or obstacle to performance. To illustrate, judgments of athletes' belief whether or not jumping over the crossbars at different heights can be accepted as measuring high-jump efficacy. Secondly, efficacy beliefs of individuals vary in generality. Individuals may feel themselves depending on performing different kinds of activities or only certain kind of activity. In this sense, Bandura (1997) pointed out that there are various dimensions of generality like degree of similarity of activities, style of capabilities as regards behavioral, cognitive or affective aspects, qualitative property of situations and the individuals' personal traits. In addition to level and generality dimensions, efficacy beliefs also differ in strength. Weak efficacy beliefs cause negative results due to invalid experiences while people having tenacious belief in their capabilities will be persistent with their efforts in spite of various difficulties and impediments without being overwhelmed easily (Bandura, 1997).

A number of authors have suggested that self-efficacy is an important antecedent of change readiness (e.g., Armenakis & Bedeian, 1999;Eby et al., 2000).

As such, it is proposed that: Self-efficacy, the perceived ability to cope with change, is thought to be an important contributor to readiness (Armenakis *et al.,* 1993; Pond *et al.,* 1984; Prochaska *et al.,*1994), Self-efficacy, the perceived ability to cope with change, is thought to be an important contributor to readiness (Armenakis *et al.,* 1993; Pond *et al.,* 1984; Prochaska *et al.,*1994),

2.3 Self-efficacy and employee readiness for organizational change

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3.   Conceptualization

The conceptual approach for this research study is based on a broad theoretical framework and the study examines the influence of self-efficacy on employee readiness for organizational change in the banks in Manmunai Patru Divisional Secretariat in Batticaloa Sri Lanka.

| Self -Efficacy | → | Employee Readiness for Organizational Change |
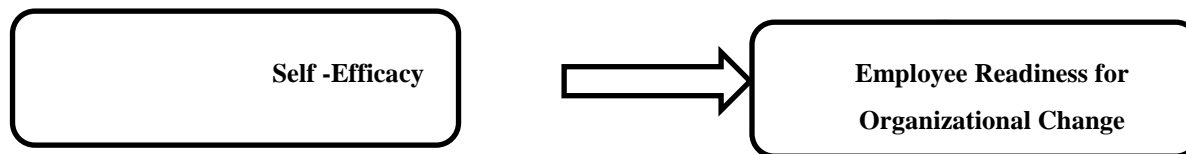
4. Methodology

4.1 Study Setting

For the study of the impact of self-efficacy on employee readiness for organizational change, data were collected based on primary and secondary sources. Primary data collected by issuing questionnaire and secondary data collected from past research papers, literature, reports, and internet.

One hundred questionnaires will be issued to the bank staff on a Simple random sampling method. For this study purpose, self-efficacy will be analyzed to carry out the study on employee readiness for organizational change. Whereas, self-efficacy will be considered as independent variables and employee readiness for organizational change will be considered as depended variable. There are two types of analysis can be taken place in a study.

4.2 Unit of Analyses

The unit of analysis refers to the level of aggregation of the data collected during the subsequent data analysis stage. This study is concerned the unit of analysis will be the individual staff at the middle level in the banks.

4.3 Time Horizon

This study was a cross sectional one in the time horizon, because data were collected in a one single time from the respondents.

4.4 Sample Size, Sampling Distribution

Sample selection is very significant process in conducting a research because in any research it is very difficult to examine entire research area or whole population. At the same time, when select a sample research should take more care because the findings taken through analyzing the sample is common for whole population. Out of the total middle level staff, only 100 will be selected as sample to conduct this research by using simple random sampling method.

4.5 Method of Measurement

Likert scale of 1-5 which ranges from "Strongly Disagree" to "Strongly Agree" will be applied in the questionnaire to evaluate responses. The numerical values will be given for the purpose of quantification of variable as follows:

1. Strongly disagree
2. Disagree
3. Neither Agree nor Disagree
4. Agree
5. Strongly agree

4.6 Data presentation, analysis and evaluation

Data will be presented using tables, bar charts and pie charts. Meanwhile Inferential and descriptive analysis will be used for data analysis. Hence under the descriptive analysis, mean and standard deviation will be derived from the analysis of samples. In inferential analysis, correlation and multiple linear regressions will be applied. Statistical package of SPSS 19.0 will be used for this purpose. Furthermore criteria shown in table will be adopted to evaluate mean values.

Table 4.2 Evaluation criteria for mean values

Range	Degree
$1 \leq X \leq 2.5$	Low level
$2.5 < X \leq 3.5$	Moderate level
$3.5 < X \leq 5.0$	High level

SOURCE- FORMED FOR THIS RESEARCH

5. Data presentation, analysis and Findings

5.1 Personal Information

5.1.1 Gender perspective of staff

Among the total respondents, 63% of respondents were found to female category, and remaining 37% represents are male category.

5.1.2   Age distribution of staff

Age distribution was categorized into three classes. Among the total respondents, 15 % of respondents were found in between to 25 - 35 years old, 35 % were founded in between 36 to 45 years of age, and remaining 50 % represents are above 46years.

5.1.3   Level of Educational Qualification of Staff

The educational level of respondents were classified by four categories from the questionnaire, 42% of the respondents had G.C.E Advanced level qualification, and 23% of the respondents had diploma qualification and remaining 35% of them were found with higher diploma and degree qualifications. This data revels that 58% of the respondents had higher educational qualification.

5.1.4   Level of Work Experience of Staff

Experience has been divided into four categories and 14 % of the respondents with 5 years working experience, 24% were 6 - 10 years working experience, 42 % were 11-15 years working experience, 20% and were more than 15 years working experience. This data revels that 62% of the respondents had more than 10 years of work experience.

5.1 Descriptive statistics

This section presents mean and standard deviation for the variables of self-efficacy and Employee Readiness for Organizational Change. Mean values have been distributed based on Liket's scale of between 1-5 which represent "Strongly Disagree" to "Strongly Agree". Meanwhile mean values were evaluated based on already established evaluative criteria which range from "Low level" to "High level".

Table 1 Mean and standard deviation for the variables of self-efficacy

Variables	Mean	Standard Deviation
Self-efficacy	4.11	0.42

As presented in Table 1, Self-efficacy variable has taken mean values of more than 3.5 which fall under the evaluative category of high level. Ultimately construct of Self-efficacy is with the mean value of 4.11 that shows the high level of self-efficacy.

Table 2:   Mean and standard deviation for the variable of Employee Readiness for   Organizational Change

Variables	Mean	Standard Deviation
Employee Readiness for Organizational Change	3. 39	0.51

As highlighted in Table 2, the variable of Employee Readiness for Organizational Change has taken the mean values of more than 3.5 which fall in high level category. Total Employee Readiness for Organizational Change construct has taken a mean value of 3.39 therefore it records high level.

This study reveals a high level of self-efficacy, the reason might be that, the banks at present are facilitated with high technology networked working instruments and the more attractive working environment. According to Bandura (1997), one's self-efficacy is task and situation specific. That is to say, individuals' level of self-efficacy differs depending on specific situations and the task itself.

The personal information of the respondents of the study reveals that 62% of them had more than 10 years of work experience and 50% were more than 46 years old, work experience and age could influence one's level of self-efficacy. Bandura (1986) pointed out that belief in one's efficacy does not remain in a stagnant state; it demonstrates variability depending upon experiences and age of the individual Higher level of these rates could be a reason for higher self-efficacy.

The respondents considered for this study were the staff working in the banks at the middle level had the tendency to analyze situations with sense of control. Individuals having high sense of efficacy have tendency to analyze adverse situations with sense of control and providing more perseverant endeavor (Pajares, 2000). According to Bandura (1997), those people with high level of self–efficacy scrutinize their decisions through elaboration without deterring against the failures and obstacles in order to attain their set of goals. The staff who are serving in the banks might have been empowered to make appropriate decisions according to the situation and condition of the customer's loyalty.

High level of self-efficacy in this study also could be revealed with the high targets assigned to the staff for which the attainment of such lead to high level of motivation and becomes a cyclical process. Pajares (2002b) claimed that people possessing high self-efficacy belief have tendency to increase their performance with strengthening their belief and spirit by coping with stress while individuals who have low self-efficacy are likely to assure failure with lowering their confidence and morale.

5.2 Correlation analysis

Correlation values were found to determine relationship between variables of self-efficacy and Employee Readiness for Organizational Change. It has been presented in the table 3.

Table 3:   *Correlation between self-efficacy and Employee Readiness for Organizational*   *Change.*

Variables	Employee Readiness for Organizational Change
Self-efficacy	0.698*

* Correlation is significant at the 0.05 level (2-tailed)

 As in table 3, the correlation value is positive and the value has been significant at 5% significant level (P<0.05). This reveals that self-efficacy variables are positively correlated with Employee Readiness for Organizational Change. Hence there is a positive relationship between self-efficacy and Employee Readiness for Organizational Change.

The statistical mean of self-efficacy scale showed self-confidence; higher qualification; work experience had enhanced the employee willingness and positive attitudes towards Employee Readiness for Organizational Change. Thus, the scale can be applied to ascertain employee attitudes and behaviours regarding readiness for change. The results of this study also show that self-efficacy scale is significantly and positively correlated with other scale of employee Readiness for Organizational Change.

In addition, the statistical mean of self-efficacy "r" scale also showed that employee of organizations can be ready and open to change. In this scale participant's response to the factors are related to situational and individual. According to Judges et al. (1995); Goulet and

Singh (2002) and Poon (2004) employee can develop positive attitudes and behaviours for an organization on the basis of the situational factor. In addition, the literature also shows that employee can develop positive attitudes on the basis of individual willingness. This was confirmed in this study, which shows that self-efficacy has a positive relationship to employee readiness for organizational change.

6. Recommendation and Conclusion

6.1 Recommendations

Based on the findings, the following recommendations are proposed for the enhancement of employee self-efficacy and Employee readiness for organizational change.

1. Achievement of higher targets of tasks should be motivated timely and systematically.
2. The views of the employee should be taken into account when introducing Organizational changes for higher performance
3. The content and the process of the organizational change process should be relevant to the level of expectation of the employee
4. A systematic approach should be practiced to enhance the moral of employees or whenever their Performance is being reviewed by reviewers.

6.2 Conclusion

Research on the relationship between self-efficacy and employee readiness for organizational change was stimulated by new interest evidences due to recent change reforms in all types of organizations in Sri Lanka. Increased attention on competition, advanced technology, mergers, expansion, product quality maintenance, enhancing employee efficiency rapid growth, new business ventures, exciting opportunities, innovations, and new leadership and management approaches led to number of countries knowing employee attitudes and behaviours of organization change.

This study is concerned with examining employee self-efficacy, attitudes, beliefs, and behaviours to readiness for organizational change. Self-efficacy had a statistically significant and positive relationship with employee readiness for organizational change. This suggest that, other things being equal, the higher the employee self-efficacy, the more readiness for organizational change and employee exert better and higher performance.

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A study on Gender differences and Defense Mechanisms among University Students

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Abstract- The aim of the present study was to investigate gender differences in the use of defense mechanism among university students. So by using purposive sampling, the researchers selected the sample of (N=100) students, 60 female and 40 males students from University of Gujarat, Hafiz Hayat campus. The Defense Style Questionnaire – 40 (DSQ-40; Andrews, Singh, & Bond, 1993) was used to collect the data on gender differences in defense mechanisms among university students. Data were analyzed by using descriptive statistics (mean, median, Standard deviation) and inferential statistics (independent t-test). The results of this research showed that there were no statistically significant gender differences in the use of defense mechanisms among university students.

 Keywords: Gender difference, Defense mechanisms, Descriptive statistics, and inferential statistics.

Introduction

In the modern age the behavior of people is very technical. So it is very interesting to illustrate technical behavior of people. That provides us huge information about how people think and deal about themselves and others? Whether the behavior of people is constructive or destructive? Due to analysis of behavior we can identify why people behave destructively and where and why conflict occurs? So the study of how people use defense mechanisms in daily life help us to understand certain types of behavior expressed by people about ourselves and others.

The idea of defense mechanism was first defined by Sigmund Freud in 1874. Freud identified several forces that impact on personality development and strategies that protect us from anxiety and tension (Phaneuf, RN, 2000)

Word "defense" is commonly used in linguistic, fun and in literature with different meanings. Researchers and clinicians used defense theory to illustrate different kinds of behavior, thoughts, emotions and psychological ailments (Blackman, 2011).

Shaver et al.,1987 define defense mechanisms address a vital part of human ability to sustain emotional balance. Without emotional homeostasis our consciousness would be more defenseless and people will experience negative emotions like anxiety, fear and sadness (as cited in Bowins, 2004).

Defense mechanisms can be defined as "regulatory processes that allow individuals to reduce cognitive dissonance and to minimize sudden changes in internal and external environments by altering how these events are perceived" (Vaillant, 1993, p. 44).

Concept of defense mechanisms was introduced by Sigmund Freud. According to DSM-IV Defense mechanism is defined as an unconscious psychological procedure that is used to cope with stressful and anxious situation. When the individual defense mechanisms are theoretically and empirically divided into various groups are known as defense level.

 Freud, 1946 defined "id" is a personality force that operates on pleasure principle and wants gratification of all wishes and impulses. When individual face anxious situation that is uncomfortable and stressful then individual take immediate action to change it. Ego creates involuntary

actions to eradicate stress and anxiety is known as defense mechanism. Freud described four categories of defense mechanisms. Figure 1. 1 shows categories of defense mechanisms (DSM IV, 1994).
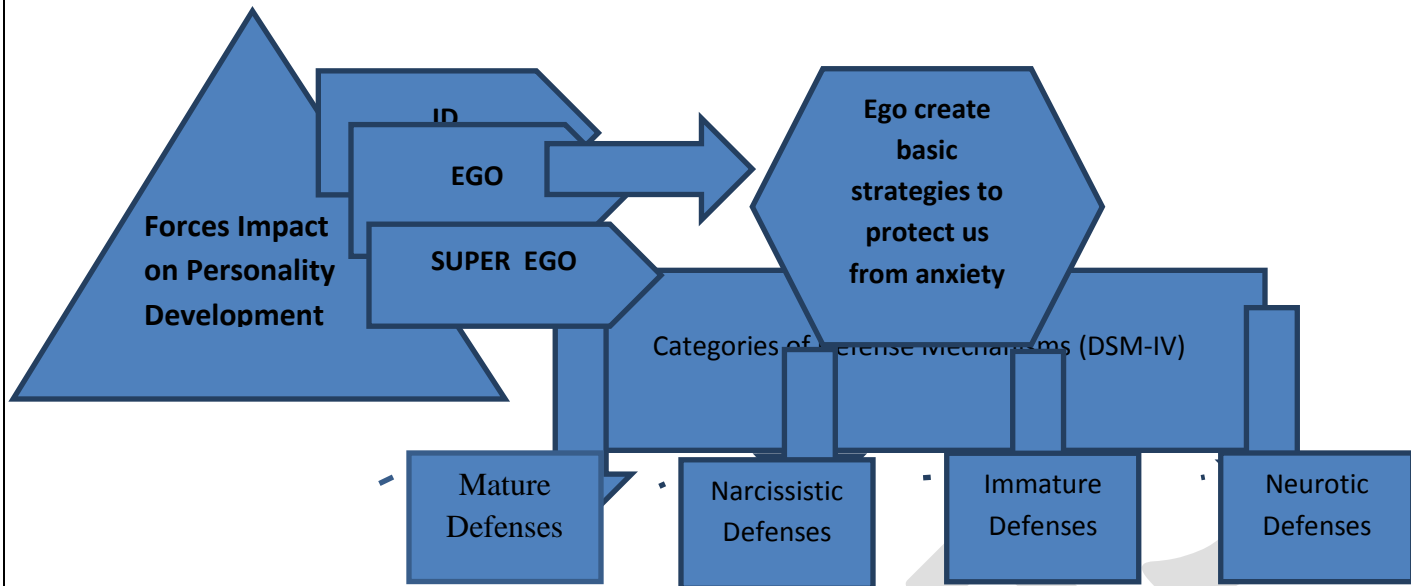
There are a lot of evidences that indicate an impact of involuntary forces on personality development. So it is very crucial and interesting to study such type of reactions. And also very crucial to investigate how people deal with stressful and anxious situations. To study defense mechanisms are very important to understand and treat patients both medical and psychiatric (Cramer, 1995).

According to Million, 1994 "A systematic assessment of defense mechanism is central to a comprehensive personality assessment" (as cited in Cramer, 1995).

Vaillant, 1992, p.3, defined "Today, no mental status or clinical formulation should be considered complete without an effort to identify the patient's dominant defense mechanism" (as cited in Cramer, 1995).

This study is socially significant as it measure gender differences in the use of defense mechanism in university students. As we know young generation is very important for society and our family structure and for whole nation.

Gender is an important consideration. Therefore, it is socially and clinically worth to explore gender variation in the use of defense mechanisms. Because clinicians can take better insight by identifying defensive style used by their male and female client. That is very crucial for treatment. On the other hand, to improve and promote healthy life style it is very important to study which type of defensive pattern are useful.

The objectives of the study are:

* To investigate gender differences in the use of defense mechanisms.

A REVIEW OF EMPIRICAL RESEARCH

There are diverse types of researches on gender difference and defense mechanism. A research was conducted on gender difference of self-report defense mechanisms by Petraglia , Thygesen, Lecours & Drapeau (2009). In this study it was identified how the men and women's are differ in the use of defense mechanisms. It was concluded that there is no significant gender difference in the use of defense mechanisms.

Cramer (1987) identified gender differences in self-report defense mechanisms among university students. It was concluded that women scored considerably higher on narcissistic defenses than male participants (as cited in Petraglia , Thygesen, Lecours & Drapeau, 2009) .

Watson & Sinha (1998) found that university male students are more likely to score high on neurotic defense mechanism than female university students (as cited in Petraglia , Thygesen, Lecours & Drapeau, 2009). Whereas, Munteanu (2002), investigated that overall scores of females are high on defense mechanisms scale than male (as cited in Petraglia , Thygesen, Lecours & Drapeau, 2009).

This study is publicly substantial as it measure gender differences in self-report defense mechanism in university students. Young generation is very important for society and nation.

In a study the defense mechanisms were identified in adults, adolescents, and children. This study has confirmed a linear design for the development of different defenses, as theorized by Anna Freud. The study testified here also delivers pragmatic provision for the basic psychoanalytic notion of the defense mechanism. The investigation also goes outside of psychoanalytic theory ij order to explore who the males and females respondents are different in the use of different type of defense mechanisms. The results of study suggested that there were no significant gender differences in defense mechanisms (Robert & Joseph, 2002).

A research was conducted on gender difference of defense mechanisms among a sample of 162 males and females respondents. Defense Style Questionnaire was used in order to explore gender differences in the use of defense mechanisms. Substantial alterations were identified between males and females respondents on the measures of projection, isolation, and denial. The results of this tests specified there was an important outcome of gender (male, female) on the expression of defense mechanisms (McNIchols, 2014).

Methodology

This study used survey research design and a convenience sample of 100 (female = 60, Male = 40) university students having age 15-25 years. The students of B.S (Hones) and M.sc from University of Gujrat Hafiz Hayat Campus was selected as the participants. Permission from the author of the scale was obtained prior to use the instrument for data collection. English version of the DSQ-40 scale was used. The Defense Style Questionnaire – 40 (DSQ-40; Andrews, Singh, & Bond, 1993) was used in order to measure the variable of interest. DSQ- 40 consists of 20 defense mechanisms that are mentioned in the DSM-IV-TR (American Psychiatric Association, 2003). This questionnaire consists of 40 items that measure four groups of defense mechanisms that are mature, narsistic, Immature and neurotic. For the purpose of taking demographic information, participants asked to indicate age, gender, department, class and semester.

Procedure

Once permission to conduct study was taken, pilot study was conducted to check the language difficulty of instruments on sample of 15 students from target population. The researcher identified the respondents by using convenience sampling technique. Importance of research and necessary information regarding the research was given to participants. Researcher personally distributed the questionnaire to the participants. An informed consent form attached with the scale so that the respondents first read that and fill the questionnaires. It was informed to the respondents that the information derived from them will be kept confidential and will not be used for any other purpose except research. The instructions about how to respond to the statements, written on the questionnaires, were read to respondents and respondents were encouraged to ask to repeat the statement if

they could not understand. In addition to completing the questionnaire, participants required to provide demographic details in term of name, age, gender, class, department and semester. An appropriate time was given to participant to complete the questionnaire.

Data analysis

Data were analyzed by using Statistical Package for Social Sciences (SPSS 16.0 version). Firstly reliability and validity of coefficient of the scale for the present sample was examined by computing Cronbach's alpha. Secondly descriptive statistics including mean, median, and standard deviation were computed for the study variables. After that inferential statistics including independent sample t-test was used in order to explore gender differences in the use of defense mechanisms among university students.

Results

Cronbach's alpha coefficients of each measure were determined for present study and are

reported in the following table.α

Table 4.1

Psychometric Properties of Major Study measures

Variables	N	M	SD	A
Defense style Questionniare-40	100	2.00	1.48	.059

Table: 4.2

Demographic Characteristics of the Respondents (N=100)

Characteristics	N	%	M	SD
Age (years)			1.53	.61
15-20	51	51		
2-25	49	49		
Gender			1.6	.49
Male	40	40		
Female	60	60		

The above table shows the frequencies and percentages of demographics including students' age & gender.

Table: 4.3

Comparison of male and female students on total DSQ-40 (Defense style Questionniare-40)

Measures	Male (N=40)		Female (N=60)		t-value	p	Cohen's d
	M	SD	M	SD			
DSQ-40	1.97	2.73	2.02	12.7	-1.69	.12	

The above table reveals that the value of p= .12. Which suggest that there is no statistically significant difference between male and female students for DSQ-40as the value of p= .12.

Table: 4.4

Comparison of male and female students on Neurotic defense mechanisms for DSQ-40 (Defense style Questionniare-40)

Measures	Male (N=40)		Female (N=60)				
	M	SD	M	SD	t-value	p	Cohen's d
DSQ-40	40.6	6.64	40.7	6.13	-.039	.96	

Above table identify gender difference for neurotic defense mechanism, so above table suggest that there is no statically significant gender difference for neurotics defense mechanism as the value of p=.95

Table: 4.5

Comparison of male and female students on mature defense mechanisms for DSQ-40 (Defense style Questionniare-40)

Measures	Male (N=40)		Female (N=60)				
	M	SD	M	SD	t-value	p	Cohen's d
DSQ-40	38.9	8.83	39.3	5.69	-.248	.81	

Above table identify gender difference for mature defense mechanism, so above table suggest that there is no statically significant gender difference for mature defense mechanism as the value of p=.81.

Table: 4.6

Comparison of male and female students on immature defense mechanisms for DSQ-40 (Defense style Questionniare-40)

Measures	Male (N=40)		Female (N=60)				
	M	SD	M	SD	t-value	p	Cohen's d
DSQ-40	1.17	13.56	1.22	9.97	-1.96	0.5	

Above table identify gender difference for immature defense mechanism, so above table suggest that there is no statically significant gender difference for immature defense mechanism as the value of p=0.5.

Discussion

The current study investigated the gender differences in defense mechanism among male and female University students. Moderating role of demographic variables (age, gender) was also examined.

Findings of the study indicated that there was no significant gender differences in defense mechanism of university male and female students are in agreement with findings of Cheah and Tang (2011) as they found no significant gender differences among male and female students in self-report defense mechanism. Finding of current study also identify the gender differences in different categories of defense mechanism. Mature, Immature and neurotic defense mechanisms are included in these categories. Analyses of all these categories suggest that there is no statistically significant gender difference in the use of different categories of defense mechanism. Finding of current study is consistent with Abdel-Khalek (1991) as their

study found no significant gender difference with respect to defense mechanism among university students. Cheah & Tang (2011) found no significant relationship in self-report defense mechanism.

A study discovers the association between gender and defenses mechanisms using the Defense Style Questionnaire (DSQ-60; Trijsburg Bond, & Drapeau, 2003). As likely, no important gender differences were showed in Overall Defensive Functioning (ODF). Indication is delivered to maintain the idea that general adaptivity of defenses is analogous; both males and females trust on diverse defensive establishments during stressful conditions (Petraglia, Thygesen , Lecours & Drapeau , 2009).

Various researches have revealed that males and females differ in their use of defense mechanisms (e.g. Cramer, 1991; Watson and Sinha, 1998). But, how and why these changes occur is a question that is open to debate (as cited in, Petraglia, Thygesen , Lecours & Drapeau , 2009). Overall findings of the study suggest that students comes from different background are facing similar environment at University they face same sort of problems related to their study and other. As a Result of conflict, poor marital satisfaction is inevitable. Along with consistent and effective use of coping strategies; they are overcoming different conflict, directing and fulfilling demands, duties, and responsibilities of various area of life in a better way.

Conclusion

The current study investigated the gender difference in the use of self-report defense mechanism. Overall, results supported that there is no significant difference in the use of self-report defense mechanism among male and female students of Gujrat University. Demographic variables including gender also did not played a significant role on study variables.

Limitations and Future Directions

The scales were not adapted to the cultural norms. It is suggested that future researches should take into account the translation of scales in local language. The sample of this study was conveniently selected hence no claim can be made about sample being representative of general population. Findings of present research cannot necessarily be generalized because sample was relatively small. It is suggested that future researches should focus on the selection of large sample from multiple educational groups. Some of the contextual variables such as personality factors had not been taken into consideration while conducting this study. These variables may influence the strength of defense mechanism. Future researches might consider the influence of uncontrolled variables.

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HYBRID VEHICLE HAVING THREE SOURCE OF POWER, FOR HANDICAP AND COMMON PERSON, WITH VARIOUS PURPOSES

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Abstract—This vehicle is about "**The power conservation, saving fossil fuel, reduction of greenhouse gases, for farmers in village like India where there is no electricity available 24 hr. and for the handicap person"** vehicle consisting of hub motor, wheel, battery, solar panel, manual power source mechanism, controller, mobile charger etc. All the components are assembled in such a manner that it will give maximum output. As present situation is very dangerous because of the production of vehicles which runs on fossil fuel is increasing tremendously in India and other countries which affecting the earth atmosphere by unwanted thing such as global warming, harm to the endanger species and contributing to increase in harmful pollutants in environment, this all result in death of many people, animals, birds etc. So, to avoid such disaster we need to take action as soon as possible and need to find out the cure to avoid it. If we build such vehicle which uses totally renewable energy, carry people and their load, uses for not one but for various purposes. Also, this type of vehicle has less cost and maintenance and can be purchase by anyone because of its less cost. If we use such ecofriendly vehicle it will help to decrease the lot of pollution of noise and air which is generally occurring due to normal vehicle. The normal car uses diesel or petrol fuel which creates lot of pollution and only uses one power source for its working. If we build such hybrid vehicle it will increase efficiency of driving and save fuel which directly decrease the pollution and greenhouse effect and use for more than one purpose*.*

Keywords— Non-conventional power sources, design and analysis, water erecting mechanism.

1. INTRODUCTION

Our main intentions behind building such hybrid vehicle is that we want to expose our idea to the world that vehicle should not be limited in its use, it must be develop in such way that it can be used for more than one purpose and we successfully demonstrate it with developing our own vehicle. Because today's situation in this world is very sensitive, lack of space as population is increasing, their need is increasing. Hence, to satisfy their thirst we need to modify our vehicles by developing them in such way that it should be compact, economical, efficient and most important ecofriendly.
Following are the three power sources that we used to power our vehicle.
1. Solar power
2. Battery
3. Human power
In normal conditions like when sun shining, it takes around 4.30 hours to charge all four batteries, when all batteries get exhausted then it can easily charge by the electrical socket, when none of the sources available then it can be run by human power. The design of the vehicle done in such way that it gives more comfort to driver if he is handicap, we can adjust its seat by 90 degrees and at last we have developed a mechanism by which we can erect the water from wells. Following are the details of component and design of vehicle that we made.

2. COMPONENT OF VEHICLE
A. **Mechanical Component:**
B. Wheel
C. Bearing.
D. Gear.
E. Shaft.
F. Chassis
G. Chain
H. Pump

B. Electrical Components:

A. Controller
B. Hub Motor (DC motor)
C. Solar panel
D. Electric charger
E. Solar charger

There are total four batteries, each of 12 volts which runs the hub motor. The hub motor is of 1250 rpm, speed of the motor can be controlled by the accelerator which will be control by the driver. The hub motor have a sprocket, sprocket is attach by chain with the rear shaft. The batteries can be easily being charged via electrical socket normally available in home. Second is solar power, the monocrystalline solar panel we use because it gives more efficiency than polycrystalline. Solar panel converts the solar energy into electrical energy, but it gives the fluctuating voltage to stabilize it we have use solar charger and at last the manual source of power which uses the gear ratio and convert human hand power into rotation of wheel.

When one power source exhaust then we are able to use the second power source. Total time require to fully charge the batteries is 4.30 hrs. In day time we can store the electricity and we can use it at night also when batteries are totally discharge we can use the manual power source there is an analog meter which indicate how much batteries are charge with which we can easily understand how far we can travel. For the handicap person there is adjustable chair which can turn 90 degree.

Another, mechanism that we specially design which helps to erect water from wells, which works like, First we have to put the vehicle in stationary position on stand which is design especially for this purpose, then we need to attach mechanism consist of pump, rubber belt drive, pulley. When motor runs it rotates rubber belt which reciprocates plastic pump which are available in market with very less cost around 1000 Rs. When lever of pump reciprocates it develops suction and due to this suction it sucks water from well.

At last we have attached a three pin socket which can be used for various purposes like mobile charging etc.
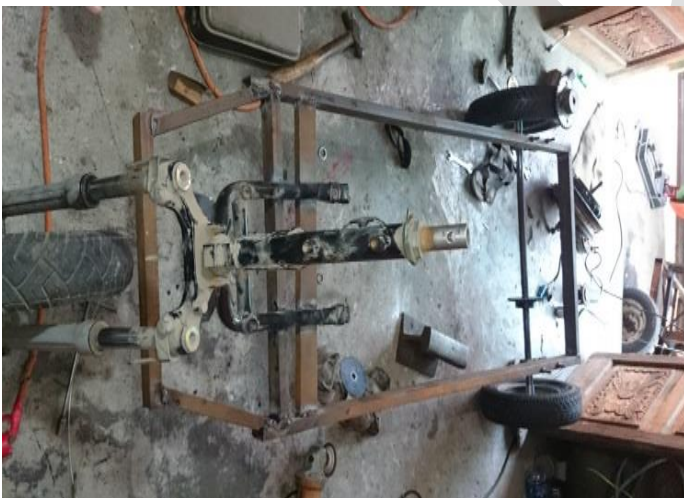
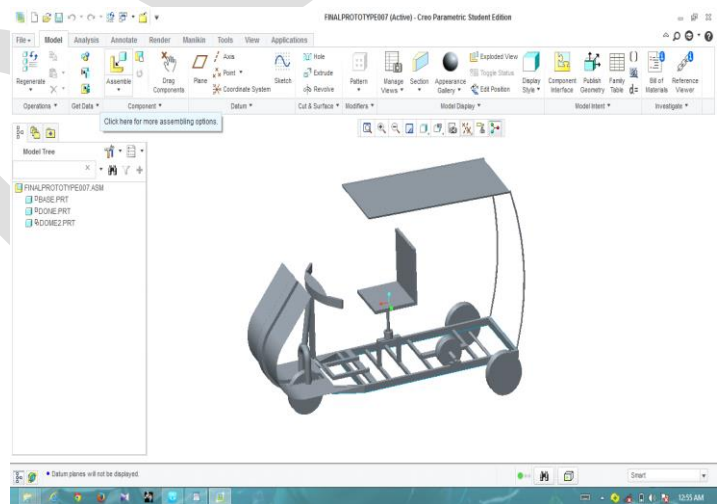### 3. DESIGN

.   **Fig.1. Actual chassis design**

Fig.2. Design of vehicle in CREO 2.0
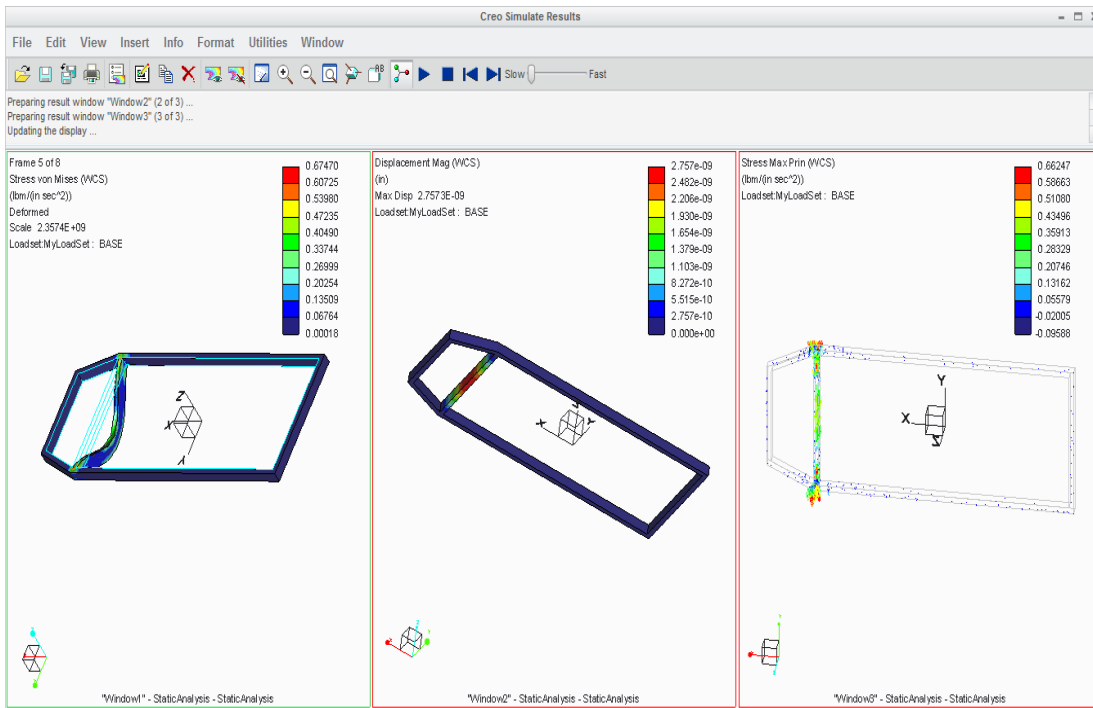

Fig.3. Final developed model

Fig-4: Simulation of Chassis in CREO 2.0 software. (The above simulation shows the stresses acting on the chassis)

4. Calculation of battery (discharge time) and motor (power)

Powered car on an inclined ramp, $\Theta=3^0$
Assuming speed with which car will run is 35 km/hr.

$$=5/18*35$$
$$=9.72 m/s \qquad \text{……. (1)}$$

Every two objects in contact in this world would suffer from friction between them. Just how much friction can be generated by the relationship of a tire and road is defined by the following equation: F=μN
Coefficient of friction μ=0.6 (rubber on dry concrete) …….. (2)
Total weight of car   =weight of car + weight of person
= 80KG+70KG= 150KG.
Force required in moving the wheelchair on a 3° ramp

$$= \text{total weight} * g*\sin\theta$$
$$= 150*9.81*\sin3^0$$
$$=77.01N$$

Power required = force *distance covered per second

$$= 77.01 * 9.72$$
$$=748.56W \qquad \text{.......... (3)}$$
$$F=0.6*77.01*\cos\Theta$$
$$= 46.14N$$

Power required =46.14*9.72 {from (1)}

$$=448.50W \qquad \text{.......... (4)}$$

Total power = 748.56W+448.50W (from3&4)
    = 1197.06W (including friction)
Now, if an 1197.06W motor is used then, one of the batteries used in this motor could be a 48V 30ah.
We know that, Power = VI
    Therefore, I = 1183/48
        = 24.93A
Number of hours the battery would last once charged

$$= 30/ 24.93$$
$$=1.20 hours \text{ (for car moving continuously on a ramp which is inclined at angle of } 3^0)$$

5. NEEDS

➢ As we know, Non-Conventional energy sources like coal, fossil fuels are in less quantity and depleting day by day. So, we use total renewable energy.

➢ In villages like India there are very less resources available like lack of electricity to run water erecting motor if such kind of mechanism available with them that can be transported easily anywhere and runs on solar power it will be very comfortable for them.

➢ Comfort for the rider which is especially handicap by legs.

➢ Cheap Transportation.

6. CONCLUSION

➢ We have developed such a vehicle which has less cost, less maintenance and high economy rate. By charging of approximately 4.30 hours. It runs on flat road with speed of 35-40 km/hr. for 1.2 hours (actual experimenting it on road)

➢ As there is no use of fossil fuel result in no pollution, zero emission of pollutants which is beneficial for environment perspective.

➢ Successfully used for erecting water from the well on total solar energy it can further improve if high quality of equipment is used.

➢ Easy to drive, gives comfort to handicap as well as normal person while driving, in back side of seat there is space for luggage.

➢ We have developed vehicle which is having less cost as compare to its uses and functions.

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Degree of Approximation of Function $\tilde{f} \in H_w$ Class by (E,1) (C,1) Means in the Holder Metric

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Abstract – In this paper, a theorem on degree of approximation of function $\tilde{f} \in H_w$ class by (E,1) (C,1) means in the Holder metric has been established.

Keywords - Degree of Approximation , Summability Method , Holder Metric, (E,1) mean, (C,1) mean.

1. Introduction

The degree of approximation of a function f belonging to various classes using different Summability method has been determined by many Mathematician ,Chandra [3] find the degree of approximation of function by Norlund transform .Later on Mahapatra and Chandra [4] obtain the degree of approximation in Holder metric using matrix transform .In sequal singh et.al. [7] obtain the error bound of periodic function in Holder metric again Mishra et.al. gave the generalization of result of Singh et.al. In this paper we find the degree of approximation of function $\tilde{f} \in H_w$ by (E,1) (C,1) means in holder metric.

2. Definition

For a 2π - periodic signal $f \in L^p$ periodic integrable in the sense of Lebesgue then the Fourier series of $f(x)$ is given by

$$f(x) \approx \frac{a_o}{2} + \sum_{n=1}^{\infty}(a_n cosnx + b_n sinnx) \qquad \text{.......(2.1)}$$

The conjugate series of Fourier series (2.1) is given by

$$\sum_{n=1}^{\infty}(b_n cosnx - a_n sinnx) \qquad \text{......(2.2)}$$

Let $w(t)$ and $w^*(t)$ denote two given modulai of continuity such that

$$(w(t))^{\frac{\beta}{\alpha}} = o\big(w^*(t)\big) \ as \ t \to 0^+ \ for \ 0 \leq \beta < \alpha < 1 \qquad \text{........(2.3)}$$

Let $c_{2\pi}$ denote the Banach Space of all 2π - periodic continuous function defined on $[\pi, -\pi]$ under sub-norm the space L_p $[0,2\pi] \ where \ p = \infty$ includes the space $c_{2\pi}$ For some positive constant k the function space H_w is defined by

$$H_w = \{f \in c_{2\pi}: |f(x) - f(y)| \leq kw(|x - y|)\} \qquad \text{......(2.4)}$$

With norm $\|.\|_{w^*}$ defined by

$$\|f\|_{w^*} = \|f\|_c + \frac{sup}{x, y} [\Delta^{w^*} f(x,y)] \qquad \text{.........(2.5)}$$

Where $w(t)$ and $w^*(t)$ are increasing function of t and

$$\|f\|_c = \frac{sup}{0 \leq x \leq 2\pi} |f(x)| \quad \text{and} \quad \Delta^{w^*} f(x,y) = \frac{|f(x)-f(y)|}{w^*(|x-y|)} \quad x \neq y \qquad \text{............(2.6)}$$

with the understanding that $\Delta^0 f(x,y) = 0$ If there exists positive constant β and k such that $w(|x - y|) \leq \beta|x - y|^\alpha$ and $w^*(|x - y|) \leq k|x - y|^\beta$ $0 \leq \beta \leq \alpha \leq 1$ than the space

$$H_w = \{f \in c_{2\pi} : |f(x) - f(y)| \le k|x - y|^\alpha , 0 \le \alpha \le 1\} \qquad \text{.........(2.7)}$$

Is Banach space and metric induced by norm $\|.\|_\alpha$ and H_α is said to be Holder metric clearly H_α is a Banach space which decreases as α increases that is

$$H_\alpha \subseteq H_\beta \subseteq c_{2\pi} \text{ for } 0 \le \beta \le \alpha \le 1 \qquad \text{........(2.8)}$$

An infinite series $\sum_{n=0}^{\infty} a_n$ is said to be (C,1) summable to s if

$$(C,1) = \frac{1}{(n+1)} \sum_{n=0}^{\infty} s_k \to s \quad as \quad n \to \infty \qquad \text{........(2.9)}$$

The (E,1) transform is defined by

$$(E,1) = \frac{1}{2^n} \sum_{n=0}^{\infty} \binom{n}{k} s_k \to s \quad as \quad n \to \infty \qquad \text{.......(2.10)}$$

The (E,1) transform of (C,1) transform defined $(EC)_n^1$ is given by

$$(EC)_n^1 = \frac{1}{2^n} \sum_{n=0}^{\infty} \binom{n}{k} c_k^1 \to s \quad as \quad n \to \infty \qquad \text{......(2.11)}$$

3.Known Results

Singh and Mahajan [7] established the following theorem to error bound of signal passing through (C,1)(E,1) transform.

Theorem 1 – Let $w(t)$ defined (2.4) be such that

$$\int_t^\pi \frac{w(u)}{u^2} du = o\{H(t)\} \qquad H(t) \ge 0 \qquad \text{.......(3.1)}$$

$$\int_0^t H(u) du = o\{tH(t)\} \qquad as \quad t \to 0^+ \qquad \text{.........(3.2)}$$

Then for $0 \le \beta < \alpha \le 1$ and $f \in H_w$ we have

$$\left\| t_n^{(CE)^1}(S;f) - f(x) \right\|_{w^*} = o\left\{ \left((n+1)^{-1} H(\frac{\pi}{n+1}) \right)^{1-\frac{\beta}{\alpha}} \right\} \qquad \text{........(3.3)}$$

Theorem 2 – Consider w(t) defined (2.4) and for $0 \le \beta \le \alpha \le 1$ and $f \in H_w$ we have

$$\left\| t_n^{(CE)^1}(f) - f(x) \right\|_{w^*} = o\left\{ \left(w(\frac{\pi}{n+1}) \right)^{1-\frac{\beta}{\alpha}} + ((n+1)^{-1} \sum_{k=1}^{n+1} w\left(\frac{1}{k+1}\right))^{1-\frac{\beta}{\alpha}} \right\}$$

$$\text{.........(3.4)}$$

In sequal Mishra and Khatri [11] gave the generalized result of above theorem . They proved the following .

Theorem 3 – Let $w(t)$ defined (2.4) be such that

$$\int_t^\pi \frac{w(u)}{u^2} du = o\{H(t)\} \qquad H(t) \ge 0$$

$$\int_0^t H(u)du = o\{tH(t)\} \qquad as \ t \to 0^+$$

Let Np be the Norlund summability matrix generated by the non –negative {Pn} such that $(n+1)pn = o(Pn)$ $\forall n \geq 0$.

Then for $\bar{f} \ \in H_w \quad 0 \leq \beta < \alpha \leq 1$ we have

$$\left\| t_n^{-NE}(f) - \bar{f}(x) \right\| w^* = o \left\{ \frac{w(|x-y|)^{\frac{\beta}{\alpha}}}{\omega^*(|x-y|)} (\log(n+1))^{\frac{\beta}{\alpha}} \left((n+1)^{-1} H\left(\frac{\pi}{n+1}\right) \right)^{1-\frac{\beta}{\sigma}} \right\} \qquad ……..(3.5)$$

And if w(t) satisfies (3.1) then for $\bar{f} \ \in H_w \quad 0 \leq \beta < \alpha \leq 1$ we have

$$\left\| t_n^{-NE}(f) - \bar{f}(x) \right\| w^* = o \left\{ \frac{w(|x-y|)^{\frac{\beta}{\alpha}}}{\omega^*(|x-y|)} \left(\log(n+1) \ w(\tfrac{\pi}{n+1}) \right)^{1-\frac{\beta}{\alpha}} + \left(\left(\tfrac{1}{n+1}\right) \sum_{k=0}^n w\left(\tfrac{\pi}{n+1}\right) \right)^{1-\frac{\beta}{\sigma}} \right\}$$

$$s \ ……..(3.6)$$

4 .Main Theorem

In this paper we have to prove a theorem on the degree of approximation of a function f(x) conjugate to a 2π- periodic function f belonging to $\bar{f} \ \in H_w$ class by (E,1) (C,1) mean of conjugate series of its Fourier series.

Theorem 1 – Let $w(t)$ satisfy the following condition

$$\int_t^\pi \frac{w(u)}{u^2} du = o\{H(t)\} \qquad H(t) \geq 0 \qquad …….(4.1)$$

$$\int_0^t H(u)du = o\{tH(t)\} \qquad as \ t \to 0^+ \qquad ………(4.2)$$

Then for $\bar{f} \ \in H_w \quad 0 \leq \beta < \alpha \leq 1$ we have

$$\left\| t_n^{-EC}(f) - \bar{f}(x) \right\| w^* = o \left\{ \frac{w(|x-y|)^{\frac{\beta}{\alpha}}}{\omega^*(|x-y|)} (\log(n+1))^{\frac{\beta}{\alpha}} \left((n+1)^{-1} H\left(\frac{\pi}{n+1}\right) \right)^{1-\frac{\beta}{\sigma}} \right\}$$

$$……….(4.3)$$

5 Lemma

In order to prove our main result ,we require the following lemma.

Lemma 1 - For $0 < t \leq \frac{\pi}{n+1}$ $\overline{K_n}(t) = o\left(\frac{1}{t}\right)$ $………(5.1)$

Proof - - For $0 < t \leq \frac{\pi}{n+1}$, $sin\left(\frac{t}{2}\right) \geq \frac{t}{\pi}$ and $|\cos nt| \leq 1$.

$$\overline{K_n}(t) = \frac{1}{2^{n+1}\pi} \sum_{k=0}^n \left\{ \binom{n}{k} \frac{1}{(k+1)} \sum_{v=0}^k \frac{\cos\left(v+\frac{1}{2}\right)t}{\sin\left(\frac{t}{2}\right)} \right\}$$

$$\leq \frac{1}{2^{n+1}t} \sum_{k=0}^{n} \left\{ \binom{n}{k} \frac{1}{k+1} \sum_{v=0}^{k} \right\}$$

$$= o\left(\frac{1}{t}\right)$$

Lemma 2 - For $\frac{\pi}{n+1} \leq t \leq \pi$ $\overline{K_n}(t) = o\left(\frac{1}{t^2(n+1)}\right)$ ………(5.2)

Proof - For $\frac{\pi}{n+1} \leq t \leq \pi$, $sin\left(\frac{t}{2}\right) \geq \frac{t}{\pi}$ and $|\sin t| \leq 1$.

$$\overline{K_n}(t) = \frac{1}{2^{n+1}\pi} \sum_{k=0}^{n} \left\{ \binom{n}{k} \frac{1}{(k+1)} \sum_{v=0}^{k} \frac{\cos\left(v + \frac{1}{2}\right)t}{\sin\left(\frac{t}{2}\right)} \right\}$$

$$\leq \frac{1}{2^{n+1}t} \sum_{k=0}^{n} \left\{ \binom{n}{k} \frac{1}{(k+1)} \sum_{v=0}^{k} \cos\left(v + \frac{1}{2}\right)t \right\}$$

$$= \frac{1}{2^{n+1}t} \sum_{k=0}^{n} \left\{ \binom{n}{k} \frac{1}{(k+1)} \left(\frac{-2\sin kt}{\sin\frac{t}{2}}\right) \right\}$$

.
$$\leq \frac{\pi}{2^{n+1}t^2} \sum_{k=0}^{n} \binom{n}{k} \frac{1}{k+1}$$

$$= o\left(\frac{1}{t^2(n+1)}\right)$$

Lemma 3 – If w(t) satisfies (4.1) and (4.2) then

$$\int_0^u t^{-1}w(t)dt = o\left(uH(u)\right) \qquad as \quad u \to 0^+$$ ……(5.3)

Lemma 4 – If $\psi_x(t) = \psi(t) = f(x+t) - f(x-t)$ then for $\bar{f} \in H_w$ we get

$$\left|\psi_x(t) - \psi_y(t)\right| \leq 2M\, w(|x-y|)$$ …….(5.4)

$$\left|\psi_x(t) - \psi_y(t)\right| \leq 2M\, w(|t|)$$ …….(5.5)

6. Proof of Theorem

Let $\bar{s}_n(f;x)$ denote the partial sum of series $\sum_{n=1}^{\infty}(b_n cosnx - a_n sinnx)$. Then we have

$$\bar{s}_n(x) - \bar{f}(x) = \frac{1}{2\pi} \int_0^\pi \psi_x(t) \frac{\cos\left(n+\frac{1}{2}\right)t}{\sin\left(\frac{t}{2}\right)} dt$$ ….(6.1)

The (C,1) mean of $\bar{s}_n(f;x)$ is given by

$$\overline{C_n^1 - }\bar{f}(x) = \frac{1}{2\pi(n+1)} \int_0^\pi \frac{\psi_x(t)}{\sin\left(\frac{t}{2}\right)} \sum_{k=0}^{n} \cos\left(k+\frac{1}{2}\right)t\, dt$$ …….(6.2)

Now (E,1) (C,1) transform of $\bar{s}_n(f;x)$ is denoted by t_n^{-EC} we can write as

$$t_n^{-EC}(f) - \bar{f}(x) = \frac{1}{2^{n+1}\pi} \sum_{k=0}^{n} \left[\binom{n}{k} \int_0^\pi \frac{\psi_x(t)}{\sin\left(\frac{t}{2}\right)} \left(\frac{1}{k+1}\right) \left\{ \sum_{v=0}^{k} \cos\left(v+\frac{1}{2}\right)t \right\} dt \right]$$

$$= \int_0^\pi \psi_x \overline{K_n}(t)dt$$ …..(6.3)

Where $\quad \bar{K}_n(t) = \frac{1}{2^{n+1}\pi} \sum_{k=0}^{n} \left\{ \binom{n}{k} \left(\frac{1}{k+1}\right) \sum_{v=0}^{k} \frac{\cos\left(v+\frac{1}{2}\right)t}{\sin\left(\frac{t}{2}\right)} \right\}$ ...(6.4)

$E_n(x,y) = |E_n(x) - E_n(y)| = \int_0^\pi |\psi_x(t) - \psi_y(t)| \bar{K}_n(t) dt$

$\quad = \left[\int_0^{\frac{\pi}{n+1}} + \int_{\frac{\pi}{n+1}}^{\pi} \cdot \right] |\psi_x(t) - \psi_y(t)| \bar{K}_n(t) dt$

$\quad = I_1 + I_2 \quad$ (Say) ....(6.5)

Using (5.5) and (5.1) assume that w(t) satisfies (4.1) and (4.2); we get

$$I_1 = \int_0^{\frac{\pi}{n+1}} |\psi_x(t) - \psi_y(t)| \bar{K}_n(t) dt$$

$$= \int_0^{\frac{\pi}{n+1}} t^{-1} w(t) \, dt$$

$$= o((n+1)^{-1}) H\left(\frac{\pi}{n+1}\right) \qquad ....(6.6)$$

Using (5.5) and (5.2) assume that w(t) satisfies (4.1) and (4.2); we get

$$I_2 = \int_{\frac{\pi}{n+1}}^{\pi} |\psi_x(t) - \psi_y(t)| \bar{K}_n(t) dt$$

$$= o\left(\frac{1}{n+1}\right) \int_{\frac{\pi}{n+1}}^{\pi} t^{-2} w(t) \, dt$$

$$= o((n+1)^{-1}) H\left(\frac{\pi}{n+1}\right) \qquad ...(6.7)$$

Now using (5.4) and (5.1) we get

$$I_1 = \int_0^{\frac{\pi}{n+1}} |\psi_x(t) - \psi_y(t)| \bar{K}_n(t) dt$$

$$= o(w|x-y|) \int_0^{\frac{\pi}{n+1}} t^{-1} \, dt$$

$$= \quad o(w|x-y| \log(n+1)).$$

Again using (5.4) and (5.2) we get

$$I_2 = \int\limits_{\frac{\pi}{n+1}}^{\pi} \left|\psi_x(t) - \psi_y(t)\right| \bar{K}_n(t) dt$$

$$= o\left(\frac{w|x-y|}{n+1}\right) \int_{\frac{\pi}{n+1}}^{\pi} t^{-2} dt$$

$$= o(w|x - y|).\qquad\qquad\qquad ....(6.9)$$

Using the fact that we can write $I_k = I_k^{1-\frac{\beta}{\alpha}} \; I_k^{\frac{\beta}{\alpha}}$, $k = 1,2$

Combining(6.6) and(6.8) we get

$$I_1 = o\left(\left[((n+1)^{-1}) H\left(\frac{\pi}{n+1}\right)\right]^{1-\frac{\beta}{\alpha}} [(w|x-y|\log(n+1))]^{\frac{\beta}{\alpha}}\right) \qquad ......(6.10)$$

Combining(6.7) and(6.9) we get

$$I_2 = o\left(\left[((n+1)^{-1}) H\left(\frac{\pi}{n+1}\right)\right]^{1-\frac{\beta}{\alpha}} [(w|x-y|)]^{\frac{\beta}{\alpha}}\right) \qquad ......(6.11)$$

Now from (2.7),(6.10) and (6.11) we have

$$\sup_{x,y}\left|\Delta^{w^*} E(x,y)\right| = \sup_{x,y}\frac{\left|E_{n(x)} - E_{n(y)}\right|}{w^*(|x-y|)}$$

$$= o\left\{\frac{w(|x-y|)^{\frac{\beta}{\alpha}}}{w^*(|x-y|)} (\log(n+1))^{\frac{\beta}{\alpha}} \left((n+1)^{-1} H\left(\frac{\pi}{n+1}\right)\right)^{1-\frac{\beta}{\alpha}}\right\} \qquad ....(6.12)$$

Since $\quad \|E_n(x)\|_c = \sup_{0 \le x \le 2\pi} \left|t_n^{-EC}(f) - \bar{f}(x)\right| \qquad ....(6.13)$

From (6.6) and (6.7) we get

$$\|E_n(x)\|_c = o\left(((n+1)^{-1}) H\left(\frac{\pi}{n+1}\right)\right) \qquad .....(6.14)$$

Combining (6.12) and (6.14) we get

$$\left\|t_n^{-EC}(f) - \bar{f}(x)\right\|_{w^*} = o\left\{\frac{w(|x-y|)^{\frac{\beta}{\alpha}}}{w^*(|x-y|)} (\log(n+1))^{\frac{\beta}{\alpha}} \left(((n+1)^{-1}) H\left(\frac{\pi}{n+1}\right)\right)^{1-\frac{\beta}{\alpha}}\right\}$$

This complete the proof of theorem.

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NON LINEAR STATIC ANALYSIS FOR RC FRAMED RESIDENTIAL BUILDING USING SAP2000

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ABSTRACT:
This research presents the steps used in performing a pushover analysis of a simple three-dimensional building of existing five storied located in seismic zone-v. SAP2000, a state-of-the-art, general-purpose three-dimensional structural analysis program, is used as a tool for performing the Pushover Analysis. According to pushover analysis the vertical distribution of static monotonically increasing lateral loads is applied to a mathematical model of the structure. The loads are increased until the peak response of the structure is obtained on a base shear vs. roof displacement plot. From this plot, and other parameters representing the expected, or design, earthquake, the maximum deformations the structure is expected to *undergo during the design seismic event can be estimated*. After completion of pushover analysis the performance point and developing of plastic hinges for each storey can be identified.

INTRODUCTION:
The recent advance of performance based design has brought the nonlinear static pushover analysis procedure to the forefront. Pushover analysis is a static, nonlinear procedure in which the magnitude of the structural loading is incrementally increased in accordance with a certain predefined pattern. With the increase in the magnitude of the loading, weak links and failure modes of the structure are found. The loading is monotonic with the effects of the cyclic behaviour and load reversals being estimated by using a modified monotonic force-deformation criteria and with damping approximations. Static pushover analysis is an attempt by the structural engineering profession to evaluate the real strength of the structure and it promises to be a useful and effective tool for performance based design. In light of these facts, it is imperative to seismically evaluate the existing building with the present day knowledge to avoid the major destruction in the future earthquakes.

Research Approach:
The general finite element package SAP 2000 has been used for the analyses. A three dimensional model of each structure has been created to undertake the non linear analysis. Beams and columns are modelled as nonlinear frame elements with lumped plasticity at the start and the end of each element. SAP 2000 provides default-hinge properties and recommends P-M-M hinges for columns and M3 hinges for beams as described in (**FEMA-356 ,2000**).Based on the location of hinges and location of performance point the damage intensity of the building can be evaluated and suitable retrofitting methods and materials are suggested for seismic strengthening of building.

A pushover analysis is performed by subjecting a structure to a monotonically increasing pattern of lateral loads, representing the inertial forces which would be experienced by the structure when subjected to ground shaking. Under incrementally increasing loads various structural elements may yield sequentially. Consequently, at each event, the structure experiences a loss in stiffness. Using a pushover analysis, a characteristic non linear force displacement relationship can be determined. Based on the results obtained from pushover analysis various retrofitting techniques for each individual elements of building are adopted to strengthen the building under seismic action.

Use of Push over curve or Capacity curve:

a) We can construct Capacity Spectrum
b) Estimation of Equivalent Damping
c) Determination of Demand Spectrum
d) Determination of Performance Point
e) And Verify Acceptance

Base shear (v)

Lateral deflection (d)
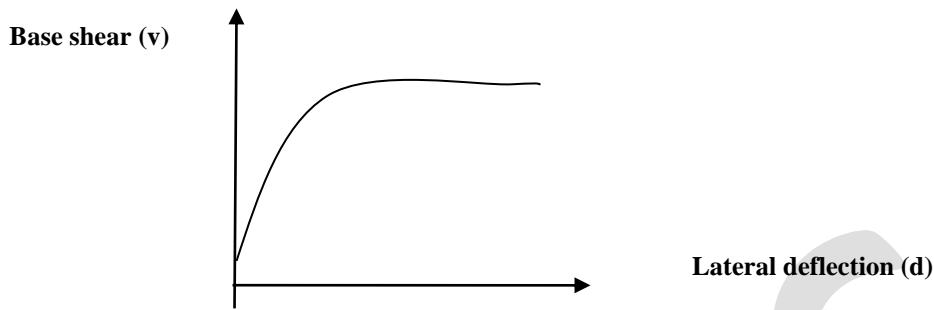
Earthquake Lateral Loads:

The design lateral loads at different floor levels are calculated corresponding to fundamental time period and are applied to the model. The method of application of this lateral load varies for rigid and flexible floor diaphragms. In rigid floor idealization the lateral load at different floor levels are applied at center of rigidity of that corresponding floor in the direction of push in order to neglect the effect of torsion. The steps as follows,

1. Modal analysis is performed to obtain modal periods/frequencies.
2. Calculate the Seismic weight of each floor: Which is its full dead load plus appropriate amount of imposed load. While computing the seismic weight of each floor, the weight of columns and walls in any storey shall be equally distributed to the floors above and below the storey.
3. Calculate the total Base shear: Design seismic base shear (V_b) is calculated according to clause 6.2.4 of IS: 1893-2002.The response spectrum ordinates used are for Type –I (Medium soil) for 5% damping and for seismic Zone-V. The design seismic base shear (V_b) can also be calculated from SAP 2000 Nonlinear using Response Spectrum Analysis as per IS: 1893-2002. The total base shear is given by,

$$V_b = A_h W \quad ……………. \quad (a)$$
$$A_h = \frac{Z I (Sa/g)}{2R} \quad ……………. \quad (b)$$

Where,

Z = Zone factor given in table 2 of IS: 1893 -2002
I = Importance factor given in table 6 of IS: 1893-2002
R = Response reduction factor given in table 7 of IS: 1893-2002

Sa/g = Average response acceleration coefficient.

W = Total Seismic Weight of the Structure.
A_h = is the design horizontal seismic coefficient.

4. Calculation of Lateral Loads: The design Base Shear distributed along the building height as per IS code and ATC-40 for parabolic and triangular, uniform lateral load distributions. IS parabolic lateral load (PLL) at floor 1 is given by,

$$Q_{pi} = V_b. \frac{W_i .h_i^2}{\sum W_j h_j^2} \quad . …………… \quad (c)$$

$$Q_{pi} = V_b .\frac{W_i .h_i^2}{\sum W_j h_j} \quad ……………… \quad (d)$$

$$Q_{pi} = V_b. \frac{W_i .h_i^2}{\sum W_j} \quad …………….. \quad (e)$$

Where,

Q_{pi} = Lateral loads as per IS: 1893-2002 and ATC-40 at each floor level

W = Total seismic weight the structure

W_i = Seismic weight of floor i

h_i = Height of floor measured from base

n = Number of levels at which the masses are lumped.

RESULTS AND DISCUSSIONS:

Seismic Analysis of a Five storey Building

A five storey building for residential building has plan dimensions as shown in Figure 54. The building is located in seismic Zone-V on a site with medium soil. Designing the building for seismic loads as per IS 1893 (Part 1): 2002.

1. The building will be used for residential purpose, only external walls 230 mm thick with 12 mm plaster on both sides are considered. For simplicity in analysis, no balconies are used in the building.
2. At ground floor, slabs are not provided and the floor will directly rest on ground. Therefore, only ground beams passing through columns are provided as tie beams. The floor beams are thus absent in the ground floor.
3. Secondary floor beams are so arranged that they act as simply supported beams and that maximum number of main beams get flanged beam effect.
4. The main beams rest centrally on columns to avoid local eccentricity.
5. For all structural elements, M20 grade concrete will be used.
6. The Sizes of all columns in upper floors are kept the same, however for columns up to plinth, sizes are increased.
7. The floor diaphragms are assumed to be rigid.
8. Centre-line dimensions are followed for analysis and design. In practice, it is advisable to consider finite size joint width.
9. Preliminary sizes of structural components are assumed by experience.
10. For analysis purpose, the beams are assumed to be rectangular so as to distribute slightly larger moment in columns. In practice a beam that fulfils requirement of flanged section in design, behaves in between a rectangular and a flanged section for moment distribution.
11. However, it is mandatory in seismic Zone-V.
12. Seismic loads will be considered acting in the horizontal direction (along either of the two principal directions) and not along the vertical direction, since it is not considered to be significant.
13. All dimensions are in mm, unless specified otherwise.
14. Selection of building plan and its dimensions were given below.

Building plan and Dimensions Details:

The following are the specifications of existing G+4 building and location is in zone V.

1. Plinth Area: 150 m^2
2. Height of Ground floor – 4.0 m
3. Remaining floors – 3.5 m each.
4. Slab thickness=130mm
5. Thickness of wall: 230mm
6. Beam sizes: 230mm×300mm (Remaining)
                     230mm×350mm (outer beams)
7. Column sizes: 230mm×300mm (Remaining)
                     230mm×350mm (corner columns)
8. Materials: Grade of steel –HYSD
9. Grade of concrete – M20
10. Density on concrete = 25 KN/m^3
11. LL on floors = 2 KN/m^2
12. Density of wall = 19KN/m^3

Calculation of Mass Distribution along floor height

Mass for various floor levels

Floor levels	Height in meters 'm'	Mass KN-s^2/m

1-1	4	73.26
2-2	7.5	72.66
3-3	11	72.66
4-4	14.5	72.66
5-5	18	68.76

Co-ordinates of Centre of Mass at various floor levels

Co-ordinates of Mass at various floor levels

Floor levels	Height in Meters (m)	Co-ordinate in X-direction	Co-ordinate in Y-direction
1-1	4	5	7.5
2-2	7.5	5	7.5
3-3	11	5	7.5
4-4	14.5	5	7.5
5-5	18	5	7.5

Calculation of Dead loads and Live loads

Earthquake Load Generation Method: Frame Stiffness Method (Direct Analysis Method) Wall Load Transfer Type: Half Wall Load is transferred on floor.

