Volume 8, Issue 1
JAN 2015-JUNE 2015
ISSN: 0974-3588
Impact factor: GIF - 2.1708, SIF - 2.745

INTERNATIONAL JOURNAL OF EMERGING TECHNOLOGIES AND APPLICATIONS IN ENGINEERING, TECHNOLOGY & SCIENCES

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POWER QUALITY PROBLEMS IMPRVOMENT USING UNIFIED OWER QUALITY CONDITIONER (UPQC)

VIPUL SOLANKI, NITIKA AGARWAL

School of Engineering, R.K.University, Rajkot, Gujarat, India
Asst.Prof. Electrical Dept., School of Engg, RK.University, Rajkot,

vipulkumarsolanki6@gmail.com, nitika.agarwal@rku.ac.in

ABSTRACT *: In this paper The increasing use of the Nonlinear devices, such as power electronics converters, inject harmonic currents in the AC system and increase overall reactive power demanded by the equivalent load. Also, the number of sensitive loads that require ideal sinusoidal supply voltages for their proper operation has increased. This paper deals with the shunt APF, series APF and the unified power quality conditioner (UPQC) which aims at the integration of series and shunt active filters. The UPQC has the capability of improving power quality at the point of installation on power distribution systems or industrial power systems.*

Keywords—Power quality, UPQC, Nonlinear Load Balancing, Voltage Swell, Voltage Sag, Voltage Dip, Hysteresis Current Controller, Matlab/Simulink

I. INTRODUCTION

The present power distribution system is usually configured as a three-phase three-wire or four-wire structure featuring a power-limit voltage source with significant source impedance, and an aggregation of various types of loads. Ideally, the system should provide a balanced and pure sinusoidal three-phase voltage of constant amplitude to the loads; and the loads should draw a current from the line with unity power factor, zero harmonics, and balanced phases.[3] To four-wire systems, no excessive neutral current should exist. As a result, the maximum power capacity and efficiency of the energy delivery are achieved, minimum perturbation to other appliances is ensured, and safe operation is warranted. However, with a fast increasing number of applications of industry electronics connected to the distribution systems today, including nonlinear, switching, reactive, single-phase and unbalanced three-phase loads, a complex problem of power quality evolved characterized by the voltage and current harmonics, unbalances, low Power Factor (PF).[1] In recent years active methods for power quality control have become more attractive compared with passive ones due to their fast response, smaller size, and higher performance. For example, Static VAR Compensator (SVC) have been reported to improve the power factor; Power Factor Corrector (PFC) and Active Power Filters (APF) have the ability of current harmonics suppression and power factor correction; some active circuits were developed to compensate unbalanced currents as well as limit the neutral current. In general, parallel-connected converters have the ability to improve the current quality while the series-connected regulators inserted between the load and the supply, improve the voltage quality.[1]

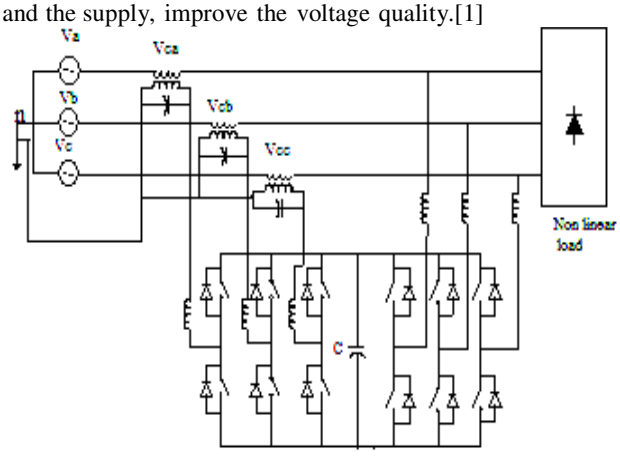


Fig.1 General UPQC block diagram

The aim of a unified power quality conditioner (UPQC) that consists of series active and shunt active filters is to compensate for supply voltage flicker/imbalance, reactive power, negative sequence current and harmonics.

In other words, the UPQC has the capability of improving power quality at the point of installation on power distribution systems or industrial power systems. The UPQC, therefore, is expected to be one of the most powerful solutions to large capacity loads sensitive to supply voltage flicker/imbalance. The UPQC can be divided into two parts i.e. general UPQC, for power distribution systems and industrial power systems; and specific UPQC for a supply voltage flicker/imbalance sensitive load, which is installed by electric power consumers on their own premises.[2] In UPQC the series active power filter eliminates supply voltage flicker/imbalance from the load terminal voltage and forces an existing shunt passive filter to absorb all the current harmonics produced by a nonlinear load. Elimination of supply voltage flicker, however, is accompanied by low frequency fluctuation of active power flowing into or out of series active filter.[2] . The shunt active filter performs dc link voltage regulation, thus leading to a significant reduction of capacity of dc link capacitor. As the name suggests, the series-shunt active filter is a combination of series active filter and shunt active filter. The topology is shown in Fig 4.1. The shunt-active filter is located at the load side and can be used to compensate for the load harmonics. On the other hand, the series portion is at the source side and can act as a harmonic blocking filter. This topology is called as Unified Power Quality Conditioner. The series portion compensates for supply voltage harmonics and voltage unbalances, acts as a harmonic blocking filter and damps power system oscillations.[5] As the name suggests, the series-shunt active filter is a combination of series active filter and shunt active filter. The topology is shown in Fig Fig.1 The shunt-active filter is located at the load side and can be used to compensate for the load harmonics. On the other hand, the series portion is at the source side and can act as a harmonic blocking filter. This topology is called as Unified Power Quality Conditioner. The series portion compensates for supply voltage harmonics and voltage unbalances, acts as a harmonic blocking filter and damps power system oscillations. The shunt portion compensates load current harmonics, reactive power and load current unbalances. In addition, it regulates the dc link capacitor voltage.[6]

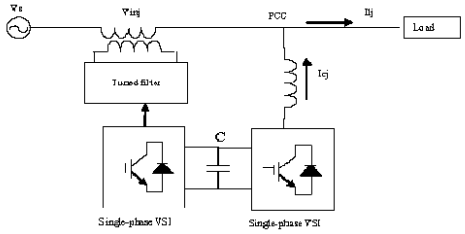


Fig.2 System under consideration

It is the combination of back to back connected shunt and series compensators through a common dc bus voltage. In this dc link storage capacitor is connected between two voltage source inverters for operating as combination of shunt and series compensator. It is a most flexible device, can suppress current in shunt and voltage in series simultaneously. It can balance the terminal voltage and eliminate negative sequence current components at the same time.[11]

- **Applications[10]**

- Unified Power Quality Compensator (UPQC)
- Voltage sag and swell correction
- Voltage balancing
- Voltage regulation
- Flicker attenuation
- VAR compensation
- Harmonic suppression
- Current balancing
- Active and reactive power control

II. THE MOST COMMON POWER QUALITY PROBLEMS [12]

- **Harmonics**

Switch mode power supplies, nonlinear loads High neutral currents, Overheated neutral conductors, Overheated transformers, Voltage distortion, Loss of system capacity.

- **Voltage Sags**

Voltage sags are the most common power problem encountered. Sags are a short-term reduction in voltage (that are 80-85% of normal voltage) and can cause interruptions to sensitive equipment such as adjustable-speed drives, relays, and robots. Sags are most often caused by fuse or breaker operation, motor starting, or capacitor switching. Voltage sags typically are non-repetitive, or repeat only a few times due to reclose operation. Sags can occur on multiple phases or on a single phase and can be accompanied by voltage swells on other phases.

- **Power Interruptions**

Power interruptions are zero-voltage events that can be caused by weather, equipment malfunction, recloser operations, or transmission outages. Interruptions can occur on one or more phases and are typically short duration events, the vast majority of power interruptions are less than 30 seconds.

- **Voltage Flicker**

Voltage flicker is rapidly occurring voltage sags caused by sudden and large increases in load current. Voltage flicker is most commonly caused by rapidly varying loads that require a large amount of reactive power such as welders, rock-crushers, sawmills, wood chippers, metal shredders, and amusement rides. It can cause visible flicker in lights and cause other processes to shut down or malfunction.

- **Switching Transients**

Switching transients are extremely rapid voltage peak of up to 20,000 volts with duration of 10 microseconds to 100 microseconds. Switching transients take place in such a short duration that they often do not show up on normal electrical test equipment. They are commonly caused by machinery starting and stopping, arcing faults and static discharge. In addition, switching disturbances initiated by utilities to correct line problems may happen several times a day. Effects can include data errors, memory loss and component stress that can lead to breakdown.

III. DEIGN OF PI CONTROLLER

The controller used the discrete PI controller that takes in the reference voltage and the actual voltage and gives the maximum value of the reference current depending on the error in the reference and the actual values. PI controller are:[14]
The voltage error V (n) is given as:

$$V(n) = V(n)^* - V(n)$$

The output of the PI controller at the nth instant is given as:

$$I(n) = I(n-1) + Kp[V(n) - V(n-1)] + Ki\ V(n)$$

IV. HYSTERESIS CONTROLLER

With the hysteresis control, limit bands are set on either side of a signal representing the desired output waveform. The inverter switches are operated as the generated signals within limits. Hysteresis-band PWM is basically an instantaneous feedback control method of PWM where the actual signal continually tracks the command signal within a hysteresis band

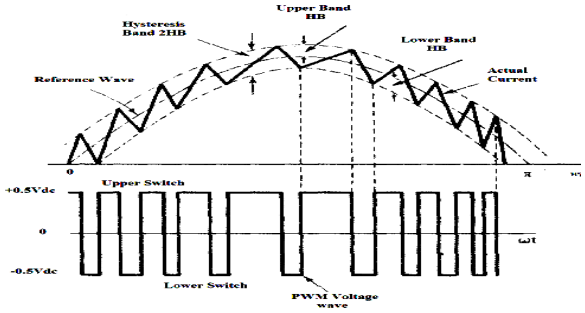


Fig.4 Basic principle of hysteresis band control

Fig.4 shows the operation principle of hysteresis-band PWM for a half bridge inverter. The control circuit generates the sine reference signal wave of desired magnitude and frequency, and it is compared with the actual signal. As the signal exceeds a prescribed hysteresis band, As a result the output transits from 0.5d.c to -0.5d.c and the signal start to decay. [16]As the signal crosses the lower limit, the lower switch is turned OFFand the upper switch is turned ON. A lock-out time (t) is provided at each transition to prevent a shoot-through fault.

V. SIMULATIONS AND RESULTS

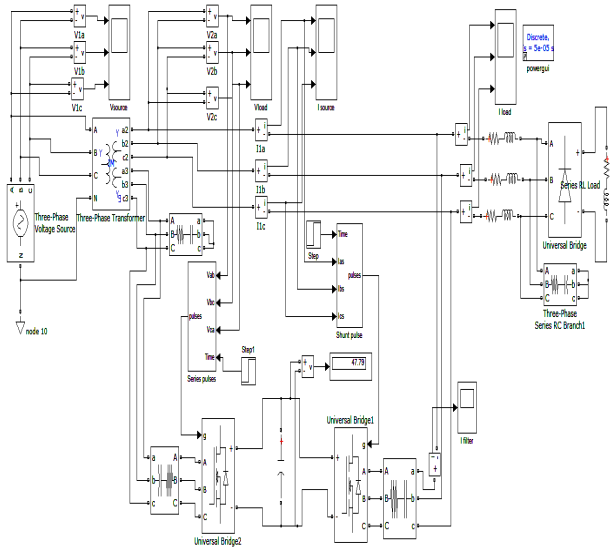


Fig. 3 PWM-inverter with active and reactive power
Control scheme

The performance of proposed UPQC model is carried out on RL load. Shows the supply voltage, supply current and injected current wave forms of the line current before the shunt current and after the shunt current injection. The overall simulation run time is 0.3 sec. the control strategy is started after 0.1 sec. After 0.1 sec the PI controller acted to settle the reference DC link voltage and current from the shunt converter injected to make the supply current sinusoidal. It is observed that after the control strategy started the wave shape of the line current at the input side is improved in term of the harmonic distortion. It is also observed that the supply voltage does not affected.

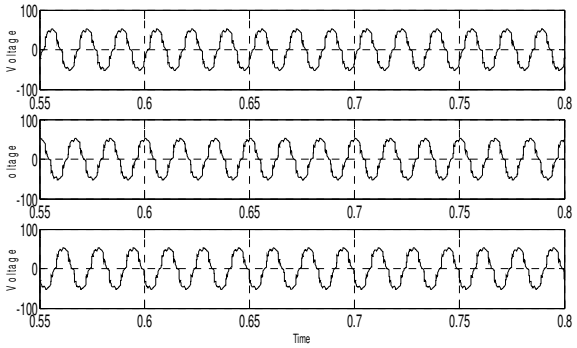


Fig.5 without compensation Load voltage

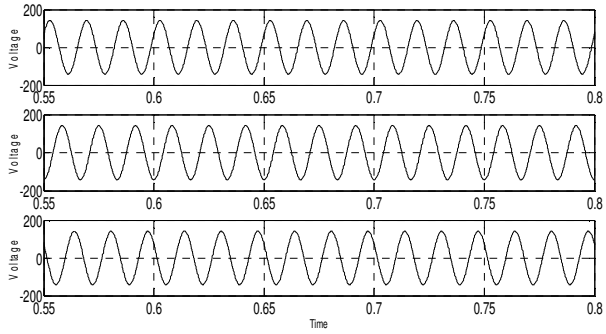


Fig.6 without compensation Source voltage

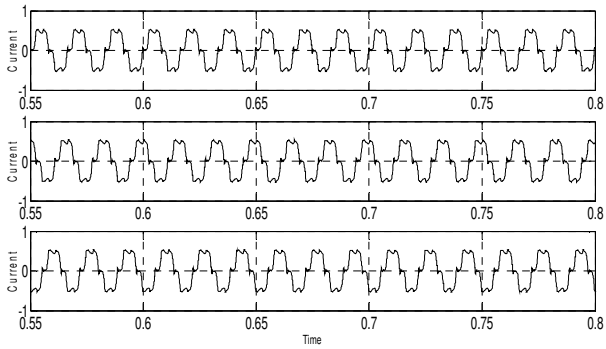


Fig.7 without compensation Source current

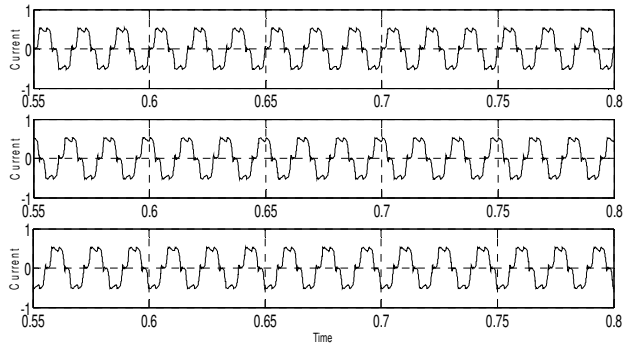


Fig.8 without compensation Load current

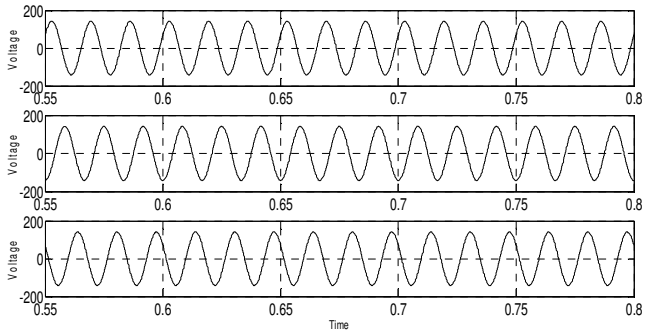


Fig.9 with compensation Source voltage

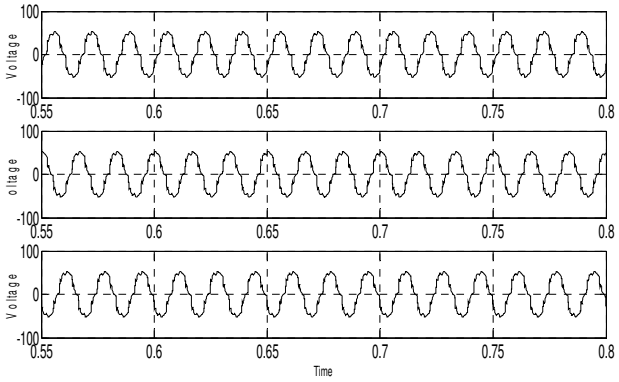


Fig.10 with compensation Load voltage

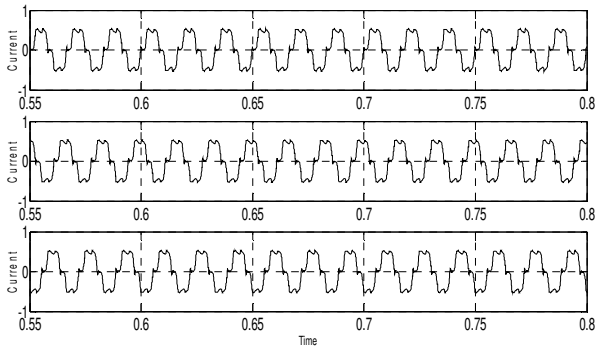


Fig.11 with compensation Source current

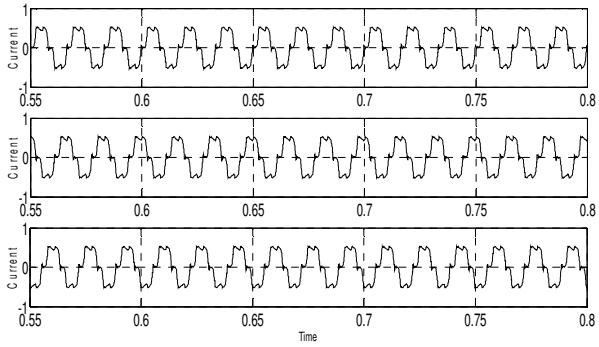


Fig.12 with compensation Load current

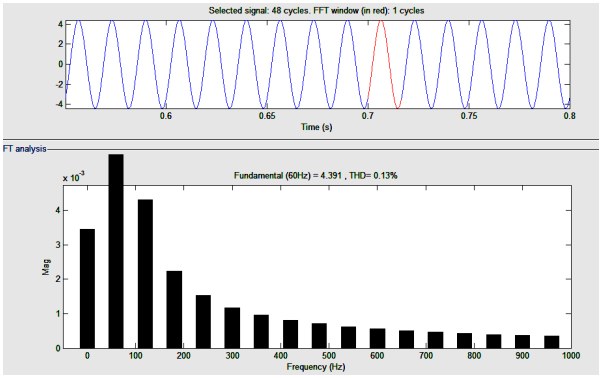


Fig.13 Source current and its harmonic spectrum after compensation

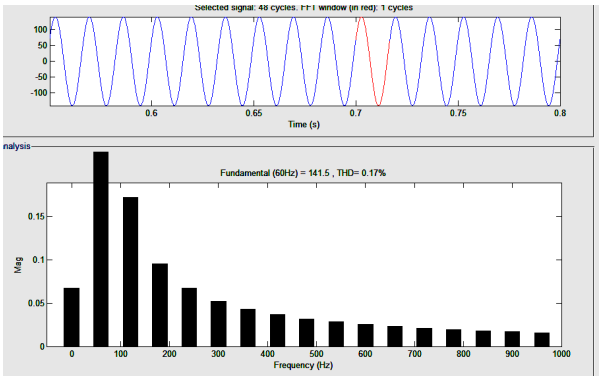


Fig.14 Source current and its harmonic spectrum after compensation

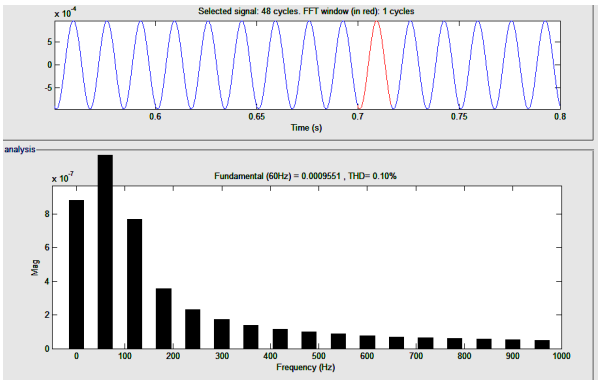


Fig.15 Source current and its harmonic spectrum after compensation

System parameter

Table.1 THD analysis for different loads, for series filter (DVR)

Load type	THD (%) load current	THD (%) source current
R-L LOAD	0.17	16.12

Table.2 THD analysis for different loads, for shunt filter (D-STATCOM)

Load type	THD (%) source voltage	THD (%) load voltage
R-L LOAD	0.17	16.12

Table.3 THD analysis of source and load voltages for UPQC

Load type	THD (%) load Voltage	THD (%) source Voltage
R-L LOAD	0.17	0.13

Table.4 THD analysis of load and source currents for UPQC

Load type	THD (%) load Current	THD (%) source Current
R-L LOAD	0.17	0.13

VI. SYSTEM PARAMETER

Parameters	**Values**
Supply voltage	150V
Frequency	50HZ
RL Load parameter	10Ω , 10MH
Line parameter	8Ω , 0.1MH
Hysteresis band gap	-0.01 TO 0.01

VII. CONCLUSION

A MATLAB based model of the UPQC has been simulated for RL using the hysteresis control technique. The simulation results show that the input voltage harmonics and the current harmonics caused by non-linear load are compensated very effectively by using the UPQC.With a fast increasing number of applications of industry electronics connected to the distribution systems today, including nonlinear, switching, reactive, single-phase and unbalanced three-phase loads, a complex problem of power quality evolved characterized by the voltage and current harmonics, unbalances, low Power Factor (PF).In recent years active methods for power quality control have become more attractive compared with passive ones due to their fast response, smaller size, and higher performance. Source current harmonics and it reduces the source current THD from 14.65 % to 0.08 %.

REFERENCES

[1] Chang, G.W.; Tai-Chang Shee; "A novel reference Compensation current strategy for shunt active power Filter control," IEEE Transactions on Power Delivery vol. 19, Issue 4, pp. 1751 – 1758, Oct. 2004.,

[2] Bhim Singh, Kamal Al Haddad and Ambries Chandra, A Review of Active Filters for Power Quality Improve ment IEEE Trans on Industrial Electronics, Vol.46 No.5 October 1999, pp. 960-970.

[3] G. Carrara, S. Gardelta, M. Marchesoni, A new multiple vel theoretical analysis, IEEE Trans. On power electron ics Vol. 7. No. 3, July, pp.497-505, 1992.

[4] V. Khadkikar, P. Agarwal, A. Chandra, A.O. Barry and T.D. Nguyen; "A Simple New Control Technique For
Unified Power Quality Conditioner (UPQC) 11th Intern tional Conference on Harmonics and Quality of Power 2004, pages: 289-293.

[5] R Virmani, P. Gaur, H. Santosi, A.P. Mittal and B. Si NghPerformance Comparison of UPQC and Active Po Wer Filters for a Non-Linear Load"; International Conf Rence on Power Electronics,Drives and Energy System

[6] H. R. Mohammadi, A. Y. Varjani, and H. Mokhtari, "M
"Multiconverter unified power quality conditioningsyste MC-UPQC," *IEEE Trans. Power Del.*, vol. 24, no. 3, p p. 1679-1686, Jul. 2009.

[7] Khadkikar.V, Chandra.A, Barry.A.O and Nguyen.T.D: "Analysis of power flow in UPQC during voltage sag a Nd swell conditions for selection device ratings Indust Strial Electronics." 2006 IEEE International Symposiu m on Volume 2, 9-13 May 2006.

[8] H. Akagi: "New trends in active filters for improvingpo rvngpower quality".Proceedings of the 1996 Internation Conference, Vol .1, Jan 1996, pp. 417 –425.

[9] J. Allmeling, "Control structure for harmonic compens Sation in active filters,"IEEE Trans. Power Electron. ,, vol.19, no.2, pp. 508-515, mar.2004.

[10] C. Sankaran, Power *quality*, Boca Raton, Fla.: CRC Press LCC, 2002.

[11] N.G. Hingorani, “Introducing custom power”, *IEEE Spectrum*, vol. 32, no. 6, pp. 41-48, June 1995.
[12] Sankaran, "Power quality," (CRC Press, New York,(2001).
[13] J. Stones and A. Collinson, "Power quality," Power Eng. Journal, vol.15, pp.58-64, April 2001.
[14] M. H. J. Bollen, "What is power quality?," Electric Power Systems Research, vol.66, pp.5-14, July 2003
[15] J. Stones and A. Collinson, "Power quality," Power Eng. Journal, vol.15, pp.58-64, April 2001.
[16] V. Khadkikar, A. Chandra, A. O. Barry, and T. D. Ng uyen, “Conceptual study of unified power qua lity conditioner (UPQC) 2006 IEEE International Sy mposium on Industrial Electronics vol. 2, pp. 108810 93, 2006.

RESCHEDULING of GENERATION for CONGESTION MANAGEMENT by PSO

[1]JAIMINI J. GOHEL,[2]Dr. B. R. PAREKH

[1]Department of Electrical Engineering, Birla Vishvakarma Mahavidyalaya, V.V.Nagar

[2]Head of Electrical Department, Birla Vishvakarma Mahavidyalaya, V.V.Nagar

jaiminig4@gmail.com, brp_bvm@yahoo.co.in

ABSTRACT:*Post-deregulated era offers quite a number of challenges amongst which network congestion is a significant one. With the transmission open access model, buyers, try to get the power from generators selling electricity as a commodity at the cheapest rate. But due to congestion in one or more transmission lines followed by the security constraints of the same it may not always be possible to discharge all contracted power transactions leading to market's inefficient and monopolistic behavior. This makes congestion management a prime concern. This paper presents generation rescheduling as one of the techniques for congestion management. It mainly focuses on demonstrating the benefits of sensitivity analysis versus the classical consideration for selecting generators to be rescheduled in order to manage congestion in the network. The said purpose is followed by an example of 75 bus Indian system. An algorithm for economic generation rescheduling using AI technique has also been presented in this paper.*

Keywords: Deregulation, congestion, generation rescheduling, sensitivity factors, PSO

I. INTRODUCTION

Introduction of deregulation in power industry provides an open access to the transmission system which facilitates buyers to buy power from the cheapest generators available. However, the amount of power that can be transferred between pt. A to pt. B on any transmission network is dependent on its thermal, voltage and stability limits. These limits when reached at their peak or beyond it, the network is said to be congested. It is vital to ensure that the power system is operating within its limits to maintain power system security which if failed, can result in widespread blackouts with potentially severe social and economic consequences. Precisely, congestion may cause prevention of new contracts, infeasibility in existing contracts, and price spike in many regions, market power abuse and depicting monopolistic behavior. Hence this makes congestion management a prime concern.

Causes of congestion may include: lack of coordination between generation companies (GENCOs) and transmission companies (TRANSCOs), contingency like generator/line outage, sudden change in load demand, and failure of various equipment.

Several techniques are being proposed and implemented till now to relieve congestion, such as: rescheduling power of generators, phase shifting transformers, FACTs devices, line switching and load shedding. However, the aim of this article is to focus on generation rescheduling.

Various congestion management techniques have been reported in literature [1]. In different type of market, the ways of tackling the transmission congestion differs. A zonalcongestion management approach has been proposed in [2]. Here the zones have been determined based on lines real and reactive power flow sensitivity indexes also called as real and reactive transmission congestion distribution factors. The generators in the most sensitive zones, with strongest and nonuniform distribution of sensitivity indexes, are identified for rescheduling their real power output for congestion management. In [3] generation rescheduling based on relative electrical distance was being approached. Also, a comparative study of cluster/zone based method against the relative electrical distance (RED) method for congestion managementwas being brought to attention in [4]. Literature on technique for optimal location of FACTS devices has been proposed in [5] for managing congestion.

A fuzzy rule based system is developed to select the generators to be rescheduled in [6]. An efficient method has been developed by using real coded genetic algorithm (RCGA) to find the optimal generation rescheduling for relieving congestion in [7]. [8] Proposes a technique for optimum selection of participating generators along with an algorithm for optimum rescheduling of generators for congestion management based on particle swarm optimization. In addition to the rescheduling of real powergeneration, demand side participation through load curtailment has been considered in [9]. However, the effect of rescheduling of reactive power output of

generators and voltage stability constraints were ignored in [8], [9]. This has been taken care of in [10] by the author.

The purpose of this article is to show a comparison between the conventional practice and revised practice of power transmission distribution factors (PTDFs) for selecting generators in order to relieve congestion by means of active power rescheduling. Also the results of particle swarm optimization for minimizing cost ran on both these cases will be shown and compared precisely. Cases of 75 bus Indian system and 30 bus IEEE system are been studied here.

II. PROBLEM FORMULATION

Congestion is the overloading of one or more transmission lines. All generators in the power network have different sensitivities to the power flow of a congested line. A change in real power flow in a transmission line k connected between bus i and bus j due to change in power generation by generator g can be termed as generator sensitivity to congested line (GS). Mathematically, GS for line k can be written as

$$GS_{Pgn}^{k} = \frac{(\Delta P_{ij})}{(\Delta PG_{gn})} \qquad (3)$$

The above equation is derived from the basic power equation given as

$$P_{ij} = -V_i^2 G_{ij} + V_i V_j G_{ij} \cos(\theta_i - \theta_j) + V_i V_j B_{ij} \sin(\theta_i - \theta_j) \qquad (4)$$

Where *V*i and *θ*i are the voltage magnitude and phase angle respectively at the *i*th bus; *G*ij and *B*ij represent, respectively the conductance and susceptance of the line connected between i and j.

The generator sensitivity values thus obtained are with respect to the slack bus as the reference. So the sensitivity of the slack bus generator to any congested line in the system is always zero. The GS factors here are considered as an inequality constraint here. The system operator selects the generators having non uniform and large magnitudes of sensitivity values as the ones most sensitive to the power flow on the congested line and to participate in congestion management by rescheduling their power outputs.

Based on the bids received from the participant generators, the amount of rescheduling required is computed by solving the following optimization problem:

$$\text{Minimize} \sum_{g}^{N_g} C_g(\Delta P_g)\Delta P_g$$

Subject to

$$\sum_{g=1}^{N_g} \left((GS_g)\Delta P_g\right) + F_k^0 \leq F_k^{max}$$

k = 1, 2…n_l

$$P_g - P_g^{min} = \Delta P_g^{min} \leq \Delta P_g \leq \Delta P_g^{max} = P_g^{max} - P_g$$

g = 1, 2…N_g

$$\sum_{g=1}^{N_g} \Delta P_g = 0 \qquad (5)$$

Where ΔP_g is the real power adjustment at bus-g and C_g are the incremental and decremented price bids submitted by generators. These are the prices at which the generators are willing to adjust their real power outputs. F_k^0 is the power flow caused by all contracts requesting the transmission service. F_k^{max} is the line flow limit of the line connecting bus-i and bus-j. N_g is the number of participating generators, nl is the number of transmission lines in the system, P_g^{min} and P_g^{max} denote respectively the minimum and maximum limits of generator outputs. It can be seen that the power flow solutions are not required during the process of optimization.

Here as part of problem formulation creation of congestion in 2 lines (13 and 59) is done by increasing load at appropriate buses of 75 bus Indian system and then a basic load flow (newton raphson in this case) was ran to get the power flows. Table 1 shows its details. Also, figure 1 represents one line diagram for the test system.

Table: 1 Details of power flow of the congested lines of 75 bus test system

Line	Power flow (MW)	Power flow limit (MVA)
Line 13(bus 4-28)	303	110
Line 59 (bus 35-36)	138.49	120

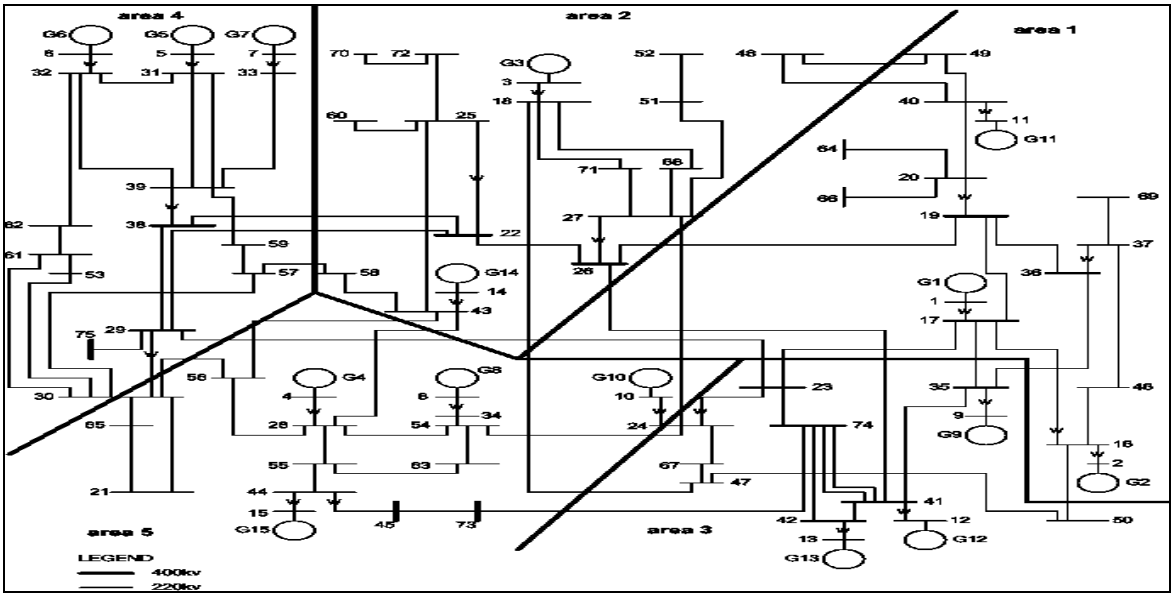


Figure 1: 75 bus Indian system

Also, the GSs for the congested lines can be given as indicated in figure 2.

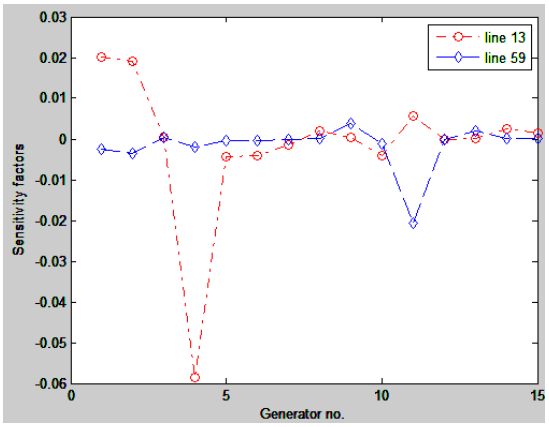


Figure: 2 GS factors of congested lines

This congestion in the respective lines has been removed here by generation rescheduling. Taking this into consideration two cases have been formed here: Case A: all generators participating and case B: selective generator's participation. Further, optimized economic rescheduled generation is desired here for which there are many methods available. Here as a part of demonstrating an artificial intelligence technique the desired task is being obtained by particle swarm optimization (PSO) method.

III. PARTICLE SWARM OPTIMIZATION

PSO is a fast, simple, effective and efficient population based optimization method that was proposed by Kennedy and Eberhart [10]. Each particle updates its position based upon its own best position, global best position among particles, and its previous velocity vector according to the following equations:

$$v_i^{k+1} = w*v_i^k + c1*r1*(pbest_i - x_i^k) + c2*r2*(gbest - x_i^k) \quad (1)$$

$$x_i^{k+1} = x_i^k + \chi*v_i^{k+1} \quad (2)$$

Where,
v_i^{k+1}= velocity of the ith particle at the$(k+1)$th iteration;
w= inertia weight of the particle;
v_i^k=velocity of the ith particle at the kth iteration;
c1, c2 = positive constants;
r1, r2 =randomly generated numbers;
p_{besti}= best position of the ith particle obtained based upon its own experience;
g_{best}= global best position of the particle in the population;
x_i^{k+1} = position of the ith particle at the $(k+1)$th iteration;
x_i^k= position of the ith particle at the kth iteration;
χ= constriction factor, which may help ensure convergence;
Suitable selection of inertia weight w provides a good balance between global and local explorations. Detailed concept of PSO has been further explored in [8], [9], and [10].

IV. RESULTS AND DISCUSSION

A 75 bus test system [10] is used here to witness the comparative results. This system consists of 15 generator buses, 60 load buses and 98 transmission lines. Slack bus generator is assigned number 1.
Case A: represents the system when tested with all its generators participating in relieving congestion.
Case B: represents the system tested with only some selective generators participating for managing congestion.
In order to select number of participating generators, the sensitivity factors of both lines have to be considered. Both active **and** reactive GS factors are considered here for selecting generators to be participated in the task of removing congestion. Also, the calculation follows deep consideration of reactive power along with the active. Here load increment is performed to simulate congestion. Details of lines thus congested are given in table 1. Also the GSs for congested lines are being mapped out in figure 1. The results here are shown only for active power rescheduling.
PSO is then ran to get the most economical solution for managing congestion. Table 2 and table 3 shows the results of algorithm on post cases after rescheduling is done. As evident from the results, case A where all generators participated is showing inferior results than case B in terms of power loss, rescheduling cost, accuracy and time consumption. They all are very high in numbers compared to case B.

Table 2: Resultant rescheduling cost

	Proposed method based on PSO	
	Rescheduled O/P of all generators (Case A)	Rescheduled O/P of few generators (Case B)
Active power rescheduling cost ($/day)	54,683.41	21,918.27
ΔP_1	2925.50	1904.87
ΔP_2	201.24	174.21
ΔP_3	38.16	Not Participated
ΔP_4	196.47	274.52
ΔP_5	493.34	402.53
ΔP_6	380.58	337.28
ΔP_7	190.96	205.66
ΔP_8	139.52	64.16
ΔP_9	298.57	Not Participated
ΔP_{10}	172.95	55.99
ΔP_{11}	81.85	Not Participated
ΔP_{12}	492.88	Not Participated
ΔP_{13}	421.17	Not Participated
ΔP_{14}	121.39	Not Participated
ΔP_{15}	207.61	Not Participated
Total active power rescheduled (MW)	6,362.19	3,419.22

Table 3: Few Post-rescheduling results

System component	System Parameter	Post-rescheduling state

		Case A	Case B
Line 13	Active power flow(MW)	107.46	72.87
Line 59	Active power flow(MW)	107.10	74.94
	Total active powerlosses (MW)	743.12	637.23

V. CONCLUSIONS

This paper focuses on demonstrating the benefits of generator sensitivities for optimum selection of generators for congestion management. The problem of congestion management is cited as an optimization problem here and is being solved with the help of particle swarm optimization method. A 75 bus Indian system is served as an example here to demonstrate the said purpose. The results thus obtained for both the cases are then compared to know if GS factors are effective to which the results clearly show that the system weighs a much lighter burden of considering all the generators instead of just considering those who possess relevance to the congested lines.

REFERENCES

[1] R. Abhyankar and Prof. S. A. Khaparde, 'Introduction to Deregulation in Power Industry'.

[2] Ashwani Kumar, S. C. Srivastava, and S. N. Singh, 'A Zonal Congestion Management Approach Using Real and Reactive Power Rescheduling', IEEE Transactions On Power Systems, Vol. 19, No. 1, February 2004

[3] Kaushik K Patel, Nilesh K Patel, 'Generation Rescheduling For Congestion Management Using Relative Electrical Distance', Journal of Information, Knowledge and Research In Electrical Engineering

[4] B. V. Manikandan, S. Charles Raja, P. Venkatesh and Manasarani Mandala, Comparative Study of Two Congestion Management Methods for the Restructured Power Systems, Journal of Electrical Engineering & Technology Vol. 6, No. 3, pp. 302~310, 2011

[5] L. Rajalakshmi, M. V. Suganyadevi and S. Parameswari, 'Congestion Management in Deregulated Power System by Locating Series FACTS Devices', International Journal of Computer Applications (0975 – 8887) Volume 13– No.8, January 2011

[6] G. Yesuratnam, N.Srilatha and P.Lokender Reddy, 'Congestion Management Technique Using Fuzzy Logic Based on Security and Economy Criteria', Recent Researches in Artificial Intelligence and Database Management.

[7] Sujatha Balaraman, N.Kamaraj, 'Congestion Management in Deregulated Power System Using Real Coded Genetic Algorithm', Sujatha Balaraman et. Al. / International Journal of Engineering Science and Technology Vol. 2(11), 2010, 6681-6690

[8] Sudipta Dutta and S. P. Singh, 'Optimal Rescheduling Of Generators for Congestion Management Based On Particle Swarm Optimization', IEEE Transactions on Power Systems, Vol. 23, No. 4, November 2008

[9] Tulika Bhattacharjee, Ajoy Kumar Chakraborty, 'Congestion management in a deregulated power system by rescheduling of sensitive generators and load curtailment using PSO', International Journal of Emerging Technology and Advanced Engineering, Volume 2, Issue 3, March 2012

[10] K. S. Pandya and S. K. Joshi, 'Sensitivity and Particle Swarm Optimization-based Congestion Management', Electric Power Components and System, 41:4, 465-484

[11] http://www.ee.washington.edu/research/pstca

[12] A.J. Wood and B.F. Wollenberg, "Power Generation Operation and Control", John Wiley publishers, New York, 1996

COMPARATIVE STUDY OF DATA MINING TECHNIQUES IN TELECOMMUNICATIONS-A SURVEY

AMJAD KHAN[1], ZAHID ANSARI[2]

[1]Dept of Electronics and Communication, P.A. College of Engineering, Mangalore, India
[2]Dept.Computer Science Engineering, P.A. College of Engineering, Mangalore, India

amjadkhanna@gmail.com,zansari4@gmail.com

ABSTRACT : *Telecommunication industries generate huge amounts of data of various forms. Telecommunication industry can apply data mining for customer retention, fraud analysis, and churn management. It helps to identify telecommunication patterns, catch deceitful activities, intrusion detection, make better use if resources and improve service quality. The data can be differentiated and the data which is most useful for the particular application can be extracted from huge amount of telecom data which is further analyzed and transformed in the format suitable for data mining process using various methods and algorithms. This paper describes about various types of telecommunication data used in telecommunication data mining. Further describes about the methods used to uncover the most relevant information lying within the telecommunication data. Different methods have been described and their comparativeness in the various applications has been validated. It also describes about effective use of data mining technique to improve telecom growth in the market and to made telecommunication fraud analysis and marketing.*

Keywords— Telecommunication Data, Data Mining, Fraud Analysis, Mining Techniques

I. INTRODUCTION

In telecommunication industry there is a wide availability of huge amounts of data of various types and there is a need for transforming those data into relevant information hence data mining conceptual theory and techniques are used to extract the data which is most relevant for the particular application. Data mining [11][31] is the process of extracting relevant information in the huge volumes of data sets[1][5]. Data mining is a part of the overall process of KDD (Knowledge Discovery in databases) which is a research area that considers the analysis of large databases in order to identify valid, useful, meaningful, unknown, and unexpected relationships. It includes the tasks of data cleaning and integration, data selection, data transformation, data mining, and presentation [5]. KDD process consists of continuous sequence of following steps:

1. Data Cleaning: To remove in conformable, in applicable, noisy and missing values from data array
2. Data Integration: integrating multiple data of array.
3. Data Selection: extracting the most useful data for the problem analysis process
4. Data Transformation: transforming the information extracted to undergo data mining process
5. Data Mining: extracting the suitable information for the problem analysis using methods
6. Data output Evaluation: suitable data outputs are to be identified for the problem analysis.

II. TYPES OF TELECOMMUNICATION DATA

Telecommunication industries originates tremendous amount of data which is to be identified and the relevant data can be analysed. Features of data can be extracted in the form suitable to undergo data mining. For the data mining process [11] it is essential to understand about the data and also useful applications can be developed using those data. Suitable transformation steps are used if the raw data is used in data mining [1][5]. There are following three types of telecommunication data are used for data mining.

2.1 Network Data

Telecommunication networks are consists of thousands of interconnected components. Each network element is generating tremendous volumes of network data stored in the form of error and status messages [15]. The stored data must analyse in order to support network management functions, such as fault isolation. It is difficult to handle large volumes of network messages so expert systems have been developed to analyse the network data and the generated data stream must be transform in the form suitable to undergo in the process of data mining.

2.2 Customer Data

Telecommunication companies have millions of customers. The customer's data base includes name, address, family income, service plan, contract, credit score and payment history. This information may be accompanied with data from credit reporting agencies. The customer data maintained by telecommunication businesses does not significantly differ from that maintained in most other industries hence to improve the overall performance, customer data along with other useful related data can be used. For example, customer data is typically used to supplement call detail data when trying to identify phone fraud.

2.3 Call Detail Data

The complete detail information about the call as call detail data is stored in telecommunication network. Huge call detail records are generated are stored which includes the originating and terminating phone numbers, date time and duration of the call. The generated call detail records are kept online for the period of some months and it is not used directly for data mining but the call detail records associated at customer level can be extracted for data mining that describes the customer's calling behaviour.

III. DATA MINING APPLICATIONS IN TELECOMMUNICATIONS

The telecommunications industry was an early adopter of data mining technology and therefore many data mining applications exist. These applications are divided into three application areas: network fault isolation & prediction, marketing/customer profiling, customer churn management and fraud analysis & detection [1].

3.1 Network Fault Isolation & prediction

Telecommunication networks are extremely complex configurations of hardware and software. Most of the network elements are capable of at least limited self-diagnosis, and these elements may collectively generate millions of status and alarm messages each month. In order to effectively manage the network, alarms must be analysed automatically in order to identify network faults in a timely manner—or before they occur and degrade network performance. A proactive response is essential to maintaining the reliability of the network. Because of the volume of the data, and because a single fault may cause many different, seemingly unrelated, alarms to be generated, the task of network fault isolation is quite difficult. Data mining has a role to play in generating rules for identifying faults. The Telecommunication Alarm Sequence Analyser is one tool that helps with the knowledge acquisition task for alarm correlation This tool automatically discovers recurrent patterns of alarms within the network data along with their statistical properties, using a specialized data mining algorithm. Network specialists then use this information to construct a rule-based alarm correlation system, which can then be used in real-time to identify faults.

3.2 Marketing/ customer profiling

Telecommunication companies maintain a great deal of data about their customers and also store call detail records, which precisely describe the calling behavior of each customer. In the telecommunications industry, it is often useful to profile customers based on their patterns of phone usage, which can be extracted from the call detail data. These customer profiles can then be used for marketing purposes, or to better understand the customer, which in turn may lead to better forecasting models. In order to effectively mine the call detail data, this information can be used to profile the customers and these profiles can then be used for marketing and/or forecasting purposes

3.3 Customer churn management

Customer churn is a most important problem in telecommunication industry which involves a customer leaving telecommunication industry leads to loss in revenue and high cost of attracting new customers. Data mining techniques permit companies the ability to mine data in order to predict when a customer is likely to leave. These techniques typically utilize billing data, call detail data, subscription information incudes calling plan, features, and contract expiration data and customer information. In the telecommunications industry, customers profile based on their patterns of phone usage can be extracted from the call detail data which can then be used for marketing purposes, leads to better forecasting models. In order to effectively mine the call detail data.

3.4 Fraud analysis & detection

Fraud is a severe issue in telecommunication industries, leading to heavy loss in telecommunication revenue. the performance of a fraud detection system should be computed at the customer level, not at the individual call level. Fraud can be divided into two categories: subscription fraud and superimposition fraud [28]. Subscription fraud occurs when a customer opens an account with the intention of never paying for the account charges. Superimposition fraud involves a genuine account with some valid activity, but also includes some superimposed illegal activity by a person other than the account holder. Superimposition fraud poses a bigger problem for the telecommunications industry hence it is very important for identifying the fraud activity using call detail records. The detected fraud triggers some action which proximately deactivates the account. The data mining application analyse huge amounts of cellular call data in order to identify fraud patterns. These patterns were then used to generate monitors, each of which observes a customer's behaviour with respect to one pattern of fraud [29]. These monitors were then fed into a neural network. Data mining can also help detect fraud by identifying and storing those phone numbers called when a phone is known to be used fraudulently. Fraud applications have some characteristics that require modifications to standard data mining techniques.

