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From the Desk of Editor – in - Chief

Dear Readers

Revision of curriculum every year is a routine exercise is any university. This exercise is critically viewed by the accreditation agencies as it is believed that quality education is heavily dependent on curriculum and its implementation. As per current practice and also as per the expectations of the regulating bodies, most important aspect of curriculum design is, to clearly lay down Learning Objectives, Learning Outcomes and Learning Specific Outcomes for each course and each programme. On one side this may bring clarity and transparency for the teacher and learner but on the other side this binds teacher and learner in a rigid frame and damages any initiatives, on the part of learner, to explore and learn by going beyond dictate of the syllabus. In objectives based system the student knows from day one what he/she has to read and reproduce in examination dictated by the learning objectives, syllabus and learning outcome. There is no motivation for learner or teacher to go beyond dictate of learning objectives and outcomes. The learning outcome is measured through examinations which are mostly theoretical and text book based. This could be one of the reasons that students these days do not want to come to classes. They feel, and rightly so, that they can get everything in the books and on the internet and crack old question papers to score very high marks in examination which is the accepted yard stick to measure learning outcome. This has further resulted in two very undesirable outcomes. Firstly, the students despite a high grade in the examination lack problem solving skill and skill to apply the knowledge at real work place, secondly, they lack hands on experience to utilize resources and most importantly they lack professional wisdom. Most of the employer's forums, in recent past, have put employability potential of most of the student pass outs in the country not beyond 25%. I wonder if the current education system is also to be squarely blamed for, poor state of research environment, innovation system and IPR generation which New Education Policy 2019 (NEP) – 2019 is trying to address. Another pertinent question, is the learning objective/outcome based examination system killing the creatively, individuality, thinking process and exploration attitude of our students; making education a totally mechanized process?

If you recall, in our ancient education system in Nalanda, Taxshila and Vikramshila era, when scholars came from all over the world to study in these top ranking Indian institutions, greater emphasis was placed on Learning Environment and Learning Experience rather than Learning Objectives and Learning Outcome. The system was then driven by the learning environment in order to, provide right direction to creativity, support thinking process, establish interactive knowledge delivery system to ignite mind of the learner, build resources to support experimentation, facilitate analysis to evolve and create opportunity to apply knowledge. The outcome of such environment was; professionals who could master the subject and who could develop competence to apply the knowledge and posses the right skill sets. This system

encouraged, promoted and supported five E's as part of the Learning Environment and Learning Experience. These five E's were **Enquiry, Explorations, Experimentation, Evolution** and **Engagement.** The learning environment was so motivating and supportive that scholar was highly encouraged to enquire and investigate any aspect of knowledge gained and was not restricted to the curriculum and learning objectives. The scholar was free to explore in any direction, experiment with various ideas, evolve new design, new process, modify existing ones, develop new knowledge, engage society with new knowledge/process/design and transfer them for betterment of society. These five E's necessarily brought in elements like meaningful discussion/interaction, skilling, hands on training, analysis, design cycles, expert's intervention, exchange of idea/experience, surveys, research, investigations, innovation and transfer of knowledge/technology and all of these became part of Learning Environment and Learning Experience. The most important prerequisite for such system will be good resources, especially good teachers which is most scares commodity.

If we look at the world's top ranking universities also, they place very high priority for building good learning environment and enriching learning experience continuously. It is off course a difficult task to exactly quantify learning environment in an institution, but it is certainly not impossible. It is high time that NEP-2019 examines this aspect and makes the education system, learning environment based and not examination based. At school level some initiatives have been taken in form of tinkering labs for students to enquire, explore and understand. In higher education the student is motivated by the marks or grades he/she scores in the examination. So, if we want to bring learning environment and learning experience as important components of our higher education system, then necessarily they have to be linked to assessment system with requisite weightage. As I said in our earlier issues, good and dedicated teachers are the first and most essential requirement, and NEP -2019 should examine this aspect on top priority with a viability angle. Teachers face serious problem of gap, between the class room and the real outside world, which is changing much faster than class room. In South Korea "Future Class Network Platform" has been created for school teachers on which 20,000 teachers interact regularly and their 'Class design' gets exchanged, upgraded and modified, which benefits each other immensely. Such interactive platform is very much needed in higher education, in addition to FDP's, for teachers to improve their quality and thus quality of education. There is therefore urgent need to create a vibrant platform for higher education teachers to interact so that they could share their views to develop good curriculum, in addition to building excellent learning environment.

While talking of grading and ranking, which come from excellence in teachers and environment; the good news is that Rabindranath Tagore University (RNTU) is now among top two hundred universities in India in NIRF ranking. In M.P. it is the only private university in the ranking list. Hearty congratulation to everyone at RNTU for achieving this distinction.

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In This Issue

Performance Analysis of Conventional Controller for Infrared Heater

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ABSTRACT
A modified technique is introduced to understand the design of Integer order PID controller. Due to simple tuning rules, conventional PID controller has the great success with the automatic tuning feature and tables that simplify their design. The Integer order PID controller show better robustness performance with the comparison of PID control's experimental to Heating control system (HIL). In Integer order control, design of simulink model of control system can be designed more straight forwardly with specification based on frequency response which can be change continuously.

Keywords: Integer order controller, Hardware in Loop, First Order Plus Time delay.

I INTRODUCTION

The PID controllers are the most commonly used controller in industrial application in industry. Now a day, various methods for tuning PID controllers, the Ziegler-Nichols (Z-N) tuning method is the most popular and is extensively used for the determination of the PID parameters. It is well known that the compensated systems with controllers tuned by Zeigler-Nichols method shows high percent overshoot with step input.

The enhancing of classical integer order calculus to non-integer order cases is new by means of new concept. The systematic studies made in the beginning by Liouville, Riemann, and Holmgren in middle of 19th century [1]. The common application of fractional order differentiation has been found in [2]. The concept of fractional order calculus shows

$$u(t) = K_p e(t) + K_i \int_0^t e(t)d(t) + K_d \frac{d}{dt}e(t)$$ (1)

And Laplace transform of equation (1) is given as

$$U(s) = K_p\left(1 + \frac{1}{sT_i} + sT_d\right)$$ (2)

Where, $K_i = \dfrac{K_p}{T_i}$ and $K_d = K_p T_d$ (3)

(a) IOPID Controller
The most common form of a fractional order PID controller is PIλDμ Controller (Podlubny, 1999a).

$$\frac{U(s)}{E(s)} = C_{FOPID}(s) = K_p + \frac{K_i}{s} + K_d s^\mu ,(\lambda,\mu > 0)$$ (4)

the attention of researchers in applied sciences as well as \4+in engineering and examples may be found in [3] and [4]. Some applications such as automatic control are discussed in [5].

Fractional order control with integer order specification has adequate modeling and performs robust control performance with respect to classical PID control. The benefits of fractional order control in modeling and control design motivate interest in various applications of control application [6].

II PID CONTROLLER

The flexibility and robustness of the PID controller makes it widely applied in many applications. The generalized form of PID controller with control law is

having an integrator of order λ and a differentiator of order μ, where λ and μ can be any real number.

Fig.1(a). Block diagram of IO-PID Controller.
Fig.1(b). X-Y representation of FOPID parameters variation.

Fig. (1) is a block diagram configuration of IOPID clearly, selecting $\lambda=1$ and $\mu=1$, an integer order PID Controller can be recovered. The selections of $\lambda=1$.

$\mu=0$ and $\lambda=0$, $\mu=1$ respectively Corresponds conventional PI and PD Controllers.

III PROCESS MODELING

In this work, for the design of controllers, the Heating system is represented as FOPTD transfer function model. The recorded data is plotted beside with time to get the process reaction curve. From the obtained process reaction curve, the First Order (FO) model parameters are process gain K, process time constant T of the Ceramic IR heater temperature system are determined.
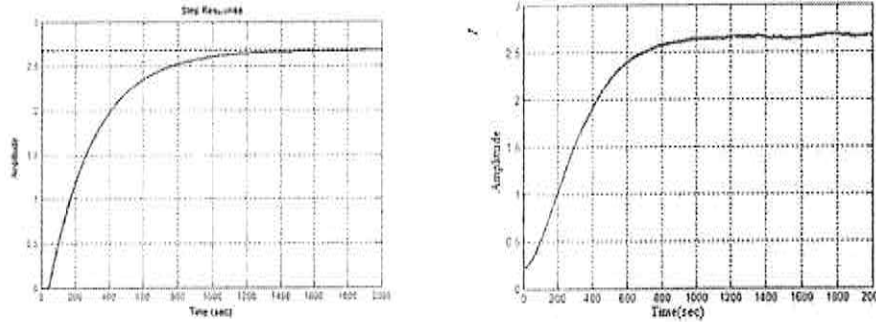
Fig. 2 Transfer function approximation using reaction curve method.

The FOPTD transfer function model for the unstable heating system is denoted as:

$$G_{IR}(s) = \frac{[2.6770]e^{-46s}}{262s+1} \qquad (5)$$

IV DESIGN OF PID CONTROLLER

ZN-PID tuning rules is the classical "closed loop" tuning rule which is normally considered as the coventional tuning rule. Ziegler and Nichols recommended the following ZN-PID tunings formulae are:

Table 1
Tuning rule for ZN-PID Controller

Controller	Gain (K_p)	Integral Gain(K_i)	Derivative Gain(K_d)
PID	0.6 Kcr	2/Pcr	Pcr/8

By putting up the value of the transfer function of ceramic IR heater having K =2.6770 rad/sec, L=46 sec and T=262 sec in Table 4.3 for Zeigler Nichols

$$C_{znc}(s) = 2.15 + \frac{0.027389}{s} + 42.193s \qquad (6)$$

closed loop then we calculate the value of K_p, K_i and K_d as 2.15, 0.027389 and 42.193, so the value of controller as:

V INTEGER ORDER BASED PID CONTROLLER

(a) **Design Specification for IOPID Controller**

$$\left|G(j\omega_{cp})\right| = \left|C(j\omega_{cp})P(j\omega_{cp})\right|_{dB} = 0 \ dB$$

$$Arg[G(j\omega_{cp})] = Arg[C(j\omega_{cp})P(j\omega_{cp})] = -\pi + \phi_{pm} \qquad (8)$$

Where.

$C(j\omega_{cp})$ is the PID Controller in frequency domain with crossover frequency and $P(j\omega_{cp})$ is the IR plant (FOPID) in frequency domain with crossover frequency.

(i) **Phase Margin & Gain Crossover frequency**

Phase and gain margin have always play important role for robustness. The phase margin is co-related to the damping of the system:

$$(7)$$

(ii) Robustness to gain variation in the plant gain

The gain variation of the plant demands that the phase directives with respect to the frequency is

$$\left(\frac{d\left(Arg(G(j\omega))\right)}{d\omega}\right)_{\omega=\omega_c} = 0 \tag{9}$$

According to the mathematical description of the IR heater. a transfer function $G_{IR}(s)$ represents FOPTD as:

$$G_{IR}(s) = \frac{K}{sT+1} e^{-Ls}$$

According to the PID Controller transfer function. the frequency response for IOPID as:

$$C(j\omega) = K_p + \frac{K_i}{j\omega} + j\omega K_d$$

The gain and phase of $C(j\omega)$ are as follow:

$$\left|C(j\omega)\right| = \sqrt{K_p^2 + \left(K_d\omega - \left(\frac{K_i}{\omega}\right)\right)^2}$$

$$Arg[C(j\omega)] = \tan^{-1}\left(\frac{\left(K_d\omega^2 - K_i\right)}{\omega K_p}\right)$$

According to design specification (1) the magnitude and is given as

$$\left|G(jw)\right| = \frac{K\sqrt{K_p^2 + \left(K_d\omega - \frac{K_i}{\omega}\right)^2}}{\sqrt{1+\omega^2 T^2}}$$

and

$$Arg\left[G(j\omega_{cp})\right] = \tan^{-1}\left(\frac{K_d\omega_{cp}^2 - K_i}{\omega_{cp}K_p}\right) - \tan^{-1}\left(\omega_{cp}T\right) - L\omega_{cp} = -\pi + \phi_{pm}$$

According to design specification given by equation (2). value of K_p. K_i. and K_d derive as:

$$K_p = \frac{1}{K}\sqrt{\frac{B_1}{1+A_1^2}} \tag{10}$$

Where. $B_1 = 1+\omega_{cp}^2 T^2$ and $\frac{K_d\omega_{cp}^2 - K_i}{K_p\omega_{cp}} = A_1$. and

$$K_i = \frac{1}{2K}\sqrt{\frac{1+A_1^2}{B_1}}\left(T\omega_{cp}^2 + LB_1\omega_{cp}^2\right) - A_1\omega_{cp}\sqrt{\frac{B_1}{1+A_1^2}} \tag{11}$$

$$K_d = \frac{1}{2K}\left[\sqrt{\frac{1+A_1^2}{B_1}}\left(T+LB_1\right) + A_1\omega_{cp}^{-1}\sqrt{\frac{B_1}{1+A_1^2}}\right] \tag{12}$$

The phase margin and gain margin of the process plant as per Bode and Nyquist plot are shown in Fig. 5. From Fig. 6, we found the value of ω_{cg} and ϕ_m as 0.008 rad/sec and 80° respectively. By putting up the value of the transfer function of ceramic IR heater

having K=2.6770. L=46 and T= 262 in equation (10). (11) and (12) and we calculate the K_p, K_i and K_d as 0.9768, 0.0063,25.6246.

So the value of controller as:

$$C(s) = 0.9768 + \frac{0.0063}{s} + 25.6246s \tag{13}$$

zero i.e. the phase bode plot is flat at a certain gain crossover frequency.
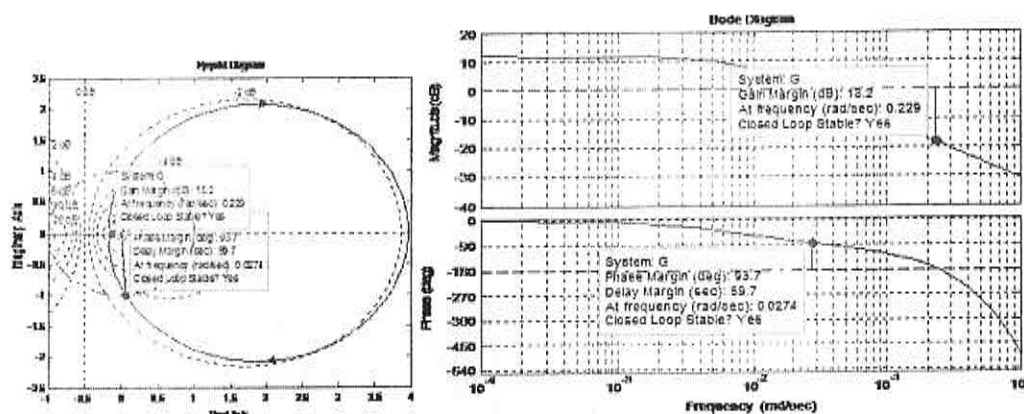
Fig. 1Nyquist plot and Bode Plot of IOPID Controller for Specification

By using MATLAB simulation of ZN closed loop and IOPID designed controller the output as shown in Fig. 4(a) and 4(b)
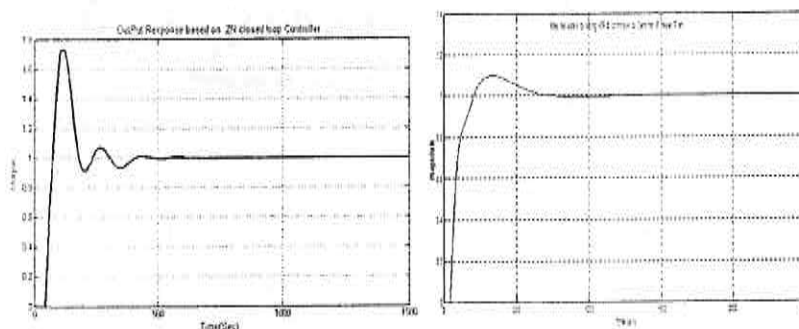
Fig.4(a). Simulation Output response of ZN-Closed Loop Controller.
Fig.4(b).Simulation Output response of IOPID Controller.

Table 2
Performance Table of ZN Closed loop and IOPID Controller.

Performance	Rise Time (Tr)	Peak Overshoot(Mp)	Peak Time(Tp)	Settling Time(Ts)	ISE	IAE
ZNC-PID	25.39	74.70	116.93	389.36	80.55	116.4
IOPID	112.41	9.8	341.91	613.86	66.92	114.8

VI EXPERIMENTAL STUDIES

PID controller works well for the system having fixed parameters. If there is presence of large parameter variations or major external disturbances, the PID controllers shows fast response with significant overshoot or Smooth but slow response.
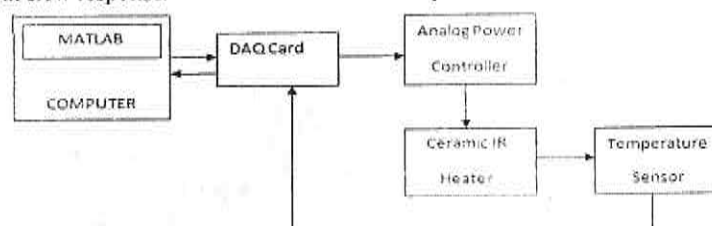
Fig. 5shows the block diagram of the open loop response test. The hardware component for the experiment consist of the computer, a power module controller, to modify the power input to the ceramic IR heater (oven) and a temperature sensor (temperature transducer) to measure the output temperature of IR heater.

Fig.5. Block diagram of the open loop response test.

Data acquisition systems incorporate input/output signals, sensors. actuators, signal conditioning circuit, data acquisition interfacing devices, and application software

(a) Analog Power Controller:
The power controller needs to be able to control and switch large loads, typically currents of up to 10 Ampere and load rated for 400W. Single phase power

regulator is used for heating control of inductive or resistive loads made by Libratherm LTC-16 as shown in Figure. 6. The output voltage can be varied proportionally to the input signal, The back to back connected SCR can control the load of 10A (2kW), 20A (4kW) and 40A 8lkW) at 230VAC which is build in it. The phase angle firing control technique ensures gradual and smooth voltage control across the load.

LTC-16 -20A-4KW   **LTC-16 -40A-8KW**
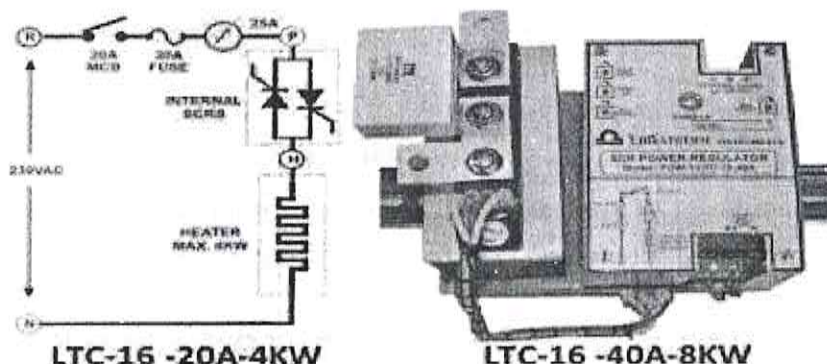
Fig.6. Circuit diagram of Analog Power Controller (Libratherm,LTC-16)

The laboratory setup and wiring diagram as shown in Fig. 7 (a) consists of Ceramic IR heater, DAQ card, Analog power controller and temperature sensor (K-type thermocouple). The power delivered to the IR heater is controlled using an analog signal using analog power controller. DAQ card is used for the analog signal

generation, where output is 0-5 V DC and it provides to analog power controller which get in firm of fixing angle to back to back SCR of analog power controller to maintain the desired analog power or voltage to IR Heater. The actual laboratory photograph of the experimental set-up is shown in Fig. 7(b).
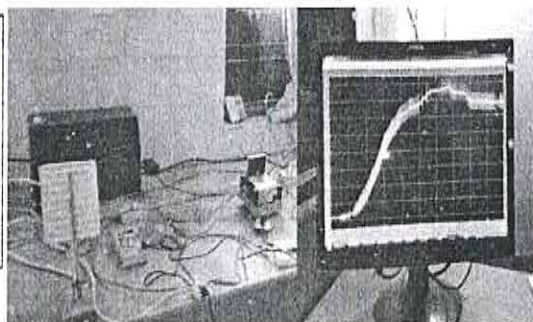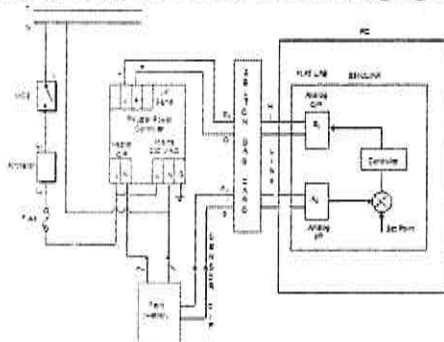
Fig.7(a). Wiring diagram of HIL Hardware system.
Fig.7(b).Laboratory photograph of the experimental setup.
Real time performance regarding Zeigler Nichols closed loop method and Controller output as shown in Fig. 8.
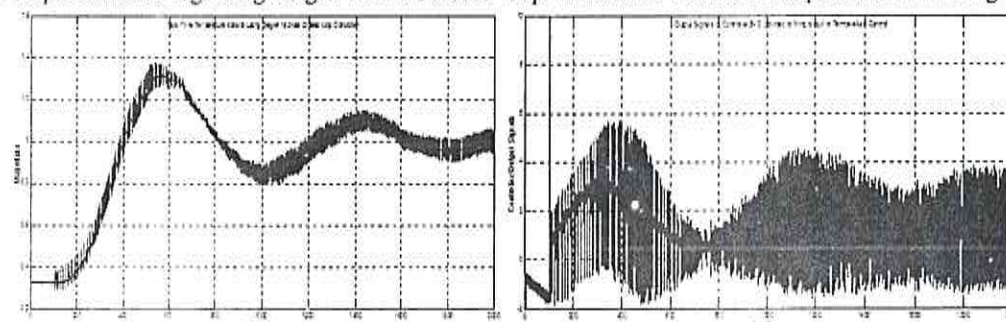
Fig.8.Real Time Temperature Control Using Zeigler Nichols Closed Loop Controller and Controller Output Signal.

Real time performance regarding Integer Order PID method and Controller output as shown in Fig. 9.
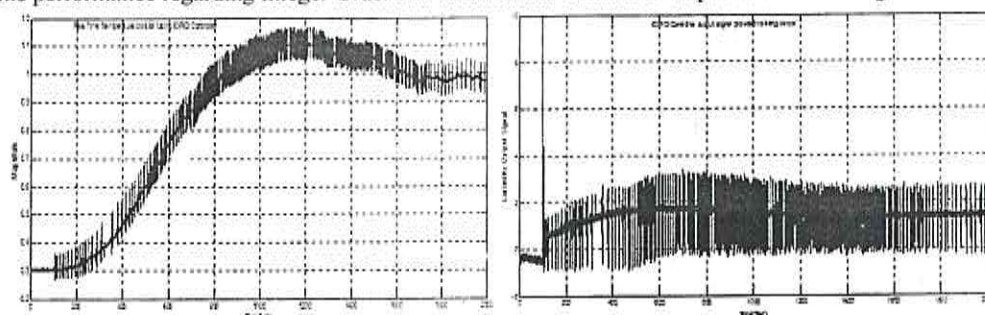
Fig.9. Real Time Temperature Control Using IOPID Controller and Controller Output Signals.

Table 3
Performance table of Experimental Setup of temperature System

Performance Parameter	Rise time (Sec)	Settling Time (Sec)	Peak Time (Sec)	Peak Overshoot(%)
ZNC-PID	226.16	1999	536.3	38.15
IOPID	484.47	1989	1129	20.07

VII CONCLUSION

The work has been undertaken with a vision to analyze an impact of fractional calculus in the development of classical control theory through challenging infrared heating control problem. The performance and robustness characteristics of IOPID controller was analyzed by conducting simulation and experimental studies of HIL System. The experimental as well as simulation results shows that the IOPID controllers took corrective action even in the presence of nonlinearity and enhanced the performance in all aspects when compared to existing classical controllers.

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Time Division Multiplexing Algorithm for Routing In Time Critical Scenarios

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ABSTRACT

Data density has a linear relation with fixed size of data and non-linear relation with variable size of data. It is challenging to manage variable size data with variable arrival rate. Given a node capacity where arrival rate is not in control then this problem becomes further challenging and requires an algorithmic solution. This research undertakes variable size data and variable rate of arrival at a node capacity and proposes an arbitration algorithm with management of node dispatch capacity algorithm to solve this problem, which will be tested against Knapsack Problem. This work has numerous industrial and social applications. Traffic management for emergency vehicle is one such challenge.

Keywords - Deadlock, Density Management & Processing, Multiplexing, Intelligent Transport System.

I INTRODUCTION

In recent past, data volume and their formats have undergone unpredictable development to support technically advanced applications. Apart from other domain, it has also affected Intelligent Transportation System (ITS) significantly, which has a major role in smart urban planning. Because of random and dynamic behavior of transport system, a flexible and comprehensive architecture is required to control the real-time traffic [1]. Modern communication and information technology is responsible for hazard free transmission and secure handling of these data through different nodes with the help of channels connecting them.

The properties of the connecting links which carry the data, determine the density level at an intermediately node. This density needs efficient management otherwise deadlock may arise bringing down the throughput of the system. Also, some data sets are important for the system under consideration, which require immediate processing. So, the capacity of available channel should be filled with data having higher priorities for optimum utilization.

In this paper, a new strategy is proposed for assigning the data sets with unknown arrival pattern, to an outgoing link of fixed capacity for a certain time slots, which is dynamically calculated. Here, The concept of Knapsack Problem is used by considering the bandwidth of the connecting links as weights or capacity and the data sets to be carried, as items. The idea is to analyze the links as sacks which should be assigned those items for further transmission that provide maximum benefit.

The research contribution of the paper can be summarized as:

(i) In order to optimize the data flow in a system, knapsack approach is proposed to reduce the waiting time of emergency packets i.e the time critical scenario are serviced first.

(ii) The overall density is distributed evenly over the network to increase its throughput and to avoid the condition of deadlock.

One of the applications of this work is in the field of intelligent transport system (ITS) but is applicable to various domains as well (eg. Wireless Sensor Network). An overview of related work in the field of routing and managing related data is given in the following section.

II LITERATURE SURVEY

The reason to approach Knapsack Problem to facilitate routing methodology is that it is very popular since centuries and several techniques are available to solve this type of problem (eg. dynamic programming, branch and bound). Silvano et al. has given an overview of basic technologies and recent advancement proposed for them along with the comparative study of their efficiency for randomly generated data instances [1].

The routing algorithms are expected to manage and control the traffic congestion or density by evenly distributing the data. The traffic network may be carrying data in the form of packets, voice or vehicles. Soh et al. has modeled the single intersection point using M/M/1 queue model. Their purpose is to minimize the queue length which automatically minimizes the delay time and increases the network throughput [2].

It is well observed that success of a routing algorithm implemented on a system depends on the accuracy of traffic congestion estimates. There are several works proposed for detection and management of traffic congestion in different fields using different technologies, algorithms and set-ups. In vehicular traffic network, one possible way is to use RFID and GSM equipped probe vehicle. which calculates vehicular speed and the average waiting time of vehicles over a stretch of road [3]. Roy et al. have used manageable, reliable and cost-effective

technology RFID to detect traffic density and accordingly traffic signals are managed using GSM [4]. Also, image processing techniques [5] and video analysis of chaotic unlaned traffic [6] can be used to estimate traffic congestion. With the advancement in smart-phones, app based activities are used to identify certain signaling patterns in cellular core network for different roads. These signals may be processed to extract congestion related information [7][8][9].

Some proposed works provide route guidance for specific elementary entities, which are critical to the application and are delay-sensitive. For e.g. an ambulance trip creates time- critical scenarios and it needs to reach the destination in minimum possible time. Rashmi et al. have used RFID to instruct the traffic signals of a lane for making a clear passage for the ambulance, when it is approaching the signal [10]. To handle such time critical situation, classification of available vehicle cluster and identifying some particular vehicle is an important function, the ITS is expected to perform. Ozkurt et al. Have presented a Neural Network model for classifying the vehicles on a stretch of road using video frames and estimating the density [11]. Recently Rajeshwari et al. Have presented a system to identify specific vehicles like Ambulance and stolen vehicle [12].

Success of any routing algorithms requires no presence of blocked points, which may cause zero-movement in the system [13][14]. Sun et al. has focused on utilizing the existing infrastructure of vehicular wireless network for providing route-guidance and avoid deadlock type of situations. They have formulated two algorithms: one guides in centralized manner while others approach is distributed [15].

This paper proposes a methodology to ensure delivery of time-critical entities in minimum possible time and to distribute the density evenly on the basis of priority of moving elements for smooth flow of traffic. The model proposed in this article can be applied to different network infrastructures deployed to serve different purposes.

III PROPOSED MODEL

The routing process forwards the network traffic from their source toward their ultimate destination through intermediate nodes by selecting best paths in the network. Here is presented a typical scenario for an intermediate node where incoming and outgoing links are available for four different directions [Figure 1].
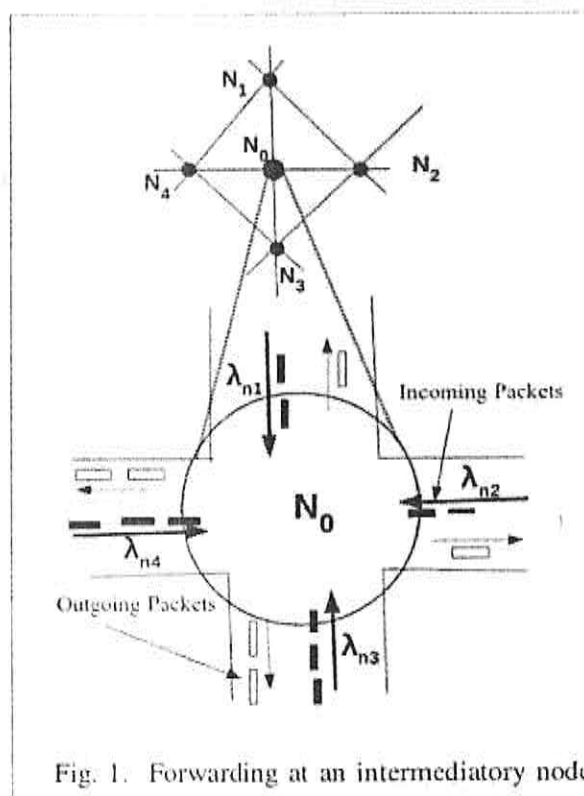
Fig. 1. Forwarding at an intermediatory node

The packets arrival rate for each incoming flow is different and independent of each other, λ_{n1}, λ_{n2}, λ_{n3} and λ_{n4}. This paper considers the bandwidth of all the outgoing links, (N0, Ni) as sack, where $1 \le i \le 4$ are assigned to the higher prioritize data sets by sub-dividing the transmission time.

The time slot for different priority-wise categories of data should be determined by their priority. The purpose of the model is to satisfy the following objective:

where, $\lambda n0 = \lambda n1 + \lambda n2 + \lambda n3 + \lambda n4$, and Prob(n0. ni) is Probability of assigning a packet to (n0, ni). Estimation of the Probi is explained further in next subsection.

(a) System Description

Let the system is defined as $S = \{s, e, X, Y, DD, NDD, fp, fc, fmc, fs, Memsh, ... | \varphi \}$ for programmer's perspective. Above terms will be described shortly in the flow of explanation.

Let. s be the known distinct start state which contributes in the initialization of functions and hence the constructor of the class which will be derived in the UML of system S. Let e be the known distinct end state going into which may result into desired outcomes. Let. $Y \in S$ be the set of outcomes of S and $X \in S$ be the input set of S. The function fmc is the implementation of the proposed algorithm resulting into outcome Y. Let, DD the deterministic behavior of function and data which helps in identifying the load/store functions or assignment functions which contribute in the space complexity resulting into tables and NDD be the non-deterministic computing functions of the system S which is to be solved by computing functions which contribute in time complexity of the algorithm.

Let $N \in X$ be set of the nodes in the system S such that:
$N = \{ni \mid i = 0, 1, 2, ... z\}$ working as source/destination/routing points and Tz be the time slots divided for any (ni, nj) connections, which holds following relation with capacity C and density δ of the considered path (i. j):

(i) The first slot of time-subdivision should be used to fill the best (N0, Ni) for a packet with urgent

$Tz(i.j) \propto \delta(i.j)/ C(i.j)$ (2)

priority (conventionally tagged with 0) to ensure their delivery to the destination in shortest possible time.