Total Weight calculation

Floor - Level	Dead Load KN	Live Load KN	Live Load Percentage	Effective Live Load KN
1-1	1444.08	450.00	25.00	112.50
2 -2	1995.36	450.00	25.00	112.50

3 -3	1995.36	450.00	25.00	112.50
4 -4	1995.36	450.00	25.00	112.50
5 -5	1954.11	450.00	0.00	0.00
Total	**9384.28**	**2250.00**	**- -**	**450.00**

Calculation of Lateral forces at each storey

Lateral force and Base shear of each storey

Floor Level	W_i (KN)	h_i in 'm'	$W_i h_i^2 \times 10^{-3}$	$\dfrac{W_i h_i^2}{\sum W_i h_i^2}$	$Q_i = \dfrac{W_i h_i^2 . V_b}{\sum W_i h_i^2}$ (KN)	V_i (KN)
1-1	2400	4	38400	0.024	25	25
2-2	2400	7.5	135000	0.087	89.26	114.26
3-3	2400	11	290400	0.187	191.86	306.12
4-4	2400	14.5	504600	0.326	334.4	640.52
5-5	1800	18	583200	0.375	384.75	1026
Total			**1551600**		**1026**	

Bending moment and Shear force results using SAP2000

The Bending moment and Shear force diagrams along XZ, YZ directions of each bay for five storied building by using SAP2000 are presented below.
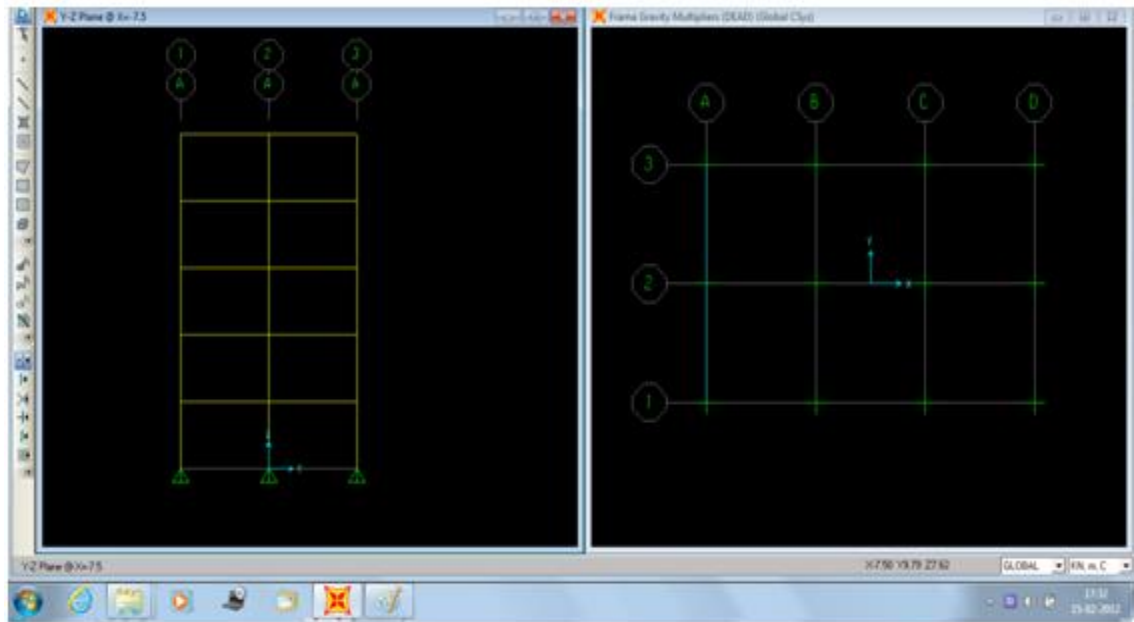
Showing elevation along 123 direction and Plan of five storied building
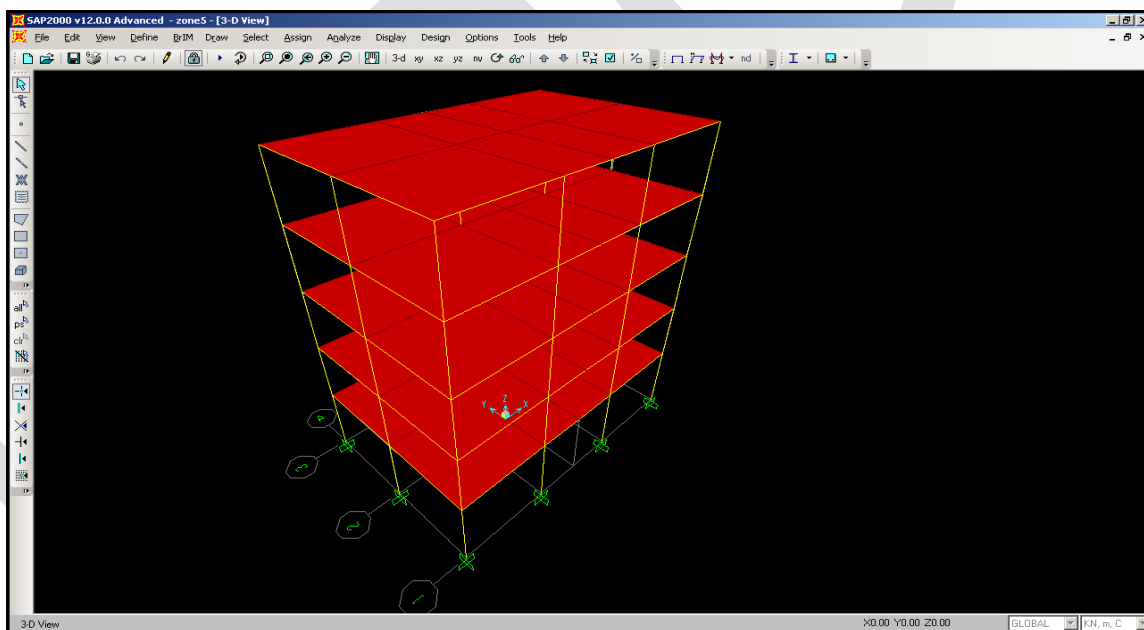
showing 3D View of five storied building
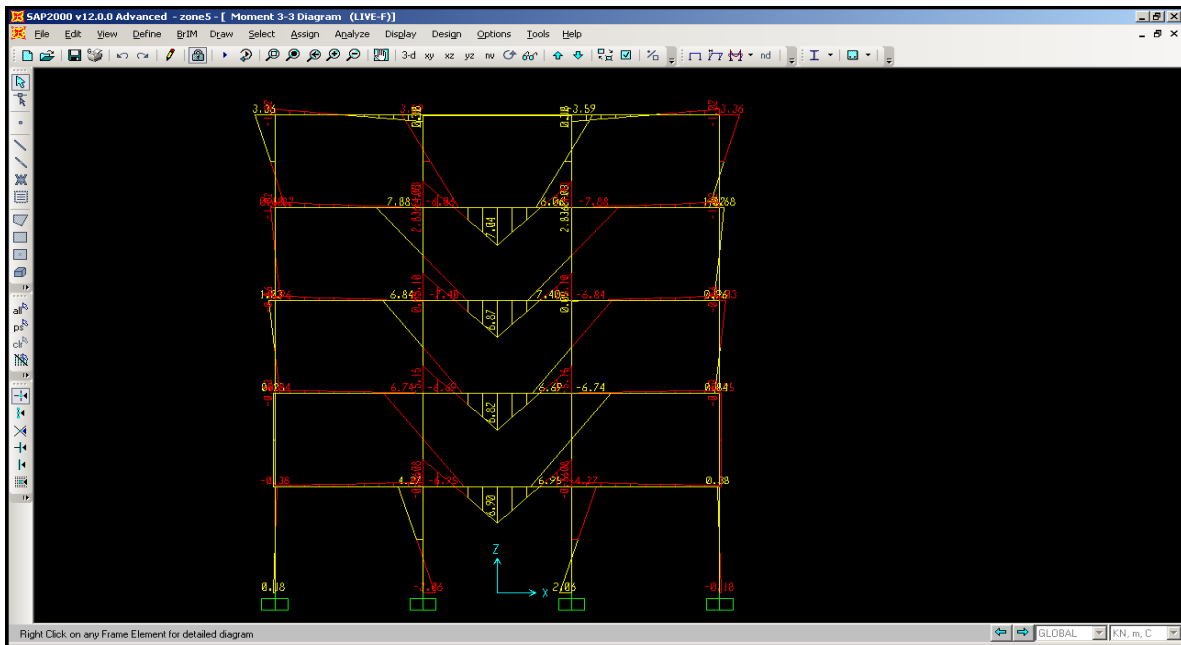
Showing Bending moment due to live load in XZ plane @Y=0

➢ The maximum bending moment due to live load in XZ plane @Y=0 is 7.88 KN-m
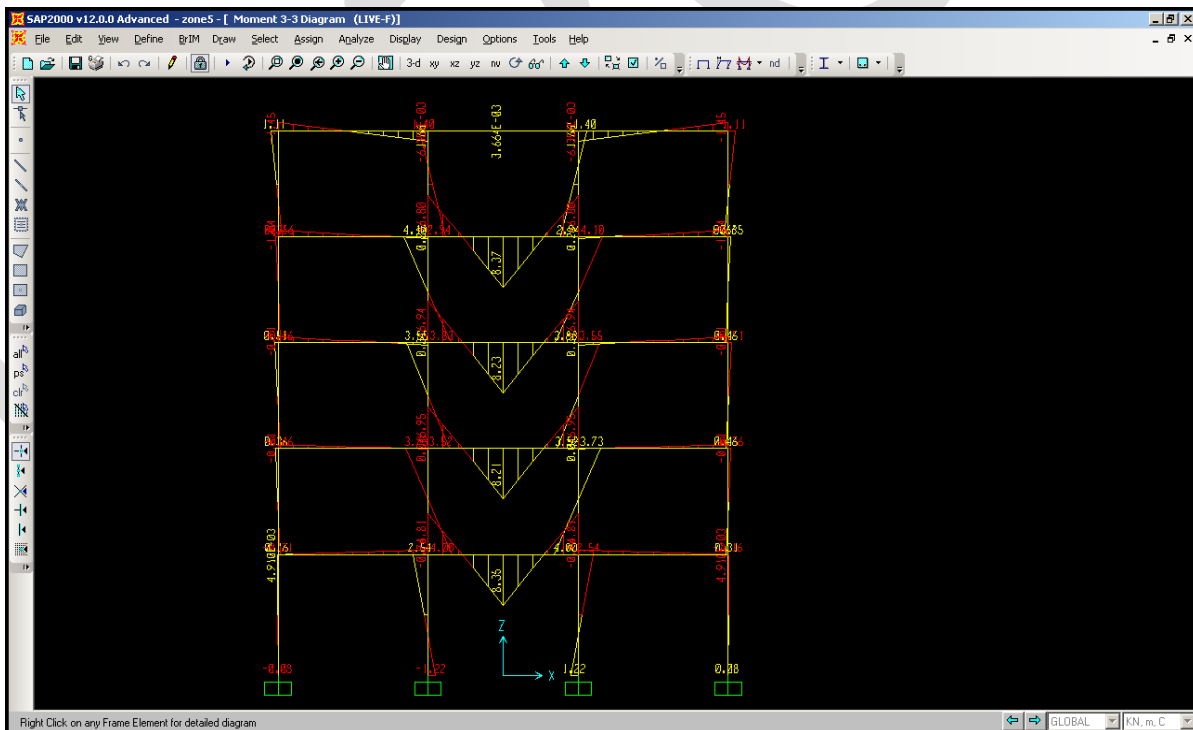
Showing Bending moment due to live load in XZ plane @Y=5m

➢ The maximum bending moment due to live load in XZ plane @Y=5m is 8.38KN-m
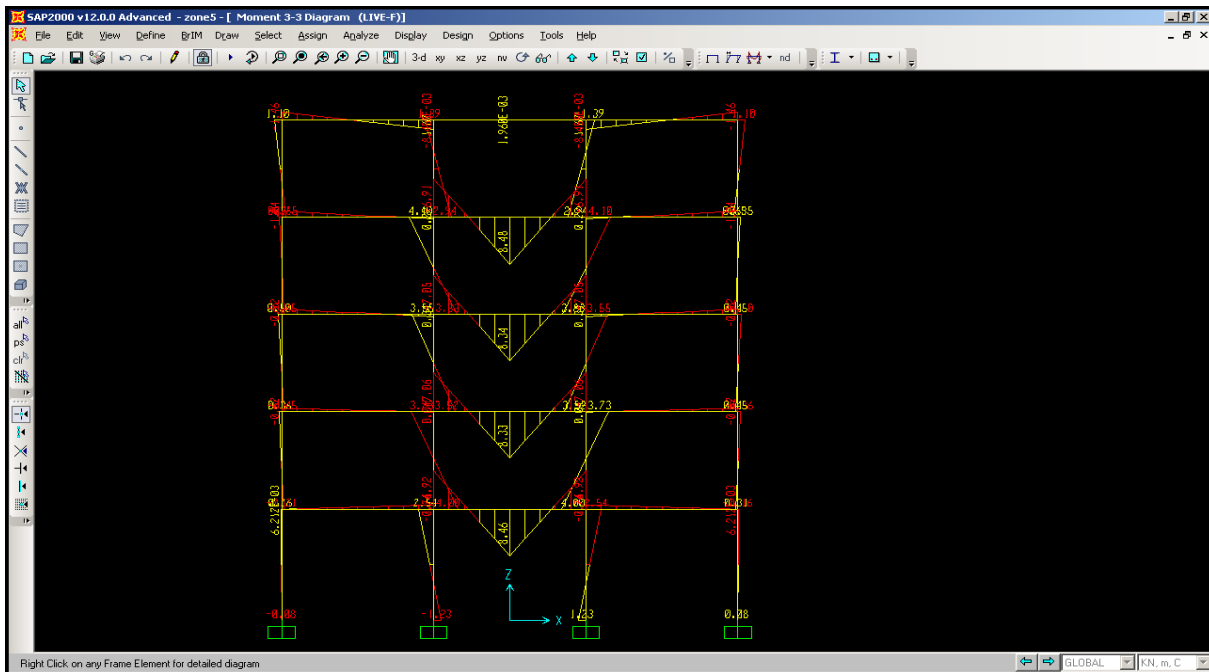
Showing Bending moment due to live load in XZ plane @Y=-5m

➢ The maximum bending moment due to live load in XZ plane @Y= -5m is 8.48 KN-m

CONCLUSION:
1. The pushover analysis is a useful tool for accessing inelastic strength and deformation demands and for exposing design weakness. The pushover analysis is a relatively simple way to explore the non linear behavior of buildings. The behavior of reinforced concrete framed building is adequate by indicating in terms of demand and capacity curves, and hinges are developed in beams.

2. After completion of pushover analysis the pushover curve is obtained. In this study both capacity and demand curves are intersected in between immediate occupancy and life safety zone. Such that building experiences moderate damage when subjected to pushover loads in seismic Zone-V.

3. For peak lateral load of 384.75 KN plastic hinges formation starts with beam ends and base columns of lower stories then propagates to upper stories and continue with yielding of interior intermediate columns in the upper stories.

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PROPERTIES OF MULTI COMPONENT COMPOSITE CEMENT CONCRETE

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ABSTRACT:

The aim of the experimental investigation is to understand the behavior of concrete produced from multi component composite cements. In this study, cement is replaced with various pozzolanic materials up to 65% and the mechanical properties have been evaluated. The pozzolanic materials used in this investigation are fly ash, rice husk ash, silica fume and metakaolin in varying parentages up to 35%. The fly ash and rice husk ash percentages are kept constant throughout the experimental investigation as 15% and 7.5% respectively. Compressive strength, split tensile strength, flexural strength and modulus of elasticity tests were conducted on M25 grade concrete standard specimens. The results were then compared with the controlled concrete. Based on the experimental investigation, it can be observed that the various strength properties of concrete are completely depends on the metakaolin replacement levels. As the metakaolin content increases upto 12.5% the strength of concrete increases. The results showed that the combination of 15% fly ash, 7.5% Rice husk ash, silica fume 0% and 12.5% Metakaolin 12.5% results in improved strength properties of concrete compared to the controlled concrete.

Key Words: Fly ash, Rice Husk Ash, Silica fume, Metakaolin, Compressive strength, Spilt tensile strength, Flexural strength and Modulus of elasticity.

1.0 INTRODUCTION

In the last few decades, industrial by-products such as fly ash, silica fume, metakaolin, and ground granulated blast-furnace slag have been increasingly used as mineral additives in the preparation of concrete. The production of cement is an energy intensive process, resulting in emission of green house gases which adversely impact on the environment. At the same the cost of production of cement is increasing at alarming rate and natural resources used for manufacturing are cement are depleting. The use of industry by-products having cementitious properties as a replacement of cement in the preparation of concrete has become the thrust area for construction material experts and researchers. The use of these pozzolans can achieve not only economical and ecological benefits but technical benefits as well. It is generally agreed that with proper selection of admixture, mixture proportioning, and curing technique, mineral additives can greatly improve the strength and durability characteristics of concrete.

2.0 OBJECTIVE

The main objective of the experimental investigation is to find the proportions of the multi component composite cement concrete. In this study, cement is replaced with pozzolanic materials upto 65% and the mechanical properties of the concrete have been evaluated. The pozzolanic materials used in this investigation are fly ash, rice husk ash, silica fume and Metakaoline in varying parentages up to 35%. The fly ash and rice husk ash percentages are kept constant for all mixes as 15% and 7.5% respectively. Compressive strength, split tensile strength, flexural strength and modulus of elasticity of concrete are to be obtained and the results have to be compared with the controlled concrete.

3.0 EXPERIMENTAL PROGRAME

3.10 Materials

3.11 Cement

The cement used for present study was 53 grade Ordinary Portland cement confirming to IS: 8112-1989.

3.12 Fine aggregate

Locally available river sand confirming to IS specifications was used as the fine aggregate for the concrete preparation. The properties of fine aggregate are shown in Table 1.

Table 1: Properties of Fine Aggregate

S.No	Property	Values
1	Specific Gravity	2.56
2	Fineness Modulus	0.95
3	Grading of Sand	Zone – II

3.13 Coarse aggregate

Coarse aggregate of nominal size 20 mm and 12.5 mm, obtained from the local quarry confirming to IS specifications was used. The properties of coarse aggregate are shown in Table.2. The coarse aggregate used for the preparation of concrete is a mixture of 60% of 20 mm and 40% of 12.5 mm size aggregates.

Table 2: Properties of Coarse Aggregate

S.NO	PROPERTY	VALUES
1	Specific Gravity	2.61
2	Water Absorption	0.4%

3.14 Fly ash

Fly ash used in this present experimental study is obtained from ASTRRA chemicals, Chennai. The properties of fly ash are indicated in the Table 3 and Table 4.

Table 3: Physical Properties of Fly Ash

Colour	White grey
Specific gravity	2.28
Bulk Density	0.994 gm/cc

Table 4: Chemical Properties of Fly Ash

SiO_2	59.00%
Al_2O	21.00%

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Fe$_2$O$_3$	3.70%
CaO	6.90%
MgO	1.40%
SO$_3$	1.00%
K$_2$O	0.90%
LOI	4.62%

3.15 Rice Husk Ash

Rice husk ash used in this present experimental study is obtained from ASTRRA chemicals, Chennai. Properties of rice husk ash are shown in the Table 5 and Table 6.

Table 5: Physical Properties of Rice Husk Ash

Colour	Off White
Specific gravity	2.25
Bulk Density	0.39 gm/cc

Table 6: Chemical Properties of Rice Husk Ash

Silica	SiO$_2$	88.90%
Alumina	Al$_2$O	2.50%
Ferric Oxide	Fe$_2$O$_3$	2.19%
Calcium Oxide	CaO	0.22%
Total Alkalies	(Na$_2$O+K$_2$0	0.69%
Loss on Ignition		4.01%

3.16 Silica fume

Silica fume is a by-product resulting from the reduction of high quantity quartz with coal in electric arc in the manufacture of silicon or ferrosilicon alloy. And it is obtained from ASTRRA chemicals, Chennai. The properties of silica fume are indicated in the Table 7 and Table 8.

Table 7: Physical properties of Silica Fume

S.No.	Properties	Results
1	Physical State	Micronised Powder
2	Odour	Odourless
3	Appearance	White Colour Powder
4	Colour	White
5	Pack Density	0.76 Gm/Cc
6	Ph Of 5% Solution	6.90
7	Specific Gravity	2.63
8	Moisture	.058%
9	Oil Absorption	55 ml / 100 gms

Table 8: Chemical properties of Silica Fume

S.No.	Property	Results
1	Silica (SiO_2)	99.886%
2	Alumina (Al_2O2)	0.043%
3	Ferric Oxide (Fe_2O_3)	0.040%
4	Titanium Oxide (TiO_2)	0.001%
5	Calcium Oxide (CaO)	0.001%
6	Magnesium Oxide (MgO)	0.000%
7	Pottasium Oxide (K_2O)	0.001%
8	Sodium Oxide (Na_2O)	0.003%
9	Loss On Ignition	0.015%

3.17 Metakaolin

Another pozzolanic material used in this investigation is metakaolin. Metakaolin is a dehydroxylated form of the clay mineral kaolinite. Stone that are rich in kaolinite are known as china clay or kaolin, traditionally used in the manufacture of porcelain. The particle size of metakaolin is smaller than cement particles, but not as fine as silica fume. Metakaolin used in this present experimental study is obtained from ASTRRA chemicals, Chennai. Properties of metakaolin are given in the Table 9 and Table 10.

Table 9: Physical Properties of Metakaolin

Properties	Value
Density (gm/cm^3)	2.17
Bulk density (gm/cm^3)	1.26
Particle shape	Spherical
Colour	Half-white
Specific gravity	2.1

Table 10: Chemical Properties of Metakaolin

Constituent	Values
Silica	53%
Alumina	43%
Iron Oxide	0.5%
Calcium Oxide	0.1%
Sulphate	0.1%
Sodium Oxide	0.05%

Potassium Oxide	0.4%

3.18 Superplasticizer

Superplasticizer used in this investigation is MYK Save Mix SP200 based on Sulphonated Naphthalene Polymers having a specific gravity of 1.25 and is supplied as a brown liquid instantly dispersible in water. MYK Save Mix SP200 has been specially formulated to give water reductions up to 25% without loss of workability and to produce high quality concrete of reduced permeability.

3.19 Water

Water fit for drinking is generally considered for making concrete. Water should be free from acids, oils, alkalis, vegetables or other organic Impurities. The local drinking water free from the impurities has been used in this experimental programme for mixing and curing.

3.20 CONCRETE MIX DESIGN

M25 grade of concrete was designed as per the Indian Standard code of practice. The percentage replacement of various pozzolanic materials in concrete mixes is as shown in the Table 11.

Table 11: Percentage Replacement Levels of Cement by Various Pozzolanic Materials

	Cement %	Fly Ash %	Rice Husk Ash %	Silica fume %	Metakaolin %
Mix-1	100	0	0	0	0
Mix-2	65	15	7.5	7.5	5
Mix-3	65	15	7.5	5	7.5
Mix-4	65	15	7.5	0	12.5
Mix-5	65	15	7.5	12.5	0

3.30 TEST SPECIMENS

The Cubes of size $150 \times 150 \times 150$ mm, cylinders with dimension of 150 mm diameter and 300 mm height and prisms with dimension of $100 \times 100 \times 500$ mm are prepared for each type of mix to obtain the compressive strength, split tensile strength, flexural strength and modulus of elasticity of concrete.

4.0 RESULTS AND DISCUSSIONS

4.10 Compressive strength:

The variation of compressive strength of concrete containing various percentages of pozzolanic materials at the age of 3, 7, and 28 days is shown in Fig. 1. The compressive strength of controlled concrete is at the age 28 days are 32.3 MPa. It can be observed that the compressive strength of concrete prepared with the combination of 65% of OPC, 15% of fly ash, 7.5% of rich husk ash and 12.5% of metakaolin is 34.2MPa.
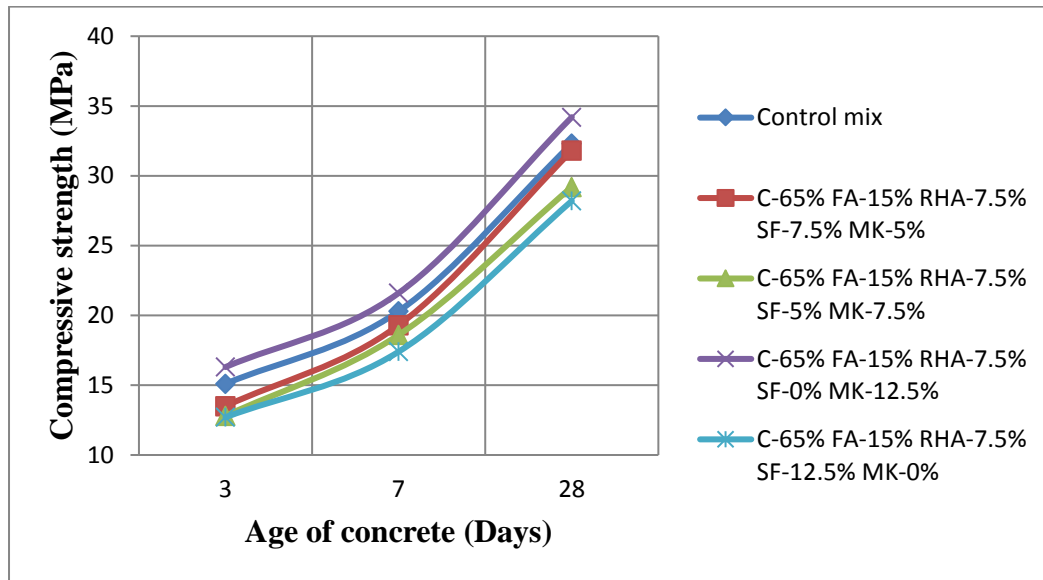
Fig 1: Variation of Cube Compressive Strength of Various Types of Concrete Mixes.

4.20 Split Tensile Strength

Fig. 2 shows variation of the split tensile strength of various concrete mixes containing different percentages of pozzolanic materials. The split tensile strength of controlled concrete is 3.44 MPa. It can be observed that the split tensile strength of concrete prepared with the combination of 65% of OPC, 15% of fly ash, 7.5% of rich husk ash and 12.5% of metakaolin is 3.86 MPa.
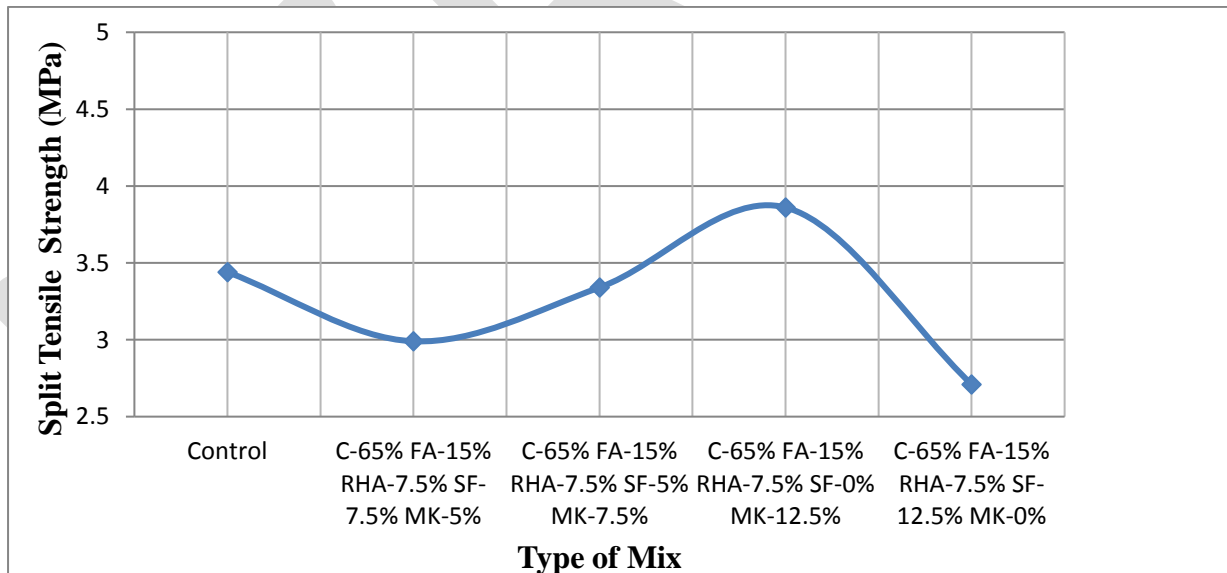
Fig 2: Variation of Split Tensile Strength of Various Types of Concrete Mixes.

4.30 Flexural strength

Fig. 3 shows the variation of flexural strength of various concrete mixes containing various pozzolanic materials. The flexural strength of controlled concrete is 4.62 MPa. It can be observed that the flexural strength of concrete prepared with the combination of 65% of OPC, 15% of fly ash, 7.5% of rich husk ash and 12.5% of metakaolin is 5.43 MPa.
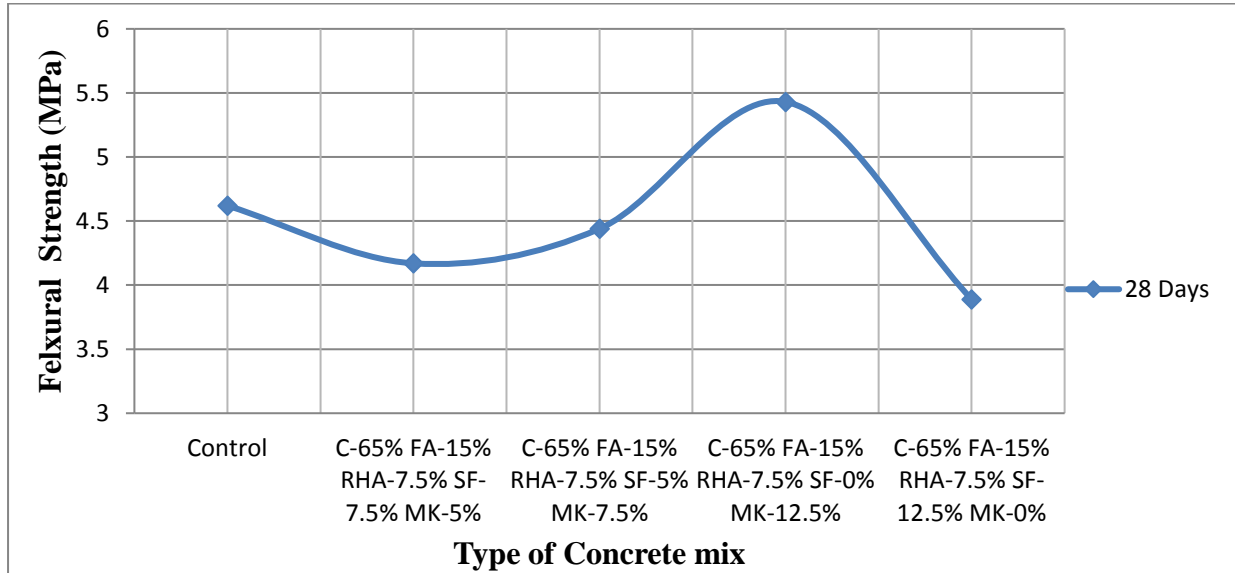
Fig 3: Variation of Flexural strength of Various Types of Concrete Mixes.

4.40 Modulus of elasticity

Fig. 4 shows the variation of modulus of elasticity of various concrete mixes containing various pozzolanic materials. The modulus of elasticity of controlled concrete is 25.2 GPa. It can be observed that the modulus of elasticity of concrete prepared with the combination of 65% of OPC, 15% of fly ash, 7.5% of rich husk ash and 12.5% of metakaolin is 25.9 GPa.
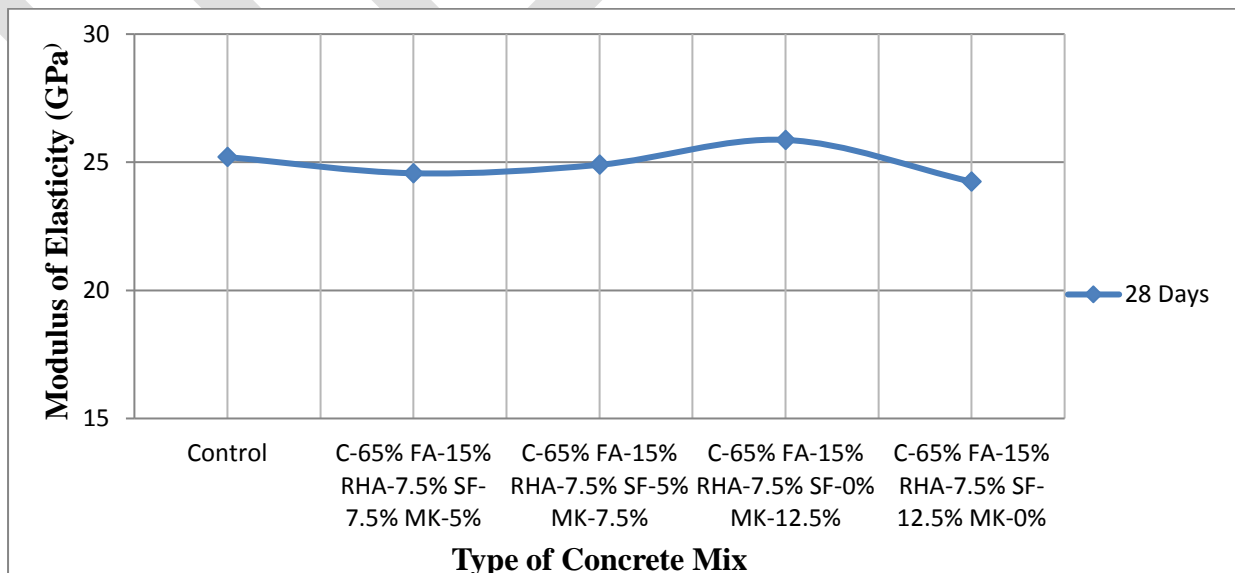
Fig 4: Variation of Modulus of Elasticity of Various Types of Concrete Mixes.

5.0 CONCLUSIONS

The main aim of the study is to obtain the suitability material as replacement of OPC in concrete. The variation of compression strength, split tensile strength, flexural strength and modulus of elasticity of various concrete mixes is obtained. The silica fume, metakaolin and rice husk ash are expensive compared to cement leading to increase in the cost of production of multi-component cement concrete. But, the reduction in the demand of cement of protects our environment from pollution.

The following conclusions are drawn from the study

1. The result shows the blending of material hasn't compromised on strength of concrete.
2. The partial replacement of OPC in concrete by industry by-products facilitates environmental friendly disposal of the waste which is generated in huge quantities by various industries.

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A REVIEW ON ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING

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Abstract—Due to the high data rate transmission and the ability to against frequency selective fading, orthogonal frequency division multiplexing (OFDM) is a promising technique in the current broadband wireless communication system. Orthogonal frequency division multiplexing (OFDM) is the recent trend in wireless technology. So, in this paper various techniques has been presented to enhance OFDM network.

Keywords— Channel estimation, Orthogonal Frequency-Division Multiplexing (OFDM), Wireless Communication, Modulation, Genetic Algorithm, Bacterial Foraging Optimization Algorithm.

INTRODUCTION

Now-a-days, OFDM is of great interest to researchers all over the world [1]. In OFDM, the entire channel is splitted into many narrow parallel sub channels, so the duration of symbol is increased and the inter symbol interference (ISI) produced by the multi-path environments is reduced or eliminated [2, 3].OFDM supports high data rate traffic because the incoming serial data stream is divided into parallel low-rate streams that are transmitted on orthogonal sub-carriers simultaneously [4]. OFDM system has the ability of extenuating a frequency-selective fading channel to a set of parallel flat fading channels, which require simple processes for channel equalization [5]. The available spectrum in an OFDM system is divided into manifold sub-carriers and all these subcarriers are orthogonal to each other [6]. OFDM has been standardized for several applications, such as digital audio broadcasting (DAB), digital television broadcasting, wireless local area networks (WLANs), and asymmetric digital subscriber lines (ADSLs) [7, 8].

Channel estimation is one of the most salient processes in communication system [9]. A perfect channel estimation algorithm should comprise both the time and frequency domain characteristics of the OFDM systems [10]. The performance of OFDM system can be improved by allowing for coherent demodulation using an exact channel estimation algorithm [11]. In OFDM transmission system, numerous channel estimation methods have been developed under the assumption of a slow-fading channel, wherein the channel transfer function remains stable within one OFDM data block [12]. Several channel estimation techniques have already been developed for MIMO–OFDM systems. These techniques are broadly classified into three categories: (1) training-based technique, (2) blind technique, and (3) semi-blind technique, which is a combination of the first two techniques [13,14].

What is OFDM?

Orthogonal frequency division multiplexing (OFDM) is a widely used modulation and multiplexing technology, which has become the basis of many telecommunications standards including wireless local area networks (LANs), digital terrestrial television (DTT) and digital radio broadcasting in much of the world. In the past, as well as in the present, the OFDM is referred in the literature as Multi-carrier, Multi-tone and Fourier Transform. The OFDM concept is based on spreading the data to be transmitted over a large number of carriers, each being modulated at a low rate. The carriers are made orthogonal to each other by appropriately choosing the frequency spacing between them. A multicarrier system, such as FDM (aka: Frequency Division Multiplexing), divides the total available bandwidth in the spectrum into sub-bands for multiple carriers to transmit in parallel [15]. It combines a large number of low data rate carriers to construct a composite high data rate communication system. Orthogonality gives the carriers a valid reason to be closely spaced with overlapping without ICI.

Principle of OFDM

In digital communications, information is expressed in the form of bits. The term symbol refers to a collection, in various sizes, of bits [16]. The main features of a practical OFDM system are as follows:

- Some processing is done on the source data, such as coding for correcting errors, interleaving and mapping of bits onto symbols. An example of mapping used is QAM.

- The symbols are modulated onto orthogonal sub-carriers. This is done by using IFFT.

- Orthogonality is maintained during channel transmission. This can be achieved by adding a cyclic prefix to the OFDM frame to be sent. The cyclic prefix consists of the L last samples of the frame, which are copied and placed in the beginning of the frame. It must be longer than the channel impulse response.

- Synchronization: cyclic prefix can be used to detect the start of each frame. This is done by using the fact that the L first and last samples are the same and therefore correlated.

- Demodulation of the received signal by using FFT.

- Channel equalization: the channel can be estimated either by using a training sequence or sending known so-called pilot symbols at predefined sub-carriers.

- Decoding and de-interleaving.

Basic OFDM system

The OFDM signal generated by the system in Figure 1 & 2 is at baseband; in order to generate a radio frequency (RF) signal at the desired transmit frequency filtering and mixing is required. OFDM allows for a high spectral efficiency as the carrier power and modulation scheme can be individually controlled for each carrier. However in broadcast systems these are fixed due to the one-way communication. The basic principle of OFDM is to split a high-rate data stream into a number of lower rate streams that are transmitted simultaneously over a number of subcarrier
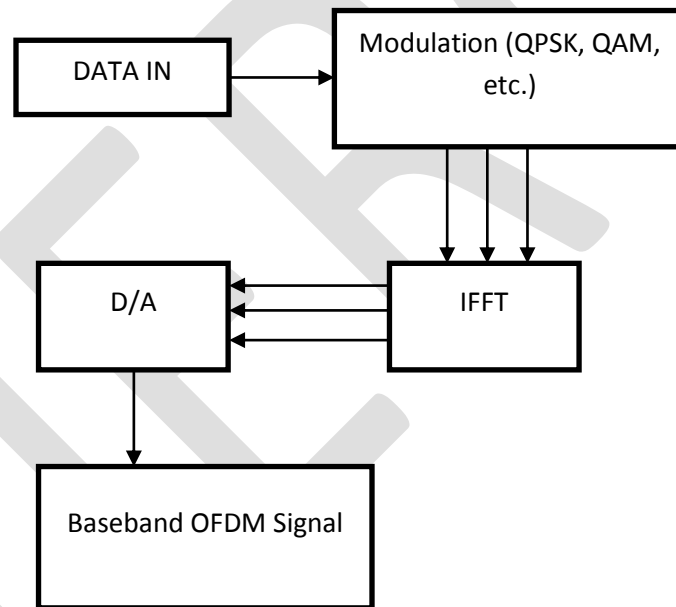
Figure 1 Transmitter
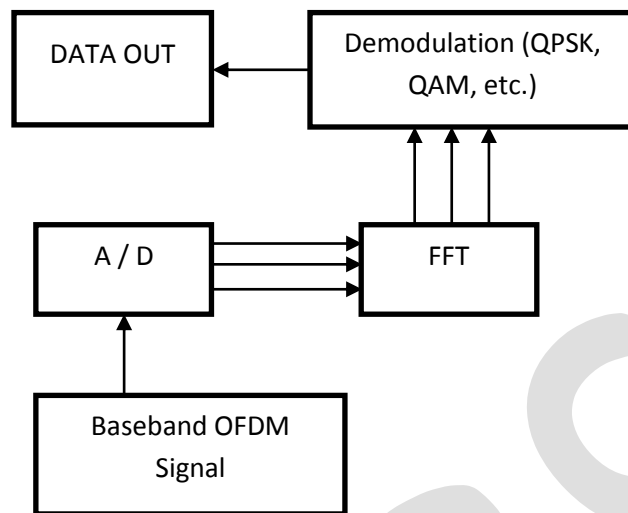
Figure 2 Receiver

The block diagram showing a simplified configuration for an OFDM transmitter and receiver is given in Fig.1 & Fig. 2.

Advantages

OFDM have several attractive features which are responsible for making it more advantageous for high speed data transmission over other data transmission techniques. They are:

- Ability to cope with severe channel conditions
- Robust against ICI and fading due to multipath propagation
- Robust against narrow-band co-channel interference
- Flexibility
- High spectral efficiency as compared to other double sideband modulation schemes
- Ease of equalization
- Efficient implementation using Fast Fourier Transform (FFT).

Disadvantages

Inspite of various advantages there are various disadvantaged of OFDM systems.

- High sensitivity to Doppler shift
- Sensitive to frequency synchronization problems
- High peak-to-average-power ratio (PAPR)
- Intercarrier Interference (ICI) between the subcarriers
- Requires a more linear power amplifier.

RELATED WORKS

Krishna .N Chaudhari et.al, 2013[15] proposed MIMO-OFDM based channel equalization. Then obtained results are compared with MLSE equalizer. From the results it has been concluded that proposed equalizer reduces the BER rate.

Nisha Achra et.al, 2013[16] proposed a work in which MIMO-OFDM performance has been measured with the two equalizers i.e. ZF and MMSE. Also they uses the three channels like AWGN, Rayleigh and Rician fading channels to implement the work.

Sandeep Kumar et.al, 2013[17] Studies the Performance Analysis of a General MIMO-OFDM System for Next Generation Communication Systems. Also it analyses various parameters like No. of antennas, modulation type, SNR, Pilot symbol etc.

Anshu Jaiswal et.al, 2014[18] author proposes review paper that includes the concept of channel estimation in MIMO-OFDM systems. OFDM systems based on pilot based channel estimation technique. To improve the accuracy, reliability of the system, there is need to have sufficient knowledge about the channel estimation. To reduce the BER, use of Channel Estimation BPSK-QPSK-PSK 16 &64 is recommended in QAM MIMO-OFDM System.

Bhavin et.al, 2014[19] proposed the utilization of ZF and MMSE equalizers to measure the performance of MIMO and OFDM system over Rayleigh channel to improve the performance.

Dejin Kong, et.al, 2014, [20] propose two channel estimation schemes, i.e., linear minimum mean square error (LMMSE) and weighted least square (WLS), and we also derive their corresponding Bayesian Cramér-Rao Bound (BCRB) and Cramér-Rao Bound (CRB) bounds, respectively. Simulation results demonstrate that the BCRB and CRB bounds could be achieved by the proposed LMMSE and WLS methods, respectively. Moreover, simulation results show that the proposed methods are much robust to the time synchronization error compared to the conventional frequency domain methods, and imply that the pulse shaping filter with waveforms concentrated in the time domain could be employed in OQAM-OFDM systems to improve the channel estimation performance and spectral efficiency.

Pratima et.al, 2014 [21] presents channel estimation scheme based on Leaky Least Mean Square (LMS) algorithm proposed for BPSK-QPSK-PSK MIMO OFDM System. By designing this they analyses the terms of the Minimum Mean Squares Error (MMSE), and Bit Error Rate (BER) and improve Signal to Noise Ratio. This estimation is taken place on pilot arrangement.

Wang Liping, 2014, [22] the author proposed the design of the completely orthogonal pilot data symbol among the different subcarriers position of different transmitting receiving antenna pair. And the pilot data symbols are distributed in the entire time-frequency grid of the channel reasonably, therefore this paper uses a FFT unit whose points are equal to the number of the OFDM subcarriers to realize the least-square channel estimation algorithm. In the process of channel estimation, the channel parameters estimation precision has increased because of the noise getting better inhibition, which reduces the least squares estimate noise sensitivity to the requirements.

VARIOUS OPTIMIZATION TECHNIQUES

Genetic Algorithm

Genetic Algorithms are adaptive heuristic search algorithm based on the evolutionary ideas of normal range and inheritance. As such they signify an intelligent operation of an arbitrary search used to solve optimization problems.
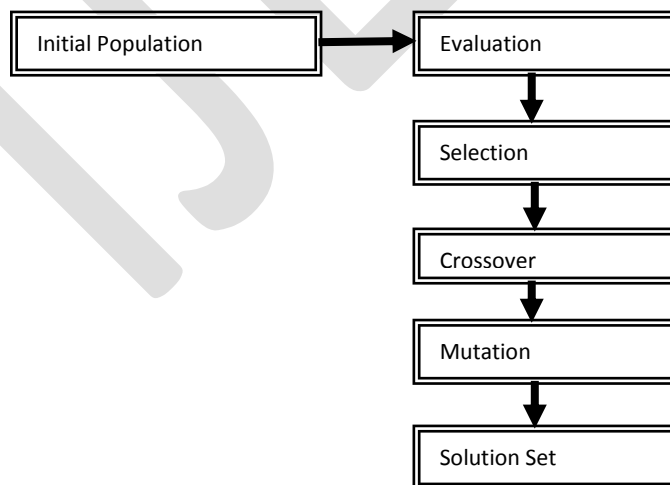

Figure 3 Genetic algorithm flowchart

Bacterial Foraging Optimization Algorithm

Bacteria Foraging Optimization algorithm is a new class of geographically confident stochastic international search technique based on mimic the foraging behavior of E. coli bacteria. This method is used for locate, handling, and ingesting the food. During foraging there can be risks due to predators, the prey may be mobile so it must be chased and the physiological characteristics of the forager constrain its capabilities and ultimate success. Bacterial Foraging optimization theory is explained by following steps.

- Chemotaxis
- Swarming
- Reproduction and
- Elimination-Dispersal
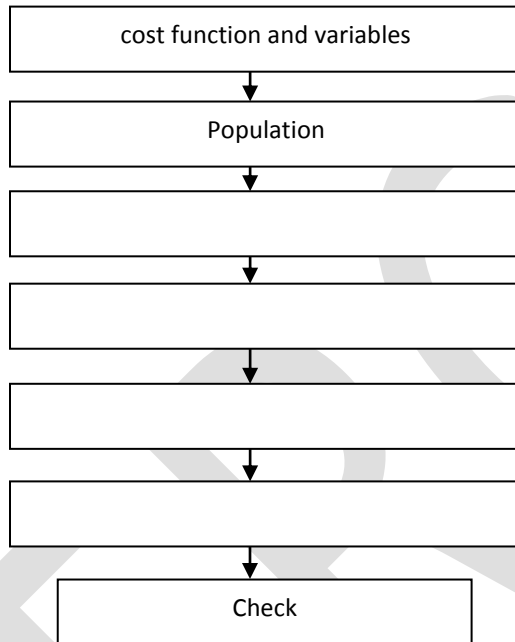
Figure 4 BFO Flowchart

CONCLUSION

These days large number of information is transmitted over communication systems. Mainly analog to digital and digital to analog links has been used these days. But modulation is very important step in communication systems. OFDM is one in which modulation takes place well. So this paper has presented various techniques like neural network, SVM and GA for optimizing the OFDM.

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Assessment of Hydropower Potential of Topchi Site at the Bamyan River in Bamyan, Afghanistan

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Abstract-For a site selection of a hydropower project, the stream flow discharges and the availability of appropriate head are fundamental considerations and the proposed site should have a good combination of these factors. In Afghanistan, there are many sites which have not been explored for the assessment of the hydropower potential or such information is scarce. A site at the Bamyan River near the Bamyan city in Afghanistan was investigated for the assessment of the hydropower potential. The gross head between the existing weir crest level and the ground level of the power house was assessed to be 35 m using Digital Elevation Model (DEM) in Arc GIS and after considering 10% head losses the net available head was estimated to be 31.5 m. The maximum and the minimum mean monthly flow rate were estimated to be 11.03 and 1.93 m^3/s, respectively. The power-law function was The Pelton turbine with 80% efficiency was identified for the proposed site.The hydropower potential was assessed to be 1720.60 KW for the maximum flow rate of 6.96 m^3/s at 15% probability level which is about to 2 times more than the estimated hydropower potential of 833.10 KW at the designed flow rate of 3.37 m^3/s at 40% probability level. The estimated hydropower potential of 1090.20 was computed at mean flow rate of 4.41 m^3/s while the minimum estimated hydropower potential of 473.57 KW was observed for the minimum flow rate of 1.77 m^3/s at 95% probability level. With the help of turbine selection chart and the hydraulic efficiency of the turbine, the Pelton turbine was selected for the proposed site.

Key words- Hydro power potential, stream flows, digital elevation model, arc Gis, pelton turbine, hydraulic efficiency, Topchi site, Afghanistan

INTRODUCTION

For the design and installation of a small hydropower plant, the assessment of the hydropower potential capacity of the proposed site is important because the hydropower potential is limited by the stream flow discharges and the available head. The intermittent nature of the stream flows have high flow discharges during the rainy seasons and very low discharges during the dry seasons. While the head at a site is constant, the available stream flow rates are highly variable necessitating the need for the study of the stream flows from the point of design and assessment of the installed capacity of a hydropower plant. The average stream flow is important from the consideration of the energy output and the minimum flows are required to predict the dependable hydropower plant capacity. So it is important to know the variations in the stream flow discharges throughout the year and the available gross head.

In Afghanistan, there are many sites which have not been explored for the assessment of the hydropower or potential and such information is scarce. One such a site is at the foot-hills of the Baba mountain ranges and is located at the Bamyan River near the Bamyan city in the Bamyan province in Afghanistan was investigated for the assessment of the hydropower potential in this study. The assessment of the hydropower potential of this proposed site at the Bamyan River requires the probability analysis of the long-term flows of the river for the selection of the maximum, mean, designed and the minimum flows at a particular probability levels. The topographic assessment of the site for the selection of the appropriate locations and alignments of the components of the power plant such as the diversion weir, forebay, penstock and the powerhouse as well as the determination of the net available head and the selection of a turbine machine that matches the designed flow discharge and the net available head are needed. So in this analysis the assessment of the hydropower potential at this proposed site was made.

METHODOLOGY

The area under this study is a part of the Kunduz watershed also called the Upper Kunduz River basin and is located at the Bamyan river near the Bamyan city in Bamyan province in Afghanistan [1]. The proposed site is at the foot-hills of the Baba mountain ranges. Wali [2] reported that the field measurements of the gross head are usually carried out either by using Digital Elevation Model (DEM), surveying techniques or by using the Global Positioning System (GPS). The generated topographic map of the watershed area and the results of the topographic survey conducted with a total station for the proposed alignment of the diversion channel and the penstock was used to propose the locations of the hydropower components and determined the designed elevations for the different components of the hydropower plant. In this study the Digital Elevation Model (DEM) 90×90 meters for the data obtained from the United States Geological Survey (USGS) website was used in the ArcGIS platform to delineate the watershed areas under study. The DEM was corrected for the depressions and then was used to generate the flow direction grids that determined the direction of the movement of the water flow from each individual grid within the watershed. The flow direction grids were then used to generate the drainage network of the watershed. The GPS point of the watershed outlets together with the above generated grids were used to delineate the watershed areas contributing water to the proposed outlets using the hydrology tools of the ArcGIS 10.2. The simulated flow of the proposed watershed was used to generate the flow duration curves (FDCs) for the site and for this the discharges were arranged in the descending order from the maximum to the minimum. The plotting position was ascertained from the most commonly used plotting position method of Weibull as described by Eq. (1) as reported by Chow[3]. The percent probability of the corresponding flow magnitude being equaled or exceeded is given as:

$$P_p = \frac{m}{N+1} \times 100 \tag{1}$$

Where P_P is the probability that a given stream flow magnitude will be equaled or exceeded. m is the ranked position of the stream flow magnitude arranged in descending order from rank 1 given to the maximum magnitude of the flow and N assigned to the minimum flow magnitude i.e. N is the total number of hydrological events of the stream flows for the total period of the flow records. In this study the mean monthly flow discharges were considered.

The hydropower potential of the selected site at the Bamyan river was assessed for the power P in watts (W) available from this proposed hydropower scheme and is given by Weedy [4] as:

$$P = \rho \, g \, Q \, H \tag{2}$$

Where Q is the flow rate (m^3/s) through the turbine, ρ is the density of the water (1000 kg/m^3), g is the acceleration due to gravity (9.81 m/s^2) and H is the gross head (m). Substituting the values of ρ and g, Eq. (2) for power P in KW is expressed as:

$$P = 9.81 \, Q \, H \tag{3}$$

Having estimated the gross head available for the generation of the hydropower, the head losses that arise due to the trash racks, pipes, bends and valves etc. were considered as 10% of the gross head and based on this the net head available to drive the turbine is equal to the gross head minus the sum of all the head losses as reported by Bansal [5] as:

$$H_n = H - \sum H_l \tag{4}$$

Where H_n is the estimated net head (m) and $\sum H_l$ is the sum of all the head losses. The power P in KW generated from the hydraulic turbine as a function of the effective net head, flow rate and the hydraulic efficiency (η) of the turbine was reported by Voros et al. [6] as:

$$P = 9.81 \times Q \times H_n \times \eta \qquad (5)$$

The selection of a particular type of turbine depends on the site data mainly the available net head and the flow discharges besides other technical parameters such as efficiency and the cost etc. The turbines are constructed to operate between the two extremes i.e. a minimum and a maximum working flow discharges. The hydraulic efficiency (η) of the turbine was taken from Table 1 suitable for the proposed hydropower plant and in this analysis turbine efficiency was assumed to be 80%.

Table 1: Typical efficiency of different type of turbines

Turbine	Efficiency range
Impulse turbine	
Pelton	80-90%
Turgo	80-95%
Cross flow	65-85%
Reaction turbine	
Francis	80-90%
Pump as turbine	60-90%
Propeller	80-90%
Kalpan	80%

Based on Fig. 1, the type of turbine was selected for the proposed site at the Bamyan river.
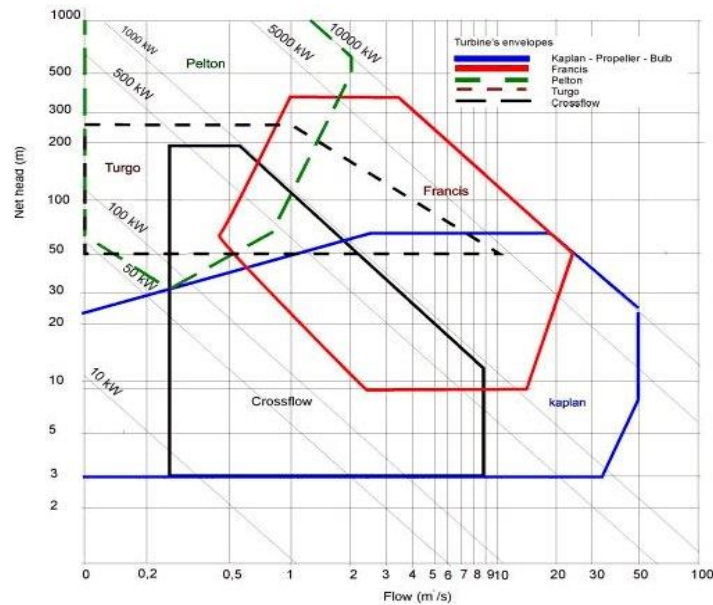
Fig. 1. Turbine selection chart

The installed capacity of the plant was considered based on the maximum flow which was taken as Q_{15} (i.e. flow rate at 15% probability) and the designed flow rate was taken Q_{40} (i.e. flow rate at 40% probability) while the mean flow rate Q_{av} was computed as reported by Adedokun et al. [7] as:

$$Q_{av} = 0.25(Q_0 + Q_{100}) + 0.05(Q_5 + Q_{95}) + 0.075(Q_{90} + Q_{10})$$

$$+0.10(Q_{20} + Q_{30} + Q_{40} + Q_{50} + Q_{60} + Q_{70} + Q_{80}) \qquad (6)$$

Where Q_5, Q_{10}, Q_{20}, Q_{30}, Q_{40}, Q_{50}, Q_{60}, Q_{70}, Q_{80}, Q_{90}, Q_{95} are the flow discharges at 5, 10, 20, 30, 40, 50, 60, 70, 80, 90 and 95% probability levels, respectively whereas Q_0 and Q_{100} are the flow rate occurring nearly at 0 and 100% probability levels, respectively. In this analysis, Q_0 has been taken as the flow rate with a probability of less than 5% and Q_{100} has been taken as the flow rate at more than 95% probability level.

RESULTS AND DISCUSSION

The topography of the watershed area of the Bamyan river varies from 4000 m at the watershed line to 2500 m at the fall of the river. The average slope of the watershed of the Bamyan River was
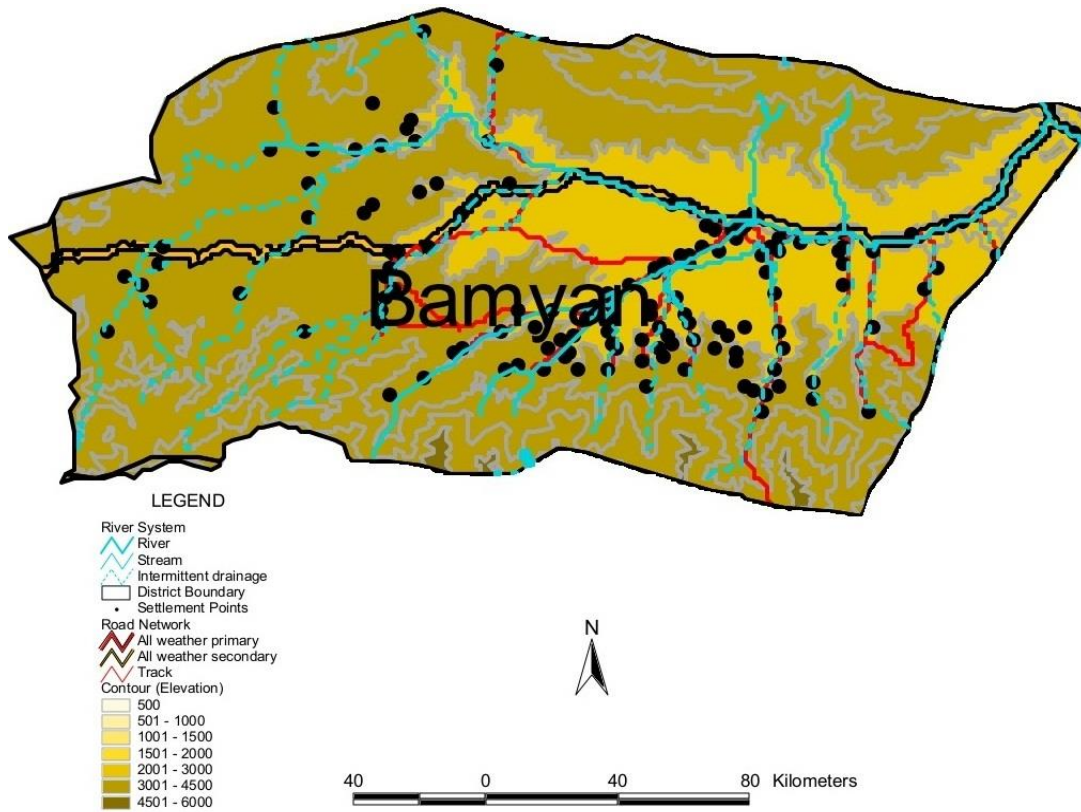
Fig. 2. Elevation map of the watershed area

estimated to be 1 in 20. The gross head was estimated to be 35 m and accounting for 10% head losses the net head available was computed to be 31.5 m.

The mean monthly discharges were assessed and are reported in Table 2 which varied from the maximum discharge of 11.03 m³/s in the month of June to a minimum discharge of 1.93 m³/s in the month of March. The average of the mean monthly flow discharge for all the 12 months of a year was estimated to be 3.88 m³/s.

Table 2: The mean monthly flow discharges

Month	Mean monthly discharge (m³/s)
Jan	1.97
Feb	2.00
Mar	1.93
Apr	2.79
May	5.83
Jun	11.03
Jul	6.68
Aug	3.85
Sept	3.55
Oct	2.56
Nov	2.23
Dec	2.18

The probability of occurrence for a particular magnitude of flow rate is reported in Table 3 in which the flow discharges have been arranged in descending order along with the rank number.

Table 3: The probability of occurrence of the mean monthly flow discharges

Mean monthly discharges arranged in descending order (m³/s)	Ranked position	Probability of occurrence (%)
11.03	1	7.7
6.68	2	15.4
5.83	3	23.1
3.85	4	30.8
3.55	5	38.5
2.79	6	46.2
2.56	7	53.8
2.23	8	61.5
2.18	9	69.2
2.00	10	76.9
1.97	11	84.6
1.93	12	92.3

The mean monthly flow data Q_P alongwith its probability of occurrence P_p were used to describe the trend of the stream flow of the Bamyan river as shown in Fig.3 and a best fit for this trend was developed as:

$$Q_P = 51.67 \, P_p^{-0.74} \qquad\qquad (7)$$
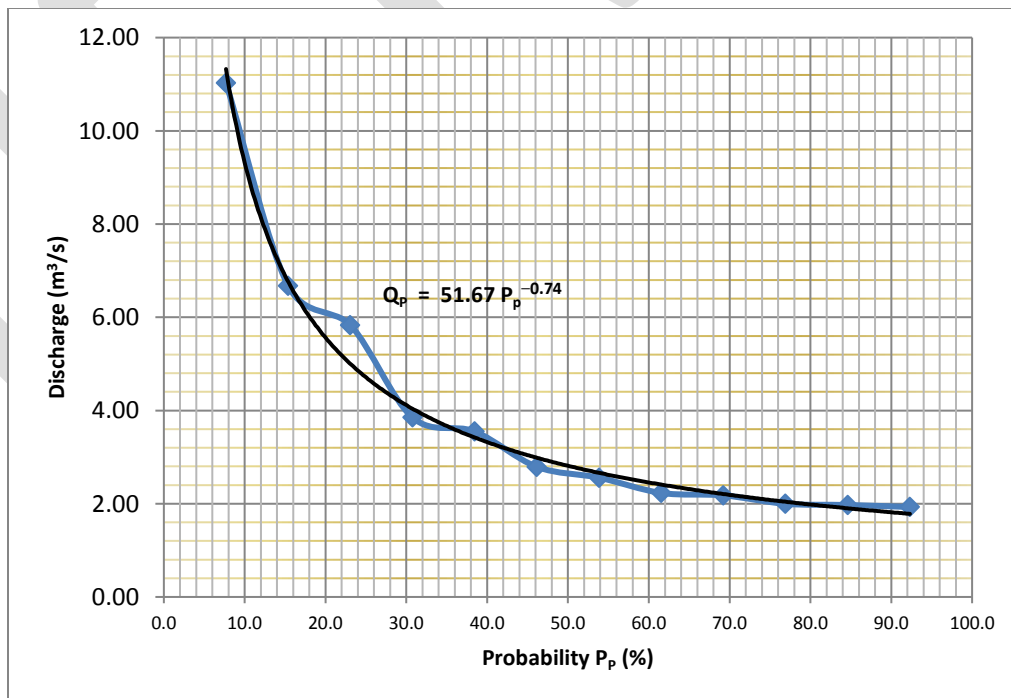
Fig.3. Flow duration curve of the Bamyan River

Using Eq. (7) the maximum, designed and the minimum flow rate and using Eq. (6) alongwith Eq. (7), the mean flow rate were assessed. Based on this flow rate the estimated hydropower potential considering the net available head of 31.5 m were assessed using Eq. (5) and are reported in Table 4.

Table 4: The estimated hydropower potential based on the net available head of 31.5 m

Type of flow rate	Flow discharge (m³/s)	Estimated hydropower potential (KW)
Maximum flow rate (Q_{15})	6.96	1720.60
Mean flow rate (Q_{av})	4.41	1090.20
Designed flow rate (Q_{40})	3.37	833.10
Minimum flow rate (Q_{95})	1.77	473.57

Table 4 showed that the hydropower potential was assessed to be 1720.60 KW for the maximum flow rate of 6.96 m³/s at 15% probability level which is about to 2 times more than the estimated hydropower potential of 833.10 KW at the designed flow rate of 3.37 m³/s at 40% probability level. The estimated hydropower potential of 1090.20 was computed at mean flow rate of 4.41 m³/s while the minimum estimated hydropower potential of 473.57 KW was observed for the minimum flow rate of 1.77 m³/s at 95% probability level. With the help of turbine selection chart and the hydraulic efficiency of the turbine, the Pelton turbine was selected for the proposed site. The Pelton turbine with 80% efficiency was identified for the proposed site. This analysis showed that there is good potential for the generation of the hydropower by establishing a small hydropower plant.

CONCLUSION

The gross head between the existing weir crest level and ground level of the powerhouse was assessed to be 35m at a site of the proposed hydropower plant at the Bamyan River near the Bamyan City in Afghanistan using DEM in the Arc GIS and the net head available was assessed to be 31.5 m. the hydropower potential was assessed to be 1720.60 KW for the maximum flow rate of 6.96 m³/s at 15% probability level which is about to 2 times more than the estimated hydropower potential of 833.10 KW at the designed flow rate of 3.37 m³/s at 40% probability level. The estimated hydropower potential of 1090.20 was computed at mean flow rate of 4.41 m³/s while the minimum estimated hydropower potential of 473.57 KW was observed for the minimum flow rate of 1.77 m³/s at 95% probability level. The Pelton turbine with 80% efficiency was identified for the proposed site.

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Using SCADA & Microcontroller for Monitoring and Automation of Petroleum Station Tanks

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Abstract— Most of industrial production lines need an accurate control, especially in the case of very sensitive production materials. Microcontroller will be used to control the essential parameters such as: Temperature, pressure, fluid flow, humidity, and the liquid level….etc. of the storing tanks of petroleum stations. We will represent the mentioned system by aid of modern programs (Labview, Protues, PIC C Compiler) to achieve a high accurate control of the required parameters, in addition to using SCADA for supervising and controlling all the system to avoid any unexpected faults; like fire catastrophe and making the system work with high accuracy. In order to automate an oil refinery and minimize human intervention, there is a need to develop a SCADA system that monitors the plant and helps to reduce the human errors.

Keywords – Automation, Labview, Protues, Microcontroller (MUC or µC), Port, SCADA, RS232.

I. INTRODUCTION

A lot of industrial production systems need a supervising and control system (SCADA) [1]. In (SCADA) , the data will be sent to a master (main) computer which receives the sensors outputs for processing them and sends control pulses to the actuators of the studied system to control the required parameters (controlled parameters) [2], such as temperature, pressure, humidity, fluid flow, and the liquid level inside the tanks as shown in Fig.1.

1.1. The importance of SCADA system

In order to automate an oil refinery and minimize human intervention, there is a need to develop a SCADA system that monitors the plant and helps to reduce the errors caused by humans. [3]
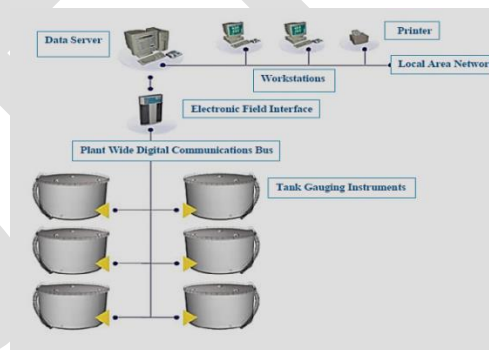
Fig.1. Diagram of tank gauging with computers system SCADA

Supervisory control and data acquisition – SCADA refers to ICS (industrial control systems) [4&5&6] used to control infrastructure processes (water treatment, wastewater treatment, gas pipelines, wind farms, oil tanks stations, etc), facility-based processes (airports, space stations, ships …etc,) or industrial processes (production, manufacturing, refining, power generation …etc). [3&7]

The following subsystems are usually present in SCADA systems: [8]

• The apparatus used by a human operator; all the processed data are presented to the operator

• A supervisory system that gathers all the required data about the process

• Remote Terminal Units (RTUs) connected to the sensors of the process, which help to convert the sensor signals to the digital

  data and send the data to supervisory stream.

• Programmable Logic Controllers (PLCs) used as field devices

• Communication infrastructure connects the Remote Terminal Units to the supervisory system.

1.2. Operation Principle of the compact system including peripherals devices

Nowadays fuel stations are operated manually. These fuel pumps are time consuming, require more manpower [9] and do not provide the accurate fuel amount for both customers and dealers. Flow sensors were used to measure the fuel amount in these fuel stations. In [10] they operates a remote monitoring system for pump output monitoring in distributed fuel stations in Nigeria by recreating a fuel dispenser with an Atmel 89C52 microcontroller based system which has an added feature of being able to send collated data via its serial port to a web-enabled PC to enable access to this data from anywhere in the world using a web-enabled device [10]. The error in oil dispensing to the tank may vary from person to person and sometimes it depends on method of measuring also. Hence it is required to have oil dispensing units which will be able to function irrespective of time, place and person [11].