IV. DATA MINING TECHNIQUES

Determination of relevant data from the tremendous amount of data generated by the telecommunication industries is possible using various data mining techniques [3][5]. The different data mining techniques[36] includes decision tree, association rules , neural networks, Rough Sets and Classification and Regression Trees (CART), Self-Organizing Map (SOM) ,fuzzy clustering, Classification, Regression, Rule generation, Sequence analyses, genetic algorithms, Forecasting Process[2][11].

A. Classification and Regression Trees (CART)

Classification and regression trees are aset of techniques for classification and prediction. it provide most useful visual means for interpreting the data set further their information can be represented in plain language rules that protect the names of the variables original measurement.

B. Self-Organizing Map (SOM

It is a clustering algorithm that is used to map a multi-dimensional dataset onto a (typically) two-dimensional surface. It is a best visualization tool for data which shows data set visually as a two-dimensional map.

C. Fuzzy Clustering(FC)

The functionality of this technique is mapping of a data item into one of several clusters where clusters haven't existed before and are natural grouping of data items based on similarity standard or probability density models. Clustering can be considered the most important unsupervised learning problems. It deals with finding a structure in a collection of unlabelled data. A loose definition of clustering cloud is "The process of organization objects into groups whose members are similar in some way". A cluster is therefore a collection of objects which are "similar" between them and are "dissimilar" to the object blogging to other clusters.

D. Decision trees(DT)

Decision trees are normally used for classification purposes. These are tree shape structures resulted by the decision taken at each node. Different decision tree methods used as a data mining technique are Classification and regression Trees (CART) and Chi Square Automatic Interaction Detection (CHAID).

E. Artificial Neural networks(ANN)

Neural networks, is a very popular AI technique that mimics the working of neurons of human brain. Artificial neural networks are simple computer programs, which can automatically find non-linear relationships in data without any predefined model.

F. Genetic Algorithms(GA)

This is one of the most recent methodologies used as a data-mining tool. Their basis is on the evolutionary computing which becomes very popular within the machine learning methodologies. A genetic algorithm is reminiscent of sexual reproduction in which the genes of two parents combine to form those of their children and only the fittest will survive. The next generation improves and is better than the previous generation only if the strongest members of the population mate together to produce the next generation. The same principle can be applied to problem solving if the population consists of possible solutions to the problem. Genetic Algorithms can be very helpful in finding solutions that are very difficult to optimize .Another advantage of using genetic algorithms is that they can propose many possible solutions of a problem. The main advantage of using genetic algorithms (GAs) is, they can be synthesized without making use of the detailed, explicit knowledge of the underlying process.

G. Association rules(AR)

It is usually employed to discover the relationship between variables in a database, and each relationship (also known as an association rule) may contain two or more features. These relationships are found by analysing the co-occurrences of features in the database. The association rule is used to overcome the business problems a customer relationship used do to the CRM is used to reduction to the problem for business. For example, the customer needs to develop the product and get the credit each transaction which forms a worthy platform for effective making and decisions for "records" customer relationship management. The performance of the integration approach is also compared with a similar approach which uses just relevance in its information extraction process.

H. Forecasting Process

Forecasting techniques are subjective, based on the opinion and judgment of consumers, experts; appropriate when past data is not available. It is usually applied to intermediate-long range decisions. Quantitative forecasting models are used to estimate future demands as a function of past data; appropriate when past data are available. The method is usually applied to short-intermediate range decisions. The process of climate change and increasing energy prices has led to the usage. It is involves the generation of a number, set of numbers, or scenario that corresponds to a future occurrence. It is absolutely essential to short-range and long-range planning.

V. COMPARATIVES OF DATA MINING TECHNIQUES

Broad classification of data mining techniques includes descriptive and predictive techniques. Descriptive Mining technique gives the general properties of data and its summary which includes segmenting customers based on their differences and similarities in the database [6] and finding their association with market data [7]

while Predictive Mining makes predictions on current data. Using predictive data one can predict the value based on existing database including predicting type of transaction either fraudulent or not[9], when a customer will leave an industry[8] and Predictive tasks allow one to predict the best direct service availing customers[10].In achieving efficient quality of service in telecommunication networks, normally Determined using association rules [7], decision tree and neural networks but to achieve data protection and efficiently measure the quality of service in telecommunication networks, Rough Sets and Classification and Regression Trees (CART) is most useful as it provides visual means for interpreting the data set and present in plain language rules which protect the names of the variables original measurement and detects potential outliers in the data [51]. This is well suited for analysing the QOS of single cell in a network and for ruling out the most important KPIs (Key Performance Indicators). The Self-Organizing Map (SOM) is a best visualization tool for data which shows data set visually as a two-dimensional map for visualizing data features and checking a priori decision making[51].it is hard to automate the data mining selection method as it needs priori knowledge of both domain and method when a data set is prepared further pre-processing of data ensures that the methods produce robust and understandable results if fuzzy clustering could be useful for the type of data used for the measurement of QOS in telecommunication network[51]. Temporal data mining can be defined as the activity of looking for interesting correlations or patterns in large sets of temporal data accumulated for other purposes which is fast-developing fields related with analysing and processing of huge volume and high speed data where association rule method is used to identify the statistically collected data attributes[52]. Directed graph approach was used for finding frequent temporal item sets which helps not only to understand about generating frequent large temporal item sets but also helps in discovering interesting temporal association relationships among large amounts of data which in turn helps in marketing, decision making and business management[52]. Prediction of fault-prone codes in large software systems using average-case analysis and rule-based analysis data mining methods improved the estimations and 70% of the defects could be detected by inspecting only 3% of the code [4] further to predict production defects, it is suggested to use file level code churn metrics between successive versions of the software and also to predict local module level defects, it is suggested to build within-company predictors for efficient performance of large telecommunication system[4]. Clustering techniques are organized as partitioning methods, hierarchical methods, density based methods, and grid based methods and model-based methods. Customer segmentation in telecommunication systems can be achieved using k-means clustering technique for grouping customers and used to determine the optimum number of segment and analysis each segment. This algorithm assigns each item into a cluster that has the minimum distance with centroid further cluster analysis is applied to marketing of telecommunications to solve the successfully and efficiently the customers segmentation problems[13]. Intangible assets are a firm's dynamic capability created by core competence and knowledge resources, including organization structure, human competency, R&D innovation capability, customer size, recognizable brand, and market share, etc. evaluation of these intangible assets can be achieved by data mining methods such as decision trees, association rules, genetic algorithms, classification techniques and artificial neural networks[17]. The decision tree (DT) and Multilayer perception neural network (MLP) are the better single classifiers that provide relatively better prediction performances than other single classifiers further hybrid classifiers incudes k-means + DT, DT + DT and, MLP + DT are the best classifiers respectively, in addition to develop the evaluation models, there are other algorithms self-organizing map as clustering technique and genetic algorithms for classification techniques can be employed [17]. Applications of data mining techniques in customer relationship management (CRM)[20][21][6], classification methods were used. Thus, it is not surprising that neural networks were used in a wide range of CRM domains [6]. Decision trees and association rules techniques rank after neural networks in popularity of application in CRM [20][34][12]. a Pearson correlation coefficient based data mining in customer relationship management, for mining large datasets in an organization, the results should be perfect(90% to 95%) using the techniques of organization, categorization, cluster, Forecasting, degeneration, chain detection, revelation using data mining concepts of data sets in an organization[21].Data Mining techniques on the evaluation of telecommunication Churn using soft computing techniques such as neural networks, decision trees, genetic algorithms and neuro-fuzzy systems to identify and understand troublesome customers in order to act upon them before they churn and using the technique models a thorough analysis is performed and hence it was proved that great cost savings can be drawn from well-founded churn retention actions. it is concluded that Among the models, neural networks with 15 hidden units accomplished the best classification, followed somewhat closely by the neuro-fuzzy system and the decision tree. The genetic algorithm based model proved to be ill suited for the data set at hand further validation of the data and modelling procedures with other datasets particularly with a larger monthly churn rate ,a larger number of observations and more available inputs have to be explored [22]. Evaluation of Clustering Telecommunication Data [19] using partition based clustering algorithms in data mining such as k-Medoids and Fuzzy C-Means(FCM)[24],[26]. The telecommunication data taken for the analysis includes the connection oriented broad band data. The distance between the server locations and their connections are taken for clustering. after analysis and comparative studies for this application it is concluded that the performance of k-Medoids algorithm is better than the FCM algorithm for the chosen connection

oriented telecommunication data based on the observation that the computational time of k-Medoids algorithm is less than the FCM algorithm and also it is shown that k-Medoids distribution is even, but the result of FCM has some unequal distributions [24],[25]. Telecommunication fraud has become a major issue as it causes heavy financial lose. User Profiles includes the user's behaviour, characteristics, context, and interaction preferences are used in Telecommunication Fraud Detection [28],[29]. The initial step in this is construction of users' profile and capturing user's behaviours. It uses an unsupervised technique that combine statistical and rule based techniques together in order to make the process of profiling more accurate and adaptable further group profiling will also be adopted to help in the process of detecting internal fraud [27]. Data privacy and security of telecommunication users is one the prime important factor to consider in data mining, privacy-preserving data mining using novel data mining techniques[32],[33] that allow extracting knowledge while trying to protect the privacy of telecommunication users these methods aim at individual privacy while others aim at company privacy. Users may have no idea of which kinds of patterns in their data may be interesting, and hence may like to search for several different kinds of patterns in parallel using various methods such as association, classification and prediction, cluster analysis, outlier analysis, evolution analysis, statistical analysis[30]. Telecommunication industries are using data mining to increase revenues and reduce costs. Data mining can be applied in retail telecommunication industry to improve market campaign. Data mining tools predict forthcoming developments and behaviours, helps organizations to make hands-on knowledge-driven decisions. Applying data mining algorithms [5], the retail telecom industry will gain, sustain and will be more successful in this competitive market [35]. The dynamic fuzzy clustering for the telecommunication companies based on finance condition to evaluate the stock through mining the relative value. The frame of relative value mining is established, the algorithm of fuzzy clustering is employed for efficient performance [40]. Data mining in education, which is the new emerging field, called Educational Data mining where the data can be collected from various educational institutes that reside in their databases. The data can be personal or academic which can be used to understand students' behaviour, to assist instructors, to improve teaching, to evaluate and improve e-learning systems, to improve curriculums and many other benefits. Educational data mining uses many techniques such as decision trees, neural networks, k-nearest neighbour, naïve bayes, support vector machines and many others. Using these techniques many kinds of knowledge can be discovered such as association rules, classifications and clustering [41].

VI. COMPARATIVE TABLES

TABLE-I

Data/Techniques	GA	AR	CART	SOM	DT	FC	ANN
Customer Data	ms	ms	ls	ls	ms	ls	ms
Call Detail Data	ms	ms	ls	ls	ms	ls	ms
Network Data	ms	ms	ms	ms	ns	ms	ms

Note: ms → more suitable, ls → less suitable

TABLE-II

Note: ms→more suitable ,ns→not suitable, ls→less suitable

TABLE-III

Data/Applications	Customer Data	Call Detail Data	Network Data
Marketing	ms	ms	ns
Churn Prediction	ms	ms	ls
Network fault isolation	ms	ns	ms
Fraud analysis and Detection	ls	ls	ms

Note: ms→more suitable ,ns→not suitable, ls→less suitable

TABLE-IV

Data/Applications	Customer Data	Call Detail Data	Network Data
Marketing	AR,,DT,ANN	AR,,DT,ANN	AR,SOM,FC,ANN
Churn Prediction	AR,DT,ANN	AR,DT,ANN	AR,CART,SOM,ANN
Network fault isolation	AR,DT,ANN	AR,DT,ANN	AR,CART,SOM,FC,ANN
Fraud analysis and Detection	GA,AR,ANN	GA,AR,DT	GA,AR,SOM,FC,ANN

VII. CONCLUSION

This paper describes about how data mining is implemented in telecommunication companies. The Telecommunications companies have been one of the early adopters of data mining and have deployed numerous data mining applications. The three important data used as a source in telecommunication companies includes customer data, call detail data and network data were discussed. From the Table I, it is known that the most suitable techniques for the different types of data were discussed it is seems to be that the network data can

be the most suitable data for all data mining techniques and also the most suitable techniques for all the types telecommunication data were seems to be a GA, AR and ANN. From Table II, it is known that the most suitable techniques for all telecommunication applications were seems to be a AR, DT and ANN and also the telecommunication application such as network fault isolation can be the most suitable application which uses all data mining techniques. From Table III, it is known that the most suitable data for the marketing and churn prediction applications are customer data and call detail data. From the Table IV, it describes about the detail about the data and applications uses the data mining techniques. The primary application areas of telecommunications where data mining can be employed are marketing, fraud detection, churn prediction and network fault isolation were discussed. Data mining in the telecommunications industry faces several challenges, due to the size of the data sets, the sequential and temporal nature of the data, and the real-time requirements of many of the applications, hence new methods have been developed and existing methods have been enhanced to respond to these challenges. This paper defines how data mining tools and techniques can be used in telecommunication companies for different types of data to discover and extract useful patterns from very large capacity of dataset in order to find observable patterns, which can help in identifying telecommunication patterns, catching deceitful activities, improving service quality and resource utilization, facilitating multi-dimensional data analysis to improve the understanding of customer behavior. Neural networks can be applied in classification, clustering and prediction. Data mining applications must always consider privacy issues, this is especially true in the telecommunications industry, since telecommunication companies preserve highly private information, such as whom each customer calls. Most telecommunication companies utilize this information carefully and accordingly privacy concerns have thus far been minimized.

REFERENCES

[1] Shu-Hsien Liao, Pei-Hui Chu, Pei-Yuan Hsiao, "*Data mining techniques and applications*" Tamkang University, No. 151, Yingzhuan Rd., Tamsui Dist., New Taipei City 25137, Taiwan, ROC, Elsevier journal, Expert Systems with Applications 39 (2012), 11303–11311

[2] Han Jiawei, Micheline Kamber, "Data Mining: Concepts and Technique". Morgan Kaufmann Publishers,2000

[3] Muhammad Shahbaz, Muhammad Shaheen, Muhammad Aslam, Syed Ahsan, Amjad Farooq, Junaid Arshad, Syed Athar Masood, "Data Mining Methodology in Perspective of Manufacturing Databases" Life Science Journal 2012;9(3):13-22 ISSN:1097-8135

[4] Burak Turhan, Gozde Kocak, Ayse Bener, "Data mining source code for locating software bugs: A case study in telecommunication industry" Dept. of Computer Engineering, Bogazici University, 34342 Istanbul, Turkey, Elsevier journal , Expert Systems with Applications 36 (2009) 9986–9990

[5] Manpreet Kaur Mand, Gunjan, Diana Nagpal, "A View on Data Mining" International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 6, June 2013

[6] Y.Chen,, G.Zhang, D.Hu, and S.Wang, "Customer Segmentation in customer relationship management based on data mining. In Knowledge Enterprise: Intelligent Strategies in Product Design, Manufacturing, and Management", pp.288-293. Boston: Springer.2006.

[7] R Agrawal., and R.Srikant., "Fast algorithms for mining association rules", In Proc. International Conference on Very Large Databases, 1994, pp.487- 499.

[8] C.Wei, and I.Chiu, "Turning telecommunications call details to churn prediction: A data mining approach" Expert Systems with Applications, vol. 23 (2), pp.103-112, Aug.2002.

[9] T. Fawcett, and F. Provost, "Adaptive fraud detection," Data Mining and Knowledge Discovery, vol.1 (3), pp.291-316, Sep.1997.

[10] C.X. Ling, and C. Li, "Applying Data Mining to Direct Marketing" In W. Kou and Y. Yesha (eds.), Electronic Commerce Technology Trends: Challenges and Opportunities, pp.185-198, IBM Press.2000.

[11] P.N. Tan, M. Steinbach, and V. Kumar, "Introduction to Data Mining", 2nd ed., Addison Wesley, 2006.

[12] Muhammad Safeer and Asif Muhammad Malik, "A Step towards Real-Time Customer Relationship Management (CRM)", International Journal of Future Computer and Communication, Vol. 2, No. 6, December 2013.

[13] Luo Ye , Cai Qruru, Xi Haixu, Liu Yijun and Zhu Guangping, "Customer segmentation for telecom with the k-means clustering method", Information Technology Journal 12(3):409-413,2013, ISSN 1812-5638.

[14] Costas S. Iliopoulos, Jalil Asghar Mirza, Arfaat Shah, "Telematics solution for teleco industry in the developing world" ISBN: 978-0-9853483-8-0 ©2013 SDIWC

[15]Sterritt, R., Adamson, K., Shapcott, C., & Curran, E. (2000). "Parallel data mining of Bayesian networks from telecommunication network data". Proceedings of the 14th International Parallel and Distributed Processing Symposium, IEEE Computer Society.

[16] Weiss, G., & Hirsh, H (1998). "Learning to predict rare events in event sequences". In R. Agrawal & P. Stolorz (Eds.), Proceedings of the Fourth International Conference on Knowledge Discovery and Data Mining (pp. 359-363). Menlo Park, CA: AAAI Press.

[17] Yu-Hsin Lu, Yu-Cheng Lin, Yu-Ling Lin, "Intangible Assets Evaluation by Data Mining Technologies" Business and Information 2013 (Bali, July 7-9)
[18] Pui Mun Lee, SIM University [UniSIM], Singapore, "Use Of Data Mining In Business Analytics to Support Business Competitiveness" Review of Business Information Systems – Second Quarter 2013 Volume 17, Number 2
[19] Isinkaye O. Folasade, "Computational Intelligence in Data Mining and Prospects in Telecommunication Industry" Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS) 2 (4): 601-605 © Scholarlink Research Institute Journals, 2011.
[20] E.W.T. Ngai a, , Li Xiu, D.C.K. Chau , "Application of data mining techniques in customer relationship management", Elsevier journal ,Expert Systems with Applications 36 (2009) 2592–2602.
[21] V. VijayaLakshmi, Dr A. Pethalakshmi, "Customer Relationship Management for Product Development Process using Pearson Correlation coefficient with Data Mining Techniques" international journal of enhanced research in management and computer applications,Volume-1,Issue 3, Dec. 2012
[22] Jorge B. Ferreira, Marley Vellasco, "Data Mining Techniques on the Evaluation of Wireless Churn" ESANN'2004 proceedings - European Symposium on Artificial Neural Networks Bruges (Belgium), 28-30 April 2004, d-side publi., ISBN 2-930307-04-8, pp. 483-488.
[23] BERRY, Michael J. A., LINOFF Gordon: "Mastering Data Mining: The Art and Science of Customer Relationship Management", John Wiley & Sons (2000).
[24] Dr. T. velmurugan, "Evaluation of k-Medoids and Fuzzy C-Means Clustering Algorithms for Clustering Telecommunication Data" Vol. 33, No. 2, Dec. 2010, pp. 321-339.
[25] Park, H.S., J.S. Lee and C.H.," A k-Means-Like Algorithm for k-Medoids Clustering and Its Performance", Department of Industrial and Management Engineering, POSTECH, South Korea, Jun, 2009.
[26] Velmurugan. T, "Performance Comparison between k-Means and Fuzzy C-Means Algorithms using Arbitrary Data Points", Wulfenia Journal, Vol 19, No. 8, Aug-2012, pp. 234-241, ISSN: 1561-882X, (Impact Factor : 0.267 by SCIE)
[27] Hebah ElGibreen, King Saud University,Riyadh, "User Profiling in Telecommunication Fraud Detection" Proceedings of First International Online Student Conference On Computer Science 2011 (IIOSCCS '11), July 30-31, 2011,MASAUM Network
[28] O. Abidogun, "Data Mining, Fraud Detection and Mobile Telecommunications: Call Pattern Analysis with Unsupervised Neural Networks," Western Cape, 2005.
[29] W. XU, Y. PANG, J. MA, S.-Y. WANG, G. HAO, S. ZENG, and Y.-H. QIAN4, "Fraud Detection in Telecommunication: A Rough Fuzzy Set Based Approach," in Seventh International Conference on Machine Learning and Cybernetics, Kunming, 2008, pp. 1249-1253.
[30] Dileep Kumar Singh, Vishnu Swaroop, "Data Security and Privacy in Data Mining" International Journal of Computer Trends and Technology- volume4 Issue2- 2013
[31] Larose, D. T., "Discovering Knowledge in Data: An Introduction to Data Mining", John Wiley & Sons, Inc, 2005.
[32] Agrawal, R, and R. Srikant, "Privacy-preserving Data Mining" Proceedings of the ACM SIGMOD Conference, Dallas, TX, May 2000.
[33] Clifton, C., M. Kantarcioglu and J. Vaidya, "Defining Privacy for Data Mining," Purdue University, 2002 (see also Next Generation Data Mining Workshop), Baltimore, MD, November 2002.
[34] Sunil Yadav, Aaditya Desai, Vandana Yadav, "Knowledge Management in CRM using Data mining Technique" International Journal of Scientific & Engineering Research, Volume 4, Issue 7, July-2013, ISSN 2229-5518
[35] Bharati M. Ramageri, Dr. B.L. Desai, "role of data mining in retail sector" International Journal on Computer Science and Engineering (IJCSE) Vol. 5 No. 01 Jan 2013
[36] Jiawei Han and Micheline Kamber (2006), "Data Mining Concepts and Techniques", published by Morgan Kauffman, 2nd edn.
[37] Step by step Data Mining guide, http://www.crisp-dm.org/CRISPWP-0800.pdf, retrieved on Jan 2010
[38] Ms. Madhu S. Shukla, Mr. Kirit R. Rathod, "Stream Data Mining and Comparative Study of Classification Algorithms" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 3, Issue 1, January -February 2013, pp.163-168
[39] Tusharkumar Trambadiya, Praveen Bhanodia, "A Comparative study of Stream Data mining Algorithms" International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 3, September 2012.
[40] Jianfeng Li, Jun Zhai, Junfeng Guo, "Relative Value Mining in Stock Market Based on Fuzzy Clustering Method" CCA 2013, ASTL Vol. 17, pp. 112 - 115, 2013
[41] Dr. Varun Kumar, Anupama Chadha, "An Empirical Study of the Applications of Data Mining Techniques in Higher Education" (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 2, No.3, March 2011

[42] Firdhous, M. F. M. (2010)." Automating Legal Research through Data Mining". International Journal of Advanced Computer Science and Applications - IJACSA, 1(6), 9-16.
[43] K. H. Rashan, Anushka Peiris, "Data Mining Applications in the Education Sector", MSIT, Carnegie Mellon University, retrieved on 28/01/2011
[44] Longbing Cao, Senior Member, IEEE, "Domain-Driven Data Mining: Challenges and Prospects" IEEE transactions on knowledge and data engineering, Volume. 22, no. 6, June 2010
[45] L. Cao, "Data Mining and Multi-Agent Integration" , Springer, 2009
[46] L. Cao, P. Yu, C. Zhang, and Y. Zhao, "Domain Driven Data Mining". Springer, 2009.
[47] L. Cao, Y. Zhao, and C. Zhang, "Mining Impact-Targeted Activity Patterns in Imbalanced Data" IEEE Trans. Knowledge and Data Eng., vol. 20, no. 8, pp. 1053-1066, Aug. 2008.
[48] Aggarwal, C. (Ed.). (2007). "Data Streams: Models and Algorithms" New York: Springer. Alves, R., Ferreira, P., Belo, O., Lopes, J., Ribeiro, J., Cortesao, L., & Martins, F. (2006). Discovering telecom fraud situations through mining anomalous behavior patterns. Proceedings of the ACM SIGKDD Workshop on Data Mining for Business Applications (pp. 1-7). New York: ACM Press.
[49] Nergis Yılmaz and Gülfem Işıklar Alptekin, "The Effect of Clustering in the Apriori Data Mining Algorithm: A Case Study" Proceedings of the World Congress on Engineering 2013 Vol III, WCE 2013, July 3 - 5, 2013, London, U.K.
[50] Estevez, P.A., Held, C.M., Perez,C.A.,2006. "Subscription fraud prevention in telecommunications using fuzzy rules and neural networks" Expert Systems with Applications31 (2), 337–344.

ENHANCEMENT OF CORRUPTED IMAGE USING DIFFERENT FILTER

NITI P. GUPTA, NILOFAR A. SHEKH

Electronics & Communication Engineering Dept., SVIT, Vasad, Anand-Gujarat-388306

ABSTRACT— *In this paper, we filter a corrupted image using different type of filters in Matlab Software. There are two parts: First, basics of different type of noise .Another part is the removal of noise through different Filters .The proposed Filter is then implemented on a matlab software & different image is studied. Pictorial quality of the Image is improved by this method.*

Index Terms—Digital image processing, Noise, Filter

I. INTRODUCTION

With widely use of information technology, the use of Image processing is getting Popularity. Image Processing is used in many areas like Medical Science, Astronomy, Military, etc. The main aim of this article is to improve the quality of image by simple and sensitive method using simple filtering techniques.

The first method is to improve the quality of the image by improving the contrast of the image. Contrast improvement means increasing the Dynamic range of the image i.e. Dynamic range=Maximum intensities/Minimum intensities. This can be implemented in matlab (fig1) through the GUI command "imcontrast" .Result is Shown in the fig2

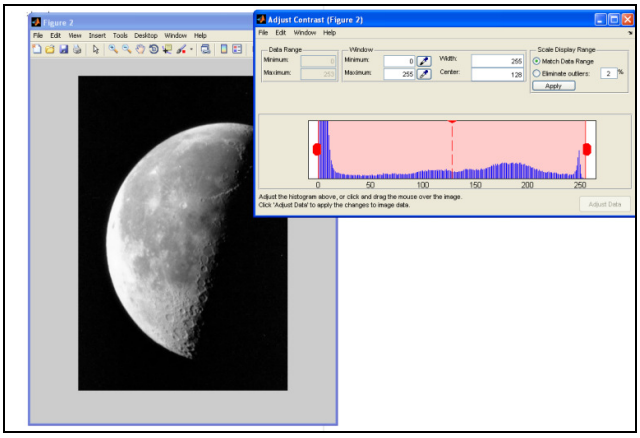


Fig1: Input Image

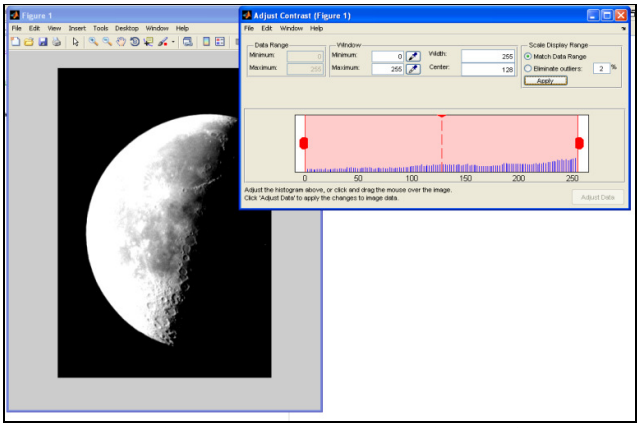


Fig2 shows the high contrast image which is clear from, the Histogram also.

The image is corrupted with the different type of Noises.
The most common model for Noise is Salt & pepper and Gaussian. Gaussian Noise mostly occurs due to factors such as electronic circuit noise & Sensor Noise due to Poor Illumination and high temperature. Salt & pepper noise arises due to quick transient such as faulty Switching take place during Imaging. The PDF function for both type of Noise is shown in the Fig3

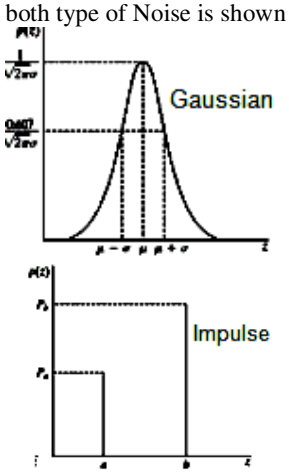


Fig 3: PDF function for noise

To remove different type of Noises, different Filters are used. Some filters are:
i) **Median Filter:** Excellent at noise removal, without the smoothing effects that can occur with other smoothing filters
Particularly good when salt and pepper noise is present.

$$\hat{f}(x,y) = \underset{(s,t)\in S_{xy}}{median}\{g(s,t)\}$$

Where each output pixel contains the median value in the M-by-N neighborhood around the corresponding pixel in the input image it can be implemented in the Matlab by the command

g = MEDFILT2 (f, [M N])

MEDFILT2 pads the image with zeros on the edges, so the median values for the points within [M N]/2 of the edges may appear distorted.
ii) **Weiner Filter**: Adaptive noise-removal filtering.

$$W(f_1,f_2) = \frac{H^*(f_1,f_2)S_{xx}(f_1,f_2)}{|H(f_1,f_2)|^2 S_{xx}(f_1,f_2) + S_{\eta\eta}(f_1,f_2)},$$

- Where S_{xx} (f1,f2), Sηη(f1,f2) are respectively power spectra of the original image and the additive noise, and H(f1,f2) is the blurring filter. H^*(f1,f2) is the complex conjugate of H(f1,f2
- Wiener filter has two separate parts, an inverse filtering part and a noise smoothing part.
- It performs the deconvolution by inverse filtering (highpass filtering) and removes the noise with a compression operation (lowpass filtering).
- In matlab it is implemented by using command

WIENER2 (I, [M N], NOISE) which filters the image using pixel-wise adaptive Wiener filtering, using neighborhoods of size M-by-N to estimate the local
image mean and standard deviation.
iii) Filters are also used to sharpen the image. In Matlab the
Command Fspecial is also used to implement various
Functional Filters.

II. IMPLEMENTATION

Fig4 (a) shows the input corrupted image consisting of mainly Salt & Pepper noise & Gaussian Noise.Fig5 (b) is obtained by median filter of size 5x5 which reduces the effect of Salt & pepper noise. The sharpened filter is implemented through the command Fspecial to sharpen the image. Weiner & Gaussian filter are used to reduce the effect of Gaussian noise

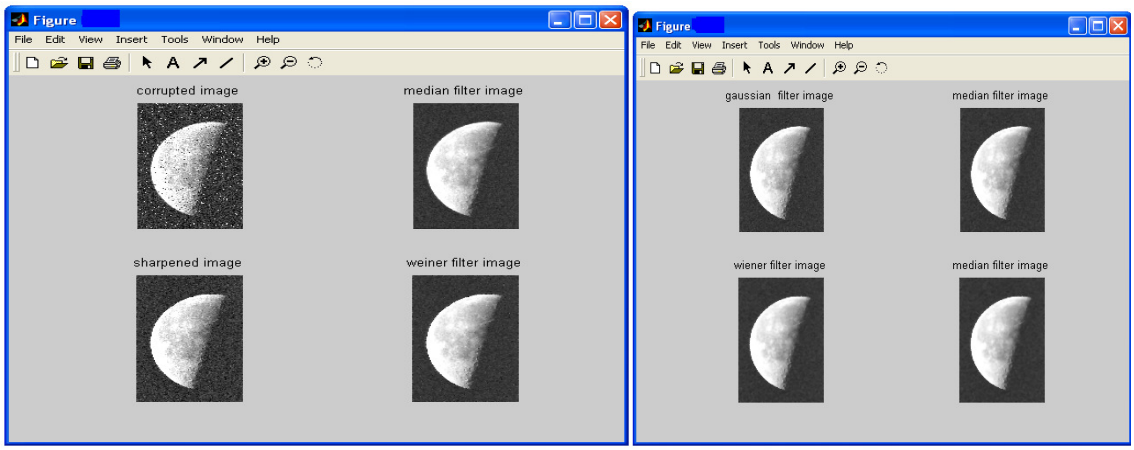


Fig 4: Implementation of Different Filte

III RESULT FIG 5 SHOWS THE COMPARISON BETWEEN THE ORIGINAL & RESTORED IMAGE

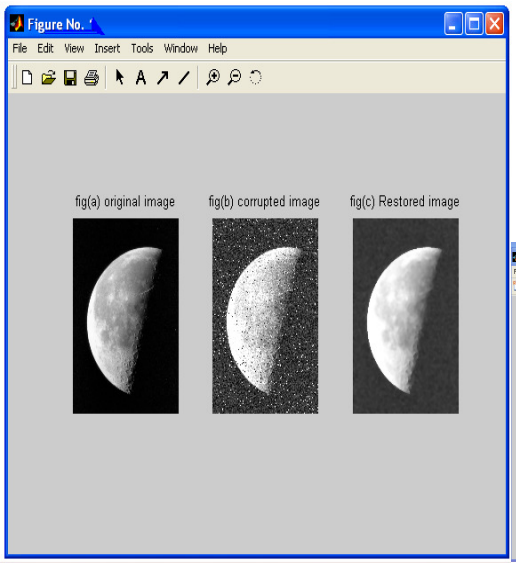


Fig5: Restored Image

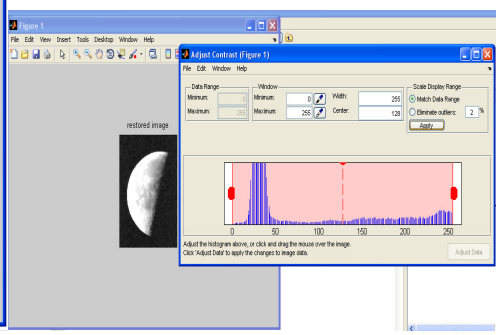


Fig6: Good Contrast Restored Image

Restored image is further enhanced by contrasting the image.

IV.CONCLUSION

The filtering method describe here is simple and effective. This method is highly flexible as it is Possible to include as many operations as needed simply by designing Filters.

V. REFERENCES

[1] R. C. Gonzalez and R. E. Woods, Digital Image Processing. Prentice Hall, second ed., 2002.
[2] Richard Huntrods, " Digital Image Processing Focusing on Special Domain Filters" February 11, 2012
[3] C. Khare and K. K. Nagwanshi, "Implementation and analysis of image restoration techniques", International Journal of Computer Trends and Technology, May to June 2011.
[4]Feng Xiao, Mingquan Zhou, and Guohua Geng, "Detail Enhancement and Noise Reduction with Color Image Detection Based on Wavelet Multi-scale," 2011, pp. 1061-1064.
[5]'Bhabatosh Chanda and Dwijest Dutta Majumder, 2002,Digital Image Processing and Analysis

DENOISING OF ULTRASOUND IMAGES USING WAVELET TECHNIQUES

[1] KINITA B VANDARA, [2] DR. G. R. KULKARNI

[1] Research Scholar, Department of Electronics and Communication, Shri J.J.T.University, vidyanagari, jhunjhunu, rajasthan
[2]Principal, Kalol Institute of Technology & Research Centre, Kalol-382721 (GUJARAT)

[1]kinitawandra.er@gmail.com, [2] grkulkarni29264@rediffmail.com

ABSTRACT*- Medical imaging is the technique and process used to create images of the human body or parts for clinical purposes (medical procedures seeking to reveal diagnose or examine disease) or medical science including the study of normal anatomy and physiology. To achieve the best possible diagnoses it is important that medical images be sharp, clear, and free of noise and artifacts. While the technologies for acquiring digital medical images continue to improve, resulting in images of higher and higher resolution and quality, noise remains an issue for many medical images. Removing noise or restore the image remains one of the major challenges in the study of medical imaging.*

Keywords- Wavelet trasform, Ultrasound Images, Image denoising, Thresolding method of denoising

1. INTRODUCTION

Ultrasound is a noninvasive, low cost, portable, real-time and non-ionizing pulse-echo imaging modality, predominantly used as a diagnostic tool in modern medicine. The technology is relatively inexpensive and portable, especially when compared with other imaging techniques such as magnetic resonance imaging (MRI) and computerized tomography (CT). It has no known long-term side effects and rarely causes any discomfort to the patient. Since it does not use ionizing radiation, ultrasound yields no risks to the patient. It provides live images, where the operator can select the most useful section for diagnosing thus facilitating quick diagnoses.
Ultrasound images are affected by Speckle noise. Speckle is a complex phenomenon, which degrades image quality with a backscattered wave appearance which originates from many microscopic diffused reflections those pass through internal organs and makes it more difficult for the observer to discriminate fine detail of the images in diagnostic examinations. The acquired image is thus corrupted by a random granular pattern that delays the interpretation of the image content and reduces ability to detect the features of interest. In medical literature also referred to as "texture", may present useful diagnostic information. For proper diagnosis of disease it is necessary to remove noise by preserving useful information for diagnosis. Thus, restoration or reducing these speckle noise from a noisy image has become the predominant step in medical image processing.

II. PRINCIPLES OF DISCRETE WAVELET TRANSFORM

The Discrete Wavelet Transform (DWT) of image signals produces a non-redundant image representation, which provides better spatial and spectral localization of image formation, compared with other multi scale representations such as Gaussian and Laplacian pyramid. Recently, Discrete Wavelet Transform has attracted more and more interest in image de-noising [3]. The DWT can be interpreted as signal decomposition in a set of independent, spatially oriented frequency channels. The signal S is passed through two complementary filters and emerges as two signals, approximation and Details. This is called decomposition or analysis. The components can be assembled back into the original signal without loss of information. This process is called reconstruction or synthesis. The mathematical manipulation, which implies analysis and synthesis, is called discrete wavelet transform and inverse discrete wavelet transform. An image can be decomposed into a sequence of different spatial resolution images using DWT. In case of a 2D image, an N level decomposition can be performed resulting in 3N+1 different frequency bands namely, LL, LH, HL and HH as shown in figure 1. These are also known by other names, the sub-bands may be respectively called a^1 or the first average image, h^1 called horizontal fluctuation, v^1 called vertical fluctuation and d^1 called the first diagonal fluctuation. The sub-image a^1 is formed by computing the trends along rows of the image followed by computing trends along its columns. In the same manner, fluctuations are also created by computing trends along rows followed by trends along columns. The next level of wavelet transform is applied to the low frequency sub band image LL only. The Gaussian noise will nearly be averaged out in low frequency wavelet coefficients. Therefore, only the wavelet coefficients in the high frequency levels need to be threshold.

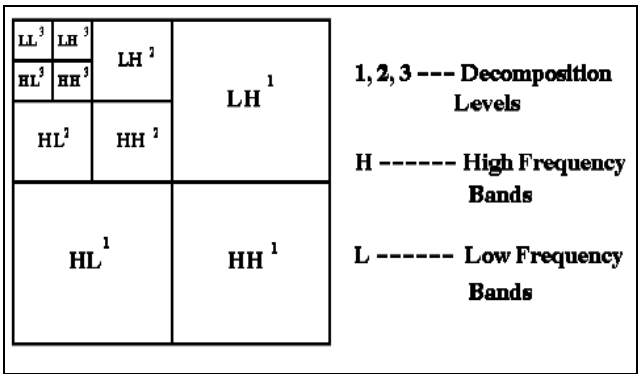


Figure 1: 2D-DWT with 3-Level decomposition

III. WAVELET THRESHOLDING

Image denoising algorithm attempts to remove this noise from the image. Ideally, the resulting de-noised image will not contain any noise or added artifacts. De-noising of natural images corrupted by Gaussian noise using wavelet techniques is very effective because of its ability to capture the energy of a signal in few energy transform values. The methodology of the discrete wavelet transform based image de-noising has the following three steps as shown in figure 2.

1. Transform the noisy image into orthogonal domain by discrete 2D wavelet transform.
2. Apply hard or soft thresholding the noisy detail coefficients of the wavelet transform
3. Perform inverse discrete wavelet transform to obtain the de-noised image.

Here, the threshold plays an important role in the denoising process. Finding an optimum threshold is a tedious process. A small threshold value will retain the noisy coefficients whereas a large threshold value leads to the loss of coefficients that carry image signal details.

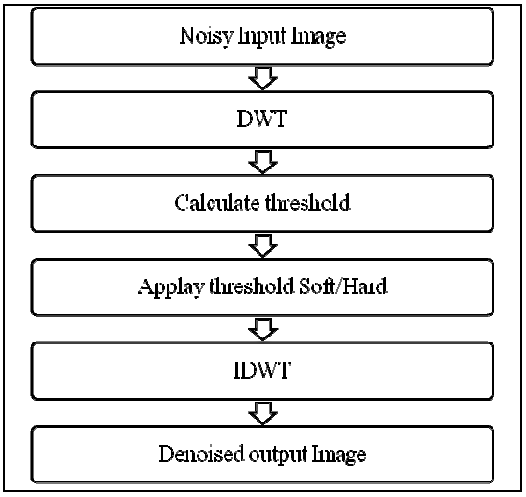


Figure2: Diagram of wavelet based image Denoising

A common approach for image de-noising is to convert the noisy image in to a transform domain such as wavelet and then compare the transform coefficients with a fixed threshold [3].

A number of wavelet thresholding techniques were considered for comparing the results with the proposed methods. They are briefed below.

Denoising based on threshold of wavelet transform

The basic theory for the thresholding of the wavelet of wavelet coefficients is supposing that there are a number of wavelet coefficients which are polluted seriously very small or near zero. So a threshold can be used to remove the polluted points in order to remove the noise.

This threshold may be divided in two categories:

• Soft threshold: The soft threshold makes the model which is smaller than the threshold of the wavelet coefficients replaced by zero [4].

The soft thresholding operator is defined as:

$$y = sign(x)(|x| - T) \qquad (1)$$

• Hard threshold: the hard threshold retains the model whose value is greater than the threshold of wavelet coefficients, and makes the model whose value is smaller than the threshold [1].

The hard threshold operator is defined as:

$$y = x \text{ if } |x| > T$$
$$y = 0 \text{ if } |x| < T \qquad (2)$$

where x is the input signal, y is the signal after threshold and T is the threshold level.

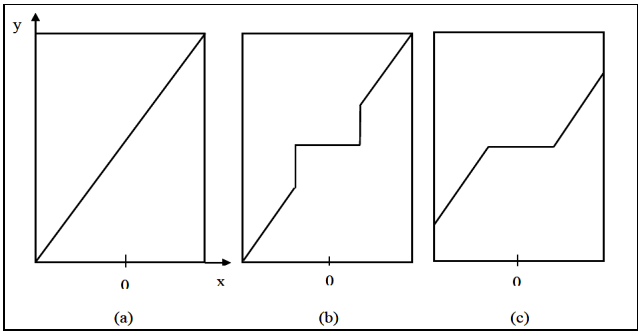


Figure.3 Threshold types: (a) Original signal; (b) Hard; (c) Soft

The hard type does not affect the coefficients that are greater than the threshold level, whereas the soft type causes shrinkage to these coefficients. In the present work, both types of threshold are evaluated but hard thresholding may create abrupt artifacts because of its discontinuous nature. The reconstructed image is a de-noised estimate of x, which is produced by the inverse DWT.

$$\hat{x} = w^{-1}\hat{y} \qquad (3)$$

Where $\hat{y}$ consists of the threshold sub bands of the noised image. The threshold level is estimated by various methods called thresholding criteria, which are based on the minimization of the averaged squared error.

$$\arg\min\left[\frac{1}{N}\sum_i \left(\hat{Y}_i - X_i\right)^2\right] \qquad (4)$$

Where X_i and $\hat{Y}_i$ are all the detail sub bands coefficients of the original image and the noised image after thresholding respectively.

Denoising based on Bayesian threshold

Based on the Bayes rule this is another technique to find out the threshold for image de-noising in the wavelet domain. Bayes Rule allows us to write the expression for the estimated image in terms of probability densities of the noise and signal.[7]
The threshold equation is given as:

$$T_B\left(\sigma_X\right) = \frac{\sigma^2}{\sigma_X} \qquad (5)$$

The Bayesian threshold described above provides a natural extension for incorporating the higher order statistical regularity present in the statistics of sub band representations.

IV. PERFORMANCE PARAMETER

Traditionally, image quality has been evaluated by human subjects. This method, though reliable, is expensive and too slow for real world applications, so there is computational models that can automatically predict perceptual image quality which known as image quality assessment techniques. Where $x(m,n)$ denotes the samples of original image, $\hat{x}(m,n)$ denotes the samples of distorted image. Where *M* and *N* are number of pixels in row and column directions, respectively, the techniques that used to assess the quality of images are:

1. Mean Square Error (MSE)

The simplest of image quality measurement is Mean Square Error (MSE). The large value of MSE means that image is poor quality. MSE is defined as follow:

$$MSE = \frac{1}{MN}\sum_{m=1}^{M}\sum_{n=1}^{N}\left(x(m,n) - \hat{x}(m,n)\right)^2$$

2. Peak Signal to Noise Ratio (PSNR):

A high quality image has small value of Peak Signal to Noise Ratio (PSNR) . PSNR is defined as follow:

$$PSNR = \left[10Log\frac{255^2}{MSE}\right]$$

3. Correlation Coefficient

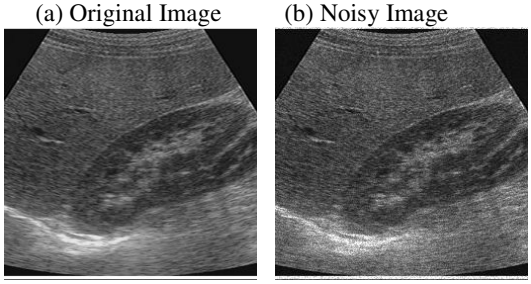
Correlation Coefficient gives value of correlation between original and targeted image. If Correlation Coefficient is nearer to 1 then original and targeted images are tends to identical and vice-versa if Correlation Coefficient is nearer to 0.

V EXPERIMENTAL ANALYSIS AND DISCUSSION

The above image de-noising methods were applied to a Ultrasound image. First the image was contaminated with a The above image de-noising methods were applied to a MRI image. First the image was contaminated with Speckle noise using the MATLAB software. The noisy image was then discrete wavelet transformed. The threshold estimation is either detail or sub band level dependent. The proposed methods are tested for various thresholding criteria and use soft thresholding to provide smoothness and better edge preservation, avoiding the discontinuity character of the hard thresholding methods. The better result is obtained using Bayes Thresholding method. The results were compared on the basis of PSNR, MSE, and Correlation coefficient. The respective values are listed in the table below:

Experimental results

(a) Original Image (b) Noisy Image



Denoising Using


(c) Soft thresholding **(d) Hard thresholding**

(e) Bayes Thresholding

Figure 4. Outputs of Ultrasound Kidney Image

Table 5.1 Compositional outputs of Ultrasound Kidney image

	MSE	PSNR	COC
Noisy Image	184.1165	25.4799	0.9484
Soft thresholding	253.5214	24.0907	0.9269
Hard Thresholding	160.8662	26.0662	0.9525
Bayes Thresholding	124.2448	27.1880	0.9640

VI CONCLUSION

All these methods are based on the application of wavelet transforms after performing the experiment for our ultrasound image, experiment results are evaluated on visual and performance parameter. This is due to the fact that the threshold does not depend on the content of the image; rather it depends on the size of image. While comparing the three alternatives to calculate threshold, the performance of BayesShrink in terms of image quality and smoothness, is better when compared to others techniques.. Better performance can be achieved in BayesShrink thresholding and also The highest PSNR and COC is obtained for Second level of DWT decomposition. Among the DWT used, db4 wavelets performed better.

REFERENCES

BOOKS:

[1] Rafael Gonzalez, Richard E. Woods, Digital Image Processing, Second Edition, Pears on Education, 2002.

[2] Rafael Gonzalez, Richard E. Woods, Digital Image Processing using MATLAB, low price Edition,, Pears on Education, 2004.

[3] Jain AK, Fundamentals of Digital Image Processing, Prentice Hall, 1989.

[4] Atam P.Dhavan, H.K.Haung, Dae-Shik Kim "principles and advance methods in medical imaging and image analysis"

PAPERS:

[1] S.Sudha, G.R.Suresh and R.Sukanesh" speckle noise reduction in ultrasound images using context-based adaptive wavelet thresholding. Downloaded free from http://www.jr.ietejournals.org on Friday, November 06, 2009].