(ii) Remaining slots should fill the available sacks as per the flow balance equation to distribute the density evenly in the network for better utilization:

$$\lambda(N0, Ni) = \lambda n0 . Prob(n0, ni)$$

(1)

Let the elementary entities are represented with set $P \in X$, where $P = \{pi \mid i = 0, 1, 2 .... \infty\}$. The number of p arrived in the system can not be controlled. fp assigns deterministically defined priority levels Prj to flowing packets Pi such that

$fp : \forall P\, Pi \in P. \exists Pr\, Prj$, where $0 \leq j \leq 8$.
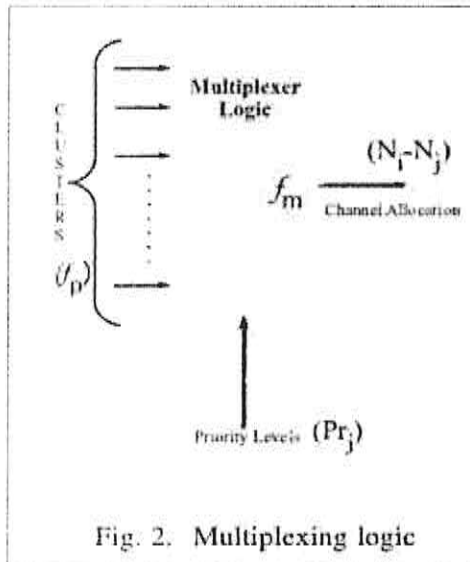
Fig. 2. Multiplexing logic

The output of fp is list of grouped packets having j number of elements. Let nr is a routing node having k links, then (r, t) link, where $0 \leq t \leq k$, fp(r,t) can be defined as:

$L[j] \leftarrow fp(r,t)\ (P(r,t)\ [n],\ Pr[j])$ (3)

where n is the number of packets in (r, t) links. Each clusters of packets obtained as elements of Lj

should be mapped to the next node respectively on the basis of priority in every slot. This task is done by a multiplexer fm [Figure 2], which selects best candidate from the list returned by fp.

The output of fm for a given Pi is serialized by fmc to generate $Yi \in Y$ such that Y CX Th efficiency of N. The efficiency of fmc depends on different parameters of $X \in S$.

a. Best Case: $[L0(i,j) / (ni.nj)] \leq$ T0(i,j) $\sqcap$ CC(i,j), for a given (ni. nj). $_{t=0\,t}$

In this case, the time critical cluster L0 will cross the nr without any delay in first sub-division of time band T0. In the remaining slots, the clusters L1 − Lj having priority (1 − j) in one to one

correspondence are distributed using flow balance equation as P given in equation (1). This depends on the inflow rate (Σ^k λ) and the probability
Probi $\in$ pi to be assigned to next link (nj. nk).
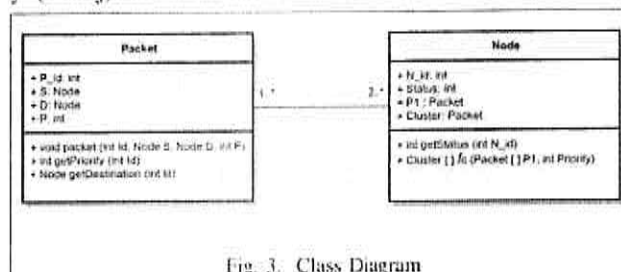
Fig. 3. Class Diagram

which is a part of the best route for pi. The probability, Probi has linear relation with Priority Pri of pi .

For any two clusters Lk and L'k having priority pr and pr' respectively, where pr > pr', fmc assigns Lk to (nr, nt) and L'k to (nr , n't) such that (nr, nt) < (nr, n't), both nt and n't have reachability to specified destination.

b. Worst Case: $[L0(i,j) / (ni.nj)] \leq$ T0(i,j) * CC(i,j), for a given (ni. nj).

In this case, higher prioritize clusters will have to wait for next T0 slots at node nr which will be available after k clock cycles, where k is the number of links connected from r. This results in worst case for delay sensitive entities.

The static view of the proposed system is represented as a class diagram given in figure 3. It displays two classes named as Packet and Node and associated data member and their behavior.

(b)Experimental Setup

In order to test the performance of the proposed routing method, vehicular traffic system is considered. Here the traveling entities act as packets having poison arrival rate and traffic signals or junction symbolizes the intermediately nodes ni. The link capacity depends on the connecting paths between two junctions. The priority level depends on the criticality of the class of vehicles. The algorithm alters the signaling pattern of a traffic signal by sub-diving the available time slot to fill the outgoing links with high prioritized vehicles.

To construct the large road network and generate vehicle traffic, a realistic open source traffic generator, Simulation of Urban Mobile (SUMO) [17] is used. In the simulation, random routing request is generated. which are measure input to the proposed algorithm. For topologies of roads. the road network is constructed by extracting the data from open Street

Map [18] and converting it to sumo compatible map using Net convert [19].

IV CONCLUSION

Various applications have some data sets that are not delay- tolerant, so their delivery to the specified destination is a time critical event. This paper proposes a routing methodology based on Knapsack problem algorithm applicable in such scenarios of various domains such as traffic algorithm, wireless network, etc. Knapsack Problem is successfully tested based on the proposed algorithm.

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Congestion Management by Optimal Positioning of FACTS Devices

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ABSTRACT

The proposed work in this paper deals with the congestion problem in deregulated power system. Due to congestion in a deregulated power system, transmission system is unable to accommodate or transfer the desired power transaction. This problem can be overcome by the use of Flexible AC transmission systems (FACTSs) devices. FACTSs devices reduce the flows of power in heavily loaded lines as a result an increased in load ability of the system. Moreover, it will improve the stability of the system, lowering down the system loss and cost of production. The optimal location for installing thyristor controlled series compensators (TCSCs) based FACTS devices is carried out by using sensitivity based analysis method. In this paper TCSC optimal location is determined by using real power performance index, reduction of total system VAR power losses and based on reduction of total system Active power losses. MATLAB based programming platform is used for validation of proposed work.

Keywords—Congestion Management (CM), Flexible AC transmission systems (FACTSs), Thyristor Controlled Series Compensation (TCSC), sensitivity analysis.

I INTRODUCTION

All over the world, the electricity supplying industries are moving towards the competitive market for better and optimal electricity pricing and focusing on customer satisfaction. An independent system operator (ISO) ensures a healthy competitive environment. ISO sets the rules and protocols for open and non-discriminatory access of transmission services. Due to fair and open competitive market, maximum utilization of available transmission system by the consumers and producers of electricity may leads to violations of power system constraints limits such as power transaction limit on transmission line, power quality, power system security and stability at the minimum cost. A situation when the transmission system is unable to accommodate or transfer the desired power transaction because of power transfer limit of transmission line is called congestion [1]. Congestion occurs when all the transactions of power cannot be allowed due to overloading of line. When power flows through transmissions lines and transformers exceeds the power transfer capability of transmission lines, congestion takes place. Due to which, line outages and blackout takes place. It also weakens power system security as well as reliability. Consequently electricity prices increased in electricity markets [2].

The congestion management (CM) is handled by ISO. The market based approaches are used by ISO to alleviate the congestion. This approaches can be categorized on the basis of price area zones, generation rescheduling, financial transmission rights and locational marginal prices. Congestion does occur in both electrically bundled and unbundled systems but the management is simpler in bundled system. Hence, flexible AC transmission systems (FACTS) are used for in better utilization of available power system capacities. It is a cost free method for congestion management [3].

Reactive power is one of the key factor for controlling congestion in transmission lines. FACTS devices are effective means of controlling reactive power flow in transmission lines by changing the reactance across the transmission line by using fast acting power electronic switches along with inductors and capacitors [4-6].

Reactive power and voltage control plays an important role in supporting the real power transfer across a large-scale transmission system [7]. In an open access system, the importance of this support is even greater as the power transfer is increased and the associated voltages then become a bottleneck in preventing additional power transfer. In simple terms, the most important aim of reactive power dispatch is to determine the sufficient amount and correct location of reactive support in order to maintain a secure voltage profile [8]. The local nature of the reactive power also implies that the generator may provide the reactive power support for a number of transactions even if that particular generator is not involved in the real power dispatch. The allocated contributions of the individual generator's reactive power output to a particular transaction can be negative or positive [9]. Reactive support is generally provided by the switching of shunt reactors, the positioning of transformer taps and the reactive power outputs of generators.

In recent years, a considerable amount of literatures have been published on congestion management issues in electricity market. An approach using the minimum total modification to the desired transactions for relieving congestion was presented in [10]. A variant of this least modifications approach [11] used a weighting scheme with the weights being the surcharges paid by the transactions for transmission usage in the congestion relieved network. Marginal cost signals were used in [12] for generators to manage congestion. In [13], transmission congestion distribution factors (TCDFs) based on AC power flow Jacobian sensitivity has been proposed. A willingness-to-pay premium [14] has been suggested to avoid curtailment of the transactions. Hogan proposed the contract path and nodal pricing

approach [15] using spot pricing theory for the pool type market.

The optimal location of TCSC for congestion management by reduction of total system reactive power loss and real power performance index is proposed in [16]. In [17], cross border coordinated redispatching by regional transmission system operators is used for multi-area congestion management. An efficient and simple model in [18] is a used for congestion management by controlling their parameters optimally. Congestion management by reducing total transfer capability (TTC) and transaction curtailment is proposed by Huang and Yan [19]. In [20], A. Oudalove proposed the load shedding combined with multiple FACTS devices approach for the coordinated emergency control system for overload limitations in a transmission system. The optimal location of unified power flow controller (UPFC) based on sensitivity-based approach is proposed in [21] for congestion management.

In the past three decades various optimization techniques have been proposed to solve OPF problems. The gradient method [22], Newton method [23], successive sparse quadratic programming (QP) method [24] are few common methods for it. In 1984 [25], Karmarkar proposed interior point method for linear programming. An interior point method is used to solve power system optimization problems for both linear and convex quadratic programming in economic dispatch and reactive power planning [26].

This paper deals with the congestion management by using TCSC based FACTS devices and finding the

$$P_{ij} = V_i^2 G_{ij} - V_i V_j \left[G_{ij} \cos \delta_{ij} + B_i(1) \right.$$

$$Q_{ij} = -V_i^2 (B_{ij} + B_{sh}) - V_i V_j \left[G_{ij} \sin \delta_{ij} - B_{ij} \cos \delta \right. (2)$$

Where,

optimal location for placing it. Reduction of total system real power loss approach is used an optimization method based on interior point method for minimizing the cost of TCSC based FACTS device and generation rescheduling. The proposed method has been demonstrated on IEEE 5 bus system and Modified IEEE-30 bus system using MATLAB based platform.

II CONGESTION MANAGEMENT

The formulation of congestion management (CM) problem is done by firstly finding the optimal location of TCSC based FACTs device for congestion alleviation process and then finding the minimum rescheduling cost to alleviate congestion using one of the available optimal power flow method. The CM problem formulation based on Sensitivity Analysis and Optimization Problem. Sensitivity Analysis is used for finding the optimal location for placement of TCSC. Interior Point Method is used for solving the optimization problem.

(a) **Sensitivity Analysis** - TCSC modelling is used for finding sensitivity coefficients in Sensitivity Analysis for optimal placement of TCSC.

(b) **Modelling of TCSC** - Fig. 1 shows a simple transmission line represented by its lumped π equivalent parameters connected between bus-i and bus-j. Let complex voltages at bus-i and bus-j are Vi(δi) and Vj(δj), respectively. The real and reactive power flow from bus-i to bus-j can be written as

Fig. 1. Model of Transmission line

Similarly, the real and reactive power flow from bus-j to bus-i is

$$P_{ji} = V_j^2 G_{ij} - V_i V_j \left[G_{ij} \cos \delta_{ij} - B_{ij} \right. (3)$$

$$Q_{ji} = -V_j^2 \left(B_{ij} + B_{sh} \right) + V_i V_j \left[G_{ij} \sin \delta_{ij} + B_{ij} \cos \delta \right. (4)$$

Where,

$$\zeta \qquad\qquad (5)$$

$$B_{ij} = \qquad\qquad (6)$$

The model of transmission line with a TCSC connected between bus-i and bus-j is shown in Fig. 2. During the steady state the TCSC can be considered as a static

reactance $-jx_c$. The real and reactive power flow from bus-i to bus-j and from bus-j to bus-i of a line having series impedance and a series reactance are
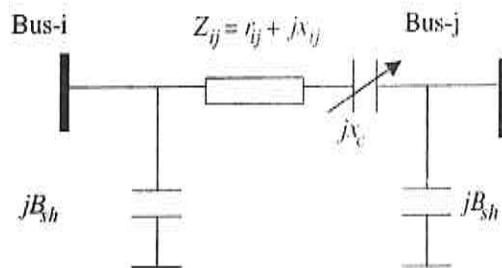
Fig. 2. Model of Transmission line with TCSC

$$P_{ij}^c = V_i^2 G_{ij}' - V_i V_j \left[G_{ij}' \cos \delta_{ij} + B_i' \right] \quad (7)$$

$$Q_{ij}^c = -V_i^2 (B_{ij}' + B_{sh}) - V_i V_j \left[G_{ij}' \sin \delta_{ij} - B_{ij}' \cos \delta \right] (8)$$

$$P_{ji}^c = V_j^2 G_{ij}' - V_i V_j \left[G_{ij}' \cos \delta_{ij} - B_{ij}' \right] \quad (9)$$

$$Q_{ij}^c = -V_j^2 (B_{ij}' + B_{sh}) + V_i V_j \left[G_{ij}' \sin \delta_{ij} + B_{ij}' \cos \delta \right] (10)$$

The active and reactive power loss in the line having TCSC can be written as

$$P_L = P_{ij} + P_{ji} = G_{ij}'(V_i^2 + V_j^2) - 2V_i V_j G_{ij}' \, co \quad (11)$$

$$Q_L = Q_{ij} + Q_{ji} = -(V_i^2 + V_j^2)(B_{ij}' + B_{sh}) +$$
$$2V_i V_j B_{ij}' \cos \delta_{ij}$$
$$(12)$$

Where,

$$G_{ij}' = r_{ij} / (r_{ij}^2) \quad (13)$$

$$B_{ij}' = -(x_{ij} - x_c)/(r_{ij}^2 + (x \quad (14)$$

(c) Optimal Location of TCSC - The optimal location of TCSC has been finding out by using the Sensitivity Analysis.

(i) Reduction of total system VAR power loss: Sensitivity factor a_{ij} is obtained by differentiating the reactive power loss (QL) with respect to net line series reactance between buses i and j as control parameter of TCSC. Hence, Loss sensitivity based on sensitivity of the total system reactive power loss is given as [16] :

$$a_{ij} = \frac{\partial Q_L}{\partial x_{ij}} = \left[V_i^2 + V_j^2 - 2V_i V_j \cos \delta_{ij} \right]. \frac{r_i}{(r_{ij}^2)}$$
$$(15)$$

(ii) Real power flow performance index sensitivity indices: The severity of the system loading under normal and contingency cases can be described by a real power line flow performance index[18], as given below

$$PI = \Sigma_i^i \quad (16)$$
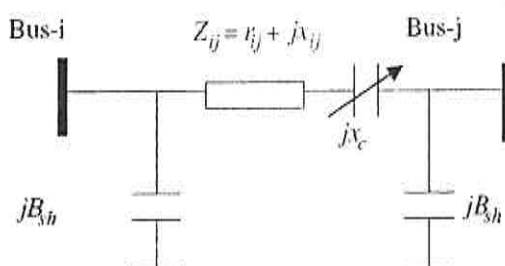
Fig. 3 Model of Transmission line with TCSC

Where,
    . is the real power is flow,
    P_i is the rated capacity of the line-m,
N is the exponent and
w_m is a real non-negative weighting coefficient.

When the lines are overloaded the value of PI is high while the lines are within their limits then PI is small.
The PI sensitivity factors for real power flow with respect to the TCSC parameters can be written as:

$$b_k \quad (17)$$

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

$$\frac{\partial PI}{\partial x_k} = \sum_{m=1}^{N_t} Wm \, P_{Lm}^3 \left(\frac{\;}{;}\right) \qquad (18)$$

Where,

$$\frac{\partial P_{Lm}}{\partial x_{ck}} = \begin{cases} S_{mi}\frac{\partial P_i}{\partial x_{ck}} + S_{mj}\frac{\partial P_j}{\partial x_{ck}}, \\ S_{mi}\frac{\partial P_i}{\partial x_{ck}} + S_{mj}\frac{\partial P_j}{\partial x_{ck}} + \frac{\partial P_j}{\partial x_{ck}}, \end{cases} \qquad (19)$$

Where,

$$\frac{\partial P_i}{\partial x_{ck}} =$$

$$-2\left(V_i^2 - V_i V_j \cos\delta_{ij}\right)\frac{r_{ij}x_{ij}}{(r_{ij}^2 + x_{ij}^2)^2} - V_i V_j \sin\delta_{ij}\frac{(x_{ij}^2 - r_{ij}^2)}{(r_{ij}^2 + x_{ij}^2)^2}$$

$$(20)$$

$$\frac{\partial P_j}{\partial x_{ck}} =$$

$$-2\left(V_j^2 - V_i V_j \cos\delta_{ij}\right)\frac{r_{ij}x_{ij}}{(r_{ij}^2 + x_{ij}^2)^2} + V_i V_j \sin\delta_{ij}\frac{(x_{ij}^2 - r_{ij}^2)}{(r_{ij}^2 + x_{ij}^2)^2}$$

$$(21)$$

(iii) Reduction of total system Active power loss: The active power loss in the line can be written as:

$$P_L = P_{ij} + P_{ji} = G_{ij}'\left(V_i^2 + V_j^2\right) - 2V_i V_j G_{ij}' \cos\delta_{ij} \quad (22)$$

The sensitivity factor cij is calculated by differentiating the equation (11) with respect to control parameter of TCSC and can be written as:

$$c_{ij} = \frac{\partial P_L}{\partial x_{ij}} = \left[V_i^2 + V_j^2 - 2V_i V_j \cos\delta_{ij}\right].\frac{-2r_{ij}x_{ij}}{\left(r_{ij}^2 + x_{ij}^2\right)^2} \quad (23)$$

(iv) Criteria for Optimal Location of TCSC

The static and dynamic performance of the system plays a vital role in placement of FACTS devices. The static performance of the system can be enhance by finding the optimal location for installing FACTS devices using sensitivity factor methods. The most sensitive line is choose for placing FACTS device.

The sensitivity indices can be calculated using three methods as bellows for TCSC placement:

- Reactive power loss reduction method – Line having most positive loss sensitivity index
- PI method - Line having most negative sensitivity index.
- Active power loss reduction method - Line having the most positive loss sensitivity index.

III CONGESTION MANAGEMENT PROBLEM FORMULATION

(a) Optimization Problem

Let the costs of rescheduled active powers and reactive powers are f_1 and f_2. Hence, the objective function is :

Minimize $Z = f_1 + f_2$

$$Pg_i - Pd_i - P_i(V,\theta,T) = 0$$
$$Qg_i - Qd_i - Q_i(V,\theta,T) = 0$$

(v) Objective Function

FACTS devices cost are high, due to which it is necessary to use cost-benefit analysis. Weather the location of installing new FACTS device is cost effective among other locations or not.

The cost of installing TCSC in line-k is given bas:

$$C_{Tcsc}(k) = c.x_c(k).P_L^2.Ba \qquad (24)$$

Hence, the objective function for placement of TCSC will be

$$min \, P_L \qquad (25)$$

Where c is the unit investment cost of FACTS device

x_c is the series capacitive reactance and PL is the power flow in line-k.

Mathematically, an OPF for minimization of the total operating cost can be written as follows:

Min $f(x) = \sum_i^{Ng}(\alpha_i * Pg_i^2 + \beta_i * Pg_i + \gamma_i) + C_{Tcsc}$

Subject to the following constraints:

Non linear equality constraints (load flow equations)

g(x)=0 $\qquad (26)$

where g(x) represents equality constraints including bus power flow equations. i.e..

i= 1,2,....N

Non-linear inequality constraints such as line flow constraints, interface flow constraints and simple inequality constraints of variables such as voltage magnitudes, generator active powers, generator reactive powers, transformer tap ratios

$$h_j^{min} \le h_j(P_g, Q_g, V, \theta, \qquad (27)$$

j=1, 2,....N_h

Where, $x =$.

α_i, β_i, γ_i are the coefficients of quadratic production cost functions at bus i,

Pg is the bus active generation,

Qg is the bus reactive generation,

Pd is the bus active load,

Q_d is bus reactive load,

V is the bus voltage magnitude,

θ is the bus angle vector,

T is the transformer Tap ratio vector.

h^{min}, h^{max} are lower bound and upper bound vectors, respectively, for inequality constraints,

Ng is the total number of generators,

N is total number of buses, and

Nh is the total number of double-side inequality constraints.

Transform the OPF problem into the following equivalent OPF problem by applying Fiacco and McCormick's barrier method as follows,

$$Min\{f(x) - \mu \sum_i^{Nh} \ln(s\,l_i) - \mu \sum_i^{Nh} \ln(su \qquad (28)$$

Subjected to the following constraints

$$g(x)=0 \qquad (29)$$
$$h(x) - sl - h^{min} = 0 \qquad (30)$$
$$h(x) + su - h^{max} = 0 \qquad (31)$$

Where, $\mu>0$.

The Lagrangian function for equalities optimization for problem (4) is

$$L = f(x) - \mu \sum \ln(sl) - \mu \sum \ln(su) - \lambda^T g(x)$$
$$-\pi l^T (h(x) - sl - h^{min}) - \pi u^T (h(x) + sl - h^{mu} \qquad (32)$$

Where λ, nl, mu are Lagrangian multiples for constraints (22),(23),(24),respectively.

The Karush-Kuhn-Tucker (KKT) first order conditions for the Lagrangian function of (3) are,

$$\nabla_x L_\mu = \nabla f(x) - \nabla g(x)^T \lambda - \nabla h(x)^T \pi l - \nabla h^T \pi u = 0 \qquad (33)$$

$$\nabla_{\pi l} L_\mu = -(h(x) - sl - \qquad (34)$$
$$\nabla_{\pi u} L_\mu = -(h(x) + su - \qquad (35)$$
$$\nabla_{sl} L_\mu = l \qquad (36)$$
$$\nabla_{su} L_\mu = \mu e \qquad (37)$$

Where, Sl=diag(sl$_i$),

Su=diag(su$_i$),

Πl= diag(sl$_i$),

Πu= diag(su$_i$).

The Newton equation for the nonlinear interior point OPF algorithm derived above may be expressed as the following compact form,

$$\begin{bmatrix} -nl^{-1}sl & 0 & - \\ 0 & -nl^{-1}sl & - \\ -\nabla h'' & -\nabla h^T & H \\ 0 & 0 & -l \end{bmatrix} = \begin{bmatrix} - \\ - \\ \end{bmatrix} \qquad (38)$$

$$\Delta sl = nl^{-1}(- \qquad (39)$$
$$\Delta su = nu^{-1}(-\nabla_{su} \qquad (40)$$

Where,

$$H(x, \lambda, \pi l, \pi u) = \nabla^2 f(x) - \lambda \nabla^2 g(x) - (\pi l + \pi u) \nabla^2 h(x),$$

By solving the Newton equation (7),   .   .   ,   ,   can be obtained. Then the Newton solution can be updated as follows,

$$(41)$$

$$(42)$$
$$x \qquad (43)$$
$$\pi \qquad (44)$$
$$mu \qquad (45)$$
$$(46)$$

Where $\sigma = 0.995{\sim}0.999\ 95$. α_p, α_d are primal and dual step length respectively. They can be determined by

$$\alpha_p = min \left\{ min \left(\frac{si}{-\Delta si} \right), min \left(\frac{s}{-\Delta} \right) \right. \qquad (47)$$

$$\alpha_d = min \left\{ min \left(\frac{-ni}{-\Delta ni} \right), min \left(\frac{n}{-\Delta} \right) \right. \qquad (48)$$

The complementary gap of the nonlinear interior point OPF is,

$$C_{gap} \qquad (49)$$

The barrier parameter can be determined by,

$$(50)$$

where $\beta = 0.01{\sim}0.2$. m is the number of inequality constraints in (21)

(b) Algorithm:

The solution procedure for the nonlinear interior point OPF is summarized as the following:

(i) Set iteration count k=0, $\mu = \mu 0$, and initialize the OPF solution.

(ii) If KKT conditions are satisfied and complementary gap is less than a tolerance, output results. Otherwise go to step III.

IV RESULTS AND DISCUSSIONS

Matlab is the software used for implementing the three sensitivity methods. Programming is written for all the three sensitivity methods in Matlab. Separate programming is written for the interior point method in Matlab. Method 1st is reactive power reduction method [16], method 2nd is the PI reduction method [18] and the active power loss reduction method is named 3rd method. It is the proposed method in the thesis work. All these three methods are discussed for the 5-bus and modified IEEE 30 bus system.

(a) IEEE 5- Bus System

The 5-bus system consists of 1 slack or reference bus, 3 generator buses and 2 load buses. The slack bus is numbered as 1 followed by the generating buses and load buses.

Table 1 gives the load flow analysis of IEEE 5-bus system. After load flow analysis. the real power flow in line 4rth between bus 2-5 is 1.034 p.u which is more than the line loading limit.

Table-2 gives the sensitivities index of reactive power loss reduction, real power flow performance index and active power loss reduction. Bold letter is used to show the sensitive line. From the column 3rd in Table 2. It is

(iii) Form and solve Newton equation in (25), then (26) and (27).

(iv) Update Newton solution by equation (26).

(v) Compute complementary gap by (28).

(vi) k=k+1 go to step II.

observed the line numbered 5 between buses 3-5 is suitable for placement of TCSC for reducing the total reactive power loss. Table 3 gives the value of power flow in the congested line 4th after placing TCSC is 0.99956 p.u. Hence, after placing the TCSC the congestion has been relieved in the system. The value of Control parameter of TCSC for computing power flow is taken as 0.2885p.u.

From the column 4th in Table 2. It is observed the line numbered 2nd between buses 1-4 is suitable for placement of TCSC for reducing the real power flow performance index (PI). Table 3 gives the value of power flow in the congested line 4th after placing TCSC is 0.99954 p.u. Hence, after placing the TCSC the congestion has been relieved in the system. The value of Control parameter of TCSC for computing power flow is taken as 0.0326p.u

From the column 5th in Table 2. It is observed the line numbered 1st between buses 1-2 is suitable for placement of TCSC for reducing the Active power loss. Table 3 gives the value of power flow in the congested line 4th after placing TCSC is 0.99936 p.u. Hence, after placing the TCSC the congestion has been relieved in the system. The value of Control parameter of TCSC for computing power flow is taken as as 0.3106p.u.

Table 1
Power Flow Result for 5- Bus System

Line	i-j	Method reported in [16]
		Power flow(pu)
1	1-2	0.07798
2	1-4	0.4145
3	2-3	0.51559
4	2-5	**1.034**
5	3-5	0.08441
6	4-5	0.40379

Table 2
Sensitivities for 5-Bus System

Line	i-j	Method reported in[16]	Method reported in[18]	PROPOSED METHOD
		aij	bij	cij
1	1-2	-0.008057	-0.0789	**-0.0004**
2	1-4	-0.967394	**-0.41433**	-0.0897
3	2-3	-0.240349	0.45582	-0.1235
4	2-5	-0.970852	1.95327	-0.5107
5	3-5	**-0.00784**	-0.10536	-0.0018
6	4-5	-0.261704	0.34953	-0.0837

Placement of TCSC in line 5th may reduce the reactive power loss and placement of TCSC in line 2nd will reduce the real power flow performance index value but it will be less effective than placing a TCSC in line 1st as can be seen from its sensitivity factors. Table 4 gives the total costs comparison of three methods. It can be observed that reduction of total system active power loss method is more economical than VAR power loss method and performance index method. The Voltage Profile of the IEEE 5-bus system obtained from the three-sensitivity analysis is given the Table 5.

Table 3
Power Flow Result for 5-Bus System after Placing TCSC Based on Sensitivity Methods

Line	i-j	Method reported in[16]	Method reported in[18]	PROPOSED METHOD
		Power flow(pu)	Power flow(pu)	Power flow(pu)
1	1-2	0.07614	0.10893	0.08791
2	1-4	0.41123	0.46051	0.42237
3	2-3	0.47879	0.51202	0.49789
4	2-5	0.99956	0.99954	0.99936
5	3-5	0.08441	0.08798	0.08798
6	4-5	0.40379	0.37453	0.40379

Table 4
Total Cost for Optimal Location of TCSC in 5-Bus System

METHOD	TOTAL COST($/DAY)
VAR reduction [16]	2126.30
PI [18]	2346.34
Active power reduction	2031.30

Table 5
Voltage Magnitude values obtained from various methods

BUS NO.	METHOD REPORTED IN[16]	METHOD REPORTED IN[18]	PROPOSED METHOD
1	1.020	1.020	1.020
2	1.040	1.040	1.040
3	1.050	1.050	1.050
4	1.090	1.120	1.060
5	1.019	1.102	1.017

(b) Modified IEEE- 30 bus system

The IEEE 30-bus system bid prices by generators for each buses are given in appendix. The 30-bus system consists of 6 generator buses and 24 load buses. The slack bus is numbered as 1 followed by the generating buses and load buses.

Table 6 gives the load flow of 30-bus system. There are two congested lines in case of 30-bus system. Those are line in between bus 1-2 numbered as line 1 and in between bus 2-9 numbered as line 5 as given in table 7. After performing load flow analysis, the real power flow at line 1 is 1.2748 p.u while at line 5 is 1.046 p.u. as shown in appendix VI. Which are more than the line loading limit.

Table-7 gives the sensitivities index of reactive power loss reduction, real power flow performance index and active power loss reduction. Bold letter is used to show the sensitive line. From the column 3rd in Table 7. It is observed the line numbered 26 between buses 14-15 is suitable for placement of TCSC for reducing the total reactive power loss. Table 8 gives the value of power flow in the congested line 1 after placing TCSC is 0.9987 p.u and in line-5 is 0.9568p.u. Hence, after placing the TCSC the congestion has been relieved in the system.

The value of Control parameter of TCSC for computing power flow is taken as 0.17885p.u.

It can be observed from column 4th in table-7 that placing a TCSC in line-8 is optimal for reducing the real power flow performance index. After placing TCSC in line-8, the power flow Value of the congested line-1 is coming out to be 0.9984 p.u and in line-5 is 0.9476 p.u as given in Table 8. Hence, after placing the TCSC the congestion has been relieved in the system.

The value of Control parameter of TCSC for computing power flow is taken as 0.0326p.u.

From the column 5th in table-7, it is observed that placing a TCSC in line-40 is optimal for reducing the Active power loss. After placing TCSC in line-40, the power flow Value of the congested line-1 is coming out to be 0.9876 p.u and in line-5 is 0.9321 p.u as given in Table 8. Hence, after placing the TCSC the congestion has been relieved in the system

Placement of TCSC in line-26 may reduce the reactive power loss and placement of TCSC in line-8 will reduce the real power flow performance index value but it will be less effective than placing a TCSC in line-40 as can be seen from its sensitivity factors. Table 10 gives the total costs comparison of three methods. It can be observed that reduction of total system active power loss method is more economical than VAR power loss method and performance index method.