The controller will compensate the fuel volume depending on the temperature changes. PIC16F877A is used as a controller for this purpose. LM35DZ will sense the environmental temperature and then it will send an analogue signal to the controller as input signal. Depending on the input signals [12], the controller will control the total fuel pumping time with compensation time. The fuel level in the tank is monitored by the level sensor. The metal probes are used in this control as fuel level sensors. The block diagram of the system is shown as in fig.2.
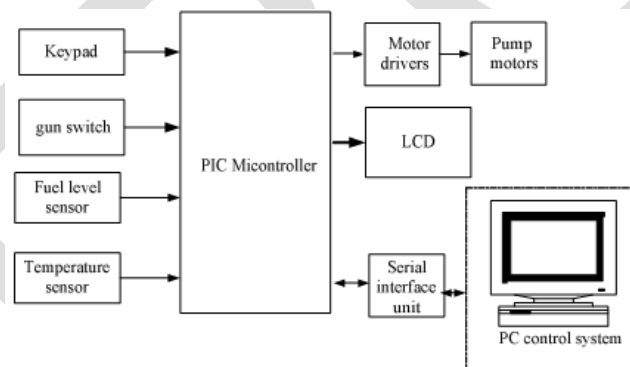
Fig.2: Block Diagram of the system

1.3. PIN configuration and description of PIC16F877A

The PIC microcontroller PIC16f877A is one of the most renowned microcontrollers in the industry. This controller is very convenient to use. The coding or programming of this controller is also easier. One of the main advantages is that it can be write-erased as many times as possible because it uses FLASH memory technology. It has a total number of 40 pins and there are 33 pins for input and output (fig. 8). PIC16F877A is used in many pic microcontroller projects. [13]
PIC16f877A finds its applications in a huge number of devices. It is used in remote sensors, security and safety devices, home automation and in many industrial instruments. An EEPROM is also featured in it which makes it possible to store some of the information permanently like transmitter codes and receiver frequencies and some other related data. The cost of this controller is low and its handling is also easy. It is flexible and can be used in areas where microcontrollers have never been used before as in coprocessor applications and timer functions etc. [13]
The goal of our paper is to study the use of SCADA to demonstrate petroleum storing stations, which consists of many tanks and controlled by microcontroller-PIC.

II. IMPORTANCE AND GOALS

Our study contains many stages:

2.1. The design of hardware

This stage includes the design and production of instruments that receive, assemble, and process the data of controlled parameters. As a result, the mentioned instruments will send the control pulses to actuators for controlling the required parameters at determined values. [1&14]

2.2. The design of software

This stage treats the received data and represents them graphically and numerically, then exports and releases related reports which contain the details of technology process and the resultant events record. In addition to sending alarm signals in case of a failure event.

2.3. The simulation of studied system

In this stage we use the suitable programs to simulate: each part of the studied system, all used sensors, and the related measurement instruments such as Protues, Labview.

a) Labview allows us to represent the used storing system with all essential parts to confirm the accuracy of the industrial technology process.
b) Special programs of µC: PIC(C) Compiler for programming the (PIC 16F877A).

2.4. The communication system and the protocol

This stage provides the data transferring between the computer input and output i.e. allows the data transferring between sensors and computers and vice versa and provides the communication between computer and actuators for a long distance up to a few kilometres. The mentioned communication system also allows using the satellite and internet with ability to encode the transferred data to confirm the system protection and maintain the accurate secrecy (as in nuclear reactors, heavy water treatment stations, and military submarines).

III. SEARCHING METHOD

Any control loop in the process control industry works in the same way, requiring three tasks to occur:

_ Measurement

_ Comparison

_ Adjustment

In Figure 3, a level transmitter (LT) measures the level in the tank and transmits a signal associated with the level reading to a controller (LIC). The controller compares the reading to a predetermined value, in this case, the maximum tank level established by the plant operator, and finds that the values are equal. The controller then sends a signal to the device that can bring the tank level back to a lower level—a valve at the bottom of the tank. The valve opens to let some liquid out of the tank.

Many different instruments and devices may or may not be used in control loops (e.g., transmitters, sensors, controllers, valves, pumps), but the three tasks of measurement, comparison, and adjustment are always present. [15]

3.1. Suggested method for controlling and monitoring

Using PLC gives us many advantages compared to the microcontrollers due to: the easy programming of PLC, the ability of the PLC system to protect the studied system from interference, the high stability, the high efficiency, and the low cost of the controlled system (automated). [16]
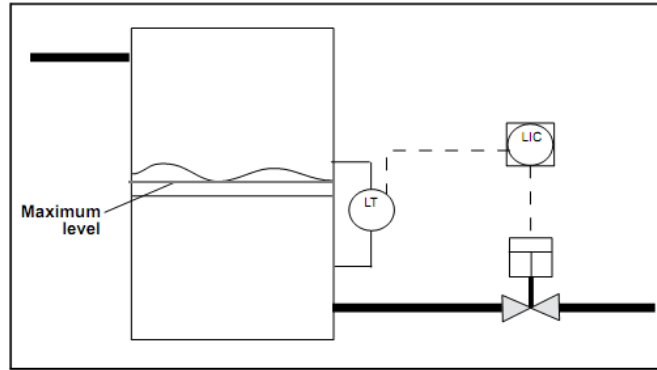
Fig.3. A simple control Loop

The suggested idea in this paper is to use the microcontroller (PIC16F877A or other MUC) connected to Labview program for building a highly accurate supervising and control system (SCADA) for storing petroleum integrated station at low cost due to the previously mentioned features of PIC16F877A.

The studied system consists of (8) analogue sensors, (7) digital sensors, supervision display screen (SDS), and LCD connected to (PIC) such as; all elements mentioned above.

Regarding to the distance, the communication lines between (SDS) and (PIC) could be via protocol (RS232) or (USB) or (TCP /IP); especially when communication is via internet or satellite. [14&17]

3.2. The search method includes

1- The design and the simulation of PIC circuit .In addition, writing the (PIC) program by using the special code (PIC C Compiler) and building the communication protocol for (sending/receiving) data in accurate form.
2- The design of the controlled studied system by using Labview, which shows the bi-directional internal data transfer in different instruments, and represents all results via counters and LED's (for presenting the analogue/ digital sensors in sequence) considering the importance of legality of the required number of switches on the (Labview) control screen, to achieve the accurate control of the output actuators of the used (PIC).

3.3. The search steps & the materials of each step including discussion and results

IV. DISCUSSION AND RESULTS

4.1. Discussion

1) The hardware design and the contents :
The design of this part needs to the following contents:

Table.01: requirements of hardware design

Microcontroller :	PIC16f877A
Compiler :	PIC C Compiler
Simulation Program :	Protues 7.8
System Interface :	Labview 2011
Communication :	Via COM Port

The microcontroller (PIC16F877A) contains 5 Ports that are used according to the following table below

Table.02: the function of microcontroller ports

PORTA	5 Analog sensors
PORTB	8 Digital Output
PORTC	RS232 Communication
PORTD	7 Digital sensors
PORTE	3 Analog sensors

The configuration of used PIC with different ports is shown in fig 4 below:

When the analogue sensors are connected to the ports (A+E), it is very necessary to provide the mentioned sensors with power supply (0-5 volt) as shown in the following practical circuit (fig 5):
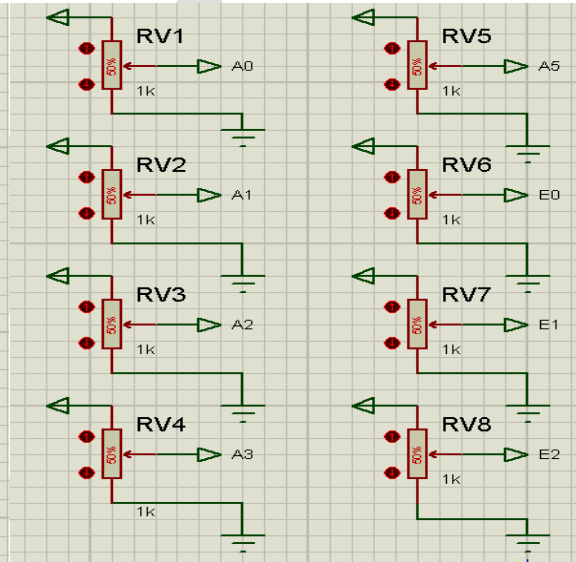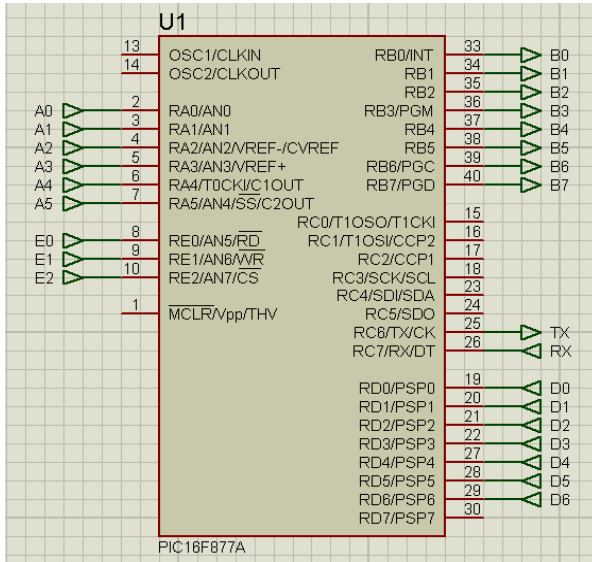
Fig.4: the representing of PIC using Protues   **Fig.5: Supplying of Ports A&E**

In the following figure 6, the digital sensors that are designed by using the Protues program have only two logic states (I/0).

The connected LEDs to the (port C) represent the connected devices (actuators) to the output of the microcontroller (PIC) to achieve the control of the required parameters via relays, motors, coolers or valves such as in fig 7.
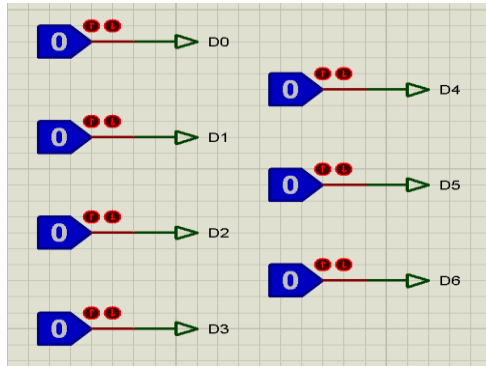
Fig.6: Design of digital sensors using PROTUES
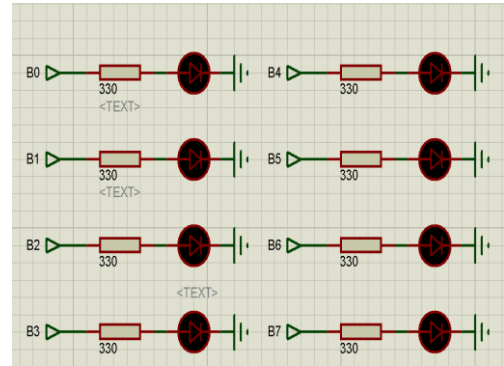
Fig.7: The LEDs connected to port C

The assembling of all mentioned parts of the studied system for representing the final form is achieved by using the Protues program as shown in the fig 8
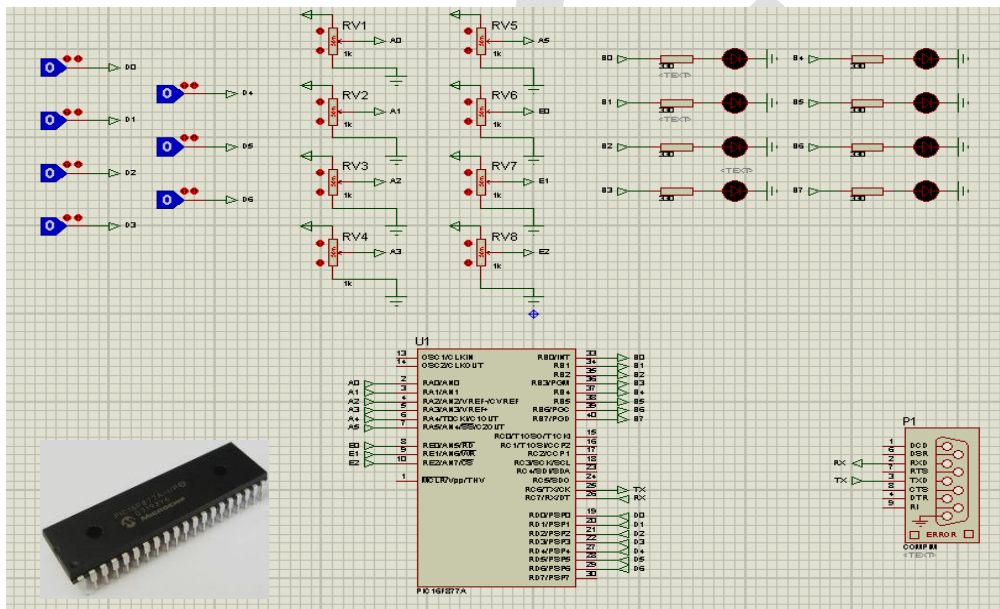
Fig.8: The general configuration of PIC by using PROTUES Program

2) Software: writing the program of PIC :

In this part, the ability of sending/receiving data between the main computer and the PIC is required. Considering the communication protocol(RS232) was used in our study where each byte of received data by the computer will contain the values 0-255, while the sending of data will be achieved by using the encoding system (ASCII).Since we can obtain the ASCII code from (PIC C) program:

PIC C compiler >> tools >> ASCII.

3) The construction of programming environments of the control system:

This aim is achieved to provide the communication for sending/receiving from Labview program to PIC and vice versa via com-port (RS232) through (NI VISA runtime engine) via many stages:

First stage: The communication will start up to determine the com-port address as shown in fig .9.
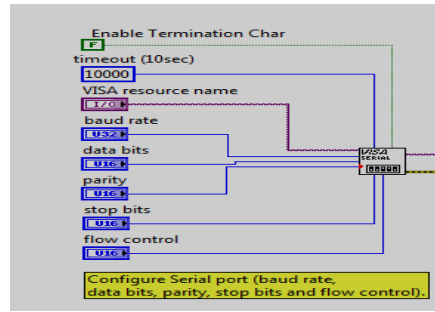
Fig.9: The communication of PIC with Labview program via Com-Port RS232

Where the bytes are connected according to the following table.03:

Table.3: The Bits positions of serial port

Timeout	Constant
VISA resource name	Indicator
Baud rate	Constant
………	………..
Flow control	Constant

Using (Constant) expression in the previous table was done to achieve removal of the displayed values from the front panel for protection purposes Fig (10-A).

Second stage: Sending the data from Labview Front panel to PIC according to the block shown in the following Fig (10-B):

Third stage: Receiving data from microcontroller (PIC) into the front panel of Labview program according to the block shown in the following [Fig 10-C].

Fourth stage: In this stage, the communication with com-port is closed (Fig 10-D).
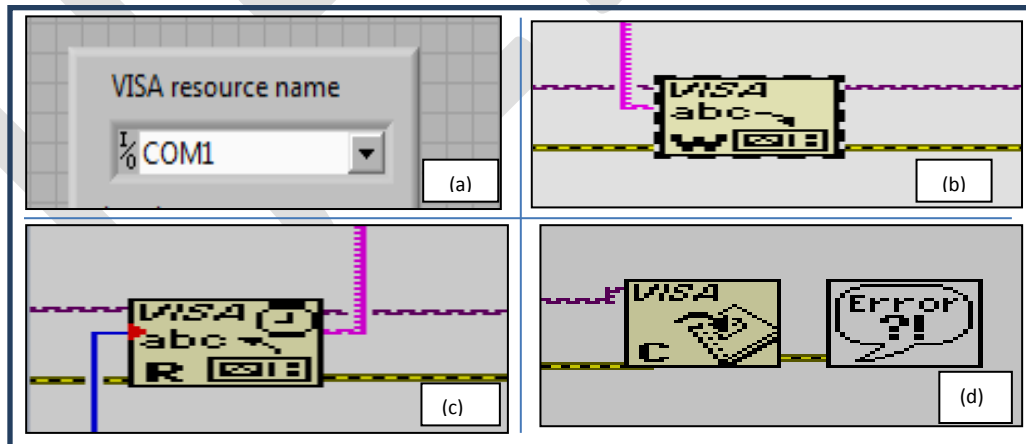
Fig.10: The interconnection between Labview front panel and PIC

4.2. Results

4.2.1 Explaining the mechanism of sent data from Labview →PIC

In this case, all analogue switches are closed in Labview program to achieve the control of required parameters connected to the port C, where the switching on of one switch (S1) in Labview program will provide output voltage (5volt).

Then this voltage can control the operating of a relay which in turn operates consequently the connected motor to demonstrate the controlled studied parameters (liquid level, temperature, pressure,…etc.)

Therefore, the sequence operation of 8 switches, and assembling the output signals and converting them into digits after regulation in (Array) contains 255 digits [0-255].

Then any digit of the previous Array will be encoded by ASCII system as shown in the following figure (11-a):

4.2.2 Explaining the process of receiving data from microcontroller (the mechanism)

The sent data from microcontroller (PIC) are regulated by using the matrix (data-send), which contains thirteen distributed values as shown in the following figure 11-b.
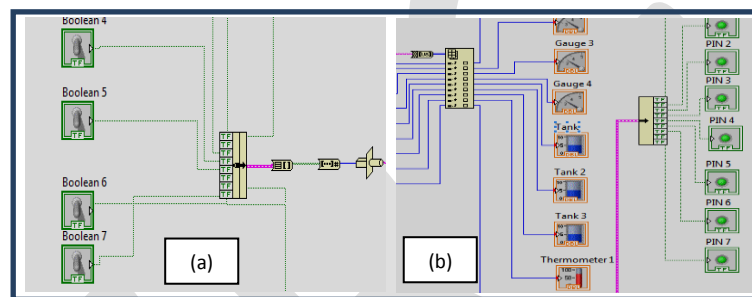
Fig.11: The process of sending/receiving data using ASCII

As a result:

In this paper we obtain many advantages; such as:

- The simplifying of the maintenance of the suggested system and high programing flexibility.
- Low cost system compared to other conventional SCADA systems. [18&19]
- The ability of Labview to add artificial intelligence, and reduce the number of humans required for management , in addition to creating periodic reports about different events in the station and required maintenance

V. CONCLUSIONS AND RECOMMENDATIONS:

- The system automation was designed by using Protues and Labview programs [Fig 12]**,** where the connection between the two programs mentioned above is very necessary to get the illustrated result shown in Fig 12.
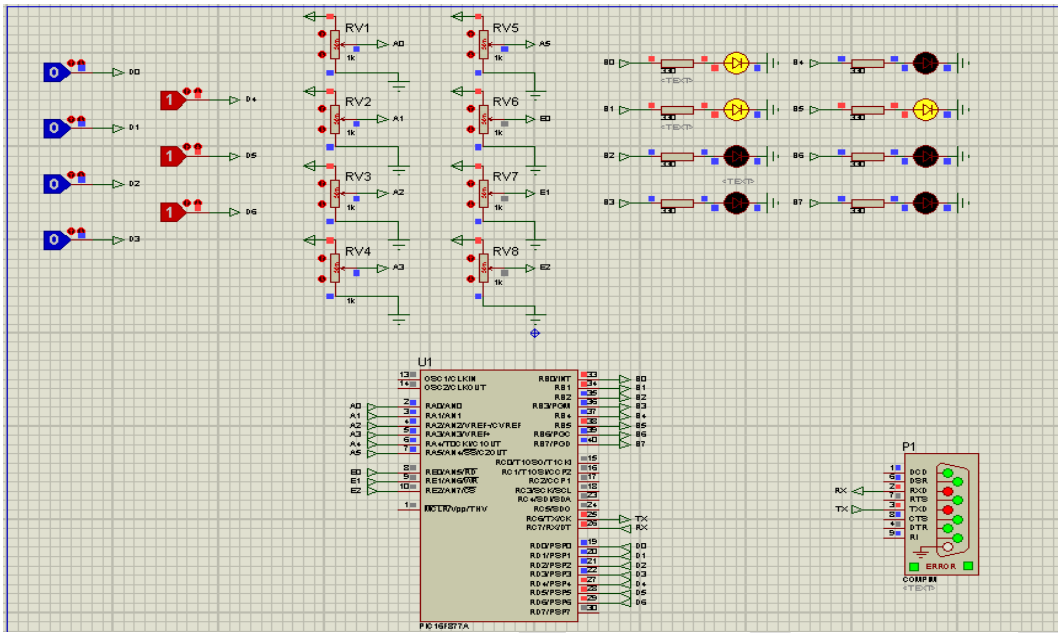
Fig.12: The system Automation by using Microcontroller represented by aid of protues and labview programs

- The clearing of data (delete) will be achieved by two stages:

At the first stage:

At the beginning the checking of the start and the end of protocol is done and compare result data with the data coming from PIC as shown in the following fig,13.
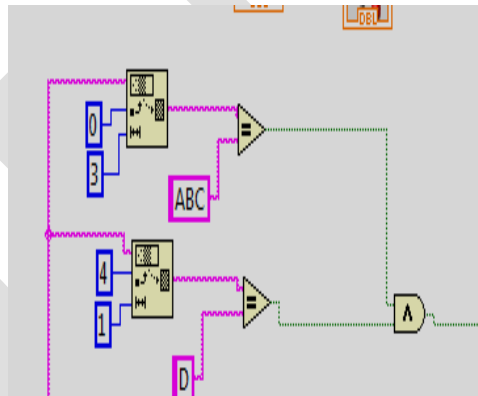

Fig.13: The check-up of protocol

At the second stage:

- Only at the end of the first stage, the access into case structure must be done to confirm the data accuracy (i.e. the similarly of the start and the end of the protocol 100%) to achieve the discharging of the data into counters in the case of analogue sensors, and into LEDs in the case of digital sensors.
- The protection of PIC from noise and interference will be achieved by using protection capacitors for discharging the interference signals, then will replace the PCB of PIC inside a suitable special bodywork (Box).
- The suggested coded program was written by compiler PIC C for use PIC16F877A. The mentioned program allows us to connect PIC to Labview program and control the required parameters.
- The suggested program given in appendix A allows controlling other parameters such as volume, cathode protection, pressure, accuracy, leakage, safety factors…etc. [14&19]
- Other tank gauging technologies could be used instead of (gradual strip + float) [Fig. 14-a] such as : manual ,(servo + float) ,radar , hybrid . [14]
- The possibility of replacing suitable safety equipment on the tanks to achieve the data transferring is illustrated in Fig. 14-b.
- We can use the same technology and programs for automation of desalination water stations. [20]
- The use of GUI will add accurate performance of the control system when using microcontroller with LM35DZ. fig. 15. [3]
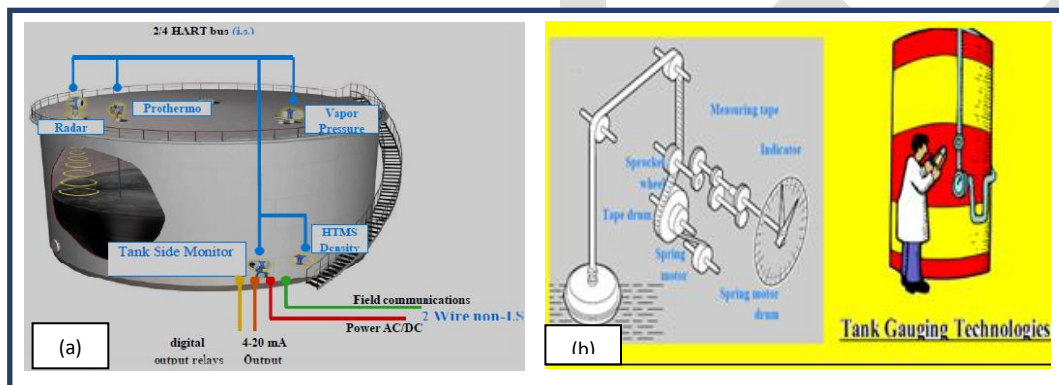

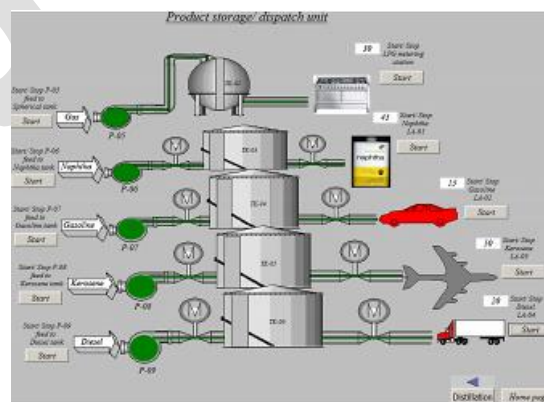**Fig.14: The measurement technology used in petroleum tank**

Fig.15: The produce storage/the dispatch unit GUI in the run mode

VI. APPENDIX (A): PIC Program

The microcontroller code:

```
#include <16f877a.h>
#device adc=8
#use delay(clock=4000000)
#use rs232(baud=9600,xmit=pin_c6,rcv=pin_c7)
#fuses xt,nowdt,noprotect
#byte porta=5
#byte portb=6
#byte portc=7
#byte portd=8
#byte porte=9
int x;
void ioset(){
set_tris_a(0xff);
set_tris_b(0x00);PORTB=0;
set_tris_d(0xff);
set_tris_e(0xff);
setup_adc(adc_clock_INTERNAL);
setup_adc_ports(ALL_ANALOG);
}
void main(){
int a,b,c,d,e,f,g;
int sum;
int y,z,i,j,k,l,m,n;
ioset();
y=z=i=j=k=l=m=n=0;
 while(1){
  x=getc();
portb=x;
set_adc_channel(0); delay_us(1000); y=read_adc();
y=y*5/255;
set_adc_channel(1); delay_us(1000); z=read_adc();
z=z*5/255;
set_adc_channel(2); delay_us(1000); i=read_adc();
i=i*5/255;
set_adc_channel(3); delay_us(1000); j=read_adc();
j=j*5/255;
set_adc_channel(4); delay_us(1000); k=read_adc();
k=k*5/255;
set_adc_channel(5); delay_us(1000); l=read_adc();
l=l*5/255;
set_adc_channel(6); delay_us(1000); m=read_adc();
m=m*5/255;
set_adc_channel(7); delay_us(1000); n=read_adc();
    n=n*5/255;
     a=b=c=d=e=f=g=0;
   if(bit_test(portd,0)==1)a=1;
   if(bit_test(portd,1)==1)b=2;
   if(bit_test(portd,2)==1)c=4;
   if(bit_test(portd,3)==1)d=8;
   if(bit_test(portd,4)==1)e=16;
   if(bit_test(portd,5)==1)f=32;
   if(bit_test(portd,6)==1)g=64;
sum=a+b+c+d+e+f+g;
if(sum==0)sum=128;
putc('A');
putc('B');
putc('C');
putc(y);
putc(z);
putc(i);
putc(j);
putc(k);
putc(l);
putc(m);
putc(n);
putc(sum);
putc('D');
delay_us(990);
}}
```

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A Framework for On-Demand Classification of Evolving Data Streams

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Abstract: Current models of the classification problem do not effectively handle bursts of particular classes coming in at different times. In fact, the current model of the classification problem simply concentrates on methods for one-pass classification modeling of very large data sets. Our model for data stream classification views the data stream classification problem from the point of view of adynamic approach in which simultaneous training and test streams are used for dynamic classification of data sets. This model reflects real-life situations effectively, since it is desirable to classify test streams in real time over an evolving training and test stream. The aim here is to create a classification system in which the training model can adapt quickly to the changes of the underlying data stream. In order to achieve this goal, we propose an on-demand classification process which can dynamically select the appropriate window of past training data to build the classifier. The empirical results indicate that the system maintains a high classification accuracy in an evolving data stream, while providing an efficient solution to the classification task.

Keywords: Stream classification, geometric time frame, microclustering, nearest neighbor

I. INTRODUCTION

As far as real world application considers, there's a necessity in data storage technology haveled to the ability to store the data for real-timetransactions. Such processes lead to data which often grow without limit and are referred to as data streams. Discussions on recent advances in data stream mining may be found in [4].One important data mining problem which has been studied in the context of data streams is that ofclassification[10].

. We develop such an on-demand classifier. The on-demand classifier is designed by adapting the (unsupervised) microclustering model [2] to the classificaton problem. Since microclustering is a data summarization technique, some of the underlying conceptscan be leveraged effectively for other problems, such as classification, which utilize the aggregate data behavior over different time horizons. In order to use such an approach for the classification problem, the following adaptations need to be made:
1. The microclustering process needs to be supervised, since each microcluster belongs to a specific class. Therefore, the representation of the microclusters and the process of updating, merging, and deletingmicroclustersneeds to be done in a class-specific way. The aim of microclustering is to test the classdiscrimination of different time horizons.

   2.A geometric time frame is used instead of the pyramidal time frame in order to store the supervised microclusters. We discuss the similarities and differences of these time frames, and also discuss the advantages of the geometric time frame.

   3.A testing phase needs to be designed in conjunction with the creation of the supervised microclusters. This testing phase needs to be sensitive to the evolution of the underlying data stream.

   4.Methods need to be designed to pick the optimumsegment of the stream in order to effectively perform the classification process. This is because the evolution of the stream [3] significantly affects the behavior of the classification algorithm. For thispurpose, the classification framework needs to divide the training stream into two parts which are discussed below.

   The testing phase of the on-demand classifier is constructed by dividing the training stream into two parts:
   1. A portion which is used for class-specific statistical maintenance of microclusters.
   2. A portion which is used for testing the nature of the horizon which provides the best classification
accuracy.

II. DEVELOPED SYSTEM

The unsupervised microclustering approach developed in [2] in order to make it work effectively for the classification problem in the context of highly evolving data streams. Recent papers have proposed the classification model in a data stream as a relatively straightforward extension of the traditional classification problem. The only difference is that one-pass mining is required in order to perform the training. In reality, the process of classification should be viewed as a continuous process in which the training stream and test stream are simultaneously generated by the underlying process.

In addition, it is assumed that both the training and test streams are evolving over time. This assumption may be true in many monitoring scenarios in which the activities inthe underlying data stream are followed by events which can be tracked in time. For example, in business activity monitoring applications, it may be possible to track variouscontrol variables as the underlying training stream and the events of significance as the test stream. The same is true of surveillance applications in which a large number of

variables may be tracked in order to monitor events of significance. For applications in which manual labeling is required, this may be true if the class of interest occurs as a

rare event. In such cases, the data stream may have a high volume, but the system may be augmented by periodic labeling when the rare events of interest do occur. The

assumption of simultaneous test and training streams may not always be necessary when the entire training data is already available, as in the case of static databases.

However, in applications in which the classification is used as a means to a rapid response mechanism, this assumption turns out to be very useful. Such applications are also

referred to as on-demand applications.
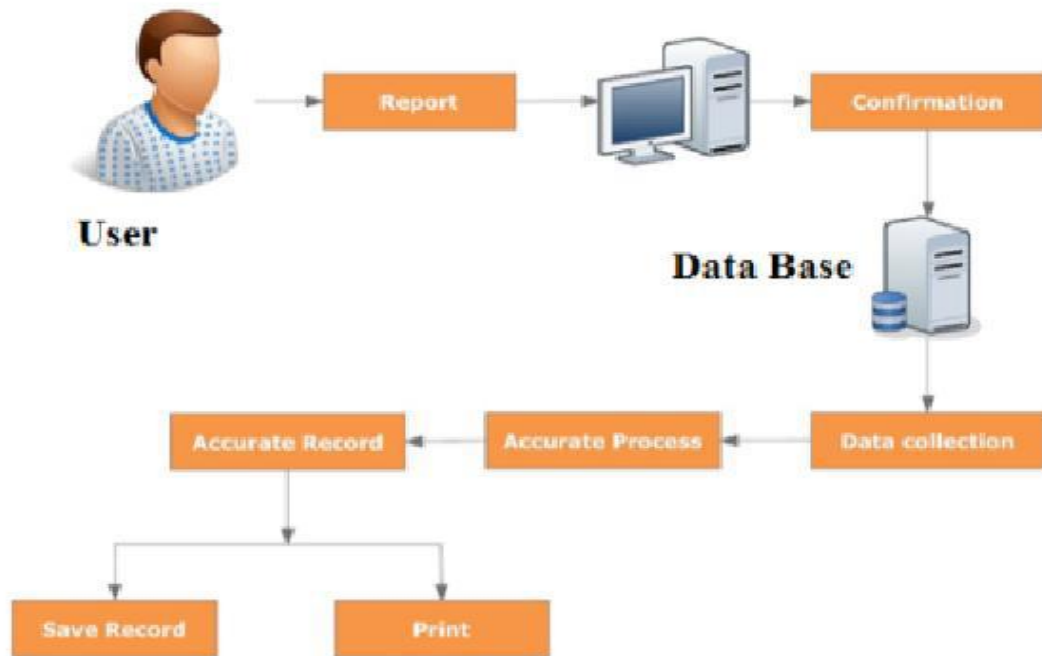
Fig 1.System Architecture

To provide users with different forms of flexibility asflexible query language as well as flexible and interactive retrieval process. By adapting the temporalabstraction [1], the

most accurate record will be retrieve since it retrieved by the Time series. A considers the every time sequence which is recorded by the control instrument. To make retrieval of

record for the generic repost provided by the physician. There are different modules through which the data flow &execution of project can understand. They are as given below;

1. Query Data Generation:-

Here the user needs to provide the inputreport for which the record has to retrieve on thebasis of Time series [2] [3]. The input report will notbe readable so it has to be converted intointermediate data which is readable by the program.Then the data present in the intermediate data will beretrieved and provided for the physician. Then thedata will be process for modifying the data in thereport if necessary. Then the finalized data will begenerated for the further processing.

2. Domain Selection:-

After acquiring the query data, the domain in which the query data have to be deal with will have to be analyzed [4]. The domain will lies in the query report by the user. Then the required record based on the domain will be clustered. Then the record for the respective domain will be retrieved.

3. Retrieving Record:-

Here the record that suits the query domain will be retrieved based on analyse of the input query data provided by the physician. Here the retrieved records will of same domain but different dimensionality that this record will be containing overall records for the domain provided in the query data. So it has to be gathered in the appropriate way[4].

4. Temporal Abstraction:-

The Outcome of retrieving records contains records of same dimensionality but different dimensions. So it's necessary to retrieve most accurate record for the query data

provided by the physician. It retrieval of the resultant record will carried out by the temporal abstraction. For implementing the Temporal Abstraction an Efficient the Viterbi algorithm is used for enhancing the temporal abstraction [1]. Temporal abstraction will analyse the each and every dimension of the records with respect to Time series [2] [8]. Then the records that match the query data will be retrieved. It will be shortlisted record of the required set from the overall domain record. Then the most accurate dataset will be retrieved from the featured records. Then the detailed information of the accurate record will be provided to the user.

5. Generation of Report:-

After acquiring the most accurate record that matches the query data, it has to provide to user in the most precise form. Hence in this module the finalized information will be saved in magnetic disk and also user can able to take printout of the information.

III DEVELOPED BASIC CONSTRUCTS FOR MAINTAINING CLASSIFICATION STATISTICS

The moments in time at which the summary statistics arestored are organized in the form of a geometric time frame.The use of the geometric time frame provides the flexibilityof the classification model. This is because the microclusters,which are stored at different moments in time, can beused to quickly construct a classification model overdifferent time horizons. At each moment in time, theclassification on the test stream is performed by using ahorizon which suits the needs of that particular moment.While the work in [2] discusses a pyramidal time frame inthe context of the clustering problem, the geometric timeframe provides a more effective implementation of thestorage process. We note that the concept of a geometrictime frame is different from the pyramidal frame in terms ofreducing the overlap among different snapshots of the data.It is assumed that the training and test data streams eachconsist of a set of multidimensional records X1 . . .Xk. . .arriving at time stamps T1 . . . Tk. . . . Each Xi is a multidimensionalrecord containing d dimensions which aredenoted by Xi ¼ ðx1i. . . xdiÞ. In addition, each record Xi inthe training data stream is associated with a class label Cj.

We assume that the class_id of the class Cjis j.We will first begin by defining the concept of supervisedmicroclusters. While the microclustering concept of [2] isuseful for unsupervised clustering, we need to makemodifications in order to use this approach for theclassification process. The supervised microclusters arecreated from the training data stream only. Each suchmicrocluster corresponds to a set of points from the trainingdata, all of which belong to the same class.Definition 2.1.A supervised microcluster for a set ofd-dimensional points Xi1 . . .Xinwith time stamps Ti1 . . . Tinand belonging to the class class id is defined as the ð2 _ d þ 4Þtuple ðCF2x, CF1x, CF2t, CF1t, n, class idÞ, whereinCF2x and CF1x each correspond to a vector of d entries. Thedefinitions of each of these entries are as follows:

1.For each dimension, the sum of the squares of the datavalues are maintained in CF2x. Thus, CF2x containsd values. The pthentry of CF2x is equal toPnj¼1ðxpijÞ2.

2.For each dimension, the sum of the data values aremaintained in CF1x. Thus, CF1x contains d values.The pthentry of CF1x is equal to Pnj¼1 xpij.

3.The sum of the squares of the time stamps Ti1 . . . Tinare maintained in CF2t.

4.The sum of the time stamps Ti1 . . . Tin are maintainedin CF1t.

5.The number of data points are maintained in n.

6.The variable corresponding to class id corresponds tothe class label of that microcluster.

The above definition of the supervised microcluster forthe set of points C is denoted by CFTðCÞ. This summaryinformation is an extension of the cluster feature vectorconcept discussed in . Since each component in thedefinition of the microcluster is an additive sum overdifferent data points, this data structure can be updatedeasily over different data streams. We note that themicroclustering construct is primarily designed for the caseof continuously defined attributes. In order to handlecategorical data, a similar construct needs to be designedfor such variables; a task which is beyond the scope of thispaper.

Frame no.	Snapshots (by clock time)
0	69 67 65
1	70 66 62
2	68 60 52
3	56 40 24
4	48 16
5	64 32

TABLE 1: A Geometric Time Window

Frame no.	Snapshots (by clock time)
0	70 69 68
1	70 68 66
2	68 64 60
3	64 56 48
4	64 48 32
5	64 32

TABLE 2: A Pyramidal Time Window

IV EXPERIMENTAL RESULTS

4.1 Comparison with Pyramidal Time Frame

The process of maintenance of supervised microclustersbelonging to different classes derives ideas from the nearest-neighbor and k-means algorithms. Because of the supervised nature of the method, class labels need to be used during the clustering process. At any moment in time,

a maximum of q microclusters are maintained by the algorithm. We denote these microclusters by $M1 \ldots Mq$. Associated with each microcluster i, we create a unique id whenever it is first created. As we shall subsequently see, the microcluster maintenance algorithm requires a merging of multiple microclusters into one microcluster. Only microclusters that belong to the same class may be merged together during the clustering process. When two such microclusters are merged, a list of ids is created in order to

identify the constituent microclusters. The value of q is determined by the amount of main memory available in order to store the microclusters. The microclusters whichare maintained in main memory correspond to the currentsnapshot of summary statistics.

1.Asmall portion of the stream is used for the processof horizon fitting. The corresponding portion of thetraining stream is referred to as the horizon fittingstream segment. The number of points in the dataused is denoted by kfit. We note that the value of kfitis typically very small, such as 1 percent of the data.

2. The remaining majority of the stream is used foraccumulation of the pertinent statistics correspondingto the microclusters and class information.
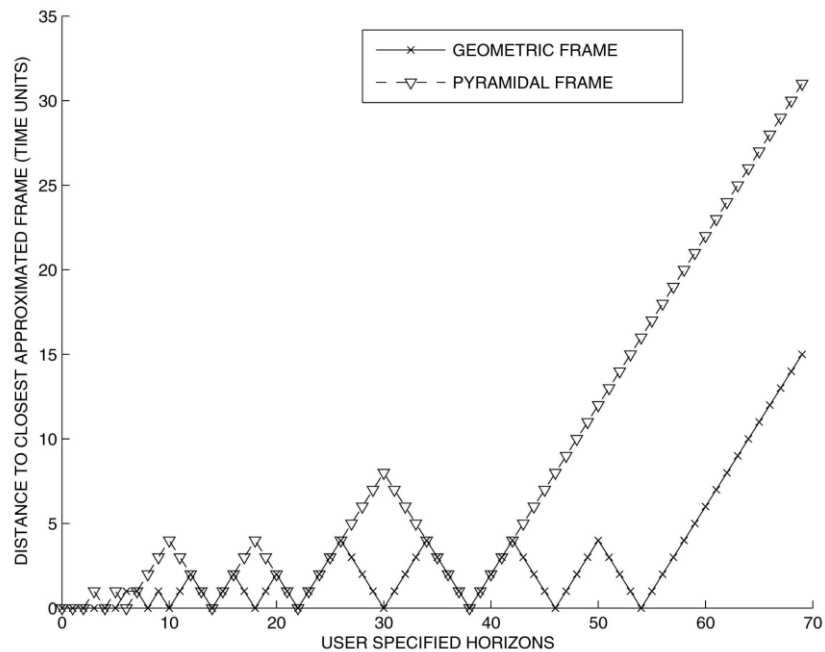
Fig. 1.Comparison between the pyramidal and geometric time window.

V CONCLUSION

In this devloped framework for the classification of dynamic evolving data streams by adapting a previously developed (unsupervised) approach for microclustering[2]. While previous research has developed methods on the development of one-pass algorithms for data stream classification, this paper proposes a new framework and a different methodology for online classification and continuous adaption to fast evolving data streams. The stream classification framework proposed in this
study has the following fundamental differences from the previous stream classification work in design philosophy.

First, due to the dynamic nature of evolving data streams, Second, stream data classification needs to use temporal data and historical summary in its analysis. However, it is too costly to keep track of the entire history of data in uniform, fine granularity. Thus, a geometric time window, with more recent time in finer granularity and more remote time in coarser granularity, strikes a good balance. Previous studies on stream data clustering and stream time-series analysis present logarithmic window [4], natural pyramidal time window [7], and pyramidal time window [2]. This documentdesign of geometric time window follows this trail but strikes a balance between logarithmic compression and sufficiently detailed coverage of recent events. Geometric time window gives us great flexibility at selection of the appropriate horizon in stream classification. It also provides good potential to carry out other powerful stream classificationtasks, such as construction and comparison of models at different time frames, discovery of the evolutionof models with time, and so on. This should be an interesting issue for further study.Third, for dynamic model construction, compression should be performed not only along with time, but also onthe data objects themselves due to the numerocity of the data. In order to achieve this goal, summary data is generated using microclustering in conjunction with a geometric time window. classification inboth continuous query mode (as a built-in watchdog) andad hoc query mode upon user's mining request. In summary, we have proposed an interesting framework 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.

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Review On Surface Finishing Methods by Using MRF Fluid

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Abstract: This paper represents surface finishing operation by using MR fluid. The surface finishing operation of various material like steel, brass etc. by using different composition of MR fluid as well as different technique as like MRAFF,R-MRFF, sintered iron-CNT compound abrasive are applied for complex internal geometry and surface finishing achieved up to Nano level.

Keywords: Magnetic Field, MR fluid

1. INTRODUCTION

Magneto-rheological (MR) fluid based finishing process was based on a MR fluid consisting of non-magnetic polishing abrasive and magnetic carbonyl iron particles (CIPs) in water or other carrier. With the appropriate composition of MR fluid, this process has successfully polished a variety of materials ranging from optical glasses to hard crystals to sub-nanometer surface-roughness level. In the absence of a magnetic field, the MR fluid behaves as a Newtonian fluid (viscosity 0.1-1 pa s). The magnetic field stiffens the MR fluid ribbon (viscosity 10-20 pa s) depending upon the magnetic field strength and behaves like a viscoplastic fluid.

Science and technology have made amazing developments in the design of electronics and machinery using standard materials, which do not have particularly special properties (i.e. steel, aluminum, gold). Imagine the range of possibilities, which exist for special materials that have properties scientists can manipulate. Some such materials have the ability to change shape or size simply by adding a little bit of heat, or to change from a liquid to a solid almost instantly when near a magnet; these materials are called smart materials. Smart materials have one or more properties that can be dramatically altered.

Most everyday materials have physical properties, which cannot be significantly altered; for example if oil is heated it will become a little thinner, whereas a smart material with variable may turn from a liquid state which flows easily to a solid. Each individual type of smart material has a different property which can be significantly altered, such as viscosity, volume or conductivity. The property that can be altered determines what type of applications the smart material can be used for.

Varieties of smart materials already exist, and are being researched extensively. These include piezoelectric materials, magnetorheostatic materials, electrorheostatic materials, and shape memory alloys. Some everyday items are already incorporating smart materials (coffeepots, cars, glasses) and the number of applications for them is growing steadily. Magneto-rheological materials (fluids) (MR) are a class of smart materials whose rheological properties (e.g. viscosity) may be rapidly varied by applying a magnetic field. Under influence of magnetic field the suspended magnetic particles interact to form a structure that resists shear deformation or flow. This change in the material appears as a rapid increase in apparent viscosity or in the development of a semisolid state. Advances in the application of MR materials are parallel to the development of new, more sophisticated MR materials with better properties and stability. Many smart systems and structures would benefit from the change in viscosity or other material properties of MR. Nowadays, these applications include brakes, dampers, clutches and shock absorbers systems.

2. Present theories and work

Vijay Kumar presented the work which is used to investigate the finishing efficiency of magneto-rheological fluid on steel specimen surfaces under magnetic field [1].

Song, choi, lee et.al. evolved in order to improve the surface quality of machining work piece a micro-precision surface finishing method by applying magneto-rheological fluid to the machined surface. Magneto-rheological fluid is colloidal suspension and stiffens into semi-solid when subjected to a magnetic field. Thus, the surface roughness of the finished surface could be controlled by magneto-rheological fluid under the different magnetic fields. Several sets of tests were performed with various normal loads, finishing speeds and magnetic fields. Their test results showed different surface characteristics of the test material under different magneticfields and proved the feasibility of this micro-precision surface finishing method to reduce the surface roughness of machining work piece efficiently [2].

Singh, jain, raghuram, et.al. .has proposed , Taguchi design of experiments is applied to find out important parameters influencing the surface quality are voltage (DC) applied to the electromagnet, working gap, rotational speed of the magnet, abrasive size (mesh number). Experimental results indicate that for a change in surface roughness (ΔR_a), voltage and working gap are found to be the most significant parameters followed by grain mesh number and then rotational speed. To analyses the finishing process, a force transducer has been designed and fabricated to measure forces acting during MAF [3].

Jha,das et.al.has developed a magneto-rheological Abrasive Flow Finishing (MRAFF) is a novel precision finishing process developed at I.I.T. Kanpur for Nano finishing of complex internal geometries using smart magneto-rheological polishing fluid. Magneto-rheological (MR) polishing fluid comprises of carbonyl iron particles (CIPs) and silicon carbide abrasives dispersed in the visco-plastic base of grease and mineral oil, exhibits change in rheological behavior in presence of external magnetic field. . In MRP-fluid, on the application of external magnetic field, the iron particles acquire dipole moments proportional to the magnetic field strength and when the dipolar interaction between the particles exceeds their thermal energy, the particles aggregate into chains of dipoles aligned in the field direction. Figures 1a and 1b shows actual photographs taken by optical microscope of CIPs interconnected chain structure. Figure 1c illustrates a model of the structure formed when no magnetic field is applied while Figure 1d shows the structure formed with abrasives trapped and embedded between iron chains, in the presence of finite magnetic field.
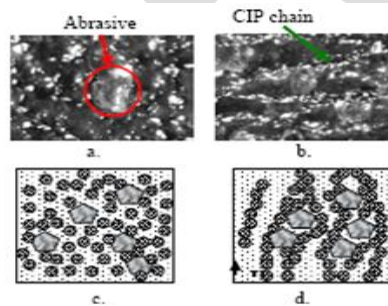

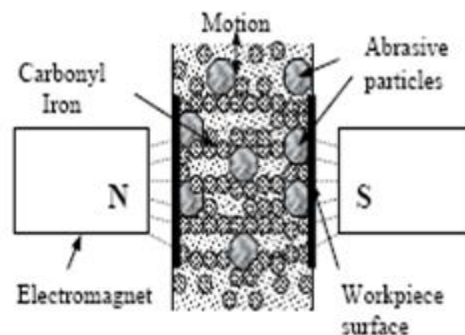Fig 1. structure of magnetorheological polishing fluide

Fig 2.Mechanism of MRAFF

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The mechanism of MRAFF action is illustrated in Fig. 2. The abrasive particles under the action of precisely controlled normal magnetic force due to CIP chains and tangential hydraulic extrusion force remove irregularities from the work piece surface to finish them in nanometer range. A hydraulically powered experimental setup as shown in Fig. 3 is designed to study the process characteristics and performance.

Fig 3. MRAFF Experimental setup

The results on stainless steel and silicon nitride work pieces are quite encouraging and surface roughness value, Ra up to 30 nm is already obtained using this process [4].

Das,jain, Ghoshdastidar et.al.had developed a new precision finishing process called magneto rheological abrasive flow finishing (MRAFF), is combination of flow machining (AFM) and magneto rheological finishing (MRF), has been developed for Nano-finishing of parts even with complicated geometry for a wide range of industrial applications[5].

Sunil Jha,V.K. Jain had inventeged a new precision finishing process for complex internal geometries using smart magneto-rheological polishing fluid is developed. Magneto-rheological abrasive flow finishing (MRAFF) process provides better control over rheological properties of abrasive laden magneto-rheological finishing medium. Magneto-rheological (MR) polishing fluid comprises of carbonyl iron powder and silicon carbide abrasives dispersed in the viscoplastic base of grease and mineral oil. A hydraulically powered experimental setup was designed to study the process characteristics and performance. The experiments were conducted on stainless steel work pieces at different magnetic field strength to observe its effect on final surface finish [6].

Das,manas, Ghoshdastidar et.al. had developed new finishing process named as 'rotational-magneto rheological abrasive flow finishing (R-MRAFF)' has been proposed to enhance the finishing performance of MRAFF process. In this process, a rotation cum reciprocating motion is provided to the polishing medium by a rotating magnetic field and hydraulic unit. By controlling these two rates (nanometer per cycle) is achieved for both stainless steel and brass work pieces. [7]

Jung, Byung-Kwon, Min, Lee,Seok et.al, had studied the main mechanism was a wheel-type magneto-rheological finishing process. The first uses a rectilinear alternating motion to improve processing conditions, and the second focuses on the use of more effective abrasives, namely magnetisable abrasives made of iron powders sintered with carbon nanotubes Furthermore, it was shown that these abrasives increase the lifetime of consumables (magneto-rheological fluid and abrasives) and the material removal rate [8].

3. Conclusion

From the literature search made produces data for different methodology for surface finishing by MR fluid such as MRAFF, R-MRAFF. From study it found that R-MRAFF is more convenient for to nanofinishing for   different geometries.

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DESIGN AND IMPLEMENTATION OF AN ALPHANUMERIC MICRO-CONTROLLER BASED GSM SCROLLING DISPLAY SYSTEM

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Abstract- There is the need for man to control electronic appliance(s) without necessarily moving an inch. This research paper discusses the design and implementation of a micro-controller-based global system for mobile communication (GSM) scrolling display system. The work uses the micro-controller (PIC 16F877A) as the control component in the construction of the device which makes simple, the design of the device due to the addition of the input/output port on the microcontroller. A GSM module was incorporated in the design which functions as the receiver of the message sent via short message service (SMS) on a GSM phone. There is an additional rechargeable battery back-up to compliment for power instability. The device is suitable for use at any location within the globe. The LED display system mainly consists of a GSM receiver and a display toolkit which can be programmed from an authorized mobile phone. It receives the SMS, validates the sending Mobile identification Number (MIN) and displays the desired information after necessary code conversion. The GSM-based system offers flexibility to display flash news or announcements faster than the programmable system. It can also be used at other public places like schools, gardens etc. without affecting the surrounding environment. The GSM network is inherently digital which makes it secured, relatively error-free and jamming-proof. Hospitals, banks, sports stadium, airports, railway stations, education sectors and stock markets etc find this device a useful tool to communicate electronically. It has an unparalleled advantage in drawing people's attention by prompting them to reflect many times on the scrolling lights, automatically displaying either messages of advertisement, place description or greetings at any time of the day. It can be used for both indoor and outdoor purposes. In fact it is the most alluring, unique, captivating and attractive means of information dissemination.

Keywords: Global System for Mobile Communication (GSM), Scrolling Display, Short Message Service (SMS), Mobile Identification Number (MIN), Light Emitting Diode (LED), Random Access Memory (RAM), Read Only Memory (ROM).

1. Introduction.

The role of information dissemination in the society cannot be over-emphasized. In addition to its vital functions of enlightening, educating, entertaining, and facilitation of commercial activities through advertisement and marketing of goods and services, its use in surveillance and monitoring (security, traffic control etc) and description of places also remain indispensable.Various means of information dissemination which include broadcasting (radio and television), the internet, newspaper, bill boards, sign posts and neon displays, are employed, the choice of which depends on factors such as the targeted audience, the environment concerned, the purpose, available technology and economy(Kobert et al 2002, Sedha 2002).

The use of "embedded system in communication" has given rise to many interesting applications which ensure comfort and secures human life. GSM network is among the most widely used wireless communication networks today for calling or sending SMS. Microcontroller controls the system by doing verification and thus making it more secured than other display systems. This system is easy to use in day to day life by any-one and at any place (globally). This will overcome the difficulties of latency faced by the previous moving text message display modules using wired entry via computer, keyboard or remote control entry (small distance).

Moving message display boards were constructed using a circuitry which uses shift registers and timers that control a system of hardwired LEDs. Digital bill board can be realized from a micro-controller. The micro-controller can manipulate data (binary values) following an organized sequence of steps in a system of micro-processor circuits that send control or driving signals to LED matrix. Thus, digital billboard can be represented generally by the control unit and display unit as shown in Figure 1.
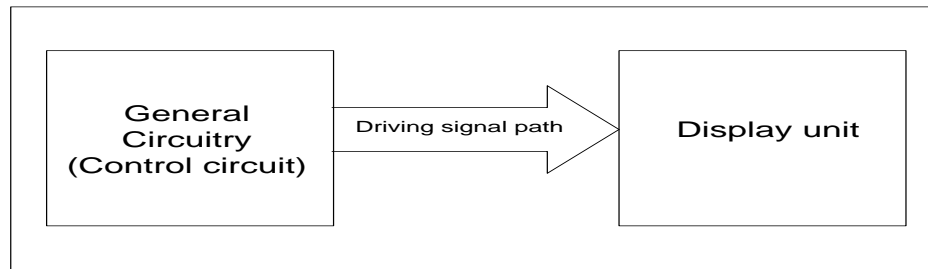
Figure 1: General Model of Moving Message Display Board

2. Microcontroller.

A microcontroller is a computer control system on a single chip. It has many electronic circuits which can decode written instructions and convert them into electrical signals. The microcontroller also goes further, stepping through the instructions and executing them one by one (Sedha 2002, Hehta 2013).

2.1. Constituents of a Microcontroller

A microcontroller is a single integrated circuit, having some important features which include central processing unit ranges from 4 bit processor to 32 or 64 bit processors. It has Volatile RAM for data storage, ROM, EPROM, EEPROM, flash memory for programming as well as storage of the processing parameters, Bi-directional I/O pins allowing control and detection of logic state, serial communication interfaces like I2C, Serial peripheral interface and controller area network for system interconnect, peripherals like timer, counter, PWM generator, watchdog timer, clock generator, ADC, DAC and finally in circuit programming and debugging support.It is also capable of consuming low power

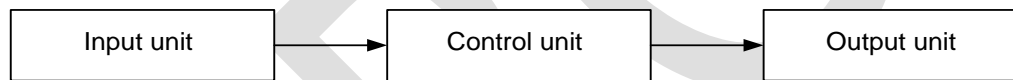The basic microcontroller system is as shown below in Figure 2.

Figure 2: Block diagram for the basic microcontroller system2

2.2. The Input Unit:

The input component consists of digital devices such as switches, push buttons, pressure mats, float switches, keypads and radio receivers, e.t.c. It also consists of analogue sensors such as light dependent resistors, thermistors, gas sensors, pressure sensors, e.t.c.

2.3. The Control Unit:

This is of course the microcontroller itself. The microcontroller monitors the inputs and as a result of the program written into it, turns output ON and OFF. The microcontroller stores the program in its memory and executes the instructions under the control of the clock circuit.

2.4. The Output Unit:

This consists of output devices such as light emitting diodes, buzzers,motors, alphanumeric displays, radio transmitters, 7-segment displays, etc.

Microcontroller is similar to microprocessor but with addition of I/O ports, memory, counter, a clock and interrupt circuitry. It is the additional circuitry that makes the microcontroller such a unique device. The microcontroller is designed primarily to operate on data that is fetched through serial or parallel input ports.The data is operated under the control of software stored in ROM and external device control though signal fed via the output port.

Microcontroller is designed to operate with the minimum of external circuitry to perform control-oriented task using a control program ROM. The instruction set for the microcontroller is simpler than that of the microprocessor, since most of its instructions will move code and data from internal memory to Arithmetic and Logic Unit (ALU). The use of many inputs/output pins allow data to be moved between file microcontroller and external devices often as single bits. The operation on single bit such as logical operation, flag

settings/clearing, e.t.c. is unique to the microcontroller. Microcontrollers are available in various sizes, the most of which is 8-bit although, 16-bit is popular for higher performance specifications (Kobert et al 2002, Leo 1984, Gaj 2014).

2.5. Features of Basic Microcontroller:

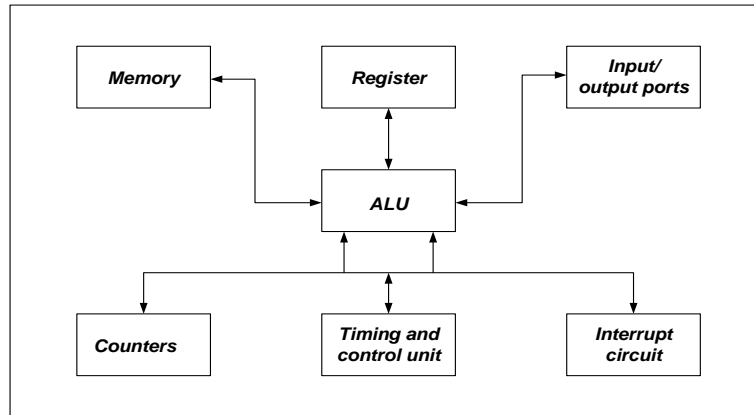The basic arrangement is shown in Figure 3 below. .

Figure 3: The basic arrangement of the internal structure of the microcontroller.

2.5.1.The Arithmetic and Logical Unit (ALU):

The Arithmetic and Logical Unit (ALU) performs arithmetic manipulations such as binary additions, subtractions and possibly multiplications and divisions. Logic functions such as AND, OR, NOT and Ex-OR can be implemented. The ALU consists of gates, which are organized to receive binary inputs and provides binary output according to the instruction codes. The register group contains the data that the processor needs while performing the task of executing a program. The registers include the Program Counter (PC), the Accumulator and Stack Pointer(Jijay et al 2014, Leo 1984).

2.5.2.The Input/ Output Unit
The input/output interface allows the connection of input data via a keyboard and sensors which can transpose information into electrical signal. For output data, this could be a monitor to display instructions, data and output that can feed external devices such as relays and LED. The amount of I/O provided in any particular microcontroller system is determined by the range of applications envisaged. In this design, input from the keyboard is accepted during the data programming and the display output during the running of the programming is displayed (Dahul and Preeti 2013, Frachee et al 2013).

2.5.3. Light Emitting Diodes (LED)
A LED is a P-N junction device (diode) that gives off light radiation when biased in the forward direction. LED chip materials are combinations of elements from the III and V columns of the periodic chart. The light emitting phenomenon makes use of the recombination within the P-N junction instead of thermal radiation. LEDs have a long life time. By controlling the forward current, the radiant flux of the LED can be easily controlled. The response time of an LED is very high (a few hundred nanoseconds) and can be pulsed at greater forward currents, to obtain high intensity radiant peaks. The resin packaging of LEDs allow for superb mechanical integrity and can withstand dropping, vibration and shock(Fanas et al 2013, Caj 2014, Brachee et al 2014).

LEDs are widely used as indicator lights on electronic devices and increasingly in higher power applications such as flashlights and area lighting. A LED is usually of a small area (less than $1mm^2$) light source, often with optics added to the chip to shape its radiation pattern and assist in reflection. The colour of the emitted light depends on the composition and condition of the semiconductor material used, and can be infrared, visible, or ultraviolet(Gaj 2014, Hehta 2013)

3. Design of the system
The power supply unit is the unit from which the maximum 5V d.c. voltage ever needed in the circuit is supplied. The unit comprises of the following components as shown in Figure 4 below.
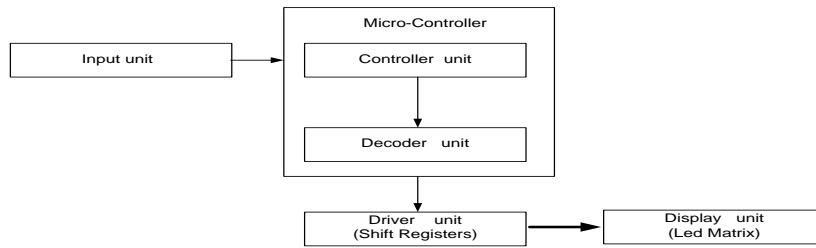
Figure 4: Design of the system

i. A transformer which steps down the a.c supply voltage to suit the requirement of the solid-state electronic devices and also provides isolation from the supply line

ii. A full wave bridge rectifier which performs the transformation of the a.c. voltage into a pulsating d.c. voltage in a process known as rectification

iii. Capacitors which filter out (remove) fluctuations or pulsations (called ripples) present in the rectifier output voltage.

iv. Capacitors which filter out (remove) fluctuations or pulsations (called ripples) present in the rectifier output voltage.

A fixed 1C voltage regulator (78L05) mounted on the internal circuit board to provide a stable + 5V d.c. output from the unregulated 12V d.c. fed into its input from the a.c/d.c. adaptor.

Using a 240V transformer on a 50Hz supply, transformer secondary r.m.s voltage output is 12V.

$$Peak\ voltage, V_p = V_{rms} \times \sqrt{2} \qquad (1)$$

$$V_p = 12\sqrt{2} = 16.97V \qquad (2)$$

$$Supply\ frequency, f = \frac{1}{period\,(T)} = 50Hz \qquad (3)$$

$$Period, T = \frac{1}{f} = \frac{1}{50} = 0.02s = 20ms \qquad (4)$$

The total voltage drop, V_d, for the two diodes involved in the rectification process in either of positive or negative cycles,

$$V_d = 2V_{BE}[V_{BE} = 0.7V\ for\ a\ silicon\ diode] \qquad (5)$$

$$V_d = 2 \times 0.7V = 1.4V \qquad (6)$$

Actual peak voltage value, $V_{LM} = (V_m - 2V_{BE})V \qquad (7)$

$$V_{LM} = (16.97 - 1.4)V \qquad (8)$$

$$V_{LM} = 15.57V \qquad (9)$$

Change in peak voltage value over the discharge period, $\delta V = V_{LM} - V_{dc} \qquad (10)$

$$V_{dc} = 10V \qquad (11)$$

The filter capacitor should not discharge down to 6V in accordance with the input voltage specification of the voltage regulator.

$$\delta V = (15.57 - 10.0) = 5.57V \qquad (12)$$

Change in time over the discharge period, $\delta t = 10ms \qquad (13)$

Total current consumption for this design is not expected to exceed 600mA

Hence the value of the filter capacitor is obtained thus:

$$C = \frac{600mA \times 10ms}{5.57V} = 1077.20\mu F \tag{14}$$

For safety reasons, the value of the capacitor was chosen to be twice the calculated value   i.e. 2154.4μF.

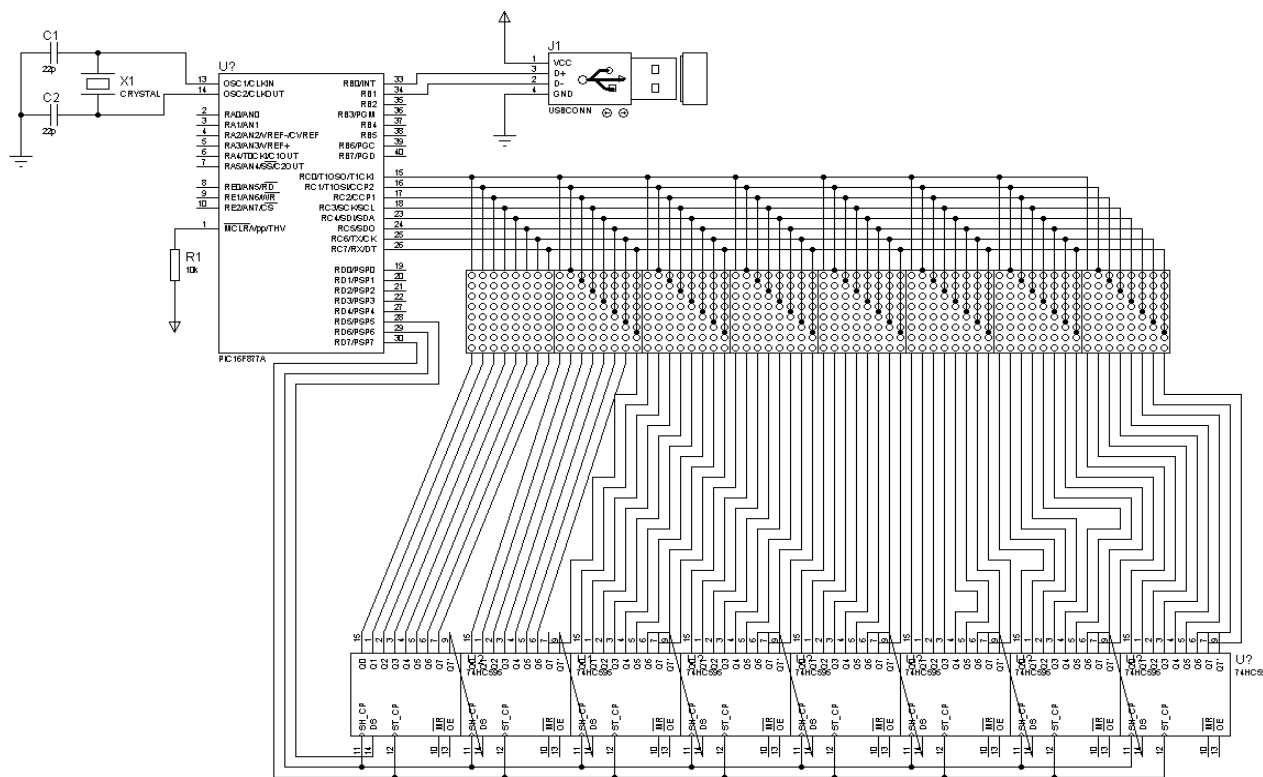The nearest available capacitor value of 2,200μF was used as the filter capacitor.