[02]Charu Khare, Kapil Kumar Nagwanshi, "Implementation and Analysis of Image Restoration Techniques", International Journal of Computer Trends and Technology- May to June Issue 2011.

[03] S.Kalaivani Narayanan and R.S.D.Wahidabanu, "A View on Despeckling in Ultrasound Imaging", International Journal of Signal Processing, Vol. 2, No.3, September 2009.

[04] Mark R. Banham and Aggelos K. Katsaggelos, "Spatially Adaptive Wavelet-Based Multiscale Image Restoration", IEEE TRANSACTIONS ON IMAGE: PROCESSING, VOL. 5, NO. 4, APRIL 1996.
[05] Alireza Mallahzadeh, Hamid Dehghani, and Iman Elyasi, "Multiscale Blind Image Restoration with a New Method", International Journal of Electrical and Electronics Engineering 2:8 2008
[06] S.Sudha, G.R.Suresh and R.Sukanesh, "Speckle Noise Reduction in Ultrasound Images by Wavelet Thresholding based on Weighted Variance", International Journal of Computer Theory and Engineering, Vol. 1, No. 1, April 2009.
[07] K. Karthikeyan, Dr. C. Chandrasekar " A Study on the Application of Wavelets for Despeckling Ultrasound Images" International Journal of Computer Information Systems, Vol. 1, No. 5, 2010
[08] Iman Elyasi, and Sadegh Zarmehi, "Elimination Noise by Adaptive Wavelet Threshold", World Academy of Science, Engineering and Technology 56 2009.
[09] R. Sivakumar and D. Nedumaran "Comparative study of Speckle Noise Reduction of Ultrasound B-scan Images in Matrix Laboratory Environment" International Journal of Computer Applications (0975 – 8887), Volume 10– No.9, November 2010.
[10] J.S. Lee, "Speckle analysis and smoothing of synthetic aperture radar images," Comp. Graphics Image Process., vol. 17, pp. 24-32, 1981
[11] Donoho, D.L. (1992) De-noising by soft-thresholding, IEEE Transaction on Information Theory, Vol.41, No.3, Pp.613-627.
[12] S.Kalaivani Narayanan and R.S.D.Wahidabanu, "A View on Despeckling in Ultrasound Imaging", International Journal of Signal Processing, Vol. 2, No.3, September 2009.
[13] Donoho, D.L. and Johnstone, I.M. (1995) Adapting to unknown smoothness via wavelet shrinkage. Journal of the American Statistical Association, Vol. 90, No. 432, Pp. 1200-1224.
[14] M. Nikpour, H. Hassanpour, "Using diffusion equations for improving performance of wavelet-based image denoising techniques", Published in IET Image Processing.

WEB SITES:

[1]Ultrasound[Online].Available: http://en.wikipedia.org/wiki/Ultrasound.
[2]Wavelet[Online]Available: http://en.wikipedia.org/wiki/Wavelet
[3] Noise in Image [Online] Available:
http://www.mathworks.in/help/toolbox/images/ref/imnoise.html
[4] General Ultrasound Imaging [Online] Available:
http://www.radiologyinfo.org/en/info.cfm?pg=genus

COMPARATIVE STUDY ON THE BANDWIDTH IMPROVEMENT IN STACKED PATCH ANTENNA BASED ON VARIOUS DESIGN CONFIGURATIONS

[1] MS. S.H KUNDALIA, [2] MS.S.R LATHIGARA, [3] PROF. VIVEK UNADKAT

[1, 2] PG Student, Department of Electronics & communication Engineering, Atmiya Institute of Technology & Science, Rajkot, Gujarat, India
[3] Asst. Professor, Department of Electronics & communication Engineering, Atmiya Institute of Technology & Science, Rajkot, Gujarat, India

sejalkundalia.8@gmail.com,shreya.lathigara@yahoo.com

ABSTRACT: *In this era of expanding wireless communications, there is increasing need for more compact and wider bandwidth for portable communications systems to respond to the great demand of applications. Conventional microstrip patch antenna provides narrower bandwidth. One way to increase bandwidth is to use stack of patch antennas. In this paper, various designs of stack patch antennas are proposed for the improvement in bandwidth and comparisons and analysis are shown.*

Keywords— Stacked patch Antennas, Bandwidth, Gain, Return loss

I: INTRODUCTION

To overcome this demerit of constricted bandwidth many different configurations such as thicker substrate, various shape patches, probes, slot antennas, loop slot antennas, slot coupled patch antennas, and patch antennas fed by a conductor-backed CPW [8]. However, all the antennas have a shortcoming, i.e. narrow bandwidth of below 5%. Addition of parasitic patches and cutting of slots (include probe-fed U-slot patch antennas double-C patch antennas and E-shape patch antennas) which provide excellent bandwidths have been realized [9]. A stacked patch antenna based on the conventional E-shaped microstrip patch antenna, realizes an input impedance bandwidth of 33.8%. Through the use of the second patch above the E-shaped patch, another resonant point is familiarized to obtain the width input impedance bandwidth of as much as 38.41% [1].

To improve the input impedance bandwidth further, a washer is used on the probe of the stacked patch antenna, compensating for the inductance suffered by the probe and an input impedance bandwidth of 44.9% is thus attained. The stacked E-shaped patch antenna with a washer is perceived to have a lower E and H plane cross-polarization than the other recommended antennas [1]. A comparison of all the different antennas is made in this paper.

A stacked patch antenna created on the conventional E-shaped microstrip patch antenna, realizes an input impedance bandwidth of 33.8% [4]. Through the use of the second patch above the E-shaped patch, another resonant point is presented to obtain the width input impedance bandwidth of as much as 38.41% [1]. To expand the input impedance bandwidth further, a washer is used on the probe of the stacked patch antenna, compensating for the inductance sustained by the probe and an input impedance bandwidth of 44.9% is thus achieved [4]. The stacked E-shaped patch antenna with a washer is perceived to have a lower E and H plane cross-polarization than the other proposed antennas. An assessment of all the various antennas is presented.

I: ANTENNA STRUCTURE

(a) E-shaped patch antenna with a square patch

The geometry of the proposed stacked E-shaped patch antenna is shown in Fig. 1 Instead of using a foam layer as the supporting substrate, the proposed antenna composes of an E-shaped patch antenna, a square patch, and a vertical probe [1]. The eight thin basswoods, which maintain the two patches at the four corners, respectively, are observed experimentally to have no effect on the antenna. The dimensions can be seen from Fig. An air-filled substrate is used and the copper patch thickness is about 0.11 mm [4]. The center frequency is designed at around 5.35 GHz and the heights of the substrate area approximately equal to 3.5 mm and 3.75 mm and are shown in the Fig.1. A standard Surface mounted attachment (SMA) connector is used as a coaxial probe with the diameter of 1.29 mm, which is connected to the E-shaped patch [1].

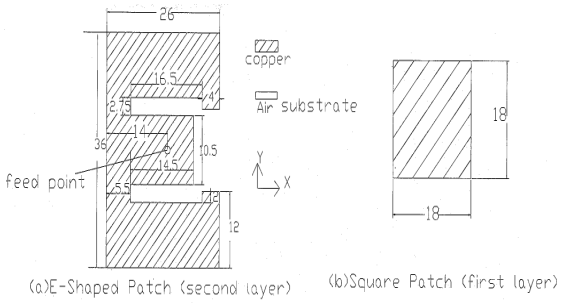


Fig.1 The geometry of the stacked E-shaped antenna (units: millimeters) [1]

(b) Antenna with E shaped upper patch and U slot lower patch

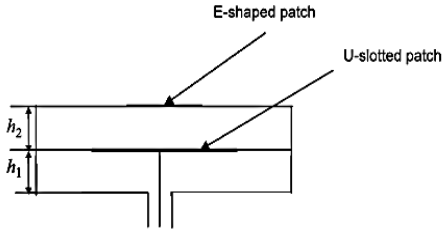


Fig.2 E-shaped stacked patch antenna stacked with U-slotted patch [2]

The configuration of the proposed antenna is shown in Fig 2 This antenna consists of an E-shaped upper patch and a U-slot lower patch fed by a vertical probe which is an addition of the inner conductor of a coaxial feed line [2]. The U-slot is placed on a dielectric substrate with dielectric constant of 1.1 and thickness of 6 mm [2]. To expand the antenna bandwidth, an E-shaped patch with another dielectric substrates stacked on top of the lower U-slot patch [2]. The geometrical shape of the upper patch resembles the letter "E" as two parallel slots are integrated within it [5]. The E-shaped patch is essentially formed by eliminating the lower portion of a U-slot that which has a low current distribution [2].

So, in the subsequent antenna structure, more parameters can be varied than with a simple patch stacking [2]. In this case careful optimization can be applied to govern the coupling level between the patches to enhance the antenna bandwidth without separating the operation band [2]. A further increase in the bandwidth is also possible through incorporating a small washer to cancel the reactance of the probe at the expense of increased difficulty of the design and fabrication [2]-[5].

(c) U shaped patch antenna with a square patch

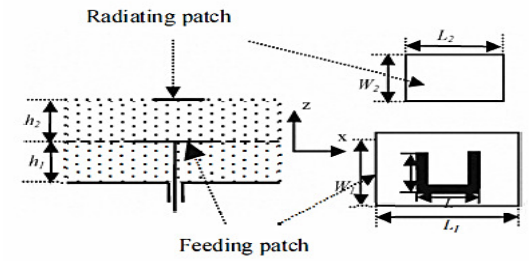


Fig.3 Geometry of a double layer u-slotted rectangular patch stacked with simple rectangular patch [3]

The proposed antenna structure involves a probe-feed dual-patch arrangement in a stacked configuration [3].Several parameters such as patch sizes, substrate thickness, dielectric constant and feed position must be elevated to attain good impedance bandwidth and antenna operation [6]. In this simulation, a coaxial probe feed is used which is one of the most widespread feeding advances due to ease in impedance matching and low spurious radiation. Nevertheless, it presents an inductive part into the input impedance, which increases with the decrease of the probe radius.so, the probe radius also has a major effect on antennas operation.

III: SIMULATED RESULTS & DISCUSSIONS

The computer simulation using IE3D is performed [1]. The parameter of the proposed antenna is measured using an HP8510 A network analyzer [1]. The simulated result of the VSWR of the E-shape stacked patch antenna as compared with the measured result is given in Fig.4. As shown in Fig. the measured input impedance bandwidth (VSWR) is about 38.41% and approximately 38.07% in the simulated result. The slight shift of the simulated VSWR is mainly due to the inappropriate modeling of the probe [1].

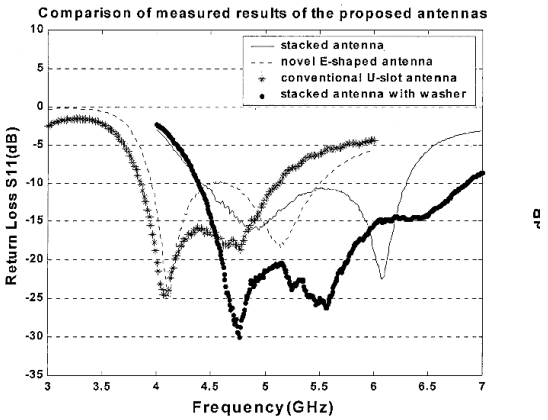


Fig.4 measured results of the stacked E-shaped
Patch antenna, stacked E-shaped patch antenna with washer, the E-shaped patch antenna and the conventional U-slot patch antenna. [1]

Fig. 5 shows the simulated and measured return loss curves. The 10 dB return loss is from 3.275–6.07 GHz (measured) and 3.27–5.85 GHz (simulated)[7]. The observed measurement confirms the wideband characteristic of the proposed design predicted by the simulation, with a slight divergence which is probably due to faultiness in the fabrication process [6].

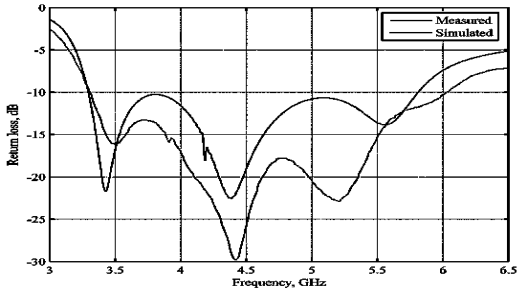


Fig.5 The measured and simulated return loss against frequency for U slot with E slot antenna [2]

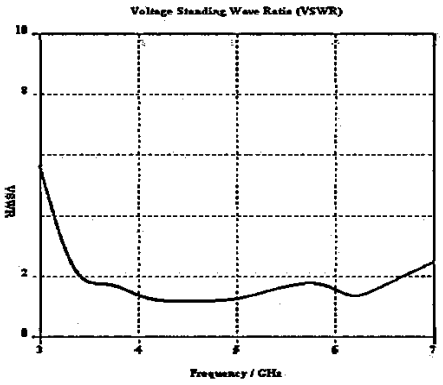


Fig.6 Antenna s VSWR for U shape stacked antenna with different sized patch [3]

The VSWR of this staked patch antenna is shown in Fig.6, where the value is less than 2 in the frequency range 3.4 to 6.8 GHz, corresponding to an impedance bandwidth of 64.3% with the entire bandwidth being 3.4 GHz.A new design of broadband stacked patch microstrip antenna having 64.3% bandwidth is presented [3]. Results obtained from simulations show that the VSWR is 2:1 across the band 3.4-6.8 GHz [3].

TABLE -1 : Comparison of Proposed Antennas

Sr.no	**Antenna designs**	**% bandwidth**	**Return Loss dB**
1.	E-shaped patch using two parallel U-slot patch	49.4	<-20
2.	U-slot patch antenna stacked with E-shaped	59.4	-10
3.	U-slot rectangular patch stacked with upper patch of different size	64.3	-9.5

IV: CONCLUSION

The paper has reviewed comparisons and simulation results for assorted designs of stacked patch antennas over same frequency range. From which we can conclude that the better performance considering bandwidth as a parameter is obtained by U-slot rectangular patch-stacked antenna i.e. 64.3% .Moreover the simulations shows that VSWR< 2 for this antenna design.

REFERENCES

[I]Ban-Leong Ooi, Shen Qin, and Mook-Seng Leong," Novel Design of Broad-Band Stacked Patch Antenna" IEEE Transactions on Antennas and Propagation, Vol. 50, No. 10, October 2002

[2] M. A. Matin, B. S. Sharif, and C. C. Tsimenidis "Probe Fed Stacked Patch Antenna for Wideband ." Transactions on Antennas and Propagation, Vol. 55, No. 8, August 2007.

[3] M. A. Matin, B. S. Sharif and C. C. Tsimenidis

" Dual Layer Electromagnetically Coupled, Stacked Rectangular Microstrip Patch Antenna",.School of Electrical, Electronic and Computer Engineering .

[4] Q. Shen, B. L. Ooi, and M. S. Leong, "A novel E-shaped broadband microstrip patch antenna," in *Proc. Progress Electromagn. Symp.*, July2000.`

[5] K. L. Wong and W. H. Hsu, "A broadband rectangular patch antennawith a pair of wide slits," *IEEE Trans. Antennas Propag.*, vol. 49, no.9, pp. 1345–1347, Sep. 2001

[6] K. H. Pan,1. T. Bernhard and T. Moore, "Effects
Of lossy dielectric materials on microstrip antennas"
inproc. IEEE AP-S Conf Antennas andPropagation for wireless Communications, pp.39-42, Nov. 2000.

[7] *"CST Microwave Studio, User Manual Version 2006,"* CST GmbH,Sep. 2005.

[8] C.H. Cheng, K. Li and T. Matsui "Stacked patch antenna fed by a coplanar Waveguide**"** Vol. 38 No. 25 Dec 2002.

[9] Vivek Unadkat, Ankit Ponkia, "Slotted Circular Microstrip Patch Antenna for Wireless Application", International Journal of Darshan Institute. On Engg. Research & Emerging Technologies Vol 2 No 1, June 2013.

THE EFFECT OF INRUSH CURRENT BEHAVIOR TO REDUCE CORE LOSSES BY ADOPTING NEW MAGNETIC MATERIAL IN TRANSFORMER DURING SWITCHING OPERATION

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[1] V. J.GUNA , [2] PROF. M. Z.THOMAS

[1] M.Tech Student In Electrical Power System, School Of Engineering Rk University, Rajkot , Gujarat , India.
[2]M.Tech (Electrical Power System) Associate Professor, School Of Engineering Rk University, Rajkot, Gujarat, India.

ABSTRACT*— Since independence in India there has always been shortage of electricity and at no point of time we have been able to meet the peak demand. The gap between the demand and generation can be bridged/ minimized by either improving the installed capacity or reducing the consumer demand. The gap between availability & demand is of order 6% as on date. If we take into account the issues like environment pollution and global warming, the preferred option is to increase the energy efficiency or minimize the consumer demand, as in the other alternative particularly in India where thermal generation dominates increased environmental pollution is inevitable. The paper covers design of transformer using a new technology superior magnetic material with thin sheets of lazer grade or amorphous core. Iron Boron Silicon amorphous alloy is a unique alloy whose structure of metal atoms occurs in random patters as opposed to conventional CRGO steel which has an organized crystalline structure. The paper covers design of distribution transformer using conventional material and the new technology improved core materials. The reflection on the no-load and load losses due to change in the material have been worked out. Commercial and technical feasibility for adoption of new technology core material has been detailed out and the payback period is quite attractive. By reducing the regular occurred power loss in the transformer, economy of the power sector and global environmental impact can be improved.*

Index Terms— Core, Copper, Tank, Steel Radiator, Transformer Oil, Power Factor, Losses, Load Factor, Insulation Material. ,CRGO, Lazer Grade, Amorphous

INTRODUCTION

Power transformers are very efficient, with losses of less than 0.5% in large units. Smaller units have efficiencies of 97% or above. It is estimated that transformer losses in power distribution networks can exceed 3% of the total electrical power generated. In India, for an annual electricity consumption of about 500 billion kWh, this would come to around 15 billion kWh. Reducing losses can increase transformer efficiency. There are two components that make up transformer losses. The first is "core" loss (also called no-load loss), which is the result of the magnetizing and de-magnetizing of the core during normal operation. Core loss occurs whenever the transformer is energized; core loss does not vary with load. The second component of loss is called coil or load loss, because the efficiency losses occur in the primary and secondary coils of the transformer [1]. Coil loss is a function of the resistance of the winding materials and varies with the load on the transformer. In selecting equipments, one often conveniently avoids the concept of life cycle costing. But the truth is that even the most efficient energy transfer equipment like a transformer, concept of life cycle cost is very much relevant [2]. The total cost of owning and operating a transformer must be evaluated, since the unit will be in service for decades. The only proper method to evaluate alternatives is to request the manufacturer or bidder to supply the load and no-load losses, in watts [3]. Then, simple calculations can reveal anticipated losses at planned loading levels. Frequently, a small increase in purchase price will secure a unit with lower operating costs. The load profile of electronic equipment from the computer in the office to the variable speed drive in the factory drives both additional losses and unwanted distortion [4]. Transformers are one of the most important components in power systems. Security and stability of transformers are both important and necessary to system operation [5]. Magnetizing inrush is typically considered to occur when a de-energized transformer is energized; magnetizing inrush can also flow after system voltage dips and during post fault voltage recovery [6]. Inrush currents may last from tens of milliseconds to tens of seconds before the steady-state condition is reached. [7] The inrush current is asymmetric and unbalanced among the phases and may place a heavy stress on the network. The transformer inrush currents can have large magnitudes and rich harmonics, which can result in power system

problems such as damage and decreased life expectancy of the transformer due to switching overvoltage .The overvoltage resulting from the inrush current could happen and cause serious damage to power apparatus.

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INRUSH CURRENT THEORY

A. Inrush Current

The saturation of the magnetic core of a transformer is the main cause of an inrush current transient. The saturation of the core is due to an abrupt change in the system voltage which may be caused by switching transients, out-of-phase synchronization of a generator, external faults and faults restoration.

The energisation of a transformer yield to the most severe case of inrush current and the flux in the core can reach a maximum theoretical value of two to three times the rated flux peak how flux-linkage and current relates.

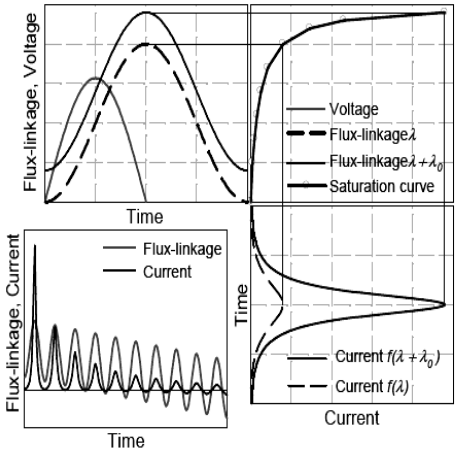


Fig. 1: Qualitative representation of the inrush current phenomenon and effect of the residual flux.

There is no direct evidence that the energisation of a transformer can cause an immediate failure due to high inrush currents. However, insulation failures in power transformers which are frequently energized under no load condition support the suspicion that inrush currents have a hazardous effect.

B. Inrush Phenomena

It has long been known that transient magnetizing inrush currents, sometimes reaching magnitudes as high as six to eight times

the rated current, flow in a transformer winding when switched on to an electric power network. It has not been generally appreciated, however, that the other transformers, already connected to the network near the transformer being switched, may also have a transient magnetizing current of appreciable magnitude at the same time. In order to understand how energizing of a transformer in a network affects the operating conditions of other transformers connected to the same network, consider a network as shown in figure1. When transformer B is switched on to the network already feeding similar transformers (C) in the neighborhoods, the transient magnetizing inrush current of the switched-on transformer also flows into these other transformers and produces in them a DC flux which gets superimposed on their normal AC magnetizing flux

C. Factors Affecting Inrush Phenomenon

a. Switching-on Angle

Inrush current decreases when switching-on angle (on the voltage wave) increases. It is maximum for $\alpha=0°$ and minimum for $\alpha=90°$.

b. Residual Flux Density

Inrush current is significantly aggravated by residual flux density, which depends upon core material characteristics and the power factor of the load at interruption when a transformer was switched off. The instant of switching-off has an effect on residual flux density depending upon the type of load.

The total current is made up of the magnetizing current component and load current component. The current interruption generally occurs at or near zero of the total current waveform. The magnetizing current passes through its maximum value before the instant at which total current is switched off for no load, lagging load and unity power factor load conditions, resulting in maximum value of residual flux density as per B- curve .

c. Series Resistance

The resistance of line between the source and transformer has a predominant effect on the inrush phenomenon. Due to the damping effect, series resistance between the transformer and source not only reduces the maximum initial inrush current but also hastens its decay rate. Transformers near a generator usually have a longer inrush because of low line resistance .Consider a series circuit of two transformers, T feeding T1 as shown in figure 2.5. When transformer T1 is energized, transformer T experiences sympathetic inrush. Resistance between T and T1 contributes mainly to the decay of inrush of T1 (and T) and not the resistance on the primary side of T.

d. Inrush Under Load

If a transformer is switched on with load, the inrush peaks are affected to some extent by the load power factor. When it is switched on under heavy load (large secondary current) with the power factor close to unity, the peak value of inrush current is smaller, and as the power factor reduces (to either lagging or leading) ,the inrush current peak is higher .

D. Inrush Current Mitigation Techniques

The phenomenon of transient transformer inrush currents was first published by Fleming in 1892 .In 1988, the only method to reduce inrush currents was the installation of pre-insertion resistors. This is however not the best solution because they must be included in the circuit breaker design and need a lot of maintenance.

In1988, Moraw et al., introduced the first concept of addressing the cause of inrush currents with the strategy called "point-on-wave controlled switching" transformer is energized phase by phase at the corresponding voltage peak.

Assuming zero residual flux in the transformer core, the moment of energisation is optimal and no transient inrush current will arise. [2] There exists one drawback: The assumption of zero residual flux is slowly true; if the transformer will be de-energized under no-load and if there is no current chopping as well as the transformer has no magnetic coupling between the phases. Finally a much more flexible method called "controlled switching taking into account the residual flux" was presented by Brunke and Fröhlich. Real substations do not consist of ideal components and suffer real conditions.

E. Simulation Of Inrush Current Transients

The inrush current transient occurring at the energisation of a transformer is a highly nonlinear phenomena. The simulation of this behavior is rather complex and a transformer has to be modeled in great detail to represent the nonlinear behavior of the magnetization, losses, and saturation effects in the core.

The main difficulties in the simulation of transformer nonlinearities in EMTP [2] The Thevenin equivalent cannot always be determined due to possible floating network formation. A transformer model for inrush current simulation based on separate magnetic and electric equivalent circuits is proposed in the pscad. The three standard ATP/EMTP models BCTRAN, TRELEG and STC (saturable transformer component) are compared for the calculation of inrush current transients. [1]

REDUCTION OF LOSSES DESIGN STAGE

Design changes to reduce transformer losses, just as in a motor, always involve tradeoffs. For example, consider varying the cross-sectional area of the transformer core. An increase tends to lower no-load loss while raising the winding loss. An increase in volts per turn reduces winding loss.while increasing the core loss. Variation in conductor area and in the electric and magnetic circuit path lengths will affect efficiency in various ways, always leading the designer to seek a cost-effective balance

To raise transformer efficiency, core loss has probably drawn the most attention. Core construction permits two important energy-saving features not applicable to industrial motors. First, the inherent co linearity between lamination orientation and the magnetic field direction allows use of grain oriented steel for transformer laminations. That greatly reduces hysteresis loss in the core-the energy required to cyclically realign the "molecular magnets" within the steel, which are randomly positioned in a non-oriented material.

Second, because laminations are sheared or slit in strips rather than being punched with slots, much thinner material can be used in a transformer core than in a rotating machine. Whereas motor laminations are usually 0.014 to 0.025 inch thick, transformer lamination thickness may be as low as 0.006, with 0.009 to 0.012 being common. That lowers eddy current loss.

A further improvement appearing during the 1980's is amorphous core material. Resembling glas more than steel, this lamination material contains no granular structure at all. Laminations only 0.001 inch thick were used in the first mass-produced distribution transformers (25 kVA) manufactured by Westinghouse in 1986. Many similar units have been put in service since then, along with some large power transformers. Typical core loss in such a transformer is only one-third of that in a conventional unit.

The design approaches for reduction of losses are well known and proven. They consists of

- Using more material
- Better material. New Material
- Improved distribution of materials

- Improvement in cooling medium and methods

Each design tries to achieve desired specifications with minimum cost of materials or minimum weight or volume or minimum overall cost of ownership. Worldwide, more and more consumers are now purchasing transformers based on the total ownership costs, than just the first cost.

A. Minimizing Iron Losses

a. Losses in Core

Choice of metal is critical for transformer cores, and it's important that good quality magnetic steel be used. There are many grades of steel that can be used for a transformer core. Each grade has an effect on efficiency on a per-kg basis. The choice depends on how you evaluate non-load losses and total owning costs. Almost all transformer manufacturers today use steel in their cores that provides low losses due to the effects of magnetic hysteresis and eddy currents. To achieve these objectives, high permeability, cold-rolled, grain-oriented, silicon steel is almost always used. Construction of the core utilizes step lap mitered joints and the laminations are carefully stacked.

The evolution of materials used in transformer core is summarized below

Table 1.Evolution of core material

Year	**Core Material**	**Thickness (mm)**	**LOSS (W/KG At 50 Hz)**
1910	Warm rolled FeSi	0.35	2 (1.5 T)
1950	Cold rolled CRGO	0.35	1 (1.5 T)
1960	Cold rolled CRGO	0.3	0.9 (1.5T)
1965	Cold rolled CRGO	0.27	0.84 (1.5T)
1975	Amorphous metal	0.03	0.2 (1.3T)
1980	Cold rolled CRGO	0.23	0.75 (1.5T)
1985	Cold rolled CRGO	0.18	0.67 (1.5T)
1995	Cold rolled CRGO	0.17	0.64 (1.5T)
2000	Cold rolled CRGO	0.15	0.63 (1.5T)
2005	Cold rolled CRGO	0.14	0.61 (1.5T)
2010	Cold rolled CRGO- Amorphous metal	0.13	0.59 (1.5T)
2013-14	Cold rolled CRGO- Amorphous metal	**=0.11**	**= 0.50 (1.5T)**

There are two important core materials used in transformer manufacturing. Amorphous metal and CRGO. It can be seen that losses in amorphous metal core is less than 25% of that in CRGO. This material gives high permeability and is available in very thin formations (like ribbons) resulting in much less core losses than CRGO.

The tradeoff between the both types is interesting. The use of higher flux densities in CRGO (up to 1.5 T) results in higher core losses; however, less amount of copper winding is required, as the volume of core is less. This reduces the copper losses.

In amorphous core, the flux density is less and thinner laminations also help in reducing core losses. However, there is relatively a larger volume to be dealt with, resulting in longer turns of winding, i.e. higher resistance resulting in more copper losses. Thus iron losses depend upon the material and flux densities selected, but affect also the

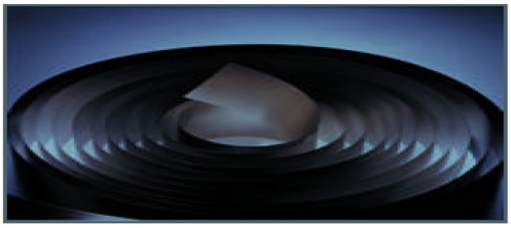


Fig.2. Amorphous core –ribbons

copper losses.

It becomes clear that a figure for total losses can be compared while evaluating operating cost of the transformers. The total operating cost due to losses and total investment cost forms the basis of Total Ownership Cost of a transformer.

B. Amorphous Cores

A new type of liquid-filled transformer introduced commercially in 1986 uses ultra low-loss cores made from amorphous metal; the core losses are between 60% to 70% lower than those for transformers using silicon steel. To date, these transformers have been designed for distribution operation primarily by electric utilities and use wound-cut cores of amorphous metal. Their ratings range from 10kVA through 2500kVA. The reason utilities purchase them, even though they are more expensive than silicon steel core

transformers, is because of their high efficiency. The use of amorphous core liquid-filled transformers is now being expanded for use in power applications for industrial and commercial installations. This is especially true in other countries such as Japan.

Amorphous metal is a new class of material having no crystalline formation. Conventional metals possess crystalline structures in which the atoms form an orderly, repeated, three-dimensional array. Amorphous metals are characterized by a random arrangement of their atoms (because the atomic structure resembles that of glass, the material is sometimes referred to as glassy metal). This atomic structure, along with the difference in the composition and thickness of the metal, accounts for the very low hysteresis and eddy current losses in the new material.

At present, amorphous cores are not being applied in dry-type transformers. However, there is continuous developmental work being done on amorphous core transformers, and the use of this special metal in dry-type transformers may become a practical reality sometime in the future. If you're considering the use of an amorphous core transformer, you should determine the economic trade off; in other words, the price of the unit versus the cost of losses. Losses are especially important when transformers are lightly loaded, such as during the hours from about 9 p.m. to 6 a.m. When lightly loaded, the core loss becomes the largest component of a transformer's total losses. Thus, the cost of electric power at the location where such a transformer is contemplated is a very important factor in carrying out the economic analyses..

INRUSH CURRENT MEASUREMENTS

A. Test objects, configuration and measuring equipment

The test objects are three-phase oil-filled distribution transformers with a three legged core. The automated sequence of operations for the acquisition of in six repeating stages

Fig.3. R,Y,B phase test of 63 KVA Transformer

II. SIMULATION RESULT

Using the magnetizing characteristic of the in-rush current for the test transformer was determined using the new model, when the supply voltage phase angle $\alpha = 0$ .The resulting transient is shown in figure 5.1 The peak in-rush current is 35.3 A, which is about 6 times the nominal load current. The transient decays during the relatively short time of about 0.25 sec, which may be explained by the high ratio of R0 to X0 in a small transformer. On the other hand, the peak magnetic flux is 0.0054 Wb, which is about 2.5 its nominal value. It's

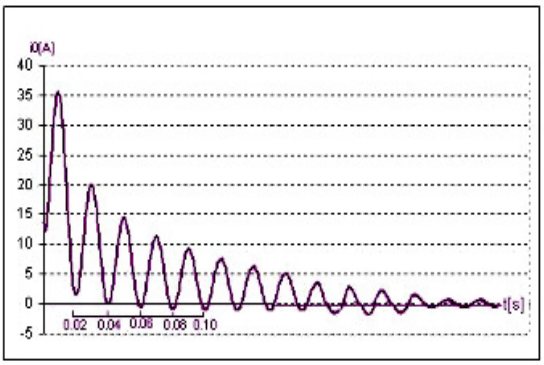


Fig.4. Simulated in-rush current and magnetic core flux for the laboratory transformer ($\alpha = 0^o$)
a periodic component decays within the same decaying time as the in-rush current.
Simulation of the laboratory transformer connected to the power supply at $\alpha = 90^o$ is shown in figure5.2. As expected, the current in this case settles immediately to its steady state value.

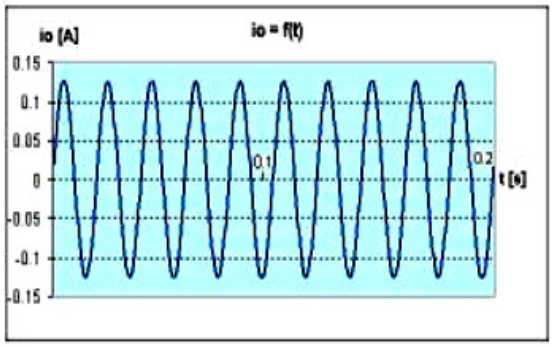


Fig.5. simulated in-rush current for the laboratory transformer ($\alpha = 0^o$)

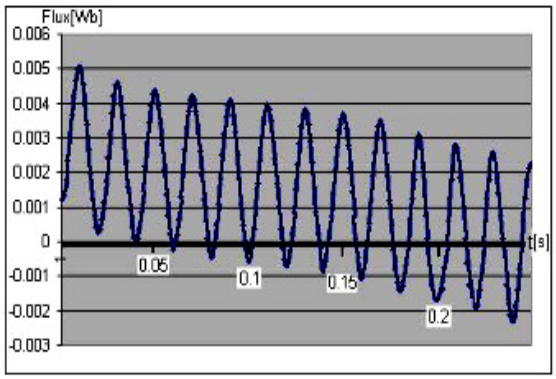


Fig.6. simulated in-rush current for the laboratory transformer ($\alpha = 90^o$).

III. CONCLUSION

I am conclude t he that how to reduce inrush current of transformer by using different mitigation method .Also measure simulation inrush current result and practical test of transformer in Emf control company.

Finally, I have changing core materials of the transformer which materials will be CRGO and Amorphous so Marge both materials we can gate good efficiency.

.REFERENCES

- Nicola Chiesa "Power transformer behavior under switching operations", January 2006
- Andreas Ebner, "Transient Transformer Inrush Currents due to Closing Time- and Residual Flux Measurement Deviations if Controlled Switching is used", High Voltage Laboratory ,ETH Zurich, Switzerland
- N. Chiesa, H. K. Høidalen "Systematic switching study of transformer inrush current: simulations and measurements"
- S. Jamali Arand, M. Saeedi, S. Masoudi "Transformer Inrush Current Mitigation Using Controlled Switching and Magnetic Flux Shunts" International Journal of Energy and Power Engineering. Vol. 2, No. 2, 2013, pp. 46-53. doi: 10.11648/j.ijepe.20130202.13
- Ravi Kumar Vaishya, Shalini Vaishya & S.K. Bajpai "Efficiency Improvements in Transformers by Adoption of New Magnetic Material" ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 3, Issue 3, March 2013
- Man Mohan and Puneet Kumar Singh "Distribution Transformer With Amorphous-crgo Core: An Effort To Reduce The Cost Of Amorphous Core Distribution Transformer"Department of Electrical Engineering, Faculty of Engineering, Dayalbagh Educational Institute, Agra, India
- Vinod Gupta, O. Naresh Kumar, K. Ashok Kumar*, U C Trivedi, T P Govindan "Comparison of Amorphous & CRGO Core "
- Transformer Losses Under Nonlinear Load Condition" Electrical Research and Development Association Vadodara, Vijai Electricals Ltd. Hyderabad
- N.Ashbahani, Ismail Daut and N.H Halim" Measurement of Overall Power Loss for Different Three Phase 100kVA Transformer Core Material" 978-1-4577-0354-6/11/$26.00 ©2011 IEEE
- S.V.Kulkarni, S.A.Khaparde Transformer Engineering Design and Practice, Indian Institute of Technology, Bombay

OPTIMAL PLACEMENT OF SSSC BY SENSITIVITY METHODS USING PSAT FOR POWER SYSTEM ANALYSIS OF GRID CONNECTED WIND FARM

[1]MR.K.C. CHANDE, [2] MR.R.H.BHESDADIYA

[1]PG Student, Gujarat Technological University, Ahmedabad, Gujarat, [2]Research scholar,R.K.University,Rajkot,Assistant Professor, Electrical Engineering Department, Lukhdhirji Engineering College morbi, Gujarat,

[1]k2k378@gmail.com,[2]rhbhesdadiya@gmail.com

ABSTRACT: *Ecological and Supporting impact for a Sustainable development have inspired the growth of electrical generation from renewable energies. A imperative demand for more electric power coupled with Convectional resources has led to an increased need for energy production from renewable energy sources such as wind and solar. The latest technological Development in wind energy conversion and an increased support from governmental and private institutions have led to increased wind power generation in recent years. Wind power is the fastest growing renewable source of electrical energy Wind power generation of electricity is seen as one of the most practical options and with better relation Techno commercial inside the active matrix now a days. This study provides the results of a study conducted to assess the "effect on voltage profile of grid connected wind farm it's improvement though application of SSSC" system and a method based on real power performance index and reduction of total system VAR power losses has been proposed to decide the optimal location of SSSC. The effectiveness of the proposed method is demonstrated on IEEE 6-bus power system*

Key Words:Squirrel Cage Induction Generator,Reactive Power Compensation,Static Synchronous Series Compensator, Power System Analysis Toolbox

INTRODUCTION

Modern power system consists of interconnected network of various type of generator, transformer, transmission line, loads. Now a day significant development in the area of wind energy, it integrated in to grid at faster rate. The wind energy is clean and required less operating cost as the fuel cost is negligible. However it may require high installation cost for same MW output as compare to conventional sources .Presently size range of wind turbine is varying from few watts to MW due to development in manufacturing technology. The fundamental issues of wind turbine are fault ride through, system voltage and frequency limits, active system voltage and frequency limits, active power regulation and frequency control, as well as reactive power/power factor/voltage regulation. In this study the voltage profile of grid connected wind farm is investigated and its improvement through effective location SSSC presented.

SQUIRREL CAGE INDUCTION GENERATOR

It is directly connected to grid via transformer, it draw reactive power from grid, In order to reduce reactive Liability on grid capacitor bank is used for providing local reactive power. Due to fixed speed wind fluctuation cause mechanical fluctuation which will result in electrical fluctuation such as voltage variations this it require reactive power compensation and rigid grid [14].

REACTIVE POWER COMPENSATION

The reactive power is Mainly require to set up magnetic field in generator and transformer core. Inadequate reactive power cause reduction in voltage on other hand excessive reactive power cause rise in voltage so effective reactive power compensation is essential for maintaining voltage limit within desirable limits**.** Presentely power electronic based shunt and series compensation such as SVC ,STATCOM, SSSC, TCSC, UPFC,DPFC,etc. are used to maintain voltage profile [4]**.**

STATIC SYNCHRONOUS SERIES COMPENSATOR

The VSC based series compensator, called static synchronous series compensator was proposed by Gyugyi in 1989 within the concept of using converter based technology uniformly for series and shunt compensation as well as transmission angle control**.** SSSC comprises of a VSC, a dc link capacitor and a coupling transformer. With proper control a voltage is injected in a transmission line. The injected voltage is in quadrature with the line current. If injected voltage is greater than zero, SSSC behaves like a capacitor and if injected voltage is less than zero, SSSC behaves like an inductor [6,7].

POWER SYSTEM ANALYSIS TOOLBOX (PSAT)

PSAT has been thought to be open source and convenient. PSAT has been developed using matlab which run on common OS, such as UNIX, LINUX, Windows, and Mac OS X. PSAT is also the first power system software which runs on GNU/Octave platforms. Once the power flow has been solved, the user can perform further static and/or dynamic analyses [5].

METHODS FOR OPTIMAL LOCATION OF TCSC

A. *Reduction of total system reactive power loss (aij):[2]*

A method based on the sensitivity of the total system reactive power loss with respect to the control variable of the SSSC. The reactive power loss sensitivity factors with respect to these control variables may be given as follows:

1. Loss sensitivity with respect to control parameter Xij of SSSC placed between buses i and j,

$$a_{ij}=\frac{\partial Q_L}{\partial X_{ij}} \quad \text{..... (1)}$$

These factors can be computed for a base case power flow solution.

$$a_{ij}=\frac{\partial Q_L}{\partial X_{ij}}=[V_i^2+V_j^2-2V_iV_j\cos(\delta_i-\delta_j)]\frac{R_{ij}^2-X_{ij}^2}{[R_{ij}^2+X_{ij}^2]^2} \quad \text{..... (2)}$$

B. *Real power flow performance index sensitivity indices:[2]*

The severity of the system loading under normal and contingency cases can be described by a real power line flow performance index, as given below.

$$PI=\sum_{m=1}^{NL}\frac{Wm}{2n}\left(\frac{PLm}{PLm^{max}}^{2n}\right) \quad \text{.....(1)}$$

where PLm is the real power flow and max PLm is the rated capacity of line-m, n is the exponent and m w a real non- negative weighting coefficient which may be used to reflect the importance of lines. PI will be small when all the lines are within their limits and reach a high value when there are overloads. Thus, it provides a good measure of severity of the line overloads for given state of the power system. Most of the works on contingency selection algorithms utilize the second order performance indices which, in general, suffer from masking effects. The lack of discrimination, in which the performance index for a case with many small violations may be comparable in value to the index for a case with one huge violation, is known as masking effect. By most of the operational standards, the system with one huge violation is much more severe than that with many small violations. Masking effect to some extent can be avoided using higher order performance indices, that is n > 1. However, in this study, the value of exponent has been taken as 2 and Wi =1.

The real power flow PI sensitivity factors with respect to the parameters of SSSC can be defined as

$$b_k=\frac{\partial PI}{\partial x_{ck}}\Big|x_{ck}=0 \quad \text{.....(2)}$$

The sensitivity of PI with respect to SSSC parameter connected between bus-i and bus-j can be written as

$$\frac{\partial PI}{\partial x_{ck}}=\sum W_m * {P_{LM}}^3\left(\frac{1}{PLm^{max}}\right)^4\frac{\partial P_{LM}}{\partial x_{ck}} \quad \text{.....(3)}$$

The real power flow in a line-m can be represented in terms of real power injections using DC power flow equations where s is slack bus, as

$$P_{LM}=\begin{cases}\sum_{\substack{n=1\\n\neq s}}^{N}S_{mn}P_n \; for\; m\neq k\\ \sum_{\substack{n=1\\n\neq s}}^{N}S_{mn}P_n+P_j \; for\; m=k\end{cases} \quad \text{.....(4)}$$

Using equation (4), the following relationship can be derived,

$$\frac{\partial P_{LM}}{\partial x_{ck}}=\begin{cases}S_{mi}\frac{\partial Pi}{\partial x_{ck}}+S_{mj}\frac{\partial Pj}{\partial x_{ck}} for\; m\neq k\\ S_{mi}\frac{\partial Pi}{\partial x_{ck}}+S_{mj}\frac{\partial Pj}{\partial x_{ck}}+\frac{\partial Pj}{\partial x_{ck}} for\; m=k\end{cases} \quad \text{.....(5)}$$

The terms $\frac{\partial P_i}{\partial x_{ck}}\Big|x_{ck=0}=\frac{\partial P_{ic}}{\partial x_{ck}}\Big|x_{ck}=0$ can be derived as below

$$=-2\left(V_i^2 - V_i V_j \cos\delta_{ij}\right).\frac{R_{ij}X_{ij}}{\left[R_{ij}^2+X_{ij}^2\right]^2} + V_j \sin\delta_{ij}\frac{R_{ij}^2-X_{ij}^2}{\left[R_{ij}^2+X_{ij}^2\right]^2}.(6)$$

II. OPTIMAL PLACEMENT CONDITIONS

The SSSC device should be placed on the most sensitive line. With the sensitivity indices computed for SSSC, following criteria can be used for its optimal location.

1. In reactive power loss reduction method SSSC should be placed in a line having the most positive loss sensitivity index.
2. In real power flow performance index sensitivity indices method SSSC should be placed in a line having most negative sensitivity index.

3. TEST SYSTEM

For the validation of the proposed FACTS's devices, SSSC have been tested on the IEEE 6 Bus test System. An IEEE 6 bus test system and this test system including 6 buses,2 generators,11 lines, and 3 loads is simulated using PSAT is presented. The generators are modelled as standard PV buses with both P and Q limits; loads are represented as constant PQ loads.

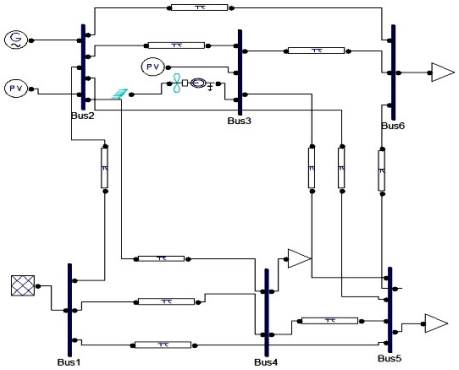


Fig.3. IEEE 6 bus test system

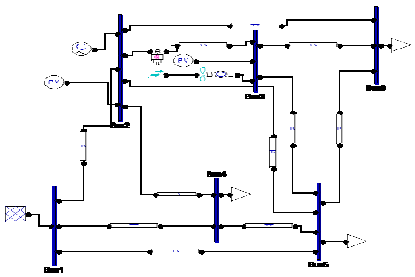


Fig.4. IEEE 6 bus test system with SSSC

III. SIMULATION RESULTS

From table 1 the calculation of reactive power loss (aij) and real power flow performance index (bij) is calculated using equation of aij and bij which is shown above. now according to conditions for optimal location of SSSC in which reduction of reactive power loss method highest aij is selected.so line no.2 is having highest index hence the SSSC is placed in Line no.2 which is between bus 3-6.now according to another method which is real power flow performance index the most negative value of bij is chosen for optimal placement of SSSC So from table 1.line 4 and line 10 having most negative indices so SSSC is also placed in line 4 and line 10.and results of voltage profile, Active power flow and reactive power loss are compared after placing TCSC in line 2,line 4,line 10.

Table 1:- Calculated Sensitivity Indices

line no	FROM BUS	TO BUS	Ak	Bk
1	2	3	-1.2139	-1.0882
2	3	6	3.1901	2.3524
3	4	5	-1.0047	-1.0550
4	3	5	-1.6919	-1.6937
5	5	6	-0.8171	-0.9356
6	2	4	2.6876	2.4917
7	1	2	0.5957	0.7545
8	1	4	1.4537	1.4593
9	1	5	-1.1163	-1.1242
10	2	6	1.4933	-1.2450
11	2	5	-0.9289	-0.8300

The voltage profile for IEEE 6 bus system with and without SSSC is shown in fig 5.and considerable improvement in voltage stability is maintain.