Table 6
Congested Line Details for 30-Bus System

CONGESTED LINE	POWER FLOW (PU)	LINE LIMIT (PU)
1-2	1.2748	1.00
2-9	1.046	1.00

Table 7
Sensitivity Indices for 30-Bus System

LINE	i-j	aij	bij	cij
1	1-2	-0.0012	1.1352	-0.0023
2	1-7	-0.5181	-0.6546	-0.3065
3	2-3	-0.3331	-0.0650	-0.1681
4	2-8	-0.1755	-0.8522	-0.1291
5	2-9	-0.3028	0.0099	-0.2239
6	3-10	-0.0151	-0.1674	-0.0142
7	4-28	-0.0051	-0.0003	-0.0036
8	7-8	-0.3965	**-0.8696**	-0.3143
9	8-9	-0.4864	0.0001	-0.3048
10	8-13	-0.1850	1.0923	-0.0012
11	9-4	-0.0924	-0.2237	-0.0575
12	9-10	-0.0282	-0.1678	-0.0205
13	9-11	-0.2399	0	-0.0026
14	9-12	-0.0423	-0.3252	-0.0037
15	9-28	-0.0184	0	-0.0113
16	11-5	-0.0468	0	-0.0043
17	11-12	-0.0341	-0.3270	-0.0024
18	12-17	-0.0013	-0.2618	-0.0012
19	12-20	-0.0030	-0.0654	-0.0033
20	12-21	-0.0200	-0.5054	-0.0237

21	12-22	-0.0042	0.6215	-0.0054
22	13-6	-0.1319	0.0169	-0.0032
23	13-14	-0.0052	-0.1687	-0.0065
24	13-15	-0.0319	-0.2155	-0.0437
25	13-16	-0.0112	-0.0872	-0.0138
26	14-15	**0.0001**	-0.2378	-0.0008
27	15-18	-0.0056	-0.0933	-0.0072
28	15-23	-0.0042	0.4660	-0.0056
29	16-17	-0.0064	-0.2607	-0.0066
30	18-19	-0.0024	-0.2607	-0.0031
31	19-20	-0.0011	-0.0636	-0.0015
32	21-22	-0.0010	0.6329	-0.0013
33	22-24	-0.0016	-0.2532	-0.0035
34	23-24	-0.0014	-0.2505	-0.0018
35	24-25	-0.0006	0.0004	-0.0010
36	25-26	-0.0007	-0.1014	-0.0018
37	25-27	-0.0026	0.7824	-0.0038
38	27-29	-0.0024	-0.0678	-0.0035
39	27-30	-0.0030	-0.3048	-0.0045
40	28-27	-0.0425	0.7821	**0.0015**
41	29-30	-0.0008	-0.3071	-0.0012

Table 8
Power Flow Result for 30-Bus System after Placement of TCSC Based on the Sensitivity Methods

LINE	i-j	Method reported in[16] Power Flow(pu)	Method reported in[18] Power Flow(pu)	PROPOSED METHOD Power Flow(pu)
1	1-2	0.9987	0.9984	0.9876
2	1-7	0.7670	0.7742	0.7637
3	2-3	0.5978	0.6023	0.5957
4	2-8	0.4590	0.4630	0.4571
5	2-9	0.9568	0.9476	0.9321
6	3-10	0.0741	0.0756	0.0735
7	4-28	0.0507	0.0513	0.0505
8	7-8	0.5851	0.6045	0.5763
9	8-9	0.5603	0.5764	0.5530
10	8-13	0.4073	0.4100	0.4061
11	9-4	-0.0166	-0.0194	-0.0154
12	9-10	0.1374	0.1393	0.1366
13	9-11	0.4752	0.4790	0.4735
14	9-12	0.2038	0.2044	0.2035
15	9-28	0.1296	0.1326	0.1282
16	11-5	0.0667	0.0672	0.0664
17	11-12	0.1159	0.1176	0.1151
18	12-17	-0.0060	-0.0059	-0.0061
19	12-20	0.0534	0.0539	0.0532
20	12-21	0.1167	0.1196	0.1154
21	12-22	0.0565	0.0572	0.0562
22	13-6	-0.2256	-0.2282	-0.2244
23	13-14	0.0881	0.0886	0.0878
24	13-15	0.2116	0.2141	0.2104
25	13-16	0.1270	0.1280	0.1265
26	14-15	0.0273	0.0274	0.0272

27	15-18	0.0919	0.0925	0.0916
28	15-23	0.0701	0.0707	0.0698
29	16-17	0.0919	0.0926	0.0915
30	18-19	0.0583	0.0589	0.0580
31	19-20	-0.0276	-0.0284	-0.0273
32	21-22	-0.0308	-0.0323	-0.0301
33	22-24	0.0153	0.0157	0.0152
34	23-24	0.0388	0.0391	0.0387
35	24-25	-0.0298	-0.0299	-0.0297
36	25-26	0.0348	0.0349	0.0347
37	25-27	-0.0635	-0.0639	-0.0633
38	27-29	0.0608	0.0611	0.0607
39	27-30	0.0701	0.0703	0.0700
40	28-27	0.1952	0.1960	0.1948
41	29-30	0.0364	0.0365	0.0364

Table 9
Voltage Magnitude (PU) values obtained from various methods

BUS	Method reported in[16]	Method reported in[18]	PROPOSED METHOD
1	1.000	1.000	1.000
2	1.000	1.000	1.000
3	0.983	0.981	0.900
4	0.980	0.984	0.900
5	0.982	0.985	0.920
6	0.973	0.978	0.980
7	0.967	0.961	0.970
8	0.961	0.958	0.965
9	0.981	0.984	0.979
10	0.984	0.984	0.985
11	0.981	0.987	0.983
12	0.985	0.986	0.987
13	1.000	1.000	1.000
14	0.977	0.982	0.984
15	0.980	0.981	0.986
16	0.977	0.98	0.974
17	0.977	0.977	0.977
18	0.968	0.965	0.974
19	0.965	0.962	0.978
20	0.969	0.978	0.987
21	0.993	1.000	1.020
22	1.000	1.000	1.000
23	1.000	1.000	1.000
24	0.989	0.900	0.920
25	0.990	0.990	1.040
26	0.972	0.976	0.980
27	1.000	1.000	1.000
28	0.975	0.979	0.980
29	0.98	0.984	0.987
30	0.968	0.968	0.971

Table 10
Total Cost for Optimal Location of TCSC

Method	Total Cost
VAR reduction	1186.5$/day
PI	1223$/day
Active power reduction	1068$/day

V CONCLUSION

In a deregulated power system, Congestion and its management is an important issue to deal with it. TCSC based FACTS device is one of the solution for congestion management. TCSC controls the power flows in the transmission line and reduces the power flow through over loaded lines. But due to high cost of FACTS devices, It is necessary to find the optimal location for installing It.

In the proposed work, Reduction of total system real power loss approach is used an optimization method based on interior point method for minimizing the cost of TCSC based FACTS device and generation rescheduling. The proposed method has been demonstrated on IEEE 5 bus system and Modified IEEE-30 bus system. The results obtained divulge that the proposed work is effective in managing congestion and finding the optimal location for placing TCSC based FACTS device.

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Diagnosis and Remedial Teaching in Mathematics- A Review

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ABSTRACT

The main objective of the study was to find out the mistakes done by the students in Factorization, give the remedial teaching and to compare the mean score of Pre remedial test or diagnostic test and post Remedial test or posttest in the unit of Factorization. In the present study researcher select the school with purposive sampling technique. On the basis of diagnosis test 35% or below scorer students were selected for the remedial teaching. Out of 60 students 32 students were included for remedial teaching in the unit of Factorization. Researcher formed a diagnosis test to find out the mistakes. Researcher measure the effectiveness of remedial teaching with the use of posttest which is formed on the basis of content of Factorization. In the present study researcher used Experimental Research method and "Single group Pretest-posttest Experimental Design," as research design. Researcher used t-test for the comparison of pretest and posttest of the students. Students were done mistakes in various formula like, $(x + a)(x + b) = x^2 + (x + b) x + ab$, $(x - a)(x-a) = x^2 - a^2$, $(x - a)^2 = x^2 - 2xa + a^2$ and $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$. As per result, Remedial teaching is effective for the better understanding the various formulas and concept clarity of Factorization in mathematics.

Key Words: diagnostic test, Remedial test, Factorization, Sampling, Experimental research, etc. Diagnosis and Remedial Teaching in Mathematics

I INTRODUCTION

Teaching of mathematics in classroom is not correlate with the computational ability of the subject but is also concerned with mathematics content and communication leading to its knowledge, understanding and application. During Instructional process in mathematics, teaching methods, strategies and pedagogic resources are much more fruitful in gaining sufficient responses from the students. For the quality in teaching-learning of mathematics, nature and quality of instructional material, teaching aids, content power of teacher, the pedagogic skills, the learning environment in classroom, the motivation of the students as well as teachers are very important.

The term "diagnosis" is commonly used in medical field, where it is defined as a careful, critical study of something to determine its nature.

According to Learning and Teaching Support Network (LTSN), diagnostic tests consist of a simple paper based test, computer generated multiple-choice questions or intelligent diagnostic systems are usually administered during the orientation week or first few weeks of the semester.

Diagnostic tests are designed to identify strength and weakness of learner with reference to specific to pics related knowledge. Diagnostic tests are more likely to focus on weaknesses than on strengths. Diagnostic tests should lead to remedial work after the instructional process. Diagnostic tests give detailed feedback about students' knowledge and understanding. Diagnostic tests provide immediate results and provide a direction for remedial teaching.

Diagnostic tests have shown to enhance students' performances in various areas of mathematics such as arithmetic, algebra, geometry etc. Some studies have also shown that diagnostic testing improves students' performance in other related tests.

Remedial Teaching can be considered as an effective correction technique, a programme to improve teaching-learning process. An instruction for overcoming difficulties and misconceptions in various subjects. The studies revealed that Remedial Instructional Materials were effective in improving academic attainment of students. Analysis of the related studies helped the investigator in the preparation of Diagnostic test and preparing remedial teaching materials. The Analysis of studies related to Diagnostic Testing and Remedial Teaching, revealed that Diagnostic Testing in teaching can be used, as a technique for finding out the frequency and types of errors committed by students, for the correction and elimination to individual weaknesses, as a tool for finding out the reason for committing errors. It cans also beused as a prevention technique for common errors and in identifying major hindrances in learning various concepts.

II REVIEW OF RELATED LITERATURE

Sankara (1957) studied the difficulties experienced by pupils of Standard IX in factorization. The study revealed that a great majority of the pupils experienced difficulties in dealing with negative numbers, applying rules of signs, factorization of polynomials and in recognizing common factor.

Elias (1966) conducted a study to identify the common errors committed by the pupils of standard VI infractions using a diagnostic test. The major findings revealed that a great majority of students experienced difficulty in division of fractions, especially with mixed fractions and multiplication and division.

Varghese (1991) studied the difficulty in learning fractions by pupils of standard VI. The study revealed that the following areas are difficult for the majority of students due to the lack of understanding of fundamental concepts: changing the whole number into a fraction; changing an improper fraction into a mixed fraction and addition and subtraction of improper and mixed fraction.

Sindhu (1996) studied the difficulties experienced by the fifth standard pupils in learning fractions. The study revealed that many of the common errors made by pupils were due to lack of understanding of principles involved in the addition, sub traction and multiplication with fraction and inadequate practice in doing problems in fraction.

(Carpenito-Moyet, 2007). In education, diagnosis can be explained through instructional approach where assessment provides information about students' mastery about relevant pre knowledge and skills within the domain as well as pre-conception or misconceptions about the material (Ketterlin-Geller & Yovanoff, 2009). Hence, diagnostic test can be defined as an assessment mainly used to identify students' strengths and weaknesses towards any subjects of learning (Zhao, 2013). It is a direct response to the perceived decay in the mathematical knowledge and skills of new students in relation to the mathematical requirements of their programmes of study (Appleby, Lawson, Croft, Hawkes, Douglas, &Sleeman, 2000).

III OBJECTIVES OF THE STUDY

(a) To form a Diagnostic test for Factorization.
(b) To find out the mistakes done by the students in Factorization.
(c) To give the remedial teaching on the basis of mistakes done by the students in Factorization.
(d) To measure the effect of remedial teaching in the unit of Factorization.
(e) To compare the mean score of Pre remedial test or diagnostic test and post Remedial test or posttest in the unit of Factorization.

IV METHODOLOGY

(a) **Hypothesis** - There will be no significance difference between the mean score of Pre remedial test or diagnostic test and post Remedial test or posttest in the unit of Factorization.

(b) **Research Method and Research Design**- In the present study researcher has used Experimental Research method and **"Single group Pretest-posttest Experimental Design."**

(c) **Population And Sampling** - In the present study researcher select the school with purposive sampling technique. All the students of standard 8 were selected for Diagnosis test, On the basis of diagnosis test 35% or below scorer students were selected for the remedial teaching. Out of 60 students 32 students were included in the group for remedial teaching in the unit of Factorization.

(d) **Research Tools**-Researcher formed a diagnosis test to find out the mistakes. On the basis of that test researcher decide the process of remedial teaching. Researcher measure the effectiveness of remedial teaching with the use of posttest which is formed on the basis of content of Factorization.

(e) **Process Of Remedial Teaching**-According to the diagnosis, researcher prepare remedial teaching plan for the various difficulty faced by students of std-8, With the use of specific model and teaching aid as well as continues repetition of various formula, students learn this unit and get proper understanding of whole topic. Researcher also used flap chart for reminding the specific formula during the calculation of sum related to formula. He also made various chits of all the formulas and gives remedial teaching to the students and at last researcher take a post test for the effectiveness of the remedial teaching.

(f) **Data Analysis** - Researcher has used t-test for the comparison of pretest and posttest of the students.

V RESULTS

(a) **Results of the Diagnosis Test**
(i) **In the formula, $(x+a)(x+b) = x^2 + (x+b)x + ab$,**
- Students done mistakes to understand above formula.
- Students done mistakes to do addition and subtraction in the middle term and multiplication of the last term of this formula.
- They also done mistakes in various sums i.e. Find the values.

(ii) **In the formula, $(x+a)(x-a) = x^2 - a^2$**
- Students were not getting proper understanding about this formula.
- Students done mistakes to do square and calculate various types of sum based on this formula.

(iii) **In the formula, $(x - a)^2 = x^2 - 2xa + a^2$**
- Students were putting negative sign in last term of this formula.

- Students done mistakes in multiplication of middle term.
- Students done mistakes in calculation of sums based on this formula.

(iv) **In the Formula of $(a+b+c)^2 = a^2 + b^2 + c^2 +2ab +2bc + 2ca$**

- Students were not getting proper understanding about this formula.
- They done mistakes in putting the signs during the factorization of $(a - b - c)^2$.
- Students done mistakes in calculation of sums based on this formula.

(b) Results of Remedial Teaching.

In the present study, calculated t-value is greater than table t-value2.46. So, hypothesis, "There will be no significance difference between the mean score of Pre remedial test or diagnostic test and post Remedial test or posttest in the unit of Factorization." is rejected at 0.02 level, on the basis of this we can say that mean score of posttest is higher than diagnostic test or pre remedial test. So, Remedial teaching is effective for the better understanding the various formulas and concept clarity of Factorization in mathematics.

VI CONCLUSION

This paper explains the need for proper diagnosis and remedial work for class room instruction if the failure rate in Mathematics among pupils is to be reduced. It also stresses the point that teachers have to be familiar with some of the methods of diagnosis before they can carry out remedial work with slow learners. Finally, teacher Diagnose content related problems as well as difficulty of our student and give proper remedial teaching based on results is very useful for the betterment of the mathematics knowledge and understanding.

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A Study of Visual Merchandising Elements in Fashion Retail Stores and their impact on Customer behaviour

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ABSTRACT

This research paper is the outcome of a study of Visual Merchandising Elements of an apparel retail store and their impact on behaviour of customers. It is an attempt to identify the most appealing elements of VM. The general purpose of Visual Merchandisin650g is to attract, invite, educate and motivate the customers to purchase merchandise being sold in the store. Visual Merchandising Elements have been categorised nt two major segments: External VM Elements and Interior VM Elements. Exterior VME comprises of Graphics &Signages, Window Display setting, Merchandise presentation, Parking facility, Brand name & logo and Façade of the store. However Interior VME comprises of Store layout, theme, color, music, temperature, lighting, mannequin styling, product display, cleanliness, Furniture, Smell, Cash Counter, Floor directory and Trial room. For this study on impact of above mentioned VME, four leading MBOs of India were selected which are Fashion at Big Bazar (FBB), Lifestyle, Shoppers stop and Reliance Trends. All these four retailers are department stores dealing into multiple brands, offer both apparels and accessories and have presence pan India through their multiple outlets in various cities. The Store size and offered brands and merchandise quantity being similar in all the stores of these brands make them perfect competitors targeting the same customer group. Hence Visual Merchandising of these stores is comparable. Secondary data was used for formulating list of VME and primary data was collected from 500 samples, to study impact of these VME through self-developed and self-administered questionnaire. The Likert scale was used to record the level of influence of VME from 'Strongly Agree' to 'Strongly Disagree'. Collected data was analysed and it was found that 80% sample agreed with the influence of VME on their behaviour. Also the most influencing External VMEs were found to be Window Display setting and Merchandise on Display. On the other hand, the most influencing Internal VMEs were found to be creative product display and mannequin styling.

Key Words: Visual Merchandising, Visual Merchandising Elements, Customer behaviour, Window Display, Mannequins, VM, VME.

I INTRODUCTION

(a) **Understanding Indian Retail Environment-** The Indian retail sector has experienced fastest growth over last few years achieving a total market size of USD 672 billion in 2017. The Indian retail market is projected to reach USD 1200 billion by 2021.While on the other hand, Indian e-commerce industry at the current growth rate of 31%,is expected to reach USD 60 billion, by 2020. India was Ranked No. 1 in A.T. Kearney's Global Retail Development Index (GRDI) in 2017, according to IBEF: India Retail Industry Report. Retail is India's largest industry, currently accounting for over 10% of the country's GDP and 8% of total employment, according to Investindia (2019). The government of India has allowed 51 % FDI in multi-brand retail and 100 % in single brand retail, according to recent FDI Policy (2017).Indian retail sector is comprised of organised and unorganised retail, where the unorganised retail market contributes 92% of the total retail sector in India. Retailing could simply be defines "Breaking the bulk". According to Upadhyay et.al. (2017), Retailing is different from whole-selling, where large amount of products are sold to few customers, however in retailing small quantity of products are sold to large number of customers.

(b) **Understanding Visual Merchandising -** Visual Merchandising helps customers to have an amazing shopping experience (Upadhyay et. al. 2018). For a Visual Merchandiser, a store is like a theatre. The walls & floor are like stage of theatre. The lighting, fixtures & visual communications makes the set of the stage & the merchandise plays the characters in the show(Upadhyay et.al. 2017). Visual Merchandising is the art of presentation, which puts the merchandise in focus. It educates the customers, creates desire and finally augments the selling process (Mohan &Ojha, 2014)

(c) **Understanding Visual Merchandising Elements -** Kotler, P.(1974) discussed shopping atmosphere and how a customer experience through a combination of such atmospheric elements like visual, sound, tactile and olfactory elements, which ultimately stimulate emotional reactions and influence buying behaviour (Fig. 1).
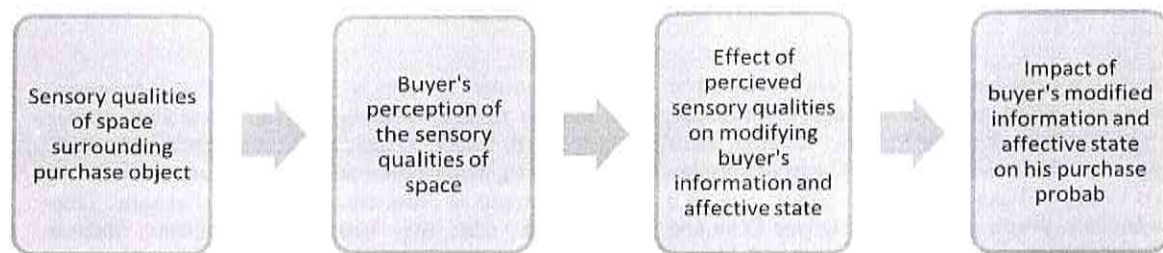
Fig. 1: Step by step process of buyers' purchase decision based on atmospheric elements
Source: Kotler, P. 1974, p.54

Kotler also considered these store atmospheric elements as part of Visual Merchandising. The primary job of these visual merchandising attributes and elements is to highlight products of a store so as to attract the customers and stimulate the selling process (Pegler, 2011)

Visual merchandising elements can be categorised as follows:
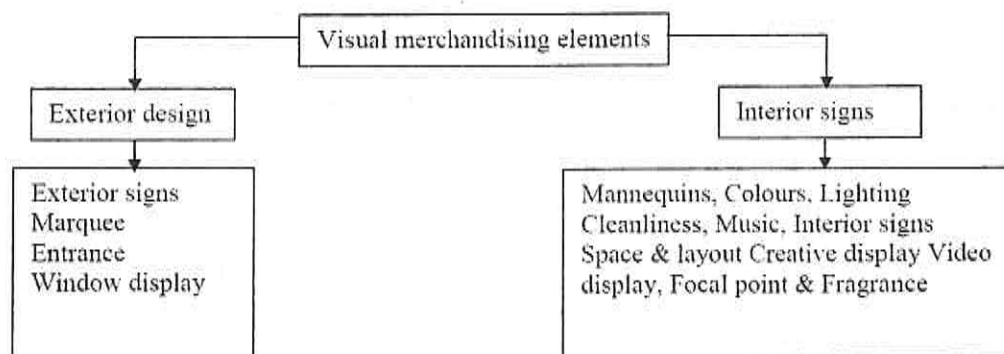
Fig. 2: Visual Merchandising Elements

The primary reason for conducting this research is to study all possible visual merchandising elements, as suggested by various authors. academicians & practitioners and to assess them for their effectiveness and preference.

II LITERATURE REVIEW

Kotler (1973) defined store atmospherics as store environment aimed to affect consumers' responses and influence their buying behaviour. Atmospherics. being an important marketing tool. attracted many researchers who studied its impact on consumer buying behaviour (Kotler. 1973: Manganari. et al.. 2011).

Donovan and Rossiter (1982) and Matilla and Witz (2008) further categorised store attributes into two major areas – Store exterior and store interior. Berman and Evans (1989), divide store VM elements into four categories: the exterior (storefront, entrances, display windows, physical characteristics of the building (e.g. height and size), surrounding area. and parking), the interior (flooring. colours. lighting. scents. sounds. fixtures. temperature. merchandise, and cleanliness), layout and design (the allocation of floor space), and point-of-purchase (displays, signs, wall decorations, certifications, pictures and artwork, price and product displays).

Turley and Milliman (2000) added one more element: human variables which mean influence of other shoppers and retail employees. They also examined influence of these atmospheric variables on consumers' shopping time. approach-avoidance and purchasing behaviour, which resulted that retail atmospherics such as colour. music. lighting and retail salespeople can have a great influence on consumers' purchasing and approach-avoidance behaviour. Other researchers found relationship between store atmospheric cues and consumers' emotions and their perception of the store (Chebat&Michon, 2003). Ambient odour could positively influence shoppers' perceptions and affect shopping behaviour (Michon, Chebat& Turley, 2005). In-store music can also increase store loyalty (Walsh et al., 2011).

Earlier. Baker et. al (1992) found a positive impact of lighting and background music on customers' purchase intention. Crowley (1993) added worked on another element-colorand concluded with influence on consumers' evaluation and activation. Later. Fiore et. al. (2000) also confirmed that scents and fragrance in a store stimulate emotional state which can lead to purchase intention. Impact of color and lightingon

consumers' purchase intention was also confirmed by Babinet. al. (2003). Aesthetic atmosphereChandonet. al. (2009),Store lighting(Aspfors, 2010), shelf arrangement(Hoch and Purk, 2000), window display (Davis and Tilley, 2004), Color, seating arrangements, props, fixtures and signage (Yun and Good, 2007).and cleanliness (Carpenter and Moore, 2006) was suggested as tools used by retailers to enhance the store image in the minds of customers. Pillai et. al. (2011), established that Visual Merchandising techniques, can convert store visitors into buyers.Razzouket. al. (2001) and Mopidevi and Lolla (2013) established that with window display, a retailer can build image and stand out in the market. However, Kim (2013) does not agree with this statement about window displays as no researcher has ever proved its effectiveness,but only increment is registered in impulse buying (Bashar and Ahmed, 2012). Garauset. al. (2015) established that store layout should be designed so as to hold the customer in the store for a longer duration and let him enjoy the shopping experience.

Singh et. al. (2014) used Likert's 5 point scale technique to check about effectiveness of 25 store attributes which were bundled into 7 major factors. They realized that attributes like window display, fixture, planogram, signage on gondola and merchandise assortment affects customers' buying pattern. However their study included attributes like price points, exchange policy, grievance handling etc. which cannot be counted under elements of visual merchandising.

Kleinovaet. al. (2015) focused on first impression, wall's texture, lighting, interior decoration, dishes offered, layout, aroma, music, staff dress code, POS material, temperature and noise, for a survey on 20 restaurants of Nitra region of Slovak Republic. They found that the best rated elements include temperature, noise and dishes offered from the menu. However, they failed to understand that, dishes of a restaurant, being product of the store, cannot be an element of visual merchandising. This research also resulted that background music is the only VM element with least impact on customer.

Rathnayaka and Madhuhansi (2017), studied only four elements of Visual Merchandising – Promotional signage. Music, Layout and Aroma and identified their influence on purchase intention. Soomroet. al. (2017) focused on four important factors of visual merchandising – store layout, window display, color& lighting and store interior and found that except store layout, all other factors have a positive impact on customers' attention. However, they failed to establish the basis of selecting only four elements of visual merchandising. Also all the questions of the questionnaire were affirmative in nature and suggested the respondents to reply with a 'Yes'. This biased questionnaire and hence its result cannot be considered reliable.

III RESEARCH METHOD

(a) **Procedure and the work plan -** The proposed methodology is shown in Figure 2. First, a comprehensive literature review was carried out, to understand the concepts and find the research gap. Then data sources, data collection methods and the data analysis methods were decided.
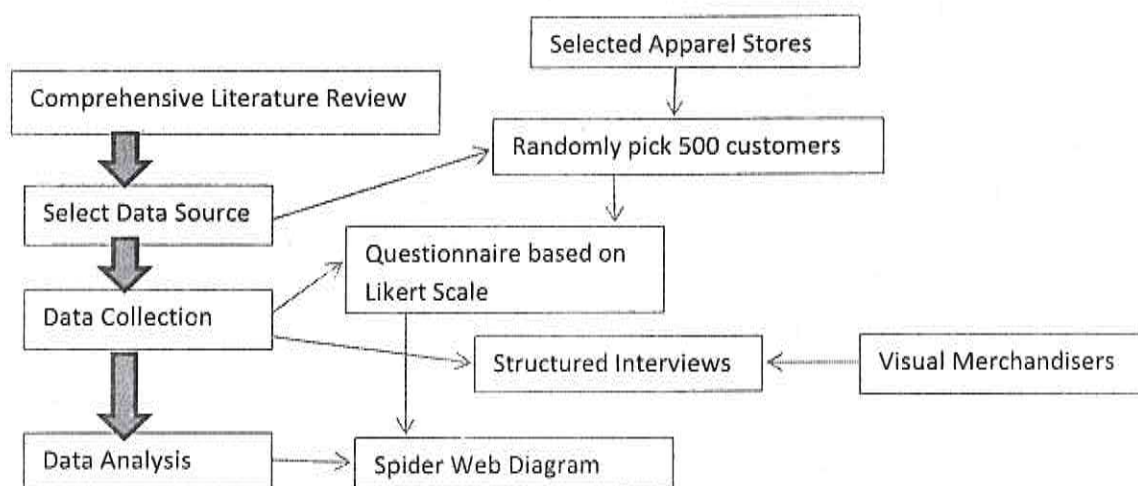
Fig. 3: Proposed methodology in sequence

(b) Research Gap: Having gone through the previous researches, it was discovered that there is no comprehensive list of VM elements and none of the researchers have ever dealt with all of them and tried to find their impact on Customers' buying behaviour. It was also found that few researchers have taken wrong attributes under consideration which could have confused respondents. It was also noticed that customers' response to any VM attribute could be for that store where the response was recorded. Such biased responses cannot be generalised and accepted in general for all the retail stores.

(c) Research Model Developed: To carry out the research, four leading Apparel retailers were selected, namely Shoopers Stop, Lifestyle, Fashion at Big Bazar (FBB) and Reliance Trends. Outlets of these retailers were visited at Bhopal, Mumbai and Bangalore in India. VM elements used by these retailers were identified and recorded under consultation with their Visual Merchandisers. 125 customers from each of these retailers were picked randomly for getting the data collected through questionnaire.
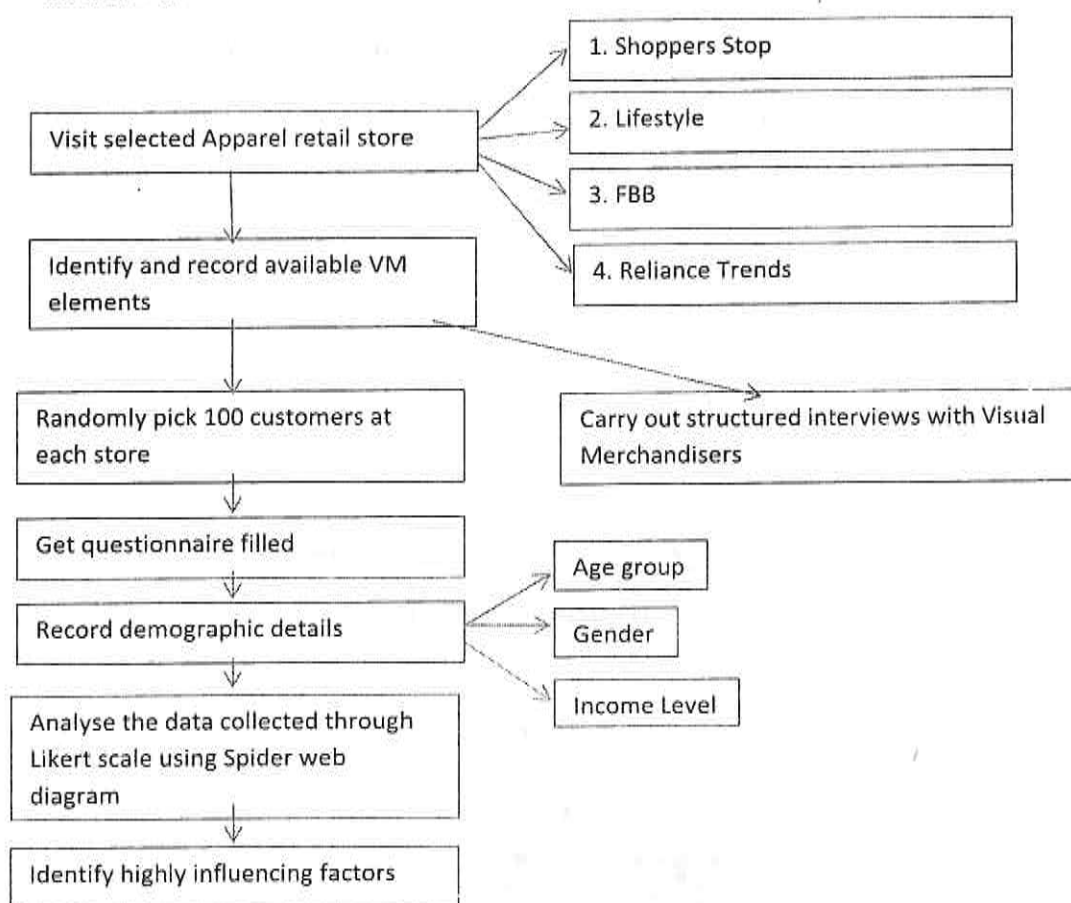
Fig. 4: Comprehensive work plan for research project

(d) Research design: The research design is divided into two parts, the first part is **Exploratory** in nature and the second part is **Descriptive**. In the first part, Visual Merchandisers and other retailers like Marketing / Sales Managers of the chosen four retail brands at three chosen cities were interviewed to understand the dimensions of VM Elements.

(e) Method of Data Collection: Quantitative data was collected through a questionnaire based survey which was self-developed and self-monitored as per requirements and objectives of the study.

(f) Sample Size & Sampling Technique: Since there is no information available regarding population of customers visiting the stores under study and also proportion of customers getting influenced by Visual Merchandising, hence the proportion of customers getting influenced by VM vis-à-vis those are not getting influenced by VM is taken as 50:50.

The method used for the sample size from proportion to estimate exact sample size.

$$S = [Z^2 P (1-P)]/d^2$$

Following are the values for the equation

Z (Z VALUE) = 1.96

P (Proportion value) = 0.5
D (Precision Level) = 0.05

Hence, the minimum sample size for this research stood at 385. To maintain the quality of research, the sample size is chosen as 500.

The sampling technique used was **Non-Probability** using **Mall Intercept Method** as customers who had purchased from the retail outlet were surveyed as they moved out of the store irrespective of whether they have purchased anything or not, since our study is not limited to just buying behaviour. Also respondents were chosen on the basis of **Convenience** of researcher.

(g) **Instrument of Data Collection**: Secondary data in the form of publications and research dedicated in the area of VM elements and their impact was taken into consideration. Primary Data was collected using close ended questionnaire for customers and instrument was distributed randomly. Interviews with Visual Merchandisers / retailers helped in listing out and understanding scope of VM elements and also for analysis of collected data post survey. Use of respondents' data was limited for research and ethical purpose only.

(h) **Analytical tool**: Data was analysed graphically using pie-charts and spider web chart. A Spider web graph is a two dimensional chart method of representing multivariate data of three or more quantitative variables. In such graphs, a point near the centre represents low value whereas a point near the edge represents high value.