Figure 5: Circuit Diagram for A GSM Based Scrolling LED Display System

4. Implementation.

The implementation of this work was done on the breadboard. The power supply was first derived from a bench power supply in the school electronics laboratory. The implementation of the work on bread board was successful and it met the desired design aims with each stage performing as designed.

5. Conclusion.

This technical paper has discussed "GSM based Alphanumeric Scrolling Display System" which can be widely used for displaying notices in colleges, advertisement in stock market, by sending messages in form of SMS. The hardware board contains PIC 16F877A microcontroller at the heart of the system. The microcontroller is interfaced with GSM Modem. It is used to convert RS232 voltage levels to TTL voltage levels and vice versa. Microcontroller coding was done using embedded C programming. Multiple users are authorized to update notices on the digital notice board provided the user has the pass code

The digital scrolling light advert display was implemented using light emitting diodes (LED) matrix array. The LED matrix array was driven by a microcontroller programmed to handle the character/ message display. The choice of the LED matrix array and the use of a microcontroller were made to ensure that the display unit does not consume much power. A GSM module which serves as the receiver of the transmitted pulses from the mobile phone was also incorporated.

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Properties of Concrete made with Portland Cement Partly Replaced with Ground Granulated Blast Furnace Slag (GGBS)

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ABSTRACT: The use of pozzolan for cementation in concrete production has become common all over the world. When incorporated in accordance with the New European standard, British standard and other international standards, they can significantly enhance both the fresh and the hardened properties of concrete. Laboratory based experimentation was conducted to investigate the properties of concrete made by partial replacement of Portland Cement (PC) as the binder with Ground Granulated Blast-furnace slag (GGBS) as the pozzolana . Concrete cubes and cylinders were cast at a constant water/binder ratio of 0.542 and moist cured for 7, 14 and 28 days using the cementing materials. Measurements of compressive strength and porosity were determined. The results showed that the use of binary blend of PC and GGBS produces concrete with improved strengths and permeability at all replacement levels in comparison to that of PC concrete. It was established that PC–GGBS concrete properties have very good qualities, and for up to 30% replacement PC with GGBS, the concrete made become compact and less porous, with improved engineering properties. The porosity of the concrete containing pozzolana (GGBS) decreases with an increase in slag level up to 30% when compared to the control.

Keywords- Portland cement (PC), Ground Granulated Blast Furnace-slag (GGBS), Durability, Porosity and Compressive Strength, Pozzolana.

1.0 INTRODUCTION

Pozzolanic cementing materials such as fly ash, blast furnace slag, silica fume, rice husk ash and metakaolin have been used as partial replacements for portland cement. These materials can improve concrete durability, reduce the risk of thermal cracking in mass concrete and is less CO_2-intensive than cement [12]. Previous investigations on the use of high volumes of GGBS as a pozzolanic material result in more durable and sustainable concrete [13]. As a result, GGBS concrete is becoming of increasing interest for use as aggregate in structural concrete and recent research has examined its performance [14].

The need to improve construction practices worldwide and the growing environmental apprehension towards energy conservation and resources, researches globally have been directed towards the utilization of both industrial and agricultural by-products as building materials [7].. Pozzolanas from industrial and agricultural by-products such as rice husk ash, pulverized fuel ash, condensed silica fume and ground granulated blast furnace slag are receiving more attention now since their uses generally improve the properties of both fresh and hardened concrete. This, reduce heat of hydration and improve concrete's resistance to a range of durability threats, such as sulfate attack, alkali aggregates reactivity and increase demand for low cost and environmental friendly construction materials, thus strengthening economic growth and competitiveness [5]. Ground granulated blast furnace slag is an industrial by-product from the manufacture of iron. GGBS is a pozzalan by characteristics obtained by quenching molten iron slag from a blast furnace in water or steam to produce a glassy granular product. This is then dried and ground into fine powder. Investigation of the additions of GGBS in concrete noticed improved strength and reduced permeability [4]. There is a decrease in porosity of concrete paste as a result of the incorporation of GGBS with the reduction of the average pore size, thereby resulting in a less permeable paste [6]. Pozzolan are Siliceous or aluminous material, which in itself possesses little or no cementing value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide Ca $(OH)_2$ to form compounds possessing hydraulic cementing properties [13]. In GGBS, the amorphous glass content is considered to be the most significant variable and certainly the most critical to its hydraulicity [5]. The rate of quenching, which influences the glass content, is thus the predominant factor affecting the strengths of slag cements. The presence of alkaline activators improves the hydraulic activity in GGBS based systems [2]. At constant basicity the strength increases with the aluminium oxide (Al_2O_3) content, and a deficiency in calcium oxide (CaO) can be compensated by a larger amount of magnesium oxide (MgO). Hydraulic activity increases with increasing calcium oxide, aluminium oxide and magnesium oxide and decreases with increasing silica (SiO_2) content.

This research used GGBS as a base material for studying binary blended cement. The influence of this material on the compressive strength and permeability of concrete is discussed and the results are compared with those obtained with control Portland cement concrete. The knowledge in terms of strength and porosity would be beneficial to the understanding of the microstructures as well as for future applications of these materials in more severe and aggressive environment in which concrete is subjected to during its service life.

2.0 EXPERIMENTAL PROGRAM

A. *Materials*
The materials used in the research consisted of Portland cement, pozzalan as slag and natural sea-dredged sand.

Portland Cement (PC)
The PC used for this investigation is of strength class 32.5R [22] in 25 kg supplied by Lafarge Group Plc UK, complying with the European Standard [19]. Some of the other oxide and chemical composition of PC can be seen in Table I, the physical properties of the PC in Table II.

Table I: Oxide and Some Chemical Composition of PC

Oxides	PC
SiO_2	21.0
Al_2O_3	6.0
CaO	66.0
Fe_2O_3	2.0
MgO	4.2
MnO	0.03 – 1.11
K_2O	3.5
Na_2O	1.5
Na_2O Equivalent	3.81
SO_3	3.0
TiO_2	1
Cl	0.01
Free Lime	-
L.O.I	4.9
Insoluble Residue	-

Table II: Physical Properties of PC.

SAMPLE	MEDIAN SIZE (μm)	COLOR	BULK DENSITY	BLAINE FINENESS
PC	14	Grey	1400.000 (kg/m^3)	3500 cm^2/g)

The Pozzolan (GGBS)
The slag used as GGBS was obtained from the Civil and Marine slag Cement limited Ltd, Newport, UK. It was in compliance with [18]. A replacement level of 10%, 20% and 30% was used. The oxide and chemical composition of GGBS is shown in Table III, the physical properties of the PC in Table IV.

Table III: Oxide and Some Chemical Composition of GGBS.

Oxides	GGBS
SiO_2	36.6
Al_2O_3	10.4
CaO	37.6

Fe_2O_3	1.16
MgO	12.8
MnO	0.45
K_2O	0.33
Na_2O	0.07
Na_2O Equivalent	-
SO_3	0.87
TiO_2	-
Cl	-
Free Lime	-
L.O.I	1.72
Insoluble Residue	-

Table IV: Physical Properties of GGBS.

SAMPLE	MEDIAN SIZE (μm)	COLOR	BULK DENSITY	BLAINE FINENESS
GGBS	-	off-whit	1200.00 kg/m^3	5100 cm^2/kg.

The Sand

The sand throughout this study was natural sea-dredged sand from Bristol Channel (UK), and was in compliance with mortar composition for fine aggregate [4], with specific gravity of 2.62, fineness modulus of 2.83 and water absorption of 0.82%.

The Coarse Aggregates

The coarse aggregate used is medium graded sand combination of 10 mm and 20 mm natural round uncrushed gravel and was made available by a local quarry. It has a specific gravity of 2.73 and water absorption of 1.10%. The rough and angular surface of the 20mm crushed aggregate gives a good bond and the dust in the present in the 10mm helps to produce a good density concrete.

B. *Mix Design, Sample Preparation and Testing of the Fresh Concrete*

The control mix for the concrete in this work adopted a mix used on various occasions in previous researches. However it was modified for the current investigation by the authors. Cementing materials used in the study comprises of binary mixes of cement and pozzolana. The water to binder ratio used is 0.542.

Based on this control mix for the concrete, the current investigation used GGBS to replace the PC in the control mix (M1). The intention was not to maintain a specified consistency but to obtain a less porous concrete, irrespective of consistency, using GGBS aggregate and, if possible, without using super-plasticisers, for cost-effectiveness. After several trials with wide range of mixes, four mixes (M2-M4) were selected, in which GGBS aggregate was used to replace the PC aggregate in the control mix. Table V shows the various mix combinations.

Table V. The Fresh Concrete Mix Design

Mix Code	Material	Cement (Kg/m^3)	Coarse Aggregates: (kg/m^3)		Sand (kg/m^3)	Water (kg/m^3)	GGBS (kg/m^3)
			20/10	10/4			
M1	Concrete	420	210	230	880	189	0
M2	Concrete	378	210	230	880	189	42
M3	Concrete	336	210	230	880	189	84
M4	Concrete	294	210	230	880	189	126

For the first mix using GGBS aggregate (M2), the PC aggregate in the control concrete mix was replaced with 10% GGBS aggregate. For the second mix (M3), the PC aggregate in the control concrete mix was replaced with 20% GGBS aggregate. The final mix was designated M4 and the mix was produced by replacing the PC aggregate in the control concrete mix with 30% GGBS aggregate.

The concrete samples were casted following the standard procedure. Cast samples were kept in steel moulds in a room where the temperature was controlled at 22 ± 20ºC and were de-molded at the age of 24 ± 4 hours after casting. The aggregates were added in the mixer with a third of the water. After 5 minutes of mixing, the cement and the GGBS were added along with the rest of the water and permitted to fully hydrate. In an attempt to evade segregation and bleeding in the concrete, the fresh mixes were cast in moulds and a vibration process was introduced to homogenize the mix for one (1) minute. A method generally adopted, however it was modified in accordance with [25].

The concrete specimens cast were cubes of $100 \times 100 \times 100$ mm for the compressive strength, the rate of absorption (porosity) was carried out on all samples for the curing period ranging from 7 days, 14 days and 28 days.
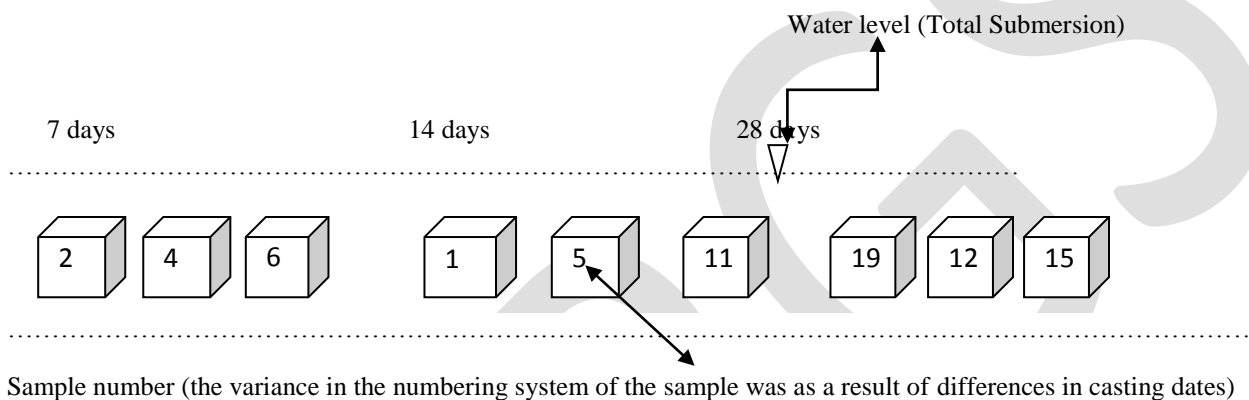
Figure 1. Curing Process Illustration.

Compressive Strength of the Hardened Concrete.
The samples of size 100x100x100 mm concrete cube mould for compressive strength were tested at the age of 7, 14 and 28days respectively. The test was done in accordance with [20], and the strength was calculated as follows:

$$\text{Where: } Rc = \frac{F}{Ac}$$

Rc = The compressive strength in (N/mm^2)

F = Maximum strength in (N)

Ac = Cross sectional area of the specimen in (mm^2)

Porosity Tests of the Hardened Concrete.
Porosity of concrete is regarded as a measure of the voids (empty spaces) in the concrete, and is a fraction of the volume of voids over the total volume. The percentage of void test determines the water absorbing capacity of the specimen indicating the porosity. For this investigation the density and percentage of voids were determined using a density rig with a 32kg weighing scale based on the [21]. The specimens were then placed in water tank at a temperature of ± 20ºC with the capacity to submerge the whole specimen. At the end of the curing period, the specimens were removed from the tank, and the surface water wiped off with a damp cloth. The mass of the specimen in water (Mw), in air (Ma) and the actual density were directly measured using a hydrostatic weighing in accordance with BS EN [19]. The percentage of voids of each specimen determined was checked against the design mix density of concrete. The percentage of voids for each specimen was calculated as:

.

$$\text{Percentage of Voids (V \%)} = \left[\frac{B - A}{A}\right] 100$$

Where:

Th   A = Actual density of the sample. B = Design mix density of concrete.

3.0 RESULTS AND DISCUSSION

Compressive Strength Results

Compressive strength results of the studied concrete are shown in Figure 2. The strengths of the concrete containing GGBS at the binary blended mixes were all higher than the control OPC (M1) at all ages. The incorporation of GGBS produces filler and dispersing effects and increases the nucleation and precipitation site, with increased compressive strength when compared with the control Portland cement concrete [7]. The incorporation of GGBS also produces the filler effect due to its fine particle size.
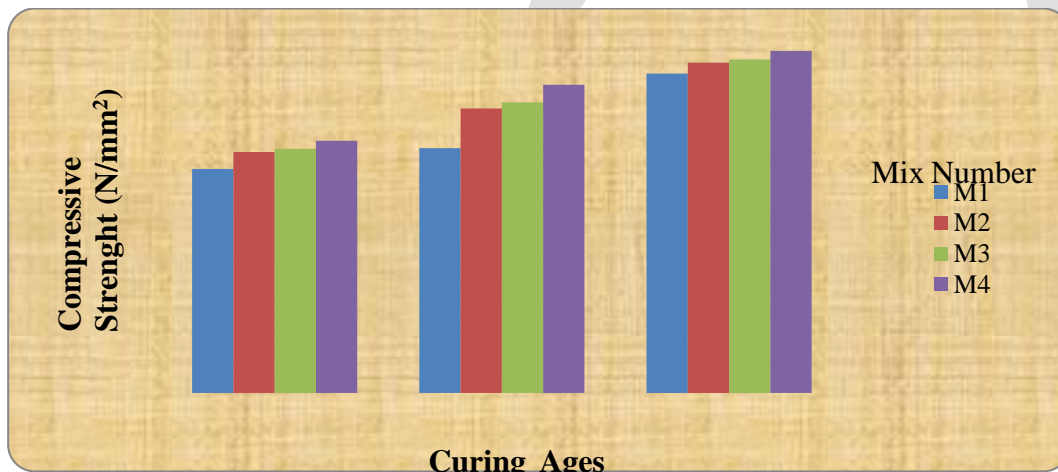
Figure 2: Compressive Strength Results for the Mixes at Different Curing Age.

Effect of GGBS on Compressive Strength of the Hardened Concrete.

The effects of different replacement levels of GGBS on the compressive strength for all the various mix composition are discussed as follows. The compressive strength of the PC used the control mix (MI) at all ages was lower than the strength of other mix composition. This is shown in Figure 2. The strength values of the mixtures prepared with GGBS mixes (M2– M4) were higher by a magnitude, which is depended on the distribution of GGBS particle sizes within the microstructure of the concrete prepared with GGBS. The higher compressive strength shown in mix (M2-M4) with the concrete containing GGBS can be attributed to the superior bonding of PC-to-GGBS interlock cementing system [15]

Compressive strength dependent mainly on the type of cement in the mortar paste and the type of aggregates; the cement/aggregate bond [12]. A good understanding of concrete's compressive strength can assist in the appropriate selection of material to minimize or possibly maximize the heat of hydration, which is influenced by the proportion of the calcium silicate hydrates (C_3S)   in the cement that causes an increase in the rate of heat of evolution at early ages of the hardened concrete. The compressive strength increases as the replacement level in the concrete increases from 10% to 30%. This trend was however expected [10].

The presence of GGBS on all the blended concrete showed positive effect on strength increase up to 28 days, since GGBS contains highly reactive siliceous and aluminous materials in a finely divided form. These materials, in the presence of water react with calcium hydroxide liberated during hydration of cement to form compounds (C–S–H gel), which possess cementing properties. In addition to

this, GGBS contains Calcia (CaO) which undergoes pozzalanic reaction with silica and alumina resulting in gel formation, also the fines and large surface area which allow GGBS to be involved more in the hydration process thereby filling the pore spaces which are left unfilled by the less fine cement particles. The characteristics strength of concrete is based on the 28 days strength test; the new European Standard minimum for characteristic cube test for various mixes as required [26] the strength obtained for M1 – M4 was all above the minimum characteristic value cube strength at 28 days curing. Therefore the results are in conformity with the acceptable engineering standard. The mix is classified as C40/50. The incorporation of blend of fine pozzolanas improves the strength of concrete due to synergic effect [9]

Influence of GGBS on Porosity Results

The results of the porosity of studied concrete at 7, 14 and 28 days in terms of percentage of voids 10%, 20% and 30% of GGBS at M2, M3 and M4 respectively are shown in Figure 3. The porosities of concrete containing blend are lower than that of the control concrete M1 at all ages. The addition of fine particles of GGBS causes segmentation of large pores and increases nucleation sites for precipitation of hydration products in cement paste [1]. This results in pore refinement and a reduction of calcium hydroxide (Ca (OH) $_2$) in the paste as a result of dilution effect and pozzolanic reactions. The concrete containing GGBS gives less porous concrete. In other word, GGBS is effective in modifying pore and reducing the porosity of concrete.
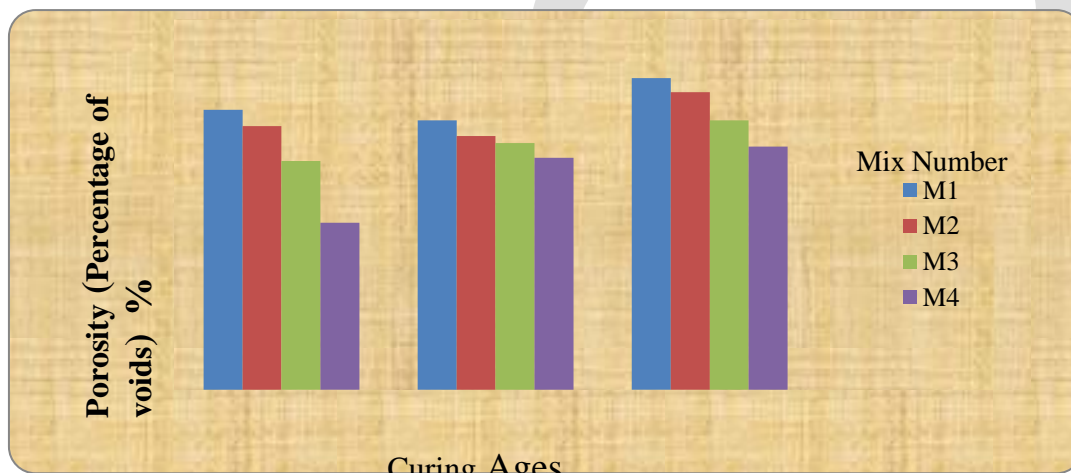

Figure 3: Porosity Results for the Mixes at Different Curing Age.

From the results, it is apparent that the percentage of voids present in the final product of concrete specimen has both direct and indirect effects on the overall performance of the concrete in service life. For instance the mechanical strength of the mixes (M2, M3 and M4) increases as curing age's progresses up to 28 days, but the percentage of void space decreases as the percentage of GGBS increases from 10% up to 30%., it was anticipated that pro-long curing (beyond 28 days) of the pozzalanic concrete of the mix (M2 – M4) will further improve the strength development. The results generally showed that, the incorporation of 10% to 30% of GGBS results in the decrease in void of the internal structure of the concrete, thereby making the concrete less permeable, [11]. Permeability is the baseline for concrete durability: a concrete with higher pore structure results in high rate of absorption, producing reduction in durability which can later lead to unbalanced tensile, excessive cracking and water ingress, and finally loss of durability when exposed to harsh environment.

This present study shows concrete containing GGBS is less permeable and chemically more stable than convectional PC concrete. This enhances its resistance to cracking and disintegration due to sulphate attack as a result of concrete exposure to aggressive water environment. The reactions between GGBS, PC and water are complex with regards to percentage of voids. This findings correlate with the result of a study, [8]. The main hydration product of PC–GGBS based system is calcium silicate hydrates. Additionally, the GGBS reacts with the excess of calcium hydroxide to form a finely dispersed gel, which fills the larger pores. The result is a hardened cement paste, containing far fewer calcium hydroxide crystals and therefore has fewer large capillary pores.

The reduction in free calcium hydroxide makes the concrete mix chemically more stable, and the finer pore structure (as a result of pore structure refinement) limits the ability of pore development and prevents chemicals diffusing through the concrete surface. Whereas in the case of mix M1, containing PC only, the PC reacts with water and creates insoluble hydration products (mainly calcium silicate hydrates). The more soluble product of hydration (calcium hydroxide) migrates through the pore solution and precipitates as discrete crystals, surrounded by large pores with expansive potential, making the PC based concrete with more pores and vulnerable to external attack.

CONCLUSIONS

The results obtained suggest that there is potential for using GGBS as partial substitutes for cement, which will facilitate more sustainable construction. The use of binary blend of PC and GGBS significantly improves the concrete in terms of strength and porosity at later age. Specifically, strength was improved at replacement levels up to 30% and porosity at higher replacement level comparable to the control Portland cement mixture. In addition, by incorporating GGBS in concrete, there is a reduction in the porosity of the concrete compared to the control Portland cement mixture. This is perhaps as a results of reduced Ca (OH)$_2$ in the interfacial zone compared to the control Portland cement. Furthermore, besides meeting the strength criteria, the parameter for the concrete specimen related to porosity, (percentage of voids) upon curing was within the acceptable limits for the durability of the final concrete product to ensure sustainable development.

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Assessment of plant extracts on the growth of <u>M.canis</u> and <u>H. capsulatum</u>

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Abstract- Plants are good sources of phytochemicals hence they are used variously in different medical uses . In this study the growth activity of M.canis and H.capsulatum on different plant parts of Argemone maxicana, Caesalpinia boundicella, Curcuma longa, Butea monosperma, Arjuna indica, Eclipta alba, Melia azadirachta and Psoralia corylifolia were assessedby sabourd dextrose medium .Some plants showed poor growth of dermatophytic fungi while some fungi promote the growth of fungi.

Key words:- phytochemicals, Dermatophytic fungi, sabourd dextrose

Introduction:- Plants which have one or more of its organs are sources of various organic and inorganic compounds , used for the therapeutic purposes , are known as medicinal plants   On the basis of report of kretivar and Basu {1918} Following plants of the noted local plants were taken to observe the influence of Acetone alcoholic and aqueous extracts on the mean dry Wt.of Mycellium

Common name	Botanical name	plants part
Fringhi Dhatura	Argemone maxicana	leaf
Arjun	Arjuna indica	Bark
Palash	Butea monosperma kunze	seed
Kati Karanj	Caesalpinia boundicella	seed
Turmeric	Curcuma longa LSPPL	Rhizome
Machrand buboi	Eclipta alba Hassole pl.	Leaf
Neem	Melia azadirachta LSPPL	Bark
Babchi	Psoralea corylifolia LSPPL	seed

Procedure:

Ten gram each of the above part was taken on dry weight basis and separately grounded in a grinder and extracted with 25ml rectified spirit and acetone. The extract were filtered and transferred to graduated test tube and kept in incubator at 60˚C to remove the acetone by evaporation the ue was suspended in 10ml of sterilized distilled water. The aqueous extract was prepared by boiling the above amount of material in 50ml of water for 30min. over water bath .The extract was filtered and adjusted to the volume of 10ml and autoclaved at 15 Psi for 15 minutes. For observing the influence of these extracts 1ml/49ml sterilized **SD** liquid medium except for the control. Selected fungal sps were grown on a thin layer of SDA medium in petridishes at room temperature .After incubation period of 10 days 5mm blocks were cut and transferred using asceptic technique to 250ml conical flask containing 50ml liquid medium of specific composition required to study the specific physiological aspect of the concern fungi .PH of the medium was adjusted to 5.8 with the help of 0.1 M KOH and 0. - 5 M KH2PO4 solution and inoculated for 15 days at 25+10c After the inoculation of 15 days , the mycelia mats were collected by filtering them through pre- weighed whatmans one to one filter paper individually and it was transferred to butter paper envelope .it was dried inside and incubated at temperature of 60±1c . After 24 hours of drying procedures the envelopes of mycelia mats were kept in sealed desicator over fused cacl2 . The actual weight of fungal mycelial were then calculated using the formula in mg

W=W1-W2, W= Wt of the mycelium , W1 =Wt of the filter paper , W2= Wt of the filter paper with mycelium

 Observation:

Temp.25±1˚C   **wt.expressed in mean dry wtin mg**

Plant	Solvent	M. canis	H. capsulatum
Argemone maxicana	water	148.000±0.577	76.000±1.453
	acetone	141.000±2.886	79.000±1.153
	Ethanol	144.000±1.5389	72.000±2.887
Arjuna indica	water	301.000±1.135	82.000±1.55
	Acetone	294.000±1.453	80.000±2.886
	Ethanol	290.000±2.886	78.00±2.086
Butea monosperma	Water	280.000±2.887	150.000±1.155
	acetone	270.000±1.453	152.555±0.882
	Ethanol	278.000±1.158	150.000±1.455
Caesapinia boundicella	Water	241.000±1.155	254.000±0.577
	Acetone	228.000±0.852	235.000±2.887
	Ethanol	240.000±1.453	234.666±1.453
Curcuma longa	Water	353.000±1.155	142.000±1.153
	Acetone	355.000±2.887	140.000±1.154
	Ethanol	350.000±1.155	142.000±1.155
Eclipta alba	Water	75.000±1.155	214.000±1.155
	Acetone	72.000±1.155	212.000±0.577
	Ethanol	60.000±0.577	214.000±1.153
Melia azadirachta	Water	202.000±1.483	137.000±1.153
	Actone	201.000±2.082	135.000±1.153
	Ethanol	200.000±1.153	132.000±0.333
Psoralia corylifolia	water	342.666±1.452	101.000±1.156
	Acetone	340.000±1.533	106.000±1.153
	Ethanol	346.666±1.453	104.000±1.153
Control CD at 1%		628.000±0.577	568.333±1.155
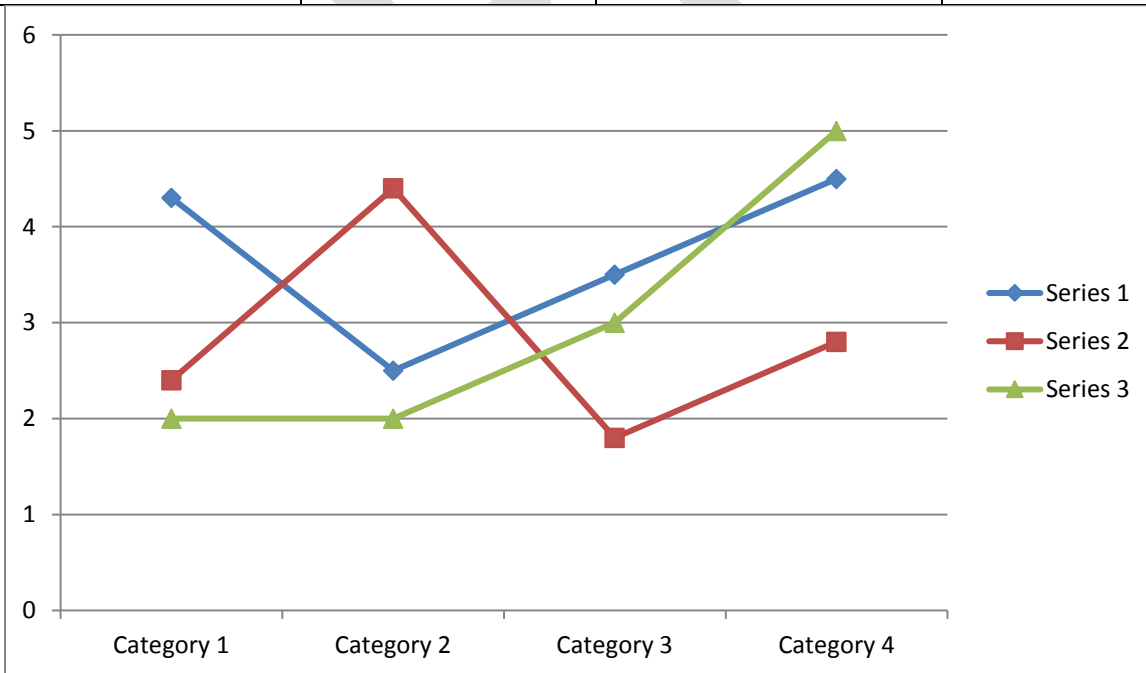
Result:

The result is highly significant for both the sps. Curcuma longa / in control condition at 1 % is found to be the best suitable for the Mycelial fungal growth of M. canis while the worst growth of Mycelial fungal was found to be in Eclipta alba in the case of Histoplasma capsulatum caesalpinia boundicella & in control condition at 1% was found to be the best growth of Mycelial fungas while the worst fungal growth was observed in Argemone maxicana.Conclusively it is said that Eclipta alba is the best checker of M. canis while Argemone maxicana is best checker of the fungus Histoplasma capsulatum fungus. The growth performance of these plant extract in **M.canis** were as:

Eclipta alba < Argemone maxicana < Melia azadiarachta< Caesalpinia bondicella < Buetia monosperma<Arjuna indica <Psoralea corilifolia <Curcuma longa <control

The poor performance of growth of fungus refers the check or inhibitory effect on fungus in according to their check performance of these plant extract in Histoplasma capsulatatum were as : Argemone maxicana < Arjuna indica < Psoralea corilifolia <Melia azadiarachta< Curcuma longa < Butea monosperma < Eclipta alba < Caesalpinia bondicella < Control cd.

Discussion

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Conclusion:-

In this study different plant parts were assessed for the for the growth of dermatophytic fungi M.canis and H. capsulatum . finally it was seen that eclipta alba and Argemone maxicanawere showed least growth ,check the growth of both fungi while Curcuma longa and Caesalpinia boundicella were promote the growth of these fungi.

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Experimental investigation of process parameters and optimization in EDM using taguchi method and grey relational analysis

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ABSTRACT-Among the thermal mode of machining, electrical discharge machining (spark erosion machining) is mainly a method for the manufacturing of a multitude[1] of ever changing geometries very often produced as unit job or in small batches.The basic concept of Electrcal Discharge Machining (EDM) process is creating out of metals affected by the sudden stoppage of the electron beam[3] by the solid metal surfaces of the anode.The portion of the anode facing the direct electrical pulse reaches the boiling point.Even in case of medium long pulse the rate of temperature increases in tens of millions of degree per second which means dealing with an explosion process.In the present work, a combined optimization approach is used for the estimation of maximum metal removal rate(MRR) [5]and minimum tool wear rate(TWR), surface roughness(SR) and overcut(OC) of produced in electrical discharge machining. The important input parameters current (I), pulse on time (T_{on}), pulse off time (T_{off}) and voltage (V) are considered. Twenty five experiments has been performed on AISI D2 steel as work piece and copper(Cu) as tool materials. The optimum setting of the machining parameters has been evaluated from the grey relational grade. With the help of Analysis of variance the percentage contribution of the input parameters has been found out. The optimal set of parameters are current (50A), voltage (27V) , pulse on time (300µs),pulse off (10µs).

Keywords: Electro discharge machining (EDM), AISI D2 steel, Copper, Taguchi Analysis,Grey relational analysis (GRA) .

INTRODUCTION

The process of electric discharge machining also known as electro-erosion or spark machining involves controlled erosion of electrically conducting materials by an interrupted, repetitive electric spark,discharge between the tool(cathode) and work(anode) separated by a dielectric fluid medium.

The process is used mainly for the manufacture of tools made of carbide and other hard materials and having complicated profiles such as dies used for molding, forging, extrusion, wire drawing etc in as hard condition.

Principle of EDM

The workpiece and electrode are separated by a gap, called spark gap(0.005 to 0.05mm) and a suitable dielectric slury,which is non-conductor of electricity, is forced through this gap at a pressure of about 2kgf/cm^2.When a proper voltage[4] is applied the dielectric breaks down and electrons are emitted from cathode and the gap is ionized.Avalanche of electrons takes place with collection of more electrons in the gap,consequently the resistance drops causing electric spark to jump between the workpiece and the tool.Each electric discharge causes a focused stream of electrons to move with a very high velocity from the cathode towards anode and their collision with the work results in the generation of compression shock waves on high spots of workpiece[12] closest to the tool which consequently developes local rise in temperature the tune of 10000^{0}C sufficient enough to melt a part of the workpiece metal. Gap control in EDM is affected through a servo system which correctly locates the tool in relation to the workpiece surface, maintains a constant gap throughout the operation,sences the changes in the gap and corrects them immediately.A short-circuit across the gap causes the servo to reverse the motion of the tool until the correct gap is established.Servo system may be electrical or hydraulic type.Eletro hydraulic servo control is preferred.
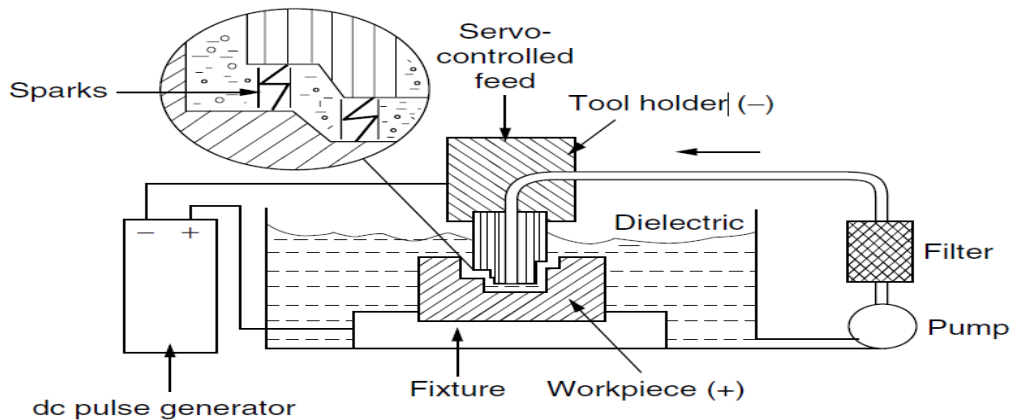
Fig.1.1 Set up of Electric Discharge Machining

Important parameters of EDM

(a) Spark on time (pulse time or T_{on}): The duration of time (μs) the current is allowed to flow per cycle. Material removal is directly proportional to the amount of energy applied during this on time. The energy is really controlled by the peak current and the length of on time.

(b)Spark off time (pause time or T_{off}) The duration of time (μs) between the sparks (that is to say, on time). This time allows the molten material to solidify and to be wash out from the arc gap. This parameter has to effect the speed and the stability of the cut. Thus, if the off time is too short, it will cause spark to be unstable.

(c) Arc gap (or gap): The arc gap is the distance between the electrode and work piece during the process of EDM. It may called as spark gap. Spark gap can be maintained by servo system.

(d) Discharge current (current): Discharge current is directly proportional to material removal rate.

(e) Duty cycle (τ): It is the percentage of the on time relative to the total cycle time. This parameter is calculated by dividing the on time to the total cycle time.

$$\tau = \frac{Ton}{Ton + Toff}$$

(f) Voltage (V): It is a potential that can be measured in volt, it is also effect the material removal rate and allowed to per cycle.

 (g) Diameter of the electrode (D): It is the electrode of copper with diameter 11 mm in this experiment.

 (h) Over cut: It is the clearance per side of the electrode and the work piece after the machining operation.

Objective of the present work

   From the literature review it is concluded that many researchers have done experiment with different workpieces and tools in EDM. In those experiments they have evaluated the value of performance parameters taken into consideration of different values of process parameters. The objective of the present work is an attempt for experimental investigation of process parameters and optimisation of the performance parameters in EDM with the help of Grey relational analysis method for AISI D2 steel.The machining parameters taken into consideration are discharge current,voltage,pulse on time,pulse off time.The performance parameters which are taken into consideration MRR,TWR,SR and OC.Five level of process parameters are taken into consideration while doing the experimental work.And one of the measure feature of the experiment is that here the machining time is constant.By keeping the machining time constant the over cut can be measuresd.

Experimental work

In this chapter we are going to discuss about the experimental work which is consist about formation of the L-25 orthogonal array based on Taguchi design, orthogonal array is reduces the total on of experiment, in this experiment total 18 run. And Experimental set up, selection of work piece, tool design, and taking all the value and calculation of MRR, TWR, and OC.

Experimental set up

Specification Of the Die sink EDM Used For Machining Process

Description	Details
Manufactured by	Electronica
Model name	EMS-5535/PS 50
Specification	(X-300*Y-200*Z-200)MM
Price	.8 Million
Year	1995

Die-Sink EDM

Selection of workpiece

For this particular research work AISI D2 steel has been considered as the workpiece because this material has good machining quality with copper tool as here in this paper copper has considered as electrode

Material specification

Chemical composition of AISI D2 Steel.

> ➢ C :- 1.50%
> ➢ Si :- 0.30%
> ➢ Cr :- 12%
> ➢ Mo:- 0.80%
> ➢ V :- 0.90%

Mechanical properties of AISI D2 Steel at room temperature

0.2% Offset yield strength	1532MPa
Tensile strength	1736MPa
Hardness (HRC)	57

Process parameters

> ➢ Current (I_p)
> ➢ Voltage (V)
> ➢ Pulse on time(T_{on})
> ➢ Pulse off time(T_{off})

Performance parameters

> ➢ Metal Removal Rate (MMR)
> ➢ Tool Wear Rate (TWR)
> ➢ Surface Roughness (SR)
> ➢ Over Cut (OC)

Taguchi design of experiment in minitab 16:-

MINITAB provides both static and dynamic response experiments in a static response experiment; the quality characteristic of interest has a fixed level. The goal of robust experimentation is to find an optimal combination of control factor settings that achieve robustness against (insensitivity to) noise factors. MINITAB calculates response tables and generates main effects and interaction plots for:-

- ➢ Signal-to-noise ratios (S/N ratios) vs. the control factors.
- ➢ Means (static design) vs. the control factors.

A Taguchi design or an orthogonal array the method is designing the experimental procedure using different types of design like, two, three, four, five, and mixed level. In the study, a four factor mixed level setup is chosen with a total of eighteen numbers of experiments to be conducted and hence the OA L25 was chosen. This design would enable the two factor interactions to be evaluated. As a few more factors are to be added for further study with the same type of material, it was decided to utilize the L25 setup, which in turn would reduce the number of experiments at the later stage. In addition, the comparison of the results would be simpler.

Machining Parameters and Their Level

Level of Control Parameters	Control Parameters			
	Current I	Voltage V	Pulse On TON	Pulse Off TOFF
1	20	20	50	8
2	30	25	100	9
3	40	27	150	10
4	50	28	200	11
5	35	26	300	12

Taguchi L25 Design Creation in Mini Tab

Expt.No	Current	voltage	T_{ON}	T_{OFF}
1	20	20	50	8
2	20	25	100	9
3	20	27	150	10
4	20	28	200	11
5	20	26	300	12
6	30	20	100	10
7	30	25	150	11
8	30	27	200	12
9	30	28	300	8
10	30	26	50	9
11	40	20	150	12
12	40	25	200	8
13	40	27	300	9
14	40	28	50	10
15	40	26	100	11
16	50	20	200	9
17	50	25	300	10
18	50	27	50	11
19	50	28	100	12
20	50	26	150	8
21	35	20	300	11
22	35	25	50	12
23	35	27	100	8
24	35	28	150	9
25	35	26	200	10

Experimental investigation:-
Calculation of MRR, TWR, SR, OC

Exp.No.	Current	Voltage	Pulse ON	Pulse OFF	MRR	TWR	SR	OC
1	20	20	50	8	12.651	.560	2.758	.120
2	20	25	100	9	9.430	.373	5.325	.110
3	20	27	150	10	6.329	.747	9.127	0
4	20	28	200	11	6.329	.186	8.191	0
5	20	26	300	12	9.493	.653	7.129	.100
6	30	20	100	10	24.261	.560	10.197	.180
7	30	25	150	11	7.383	.842	7.197	.030
8	30	27	200	12	7.383	.747	6.234	.040
9	30	28	300	8	6.329	.653	9.231	.050
10	30	26	50	9	3.164	.280	8.919	.030
11	40	20	150	12	13.712	.934	7.231	.070
12	40	25	200	8	12.651	.934	8.951	.100
13	40	27	300	9	6.329	.653	9.321	.130
14	40	28	50	10	5.274	.280	5.613	.070
15	40	26	100	11	4.219	.560	5.239	.090
16	50	20	200	9	27.426	.373	12.235	.130
17	50	25	300	10	31.647	.934	12.913	.190
18	50	27	50	11	8.438	.934	9.132	.020
19	50	28	100	12	7.383	.934	7.197	.100
20	50	26	150	8	7.383	.653	6.239	.030
21	35	20	300	11	21.097	.934	11.239	.130
22	35	25	50	12	8.438	.842	7.197	.030
23	35	27	100	8	6.329	.747	9.231	.070

| 24 | 35 | 28 | 150 | 9 | 4.219 | .653 | 8.951 | .060 |
| 25 | 35 | 26 | 200 | 10 | 3.164 | .280 | 6.391 | .090 |

Effect of process parameters on performance parameters
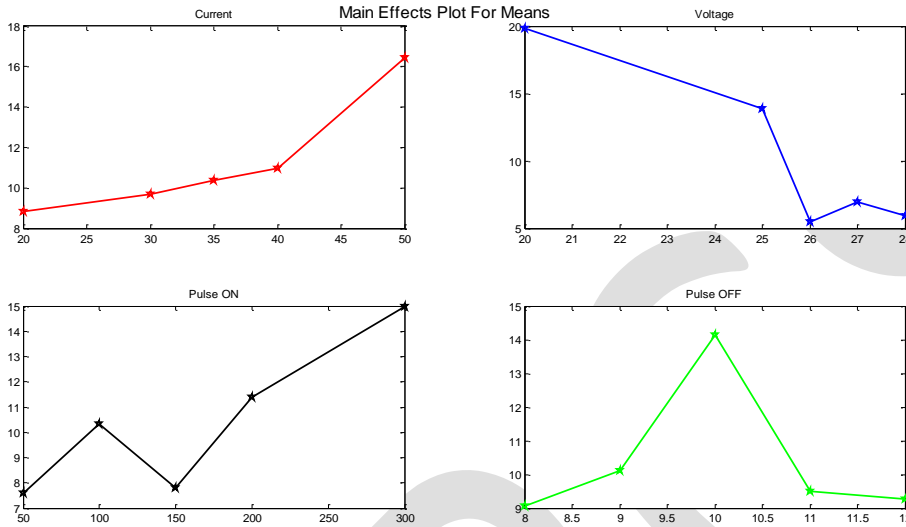
Effect of Process Parameters on MRR
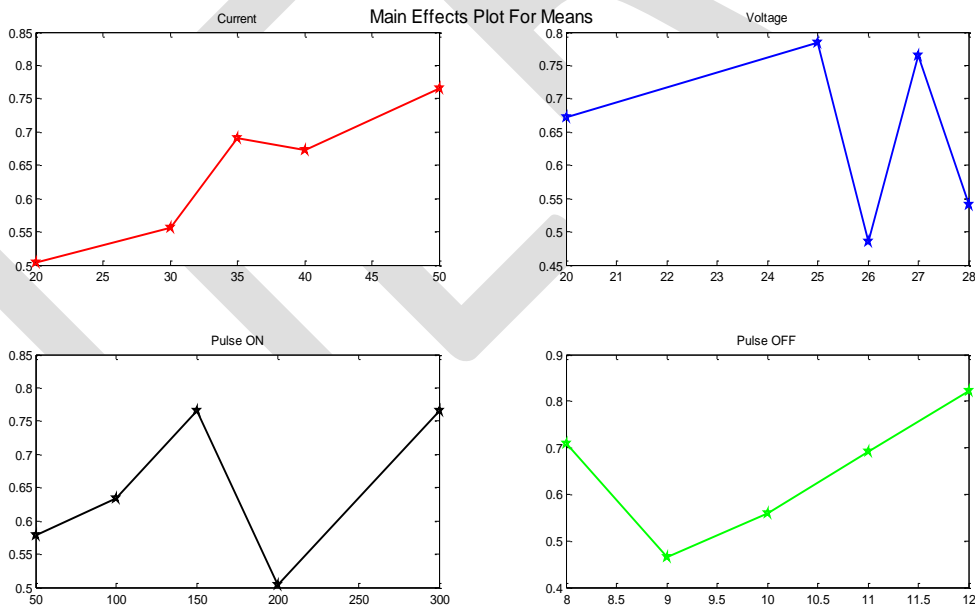
Effect of Process Parameters on TWR
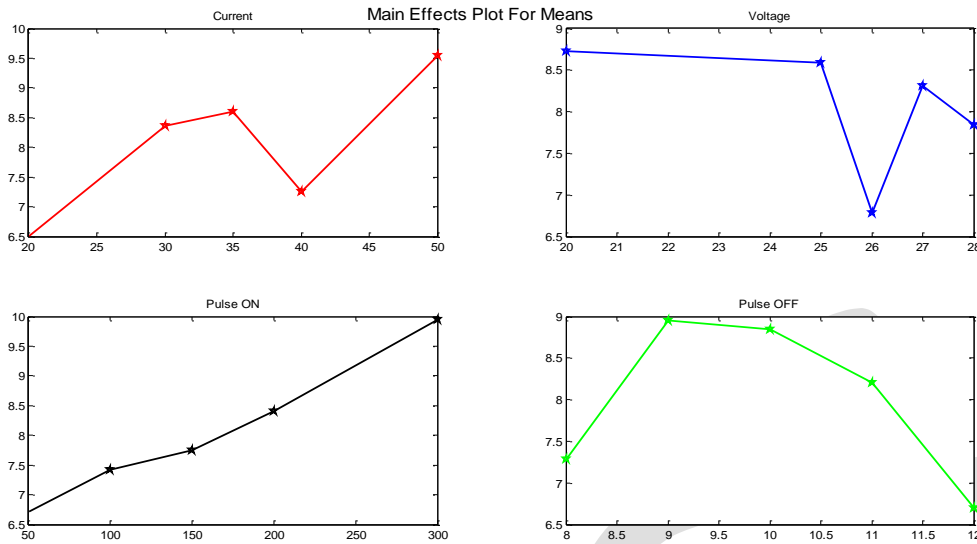
Effect of Process Parameters on SR
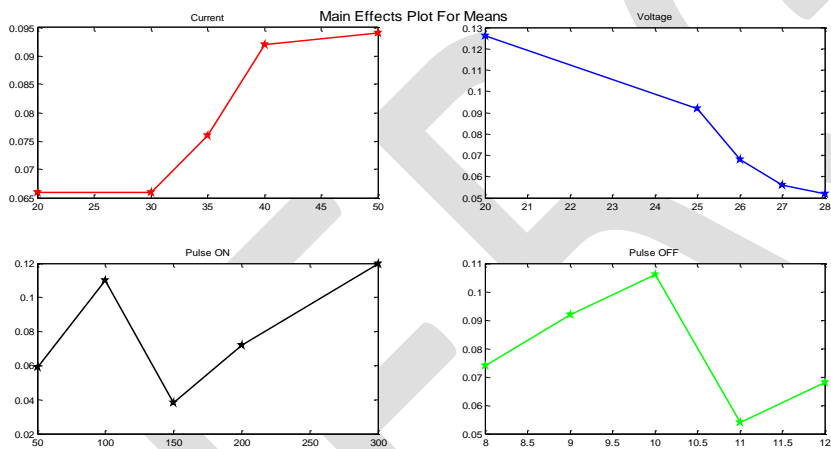
Effect of Process Parameters on OC

Optimization method

The experiment was conducted based on varying the process parameters which affect the machining process to obtain the required quality characteristics. Quality characteristics are those response values or output values expected out of the experiments. The most commonly used quality characteristics are:

(1) Larger the better
(2) Smaller the better
(3) Nominal the better

As the objective is to obtain the high material removal rate, low tool wear rate ,low over cut and smaller value of surface roughness. So it is concerned with connected with larger value of MRR, smaller value of tool wear, low value of over cut and smaller value of surface roughness. Hence the required quality characteristics for high MRR is larger the better, which states that the output must be as large as possible and for tool wear, over cut and surface roughness is smaller the better which states that the output must be as low as possible.

Grey relational analysis

In Grey Relational Analysis the multiple performance characteristics have been investigated with Grey Relational approach.In this approach the multiple performance characteristics can be converted into single grey relational grade. In the grey relational analysis, the grey relational grade is used to show the relationship among the sequences. If the two sequences are identical, then the value of grey relational grade is equal to 1. The grey relational grade also indicates the degree of influence that the comparability sequence could exert over the reference sequence. Therefore, if a particular comparability sequence is more important than the other comparability sequences to the reference, then the grey relational grade for that comparability sequence and reference sequence will be higher than other grey relational grades.

Steps for optimization using grey relational analysis

STEP-1

| TRANSFORMATION OF S-N RATIO VALUES FROM THE ORIGINAL RESPONSE VALUES. |

STEP-2

| PREPROCESSING OF DATA TO BE ERFORMED FOR NORMALIZING THE RAW DATA FOR ANALYSIS |

STEP-3

| CALCULATION OF GEY RELATIONAL CO-EFFICIENT TO EXPRESS THE RELATIONSHIP BETWEEN THE IDEAL AND ACTUAL NORMALIZED EXPERIMENTAL RESULTS |

STEP-4

| DETERMINATION OF GREY RELATIONAL GRADE BY AVERAGING THE GREY RELATIONAL CO-EFFICIENT CORRESPONDING TOEACH PERFORMANCE CHARACTERISTICS |

STEP-5

| DETERMINATION OF THE OPTIMAL FACTOR AND ITS LEVEL COMBINATION |

Formula used in each step in gra

Step-1:

Type 1: $S/N_{HB} = -10\log_{10}[(\frac{1}{n})(\sum \frac{1}{Y_{ij}^2})]$

Type-2: $S/N_{LB} = -10\log_{10}[\sum \frac{Y_{ij}^2}{n}]$

Where Y_{ij} is the value of the response
'j' in the ith experiment condition , with i=1,2,3....n; J=1,2,....k

Step-2:

$Z_{ij} = \dfrac{y_{ij} - \min(y_{ij}, i=1,2,..n)}{\max(y_{ij}, i=1,2,..n) - \min(y_{ij}, i=1,2,..n)}$ for higher the better criteria

$Z_{ij} = \dfrac{\max(y_{ij}, i=1,2,..n) - y_{ij}}{\max(y_{ij}, i=1,2,..n) - \min(y_{ij}, i=1,2,..n)}$ for lower the better criteria

Step-3:

$\xi_i(k) = \dfrac{\Delta_{\min} + \zeta\Delta_{\max}}{\Delta_{0i}(k) + \zeta\Delta_{\max}}$

Where $\Delta_{oi}(k)$ is the deviation sequence of the reference sequence and compatibility sequence

$\Delta_{0i}(k) = \| y_0(k) - y_i(k) \|$

$\Delta_{\min} = \dfrac{\min \min \| y_0(k) - y_j(k) \|}{\forall j \in i \forall k}$

$\Delta_{\max} = \dfrac{\max \max \| y_0(k) - y_j(k) \|}{\forall j \in i \forall k}$

y_0 (k) denotes the sequence and $y_j(k)$ denotes the comparability sequence . ζ is distinguishing or identified coefficients. The value of ζ is the smaller and distinguished ability is the larger. ζ =0.5 is generally used.

Step-4:

$$\gamma_i = \frac{1}{n} \sum_{k=1}^{n} \xi_i(k)$$

Where γ_i is the gray relational grade for the jth experiment and k is the number of performance characteristics

RESULTS AND DISCUSSION

**Tabulation representation of step-1 for optimization using grey relational analysis**

Expt.No.	Response values				S/N Ratio			
	MRR	TWR	SR	OC	MRR	TWR	SR	OC
1	12.651	.560	2.758	.120	22.042	5.036	-8.811	18.416
2	9.430	.373	5.325	.110	22.219	11.576	-11.51	22.182
3	6.329	.747	9.127	0	20.790	7.304	-14.43	44.710
4	6.329	.186	8.191	0	22.047	20.630	-12.24	0
5	9.493	.653	7.129	.100	26.580	10.691	-10.07	26.989
6	24.261	.560	10.197	.180	35.480	12.817	-12.38	22.676
7	7.383	.842	7.197	.030	25.812	9.944	-8.692	38.908
8	7.383	.747	6.234	.040	26.391	11.564	-6.988	36.989
9	6.329	.653	9.231	.050	25.569	13.244	-9.762	35.563
10	3.164	.280	8.919	.030	20.004	21.050	-9.006	40.457
11	13.712	.934	7.231	.070	33.155	11.006	-6.770	33.511
12	12.651	.934	8.951	.100	32.834	11.384	-8.245	30.791
13	6.329	.653	9.321	.130	27.166	14.841	-8.249	28.860
14	5.274	.280	5.613	.070	25.904	22.518	-3.522	34.559
15	4.219	.560	5.239	.090	24.265	16.797	-2.624	32.676
16	27.426	.373	12.235	.130	40.804	20.607	-9.710	29.762
17	31.647	.934	12.913	.190	42.311	12.897	-9.916	26.729
18	8.438	.934	9.132	.020	31.077	13.143	-6.658	46.532
19	7.383	.934	7.197	.100	30.152	13.380	-4.358	32.787

20	7.383	.653	6.239	.030	30.374	16.710	-2.891	43.467
21	21.097	.934	11.239	.130	39.703	13.815	-7.792	30.943
22	8.438	.842	7.197	.030	31.949	14.917	-3.718	43.881
23	6.329	.747	9.231	.070	29.643	16.180	-5.687	36.715
24	4.219	.653	8.951	.060	26.300	17.503	-5.235	38.239
25	3.164	.280	6.391	.090	23.984	25.036	-2.131	34.894

In the above table S/N ratios are calculated for the different response values found for every performance parameter from the experiment.

Tabulation and graphical representation of step-2 for optimization using grey relational analysis

Expt.No.	Current	Voltage	Pulse ON	Pulse OFF	Normalized S/N Ratio			
					MRR	TWR	SR	OC
1	20	20	50	8	0.0913	1.000	0.8611	0.6042
2	20	25	100	9	0.0992	0.6730	0.8850	0.5232
3	20	27	150	10	0.0352	0.8860	1.1611	0.0648
4	20	28	200	11	0.0915	0.2208	0.9540	1.0000
5	20	23	300	12	0.2947	0.7172	0.7490	0.4199
6	30	20	100	10	0.6937	0.6109	0.9679	0.5126
7	30	25	150	11	0.2603	0.7546	0.6191	0.1638
8	30	27	200	12	0.2863	0.6736	0.4583	0.2050
9	30	28	300	08	0.2494	0.5896	0.7201	0.2357
10	30	26	50	09	0.0000	0.1993	0.6488	0.1305
11	40	20	150	12	0.5895	0.7015	0.4378	0.2798
12	40	25	200	08	0.5751	0.6826	0.5770	0.3382
13	40	27	300	09	0.3210	0.5097	0.5773	0.3797
14	40	28	50	10	0.2644	0.1259	0.1310	0.2573
15	40	26	100	11	0.1910	0.4119	0.0465	0.2977
16	50	20	200	11	0.9324	0.2214	0.7152	0.3603
17	50	25	300	10	1.000	0.6080	0.7347	0.4255
18	50	27	50	11	0.4963	0.5946	0.4272	0.0000
19	50	28	100	12	0.4549	0.5828	0.2101	0.2953
20	50	26	150	08	0.4648	0.4163	0.0717	0.0658
21	35	20	300	11	0.8830	0.5610	0.5342	0.3350
22	35	25	50	12	0.5354	0.5059	0.1497	0.0569
23	35	27	100	08	0.4321	0.4443	0.3355	0.2109
24	35	28	150	09	0.2823	0.3766	0.2929	0.1782
25	35	26	200	10	0.1784	0.0000	0.0000	0.2501

Tabulation and graphical representation of step-3 for optimization using grey relational analysis

Expt.No.	Current	Voltage	Pulse ON	Pulse OFF	Deviation Sequence			
					MRR	TWR	SR	OC
1	20	20	50	8	0.9087	0.0000	0.3000	0.3958

2	20	25	100	9	0.9008	0.3270	0.2761	0.4768
3	20	27	150	10	0.9648	0.1140	0.0000	0.9352
4	20	28	200	11	0.9085	0.7792	0.2710	0.0000
5	20	23	300	12	0.7053	0.2828	0.4121	0.5801
6	30	20	100	10	0.3063	0.3891	0.1932	0.4874
7	30	25	150	11	0.7394	0.2454	0.5421	0.8362
8	30	27	200	12	0.7137	0.3264	0.7028	0.7950
9	30	28	300	08	0.7506	0.4104	0.4410	0.7643
10	30	26	50	09	1.0000	0.8007	0.5123	0.8695
11	40	20	150	12	0.4105	0.2985	0.7233	0.7202
12	40	25	200	08	0.4249	0.3174	0.5841	0.6618
13	40	27	300	09	0.6790	0.4930	0.5838	0.6203
14	40	28	50	10	0.7356	0.8741	1.0301	0.7427
15	40	26	100	11	0.8090	0.5881	1.1146	0.7023
16	50	20	200	11	0.0676	0.7786	0.4459	0.6397
17	50	25	300	10	0.0000	0.3916	0.4264	0.5745
18	50	27	50	11	0.5037	0.4054	0.7339	1.0000
19	50	28	100	12	0.5451	0.4172	0.9510	0.7047
20	50	26	150	08	0.5352	0.5837	1.0830	0.9342
21	35	20	300	11	0.1170	0.4390	0.6269	0.6680
22	35	25	50	12	0.4646	0.4941	1.0114	0.9431
23	35	27	100	08	0.5679	0.5557	0.8256	0.7891
24	35	28	150	09	0.7177	0.6234	0.8682	0.8218
25	35	26	200	10	0.8216	1.0000	1.1611	0.7499
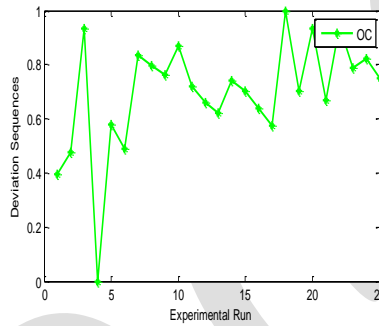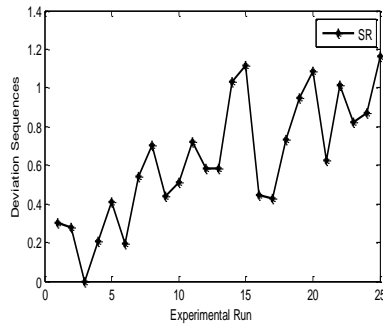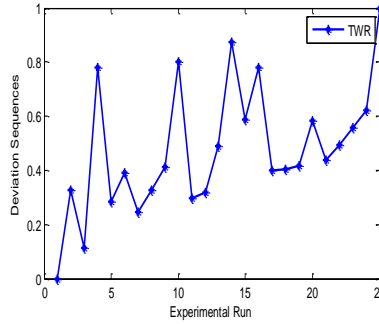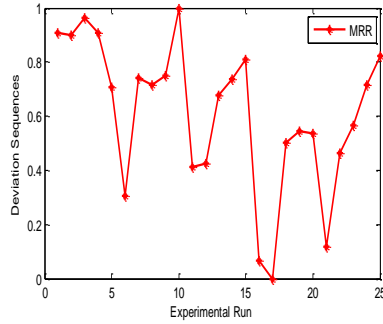
Calculation of gray relational co-efficient

Expt.No.	Current	Voltage	Pulse ON	Pulse OFF				
					MRR	TWR	SR	OC	
1	20	20	50	8	0.3549	1.0000	0.6250	0.5581
2	20	25	100	9	0.3569	0.6045	0.6442	0.5118
3	20	27	150	10	0.3413	0.8143	1.0000	0.3483
4	20	28	200	11	0.3549	0.3908	0.6485	1.0000
5	20	23	300	12	0.4148	0.6387	0.5481	0.4629
6	30	20	100	10	0.6201	0.5623	0.7219	0.5063
7	30	25	150	11	0.4033	0.6707	0.4798	0.3741
8	30	27	200	12	0.4119	0.6050	0.4156	0.3861
9	30	28	300	08	0.3998	0.5409	0.5313	0.3954
10	30	26	50	09	0.3333	0.3844	0.4939	0.3650
11	40	20	150	12	0.5491	0.6261	0.4087	0.4097
12	40	25	200	08	0.5405	0.6119	0.4611	0.4303
13	40	27	300	09	0.4240	0.5048	0.4613	0.4463
14	40	28	50	10	0.4046	0.3638	0.3267	0.4023

15	40	26	100	11	0.3819	0.4595	0.3096	0.4158
16	50	20	200	11	0.8809	0.3910	0.5288	0.4387
17	50	25	300	10	1.0000	0.5607	0.5397	0.4653
18	50	27	50	11	0.4981	0.5522	0.4052	0.3333
19	50	28	100	12	0.4784	0.5451	0.3445	0.4150
20	50	26	150	08	0.4829	0.4613	0.3157	0.3486
21	35	20	300	11	0.8103	0.5324	0.4436	0.4280
22	35	25	50	12	0.5183	0.5029	0.3308	0.3464
23	35	27	100	08	0.4682	0.4736	0.3771	0.3878
24	35	28	150	09	0.4106	0.4450	0.3654	0.3782
25	35	26	200	10	0.3783	0.3333	0.3010	0.4000
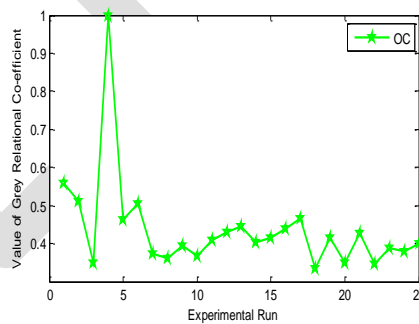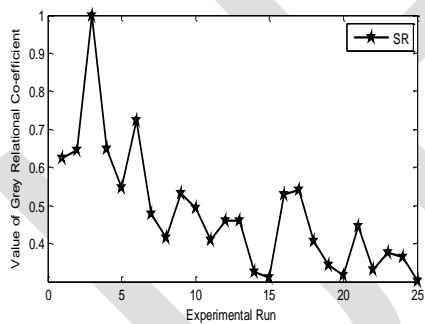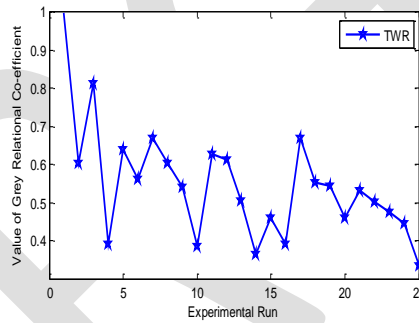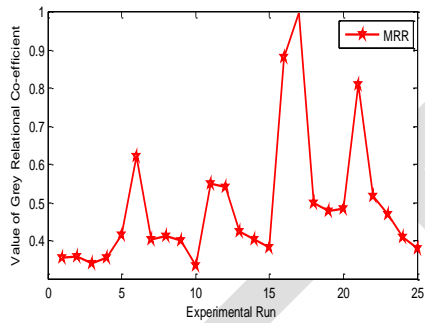
Tabulation and graphical representation of step-4 for optimization using grey relational analysis

Exp.No.	Current	Voltage	Pulse ON	Pulse OFF	Grey Relational Grade
1	1	1	1	1	.6345
2	1		2	2	.5293

3	1	3	3	3	.6259
4	1	4	4	4	.5985
5	1	5	5	5	.5161
6	2	1	2	3	.6026
7	2	2	3	4	.4819
8	2	3	4	5	.4546
9	2	4	5	1	.4668
10	2	5	1	2	.4654
11	3	1	3	5	.4984
12	3	2	4	1	.5109
13	3	3	5	2	.4591
14	3	4	1	3	.3743
15	3	5	2	4	.3917
16	4	1	4	2	.5598
17	4	2	5	3	**.6414**
18	4	3	1	4	.4471
19	4	4	2	5	.4457
20	4	5	3	1	.4021
21	5	1	5	4	.5535
22	5	2	1	5	.4246
23	5	3	2	1	.4206
24	5	4	3	2	.3998
25	5	5	4	3	.3530

Grey Relational Grade for maximum MRR,minimum TWR,minimum OC,minimum SR
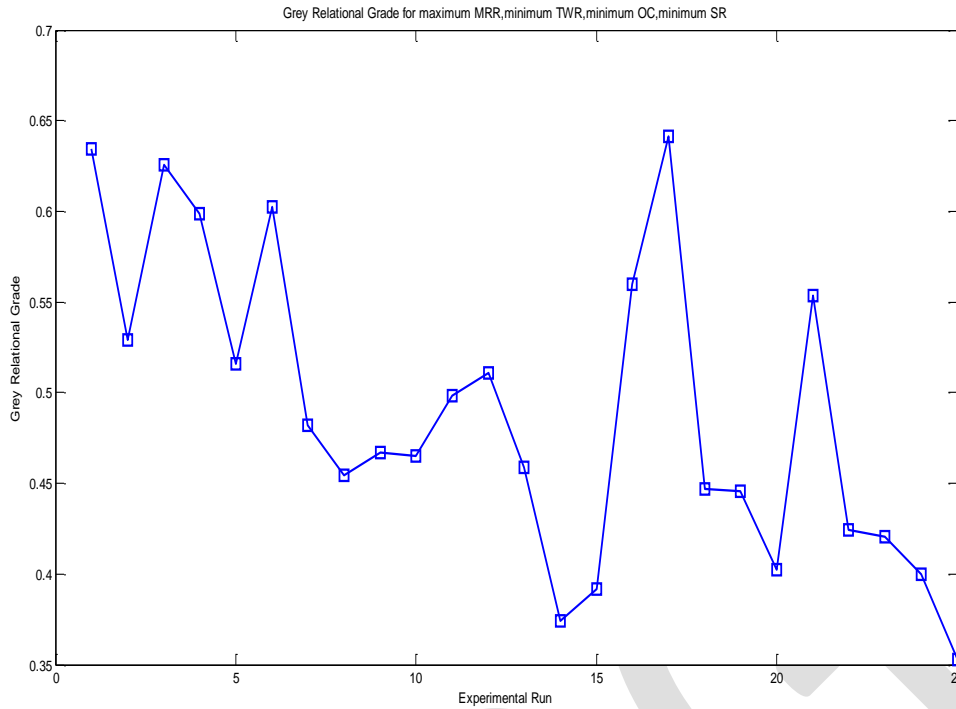
The above graph shows the value of gray relational grade for maximum MRR, minimum TWR, minimum SR, minimum OC against each experimental run.