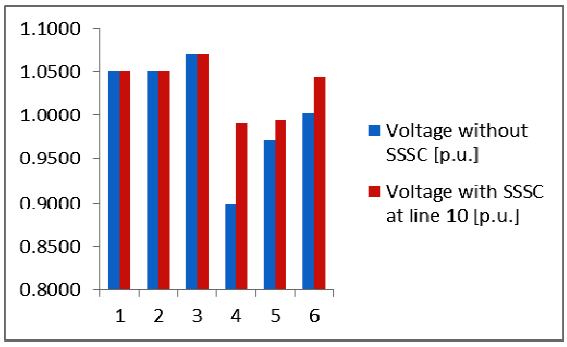


Fig.5. Voltage Profile Comparisons

Fig shows the comparisons of Active power flow without and with SSSC at line 2,4,10. from table 2 the active power flow in line 2 is improved as compared without and with SSSC placed in line 4 and line 10.so hence line 2 is effective location of SSSC for relieving congestion.

Table 2:- Active power flow with and without SSSC

Line	From Bus	To Bus	real power flow without SSSC	real power flow with SSSC at line no 2	real power flow with SSSC at line no 4	real power flow with SSSC at line no 10
			[p.u.]	[p.u.]	[p.u.]	[p.u.]
1	2	3	0.0758	0.1047	0.1498	-0.0909
2	3	6	0.4318	5.0305	0.3185	0.2877
3	4	5	-0.0901	-0.0931	-0.1195	0.0106
4	3	5	0.2433	0.2183	1.4546	0.2209
5	5	6	-0.0251	-0.0522	0.0619	-0.0757
6	2	4	0.0303	0.0304	0.0256	0.2961
7	1	2	0.1517	0.1429	0.1793	0.3071
8	1	4	0.6197	0.6156	0.5850	0.4395
9	1	5	0.3315	0.3283	0.3099	0.3155
10	2	6	0.3126	0.2743	0.3348	3.0223
11	2	5	0.2304	0.2313	0.1655	0.0988
total active power flow			2.3119	**6.8310**	3.4655	4.8319

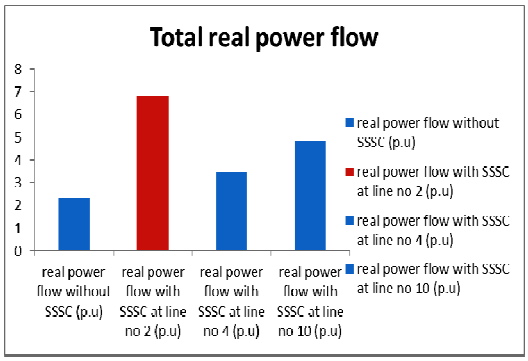


Fig.6. Active power flow Comparisons

Table 3 shows the comparisons of Reactive power loss without and with SSSC at line 2,4,10.from table 3 the Reactive power loss in line 2 is reduced as compared without and SSSC placed in line 4 and line 10.So hence line 7 is effective location of SSSC for improving voltage stability.

Table 3:- Reactive power flow with and without SSSC

Line	From Bus	To Bus	reactive power flow without SSSC	reactive power flow with SSSC at line no 2	reactive power flow with SSSC at line no 4	reactive power flow with SSSC at line no 10
			[p.u.]	[p.u.]	[p.u.]	[p.u.]
1	2	3	-0.1312	-0.1363	-0.1437	-0.0982
2	3	6	0.6399	8.7791	0.5184	0.2087
3	4	5	-0.1491	-0.1583	-0.2495	-0.0537
4	3	5	0.2682	0.2504	3.5285	0.1819
5	5	6	-0.1187	-0.1830	0.0513	-0.1693
6	2	4	0.0283	0.0275	0.0227	0.4625
7	1	2	-0.0947	-0.0907	-0.1072	-0.1627
8	1	4	0.6386	0.6259	0.5043	0.1931
9	1	5	0.1667	0.1430	-0.0829	0.0884
10	2	6	0.1243	-0.0153	0.0494	3.6823
11	2	5	0.1818	0.1572	-0.0545	0.1394
total active power flow			1.5541	**9.3997**	4.0367	4.4725

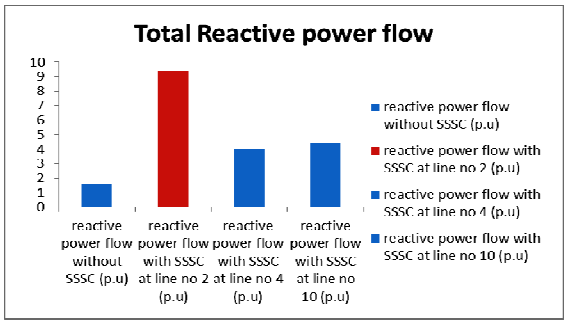


Fig.7. Reactive power loss Comparisons

CONCLUSION

In this paper, reduction of reactive power loss and real power flow performance index or sensitivity-based method has been developed for determining the optimal location of SSSC in an electricity market. The developed method is implemented on IEEE 6 bus system and the results reveal that the proposed method is simple, reliable and efficient for the implementation.

REFERENCES

[1] Madhura Gad, Prachi Shinde, Prof.S.U.Kulkarni,"Optimal Location of TCSC by Sensitivity Methods," International Journal of Computational Engineering Research, Vol.2, Oct.2012.

[2] Seyed Abbas Taher, Hadi Besharat "Transmission Congestion Management by Determining Optimal Location of FACTS Devices in Deregulated Power systems," American Journal of Applied Sciences, 5 (3):242-247, ISSN 1546-9239, 2008.

[3] Md. Nasimul Islam Maruf et. al. "Study Of Thyristor Controlled Series Capacitor (TCSC) as a Useful FACTS Device" International Journal of Engineering Science and Technology" Vol. 2(9), 2010, 4357-4360

[4] B.Likhitha, J.Srinivasa Rao, J.Amarnath, " Sensitivity Approach for the Effective location of TCSC in a Deregulated Electricity Market", IOSR Journal of Engineering (IOSRJEN) ISSN: 2250-3021 Volume 2, Issue 6 (June 2012), PP 09-15

[5] Abouzar samimi, Peyman Naderi "A New Method for Optimal Placement of TCSC based on Sensitivity Analysis for Congestion management," Smart Grid and Renewable Energy, 2012, 3, 10-16

[6] N.Sambasivarao, "A Novel Method for Mitigation of Active, Reactive Power Loss and Overloading inA Restructured Power system Using TCSC", International Journal of Engineering Research & Technology (IJERT)Vol. 2 Issue 10, October – 2013,ISSN: 2278-0181

[7] Renu Yadav, Sarika Varshney & Laxmi Srivastava, "Enhancement of Voltage StabilityThrough Optimal Placement of TCSC",International Journal of Power System Operation and Energy Management, ISSN (*PRINT*): 2231–4407, Volume-1, Issue-2, 2011

[8] N.G. Hingaroni and L. Gyugyi. "Understanding FACTS concepts and technology of flexible ac transmission systems. IEEE Press, New York, 2000.

[9] Kadam D. P. and Dr. Kushare B. E. "Mitigation of voltage variations in grid connected wind farm system", International Journal of Electrical Engineering, Vol. 3, Issue 4, Oct 2013, PP51-58

[10] Federico Milano." An Open Source Power System Analysis Toolbox" IEEE Transactions on power systems, VOL. 20, NO. 3, AUGUST 2005,PP 1199-1206

[11] T. F. Orchi, H. R. Pota, M. J. Hossain "Stability improvement of wind farm using Shunt and Series Compensation" AUPEC 2012 Proceedings.

[12] Aghdam Hossein Nasir "Analysis of Static Synchronous Series Compensators (SSSC), on Congestion Management and Voltage Profile in Power System by PSAT Toolbox" Research Journal of Applied Sciences, Engineering and Technology 3(7): PP 660-667, 2011

[13] M. O. AlRuwaili, M. Y. Vaziri, S. Vadhva and S. Vaziri "Impact of Wind Generation Variability on Voltage Profile of Radial Power Systems" 2013 IEEE Green Technologies Conference

[14] Mishra N.G, Sinha M.N,Parekh B.R and Sheikh A.A "Grid Code Requirement of Large-Scale Wind power" National Conference on Recent Trends in Engineering & Technology may 2011

COMPARATIVE ANALYSIS OF SPATIAL DOMAIN EDGE DETECTION TECHNIQUES

KALPESH R RANIPA[#1], MITUL S. NAGAR[#2],HITESH H. MATHUKIYA[#3], PURVESH N. NAYAK[#4]

[#]Electronics & Communication Department (CUSU), C. U. Shah College of Engineering and Technology, Near Kothariya village, Wadhwan 363030, India

k.ranipa@gmail.com1mitul, mitul.nagar.08ec@gmail.com, hitesh.mathukiya@gmail.com, purvesh.nayak13@gmail.com

ABSTRACT : *Edges characterize boundaries and are therefore a problem of fundamental importance in image processing. Image Edge detection significantly reduces the amount of data and filters out useless information, while preserving the important structural properties in an image Since edge detection is in the forefront of image processing for object detection, it is crucial tohave a good understanding of edge detection algorithms. In this paper the comparative analysis of various Image Edge Detection techniques is presented. The software is developed using MATLAB 7.0. It has been shown that the Cranny's edge detection algorithm performs better than all these operators under almost all scenarios. Evaluation of the images showed that under noisy conditions Canny, LOG (LaplaciaO of Gaussian), Robert, Prewitt,Sobel exhibit better performance, respectively. 1. It has been observed that Canny's edgedetection algorithm is computationally more expensive compared to LoG(Laplacian of Gaussian), Sobel, Prewitt and Robert's operator.*

KEYWORDS: Spatial domain approch, Edge Detection, Image Noise, Digital Image Processing

1. INTRODUCTION

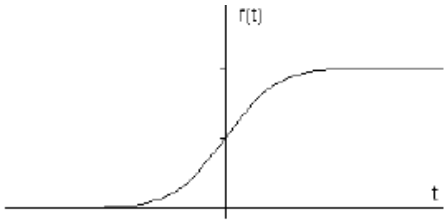
Edge detection refers to the process of identifying and locating sharp discontinuities in an image. The discontinuities are abrupt changes in pixel intensity which characterize boundaries of objects in a scene. Classical methods of edge detection involve convolving the image with an operator (a 2-D filter), which is constructed to be sensitive to large gradients in the image while returning values of zero in uniform regions. There are an extremely large number of edge detection operators available, each designed to be sensitive to certain types of edges. Variables involved in the selection of an edge detection operator include Edge orientation, Noise environment and Edge structure. The geometry of the operator determines a characteristic direction in which it is most sensitive to edges. Operators can be optimized to look for horizontal, vertical, or diagonal edges. Edge detection is difficult in noisy images, since both the noise and the edges contain highfrequencycontent. Attempts to reduce the noise result in blurred and distorted edges. Operators used on noisy images are typically larger in scope, so they can average enough data to discount localized noisy pixels. This results in less accurate localization of the detected edges. Not all edges involve a step change in intensity. Effects such as refraction or poor focus can result in objects with boundaries defined by a gradual change in intensity [1]. The operator needs to be chosen to be responsive to such a gradual change in those cases. So, there are problems of false edge detection, missing true edges, edge localization, high computational time and problems due to noise etc. Therefore, the objective is to do the comparison of various edge detection techniques and analyse the performance of the various techniques in different conditions. There are many ways to perform edge detection. However, the majority of different methods may be groupedinto two categories:

Gradient based Edge Detection:

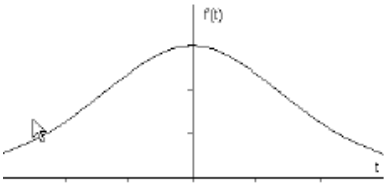
The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image

Laplacian based Edge Detection:

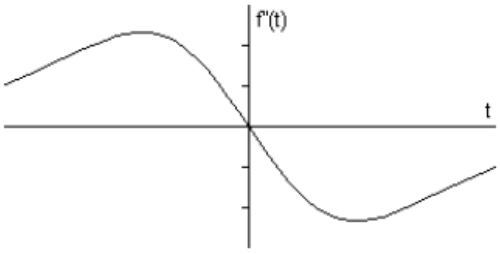
The Lallation method searches for zero crossings in the second derivative of the image to find edges. An edge has the one-dimensional shape of a ramp and calculating the derivative of the image can highlight its location. Suppose we have the following signal, with an edge shown by the jump in intensity below: Suppose we have the following signal, with an edge shown by the jump in intensity below:



If we take the gradient of this signal (which, in one dimension, is just the first derivative with respect to t) we get the following:



Clearly, the derivative shows a maximum located at the centre of the edge in the original signal. This method of locating an edge is characteristic of the "gradient filter" family of edge detection filters and includes the Sobelmethod. A pixel location is declared an edge location if the value of the gradient exceeds some threshold. As mentioned before, edges will have higher pixel intensity values than those surrounding it. So once a threshold is set, you can compare the gradient value to the threshold value and detect an edge whenever the threshold is exceeded [2]. Furthermore, when the first derivative is at a maximum, the second derivative is zero. As a result, another alternative to finding the location of an edge is to locate the zeros in the second derivative. This methodis known as the Laplacian and the second derivative of the signal is shown below:



In this paper we analyzed and did the visual comparison of the most commonly used Gradient and Laplacian based Edge Detection techniques. In section 2 the problem definition is presented. In section 3 the various edge detection techniques have been studied and analyzed. In section 4 the visual comparisons of various edge detection techniques have been done by developing software in MATLAB 7.0. Section 5 discusses the advantages and disadvantages of various edge detection techniques. Section 6 discusses the conclusion reached by analysis and visual comparison of various edge detection techniques developed using MATLAB 7.0.

2. PROBLEM DEFINITION

There are problems of false edge detection, missing true edges, producing thin or thick lines and problems dueto noise etc. In this paper we analyzed and did the visual comparison of the most commonly used Gradient andLaplacian based Edge Detection techniques for problems of inaccurate edge detection, missing true edges,producing thin or thick lines and problems due to noise etc. The software is developed using MATLAB 7.0

3. Edge Detection Techniques

3.1 Sobel Operator

The operator consists of a pair of 3×3 convolution kernels as shown in Figure 1. One kernel is simply the otherrotated by 90°.

-1	0	+1
-2	0	+2
-1	0	+1

Gx

+1	+2	+1
0	0	0
-1	-2	-1

Gy

FIGURE 1: Masks used by Sobel Operator

These kernels are designed to respond maximally to edges running vertically and horizontally relative to the pixel grid, one kernel for each of the two perpendicular orientations. The kernels can be applied separately to the input image, to produce separate measurements of the gradient component in each orientation (call these *Gx* and *Gy*). Thesecan then be combined together to find the absolute magnitude of the gradient at each point and the orientation of that gradient [3]. The gradient magnitude is given by:

$$|G| = \sqrt{Gx^2 + Gy^2}$$

Typically, an approximate magnitude is computed using:

$$|G| = |Gx| + |Gy|$$

which is much faster to compute.
The angle of orientation of the edge (relative to the pixel grid) giving rise to the spatial gradient is given by:
q = arctan(*Gy* /*Gx*)

3.2 Robert's cross operator:

The Roberts Cross operator performs a simple, quick to compute, 2-D spatial gradient measurement on an image. Pixel values at each point in the output represent the estimated absolute magnitude of the spatial gradient of the input image at that point. The operator consists of a pair of 2×2 convolution kernels as shown in Figure 2. One kernel is simply the other rotated by 90°[4]. This is very similar to the Sobel operator.

+1	0
0	-1

Gx

0	+1
-1	0

Gy

FIGURE 2: Masks used for Robert operator.

These kernels are designed to respond maximally to edges running at 45° to the pixel grid, one kernel for eachof the two perpendicular orientations. The kernels can be applied separately to the input image, to produceseparate measurements of the gradient component in each orientation (call these *Gx* and *Gy*). These can thenbe combined together to find the absolute magnitude of the gradient at each point and the orientation of thatgradient. The gradient magnitude is given by:

$$|G| = \sqrt{Gx^2 + Gy^2}$$

although typically, an approximate magnitude is computed using:

$$|G| = |Gx| + |Gy|$$

which is much faster to compute.
The angle of orientation of the edge giving rise to the spatial gradient (relative to the pixel grid orientation) is given by:
q = arctan(*Gy* /*Gx*) − 3p / 4

3.3 Prewitt's operator:

Prewitt operator [5] is similar to the Sobel operator and is used for detecting vertical and horizontal edges inimages.

$$\theta = \arctan(Gy / Gx) - 3\pi / 4$$

-1	0	+1
-1	0	+1
-1	0	+1

Gx

+1	+1	+1
0	0	0
-1	-1	-1

Gy

FIGURE 3: Masks for the Prewitt gradient edge detector

3.4 Laplacian of Gaussian:

The Laplacian is a 2-D isotropic measure of the 2nd spatial derivative of an image. The Laplacian of an image highlights regions of rapid intensity change and is therefore often used for edge detection. The Laplacian isoften applied to an image that has first been smoothed with something approximating a Gaussian Smoothingfilter in order to reduce its sensitivity to noise. The operator normally takes a single gray level image as inputand produces another gray level image as output.

The Laplacian $L(x,y)$ of an image with pixel intensity values $I(x,y)$ is given by:

$$L(x,y) = \frac{\partial^2 I}{\partial x^2} + \frac{\partial^2 I}{\partial y^2}$$

1	1	1
1	-8	1
1	1	1

-1	2	-1
2	-4	2
-1	2	-1

FIGURE 4. Three commonly used discrete approximations to the Laplacian filter.

Since the input image is represented as a set of discrete pixels, we have to find a discrete convolution kernel that can approximate the second derivatives in the definition of the Laplacian[5]. Three commonly used small

kernels are shown in Figure

$$LoG(x,y) = -1/\pi\sigma^4 [\, 1 - (\frac{x^2 + y^2}{2\sigma^2})] e^{-\frac{x^2+y^2}{2\sigma^2}}$$

and is shown

0	1	0
1	-4	1
0	1	0

in Figure 5.

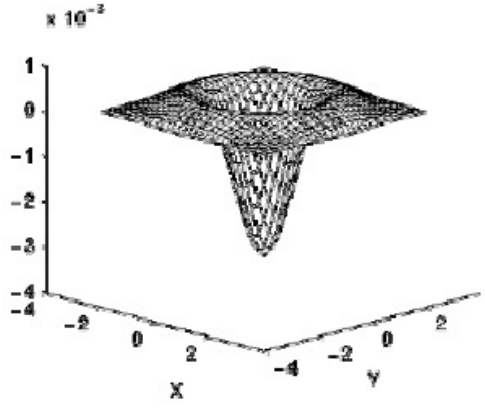


FIGURE 5. The 2-D Laplacian of Gaussian (LoG) function. The *x* and *y* axes are marked in standard deviations (s).A discrete kernel that approximates this function (for a Gaussians= 1.4) is shown in Figure 6.

0	1	1	2	2	2	1	1	0
1	2	4	5	5	5	4	2	1
1	4	5	3	0	3	5	4	1
2	5	3	-12	-24	-12	3	5	2
2	5	0	-24	-40	-24	0	5	2
2	5	3	-12	-24	-12	3	5	2
1	4	5	3	0	3	5	4	1
1	2	4	5	5	5	4	2	1
0	1	1	2	2	2	1	1	0

FIGURE 6. Discrete approximation to LoG function with Gaussians
= 1.4.

Note that as the Gaussian is made increasingly narrow, the LoG kernel becomes the same as the simpleLaplacian kernels shown in figure 4. This is because smoothing with a very narrow Gaussian (s< 0.5 pixels) ona discrete grid has no effect. Hence on a discrete grid, the simple Laplacian can be seen as a limiting case ofthe LoG for narrow Gaussians [8]-[10].

3.5 Canny Edge Detection Algorithm

The Canny edge detection algorithm is known to many as the optimal edge detector. Canny's intentions were to enhance the many edge detectors already out at the time he started his work. He was very successful in achieving his goal and his ideas and methods can be found in his paper, "A Computational Approach to Edge Detection"[11]. In his paper, he followed a list of criteria to improve current methods of edge detection. The firsthand most obvious is low error rate. It is important that edges occurring in images should not be missed and that there be no responses to non-edges. The second criterion is that the edge points be well localized. In otherworlds, the distance between the edge pixels as found by the detector and the actual edge is to be at minimum. A third criterion is to have only one response to a single edge. This was implemented because the first two were not substantial enough to completely eliminate the possibility of multiple responses to an edge.

Based on these criteria, the canny edge detector first smoothes the image to eliminate and noise. It then finds the image gradient to highlight regions with high spatial derivatives. The algorithm then tracks along these regions and suppresses any pixel that is not at the maximum (no maximum suppression). The gradient array isnow further reduced by hysteresis. Hysteresis is used to track along the remaining pixels that have not been suppressed. Hysteresis uses two thresholds and if the magnitude is below the first threshold, it is set to zero(made a non edge). If the magnitude is above the high threshold, it is made an edge. And if the magnitude is between the 2 thresholds, then it is set to zero unless there is a path from this pixel to a pixel with a gradient above T2.

Step 1:-

In order to implement the canny edge detector algorithm, a series of steps must be followed. The first step is tofilter out any noise in the original image before trying to locate and detect any edges. And because the Gaussian filter can be computed using a simple mask, it is used exclusively in the Canny algorithm. Once a suitable maskhas been calculated, the Gaussian smoothing can be performed using standard convolution methods. Convolution mask is usually much smaller than the actual image. As a result, the mask is slid over the image, manipulating a square of pixels at a time. The larger the width of the Gaussian mask, the lower is the detector's sensitivity to noise. The localization error in the detected edges also increases slightly as the Gaussian width is increased.

Step 2:-

After smoothing the image and eliminating the noise, the next step is to find the edge strength by taking the gradient of the image. The Sober operator performs a 2-D spatial gradient measurement on an image. Then, the approximate absolute gradient magnitude (edge strength) at each point can be found. The Sobel operator [3]uses a pair of 3x3 convolution masks, one estimating the gradient in the x-direction (columns) and the other estimating the gradient in the y-direction (rows). They are shown below:

-1	0	+1
-2	0	+2
-1	0	+1

Gx

+1	+2	+1
0	0	0
-1	-2	-1

Gy

The magnitude, or edge strength, of the gradient is then approximated using the formula:

$|G| = |Gx| + |Gy|$

Step 3:-

The direction of the edge is computed using the gradient in the x and y directions. However, an error will be generated when sumX is equal to zero. So in the code there has to be a restriction set whenever this takes place. Whenever the gradient in the x direction is equal to zero, the edge direction has to be equal to 90degrees or 0 degrees, depending on what the value of the gradient in the y-direction is equal to. If GY has value of zero, the edge direction will equal 0 degrees. Otherwise the edge direction will equal 90 degrees. Theformula for finding the edge direction is just:

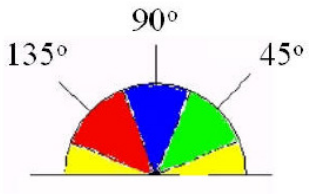
Theta = invtan (Gy / Gx)

Step 4:-

Once the edge direction is known, the next step is to relate the edge direction to a direction that can be traced in an image. So if the pixels of a 5x5 image are aligned as follows:

x x x x x
x x x x x
x x a x x
x x x x x
x x x x x

Then, it can be seen by looking at pixel "a", there are only four possible directions when describing the surrounding pixels - 0 degrees (in the horizontal direction), 45 degrees (along the positive diagonal), 90 degrees(in the vertical direction), or 135 degrees (along the negative diagonal). So now the edge orientation has to be resolved into one of these four directions depending on which direction it is closest to (e.g. if the orientation angle is found to be 3 degrees, make it zero degrees). Think of this as taking a semicircle and dividing it into 5regions.



Therefore, any edge direction falling within the yellow range (0 to 22.5 & 157.5 to 180 degrees) is set to 0degrees. Any edge direction falling in the green range (22.5 to 67.5 degrees) is set to 45 degrees. Any edge direction falling in the blue range (67.5 to 112.5 degrees) is set to 90 degrees. And finally, any edge direction falling within the red rage (112.5 to 157.5 degrees) is set to 135 degrees.

Step 5:-

After the edge directions are known, non-maximum suppression now has to be applied. Non-maximum suppression is used to trace along the edge in the edge direction and suppress any pixel value (sets it equal to0) that is not considered to be an edge. This will give a thin line in the output image.

Step 6:-

Finally, hysteresis[12] is used as a means of eliminating streaking. Streaking is the breaking up of an edge contour caused by the operator output fluctuating above and below the threshold. If a single threshold, T1 is applied to an image, and an edge has an average strength equal to T1, then due to noise, there will be instances where the edge dips below the threshold. Equally it will also extend above the threshold making an edge look like a dashed line. To avoid this, hysteresis uses 2 thresholds, a high and a low. Any pixel in the image that has a value greater than T1 is presumed to be an edge pixel, and is marked as such immediately Then, any pixels that are connected to this edge pixel and that have a value greater than T2 are also selected as edge pixels. If you think of following an edge, you need a gradient of T2 to start but you don't stop till you hit gradient below T1.

4. Visual Comparison of various edge detection Algorithms

FIGURE 7: Image used for edge detection analysis (wheel. if)

Edge detection of all four types was performed on Figure 7[13]. Canny yielded the best results. This was expected as Canny edge detection accounts for regions in an image. Canny yields thin lines for its edges by using non-maximal suppression. Canny also utilizes hysteresis with shareholding.

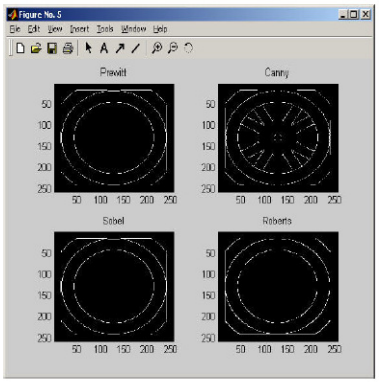


FIGURE 8: Results of edge detection on Figure 7. Canny had the best results

FIGURE 9: Comparison of Edge Detection Techniques Original Image (b) Sobel (c) Prewitt (d) Robert (e) Lallation (f)aplacian of Gaussian

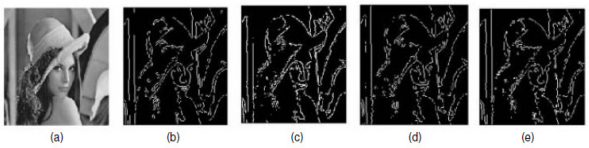


FIGURE 10: Comparison of Edge Detection Techniques on Lena Image Original Image (b) Canny Method (c) Roberts
Edges (d) LOG edges (e) Sobel

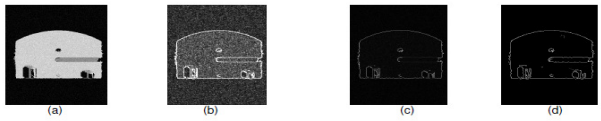


FIGURE 11: Comparison of Edge Detection technique on Noisy Image (a) Original Image with Noise (b) Sobel (c) Robert
(d) Canny

5. Advantages and Disadvantages of Edge Detector

As edge detection is a fundamental step in computer vision, it is necessary to point out the true edges to get thebest results from the matching process. That is why it is important to choose edge detectors that fit best to theapplication. In this respect, we first present some advantages and disadvantages of Edge Detection Techniques[13]-[21] with in the context of our classification in Table 1.

Operator	Advantages	Disadvantages
Classical (Sobel, prewitt, Kirsch,...)	Simplicity, Detection of edges and their orientations	Sensitivity to noise, Inaccurate
Zero Crossing(Laplacian, Second directional derivative)	Detection of edges and their orientations. Having fixed characteristics in all directions	Responding to some of the existing edges, Sensitivity to noise
Laplacian of Gaussian(LoG) (Marr-Hildreth)	Finding the correct places of edges, Testing wider area around the pixel	Malfunctioning at the corners, curves and where the gray level intensity function varies. Not finding the orientation of edge because of using the Laplacian filter
Gaussian(Canny, Shen-Castan)	Using probability for finding error rate, Localization and response. Improving signal to noise ratio, Better detection specially in noise conditions	Complex Computations, False zero crossing, Time consuming

Table 1

6. CONCLUSIONS

Since edge detection is the initial step in object recognition, it is important to know the differences between edge detection techniques. In this paper we studied the most commonly used edge detection techniques of Gradient-based and Lallation based Edge Detection. The software is developed using MATLAB 7.0.Gradient-based algorithms such as the Prewitt filter have a major drawback of being very sensitive to noise. The size of the kernel filter and coefficients are fixed and cannot be adapted to a given image. An adaptive-detection algorithm is necessary to provide a robust solution that is adaptable to the varying noise levels of these images to help distinguish valid image contents from visual artefacts introduced by noise. The performance of the Canny algorithm depends heavily on the adjustable parameters, _, which is the standard deviation for the Gaussian filter, and the threshold values, 'T1' and 'T2'. _ also controls the size of the Gaussian filter. The bigger the value for the larger the size of the Gaussian filter becomes. This implies more blurring, necessary for noisy images, as well as detecting larger edges. As expected, however, the larger the scale of the Gaussian, the less accurate is the localization of the edge. Smaller values of imply a smaller Gaussian filter which limits the amount of blurring, maintaining finer edges in the image. The user can tailor the
algorithm by adjusting these parameters to adapt to different environments.Canny's edge detection algorithm is computationally more expensive compared to Sobel, Prewitt and Robert's
operator. However, the Canny's edge detection algorithm performs better than all these operators under almostall scenarios. Evaluation of the images showed that under noisy conditions, Canny, LoG, Sobel, Prewitt,Roberts's exhibit better performance, respectively.

• References

[1]. E. Argyle. "Techniques for edge detection," Proc. IEEE, vol. 59, pp. 285-286, 1971

[2]. F. Bergholm. "Edge focusing," in Proc. 8th Int. Conf. Pattern Recognition, Paris, France, pp. 597- 600, 1986

[3]. J. Matthews. "An introduction to edge detection: The sobel edge detector," Availableathttp://www.generation5.org/content/2002/im01.asp, 2002.

[4]. L. G. Roberts. “Machine perception of 3-D solids” ser. Optical and Electro-Optical Information Processing.MITPress, 1965 .
[5]. R. C. Gonzalez and R. E. Woods. “Digital Image Processing”. 2nd ed. Prentice Hall, 2002.
[6]. V. Torre and T. A. Poggio. “On edge detection”. IEEE Trans. Pattern Anal. Machine Intell., vol. PAMI-8, no.2, pp. 187-163, Mar. 1986.
[7]. E. R. Davies. “Constraints on the design of template masks for edge detection”. Partern Recognition Lett.,vol. 4, pp. 11 1-120, Apr. 1986.
[8]. W. Frei and C.-C. Chen. “Fast boundary detection: A generalization and a new algorithm ”. lEEE Trans.Comput., vol. C-26, no. 10, pp. 988-998, 1977.
[9]. W. E. Grimson and E. C. Hildreth. “Comments on Digital step edges from zero crossings of second Directionalderivatives’’. IEEE Trans. Pattern Anal. Machine Intell., vol. PAMI-7, no. 1, pp. 121-129, 1985.
[10]. R. M. Haralick. “Digital step edges from zero crossing of the second directional derivatives,” IEEE Trans.Pattern Anal. Machine Intell., vol. PAMI-6, no. 1, pp. 58-68, Jan. 1984.
[11]. J. F. Canny. “A computational approach to edge detection”. IEEE Trans. Pattern Anal. Machine Intell., vol.PAMI-8, no. 6, pp. 679-697, 1986
[12] J. Canny. “Finding edges and lines in image”. Master’s thesis, MIT, 1983.
[13]. R. A. Kirsch. “Computer determination of the constituent structure of biomedical images”. Comput.Eiorned. Res., vol. 4, pp. 315-328, 1971.
[14]. M. H. Hueckel. “ A local visual operator which recognizes edges and line”. J. ACM, vol. 20, no. 4, pp. 634-647, Oct. 1973.
[15]. Y. Yakimovsky, “Boundary and object detection in real world images”. JACM, vol. 23, no. 4, pp. 598-619,Oct. 1976

MOVING VEHICLE DETECTION TECHNIQUE: BACKGROUND SUBTRACTION

[1] MS.BHAGYASHRI MAKWANA, [2] PROF.PRAVESH KUMAR GOEL

[1] B.H. GARDI COLLEGE OF ENGINEERING, RAJKOT, GUJRAT
[2] B.H. GARDI COLLEGE OF ENGINEERING, RAJKOT, GUJRAT

bhagyashree.rinku786@gmail.com , goelpravesh2006@gmail.com

ABSTRACT : Background subtraction approach is used to detect the moving object from background. Different methods have been proposed to detect object motion by using different background subtraction techniques over recent years.. Background subtraction approach is used to detect the moving object from background. Tha method use for static camera. Background subtraction is process of extracting foreground objects from maintained background model. A foreground object is any entity that detected by producing difference of the every frame of sequence to background model. It is a widely use for extract moving object.

Key Words: Background Subtraction, foreground

1. INTRODUCTION:-

Detection is a difficult task in a complex environment because of moving object interact with each other and it may move in unexpected ways .This requires a robust method without being affected by changes of environment features. The computational complexity and even the constant factors of the algorithms are important for real time performance. The system is initialized by feeding video imagery captured by a static camera. To detect any moving object from the incoming frame; the system is divided into three main stages: detection; reduce noise and extract meaningful objects and their features (area, width, height and center of a region). Detection stage is able to differentiate moving foreground objects from static background objects in dynamic scenes. Most of the methods are used for both color and gray scale video imagery[2].A background modelling is a process that is dividing in three model:

1. Representation Model 2. Initialization Model 3. Adaptation Model

The first model used for represent the background; the second one used for initialization of this model, and the third used for adjusting the model to the background changes(e.g. suddenly illumination changes).Generally background models have two distinct stages in their process: initialization and update. in this we are use adaptation model.[3] The background model can be static or dynamic. Dynamic background model is one in which the background of scene may contain moving objects in outdoor environment, Pixel-based and block based are two major kind of approached are for background Subtraction. To construct a statistical representation of background scene non-parametric statistical Modeling of pixel process is used. The different challenges that has to face to construct a good background subtraction algorithm are robustness against the changes in illumination and shadow detection.

In this work, a few of the known background subtraction techniques are discussed and compared. an overview.we discuss the basic and simple methods of frame differencing (FD) and running Gaussian averaging (RGA).a mixture of Gaussians (MoG) .

2. BASIC BACKGROUND SUBTRACTION:

Frame differencing is a method in which subtract current frame to previous frame. It only works well in particular conditions of object speed and frame rate and is very sensitive to the threshold.[3] Using frame differencing on frame-by-frame basis a moving object, if any, is detected with high accuracy and efficiency.[4] Frame difference [11] calculates the difference between 2 frames at every pixel position and store the absolute difference. It is used to visualize the moving objects in a sequence of frames. It takes very less memory for performing the calculation. Let us consider an example, if we take a sequence of frames, the present frame and the next frame are taken into consideration at every calculation and the frames are shifted (after calculation the next frame becomes present frame and the frame that comes in sequence becomes next frame.shows the frame difference between 2 frames.According to this scheme, pixels belongs to foreground if

$$|I_i(x,y) - I_{i-1}(x,y)| > T$$

The background model at each pixel location is based on the pixel's recent history. The history can be the average of the previous n frames or the weighted average, where recent frames have higher weight. The

weighted average is computed as the chronological average from the pixel's history and no spatial correlation is used between different (neighbouring) pixel locations. At each new frame, each pixel is classified as either foreground or background. The selective background model ignores any pixels which are classified as foreground by the classifier.

The limitations of basic background subtraction are that it does not provide an explicit method to choose the threshold and it can't cope with multiple modal background distributions (for a single value of the threshold).

3. RUNNING GAUSSIAN AVERAGE

PF inder, a method proposed in [1], works by fitting one Gaussian distribution over the histogram of the history of each pixel, which is then used as the background probability density function (PDF) for a particular pixel. At the next frame, the background PDF is updated by using a running average as follows:

$$\mu_i(x,y) = \alpha I_{i-1}(x,y) + (1-\alpha)\mu_{i-1}(x,y)$$
$$\sigma_i^2(x,y) - \alpha(I_{i-1}(x,y) - \mu_{i-1}(x,y))^2 + (1-\alpha)\sigma_{i-1}^2(x,y)$$

The update is followed by testing if $|I_i(x,y) - \mu_i(x,y)| > T$ where the threshold T can be chosen as some constant multiple of $\sigma_i(x,y)$.

A disadvantage of this method is that it does not cope with multimodal background distributions, where a single Gaussian PDF would be insufficient.

4. MIXTURE OF GAUSSIANS

A single Gaussian, as used in the previous section, may be enough to model the pixel value over time if each pixel came from the same surface under the same lighting. This would also have accounted for acquisition noise. Also, a single, adaptive Gaussian may be enough if the lighting is the only thing that changes over time.

Consider a particular pixel (x; y). For notational convenience we define ci to be the value of the pixel in frame i,

$$c_i = I_i(x,y)$$

where I is the image sequence and Ii is the current frame.Note that ci is assumed to be a 3-element vector containing, for example, the red, green and blue components of the pixel.

The history of pixel (x; y), at any given time t, is therefore given by the ordered set

$$\{c_1, c_2, \ldots \ldots, c_t\}$$

An aspect of variation occurs if moving objects are present in the scene. A moving object will normally produce more variance than a stationary object. We model this history by a mixture of K Gaussian distributions, so that the probability of observing the current pixel value is

$$P(c_t) = \sum_{i=1}^{K} \omega_{i,t} n(c_t; \mu_{i,t} \varepsilon_{i,t})$$

where K is the number of distributions, wi,t is an estimate of the weight (what portion of the data is accounted for by this Gaussian), η i,t is the mean value, ε i,ttis the covariance matrix of the ith Gaussian in the mixture at time t, and η s a Gaussian probability density function:

$$n(c; \mu; \varepsilon) = \frac{1}{(2\pi)^{\frac{d}{2}} |\varepsilon|^{\frac{1}{2}}} e^{-\frac{1}{2}(c-\mu)^T \varepsilon^{-1}(c-\mu)}$$

Here d is the number of dimensions of c, in this case d = 3.

As we know, images usually consist of multiple surfaces and lighting conditions change. Thus, multiple adaptive Gaussians may be necessary .A mixture of adaptive Gaussians can be used to approximate this process, as proposed in [2]. Each time the parameters are updated, the Gaussians are evaluated and a simple heuristic is used to decide which are most likely to be part of the background.

An advantage of using this method is that the existing background is not destroyed if something is allowed to become part of the background. The original background color remains in the mixture until it becomes the Kth most probable and a new color is observed. An example of how this is useful is when an object remains motionless, just long enough to become part of the background, and it then moves again. The distribution describing the previous background does still exist with the same mean and variance, but with a lower weight and will quickly be re-incorporated into the background.

4. MEAN-SHIFT BASED ESTIMATION

Mean-shift based estimation [7] is a gradient-ascent method that is able to detect the modes of a multimodal distribution, along with their covariance matrices. The method is iterative, thus it is very slow and the memory requirements are very high. A way to overcome the computation issue is to use this method only for detecting the background PDF modes at initialization time and then use a method that is computationally lighter, such as mode propagation.

5. OPTICAL FLOW

The optical flow method involves estimating the displacement field between two images.It is usually used when correspondences between pixels are needed. The aim of this method is to approximate a projection of the three dimensional velocities of surface points onto a two dimensional surface. There are also a few techniques for determining Optical flow. See [9] for a detailed analysis of the various techniques, as well as their performances. Since this method determines what pixels are moving, we can identify the moving objects.

	Speed	Memory Requirement	Accuracy
Average	Fast	High	Acceptable
Median	Fast	High	Acceptable
Running Average	Fast	Low	Acceptable
MoG	Intermediate	Intermediate	Good
Standard Mean Shift	Slow	High	Better
Optical Flow	Intermediate	Intermediate	Better

Table 1. Summary Of difference Method

6. CONCLUSION

A few shortcomings that we came across is in the basic background subtraction (BBS) and the running Gaussian average (RGA) methods. The BBS (section 2) does not provide an explicit method to choose the threshold and it can not cope with multiple modal background distributions for a single value of the threshold. As well as RGA that does not cope with multimodal backgrounds.

If we discuss about at the execution times of the methods in MoG, significantly faster and a bit slower than FD and AM. FD, on the other hand, is the fastest bya signicant margin, because of the small amount of calculations that has to be done by the technique.

7.REFERENCES

[1] C. Wren, A. Azarbayejani, T. Darrell, and A. Pentland, \Pnder:Real-time Tracking of the Human Body," IEEE Trans. on Patt. Anal. and Machine Intell., vol. 19,no. 7, pp. 780-785, 1997

[2] Stauer C, Grimson W. E. L, \Adaptive background mixture models for real-time tracking," in Proceedings. 1999 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Cat. No PR00149). IEEE Comput. Soc. Part Vol.2, 1999.

[3] Elgammal A., Harwood D., Davis L, \Non-parametric model for background subtraction," in IEEE ICCV'99 FRAME-RATE WORKSHOP. 1999.

[4] D. W. Scott, \Multivariate Density Estimation," Wiley-Interscience, 1992.

[5] K.-P. Karmann and A. von Brandt, \Moving object recognition using and adaptive background memory, in Time-Varying Image Processing and Moving Object Recognition," Elsevier Science Publishers B.V., 1990.

[6] N. M. Oliver, B. Rosario, and A. P. Pentland, \A Bayesian Computer Vision System for Modeling Human Interactions," IEEE Trans. on Patt. Anal. and Machine Intell., vol. 22, no. 8, pp. 831-843, 2000.

[7] M. Piccardi and T. Jan, \Mean-shift Background Image Modelling", 2004

[8] B. Han, D. Comaniciu, and L. Davis, \Sequential kernel density approximation through mode propagation: applications to background modeling," Proc. ACCV-Asian Conf. on Computer Vision, 2004. Running Gaussian average.

[9] J. L. Barron, D. J. Fleet, and S. Beauchemin (1994), \Performance of optical flow techniques," International Journal of Computer Vision (Springer).

End-to-End Delivery in Computer Networks with Transmission Control Protocol

Jaydevsinh B Vala
Government Polytechnic
Rajkot- Gujarat, India
E-mail:- jaydev.vala@gmail.com

***Abstract*—This TCP works between Application layer and Network layer. When a process running on a sender host wants to send a large amount of data, it sends data to the TCP. TCP breaks the data into a set of TCP segments, inserts a TCP header to each segment and sends to the IP. IP handles each received TCP segment independently. IP inserts IP header to each segment making an IP packet and sends to the lower layers for further processing. At the destination, destination IP receives IP packets. Destination IP sends these IP packets to the destination TCP. TCP reforms the original data and delivers to the destination process. Various TCP services are explained in this paper. The byte oriented numbering system along with TCP header structure is also explained. This paper can be useful for the researchers to start working on computer networks.**

Keywords—TCP; Network; Header; Congestion;

I. INTRODUCTION

TCP works between Application layer and Network layer. When a process running on a sender host wants to send a large amount of data, it sends data to the TCP. TCP breaks the data into a set of TCP segments, inserts a TCP header to each segment and sends to the IP. IP handles each received TCP segment independently. IP inserts IP header to each segment making an IP packet and sends to the lower layers for further processing. At the destination, destination IP receives IP packets. Destination IP sends these IP packets to the destination TCP. TCP reforms the original data and delivers to the destination process[1]. Various TCP services are explained below [2].

1. Process to Process Communication: - TCP identifies each end of the communication via a socket address. A socket address is a combination of IP address and Port address. IP address identifies a specific host and Port address identifies a specific process running on that host[2]..

2. Connection Oriented Communication: - The two TCP's, sender TCP and destination TCP have to establish a connection using three - way handshaking protocol. The connection is a logical connection. Connection is required for flow control and stream delivery[2]..

3. Stream Communication: - IP protocol doesn't maintain any relationship among the segments received from the TCP. IP packets may travel to different routes and reach out of order at the destination. It is essential to reorder the packets to reform the message exactly what was actually sent. TCP is a byte oriented protocol which uses byte oriented sequence number concept to reorder the segments[2]..

4. Flow Control: - The rate at which the sender is sending the data must be less than or equal to the rate at which the destination can receive. Receiving TCP informs the sender the suitable rate according to its current buffer capacity[2]..

5. Congestion Control: - The sender TCP has to slow down the rate of sending data not only as per the destination's capacity but also as per the network's capacity. Congestion

control slows down the rate if network is not capable to handle large amount of data[2]..

6. Error Control: - TCP provides reliability with error control. TCP deals with lost, duplicate, corrupted and out of order segments. TCP discards duplicate segments, discards corrupted segments and will be treated just like lost segments and rearranges out of order received segments. TCP uses acknowledgements to confirm delivery of data. TCP sender waits for an acknowledgement for the sent data. On time out or on receiving few duplicate acknowledgements asking for the already sent data, it takes decision based on the congestion control scheme[2]..

II. TCP NUMERING SYSTEM

TCP is byte oriented. Although TCP transmits and receives segments, it has no concept like segment numbers. Each of the bytes of every segment has a unique byte number assigned. There are two byte oriented fields known as sequence number and acknowledgement number. TCP assigns a unique 32 bit number to every byte being transmitted. It is not necessary that TCP numbering starts from 0. Any arbitrary number between 0 and 232 – 1 can be used as the starting number for 1st byte. TCP uses ISN – Initial Sequence Number concept to choose the starting byte number to avoid disturbance of any previous TCP connection on current TCP connection due to delayed delivery. ISN should be different for each connection so subsequent connections get totally different ranges of byte number [2].

The main purpose of TCP numeric system is to provide ordered and reliable delivery. TCP sender sends bytes in order. TCP receiver ensures the received data is formed of correct sequence of bytes. Those bytes which are missing are retransmitted as per TCP's congestion control mechanism[3].

A. Sequence Number

TCP assigns a sequence number to each segment which is the byte number of the 1st byte inside that segment. The sequence number of the 1st segment is the ISN and sequence number of any other segment is sequence number of last sent byte plus 1. Generally TCP segment carries data as well as control information for piggybacking support. Sometimes some TCP segments (connection establishment, termination) have only control information. Such segments consume only one sequence number which is used for the acknowledgement purpose [3].

B. Acknowledgement Number

As TCP is a reliable protocol, it needs confirmation of the delivery of data. Destination sends an acknowledgement to inform sender about successful delivery of data. The value of the acknowledgement field defines the number of the next byte destination expects to receive. TCP acknowledgements are cumulative means it confirms proper delivery of all byte up to acknowledgement number minus 1 [2,3].

Suppose a TCP connection transfers 3000 bytes. ISN is 5001 and segment size is 1000 bytes which requires total of 3 segments.
Segment 1:- Bytes:- 5001 to 6000 (1st 1000 bytes of data) :- Sequence Number:- 5001
Segment 2:- Bytes:- 6001 to 7000 (2nd 1000 bytes of data):- Sequence Number:- 6001
Segment 3:- Bytes:- 7001 to 8000 (3rd 1000 bytes of data):- Sequence Number:- 7001

Destination sends acknowledgement based on its strategy. In a simplest approach, on receiving a segment, destination asks for the next segment.
Segment 1 received so Acknowledgement with Acknowledgement Number 6001
Segment 2 received so Acknowledgement with Acknowledgement Number 7001
Segment 3 received so Acknowledgement with Acknowledgement Number 8001

Acknowledgements are cumulative. A single acknowledgement with acknowledgement number 8001 indicates all the bytes numbered up to 8000 have been successfully received. It doesn't mean that total 8000 bytes have been received. Because ISN may not starts with 1. The purpose of cumulative acknowledgements is to reduce network traffic. The ratio of cumulativeness depends upon the TCP strategy being used. TCP sends an acknowledgement immediately on receiving any out of order segment [2,3].

III. TCP SEGMENT

TCP receives stream of bytes from the Application layer and breaks into a set of segments. A packet in TCP is known as TCP segment. TCP inserts a TCP header to each of the segments and forward them to the Network layer - IP for further processing. TCP segment has two parts: Header and Data.