IV ANALYSIS AND RESULT

Responses collected from 500 customers across all the four retail brands stores in three different cities, is given in the table below:

Table 1
Most influencing feature driving shopper inside the store

Most influencing feature driving shoppers inside the store	Exterior Graphics & signage	Window Display Setting	Store Façade	Merchandise on Display	Brand name and logo	Parking facility
Count	60	125	65	120	75	55

Fig. 5: Analysis of responses for external VM attributes

Table 2
Ranking order of External VM features based on response at Table 1

Rank	External VM Attribute
1	Window Display Setting
2	Merchandise on Display
3	Brand Name and Logo
4	Store Façade
5	Exterior Graphics and Signage
6	Parking Facility

The pie-chart diagram above explains that customers have diversified choices with respect to driving factors. However, the most influential features of external VM elements were found to be Window Display setting and Merchandise on Display. This means that Window Display is the most impactful characteristic of a store image which invite customers inside the store. There are other characteristics too which could be important for few and not for others. Brand name and logo was the third highest impactful attribute which means customers tend to walk inside a store of a trusted brand and they identify its outlets by its brand name and logo. This group of respondents do not get affected by VM attributes of other stores and have chosen this attribute as the most influencing factor for them to walk in a store. This also means that these customers are

brand loyal and do not get diverted with attractive offers and displays by other brands. The fourth highest rated attribute is store façade. This means that this set of respondents / customers are influenced by store's outer appearance, building size, color and entrance. These sub elements of Store Façade helps these customers to make a perception about the store's offerings. The least rated attribute was found to be Parking facility, which was chosen by around 10% of respondents. This means that only customers with own car / vehicle faced with the problem of parking their vehicle and this makes them to choose a store where they are provided with such facility. Other respondents either choose public transport or a cab to reach the store and hence they didn't get affected with parking issue.

Table 3
Most noticed feature inside store

Most noticed feature inside store	Layout	Theme	Color	Music	Lighting	Mannequin	Display	Cleanliness	Temperature	Furniture	Smell	Cash Counter	Floor directory	Trial Room
Count	0	0	0	48	68	87	95	65	0	0	0	70	0	67

Most noticed feature inside the store

Trial Room 13% | Music 10% | Lighting 14% | Mannequin 17% | Display 19% | Cleanliness 13% | Cash Counter 14%
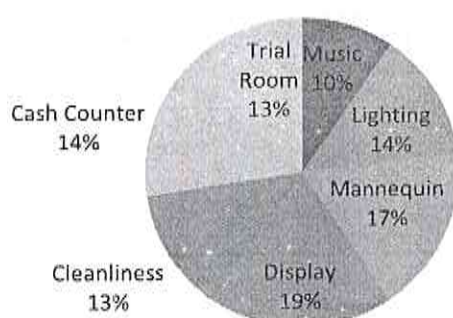
Fig. 6: Analysis of responses for Internal VM attributes
Table 4
Ranking order of Internal VM features based on response at Table 3

Rank	Internal VM Attribute
1	Creative Product Display
2	Mannequin styling
3	Cash Counter and Lighting
4	Cleanliness and Trial Room
5	Music
6	Store Layout, Interior Theme, Color, Temperature, Furniture, Smell and Floor Directory

The most noticed features inside a store were found to be Display and Mannequins. This could have aroused from recent experiments by Shoppers Stop and Lifestyle with innovative mannequins and display techniques. And also since mannequins give an idea about the garments look and fit, which makes the customers to notice the garment and mannequin more than other VM attributes. The other important attributes were cleanliness in the store; trail rooms and cash counter where customers spend a considerable amount of time and happen to notice them. Availability of trial rooms can even make or break a selling opportunity. There are customers who restrict themselves to buy garments without trying them. in spite of store's return / exchange policies. Cash counter is a place where customers might have to wait in a que for their turn to billing process. Its frequency and duration may wary with season, day of the week and hourof the day. Generally there is huge crowd during sale and festive season. Also customers might have to wait in que on weekends and evening hours of the day. Here waiting in the que is not that important with respect to VM elements. On the contrary, the most important feature about cash counters is its impact on impulse purchase. Retailers tend to put some items near cash counters, to be noticed and tempted by customers while they are waiting in the Que. This leads to impulse buying and there by sales of the store. Music was found to be least noticed feature inside the store but it does not mean it is the least important too. Actually impact of Music and lighting is more of psychological then physiological. Customers might be enjoying the music and thereby the shopping experience without noticing that it is the music which made them feel good. However the attributes of music and lighting were not completely rejected which means that these attributes attracted customers' attention, made a remark and registered their presence.

Other internal attributes of a store like layout, theme, color. temperature. furniture, smell and floor directory could not get a single response in this survey. However this does not mean that these attributes lack importance as the question was for the most noticed feature. This means that these attributes were definitely not the most noticed nc but could be of considerable importance to customers and anyway all these elements of the store, collectively helps to build up the store image.

Table 5
Level of agreement on impact of VM elements

Attributes	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Exterior Signage	50	195	200	55	0
Façade	232	260	8	0	0
Parking lot	175	163	140	22	0
Window Display	405	95	0	0	0
Merchandise Presentation	255	237	8	0	0
Brand Name and logo	50	220	230	0	0
Furniture	70	167	163	100	0
Music	165	235	80	20	0
Lighting	312	188	0	0	0
Temperature	170	300	30	0	0
Cleanliness	270	230	0	0	0
Smell	255	210	35	0	0
Cluster Displays	270	230	0	0	0
Color Blocking	387	113	0	0	0
POS	70	200	210	20	0
Price tag	320	120	50	10	0
Trail Room	305	106	39	50	0
Mannequin	378	122	0	0	0
Interior Signage	217	283	0	0	0
Store layout	137	210	128	25	0
Total Responses	4493	3884	1321	302	0
Percentage	45%	39%	13%	3%	0%
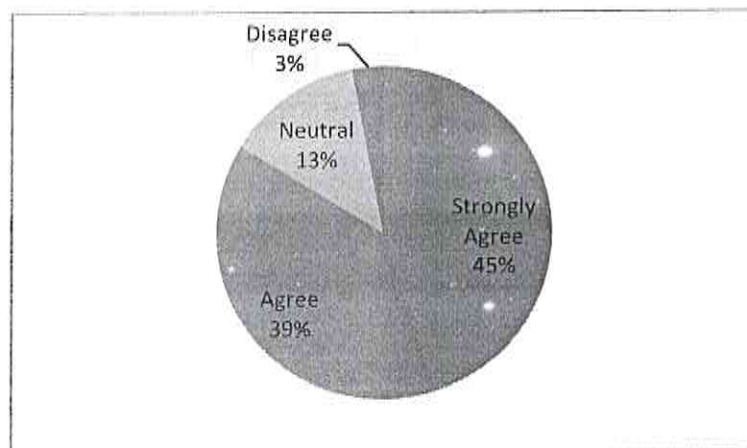
Fig. 7: Pie chart- Response distribution of sample

Total responses of 500 samples were analysed to check the impact of VM elements on behaviour of customers. The Pie-chart distribution above shows that 84% of the total responses are either 'strongly agree' or 'agree' which proves a positive impact of VM elements on customer behaviour. 13% of response was 'Neutral' which could be because respondent was not aware of the impact of that VM element. Out of total responses of 500 respondents, "Strongly Disagree" was not noted even once. The above data was plotted in spider-web diagram to clearly demonstrate the highly influential VM elements.
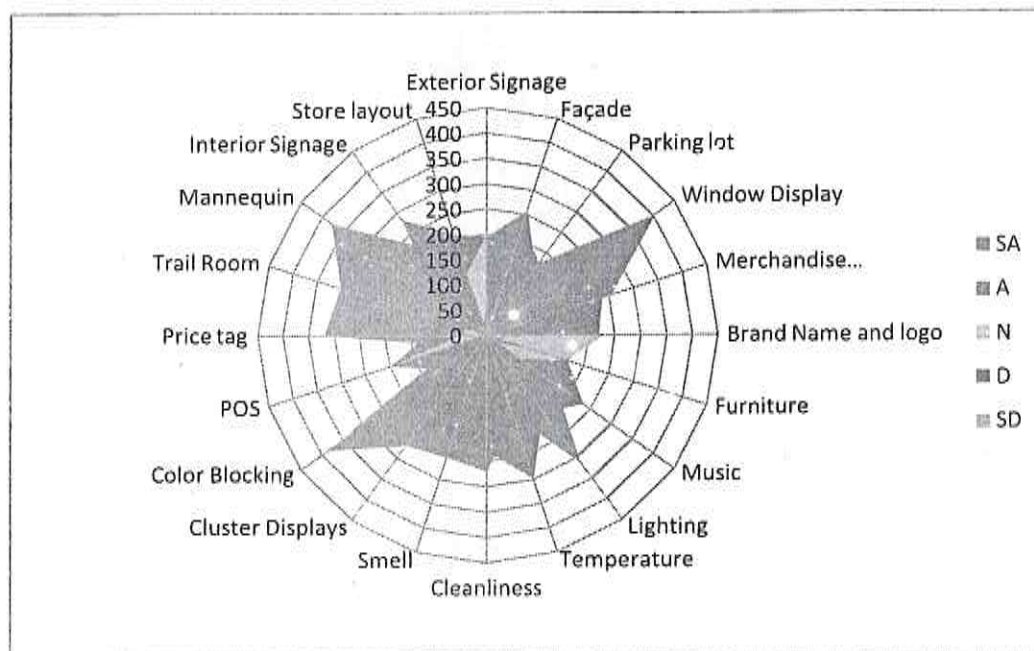
Fig. 8: Spider-Web diagram - showing number of responses on impact of VM elements

The graph and the table above, clearly indicates that Window display, Color blocking and mannequins are the most influential elements on consumer buying behaviour. Lighting and use of Price tags also found to be of great impact which might be because customers are price sensitive.

(a) **Gender Information:**

(i) Gender information graph below shows that 73% of sample respondents were Female and only 27% respondents were male, who buy apparels from the stores under study. Hence these stores should target and arrange the VM of the store so as to attract and influence women customers.

Gender distribution

Figure no. 9: Analysis of Gender Information of the sample

(b) Age Group Information:

The graph below show that majority of respondents belong to the age group of 30-40 years where as almost equal percentage of respondents belonged to the age group of 20-30 years. However we have a small percentage of samples (6%) with age of 50 years and above. Hence these retail stores should focus on the age group of 20 to 40 years.

Age group distribution
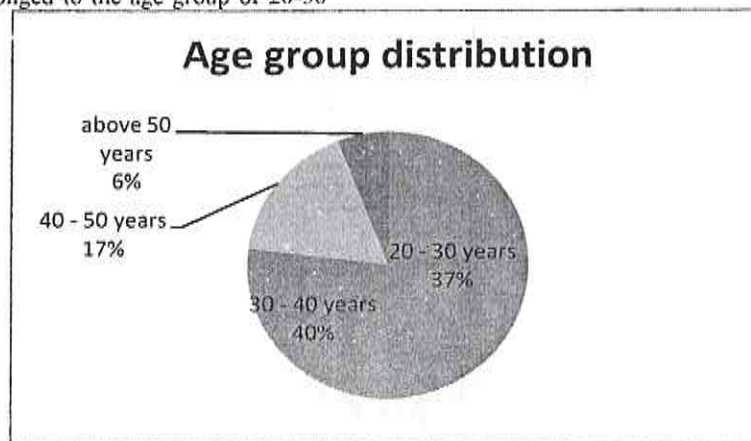
Fig. 10: Age group distribution of sample

(c) Occupation Information: A major portion of sample respondents either have a job or a business and are earning through it. however an equally big portion of respondents were student which means their expenses are being taken care by either their parents or guardians. A little less population belonged to 'unemployed' yet not students form the 15% population of the samples under study.

Occupation of sample
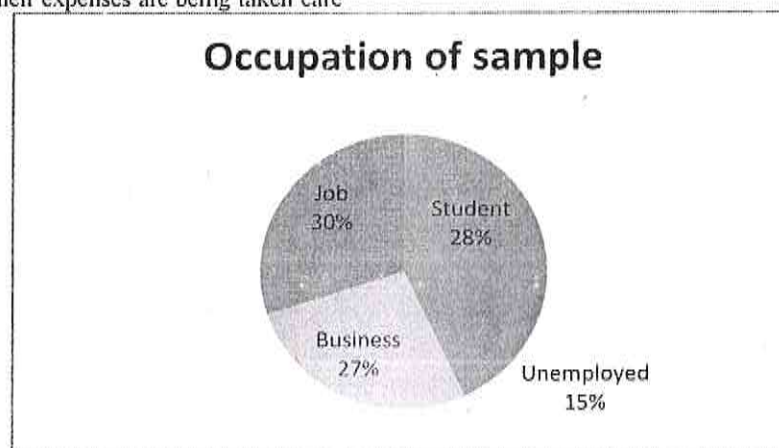
Fig. 11: Occupation information of sample

(d) Family Income Information: The graph below shows that majority of respondents have an annual family income from 5 to 10 lacs and above 10 lacs. This is because these stores are premium retailers which sell on MRP and occasional discounts. Hence, if this bracket of high income customers is targeted well, sales can be increased dramatically.
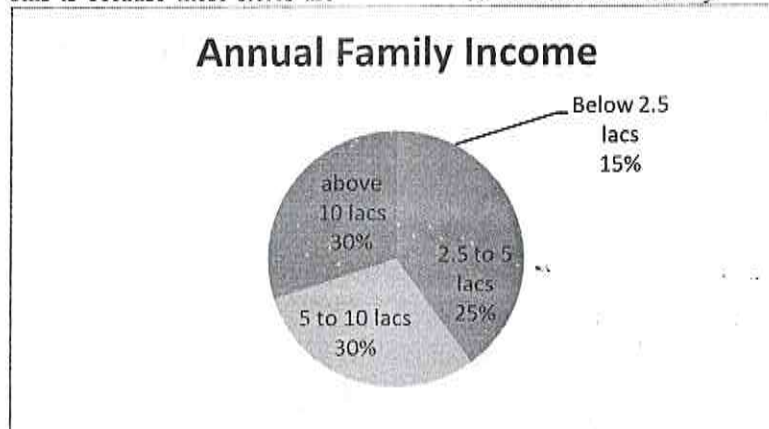
Fig. 12: Annual family income information of sample

(e) Education Information: 80% of samples were found to be Graduate and above.

Fig. 13: Educational Qualification of sample

(d) Frequency of visit to the store: 41% of samples visit the store every month. And 38% of samples visit the store once in three month. However, apart from VM frequency of visit also depends on festivals, vacations, seasons and availability of new merchandise in the store.
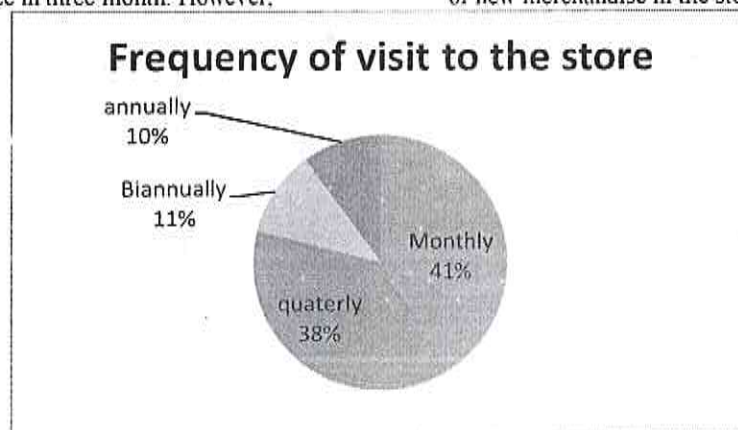
Fig. 14: Frequency distribution of visit to the store

(e) Expenditure per visit: The average expenditure per visit of 43% of samples was found to be below Rs. 2000. This bracket of customers can be made to spend more by using sales promotion schemes. VM can also help in increasing the bill value by suggesting mix and match options of apparels and accessories and impulse sales. ,
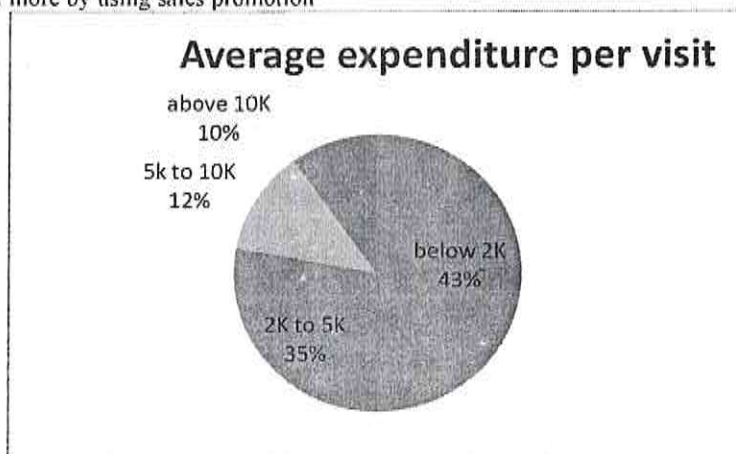
Fig. 15: Average expenditure of samples per store visit

V RECOMENDATION AND CONCLUSION

The highly effective or influential visual merchandising elements of apparel retail stores were found to be Window Display, Color blocking, Mannequins, Lighting and use of Price tags. Taking these highly influential factors into account, it is recommended that:

(a) Retailers should concentrate more on creative and interesting window displays at the store front, which could attract attention of passers-by, build a positive brand image and invite them inside the store. Since mannequin was also found to be one of the highly influential attribute of VME, its use in window displays will increase its effectiveness multiple times. Lighting inside the window display area should be proper and sufficient enough so as to make it clearly visible from a distance.

(b) Use of digital screens inside the store and also in the window display area is also in fashion. Instead of spending hours of time, money and labour in creating and executing a window display and keep changing it at regular intervals to hold the interest levels of customers, retailers have now moved to digital versions of window display by using digital screens in the display area. Pictures or videos of items on promotion can be displayed on such screens. Pictures can be changed easily by putting it on slide show. Also use of large screens or a combination of screen makes it possible for customers to observe the displayed product from a distance. Mannequins are then replaced by real models used for photo shoot of apparels. And with video, retailers can also show the usage and fit of the garments with different combinations of other items and accessories.

(c) Since lighting was also found to be an influential element of VM, it is suggested to use it in a creative way with a motive of inspiring customers.

(d) To attract customers' attention on apparels inside the store, mannequins can be used interestingly. There are stores where colourful / metallic mannequins are being used, just to stand out in the market and grab customers' attention. On the other side, stores have started rejecting ideal body type mannequins and adopted real life body type mannequins like underweight, overweight and pregnant lady body type.

(e) It was realised that almost 3 quarters of the sample respondents were female. Hence these stores should target and arrange the VM of the store so as to attract and influence women customers.

VI LIMITATIONS

Sampling method used for this research was non-probabilistic and also data was collected only from three cities which do not give equal distribution of samples across the country. Stores under study were Premium category retailers. However, response for discount stores, mass brands and luxury brand retailers could differ.

VII FUTURE RESEARCH SCOPE

(a) Frequency of visit of samples was studied through this research. However reason of visit was not checked. Future researchers may try to find out reasons for visit and relate them to VM elements.

(b) This research was based on Premium category MBOs. Similar research on SBOs and Discount stores can also be conducted.

(c) Through this research impact of VME were studied on behaviour of customers. However Consumer buying behaviour can also be studied by future researchers relating the impact of VME with buying pattern.

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Develop a Novel Screening Tool Based on Wavelet Transform for Identification of Diabetic Retinopathy

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ABSTRACT

Diabetes is a long term organ disorder that occurs when the level of blood sugar is huge as pancreas does not produce enough insulin in body or alternatively, cells do not react well to insulin. Diabetic Retinopathy (DR) is the critical and most common eye related disease which arises on diabetic patients. It appear when the blood vessels of retina started to swell and leaks blood that at last became major source of vision loss. Early retinal screening is the best solution to prevent from Diabetic Retinopathy. In this paper we present an Image Retrieval method which find and retrieve the patient's retina image from the Database of normal and DR affected images. A retrieval process will be developed by extracting image's features by using Discrete Wavelet Transform (DWT) and checking the similarity between the query and database image by measuring the Euclidean distance. The Discrete Wavelet Transform retrieval system will give fast search over the number of images and improve accuracy. The presented system will reduces the professionals work to analyze every fundus image rather than diabetic affected image and develop a prototypical DR image management system to improve diagnostic performance.

Keyword - Image Retrieval, Discrete wavelet transform, Diabetic Retinopathy, Euclidean distance, Retina image.

I INTRODUCTION

As the time goes the number of diabetic patients has been increased. It arises when the blood sugar level is very high either due to inadequate production of insulin in body or the cells do not respond properly to insulin [1]. Due to diabetic diseases body blood vessels may get weakened and it can affect different regions of physical structure. When glucose level in retinal blood vessels is high, the sight will be affected and obscured and cause blindness. This is known as Diabetic Retinopathy [2]. It damages the small blood vessels present in retina which may result in bleed or leak fluid and distorting vision. The risk of the DR becomes more affected and danger with age and so older diabetic patients are prone to Diabetic Retinopathy [3-5].

There are four different stages of diabetic retinopathy. The condition of DR may increases from no or mild retinopathy to a much more severe stage. The explanation of Different stages is given as [6-9]:

(a) **Mild nonproliferative diabetic retinopathy:** it is the first stage of DR. In this stage the retina's small blood vessels are started to swell which is called microaneurysms.
(b) **Moderate nonproliferative diabetic retinopathy:** in this stage the swelling increases and the blood vessels started to distort.
(c) **Severe nonproliferative diabetic retinopathy:** in this stage the many blood vessels are blocked due to which blood supply to retina areas are deprived.
(d) **Proliferative diabetic retinopathy:** it is the last and most dangers stage in which new fragile blood vessels of retina can begin to grow. This new vessels can leak blood and pull on the retina as they grow which causes of vision loss.
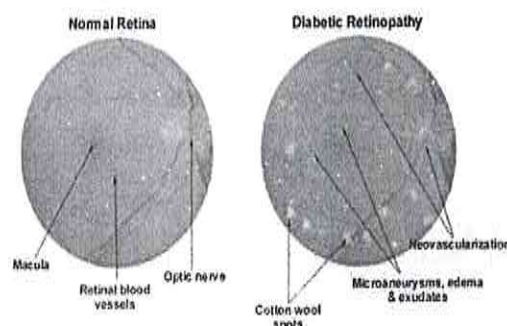
Fig. 1: Retinal image

The early detection of diabetic retinopathy stages can effectively reduce the risk of vision loss in diabetic patients. For the detection process the content based image retrieval technique become more popular [10-12]. CBIR is an automatic image retrieval system based on some specific characteristic like color, shape and Texture. The main purpose of the presented work is to retrieve images matched with the patient's retina image from retina's databases by using DWT based feature extraction technique. Feature extraction is the essential act in the design of retrieval model in which we extract unique and important information from the image [13]. Here the DWT is used to create the feature vector properties. The input retina image is compared with the image database by extracting features from images and computing Euclidean distance between them which is used for the purpose of similarity comparison. At last the images with minimum distance are displayed.

II PROPOSED SYSTEM

This system proposes an algorithm for automatic detection of DR using digital retina images. On the regard of difficulties that arise due to the direct application of typical expansion techniques to Diabetic Retinopathy, we propose to utilize DWT technique.

(a) Discrete Wavelet Transform: By far the most useful information that can be extracted from images for matching purpose is the image's feature point like-energy. Energy is the most popular feature of an image and it is very easy to find and operate. This paper try to analyze such a technique that matches images based on their energy feature describe by DWT [14].

DWT decompose an image not only in one but in number of basis function and because of their multi-resolution behavior it gives fast search over the number of images [15-17]. DWT is that decode constantly from low to high resolution. It divides the image into low and high frequency element. The low frequency is again divided into high and low frequency elements. Many researchers are interested by it because it does not damage by rotation, scaling and translation of an image. Here we find quadratic distance between two color retinal images are from database and query image. First decompose the image in 4 sub-bands using DWT then energy of lower sub-band are calculated. Finally evaluate the Euclidean distance from database to query image [18].

(b) Algorithm & Flow Chart:
    (i) Input the query image.
    (ii) Resize image to 256×256.
    (iii) Convert the RGB query image into Grey image [19].
    (iv) Decompose the image into four sub-images by applying Discrete Wavelet transform (DWT).
    (v) Find out the value of energy of lower subband [20], using following formula:

$$E = \frac{1}{N}\sum_{x,y}(I_{m,n})^2 \qquad (1)$$

Where I is the intensity of the pixel located at row m and column n and N is the total number pixel.
    (vi) Create the retinal image database which contains images of various diabetic retinopathy signs.
    (vii) Reading all the retinal images from database.
    (viii) Resize to 256×256.
    (ix) Decompose each and every image of Database separately by using DWT and Calculate Energy of lower sub-bands for each image.
    (x) Storing the feature vectors as an array.
    (xi) Comparing the feature vector of query image with data base images using Euclidean distance [21]. Euclidean distance (ED) measures the distance between two vectors of Images as:

$$ED = \sqrt{\sum_{x=1}^{k}(E_x - D_x)^2} \qquad (2)$$

Where E_x is the query feature vector and D_x is the dataset feature vector. k is the total number of feature vectors.
    (xii) Arranging them in a sorted order.
    (xiii) Find the minimum distance and give similar images as result.
    (xiv) To measure performance of the system calculate precision and recall by following formulae:

$$Precision = \frac{(No.\ of\ retrieved\ images\ that\ are\ relevant)}{Total\ no.\ of\ retrieved\ images}$$
$$(3)$$
$$Recall = \frac{(No.\ of\ retrieved\ images\ that\ are\ relevant)}{Number\ of\ relevant\ images\ in\ the\ database}$$
$$(4)$$

Fig.2 depicts the overall methodology in detection of diabetic retinopathy.
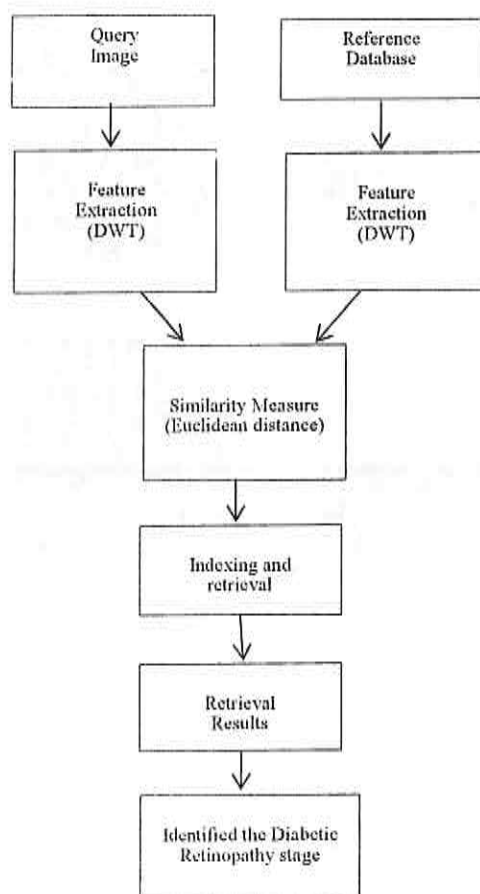
Fig. 2: Flowchart of the proposed methodology

III EXPERIMENTAL RESULTS

The retinal image database which contains images of various diabetic retinopathy signs are collected and analyzed from Aashirwad Laser & Phaco Eye Hospital Bilaspur. The patient's retina images (Shown in fig.3) are processed and features are extracted using DWT as shown in fig 4.
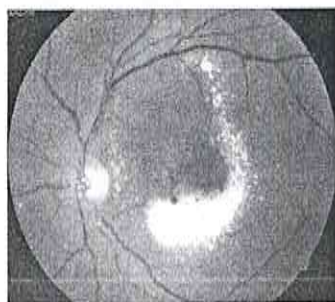
Fig.3: Query image
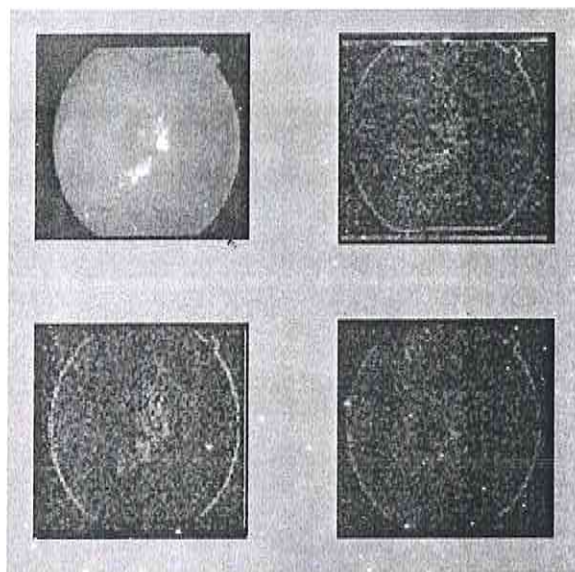
Fig.4: Wavelet Transform of Query image

After finding energy of each and every database images, the results are measured by Euclidean distance. According to minimum Euclidean distances the result is sorted in descending order and the top 5 most similar image is shown in fig 4 which is all related to nonprolifrative diabetic retinopathy. The table 1 shows the Euclidean distances between query image and the database image.

The precision and recall is calculated as:
- Precision: 64%
- Recall: 57%
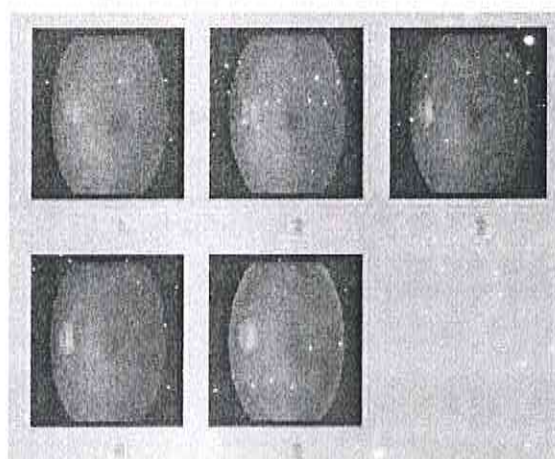
Fig. 5: The Retrieve retina image

Table 1
Euclidean Distance of Retinal Images

S. No.	Euclidean distance
1	0.149
2	0.151
3	0.156
4	0.162
5	0.171

Displayed result: "Patient has nonproliferative Diabetic retinopathy".

IV CONCLUSION

Early detection and timely treatment of DR can reduce the growth of it and prevent blindness. The Retrieval algorithm presented in this paper reduces the complex computational work and at the same time improves the detection process. The accuracy is also improved because the images are matched on the base of energy feature extracted by DWT. The experiment result shows that the limited numbers of relevant image is retrieved with precision rate of 64% and recall rate of 57% to reduce the analysis time. As this method is implemented in Matlab software, it can be applicable freely in numbers of real time applications.

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Uncertain Load Models and Their Representation in Power Systems

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ABSTRACT

Various uncertainties exist in the power systems and one of them is load uncertainty. As the power system network is undergoing various market pressures these days, it becomes very important to tackle the uncertainties. Due to the penetration of the distributed generation at the load ends in the system, the load bus uncertainty becomes a matter of serious concern. In this paper, the handling and representation of various uncertain load models are given. The affect of uncertainties in the system has been observed by a dynamic load flow program and severe case has been identified by a sensitivity index namely absolute minimum eigen value of load flow Jacobian. The proposed scheme is implemented on IEEE-14 bus system.

Keywords: Uncertain loads. L-Index. dynamic load flow

I INTRODUCTION

Various uncertainties exist in a power system and one of them is the load uncertainty. These uncertainties need to be tackled carefully while performing any kind of analysis in the power system. Due to the increasing nonlinear and dynamic loads. Distributed Generation units, unplanned outages, and other contingency events, the penetration level of uncertainty at the load end increases. The primary objective of the power system operators and planners is to make the operation of the system adequately within acceptable limits of the operating quantities. The conventional approach for the analysis purpose of the power system were based on deterministic methods but these days, the uncertainties in the complex systems are tackled by the probabilistic methods which bank upon the development of uncertain load models and dynamic load flow programs. In [1, 2], the estimation and representation for the complex analysis of the system are shown. The commonly used techniques for uncertainty and sensitivity analysis are presented in [2] using response surface analysis. Monte Carlo analysis, differential analysis. fast probability integration. Fourier amplitude sensitivity test. and Sobol's variance decomposition. In this paper, the uncertain load models namely 'Normal distribution, Exponential distribution. Gamma distribution. Beta distribution. Deviation from the base case loading and Lognormal distributed load models are presented. L indexes and the load flow results corresponding to

critical case are given in results and discussion section.

This paper is organized as follows: Section-I is introductory part. section-II deals with uncertain load models. the results and discussions are given in section III. Section IV contains the concluding remarks preceded by reference section.

II UNCERTAIN LOAD MODELS

The proposed scheme is implemented on IEEE-14 bus system. Refer Appendix of this paper for details.