Tabulation and graphical representation of step-5 for optimization using grey relational analysis

Parameters	Level-1	Level-2	Level-3	Level-4	Level-5
Current	.5434	.4638	.4651	**.5634**	.4541
Voltage	.5269	**.5778**	.4603	.4616	.4173
Pulse ON	.4857	.4834	.4893	.4940	**.5468**
Pulse OFF	.4739	.5023	**.5391**	.4891	.5123

The above table shows the optical factor and its level of combination for the performance parameters.
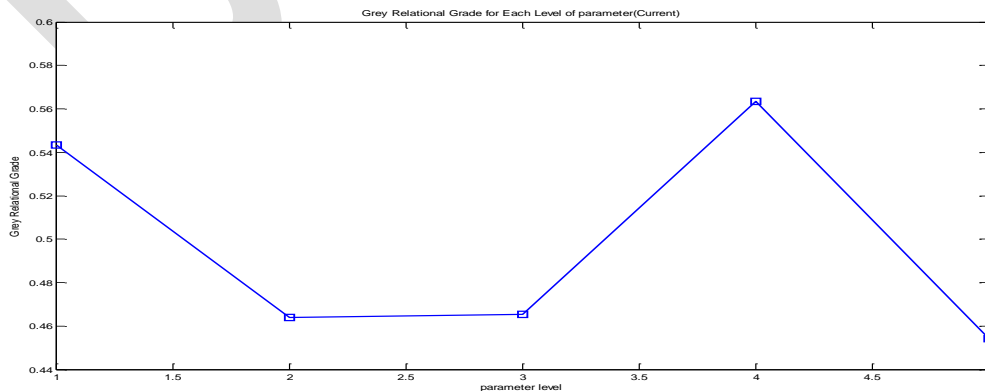
Grey Relational Grade for Each Level of parameter(Current)

Representation of grey relational grade for each level of parameter (Current)
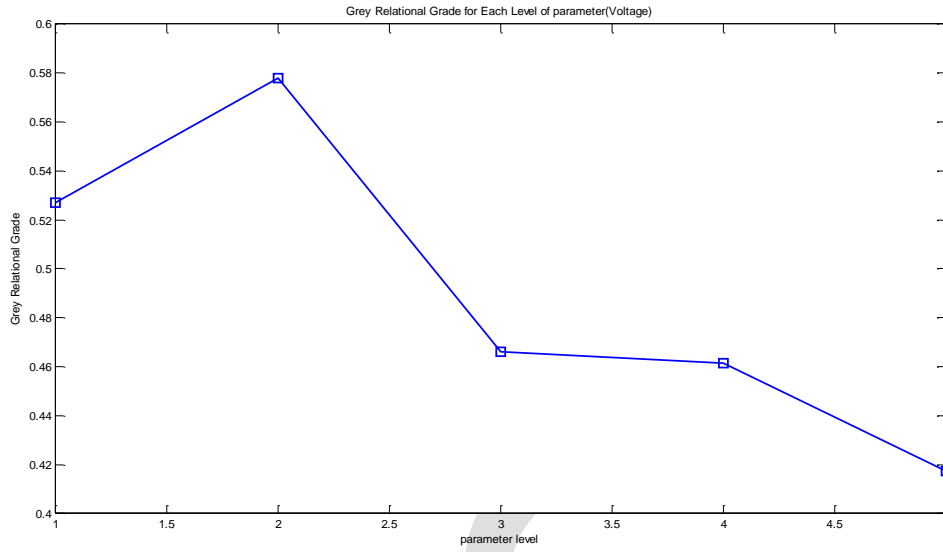
Representation of grey relational grade for each level of parameter (Voltage)
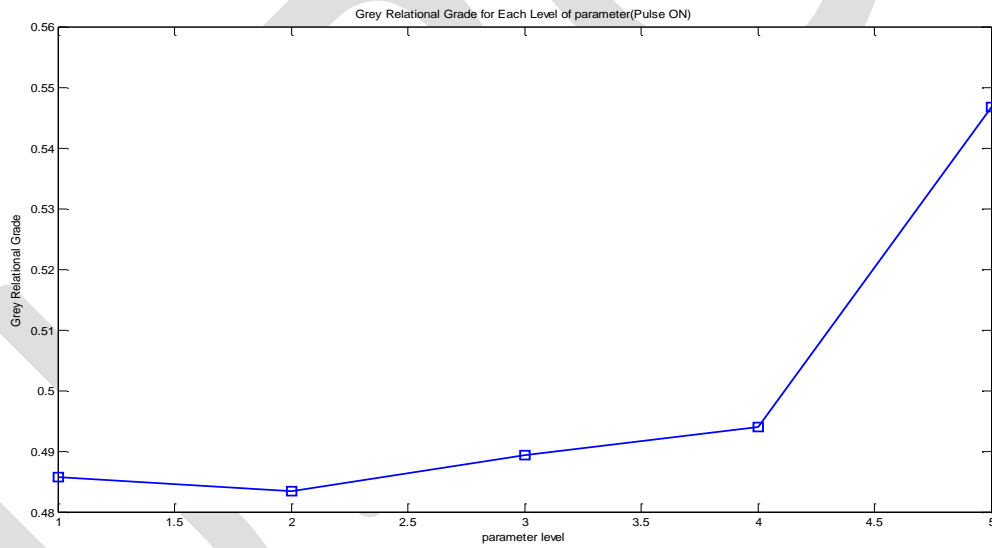
Representation of grey relational grade for each level of parameter (Pulse ON)
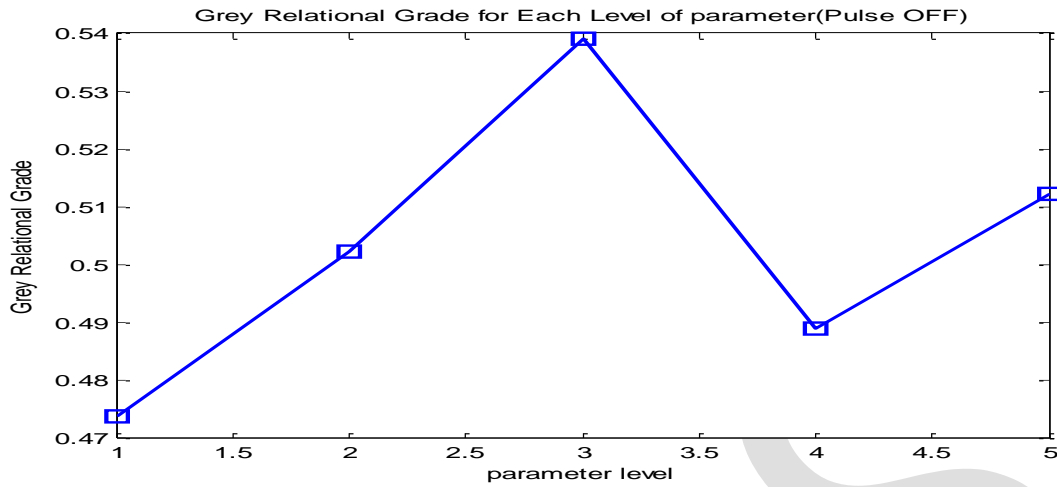
Representation of grey relational grade for each level of parameter (Pulse OFF)

Tabulation for Result Of Analysis Of Variance Of MRR

Parameters	DOF	Sum of squares	Mean squares	F	P	Rank
Current	4	40.230	10.057	40.214	37.260%	1
Voltage	4	20.140	5.035	20.140	18.650%	3
Pulse on	4	28.360	7.090	28.036	26.2666%	2
Pulse off	4	17.240	4.310	17.240	15.96%	4
Error	8	2.000	.250			

Tabulation for Result Of Analysis Of Variance Of TWR

Parameters	DOF	Sum of squares	Mean squares	F	P	Rank
Current	4	2.831	.7077	23.82	47.26%	1
Voltage	4	1.329	.3322	10.818	23.18%	2
Pulse on	4	.651	.1627	5.3344	11.90%	3
Pulse off	4	.932	.183	3.315	15.55%	4
Error	8	.242	.0305			

Tabulation for Result Of Analysis Of Variance Of SR

Parameters	DOF	Sum of squares	Mean squares	F	P	Rank
Current	4	12.3154	3.0788	7.9596	19.09%	2
Voltage	4	8.5924	2.1481	5.5535	13.92%	3
Pulse on	4	40.3263	10.0815	26.0638	65.96%	1
Pulse off	4	7.7291	1.9322	4.9953	10.72%	4
Error	8	3.0946	.3838			

Tabulation for Result Of Analysis Of Variance Of OC

Parameters	DOF	Sum of squares	Mean squares	F	P	Rank
Current	4	.2091	.0522	10.6967	31.33%	2
Voltage	4	.3924	.0981	20.1024	53.16%	1

Pulse on	4	.0524	.0131	2.6844	8.09%	3
Pulse off	4	.0451	.0112	2.2950	7.11%	4
Error	8	.0390	.0048			

CONCLUSION

Taguchi signal –to- noise ratio (SNR) and grey relational analysis is applied in this work to improve the multi-response characteristics such as MRR (Material Removal Rate),TWR (Tool Wear Rate),SR (Surface Roughness),OC (Over Cut).The conclusions are as follows:

- ❖ The optimal parameters combination is determined as A4B2C5D3 i.e. current (50A), voltage (27V), pulse on time (300µs),pulse off (10µs).

- ❖ The work demonstrates the method of using Taguchi methods for optimizing the EDM parameters for multiple response characteristics.

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A Survey on QoS in SPEED Routing Protocol for MANET

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Abstract—A lot of research is being done on Quality-of-Service (QoS) routing protocols to enhance their efficiency. Most of the work depends on finding the feasible route from a source to a destination without considering MANET network traffic or security requirements. In this paper, firstly, we have given an overview of the QoS in MANETs, different metrics are used to evaluate the performance and briefly discussed about SPEED protocol along with various classification techniques with which it can be used to enhance over-all network performance.

Keywords— MANET, SPEED Protocol, QoS,Routing Protocol.

INTRODUCTION

Ad-hoc network is a collection of mobile nodes that can be deployed without the need of any centralized infrastructure. Ad hoc network is very flexible and can configure itself automatically. As there is a distributed infrastructure, so, no preinstalled routers exists which can forward packets from one host to another, therefore, this task has to be taken over by the distributed mobile nodes of the network. Each of the node in the network takes equal roles, which means that all of them can operate as a

host and as a router [1] . Such network is dependent on the cooperation of their nodes to provide communication routes.

In MANET, each node acts both as a router and as a host & even the topology of network may also change rapidly. Routing protocols for MANETs [1] have been explored extensively in recent years. The work depends on finding a feasible route from a source to a destination without considering current network traffic or security requirements. The distributed systems are prone to several security risks. When some nodes behave maliciously or in a selfish manner; the operation of the whole network gets severely affected the results in the degradation of the performance of the network or even disruption of its operation altogether [3].

A lot of research has been done on Quality-of-Service (QoS) routing protocols to enhance the efficiency. Requirements of limited resource constrains like limited power energy, limited communication capability, limited processing and storage capacity make it difficult to design a MANET QoS routing protocols are SAR (Sequential Assignment Routing) [4], SPEED Stateless Protocol for End-to-End Delay) [5], MMSPEED (Multipath Multi SPEED) [6], QEMPAR [7],TBRR (Tree Based Reliable Routing), REAR (Reliable Energy Aware Routing) [8], MBRR (Majority Based Re-Routing) [9], etc.

The protocol discussed in this paper is SPEED. SPEED is a real-time QoS routing protocol, but it has some drawbacks like node failure or congestion. SPEED is a real –instance QoS routing protocol which needs to deliver a data packet to the destination within a certain time period, if the packet cannot be reached within the time period, the packet is dropped back that decreases the performance of speed protocol. Node failure or congestion leads to, large amounts of dropping of the data packets, which may lead to devastating consequences [9].

EVALUATION METRICS FOR QOS ROUTING PROTOCOLS

As different applications have different requirements, the services required by them and the associated QoS parameters differ from application to application. For example, in case of multimedia applications, bandwidth, delay and delay-jitter are the key QoS

parameters, whereas military applications have stringent security requirements. The following is a sample of the metrics commonly used

i. **Throughput :** Throughput is the total number of data packets received by the central receiver .The throughput is nowhere related to accuracy of the data packets

ii. **Bit Error Rate**: The bit error rate is the rate of error which is being shown after the successful transmission of the entire data packets to the receiving station.

iii. **Energy:** It is the amount of energy dissipated during packet transmission.

iv. **Speed:** Speed is the maximum speed that is required for delivery of data packet from source to destination.

RELATED WORKS

Emad Felemban et.al, 2006, [10] presented a novel packet delivery machine called Multi Path and Multi SPEED Routing Protocol for probabilistic QoS guarantee in wireless sensor networks. **Gaganpreetkauretal, 2014, [11]** has defined spatiotemporal communication protocol, called SPEED, which is a real-time Quos protocol. SPEED supports spatio-temporal communication service by ensuring a preferred delivery speed across the sensor network, and making end-to-end delay relative to the distance between the source and destination. **Tian Hea et al. [12]** has shown a real-time statement protocol for sensor networks, called SPEED. The protocols provide three types of real-time communication services, namely, real-time uncast, real-time area-multicast and real-time area-any cast. **Amandeep Kaur et.al, 2013, [13]** has presented a survey of QoS aware routing protocols for mobile ADHOC networks. Different protocols discussed in the research are very effective and useful for new researchers to identify topics for further research. **Dhilip Kumar, et.al, 2013, [14]** has discussed some types of routing protocol which provides performance in mobile ad-hoc network by different types of Routing mechanism. Some routing protocols provide better performance compare then other routing protocol to discover the neighbor's node and shortest path destination without any delay but our conclusion prefer the few routing protocol like AOMDV DSR and OLSR. **Nitika, et.al, 2015, [15]** has presented the state of the research by summarizing the work on QoS based routing protocols by highlighting the QoS issues being addressed. They have presented a spatiotemporal communication protocol for sensor networks, called SPEED for optimization purpose. **Sangeeta Vhatkar, 2015, [16]** has presented an overview of the requirements for QoS based routing protocols, and factors that are the challenges in implementing protocols in a WSN Each routing protocol is discussed along with their solution to meet QoS requirements. Comparison between SPEED and MMSPEED is performed and QoS is improvised.

VARIOUS OPTIMIZATION TECHNIQUES

Genetic Algorithm

Genetic Algorithms are adaptive heuristic search algorithm based on the evolutionary ideas of normal range and inheritance. As such they signify an intelligent operation of an arbitrary search used to solve optimization problems.

Figure 3 Genetic algorithm flowchart

Bacterial Foraging Optimization Algorithm

Bacteria Foraging Optimization algorithm is a new class of geographically confident stochastic international search technique based on mimic the foraging behavior of E. coli bacteria. This method is used for locate, handling, and ingesting the food. During foraging there can be risks due to predators, the prey may be mobile so it must be chased and the physiological characteristics of the forager constrain its capabilities and ultimate success. Bacterial Foraging optimization theory is explained by following steps.

- Chemotaxis
- Swarming
- Reproduction and

SPEED PROTOCOL IN MANET

SPEED maintains some sort of desired delivery speed across sensor networks by simply re-routing targeted traffic on the networking layer and locally managing packets provided for the particular MAC layer.

This involves the next components:

- An API
- A neighbor beacon exchange scheme
- A delay estimation scheme
- The Stateless Non-deterministic Geographic Forwarding algorithm (SNGF)
- A Neighborhood Feedback Loop (NFL)
- Backpressure Rerouting
- Last mile processing

The architecture of SPEED Protocol is revealed through this figure.
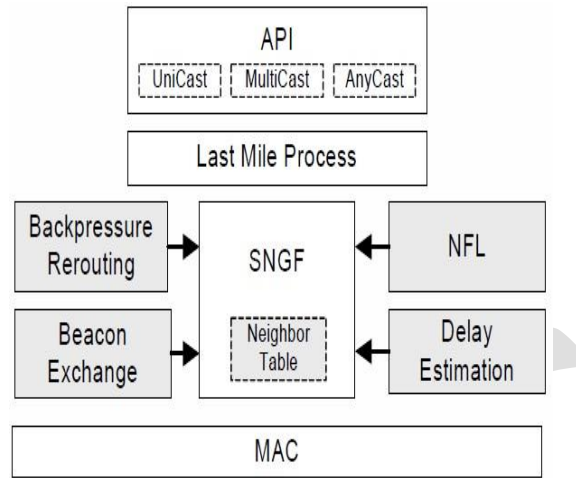
Figure1 Architecture of SPEED Protocol

As shown in above figure, SNGF is the routing component liable for choosing another hop prospect that could help the required delivery speed. The last mile process is furnished to support particularly a few connection semantics. Delay appraisal is the system where some sort of node ascertains to check whether or not traffic jam features took place. In addition to this, beacon exchange provides geographic position from the neighborhood neighbors' to ensure that SNGF can do geographic based routing. The facts of such ingredients are reviewed from the subsequent pieces, respectively.

VARIOUS CLASSIFICATION TECHNIQUES

Neural Network

Machine learning algorithms facilitate a lot in decision making and neural network has performed well in categorization purpose in medical field [8]. Most popular techniques among them are neural network. Neural networks are those networks that have a collection of simple elements which functions equivalent. A neural network can be trained to perform a particular function by adjusting the values of the weights between elements [9]. Network function is determined by the connections between elements. There are several activation functions that are used to produce relevant output.

Figure 2 Flowchart of Neural Network

Above given figure shows the flow of working of neural network algorithm.
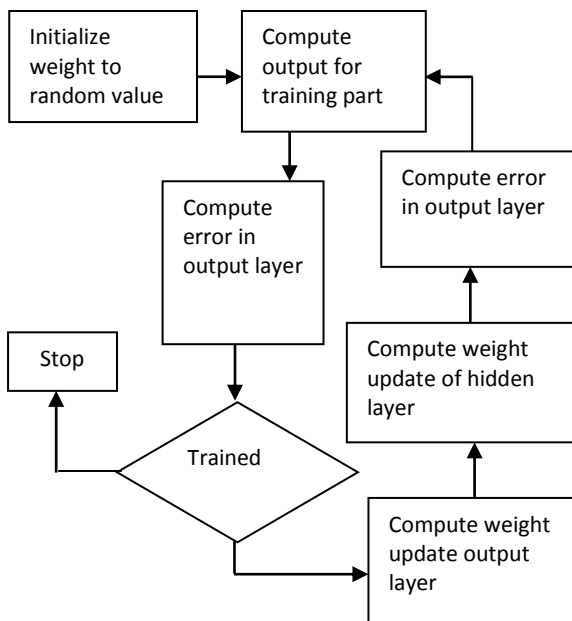
Genetic Algorithm

Genetic Algorithms are adaptive heuristic search algorithm based on the evolutionary ideas of normal range and inheritance. As such they signify an intelligent operation of an arbitrary search which is used to solve optimization problems. The basic techniques of GA is to calculate processes in natural systems required for growth.
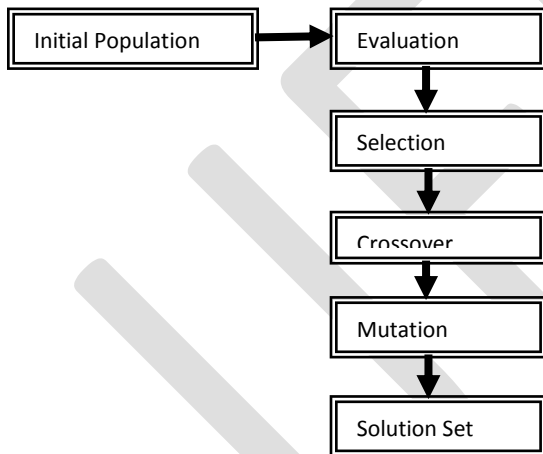
Figure 3 Genetic Algorithm Flowchart

Support Vector Machine

A support vector machine (SVMs) is a binary classification algorithm developed by Vapnik. The main features of SVM are shown below, due to which its applications are quite important:

    i.   Robust to large number of variables.

    ii.   It can learn complex and simple learning models.

    iii.   It avoid overfitting.

Support vector machines (SVMs) have the hyperplane that classifies the various variables as shown below;
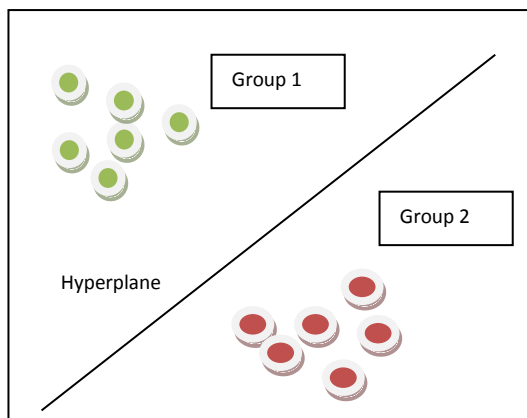
Figure 4 Support Vector Machine

- Elimination-Dispersal
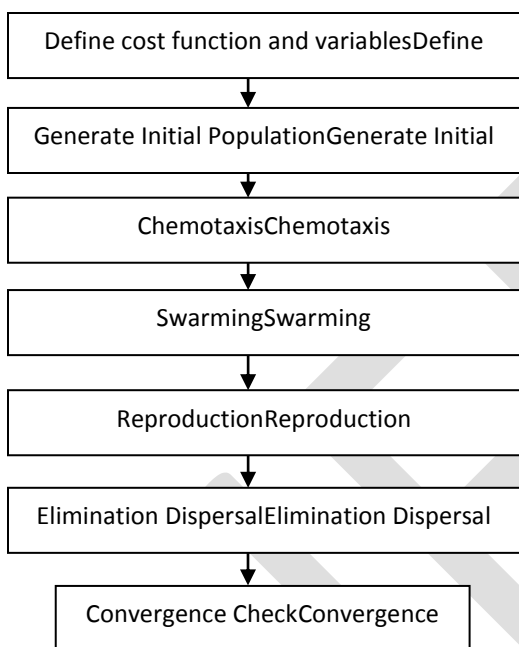
Figure 4 BFO Flowchart

CONCLUSION

In this work, we presented an overview of the requirements for QoS based routing protocols, and also discussed a spatiotemporal communication protocol for sensor networks, called SPEED for optimization purpose. SPEED is specifically tailored to be a localized algorithm with minimal control overhead along with various classification algorithm which can be implemented to enhance network performance in a MANET.

A lot of research has been done in this field and new techniques have been developed. In future work, we can use a crossbreed approach using SPEED protocol along with any specific classification algorithm such as neural network, Support Vector Machine etc.

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A study on Particle Swarm Optimization Scheduling for cloud computing environment

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Abstract: This paper represents cloud computing has become popular due to its attractive features. The load on the cloud is increasing tremendously with the development of new applications. Load balancing is associate degree necessary a part of cloud computing surroundings that ensures that each one devices perform same quantity of labour in equal quantity of time. Different models and algorithms for load balancing in cloud computing has been developed with the aim to build cloud resources accessible to the end users easily. The overall objective is to represent the comprehensive overview of the research on load balancing algorithms in cloud computing. So it shows that one of the technique i.e. particle swarm optimization algorithmic rule has been wide accepted as a global improvement algorithmic rule of current interest for distributed improvement and management

 Keyword: Cloud computing, Load balancing, ACO, PSO, Red black tree, Bayesian Classifier, Flow Time, Makespan.

INTRODUCTION: The dream of Computing as a Utility has been realized by Cloud computing. Cloud computing provides us the various methods to access the applications as utilities over the internet[11]. According to the NIST, the definition of cloud computing has the five important features: On demand, Self Service, Scalability of resources, measured services, access to broad network. The services of Cloud can be divided into three categories: Software as a service (SaaS): This model impart various software as a service to the end user over the internet ,for example: SalesForce.com, Google App. Platform as a service(PaaS): This model provides the runtime environment for applications, development & deployment tools, etc. For example: Microsoft azure, GAE provides PaaS. Infrastructure as a service (IaaS): this model provides access to basic hardware resources such as physical device, virtual machines etc. Some of the IaaS providers are GoGrid, Layered Technologies. All these services are provided as utilities. Reducing cost to provide better performance and enhancing response time, energy efficiency are some of the objectives of cloud computing. [5] **Load balancing** : The load balancing is used for sharing the load of virtual machines across all the nodes equally to have better energy efficiency management.
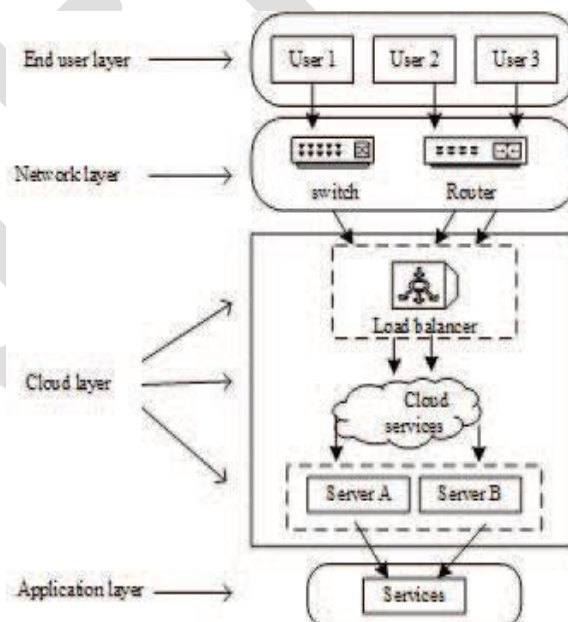
Fig. 1: Load balancing in cloud computing

A load can refer to the number jobs waiting in the queue to be assigned a processor. Due to load balancing, load across the nodes is shared due to which every node can work with full capability. There is no delay due to data being received and sent. Minimum number of machines will be active at any instance at the cloud data centers. There are various algorithms for load balancing which

can be carved up in two classes : static and dynamic . In static class of algorithms all the information required for the purpose of scheduling is provide prior to the scheduling job. These algorithms are non preemptive by nature. The major drawback of this approach is that it does not take into account the current state of the load for making the decision of load balancing. In Dynamic Load balancing algorithms decisions are prepared at the time of current load balancing. There are various problems in load balancing. These can be estimation of load, a perfect load balancing degree, partitioning of tasks to be performed. There are a significant number of algorithms that help to balance the load in completely parallelized system. [1]

Technologies used: Particle Swarm Optimization(PSO): Particle swarm optimization was brought to lights by Eberhart and Kennedy. The standard PSO algorithm is not commonly used in the field of discrete space but is used in continuous space. So Kennedy and Eberhart worked out a binary particle swarm optimization to still widen the scope of PSO to enable it to improve the results of the combination problems. The methodology of binary particle swarm optimization algorithm discussed in [6] is as follows: In this technique, every particle is made up of D elements each one of which represents a candidate solution. A fitness function is utilized with the intention to evaluate the correctness of all the solutions. All the particles are thought of in the role of a location in a D-dimensional MATRIX and the binary value for each of the element of the particle position can be 0 or else 1 where 1 represent "included" along with 0 indicating "not included". All particles of the elements possess a D- dimensional velocity vector. The elements of velocity vector are in the range of [-Vmax,Vmax].The probabilities which represents that a bit will be present in one state or the other ,makes up velocities. A considerable variety of particles as well as their velocity vectors are initiated arbitrarily so as to start out the algorithmic program. Then using fitness function the optimal solution is calculated in next iterations. For updating the positions the velocity vector in each step contains two parameters for positions .i.e. pbest and gbest. The pbest i.e. Personal Best represents the best position the particle has ever experienced .The gbest represents the best position which particle and its neighbors have been from the time of first step. [3] It has been observed that running time of the PSO is too high. Thus an improved PSO is discussed [1].   Improved PSO: PSO is intended for designing computing workstations in the environment of cloud computing. But still the time complexity for the algorithmic rule is directly proportional to the variety of tasks and variety of computing nodes. The division operation of the linear growth, leads to large CPU time. Thus to solve this problem the procedure followed is: the flow time of the summation process should be used instead of the flow time of the original process by making use of improved makespan. The flow time can be defined as the total time required carrying out or performing the whole task. The makespan parameter represents the longest time at each machine to finish the task. Thus one moves to calculate the required parameters and then perform the remaining part of the PSO algorithm to perform the load balancing. Based on the ETC (expected time to compute) a calculation for each resource node is carried out at the backend. This leads to addition of cloud tasks allocated which consume the resources. Afterward each machine performs division in order to deduce the time which each node takes to complete the last task which leads to reduction in the time complexity to a considerable value .Then the division time of machine is added to calculate the flow time . The maximum value out of this is makespan. [1] But this Improved PSO algorithm has still scope for improvement in terms of the time complexity improvement.

PSO coalesced with the Red Black Tree: The improved execution time of PSO is still more as compared to red black trees algorithm and naïve Bayes classifier algorithm (assuming that the training time required for bayes classifier in not considered in the time complexity). The major return for considering the PSO algorithm is that the load equalization degree of the PSO algorithmic program is extremely worth implementing. The red black tree algorithm does not perform the optimized load balancing across each node. This algorithm divides the computing nodes into four queues for assigning the tasks, but the problem is that this algorithm uses random ways to assign the tasks to the queues which causes unsatisfactory levels of load balancing performance. Thus it is combined with the improved PSO. Linear addition of PSO algorithm is used to additionally cut down the time (the overall execution time of the algorithm is the sum of the four sets of PSO's flowtime; thus it is more synchronized than the simple red black tree algorithm). [1].

Ant Colony Optimization Algorithm: Load balancing is also implemented by one of the significant methods which is called as Ant Colony Optimization Algorithmic rule.

1.   Load balancing by the underload node: The underload node sends an ant from time to time in order to balance the workload evenly across all nodes on the open cloud computing federation. This technique also allows to keep the strength of the complex network alive by updating the pheromone (the chemical secreted by the ants on their movement) with the help of following two methods: (A) On one while when the ant starts its journey , after each progress of the ant , the likelihood that an ant will stop at node Nj starting from Node Ni is given by the following function:

$$P_{ij}(t)=\begin{cases}\dfrac{[\Gamma_{ij}(t)]^{\alpha}[\eta_{ij}(t)]^{\beta}[D_{ij}(t)]^{\curlywedge}}{\sum_{j\in N_n}[\Gamma_{ij}(t)]^{\alpha}[\eta_{ij}(t)]^{\beta}[D_{ij}(t)]^{\curlywedge}} & \text{if } j\in N_n\\ 0 & \text{if } j\in N_n\end{cases}$$

Where the variable N_n stands for the neighboring nodes of node N_i which have not been visited by the node N_i, Γ_{ij} stands for the pheromone value at the edge(i,j) of length d_{ij}. The value of D_{ij} is calculated as :

$$D_{ij}=d_j/\square d_k$$

$$\square\square\square\square\square\square\square\square\square\square\square\square\square\square k\ NBi$$

NBi is the set of neighborhood nodes of N_i.

(B). In order to update the pheromone the ant during its visit, keeps notice of the node which has the maximum and minimum workload and denotes the as N_{max}, N_{min} respectively and uses them to balance the load

Load Balancing through the Overload node: If a node finds its own workload to be above some threshold value W, then same procedure can be followed as in underload node's case except that the source node can be selected as the N_{max} .[2]

RELATED WORK:

Yongfei Zhu et al. [1] proposed a neoteric algorithm which makes use of the Particle Swarm optimization algorithm and the classifier along with red black tree in the cloud computing environment. Zehua Zhang et al. [2] presented a novel load balancing technique based on Ant Colony Optimization and complex network theory for the realization of the open cloud computing federation. Hesam Izakian et el [3] introduced a new adaptation of the Dynamic Particle Swarm Optimization algorithm for planning the grid job execution. Sidra Aslam et el [4]. This paper realized the significance of the field of the cloud computing and the technique of load balancing for solving the problem of rampantly increasing load on the cloud. Dr. Naveen Kumar Gondhi et el [5]. To do away with the hazards and problems in cloud computing, this paper presented a customized method taking Ant Colony Optimization as the heart Jianhua Liu et el [6]. In this paper the binary particle swarm optimization algorithm was studied under changing experimental conditions. Xuesong Yan1 et el[7]This paper studied the disadvantages of the standard particle swarm optimization algorithm provided improvements over the standard particle swarm algorithm. Ren Gao et el[8] This paper discussed the facts to disseminate and to synchronize the nodes in a cloud computing environment so that the resources are used optimally and overloading is avoided. So in this paper a new approach is discussed for load balancing through the ant colony optimization(ACO). Wei Zhang et el[9]. This Paper threw lights upon Naïve bayes classifiers which have a wide range of applications in the field of text classification in machine learning. Rodrigo. Calheiros et el[10]. This paper discussed Cloud sim which is a toolkit for simulation and modeling of the system and behavior of the cloud computing environment including data centers, virtual machines provisioning as well as resource distribution.

Comparison Table:

Sr. no.	Year	Paper Title	Techniques used	Benefits	Limitations
1	2016	A Novel Load Balancing Algorithm Based on Improved Particle Swarm Optimization in Cloud Computing .	Particle Swarm Optimization, , Naïve Bayesian algorithm, Red Black tree algorithm	Time Complexity of PSO algorithm is improved.	The PSO is focused on initial set of particles.
2	2010	A Load Balancing Mechanism Based on Ant Colony and Complex Network Theory in Open Cloud Computing Federation	Ant Colony optimization, complex network theory	The complex network theory allows the qualitative analysis through prototype and simulation which proves better than only ACO.	The Prototype developed may not reflect the original changes taking place in the network.
3.	2010	A discrete particle	Discrete particle	DPSO provides a	The DPSO

		swarm optimization approach for grid computing.	swarm optimization technique- for grid computing.	superior method for grid computing which is heterogeneous in nature to curtail the makespan and flow time.	algorithm suffers from the problem of very high time complexity.
4.	2015	Load Balancing Algorithms in Cloud Computing: A survey of modern techniques.	Static load Balancing, Round Robin, Min- Min, Max – Min, Dynamic load Balancing, Honey Bee, Ant - Colony Carton, Throttled load Balancing	The limitations and advantages of these algorithms is presented in a comparison table.	The shortcomings of the existing work is that it does not deal with the connected issues like high throughput, fairness and equality.
5.	2015	Local Search based Ant Colony Optimization for scheduling in cloud computing.	Ant Colony optimization algorithm and local search algorithm	Better virtual machine allocation process to physical machines eventually leading to more efficient usage of physical resources.	This approach provides the users with single optimal solution at the end.
6.	2009	The Analysis and Improvement of Binary Particle Swarm Optimization	Improved Binary particle optimization	It lets the particle to converge to a optimal particle and also the local exploration of binary PSO is improved.	The original BPSO is lacking ion local explorations.
7.	2013	An Improved Particle Swarm Optimization Algorithm and Its Application	Improved particle swarm optimization algorithm	The disadvantages of PSO are done away. Capability of global searching is improved.	Newly developed algorithm is discussed only through the few optimization problems like TSP.
8.	2015	Dynamic Load Balancing Strategy for Cloud Computing with Ant Colony Optimization	forward-backward ant mechanism and max-min rules,	Dynamic load balancing. High network performance under varying load.	The pheromone update can be time consuming, leading to more time to search the candidate node .
9.	2011	An Improvement to Naive Bayes for Text Classification	Naïve Bayesian classifier	This technique selects the feature from a list of feature and then uses the feature to reclassify the text.	Time complexity of naïve Bayesian classifier is high.
10.	2010	CloudSim: a toolkit for modeling and simulation of cloud computing environments and evaluation of resource provisioning algorithms	CloudSim: A Simulation toolkit.	This toolkit provides the support of the integral features of behavior and system modeling of the components of the cloud computing components.	Factors like socio economic and environmental conditions which affect the processing speed also need to be studied.

GAPS IN LITERATURE

1. On account of huge capability for being channelized in complex problems, Particle

swarm optimization algorithm has been widely accepted as a global optimization algorithm of current interest for distributed optimization and control.

2. Particle swarm optimization is limited to initial set of particles, wrongly selected particles tends to poor results. The improved particle swarm optimization still has a large scope for improvement. It initially selects the tasks for a particular computing node without taking into consideration of any feature of the participating particles.

CONCLUSION: Cloud computing is becoming hottest technology in these days. Cloud computing is becoming more and more popular among the business institutions and research institutions, from some time. The main objective is to use the computing resources in virtualization. Also with the load balancing mechanism running the focus is to distribute the resources in data centre virtualization. It has focused on the different swarm intelligent based techniques called Random forest and Particle swarm optimization based techniques comparison which has benefits and limitations so one of the main limitation in survey is i.e. particle swarm optimization is limited to initial set of particles, wrongly selected particles tends to poor results. In order to overcome these constrains a new hybrid Particle swarm optimization and Random forest algorithm for cloud computing environment will be propose to enhance the energy consumption rate further.

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Review on EMACS algorithm in Mobile Cloud Computing

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Abstract— this paper represents mobile cloud computing (MCC) which extends cloud computing with the advantages of mobility and wireless networks to create a new infrastructure where cloud takes over mobile devices' responsibilities of executing tasks and storing enormous amounts of data. The overall it shows the broad survey of mobile cloud computing and also specify concerns in mobile cloud computing which are highlighted . A taxonomy is also presented based on the key issues in this area, and discuss the different approaches taken to tackle these issues. The comparison of various techniques based on various parameters has been discussed which shows that it minimizes the response latency, cost of application migration.

Keywords— Cloud computing, Mobile cloud computing, Cloudlet, Load balancing, E-MACS, Energy conservation, response latency, application migration.

INTRODUCTION

Cloud computing is described as a source of innumerous virtualized resources. These resources are in a ready state so that they can be shared at any time and can be accessed from anywhere in the world, over the Internet. An Internet based cluster system is responsible for providing services offered by a cloud. These cluster systems may be a collection of personal computers or servers. The resources provided by a cloud are organized according to a particular strategy to provide easy, fast and reliable access to services like computation, access to resources, storage, etc. Cloud computing environment requires infrastructure providers and service providers. Management of cloud platform and selection of resources according to need is done by infrastructure provider. Service provider provides resources from Infrastructure provider to end user and use different pricing models, generally it uses pay-per-use model. Cloud computing provides services to more than one user at a time using the concept of virtualization. Virtualization provides an abstraction of execution environment that can be made dynamically available to users by using some protocols, software configuration and resources.

Cloud and user are the two main entities of cloud but there are some other service level entities i.e cloud providers, cloud service brokers, cloud resellers and cloud consumers. Service providers are the companies that provide services like Internet, telecommunication services, system integration (building and supporting data centers). Cloud service broker are IT consultants, business professional service organizations, etc. that help consumer to select a cloud computing solution. They help to make a healthy relationship between consumers and providers. Cloud reseller is an important factor for extending the cloud over a region. Resellers help to expand the business of cloud providers. A reseller may be selected to resell a particular cloud based products in a region. The end users are consumers who use the cloud services.

A. Types of clouds:

There are three types of clouds: Public, Private, and Hybrid clouds. Public cloud is a standard cloud model. This cloud makes the various IT resources available to the public. These resources are offered either for free or on pay-per-use model. Private cloud is a kind of community cloud which is available for some special users and not for ordinary people. Such clouds are build when different organizations feel same type of requirements. These clouds have high security and privacy than public clouds. The amalgamation of public and private cloud results into Hybrid cloud. It provides environment where some of the resources are personal to the organization and other are available for public use. Figure 1 shows various clouds.

B. Mobile computing:

In the last few years a revolution has seen in computing that makes mobile computing very popular. The availability of mobile devices among the users has increased dramatically. Mobile computing is increasing repeatedly in the area of computing. An enormous growth has seen in development of mobile devices such as smartphones, GPS Navigation, PDA, embedded devices. This has changed the way humans think of computers. Mobile computing is a human computer interaction by which motivation is expected. Mobile computing is a result of combination of hardware, software, and communication.
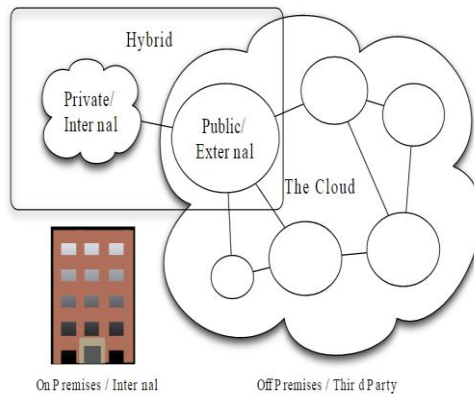
Fig 1: Cloud computing types

Mobile hardware involves all the required components needed for mobility. Mobile software deals with all the requirements of mobile applications. Communication involves infrastructure network, ad-hoc network, protocols, encryption techniques, communication properties. Mobile computing helps to use the same computing device when location properties changes frequently. Mobility and Portability are main aspects of it. Mobile computing allows users to access the services of computing without any pre-defined location or connections to network. Mobile computing provide some features such as portability, mobility, increased productivity, dis-symmetrical network communication. But mobile resources are weak resource of computing due to limited energy, size, computing power.

As the mobile devices has limited resources so this results into serious problems like Quality of service (QoS) insurance, mobility management, security issues, energy management. So these problems motivated the researchers in the area of mobile computing to find an infrastructure that can provide resources to mobile devices. So cloud computing was found helpful. In cloud computing, a cloud provider has control over the resources and services and these can be accessed over the Internet. With improved communication technologies like 3G, Wi-Fi, etc. the requirements of resource constrained mobile devices can be shifted to cloud computing system. These requirements can be processing, storage or memory requirement.

C. Mobile cloud computing:

Mobile cloud computing (MCC) is an amalgamation of cloud computing and mobile computing. Figure 2 shows th MCC environment. In moble cloud computing the tasks are offloaded to cloud and after careful scheduling, the tasks are executed on cloud and mobile devices which in turn improve the performance of mobile devices. The performance improves because the servers at the cloud side have much high computing power and speed than the mobile. The offloading of tasks also saves energy in mobile devices. Some advantages of mobile cloud computing are:

- Mobile devices give its users an easy access to cloud services from anywhere in the world.
- Mobile cloud services get the information about device location, requested services and context for better user experience.
- Every mobile has energy, computing and storage resources that are limited. Mobile cloud computing even helps in computations that require much more resources than available.
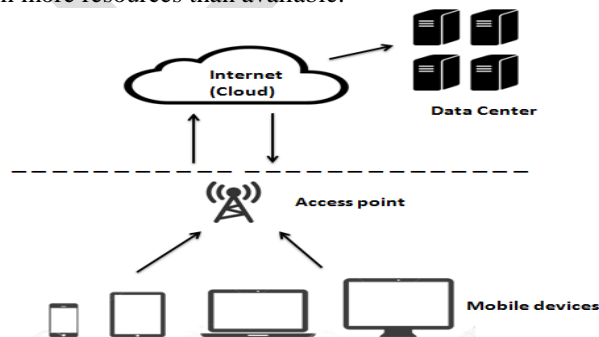
Fig 2: Mobile cloud computing

So mobile cloud computing is and infrastructure where data storage and computing happens outside the mobile device and after computing the results are returned to the mobile device. This storage and computing is done on a centralized computing platform located at cloud side. The applications are accessed over the Internet through a web browser on mobile devices. Mobile cloud computing not only provides cloud's resources to mobile but also inherits its features like scalability, low cost, robustness. According to an experiment constructed in [1], the application is first divided into tasks and these tasks are then offloaded to the cloud. So in MCC, the application as a whole or its parts can be offloaded to the cloud. This helps to handle the sophisticated applications and services like mobile games, voice searching, mobile sensing. In order to make MCC efficient, researchers have proposed different

architectures. There are mainly four categories of architectures. In first category, the mobile applications are offloaded to large remote data centers on cloud and after computations results are returned to the mobile devices. But this type of architecture introduces a problem of response latency. In second category, the mobile applications are offloaded to the local service infrastructures known as cloudlets which are logically implemented at access points of mobile devices. In third category, the mobile devices collaborate with each other to make a pool of resources and applications run on this collaboration. This collaboration is known as local mobile cloud. It eliminates the need of any remote cloud infrastructure. In fourth category, the cloud infrastructure is moved close to the user to improve response time. Different architecture for MCC proposed by researchers are Cloudlet, Cloudsim, Hyrax, CloneCloud, MAUI. These architectures utilize cloud resources as well idle mobile resources in order to provide computing results with higher QoS. But offloading applications to cloud introduce a problem of response latency. Meanwhile, various mobile cloud computing based application have been developed like Google Maps, Gmail, Navigation system, MobileMe, MotoBlur, Live Mesh, etc. According to a research, the MCC based applications and softwares have increased to approximately 88% in last few years. This large number of applications has contributed billions of dollars to the IT business.

The meeting of mobile computing and cloud computing arises a new architectural element known as Cloudlet. At the University of Rochester, a new architecture has been developed known as Mobile Cloud Hybrid Architecture (MOCHA) which introduced the cloudlet. It is the second tier of three tier hierarchy of mobile cloud computing- mobile devices, cloudlet and cloud. Cloudlet helps to bring the cloud closer to the users. A cloudlet is the ideal offload site for cognitive assistance as it is a powerful, well-connected and trustworthy cloud proxy that is just one wireless hop away. In mobile-cloudlet connection, the user's mobile search and connects with the nearby cloudlet. Then all the applications are offloaded to the cloudlet. It may further search for the cloud for some services and when all the processing is done, results are returned to mobile. In recent years, growing investments in cloudlet like infrastructure have been seen like Nokia announced RACS (Radio Access Cloud Platform) availability to its user in 4G cellular system, Dell, Huawei have also introduced micro data centers.

E-MACS ALGORITHM IN MCC:

Energy-aware Mobile Application Consolidation and Scheduling. A new scheduling algorithm is proposed in [2]. This algorithm helps to minimize the makespan of tasks and resources required. To achieve good QoS, the load balancing and reduction in energy consumption should be done efficiently. The concept of application consolidation is used in this method. The idle applications are migrated to a server and then that server is shut down. The idle applications are considered to be consuming more applications than the running applications. Application consolidation makes better utilization of servers. The main objective of this algorithm is to keep the load balanced by efficient scheduling of applications so as to achieve QoS. This algorithm helps in better resource utilization, reduce the end-to-end latency and reduce energy consumption. The working mechanism of EMACS is as:

1. Requests are submitted by mobile devices.
2. Offload the applications to cloudlet using Internet.
3. Applications are executed by cloudlet. Idle applications are moved to a server which is then temporarily shut down.
4. The E-MACS algorithm is then executed for application scheduling.
5. While scheduling the applications are offloaded to mobile devices in a local mobile cloud.
6. Various mobile devices are available that acts as resource provider and they have different loads.
7. Offload applications to mobile devices with least load.
8. Return results to cloudlet.
9. Cloudlet further return results to the mobile devices.

The working mechanism of E-MACS is represented in figure 3.

RELATED WORK:

Wei et al. [1] introduced a new model called HLMCM by modifying the cloudlet architecture. HLMCM has low response latency but scheduling becomes a problem. So HACAS algorithm is proposed to solve this problem. The load balancing scheme of this algorithm is 60% efficient than normal scheme. Shakkeera et al. [2] focused on energy conservation and purposed a new EMACS algorithm to minimize energy consumption in cloudlets. EMACS make the use of local mobile cloud and has efficient task scheduling criteria. The makespan of EMACS is 70% better than the HACAS and ACO. It also improves average latency, load balancing and resource utilization. Fernando et al. [3] considered various problems and suggested solutions to tackle them. An architecture is also purposed for mobile computing to improve privacy, security and cost factors. The architecture has three main components: Resource handler, Cost manager and Job handler. It helps to manage resources, minimize cost and handle jobs easily. Wua et al. [4] introduced a new algorithm for scheduling. This algorithm sort all the tasks according to their priority and then calculate their completion time with respect to different services. Then it executes the best suited service. This algorithm focuses to improve QoS factor. Lin et al. [5] proposed a new algorithm to minimizing the energy consumption by mapping the tasks to local cores or by migrating them to cloud. The experimental results show that the energy consumption reduces with a factor of 3.1. It also satisfies the completion time constraint. Mishra and Jaiswal [6] introduced a new method based on Ant Colony Optimization to improve load balancing. In this method, every node has a pheromone table which stored probability values for all possible destination nodes. Ants refer these probabilities to move to next node and also update its probability values corresponding to their source node. This method helps to separate load among many possible paths in network. Yamauchi et al. [7] introduced a new methodology for Distributed Parallel

Scheduling in mobile cloud computing. In the proposed methodology, a master device monitors some parameters of slave devices and if these parameters come out to be inadequate for performing parallel programming then master device selects other slave devices. This method improves load balancing and considers battery consumption, network quality which in result improves the overall performance of mobile device. Karthik et al. [8] considered some of the problems of mobile computing and discussed Computation Offloading as a solution to it. In computation offloading, the heavy computations are offloaded to the external resource providers and results are returned back to mobile devices. Future work of different research areas in offloading is also highlighted. Jaiswal et al. [9] described performance analysis of different cloudlet architectures. The conclusion of this comparison is that VM based cloudlet architecture is more efficient than other architectures. Suryadevera et al. [10] purposed a new algorithm based on ACO for load balancing. This algorithm calculates pheromone value by considering various parameters. Higher pheromone trail represents shortest path. The pheromone represents the capability of resources to do various computations. The purposed algorithm improved the throughput of the system and helped to improve the overall system performance in grid computing. wang et al. [11] presented a survey of mobile cloud computing applications of existing and future generation. The challenges faced while building mobile cloud computing applications are discussed. A survey of existing solutions to these problems is provided and suggested a future search direction of combining trust management techniques to introduce a new method which can enhance QoS and security of mobile cloud computing. Yang et al. [12] purposed a novel offloading service that helps to offload heavy tasks from mobile handsets to nearby extrinsic resource rich surrogates. The purposed service can efficiently offload the applications if they are implemented in java. The experimental results prove the effectiveness of the service.
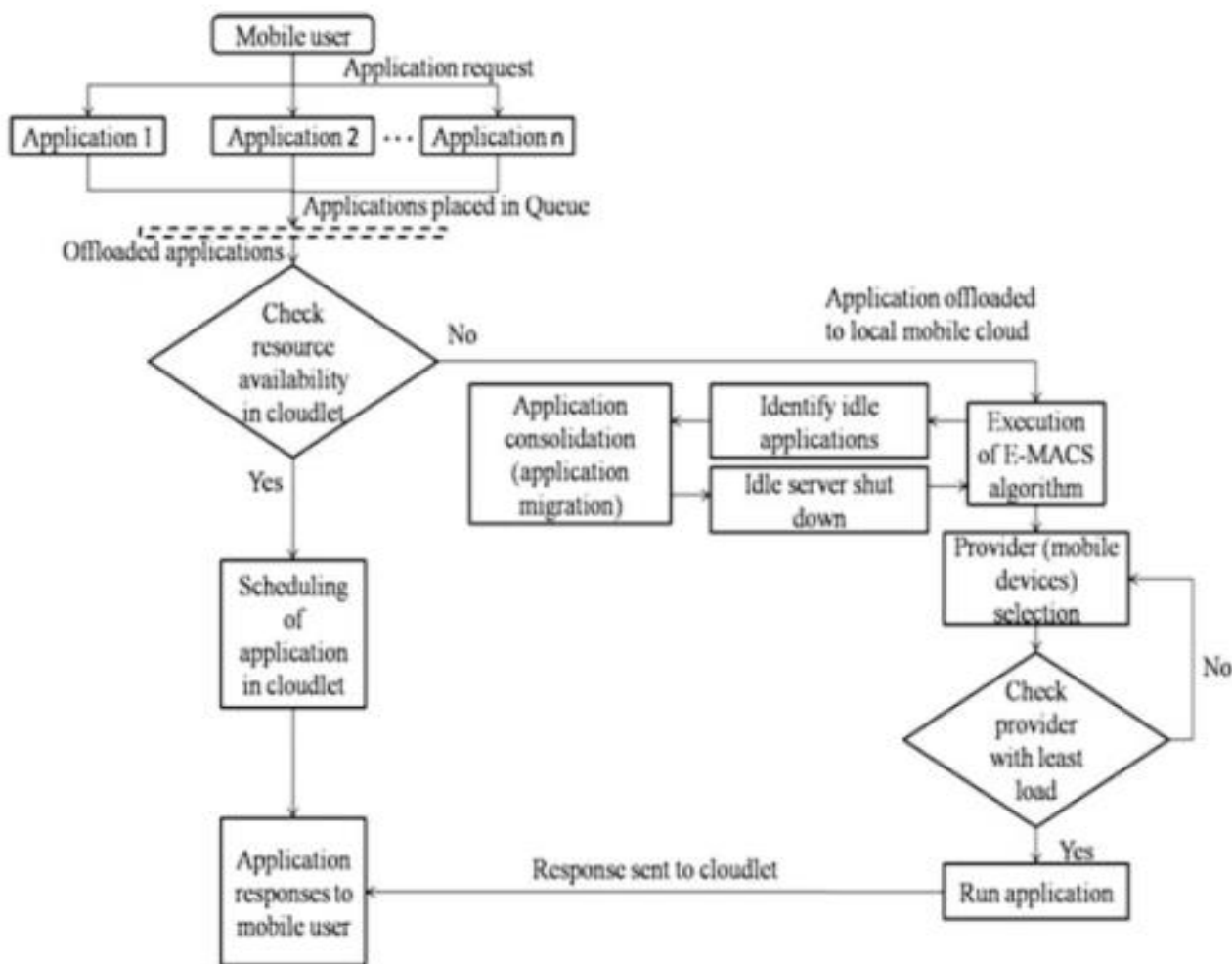
Fig 3: Workflow of E-MACS

COMPARISON TABLE:

Refrence	Title	Objective	Resource management	Response latency	Energy consumption	Load balancing	Less Cost
[1]	Application Scheduling in Mobile Cloud Computing with Load Balancing	To improve computing and sensing capabilities of mobile devices using HLMCM	✓	Low	Less	✓	
[2]	Energy-Aware Application Scheduling and Consolidation in Mobile Cloud Computing with Load Balancing	To minimize the energy consumption	✓	Low	Less	✓	
[3]	Mobile cloud computing: A survey	To exploit the locally available mobile resources	✓	Low		✓	✓
[5]	Energy and Performance-Aware Task Scheduling in a Mobile Cloud Computing Environment	To minimize energy consumption by migrating tasks among the local cores and the cloud.	✓	Low	Less	✓	
[6]	Ant colony Optimization: A Solution of Load balancing in Cloud	A method is purposed based on ACO to minimize load balancing	✓	Low		✓	
[7]	Effective Distributed Parallel Scheduling Methodology for Mobile Cloud computing	To improve the values of some parameters in MC using new distributed parallel scheduling methodology for MC.		Low	Less		✓
[8]	A Survey of Computation Offloading for Mobile Systems	Provide detailed knowledge about computation offloading		Low	Less	✓	
[10]	Cloudlets: at the Leading Edge of Mobile-Cloud Convergence	To show how cloudlets enable cognitive assistant applications.	✓	Low			

CONCLUSION

Regardless of increased usage of mobile computing, utilizing it to its fullest potential is very difficult due to its intrinsic problems such as limited resources, mobility and repeated disconnections. Mobile cloud computing can tackle with these problems by migrating mobile applications on external resource providers. In this paper represents the various types of clouds and among one of these mobile cloud computing is discussed with EMACS algorithm and also compare the different techniques based on the various parameters which shows that it minimizes the response latency, cost of application migration. But still there are some issues with E-MACS have shown a low convergence rate to the true global minimum even at high numbers of dimensions. So to overcome these issues we will propose a new hybrid backtracking search optimization algorithm and EMACS for cloud computing environment.

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CURVELET Based IMAGE DENOISING

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Abstract— In the proposed method second generation curvelet transform is used for image denoising. Curvelet coefficients are thresholded for noise removal. The threshold is determined by noise image standard deviation.The existing denoising methods are frequency filtering and frequency smoothing. These methods are having same drawback that the denoising process will cause loss of image information. The new frequency domain denoising method was wavelet based denoising. Wavelet transform require many coefficient for representing edges and thus take more memory. But the curvelet transform overcome this disadvantage that it takes few nonzero coefficients to discribe the edge.The loss of data in denoising using curvelet transform will be less compare to other methods and requies minimum number of curvelet coefficeints.

Keywords— Standard deviation, Threshold value, curvelet coefficient,noise ratio,SNR,SSIM,variance.

Introduction

In remote sensing images noise are introduced during image acquisition, sensor saturation, quantization error and transition error. Noise can generally be grouped into two classes:

- Independent noise.
- Noise which is dependent on the image data.

    Independent noise: Image independent noise can often be described by an additive noise model, where the recorded image $f(i,j)$ is the sum of the true image $S(i,j)$ and the noise $n(i,j)$.

    $f(i,j)=S(i,j)+n(i,j)$

    The noise $n(i,j)$ is often zero-mean and described by its variance $\sigma n2$. The impact of the noise on the image is often described by the signal to noise ratio (SNR), which is given by:

    $$SNR=\sigma s\sigma n=\sigma f2\sigma n2-1$$

    Where, $\sigma s2$ and $\sigma f2$ are the variances of the true image and the recorded image.

    Data dependent noise: In the data-dependent noise, is possible to model noise with a multiplicative, or non-linear, model. These models are mathematically more complicated; hence, if possible, the noise is assumed to be data independent.

    The noise present in the image the quality of the image is degraded. Image denoising is required to remove the noise content in the image and enhance the image. The noise present in the image should be removed in such a way that the there is minimum loss in information content of the image.

PROPOSED METHOD

Denoising is the process of reducing the noise in the digital images that consists of three steps:

- transform the noisy image to a new space.
- In the new space, keep the coefficient where the signal to noise ratio is high, reduce the coefficient where the signal to noise ratio is low.
- Transform the manipulated coefficients back to the original space.

    The noise threshold is being calculated by statistical properties of noise and after thresholding the curvelet coefficients the image is reconstructed.
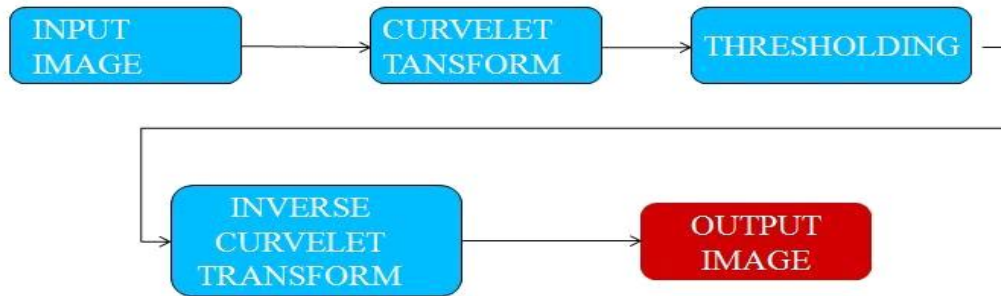
Figure 7: System Design

The noisy image is transformed to the curvelet domain by applying forward curvelet transform to the image. The threshold is performed on basis of statistical properties of coefficients. A thresholding is calculated based on which depends on standard deviation of curvelet coefficients. The thresholding is based on combination of three parameters to compute the threshold value for denoising the given image, the contrast ratio which is the ratio of standard deviation and mean of curvelet coefficients, the absolute median of curvelet coefficients and a level dependent parameter.

The threshold also depends on the absolute median of curvelet coefficients. In the multiresolution a analysis, the noise propagates at a higher level also, but in a smoothed manner. For better noise removal, thresholding at higher levels are also required. Hence, the threshold value should decrease, going from lower to higher levels. The thresholding is applied to these noisy levels in order to reduce the noise and reconstruct the images. The thresholding is done based on the equation

$$\text{Threshold} = 12j\text{-}1 \ (\sigma\mu)M$$

Where j is the number of level at which thresholding is applied, M is absolute median of curvelet coefficients, σ and μ are standard deviation and absolute mean of curvelet coefficients at j^{th} level. Now apply inverse curvelet transform to reconstruct the image.

INPUT DATASETS Used

CARTOSAT1 images: Cartosat-1 or IRS-P5 is a stereoscopic Earth observation satellite in a sun-synchronous orbit, and the first one of the Cartosat series of satellites. Satellite DOP, Path/Row, Resolution, Radiometric Resolution, min and max values.

[multilevel threshold based image denoising in curvelet domain]

RESULTS
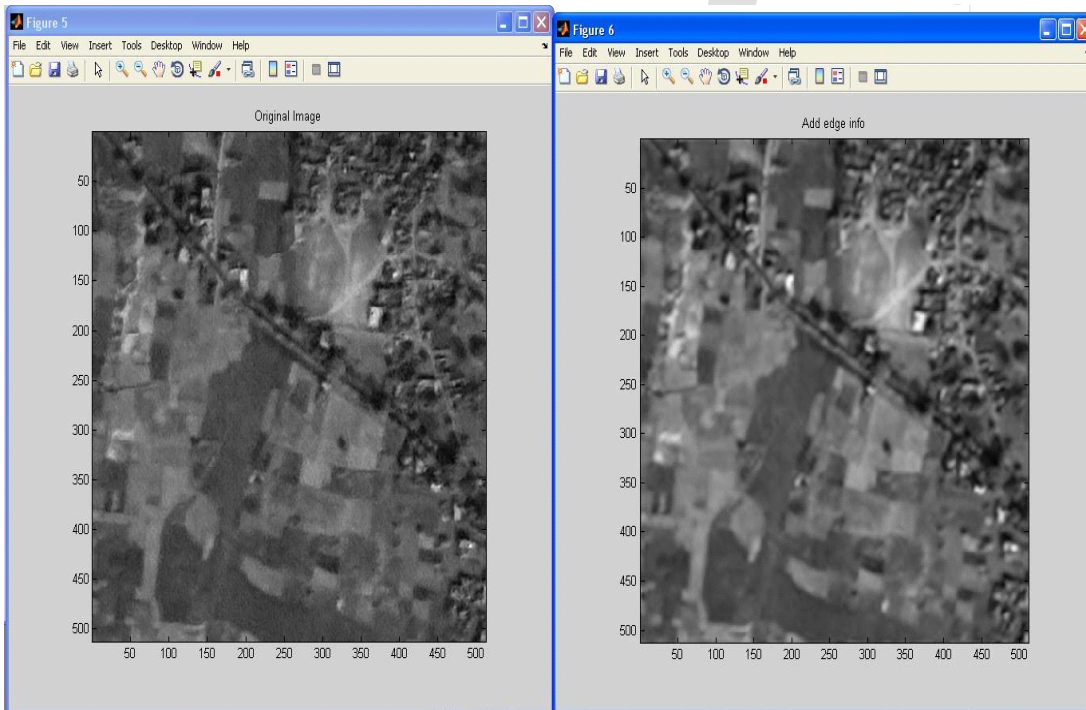
Original noisy image   **Curvelet based denoised image**
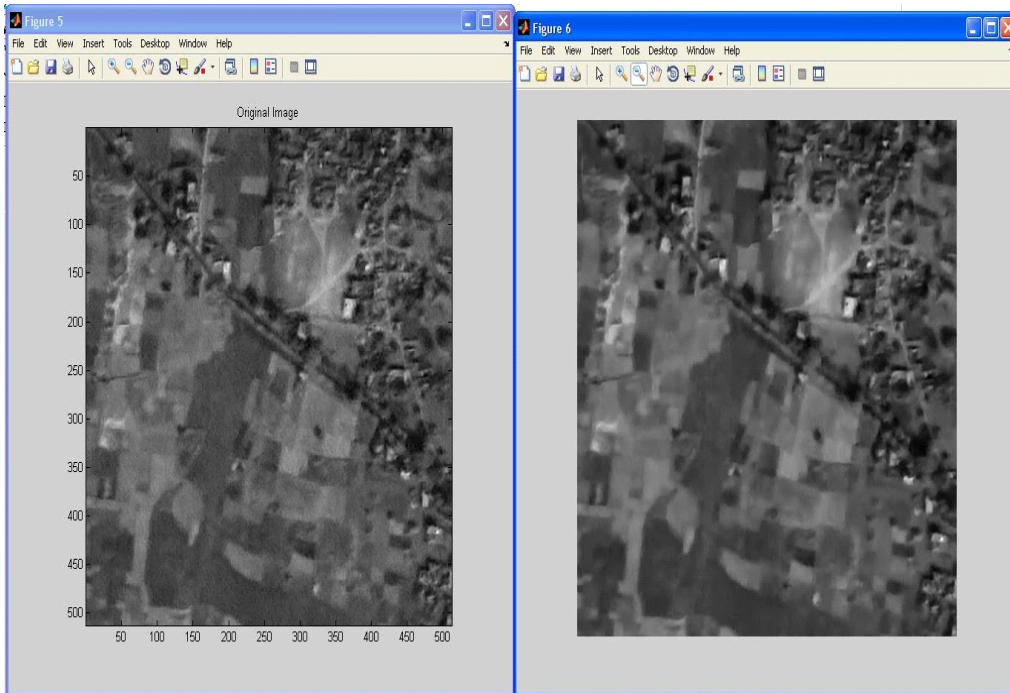
Wavelet based denoised image   **Curvelet based denoised image**

CONCLUSION

The image usually has noise which is not easily eliminated in image processing. The main purpose of the noise reduction technique is to remove noise by retaining the important feature of the images. The curvelet transform based denoising is superior to other denoising methods such as Fourier and wavelet denoising because it can handle one-dimensional discontinuity, i.e., straight edges. Remote sensing images having more curved edges hence the curvelet transform can handle linear discontinuities in images.

SSIM INDEX

- The structural similarity (SSIM) index is a method for measuring the similarity between two images.
- SSIM considers image degradation as perceived change in structural information
- The SSIM metric is:

$$SSIM(x,y)=(2\mu x\mu y+C1)(2\sigma x,y+C2)(\mu x2+\mu y2+C1)(\sigma x2+\sigma y2+C2)$$

Where, X and Y are the noisy input and denoised output image, μx and μy are the mean of the noisy input and denoised output image, σx and σy are the standard deviation of noisy input and denoised output images

Standard Deviation (SD)

The large value of Standard Deviation means that image is poor quality

	Curvelet transform	**Wavelet transform**
SD	5.0022	17.7162
SSIM	0.7789	0.6241

Table 2: Image denoising quality assessment

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DESIGN AND CONSTRUCTION OF AN RFID BASED E-ATTENDANCE REGISTER

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ABSTRACT This work is about the design and construction of an RFID based electronic attendance register. It takes advantage of the wireless and cheap RFID technology in combination with a real time clock module and an SD card module to take automated attendance and log the data for further analysis if desired. It is microcontroller based and the Arduino Micro-controller was used as well as the MFRC522 RFID module. Each subject of the register would be represented by a tag whose identity is already stored, which when placed close to the reader would cause the micro-controller to log the subject's information in an SD card. The stages involved in this research are the design stage where the whole system was designed, the coding stage where the code for the microcontroller was written and debugged and the final build stage where everything was put together.