A. TCP Header

TCP header size is 20 bytes (no option fields) and maximum 60 bytes (with option fields). Data field carries the actual data of transmission. Length of Data field (typically 576 or 1500 bytes) is variable. During connection establishment, destination can inform the sender the MSS – Maximum Segment Size, The maximum number of bytes per segment that a destination can receive for a particular TCP connection. MSS is with reference of the actual data only. It doesn't count TCP header. So if MSS is 200 bytes, then the actual segment size would be 220 bytes with a TCP header of additional 20 bytes. MSS is a ceiling on TCP segment size. But at any particular moment, actual TCP segment size depends upon the current window size which is maintained by the sender with the help of destination and network for flow and congestion control purpose. There should be one to one correspondence between a TCP segment and an IP packet. TCP segment (TCP header + Data) becomes Data for IP packet. IP inserts an IP header and forwards to the lower layers. Various fields of TCP header are discussed below [2,3].

1. Source Port Address defines the process running at the sender host which is sending the data.
2. Destination Port Address defines the process running at the destination host which is receiving the data.
3. Sequence Number defines the number assigned to the 1st byte of the data contained inside a segment.
4. Acknowledgement Number defines the number of the byte which receiver expects to receive in next segment. Acknowledgement and data can be piggybacked. Acknowledgement Number confirms the delivery of all the previous data up to Acknowledgement Number - 1 to the sender.
5. Header length indicates the number of 4-bytes words in TCP header. The TCP header can be of 20 to 60 bytes. So value of this field is between 5 and 15.
6. Control field defines 6 flags which are set whenever required.

CWR	ECE	URG	ACK	PSH	RST	SYN	FIN

a) SYN – Synchronization: - SYN flag is set for the 1st segment sent from the sender to the receiver when TCP connection is found.

b) FIN – Finish:- FIN flag is set to inform that the sender has finished sending data but it can still receive. This flag is used for half-close.

c) RST – Reset:- RST flag is set to terminate the TCP connection. This flag is used for full-close.

d) ACK – Acknowledgement: - ACK flag is set whenever the value of Acknowledgement Number field is valid.

e) URG – Urgent:- URG flag is set whenever the value of Urgent Pointer is valid.

f) PSH – Push:- PSH is set when sender wants receiver to immediately

delivery the data to the receiving process without waiting for window to be filled completely.

g) ECE –Explicit Congestion Notification Echo:- Routers supporting ECN have Active Queue Management functionality to predicate the congestion using various mechanisms like Random Early Detection. Such routers set congestion info underwith ECN. When destination gets ECN bits in a packet header, it notifies actualsource regarding congestion by setting ECE flag in TCP header of reply.

h) CWR– Congestion Window Reduce: - when packet with ECEis received, source immediately reduces transmission rate as per congestion control. And informs destination about reporting using CWR flag in next packet.

7. Window Size: - Receiver sends max. rate at which it is possible to receive to the sender using this field. Being a 16 bits field, maximum window size is 65535 bytes.

8. Checksum: - 16-bit checksum is calculated for error detection purpose.

9. Urgent Pointer: - This field is valid when URG flag is 1. It defines the urgent data inside a segment. This value is added with the sequence number to find the last byte of the urgent data.

10. Options: - Optional data is used to send some additional information. Maximum Segment Size, Selective acknowledgements, Timestamps, Alternate Checksum values etc are part of this field.

Acknowledgement Number, Window Size, ACK Flag and ECE Flag are used by receiver. Options field is used by receiver for sending information about selective acknowledgements. Various TCP variants like Tahoe, Reno and NewReno are proposed for improvement[4].

CONCLUSION

TCP is a transport layer which is responsible for end to end delivery of bytes. Apart from delivery, it ensures reliability to provide ordered and error free delivery. TCP is most widely used protocol over all the other transport layer protocols. The main purpose of this paper is to discuss various services provided by TCP, TCP's numerical system and TCP's header field. This survey helps researchers in understanding TCP prior to formulation of their research problems.

References

[1] Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa , "Ad Hoc Mobile Wireless Networks - Principles, Protocols, and Applications" - Auerbach Publications Taylor & Francis Group

[2] BehrouzForouzan, "TCP/IP Protocol Suite", 4/e, McGraw-Hill

[3] W. Richard Stevens, "TCP/IP Illustrated, Vol. 1: The Protocols" (Addison-Wesley Professional Computing Series)

[4] Ghassan A. Abed *, Mahamod Ismail, KasmiranJumari, "Exploration and evaluation of traditional TCP congestion control techniques", Journal of King Saud University – Computer and Information Sciences (2012) 24, 145–155

IMPINGEMENT OF 4G COMMUNICATION ON HEALTH

[1] NUSRAT MALIK, [2] NANDU FATAK

[1]Electronics and Communication Engineering, L.J.I.E.T., Ahmedabad 382010
[2] Information Technology, Sir B.P.T.I., Bhavnagar 364002

nusratsmalik@gmail.com, nandufatak@gmail.com

ABSTRACT: *4G communication is the futuristic communication technology. It promises up to 1 Gbps of speed and will be a packet based network. Because of high speed our most of the applications will go wireless and average contact hours of an individual will be significantly increased. 4G works on higher band of frequency. The concern has been raised about the possibility that exposure to the radiofrequency (RF) fields from 4G user terminals or their base stations could affect people's health. Higher functionality handsets deliver more SAR and higher bracket of frequency add up possibly more risk. The WHO has classified mobile phone radiation on the IARC scale into Group 2B - possibly carcinogenic. This work demonstrates findings on this aspect and a detailed survey has been done and possible ways to reduce health risk are proposed.*

Key words: 4-G communication, SAR, Radiation, WHO, IARC.

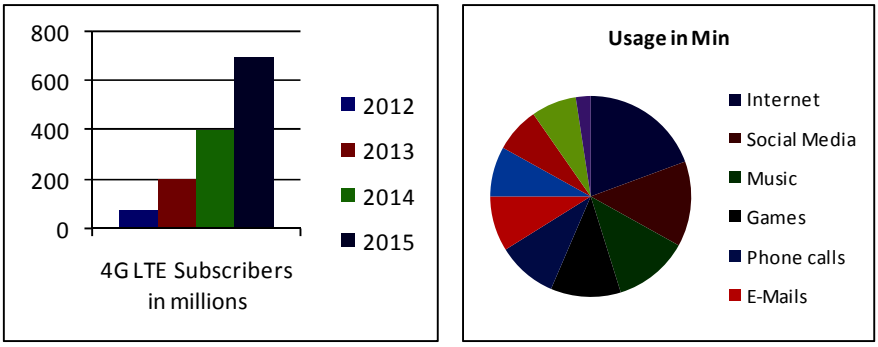
1 INTRODUCTION

Our life is completely dependent on wireless gadgets because most applications rely upon mobile networks and small wireless gadgets. Every wireless gadget works on electromagnetic. It means signal is transferred via electromagnetic radiation. This signal produces electromagnetic radiation in the form of thermal radiation that consists of ionizing radiation and non -ionizing radiation [1]. When using mobile phone, electromagnetic wave is transferred to the body which causes health problems.

4G/LTE provides a comprehensive and secure all-IP based mobile broadband solution to all kinds of mobile communication devices. WiMAX, HSPA+ and Long Term Evolution (LTE) have been the dominant technologies in this market. These technologies have been designed for higher speed, high bandwidth and higher frequency band. Our concern for the health will be more pronounced because of higher contact hours, higher frequency band and higher radiation.RF energy is used in all sort of wireless telecommunication. More the frequency more the radiation.4G has been the latest technology and hence it uses higher band in frequency spectrum allocated. RF energy is used in telecommunications services, including radio and television broadcasting, mobile communication, GPS devices, radio communications for police and fire departments, and satellite communications [2]. Non-communication sources of RF energy include microwave ovens, radar, and industrial uses. The complete electromagnetic spectrum consists of both ionizing and non-ionizing radiation [1]. Non-ionizing radiation does not carry enough energy to remove an electron from an atom or a molecule. Sources of non-ionizing radiation include microwaves, radio waves, cordless phones, wireless networks (wi-fi), power lines and MRIs [3].

2 Cell Phone Use Patterns

With the penetration of 4G technology, high end phone handset registered high selling. A smart-phone is defined as a cell phone that is capable of doing more than just phone. Users can email, search the web, edit documents, video call, check the weather, play online games, and perform many other functions. Smart phone leads to higher human contact hours because of its higher range of application support. Daily smart phone usage is jumped quite steeply. Figure 1 shows the survey conducted by various agencies regarding cell phone usage and also that average people sleep with smart phone is very high. It means lots of unnecessary hours increase in contact with phone. Studies suggest that age group of 30-49 years and 18-29 years sleeps with smart phone every single night and exposes themselves unnecessarily to radiation [5].



(Figure 1: Rise of 4G subscriber and usage [4])

3 Radiofrequency (RF) Exposure from 4G cell phones

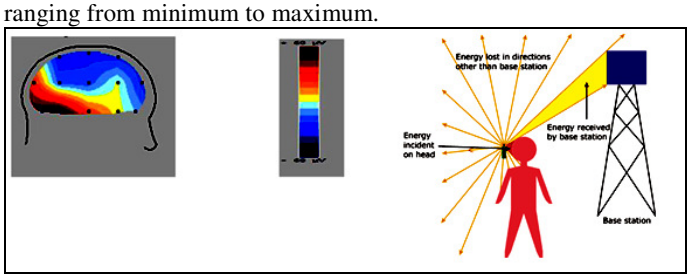
Cell phone networks worldwide use the Ultra High Frequency (UHF) portion of the RF spectrum for transmission and reception. It allows the transmission of large amounts of digital data over a wide spectrum of frequency bands with very low power for a short distance. Most cell phones used in 2011–2012 operate at frequencies between 450 and 2700 MHz and it will increase, with peak powers in the range of 0.1 to 2 watts. The radiofrequency exposure to a user decreases rapidly with increasing distance from the phone [6].

Specific Absorption Rate (SAR): Exposure to RF energy is determined by the Specific Absorption Rate (SAR), a measure of the rate at which energy is absorbed by the body when exposed to radiofrequency. It is defined as the power absorbed per mass of tissue, measured in watts per kilogram (W/kg).The SAR is commonly used to measure power absorbed during MRI scans and from mobile phones. The FCC's allowable SAR limit for the head is 1.6 W/kg (measured where the absorption rate is highest, which in the case of a mobile phone is often close to the phone's antenna) [7]. For exposure of other parts of the body from cell phones, partial-body SAR limits have been established to control absorption of RF energy. SAR for electromagnetic energy can be calculated from electric field within the tissue as following where ρ is sample conductivity and σ is sample density [8].

$$SAR = \int_{sample} \frac{\sigma(r)|E(r)|^2}{\rho(r)} dr$$

4 Health Risks by RF radiation

Part of the radio waves emitted by a mobile telephone handset is absorbed by the human head. The radio waves emitted by a 3G/4G handset can have a peak power of 2 watts. The influence of the weak EM radiations on human can be realized as sequence of events which includes exposure to EM radiations which when absorbed modulates the biological field patterns, accumulation of energy and information into the body fluid, change in the functional activities of cell which finally results into some disease. Figure shows the level of electrical activities generated in brain. The voltage level ranges from blue to red and represents electrical activities ranging from minimum to maximum.



(Figure 2: Effect of electromagnetic radiation in human brain [9])

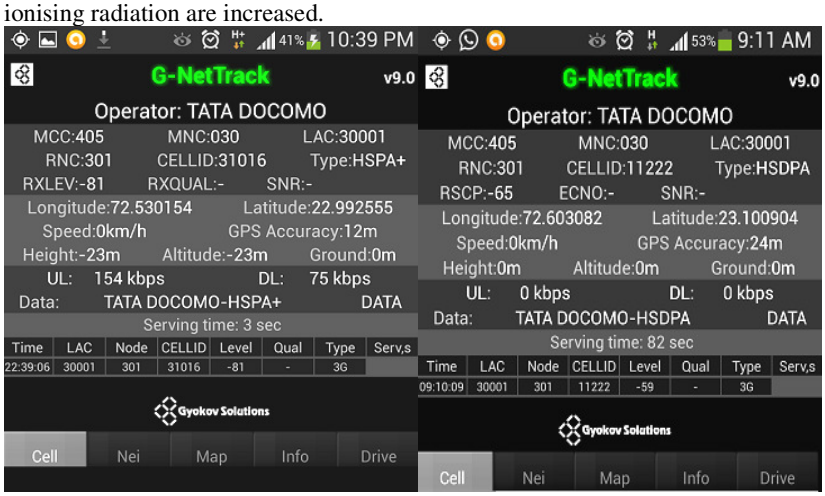
Some symptoms of radiation exposure are chronic fatigue, hyperactivity, cramps, stiffness, hyperventilation, Rigid left shoulder etc [10]. Exposure to RF radiation could cause a wide range of health effects, including behavioural changes, effects on the immunological system, reproductive effects, changes in hormone levels, headaches, irritability, fatigue, and cardiovascular effects [11]. 4G radiations are non-ionizing radiation, with long wavelength and low frequency, do not break chemical bonds, but has sufficient energy to move electrons and heat body tissue, leading to biological effects at certain doses. Except for optical radiation, there is little data on the quantitative relationships between exposures to different types of non-ionizing radiation and effects on human health [12]. Referring to IARC cancer group, it is very clear that cellular mobile falls into the Group 2A which is possibly carcinogenic. Nervous system is the area which is likely to be suffered from radiation. Minor effects on brain activity have been found. Examples of effects in humans include impaired cognitive

performance after exposure to a pulsed electromagnetic field and slower response times to spatial working memory tasks when exposed to RF from a standard GSM cellular phone placed next to the head of male subjects. Several research studies have examined the effects of RF-EMF on the male reproductive system [13]. Semen exposed to RF electromagnetic waves emitted from cell phones had higher levels of damaging free radicals, lower sperm motility, lower sperm viability, and possibly greater oxidative stress [14]. Researchers have studied the potential of RF-EMFs to cause changes in a cell's genetic material (DNA) and/or to damage the genome. "Genotoxic" substances can potentially cause genetic mutations or cellular damage that can contribute to the development of cancerous tumours. Many ocular effects on eye lenses and epithelial cell are studied. The addictive nature of cell phones has concerned psychologists for years. Recently, psychologists have warned that Smartphone users are especially at risk for becoming addicted to their devices. In a recent study, user checks their phones 34 times a day [15].

6 Results:

In this work detailed survey is made on link between wireless gadget's electromagnetic radiation and health risk. It is discussed below in various findings derived by us.

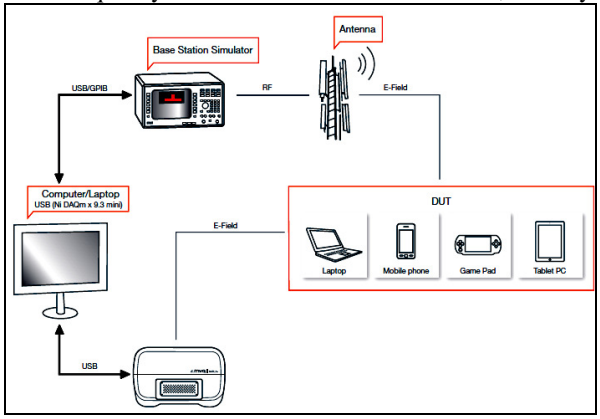
Findings: 1 Observations are taken from android application G-Net Track [15] it is found that as we change our height, altitude power level requirement changes. Figure 3 clearly show that as handsets are kept in poor coverage conditions, BTS power drops and it leads to drain our battery more and leads our antenna to radiate more. Observations are taken from NEMO and JDSU kit at popular cellular operator at Ahmedabad location proves that with more requirement of power radiation level are increased and hence the health risk from non-ionising radiation are increased.



(Figure 3: G-Net Track screenshots (a) Poor coverage (b) Good coverage)

Instrument like SARLITE [16] checks SAR level instantly on every condition in field. We observed that SAR level increases in following conditions.

1. BTS power reduces to user terminal. More distance from it or poor coverage area or elevation.
2. High end phone used with enhanced capability of high speed internet and other wireless technologies.
3. As frequency band increases loss increases. So, 4G may suffer from higher loss as compared to 3G.



(Figure 4: SAR measurement experimental setup [16])

SAR measures exposure to fields between 100 kHz and 10 GHz. Surveying various handsets and its SAR declared by manufacturers it is very clear that high end mobiles and higher frequency model carry more SAR value on theoretical ground [17].

Findings: 2

Author	Research
Khurana VG et al. (2009)Australia[18]	"There is adequate epidemiologic evidence to suggest a link between prolonged high-end, high frequency phone usage and the development of an ipsilateral brain tumor."
Han YY et al. (2009) Pittsburgh Cancer Institute[19]	"Longer term cell phone use have found an increased risk of ipsilateral AN [acoustic neuroma]."
Myung et al. National cancer center,Korea[20]	"There is possible evidence linking mobile phone use to an increased risk of tumors from a met-analysis of low biased case-control studies."
Kundi (2008) Medical University Vienna,Austria[21]	"The overall evidence speaks in favor of an increased risk, but its magnitude cannot be assessed at present because of insufficient information on long-term use."
DeIuliis et al.62 [2009] [23]	"Extensive use of high frequency mobile phone in both the power density and frequency range has clear implications on males of reproductive age by potentially affecting both their fertility and the health."
Salama N et al.[2009][22]	"Low intensity pulsed radio frequency emitted by a conventional mobile phone kept in the standby position could affect the testicular function and structure in the adult rabbit."
Agarwal A et al.[2009][13]	"Radiofrequency electromagnetic waves emitted from cell phones may lead to oxidative stress in human semen. We speculate that keeping the cell phone in a trouser pocket in talk mode may negatively affect spermatozoa and impair male fertility."
Narayan SN et al.[2010][25]	Altered passive avoidance behavior and hippocampal morphology. Experimentation on Rat.
Fragopoulou AF et al.[2010][14]	Deficits in consolidation and/or retrieval of learned spatial information. Experimentation on Rat.
Daniels WM et al.[2009][26]	Decreased loco motor activity, increased grooming and a tendency toward increased bas alcorticosterone level. Experimentation on Rat.

Table: 1 Survey on health risk and cellular communication

Findings: 3 In experiments where plankton has been exposed to WIFI and/or 3G/4G radiation the plankton dies or is deformed within several days. With WIFI it takes about 96 hours, with 3G about 72 hours and with 4G it occurs within 48 hours [19]. EEG machine is used to capture the brain activity here under three conditions: without cell phone, while using cell phone and while using high-end 4G smart phone.

Findings: 4 N=47 studies conducted at Brookhaven National Laboratory whole 2009.It was aimed to find if acute cell phone exposure affected regional activity in the human brain. Project evaluated the effects in healthy participants (N = 47) of acute cell phone exposures on brain glucose metabolism, measured using PET with injection of fluorodeoxyglucose (^{18}FDG). Brain glucose metabolic activity is a more proximal marker of neuronal activity than measures of CBF, which reflects vascular as well as neuronal components. Because exposure to RF-EMFs from cell phones is well localized and is highest in brain regions closest to the antenna, they hypothesized that the effects on brain metabolism would be greatest in inferior and anterior brain regions, the regions that would be exposed to the highest RF-EMF amplitude for the cell phone model used in this study. Result provides evidence that the human brain is sensitive to the effects of RF-EMFs from acute cell phone exposures. The findings of increased metabolism in regions closest to the antenna during acute cell phone exposure suggest that brain absorption of RF-EMFs may enhance the excitability of brain tissue [25].

Findings: 5 Proposed Regulations:

Following standards can be proposed to limit human exposure to cell phone radiation exist listed below.

- Government should regulate the content used in making of cell phones.
- Producer and users should take the accountability on disposal of cell phone waste because antenna, loudspeaker, cell phone, BTS all are radiating.
- Cell phone radiation should have pre-Market emissions testing.
- Low cost RF measurement devices to be developed to measure cumulative exposure.
- SAR values, Radiation level should be made public.
- Radiation level should be made public.
- Cell site design and installation should have stricter norms.

Findings: 6 Proposed way to reduce health risk due to 4G radiation:

1. It is highly recommended to reduce talk time. If longer talks are unavoidable hands free kits should be used.EEG clearly suggest that this way the possible damage can be reduced.
2. It is recommended that current regulations for cell phones concerning exposure of the population to RF radiation be extended to other devices (e.g. laptops, tablet computers, baby monitors, etc.).
3. Use of a wired ear-piece/microphone hands-free accessory,, texting rather than talking, keeping the phone a distance from the body, and placing your thumb between the phone and ear could prove beneficial.
4. Reduction in talk time is highly recommended.
5. There should be distance with smart phone while sleeping.
6. Usually a phone in an area with good reception will transmit at much lower levels than in an area with poor reception like a lift or deep within a large building.
7. Use of an earthling sheet, which should be put on bed and connect to a ground by means of a wire. All the accumulated radiation in the body is immediately fed to ground.

Conclusion:

Technological advancements in multiplexing techniques, cell design, MIMO, turbo code etc. will definitely make 4G communication works at promised 1 Gbps speed. This speed will come up with high frequency band deployment and much higher contact hours of human to smart phone. Higher the frequency band more the radiation and higher the configuration of smart phone higher the SAR. Hence health risks shown in this work will be more pronounced. Few regulations are suggested that can help average user to avoid unnecessary radiation exposure. Many unorthodox ways can be used to reduce radiation but smart usage of smart phone will be the most effective way to reduce radiation from world most promising technology.

REFERENCES

1. Mat, Kipli, et al., “Visualization and Analytical Measurement of Electromagnetic Radiation from Handheld Mobile Phones”. Published in: Computer Engineering and Applications (ICCEA), Second International Conference on (Volume:2), 19-21 March 2010. Page(s): 246 - 250 E-ISBN : 978-1-4244-6080-9.
2. Simba, Koganei, Hikage, Nojima, “A review of mobile phone usage in enclosed areas and RF safety guideline”, Published in: AFRICON, 23-25 Sept. 2009, Nairobi.
3. Binhi, Vladimir N; Repiev, A & Edelev, (2002). Magneto biology: underlying physical problems. San Diego: Academic Press. pp. 1–16.
4. Delgado JM, Leal J, Monteagudo JL, Gracia MG, "Embryological changes induced by Weak, extremely low frequency electromagnetic fields". Journal of Anatomy 134.pg: 533–51.
5. Nielsen Wire. Play Before Work: Games Most Popular Mobile App Category in U.S. July 6, 2011; Harun, H. Smartphone Penetration in Asia Set to Boom. Nielsen Wire. July 12, 2011.
6. www.nopr.niscair.res.in/bitstream
7. Bit-Babik G, et al. “Estimation of the SAR in the human head and body due to radiofrequency radiation exposure from handheld mobile phones with hands-free accessories”.
8. www.iaeng.org/publication/WCE2010/WCE2010_pp759-763.pdf
9. www.keck.bioimaging.wisc.edu -
10. Kramer A et al. Development of Procedures for the Assessment of Human Exposure to EMF from Wireless Devices in Home and Office Environments. 2005; Swiss Federal Office of Public Health FOPH, 2007.
11. CTIA. Wireless Quick Facts. Year and Figures; Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, Jan–June 2010, National Center for Health Statistics, December 2010.
12. Kramer A et al. “Development of Procedures for the Assessment of Human Exposure to EMF from Wireless Devices in Home and Office Environments”, Swiss Federal Office of Public Health FOPH. 2007.
13. Agarwal A, Desai NR, Makker K et al., “Effects of radiofrequency electromagnetic waves (RF-EMW) from cellular phones on human ejaculated semen: an in vitro pilot study”, Fertil Steril. 2009 Oct.
14. Fragopoulou, et al. “Whole body exposure with GSM 900 MHz affects spatial memory in mice”. Pathophysiology Pathophysiology. 2010.June.
15. Regel SJ, Achermann P: Cognitive Performance Measures in Bioelectromagnetic Research–Critical Evaluation and Recommendations.Environmental Health 2011.
16. www.satimo.com
17. www.sarvalues.com
18. Khurana VG, Teo C, Kundi M, et al. Cell phones and brain tumors: a review including the long-term epidemiologic data. Surg Neurol. 2009 Sep;72(3):205-14.
19. Han YY, Kano H, Davis DL. Cell phone use and acoustic neuroma: the need for standardized questionnaires and access to industry data. Surg Neurol. 2009 Sep;72(3):216-22.
20. Myung SK, Ju W, McDonnell DD, et al. Mobile phone use and risk of tumors: a meta-analysis, Oct 13.
21. Kundi M, The Controversy about a Possible Relationship between Mobile Phone Use and Cancer. Environ Health Perspect Cien Saude Colet. 2010 August.

22. Effects of exposure to a mobile phone on testicular function and structure in adult rabbit. International Journal of Andrology. 2010
23. February. (33)1: 88-94. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2605.2008.00940.x/full. DeIuliis et al. Mobile Phone Radiation Induces Reactive Oxygen Species Production and DNA Damage in Human Spermatozoa In Vitro. PLoS One 4(7): e6446.
24. Agarwal A, Desai NR, Makker K et al. Effects of radiofrequency electromagnetic waves (RF-EMW) from cellular phones on human ejaculated semen: an in vitro pilot study. Fertil Steril. 2009 Oct.
25. Nora D. Volkow, MD, Dardo Tomasi. JAMA: journal for american medical association: "Effects of Cell Phone Radiofrequency Signal Exposure on Brain Glucose Metabolism".
26. Daniels WM et al. The effect of electromagnetic radiation in the mobile phone range on the behaviour of the rat. Metab Brain Dis 2009.

STRAY LOSS REDUCTIONINPOWER TRANSFORMER USING FEM

[1]JAYDEEP D. PARSANA,[2]CHIRAGKUMAR N. PAREKH,
[3]MANISH SINHA

[1]Department of Electrical Engineering, Birla Vishvakarma Mahavidyalaya, V.V.Nagar

[2]Atlanta Electricals Pvt. Ltd., V.U.Nagar, Anand

[3]Department of Electrical Department, Birla Vishvakarma Mahavidyalaya, V.V.Nagar

jaydeepparsana@gmail.com,chirag.parekh@atlantaelectricals.com,
[3]mnsinha@bvmengineering.ac.in

ABSTRACT: *The load loss in the transformer consist of losses due to the ohmic resistance of windings and certain additional losses. These additional losses are generally known as stray losses. The stray losses take place in the winding and metal parts surrounding the windings. These also take place in the metal parts around the leads. The stray losses are largely associated with the leakage flux and magnetic field surrounding the leads. The work is associated to the practical approach and FEM based analysis at manufacturing and Design stage respectively for stray loss calculation, measurement and respective reduction. Stray loss analysis is presented herewith in form of case study for 15 MVA, 25 MVA & 31.5 MVA transformers. We have used calibrated measurement instruments in all the experiments. Moreover, a 3-D finite-element analysis of the geometry of interest has been used to verify the leakage flux and metallic part interaction.*

Keywords: Transformer Design, Stray loss,FEM, Power Transformer

I. INTRODUCTION

Power transformer is most important and most costliest component of transmission network hence from early times, their design, manufacturing, Fault diagnosis and condition based monitoring have been a major concern and has been the subject of extended research.

In this paper the stray loss phenomenon in transformer, their cause and method of reduction are discussed in detail. Apart from conventional it is discussed with latest techniques like FEM 2D and 3D modeling and respective electromagnetic analysis.

II. TRANSFORMER DESIGN

Transformer design is a complex task in which engineers have to ensure that compatibility with the imposed specifications is met, while keeping manufacturing costs low.

Early efforts were based on conveniently adapted analytical solutions enabling one to optimize their construction and to take advantage of the improvements in magnetic and electric material properties for design and trial and error methods for design verification and condition monitoring.

During recent decades the development of the philosophy of transformer design has been a logical extension of the use of computers and numerical tools enabling one to model accurately the geometrical complexities as well as the nonlinear material characteristics for problem analysis. In addition, optimization algorithms have been very successfully combined with numerical techniques to represent the electromagnetic and thermal phenomena developed in power transformers, resulting in very powerful composite computational methodologies. In particular, artificial intelligence algorithms incorporated in such techniques have dramatically enhanced the speed and capability for achieving detailed optimum designs and assessment of transformer life.

It is only customized product. It designs and manufactures according to the customer's requirement. Transformer caters huge cost of power system .So its utmost responsibility of designer to design most efficient and reliable transformer at low cost, which is prime requirement both for manufacturer and utility.

The conventional design methodology is sufficient to design and manufacture the transformer but when the matter of reliability and long-term performance of transformer to be focused by designer, it will certainly ask for innovative ideas for critical characteristic like stray analysis, Hot spot detection, Impulse distribution, Short circuit. Withstand capability and many more. Further the Designing a reliable yet cost-effective transformer is a

very challenging task. Needless to say, this requires a sound design philosophy supported by advanced design and analysis techniques.

The Finite Element Method (FEM) has emerged as the most popular numerical method for product design and analysis, and many commercial 2-D and 3-D FEM packages are available for the purpose. The available literature shows that, over the last two decades, a number of intricate problems in transformers have been resolved by the FEM analysis approach.

III. STRAY LOSS IN TRANSFORMER

Stray loss is the byproduct of copper loss, which varies from 10% to 40% of total losses. Increase in % of stray loss compare to designed value, leads towards the hot-spot temperature increase in electrical as well as magnetic circuit in the transformer, and that is considered as a catalysts for transformer lifecycle declination.

Generally stray losses appear in all metal parts penetrated by magnetic leakage field produced by the windings or current loops. This means that there are many potential locations where stray losses may appear and the most important ones are those.

In winding conductors due to eddy-current (skin-effect), In winding parallel strands, due to circulating currents, In tank due to magnetic leakage flux from the windings, In tank cover around the high current bushings, In clamping plates of core due to winding leakage flux, in core sheets at the outer packages of the core limbs due to the winding leakage flux.

The load loss in the transformer consist of losses due to the ohmic resistance of windings and certain additional losses. These additional losses are generally known as stray losses. The stray losses take place in the winding and metal parts surrounding the windings. These also take place in the metal parts around the leads. The stray losses are largely associated with the leakage flux and magnetic field surrounding the leads.

Leakage flux dominantly affect the stray loss, leakage impedance and electromagnetic force under short circuit conditions. The leakage flux can some time lead to local overheating. Hence in large power transformer, the leakage is decisive factor in design of the transformer. For a transformer with a certain impedance ,some amount of leakage flux can be controlled and stray losses resulting out of the leakage flux can be considerably reduced, and local over heating can be controlled .decrease in stray loss will improve the efficiency , and will effect large saving in cooler ,oil steel costs.

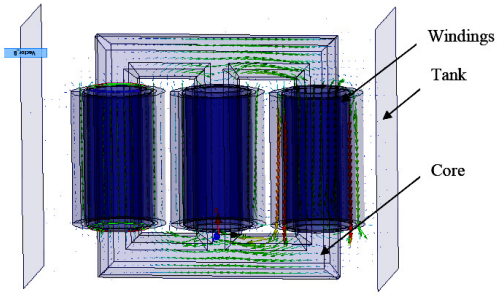


Figure: 1A 3-D Flux distribution during operation

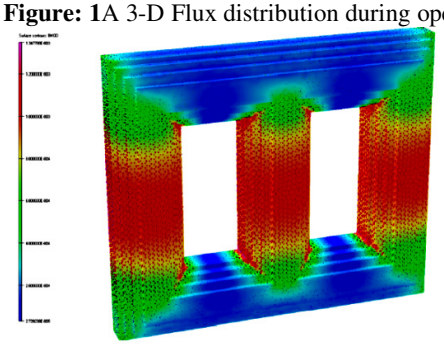
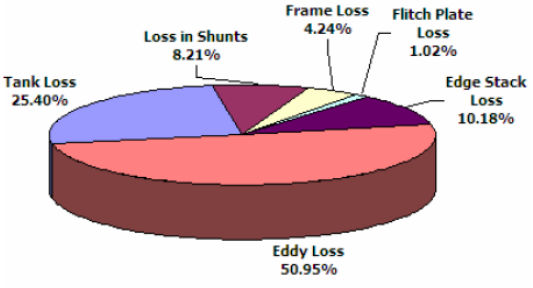


Figure: 2 Flux distribution in the core of a three phase three limb power transformer

Distribution of component stray losses, calculated as percentage of the total stray load losses

IV. LOSSES IN WINDING

The major portion of stray losses take place in the winding and is called eddy current losses. In large transformers, the turns in the winding consists of large numbers of conductors and if theyare not



Component stray losses as percentage of the total stray losses

Figure: 3 Component stray losses as percentage

suitably transposed can give rise to circulating currents within the parallel conductors. In such arrangement, unequal voltage are induced in different conductor due to varying leakage field .Unequal voltages in parallel strands gives rise to circulating current. The losses due to circulating current within few strands of conductor may not reflect much in overall losses but still can cause overheating of strands.

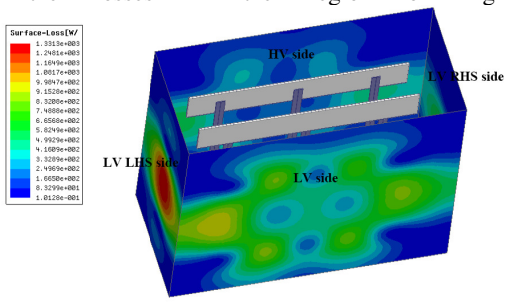
V. CASE STUDY

Transformer of 15 MVA 66/11 was designed for 65 Kw load loss. The I2R & stray losses were calculated 55 kW and 10 kW respectively. After manufacturing, the transformer was tested. The measured losses were 110 kW instead of 65 kW, which comprises 54.7 kWI2R loss and 55.3 stray loss. The load loss test value unexpected in which the stray losses value was most volatile. After investigation it was concluded that the transposition in LV winding was improper and that was initiating the circulating current for boosting the winding eddy current losses. The same was rectified and all winding were remanufactured and completed the entire transformer manufacturing process. Now the tested Load loss value was almost near to the design value i.e. 63.75 KW.

The above presented real case study indicates the vulnerability of wrong transposition in the winding.

VI. LOSSES IN METALLIC PARTS DUE TO LEAKAGE FIELD

The leakage field cuts the various metallic parts namely tank wall, core clamping plates, flitch plates on limb etc. Whereas magnetic field cuts the metallic face eddy current are set up in the plate and give rise to additional losses and the losses in the region of high intensity of field can lead local



overheating.

The leakage field on the tank walls

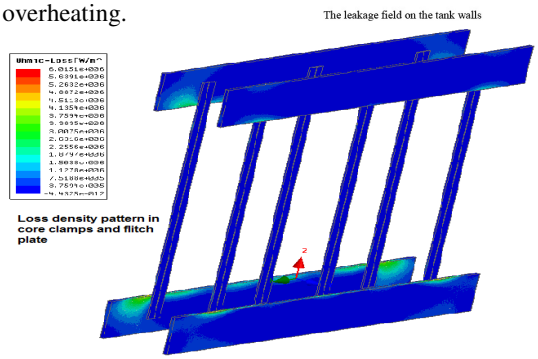


Figure: 4 Leakage field on tank walls

VII. CASE STUDY

Transformer of 25MVA 66/11 was designed for 120 kW load loss. The I^2R & stray losses were calculated 100 kW and 20 kW respectively. After manufacturing, the transformer was tested for 75% load current in open condition without tank. The measured Load losses were 117 kW (99 kW I2R + 18 kW Stray) .The same CCA was placed in its tank and again measures the Load losses and that t was 132 kW(99kW I2R+ 33 kW Stray).That means the excess 15 Kw stray losses due to tank wall and leakage flux interaction. In similar transformer the top and bottom yoke clamp were replaced from Mild steel material to laminated insulated perm wood. That again resulted in reduction of stray loss up to 4 kW. Further in similar transformer the flitch plate of core was change from Mild steel to stainless steel material. That also respond to further reduction of stray loss of 1 KW.

The above presented real case study with consecutive experiment indicates the phenomenon of stray loss in Metallic parts due to leakage field in the transformer.

VIII. LOSSES DUE TO CURRENT CARRYING LEADS

Leads carrying current, in duce magnetic field around the leads. The field if strong and in close vicinity of metallic parts produces eddy current losses. The interconnection used for making star delta connection in 3 phase transformer carries heavy current produces high flux intensities in the nearby tank surface and clamping structure. The effect of the current in the lead depends upon the magnitude of current, distance of lead from metallic parts and resistivity of material.

IX. METHODS OF STRAY LOSS REDUCTION

Stray losses in the transformer are reduced by taking several appropriate measures depending on the type and geometry of the transformer. Few among them are as following.

Use of small dimensioned conductors for windings, Use of CTC conductors in case of Higher current windings, Optimum transposition of the parallel strands, Magnetic shielding of the inner tank walls, Use of Non-Magnetic shield in the area of strong magnetic fields, Optimum selection of winding type, which can reduce the stray up to 50 to 60 % compare to conventional design.

A minimum losses design can be achieved by analyzing symmetrically the source of leakage flux, path of leakage flux and it's relation to the stray losses. Main leakage in the transformer will always exist and losses arising out of this can be reduced by various means. Stray loss due to leads can either be eliminated or reduced to great extent by properly running the leads or shielding the leads.

X. EDDY-STRAYLOSSES REDUCTION IN WINDING

Subdivision of conductors radially reduces the eddy current due to axial leakage field and subdivision of conductor axially reduces the eddy current loss due to the radial component of leakage field. Complete transposition of the conductors equalizes induced voltage in each strip and eliminates the circulating current. For high current windings, use of pre-transposed conductors would be ideal to minimize total eddy current losses. The reduction by CTC is about 75 % on large transformer.

In High voltage winding with moderate current requirement 2-3 conductors in parallel, bunched conductor can be used to improve winding spacefactor, and to improve radial subdivision of conductors.

XI. STRAY LOSS REDUCTION BY MAGNETIC SHIELDING ON TANK WALL

Transformer with large rated power and high stray fluxes have the side wall of the tank and some cases the covers provided with a screen to reduce eddy current losses in the tank wall and covers and pre vent Local overheating .For this purpose either magnetic shunt or electromagnetic screen are used.

In the large power transformers the stray-field loss and the local loss density caused in the conducting parts are considerably increased with the capacity, which probably result in the hazardous local overheating and/or because the insulation material destroyed, consequently endanger the transformer running.

In the electromagnetic design of larger powertransformer, the stray-field loss must be controlled in an acceptable level for saving energy, as well as avoiding the un-allowed overheating. So the possible engineering strategies to cope with it have been adopted, such as the optimum material configuration and structures, and any possible shielding, etc. An example of the magnetic shields installed inside the oil-tank of a large power transformer is shown in Fig. The electromagnetic shielding is used to prevent the leakage magnetic flux into the conducting parts by the reaction of the eddy current field induced in the shields of high conductivity, which is also called electromagnetic screen; however the magnetic shielding makes the leakage magnetic flux changing the path into the shields of high permeability, named magnetic shunt.

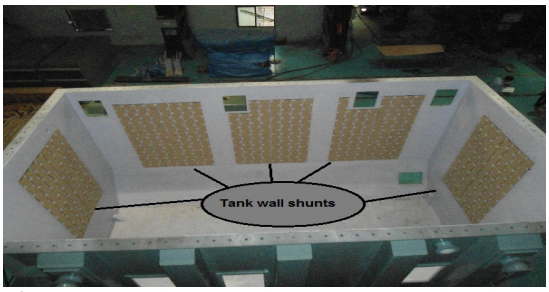


Figure: 5 Shunting on tank walls as per design change

XII. STRAY LOSS REDUCTION BY MAGNETIC YOKE SHEILD APPLICATION

Magnetic shield, made up of laminated core plates are used under the yoke providing a low reluctance return path. A large proportion of axial leakage flux is fed back in to the transformer yokes. The yoke clamp assembly is shielded and reduction of radial flux to tank side is also achieved depending on the pacing between shield & winding.

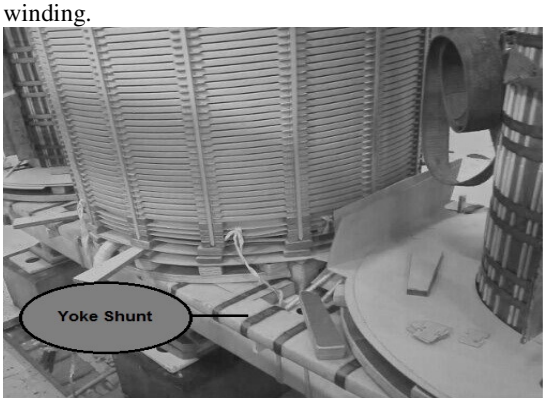


Figure: 6 Yoke shunting for stray reduction

XIII. STRAY LOSS REDUCTION BY FITCH PLATE MODIFICATION CONCEPT

The core limb plates are very near to the leakage field are and are subjectedto increase radial field and of winding. The losses in the Fitchplates are significant but the temp rise should be controlled. Severe heating of Fitch plates can take places in large transformer due to high intensity of radial flux. The reduction of losses in Fitch plates can be achieved by using Fitch plates of high resistivity material like SS or other material. Substantial reduction of losses & temperature rise can be achieved by provision of slots on the Fitchplates. This slots helps in subdividing the Fitch plate's width.

XIV. STRAY LOSS REDUCTION AT BUSHING MOUNTING PLATE ON TOP COVER OR SIDE WALL

Line lead from the winding are connected to the bushings mounted on the tank plates or tank cover. This area is prone to high eddy current and excessive heating. To reduce the losses and heating nonmagnetic steel inserts are welded in to the mounting plates at bushing locations. Sometimes mounting plates of Non-magnetic material like aluminum are used for high current bushings.

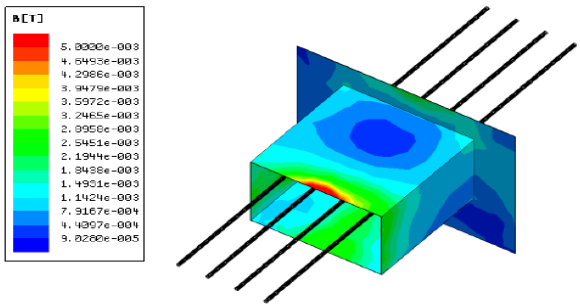


Figure — Magnetic flux density distribution in the LV throat (T).

Figure: 7 Magnetic flux density distribution in LV.

In Table-I it can be observed that there is a significant difference in total losses of a 4000 kVA transformer with and without throat, as total losses increase from 630 W to 1650 W, the comparison is made when both transformers have the SS plate in the tank wall where the LV bushings are mounted. Authors recommend the use of plastic throats to avoid the 1020 watts of losses in the low voltage throats of 4000 kVA transformers.

Table –I Total Losses with and Without CS throat for a 4000 KVA transformer

Simulation	Tank Wall Losses(W)	CS throat Losses(W)	SSP Losses (W)	Total Loss(W)
Without LV Throat	580	---	50	630
With LV Throat	415	1175	70	1650

XV. STRAY LOSSES DUE TO THE CORE CLAMPS OF A TRANSFORMER AND METHOD FOR REDUCTION

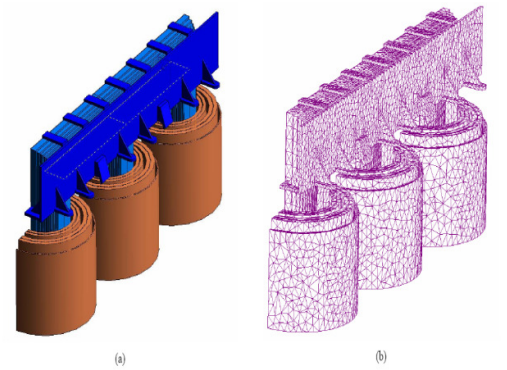


Figure: 83-D finite-element model of the transformer (a) solid model. (b) Meshed model

XVI. LOSS CALCULATION

The losses have been calculated for the case of reduced voltage short circuit test with rated current flowing in 31.5 MVA 110/33 kV transformer. There are 698 turns at high-voltage (HV) side which corresponds to the tap position for rated voltage and 146 turns at low voltage (LV) side. The current at HV side is 165 A and at LV side is 551 A. For all parts of the clamps the material of constant relative permeability μr and constant electric conductivity σ is used. The permeability and conductivity are slightly varied and the results areshown in Table I. The distribution of losses on the front (away from the core) and the back (closer to the core) sides of the core clamps is shown in Fig. (a) From Table I it is present that slight variations of relative permeability and conductivity do not seriously affect the calculated losses.

Table: 1 Clamp Losses as a function of iron permeability and conductivity

Material properties	P_{loss} (W)
$\mu_r = 300, \sigma = 5{\cdot}10^6$ S/m	3233.2
$\mu_r = 500, \sigma = 5{\cdot}10^6$ S/m	3232.8
$\mu_r = 700, \sigma = 5{\cdot}10^6$ S/m	3198.8
$\mu_r = 300, \sigma = 6{\cdot}10^6$ S/m	3218.8
$\mu_r = 500, \sigma = 6{\cdot}10^6$ S/m	3239.6
$\mu_r = 700, \sigma = 6{\cdot}10^6$ S/m	3220.4
$\mu_r = 700, \sigma = 8{\cdot}10^6$ S/m	3238.8

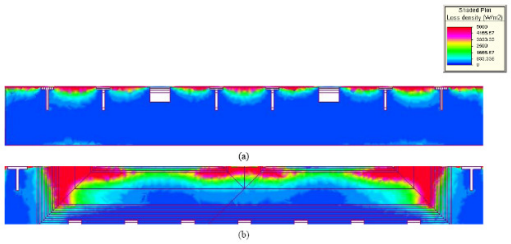
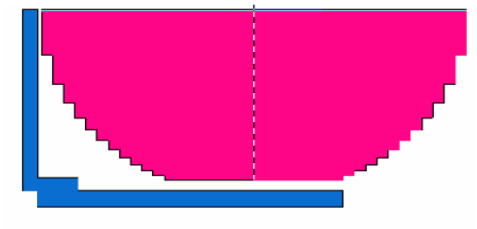


Figure: 9 Distribution of losses on the surface of the core clamps (a) front side (b) back side

The losses in the clamps can be reduced by usingdifferent materials and by changing the clamp dimensions. Fig. shows an example of using a narrower clamp whose width has been reduced so that its edge coincides with the narrowest core lamination step.



		Material properties	P_{loss} (W)
Core clamps with reduced width of the plate by 38 %		μ_r=500, σ=5·10^6 S/m	2101.6
Twice shorter winding clamps		μ_r=500, σ=5·10^6 S/m	2492.8
Iron core clamps with regular size winding clamps made of chrome alloy	Core clamp	μ_r=500, σ=5·10^6 S/m	1762.8
	Winding clamp	μ_r=1, σ=1.4·10^6 S/m	86.8
		Σ	1849.6

Figure: 10 Cross-section of the transformer core and core clamp with reduced width
Table: 2 Losses in the clamps with modified dimensions and material properties

XVII. CONCLUSION

Use of small dimensioned conductors for windings, Use of CTC conductors in case of Higher current windings, Optimum transposition of the parallel strands, Magnetic shielding of the inner tank walls, Use of Non-Magnetic shield in the area of strong magnetic fields, Optimum selection of winding type, which can reduce the stray up to 50 to 60 % compare to conventional design.

These all are the practical constraint to be considered while designing the transformer. But the analytical tools like ANSYS, FEM and COMSOL has made revolution in the transformer engineering as they are producing most efficient analysis of electromagnetic ,thermal and insulation characteristics. Especially the FEM based analysis of electromagnet characteristic helps a lot to predict and resolve the stray loss phenomenon in large power transformer at design stage instead of manufacturing stage. Plenty of work done in this stray loss reduction field but still there is wide scope for reduction of stray losses as even today they are in the range of 15 to 30 % of Load loss.

REFERENCES

[1] J.C. Olivares,R. Escarela-Perez,S.V. Kulkarni ,F. de Leónd M.A. Venegas-Vega, '2D finite-element determination of tank wall losses in pad-mounted transformers', Electric Power Systems Research 71 (2004) 179–185

[2] Lenart Kralj, Damijan Miljavec, 'Stray losses in power transformer tank walls and construction parts'.