(a) Normal distributed load
Bus no. 4 is selected for normally distributed load modelling. This load modeling is done as follows [3,4]

$$f(P_D) = \frac{e^{-\frac{(P_D-\mu)^2}{2\sigma^2}}}{\sigma\sqrt{2\Pi}}$$

(i)

$$-\infty \leq P_D \leq \infty$$

$$\sigma > 0$$

$$P_{D_i}(\Psi_N) = Normrnd(\mu,\sigma,m,n) \text{(ii)}$$

Where:
P_D is the rated load at bus no. 4
$\mu=20$
$\sigma=2$
$m \times n$ is a 24×1 array
The load distribution curve is shown in figure 1.
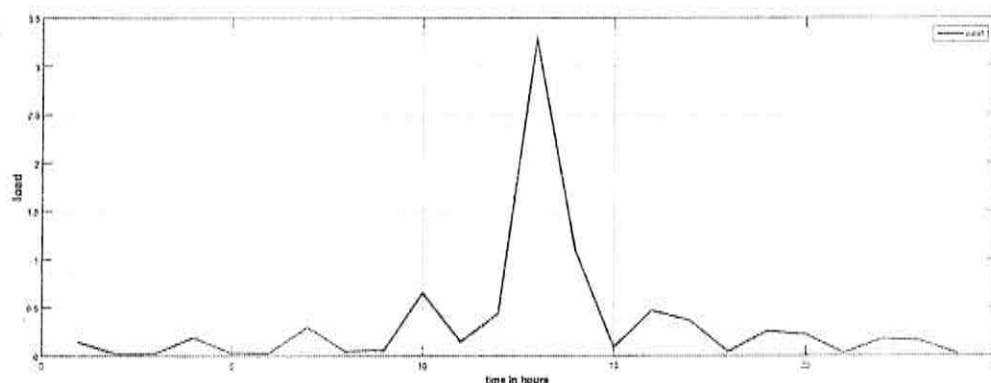
Fig.1 normally distributed load at bus no.4

(b) Exponential distributed load
Bus number 5 has been selected for exponential load modelling. This load modelling is done as follows:

$$f(P_D) = \frac{e^{-\frac{(P_D-\mu)}{b}}}{b} \quad \text{(iii)}$$

$P_D \geq \mu$
$b > 0$

Exponentially distributed real power load is at bus no. 5 with b=1.8 is shown in figure 2

(c) Lognormal Distribution
Bus number 12 has been selected for exponential load modelling. This load modelling is done as follows:

$$f(P_D) = \frac{e^{-\frac{\left(\ln\left(\frac{P_D-\mu}{m}\right)\right)^2}{2\sigma^2}}}{\sigma(P_D-\mu)\sqrt{2\Pi}} \quad \text{(iv)}$$

$P_D \geq \mu$
$\sigma > 0$
where
m: The scale parameter
ln: The natural logarithm

Lognormally distributed real power load is at bus i=12 with μ=0.5 and σ=0.3 and its distribution is shown in figure 2
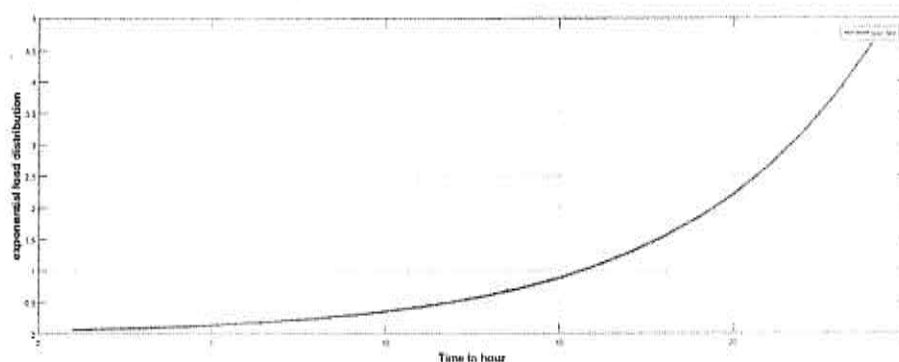
Fig.2 exponentially distributed load at bus no.5
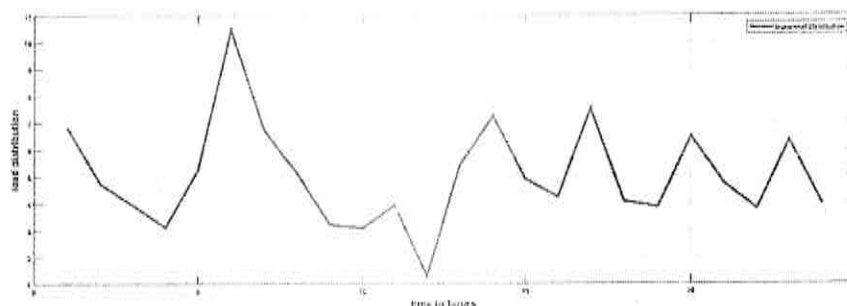
Fig.3 lognormally distributed load at bus no.12

(d) Gamma Distribution

Bus number 11 has been selected for exponential load modelling. This load modelling is done as follows:

$$f(P_D) = \frac{(P_D - \mu)^{a-1}}{b^a \Gamma(a)} e^{-\left(\frac{P_D - \mu}{b}\right)} \quad \text{(v)}$$

$$P_D \geq \mu$$
$$a > 0$$
$$b > 0$$

Gamma distributed real power load is at bus i=12 with μ=0.4 and shown in figure 4.

$$d \leq P_D \leq c$$
$$a > 0$$
$$b > 0$$

where
a,b: The shape parameters

(e) Deviation from the base loading

Bus no. 10 is selected for this load modelling and it has been done as follows:

We took a load adjustment factor (λ) which increases the load uniformly from 0 to 1.5 of rated load value and it is shown in figure 5.

$$P_{Di}(\Psi_{db}) = P_{Di}^0(1 + \lambda) \quad \text{(vi)}$$

(f) Beta Distribution

Bus no. 7 is chosen for Beta distribution load modelling it has been done as follows

$$f(P_D) = \frac{(P_D - d)^{a-1}(c - P_D)^{b-1}}{B(a,b)(c-d)^{a+b-1}} = \frac{\Gamma(a+b)(P_D - d)^{a-1}(c - P_D)^{b-1}}{\Gamma(a)\Gamma(b)(c-d)^{a+b-1}} \quad \text{(vii)}$$

c: The upper bound
d: The lower bound
B (a, b): The beta function
Here, the beta distributed load model is shown in figure 6.
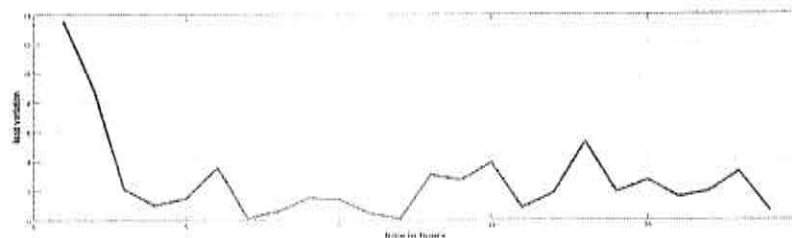
Fig.4 Gamma distributed load at bus no.11
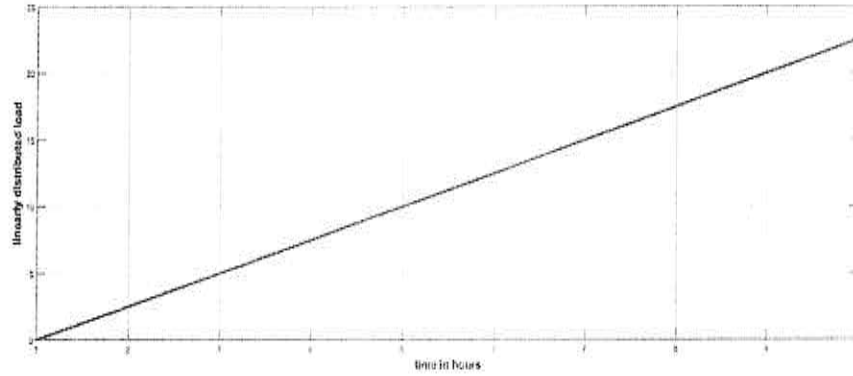
Fig.5 Gamma distributed load at bus no.10
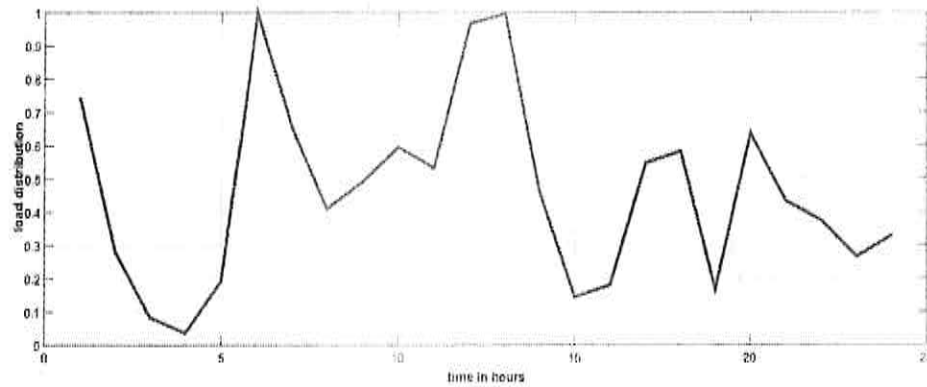
Fig.6 Beta distributed load at bus no.10

III RESULTS AND DISCUSSIONS

Corresponding to above mentioned uncertain inputs a critical case is identified by a sensitivity index the results are discussed here. The L-index [5] for all the lines of IEEE-14 bus system for the critical case has been calculated by using the equation(viii) and shown in table 1 and the critical values which are close to unity are highlighted. Where:

X_{ij}:   Line reactance.
P_j: Active power at the receiving end
Q_j: Reactive power at the receiving end
V_i: Sending end voltage

Any line in a system that exhibits Lij closed to unity indicates that the line is approaching its stability limit and hence may lead to system violation. Lij should always be less than unity in order to maintain a stable system. Lij is termed as voltage stability index of the line. At collapse point, the value of Lij will be unity. Based on voltage stability indices, voltage collapse can be accurately be predicted. The lines having high value of the index can be predicted as the critical lines, which contribute to voltage collapse. At or near the collapse point, voltage stability index of one or more-line approach to unity. This method is used to assess the voltage stability. Line voltage stability index is used to calculate the proximity of the operating point to voltage collapse.

$$L_{ij} = \frac{4\left[\left(P_j X_{ij} - Q_j R_{ij}\right)^2 + \left(P_j R_{ij} + Q_j X_{ij}\right)V_i^2\right]}{V_i^4}$$ (viii)

Table -1
L index of all the lines

Line no.	1	2	3	4	5	6	7	8	9
L-index	0.0427	0.0842	0.0409	0.1284	0.1503	0.1518	0.0067	0.1573	0.26712
Line no.	10	11	12	13	14	15	16	17	18
L-index	0.3057	0.9850	0.0797	0.1717	0.2521	0.1296	0.0061	0.0058	0.0530

Line no.	19	20	
L-index	0.0778	0.2245	Table shows the L-index for all the lines of IEEE-14 bus system
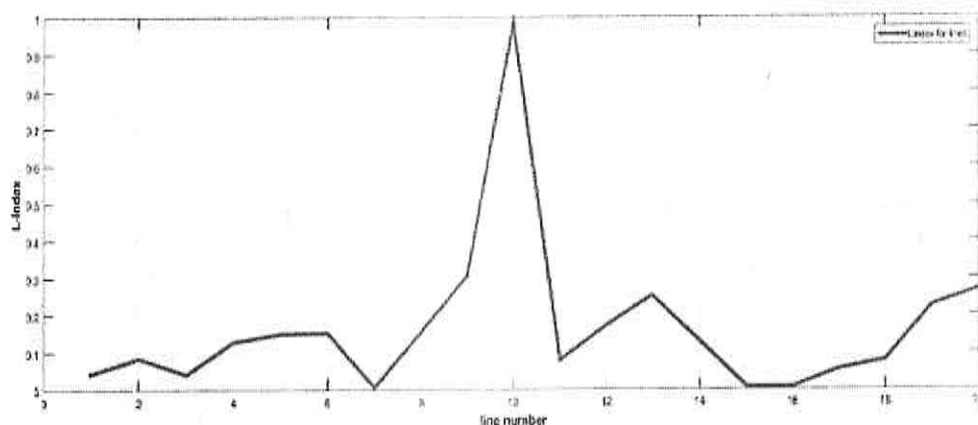
Fig.7 Variation of L-index

Table 2
Load Flow Results Corresponding to Critical Case
Min Eigenvalue = 0.5281

Bus No.	Voltage Mag. (p.u.)	Active Load (pu)	Reactive Load (pu)	Active Generation (pu)	Reactive Generation (pu)
1	1.010	0.000	0.000	1.14700	0.09960
2	1.000	0.21700	0.12700	1.29924	0.53098
3	0.950	0.94200	0.19100	0.20000	0.15550
4	0.944	0.59488	0.06080	0.000	0.000
5	0.952	0.8236	0.01600	0.000	0.000
6	0.970	0.11200	0.07500	0.000	0.11149
7	0.946	0.000	0.09980	0.000	0.000
8	0.970	0.000	0.000	0.000	0.13306
9	0.933	0.29500	0.16600	0.000	0.000
10	0.933	0.07181	0.04628	0.000	0.000
11	0.947	0.03500	0.01800	0.000	0.000
12	0.952	0.06100	0.01600	0.000	0.000
13	0.945	0.13800	0.05800	0.000	0.000
14	0.918	0.14900	0.05000	0.000	0.000
Total		2.69804	0.92387	2.78897	1.03063

IV CONCLUSION

In this paper, a scheme for representation of uncertain loads is presented and its handling in power system load flow studies has been shown. This can further be used for the voltage stability analysis and power system optimization studies. The critical case corresponding to uncertain inputs has been identified by the absolute value of minimum load flow Jacobian and corresponding load flow results are shown. Matlab2015 has been used to solve the formulated problem.

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APPENDIX
IEEE-14 BUS SYSTEM

IEEE 14 bus 20 lines system is shown in Figure 8 and its bus data are given in table 3. System Bus no. 1 is choosen as slack bus and bus no. 2, 3, 6, & 8 are generator buses. While the remaining buses 4, 5, 7, 9, 10, 11, 12, 13, & 14 are the load buses.
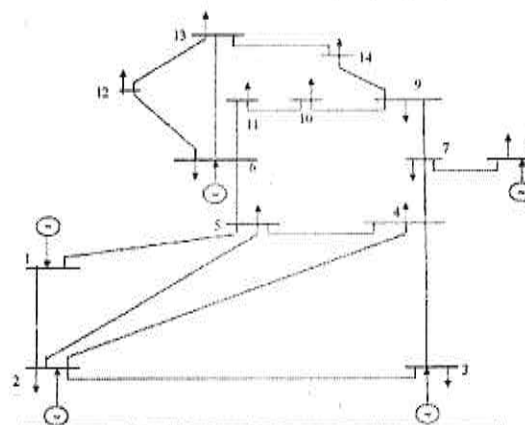
Bus No.	Vsp (pu)	P_{Li} (MW)	Q_{Li} (Mvar)
1	1.0600	0	0
2	1.0450	21.7000	12.7000
3	1.0100	94.2000	19.0000
4	1.0000	47.8000	-3.9000
5	1.0000	7.6000	1.6000
6	1.0700	11.2000	7.5000
7	1.0000	0	0
8	1.0900	0	0
9	1.0000	29.5000	16.6000
10	1.0000	9.0000	5.8000
11	1.0000	3.5000	1.8000
12	1.0000	6.1000	1.6000
13	1.0000	13.5000	5.8000
14	1.0000	14.9000	5.0000

Single Tuned Harmonic Filter Design for Grid Connected PV System

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ABSTRACT

A grid-connected photovoltaic power system or grid-connected PV power system is electricity generating solar PV system that is connected to the utility grid. Its impact on power quality of the system is major concern for both utility company and users but that quality may be affected by harmonics. Therefore reducing harmonic content in the grid connected power system is very important. In this paper, effect of single tuned harmonic filter on grid connected PV system is analyzed. Its impact on harmonics and power factor is considered. For simulation study PV connected system of Dr. C.V. Raman university, Kota is considered .For simulation study ETAP software is used. The system parameters are taken from actual site condition.

Keywords- PV Solar, Harmonic, power quality, LV distribution system, harmonic filter.

I INTRODUCTION

The power quality of electrical power systems has a severe influence on control and utilization of power.

Electrical power systems behave like nonlinear loads, creating a deformed waveform that is made up of voltage and current harmonics. Voltage and current harmonics created by these nonlinear loads cause problems such as increasing power losses, degrading the conductors, and as a result have negative effect on the distribution systems and other electrical segments. It is therefore essential to evaluate the complete effect of these harmonics. The sum total of the various harmonics present in a system is called Total Harmonic Distortion (THD). THD gives the opportunity to evaluate the extent of distortion in a system.

Total Harmonic Distortion (THD) is the common used index to indicate the level harmonic distortion the THD can be calculated using

Where F_i is the amplitude of ith harmonic, and F1 is for fundamental component [3].

Individual frequency components are aggregated based on rms calculation as shown in below equation

Where F represent voltage (V) and current (I) in rms value represent the harmonic order, I is a simple counter [4].

II METHODOLOGY

Single line diagram of PV connected distribution system of Dr. C.V. Raman University is shown in figure 1. At present distribution system is supplied from 315kVA, 11000/415V Grid connected Transformer. 10kW solar panel is also grid connected through 415 V system at Bus 5. Simulation is done by using ETAP software.

$$THD = \frac{\sqrt{\sum_{2} F_i^2}}{F_1}$$

$$F_{rms} = \sqrt{\frac{1}{15} \sum_{i=1}^{15} I_i^2}$$
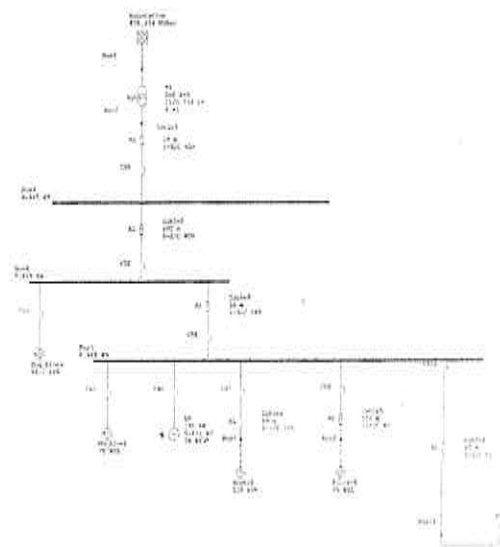
Fig.1 Distribution system single line diagram of Dr. C.V .Raman University

Total Harmonic Distortion analysis is performed for the single line diagram as shown in figure.1 and it is found that the THD at bus3, bus 4 and bus5 is 4.91%, 4.38% and 4.23% respectively. To reduce this harmonic content in.the system use of single tuned harmonic filter is considered.
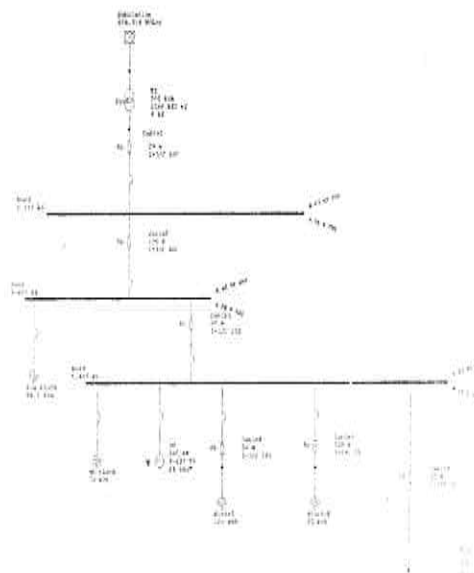
Fig.2 THD analysis of 10kW Grid connected PV solar system

The objective of this research is to analyze the effect of single tuned harmonic filter on the harmonics for PV Integrated system in order to avoid exceeding harmonic limits therefore the future problem that will arise due to the large integration of grid connected PV solar system can be avoid during initial planning. [6,9]. In order to reduce the harmonic content , single tuned harmonic filter is considered and simulated and connected at bus 3 via a circuit breaker. Single tuned harmonics Filter can be designed for any particular harmonics to eliminate. To design the single tuned harmonics filter, its different parameters(capacitance, inductance, resistance) must be set to eliminate a particular harmonic frequency.
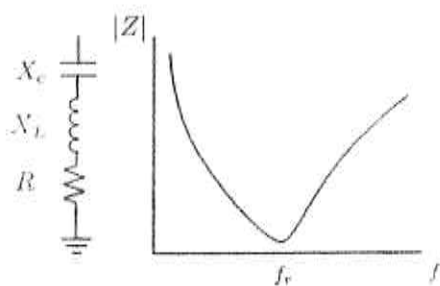
Single tuned filter

$$C = \frac{Q_c}{2\pi f V^2} \qquad X = \frac{1}{2\pi f h C} = \sqrt{\frac{L}{C}}$$

$$L = \frac{X}{2hf} \qquad Q = \frac{2\pi f L}{R} \qquad R = \frac{1}{2\pi f C}$$

Existing power factor is approx 90% and desired power factor is 97% . To reduce say .10th order harmonic component harmonic frequency would be 500 Hz and all the parameters are set according to this harmonic frequency. . C = 2.2 millifarade, inductive reactance =0.01 ohms ,resistance = 0.15ohms. These data are fed to ETAP software and the simulation results are shown as follows
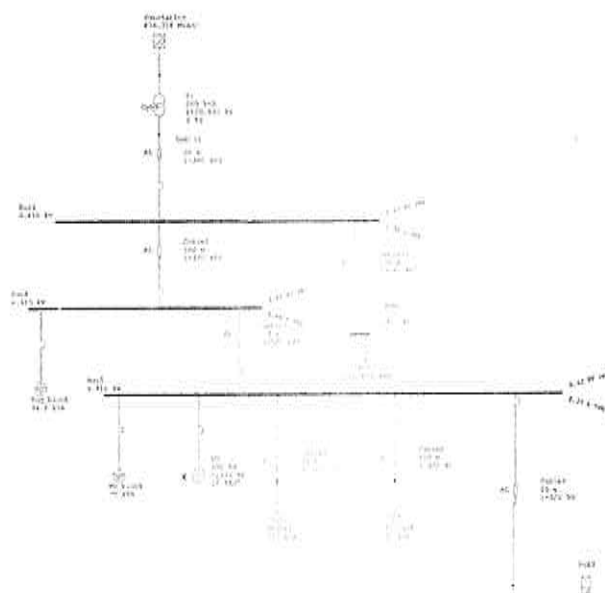
Fig.4 THD for single tuned harmonic filter connected to grid connected PV system

III RESULT

From above analysis ,THD is analyzed for single tuned harmonic filter designed to eliminate 10th order harmonic in grid connected PV system.

SINGLE TUNED FILTER	THD at BUS 3	THD at BUS 4	THD at BUS 5
WITHOUT FILTER	4.91%	4.38%	4.23%
WITH FILTER	2.78%	2.46%	2.37%

Thus by considering single tuned filter for grid connected PV system THD is within IEC standard.

IV CONCLUSION

THD analysis of LV grid connected PV System is done for single tuned filter. Harmonics decreases when it was set to eliminate specific order of harmonics and are within IEC standard. As harmonics decreases, power quality of the system improves. Desired power factor can also be achieved by using these harmonic filters. Thus By using these filters power factor correction is also performed. Therefore it is required to have a proper study of PV Grid connected power system. The analysis from such studies will help to manage harmonic of the PV connected power system.

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Conversion of Mine Water to Potable Water

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ABSTRACT

It is very well known that there is acute shortage of good quality drinking water. The quality of water which the common man drinks is not at par with the Indian standard specifications for drinking water i.e., IS-10500. The mine water coming out from Jharia coal fields, Raniganj coal field, Central coal field, Talcher coalfield, Northern coalfield, North Eastern coal field and Western coalfield,when characterized revealed that in most of the cases, higher values of TSS, TDS, Fe, Mn, Cl, F, SO₄, Cu, As, Hg, CN, Ni, Cr, Al, Zn, Nitrate, Hardness, Phenol, Oil & grease and coliform were observed as compared to the respective values givenin IS-10500. When this water were treated with optimum dose (concentration and time) of ozone, the results were encouraging and the higher values of the above parameters were reduced and found to be at par with IS -10500. Since this work was carried out for a private party on payment basis, the details of the data generated at different doses of ozone (concentration and time) cannot be provided. The present paper deals with the basic principles/science behind such a reduction i.e., conversion of mine water to potable water.

Keywords- Granular Active Carbon Filter. (GACF) Dissolved Organisation. (Doc). Total Dissolved Solid (TDS) etc

I INTRODUCTION

Providing good quality drinking water to all human being is the basic need for all the government of any country. If mankind are not getting good quality potable water, they are suffering from various water borne diseases e.g., if the pH of water is beyond the recommended range, the water will affect the mucous membrane and/or water supply system. If the TDS is not in the recommended range then palatability of water decreases and may cause gastro-intestinal irritation. Similarly chloride, beyond the limits, affect taste, corrosion, and palatability. Taste of water becomes unpleasant if alkalinity data is not in the range. Due to high calcium, hardness, encrustation in water supply structure and adverse effects on domestic use are distinctly visible. Magnesium hardness affects heart beat and ultimately leads to heart attack. More sulphate causes gastro intestinal irritation when Na/Mg are present. Higher nitrate is responsible for Methanemoglobinemia. Oxygen carrying capacity becomes less. More ammonium converts into urea. Causes stone formation in gallbladder, kidney. Coliform is the root cause of large number of diseases viz Ecoli, Bcoli, Jaundice, diohrrea, dyssentry, Giardia, Amoebia etc. Healthy human being of any country makes the nation healthy. Keeping the above in view, we have carried out the work on conversion of mine water to potable water.

II EXPERIMENTAL

The ozone was prepared by silent electric discharge method in a ozone generator. The ozone coming out from the generator was subjected to flow meter followed by passing it from bottom of a graduated transparent long & wide column which contain mine water.System was continuous. The outlet at the top was connected to sand filter and then Granular Active carbon filter. The treated water coming out of the filters was analysed and the results were compared with the respective data of raw mine water. The filters were cleaned after each experiment. Filters contained solid materials/precipitates. The dose was fixed and to each fixed dose, time of interaction of ozone with mine water was varied, and vice versa. For a given time of interaction of O_3 with mine water, the system was preset. Similarly optimum concentration of ozone dose was determined. The best results were obtained when both optimum concentration andoptime time were applied.

III RESULTS AND DISCUSSION

Table 1 summarizes the physico-chemical characteristics of some of the mine water. Table-2 compiles the data on indian standard specification for drinking water IS-10500 for ready comparison. It is evident that in some or most of the cases TSS, TDS, Hardness, Fe, Mn, Cl, F, SO_4, NO_3, Cu, As, Hg, CN, Ni, Cr, Al, Zn, Phenol, oil & grease, coliform and organic are higher than the corresponding values given in Table-2, making the mine water unfit for drinking purposes. Ozone as disinfectant was tried for the first time in 1893. But in India, its use is practically nil. In Dhanbad and nearby areas, anyone who stays beyond six months becomes patient of acute gastritis. The reason is, presence of Giardia, amoebia etc. in water. Frequently the residents suffer from urinary Tract Infection- Ecoli, Bcoli and also 58% of the residents suffer from Asthama due to Pollen grains, Algae, Fungi, and different types of mites i.e., due to air pollution.

Table 1
Indian standard specifications for Drinking water IS – 10500
1992→(1993)

Sl No.	Parameter	Desirable	Extended up to
1	Colour(Max) Hazen units	5	25
2	Turbidity(NTU) Max	5	10
3	pH	6.5-8.5	9.2
4	Total hardness as $CaCo_3$(Max)	300	600
5	Calcium(Ca) (Max)	75	200
6	Magnesium (Mg) (Max)	30	100
7	copper (Cu) (Max)	0.05	1.5
8	Iron as Fe (Max)	0.3	1.0
9	Manganese (Mn) (Max)	0.1	0.3
10	Chlorides as cl (Max)	250	1000
11	Sulphates (SO_4) (Max)	200	400
12	Nitrates (NO_3)	45	100
13	Fluoride (Max)	1.0	1.5
14	Phenolic compounds (C_6H_5OH) Max	0.001	0.002
15	Mercury(Hg) Max	0.001	No
16	Cadmium(cd) Max	0.01	No
17	selenium(Se) Max	0.01	No
18	Arsenic (As) Max	0.05	No
19	cyanide (CN) Max	0.05	No
20	Lead (Rb) Max	0.05	No
21	Zinc(Zn) Max	5.0 15	
22	Anionic detergents (MBAS) Max	0.2	1.0
23	Chromium (Cr^{+6}) Max	0.05	No
24	PAH (Max)	-	-
25	Mineral oil (Max)	0.01	0.03
26	Residual Free chlorine (Max)	0.2	-
27	Pesticides αemitters Bq/l Max	sent	0.001
28	Radioactive β emitters Pci/ Max	-	0.1
29	Odour	Unobjectionalble	
30	Taste	Agreeable	
31	Dissolved solids (Max)	500	2000
32	Alkalinity Max	200	600
33	Aluminium (Al) Max	0.03	0.2
34	Boron(B) Max	1	5

Table 2
General standards for discharge of Environmental pollution Effluents

S.no.	Parameter	Inland surface water	Public sewers	Land of irrigation	Marine/coastal areas
1	colour & odou				
2	Suspended soid mg/l max	100	600	200	Process waste water – 100 cooling water- 10% above total suspended matter of influent
3	Particle size of suspended solid	- 850µ 15 sieve			Flotable – max 3mm setueable –max 856µ
4			5.5-9.0	5.5-4.0	5.5
5	Temperature	Shall not exceed 5°c above receiving water temp	-	-	Shall not exceed 5°c above receiving water Temperature
6	Oil & grease mg/l max		20	10	
7		1.0	-	-	1.0
8	Ammoniacal Nitrogen as N mg/l max	50	50	-	50
9	Total Nitrogen as N mg/l	100	-	-	100
10	Free Ammonia as NH$_3$ mg/l max	5.0	-	-	5.0
11	Biochemical Oxygen Demand 3days at 27 °c	30	350	100	100
12		)	-	-	250
13	As mg/l max	0.2	0.2	0.2	0.2
14	Hg mg/l max	0.01	0.01	-	0.01
15	Pb mg/l max	0.1	0.1	-	2.0
16	cd mg/l max	2.0	1.0	-	2.0
17	Cr^{16} mg/l max	0.1	2.0	-	1.0
18	Total Cr mg/l max	2.0	2.0	-	2.0
19	Cu mg/l max	3.0	3.0	-	30
20	Zn mg/l max	5.0	15	-	15
21	Se mg/l max	0.05	0.05	-	0.05
22	Ni mg/l max	3.0	3.0	-	50
23	Cn mg/l max	0.2	2.0	0.2	0.2
24	F mg/l max	2.0	15	-	15
25		5.0	-	-	-
26	Dissolved Phosphates (p) mg/l max		-	-	5.0
27		1.0	5.0	-	5.0
28	Phenolic compounds as Radioactive materials α emitters microwave mg/l max	10^{-7} 10^{-6}	10^{-} 10^{-6}	10^{-8} 10^{-7}	10^{-7} 10^{-6}
29	β emitters microw mg/l max	90% Survival of fish after 96 hrs is 100% effluent	90%survival of fish after 96 hrs is 100% effluent	90% survival of finish after 96 hrs is 100% effluent	90% survival of fish after 96 hrs in 100% effluent
30	Mn mg/l				
31	Fe mg/l	3	3	3	3
32	V mg/l	0.2	0.2	0.2	0.2
33	Nitrate N mg/l	10	-	-	20

These standards shall be applicable for industries, operation or process other than those industries, operation or process for which standards have been specified in schedule of Environment protection Rules 1989.

As mentioned above, a number of parameters are found to be higher than the prescribed limits. Let us understand how treatment of mine water with different doses and for various timings reduces the higher values of above parameters to the prescribed limit, one by one.

(a) Organic Matter:-

Natural organic matter (NOM) is measured as dissolved organic carbon (DOC) usually in concentrations 0.2 to >10mg/l, creates odour & taste problems, Organic disinfection by-products (DBP's) formation supports bacterial regrowth in distribution system. DBP's are mainly formed during the reaction between organicmatter (OM) and ozone (O_3), here disinfectant. These organic DBP's do not have any risk of violation of drinking water standards. Pesticides are also organic matter e.g., diaznion, diemethoate, pantheon-methyl, diuron, linuron, methabenzthiazuron, metabromuron, MCPA, MCPP, Chlortoluron, isoproturon,metaxuron,vinclozolin etc.

Odour and taste forming compounds are present in raw water, can also be formed during water treatment, and may be derived from the decomposition of plant matter, as also due to activity of living organism present in water. Present day chlorine treatment leads to unpleasant taste and odour. Ozone is more effective in removing unsaturated hydrocarbon forming insoluble ozonides. Algae produces Geosmine and 2-methyl is oborneol (MIB), resistant odorous compounds present in water can also be removed by ozone.