Keyword; MFRC522 RFID module, Arduino, attendance register, debugged, SD card. Register, reader

1.   INTRODUCTION

Attendance is the concept of people, individually or as a group, appearing at a location for a prescheduled event. Measuring attendance is a significant concern for many organizations, which can use such information to gauge the effectiveness of their efforts and to plan for future efforts; it also goes a long way in sporting and entertainment industries to determine the success of such events. Radio Frequency or waves has been a vital part in electronics and communication, it denotes electromagnetic waves that have a wavelength suited for use in radio communication.. It has over the years through detailed study and research produced result of very unique and ingenious applications in the field of Engineering as a whole such applications areas include; transportation, health-care, agriculture, the hospitality industry, academic and business settings to mention but a few. These unique applications of the concept of radio waves have made life easier and led to the solutions to many of man's problems directly or indirectly. The impact of Radio frequency solutions ranges from the use of a car key, the use of a card to access buildings, validation of bus tickets to more sophisticated usage such GSM phones. The major problems faced by organizations with regards to attendance data collection are; time consumption of manual attendance systems, resources wastage, and data inconsistency. Radio Frequency Identification (RFID) is one of the automatic identification technologies more in vogue nowadays. There is a wide research and development in this area trying to take maximum advantage of this technology, and in coming years many new applications and research areas will continue to appear. The information contained within an RFID tag's electronic chip depends on its application. It may be a UII, Unique Item Identifier or an EPC Electronic Product Code, once this identifier has been written into the electronic circuit of the tag, it can no longer be modified, only read. This principle is called WORM (once written read multiple). Some electronic chips have another memory in which users can write, modify and erase their own data. These memories vary in size from few bits to tens of kilobytes This sudden interest in RFID also brings about some concerns, mainly the security and privacy of those who work with or use tags in their everyday life.

As for system development and implementation, it should be able to help in managing their student attendance systematically. The system must have database that contains employee/student information and it must be able to help lecturer to manipulate data, update database, alert manager accordingly, and also nice interface to make it easier to use. Finally, the attendance system must be user friendly for commercial purpose.

Our project is going to solve these problems by using RFID technology. Radio Frequency Identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. So the RFID is a wireless identification. Normally the RFID system comprises of two main parts are RFID Reader and RFID Tag.

2. RELATED WORKS

Until the mid-18th century, most people led simple one-dimensional lives as small-scale farmers, anglers, or artisans, and their work output depended on natural forces such as the sun and the wind. The concept of time management depended on several factors such as; agricultural tempos, tides, weather, and seasons. For instance, daylight hours determined work hours, inclement weather determined holidays, and productivity depended on the variations of the growing season. The sun and the moon, and disposition of the laws of the universe determined time management. (curtin et al, 2006). The industrial revolution and subsequent developments enabled humans to harness nature for their ends. Big machines in factories ended the dependence on the weather, and the invention of electricity and deployment of artificial lighting rendered the concept of daylight hours insignificant. (curtin et al, 2006). The invention of mechanical clocks made it possible to manage time, but the notion of time was still different from what it is today. The earliest of clocks could keep time to the second, but most early-clocks came only with an hour hand and indicated time to the closest quarter hour. People in the early industrial revolution still did not consider accounting for their time to the second to be important or necessary. (Davis, 2004). The history of time management in the early 20th century ran parallel to the evolution of management science. Taylor's scientific approach to management which was aimed at shop management, centered on the principle of effective time management. He attributed inefficiency of his worker to tendencies to work slowly, without any incentives to work fast. He advocated establishing specific work targets and paying workers for the tasks and goals met. This mandated better usage of time and became the basis for modern time management approaches. (Clarke, 2005). RFID (Radio-Frequency Identification) is a technology for automated identification of objects and people. Human beings are skilful at identifying objects under a variety of challenge circumstances. For example, a bleary-eyed person can easily pick out a cup of coffee on a cluttered breakfast table in the morning. Whereas, computer vision performs such tasks poorly but RFID may be viewed as a means of explicitly labelling objects to facilitate their "perception" by computing devices. (Curtin et al. 2006) Most histories of RFID technology can be traced back to the radio-based identification system used by Allied bombers during World War II. During the war bombers could be shot down by German anti-aircraft artillery, so they had a strong incentive to fly bombing missions at night because planes were harder for gunners on the ground to target and shoot down. Of course, the Germans also took advantage of the cover that darkness provided. Early Identification Friend or Foe (IFF) systems made it possible for Allied fighters and anti-aircraft systems to distinguish their own returning bombers from aircraft sent by the enemy. These systems, and their descendants today, send coded identification signals by radio: An aircraft that sends the correct signal is deemed to be a friend, and the rest are foe. Thus, radiofrequency identification was born. (Farragher, 2009) Shortly after the war, an engineer named Harry Stockman realized that it is possible to power a mobile transmitter completely from the strength of a received radio signal. His paper "Communication by Means of Reflected Power" introduced the concept of passive RFID systems. Work on RFID systems as we know them began in earnest in the 1970s. In 1972, Kriofsky and Kaplan filed a patent application for an "inductively coupled transmitter-responder arrangement. The system used separate coils for receiving power and transmitting the return signal. In 1979, Beigel filed a new application for an "identification device" that combined the two antennas; many consider his application to be the landmark RFID application because it emphasized the potentially small size of RFID devices. (Sorrells, 2000)

3. METHODOLOGY

This research concept is based on a microcontroller approach that digitalizes analogue signals obtained from sensors used to monitor the receipt of signals from radio frequency chips implanted in tags and cards. It monitors persons or object and keeps record or a register of their attendance automatically through the aid of a timing mechanism, and stores the register information on an SD card through the SD Card Module incorporated into the project. The register information that is stored in the SD card can then be easily gotten by removing the SD card from the module and copying out the data for further manipulation through the various softwares available such as SPSS, Microsoft Access, and Excel.

A.   Functional Unit Description

Every circuit has a number of functional units that makes up that circuit. In order to have a good, durable and cost effective design, the choice of materials used was based on availability, efficiency, durability and cost.
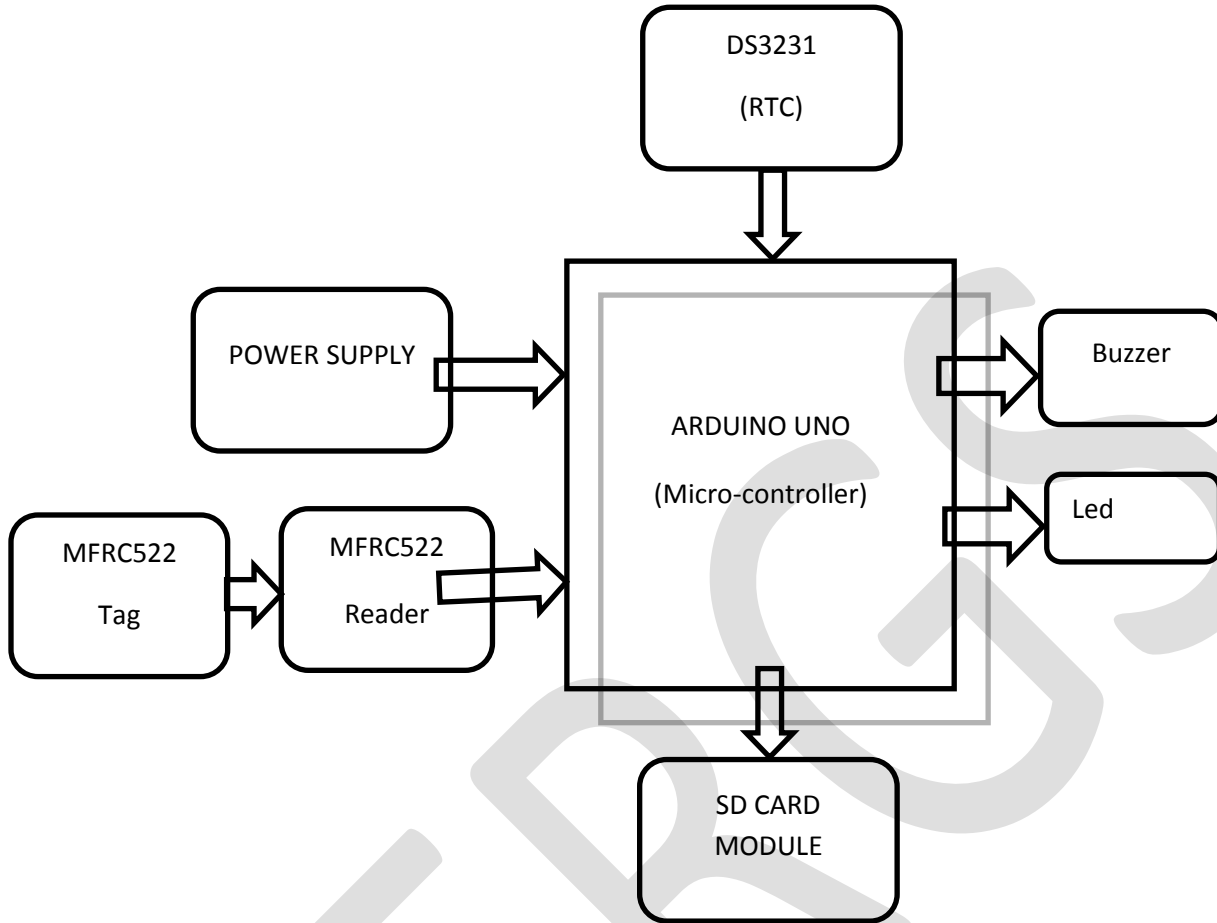
Figure1 Block diagram of an RFID based e-attendance system with storage

B. Units And Devices
The research is divided into several units which shall be discussed in details

- The Micro-Controller Unit
- The RFID unit
- The Storage Unit
- The Audio Indicator Unit
- The Visual Indicator Unit
- The Timing Unit
- The Power supply unit

C. The Micro-Controller Unit
The heart of the whole project is the Micro-controller unit. For this project the Arduino Uno Micro-controller was used. It is a low power general purpose micro-controller with good processing speed, small physical dimension, that is durable and cheap.

Technical Specifications of an Arduino Uno

Table 1 Specifications of the Arduino

Microcontroller	ATmega328
Operating voltage	5V input voltage (recommended) 7-12V input voltage (limits)
Digital I/O pins	14 (of which 6 are PWM output)
Analog input pins	6
PWM Digital I/O pins	6
Dc current per I/O pin	20Ma
Dc current for 3.3V pin	50Ma
EEPROM	1KB
SRAM	2KB
Clock speed	16MHz
Flash memory	32KB of which 0.5Kb used by bootloader
Length	**68.6mm**

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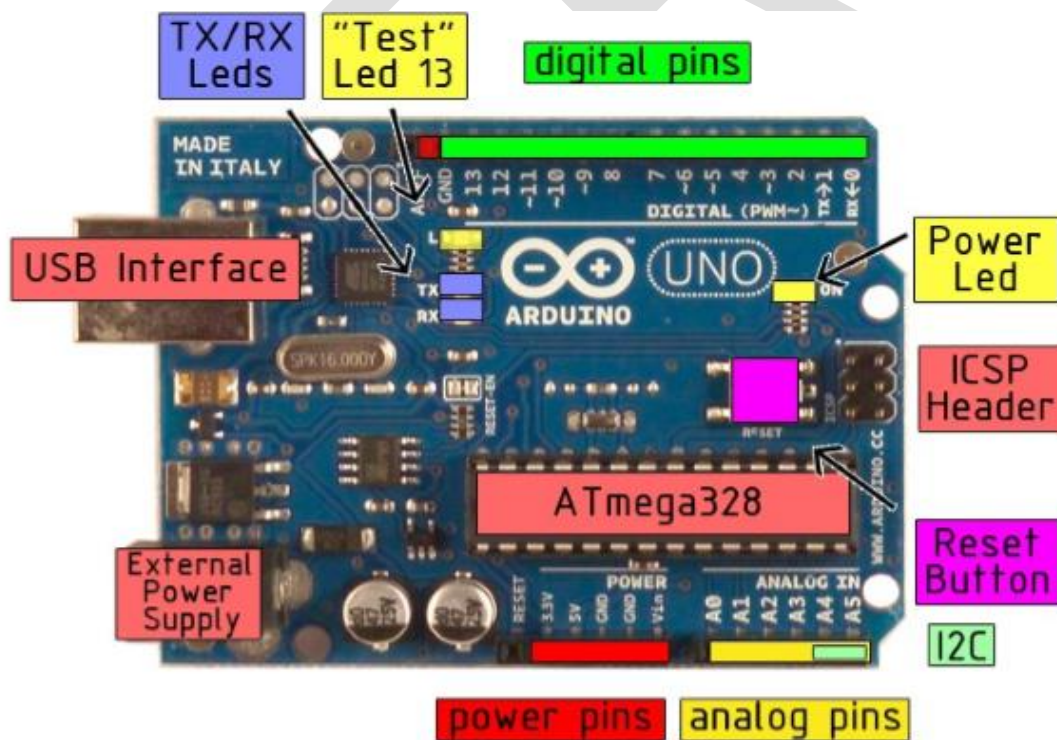
Figure 2: The Arduino Uno Microcontroller

The Arduino Uno Micro-controller is interfaced with the RC522 Reader and DS3231 real –time clock module as inputs and the SD card module and both buzzer and led indicators as outputs. Each pin on the arduino micro-controller can supply 20mA each with 20 pins which gives a total of 400mA maximum current draw from the micro-controller, but it is not recommended to load the micro-controller to its maximum.

The Storage Unit

The storage unit is the Arduino SD card module, this is a simple solution for transferring data to and from a standard SD card. The pinout is directly compactible with the Arduino Uno micro-controller, which is most convenient for mass data storage and data logging.
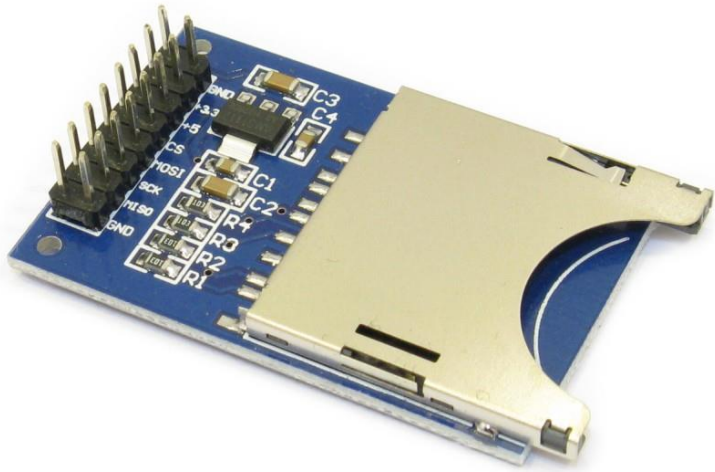
Figure 3: SD Card Module

Since a single log of data from a swiped card is about 20byte

128MB card would be able to log

128, 000, 000 byte / 20 bytes = 6,400,000 logs

POWER SUPPLY UNIT

The project is powered from a 9 volts battery. This is due to the need for a ease in mobility and compactness of the project. The 9 volts batter can supply upto 600mAh to 1200mAh
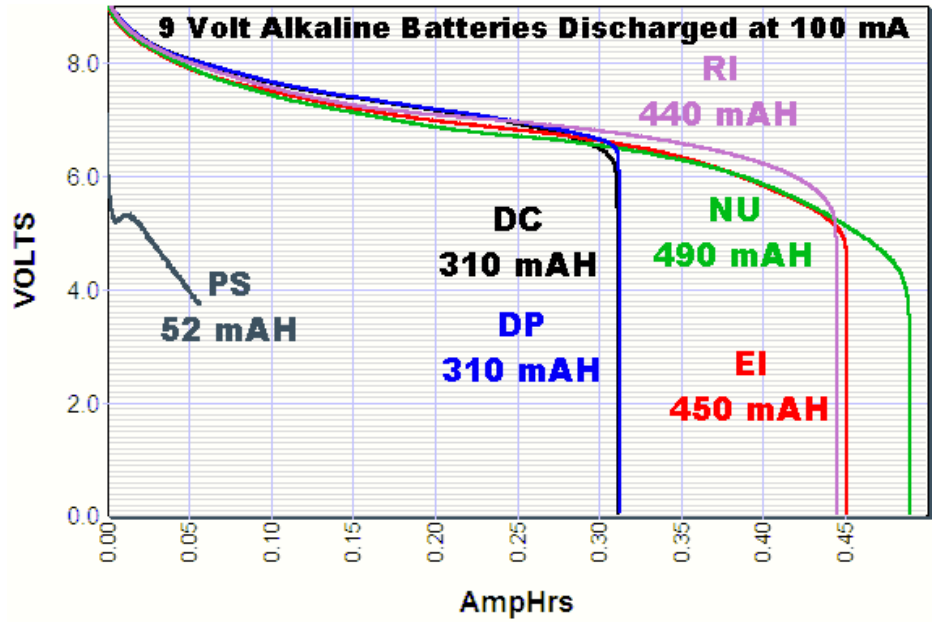
Figure 4: Alkaline batteries discharge rate

Circuitry diagram and flow chart

The Circuit diagram for this project is as shown in fig. 3.7, with all voltage supply or vcc symbol refering to appropriate voltage level required by module or unit.
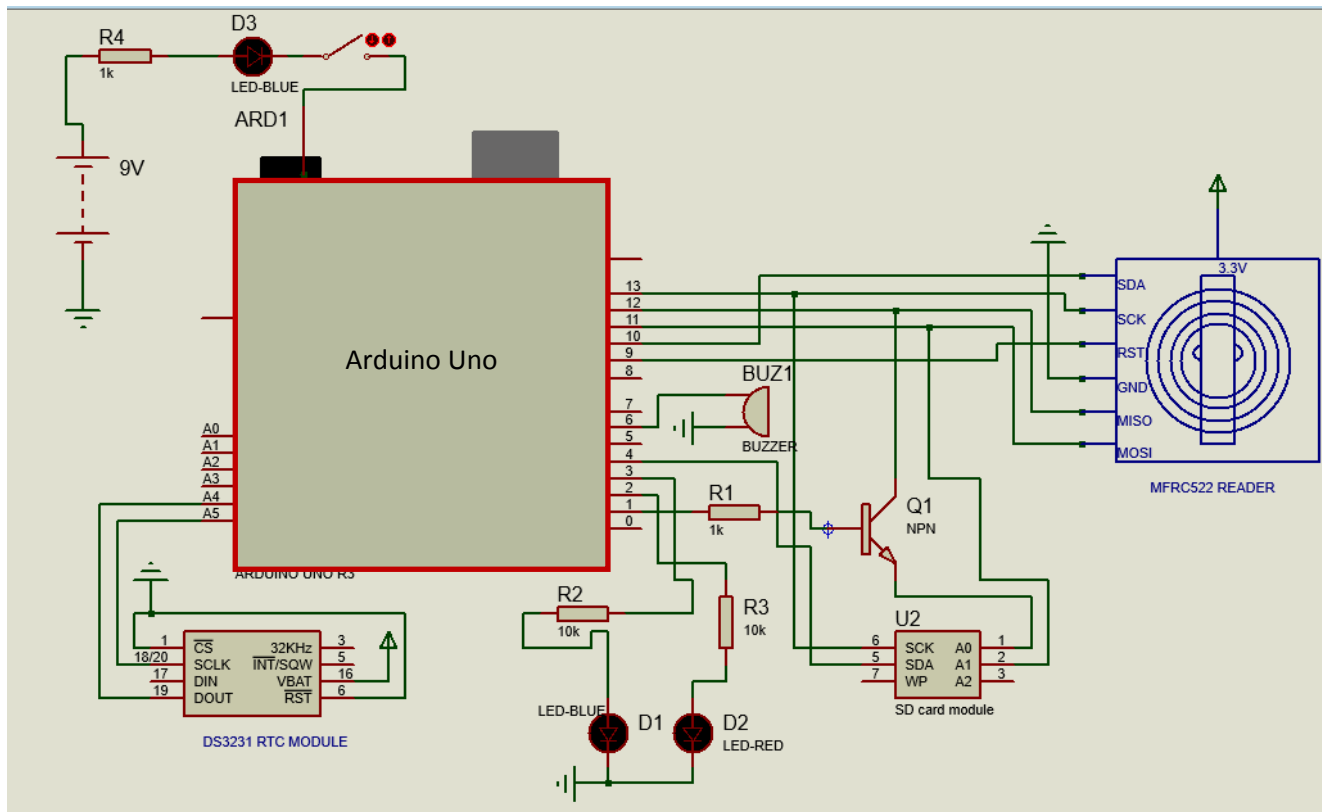
Figure 5: Circuit Diagram for an RFID based e-Attendance Register with Storage
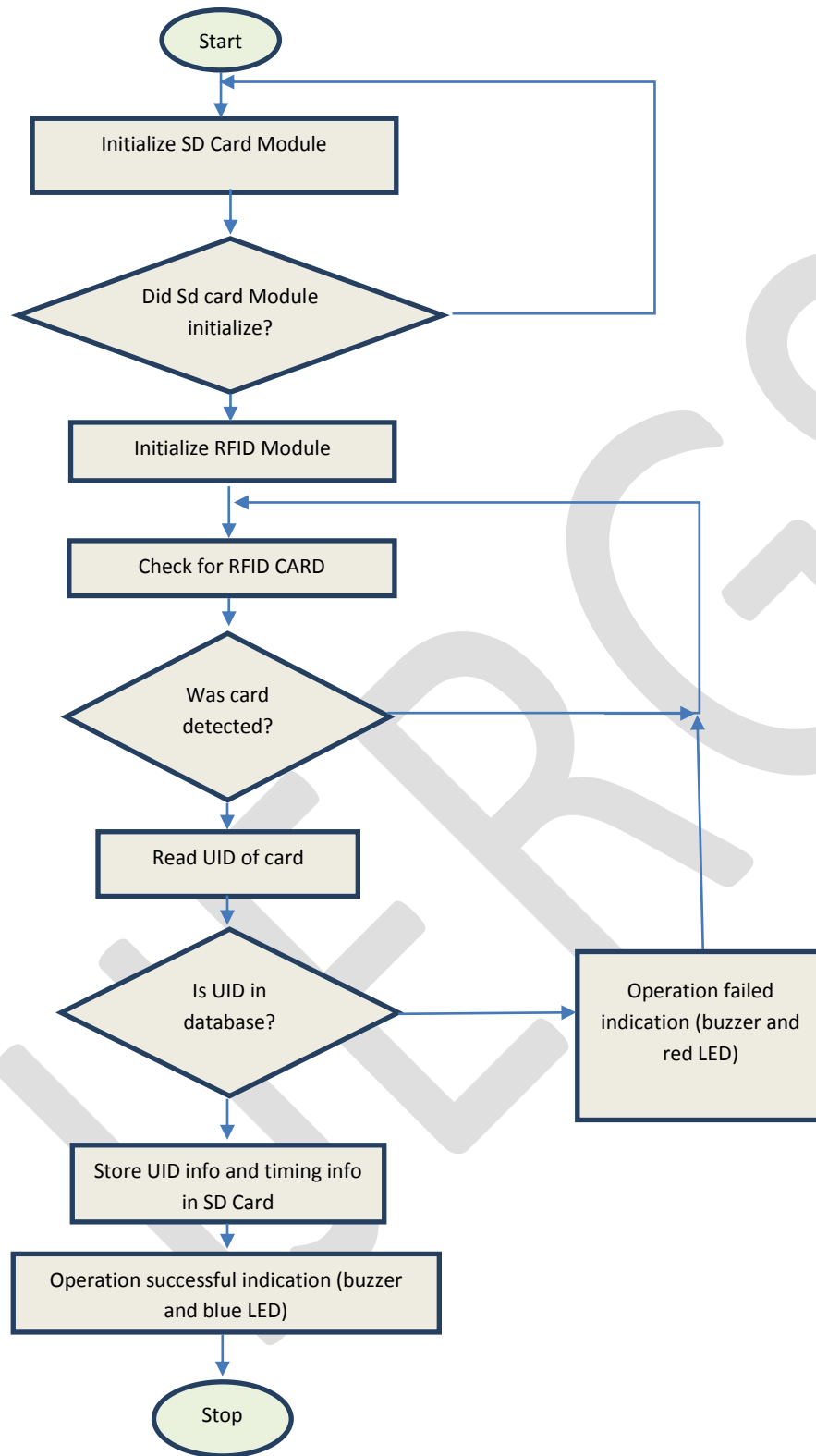
Figure 6 : Flow chart for an RFID based e-Attendance register

4. RESULTS AND DISCUSION

The performance analysis of an electronic device is very important because it helps the end users of this device to know its efficiency, life span and limitations. It also gives room for further enhancement of the design. However, the performance analysis concerned with this device is limited to components specification/tolerance as slated in the datasheet.

Components specifications/tolerance

Table 2: Power Analysis

Module	Current(max)	Voltage	Power(max)
Arduino board	50mA	5v	0.25
MFRC522	26mA	3.3v	0.0858
DS3231 RTC	0.17mA	5v	0.00085
SD card module	100mA	5v	0.5
Piezo Buzzer	30mA	5v	0.15
LEDs	50mA	5v	0.25
TOTAL	Total Amperage 256.17mA		Total wattage 1.237watts

Since the 9v battery can supply up to 1200mA every hour, a single battery would sustain the project for a minimum of 4.6hours. which can be greatly increased based on usage.

Transistor Base resistor calculation for SD card MISO pin

From Datasheet of NPN transistor

I_c =133mA   hfe = 30 I_c/hfe =4.43mA V_{be}=0.95

R_b= (V_{cc}-V_{be})/I_b = (5-0.95)/4.43 = 913 ohms preferred standard value 1k

Table 3: System Reliability and Maintenance(DS3231)

Temperature	Operating: -25℃ to 85℃
	Storage: -40℃(168h) to 85℃ (500h)
moisture and corrosion	Operating: 25°C / 95% rel. humidity
	Non-Operating: 40°C / 93% rel. hum./500h salt water spray:
	3% NaCl/35C; 24h acc. MIL-STD Method 1009
Durability	10,000 mating cycles
Bending	10N
Torque	0.10N*m. ±2.5∘ max
Drop Test	1.5m free fall
Visual Inspection/Shape and Form	No warp age; no mold slim; complete form; no cavities; surface smoothness ≦ -0.1mm/ cm^2 within contour; no cracks; no pollution (oil, dust, etc.)

Table 4: Reliability and Durability Specifications (DS3231)

MTBF	1,000,000 hours
Preventive Maintenance	None
Data Reliability	< 1 non-recoverable error in 1014 bits read
Endurance	MLC 3,000 -10,000 write/erase cycles
	TLC 500-1,000 write/erase cycles

Table 5: Electrical Characteristics (DS3231)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply voltage	V_{cc}		2.3	3.3	5.5	V
	V_{bat}		2.3	3.0	5.5	V
Logic 1 Input SDA, SCL	V_{IH}		$0.7 \times V_{cc}$		$V_{cc} + 0.3$	V
Logic 0 Input SDA, SCL	V_{IL}		-0.3		$0.3 \times V_{cc}$	V

Table 6: Electrical Static Discharge (ESD) requirement (DS3231)

ESD Protection	Contact Discharge:	±4KV, Human body model according to IEC61000-4-2.EN55024
	Air Discharge;	±8KV, Human body model according to IEC61000-4-2.EN55024
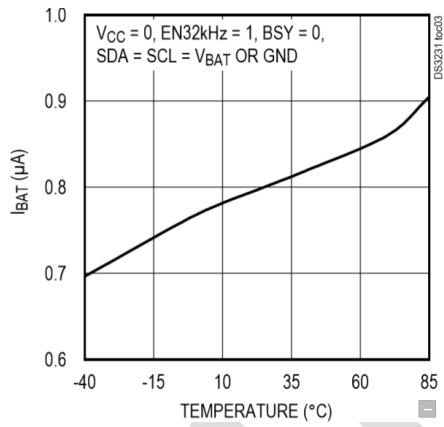
Figure 7: Graph of Supply Current Vs Temperature (DS3231)
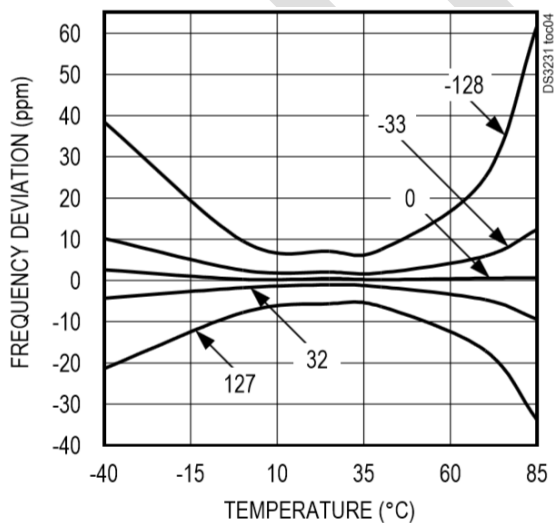
Figure 8: Graph of Frequency Deviation vs Temperature (DS3231)

4. DISCUSSION

More compatible modules can be used for the construction as SD card module and MFRC522 were not really compatible together but was got to work through ingenious means. Also the memory allocation for data collection/logging can be improved on. As FAT16 is the specified format for formatting an SD card lower than 2Gb, while FAT 32 is for formatting an SD card higher than 2Gb. The timing module (DS3231) despite the high-level of accuracy and temperature compensation can be made more accurate for long term purpose of time keeping. As it has a slack of few minutes yearly.

Limitations Of This Device

- For high security use, it is recommended to use this device along with other devices to complement it.
- Cards can be stolen or misplaced
- This device is also limited by the amount of memory allocated to it by the administrator for storage of data.
- Alkaline batteries can also be a limitation for prolonged usage.

5. CONCLUSION

This device is very important in today's world because of its application in various areas. It makes life easier which is the purpose of engineering, it makes work more efficient. Its application in non-human attendance taking is very crucial as other biodata collection techniques would fail in this aspect. The device is also cheaper and small which is the current trend in today's technology. Anyone can easily own one for personal use. Lecturers can automatically take their attendance and accurately time students, workers attendance can be much more reliable and it adds class in business environment at such little cost. It is a unique design which is very easy to implement by everyone.

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COMPARISON OF MALE AND FEMALE VOWEL FORMANTS BY NATIVE SPEAKERS OF MARATHI LANGUAGE

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Abstract: -Now a day's many studies are being conducted on speaker identification between male and female voice. In our present study, we compared and found formant frequencies of male and female voice samples in a number of 12 Marathi vowels produced by 10 Marathi native speakers (Male and Female). Day by day voice related crimes are increasing rapidly across the world, e.g. Bribery, Ransom call, threatening and terrorist activities cases, etc. Hence there are lots of applications available on voice and speaker identification and as we know that, voice's uniqueness in the resonant frequencies proves that voice is unique. So we focused on Marathi native speakers (Male and Female), the voice comparison is made on the basis of resonant frequencies, Linear Predictive Coding (LPC) and spectrographic analysis using Multi-Speech application. This technique uses Linear Predictive Coding (LPC) and we compared formant frequencies of Marathi native speakers (Male and Female).

Keywords: -Marathi native speakers, vowels, gender, voice analysis, formant frequency measurement, sound and pitch.

Introduction: -Many research papers and studies on voice comparison (Male and Female) have been done in the field of major global language for example English, Spanish and French etc. But a lot is still to be explored in native languages that are inherited in our country. With a view to study and learn more about Marathi language vowels, we intended to conduct a research and prepare a paper on the same. Since DFSL is located in Mumbai, Maharashtra and receive the cases in native language i.e. Marathi, this study would be helpful.

When audio cases are received, the disciplined involved while solving those voice cases are not confined to one particular scientific field solely i.e. [1] not only do we consider the fundamental frequencies and resonant frequencies of voice but also take into consideration the state of mind involved, behavioral pattern portrayed while committing a crime i.e. acting in his/her natural senses etc. and compare this natural behavioral pattern with learned behavioral pattern. The paper intends to study the issues related to the above clauses.

As per studies that were being conducted till now did not gave us particular frequency values for male and female in Marathi native language. Our motto is to conduct a research and work on the same so as to come out with certain set of frequency values that could be certainly considered as standard values.

Participants: -Five male and five female native speakers of Maharashtra were well versed in Marathi language and Marathi was their first language, took part in this study. All were university students with normal hearing capability.

Table 1:- Marking of Female and Male voice samples.

Sr. No.	Female voice Samples	Marked	Male voice samples	Marked
1	Marathi Female Voice Sample1	MFVS1	Marathi Male Voice Sample1	MMVS1
2	Marathi Female Voice Sample2	MFVS2	Marathi Male Voice Sample2	MMVS2
3	Marathi Female Voice Sample3	MFVS3	Marathi Male Voice Sample3	MMVS3
4	Marathi Female Voice Sample4	MFVS4	Marathi Male Voice Sample4	MMVS4
5	Marathi Female Voice Sample5	MFVS5	Marathi Male Voice Sample5	MMVS5

Recorded samples: -12 Marathi vowels [5] (a/ə/, ā/a/, I/i/, Ī/i:/, U/u/, Ū/u:/, e/e/, ai/əi/, o/o/, au/əu/, aṃ/əm/, aḥ/əɦə/) were recorded from the participants (5 male and 5 female speakers).

Devices used: -To record the samples we used the following devices:

I. Digital Voice Recorder named – Sony company, sampling rate is 44100Hz.
II. Laptop named –Lenovo Company (G-50-80).
III. Mobile phone named - One plus one Company.

From the above recording devices, we considered the samples recorded from Digital Voice Recorder for analysis purpose.

Procedure: -[2]To go ahead with the approach, we called our participants to record the sample voice. To do so, we needed an ideal room so as to cut down the external disturbances interfering the recording procedure i.e.[1]noise from AC & fans, other conversations, vehicle horn, ticking of watch etc. We did this so that the natural quality of the voice recorded remains intact and to get precise results. Hence we chose to record the sample voice in a soundproof room.

Every speaker was instructed to repeat one vowel thrice and in all we considered 12 such vowels for analysis. These samples were recorded using mobile, laptop and digital voice recorder. Of all the recorded samples, the sample recorded from digital voice recorder was considered for our further analysis.

Basic information: - [2]Most of the sound generated by the human voice organ can be understood by the following human. Actually a spoken word has more meaning than its explanation in the dictionary. We produce sound to express emotions, mental imagery, and language. Human voice is the most natural form of communication involved with environmental and situational reality. The formant frequencies of female are higher than that of male. Voice tract of the female is shorter than that of male, which causes sharp and clear voice generation in females.

[4]The formant is term applied to describe the resonant frequencies of the voice tract. The formants are frequency information characteristics of the voice. The formants change the Centre frequency and bandwidth during speech. Adult men and women have different vocal folds sizes; reflecting the male – female differences in larynx size. Adult male voices are usually lower pitched and have larger folds. The male vocal folds are between 17mm and 25mm in length. The female vocal folds are between 12.5mm and 17.5mm in length. Male and female voices differ in the fundamental frequency mainly due to length of the vocal voice tract because formant frequencies are inversely proportional to the length of the voice tract.[1] Individual speakers differ from larynx mechanism and the vocal tract, but it has been seen that differences in the vocal fold vibration play a major role in enabling listeners to identify the individual voice.

Analysis:-Words were first extracted from the frame sentence. Since the sample voice was recorded thrice, only the most acoustically satisfactory occurrence was selected, making up a total of 360 samples (10 speakers, 12 vowels). We then segregated and labeled voice samples in phones. This task was performed with the help of Gold wave application.

The file format of the sample was converted from .mp3 format to .wav (PCM sine 16-bit mono) format with the help of Gold wave software. Our study revolves around comparative study of 12 vowels between male and female Marathi native speakers (a/ə/, ā/a/, I/i/, Ī/i:/, U/u/, Ū/u:/, e/e/, ai/əi/, o/o/, au/əu/, aṃ/əm/, aḥ/əɦə/). We used Multi-Speech application for the analysis purpose. We opened the respective file and ran it in Multi-Speech one at a time. We then down sampled the sample voice at 11025Hz, to make digital audio signal smaller by lowering its sampling rate or sample size (bits per sample). Down sampling is done to decrease the bit when transmitting over a limited bandwidth or to convert to a more limited audio format. Further we conducted spectrographic test for

detailed analysis. [3]The spectrographic test is divided into three parts: 1) Amplitude vs. Time analysis (waveform analysis), 2) Frequency vs. Time analysis (formant analysis),3) Energy vs. Frequency .Once this done, we focused on formant frequencies (F1 & F2) of male and female samples with the help of LPC technique. We did this because of the role it plays in the recognition and differentiation of speech sounds.

Amplitude V/S Time

Frequency V/S Time (Hz)

Energy V/S Frequency (dB)
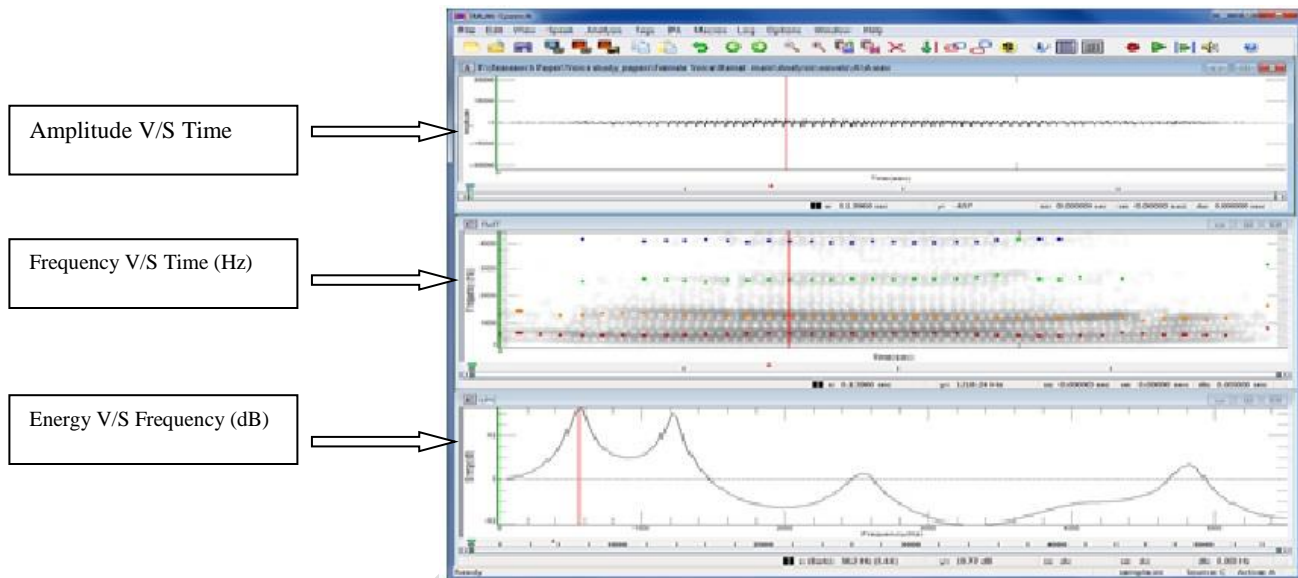
Figure: -1: Spectrographic result of one of the native speaker.

[1]It must be stressed that the formant pattern of particular sound is the outcome of the acoustic character of the whole tract working as one resonant system. Hence is not justifiable to assign any one formant to a particular part of the vocal tract. The frequency F1 and F2 are interdependent, since in general the lengthening of one section of the tract implies the shortening of the other. It is true, however, that the vertical section is longer than the horizontal and is therefore responsible for the wavelength of the lowest formant, F1 while the shorter section tends to determine F2. This results in an F1 of comparatively low frequency together with an F2 of high frequency.

The following observations are based on 5 female native speakers that were our participants. Formant frequency (F1)values are obtained after a detailed analysis of the sample voice taken. After obtaining these values for every vowel, we have taken out their mean values for the same vowel.

Table 2:-F1 Values of MFVS1 to MFVS5.

Sr. No	Name	Marathi Vowels											
		a /ə/	Ā /a/	I /i/	Ī /i:/	U /u/	ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əĥə/
1	MFVS1	604.02	936.33	404.33	378	435.17	436.81	431.22	431.13	438.4	440.52	651.67	787.11
2	MFVS2	563.51	964.54	417.51	426.77	433.88	441.24	435.43	422.24	470.15	564.74	509.51	602.44
3	MFVS3	751.22	991.66	478.86	464.07	370.28	400.95	546.09	521.92	524.89	807.86	794.95	995.77
4	MFVS4	639	992.62	321.35	362.51	321.97	346.09	524.81	740.99	535.76	485.89	768.15	813.43
5	MFVS5	539.81	930.88	299.14	350.13	453.01	355.29	527.91	502.77	495.25	558.8	720.32	894.79
Total		3097.5	4816.03	1921.19	1981.48	2014.31	1980.38	2465.46	2619.05	2464.45	2857.81	3444.6	4093.5
Average		619.51	963.20	384.238	396.29	402.86	396.07	493.09	523.81	492.89	571.56	688.92	818.70

The following observations are based on 5 female native speakers that were our participants. Formant frequency (F2) values are obtained after a detailed analysis of the sample voice taken. After obtaining these values for every vowel, we have taken out their mean values for the same vowel.

Table 3:-F2 Values of MFVS1 to MFVS5.

Sr. No	Name	Marathi Vowels											
		A /ə/	ā /a/	I /i/	Ī /i:/	U /u/	Ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əɦə/
1	FVS1	1321.12	1491.24	1485.59	1564.87	701.71	701.71	2799.53	2800.23	859.34	861.54	1284.38	1471.17
2	FVS2	1218.92	1462.96	2588.38	2660.35	899.87	899.87	2535.02	2522.11	919.8	1008.77	1229.37	1078.03
3	FVS3	1306.08	1483.24	2950.87	2940.05	1043.81	1043.81	2727.49	2521.06	1067.04	1264.8	1311.49	1409.65
4	FVS4	1300.13	1514.84	2881.65	2885.53	805.21	805.21	2173.61	1742.82	990.72	1013.35	1249.07	1365.81
5	FVS5	1261.09	1483.88	3014.66	2812.06	884.02	884.02	2570.79	2823.63	967.84	974.6	1245.81	1543.41
	Total	6407.34	7436.08	12921.15	12862.8	4334.62	4334.6	12806.4	12409.8	4804.74	5123.06	6320.12	6868.07
	Average	1281.46	1487.21	2584.23	2572.57	866.924	866.92	2561.28	2481.97	960.948	1024.61	1264.02	1373.61

The following observations are based on 5 male native speakers that were our participants. Formant frequency (F1) values are obtained after a detailed analysis of the sample voice taken. After obtaining these values for every vowel, we have taken out their mean values for the same vowel.

Table 4:-F1 Values of MMVS1 to MMVS5.

Sr. No	Name	Marathi Vowels											
		A /ə/	ā /a/	I /i/	Ī /i:/	U /u/	Ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əɦə/
1	MVS1	663.13	1001.42	423.81	451.58	451.06	459.14	485.17	611.01	498.94	638	780.53	788.11
2	MVS2	550.15	627.62	348.54	302.32	352.41	363.11	416,27	467.12	428.96	484.15	626.19	753.3
3	MVS3	550.57	767.98	301.99	275.7	328.31	335.65	470.67	455.45	505.9	498.99	575.78	665.98
4	MVS4	539.74	750.77	330.65	329.18	361.96	379.31	432.95	351.32	491.8	478.23	592.73	686.88
5	MVS5	492.2	841.37	333.36	333.31	369.38	369.62	385.89	402.42	545.14	520.92	412.25	778.75
	Total	2795.79	3989.16	1738.35	1692.09	1863.12	1906.83	1774.68	2287.32	2470.74	2620.29	2987.48	3673.02
	Average	559.158	797.832	347.67	338.418	372.624	381.366	443.67	457.464	494.148	524.058	597.496	734.604

The following observations are based on 5 male native speakers that were our participants. Formant frequency (F2) values are obtained after a detailed analysis of the sample voice taken. After obtaining these values for every vowel, we have taken out their mean values for the same vowel.

Table 5:-F2 values of MMVS1 to MMVS5

Sr. No	Name	Marathi Vowels											
		A /ə/	ā /a/	I /i/	Ī /i:/	U /u/	Ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əɦə/
1	MVS1	1346.53	1456.87	2448.22	2250.65	731.15	752.62	2275.51	2227.85	814.67	1081.45	1237.63	1314.83
2	MVS2	1137.81	1224.36	2150.73	2146.68	673.69	669.58	2044.11	1753.89	758.92	846.05	1130.87	1271.03
3	MVS3	1283.11	1287.04	2399.54	2385.45	743.71	765.43	2137.97	2067.54	798.02	996.05	1276.7	1308.15

4	MVS4	1125.75	1146.37	2314.88	2351.45	659.93	681.08	2052	2141.56	818.99	826.49	1275.1	1146.19
5	MVS5	1294.73	1308.78	2719.25	1479.33	792.45	788.92	2353.71	2414.74	1202.31	1158.81	1118.57	1367.4
Total		6187.93	6423.42	12032.62	10613.5	3600.93	3657.63	10863.3	10605.5	4392.91	4908.85	6038.87	6407.6
Average		1237.58	1284.68	2406.524	2122.71	720.186	731.526	2172.66	2121.11	878.582	981.77	1207.77	1281.52

Observation: -The comparative study of male and female speakers is tabulated as follows:

The mean values of F1 and F2 for 5 female native speakers are as follows:
Table 6:- F1 and F2 Values of MFVS1 to MFVS5.

Sr. No	F.F.	Marathi Vowels											
		A /ə/	ā /a/	I /i/	Ī /i:/	U /u/	Ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əɦə/
1	F1	619.51	963.20	384.238	396.29	402.86	396.07	493.09	523.81	492.89	571.56	688.92	818.708
2	F2	1281.46	1487.21	2584.233	2572.57	866.924	866.92	2561.28	2481.97	960.948	1024.61	1264.02	1373.614

Note: - Formant Frequencies (F.F.)

The mean values of F1 and F2 for 5 male native speakers are as follows:
Table 7:-F1 and F2 Values of MMVS1 to MMVS5.

Sr. No	F.F.	Marathi Vowels											
		A /ə/	ā /a/	I /i/	Ī /i:/	U /u/	Ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əɦə/
1	F1	559.158	797.832	347.67	338.418	372.624	381.366	443.67	457.464	494.148	524.058	597.496	734.604
2	F2	1237.58	1284.68	2406.524	2122.71	720.186	731.526	2172.66	2121.11	878.582	981.77	1207.77	1281.52

Note: - Formant Frequencies (F.F.)

The above table: - 6 and 7 gives us mean values of F1 and F2 formants for pure vowels of Marathi based on data obtained from samples of Marathi native speakers.

Result and discussion: - The formant frequencies of all the native speakers have been observed.

Fundamental frequency is measure of how high or low the frequency of voice sound is of the person. A person's voice typically varies over a range of fundamental frequencies. This acoustic analysis has given interesting results concentrated on fundamental frequencies and harmonic frequencies. We obtained the mean of F1 and F2 formant frequencies. We significantly saw that the formant frequencies in Marathi vowels are higher for female than male.

Comparison of mean values of formant frequencies (F1 and F2) of female and male native speakers.
Table 8:-F1 and F2 Values Male and Female voice samples.

Sr. No	F.F	Marathi Vowels											
		a /ə/	ā /a/	I /i/	Ī /i:/	U /u/	ū /u:/	e /e/	ai /əi/	o /o/	au /əu/	aṃ /əm/	aḥ /əɦə/
1	Female F1	619.51	963.20	384.238	396.29	402.86	396.07	493.09	523.81	492.89	571.56	688.92	818.70
2	Male F1	559.158	797.832	347.67	338.418	372.624	381.366	443.67	457.464	494.148	524.058	597.496	734.60
3	Female F2	1281.46	1487.21	2584.23	2572.57	866.924	866.92	2561.28	2481.97	960.948	1024.61	1264.02	1373.61

4	Male F2	1237.58	1284.68	2406.524	2122.71	720.186	731.526	2172.66	2121.11	878.582	981.77	1207.77	1281.5

Note: - Formant Frequencies (F.F.)

Figure 2: All mean values of Formant Frequencies (F1 and F2) of Female (F) and Male (M) Marathi native speakers

Conclusion: -Thus in this study we compared the formant frequencies of female and male speakers using Multi-Speech application. It is found that the formant frequencies of female sample voice is higher than male sample voice for certain vowels (a/ə/, ā/a/, I/i/, Ī/i:/, U/u/, Ū/u:/, e/e/, ai/əi/,aṃ/əm/, aḥ/əɦə/) but for certain vowels (o/o/, au/əu/)formant frequencies (F1 and F2) are found to be overlapping. Also from this study we tried to obtain standard values for F1 and F2 for native speakers for Marathi language.

This study would prove as a useful reference and a resource for future applications related to voice analysis.

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Design and Simulation of 4T-Cascode Amplifier at 45 Nanometer Technology Node

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Abstract- In this research paper, design and simulation of of 4T-Cascode Amplifier at 45 Nanometer Technology Node has been performed using 45nm technology. DC voltage gain, average power, bandwidth and output resistance have been computed using HSPICE Software. Further, the low voltage Cascode Op Amp has better DC Gain, output resistance and less power dissipation. Thus the simulation studies have revealed that the performance of the low voltage folded cascode Op Amp can be improved optimized at different voltage. DC voltage gain is 35.6 dB , average power is 7.81 uW, bandwidth is 4.08 MHz , Phase Margin 88.3^0 and Output Resistance 25.16 K-Ohms have been computed using HSPICE Software at 0.9V. DC voltage gain is 13.7 dB, average power is 0.23uW, bandwidth is 110.7 MHz , Phase Margin 95.3^0 and Output Resistance 9.5 K-Ohms have been computed using HSPICE Software at 1.5V

Keywords: - 4T-Cascode amplifier, DC Gain, Output Resistance, Band width, Average Power

I.   INTRODUCTION

The cascode topology has the advantage of higher gain performance at lower frequency. As the operation frequency increases, cascode transistors have a larger parasitic capacitance which reduces the inter-stage impedance and gain. Cascode topology and the gain-boost cascode topology in millimeter-wave ranges, three topologies as shown in Fig. 1 are fabricated using 65-nm CMOS technology. The transistor M1 in the three topologies is the same one, which uses the asymmetric-layout technique in. The transistor M2 uses the common layout provided by foundry [1]. One drawback of the cascode configuration, however, is the reduced voltage swing at the output compared to the simple common-source amplifier with current source load. Advantages of the cascode amplifier configuration include high gain (due to high output resistance) and improved bandwidth due to reduced Miller Capacitance associated with the input time constant. Invented in 1979 and subsequently refined in 1990, the CMOS active-cascode gain-enhancement technique1 finds wide applications in analog integrated circuits, such as Nyquist-rate and oversampling data converters, sample-and-hold amplifiers, switched-capacitor filters, band-gap reference circuits, and voltage regulators. By boosting the low-frequency transconductance of the cascode device, the technique increases the output resistance of a CMOS cascode operational amplifier (op amp), and hence the voltage gain without degrading its high-frequency performance. As a result, it is ideally suitable for on-chip applications, where a large gain- bandwidth product is desirable while driving capacitive loads. In addition, as the technique derives extra gain laterally using an auxiliary amplifier (booster) without stacking multiple cascode transistors, it retains the high- swing feature of a simple cascode stage, and thus, becomes widely popular in scaled CMOS technologies with low supply voltages [2-5]. This has an advantage in the attainable bandwidth of the amplifier when driving a capacitive load, which itself acts as the compensation capacitor [6-10].
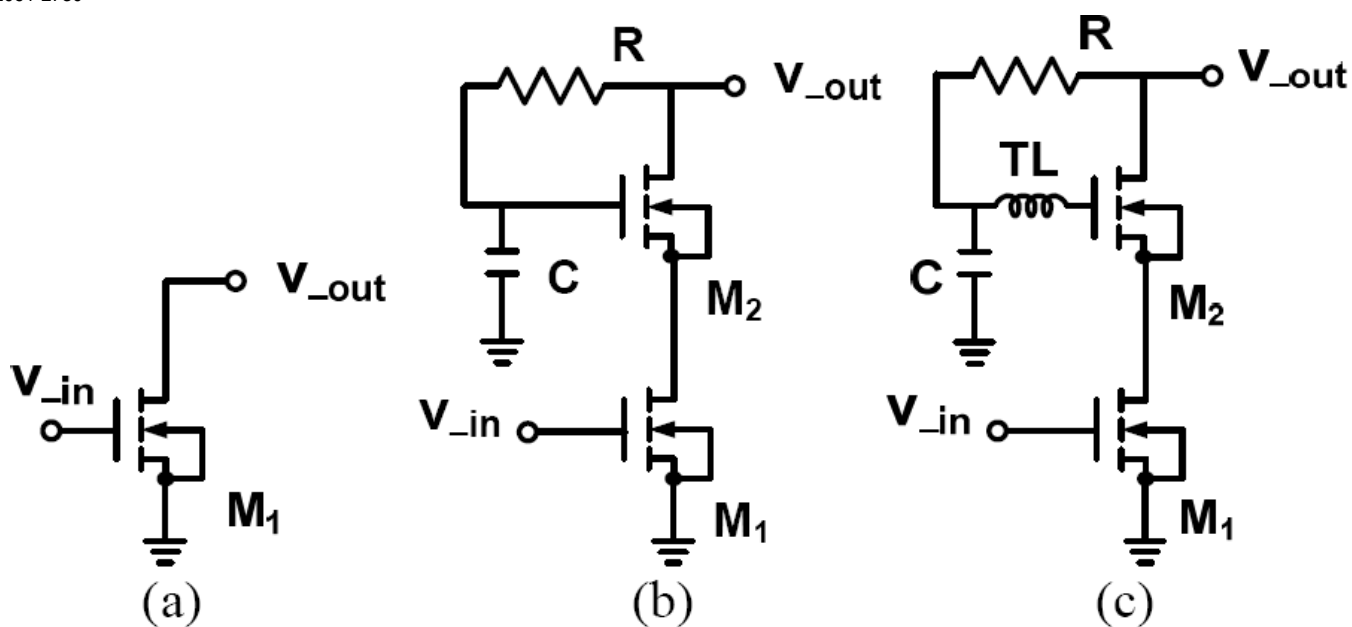
Fig 1 (a) Common Source Topology (b) Cascode topology (c) Gain boosting cascode topology

This paper begins with an overview of Cascode Amplifier in section 2, Simulations of proposed 4T-Cascode Amplifier in section 3, & Section 4 gives result and conclusion.

II.   PROPOSED 4T- CASCODE AMPLIFIER

Common Source amplifier with current source load is implemented using the short-channel CMOS Technology of 45nm. The gain of the general Amplifier is low. To boost the gain of the single-stage amplifier and to eliminate, or more correctly to reduce, the Miller effect, consider the cascode amplifier seen in Fig 2. The gain of the cascode amplifier is the resistance in the drain divided by the resistance in the source of the amplifying device (Ml).Input ac signal is applied at the gate of M1 to amplify.
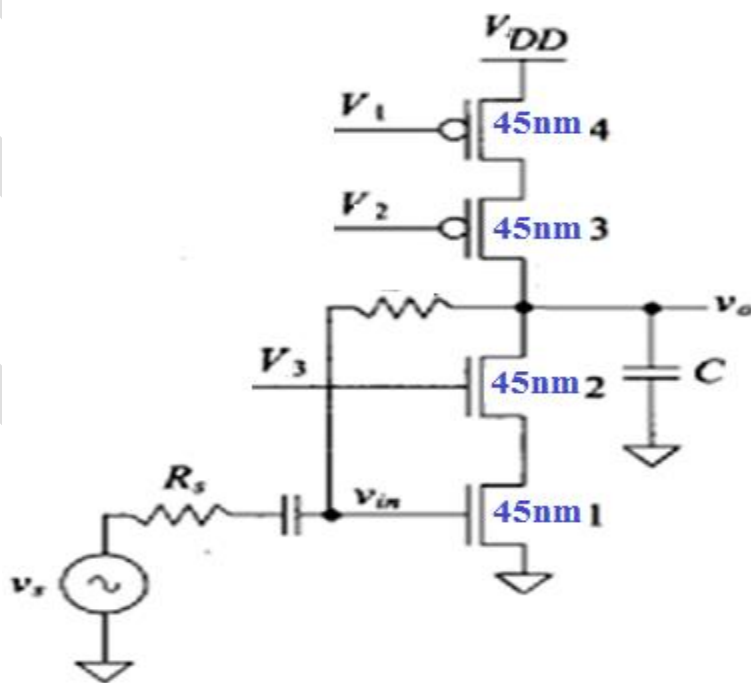
Fig 2: Conventional CMOS Cascode amplifier

SIMULATIONS OF PROPOSED 4T-CASCODE AMPLIFIER
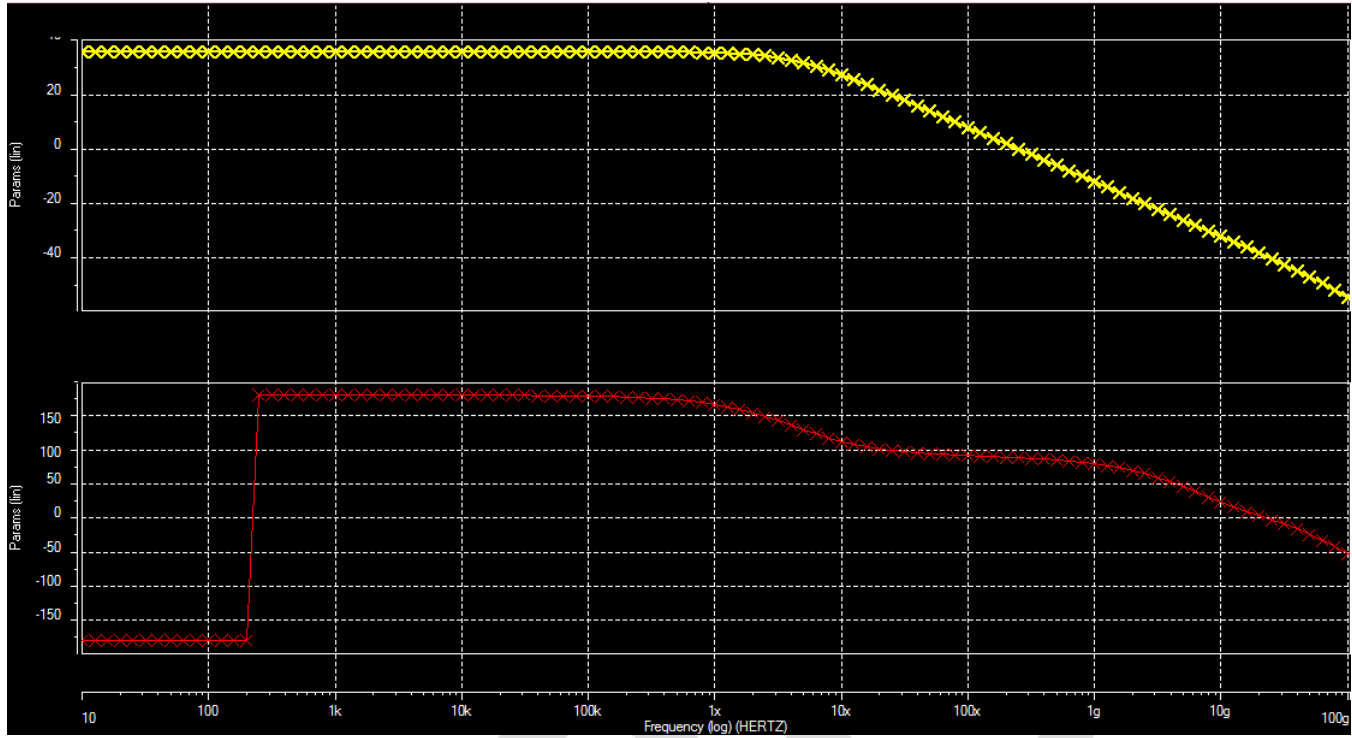
Fig 3: Frequency response of 4T-Cascode Amplifier at 0.9V
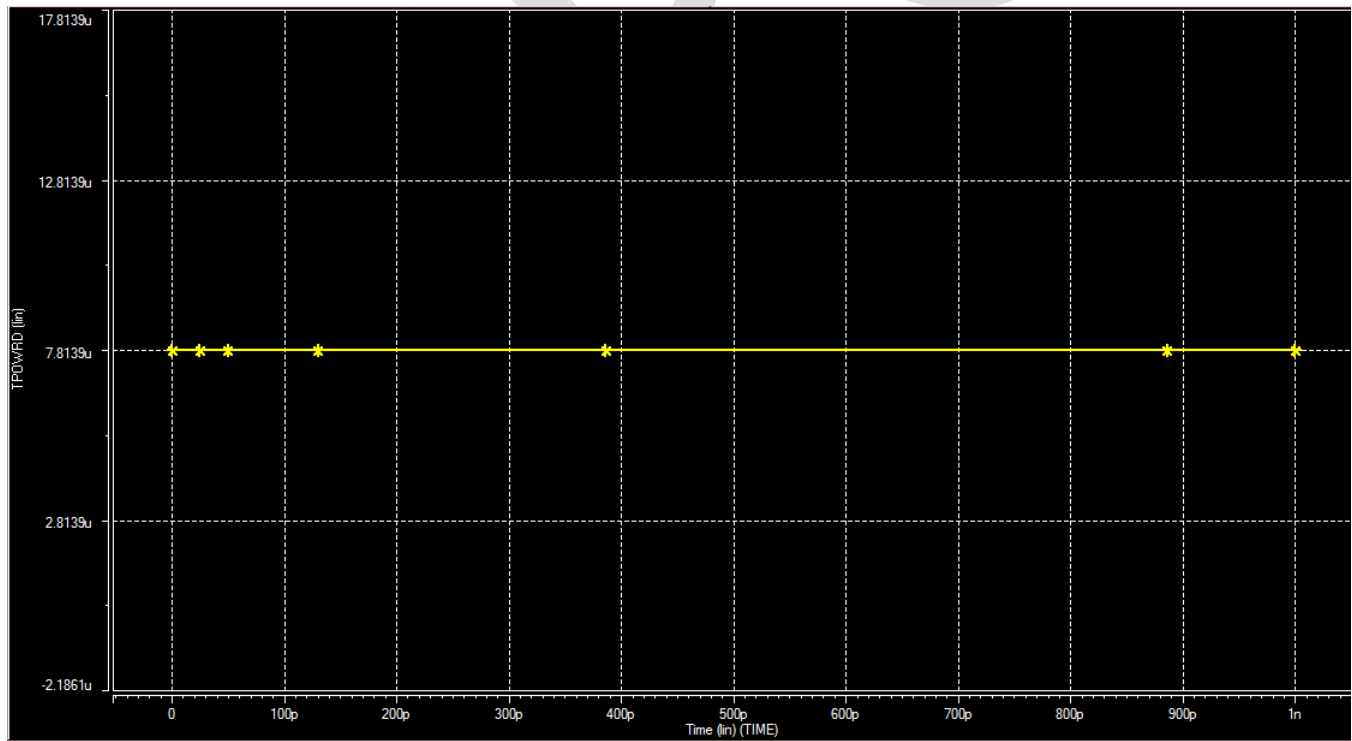
Fig 4 : Average Power of 4T-Cascode Amplifier at 0.9V
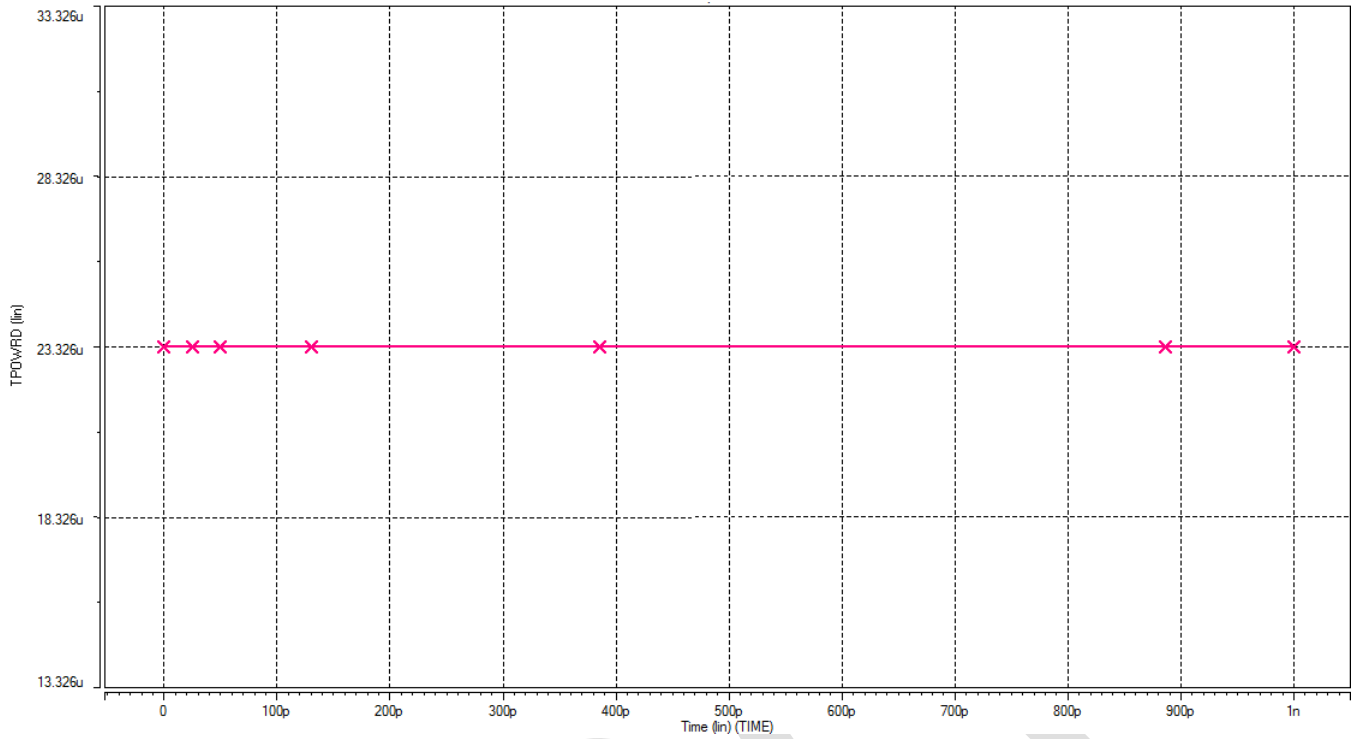
Fig 5: Frequency response of 4T-Cascode Amplifier at 1V
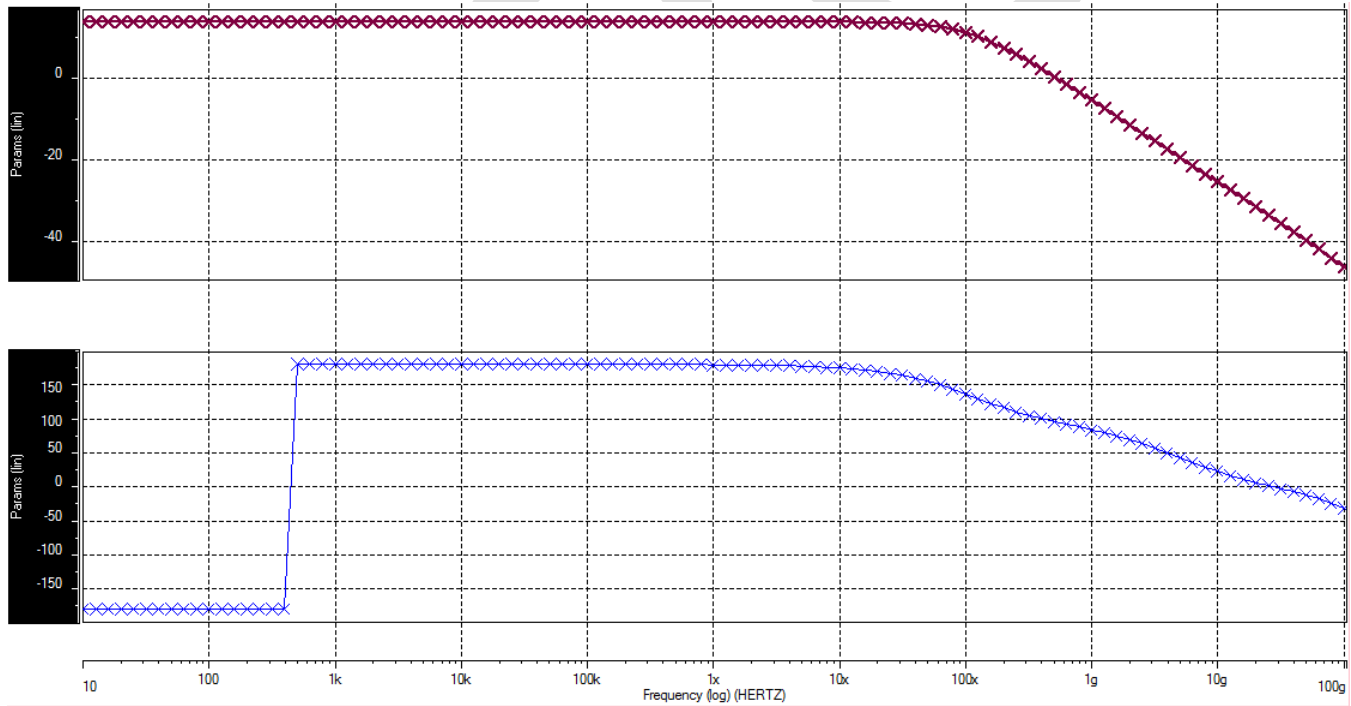
Fig 6: Average Power of 4T-Cascode Amplifier at 1V

IV- RESULT AND CONCLUSION

This paper has successfully designed and simulated 4T- cascode amplifier based on at 45nm. DC voltage gain is 35.6 dB , average power is 7.81 uW, bandwidth is 4.08 MHz , Phase Margin 88.30 and Output Resistance 25.16 K-Ohms have been computed using HSPICE Software at 0.9V. DC voltage gain is 13.7 dB, average power is 0.23uW, bandwidth is 110.7 MHz , Phase Margin 95.30 and

Output Resistance 9.5 K-Ohms have been computed using HSPICE Software at 1.5V. The overall design and indicates that the four transistor based cascode amplifier has excellent performance in terms of DC gain, output resistance, Band width and average power.