[3] Juan Carlos Olivares-Galvan, Eduardo Campero- Littlewood , Jose Luis Hernandez-Avila, Rafael, Salvador Magdaleno Adame, Andreas D. Theocharis, 'Evaluation of Stray Losses in Throats of Distribution Transformers Using Finite Element Simulation', 2012 Andean Region International Conference

[4] D.A.Koppikar and A.V.Chiplonkar, 'Stray loss in transformer'.

[5] Zarko Janic, Zvonimir Valkovic and Zeljko Stih, 'Stray Losses in Transformer Clamping Plate'.

[6] Damir Žarko, Zlatko Maljković, Stjepan Štefan, 'Calculation of Losses in the Core Clamps of a Transformer Using 3-D Finite-Element Method'.

[7] Yan Li, Longnv Li, Yongteng Jing, Bo Zhang, '3D Finite Element Analysis of the Stray Loss in Power Transformer Structure Parts', Energy and Power Engineering, 2013, 5, 1089-1092

[8] Chetan C. Adalja, M.L. Jain, Technology Department, EMCO Limited, Thane, India, 'Analysis of Stray Losses in Power Transformers by 3-D Magnetic Field Simulation', Fifteenth National Power Systems Conference (NPSC), IIT Bombay, December 2008

[9] Sumei Yangi, Zhiguang Cheng, Qingxin Yang, Xiaoquan Zhu, 'The Stray Loss on Magnetic Shielding in Power Transformers', Proceedings of the 6th WSEAS International Conference on Applied Computer Science, Hangzhou, China, April 15-17, 2007

[10] Bogdan Ionescu, Multiphysics-based simulation reduces transformer size, cost and noise.

[11] A.V.Chiplonkar,"Design,Operation and Maintenance of Core type Oil filled Power Transformers",Mumbai 2008.

[12] Pavlo S.Georgilakis, "Spotlight on modern transformer design", Springer-Verlag London Limited 2009

[13] S.V.Kulkarniand S.A.Kaparade,IIT Mumbai. Marcel Dekker,"Transformer Engineering – Design and Practices", Inc.2004.USA.

ANALYSIS OF ANTENNA DIVERSITY TECHNIQUES FOR IMPROVEMENT OF WIRELESS COMMUNICATION

[1]MIKITA H. SHAH, [2]PROF. NIRALI KOTAK, [3]PROF. A. K. SISODIYA

[1]Department Of Electronics and Communication, L.J. Institute Of Engineering and Technology, GTU, Gujarat, India
[2]Department Of Electronics and Communication, Gandhinagar Institute Of Technology, GTU, Gujarat, India

ABSTRACT*-According the current situation fading is the big problem for wireless communication. we use the different diversity techniques to overcome this problem. This paper represent the result of single input single output system, multiple input single output system and multiple input multiple output system with different modulation for different value of SNR. Similarly represent the result of single input single output system, multiple input single output system and multiple input multiple output system with different modulation with rician channel. The aim of this paper is to explain increase the link performance as increase the number of antenna at transmitting side or receiving side.*
Keywords-Signal to noise ratio ,Doppler shift, single input single output system, multiple input single output system, multiple input multiple output system Diversity gains.

I. INTRODUCTION

Electromagnetic waves carry the signal over entire communication path in the wireless communication.
The performance of the various schemes considered for fading channels., the error probabilities all decay very slowly, like 1/SNR. It can be seen that the root cause of this poor performance is that reliable communication which depends on the strength of a single signal path. If the path is in a deep fade any communication suffer from errors. One of the solution for this problem is multiple signal paths, and one of the paths is strong is called diversity. There are many ways to obtain diversity. Diversity over time can be obtained via coding and interleaving: information is coded and the coded symbols are dispersed over time in different coherence periods. One can also exploit diversity over frequency if the channel is frequency-selective. In a channel with multiple transmit or receive antennas spaced sufficiently, diversity can be obtained over space as well. In a cellular network, macro diversity can be exploited by the fact that the signal from a mobile can be received at two base-stations. In the next few sections, we will discuss diversity techniques in time, frequency and space. In each case, we start with a simple scheme based on repetition coding: the same information symbol is transmitted over several signal paths. Maximum diversity is achieves by repetition coding More sophisticated schemes can increase the data rate and achieve a coding gain along with the diversity gain. To keep the discussion simple we begin by focusing on the coherent scenario: the receiver has perfect knowledge of the channel gains and can coherently combine the received signals in the diversity paths. As discussed in the previous section, this knowledge is learnt via training (pilot) symbols and the accuracy depends on the coherence time of the channel and the received power of the transmitted signal. We discuss the impact of channel measurement error and non-coherent diversity.[6]

The aim of this paper is to study the impact of diversity over individual problem solving abilities when a team faces a demonstrable intellective task over a large solution space. We assume that the solution must be found in a very large solution space and that agents abilities are constrained to explore only limited regions of such space. We exhibit sufficient conditions under which a team of two or more agents succeeds in solving a difficult problem with a large solution space: even though no agent is sure to crack it, pooling their diverse abilities achieves the goal. In other words, we prove when it takes (at least) two to solve a problem. We also provide sufficient conditions under which teaming up does not always guarantee success because agents are not sufficiently creative.[7]

II. ANTENNA DIVERSITY

Antenna diversity, uses two or more antennas to improve the quality and reliability of a wireless link. There is no clear line-of-sight (LOS) between transmitter and receiver in urban and indoor environments. Before finally being received Signal is reflected along multiple paths. This reflection introduce phase shifts, time delays, attenuations, and distortions that can interfere with one another.[1-5]

Telephone exchange with later antennas mounted higher for Antifade[1-5]

[8]

Antenna diversity mainly use for multipath situation. It offers multiple antennas at receiver side. Each antenna observe the same signal Each antenna will experience a different interference environment. If one antenna has occurs deep fading another has a sufficient signal. It is also possible for transmitting system, is called transmitting diversity.[1-5]. Inherently an antenna diversity scheme requires additional hardware and integration versus a single antenna system but due to the commonality of the signal paths a fair amount of circuitry can be shared. Multiple antennas is an effective way to decrease the number of drop-outs and lost connections.[1-5]

A. Antenna Diversity useful to improve wireless Signal

Many USB modems, hotspots, and embedded modems have multiple antenna ports. Most people purchase a single antenna for wireless reception. Even if there signal is weak they purchase an amplifier as well. But there is another solution is 3Gstore took a look at antenna diversity. [8]

if a single antenna is not capable for receiving a strong signal there is providing second antenna at the receiving side. It is known as a multiple-input and multiple-output or a diversity antenna. This type of technique is useful where wireless interference is lots of or in places where there is no clear line of sight to a cell tower(apartment complexes, townhomes, office buildings, etc.).A diversity antenna can help increase upload and download speeds, but speed isn't everything if you can't use it. Diversity is also useful for reliability and achieving a stable connection.[8]

B. Transmit/Receive diversity

Transmit/Receive diversity is one of the case of antenna. In this type of diversity uses two separate antennas for transmit and receive functions. So that eliminates the need for a duplexer and can protect sensitive receiver components from the high power used in transmit.[1-5].

Transmit diversity is radio communication using signals that originate from two or more independent sources that have been modulated with identical information-bearing signals and that may vary in their transmission characteristics at any given instant.[9]

It help us for problem of fading and circuit failures. In the transmit/receive diversity received signal improvement depends on the fading characteristics as well as circuit outages and failures.[9]

Considering antenna diversity, in many systems additional antennas may be expensive or impractical at the remote or even at the base station. In these cases, transmit diversity can be used to provide diversity benefit at a receiver with multiple transmit antennas only. With transmit diversity, multiple antennas transmit delayed versions of a signal, creating frequency-selective fading, which is equalized at the receiver to provide diversity gain.[9]

since transmit diversity with N antennas results in N sources of interference to other users, the interference environment will be different from conventional systems with one transmit antenna.[9]

C Diversity gain

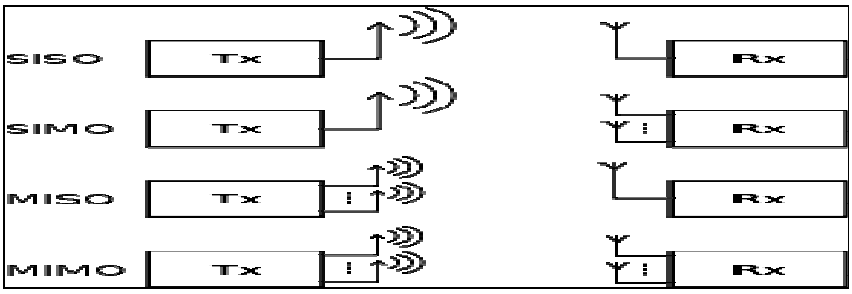
When the diversity scheme is introduce in wireless communications, diversity gain is the increase in signal-to-interference ratio or transmission power can be reduced. Diversity scheme is introduced without a performance loss. Diversity gain is usually expressed in decibel, and sometimes as a power ratio. An example is soft handoff gain.[10]

D Multiple Input Multiple Output

Understanding of SISO, SIMO, MISO and MIMO (note that the terms input and output refer to the radio channel carrying the signal, not to the devices having antennas)[11]

Multiple-Input and Multiple-Output use multiple antennas at both the transmitter and receiver to improve communication performance. It is the best case of the antenna diversity.[11]

MIMO technology is centre attention of wireless communications, because it increases in data and link range without additional bandwidth or increased transmit power. This goal is achieves by spreading the same total transmit power over the antennas to achieve an array gain that improves the spectral efficiency. Because of these properties, MIMO is an important part of modern wireless communication standards such as IEEE 802.11n (Wi-Fi), 4G, 3GPP Long Term Evolution, WiMAX and HSPA+. [11]

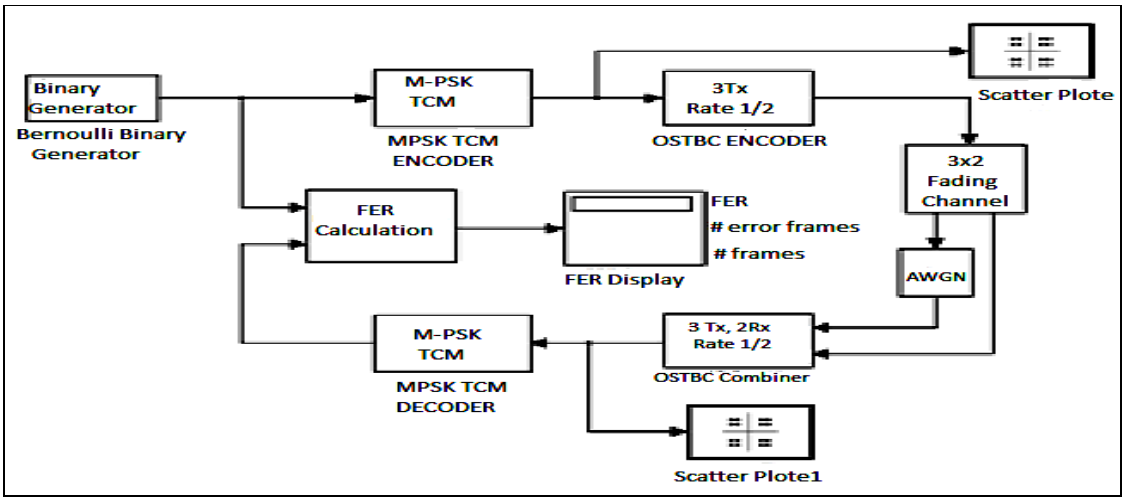


[11]

The MIMO channel model is commonly used for many multiple access communication scenarios such as, DS-CDMA (direct-sequence), cellular mobile system with antenna array at the base station (BS), and multi-cellular system with joint multiuser detection [13].

Antenna arrays helps in improving the system performance by increasing channel capacity and spectrum efficiency, extending range coverage, tailoring, steering multiple beams to track many subscribers, and compensating antenna aperture distortion electronically. It also reduces multipath fading, co channel interferences (CCI), and bit error rate (BER) [14–16].

III BLOCK DIAGRAM OF MIMO SYSTEM



IV. RESULTS

A FER for SISO system for different modulation system with Rayleigh channel

Sr No.		Single Input Single Output FER(Frame Error Rate)			
	SNR	BPSK	QPSK	MPSK	QAM
1	5	0.4476	0.6321	0.526	1
2	10	0.113	0.2888	0.1382	0.7752
3	15	0.04797	0.1088	0.04866	0.3651
4	20	0.02555	0.03459	0.02887	0.1105

B FER for SISO system for different modulation system with Rician channel

Sr No.		Single Input Single Output FER(Frame Error Rate)			
	SNR	BPSK	QPSK	MPSK	QAM
1	5	0.5429	0.7974	0.6274	1
2	10	0.1988	0.3238	0.2352	0.8576
3	15	0.06291	0.1362	0.07811	0.4417
4	20	0.03248	0.04695	0.03867	0.1713

C FER for MISO system for different modulation system with Rayleigh channel

Sr No.		Single Input Single Output FER(Frame Error Rate)			
	SNR	BPSK	QPSK	MPSK	QAM
1	5	0.4535	0.7496	0.6277	1
2	10	0.1172	0.3511	0.1067	0.8361
3	15	0.0248	0.03702	0.0308	0.4677
4	20	0.0036	0.008836	0.0062	0.04878

D FER for MISO system for different modulation system with Rician channel

Sr No.		Single Input Single Output FER(Frame Error Rate)			
	SNR	BPSK	QPSK	MPSK	QAM
1	5	0.5408	0.5339	0.6406	0.998
2	10	0.1981	0.1983	0.244	0.8621
3	15	0.06295	0.06298	0.07806	0.3965
4	20	0.03047	0.02927	0.03873	0.1715

E FER for MIMO system for different modulation system with Rayleigh channel

Sr No.		Single Input Single Output FER(Frame Error Rate)			
	SNR	BPSK	QPSK	MPSK	QAM
1	5	0.017	0.1094	0.0232	0.9843
2	10	$7.07e^{-005}$	0.002349	0.0002	0.4525
3	15		$2.24e^{-006}$		0.0233
4	20				0.000906

F FER for MIMO system for different modulation system with Rician channel

Sr No.		Single Input Single Output FER(Frame Error Rate)			
	SNR	BPSK	QPSK	MPSK	QAM
1	5	0.1995	0.3501	0.2472	0.8734
2	10	0.06447	0.1548	0.0782	0.501
3	15	0.03252	0.04921	0.0415	0.1731
4	20	0.01079	0.01946	0.0128	0.06167

V. APPLICATION

A well-known practical application of diversity reception is in wireless microphones, and in similar electronic devices such as wireless guitar systems.. A wireless microphone or sound system using diversity reception will switch to the other antenna within microseconds if one antenna experiences noise, providing an improved quality signal with fewer drop-outs and noise. Ideally, no drop-outs or noise will occur in the received signal.[1-5]

It is also used in Wi-Fi networking gear and cordless telephones to reduce for multipath interference. The base station will receive one of two antennas depending on which is currently receiving a stronger signal. For microwave bands, where the wavelengths are under 100 cm, this can often be done with two antennas attached to the same hardware. For lower frequencies and longer wavelengths, the antennas must be several meters apart, making it much less reasonable.[1-5]

Mobile phone towers also often take advantage of diversity each face of a tower will often have two antennas; one is transmitting and receiving. Two receivers are used to perform diversity reception.[1-5]

MIMO is also planned to be used in Mobile radio telephone standards such as recent 3GPP and 3GPP2. In 3GPP, High-Speed Packet Access plus (HSPA+) and Long Term Evolution (LTE) standards take MIMO into account.[11]

MIMO technology can be used in non-wireless communications systems. One example is the home networking standard ITU-T G.9963, which defines a power line communications system that uses MIMO techniques to transmit multiple signals over multiple AC wires (phase, neutral and ground). [11]

VI. CONCLUSION

In this paper we observe the result of Frame Error Rate with different modulation techniques for SISO, MISO, and MIMO system. We conclude that we get better output in MISO system compare to the SISO system and also we get better output in MIMO system compare to the MISO system. We use Rayleigh and Rician channel for SISO, MISO, and MIMO system. We get better output for rician channel compare to the Rayleigh channel.

REFERENCES

1. J. Moon and Y. Kim. "Antenna Diversity Strengthens Wireless LANs." Communication Systems Design, pages 15–22, Jan 200
2. S.M. Lindenmeier, L.M. Reiter, D.E. Barie and J.F. Hopf. "Antenna Diversity for Improving the BER in Mobile Digital Radio Reception Especially in Areas with Dense Foliage." International ITG Conference on Antennas, ISBN 978-3-00-021643-5, pages 45–48. Mar 30 2007.
3. "Adaptive Arrays and Diversity Antenna Configurations for Handheld Wireless Communication Terminals" by Carl Dietrich, Jr. Feb 15, 2000
4. "Adaptive Antenna Tutorial: Spectral Efficiency and Spatial Processing" by Marc Goldburg. FCC Office of Engineering and Technology. Sept 7, 2001.
5. "A MATLAB-based Object-Oriented Approach to Multipath Fading Channel Simulation" A white paper by C.D. Iskander. Feb 2008.
6. Point-to-point communication: detection, diversity, and channel uncertainty
"https://www.google.co.in/#q=basic+information+related+frequency+diversity+papers"
7. M. LiCalzi and O. Surucu,"The power of diversity over large solution spaces"Universita Ca'fascari Veneria,Pages 4-5,Sept,2011
8. Antenna diversity
"http://www.evdoinfo.com/content/view/4546/64/"
9. Wikipedia,Transmit diversity,
"http://en.wikipedia.org/wiki/Transmit_diversity"
10. Jump up^D G Brennan, "Linear diversity combining techniques," Proc. IRE, vol 47, no1,pp.1075-1102,June 1959
11. Wikipedia,Multiple Input Multiple Output,
"http://en.wikipedia.org/wiki/Multiple-input_multiple-output_communications
12. J. Ikuomola," Wireless Communication II" Natural Science University of Agriculture Abeokuta, Pages 14-16,2011
13. P.B. Rapajic and D. Popescu, "Information Capacity of a Random Signature Multiple-Input Multiple-OutputChannel", IEEE Transactions on Communications, Vol. COM-48, No. 8, pp. 1245–1248, 2000.
14. L.C. Godara, "Applications of Antenna Arrays to Mobile Communications, Part I: Performance Improvement, Feasibility, and System Considerations", Proceedings of the IEEE, Vol. 85, No. 7, pp. 1031–1060,1997
15. L.C. Godara, "Applications of Antenna Arrays to Mobile Communications, Part II: Beam-Forming and Direction-of-Arrival Considerations", Proceedings of the IEEE, Vol. 85, No. 8, pp. 1193–1245, 1997.
16. K. Pahlavan and A.H. Levesque, "Wireless Data Communications", Proceedings of the IEEE, Vol. 82, No. 9,pp. 1398–1430, 1994.
17. www.mathworks.in

TRANSFORMER FAULT DETECTION USING FREQUENCY RESPONSE ANALYSIS

B. L. JOGI [1], D. KUMAR [2]

[1, 2] RK SCHOOL OF ENGINEERING, RK UNIVERSITY, RAJKOT, GUJARAT, INDIA.

jogi.brijesh@gmail.com

***ABSTRACT**: Power transformers prove to be a vital element or tool in electrical power supply and transmission system. They are capital intensive units and need to be monitored for faults. Thus, there is a need to detect such faults at an initial level. Frequency response analysis (FRA) is a frequency-domain method which is used to detect mechanical faults in transformers. The frequency response of a transformer is determined by its geometry and material properties, and it can be considered as the transformer's fingerprint. This paper aims to detect, diagnose the nature and cause of mechanical faults, their identity, type and their locale using frequency response analysis.*

KEYWORDS: Complex Permeability, Lumped Circuit Model, Frequency Response Analysis, High Frequency Modeling, Transformer Diagnosis, Reluctance Network Method.

1. INTRODUCTION

If there are any mechanical changes in the transformer, for example if the windings are moved or distorted, its fingerprint will also be changed so, theoretically, mechanical changes in the transformer can be detected with FRA. A problem with FRA is the fact that there is no general agreement about how to interpret the measurement results for detection of winding damages [1].

Power transformers are very large and expensive so preventive replacement of old ones with new ones, in order to increase the system reliability, is often not economically justified; therefore, they are supposed to be used for maximum number of years, and they are also supposed to be in continuous operation for reliable and uninterrupted power supply. These goals can only be achieved through proper maintenance and condition monitoring, so that deteriorations in the transformer, which may lead to a failure, can be detected at an early stage [2].

A number of different methods are routinely used for condition monitoring and diagnostics of transformers, for instance oil analysis, winding resistance measurements, winding transfer ratio measurements, dielectric response measurements (DFR) and frequency response analysis (FRA). This thesis concentrates on the method of FRA, which is one of the more recent and advanced diagnostic methods.

Frequency Response Analysis (FRA) is a trenchant tool for monitoring transformers. Frequency response analysis is a potent method to diagnose mechanical faults at an initial level, thereby, preventing transformer from complete breakdown. This technique uses the frequency range of 20 Hz – 2 MHz for analyzing the response curve of transformers for detail inspection of faults.

The whole technique of FRA is based on comparisons which are typically taken in three manners:

1. Time based comparison:

Current condition is compared with previous condition of same transformer.

2. Type based comparison:

Conditions of two equal transformers are compared.

3. Phase comparison:

Condition of one phase is compared with that of other phase of the same transformer.

Also, every transformer has a unique transfer function and so, the frequency response of transformer can be calculated by means of inserting the input frequency of transformer in the transfer function. Calculating the real transfer function of transformer is difficult and need to have exact parameters of transformer [1]. Another method for modeling the transformer is "lumped modeling" method. For high frequency applications, the model contains stray capacitances. This type of model is low accurate but simple and proper for abstract studying [2-3]. Each one of the aforementioned frequency dependent models of power transformer have been presented in a lot of papers and some of them are very accurate, but it is necessary to point out that a model is applicable when it has two main characteristic: I- desired accuracy II- simple and fast computation.

In this paper, a dynamic time domain lumped model of transformer is used for modeling the frequency response of transformer, but this model will differ in various frequencies. The frequency variation is divided into three

ranges and accordingly three different transformer models exist which will be used in simulations: low frequency model, medium frequency model and high frequency model. With this method, only three lumped model of transformer will be used which increase the speed of calculations, while having good accuracy in output results [2].

2. MEASURING METHOD

The sweep frequency method is used in this study. HP4395A is meanwhile used as network analyzer for the purpose of generating the signal and making the measurement. The frequency range is from 5Hz to 10 MHz. The sweep frequency data is collected in 5 sub bands of 2 kHz, 20 kHz, 200 kHz, 2 MHz, and 10 MHz. Each sub band consists of 401 equally spaced points with the total of 2005 points. Figure 1 shows block diagram of the test set-up, while Figure 2 shows circuit diagram of the test set-up [2].
A few fault cases involving winding and tap changer are selected. Data from healthy transformers of different manufacturers are also taken as references. The main purpose of this study is to find how FRA diagnostic test can help in monitoring the condition of healthy transformers. Figure 3 shows the outcome of an analysis from a power transformer. The test is done on a transformer that has a healthy high voltage winding.

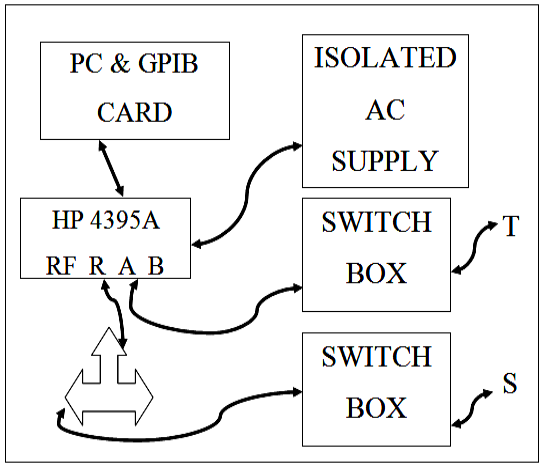


Figure 1: Block diagram

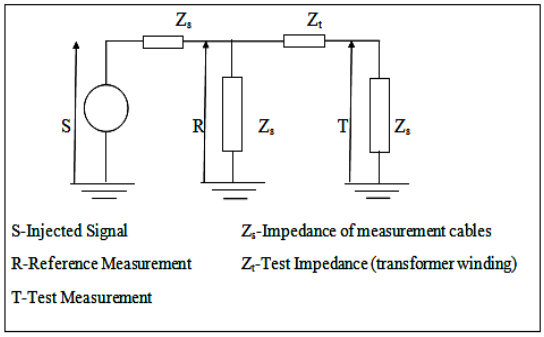


Figure 2: Circuit diagram

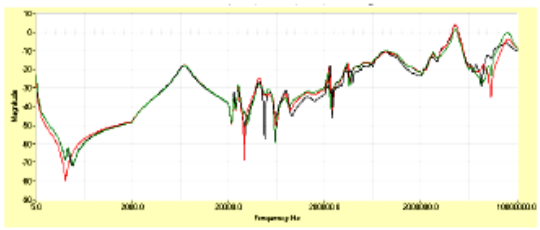


Figure 3: test set up based graph (signature of healthy transformer) [2]

Numerical data obtained from FRA program is manipulated through MATLAB program by plotting a graph either in logarithmic or linear format. Data obtained from various measurements made on the same or different transformers can be plotted on the same axes according to the need [3].

The plotting is banded according to Double analysis zones that are low frequency for core and magnetic circuit (frequency < 10 kHz), mid frequency for winding geometry (10 kHz < frequency < 600 kHz), and high frequency for inter-connections and test system (frequency > 600 kHz).

3. DIAGNOSIS TEST OF TRANSFORMER WITH FRA

There are three approaches for comparing measured curves to reference data:
A. Time Based Comparison
B. Type Based Comparison
C. Design Based Comparison
If Compare new measurements to fingerprint measurements on the same unit , it is time based comparison, if comparing measurements between identical (twin/sister) transformers , it is type based comparison and if comparing measurements made on symmetrical windings / limbs / phases on the same transformer it is design based comparison.
A characteristic reference curve (fingerprint) of every winding should be captured when the transformer is known to be in good condition [4]. This profile is an investment as a future reference when the transformer has to be done time based comparison. As shown in figure 4 we can see blue and red lines which are taken from different time period.
But if no reference measurement has been made of the actual transformer, as figure 5 we can use measurements from a "sister" transformer of the same design and a characteristic curve of every winding should be capture and compares with type based comparison.
And a shown in figure 6 design based comparison, we use knowledge about symmetries between windings in a transformer. If FRA measurements have been performed on this transformer in the past, the results of the measurements should be uploaded into the software of the available FRA instrument and shall be analyzed prior to the planned test.
And a shown in figure 6 design based comparison, we use knowledge about symmetries between windings in a transformer. If FRA measurements have been performed on this transformer in the past, the results of the measurements should be uploaded into the software of the available FRA instrument and shall be analyzed prior to the planned test. During this, one should check the existing data for consistency and correct documentation. A key factor of the documentation is the way the connections have been carried out. From a practical point of view it has turned out to be best practice to store photographs of the connection details together with the measurement data [3]. this is significant help to achieve the highest possible degree of repeatability while reproducing the same arrangement for the measurement.

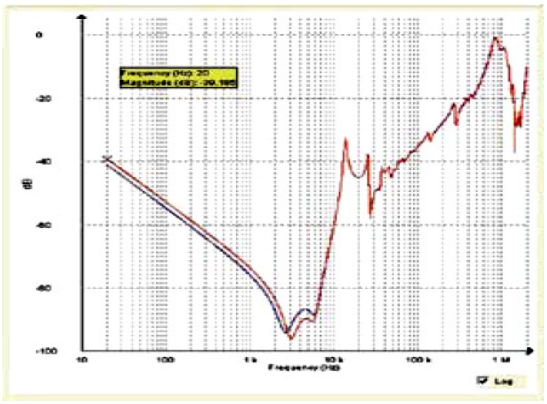


Figure 4: Response above 10 kHz is identical but deviation at low frequency indicates a magnetically core [3]

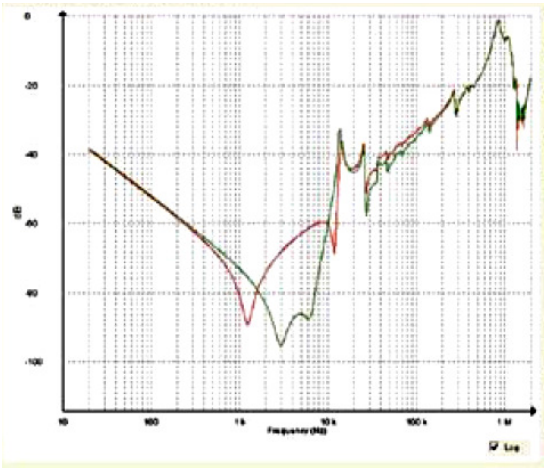


Figure 5: Deviation due to disconnection of core grounding [3]

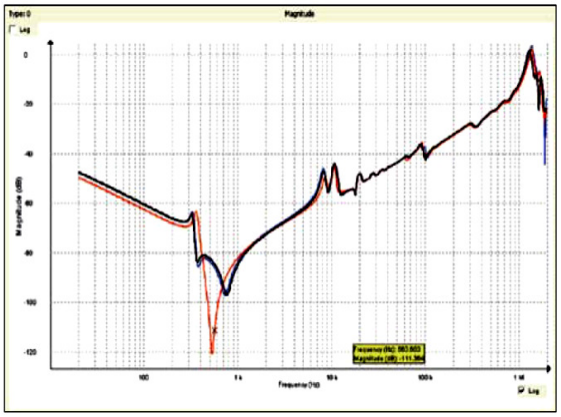


Figure 6: Measurements on symmetrical phases show no deviation [3]

4. SIMULATION AND RESULT

While we put bellowed data in MATLAB, We can get result as figure 7. The disc in the models consist of n = 10 turns of varnished copper wire with the conductivity σ = 5.8×107 S/m, the conductor height h = 7 mm and width w = 3 mm. The inner sides of the square disc have a length of 1.2 m (2d = 1.2 m), and the gap between any two neighboring conductors (turns) i.e. twice the insulation thickness is τi = 0.4 mm, and there is no ground wall which means that d0 and di are set to infinity in the calculations. So we may get result as figure 7 [4].

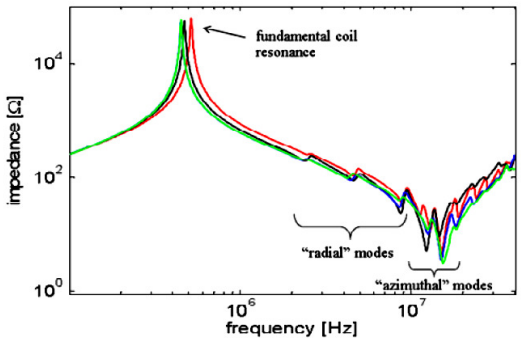


Figure 7: Frequency responses graph from given data [4]

5. CONCLUSION

Frequency response analysis is a very effective tool for diagnosing transformer condition. It is particularly useful in detecting any fault that is due to mechanical damage to the winding. The technique is also very reliable

for detecting any short circuit to the winding. Test can be done on same or sister transformer and reference data carried out [1]. The reference can either be from historical data of the same transformer or from sister transformers. In many cases, historical data for transformers already in operation is difficult to get owing to shutdown requirement [2]. Sister transformers are used in those cases as the reference measurement. The interpretation of the results is meanwhile a great help in determining further action to be taken especially for suspected transformers. FRA can be a very effective tool for condition monitoring [3]. It can avoid catastrophic failure in transformers and also help maintenance engineer to estimate time and cost for repairing the transformer after the fault before undertaking maintenance. By this measurement data we can plot graph and identify fault in transformer. So without opening transformer we can locate fault in transformer [4].

REFERANCE

[1] Seema Arora, Bhavna Srivastava, Priyanka, Raghav Parasha and Shivangi Gaur; "Transformer Fault Detection Using Frequency Response Analysis" International Journal of Innovative Research in Science, Engineering and Technology Vol. 1, Issue 2, December 2012.
[2] Muhammad Azizi Abdul Rahman and Halimatun Hashim; P.S. Ghosh "FREQUENCY RESPONSE ANALYSIS OF A POWER TRANSFORMER" The International Journal for Computation and Mathematics inElectrical and Electronic Engineering, Vol. 28 No. 3, 2009, pp. 700–710.
[3] Mojtaba Gilvanejad and Abolfazl Vahedi; "Modeling the Frequency Response of Power Transformer by means of Time Domain Variable Frequency Models", Secondary of Distribution Transformers", High Voltage Engineering Symposium, 22-27 August 1999, IEE.
[4] Information from Megger, "Frequency response analysis of power transformers"

IMPLEMENTATION OF DATA TRANSFER OPERATION FOR MULTILAYER AHB BUS MATRIX

[1] VIDHYA VYAS, [2] PROF. VISHAL S. VORA

[1] STUDENT OF M.E.E.C OF AITS RAJKOT,
[2] FACULTY OF AITS RAJKOT.

ABSTRACT*—Based on AMBA AHB protocol, the adaptive dynamic arbiter which is based on self-motivated arbitration scheme is being implemented on the slave side arbitration. The multilayered advanced high-performance bus (ML-AHB) bus matrix is an interconnection between multiple masters and multiple slaves in a system. The master and the slave communicate in terms of request and grant signals. The master merely starts a burst transaction and waits for the slave response to proceed to the next transfer. However, the ML-AHB bus matrix of ARM offers only transfer-based fixed-priority and round-robin arbitration schemes. In fixed priority arbitration scheme, each master is assigned a fixed priority value. It is simple in implementation and has small area cost. But in heavy communication traffic, master that has low priority value cannot get a grant signal. In round robin arbitration scheme, each master is allotted a fixed time slot. If the new master sends a request in between, then that master has to wait until all masters completetheir tasks. In Self-motivated arbitration scheme, the design and implementation of a Adaptive dynamic arbiter for the ML-AHB bus matrix is to support three priority policies—fixed priority, round robin, and dynamic priority and three data multiplexing modes—transfer, transaction, and desired transfer length. The slave side arbiter dynamically selects one of the three possible arbitration schemes based upon the priority-level notifications and the desired transfer length from the masters so that arbitration leads to the maximum performance. The area overhead of the adaptive dynamic arbitration scheme will be 9%--25% larger than those of the other arbitration schemes and improves the throughput by 14%–62% compared to other schemes. There are totally nine arbitration schemes. Among the nine arbitration schemes, the self-motivated arbitration scheme is the efficient one and the master which has accessed the bandwidth less number of times will be given highest priority and will get the grant signals.*

Key words— Multilayer AHB (ML-AHB) bus matrix, on-chip bus, self-motivated (SM) arbitration scheme, slave-side arbitration, system-on-chip (SoC).

1. INTRODUCTION

The on-chip bus plays a key role in the system-on- chip (SoC) design by enabling the efficient integration of heterogeneous system components such as CPUs, DSPs, application-specific cores, memories, and custom logic. Recently, as the level of design complexity has become higher, SoC designs require a system bus with high bandwidth to perform multiple operations in parallel. To solve the bandwidth problems, there have been several types of high-performance on-chip buses proposed, such as the multilayer AHB (ML-AHB) bus matrix from ARM, the PLB crossbar switch from IBM, and CONMAX from Silicore. Among them, the ML-AHB bus matrix has been widely used in many SoC designs. This is because of the simplicity of the AMBA bus of ARM, which attracts many IP designers, and the good architecture of the AMBA bus for applying embedded systems with low power.

The ML-AHB bus matrix is an interconnection scheme based on the AMBA AHB protocol, which enables parallel access paths between multiple masters and slaves in a system. This is achieved by using a more complex inter- connection matrix and gives the benefit of both increased overall bus bandwidth and a more flexible system structure. In particular, the ML-AHB bus matrix uses slave-side arbitration. Slave-side arbitration is different from master-side arbitration in terms of request and grant signals since, in the former, the mastermerely starts a burst transaction and waits for the slave response to proceed to the next transfer. Therefore, the unit of arbitration can be a transaction or a transfer. The transaction- based arbiter multiplexes the data transfer based on the burst transaction, and the transfer-based arbiter switches the data transfer based on a single transfer. However, the ML-AHB bus matrix of ARM presents only transfer- based arbitration schemes, i.e., transfer based fixed-priority and round-robin arbitration schemes. This limitation on the arbitration scheme may lead to degradation of the system performance because the arbitration scheme is usually dependent on the application requirements; recent applications are likewise becoming more complex and diverse.

By implementing an efficient arbitration scheme, the system performance can be tuned to better suit applications. For a high-performance on-chip bus, several studies related to the arbitration scheme have been proposed, such as table-lookup-based crossbar arbitration, two-level time-division multiplexing (TDM) scheduling, token-ring mechanism, dynamic bus distribution algorithm, and LOTTERYBUS. However, these approaches employ master-side arbitration. Therefore, they can only control priority policy and also present some limitations when handling the transfer-based arbitration scheme since master-side arbitration uses a centralized arbiter. In contrast, it is possible to deal with the transfer-based arbitration scheme as well as the transaction- based arbitration scheme in slave-side arbitration. In this paper, we propose anadaptive dynamic arbiter based on the self-motivated arbitration scheme for the ML-AHB bus matrix.

Proposed arbitration scheme has the following advantages:

1) It can adjust the processed data unit;
2) It changes the priority policies during runtime; and
3) It is easy to tune the arbitration scheme according to the characteristics of the target application.

The arbiter presented in this paper is able to not only deal with the transfer-based fixed-priority, round-robin, and dynamic-priority arbitration schemes but also manage the transaction-based fixed-priority, round-robin, and dynamic-priority arbitration schemes. Furthermore, Arbiter provides the desired transfer length based fixed-priority, round-robin, and dynamic priority arbitration schemes. In addition, the proposed self-motivated arbiter selects one of the nine possible arbitration schemes based on the priority-level notifications and the desired transfer length from the masters to ensure that the arbitration leads to the maximum performance.

Here, Section II briefly explains the arbitration schemes for the ML-AHB bus matrix of ARM, while Section III describes an implementation method for our flexible arbiter based upon the AD arbitration scheme for the ML-AHB busmatrix. Section IV represents the implementation results and performance analysis. Simulation resultsin Section V and concluding remarks in Section VI.

2 ARBITRATION SCHEMES FOR THE ML-AHB BUSMATRIX OF ARM

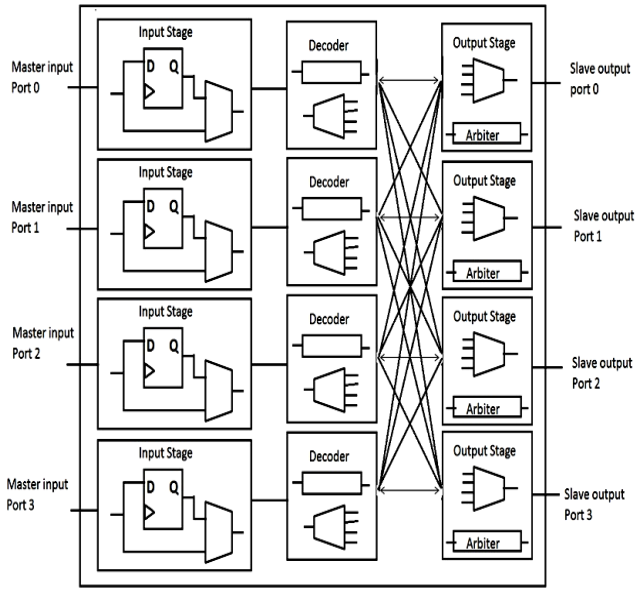


Fig. 1 Overall structure of ML - AHB bus matrix

The ML-AHB bus matrix of ARM consists of the input stage, decoder, and output stage, including an arbiter. Fig. 1 shows the overall structure of the ML-AHB bus matrix of ARM. The input stage is responsible for holding the address and control informationwhen transfer to a slave is not able to commence immediately. The decoder determines which slave that a transfer is destined for. The output stage is used to select which of the various master input ports is routed to the slave. Each output stage has an arbiter. The arbiter determines which input stage has to perform a transfer to the slave and decides which the highest priority is currently. The ML-AHB busmatrix employs slave-side arbitration, in which the arbiters are located in front of each slave port, as shown in Fig. 1. The master simply starts a transaction and waits for the slave response to proceed to the next transfer. Therefore, the unit of arbitration can be a transaction or a transfer. However, the ML-AHB busmatrix of ARM furnishes only transfer-based arbitration schemes, specifically transfer- based fixed-priority and round-

robin arbitration schemes. The transfer-based fixed-priority (round- robin) arbiter multiplexes the data transfer based on a single transfer in a fixed-priority or round- robin fashion.

3 SM ARBITRATION SCHEME FOR THE ML-AHB BUSMATRIX

An assumption is made that the masters can change their priority level and can issue the desired transfer length to the arbiters in order to implement a Self-motivated arbitration scheme. This assumption should be valid because the system developer generally recognizes the features of the target applications. For example, some masters in embedded systems are required to complete their job for given timing constraints, resulting in the satisfaction of system-level timing constraints. The computation time of each master is predictable, but it is not easy to foresee the data transfer time since the on- chip bus is usually shared by several masters. Previous works solved this issue by minimizing the latencies of several latency-critical masters, but a side effect of these methods is that they can increase the latencies of other masters; hence, they may violate the given timing constraints. Unlike existing works, proposed scheme can keep the latency close to its given constraint by adjusting the priority level and transfer length of the masters. Fig. 2 shows an example.

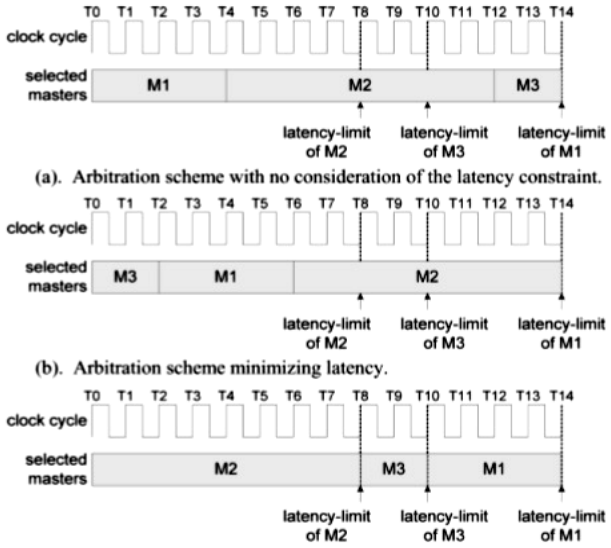


Fig. 2 Arbitration scheme examples in an embedded system.
(a) Arbitration scheme with no consideration of the latency constraint. (b) Arbitration scheme minimizing latency. (c) SM arbitration scheme.

In this example, the service latencies (latency-limit times) of M1, M2, and M3 are 4, 8, and 2 cycles (T14, T8, and T10), respectively. The requests for three masters are all initiated at T0, and M3 is the most latency-sensitive master. Fig. 2(a) shows an arbitration scheme that does not use latency constraints for arbitration. Therefore, M2 and M3 violate the latency constraint as the masters are selected in ascending order. Only M1 meets the constraint. Fig. 2(b) shows the scheduling of a typical latency- minimizing arbiter. It minimizes the latency of the most latency-sensitive module, namely, M3, causing M2 to violate its constraint. Although neither of these two arbitration schemes can meet the latency constraints for all three masters, in the SM arbitration shown in Fig. 2(c), all masters use the bus with no violations by configuring the priority levels (transfer lengths) of M1, M2, and M3 as the lowest, highest, and intermediate priorities (4, 8, and 2), respectively.We use part of a 32-b address bus of the masters to inform the arbiters of the priority level and the desired transfer length of the masters. Fig. 3 shows the decoding information for our address bus.

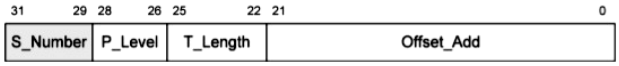


Fig. 3 Decoding Information of 32 bit Address

In Fig. 3, S_Number indicates the target slave number, P_Level means the priority level of a master, T_Length denotes the desired transfer length of a master, and Offset_Add specifies the internal address of the target slave. Each of S_Number and P_Level consists of 3 b because the maximum number of master–slave sets is 8 8. Also, T_Length is composed of 4 b because the maximum number of burst lengths is 16. Although we used 7 b for P_Level and T_Length in the 32-b address bus to notify the arbiters of the priority level and the de- sired transfer length of a master, we consider it adequate toexpress the internal address of a slave because the range of Offset_Add is from 0 to 2221. Through the aforementioned assumption, the priority level and transfer length can then be changed by the SM demand of each master.

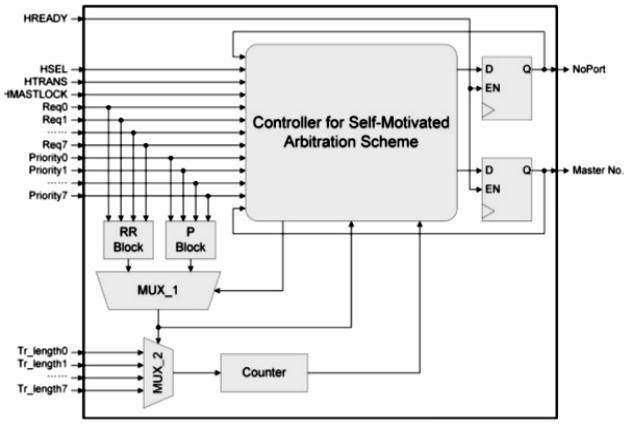


Fig. 4 Internal structure of proposed arbiter

Fig. 4 shows the internal structure of proposed arbiter based upon the Self-motivated arbitration scheme. The No Port signal means that none of the masters must be selected and that the address and control signals to the shared slave must be driven to an inactive state, while Master No. indicates the currently selected master number generated by the controller for the AD arbitration scheme.In general, our arbiter consists of an RR block, a P block, two multiplexers, a counter, a controller, and two flip-flops. MUX_1 and MUX_2 are used to select the arbitration scheme and the desired transfer length of a master, respectively.A counter calculates the transfer length, with two flip-flops being inserted to avoid the attempts by the critical path to arbitrate. An RR block (P block)performs the round-robin- or priority-based arbitration scheme.

Fig. 5 shows the internal process of an RR block.

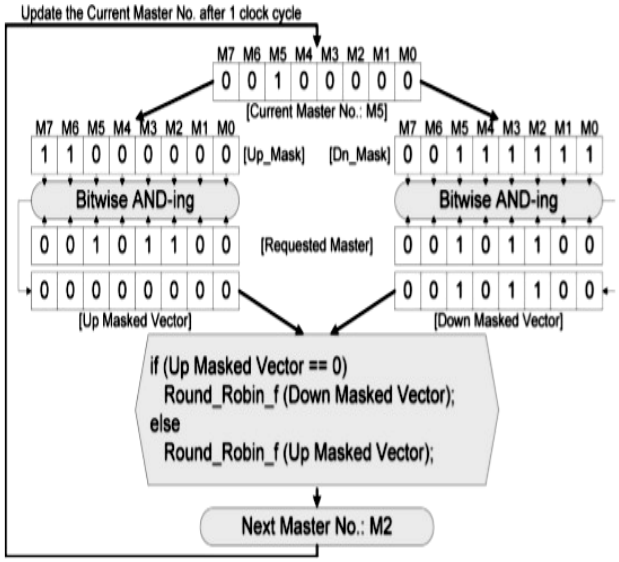


Fig. 5 Internal Process of RR block.

Initially, we create the up- and down-mask vectors (Up_Mask and Dn_Mask) based on the number of currently selected masters, as shown in Fig. 5. We then generate the up- or down-masked vector created through bitwise AND-ing operation between the mask vector and the requested master vector. After generating the up- and down-masked vectors, we examine each masked vector as to whether theyare zero or not. If the up-masked vector is zero, the down-masked vector is inserted to the input parameter of the round-robin function; if it is not zero, the up-masked vector is the one inserted. A master for the next transfer is chosen by the round-robin function, and the current master is updated after 1 clock cycle. The RR block is then performed by repeating the arbitration procedure shown in Fig. 5.