By ozonation OM is partially oxidised to –

(i) Higher aldehydes, ketones and carboxylic acids which are insoluble in water and can be filteredout,

(ii) Form polar molecules containing hetero-atoms having loan pair of electrons which has ability to form chelates/metal complexes with cations. Anions are associated with the metal chelates to neutralise the cationic charges,

(iii) If bigger molecules of size 10-2000Å are formed resulting in turbidity/colloidal solution, as also TSS, ozone enhances coagulationprocess. These precipitates, that meansinsolubles can be fittered out and

(iv) The coliform, viruses, Giardia, amoebia, Ecoli, Bcoli, bacteria, living organisms, microbiological agents, protozoans, cryptosporidium etc are oxidised to higher aldehydes, ketones and carboxylic acids which are insoluble in water and can be filtered out.

(b) Total Dissolved Solid (TDS),Cations and Anions: -

TDS contain Inorganic as well as organic. Ozonation of OM has been discussed in detail above. Inorganic matter contains cations such as Ca, Mg, Na, K etc which on oxidations forms metal chelates and insoluble oxides and can be filtered out. Anions present e.g., CO_3, HCO_3, Cl, SO_4,NO_3, are associated with metal complexes to neutralize cationic charges as discussed in the previous section. The Tolerance limits for Ca, Mg, Fe, Mn and sulphate are 75,30,0.3,0.1 and 150mg/l respectively.

(c) Oil & Grease, TSS and Coliform:-

Oil and Grease are organic matter and its inter actions with ozone has already been dealt in organic matter section of results and discussions.Similarly precipitation of total suspended solids using ozones coagulating properties has also been discussed in organic matter section of results and discussion.

(d) Advantage of ozone over chlorine:-

(i) Ozone is 25 times more effective than HOCl (hypochorous acid), 2500 times more effective than hypochlorite (OCl) and 5000 times more effective than chloramines (NH_2Cl). This is measured by comparison of CT constants i.e. the concentration and the time needed to kill 99.9% of all micro-organisms. Chlorine reacts with organic materials to form chlorine containing organics such as $CHCl_3$, CCl_4, CH_3Cl and others generally known as Trihalomethanes (THM's).

(ii) Ozone reacts with organics to break them down into simpler compounds these do not readily break down all the way to CO_2 with just O_3, but if subjected to bacterial degradation on activated charcoal, they will be removed. This water can be later treated with a low level of Cl_2 say 0.2-0.3 ppm to maintain sanitation in the distribution system. This way no THM's will be formed. These have been implicated as carcinogens in the development of kidney, Bladder and colon cancer. The limit of THM's in potable water is 0.01 ppm.

(iii) Ozone does not react significantly with THM's as they are more resistant to oxidation- it takes a very long time to achieve complete oxidation. THM's are removed as a result of physical sparring by the aeration action of ozone/air mixture.

(iv) Some of the properties of ozone and chlorine are summarized below as available in literature.

Action in water	Ozone	Chlorine
Oxidation Potential (Volts)	2.07	1.36
Disinfection (Bacteria & viruses)	Excellent	Moderate
Environment friendly	Yes	No
Color Removal	Excellent	Good
Carcinogen formation	Unlikely	Likely
Organic oxidation	High	Moderate
Microflocculation	Moderate	None
pH effect	Lowers	Variable
Water half life	20min	2-3 hours
Operational Hazards(Skin toxicity)	Moderate	High
Operational Hazards (Inhalation Toxicity)	High	High
Complexity	High	Low
Capital cost	High	Low
Monthly use cost	Low	High

(e) **Other Properties**

Ozone	Chlorine
Ozone is toxic at 100 ppt level Ozone is generated in Premises	It is not only toxic but poisonous also Chlorine is stored in high pressure containers in the premises & is hazardous
Ozone degrades all organic substances into harmless ashes and does not leave any other product than oxygen.	Chlorine when mixed with body fluids and perspiration, will form chloramines that will cause eye irritation and are carcinogenic in nature
Ozone becomes less expensive due to an increase in efficiency and lower energy consumption	The cost of chlorine is constantly increasing and it has become quite expensive.
Ozone does not require pH control	Chlorine needs pH control (7.0-7.4) for reliable results.
Ozone is an excellent deodorizing agent for many substance e.g., H_2S, NH_3, smokes, cooking smells, paints etc.	Chlorine does not have such effects.
Ozone is 600 to 3000 times more active is destruction of bacteria and viruses than chlorine. Ecoli is killed within 5 seconds at a concentration of 1 mg/l. Even the cysts and spores cannot resist ozone.	For killing Ecoli, chlorine requires 15000 seconds at a concentration of 1mg/l

(f) **Reactions involved during ozonation of Mine water:**

  (i)   **Ozone reacts with water to produce OH^- :**

$$O_3 + H_2O \rightleftharpoons 2OH^- + O_2$$

When mine water is kept, it is in chemical equilibrium. When OH^- is added to the system in equilibrium, as per Le Chattelier's principle. "The concentration stress on an added reactant/product/substance is relieved by net reaction in the direction that consumes the added substance, means OH^- has to be consumed.

$Ca^{2+} + 2OH^- \longrightarrow Ca(OH)_2$
$Mg^{2+} + 2OH^- Mg(OH)_2 \rightarrow$
$Fe^{2+} + O_3 \longrightarrow Fe^{3+}$
$Fe^{3+} + 3OH^- Fe(OH)_3 \rightarrow$
$Mn^{2+} + O_3 \quad Mn^{4+} \rightarrow$
$Mn^{4+} + 4OH^- Mn(OH)_4 \rightarrow$

$Cr^{3+} + 3OH^-Cr(OH)_3 \longrightarrow$
$Cr^{3+} + O_3 \quad\longrightarrow Cr^{6+}$
$Cr^{6+} + 6OH^-Cr(OH^-)_6 \longrightarrow$
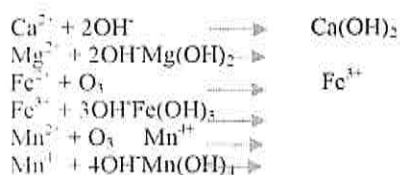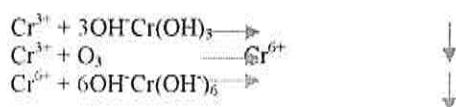
(ii) Formation of Metal Chelates:

Heteroatoms with lone pair of electrons behaves like ligand and comes in contact with

M^{2+} cations. $-\quad -$ and/or $-\quad -$ and/or $-\quad - + M^{2+}$

$2+ \qquad SO_4^{2-}$ or $2Cl^-$ or CO_3^{2-} etc.

N   Ö   S
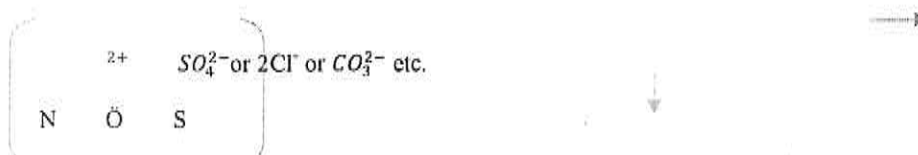
Anions are there to neutralize the cationic charges forming metal chelates

(iii) Reactions with organic matter, coliform, oil & grease etc.

$C=C \quad + O_3 \rightarrow$ O-C
unsaturated hydrocarbon O H_2O $2 \geqslant C=O$
                              O-C   Carbonyl compound
Ozonide

$CH_3(CH_2)_2CH=CH_2 \quad \xrightarrow[H_2O]{O_3} \quad CH_3(CH_2)_2CHO + HCHO$
aldehyde

$CH_3CH=C(CH_3)_2 \quad \xrightarrow[H_2O]{O_3} \quad CH_3COCH_3 + CH_3CHO$
                                        ketone   aldehyde

$(CH_3)_2 C=C(CH_3)_2 O_3 2CH_3COCH_3$
                    $H_2O \longrightarrow$ ketone

$R-C\overset{O}{\underset{OH}{}} + O_3 \longrightarrow R-C\overset{O}{\underset{OH}{}}$
                                   Carboxylic acid
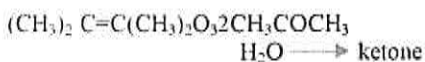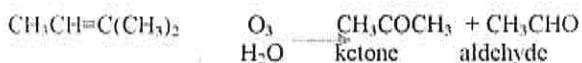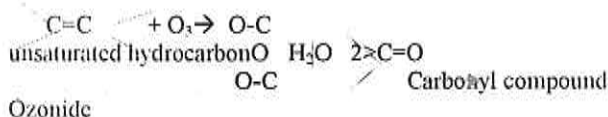
The first four aliphatic members are soluble in water due to intermolecular hydrogen bonding with water molecules. But here in this case the number of aliphatic members are more than four and bigger in size. The non-polar part of the molecule predominates there and reduces the solubility in water. The higher members are practically insoluble in water.

(iv) Ammonia reacts with aldehydes and ketones to form imines:

$CH_3CH_3 \quad OH$
        $C=O + NH_3 \quad\quad CH_3\overset{}{\underset{H}{C}}\overset{}{\underset{NH_2}{}} \quad / H_2O \quad C=NH$
    H   H

$6HCHO + 4NH_3$ $-6H_2O$ (Hexa methylene ... tetramine)
Hexa methylene

$2CH_3COCH_3 +$ NH_3 → ... $+ H_2O$
Diacetonamine

$3C_6H_5CHO + 2NH_3$ ... $+3H_2O$
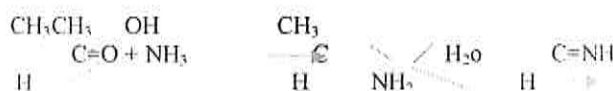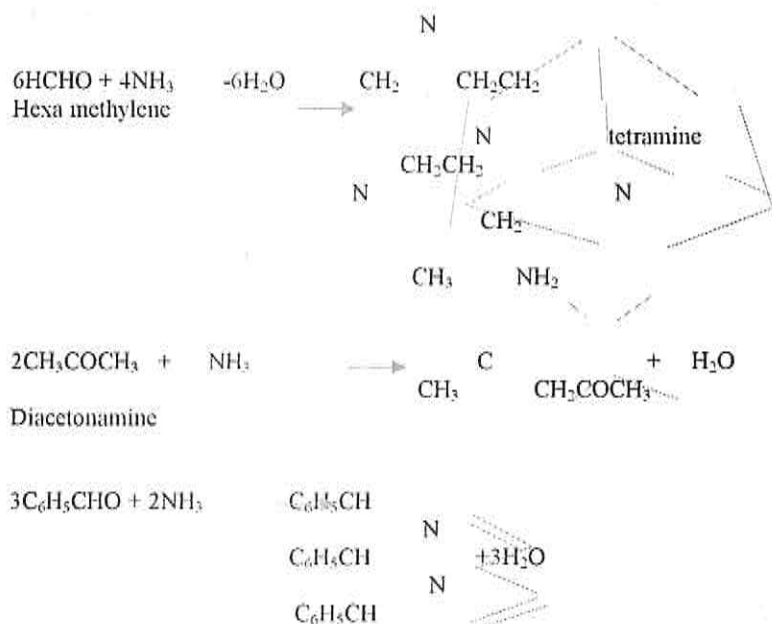
(v) Reaction with carboxylic acid :-

$RCOOH + M^{2+} R(COO)_2M + H_2$

$2CH_3COOH + M^{2+}$ $(CH_3COO)_2M + H_2$

$RCOOH + NaOH RCOONa + H_2O$

$RCOOH + NaHCO_3 RCOONa + CO_2 + H_2O$

$RCOOH + NH_3$ $RCOONH_4$

$CH_3CH_2CH_2COOH$ O $CH_3-CH-CH_2-COOH$
                                   |
                                  OH
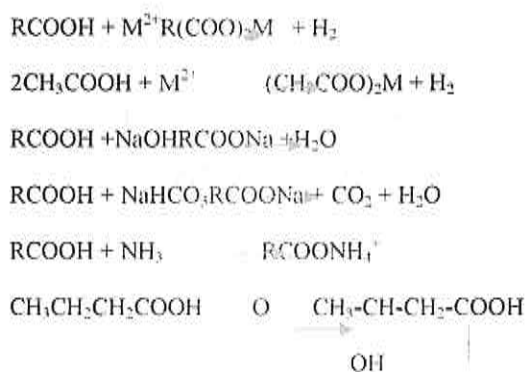
IV CONCLUSION

It can be seen from the above discussions that after optimizing CT doses of Ozone, in above mine water samples, the out of range (with respect to IS-10500) parameters can be brought to thin the range and then the resultant waters can be used for drinking purposes. More research is needed using samples of mine waters from all over India. Use of age old technology by conversion of soluble bicarbonates into insoluble carbonates may also be tried before ozone treatment where hardness is much more. Similarly permuitit method, calgon process and or Ion exchange resins may be used for such very high hardness mine water before ozone treatment, to get the desired result.

Dosimetric Comparison of Two Type Brachytherapy Planning Approaches in HDR Treatment of Carcinoma Uterine Cervix: Standard Library Plan Approaches vs. 3D CT Image Based Planning

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ABSTRACT

Due to unavailability or limited resources of imaging modality some centres in low and middle income countries (LMICs) are still unable to adopt image based treatment planning in brachytherapy practice. This study aimed to compare the volumetric dose differences between images based planning and standard library plan (SLP) approaches to find out the feasibility of using SLP approaches for HDR treatment planning in LMICs. Total ninety four plans of 47 patients image based plan were evaluated retrospectively. For each set of image based plans, one additional set of plans were generated by applying dwell positions and dwell times of SLP approach on reconstructed applicator position of CT image data of each patient. The mean dose of bladder D_{2cc}, D_{1cc} and $D_{0.1cc}$ were higher by 0.03 Gy, 0.4 Gy and 0.06 Gy respectively in SLP approach rather than image based plan (p-value > 0.05). For rectum and sigmoid colon the mean dose of D_{2cc}, D_{1cc} and $D_{0.1cc}$ were significantly increases in SLP approach rather than image based plan. Higher increase for $D_{0.1cc}$ mean dose of rectum (0.12 Gy, 2.19%) and sigmoid colon (0.12 Gy, 1.69%) were found when SLP approach was used in place of image based plan. The results of this study shows that mean doses of target and OAR (bladder, rectum and sigmoid colon) are increases with SLP approach. The increase dose to rectum, bladder and sigmoid colon in SLP approach may lead to enhance the toxicity and hence affect the quality of life. The results of this study emphasized that if limited resource settings use SLP approach the proper applicator placements, adequate packing and other accounting factors should be considered carefully.

Keywords: High dose rate, Volumetric dose, Standard library plan, Image based plan

I INTRODUCTION

Carcinoma uterine cervix (Ca Cx) is usually the most common malignancy in many low and middle income countries (LMICs), where resources are limited or unavailable for prevention, diagnosis and treatment [1]. Intracavitary high dose rate (HDR) brachytherapy either alone or in combination with external beam radiotherapy is recommended as definitive radiation therapy for Ca Cx [2]. Brachytherapy has proven as an integral component of definitive radiotherapy treatment of Ca Cx [3]. Brachytherapy follows the inverse square rule, in which physical radiation dose is inversely proportional to the square of distance from radioactive source. Intracavitary HDR brachytherapy system which allows to be delivered high localized radiation dose to uterine cervix within a short time and sparing the organ at risk (OAR) such as bladder, rectum and sigmoid colon to large extent. The characteristic rapid dose fall-off with distance from intracavitary applicator is both the major advantage and major disadvantage of brachytherapy [4]. Hence, appropriate placement of applicator is the most essential step to deliver sufficient dose to the tumor and spare OAR [4].

Various computerized planning systems are available for dose calculation and to create brachytherapy treatment plans for Ca Cx. Typically HDR intracavitary applicator mainly consists of one central tandem and two lateral ovoids generating pear-shaped isodose lines centered around the uterine cervix. This applicator system grants to delivered high dose to uterine cervix at the same time sparing OAR. In image based treatment planning the calculated doses are related to geometry of applicator, patient anatomy and dose for OAR can be made available. While, treatment planning generated with the help of computer is known as standard template plan (SLP). In SLP there is no exact idea that how much dose received by tumor and OAR. With the advent of computerized treatment planning systems it has feasible to create treatment plan in 'actual time' before treatment [5]. These treatment planning systems provides precise calculation of dose to target and OAR, well plan documentation, better estimation of implant geometry and capable to optimize the treatment plan[5].

The Radiation dose calculation and dose distribution in BrachyVision treatment planning system is based on following mathematical algorithm-

TG-43 Algorithm:- As per AAPM TG-43 algorithm [6,7,8] the dose rate $\dot{D}$ (r.θ) at a point (r. θ can be written as-

$$\dot{D}(r,\theta) = S_k \wedge \cdot \frac{G(r,\theta)}{G(r_0,\theta_0)} \cdot g(r) \cdot F(r,\theta)$$

Where,

r → the distance between centre of source to dose point. θ → Angle subtended by line joining centre of source to dose point with long axis of source. S_k → Air Kerma Strength of radioactive source. ∧ → Dose rate constant. G(r,θ) → Geometry factor. g(r) →

Radial Dose function and F $(r,\theta) \rightarrow$ Anisotropy function

With the advancement in imaging technology the use of 3 dimensional imaging MRI and CT are increasing globally and availability of CT scanners made it common 3D imaging modality for image guided brachytherapy planning. Recently, published guidelines GEC-ESTRO and ICRU-89 strongly recommended individualized 3D image based brachytherapy treatment planning in carcinoma cervix for each fraction [9, 10]. Besides advances in imagining technology some centers especially in LMICs use standard library plan instead of 2D or 3D image based plan. Image based brachytherapy treatment planning is not in approach to some centers due to unavailability or limited resources of imaging modality.

The main aims of this study was to compare the volumetric dose differences between image based plan and SLP to find out the feasibility of using SLP approaches for HDR treatment planning in LMICs.

II MATERIALS AND METHODS

Retrospectively forty seven 3D CT image based plans of 47 patients (only first fraction image based plan) who have been received intracavitary treatment for carcinoma cervix with high dose rate brachytherapy machine were selected for the study. The (mean ± s.d) age of patients was 49.11 ± 7.90 years involved in this study. The distributions of patient disease were stage ranges from IIB-IVA of FIGO staging system. All the patients had received 23-25 fractions of 2 Gy per fraction (a dose of 46-50 Gy over a period of five weeks) by external beam radiotherapy either on Linear Accelerator or on Tele-cobalt machine using either four field box technique or two parallel opposed AP-PA fields before initiation of brachytherapy treatments. Subsequently finishing the external beam radiotherapy all the patients were planned to receive 3 fractions of 7 Gy (dose of 21 Gy on weekly intervals over three weeks) by means of intracavitary brachytherapy using fixed geometry Fletcher style applicator. Patients were elucidated about image based treatment procedure before applicator insertions and informed consents were taken.

The applicator insertions were done under consideration of all aseptic precautions. For immobilization and avoid slippage of applicator assembly, adequate vaginal packing were done using Betadine soaked gauge. Foley's catheter was placed in the urinary bladder and bladder was left to drain in all patients. After insertion of applicator 3D images with 2.5 mm slice thickness were acquired on CT simulator (Discovery RT, GE Health Care) from umbilicus to mid thigh. All images were imported into Brachy Vision v. 8.9 TPS (Varian Medical Systems, Palo Alto, CA, USA) using CD/DVD. The contouring of tumour (HR-CTV) and OAR (bladder,

rectum, and sigmoid colon) were performed by Radiation Oncologist following ABS/GEC-ESTRO guidelines. All applicator insertions and contouring were carried out by single Radiation Oncologist and treatment planning by single Medical Physicist to mitigate inter-personal variations.

The 3D image based brachytherapy treatment plans on CT image data of first fraction of each patient were created and dose of 7 Gy was prescribed at point 'A' as per ABS guidelines. The treatment plans were optimized in this fashion that combined EQD2 doses from external beam radiotherapy and brachytherapy were kept ≤ 90 Gy for bladder and ≤ 75 Gy for rectum and sigmoid colon. The actual brachytherapy treatment was delivered to patients with remote afterloading unit (Gamma Med Plus, Varian Medical Systems) using ^{192}Ir HDR brachytherapy source.

The standard library plan (SLP) was created for each set of applicator (tandem length and ovoid diameters) by simulating applicator assembly on CT simulator. Post simulation of applicator assembly image was imported into Brachy Vision TPS. The applicator was reconstructed and dose of 7 Gy was prescribed on point 'A' and treatment planning was performed to produce pear shape following similar image based planning procedure of actual patients.

For dosimetric comparison between standard library plan (SLP) and 3D CT image based treatment plan, re-plans were created using CT image based treatment plans of patients. One additional set of plans were generated by applying treatment parameters (dwell positions and dwell time) of SLP on reconstructed applicator position of CT image data set of each patients. In this way total two plans were generated for each patient. Thus total 94 3D CT image based plans evaluated in this study. As per established guidelines (ABS, GEC-ESTRO and ICRU 89) the dose volume parameters D90 and D100 (dose to 90% and 100% of HRCTV volume) were used for reporting target (HRCTV) doses and dose at point 'A' (right, left and mean) were also recorded and evaluated . Again dose volume parameters D_{2cc}, D_{1cc} and $D_{0.1cc}$ (minimum doses received by maximum volume of 2cc, 1cc and 0.1cc) were recorded and evaluated for OAR (bladder, rectum and sigmoid colon). These dose volume parameters for HRCTV and OAR were estimated from cumulative dose-volume histogram (DVH) as shown in Fig.1. SPSS statistics version 20 (IBM corporation, USA) software was used for statistical analysis. A paired t-test was used to assess the significance in difference between SLP approaches and 3D image based treatment planning. The p-value < 0.05 were considered for significance of statistical inferences.

III RESULTS

The comparison of volumetric doses (D90 and D100) of HR-CTV and point 'A' (right, left and average) doses are presented in Table.1. All the doses of HR-CTV and point 'A' were expressed as (mean ± s.d) in Gy. The result showed that HR-CTV D90 mean doses were 10.48 ± 1.23 and 10.68 ± 1.33 in image based plan and SLP approach respectively. There were significant differences (p-value 0.000 < 0.05) between image based plan and SLP approach. For HR-CTV D100 the mean doses were 5.52 ± 0.95 and 5.59 ± 0.99 in image based plan and SLP approach respectively. For HR-CTV D100 there were

Table.2 shows the various dose volume parameters (D_{2cc}, D_{1cc} and $D_{0.1cc}$) for bladder, rectum and sigmoid colon of both image based plan and SLP. All the doses of bladder, rectum and sigmoid colon were expressed as (mean ± s.d) in Gy. The bladder D_{2cc} mean dose were 4.85 ± 1.32 and 4.88 ± 1.31 in image based plan and SLP approach respectively. For bladder D_{2cc} there were statistically insignificant differences between image based and SLP approach (p-value: 0.145 > 0.05). The bladder D_{1cc} mean dose

insignificant differences (p-value: 0.084 > 0.05) between image based plan and SLP approach.

The mean doses at left point 'A' was 6.95 ± 0.95 using image based plan, while it significantly increased to 7.05 ± 0.16 when SLP approach was used (p-value: 0.000 < 0.05). The mean dose at right point 'A' was 7.06 ± 0.18 using image based plan, while it significantly increased to 7.17 ± 0.16 when SLP approach was used (p-value: 0.001 < 0.05). Finally for average point 'A' the mean dose was 7.00 ± 0.15 using image based plan, while it significantly escalated to 7.11 ± 0.15 when SLP approach was used (p-value: 0.000 < 0.05).

were 5.35 ± 1.51 and 5.39 ± 1.49 in image based plan and SLP approach respectively. For bladder D_{1cc} there were statistically insignificant differences between image based and SLP approach (p-value: 0.104 > 0.05). The bladder $D_{0.1cc}$ mean doses were 6.55 ± 2.04 and 6.61 ± 2.02 in image based plan and SLP approach. For bladder $D_{0.1cc}$ there were statistically insignificant differences between image based plan and SLP approach (p-value: 0.059 > 0.05).

Table 1
Comparison of HR-CTV and Point 'A' (right, left and average) doses between Image based plan and standard library plan

Parameter	Image Based Plan (mean ±s.d) in Gy	Standard Library Plan (mean ±s.d) in Gy	Mean Differences in Gy	P-value
HR-CTV D90	10.48 ± 1.23	10.68 ± 1.33	-0.20	0.000
HR-CTV D100	5.52 ± 0.95	5.59 ± 0.99	-0.09	0.084
Right A	6.95 ± 0.13	7.05 ± 0.16	-0.10	0.000
Left A	7.06 ± 0.18	7.17 ± 0.16	-0.11	0.001
Avg. A	7.00 ± 0.15	7.11 ± 0.15	-0.11	0.000

The rectum D_{2cc} mean doses were 4.19 ± 0.63 and 4.26 ± 0.67 in image based plan and SLP approach respectively. For rectum D_{2cc} there were statistically significant differences between image based and SLP approach (p-value: 0.001 < 0.05). The rectum D_{1cc} mean doses was 4.58 ± 0.95 in image based plan,

while it significantly increased to 4.67 ± 0.76 when SLP approach was used (p-value: 0.000 < 0.05). The rectum $D_{0.1cc}$ mean dose was 5.48 ± 0.95 in image based plan, while it significantly increased to 5.60 ± 1.00 when SLP approach was used (p-value: 0.000 < 0.05).

Table 2
Comparing mean doses of various dose-volume parameters for organs at risk (Bladder, Rectum and Sigmoid colon) and their clinical significances

Parameter		Image Based Plan (mean ± s.d) in Gy	Stanadard Library Plan (mean ± s.d) in Gy	Mean Differences	P-value
Bladder	D_{2cc}	4.85 ± 1.32	4.88 ± 1.31	-0.03	0.145
	D_{1cc}	5.35 ± 1.51	5.39 ± 1.49	-0.04	0.104
	$D_{0.1cc}$	6.55 ± 2.04	6.61 ± 2.02	-0.06	0.059
Rectum	D_{2cc}	4.19 ± 0.63	4.26 ± 0.67	-0.07	0.001
	D_{1cc}	4.58 ± 0.72	4.67 ± 0.76	-0.09	0.000
	$D_{0.1cc}$	5.48 ± 0.95	5.60 ± 1.00	-0.12	0.000
S. Colon	D_{2cc}	5.04 ± 0.57	5.11 ± 0.62	-0.07	0.001
	D_{1cc}	5.62 ± 0.68	5.71 ± 0.72	-0.09	0.001
	$D_{0.1cc}$	7.10 ± 1.25	7.22 ± 1.26	-0.12	0.001

The sigmoid colon D_{2cc} mean dose was 5.04 ± 0.57 in image based plan, while it significantly escalated to 5.11 ± 0.62 when SLP approach was used (p-value: 0.001 < 0.05). The sigmoid colon D_{1cc} mean dose was 5.62 ± 1.25 in image based plan, while it significantly escalated to 5.71 ± 0.72 when SLP approach was used (p-value: 0.001 < 0.05). The sigmoid colon $D_{0.1cc}$ mean dose was 7.10 ± 1.25 in image based plan, while it significantly escalated to 7.22 ± 1.26 when SLP approach was used (p-value: 0.001 < 0.05).

IV DISSCUSSION

The results of our study demonstrated that HR-CTV D90 mean dose was increases 1.9% (0.20 Gy) in SLP approach than image based plan and increment was significant. A small increase of 0.07 Gy (1.2%) in HR-CTV D100 mean dose with SLP approach compared to image based plan and increment was insignificant. The Point 'A' (right, left and average) mean doses were significantly higher 1.56%, 1.44% & 1.57% respectively with SLP approach in comparison to image based plan. In image based treatment plan the calculated dose of organs (HR-CTV and OAR) are related to applicator geometry. In SLP approach doses are calculated from reconstruction of applicator assembly only, whereas in image based plan the applicators are within tumour and calculated dose reflects actual physical dose. Patone H. et al. found that there is significant dose rate dependency on applicators geometry [5].

Considerable geometrical variations occurred during multiple HDR applications and their impacts on dosimetric parameters were illustrated in literatures [4,11,12]. Since only small changes in distance between anatomical structures (bladder, rectum and s. Colon) and applicator source may produce larger deviations in dose received to these structures [12]. Hoskin et al. emphasized that it is essential to be attentive of changes in applicators positions between HDR fractions in same patient for the same treatment schedule [12].

Our study finds that bladder (D_{2cc}, D_{1cc} and $D_{0.1cc}$) mean doses are higher by 0.03 Gy, 0.4 Gy and 0.06 Gy respectively in SLP approach in comparison to image based plan. These increments are found statistically insignificant. In our study significant increase of 1.67%, 1.97% and 2.19% in rectum ($D2cc$, D_{1cc} and D0.1cc) mean doses are observed respectively with SLP approach in comparison to image based plan. Maximum increase of 0.12 Gy in mean dose for 0.1cc volume of rectum is noted if SLP approach used in place of image based plan. Significantly higher mean doses by 1.39% 1.60% 1.69% are recorded for sigmoid colon (D_{2cc}, D_{1cc} and $D_{0.1cc}$) when SLP approach are used in place of image based plan. In sigmoid colon also maximum increase of 0.12 Gy in mean dose are recorded for 0.1cc volume with SLP approach in comparison to image based plan.

Patone H. et al. performed a dosimetric comparison of standardized dose rate template planning and computerized treatment planning to determine the dose differences at point 'A' and ICRU 38 bladder and rectum reference points [5]. Patone H. et al. concluded that if standard template plan approach has been used, significantly higher doses would have

been delivered and emphasized that standard template plan approach should have carefully considered [5]. A study by Jamema et al. was done to compare the rectal and bladder ICRU point doses between orthogonal and CT image based planning [13]. Jamema et al. concluded that ICRU rectal point doses were in correlation with maximum rectal doses, whereas ICRU bladder points dose underestimates the maximum bladder dose [13]. The higher radiation doses to OAR (bladder, rectum and sigmoid colon) will increase the complication and reduce the quality of life.

Fig.1
Dose volume Histogram (DVH)

Cumulative Dose Volume Histogram (DVH)
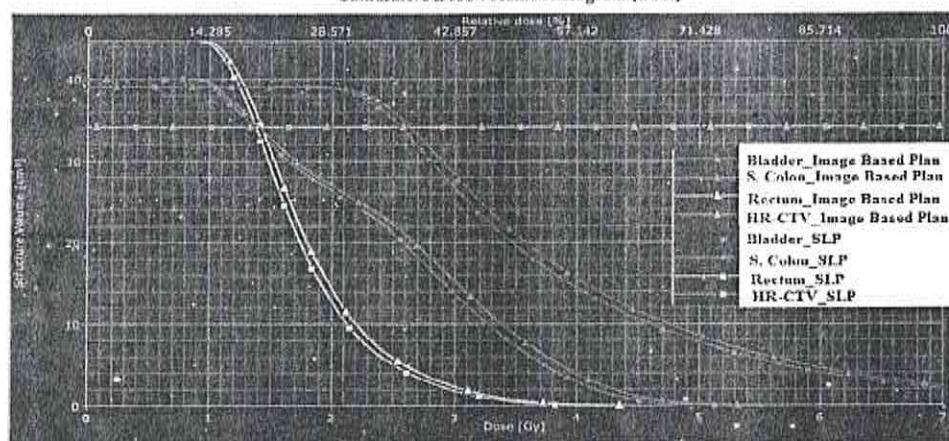
Kirisits et al. demonstrated that there were increase in point and volume doses to OAR and target if single plan were used for all subsequent fractions of brachytherapy [14]. A study by Mobit et al. was done to assess the advantage of 3D image based planning over standard treatment planning for brachytherapy treatment of cervical cancer with tandem and ovoids [15]. Mobit et al. concluded that use of customized plans did not always cut down the OAR (bladder, rectum, sigmoid colon and small bowl) doses as compared to standardized plan [15].

Grover et al. updated the ABS survey and reported that in U.K. the use of CT, MRI and X-ray in image based brachytherapy planning were 95%, 34% and 15% respectively [16]. The results of 2014 survey by American Brachytherapy Socity revealed that use of point 'A' and HR-CTV based dose prescription were 42% and 52% in 2014 ABS survey in comparison of 76% and 14% in 2007 ABS survey [16].

V CONCLUSION

The results of this study shows that mean doses of target and OAR (bladder, rectum and sigmoid colon) are increases when SLP approach is used instead of image based planning. The increase dose to rectum, bladder and sigmoid colon in SLP approach may lead to enhance the toxicity and hence affect the quality of life. In this study the increase in dose volume parameters of target and OAR using SLP approach is firmly indicate the dependency of dose distribution on applicator geometry. The results of this study emphasized that if limited resource settings use SLP approach, the proper applicator placements, adequate packing and other accounting factors should be considered carefully. On the basis of recent research based on advanced imaging it is proposed that image based planning for each fractions will be adopted in routine brachytherapy practice if it will be feasible.