Table 1: Comparative analysis of Simulation of 4T-Cascode Amplifier at 45 Nanometer Technology Node at different V_{DD}

S. No.	Parameters	4T-Cascode Amplifier at 1 V	4T-Cascode Amplifier at 1.2V
1	DC Gain	35.6dB	13.7 dB
2	Bandwidth	4.08MHz	110.5 MHz
3	Output Resistance	25.16 K-Ohms	9.5K-Ohms
4	Average Power	7.81uW	0.23uW
5	Phase Margin	88.3^0	95.3^0

Table 2: Parameters used in the proposed 4T-Cascode Amplifier

S. No.	Parameters	Value
1	Channel Length	45nm
2	Channel Width	763nm
3	Supply Voltages	0.5V and 1.5V
4	nMOS Transistors	2
5	pMOS Transistors	2
6	Technology File	PTM45v203

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MULTIPLE EXPOSURE FUSION FOR HDR IMAGE ACQUISITION

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ABSTRACT: -Combination of results from supervised and unsupervised classifiers is used to propose "A Decision Fusion Approach". In these the final output takes advantage of the power of a support Vector machine based supervised classification in class separation and also the capability of the unsupervised K-means classifier in reducing spectral variation impact in Homogeneous regions. Decision fusion approach adopts the majority voting rule and can achieve the same objective of object-based classification.
Index Terms — Classification, decision level fusion, hyper spectral imagery

1. INTRODUCTION

As the classification accuracy of individual classifiers cannot be beyond their limitations, many studies have been undertaken to develop and analyze the way to combining results from different classifiers for a better result than using each and every individual classifier [1]. Unlike feature level fusion that extracts features and combines them to improve performance, level of decision fusion adopts a rule to combine the results of individual classifiers to achieve the final decision. Most researchers apply decision level fusion to satellite image classification [2-6]. In a [2], on a support vector machine (SVM) based fusion method was used for multisource satellite image classification. Technique utilizing both feature and decision level fusion capabilities were proposed in [3]. In this [4] method was developed to evaluate the effect of combination schemes. Neural network based classifier fusion was proposed in [5]. And [6] suggested several voting schemes to be employed in decision level fusion. The most decision fusion approaches mainly focus on supervised classifiers as base learner, i.e., all classifiers need training and also the classification results can only be as good as training data. On to avoid the possible negative influence from the limited quality of training data, we are motivated to proposed a method which can combine supervised and

unsupervised classifiers. For in general, a supervised classifier can provide better

classification than an unsupervised classifier. In the addition to training data limitation, a supervised classifier may result in the over-classification for some homogeneous areas. An

unsupervised classifier, although it may be less powerful and it can generally well classify those spectrally homogeneous areas. Thus for fusing supervised and unsupervised classification may yield better performance since the impact for trivial spectral variations may be alleviated and the subtle difference between spectrally similar pixels may not be exaggerated. Although individual classifiers are pixel based, the final fused classification has a similar result to an object-based classifier [7-9]; however, the overall impact/performance using supervised and unsupervised classifier fusion is less sensitive to region segmentation result.

2. METHODOLOGY

In this paper, the supervised classifier is SVM and the unsupervised classifier is K-means clustering. Fig. 1 shows the simple diagram of the proposed decision level fusion.
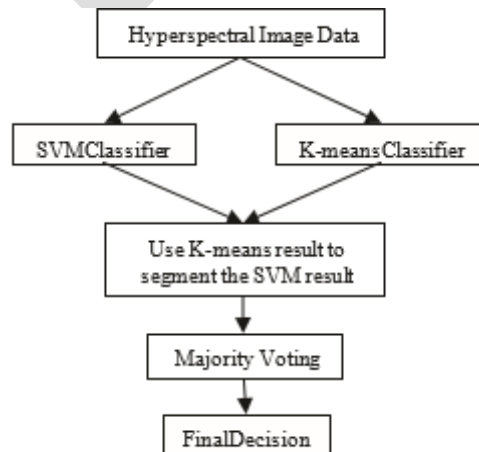
Figure 1. The diagram for the proposed decision fusion for supervised and unsupervised classifiers.

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After classifications results are completed from both classifiers, the K-means based classifications has been deployed on the SVM based classification as region segmentation. Spatially adjacent pixels grouped by the K-means classifier are re-classified using the majority voting rule by considering the SVM classification result. In other words, all the pixels in each segmented region are classified into the same class, which is the class that most pixels belong to using the SVM based decision.

K-means clustering can be conducted with different similarity metrics, such as L_2 norm (Euclidean distance), L_1 norm, spectral angle (SA), or spectral correlation coefficient (CC). From the experimental result, it seems that L_2 norm is not a good choice since it may be too sensitive to the absolute spectral difference. The K-means clustering can also be initiated using the prior information, including the number of classes and their sample means.

3. EXPERIMENTS

The hyper spectral data used in the experiments was taken by the airborne hyper spectral Digital Imagery Collection Experiment (HYDICE) sensor. It was collected for the Mall in Washington, DC with 210 bands covering 0.4-2.4 μm spectral region. The water-absorption bands were deleted, resulting in 191 bands. The original data has 1280×307
Pixels.

A. Test 1 Experiment

The original image was cropped into a sub image of size 304×301 pixels. The image in pseudo color is shown in Fig. 2, which includes six classes: {road, grass, shadow, trail, tree, roof}. Fig. 3 illustrates the location of training and test samples, and the number of samples for every class is listed in Table I.
Fig. 4(a) shows the classification result from SVM. Compared with Fig. 2, also there were some misclassifications in roof, trail, and road pixels. Fig. 4(b) is the K means classification map using L1 norm as the similarity metric, where the misclassifications between roof and trail were obvious. Fig. 4(c) is the combined decision, where the roof areas became smoother and many roof pixels misclassified to trail or road before were corrected.

Figure 2. Test 1 image.

TABLE I

NUMBER OF TRAINING AND TEST SAMPLE FOR TEST 1 EXPERIMENT

	Training	Test
Road	55	892
Grass	57	906
Shadow	50	539
Trail	46	578
Tree	49	630
Roof	69	1500
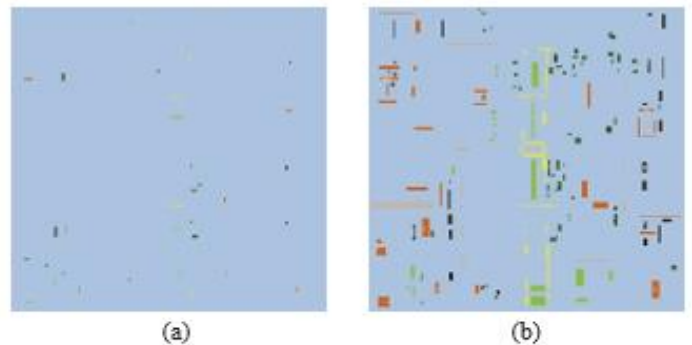
Road Grass Shadow Trail Tree Roof
Figure 3. (a) Training and (b) test samples used in Test 1 experiment.

(a) SVM classification   (b) K-means classification (L_1)   (c) Fused result

Road   Grass   Shadow   Trail   Tree   Roof

Figure 4. Classification results for Test 1 data.
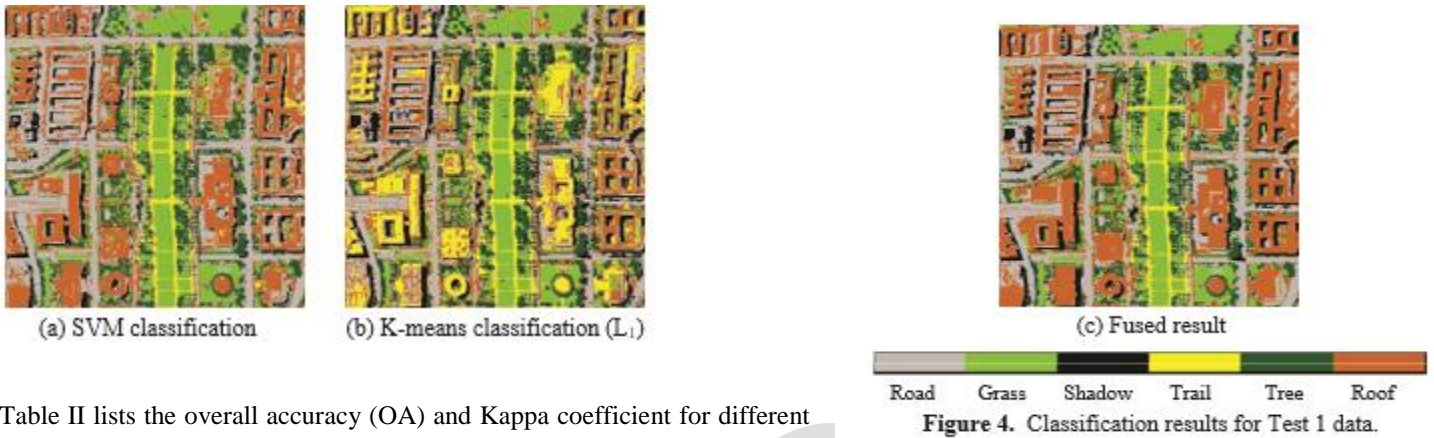
Table II lists the overall accuracy (OA) and Kappa coefficient for different cases. The original SVM produced 92.86% OA and 0.9177 Kappa values. If fused with K means clustering with L_2 norm as similarity metric, these values were slightly improved. If the similarity metric was changed to L_1 norm, SA, or CC, then the improvement was more significant. Using L_1 norm the result was the best.

TABLE II
CLASSIFICATION ACCURACY USING DIFFERENT SIMILARITYS
METRICS FOR K-MEANS CLUSTERING IN TEST1 EXPERIMENT

	OA	Kappa
SVM	92.86%	0.9177
SVM + K means (L_2)	93.44%	0.9185
SVM + K means (L_1)	96.71%	0.9593
SVM + K means (SA)	95.88%	0.9491
SVM + K means (CC)	96.47%	0.9564

B. Test 2 Experiment

The original image was cropped into Test 2 data with 266×304 pixels as shown in the Fig. 5 in pseudo color. It also includes seven classes: {road, grass, water, shadow, trail, tree, roof}. Fig. 6 illustrates location of training and test samples. The number of sample in each class is listed in Table III.

Figure 5. Test 2 image.

(a)   (b)

Road   Grass   Water   Trail   Tree   Shadow   Roof

Figure 6. () a Trae in ng and (b)   test samples used in Test 2 experiment.

Fig. 7(a) shows the classification result using SVM. Compared with Fig. 5, we can see that there are some misclassifications among roof, trail, and road pixels as well as among shadow, road, and water pixels. Fig. 7(b) is the K means classification map using L_1 norm as the similarity metric, where the misclassifications between roof and trail were obvious; there were also lots of misclassified shadow and water pixels. Fig. 7(c) is the fused decision, where the improvement as in roof regions was significant.

TABLE III

NUMBER OF TRAINING AND TEST SAMPLES FOR TEST 2 EXPERIMENT

	Training	Test
Road	63	1074
Grass	62	1071
Water	53	449
Trail	59	354
Tree	60	693
Shadow	61	413
Roof	60	1280

(a) SVM classification   (b) K-means classification (L_1)   (c) Fused result

Road   Grass   Water   Trail   Tree   Shadow   Roof

Figure 7. Classification results for Test 2 data.

TABLE IV

CLASSIFICATION ACCURACY USING DIFFERENT SIMILARITY METRICS FOR K-MEANS CLUSTERING IN TEST2 EXPERIMENT

	OA	Kappa
SVM	95.58%	0.9465
SVM + K means (L_2)	92.69%	0.9108
SVM + K means (L_1)	98.33%	0.9798
SVM + K means (SA)	95.97%	0.9512
SVM + K means (CC)	96.03%	0.9519

Table IV list the OA and Kappa coefficient in different cases. If fused with K-means clustering using L1 norm as similarity metric and the OA was improved from 95.88% to 98.33% and Kappa value was from 0.9465 to 0.9798. If the similarity metric was SA or CC, there was some improvements. However, if it is using L2 norm, the result was degraded. To carefully investigate the reason of performance degradation using L2 norm, Tables V and VI list the confusion matrices before and after the fusion using the L2 norm based K-means clustering. Actually, all the class-pair separation was improved except the road and shadow class separation was worsened, resulting in the degradation on average. In this image scene, these are two classes are very difficult to be separated, in a particular when using L2 norm. Table VII list the confusion matrix with L1 norm, where the separation of the shadow-road pair was slightly improved, thereby overall improvement was significant.

TABLE V

CONFUSION MATRIX USING SVM IN TEST2 EXPERIMENT

	Road	Gras	Wate	Trail	Tree	Shado	Roof
Road	1036	0	9	0	0	50	16
Grass	0	1069	0	1	2	0	60
Water	0	0	400	0	0	0	13
Trail	1	0	0	353	0	0	5
Tree	0	2	0	0	691	0	0
Shado	0	0	40	0	0	363	0
Roof	37	0	0	0	0	0	1186

TABLE VI

CONFUSION MATRIX USING SVM AND K-MEANS CLUSTERING WITH

L_2 NORM IN TEST2 EXPERIMENT

	Road	Gras	Wate	Trail	Tree	Shado	Roof
Road	1066	0	0	0	0	342	14
Grass	0	1070	0	0	2	0	16
Water	0	0	449	0	0	0	2
Trail	0	0	0	354	0	0	5
Tree	0	1	0	0	691	0	0
Shado	0	0	0	0	0	71	0
Roof	8	0	0	0	0	0	1243

TABLE VII

CONFUSION MATRIX USING SVM AND K-MEANS CLUSTERING WITH

L_1 NORM IN TEST2 EXPERIMENT

	Road	Gras	Wate	Trail	Tree	Shado	Roof
Road	106	0	10	0	0	48	6
Grass	0	107	0	0	3	0	0
Water	0	0	437	0	0	0	4
Trail	2	0	0	354	0	0	4
Tree	0	1	0	0	690	0	0
Shado	4	0	2	0	0	365	0
Roof	5	0	0	0	0	0	126

4. *CONCLUSION*

In this paper, we propose a final fusion approach for supervised and unsupervised classifiers. The final output can take advantage of the power of the SVM based classification in class separation and the capability of the K means classifier in minimizing the impact from spectral variations in homogeneous regions. This approach simply adopts the majority voting rule, but can achieve the similar objective of object-based classification. From the preliminary results, it seems that L1 norm is the best metric to be employed for K-means clustering. Currently, no spatial information is considered for classification. For images with high spatial resolution, incorporating spatial features during classification and fusion may further improve classification accuracy. This is the future work to be conducted.

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Simulation study of L-V-F-C Operational Amplifier

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Abstract—In this research paper, Simulation study of folded cascode Op Amp based on low voltage has been performed. DC voltage gain, average power, unity gain bandwidth and output resistance have been computed using HSPICE Software. Low voltage folded cascode Op Amp results in high performance. Further, the low voltage Cascode Op Amp has better DC Gain, output resistance and less power dissipation. Thus the simulation studies have revealed that the performance of the low voltage folded cascode Op Amp can be improved optimized at different voltage.

Index terms- low voltage, folded cascode Op Amp, simulation, dc gain, power consumption, output resistance, Bandwidth

I. INTRODUCTION

Supply voltage reduction guarantee the reliability of devices as the lower electrical fields inside layers of a MOSFET produces less risk to the thinner oxides, which results from device scaling. However, the reduction in supply voltage leads to degraded circuit performance in terms of available bandwidth and voltage swing. Scaling down the threshold voltage of the MOSFETs reduces the performance (degraded bandwidth, low voltage swing etc.) to some extent but there is increase in the static power dissipation.. [1-10]. The performance analysis of conventional Op Amps techniques at large channel length is going to out of reach in near future. The appropriate topology is suggested which has a perfect balance between complexity and performance. Scaling of complementary metal-oxide semiconductor (CMOS) technology to the nano ranges has many limitations and leads to increase the leakage currents, power dissipation, and short-channel effects [16-20].

II. PROPOSED FOLDED CASCODE OP AMP DESIGN

The Figure 1 shows the schematic of a folded-folded cascode op-amp using a class AB output buffer. In the frequency response of the op-amp, the load of the op-amp is a 1 pF capacitor. Folded cascode Operational Amplifier is designed at different voltages. The widths of MOSFETs are chosen to be identical for a reasonable comparison.

We simulated the proposed circuit using HSPICE which can be used in VLSI systems such as microprocessors, DSP architectures and nano-micro systems.
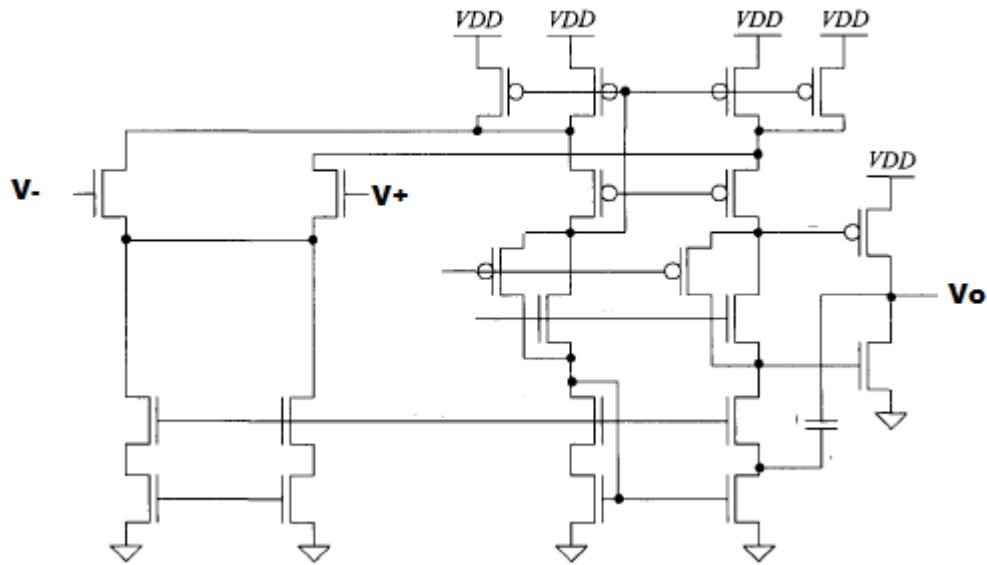
Figure 1. Proposed FOLDED CASCODE OP AMP DESIGN

SIMULATIONS OF PROPOSED FOLDED CASCODE OP AMP DESIGN
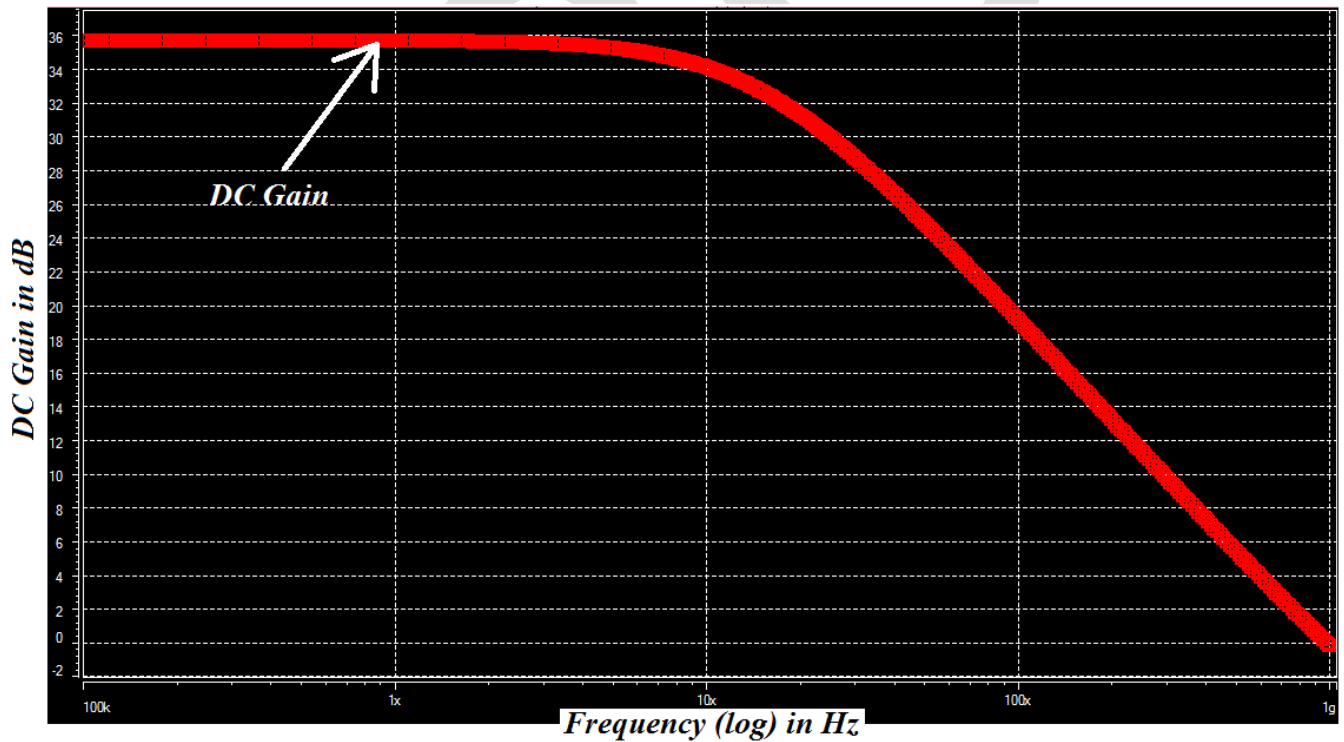
Figure2: Frequency response of CMOS based folded cascode op amp design at 1.4V
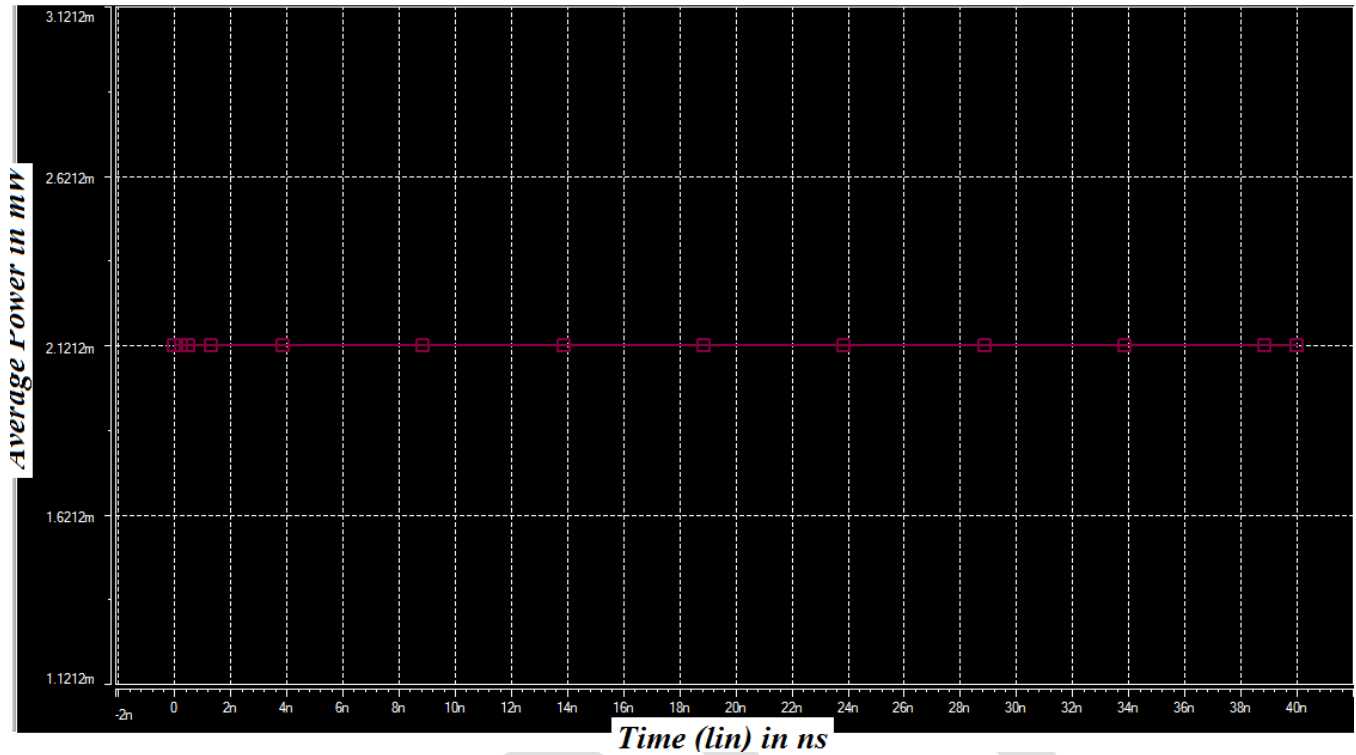
Figure 3: Average Power of CMOS based folded cascode op amp design at 1.4V
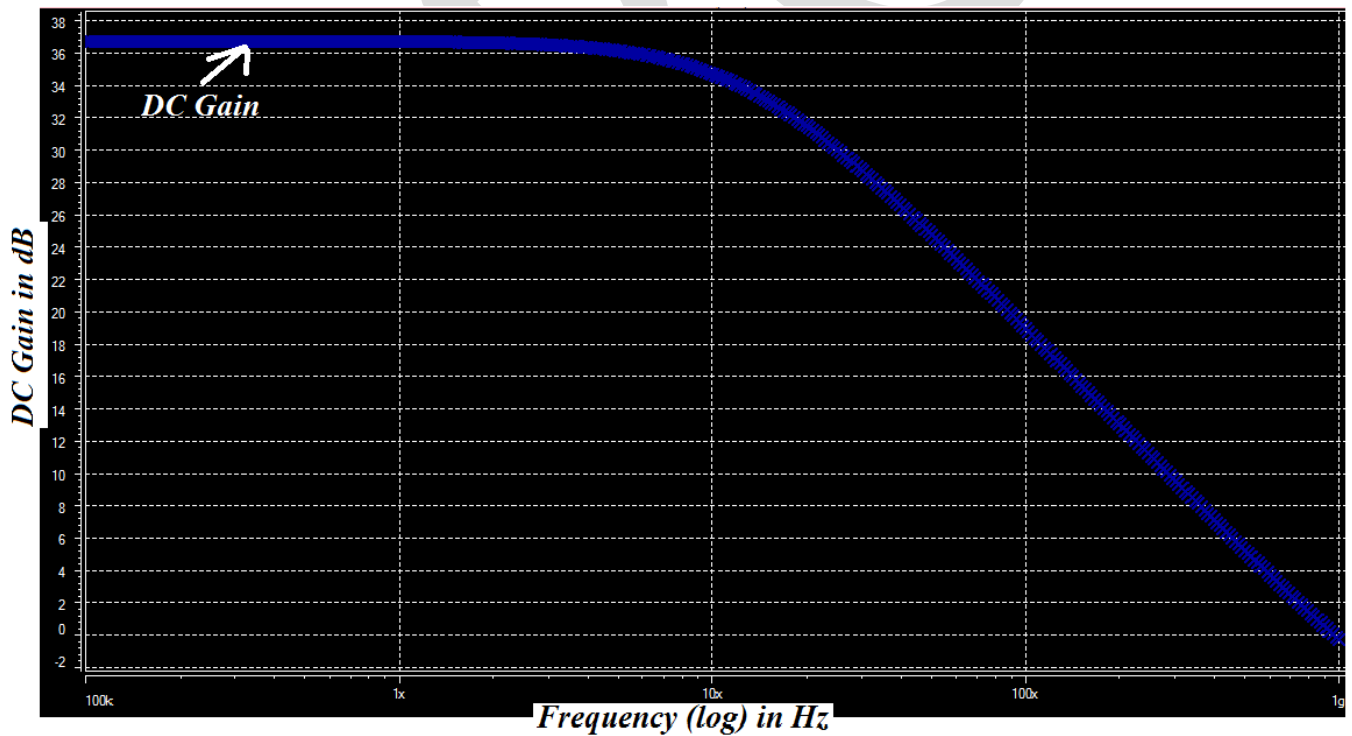
Figure4: Frequency response of CMOS based folded cascode op amp design at 1.2V
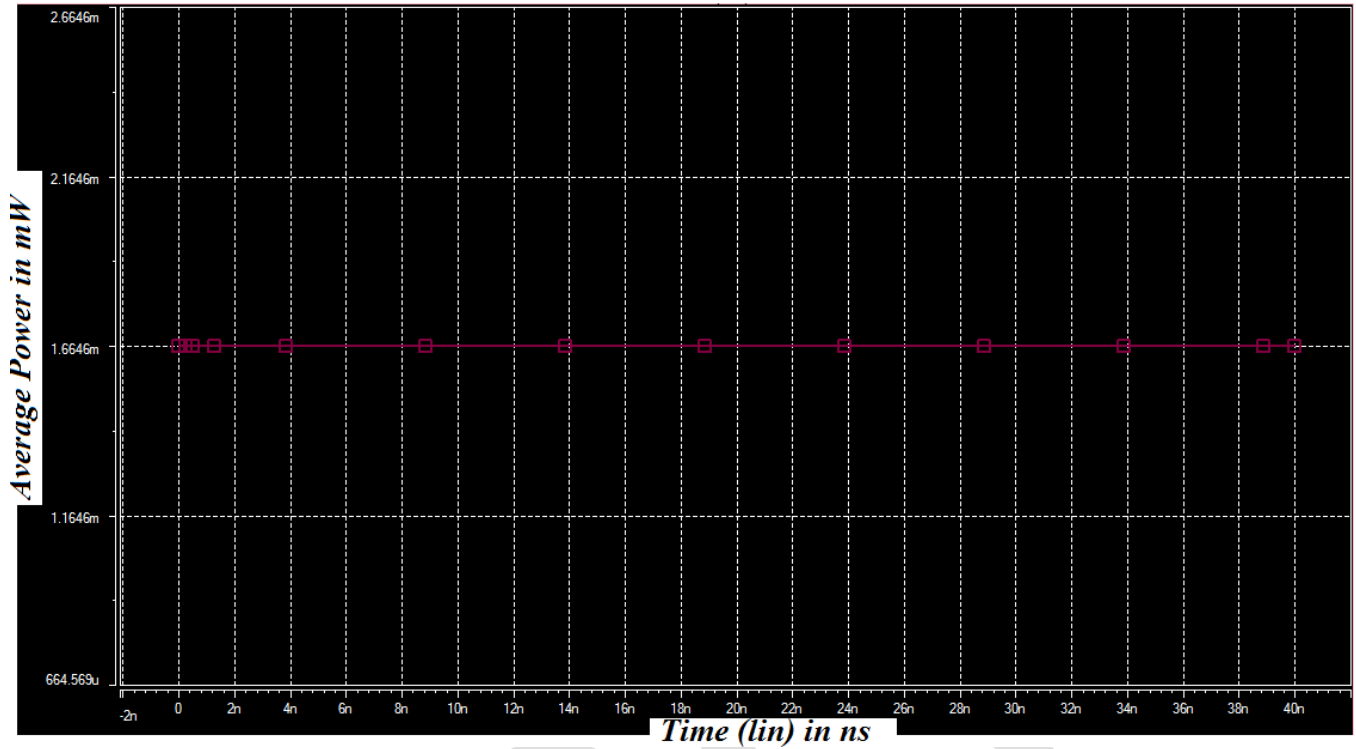
Figure 5: Average Power of CMOS based folded cascode op amp design at 1.2V
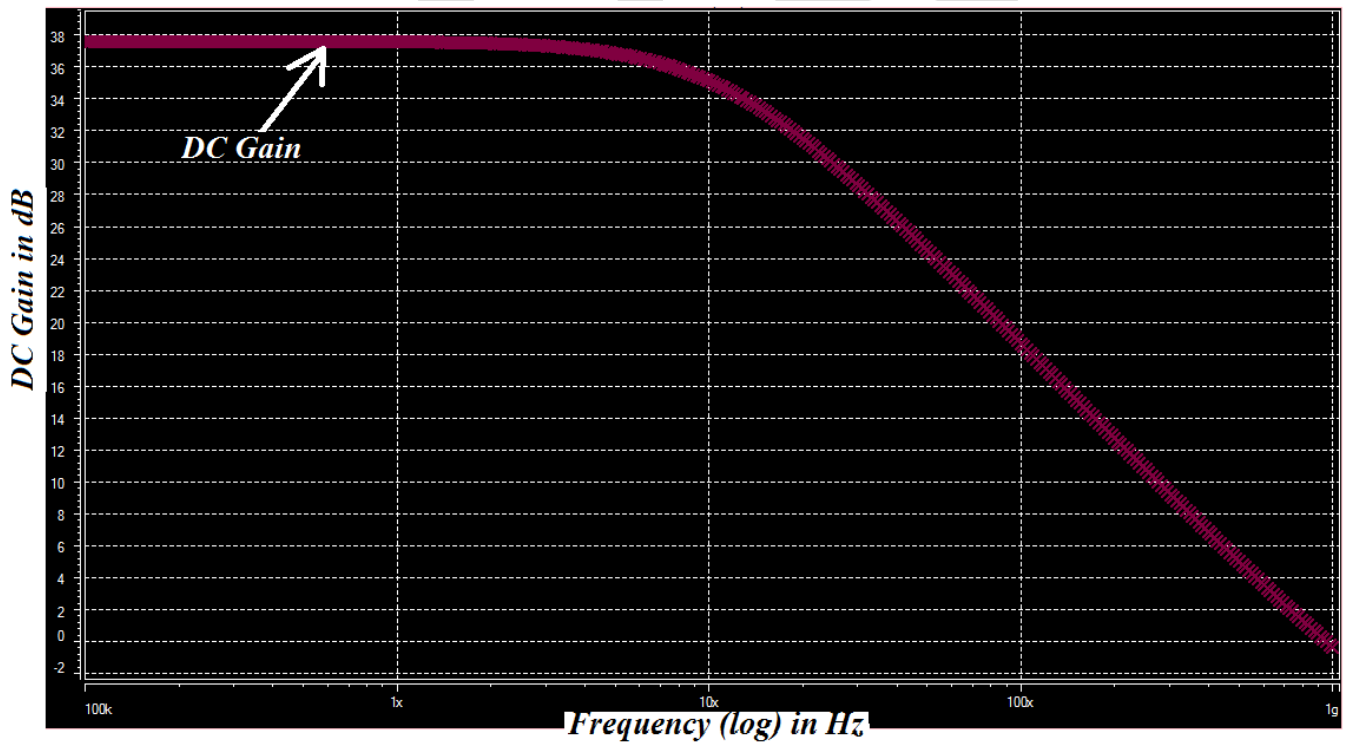
Figure6: Frequency response of CMOS based folded cascode op amp design at 1 V
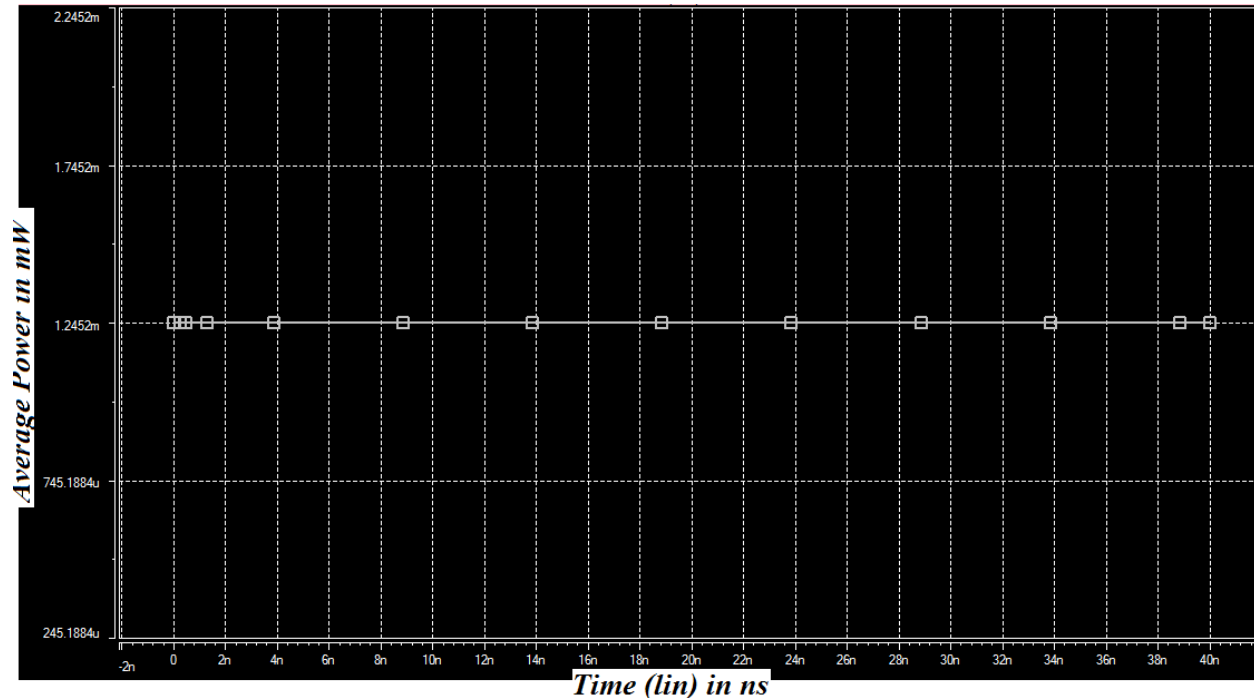
Figure 7 Average Power of CMOS based folded cascode op amp design at 1V

Table 1: Comparative analysis of Folded Cascode Op Amp Design
with C_L = 1 pf , at different V_{DD} .

S. NO.	PARAMETERS	CMOS BASED FOLDED CASCODE AMPLIFIER AT 1V	CMOS BASED FOLDED CASCODE AMPLIFIER AT 1.2V	CMOS BASED FOLDED CASCODE AMPLIFIER AT 1.4 V
1	DC GAIN	37.6 dB	36.7 dB	35.7 dB
2	Unity Gain Freq	951 MHz	963 MHz	978 MHz
3	Output Resistance	23.1 Ohms	23.4 Ohms	24 Ohms
4	Average Power	1.24mW	1.66mW	2.12 mW
5	Phase Margin	79.2^0	80.5^0	81^0
	Slew Rate	8.57E+8	1.1E+9	1.3E+9

III.   CONCLUSION

In this research paper, simulation of low voltage folded cascode Op Amp based on different voltages has done at 45 nm .DC voltage gain, average power, Unity gain bandwidth and output resistance have been computed using HSPICE Software . low voltage folded cascode Op Amp results in high performance. The proposed low voltage Cascode Op Amp is better for applications in VLSI design for low voltage applications.

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Analysis and Performance Evaluation of 1-bit Full Adder Using Different Topologies

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Abstract— An adder is a digital circuit that performs addition of numbers and it plays an important role in today's digital world. In processors and other kinds of computing devices, Adders are used in the arithmetic logic units. They are also utilized in other parts of the processors for calculating addresses, table indices, increment and decrement operations and other similar operations because it is the basic building block of on-chip libraries. Also, it can be used for the construction of many number representations and it is a trivial to modify an adder into an adder-subtractor. Full adder reduces circuit complexity and can be integrated in the calculators for addition and subtraction operations. At DSP oriented system and at networking side full adder is used mostly. Full adders can be cascaded (e.g.: ripple carry adder) easily so that one can make a cascade to add any number of bits that form the word-width of a system. In recent years, low power circuit design has been encountered as a major issue in VLSI design areas. This paper focuses on the Performance evaluation of 1-bit full adder for low power in CMOS technology using three different topologies as Static or Conventional CMOS, Gate Diffusion Input (GDI), and Hybridizing PTL (Pass Transistor Logic) techniques. This paper describes comparison of these three topologies of 1-bit full adder based on area, delay, power consumption and transistor count. Simulations are done using NgSPICE and MICROWIND DSCH tool.

Keywords— CMOS Technology, Full Adder, Conventional or static logic, GDI logic, PTL, Hybridizing PTL, NMOS, PMOS, Pull up and pull down transistors, Multiplexer, sleep transistor, Xor gate, Xnor gate, SPICE, MICROWIND.

INTRODUCTION

Need for low power VLSI chips arise from evolution forces of integrated chips. VLSI design is a modular technology originated by Carver Mead and Lynn Conway for saving microchip area by minimizing the interconnect fabric area. Low power is needed because of desirability of portable devices like cell phones batteries and in biomedical field like in heart pacemakers, however large power dissipation requires larger heat sinks hence increased area. So a new solution is to be provided for low power applications for VLSI designers. Especially, this work focuses on the reduction of power, which is showing an ever-increasing growth with the scaling down of the technologies.

A new low power design technique that solves almost all of the problems known as Gate-Diffusion-Input (GDI) is implemented. This technique allows in the reduction of power consumption, propagation delay, and area of digital circuits. The advantage of using Conventional CMOS is that it has layout regularity, high noise margins and stability at low voltage due to complementary transistor pair and smaller number of interconnecting wires and disadvantage is that it has weak output driving capability due to series transistors in output stage and consumes more power and large silicon area.

Main idea behind PTL (Pass Transistor Logic) is to use purely NMOS Pass Transistors network for logic operation. In this design style, transistor acts as switch to pass logic levels from input to output and this design requires less transistor count because one pass transistor network (either NMOS or PMOS) is sufficient to perform the necessary logic operation. Speed is increased because less number of transistors is used for design. PTL has some advantage over static CMOS that it has the capability to implement a logic function with smaller number of transistor, smaller area and less power consumption.

CONVENTIONAL OR STATIC LOGIC

The CMOS logic circuits are categorized into two categories: - static (conventional) and dynamic logic circuits. These different logic styles are used according to different design requirements such as power consumption and dissipation, speed and area. In a static logic circuit a logic value is retained by using the circuit states while in a dynamic logic circuit a logic value is stored in the form of charge.

So, in static logic circuit [1][2] each output of the gate assume at all the times the value of Boolean function implemented by the circuit. So, at every point the output will be connected to either Vdd or Gnd via a low resistance path. The static logic eliminates pre-charging and decreases extra power dissipation, thus, widely used for low power circuit designs.

Static logic is further divided into two types: - single rail and dual rail logic. In single rail logic its input is either true or complementary output signals. However dual rail uses its input either true or false and yield both true and false signals as their output at the same time. Most commonly used static logics are Pseudo-nMOS, fully CMOS, transmission gate logic (TGL), Complementary pass transistor logic (CPL), Gate diffusion input logic (GDI), Double pass transistor logic (DPL) and Pass transistor logic (PTL).

A) STATIC FULL ADDER

In digital electronics an adder or summer, is a circuit that performs addition of any numbers. An adder is used to calculate address, table indices and similar operations in other parts of processors. A full adder is a combinational circuit that performs the arithmetic sum of three input bits: augends (Ai), addend (Bi) and carry in (Cin) from the previous adder. Its results contain the sum out, Sout and the carry out, Cout, to the next stage.
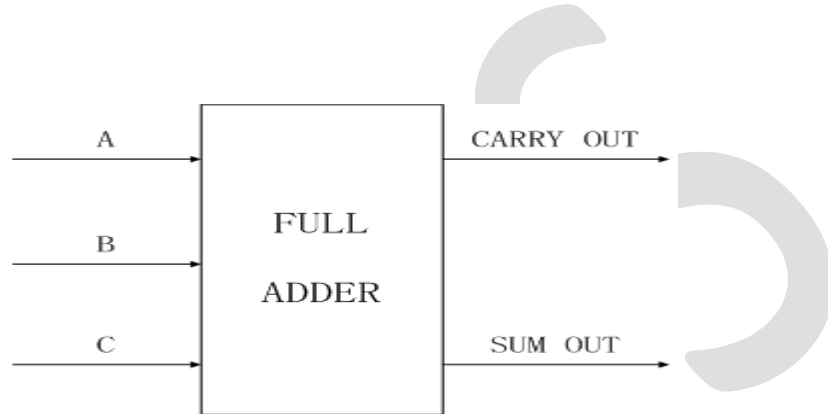
Fig: 1 Full adder block diagram

A	B	Cin	Sout	Cout
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Table: 1 Truth table of full adder

The Boolean equations of a full adder are given by:

Sout = ABC + AB'C' + A'B'C + BA'C' = (AB'+BA') C +AB+A'B') C'
Sout = A xor B xor C
Cout = AB + AC + BC = AB + C (A xor B)
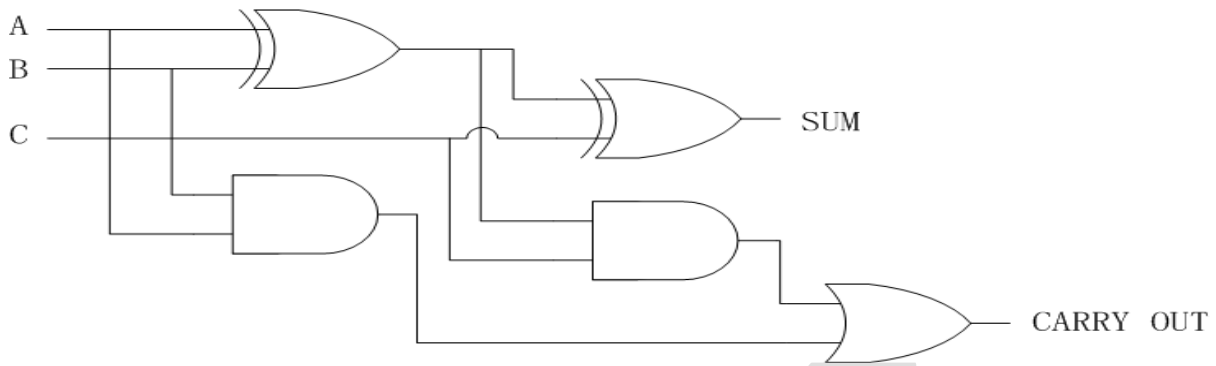
Fig: 2 Gate level representation of full adder

B) 28T STATIC LOGIC

Full adder is a circuit that performs the addition of a given three 1-bit inputs A, B, C and two 1-bit outputs sum and carry. Many full adder cells designed with the help of static logic.

$$Sum = A \oplus B \oplus C$$
$$Sum = A'B'C + AB'C + A'BC' + ABC$$
$$Sum = ABC + (A+ B + C) \text{ Carry bar}$$

$$Carry = AB + BC + CA$$
$$Carry = AB + C (A+B)$$

This CMOS full adder cell uses 28 transistors which consist of 14 pull-up and 14 pull-down networks. Complementary transistor pairs make the circuit design simple but it makes some complexity in the layout area. Complementary CMOS (CCMOS) generates carry through a static gate. Due to complementary transistor pair and smaller number of interconnecting wires this CCMOS design has layout regularity, high noise margins and stability at low voltage. Disadvantage is that in this design it uses Cout signal inorder to generate the sum output which is responsible for the production of an unwanted additional delay in the circuit. It has weak output driving capability due to series transistors in output stage and consumes more power and large silicon area.

Cout is generated first using above Cout equation. Then the sum is derived from the sum equation shown in above. One of the most significant advantages of the 28T full adder was its high noise margins and was responsible for reliable operation at low voltages. The layout of CMOS gates get somewhat simplified due to the complementary transistor pairs. But the use of same number of pull-up and pull-down transistors results in high input loads, increase in power consumption and larger silicon area.
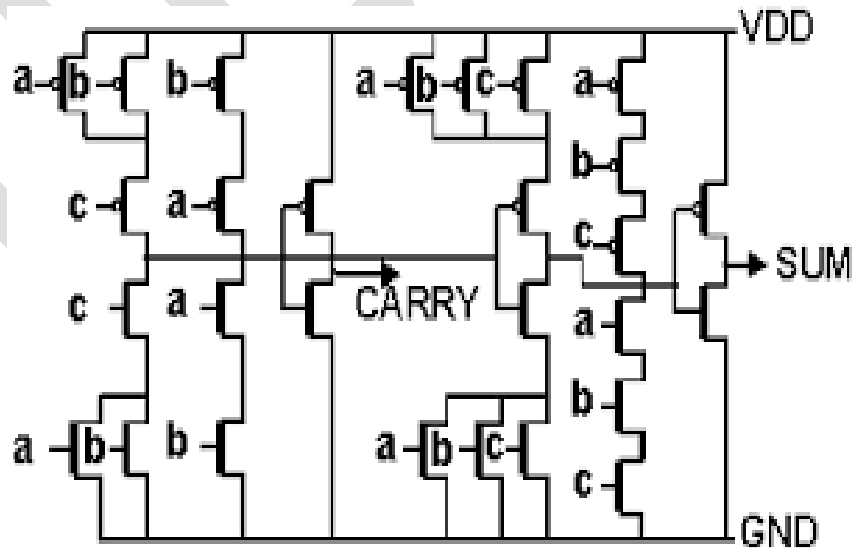
Fig: 3 Static 1-bit full adder

GDI LOGIC

Gate Diffusion Input (GDI CELL) [6][8] make use of a pure and simple cell as shown in figure below. At first sight itself this basic cell reminds us the standard CMOS inverter but there are some major and important differences:

1. GDI CELL contains three inputs: G (gate input common for both NMOS and PMOS), P (input to the source of PMOS), and N (input to the source of NMOS).

2. Bulks of both NMOS and PMOS transistors are connected to N or P inputs (respectively), so we can say that it can be arbitrarily biased at contrast with CMOS inverter.

One of the major differences between the CMOS and GDI based design techniques [9][10] is that the input P (source) of the PMOS in a GDI cell is not connected to supply voltage (VDD) and the input N (source) of the NMOS is not connected to ground (GND). This idealistic feature gives the GDI cell two extra input pins for making the GDI design more flexible than CMOS design. The basic GDI cell shown in Figure 4 was proposed and implemented by Morgenshtein. It is a new approach for the reduction of power in digital combinational circuit design. This technique helps to reduce power consumption, propagation delay and area of digital circuits while maintaining low complexity of logic design.
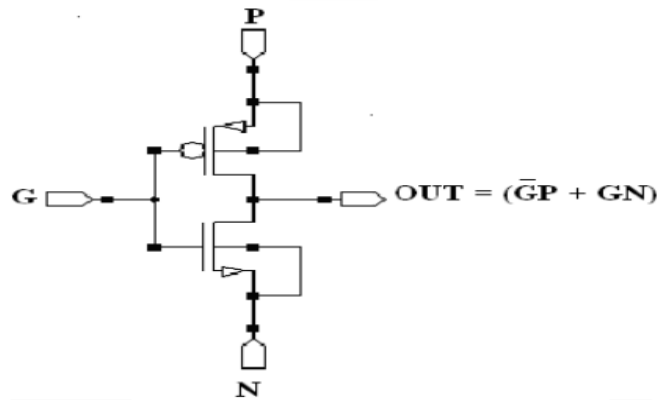
Fig: 4 basic GDI cell

Table below shows, how a simple change of the input configuration of the simple GDI cell corresponds to very different Boolean functions. Most of these functions are complex (6-12 transistors) in CMOS, as well as in standard PTL (Pass Transistor Logic) implementations, but very simple (only 2 transistors per function) in GDI design method. A simple change of the input configuration of simple Gate Diffusion Input (GDI) CELL is shown in table corresponds to six different Boolean functions.

N	P	G	D	FUNCTION
0	B	A	A'B	F1
B	0	A	AB	AND
1	B	A	A+B	OR
B	1	A	A'+B	F2
0	1	A	A'	NOT
C	B	A	A'B+AC	MUX
B'	B	A	AB'+A'B	XOR
B	B'	A	AB+A'B'	XNOR

Table: 2 Some logic functions that can be implemented using a single GDI cell

XOR and XNOR functions are the key elements and operations in adder equations. If the design, implementation and generation of them is optimized, this will greatly affect the performance and function of the full adder cell. In this new cell has used the GDI technique for generating of XOR and XNOR functions. It uses only eight transistors to generate the balanced XOR and XNOR functions, as shown in figure 5.

XOR =A'B+AB' and   XNOR=AB+A'B'
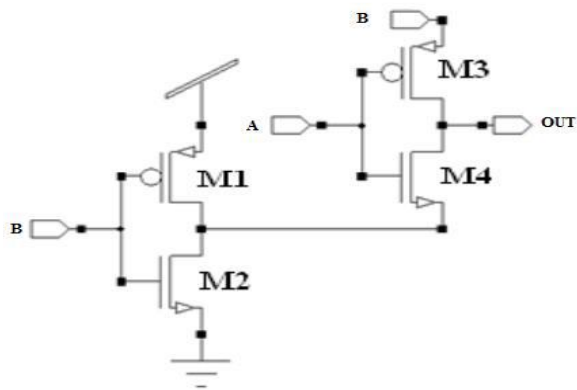
Fig: 5 XOR cell with GDI technique   **Fig: 6 XNOR/ XOR cell with GDI technique**
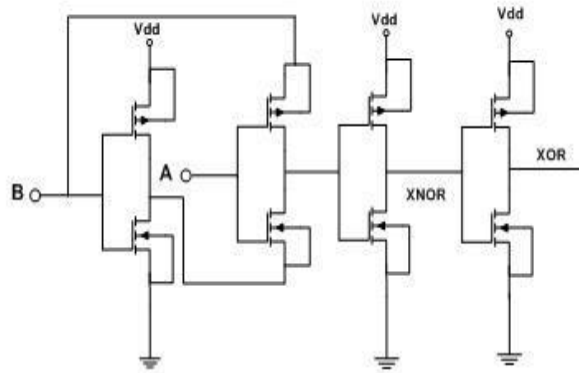
A one-bit full adder takes three one-bit inputs: A, B and Cin and generate two outputs: sum and carry.

Sum= (A xor B xor Cin)
Carry= A. B + Cin (A xor B)

The goal is to design a high performance and low power full adder cell with the GDI technique [11][12]. In the first stage of this cell, the GDI technique is used for generating of XOR and XNOR functions. This stage shows full swing with low voltage. These complementary outputs, together with other inputs, will be fed to the second stage. The Sum and Carry are generated from the second stage of the cell design. Adder cells are normally cascaded to form a normal arithmetic circuit and their capabilities must be ensured with proper design approaches. Fig: 5 show the implementation of XOR gate using GDI technique. It is the main building block of full adder circuit. So if we can optimize XOR gate then it can improve the overall performance of the 1 bit full adder circuit. It uses less number of transistors as compared to conventional or static CMOS logic design of XOR gate. Fig: 7 show the detail circuit of GDI XOR based 10T Full Adder.
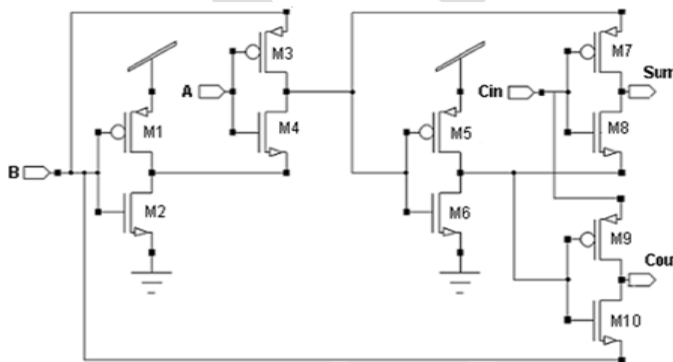
Fig: 7 1-bit full adder (10 T) using GDI technique

In fig: 7 M1, M3, M5, M7, and M9 are the PMOS transistor whereas M2, M4, M6, M8, and M10 are the NMOS transistors. A, B and Cin are taken as input and output of the circuit is drawn from the Sum and Cout.

The proposed GDI 11-T Full Adder is shown in Fig: 8 M1, M3, M5, M7, and M9 are the PMOS transistor. M2, M4, M6, M8, and M10 are the NMOS transistors. A, B and Cin are the inputs of the full adder and output of the circuit is taken from the Sum and Cout nodes. Here M11 act as a sleep transistor which is responsible for the average power consumption reduction of the entire circuit. When the circuit is in active mode, sleep transistor M11 will be in OFF state and when the circuit is in standby mode, the sleep transistor will be in ON state. By using modified GDI based 11T full adder design, there will be a drastic reduction in the power consumption and the delay of the circuit compared to GDI 10T based full adder circuit.
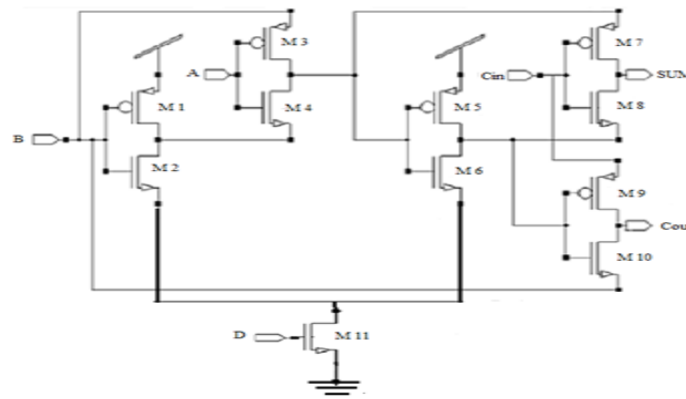
Fig: 8 11T full adder using GDI technique

"Sleep transistors" are designed to minimize the power consumption and heat dissipation of a given circuit. Basically, the chip will contain specialized circuitry that will shut down some specific areas of the chip that aren't immediately needed for the proper function of the circuit. The problem with this approach is that it will degrade the performance of the circuit to a small extend, and will lead to an increase in the number of transistors.

The sleep transistors can be implemented as: "coarse-grain" or "fine-grain" power gating styles. In the "fine-grain" power gating implementations, the sleep transistor will be accomplished inside each and every standard cell which is often called MTCMOS cell. The advantage of the fine-grain sleep transistor approach is that the virtual power networks (VVSS or VVDD) are very short and are hidden in the circuit during the time of implementation. However, the fine-grain sleep transistor implementation adds a sleep transistor to every cell that results in significant area increase. In the "coarse-grain" power gating design styles, the sleep transistors are connected together between the permanent and the virtual power supply networks. One of the main advantage of the "coarse-grain" power gating is that sleep transistors share (charged or discharged) current. Also, the area overhead is significantly smaller among sleep transistors due to their charge sharing behavior. Most power-gating designs are based on "coarse-grain" sleep transistor implementation because the "fine-grain" implementation which incurs large area penalty.

PASS TRANSISTOR LOGIC

In electronics, pass transistor logic (PTL) [3][4] describes several logic families used in the design of IC chips. It reduces the number of transistors used in the construction of different logic gates, by eliminating redundant transistors. Here transistors are used as switches inorder to pass the logic levels between the nodes of a circuit, instead of switches that are connected directly to supply voltages. This reduces the number of active devices, but it has the disadvantage that the voltage difference between high and low logic levels will dramatically decrease at each stage. Each series transistor is less saturated at its output than at its input. When several devices are chained in series in a logic path, inorder to restore the signal voltage to a full value a conventionally constructed gate may be required. By contrast, conventional CMOS logic switches the transistors so that the output connects to one of the power supply rails and the logic voltage levels in a sequential chain do not decrease or reduce drastically. Circuit simulation may be required or it is essential to ensure adequate performance and functionality of the circuit.
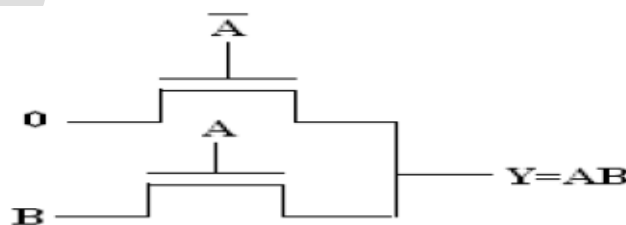
Fig: 9 AND gate using PTL logic

Pass transistor logic often uses fewer transistors and thus it runs faster. It requires less power than the same function implemented with the same transistors in fully complementary CMOS logic. XOR has the worst-case Karnaugh map -- if implemented from simple

gates, it requires more transistors than any other function. The designers and many other chip manufacturers save a few transistors by implementing the XOR gate using pass-transistor logic rather than simple gates.
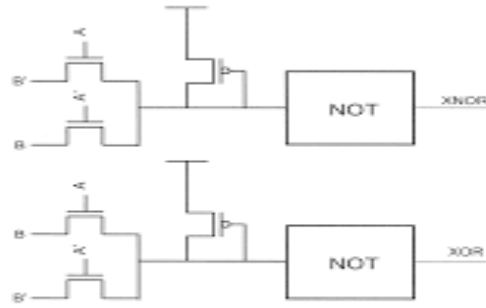
Fig: 10 XOR gate using PTL logic

Some writers use the term "Complementary Pass Transistor Logic" (CPL) to point out the style of implementing logic gates that uses transmission gates which consist of both NMOS and PMOS pass transistors. Other authors use the term CPL to indicate a style of implementing logic gates where each gate consists of a NMOS-only pass transistor network, followed by a CMOS output inverter. Other authors use the term CPL to indicate a style of implementing logic gates using dual-rail encoding. Every CPL gate has two output wires, both the positive signal and the complementary signal, eliminating the need for inverters.

A) HYBRIDIZING PTL 9T FULL ADDER

The design of hybridizing PTL full adder consists of three modules. Module 1 consists of an XOR –XNOR module which was implemented by 5 transistors. Module 1 produces two intermediate signals which are given as the inputs to the module 2 and module 3 to obtain sum and carry output as shown in Fig: 11. Module 2 and 3 are GDI 2:1 MUX with different input and select lines which produce carry and sum respectively. Module 1 produces two outputs: *A* xnor *B* and A xor B. For module 2, *A* xor *B* act as a select line and A, C as inputs. On the other hand for module 3, C act as a select line and AOB and *A* xor *B* as inputs. Proposed full adder design is hybridized design because two different logic styles have been used to make the full adder. Module 1 was implemented by PTL logic and GDI technique has been used for the implementation of module 2 and 3.
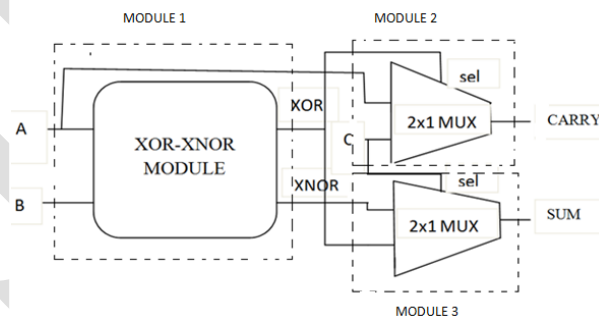
Fig: 11 Proposed adder schematic

Hybridizing PTL full adder has been implemented by using only 9 transistors i.e. five transistors are used in module 1 stage and module 2 and 3 uses 2T GDI multiplexer. Sum is realized by module 1 and module 3 as per equation 1 and carry is realized by module 1 and module 2as per equation 2. Module 1 has been implemented by proposed 5T XOR-XNOR module and GDI technique has been used for module 2 and 3. In module 1 a XOR-XNOR cell is used to drive the selection lines and control signal lines of the multiplexer in module 2 and 3. The XOR-XNOR module in Fig: 12 have been designed by PTL logic and consist only 5 transistors which shows least transistor count as compared to all previous discussed designs.
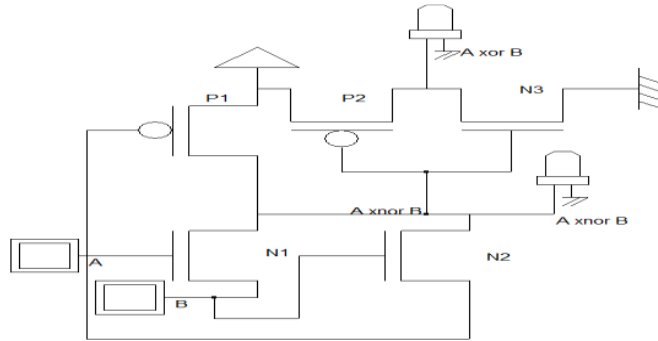
Fig: 12 Proposed PTL based XOR-XNOR Module

Proposed design XOR-XNOR module has been made by 3 NMOS and 2 PMOS transistors which provide an area efficient circuit design as compared to previous discussed design models. MOS logic states on four different input combination has been shown in table 1 for both XOR and XNOR output. Comparative analysis of proposed XOR-XNOR module in terms of area with other existing XOR-XNOR module has been shown in Table: 3.