A master for the next transfer is selected, with the priority level of the least significant bit in Masked_Vector being the highest. If we modify the range of Masked_Vector to "0 to Masked_Vector'left," then the priority level of the most significant bit in Masked_Vector becomes the highest.

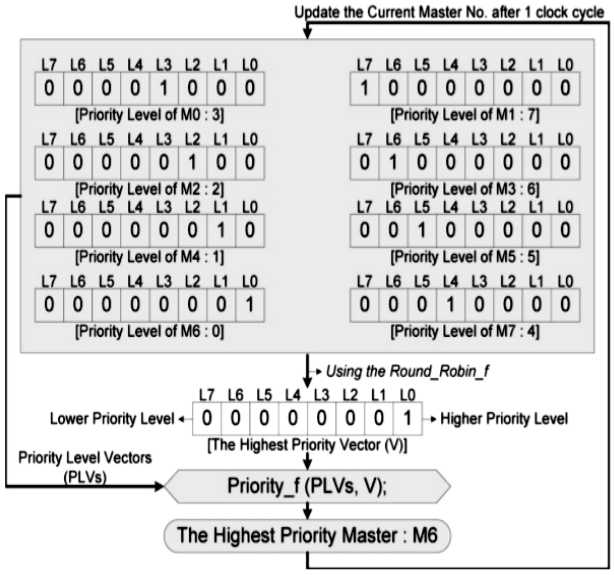


Fig. 6 Internal process of P Block.

Fig. 6 shows the internal procedure of the P block. First of all, we create the highest priority vector (V) through the round-robin function. After generating the highest priority vector (V), the priority-level vectors and the highest priority vector (V) are inserted to the input parameters of the priority function. The master with the highest priority is chosen by the priority function, while the current master is updated after 1 clock cycle. The master with the highest priority is selected in Fig 6.

A controller compares the priority levels of the requesting masters. If the masters have equal priorities, the controller selects the round-robin arbitration scheme (RR block); in other cases, it chooses the priority arbitration scheme (P block). The controller also makes the final decision on the master for the next transfer based on the transfer length of the selected master. The control process follows the following three steps.

1) If HMASTLOCK is asserted, the same master remains selected.

2) If HMASTLOCK is not asserted and the currently selected master does not exist, the following hold.

a) If no master is requesting access, the NoPort signal is asserted.

b) Otherwise, a new master for the next transfer is initially selected. If the masters have equal priorities, the round-robin arbitration scheme is selected; otherwise, the priority arbitration scheme is chosen. In addition, the counter is updated based on the transfer length of the selected master.

3) If none of the previous statements applies, the following hold.

a) If the counter is expired, the following hold.

i) If the requesting masters do not exist, the No- Port signal is updated based on the HSEL signal of the currently selected master. If the HSEL signal is "1," the same master remains selected, and the NoPort signal is disserted. Otherwise, the NoPort signal is asserted.

ii) Otherwise, a master for the next transfer is selected based on the priority levels of the requesting masters. Also, the counter is updated.

b) If the counter is not expired, and the HSEL signal of the current master is "1," the same master remains selected, and the counter is decreased.

c) If the currently selected master completes a transaction before the counter is expired, the following hold.

i) If the requesting masters do not exist, the No- Port signal is asserted.

ii) Otherwise, a master for the next transfer is chosen based on the priority levels of the requesting masters, and the counter is updated.

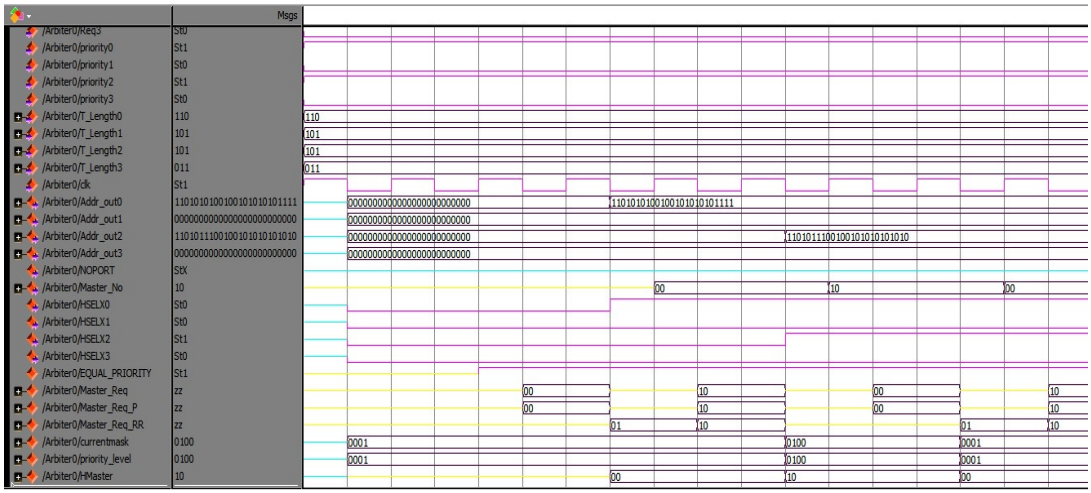
The SM arbitration scheme is achieved through iteration of the aforementioned steps. Combining the priority level and the desired transfer length of the masters allows our arbiter to handle the transfer based fixed-priority, round-robin, and dynamic priority arbitration schemes (abbreviated as the FT, RT, and DT arbitration schemes, respectively), as well as the transaction-based fixed-priority, round-robin, and dynamic-priority arbitration

schemes (abbreviated as the FR, RR, and DR arbitration schemes, respectively). Moreover, our arbiter can also deal with the desired-transfer-length- based fixed-priority, round-robin, and dynamic- priority arbitration schemes (abbreviated as the FL, RL, and DL arbitration schemes, respectively). The transfer- or transaction-based arbiter switches the data transfer based upon a single transfer (burst transaction), and the desired-transfer-length-based arbiter multiplexes the data transfer based on the transfer length assigned by the masters.

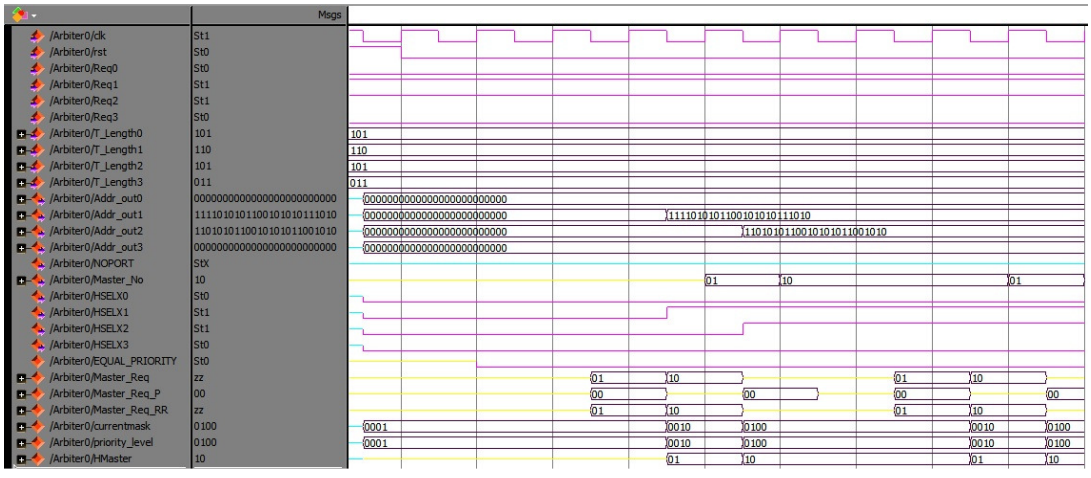
4 SIMULATION RESULTS AND PERFORMANCE ANALYSIS

A SIMULATION RESULT:

The ML-AHB busmatrix of ARM provides only two arbitration schemes: FT and RT arbitration schemes. Thus, we compared the FT- and RT-based busmatrixes of ARM with our corresponding bus- matrixes in the area overhead to show the credibility of our implementation. The total areas of our FT- and RT-based busmatrixes decreases by 21% and 13% on average, respectively, compared with the FT- and RT-based busmatrixes of ARM. One reason is that we adapted the bit masking mechanism to our busmatrixes to reduce the area of the arbiter. We utilized a ModelSim II simulator to measure the performance of the ML-AHB busmatrixes with the different arbitration schemes and demonstrate the efficiency of our flexible AD arbitration scheme.



FIXED PRIORITY ARBITRATION SCHEME FOR ARBITER



ROUND ROBIN ARBITRATION SHEME FOR ARBITER

5 CONCLUSION

In this paper, we proposed a flexible arbiter based on the Self-motivated arbiter for the ML-AHB busmatrix. Our arbiter supports three priority policies-fixed priority, round-robin, and dynamic priority and three approaches to data multiplexing-transfer, transaction, and desired transfer length; in other words, there are nine possible arbitration schemes. In addition, the proposed AD arbiter selects one of the nine possible arbitration schemes based on the priority-level notifications and the desired transfer length from the masters to allow thearbitration to lead to the maximum performance. Experimental results show that, although the area of the proposed AD arbitration scheme is 9%–25% larger than those of other arbitration schemes, our arbiter improves the throughput by14%–62% compared with other schemes. We there-fore expect that it would be better to apply our AD arbitration scheme to an application-specific sys-tem because it is easy to tune the arbitration scheme according to the features of the target sys-tem. For future work, we feel that the configurations of the AD arbitration scheme with the maxi-mum throughput need to be found automatically during runtime.

6 REFERANCES

[1] M. Drinic, D. Kirovski, S. Megerian, and M. Potkonjak, "Latencyguidedon-chip bus-network design," IEEE Trans. Comput.-Aided DesignIntegr. Circuits Syst., vol. 25, no. 12, pp. 2663–2673, Dec. 2006.

[2] S. Y. Hwang, K. S. Jhang, H. J. Park, Y. H. Bae, and H. J. Cho, "Anameliorated design method of ML-AHB busmatrix," ETRI J., vol. 28,no. 3, pp. 397–400, Jun. 2006.

[3] ARM, "AHB Example AMBA System," 2001 [Online]. Available:http://www.arm.com/products/solutions/AMBA_Spec.html

[4] IBM, New York, "32-bit Processor Local Bus Architecture Specification,"2001.

[5] R. Usselmann, "WISHBONE interconnect matrix IP core," Open-Cores, 2002. [Online]. Available: http://www.opencores.org/?do=project=wb_conmax

[6] N.-J. Kim and H.-J. Lee, "Design of AMBA wrappers for multipleclockoperations," in Proc. Int. Conf. ICCCAS, Jun. 2004, vol. 2, pp.1438–1442.

[7] D. Flynn, "AMBA: Enabling reusable on-chip designs," IEEE Micro,vol. 17, no. 4, pp. 20–27, Jul./Aug. 1997.S. Y. Hwang, H.-J. Park, and K.-S. Jhang, "Performance analysis ofslave-side arbitration schemes for the multi-layer AHB busmatrix," *J.KISS, Comput. Syst. Theory*, vol. 34, no. 5, pp. 257–266, Jun. 2007.

[9] S. S. Kallakuri and A. Doboli, "Customization of arbitration policiesand buffer space distribution using continuous-time Markov decisionprocesses," *IEEE Trans. Very Large Scale Integr. (VLSI) Syst.*, vol. 15,no. 2, pp. 240–245, Feb. 2007.

[10] D. Seo and M. Thottethodi, "Table-lookup based crossbar arbitrationfor minimal-routed, 2D mesh and torus networks," in *Proc. Int. Conf.IPDPS*, Mar. 2007, pp. 1–10.

[11] K. Lahiri, A. Raghunathan, and S. Dey, "Performance analysis of systemswith multi-channel communication architectures," in *Proc. Int.Conf. VLSI Design*, Jan. 2000, pp. 530–537.

[12] J. Turner and N. Yamanaka, "Architectural choices in large scale ATMswitches," *IEICE Trans. Commun.*, vol. E-81B, no. 2, pp. 120–137,Feb. 1998.

[13] C. H. Pyoun, C. H. Lin, H. S. Kim, and J. W. Chong, "The efficientbus arbitration scheme in SoC environment," in *Proc. Int. Conf. SoCReal-Time Appl.*, Jul. 2003, pp. 311–315.

[14] K. Lahiri, A. Raghunathan, and G. Lakshminarayana, "The LOTTERYBUSon-chip communication architecture," *IEEE Trans. VeryLarge Scale Integr. (VLSI) Syst.*, vol. 14, no. 6, pp. 596–608, Jun. 2006.

[15] J. H. Han, M. Y. Lee, B. Younghwan, and C. Hanjin, "Application specificprocessor design for H.264 decoder with a configurable embeddedprocessor," *ETRI J.*, vol. 27, no. 5, pp. 491–496, Oct. 2005.

[16] M. Jun, K. Bang, H.-J. Lee, N. Chang, and E.-Y. Chung, "Slack-basedbus arbitration scheme for soft real-time constrained embedded systems,"in *Proc. Int. Conf. ASP-DAC*, Jan. 2007, pp. 159–164.

[17] S. Y. Hwang, H. J. Park, and K. S. Jhang, *An Efficient ImplementationMethod of Arbiter for the ML-AHB Busmatrix*. Berlin, Germany:Springer-Verlag, May 2007, vol. 4523, LNCS, pp. 229–240.

[18] E.-G. Jeong, J.-G. Lee, K.-S. Jhang, J.-A. Lee, and D. Har, "Asynchronouslayered interface of multimedia socs for multiple outstandingtransactions," *J. VLSI Signal Process. Syst.*, vol. 46, no. 2/3, pp.133–151, Mar. 2007.

[19] S. Y. Hwang, H. J. Park, and K. S. Jhang, "An implementation and performanceanalysis of slave-side arbitration schemes for the ML-AHB
busmatrix," in *Proc. Int. Conf. ACM Symp. Appl. Comput.*, Mar. 2007,vol. 2, pp. 1545–1551.

COMPARATIVE ANALYSIS OF FORGED STEEL AND CAST-IRON CRANKSHAFTS

[1]ANJANA D. SAPARIA, [2]DR. HEMANT S. TRIVEDI, [3]RUPESH V.RAMANI

[1]Research Scholar Singhania University, [2]Associate Professor, S.S. Engg. College,Bhavnagar, [3] Senior Lecturer, V.V.P. Engineering College, Rajkot

saparia_anjana@yahoo.co.in

ABSTRACT: *This paper deals with optimization of a forged steel and cast-iron crankshaft from a single cylinder four stroke engine. The use of finite element analysis was performed to obtain the static and dynamic behavior of structure at critical locations. Using proper boundary condition and types of loading are important since they strong affect the results of the finite element analysis. These two crankshafts are from similar engines, same boundary condition and loading were used for both. Optimization process is weight reduction of the crankshaft considering dynamic loading. The optimization process resulted in the weight reduction, increased fatigue strength and reduced cost of the crankshaft This analysis was done by simulations in ANSYS.*

Keywords- Crankshaft, Optimization, FEM, Cast Iron, Forged Steel

I INTRODUCTION

The crankshaft is most important component of the internal combustion (IC) engine and has a complex geometry consisting of cylinders as bearings, and plates as the crank webs. The objective of this study was to compare the durability of crankshafts from two competing manufacturing processes, as well as to perform static load and stress analysis, and optimization. The crankshafts used in the study were forged steel and ductile cast iron from a one-cylinder gasoline engine. Strain-controlled monotonic and fatigue tests as well as impact tests were performed on specimens machined from the crankshafts. Load-controlled component bending fatigue tests were also carried out on the crankshafts. Material tests showed that the forged steel had 26% higher tensile strength and 37% higher fatigue strength than the ductile cast iron, while component tests showed that the forged steel crankshaft had 32% higher fatigue strength resulting in a factor of six longer fatigue life. Reduction, increased fatigue strength and reduced cost of the crankshaft.

Literature Review

Kamimura (1) performed experiments on the effect of fillet rolling on fatigue strength of a ductile cast iron crankshaft. Series tests were conducted on crankshaft pin samples with a fatigue evaluation on test pieces in order to study the fatigue strength of fillet rolled crankshafts and specimens. This study showed that an optimum deep rolling method could increase the bending fatigue strength by 83% over conventional ductile iron crankshafts that were not fillet rolled.

One more scientist Park (2) concluded that without any dimensional modification, the fatigue life of a crankshaft could be improved significantly by applying various surface treatments. Fillet rolling and nitriding were the surface treatment processes that were studied in this research. Their study showed that the standard base sample had a fatigue limit of 10 kN, while fillet rolled specimens with 500 kgf load exhibited a 14 kN fatigue limit (i.e. 40% increase in fatigue limit). With 900 kgf rolling load, the fatigue limit increased to more than 18 kN (i.e. 80% increase in fatigue limit). These experimental data clearly indicate that fillet rolling can dramatically increase the fatigue performance of crankshafts. Although higher rolling force results in better fatigue strength as a result of inducing higher compressive stress on the fillet surface, the load should not be so high as to cause excess plastic deformation. The specimens prepared from the crankshaft in the Park et al. study found the optimum level of rolling force was experimentally to be between 690 and 990 kgf.

PROBLEM DEFINITION

1. Crankshafts are typically manufactured by casting and forging processes.
2. In addition, directional properties resulting from the forging process help the part acquire higher toughness and strength in the grain-flow direction
3. Manufacturing by forging has the advantage of obtaining a homogeneous part that exhibits less number of micro structural voids and defects compared to casting.
4. We are going to design two types of crank-shafts, one with cast iron and other with forged steel.
5. While designing forging process for crankshaft, the grain flow direction can be aligned with the direction of maximum stress that is applied to the component.

It is not possible to obtain analytical mathematical solutions for many engineering problems. An analytical solutions is a mathematical expression that gives the values of the desired unknown quantity at any location in the body, as consequence it is valid for infinite number of location in the body. For problems involving complex material properties and boundary conditions, the engineer resorts to numerical methods that provide approximate, but acceptable solutions.

The finite element method has become a powerful tool for the numerical solutions of a wide range of engineering problems. It has developed simultaneously with the increasing use of the high-speed electronic digital computers and with the growing emphasis on numerical methods for engineering analysis. This method started as a generalization of the structural idea to some problems of elastic continuum problem, started in terms of different equations or as an extranet probe The fundamental areas that have to be learned for working capability of finite element method.

The finite element method is numerical analysis technique for obtaining approximate solutions to a wide variety of engineering problems. Because of its diversity and flexibility as an analysis tool, it is receiving much attention in engineering schools and industries. In more and more engineering situations today, we find that it is necessary to obtain approximate solutions to problems rather than exact closed form solution.

The finite element method include:

1. Matrix algebra.
2. Solid mechanics.
3. Variation methods.
4. Computer skills.

Matrix techniques are definitely most efficient and systematic way to handle algebra of finite element method. Basically matrix algebra provides a scheme by which a large number of equations can be stored and manipulated. Since vast majority of literature on the finite element method treats problems in structural and continuum mechanics, including soil and rock mechanics, the know-ledge of these fields became necessary. It is useful to consider the finite element procedure basically as a Variation approach. This conception has contributed significantly to the convenience of formulating the method and to its generality.

The term “finite element” distinguishes the technique from the use of infinitesimal “differential elements” used in calculus, differential equations. The method is also distinguished from finite difference equations, for which although the steps in to which space is divided into finite elements are finite in size; there is a little freedom in the shapes that the discrete steps can take. F.E.A is a way to deal with structures that are more complex than dealt with analytically using the partial differential equations. F.E.A deals with complex boundaries better than finite difference equations and gives answers to the „real world“ structural problems

4. RESULTS AND DISCUSSION

4.1. ANALYSIS OF CRANKSHAFT - CAST IRON

Structural	
Young's Modulus	1.75e+005 M Pa
Poisson's Ratio	0.27
Density	7.1e-006 kg/mm³

TABLE 1 - CAST IRON PROPERTIES

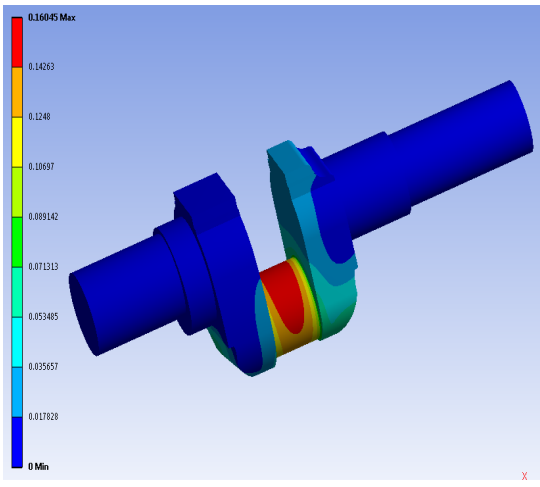


Fig 1.Crank Shaft (Cast Iron)

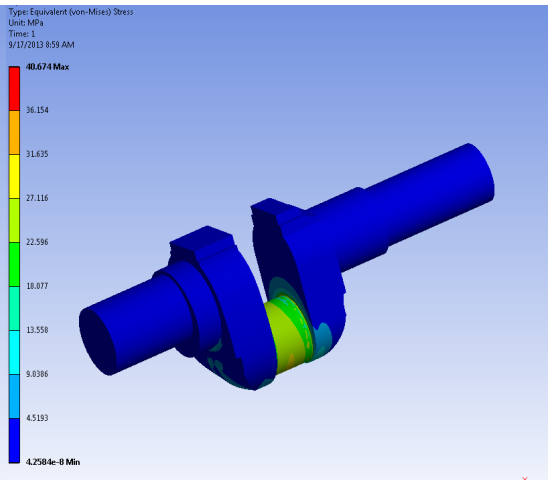


Fig 2.Castiron Crank Shaft loading

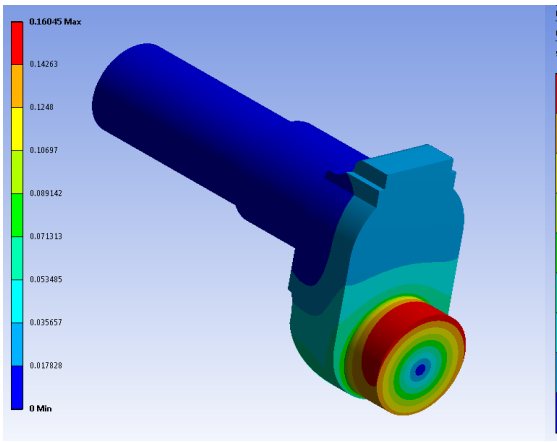


Fig 3.Castiron Crank Shaft total deformation

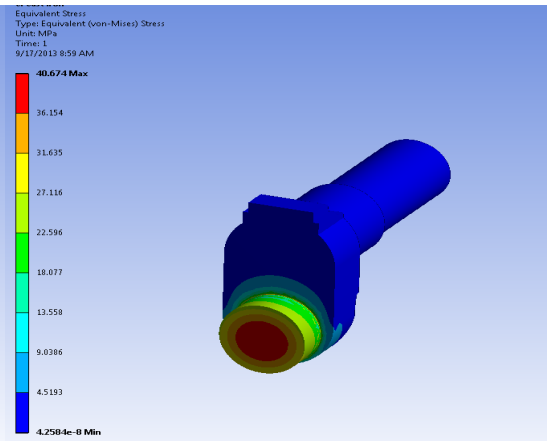


Fig 4.Castiron Crank Shaft elastic stress

4.2. ANALYSIS OF CRANKSHAFT- FORGED STEEL

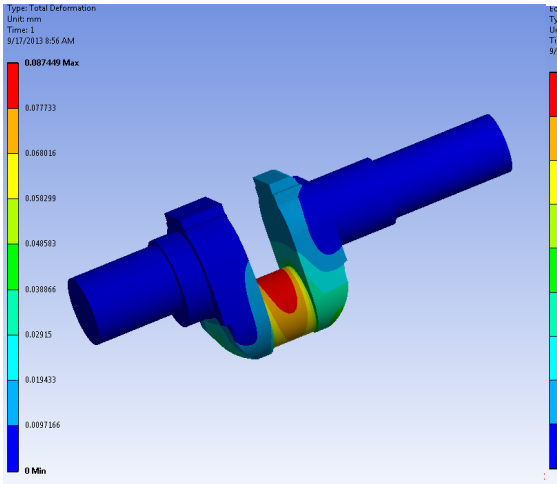


Fig. 5 Forged steel crankshaft

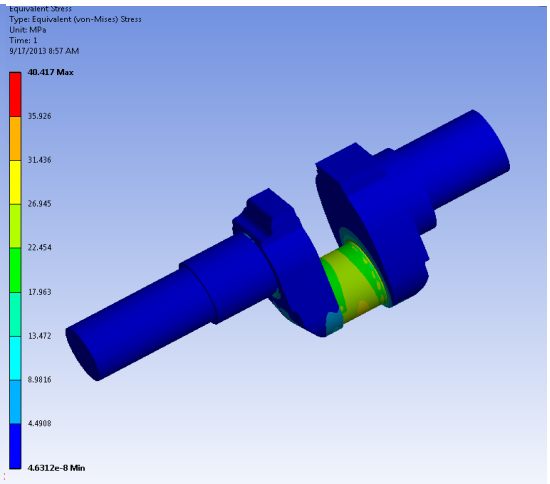


Fig. 6 Forged steel crankshaft loading condition

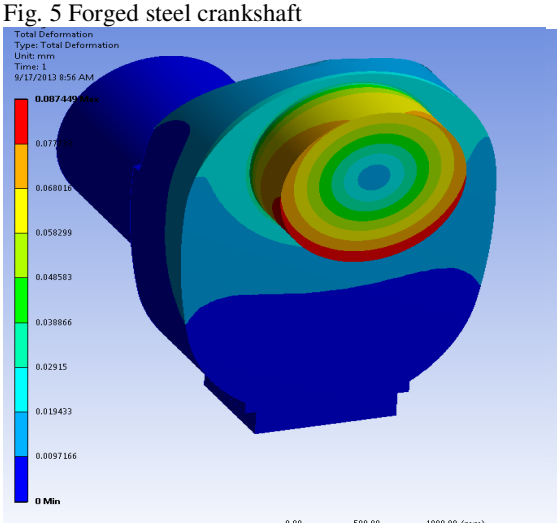


Fig. 7 Forged steel crankshaft total deformation

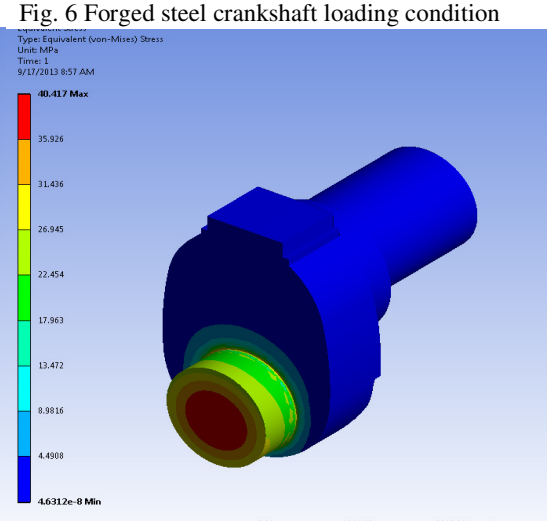


Fig. 8 Forged steel crankshaft elstic stress.

TABLE 2 : FORGED STEEL PROPERTIES

Structural

Young's Modulus	2.1e+005 M Pa
Poisson's Ratio	0.27
Density	7.833e-006 kg/mm³

TABLE 3

COMPARISON OF PROPERTIES OF FORGED STEEL AND CAST IRON

PROPERTIES	FORGED STEEL	CAST IRON
TOTAL DEFORMATION (mm)	0.087	0.16
VON MISES STRESS (MPa)	40.674	40.41

5 .CONCLUSION

This analysis results from the testing of crankshaft under static stress and deflections are listed in above mentioned tables. The forged steel crankshaft is able to withstand the static load compared to cast iron. It is concluded that cast replace the cast iron crankshaft by forged steel crankshaft. We also observe d the reduction in forged steel crankshaft cost for mass production. Analyzing software (ANSYS) can be used for next coming designs of various parts of engines.

REFERENCES

1) Farzin H. Montazersadgh and Ali Fatemi – "Stress Analysis and Optimization of Crankshafts Subject to Dynam-ic Loading" - FIERF, AISI

2) Muhammed Nasiruddin Bin Anidin –"Finite element analysis of upper crank shaft six stroke engine using CAE Software" – University Malaysia Pahang.

3) Steve Smith – "Utilizing crankcase deflection analysis to improve crankshaft design and engine performance" – Oxford, U.K

4) Jonathan Williams, Farzin Montazersadgh and Ali Fatemi –"Fatigue performance comparison and life prediction of forged steel and ductile cast-iron crankshafts" –University of Toledo, Ohio.

5) M.Zorouf and A.Fatemi- "The durability evaluation of crankshafts including comparisons of competing manufacturing processes and cost analysis.

6) Zissions P.Mourelatos –"A crank shaft system model for structural dynamic analysis of internal combustion en-gines".

7) J.Grum –"Analysis of residual stresses in main crank shaft bearings after induction surface hardening and finish grinding – University of Ljublijana, Slovenia.

8) Xue-Qin Hou**,** Ying Li,Tao Jiang-" Fracture failure analy-sis of ductile cast iron crankshaft in a vehicle engine – Bei-jing Institute of Aeronautical Materials ,China.

9) Tian Guanglai,Wei Hanbing,-"Analysis of Stresses in Forged steel Crankshaft of internal combustion engines

ENHANCING POWER OF QUERY OPTIMIZATION WITH OPTIMIZER STATISTICS

[1] GAJANAN RAMPURI GOSAVI, [2] M. K. KURHADKAR

[1] Dept. of Computer Engineering, Dr. Panjabrao Deshmukh Polytechnic, Amravati, Maharashtra, India
[2] Dept. of Computer Engineering, Dr. Panjabrao Deshmukh Polytechnic, Amravati, Maharashtra, India

Dinesh.Gosavi@rediffmail.com,Malhar.Kurhadkar@gmail.com

ABSTRACT *— To optimize the query processor to select the best choices for given alternative. Different qualities of database management systems have different ways of balancing these two. Cost base analysis is required for evaluate the resource footprint of various query plans and use this as the basis for plan selection. The assign the cost how much time to execute to each possible plan possible query plan, and choose the plan with the smallest cost. Costs are used to estimate the runtime cost of evaluating the query, in terms of the number of I/O operations required, CPU path length, amount of disk buffer space, disk storage service time, and interconnect usage between units of parallelism, and other factors determined from the data dictionary. The set of query plans examined is formed by examining the possible access paths (e.g., primary index access, secondary index access, full file scan) and various relational table join techniques (e.g., merge join, hash join, product join). Which depends of the complexity of query plan There are two types of optimization. These consist of logical optimization—which generates a sequence of relational algebra to solve the query—and physical optimization—which is used to determine the means of carrying out each operation.*

Keywords— Query Optimizer,Join Ordering, Query Planning, Cost Estimation,Query Statistics

INTRODUCTION

Query optimization is a function of many relational database management systems. The **query optimizer** attempts to determine the most efficient way to execute a given query by considering the possible query plans.

Generally, the query optimizer cannot be accessed directly by users: once queries are submitted to database server, and parsed by the parser, they are then passed to the query optimizer where optimization occurs. However, some database engines allow guiding the query optimizer with hints.

A query is a request for information from a database. It can be as simple as "finding the address of a person with SS# 123-45-6789," or more complex like "finding the average salary of all the employed married men in California between the ages 30 to 39, that earn less than their wives." Queries results are generated by accessing relevant database data and manipulating it in a way that yields the requested information. Since database structures are complex, in most cases, and especially for not-very-simple queries, theneeded data for a query can be collected from a database by accessing it in different ways, through different data-structures, and in different orders. Each different way typically requires different processing time. Processing times of the same query may have large variance, from a fraction of a second to hours, depending on the way selected. The purpose of query optimization, which is an automated process, is to find the way to process a given query in minimum time. The large possible variance in time justifies performing query optimization, though finding the exact optimal way to execute a query, among all possibilities, is typically very complex, time consuming by itself, may be too costly, and often practically impossible. Thus query optimization typically tries to approximate the optimum by comparing several common-sense alternatives to provide in a reasonable time a "good enough" plan which typically does not deviate much from the best possible result.

JOIN ORDERING

The performance of a query plan is determined largely by the order in which the tables are joined. For example, when joining 3 tables A, B, C of size 10 rows, 10,000 rows, and 1,000,000 rows, respectively, a query plan that joins B and C first can take several orders-of-magnitude more time to execute than one that joins A and C first. Most query optimizers determine join order via a dynamic programming algorithm pioneered by IBM's System R database project[*citation needed*]. This algorithm works in two stages:

First, all ways to access each relation in the query are computed. Every relation in the query can be accessed via a sequential scan. If there is an index on a relation that can be used to answer a predicate in the query, an index scan can also be used. For each relation, the optimizer records the cheapest way to

scan the relation, as well as the cheapest way to scan the relation that produces records in a particular sorted order.

The optimizer then considers combining each pair of relations for which a join condition exists. For each pair, the optimizer will consider the available join algorithms implemented by the DBMS. It will preserve the cheapest way to join each pair of relations, in addition to the cheapest way to join each pair of relations that produces its output according to a particular sort order.

Then all three-relation query plans are computed, by joining each two-relation plan produced by the previous phase with the remaining relations in the query.

Sort order can avoid a redundant sort operation later on in processing the query. Second, a particular sort order can speed up a subsequent join because it clusters the data in a particular way.

QUERY PLANNING FOR NESTED SQL QUERIES

A SQL query to a modern relational DBMS does more than just selections and joins. In particular, SQL queries often nest several layers of SPJ blocks (Select-Project-Join), by means of group by, exists, and not exists operators. In some cases such nested SQL queries can be flattened into a select-project-join query, but not always. Query plans for nested SQL queries can also be chosen using the same dynamic programming algorithm as used for join ordering, but this can lead to an enormous escalation in query optimization time. So some database management systems use an alternative rule-based approach that uses a query graph model.

COST ESTIMATION

One of the hardest problems in query optimization is to accurately estimate the costs of alternative query plans. Optimizers cost query plans using a mathematical model of query execution costs that relies heavily on estimates of the cardinality, or number of tuples, flowing through each edge in a query plan. Cardinality estimation in turn depends on estimates of the selection factor of predicates in the query. Traditionally, database systems estimate selectivities through fairly detailed statistics on the distribution of values in each column, such as histograms. This technique works well for estimation of selectivities of individual predicates. However many queries have conjunctions of predicates such as**SELECT COUNT**(*) **FROM** R **WHERE** R.make ='Honda' **AND** R.model='Accord'. Query predicates are often highly correlated (for example, model='Accord' impliesmake='Honda'), and it is very hard to estimate the selectivity of the conjunct in general. Poor cardinality estimates and uncaught correlation are one of the main reasons why query optimizers pick poor query plans. This is one reason why a database administrator should regularly update the database statistics, especially after major data loads/unloads.

OPTIMIZER STATISTICS are a collection of data that describe the database, and the objects in the database. These statistics are used by the Optimizer to choose the best execution plan for each SQL statement. Statistics are stored in the data dictionary, and can be accessed using data dictionary views such as USER_TAB_STATISTICS. Optimizer statistics are different from the performance statistics visible through V$ views. The information in the V$ views relates to the state of the system and the SQL workload executing on it.

This necessary information is commonly referred to as Optimizer statistics. Understanding and managing Optimizer statistics is key to optimal SQL execution. Knowing when and how to gather statistics in a timely manner is critical to maintaining acceptable performance. This whitepaper is the first in a two part series on Optimizer statistics, and describes in detail, with worked examples, the different concepts of Optimizer statistics including;

- Gathering statistics• Managing statistics•

Optimizer statistics are a collection of data that describe the database, and the objects in the database. These statistics are used by the Optimizer to choose the best execution plan for each SQL statement. Statistics are stored in the data dictionary, and can be accessed using data dictionary views such as USER_TAB_STATISTICS. Optimizer statistics are different from the performance statistics visible through V$ views. The information in the V$ views relates to the state of the system and the SQL

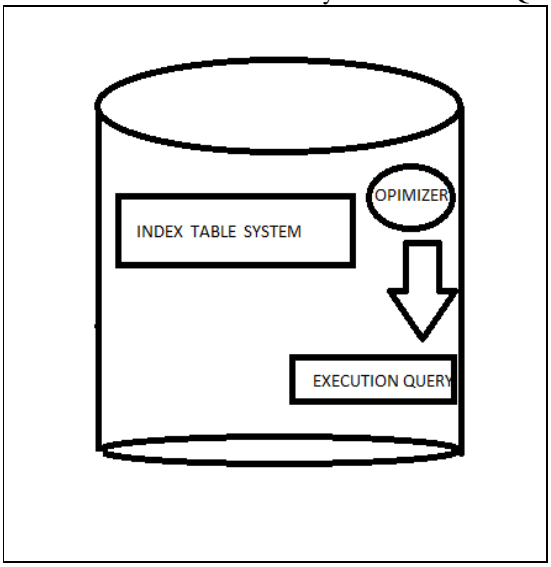


Table and Column Statistics Table statistics include information on the number of rows in the table, the number of data blocks used for the table, as well as the average row length in the table. The Optimizer uses this information, in conjunction with other statistics, to compute the cost of various operations in an execution plan, and to estimate the number of

rows the operation will produce. For example, the cost of a table access is calculated using the number of data blocks combined with the value of the parameter DB_FILE_MULTIBLOCK_READ_COUNT. You can view table statistics in the dictionary view USER_TAB_STATISTICS.

Column statistics include information on the number of distinct values in a column (NDV) as well as the minimum and maximum value found in the column. You can view column statistics in the dictionary view USER_TAB_COL_STATISTICS.

Additional column statistics Basic table and column statistics tell the optimizer a great deal but they don't provide a mechanism to tell the Optimizer about the nature of the data in the table or column. For example, these statistics can't tell the Optimizer if there is a data skew in a column, or if there is a correlation between columns in a table. Information on the nature of the data can be provided to the Optimizer by using extensions to basic statistics like, histograms, column groups, and expression statistics. Histograms Histograms tell the Optimizer about the distribution of data within a column. By default (without a histogram), the Optimizer assumes a uniform distribution of rows across the distinct values in a column. As described above, the Optimizer calculates the cardinality for an equality predicate by dividing the total number of rows in the table by the number of distinct values in the column used in the equality predicate. If the data distribution in that column is not uniform (i.e., a data skew) then the cardinality estimate will be incorrect. In order to accurately reflect a non-uniform data distribution, a histogram is required on the column. The presence of a histogram changes the formula used by the Optimizer to estimate the cardinality, and allows it to generate a more accurate execution plan.

Frequency Histograms Frequency histograms are created when the number of distinct values in the column is less than 254. Oracle uses the following steps to create a frequency histogram. 1. Let's assume that Oracle is creating a frequency histogram on the PROMO_CATEGORY_ID column of the PROMOTIONS table. The first step is to select the PROMO_CATEGORY_ID from the PROMOTIONS table ordered by PROMO_CATEGORY_ID. 2. Each PROMO_CATEGORY_ID is then assigned to its own histogram bucket.Extended Statistics In Oracle Database 11g, extensions to column statistics were introduced. Extended statistics encompasses two additional types of statistics; column groups and expression statistics. Column Groups In real-world data, there is often a relationship (correlation) between the data stored in different columns of the same table. For example, in the CUSTOMERS table, the values in the CUST_STATE_PROVINCE column are influenced by the values in the COUNTRY_ID column, as the state of California is only going to be found in the United States. Using only basic column statistics, the Optimizer has no way of knowing about these real-world relationships, and could potentially miscalculate the cardinality if multiple columns from the same table are used in the where clause of a statement. The Optimizer can be made aware of these real-world relationships by having extended statistics on these columns as a group

```
SQL> SELECT DBMS_STATS.CREATE_EXTENDED_STATS(null,'customers', '(country_id, cust_state_province)')
  2 FROM  dual;

DBMS_STATS.CREATE_EXTENDED_STATS(NULL,'CUSTOMERS','(COUNTRY_ID,CUST_STATE_PROVINCE)')
------------------------------------------------------------------------------
SYS_STUJGVLRVHSUSVTDUSXNV4_IR44

SQL>
SQL> Exec DBMS_STATS.GATHER_TABLE_STATS(null,'customers');

PL/SQL procedure successfully completed.
```

Figure 10. Creating a column group on the CUSTOMERS table

After creating the column group and re-gathering statistics, you will see an additional column, with a system-generated name, in the dictionary view USER_TAB_COL_STATISTICS. This new column represents the column group (Figure 11).

```
SQL> SELECT column_name, num_distinct, num_nulls, histogram
  2 FROM  user_tab_col_statistics
  3 WHERE  table_name='CUSTOMERS';

COLUMN_NAME                    NUM_DISTINCT  NUM_NULLS HISTOGRAM
------------------------------ ------------ ---------- ---------------
SYS_STUJGVLRVHSUSVTDUSXNV4_IR44          145          0 NONE
CUST_ID                                55500          0 NONE
CUST_FIRST_NAME                         1300          0 NONE
CUST_LAST_NAME                           908          0 NONE
CUST_GENDER                                2          0 NONE
CUST_YEAR_OF_BIRTH                        75          0 NONE
CUST_MARITAL_STATUS                       11      17428 NONE
CUST_STREET_ADDRESS                    49900          0 NONE
CUST_POSTAL_CODE                         623          0 NONE
CUST_CITY                                620          0 NONE
CUST_CITY_ID                             620          0 HEIGHT BALANCED
CUST_STATE_PROVINCE                      145          0 FREQUENCY
CUST_STATE_PROVINCE_ID                   145          0 FREQUENCY
COUNTRY_ID                                19          0 FREQUENCY
CUST_MAIN_PHONE_NUMBER                 51344          0 NONE
CUST_INCOME_LEVEL                         12         41 NONE
```

Expression Statistics It is also possible to create extended statistics for an expression (including functions), to help the Optimizer to estimate the cardinality of a where clause predicate that has columns embedded inside expressions. For example, if it is common to have a where clause predicate that uses the UPPER function on a customer's last name, UPPER(CUST_LAST_NAME)=:B1

Gathering Statistics For database objects that are constantly changing, statistics must be regularly gathered so that they accurately describe the database object. The PL/SQL package, DBMS_STATS, is Oracle's preferred method for gathering statistics, and replaces the now obsolete ANALYZE2 command for collecting statistics. The DBMS_STATS package contains over 50 different procedures for gathering and managing statistics but most important of these procedures are the GATHER_*_STATS procedures. These procedures can be used to gather table, column, and index statistics. You will need to be the owner of the object or have the ANALYZE ANY system privilege or the DBA role to run these procedures. The parameters used by these procedures are nearly identical, so this paper will focus on the GATHER_TABLE_STATS procedure. GATHER_TABLE_STATS The

DBMS_STATS.GATHER_TABLE_STATS procedure allows you to gather table, partition, index, and column statistics. Although it takes 15 different parameters, only the first two or three parameters need to be specified to run the procedure, and are sufficient for most customers; The name of the schema containing the table• The name of the table• A specific partition name if it's a partitioned table and you only want to collect statistics for a• specific partition
(optional)

Changing the default value for the parameters in DBMS_STATS.GATHER_*_STATS

You can specify a particular non-default parameter value for an individual DBMS_STATS.GATHER_*_STATS command, or override the default value for your database. You can override the default parameter values for DBMS_STATS.GATHER_*_STATS procedures using the DBMS_STATS.SET_*_PREFS procedures. The list of parameters that can be changed are as follows:

AUTOSTATS_TARGET (SET_GLOBAL_PREFS only as it relates to the auto stats job)
CONCURRENT (SET_GLOBAL_PREFS only)
CASCADE
DEGREE
ESTIMATE_PERCENT
METHOD_OPT
NO_INVALIDATE
GRANULARITY
PUBLISH
INCREMENTAL
STALE_PERCENT

You can override the default settings for each parameter at a table, schema, database, or global level using one of the following DBMS_STATS.SET_*_PREFS procedures, with the exception of AUTOSTATS_TARGET and CONCURRENT which can only be modified at the global level.

SET_TABLE_PREFS
SET_SCHEMA_PREFS
SET_DATABASE_PREFS
SET_GLOBAL_PREFS

CONCLUSION In the order of cost base we have use this statistics of Optimizer to improve the speed of query processor it must have information about all of the objects (table and indexes) accessed in the SQL statement, and information about the system on which the SQL statement will be run. This necessary information is commonly referred to as Optimizer statistics. Understanding and managing statistics are key to optimal SQL execution. Knowing when and how to gather statistics in a timely manner is critical to maintaining good performance. By using a combination of the automatic statistics gathering job and the DBMS_STATS package, a DBA can maintain an accurate set of statistics for a system, ensuring the Optimizer will have the best possible source of information to determine the execution plan.

REFERENCES

- Chaudhuri, Surajit (1998). "An Overview of Query Optimization in Relational Systems". Proceedings of the ACM Symposium on Principles of Database Systems. pp. pages 34–43. doi:10.1145/275487.275492.
- Understanding Optimizer Statistics January 2012 Author: Maria Colgan Oracle Corporation World Headquarters 500 Oracle Parkway Redwood Shores, CA 94065 U.S.A. Worldwide Ioannidis, Yannis (March 1996). "Query optimization". ACM Computing Surveys **28** (1): 121–123. doi:10.1145/234313.234367.
- Selinger, P. G.; Astrahan, M. M.; Chamberlin, D. D.; Lorie, R. A.; Price, T. G. (1979). "Proceedings of the 1979 ACM SIGMOD International Conference on Management of Data". pp. 23–34. doi:10.1145/582095.582099. ISBN 089791001X.

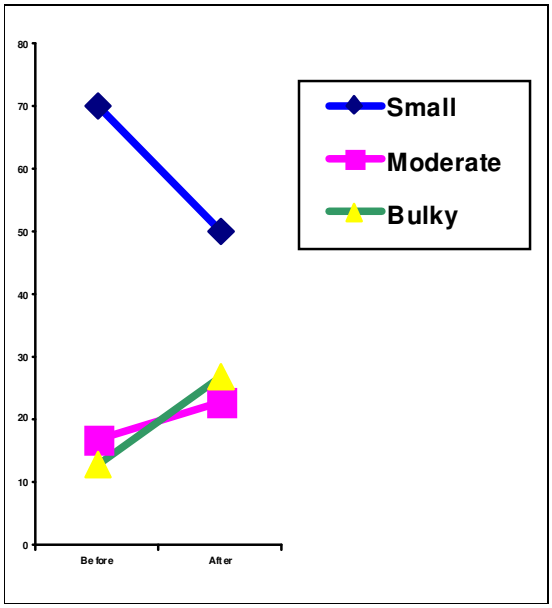


FIG : Percentage Change in the space saved ..

If the appropriate weight is allotted to the item class as

Class of Item	Weight
Small	1
Moderate	2
Bulky	3

Then the Space Saved Index (S.S.I) can be calculated as

$$S.S.I. = \frac{\text{(Sum of Weighs)}}{\text{(maximum Weight)}} * 100$$

Before :

$$S.S.I. = \frac{\{(70 * 1) + (17 * 2) + (13 * 3)\}}{\{(100 * 3)\}} * 100$$

$$= \mathbf{47.66}$$

After :

$$S.S.I. = \frac{\{(50 * 1) + (23 * 2) + (27 * 3)\}}{\{(100 * 3)\}} * 100$$

$$= \mathbf{59}$$

The difference in the space saved index is of 12 between before and after implementing the

Customization , consequently great saving of space resource .

Application of following algorithm can be used as a fitting tool to optimize the performence.