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A Study on Visual Secret Sharing Scheme using Speech Recognition Method

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ABSTRACT

Visual secret sharing (VSS) scheme and Speech recognition method, both aremainly used for digital security. By using Random grid based technique Visual secret sharing schemes are used for performing decryption. But in many cases, it may be decrypted by applying different methodologies. Actually, VSS allows confidential message to be encrypted into (k, n), (n, n) or different secret scheme. In (k, n) it can define k as threshold and n as some group. So when n ≥ k then the confidential message can be acquired by these participants. Visual Secret Sharing Scheme is interesting because for decryption, even if, there is no knowledge of complex cryptography algorithm then also, it can perform decryption. Hence, based on this scheme, a new method is proposed to examine VSSS that uses speech recognition method, as proposed in this method.

Index Terms: Random grid. Visual Secret Sharing. Image recognition. Cryptography. Speech recognition and Spectrogram.

I INTRODUCTION

In 2007. an idea came to light, if nonphysical subjects project their voices onto tape recording, could they also send pictures with sound. Work was going on for few years and consequently, new idea came that could recognize image with speech. This method is only known to few and not formally recognized till 2017.

The idea is so simple. As we all know that sound is energy and we are also part of energy. Things not in physical form on this earth are also form of energy. So by saying this, we can say energy can be created: in this way any nonphysical properties can also create energy. If they can mark their energy upon sound wave, then it can receive visual image. In many cases. Robots also sense our emotion via radio wave. One of the techniques for this research is Spectrogram: it is a visual representation of spectrum of frequencies of a signal as it varies with time. Recognizing image by speech Spectrogram is also known as voiceprints or sonographs. When data is represented in three dimensional (3D) plot then, that is called as waterfalls. Spectrogram can be generated by an optical spectrometer. A common format of this is a graph with 2 geometric dimensions: one axis represents time and other frequency. Spectrometer of light may be created directly using optical spectrometer over time. In this we will see band pass filter is also used for analogue processing to divide input signal into frequency bands. Creating a spectrometer using FFT is a digital process. In below algorithm we will see how the image will be divided into different share and their reconstruction.

Algorithm: Division of image into different Share.
Step 0:   START
Step 1:   Take ASCII code from character say A(i)
Step 2:   input random number r
Step 3:   count value $A(i)' = A(i) + rp$
Step 4:   for j=1 to n
Step 5:   for i=1 to |length of message|
Step 6:   if count value k (j,i) = A(i)' mod d(j) goto step 7.
                 Else goto step 6.
Step 7:   Reflectionke-1 : k(1,1)....k(1,i) to Reflection ke-n k(n,1) to k(n,i)
Step 8:   STOP

Digitally sampled data in the time domain is divided into different fragments which usually overlap and Fourier transform to calculate magnitude of the frequency spectrum for each fragment.

During analysis of this research, image will be decoded with two secrecies: first for visual secret sharing scheme with random grid encoded technique and other is speech recognition, so in this way secret of sharing image is more secure. We will also use cryptography techniques in this for providing secret key and that images will be decrypted only with key and speech matching. The algorithm for information sharing is known as Threshold scheme. Using this scheme, image will be divided into n different share in such a way that any m (where m ≤ n) from that may be used to reconstruct the information. This is known as (m, n) threshold scheme.

(a) **Visual Cryptography:** As the name suggests Visual Cryptography is a cryptographic technique that allows Visual information to be encrypted in such a way that decrypted message will appear as Visual image. That visual information may be image, text etc. In visual cryptography we will study technique developed by Moni Naor and Adi Shamir in 1994[1]. They had proven visual secret sharing scheme: In this method, images are divided into n shares so that only someone with all n share could decrypt the image, while n-1 shares publish no information about the original image. There are many extensions of basic scheme including k-out-of n visual cryptography.

(b) **Secret Sharing Scheme (2, N) Visual Cryptography:** In this method, images will be shared into N share out of them 2 can decode the secret. it was developed in 1994 by Naor and Shamir [1]. In this method, we will have secret image which will be encoded into N share printed on transparencies. The share appears random and it contain clear information about secret image however if any 2 of the share are stacked on the top of one another than the secret image will be cleared by human eye.

Voice is the basic thing to communicate and interact with people. Today speech recognition is common but image sharing with voice is little difficult. A secret (2, n) gateway (i.e. threshold) secret scheme consists of algorithm as shown below:

(i) **Share:** A algorithm that uses random number to decide what next thing will be performed giving information m in terms of s= (s1, s2, ..., sn) share as input and output of a sequence.

(ii) **Reconstruct:** a deterministic algorithm that takes a collection of 2 share as input or output of message.

As we know that problem of key distribution cannot be addressed by Encryption Algorithm, in the same manner the thing who run the share algorithm their address can also not be used by secret share neither with n different user who actually send share securely.

II LITERATURE SURVEY

Presently, Speech recognition is practical concept and It can be applied by different languages. It can also be used in human based application as data recovery (the process of recovery of data). As discussion on speech that is captured by mobile can be easily converted from real voice to set of words that's why image can also not be converted into speech. Therefore, the converted word can either be final result or by applying different random grid share techniques the word can be converted into image which will be the final result. Speech recognition can be described by way of speaking, signal to noise ratio, transducer, etc.

(a) **Types of image processing:** There are two basic methods of image processing technique used:
(i) Analogue.
(ii) Digital image processing

Analogue image processing is used for hard copies as printout and photograph. Association is another important tools in visual technique. So Analyst gives a merging of own knowledge and auxiliary data to image processing.

While image processing in Digital manner is used for manipulating digital image by using computer. As raw data from imaging sensors from satellite platforms contains deficiencies. To overcome this problem, it has to undergo various phases of processing.

In a secret sharing scheme each person is assigned a certificate issued by certification authority to establish its authority. For importing any file through secret first of all access the certification authority site and create browser certificate, authenticating with credentials. Then import the download certificate into browser, as a certified user it is possible to register in the Framework. In the framework, it is possible to create and join a group of n people with a common interest in sharing information. After this group decides minimum number of people k (threshold) required for information recovery i.e., k ≤ n this is nothing but (k, n) threshold Shamir secret sharing scheme. Upload the information to share. Then check condition for sharing are satisfied or not by all group member in session, threshold agreed and defined, pdf assigned to group. And begin the Distribution Process. In the certificate extension of each person a share part of the secret is added. The pdf is encrypted with the group key now a new certificate with the updated extension is issued for each person. At last access again the certificate authentication site and get the new browser certificate authenticating with credentials. Import the new certificate in browser. To view the shared pdf, it is necessary to recover the secret. To recover the secret at least k people are required.

Begin the recovery process: it is possible to recover the key that encrypt the pdf with k shares. So the pdf can now be viewed by all group members.

In 1994, Naor and Shamir [1] extended the concept of sharing by cryptography shown in figure 1. In this a (k, n) share visual cryptography encodes a black and white secret images into n meaningless shares such that any k-1 cannot show any information about secret image.
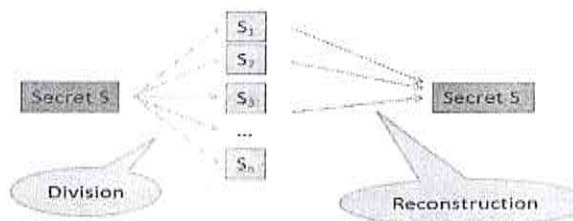
Fig. 1 Secret Sharing with Cryptography

text

Fig. 2 Conversion from text to speech.

In this paper a new type of cryptographic scheme is considering which can decode image sharing without any cryptographic computation. Visual secret sharing scheme assumes that the message consists of black and white pixel [1] and each pixel is operated separately. Each original pixels is divided into n share one for each Opacity. Every black and white pixel [1] is combining and acts as one share. Structure come out from this can be described by m*n Boolean matrix $C=[c_{ij}]$ where $c_{ij}=1$ if and only if j^{th} sub pixel in the ith opacity is black. When opacity i1,i2,....,ij are stacked together in such a way that properly pick the sub pixel, then combined share can be seen whose black pixel are represented by OR Gate in Boolean and their row is i1,i2,....ij in C.

Shamir and Blakely [2] proposed (k, n) threshold scheme in 1979. In (k, n) k is threshold and n is group size. In this scheme each bit of any share carry at most [k/n] bit of secret. While in (n, n) sharing scheme the information carries per bit share is [1/n] bit of the secret. One of the main goal of this paper [3] is to apply neural network for speech recognition. Spectrogram is a method which use discrete Fourier transform for translating one dimensional time sequence more frequently but not on a Mandatory basis segment of audio into 2 D images containing the same information but organized in a way that makes locality meaningful in 2 D rather than just one [3].

Speech recognition is primary mode of communication between human being. When human communicate with computer than it is called as human computer interface. The goal of speech recognition area is to develop speech input to machine. So today automatic speech recognition finds prevailing application in task that require human machine interface such as automatic call processing. The goal of machine recognition technique is to get information by hearing and act upon spoken information. The speech recognition may be viewed as working in four stages [4]:

- Analysis
- Feature extraction
- Modeling
- Testing.

Text to Speech Analysis technique shown in figure 2:
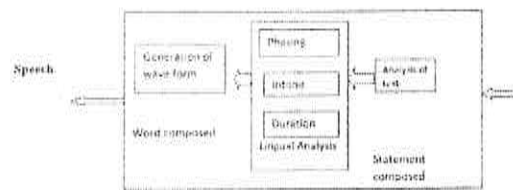
Conversion of text to speech contains into two parts [5] one is front end other is back end. Frontend is used for solving two major tasks. One for converting raw text like numbers and abbreviation into words. This process is commonly called as text standardization or lexical analyzer. Every word is having phonographic transcription assign by front end, that divide and grade the text into prosodic unit like any sentence. The term which assign phonographic transcription to words is called text to phoneme (small unit of sound) conversion. Phonographic transmission and pingal information combined with each other and make up the symbolic linguistic representation which is output by the front end.

The back end is rarely referred as synthesizer. It converts the symbolic language notation into sound shown in figure 3. In some system this parts include the computation of target pingal [21] which is imposed on output speech.
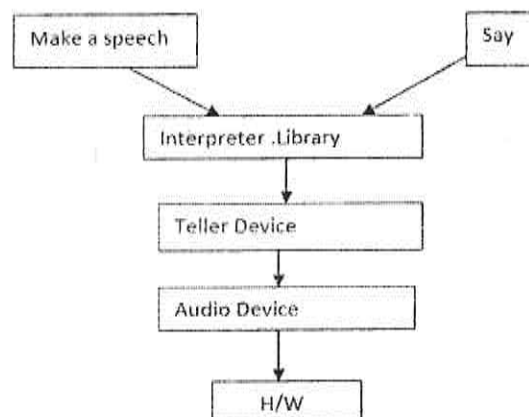
Fig. 3 Transfer of symbolic notation into sound.

Smartest method for generating properties and features from face and movement of body is called as Active Shape Model (ASM).

The original ASM was develop by Cootes et al [22] suffer from factor such as poor model initialization. Here each frame is divided into reasonable points which don't have any static position so because of non-static that can be changed to other position, because of dynamic behavior it can be design for shape of each frame. In medical field each text message from patient includes a set of frame based on these set of frame, distinctive frame is divided into particular points. It can be assumed that frames number is "j" in first equation and the number of

points is represented by 'P' and 'r' has an responsibility between Zero and 'P'.

Image recognition, Lip movement and body parts are included feature issue and classification of data set. Active Shape Model (ASM)[6] can fulfill our needs in future issue and summarized valuable data by dividing images into different points which are related to lip. image recognition or other parts of body by finding out sketch is a complex step in image recognition and by area based calculation is quite good compare to edge based; by using this displacement of movement of points can be calculated, and that can be saved as a chain of states for specific action like Lip motion and receive data set for training data. in next coming step this data is check in mobile phone that are available in patients. this work happen in both way i.e. automatically or manually in front of camera. It is the best way to record patient information. This result (Speech and motions) then compared with data base by matching each frame from patient with each frame from set of data then best result will be selected and give decision about them.

After feature extraction. classification is next step and the best solution is Fuzzy c-means [7](allow one piece of data to belong to two or more cluster). Mostly Fuzzy Clustering Means (FCMS) used in pattern recognition and it is having soft and flexible behavior. Due to soft and flexible manner in comparison of models from one side and frame which are collected from camera.

The minimization of feature vectors can be solved by adding PCA (Principal Component Analysis) and Fisher Linear Discriminant (FLD) [8] and their after we use projection for feature vector integration. Then classification is important issue. there are two choices for exact recognition, one is Hidden Markov Model (HMM) [9] while other is Recurrent Neural Network (RNN) [10]. in first method each word will be stated by chain of states from left to right, during time the number of states will be increased while in second method is used for learn new condition and data will be saved by its reverse ability.

First of all, face or body will be dividing in few parts that can use for transforming valuable message to us. In this we will study Property of each part. For this purpose. face contains important role and it is divided into lip. eye. eyebrow. head and mouth and their properties are their movement and color. Body can be categorized into head. hands and feet their properties are movement and color these parts can help us to have a better perception of patient's situations.

It was argued that the meaning of an image did not become apparent until it is accompanied and explicated by text. Pictures were ambiguous and their work was dependent on words to specify and focus their multiple and uncertain meanings. However, it was also apparent that in context between texts and images might be in different forms. Furthermore, for the development of visual secret sharing scheme

using speech recognition the scientists mediate the meanings of pictures come in two different forms and contexts. There were the words of respondents – captured by interviews, questionnaires and other research devices – and those of different science theory and analysis. Similarly. images might be generated by respondents, by researchers or derived from secondary sources by respondents or researchers. [11] Alan F. et al., (2004).

It was a qualitative with a mix of interviews and focus groups and a new experiment of a visual secret sharing scheme using speech recognition method generally used inside design and fashion environments. It was a study based on the contrast of a growing trend towards sustainability and the rise of fast provision in which consumers are demanding cheaper items completely. It was also determine in two or more research where the comparison of data emanating from different cultures and languages presents specific dilemmas for researchers. [12] Lindsey C. et al. (2014).

It was described that a visual secret sharing scheme using speech recognition method and then relates them in detail in the abstract and analyses the exemplar as a verbal text. After this visual one show the way that analogy between the words and images reiterates the confederacy between the brand advantage and the images used to dispatch it. Ends with a call for maximize visual literality in order to advertising from a humanistic perspective. [13] Barbara B. S. et al. (1994).

It was argued that social network platforms were not social utilities, but, in fact, clarification utilities. They were programmed to be necessarily brand users by extracting and filtering identifications to be easily consumed by advertisers. just as micro celebrities promote specific. "authentic" aspects of self that could be easily consumed by fans. Through a discourse analysis of Facebook's functionalities and in-depth interviews with 45 emerging adults, I found that by using visual secret sharing scheme using speech recognition for self-branding but were instead compelled by the site's inherent design to unintentionally brand – they unknowingly align with corporation-like mission statements; ignore multiple, dynamic selves: and discard their right to anonymity. [14] Angela M. Cirucci. (2018).

The 'brain speech' involves visible and local terms that results in a particular kind of objectification of the organ of the self. The overbearing presence of visual media (i.e.. magnetic resonance imaging, computed tomography. angiographic studies) further gave rise to particular forms of interactions with patients and physicians where the 'image able' (i.e., the image on the screen) became the 'imaginable' (i.e.. the metaphor). Furthermore. It was informed compassion for concrete representations and especially for the patient. these representations redefined an ungraspable situation for visual secret sharing scheme using speech recognition will be

proposed, where a tumor – an object – can so easily affect the organ of their subjectivity, into something comprehensible through the materialistic, often mechanistic actions of most mundane objects [15] Sky Gross, (2011).

Normally for money-producing organization has been traditionally applied by Business concept comes under Knowledge management for aim of maximized and Enhancing operations to rise Emulative advantage and maximize profit. Knowledge management can also have applied for nonprofit such as government and legal boards. It can also be used for improving communication between Staff and higher management. Knowledge management will help to drop a culture of sharing and implement a reward based on performance for its employees. For enabling company to be competitive and profitable in its sector, knowledge management mixing a complex process of regulate the company mission statement with best practice. It also demands to show how knowledge management can effectively be applied to the visual secret sharing scheme using speech recognition. It had a mission to deliver a world class library system, which is easy, obtainable and useful to the people of Singapore [16] Seeman, P. (1999).

It was given an in depth view of the strategies by the world's leading chief executive officers in an attempt to provide guidance to new chief executives of today. Marketing strategies employed by chief executives of today applied to any product for taking decision can help this theory. Uses anecdotal evidence to formulate a number of theories which could be used to compare your company with the best in the world. By this several manipulations and choices can be survived through best strategies and using visual secret sharing scheme using speech recognition will improve [17] George K. Chacko, (1999).

It was understood the facets of the human thought process and apply their results to the creation of machines which "can learn from experience", "understand and speak a natural language", and "assess situations". The visual secret sharing scheme using speech recognition will be used to produce a tool with "Common sense", initially work will be carried out in vision capabilities [18] Seeman, P. et al. (1985).

It can also be seen that by similarity Aware greedy algorithm in which we can see how to determine sub modular function f(S). here greedy algorithm is used for generating unique image subset using greedy algorithm as shown in below algorithm that has been developed by P Zuo, Ya Hua, Y Sun, X Liu [24]. Algorithm: The Similarity aware greedy algorithm.

Input: Sub-modular Function f (). The weighted graph V= {G. L. w}, the remaining energy is L_{bat}
Output: O_k, where k is number of Iteration.
Step1: calculate threshold T_w based on L_{bat};
Step2: Partition graph V using T_w;
Step3: get the number of partition subgraphs b;
Step4: choose u1 arbitrarily;

Step5: R1 ← u1;
Step6: while mod Ri ≤b do
Step7: choose ui∈argmax$_{ui}$∈G\ $_{Ri}$ f(RiU{u1});
Step8: R_{i+1}←R_iU {u1};
Step9: i←i+1;
Step10: End while

The role of information within management was in a state of dramatic transformation. Managers might grasp and act on the implications of this change if they were to maintain their competitive position both corporately and as individuals. Scenario of Exponential rate can improve Information Technology. But this was only an Built Up of what had Preterit before, It should be understood and used in this light. Much more information similar to managers was now approachable than ever before, particularly here-with the use of electronic databases and networks. A major information of database such as List was provided. Specifically managers, whatever their function, might learnt to take full advantage of the information resources available to them, and do so continuously as part of their management techniques. This Organization will apply the VSS scheme using speech recognition method to develop an information strategy and corporate structure which ensures the fullest use of internal and external resources. [19] Bob N. et al. (1989).

Neologisms took on a life of their own, losing the associations that they were intended to have with other ideas, and shedding their embedment in a body of theory. For a new term to successfully project a meme, its proponent might enthuse a critical mass of early adopters to apply it, and to generate a further round of adopters. Concepts were seldom tracked over time. The visual secret sharing scheme using speech recognition will show that a new term and its associated body of theory require more than publications in top-level journals if they were to have significant impacts on academic research and industry practice [20] Roger Clarke, (2014).

The feature extraction algorithm can be seen by below mention algorithm which summaries one binary feature matrix from each natural image as input say I. Steps 3 to 5 gives feature value of each pixel in the form of block. Here Stabilization process is performed in Steps 6 & 7. Noise will be added in steps 8 to 11 based on given parameter A_{noise} And last steps i.e. 12 gives output [23].

Algorithm:
Feature Extraction Algorithm (FE):
Algorithm FE ()
Input: I, a, Noise
Output: F
Steps 1: Divide I block into blocks into a x a pixel.
Steps 2: For each block repeat steps 3-11.
Steps 3: ∀ x1 ≤ x ≤ x_a calculate $H^{x,y}$ by equation $H^{x,y}=A^{x,y}_R+A^{x,y}_G+A^{x,y}_B$;
Steps 4: calculate M.

Steps 5: $\forall\ x1 \le x \le x_n$ calculate $f^{x,y}$ by equation $f^{x,y}= f$ $(H^{x,y}) = \{^{1,}\ H^{x,y} \ge M,\ 0$ otherwise.

Steps 6: calculate Q_s by $Q_s=(\forall\ x1 \le x \le x_n,\ \forall\ y1 \le y \le y_n$ $f^{x,y}) -b^2/2.$

Steps 7: randomly select Q_s where $f^{x,y}=1$ and $H^{x,y=}\ M.$ let $f^{x,y}<-0.$

Steps 8: calculate Q_c by $Q_c = b^2/2\ x\ A_{noise}$

Steps 9: randomly select Q_c candidate pixel where $f^{x,y}= 1$

Steps 10: randomly select Q_c candidate pixel where $f^{x,y}= 0$

Steps 11: Alter all values of $f^{x,y}$ that were selected in step 9 and 10

Steps 12: Output F.

III CONCLUSION

Visual secret sharing scheme with speech recognition exploit human eyes to decrypt secret image with no computation but highly secure manner. As input will be divided into many visual encrypted parts as share with key as speech also. So the given input image can be divided into secret sharing parts with speech key which can be used in future for encryption. We can use different algorithm technique with speech recognition method for implementation of this encryption technique. This paper suggests sharing information but we would be developing as it is more secure and robustness algorithm for image encryption. This paper exploits the technique of spectrometer also. The proposed scheme declared good security due to encryption with cryptography and speech recognition technique.

IV FUTURE SCOPE

This study will improve security for sharing image and it will also improve E health precision in telemedicine by smart phone or other automatic system. The analysis of Speech Recognition with Visual Secret Sharing Scheme also have effects on face, lip and other parts of the body in an efficient manner and specially on emergency medical situations for best treatment of patients.

Also in normal secret sharing image can be share by different secret key. Now in this scheme image can have secret key as well as speech pattern so for decrypting image they should have encryption key and speech pattern.

In many cases Robot also sense our emotion via radio wave. One of the techniques for this research is Spectrogram; it is a visual representation of spectrum of frequencies of a signal as it varies with time. For recognizing image by speech Spectrogram is also known as voiceprints or sonographs. When data is represented in 3d plot than they called as waterfalls. Spectrogram can be generated by an optical spectrometer. A common format of this is a graph with 2 geometric dimensions: one axis represent time while other frequency. Spectrometer of light may be created directly using optical spectrometer over time. In this we will see band pass filter is also used for analog processing to divide input signal into frequency bands. Creating a spectrometer using FFT is a digital process.

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Design of Image Steganography & Symmetric Cryptography for Image hiding by using DWT

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ABSTRACT

The combination of encryption and invisibility of encrypted data, it unchanged the message entirely protected against data espionage. This concept can also provide an easy means to exchange imperative messages in a message. Based on this concept, we proposed a new encryption algorithm that providing confidentiality and authentication for secure data and this data is hiding behind cover image by using proposed steganography algorithm having less cover size. Another concept we used in this that is discrete wavelet transform which is applicable on large size of secretes image data to compress. PSNR and Entropy of stego image is showing the effectiveness of proposed algorithm.

Keyword: Security, Cryptography, Encryption, Decryption, Steganography, Wavelet Transform

I INTRODUCTION

The uses of digital media and transmission of the information is easiest way through network in today world just because of expansion of internet knowledge [1]. However, the transmission of secret messages through the Internet system suffers serious security expenses [2]. Therefore, the fortification of top secret messages for the period of transmission becomes an important issue. Although cryptography changes the message so that it can't be understood, this can generate the level of curiosity of a hacker [3]. It would be much more sensible if the secret message is integrated intelligently in another medium so that no one can guess if there is something hidden there or not. This thought in steganography, which is a subdivision of information that is secreted by hiding secret information inside other information [4]. The word stegano-graphy in Greek means "covered writing" (Greek words "stegos" meaning "cover" and "graffia" meaning "writing") [4]. The key objective of steganography is to hide a secret message inside harmless means of coverage in such a way that the observer can't see the secret message [5]. Therefore, the stego image should not diverge much from the original cover image. In this generation, steganography is used primarily in computers with digital data that are operators and networks are high-speed delivery channels [6]. Here figure 1 is showing that the basic structure of the steganography.
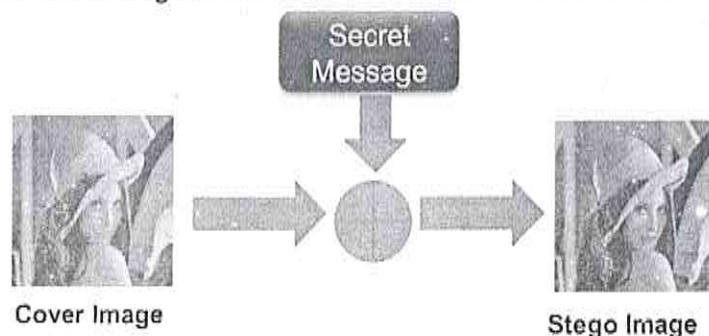
Fig. Error! No text of specified style in document.: Block diagram of steganography system

Cryptography and steganography are measurably two traditions of trouncing messages, they are corresponding, and they are not the same.

Organization of the paper is as follow: section-I is presetting introduction, section-II is presenting literature survey, Section-III is presenting proposed work, Section-IV is presenting results and section-V is presenting conclusion.

II LITERATURE SURVEY

A new steganography method proposed by [7] which included two methods, one is symmetric key cryptography and another is wavelet transformation. In this steganography method, secrete data is selected and if it is an image then authors apply image compression technique to reduce the size of image. Here they used lossless wavelet transformation for image compression. After that compressed image pass to the proposed symmetric cryptography to encrypt. At last proposed steganography method apply on encrypted data and authors used standard LSB mechanism.

Another image steganography approach is presented in [8] where the cover image is splitting into 2×2 non-overlapping pixel blocks. The upper-left pixel of that block embeds a certain number of bits of the secret bit stream. Whereas, the remaining pixels of the same block embed the secret data using a advancement of the 'pixel-value-differencing' (PVD) technique that considers concealing confidential message into both vertical and horizontal edges.

Haar Discreet Wavelet Transform (HDWT) method for data hiding along with Advanced Encryption System (AES) for encrypting the data is proposed by [9]. The aims of HDWT is to reduce the difficulty occur during normal steganography while providing low image distortion and lesser detection ability. In this method, one portion of the cover image carry the details of the one-fourth of the image and rest of the portion of the cover image carry less details of the image then the cipher-text is hidden at most two LSB positions in the less detailed portion of the cover image, second LSB used if and only if the message does not fit in the first LSB

In [10] we propose a Discrete Wavelet Transform (DWT) based high capacity steganography using coefficient replacement with increased security by adapting an encryption of payload Image. The Haar and biorthogonal DWT is applied separately on cover image and Advanced Encryption Standard (AES) with modification is applied on payload to convert payload image into an encrypted image. The resulted coefficients of payload image are embedded inside the high frequency bands of cover image. The new concept of replacing HH sub band coefficients by encrypted payload is introduced to generate intermediate stego image.

In [11] another combination of cryptography and steganography is presented. Here cryptography is used to encrypt the data and then steganography conceal to encrypt data in cover image so two layer of security can be applicable on a confidential data.

Picture quality based on PSNR and uncertainty (entropy) in the produced stego image are the two parameters which is play important role to evaluate the performance of any steganography technique. In [7, 8 and 9] produced PSNR is not satisfactory and basically PSNR is giving the picture quality of original cover image and produced stego image. For example if a cover image has 100% picture quality then stego image should near about 100%. Similarly uncertainty (entropy) mean differences between original cover image pixel and produced stego image pixel. For example if a pixel of cover image has third position and same pixel has 78th position in stego image, then this is representing the uncertainty which is calculated as entropy. In [10 and 11] producing low entropy which can be increased.

III PROPOSED WORK

The proposed encryption algorithm is simple and efficient against existing algorithms. It has a key of 128-bits long which has enhancing its security. Its structure is robust against an assortment of attacks. Adding a steganography procedure increases its security, the proposed steganography is implemented in such a way that it improves the quality of cover file without changing the cover file size. Here the secrete message which is image using wavelet transform compression mechanism to compress the size of the image and this compression is not for text data. Proposed encryption applies on compress data to encode and this encoded data is concealing behind a cover image by using proposed steganography mechanism.

Fig.-2 is showing the sender side steganography architecture where secrete message 'SI' is required wavelet transformation 'WT' to compress 'COM' data if it is image. Here Lossless 'L' wavelet transformation is used. Once we completed 'WT' step if its applicable then proposed encryption 'E' encoded that data with key 'K' of 128-bits. At last steganography 'S' is applied on encoded data which is required a cover image 'CI'. Standard least significant bit (LSB) mechanism is using to implant encoded data to produce stego image 'SIm'.

SI: Secrete Information (Text/Image)

COM: Compression

WT: Wavelet Transformation

L: Lossless Transformation

E: Encoding

S: Steganography

CI: Cover Image

LSB: Least Significant Bit

SIm: Stego Image

K: Key

UCOM: UnCompression

D: Decoding
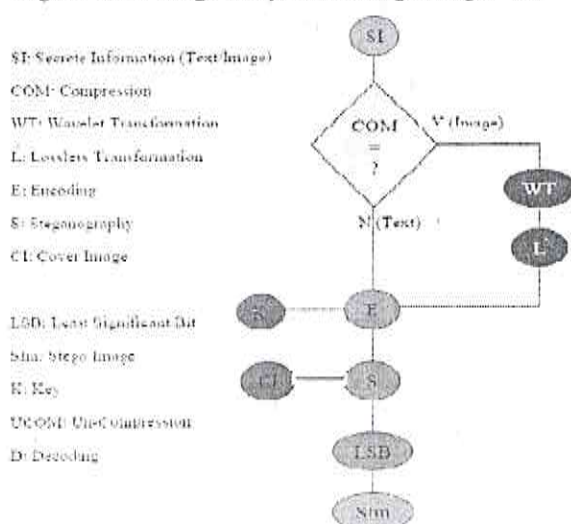
Fig. 2: Encryption of Proposed Steganography
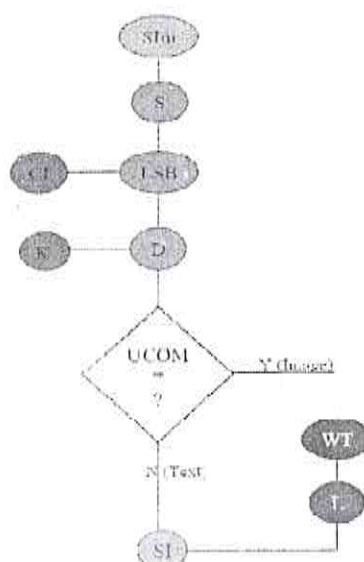
Fig. 3: Decryption of Proposed Steganography

Fig.-3 is showing the receiver end steganography architecture. Here stego image 'SIm' work with steganography 'S' which interpret 'LSB' of 'SImg'. Once we get 'LSB' of 'SImg' which is encoded by encryption mechanism pass to propose decryption 'D' mechanism to decode and rest of the value make cover image 'CI'. Key 'K' is used in decoding, once we decode the data, we apply wavelet compression 'WT' mechanism to uncompress 'UN-COM' data to get secrete image 'SI' if data is text then no need of 'WT'

(a) **'Wavelet-Transform' Method** - Lossy and Lossless are two wavelet compressions method are available [12] where lossless compression provide the facility to get original image from compressed image. but this is not possible with lossy compression because its support to the partial reconstruction of the original image. As we know that wavelet transformation is the facts which is required few space to store compressed data. due to this mechanism large image can be easily transferred from one place to another [13].

(i) **Steps In 'Wavelet-Compression'**

- Initially select secrete image
- Apply 'Wavelet-Decomposition' on the secrete image,
- At last 'compress' through fixed 'Threshold'.

(b) **Proposed 'Encryption/Decryption' Architecture-** Fig.-4 is presenting the encryption architecture. Initially 128-bits of secrete message interpreted which is splitting in two part each one is 64-bits and each part of secrete message performing circular shifting operation in sequential manner. XOR operation is performing with key which is also split in two parts of 64-bits to get cipher message.

Fig. Error! No text of specified style in
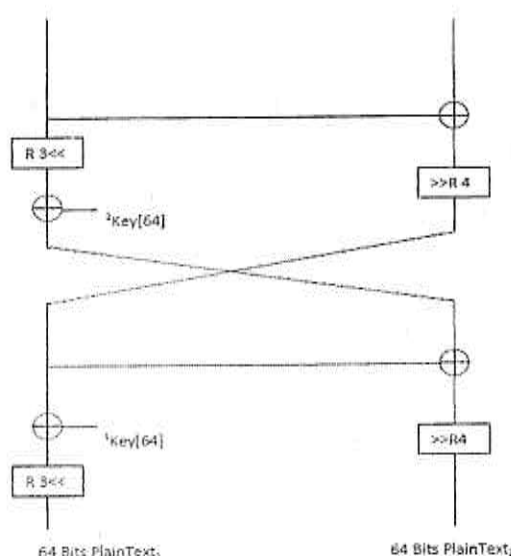
Fig. 5: Proposed Decryption Architecture

Fig.-5 is presenting the architecture of proposed decryption. Initially 128-bits cipher data is splitting in two part 64-bits each, and each part of cipher data

(i) **Algorithm of 'Proposed Encryption'**
- Loop on Input Message 1to N
- Select secret message in terms of bits
  bits→ 128-bits
- Select Key
  K→ 128-bits
- Split bits and K
  bits = bits/2→ (^{1}bits. ^{2}bits)
  K = K/2→ (^{1}Key. ^{2}Key)

performing circular shifting operation in sequential manner and XOR operation is performing with key to get original secrete message.