A	B	N1	N2	N3	P1	P2	A xor B	A xnor B
0	0	OFF	OFF	ON	ON	OFF	0	1
0	1	OFF	ON	OFF	ON	ON	1	0
1	0	ON	OFF	OFF	OFF	OFF	1	0
1	1	ON	ON	ON	OFF	ON	0	1

Table: 3 Analysis of Proposed XOR-XNOR Module

Verification and simulation of the functionality of proposed XOR-XNOR module is first done by using DSCH 3.5 designing tool. Channel width should be accurate for efficient working of the design. Channel width can be changed in DSCH schematic editor. The timing simulated for 5T XOR –XNOR module will show the accurate functioning of the proposed design.

The 5T XOR-XNOR module has been compared with the previous discussed XOR-XNOR designS in terms of area in Microwind designing tool. Microwind deals with both front end and back end designing. In front end it has DSCH in which both transistor level and gate level designing can be done. DSCH generate a Verilog file which can be compiled by the Microwind back end designing tool to get power and area consumption. The 5T XOR-XNOR module is compared with the discussed XOR-XNOR designs in terms of area on 45nm technology.

Outputs of module 1 act as inputs for the module 2 and module 3. The logical Boolean expression for module 2 and 3 can be expressed as:

SUM   = C(A xnor B) + C bar(A xor B)
CARRY = C(A xor B) + A(A xnor B)
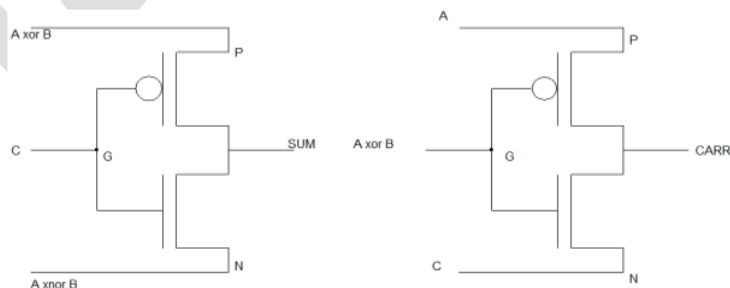
Fig: 13 Use of GDI cell as Module 2& 3

GDI technique is an efficient technique for designing area and power efficient digital circuits as compared to PTL, TG, CPL and DPL designing approaches. Schematic of proposed full adder has been designed and simulated in DSCH 3.5 logic editor and simulator.
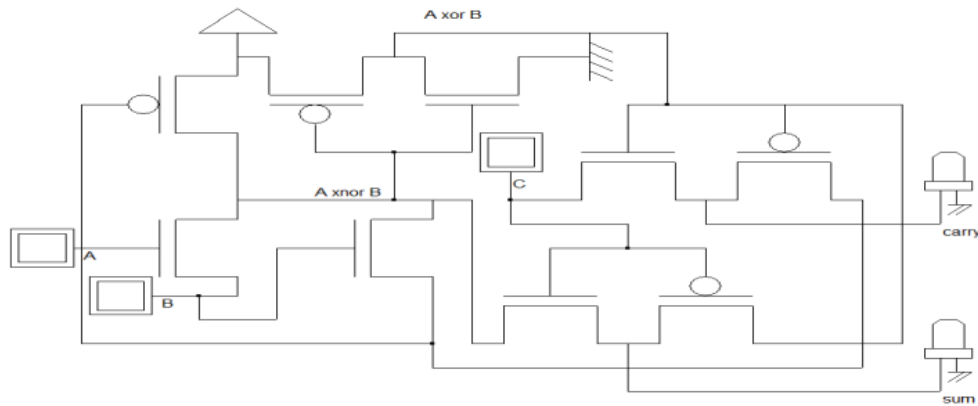
Fig: 14 9T Hybridizing PTL Full Adder Design

B) 8T FULL ADDER DESIGN

In the proposed 8T full adder [8] sum is generated using 3T XOR module twice, and carry is generated using NMOS and PMOS pass transistor logic devices as shown in Fig.15. The equations are modified so as to visualize the 8T full adder design. The modified equations for 8T full adder design are:

$$SUM = A \text{ xor } B \text{ xor } C$$
$$= (A \text{ xor } B) \text{ xor } C$$
$$CARRY = AB + BC + CA$$
$$= AB + BC (A + Abar) + AC (B + Bbar)$$
$$= AB + (A \text{ xor } B) C$$
$$= (Abar*B)Bbar + (A \text{ xor } B) C$$

Instead of using two NMOS pass transistor devices we have used one NMOS and one PMOS pass transistor device, because of ease of the design and as according to the equation as shown in Fig.15.
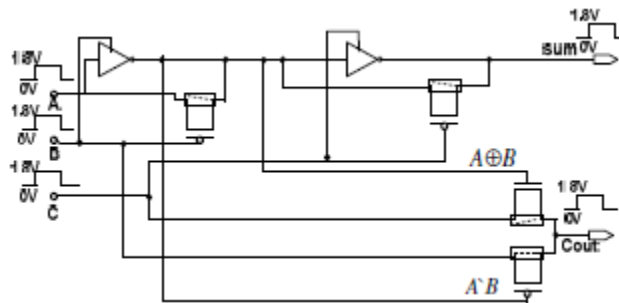
Fig: 15 8T Hybridizing PTL Full Adder Design

It must be noted that PMOS transistor passes ' l' clearly, but cannot pass '0' completely thus, the carry output has weak '0'. NMOS transistor passes '0' very precisely, but cannot pass '1' completely therefore, the carry output has weak ' 1 ', Having weak '0' and '1' at carry outputs is one of the disadvantages of 8T full adder circuit and also the PMOS transistor (5) count is high compared to NMOS transistor (3) count. In practical situations, one solution for this problem is using an inverter at carry output, but this solution will increase the power and area of the circuit.

SIMULATION RESULTS

It is difficult to implement a 28T full adder using DSCH tool. By using NgSPICE we can solve that problem. All other simulations were done using MICROWIND DSCH tool. 45nm technology was used for this purpose. Power consumption is calculated by the equation,

Power, P = Supply voltage (Vdd) * Current (I)
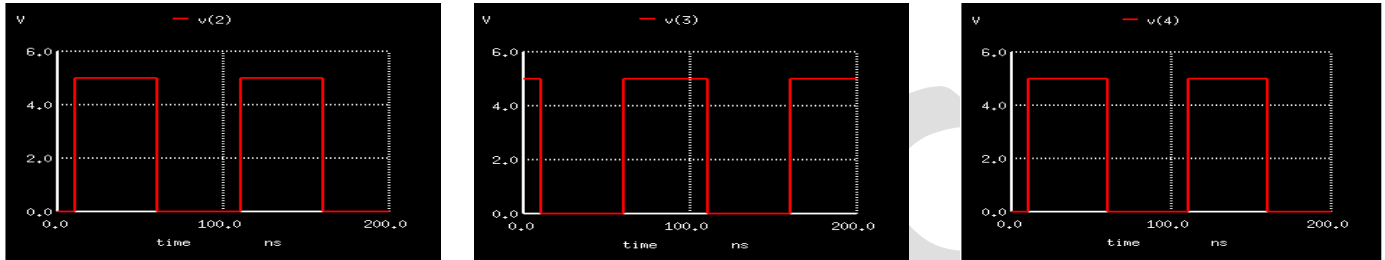
Fig: 16 Simulation of 28T Static adder using NgSPICE a) input A b) input B c) input C
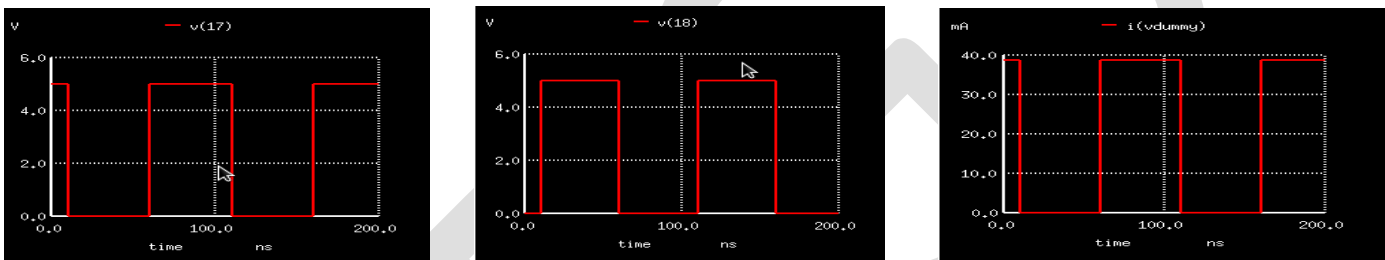
Fig: 17 a) sum b) carry c) current at sum and carry node

A) MICROWIND SIMULATION OF 10T FULL ADDER USING GDI
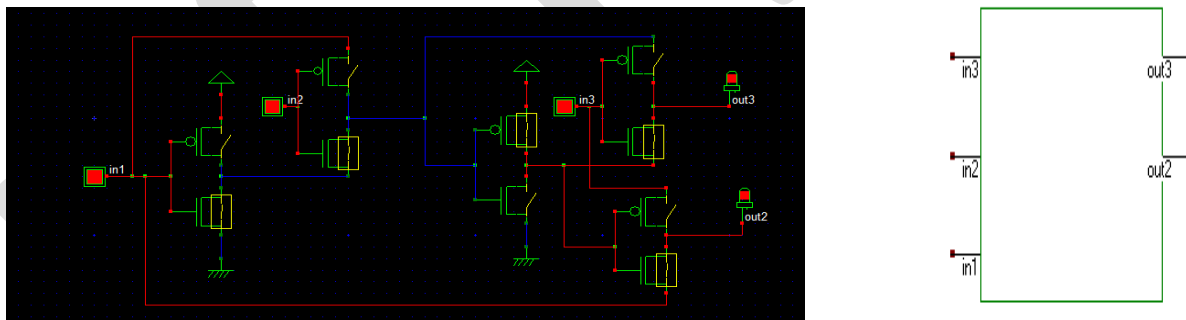
Fig: 18 a) Transistor Level Simulation b) Schematic symbol
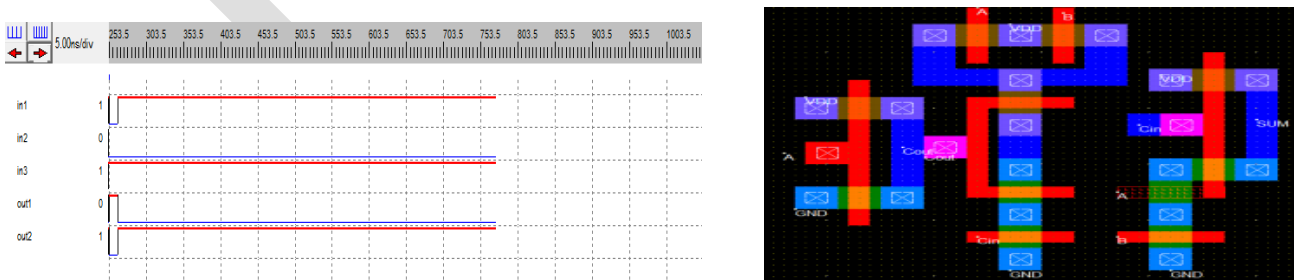
Fig: 19 a) Timing Diagram b) Layout
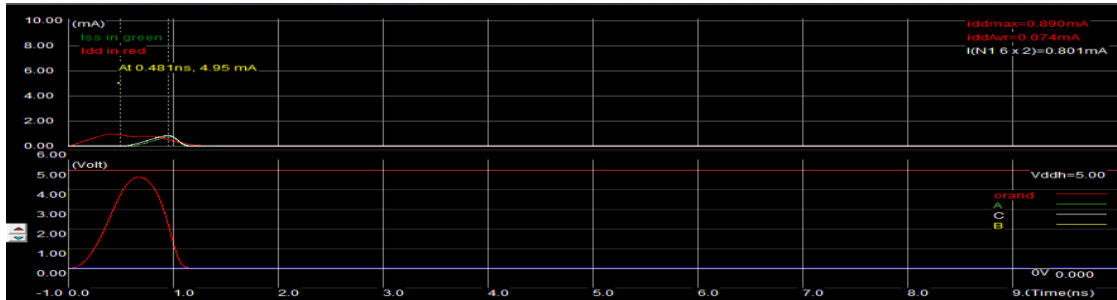
Fig: 20 Voltage, Current versus Time

B) MICROWIND SIMULATION OF 11T FULL ADDER USING GDI
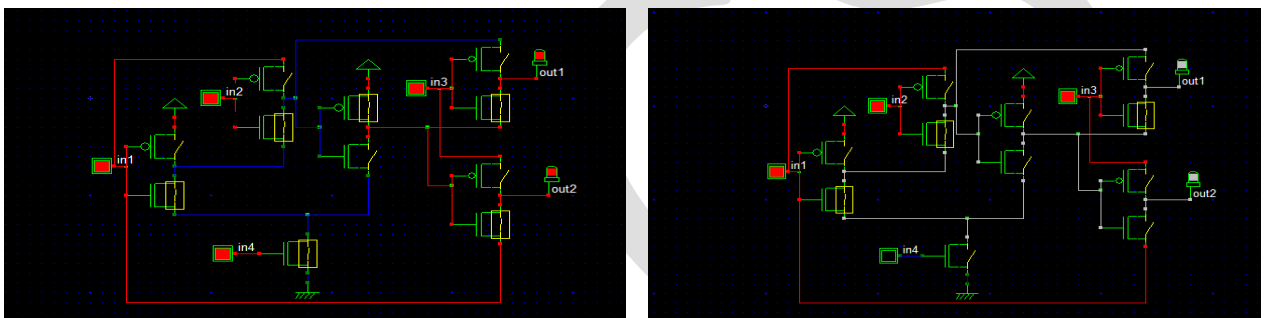
Fig: 21 a) Sleep transistor working as in4 b) Sleep transistor not working
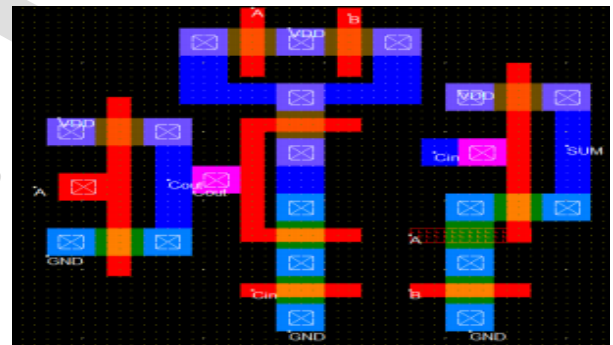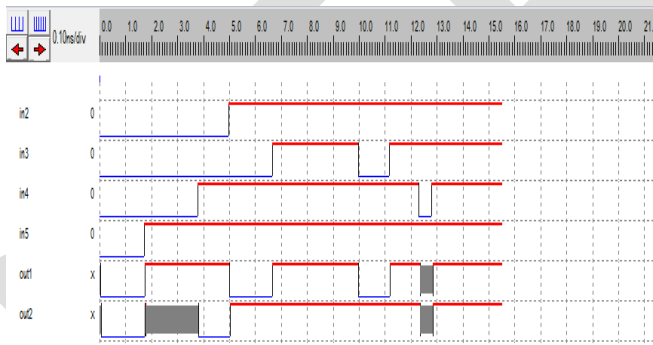
Fig: 22 a) Timing Diagram b) Layout
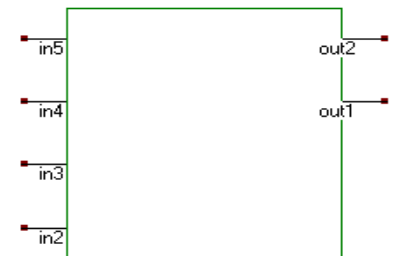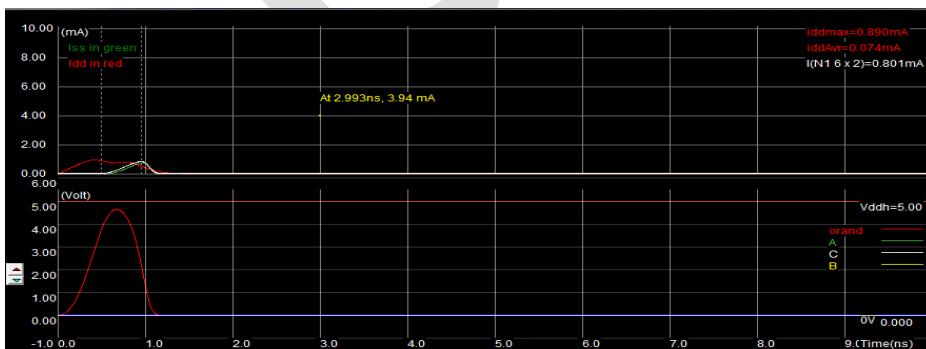
Fig: 23 a) Voltage, Current versus Time b) Schematic Symbol

C) MICROWIND SIMULATION OF 9T FULL ADDER USING HYBRIDIZING PTL AND GDI LOGIC
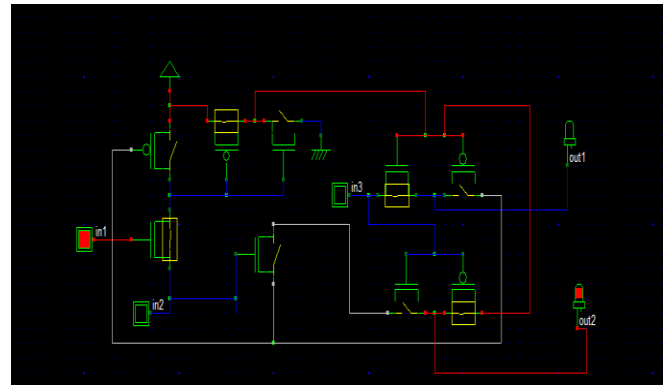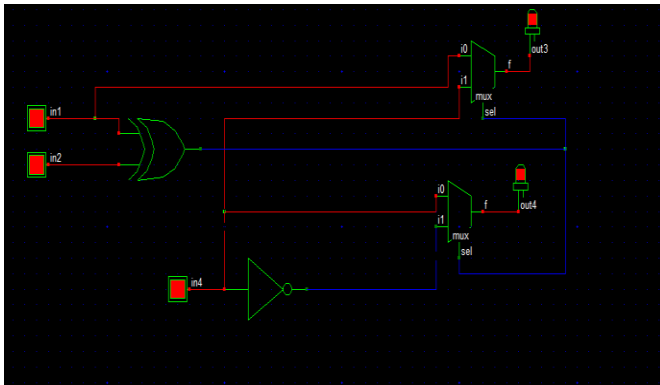
Fig: 24 a) Gate level simulation b) Transistor level simulation
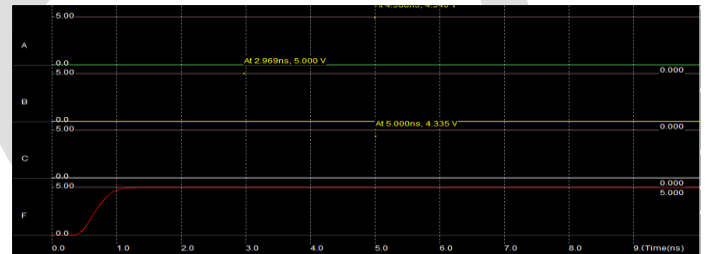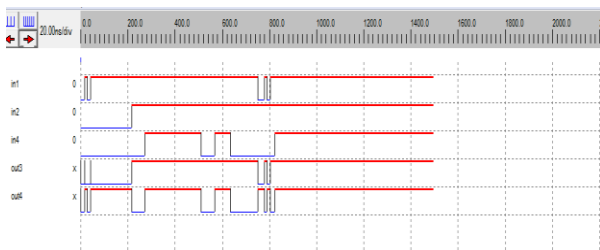
Fig: 25 a) Timing diagram b) Voltage Vs Time
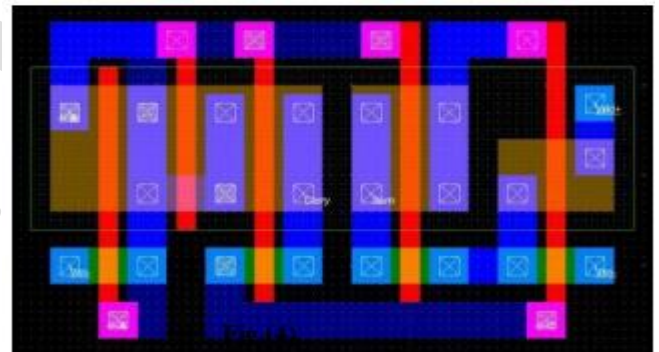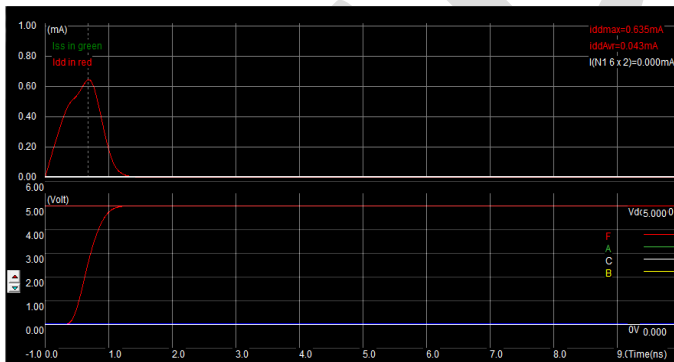
Fig: 26 Voltage, Current Vs Time b) Layout

D) MICROWIND SIMULATION OF 8T FULL ADDER USING HYBRIDIZING PTL AND GDI LOGIC
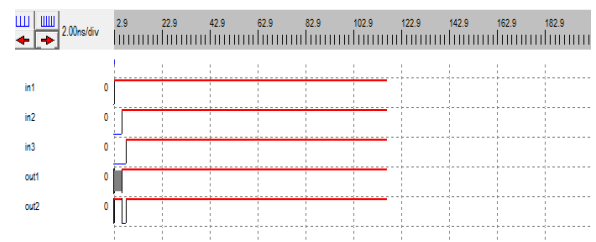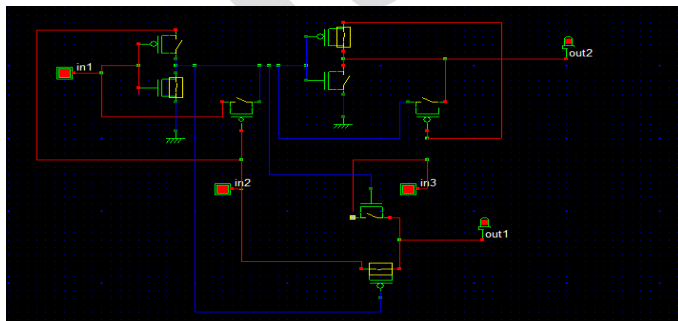
Fig: 27 a) Transistor level simulation b) Timing diagram
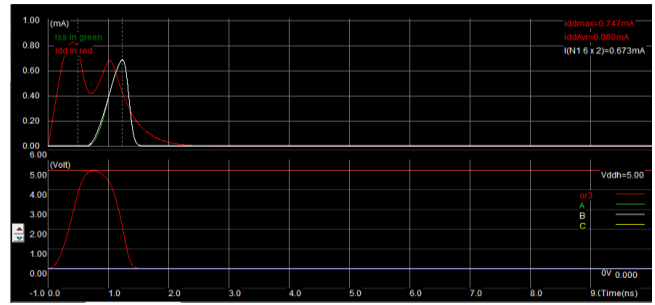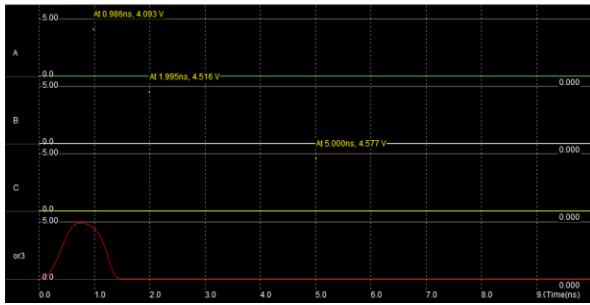
Fig: 28 a) Voltage Vs Time b) Voltage, Current Vs Time
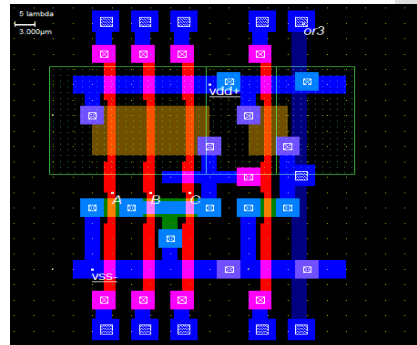
Fig: 29 Layout

E) MICROWIND SIMULATION OF 28T STATIC FULL ADDER
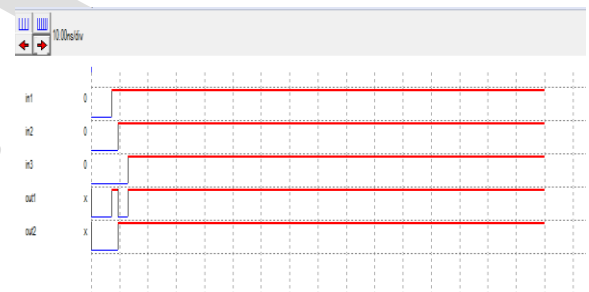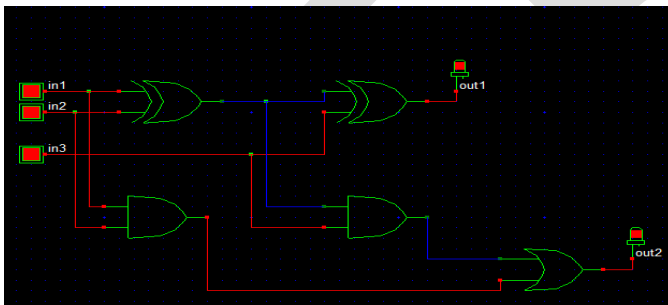
Fig: 30 a) Gate Level Simulation b) Timing Diagram
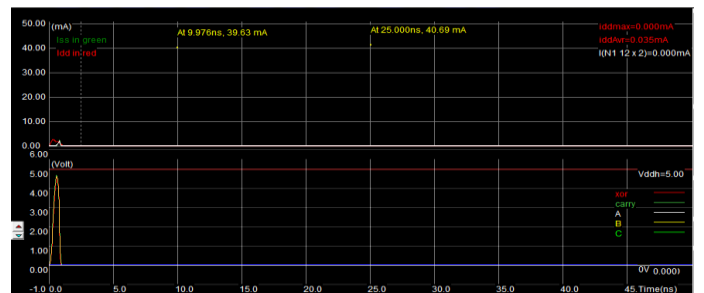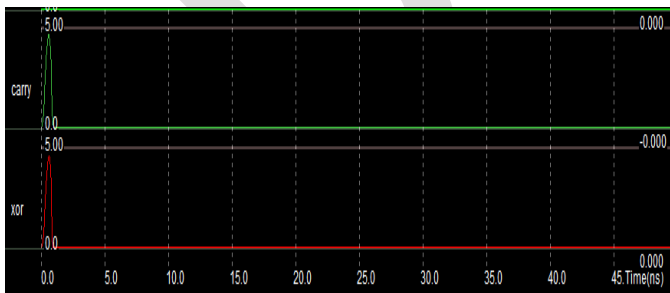
Fig: 31 a) Voltage Vs Time of output (same for all simulations) b) Voltage, Current Vs Time
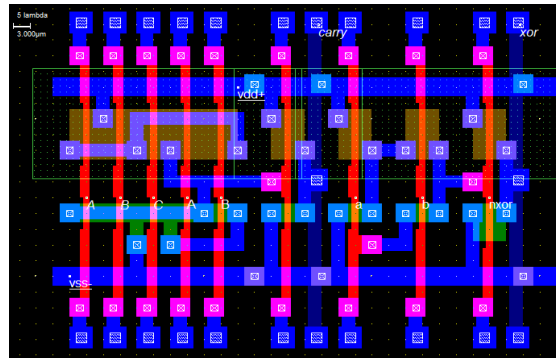
Fig: 32 Layout

	STATIC LOGIC	GDI LOGIC WITH SLEEP TRANSISTOR	GDI LOGIC W/O SLEEP TRANSISTOR	PTL & GDI	PTL & GDI
NO:OF TRANSISTORS	28T	11T	10T	9T	8T
NMOS	14	6	5	5	3
PMOS	14	5	5	4	5
VOLTAGE	5V	5V	5V	5V	5V
CURRENT(mA)	39.63	3.94	4.95	0.68	0.89
POWER (mW)	198.15	19.70	24.95	3.40	4.45

Table: 4 Simulation Table

Layout area was calculated as per design rules (in terms of lambda). 28T static full adder has highest Layout area & it has highest power dissipation. Here the supply voltage was taken as 5V for three topologies. So, the delay didn't change very much. When supply voltage is reduced delay will increase drastically. Also, we can compare 1-bit full adder design with 7T and 6T full adder circuits.

CONCLUSION

In this paper conventional complementary metal oxide semiconductor (CMOS), gate diffusion input (GDI) and hybridizing PTL adder circuits are analyzed in terms of power. In this paper I have presented three different logic circuits in which power delay product is improved more than 50% compared with that of conventional CMOS circuits. The simulation result and comparative performance revealed that power dissipation in hybridizing PTL logic produces considerably lower power than conventional CMOS logic. Also, the transistor count decreased drastically from 28 to 9 which in-turn helps to reduce the layout area of the circuit with better performance.

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Response of Maize (*Zea mays L*) Crop to Different Planting Machine: A Review

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Abstract- Availability of a multi crop planter with replaceable metering plate is crucial to meet the seed rate requirements and to reduce the cost involved in machinery management. Though different types of planters having different seed metering mechanisms were evolved, their performance is not up to the mark. Seed metering device is a heart of seed sowing machine which is evaluated for seed distance, seed size between seed varieties. In India traditionally sowing of maize with help of animal and manual operated planter which is very tedious and slow process. The study of existing literature of maize planter shows there are mainly three types of planter viz. manually operated planter, animal drawn planter and tractor operated planter with raised bed planting and flat planting. Performance of available planter on different parameter has been studied which shows tractor operated planter gives better result. Study also focus on their limitations of cost and source of power supply. There is scope of seed metering mechanism on developed tractor drawn planter which will changeable by other crop of metering plate. By attaching different types of metering plate we can use multicrop planter for sowing of different crops.

Keywords – Maize, Tractor drawn planter, Animal drawn planter, Manual operated planter, Raised bed planting, Flat planting, Cost economic.

INTRODUCTION

In India, maize is the third most important food crops after rice and wheat. According to advance estimate it is cultivated in 8.7 million ha (2010-11) mainly during *Kharif* season which covers 80% area. Maize in India, contributes nearly 9% in the national food basket and more than Rs. 100 billion to the agricultural GDP at current prices apart from the generating employment to over 100 million man-days at the farm and downstream agricultural and industrial sectors. In addition to staple food for human being and quality feed for animals, maize serves as a basic raw material as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceutical, cosmetic, film, textile, gum, package and paper industries etc.

Maize is mainly sown directly through seed by using different methods of tillage and establishment but during winters where fields are not remain vacant in time (till November), transplanting can be done successfully by raising the nursery. However, the sowing method (establishment) mainly depends on several factors *viz* the complex interaction over time of seeding, soil, climate, biotic, machinery and management season, cropping system, etc. Therefore it is very important that different situations require different sowing methods for achieving higher yield. Sowing/planting should be done on the southern side of the east-west ridges/beds, which helps in good germination. Planting should be done at proper spacing.

REVIEW OF LITERATURE

A prototype punch planter was developed for no-till corn to provide different seed spacing. Plant population was adjusted by changing planter punch wheels. Seed spacing of 136, 165, and 210 mm were obtained by constructing three punch wheels with different punch lengths, represented by external diameters of 650, 825, and 1,000 mm, respectively. Laboratory and field tests were conducted at speeds of 1.5, 2.0, and 2.5 m·s^{-1} to evaluate the effect of the punch lengths and speeds. Field tests were conducted in three different residue covers (corn, grain sorghum, and soybean). Overall, high values for quality of feed index (spaces between seeds or plants within 0.5 and 1.5 the theoretical seed spacing) were observed. Despite problems with synchronization between the seed meter and punch wheels, the length of the punches offered no performance limitations at the speeds tested. A soil cleaning device was designed to reduce soil sticking to the punches and reduce soil disturbance. The volume of soil displaced by the smallest punch wheel (650 mm) was less than half of that displaced by a commercial notill planter. Differences in planting depth due to residue cover and punch wheel

diameter were minimal. Emergence was delayed under the corn residue cover and may have influenced the lower performance of the planter prototype as compared to the other two residue types (Molin *et al*., 1998).

No-tillage and raised beds are widely used for different crops in developed countries. A field experiment was conducted on an irrigated maize-wheat system to study the effect of field layout, tillage and straw mulch on crop performance, water use efficiency and economics for five years (2003–2008) in northwest India. Straw mulch reduced the maximum soil temperature at seed depth by about 3ºC compared to the no mulch. During the wheat emergence, raised beds recorded 1.3ºC higher soil temperature compared to the flat treatments. Both maize and wheat yields were similar under different treatments during all the years. Maize and wheat planted on raised beds recorded about 7.8% and 22.7% higher water use efficiency than under flat layout, respectively. Straw mulch showed no effect on water use and water use efficiency in maize. The net returns from the maize-wheat system were more in no tillage and permanent raised beds than with conventional tillage. Bulk density and cumulative infiltration were more in no tillage compared with conventional tillage (Ram *et al*., 2011).

Inclined plate seed metering device was designed and evaluated in laboratory for singulation and uniform placement of maize and soybean seeds at three different cell shapes and sizes. The performance parameters like average spacing, multiple index, quality of feed index and precision were measured. Among the combinations of design variables, the seed metering plate with semi-circular cell shape having cell size 7 mm diameter was found to be the optimum for metering maize seed. Average spacing, quality of feed index, multiple index, miss index and precision were 17.48 cm, 79.33%, 18.67%, 2% and 10.5%, respectively (Singh *et al*., 2014).

A three - row bullock drawn multi-crop inclined plate planter was developed at C.I.A.E Bhopal for sowing different type of crops. The calibration for the seed and fertilizer rate was done in the laboratory of C.A.E. , R.A.U., Pusa, Samastipur. The seed rate was found 20.60 kg·ha^{-1} for the maize crop and fertilizer rate was found from 9.3 kg·ha^{-1} to 124.3 kg·ha^{-1}. The wheel skid was in tolerable limit as it was recorded 4.53 %. The field capacity was 0.23 ha·hr^{-1} and field efficiency was 51.1%. The plant population was found 10-12 plants per square meter. The cost of sowing per hectare was 3.5 times economical than traditional method (Nirala *et al.*, 2011).

Seed metering devices meter the seed from the seed box and deposit it into the delivery system that conveys the seed for placement on or in the seedbed. The major functional requirements of seed metering systems are to meter the seed at a predetermined rate/output (e.g. kg·ha-1 or seeds/meter of row length) meter the seed with the required accuracy (spacing) to meet the planting pattern requirements (i.e. drill seeding, precision drilling, etc); and cause minimal damage to the seed during the metering process. The seed sowing machine is a key component of agriculture field. The performance of seed sowing device has a remarkable influence on the cost and yield of agriculture products. Therefore studied the review on the field performance of three different types of planter (manual operated, animal drawn and tractor drawn) for sowing of maize crop.

Oduma et al., (2014) evaluated the performance of developed three-row manually operated maize seeding machine. An average weight varying from 4.44g to 4.72g of seeds was discharged by the three hoppers at a mean planting space range of 48.2cm to 49.8cm obtained from the field and laboratory test respectively. The planter effectively metered out two seeds per discharge at average planting depth varying from 2.47cm to 2.60cm with minimum percentage seed damage of 1.79%. The field efficiency of 72.3% and average field capacity of 0.43 ha/hr were obtained from the test. The planter is simple to operate portable and easy to maintain and can relief the difficulties encountered by maize farmers in rural areas if properly maintained.
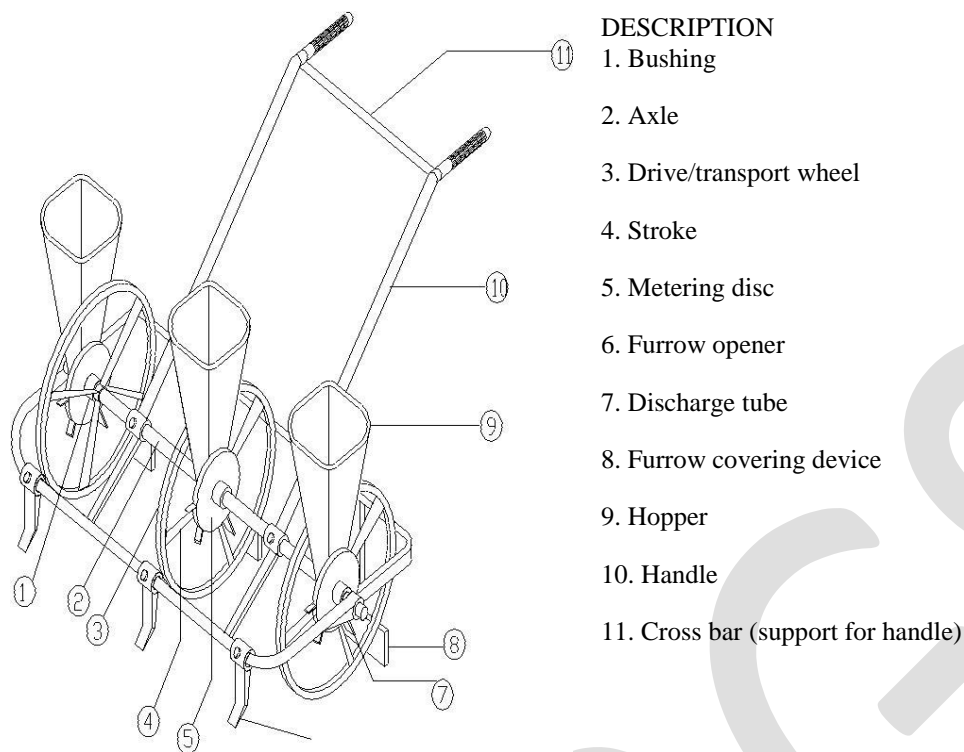
DESCRIPTION

1. Bushing

2. Axle

3. Drive/transport wheel

4. Stroke

5. Metering disc

6. Furrow opener

7. Discharge tube

8. Furrow covering device

9. Hopper

10. Handle

11. Cross bar (support for handle)

Figure 1: Three-Row maize planter

Narang et al., (2015) evaluated the 3 planters namely tractor operated raised bed planter, inclined plate planter and manually operated multicrop planter in field for sowing of maize. The mean grain yield per ha was found maximum for raised bed maize planter as 7.017 t-ha^{-1} and for inclined plate planter and manually operated planter it was 5.778 t-ha^{-1} and 6.097 t-ha^{-1}, respectively. The percent saving in labor cost and time in maize sown with raised bed planter was 89.90% and 91.80% as compare to maize sown with traditional manual method and was highest among three planters. Planting of maize was done with the machines viz. raised bed (ridge) planting as well as inclined plate planter and manual planter at the departmental research farm in sandy loam soil. The three machines were operated in the field and parameters like width, forward speed, depth of seed placement and fuel consumption were measured and are shown in Tab. 2. It is clear from Tab. 1 that average fuel consumption for raised bed planter was 4.95 l·hr-1 whereas for inclined plate planter it was 6.03 l·hr^{-1}. The average field capacity of raised bed planter was 0.49 ha·h^{-1}, for inclined plate planter was 0.48 ha·h^{-1}, whereas for manually operated planter it was 0.23 ha·h^{-1}, and the effect of different machines was significant on field capacity, as well as on forward speed at 5% level of significance. The depth of seed placement varied from 20-50 mm for three planters and the effect of different their effect on depth of seed placement was nonsignificant at 5% level of significance.

Table 1. Field parameters for three different planters

Name of machine	Raised bed planter	Tractor drawn inclined plate planter	Manually operated planter	CD at 5 %
Width of machine (m)	1.80	1.80	0.04	
Mean forward speed (km·h^{-1})	2.72	2.68	0.48	0.151757
Mean effective field capacity (ha·h^{-1})	0.49	0.48	0.23	0.0256957
Mean depth of seed placement (mm)	40.00	33.33	23.33	NS
Mean fuel consumption (l·h^{-1})	4.95	6.03	--	--

Fig.2 Raised bed maize multicrop planter

Fig.3 Inclined plate planter

Fig.4 Manually operated planter

Table 2. Economics analysis of different planters used for sowing of maize

Method of planting	Bed planting	Flat planting		
Planter used for sowing maize	Raised bed planter	Tractor drawn inclined plate planter	Bullock drawn inclined plate planter	Manually operated planter
Cost of machine operation , Rs·ha-1 (Including fixed and variable costs)	472.39	538.81	119.5	115.19
% saving in labor cost as compared to traditional method	89.90%	87.98%	76.32%	75.96%
% Saving in time as compared to manual method	91.80%	91.74%	84.57%	82.46%
% Saving in irrigation water with bed planting as compared with flat planting	10-15%	----		----

CONCLUSION

Based upon the above reviews the main conclusions are the mean grain yield per ha was found maximum for raised bed maize planter as 7.017 t·ha^{-1} and for inclined plate planter and manually operated planter it was 5.778 t·ha^{-1} and 6.097 t·ha^{-1} respectively. The cost of operation per ha with raised bed, inclined and manual planters were Rs. 472.39, 538.81 and 115.19 respectively. The cost of sowing per ha with bullock drawn planter was Rs. 119.5/ha. The existing tractor drawn maize planter saves the time and cost as compared to bullock drawn and manually operated planter. The animal drawn and manually operated maize planter is economically efficient but it consume more time as compared to tractor drawn maize planter. The per cent saving in labor cost and time in maize sown with raised bed planter was 89.90% and 91.80% as compared to maize sown with traditional manual method and was highest amongst three planters. Sowing with the bullock drawn 3 row inclined plate planter is 3.5 times economical than traditional (manual method). In maize sown raised bed planter there was saving of water from 10-15% as compared to maize sown on flat with other planters. Maize planted on raised beds recorded about 7.8% higher water use efficiency than under flat layout. Raised bed planting give more advantage as compare to flat planting in the field of cost saving, time saving and water used efficiency. Review also underlines the need of sowing implement which has less cost of operation. The maize planter can be used for sowing of other crop after changing the metering mechanism.

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DESIGN AND SIMULATION OF GAS AND FIRE DETECTOR AND ALARM SYSTEM WITH WATER SPRINKLE

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Abstract- This work is to design and implement a Fire and Gas Detection System with water sprinkler using SMS Feedback. This system makes use of a microcontroller along with sensing circuit which will detect gas leakage and fire and with the help of an alarm system the system gives alert about fire or gas leakage and with the installation of a GSM modem SMS can be sent to notify the user if there is fire or gas leakage and if the fire occurs the water sprinkler sprinkles water on the affected area to reduce the effect of the fire. A Liquid Crystal Display (LCD) displays the status of the system

Key words: Gas Detection, sprinkler, Liquid Crystal Display (LCD)

I. INTRODUCTION

Fire and Gas systems (FGS) are important tools for safeguarding our residence home and other facilities that handle flammable and toxic materials. All such facilities have inherent fire risk that cannot be fully mitigated with instrumented protective function, in some cases these facilities require the installation of fire and gas systems to mitigate these hazards. Proper design of fire and gas systems begins with the selection of a performance target for functions employed by the fire and gas system. Performance of a fire and gas System is primarily characterized by the system's ability to detect hazards (detector coverage) and the system's ability to mitigate hazards. Determination of the necessary coverage, mitigation effectiveness requirements for a FGS is an exercise in risk analysis. A well designed fire and gas system is intended to detect and in some cases automatically mitigate fire, combustible gas and toxic gas hazards. Proper placement of detectors is critical in the design of a fire and gas system to ensure that coverage is adequate to detect hazards at their incipient stage, in order to avert escalation. The gas detection system can detect a leakage of combustible or toxic gas and take action to mitigate or prevent it from escalating into a fire or explosion. If a fire should result, systems can be attached to extinguish the fire and protect other areas from the actions of the fire. The same system, usually with different detectors and principles, can be used to detect toxic gases, give warning to personnel and provide the possibility of taking automatic actions. Fires in process plants may be either like any other industrial fires, for example electrical fires in utility or an ignited leak of a product from the process. Some facilities use separate gas and fire detection systems. Generally, the fire detection system and gas detection system is combined into one fire and gas system. A separation that may be made is to have one fire and gas system for the 'process' areas and another sub-system for the utility or office/accommodation areas. Systems can be single, duplicated or triplicate. Redundant systems are not new. Systems in the early 1980's were being delivered with dual, diversely located controllers, dual detectors, and dual control outputs. Kenexis,(2014).

2. RELATED WORK

A. Intelligent Residential Security Alarm and Remote Control System Based on Single Chip Computer: LIU zhen-ya et al,(2008) the paper focuses on, Intelligent residential burglar alarm, emergency alarm, fire alarm, toxic gas leakage remote automatic sound alarm and remote control system, which is based on 89c51 single chip computer. The system can perform an automatic alarm, which calls the police hotline number automatically. It can also be a voice alarm and shows alarm occurred address. This intelligent security system can be used control the electrical power remotely through telephone (Forzani et al, 2009).

B. Design and implementation of Remote

Monitoring System Based on GSM: Chen et al, (2008) this paper focuses on the wireless monitoring system, because the wireless remote monitoring system has more and more application, a remote monitoring system based on SMS through GSM. Based on the overall architecture of the system, the hardware and software architecture of the system is designed. In this system, the remote signal is transmitted through GSM network. The system includes two parts which are the monitoring center and the remote monitoring station. The monitoring center consists of a computer and a TC35 communication module for GSM. The computer and the TC35 are connected by RS232. The remote monitoring station consist of a TC35 communication module for GSM, a MSP430F149 MCU, a display unit, sensors and a data gathering and processing unit. The software for the monitoring center and the remote monitoring station were designed using VB (Geng et al, 2007).

C .A New Approach of Automatic Localization System Using GPS and GSM/GPRS Transmission: Lita et al, 2006 this paper focuses on, a low cost automotive localization system using GPS and GSM-SMS services, which provides the position of the vehicle on the driver's or owner's mobile phone as a short message (SMS) on his request. The system can be interconnected with the car alarm system which alerts the owner, on his mobile phone, about the events that occurs with his car when it is parked. The system is composed by a GPS receiver, a microcontroller and a GSM phone. In additional the system can be settled for acquiring and transmitting the information, whenever requested about automobile status and alerts the user about the vehicle started engine. The system can be used as a low cost solution for automobile position localizing as well as in car tracking system application.

D. Investigation of gas sensors for vehicle cabin air quality monitoring: Galatsis et al, (2002) this paper focuses on, car cabin air quality monitoring can be effectively analyzed using Metal Oxide Semiconducting (MOS) gas sensors. In this paper, commercially available gas sensors are compared with Fabricated Moo3 based sensors possessed comparable gas sensing properties. The sensor has response 74% higher relative to the host commercial sensor tested

3. METHODOLOGY

The Operation of the Fire and Gas Detection System is presented in the block diagram as shown in figure 3.1. It consists of a Power Supply Unit PSU which supplies the needed power to the PIC16F877A microcontroller, MAX232, GSM module SIM900, Gas sensor MQ-2, Temperature sensor LM35 and the Liquid Crystal Display LCD. The microcontroller is connected to the Power Supply Unit, LCD, Gas sensor, Temperature sensor and MAX232. The LCD shows the status of the system when there is a presence of gas or smoke which may lead to fire outbreak in the environment. A detailed analysis of the various units in the system is shown in the block diagram given in fig 1 below
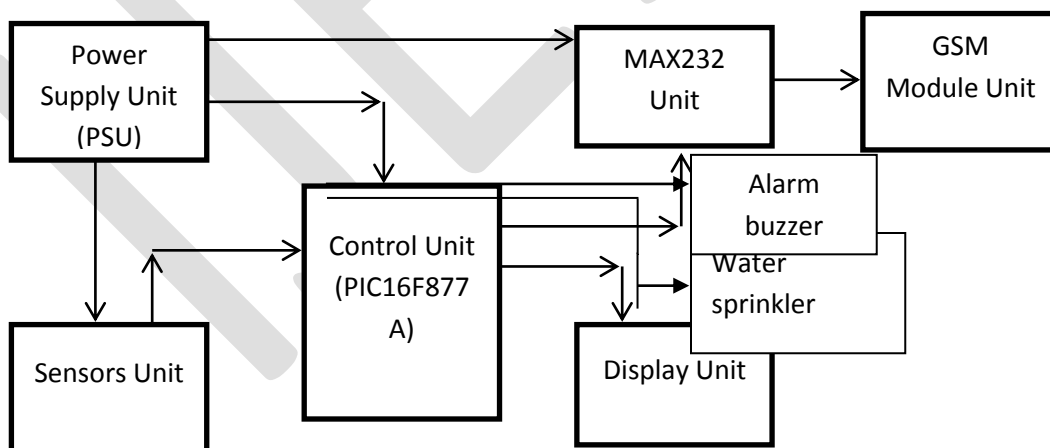

Fig1: Block Diagram of Fire and Gas Detection System

A. Power supply unit (psu)

The power supply unit is necessary for the provision of regulated (step-down rectified) Dc power supply from AC mains to circuit components i.e. microcontroller, GSM Module, sensors, LCD's and MAX232. The power supply unit consists of a step down transformer (240/24v), the diode Rectifier, voltage regulator and capacitors for filtering.

Sensors Unit

The sensor unit consists of the various sensors used in the sensing of the presence of gas or flame which may lead to fire outbreak in an environment. The sensors used in this system are the MQ-6 and LM35 for Liquefied Petroleum Gas (LPG) and Temperature detection of the environment respectively.

1. Gas Sensor (MQ-6)

The MQ series of gas sensors use a small heater inside with an electro-chemical sensor. They are sensitive for a range of gasses and are used indoors at room temperature. The output is an analog signal and can be read with an analog input of a PIC microcontroller. The MQ-6 Gas Sensor module is useful for gas leakage detecting in home and industry. It is highly sensitive in the detection of the presence LPG, butane, propane, methane, alcohol, hydrogen and smoke. Some modules have a built-in variable resistor to adjust the sensitivity of the sensor. It was used in this research work for the detection of LPG and smoke in the building. The sensor and it configuration is shown in the fig below.

Fig 2: MQ-6 Sensors
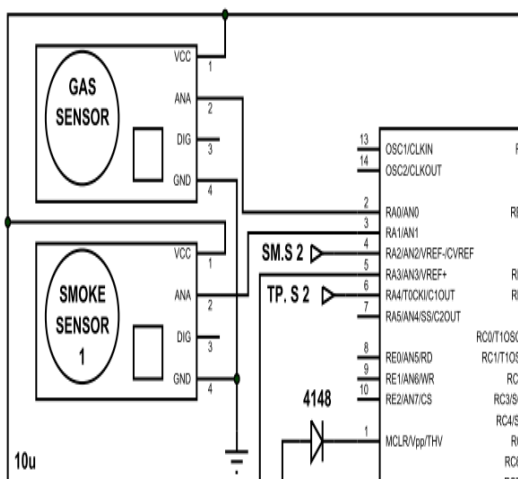
Fig 3: circuit of interfacing mq-6 as an lpg and smoke detector

2. Temperature sensor (LM35)

Temperature sensor LM35 is chosen, it's used to sense the temperature of the environment and when the temperature goes above a certain level say 45° a certain voltage corresponding to the said degree will be read by the microcontroller indicating the occurrence of a possible fire outbreak. The sensor and it configuration is shown in the fig below.
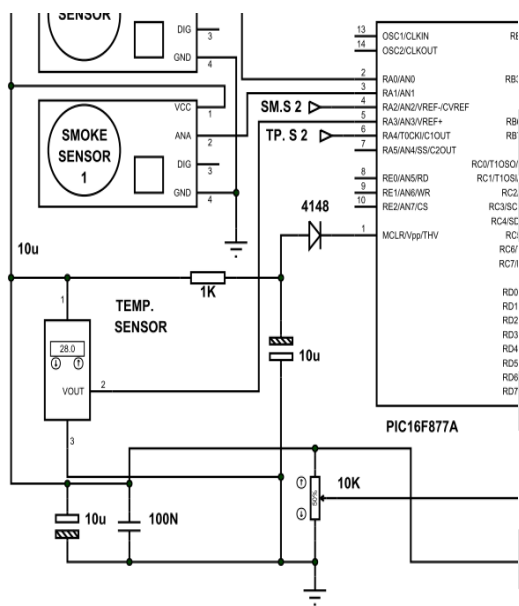

Fig 4: Lm35 Sensor

Fig 5: circuit of interfacing lm35 sensor

C. Control Unit (Pic16f877a Microcontroller)

The control unit is the brain of this section and its main components is the PIC16F877A microcontroller.

1. PIC16f877A Microcontroller Architecture

PIC 16F877A is a 40-pin 8-Bit CMOS FLASH Microcontroller from Microchip. The core architecture is high-performance RISC CPU with only 35 single word instructions. Since it follows the RISC architecture, all single cycle instructions take only one instruction cycle except for program branches which take two cycles. 16F877A comes with 3 operating speeds with 4, 8, or20 MHz clock input. Since each instruction cycle takes four operating clock cycles, each instruction takes 0.2µs when 20MHz oscillator is used. It has two types of internal memories; program memory and data memory. Program memory is provided by 8K words (or 8K*14 bits) of FLASH Memory, and data memory has two sources. One type of data memory is a 368-byte Random Access Memory (RAM)

and the other is256-byte EEPROM (Electrically erasable programmable ROM).The core feature includes interrupt capability up to 14 sources, power saving SLEEP mode, and a single 5V In-Circuit Serial Programming (ICSP) capability. The sink/source current, which indicates a driving power from I/O port, is high with 25mA. Power consumption is less than 2mA in 5V operating condition.PIC16F877A is show in fig 6.
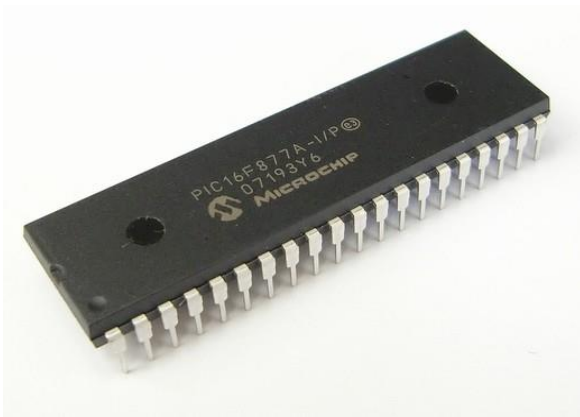

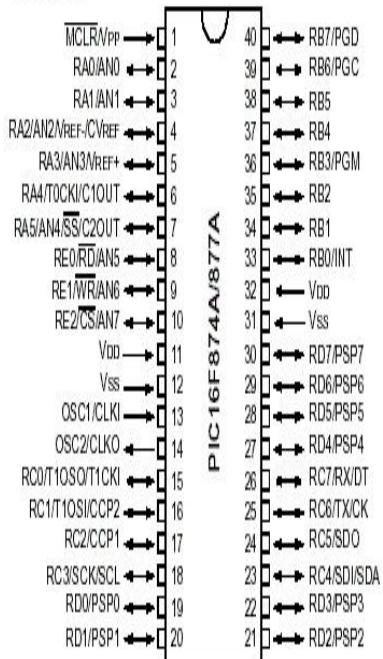Fig 6: PIC16F877A Microcontroller

3. PIC16F7F877A Pin Description

Fig 7: PIC16F877A Pin Descriptions   Fig 8: The complete circuit diagram of the Fire and Gas Detection System
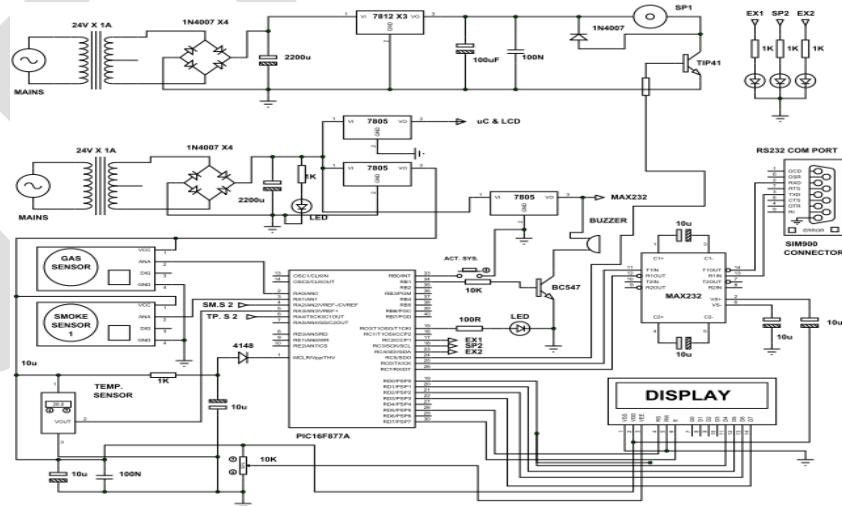
D. Fire And Gas Detection System

The Fire and Gas Detection system makes use of two sensors the MQ-2 and the LM35; the MQ-2 is used to detect the presence of Liquefied Petroleum Gas (LPG) and the LM35 is used to detect the temperature of the surrounding and as well detect the presence of flame in the surrounding and the signal gotten from the two sensors are sent to the microcontroller and the status of the system is displayed on an LCD. With the help of the GSM module, the system sends SMS to the user's phone number telling the user the status of the environment whether a gas is detected or flame is detected in the surrounding.

E. MAX232

 The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pump sand external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5V. It is helpful to understand what occurs to the voltage levels. When a MAX232 IC receives a TTL level to convert, it changes TTL logic 0 to between +3 and +15 V, and changes TTL logic 1 to between -3 to -15 V, and vice versa for converting from RS232 to TTL. This can be confusing when you realize that the RS232 data transmission voltages at a certain logic state are opposite from the RS232 control line voltages at the same logic state. The MAX232has two receivers that convert from RS-232 to TTL voltage levels and two drivers that converts from TTL logic to RS-232 voltage levels. As a result, only two out of all RS-232 signals can be converted in each direction. Typically, the first driver/receiver pair of the MAX232 is used for TX and RX signals, and the second one for CTS and RTS signals.
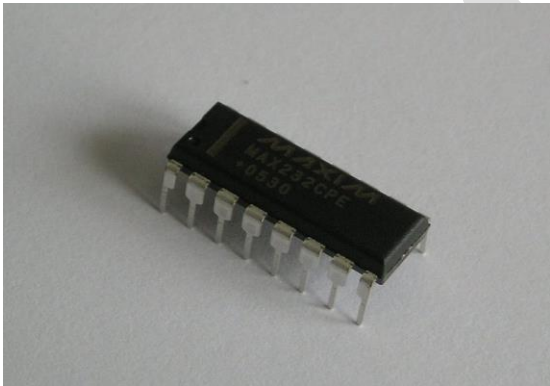

Fig 9: MAX232

F. Liquid crystal display unit

This unit consists of a 16× 2 Character LCD. The liquid crystal display is connected through a variable resistor; the variable resistor (10kΩ) is used to adjust the brightness of the LCD.

The LCD displays the status of the system when gas detected or when a flame is detected through the various sensors installed the system; this is shown in fig 10 below.

Fig 10: Liquid Crystal Display

G. Gsm Module (Sim900)

This is a GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz and which can be used not only to access the Internet, but also for oral communication (provided that it is connected to a microphone and a small loud speaker) and for SMSs. The module is managed by an AMR926EJ-S processor, which controls phone communication, data communication (through an integrated TCP/IP stack), and (through an UART and a TTL serial interface) the communication with the circuit interfaced with the cell phone itself. The processor is also in charge of a SIM card (3 or 1,8V) which needs to be attached to the outer wall of the module. In addition, the GSM modem (Sim900) device integrates an analog interface, an A/D converter, an RTC, an SPI bus, an IC, and a PWM module. The radio section is GSM phase 2/2+ compatible and is either class 4 (2 W) at 850/ 900 MHz or class 1 (1 W) at 1800/1900MHz. The TTL serial interface is in charge not only of communicating all the data relative to the SMS already received and those that come in during TCP/IP sessions in GPRS (the data-rate is determined by GPRS class 10: max. 85.6 kbps), but also of receiving the circuit commands (in our case, coming from the PIC governing the remote control) that can be either AT standard or AT-enhanced SIMCom type. The module is supplied with continuous energy (between 3.4 and 4.5 V) and absorbs a maximum of 0.8 A during transmission. The fig 3.12 shows the SIM900 GSM Module.
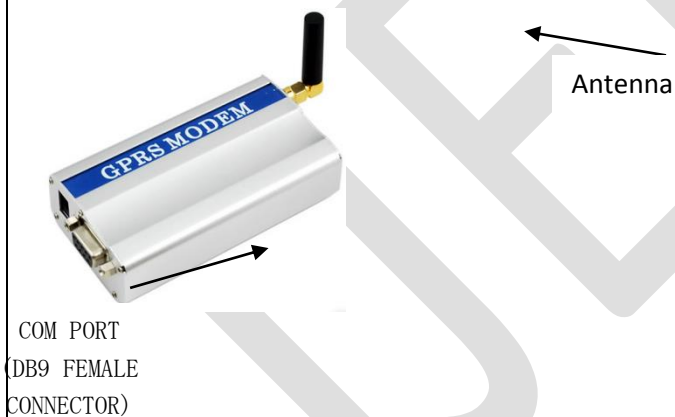

Fig 11: SIM900 GSM Modules

H. Software Design

The system software was programmed to read the sensors (mq-6 and lm35) and produce an output when the preset value and sensor analog signal is matched. All logic decisions by which all other control actions like scanning of available parking space in the park are written using the micro C compiler and simulated for test purpose before burning the compiler generated hex file using proteus simulation wizard.
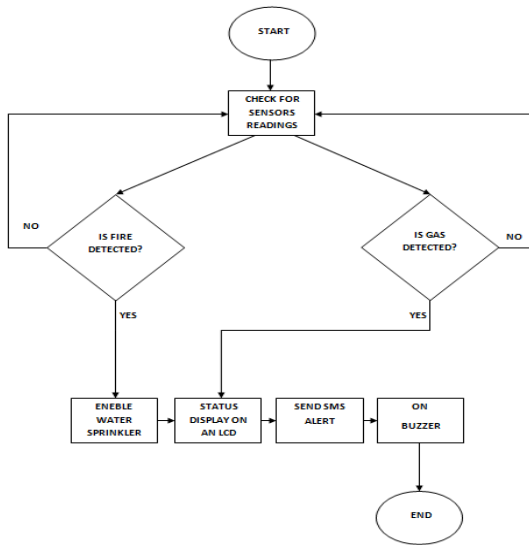
I. System design flow chats

Fig 12: System flow chart
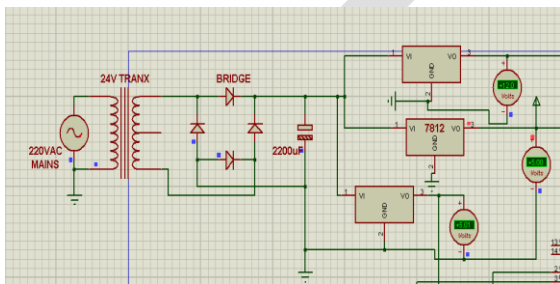
4. RESULT AND DISCUSSION

A. Power supply unit

Fig 13 simulated result of the power supply

Table 1: Table of Voltage Regulator Testing results

Voltage regulator	Voltage (dc)
7812	11.89
7805	4.98

The table shows the dc voltage that was gotten from the power supply after the power supply unit was transferred to the board.

B. System simulation result of the controller unit is shown and explained as follows.
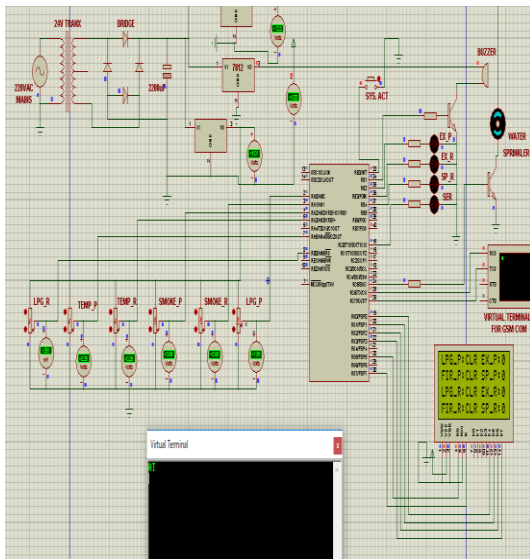
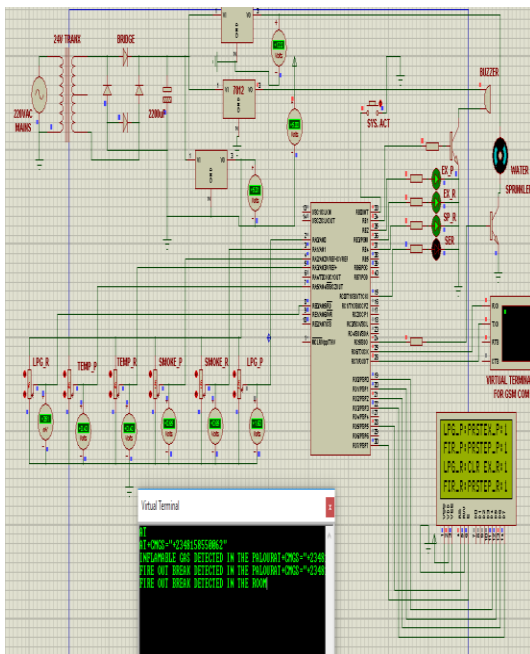Fig14 simulated result when the environment is clear from fire and lpg licks

Fig 15: simulated result when there is presence of gas in the parlor, present of fire in the parlor and room.

From the result, the last column indicated with "1" on the second caption represent the status of the water sprinkling system and the fire extinguishing system where "1" represent on and "0" represent off.

5. CONCLUSIONS

A fire and gas hazard control has been designed, implemented and found working. This system has solved the problem caused by gas leakage in our surrounding which lead to fire outbreak that has caused the death of its victims. This system has been designed to carry out the detection and notify the presence of a Liquefied Petroleum Gas (LPG) in our surroundings. It also detect and notify the presence of fire in the environment then fight the fire outbreak itself using fire extinguisher and the water sprinkling system. The construction was made such that maintenance and repairs are done easily incase the system breaks down or if a fault occurs.

This system can be applied in residential places, offices and hotels. With this system safety is assured.

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