Algorithm to allocate (n)
size(Rack) = Precision + size(Bin)
Scan free list for *smallest* block with nItem >= size(Rack Bin)
If block not found
Failure (time for Noting collection!)
Else if free block nItem >= size(block) + threshold Precision
Exploit into a free block and an in-use block
Free block nItem = Free block nItem - Precision (negligible)
In-use block nItem = size(Bin)
Return pointer to in-use Rack Bin
Else
Unlink Rack from free list
Return pointer to next Rack
*Threshold must be at least size(Precision) + 1 to leave room for Precision header and Pointer to next
Threshold can be set higher to combat loss of Bins
Allocation time is O(K) (K = number of Rack bins in free list)

Result and Discussion

The non conventional customizations are recommended and most of them are implied the rejuvenating optimization results , illustrated with critical analysis along with example reports . ERP optimization is worked out as an outstanding idea of minimizing the resources consumed , while maximizing the throughput .The various resources under consideration are Manpower , Money , Space used , transportation cost , Infrastructure and other tangibles . The Optimization further has amazingly shown off , affecting the best fit space utilization through ERP software parameters & intelligent Reports generation .

REFERENCES

[1] Marianne Bradford, "Modern ERP: Select, Implement & Use Today's Advanced Business Systems," Amazon's, pp. 127-211.

[2] The Journal of Strategic Information Systems (JSIS) - http://www.journals.elsevier.com/the-journal-of-strategic-information-systems

[3] International Journal of Intelligent Systems Technologies and Applications(IJISTA) - http://www.inderscience.com/browse/index.php?journalID=35

[4] Thomas L. Legare (2002), "The Role of Organizational Factors in Realizing ERP Benefits", Information system management.

[5] Wilhelm Scheer, Frank Habermann (2000), "Making ERP a sucess", ACM,Vol 43,4.

[6] Elisabeth J. Umble, M.Michael Umble (2002):"Avoiding ERP implementation Failure", Industrial Management.

[7] Ahituv Niv, Neumann Seev, Zviran Moshe, "A system development methodology for ERP systems", Journal of Computer Information Systems, 2002.

[8] Grossman Theodre, Walsh James, "Avoiding the pitfalls of ERP system implementation", Information systems management, 2004.

EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER IN POOL BOILING OF WATER-SILICA AND WATER-TUNGSTEN OXIDE NANOFLUIDS ON VERTICAL CYLINDRICAL COPPER SURFACE

[1] M.P.RANGAIAH, [2] DR.B.UMA MAHESWAR GOWD,

[1] Lecturer Mechanical Engineering Department, JNTUA College of Engineering Ananthapuramu A.P. India.
[2] Professor & Director Admission, Mechanical Engineering Department, JNTUA College of Engineering Ananthapuramu A.P. India.

mp.ranga@yahoo.com

ABSTRACT: *Experimental Investigation of heat transfer during pool boiling of two nanofluids i.e. water- silica and water-tungsten oxide has been carried out. Nanoparticles were tested at the concentration of 0.01g/l to1.0g/l. The vertical cylindrical copper specimen having 12mm diameter and 17mm length formed test heater. The experiments have been performed to establish the influence of nanofluids concentration as well as surface material on heat transfer coefficient at atmospheric pressure. The results indicate that independent of concentration nanoparticle material (silica and tungsten oxide) has influence on heat transfer coefficient while boiling of water –silica or water- tungsten oxide on vertical surface of copper specimen. It seems that heater material did not affect the boiling heat transfer in 1.0 g/l water-silica or water-tungsten oxide nanofluid.*

Keywords: Silica and Tungsten Oxide Nanofluids, Pool Boiling, Vertical Cylindrical Surface of Copper Specimen.

INTRODUCTION

In nanotechnology field have allowed development of a new category of liquids termed nanofluids, which was first used by a group in Argonne National Laboratory USA to describe liquid suspensions containing nanoparticles with thermal conductivities, orders of magnitudes higher than the base liquids, and with sizes significantly smaller than 100 nm. The augment of thermal conductivity could provide a basis for an enormous innovation for heat transfer intensification, which is pertinent to a number of industrial sectors including transportation, power generation, micro-manufacturing, chemical and metallurgical industries, as well as heating, cooling, ventilation, and air-conditioning industry.

The intensification of heat transfer processes and the reduction of energy losses are hence important tasks, particularly with regard to the prevailing energy crisis. In this regard, the heat transfer boiling has been used extensively to acquire good heat transfer performance. In terms of boiling regimes, nucleate boiling is an efficient heat transfer mechanism however, for the incorporation of nucleate boiling in most practical applications. For decades, researchers have been trying to develop more efficient heat transfer fluids. This would, in turn, improve process efficiency and reduce operational costs. This is where nanofluids could play a key role, nanofluids could potentially revolutionise heat transfer.

Accordingly, various techniques for enhancement of the boiling heat transfer have been proposed and studied. Typical approaches that have been considered to enhance pool boiling heat transfer in particular include oxidation or selective fouling of a heater surface to increase the wettability of the liquid, vibration of heaters to promote the departure of bubbles from a heater surface and extended heater surface to increase the heat transfer area. An interesting advantage of using nanofluids for heat transfer applications is the ability to alter their properties. That is the thermal conductivity and surface wettability, for example, can be adjusted by varying the particle concentration in the base fluid, and hence allowing nanofluids to be used for a variety of different applications. However, it is also important to note that addition of nanoparticles to a base fluid also changes the viscosity, density and even the effective specific heat these properties also have a direct effect on the heat transfer effectiveness.

With the modern technology available it is quite possible to produce ultra fine nanosized metallic non-metallic particles which will revolutionize heat transfer enhancement methods (Zeinali et al.2007). Considering very small particle size and their small volume fraction problems such as clogging and increased pressure drop become insignificant if these particles are used along with base fluids. The relative large surface area of nanoparticles increases the

stability and reduces the sedimentation in addition to dramatic improvement in heat transfer efficiency. This is possible due to decreased particle size in a suspension and increased surface area of the particles.

In this regard improving the thermal properties of energy transmission fluids may become an effective means of augmenting heat transfer. Conventional heat transfer fluids such as water, ethylene glycol and oil have inherently low thermal conductivity relative to metals and even metal oxides. Therefore fluids with these suspended solid particles can offer better heat transfer properties compared to conventional heat transfer fluids.

POOL BOILING EXPERIMENTS:

Figure 1 shows the schematic diagram of the experimental set up. It consists of a boiling vessel of 80 mm diameter and 200 mm long made up of stainless steel 316 fitted with flanges at top and bottom.

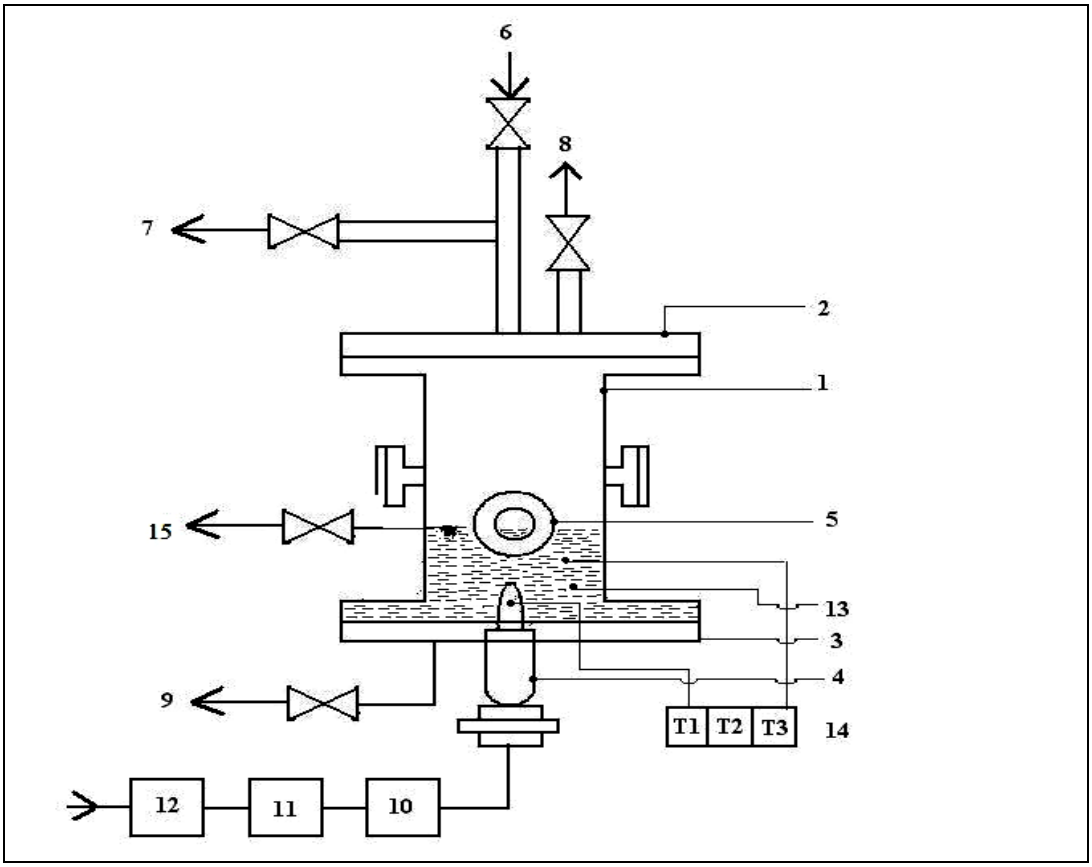


Figure 1 Schematic Diagram of Experimental Setup

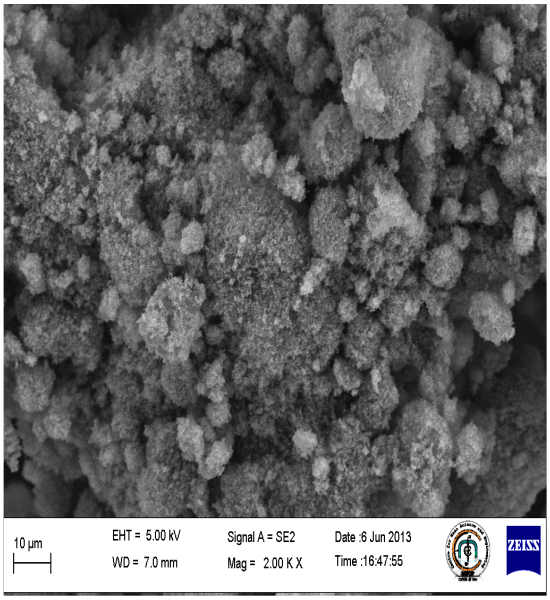
1. Boiling vessel
2. Top flange
3. Bottom flange
4. Heater
5. Watch glass
6. Liquid inlet (surface and liquid temperature)
7. to vaccum
8. Pressure relief valve
9. Drain
10. Wattmeter
11. Dimmer stat
12. Stabiliser
13. .Nanofluid
14 .Temperature indicator
15. Make up water

Due provisions are made in these flanges for liquid charging inlet and outlet, vacum pump lines, thermocouples, test heater section and drain. The vessel is heavily insulated by asbestos rope and woollen ropes covered by packing material to reduce any heat transfer to surroundings. The test section is a cylindrical vertical surface of 12mm diameter and 17 mm length with two thermocouples fixed to the surface at opposite sides around at a depth of 1mm on the periphery. The test section is heated by an electrical heating element of 1000 w capacity. The heating element is connected to a wattmeter through a dimmer stat to vary the heat input during the experimentation.

PREPARATION OF NANOFLUIDS:

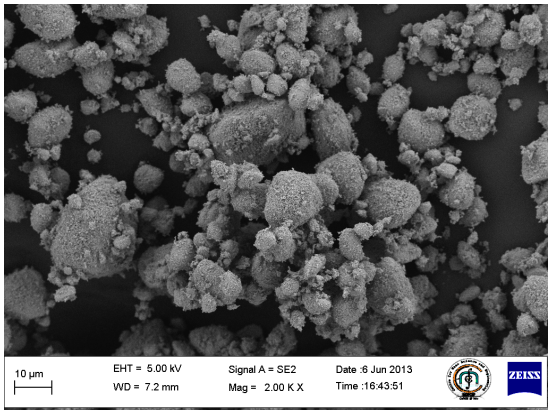
In this work to prepare the nanofluids with desired concentration, nanoparticles were homogeneously dispersed into pure water. The characteristics of nanofluids are governed by not only the kind and size of the nanoparticles but also their dispersion status in the pure water. Due care was taken to ensure complete dispersion. After weighing equivalent weight of the solid nanoparticles were mixed with pure water in a flask, and then each time, vibrating machine was used to mix the nanoparticles uniformly for about 3 – 4 hrs. No considerable sedimentation was observed for the range of concentrations tested even after 24 hrs. One hour before adding nanofluids into the test vessel, the experimental outcomes are reliable.

Tungsten Oxide Nanofluid



SEM image of silica nanoparticles

Silica Nanofluid



SEM Image of WO_3 Nanoparticles

Fig 2 Nanofluids and SEM image of Nanoparticles

EXPERIMENTAL PROCEDURE:

First test setup is checked for its electrical consistency. The instrumentation thermocouples test vessel is cleaned by emery paper, dust, and other particles are cleared by using vacuum cleaner. The surfaces are cleaned by water splashing and draining off the test surface Pin is put in position into the heater necessary instrumentations (thermocouple) are arranged on the Pin and as well as in the liquid space. The vessel is charged with test liquid (water) and again the water is drained of twice to make sure that there are no sedimentation particles. Fresh charge of liquid is again filled. The auxiliary heater is switched on slowly and steadily the temperature of the liquid is brought to its saturation temperature. Once the steady state conditions are satisfactory maintained power is given to the test Pin heater slowly the heat is increased in steps to get to the desired condition. The make up water is expected to keep the concentration uniform. The readings are noted down. Then the heat is increased to the next position insteps and readings are noted down. The procedure is repeated till the last desired value of heat input (1kW).

The above procedure is followed with nanofluids.

The heat flux q is calculated using the following relation.

$q = Q/A$ W/m^2 or kW/m^2 1

Where Q is the heat input in W or kW

A is the surface area in mm^2 or m^2

Heat transfer coefficient h between the surface and the liquid is calculated by applying Newton's law of cooling.

$h = q / T_s - T_l$ $W/m^2 K$ or $kW/m^2 K$..... 2

Where Ts is the average of surface temperatures recorded by thermocouples

T_l is the liquid temperature recorded by thermocouple

RESULTS AND DISCUSSION:

The comparative graph showing results of water and different concentrations of silica nanofluids on copper surface is shown fig 3 It can be seen at lower heat fluxes less than $1000kW/m^2$ though there is an enhancement of heat transfer coefficient for different concentrations nanofluids with higher concentrations of 0.5g/l and 1.0g/l show marked enhancement of heat transfer coefficient over that of pure water. While for heat fluxes higher than $1000kW/m^2$ the enhancement of heat transfer coefficient is rather low for all concentrations.

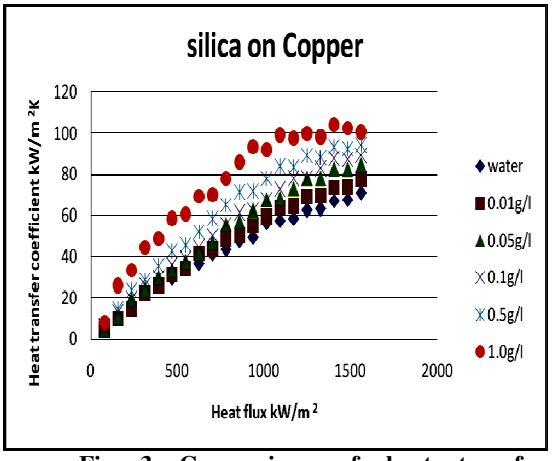


Fig 3 Comparison of heat transfer coefficients for silica nanofluid different concentrations on copper vertical surface

In the present case since the boiling on the vertical surface involves bubble growth and detachment it may be the nanoparticle churn creating local density variations that gave higher heat transfer coefficient for greater particles concentrations at lower heat fluxes. At higher heat fluxes the density variations would have come to a thresh hold values.

Heat transfer coefficient enhancement is about 9.86% with 0.01g/l, 15.65% with 0.05g/l, 22.07% with 0.1g/l, 29.25% with 0.5g/l, 37.33% with 1.0g/l of silica nanofluids compare with those of pure water.

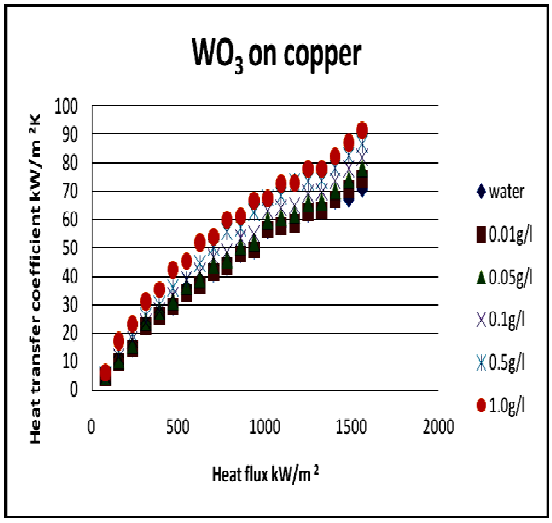


Fig 4 Comparison of heat transfer coefficients for WO_3 nanofluid different concentrations on copper vertical surface

The comparative graph showing results of water and different concentrations of WO_3 nanofluids on copper surface is shown fig 4. At the same heat flux the heat transfer coefficient at higher concentration of nanofluid is higher than that at lower concentrations across the range of heat flux. Here all the concentrations and water heat transfer coefficient is almost similar up to $300kW/m^2$ after that increased at higher level.

Heat transfer coefficient enhancement is about 4.63% with 0.01g/l, 9.86% with 0.05g/l, 15.64% with 0.1g/l, 22.07% with 0.5g/l, 29.25% with 1.0g/l of tungsten oxide nanofluids compared with those of pure water.

In order to validate the experimental apparatus as well as the procedure these results are compared with previous works for water on horizontal copper, shown in fig 5

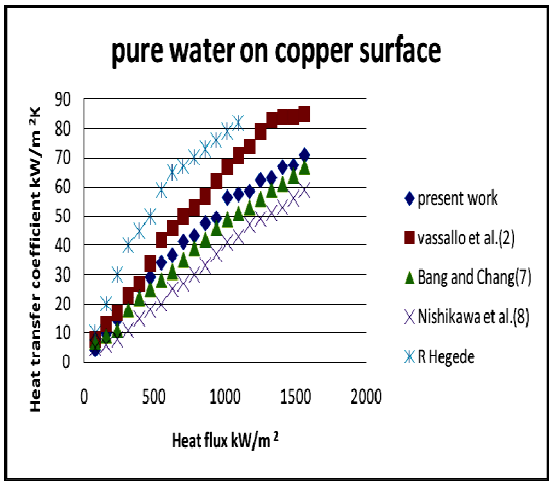


Fig 5 Pure water on copper surface with other works

It may be noted that very few works are available with vertical surfaces only one work i.e. Hegde.R is on vertical surface where as other works are on horizontal surfaces. The present work data collected is very near to other work. The variation in values is quite normal in boiling experiments. Hence it is ascctaiued that the experimental equipment and procedures are acceptable.

CONCLUSION:

Investigation of Nucleate pool boiling heat transfer has been conducted on copper cylindrical specimen for different concentrations of silica and tungsten oxide nanofluids. For copper vertical cylindrical specimen, the presence of nanoparticles significantly enhanced the pool boiling heat transfer coefficient. Furthermore based on the experimental results it is recommended to use nanofluids for enhancing the heat transfer coefficient around the copper cylindrical surfaces. In conclusion in terms of quantity for silica and tungsten oxide nanoparticles,

The heat transfer coefficient verses heat flux along with results obtained from the correlations proposed by some selected authors. The heat transfer coefficient has been seen to increase with heat flux. Compared to the wide variations in the prediction of pool boiling data, the present data is seen to be quite consistent and compare well with the literature.

Heat transfer coefficient enhancement of about 41.25% for copper is found with silica nanofluid of concentration at 1.0g/l silica. And 29.25% for copper is found with tungsten oxide nanofluid of concentration at 1.0g/l Tungsten oxide.

REFERENCES

1. Lee, S., Choi, S. U. S., Li, S., and Eastman, J. A. Measuring thermal conductivity of fluids containing oxide nanoparticles. Journal of Heat Transfer, 121, 280–289 (1999).
2. Wang, X., Xu, X., and Choi, S. U. S. Thermal conductivity of nanoparticle-fluid mixture. Journal of Thermophysics and Heat Transfer, 13, no. 4, 474–480 (1999).
3. Murshed, S. M. S., Leong, K. C., and Yang, C. Enhanced thermal conductivity of TiO2 - Water based nanofluids. International Journal of Thermal Sciences, 44, no. 4, 367–373 (2005).
4. Srdic, V., Winterer, M., Moller, A., Miehe, G., and Hahn, H. Nanocrystalline Zirconia surface-doped with alumina: chemical vapor synthesis, characterization, and properties. Journal of the American Ceramic Society, 84, 2771–2776 (2001).
5. Cao, H., Qian, X., Gong, Q., Du, W., Ma, X., and Zhu, Z. Shape- and size-controlled synthesis of nanometer ZnO from a simple solution route at room temperature. Nanotechnology, 17, 3632–3636 (2006).
6. Xuan, Y. and Li, Q. Heat transfer enhancement of nanofluids. International Journal of Heat and Fluid Transfer, 21, 58–64 (2000).
7. Li, X., Zhu, D., and Wang, X. Evaluation on dispersion behavior of the aqueous copper nano-suspensions. Journal of Colloid and Interface Science, 310, no. 2, 456–463 (2007).
8. Vassallo, P., Kumar, R., and Amico, S. D., "Pool Boiling Heat Transfer Experiments in Silica–Water Nano-Fluids," Int. J. Heat Mass Transfer, Vol. 47, No. 2, 2004, pp. 407– 411.
9. Lotfi H, Shafii MB. Boiling heat transfer on a high temperature silver sphere in nanofluid. Int J Thermal Sc. 2009;48:2215–2220.
10. Trisaksri, V. and Wongwises, S., Nucleate Pool Boiling Heat
Transfer of TiO2–R141b Nanofluids," Int. J. Heat Mass Transfer, Vol. 52, No. 5–6, 2009, pp. 1582–1588.
11. Suriyawong, A. Wongwises, S., "Nucleate Pool Boiling Heat Transfer Characteristics of TiO2-Water Nanofluids at Very Low Concentrations," Exp. Therm. Fluid Sci., Vol. 34, No. 8, 2010, pp. 992–999.

ERP INNTELLIGENT CUSTOMIZATION ON ITEM DIMENSION

[1] GAJANAN RAMPURI GOSAVI, [2] M. K. KURHADKAR

[1] Dept. of Computer Engineering, Dr. Panjabrao Deshmukh Polytechnic, Amravati, Maharashtra, India
[2] Dept. of Computer Engineering, Dr. Panjabrao Deshmukh Polytechnic, Amravati, Maharashtra, India

dinesh.gosavi@rediffmail.com,malhar.kurhadkar@gmail.com

ABSTRACT*—ERP is today's Engineering trend to automate Industrial Transaction processing systems. A System's approach to optimally use resources, intelligent enough to curtail on resource expenditure using Computerized optimization approach is certainly a great rejuvenation to Automation of Industrial applications. The paper explores and elaborates the insight to optimally minimize the resource of space in Item domain of an IMS system in ERP. A pure system approach gives a sharp edge to manipulate the system resource usage*

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Keywords—ERP; Optimizatio, Intelligent Customization, Best Fit;

INTRODUCTION

ERP is an enterprise-wide information system that facilitates the flow of information and coordinates all resources and activities within the organization. Of all the software an organization can deploy, ERP has potentially the most direct
impact on reducing costs. ERP solutions are effective for reducing costs through improving efficiencies and decision-making. Competitive advantages arise to firms that can contain costs so that increased revenues translate into higher profits. Effective solutions open to door to vast business process improvements as indicated by better customer service, smoother functioning business, decision support, eliminating IT barriers to growth, and the coordination of various business activities.

The various computing resources used in process would be:

A **file server** allows you to access files.

A **print server** allows you to select a printer and send your print job to it.

A **database server** allows you to access a database by submitting a query say in SQL. The server will run your query and send you a reply.

A **web server** lets you access web pages. When we "surf the web" by typing a URL in a browser window or by clicking on a link on a page, we are asking for pages from a web server on the internet.

The **client server technology** is based on a request-reply model, where the client sends a "request" to the server and the server handles the request and sends a "reply" or "response" back to the client. Thus, when we surf the web, we are requesting a page from the server and the response is an HTML file that contains the page. On receiving it, your browser knows how to decode the HTML file and display the contents of the file nicely in the browser window.The various resources, for example, to be minimized could be considered :

Production : Plants, Machines, Products, materials, Production order

Sales :Customers, Prospects, Sales orders, Products, prices

Marketing: plans, Strategy, Markets, New products,

Human relations :Employees, Departments, Units, Skills, Contact.

Accounting: Receipts, Payments, Receivables, Payables, Asset values, Liabilities, Purchase orders

While, minimum notable reduction in the consumption of resources , for a moderate organization with average turnover can run into huge countable , the paper provides the original research base and consequently practical results are mind-blowing .

INTELLIGENT CUSTOMIZATION PROPOSED

THE DATABASE : Item master

THE CUSTOMIZATION : Item_Dimension

FIELDS MEANING : The Item_Dimension field refers to the Length×Hight×Width Dimensions of the Item

DESCRIPTION : Traditionally Items are stored with the 'Best fit judgement' of the keeper .However for an organization having an average sized Warehouse in the most demanded place / site is not uncommon . The best utilization of the space could be worked out , had the Item dimensions been matched with the Rack Dimensions, at the time of Rack allocation for storage of the Items. For an Organization like Moderate one with average land cost of site @5000/- per Sq. Ft., The 2000 Sq.Ft. space saved can save 100,00000/- Rupees . It's remarkable. The matching makes use of dimension wise Item report and Rack dimensions Report

ACTIONS TRIGGERED :Find out the best available Rack, dimensions wise matching to the Item

ITEM DIMENSIONS REPORT AS ON Sample Date										
Sr. No	**Item No.**	**Item Name**	**Item Short Discription**	**Item Long Discription**	**UOM**	**Weight (Gms)**	**Manufactu Date**	**Expiry Date**	**Quantity in hand**	**Item Dimensions(Cms)**
1	ZN00004	Zink Alloy	Zink Alloy 70% Zink	Zink Alloy with 70% pure Zink	Boxes	500	1/1/2005	1/1/2010	26	12.5 * 19 * 27
2	SW51498	Switch	Electronic Switch	Modern Gear Crain Switch	Cartoons	800	13/11/2004	23/13/2013	21	22 * 12 * 07
3	SW51002	Clapper Switch	Clapper Switch With Lever	Clapper Switch with Lever three way switch	Packets	2500	10/10/2000	20/10/2012	30	92 * 58 * 18
4	SL00600	Shaft Roller	HRM Roller	HRM Roller 0.5 Meter Dia	Nos	306000	3/11/2004	12/11/2018	7	8700 * 500 * 500
5	SC89218	Screw	General Purpose Screw	1.5 Inch general purpose screw	Dozens	12	4/9/2005	11/6/2028	436	4.5 * 1.6 * 0.4
6	PB00444	Platinum Base	Platinum Base Compund	Platinum Base 22 % Concentration W/W	Liters	300	1/1/2002	3/7/2013	6	80 * 40 * 25
7	LT91562	Laith	CRM Laith Machine	Grade III CRM Laith with Accessories	Nos	849828	23/8/2004	10/9/2013	6	6989 * 1345 * 1657
8	GD14721	Guide	Steel Guide	Hot Rolling Mill steel sheet guide	Nos	12038	10/9/2003	3/7/2009	57	1898 * 1267 * 4493
9	FL16720	File	Strip Threaded File	1.5 Feet Blade Strip Threaded File	Nos	1200	1/1/2005	11/6/2028	88	690 * 40 * 34
10	CR00301	Corrogator	Moderate Corrogator	Sharpening Wagon Corrogator with in Patcher	Nos	32033	14/10/2005	31/12/2021	12	8798 * 1204 * 3390
11	BO10116	Bolt	Bolt 20 In	Threaded 20 in Bolt round necked	Dozens	400	12/12/2001	25/03/2021	30	187 * 42 * 24
12	AL01167	Aligner	Strips Aligner	Major , Automatic strips aligner	Nos	65748	23/03/2003	28/06/2008	3	12393 * 134 * 99

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EVALUATIONS

Percentage Change in the space saved .

Sr. No.	Item's Dimensions	Space Saved	
		Before	After
		%	%
01	Small	70	50
02	Moderate	17	23
03	Bulky	13	27
	Total	**100**	**100**

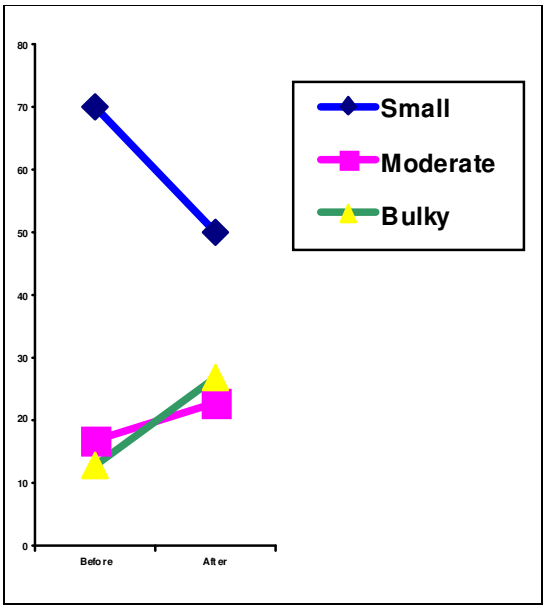

FIG 1 : Percentage Change in the space saved ..

If the appropriate weight is allotted to the item class as

Class of Item	Weight
Small	1
Moderate	2
Bulky	3

Then the Space Saved Index (S.S.I) can be calculated as

$$\text{S.S.I.} = \frac{\text{(Sum of Weighs)}}{\text{(maximum Weight)}} * 100$$

Before :

$$\text{S.S.I.} = \frac{\{(70 * 1) + (17 * 2) + (13 * 3)\}}{\{(100 * 3)\}} * 100 = 47.66$$

After :

$$\text{S.S.I.} = \frac{\{(50 * 1) + (23 * 2) + (27 * 3)\}}{\{(100 * 3)\}} * 100 = 59$$

The difference in the space saved index is of 12 between before and after implementing the Customization , consequently great saving of space resource .

Application of following algorithm can be used as a fitting tool to optimize the performence.

Algorithm to allocate (n)

size(Rack) = Precision + size(Bin)
Scan free list for *smallest* block with nItem >= size(Rack Bin)
If block not found
Failure (time for Noting collection!)
Else if free block nItem >= size(block) + threshold Precision
Exploit into a free block and an in-use block
Free block nItem = Free block nItem - Precision (negligible)
In-use block nItem = size(Bin)
Return pointer to in-use Rack Bin
Else
Unlink Rack from free list
Return pointer to next Rack
*Threshold must be at least size(Precision) + 1 to leave room for Precision header and Pointer to next
Threshold can be set higher to combat loss of Bins
Allocation time is O(K) (K = number of Rack bins in free list)

RESULT AND DISCUSSION

The non conventional customizations are recommended and most of them are implied the rejuvenating optimization results , illustrated with critical analysis along with example reports . ERP optimization is worked out as an outstanding idea of minimizing the resources consumed , while maximizing the throughput .The various resources under consideration are Manpower , Money , Space used , transportation cost , Infrastructure and other tangibles . The Optimization further has amazingly shown off , affecting the best fit space utilization through ERP software parameters & intelligent Reports generation .

REFERENCES

[1] Marianne Bradford, "Modern ERP: Select, Implement & Use Today's Advanced Business Systems," Amazon's, pp. 127-211.

[2] The Journal of Strategic Information Systems (JSIS) - http://www.journals.elsevier.com/the-journal-of-strategic-information-systems

[3] International Journal of Intelligent Systems Technologies and Applications(IJISTA) - http://www.inderscience.com/browse/index.php?journalID=35

[4] Thomas L. Legare (2002), "The Role of Organizational Factors in Realizing ERP Benefits", Information system management.

[5] Wilhelm Scheer, Frank Habermann (2000), "Making ERP a sucess", ACM,Vol 43,4.

[6] Elisabeth J. Umble, M.Michael Umble (2002):"Avoiding ERP implementation Failure", Industrial Management.

[7] Ahituv Niv, Neumann Seev, Zviran Moshe, "A system development methodology for ERP systems", Journal of Computer Information Systems, 2002.

[8] Grossman Theodre, Walsh James, "Avoiding the pitfalls of ERP system implementation", Information systems management, 2004.

IMAGE COMPRESSION BASED ON WAVELET PACKET TRANSFORM

[1]RIDDHI J. GOHEL , [2]PROF. KHUSHBU JOSHI,
[1]PROF. NABILA SHAIKH

[1]Department of Electronics and Communication ,L.J. Institute of Engineering and Technology, GTU, Gujarat, India
[2]Department of Electronics and Communication ,L.D.R.P Institute of Technology and Research, GTU, Gujarat, India

ABSRACT: *In order to meet the demand for high speed transmission of image ,efficient image storage, image compression is essential. The development and demand of multimedia product is growing increasingly fast contributing to insufficient bandwidth of network and storage of memory device. This justifies the use of different compression techniques to decrease the storage space. In this Paper novel method is proposed for image compression. Quantizing and encoding of wavelet packet coefficients is done. A fast algorithm is used in order to find best basis for wavelet packet tree that contains maximum information. Rate Distortion Technique is also used. Results Shows that with wavelet packet transform better PSNR and low bit rate is achieved.*

KEY WORDS: Image Compression, Wavelet Packet, Rate Distortion, Soft Thresolding

I. INTRODUCTION

With the tremendous use of internet and wireless devices there is the necessity of image compression. Image Compression is used for reducing the image size without degrading the quality of the Image for better transmission and reduction in storage space due to this reason various techniques are used for image compression , among this for achieving better quality of an image transform based compression is mostly used. Image compression is basically concerned with maintaining the number of bits which are required to transmit or store the digital images as the total number of bits required can be extremely large. Hence there is also an issue of storage capacity of media and bandwidth required for transmission [7].

Wavelet transform is regarded as a better choice than Fourier transform as with wavelet transform it's possible to localize in frequency and time at the same time. Wavelets are used to characterize a complex pattern as a series of simple patterns and coefficients that, when multiplied and summed, reproduce the original pattern[8]. The wavelet transform is generally used because wavelet represents large class of signals.However wavelets are not always the best option for compression hence wavelet packets are used widely. As in wavelet packet based image compression best basis for image compression is used.

II. WAVELET TRANSFORM

Wavelet is basically small wave which is defined over small interval. Wavelet Transforms Convert a signal into a series of wavelets and also it Provides a way for analyzing waveforms, bounded in both frequency and duration. This transform is able to better approximate real-world signals and it is Well-suited for approximating data with sharp discontinuities. Wavelets are functions defined over a finite interval. The basic idea of the wavelet transform is to represent an arbitrary function $f(x)$ as a linear combination of a set of such wavelets or basis functions.The purpose of wavelet transform is to change the data from time-space domain to time-frequency domain which makes better compression results.

The fundamental idea behind wavelets is to analyze the signal at different scales or resolutions, which is called multi resolution. Wavelet Transform is Multiresolution Analysis means it basically Analyze the signal at different frequencies with different resolutions. A family of wavelets can be constructed from a mother wavelet.wavelets automatically adapt to both the high-frequency and the low-frequency components of a signal by different sizes of windows[8]

A. WAVELET BASED DECOMPOSITION

Image is basically filtered by low pass Filter that includes smooth variation between gray level pixels while high pass filter includes high variation between gray level pixels. Image is decomposed into multilevel which include approximation details (LL subband), horizontal detail (HL subband), vertical (LH subband) and diagonal details (HH subband) [10]

Each subband provides different information about the image. The LL subband is a coarse approximation of the image. The LH subband removes high frequency information along the rows and emphasizes high frequency information along the columns. The result is an image in which vertical edges are emphasized. The HL subband

emphasizes horizontal edges, and the HH subband emphasizes diagonal edges. To compute the DWT of the image at the next scale the process is applied again to the LL subband [10].

The LL subband contains approximate image detail, HL subband contains horizontal details, LH subband contains vertical details and HH subband contains diagonal details.Size of original image is N X N then at level 1 decomposition the size of an image wii be of N/2 X N/2.Decomposition up to level 3 is as shown in figure (3).

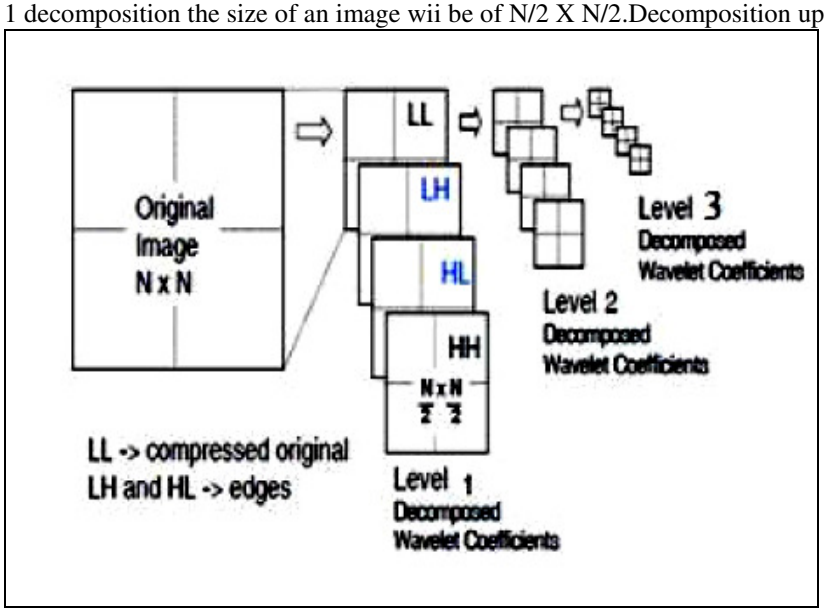

Figure 1. Decomposition structure of an image up to level 3[10]

III. WAVELET PACKET TRANSFORM

Wavelet Packet Bases were introduced as collection of orthogonal bases for discrete functions of R^N.This library contains the well known wavelet basis, STFT(Short time Fourier transform like basis, Walsh functions and smooth versions of Walsh transform called Wavelet Packets. They basically represent a generalization of multi resolution decompositions. The library of wavelet packet bases organizes itself into homogeneous tree which can be efficiently searched for best bases under some optimality criterion. The entire WP tree can be obtained by recursive decomposition of both high pass and low pass band using filters [7]. From the point of view of compression, as many small values as possible, are needed the standard wavelet transform may not produce the best result, since it is limited to wavelet bases that increase by a power of two with each step. It could be that another combination of bases produce a more desirable representation. Wavelet packet transform is applied to both low pass results (approximations) and high pass results (details).

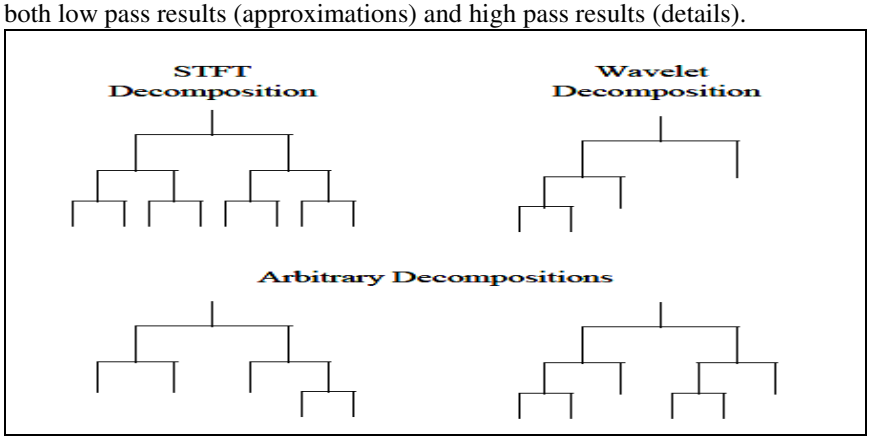

Figure 2. Wavelet packet decomposition[7]

The best basis algorithm finds a set of wavelet bases that provide the most desirable representation of the data relative to a particular cost function. A cost function may be chosen to fit a particular application. For example, in a compression algorithm the cost function might be the number of bits needed to represent the result.

IV. ALGORITHM

The Lagrangian Cost Function:

Lagrangian Cost Function is used to determine the optimal block size for an adaptive variable block size WPT. The cost is determined by a linear function of the mean distortion by a linear function of the mean distortion and the rate scaled by a value lambda. $J = D + \lambda R$

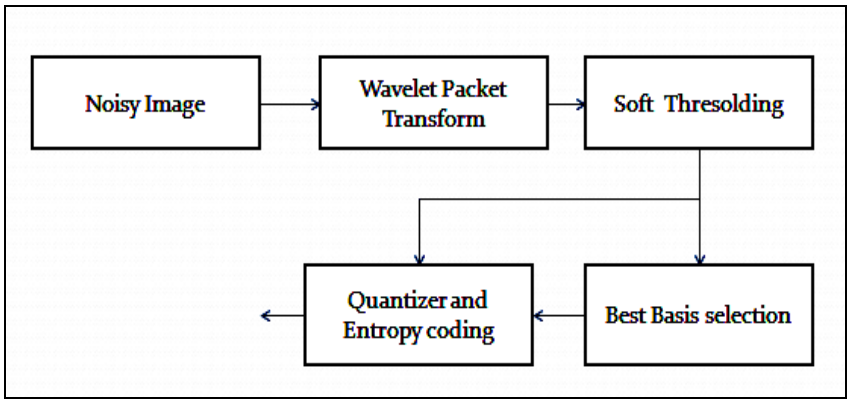

Figure 3. Block diagram of Algorithm for wavelet Packet based compression

In this algorithm first de noising is performed then initialization of λ is done. Now compute the cost function at each node. For each node if the lagrangian cost function of parent node is greater than the sum of lagrangian cost function of all four child node the splitting of that node is done otherwise merge that node. Hence in this way Best Basis that contains highest information is found.

ALGORITHM STEPS

1. Read noisy input image
2. The input image is then decomposed using Wavelet transform.
3. Image will be decomposed up to level 3 and the Wavelet coefficients are obtained.
4. Apply soft thresholding to wp coefficient to get denoised coefficient.
5. Quantize wp coeff. and get rates and distortion with rate-distortion.
6. Initialize Value of and find Lagrangian cost function
7. If $J_p(\lambda) < J_c(\lambda)$ then splitting of that node is done otherwise merge.
8. Process is continued for whole tree to get better PSNR value with Minimum Distorion and High Bit Rate

V. RESULT

Wavelet packet tree Best basis has been implemented in the paper. The proposed algorithm is tested on standard testing image of size 256×256.MATLAB software has been used for the simulation. The Results are as shown below.

Figure 4. Noisy Image

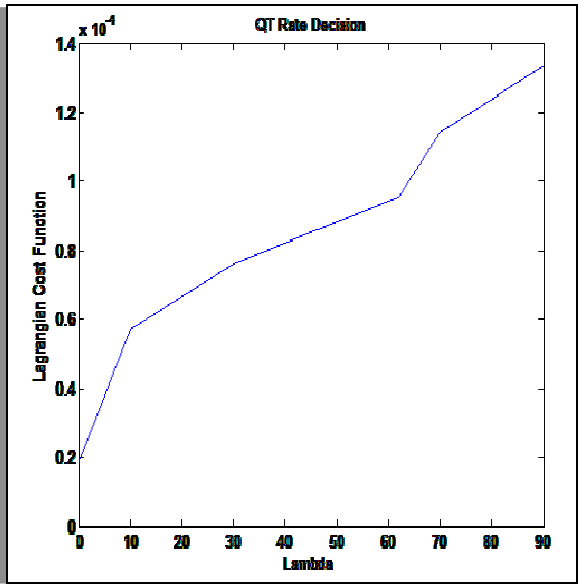

Figure 5. Rate performance

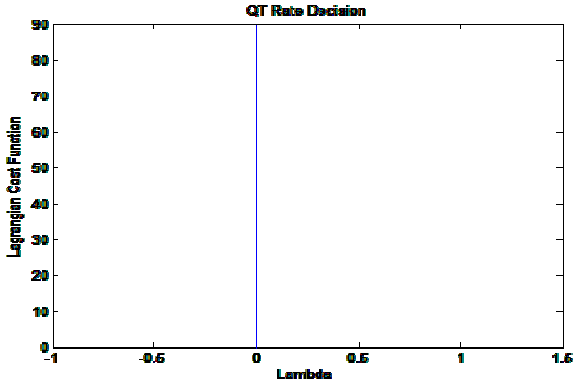

Figure 6. Lagrangian Cost Function

Step Size	PSNR	JT (cost)	RT (Rate)	DT (Distortion)
2	48.0001	7.6015	1.0752	0.0754
4	41.6782	7.9579	1.0577	0.5543
16	36.8116	6.6229	0.8113	0.9440

Table 1. Comparison of JT, RT, DT for different Block size

VI. CONCLUSION

By comparing the above Results, it can be observed that by using wavelet Packet Transform high PSNR and low bit rate is achieved. As step size increases, distortion is also increasing. wavelet Packet Transform is more suited for image compression compared to wavelet packet as in wavelet packet there is best basis which contains more information.

VI . REFERENCES

[1] Rammohan, T.; Sankaranarayanan, K., "An efficient image compression technique with scalar quantization through wavelet-based Contourlet Transform with Modified SPIHT encoding," Energy Efficient Technologies for Sustainability (ICEETS), 2013 International Conference on , vol., no., pp.156,162, 10-12 April 2013

[2] Effectiveness of Contourlet vs Wavelet Transform on Medical Image Compression: a Comparative Study , World Academy of Science, Engineering and Technology 25 2009

[3] "Fast and Efficient Medical Image Compression Using Contourlet Transform, "Open Journal of Computer Sciences Vol.1, No.1, 7-13 ©KINDI PUBLICATIONS May, 2013 ISSN: 2336-0089

[4] Hashemi-Berenjabad, S.; Mahloojifar, A.; Akhavan, A., "Threshold based lossy compression of medical ultrasound images using contourlet transform," Biomedical Engineering (ICBME), 2011
18th Iranian Conference of , vol., no., pp.191,194, 14-16 Dec. 2011

[5] Karimi, N.; Samavi, S.; Shirani, S.; Talebi, H.; Zaynolabedin, S. M A, "Contourlet based image compression using controlled modification of coefficients," Electrical and Computer Engineering, 2009. CCECE '09. Canadian Conference on , vol., no., pp.991,994, 3-6 May 2009

[6] Xi Zhi-hong; Xiao Yi-han, "An Image Compression Scheme Adopted for Contourlet Transform," Image and Signal Processing, 2009. CISP '09. 2nd International Congress on , vol., no., pp.1,4, 17-19 Oct. 2009

[7] Joshi Khushbu R., Mr. Kunal Acharya ,"Beat Wavelet Packet Bases in a Rate Distoration Sense",National Woman's Conference on Exploring Potentialities of woman in engineering (EPWIE)July 3-4,2009,CIT- Changa ,Gujarat,India

[8] V. V. Sunil Kumar,M. Indra Sena Reddy, "Image Compression Techniques by using Wavelet Transform "
Journal of Information Engineering and Applications ,ISSN 2224-5782 (print) ISSN 2225-0506 (online)
Vol 2, No.5, 2012

[9] Afshan Mulla ,Namrata Gunjika, Radhika Naik,
" Comparison of Different Image Compression Techniques",
International Journal of Computer Applications (0975 – 8887) Volume 70– No.28, May 2013

[10] Darshana Mistry, Asim Banerjee
"DISCRETE WAVELET TRANSFORM USING MATLAB" International Journal of Computer Engineering and Technology (IJCET), ISSN 0976-6367(Print), ISSN 0976 – 6375(Online) Volume 4, Issue 2, March – April (2013), © IAEME

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