- Perform Shifting on 1bits, 2bits
  ^{1}bits= Left_Circular_Shift_3 (^{1}bits)
  ^{2}bits= Right_Circular_Shift_4 (^{2}bits)
- Perform XOR between 1bits & 1Key
  ^{1}bits = ^{1}bits $\oplus$ ^{1}Key
- Perform XOR between 1bits, 2bits
  ^{2}bits = ^{1}bits $\oplus$ ^{2}bits
- Interchange Value of 1bits, 2bits
  ^{2}bits = $b_1 \rightarrow$ ^{2}bits
  ^{1}bits = ^{2}bits $\rightarrow$ ^{1}bits
- Perform XOR between 1bits & 2Key
  ^{1}bits = ^{1}bits $\oplus$ ^{2}Key
- Perform Shifting on b1, b2
  ^{1}bits = Left_Circular_Shift_3 (^{1}bits)
  ^{2}bits= Right_Circular_Shift_4 (^{2}bits)
- Perform XOR between 1bits & 2bits
  ^{2}bits = ^{1}bits $\oplus$ ^{2}bits
- Loop End
- End

(ii) Algorithm Of 'Proposed Decryption'
- Loop on Cipher message (Cipher_bits) 1to N
- Select Cipher Message
  Cipher_bits $\rightarrow$ 128-bits
- Select Key
  Key$\rightarrow$ 128-bits
- Split Cipher_bits and K
  Cipher_bits = Cipher_bits /2$\rightarrow$ (Cipher_bits1, Cipher_bits2)
  Key = Key/2$\rightarrow$ (1Key, 2Key)
- Perform XOR between Cipher_bits1 & Cipher_bits2
  Cipher_bits2 = Cipher_bits1 $\oplus$ Cipher_bits2
- Perform Shifting on Cipher_bits1, Cipher_bits2
  Cipher_bits1 = Left_Circular_Shift_3 (Cipher_bits1)
  Cipher_bits2 = Right_Circular_Shift_4 (Cipher_bits2)
- Perform XOR between Cipher_bits1 & 2Key
  Cipher_bits1 = Cipher_bits1 $\oplus$ 2Key
- Interchange Value of Cipher_bits1, Cipher_bits2
  Cipher_bits2 = Cipher_bits1$\rightarrow$ Cipher_bits2
  Cipher_bits1 = Cipher_bits2$\rightarrow$ Cipher_bits1
- Perform XOR between Cipher_bits1 & Cipher_bits2
  Cipher_bit2 = Cipher_bits1 $\oplus$ Cipher_bits2
- Perform XOR between Cipher_bits1 & 1Key
  Cipher_bits1 = Cipher_bits1 $\oplus$ 1Key
- Perform Shifting on Cipher_bits1, Cipher_bits2
  Cipher_bits1 = Rev_left_Circular_Shift_3 (Cipher_bits1)
  Cipher_bits2 = Rev_Right_Circular_Shift_4 (Cipher_bits2)
- Combine Cipher_bits1 and Cipher_bits2 to get 12- bits Cipher_bits as a cipher
  Cipher_bits = Cipher_bits1 $\odot$ Cipher_bitsC2
- Replace Cipher_bits (Cipher value) into Plain_Text as Original value
  Plain_Text = Cipher_bits
- End Loop
- Exit

(c) **Steganography Algorithm - Proposed** Encryption/Decryption algorithm provide high security but still intruders can try to crack the keys. to strengthen the proposed architecture. the encryption/decryption algorithm is combined with steganography algorithm. Here proposed an efficient steganography algorithm which is the extension of LSB method. Steps of proposed steganography algorithm are as follow:

(iii) Sender End Algorithm

- Start
- Select Cover Image as (CImage)
  CImage = Image→ CImage
- Select Secrete Message as Binary_MSG
- Loop Binary_MSG 1 to N
- Binary_MSG = Binary_MSG →128-bits
- Interpret binaries of secret message as Binary_MSG and CImage
  Binary_Value_ Binary_MSG = BReader (Binary_MSG)
  Binary_Value_CImage = BReader (CImage)
- Interpret 'LSB' of CImage
  LSB_CImage = LSBReader (CImage)
- Substitute LSBCImage from Binary_Value_Binary_MSG
  LSB_CImage   =   Binary_Value_Binary_MSG
- Loop End
- End

(d) Receiver End Steganography

- Select Stego Image as SImage

SImage = Image→SImage
- Loop SImage 1 to N
- Interpret Binaries of SImage
- Binary_SImage = Binary_Read (SImage)
- Interpret LSB of Binary_SImage
  LSB_Binary_SImage = LSB_Reader (Binary_SImage)
- Implanted LSB_Binary_SImage as secret message
  Binary_MSG = Implanted_LSB (LSB_Binary_SImage)
- Loop End
- End

IV RESULTS

Hear results are showing the competence of the proposed concept that is based on selected performance attribute. For a concept it is imperative to be proficient and secure. Performance of an algorithm is evaluated on the bases of selected parameters and here proposed system has chosen one performance parameters that is execution time for encryption/decryption algorithm and measurement used parameters are Entropy, Correlation and Peek Signal to Noise Ratio (PSNR) for steganography algorithm [14]. Desktop device has been used to compute experimental outcome. Configuration of desktop device is following (See Table 1)

Table 1
Configuration

S. No.	Processor	Memory(Primary)	Platform	Software Application
1	Intel Core i3 2.67 Ghz.	2 GB of RAM	Window-7 Home Basic SP1	Dot Net 2008

(a) **Time Examination** - It is essential for any technique that it should be time competent. Encryption and Decryption process is used for secrecy. but this secrecy is applied numerous times on real time information. if the encryption and decryption progression is not time proficient than it can't be used for actual time broadcast. The execution time is deliberate the instance that an encryption/decryption algorithm takes to construct a plain text to cipher text and cipher text from a plaintext respectively [15]. Experimental outcome of the proposed encryption/decryption algorithm is presents in Table 2.

Table-2
Assessment of Time of Encryption/Decryption in millisecond of Proposed-Algorithm with AES on different Size of File

Size of File in KB	Methods	
	Time of execution in Millisecond	
	Proposed-Algorithm	AES
5	0.140	0.201
10	0.597	0.681
20	2.252	3.038

Encryptio/Decryption Time
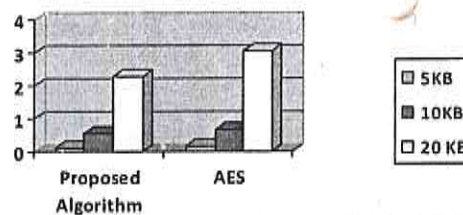
Fig. 6: Encryption/Decryption time of the proposed encryption/decryption algorithm

It is clearly seen from the Table 2 that proposed encryption/decryption algorithm is time efficient. Hence it is suitable for real time data transmission. A graphical representation for the encryption/decryption time is shown in Figure 6. From Figure 2, it is clearly seen that proposed encryption/dercyption time is much lesser than the other existing encryption algorithm. It shows the efficiency of proposed encryption algorithms. It proves that proposed encryption algorithm can be suitable real time communication.

(a) **PSNR and Entropy Examination** -This work has proposed its own steganography technique. Therefore it is important to ensure its effectiveness. To ensure the effectiveness of proposed steganography algorithm, I have evaluated two parameters that are entropy and PSNR [16]. Proposed algorithm run numerous time on various size of secrete image file shown in table 3 with two cover image shown in figure 7 and measure the performance.

(a) "Lena.jpg"

(b) "Monalesa.jpg"

Fig. 7: Cover-Images

(b) **Peek-Signal to Noise-Ratio (PSNR)** - For PSNR calculation we need MSE (Mean Squared Error) and PSNR equation which are as follow:[17]

$$MSE = \frac{\sum_i \sum_j |x(i,j)-y(i,j)|^2}{..}$$

$$PSNR = 10log_{10}\frac{(L-1)^2}{MSE}$$

Table 3
PSNR Evaluation of Proposed Steganography Algorithm on Cover Image Lena.jpg

Input		PNSR	
Secrete Image	Size in KB	Proposed Algorithm	Existing[7]
Image1	1.85	44.38	43.41
Image2	2.72	44.41	43.42
Image3	3.68	44.41	43.42
Image4	4.36	45.40	43.50
Image5	9.35	45.41	43.51
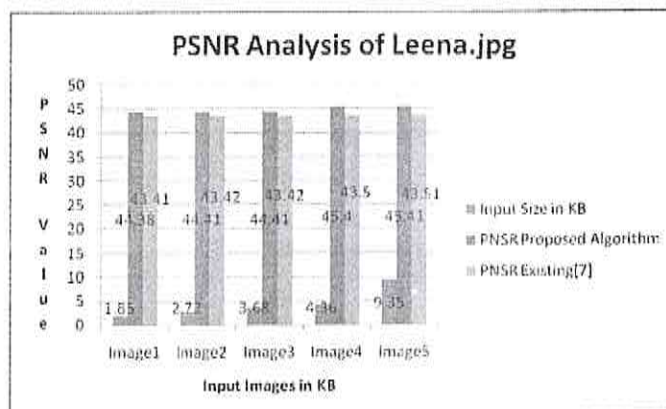
Fig. 8: PSNR analysis of Proposed Steganography Algorithm on Cover Image Lena.jpg

Table 4
PSNR analysis of Proposed Steganography Algorithm on Cover Image Monalesa.jpg

Input		PNSR	
Secrete Image	Size	Proposed Algorithm	Existing [7]
Image1	1.85	44.38	43.41
Image2	2.72	44.41	43.42
Image3	3.68	44.41	43.42
Image4	4.36	45.40	43.50
Image5	9.35	45.41	43.51
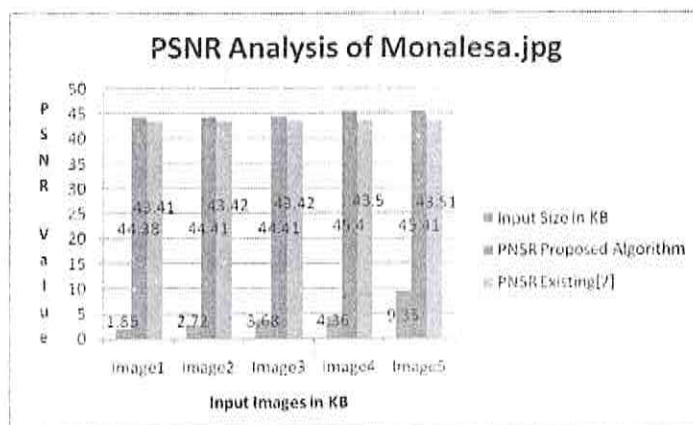
Fig. 9: PSNR analysis of Proposed Steganography Algorithm on Cover Image Monalesa.jpg

(c)   Entropy Analysis
Entropy defined as follows [17].

$$H_e = -\sum_{k=0} P(k) \log_2 (P(k))$$

Table 5 and 6 is showing the Entropy performances between proposed and exiting concept over text and image of various size.

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Entropy analysis of Proposed Steganography Algorithm on Cover Image Lena.jpg

Input		Entropy	
Secrete Image	Size	Proposed Algorithm	Existing[7]
Image1	1.85	0.621	0.6138
Image2	2.72	0.622	0.6212
Image3	3.68	0.624	0.6352
Image4	4.36	0.632	0.6447
Image5	9.35	0.634	0.6447
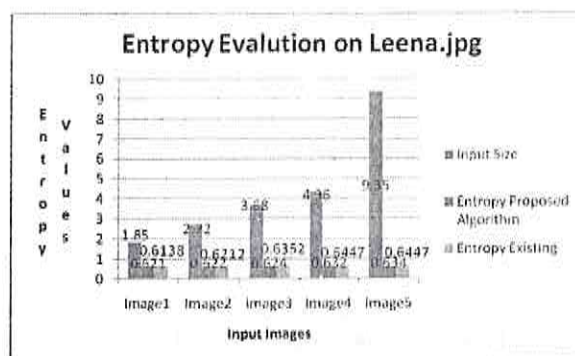
Fig. 10: Entropy analysis of Proposed Steganography Algorithm on Cover Image Lena.jpg

Table 6
Entropy analysis of Proposed Steganography Algorithm on Cover Image Monalesa.jpg

Input		Entropy	
Secrete Image	Size	Proposed Algorithm	Existing[7]
Image1	1.85	0.621	0.6138
Image2	2.72	0.622	0.6212
Image3	3.68	0.624	0.6352
Image4	4.36	0.632	0.6447
Image5	9.35	0.634	0.6447
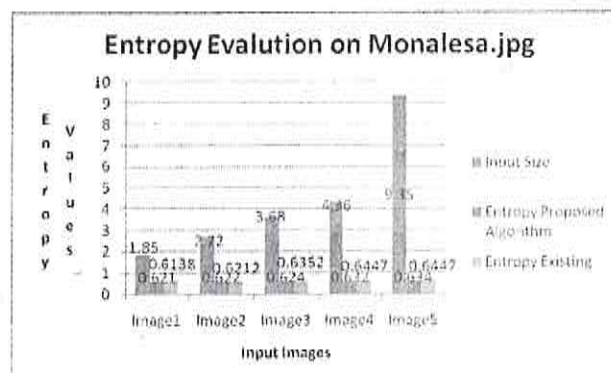
Fig. 11: Entropy analysis of Proposed Steganography Algorithm on Cover Image Monalesa.jpg

(d) Results Discussion- Calculated results are shown in table 3 to 6 for PSNR, and Entropy parameters on various image data as an input data and monalesa.jpg and Leena.jpg both are selected as cover image. Table 3 and figure 8 shown "PSNR" results 43.41 for image1 over lena.jpg cover image with existing algorithm and "PSNR" results 44.38 with proposed algorithm which is good as compare existing. Similarly table 4 and figure 9 is producing 43.41 "PSNR" with existing algorithm and 44.38 with proposed algorithm. For both results it is very clear the proposed algorithm having good results of PSNR as compare exiting. Table 5 and figure 10 showed Entropy 0.644 for image1 over lena.jpg cover image with existing algorithm and 0.634 with proposed algorithm. Similarly table 6 and figure 11 is shown entropy 0.644 with existing algorithm and 0.634 with proposed algorithm. Entropy results clearly shown that proposed algorithm is producing superior results as compare existing. Proposed security system considers the key size as a measure to evaluate the performance of the proposed concept. The obtainable experimental outcome shows the superiority of the proposed technique over other technique in terms of the processing execution time, entropy and PSNR.

V CONCLUSION

The earlier presented techniques are time consuming. So it is required to develop a fast encryption technique. In this research work, a new selective steganography technique based on a combination between LSB image hiding, and a proposed encryption method is introduced. Another image compression concept is used for image data. Here lossless wavelet transformation image compression is used along with proposed encryption and steganography. Presented outcome of the proposed method proved that proposed encryption is time efficient as compare exiting, and proposed steganography is more safe and having low deformation of the cover image. Proposed method can be applicable on any type of network because of its simplicity and portability. The proposed encryption gives remarkable execution time as compare AES for large size of data files. PSNR of stego image show that proposed steganography is batter then earlier presented technique. There are very less differences between original cover image and setgo image. In future proposed method will include all type of multimedia data file like audio, vedio and many more.

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Evaluation of Agent Based Host Intrusion Detection System (AHIDS) through Various Classification Techniques

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ABSTRACT

Intrusion-detection-system (IDS) is the necessary part of the system form security point of view. It comes in both hardware and software IDS. Primary works of IDS is the recognized and differentiate between usual and unusual things that are happing in the system and show unusual thing as intrusion. At present unusual activity in the system are growing every year so improvement in existing IDS is always required. This paper is presents two thing, one is the concept of new host based IDS which used agent based mechanism to find intrusion on a host so it become host based intrusion detection system (AHIDS) and second is the selection of good classification technique for IDS. Selection of good classification technique is necessary because it is provide more accurate and prediction analysis on large amount of record set and IDS uses such type of data set for finding intrusions. Proposed AHIDS using three agent like PE, RA and DB agent where PE is the packet capturing and extracting agent, RA is rule agent and DB is the database agent. All agents are work together that means PE agent pass data to DB agent and RA agent collect data from DB agent. For the selection of good classification technique, proposed AHIDS comparing five different classification techniques like Naive-Bayes, K-nearest- neighbors, SVM, J48, and Random-Forest. NSL-KDD data set is used for results examination.

Keyword— Intrusion Detection System (IDS). Intrusion. Classification, Security. Agent.

I INTRODUCTION

The Internet is a global public and large scale open network. It has its own pros and cons. With expansion of the Internet and its capability, life is becoming easy for everyone [1]. It is helpful and beneficial for both business organization and individual user. In today's world, most of the work can easily done by Internet like e-business, e-ticket, e-shopping and many more. More and more public are associating with Internet to take benefit of these facilities. Now days, internetwork connectivity is becoming very important phase [2]. The widespread growth of Internet and increasing easily accessibility of tools for attacking computer network is one of the major concerns of network administrators and security providers for the security of computer systems and data in it.

Unusual events in system are called intrusion and they are tried to escape protection shield of the system. As we know that availability, integrity and confidentiality, are the basic security principal and it is suffer by the every attempt of intrusion [3].

Therefore, all unusual activity which is happening in the system is done by outside that means it is accessing system through network or insider that may by its authenticated person but both are trying to get control of the system so they can stop the security feature of the system or they can access the information of the system. [4-5].

Organizations of the paper are as follow: Introduction is in Section 1. Section 2 is present about intrusion detection system and data-mining classification technique. Literature surveys are discussing in Section 3 and section 4 is showing research finding. Section 5 gives proposed agent based host intrusion detection system. Section 6 discusses about the results and the section 7 is of conclusion.

II INTRUSION DETECTION SYSTEM AND DATA MINING CLASSIFICATION TECHNIQUE

IDS come in hardware or software form that examines a network or network node or computer for unfriendly movement [5]. Intrusion detection system works on the safety rules for identifying any abnormal activity. System administrator is the person who defines these policies according to the requirement of organization. Any action which breach these rules are consider as unusual activity. Every observed unusual activity is informed to the administrator through mails or any means. For efficient working of Intrusion detection system these security rules should be restructured regularly. Intrusion Detection System [5] is a system which examines a computer or group of computers on the network against any intrusion. Intrusion is any access or action in system which is not authorized. IDS are primarily used to identify any misuse of system or network. IDS identify the occurrence of an intrusion in the network and generate an alert [6]. Intrusion detection system performs three main roles: examining the systems, detection of any intrusion and raise an alert if any malicious activity is detected. Conceptualized IDS can be classified in two ways to defend the system from spiteful activities [7]. First move toward of build IDS for totally safe system through various cryptographic technique along with authorization techniques [8]. Figure 1 is showing the basic intrusion detection system mechanism. In this host are connected with various IDS and these IDS are handled by IDS admin if any intrusion are

identified by IDS then it reported to IDS admin for   further action.
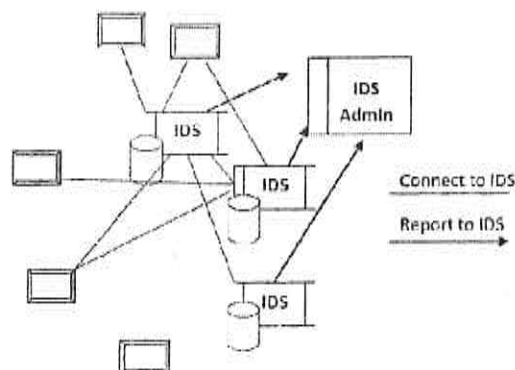
Fig. 1: Intrusion Detection System Mechanism

This approach is not providing fully safe system because each user has different type of vulnerability. So another way is required to protect system completely and IDS can be mechanisms which can be provide such type of environment where system can be fully safe and secure. There are four type of IDS available, named are information-based (knowledge-based), behavior-based, host-based, and net-based [11].

(a) **Knowledge-Base IDS** - Knowledge-Based or signature based IDS use predefine signature of the intrusion that is also known as patterns of the computer or network and its identified intrusion based on pre-knowledge. Its maintain record of previous signature of intrusion and vulnerabilities [12].

(b) **Behavior Base IDS** - Behavior based IDS work on the normal behavior of the System. It is continuously watch to the system and recorded normal activity of the system. on the basis of these normal activities, it is identify to the intrusion [13].

(c) **Host Base IDS** - The host-based-intrusion-detection system never monitors traffic of the network, moderately it checks out what is happening over the original targeted machines. This is done through monitoring the security event-logs or by monitoring the modification in the system, as an example modification to the complicated system-files or to systems-registry [14].

(d) **Network Base IDS** - Network-based IDS analyze network traffic to monitor entire computer networks. Controls the packets on network-wire and tried to introduce an intruder through matching attack-pattern for database of well known patterns of attack [14].

(e) **Data-Mining for IDS:** There are many data mining techniques for intrusion detection such as classification, clustering, frequent pattern mining and many more. Clustering is the technique of tagging data and give into cluster of comparable items exclusive of using recognized arrangement of data points. Members of similar group are like and instances of dissimilar groups are dissimilar from each other. Clustering technique can be categorized into groups of four: one is hierarchical algorithm second is partitioning algorithm, third is Grid based algorithm and fourth is density based algorithm [15]. Classification: Classification is the assignment of captivating each and every instances of record set in thought and transmission it to a exacting abnormal and normal class that means recognized arrangement is used for new instances. It can be efficient for together anomaly and misuse detection, but more regularly used for misuse detection [15]. Classification categorized the datasets into predetermined sets. Various classification method like Support vector machine, naive bayes classifier decision tree, K-nearest neighbors classifier, etc. are used in IDS [15].

III RELATED WORK

An intrusion detection system proposed by [16] which is the combination three classification techniques named are Naïve Bayes, decision trees and support vector machines (SVM). With the help of presented IDS they are trying to increase the accuracy of intrusion detection and trying to reduce false positive rate. Another IDS presented by [17] which is using is the combination of attribute selection, outlier detection, and enhanced multiclass SVM classification methods. They are trying to reduce its processing time and improving the intrusion detection accuracy. In [18] a mobile agent immune system (MAIS) intrusion detection system proposed. In this they have three agent named mobile and static agents with detector agents which is the major factor in MAIS-Intrusion detection system. Presented IDS of [18] has cloning, transmutation, immigration, association. as well as arbitrariness mechanism to improve intrusion detection accuracy. Another IDS presented by [19] which is using is the combination of Support Vector Machine (SVM) and Ant Colony Network (CAN).classification methods.

They are also trying to reduce its processing time and improving the intrusion detection accuracy. An network intrusion detection system proposed by [20] which is the combination three classification techniques named are support vector machine (SVM), K-Nearest-neighbors (KNN) and Decision Tree. In this they are trying to increase the accuracy of intrusion detection and trying to reduce false positive rate. In [21] a hybrid classifier model of IDS is proposed which is using genetic algorithm (GA) for feature selection to improving the accuracy of classification and support vector machine (SVM) which is a machine learning technique for classification of intrusions. Tree based data mining classification techniques such as Hoeffding tree, j48, Random Forest, Random Tree, Rep-Tree used in [22] on intrusion detection . They used KDD-99 data set with WEKA 3.9 tool to implement this model [22]. In [23] providing study and comparative analysis of various classification technique like Random-forest. Tree J.48, rules part, Neural network, Random-tree, logistic, SVM, Bayes-Net, decision table, Hoeffding tree, and Naïve-Bayes which is usable in IDS.

IV RESEARCH FINDING

Form the study of the various existing IDS [16-23] and the uses of classification technique for the evolution of IDS on parameters like false positive rate, precision, detection rate etc; it is very difficult to find the good classification technique to evaluate IDS because results are varying from IDS to IDS. As we know that classification techniques is the part of data mining and it can be apply on big data record set to assist more accurate and prediction analysis with this

reason we focused on identification of good classification technique for IDS because IDS work on large data record set and accuracy and predication analysis is an important issue to evaluate any IDS.

V PROPOSED WORK

Proposed IDS "Agent Based Host Intrusion Detection System (AHIDS)" is an intrusion detection system (IDS). the proposed AHIDS is having three agents on host and the working of each agent is different from other. The purpose of proposed AHIDS structure is to boost, importunate disruption removal increasingly. The proposed AHIDS can be exploit to boost systematize way as it make menacing of communication as disruption to be predictable. Proposed AHIDS is the agent based HIDS which gratify position based efficacy. Figure-2 expresses the essential model of proposed AHIDS. Proposed AHIDS is a completely different from other HIDS or NIDS. It is software application which will install on particular hosts to be monitored. It will examine different types of modification over time on host which may signal safety problems. AHIDS examines the actions and activities of a host which is to be monitored and match up to with its abnormal behavior. By the proposed AHIDS it is examining and monitoring individual computer systems, software applications are installed on them. It only analyses the essential packets which is capturing by the PE agent. After monitoring packets by RA agent who are installed on workstations with classification technique, write down the data to database by DB agent for further action.
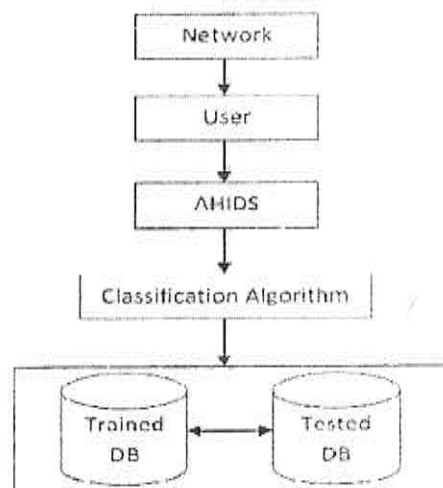
Fig. 2: Proposed Model of AHIDS

Proposed AHIDS can be execute real time. also the proposed AHIDS will grab real information at real time and it will move toward IDS. Figure-3 is showing the architecture of Proposed AHIDS which

has three agents named is PE agent. RA Agent and DB agent. Workings of each agent are defined as follow:
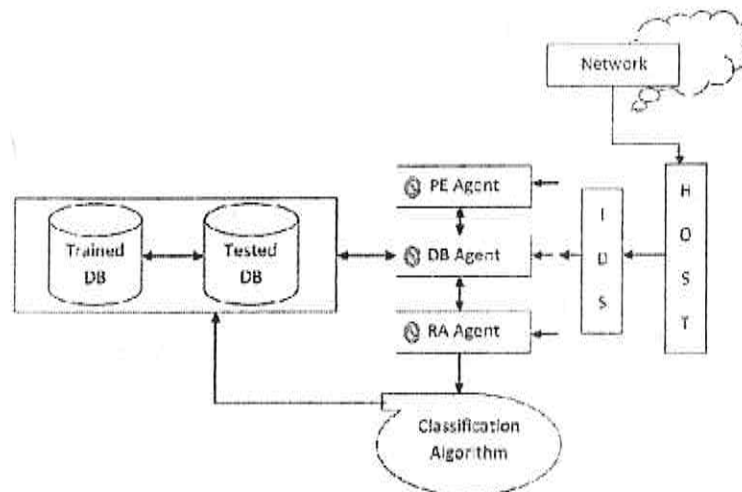
Fig. 3: Proposed Architecture of AHIDS

(a) **Agent-1: PE Agent** - PE Agent is the packet capture and extract agent. This agent captured packet form network and extract packet to fetch information from the packet which is passed to DB agent to store in tested data base for further uses. This is the first agent of the proposed IDS.

(b) **Agent-2: RA Agent** - RA Agent is the rule agent and it is very important agent because all rules which are design for intrusion detection are handled by this agent. Basically this agent is designing and implementing set of rules to find intrusion. Basically it used classification technique to identify intrusion. During intrusion detection this agent will retrieve data with the help DB agent from tested database and compare with each record of trained data base to find predefine pastern, if it is find then it marked that record as intrusion otherwise it is marked as normal.

(c) **Agent-3: DB Agent** - DB Agent is used to manage trained and tested data base. This agent will collect data from PE agent and store in the tested data base for further uses. DB agents provide data to RA agent on demand.

VI RESULTS

The proposed agent host based intrusion detection system has been implemented in Java along with classification techniques and tested on intel I5-2540M CPU with 2.60 Ghz and 4 GB ram on window 7 platform. The examination is arranged based on diverse constraint like True positive rate, false positive rate and precision and. True Positive (TP) that means rightly identifies normal which was predicted as normal [24]. False Positive (FP) that means predicated as intrusion but it is not an intrusion. Precision shows retrieved documents that are relevant to the query. There are various data record sets are available, but all have a few confines. The well-known data record set is KDD-99, but it has redundant information so it is not useful for the results evulsions [25]. In place of KDD-99 we used NSL-DD which is refine version of this data record set [25]. The NSL-KDD has two class of network packet one is normal and second is abnormal. In abnormal class various type of attack are shown like DOS, U2R, Probe and R2L [25]. Here we have used only 10% data record set of original NSL-KDD for results examination which is shown in table-1.

Table-2
Data Record Sets

Record Type	Instances
Normal/Intrusion	2000/3000

For the proposed IDS evaluation we have compared five classification techniques like Naïve-Bayes, K-nearest- neighbors. SVM. J48, and Random-Forest. Three parameters like True Positive Rate, Precision and False Positive Rate are participating in results by the 5 different classification techniques on predefine dataset which is shown by Table-1 and produced values are shown in Table-2.

Table- 2
Relative Examination of five classifications technique by Proposed IDS on True Positive Rate, Precision and False Positive Rate

S. No.	Algorithms	TPR	Precision	FPR
1	NaiveBayes	0.986	0.986	0.006
2	K nearest Neighbours	0.988	0.988	0.004
3	SVM	0.985	0.985	0.004
4	J48	0.942	0.942	0.069
5	Random Forest	0.976	0.977	0.048
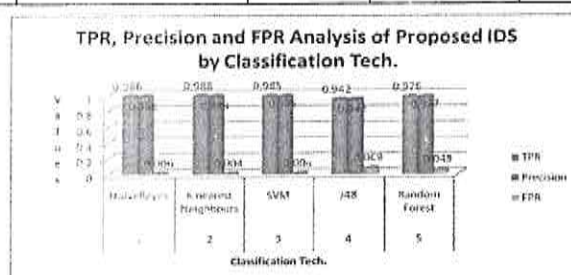
Fig. 4: Relative Examination of five classifications technique by Proposed IDS on True Positive Rate, Precision and False Positive Rate

Greater values of true positive rate and precision while lesser values of false positive rate are show the efficacy of the technique. From table 2 we get 0.988 true positive rates and precision for K-Nearest-neighbors while false positive rate of this is 0.004 similarly which is show that this classification technique is good of IDS. Similarly 0.986 true positive rate and precision for Naives Bayes while false positive rate of this is 0.006 which is the second good technique for IDS and furthermore 0.976 true positive rate and precision for Random Forest while false positive rate of this is 0.048 and 0.985 true positive rate and precision for Support Vector Machine SVM while false positive rate of this is 0.004 are also good for IDS but 0.942 true positive rate and precision for J48 while false positive rate of this is 0.069 are not producing effective results for IDS. Figure 4 is showing graphical analysis of presented results in table 3.

VII CONCULSION

Proposed Agent Based Host Intrusion Detection System (AHIDS) is an intrusion detection system (IDS) which is having three agents (PE, RA and DB) on host and the working of each agent is different from other. Basically proposed IDS are different from other HIDS because it's mechanism. The primary objective of this research is to find good classification technique for proposed IDS. To achieve this objective, we compared five classification techniques on three parameters like true positive rate, precision and false positive rate. Here results performance is completed on predefine NSL KDD data record set. As per results examination K-Nearest neighbors produced high true positive rate and precision where J48 classification technique produced low true positive rate and precision. False positive rate is good for K-Nearest-neighbors and support vector machine (SVM). It is found that K-Nearest-neighbors classification technique provides a high true positive rate and precision of above 98% with low false positive around 2%. So we can conclude K-Nearest-neighbors classification technique is appropriate and good for proposed agent based intrusion detection system when assessed with NSL-KDD dataset.

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Investigation of Mechanical and Water Absorption Behavior of Wood Flour Filled Glass Fiber Reinforced Epoxy Composite

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ABSTRACT

In the present paper, effect of wood flour (WF) on E glass fiber (GF) reinforced epoxy polymer (GFRP) composite has been discussed. Composite panels were prepared using hand lay-up technique. The percentages of wood flour were varied from 2.5 wt. % to 10 wt. % keeping glass fiber constant in epoxy. Mechanical and water absorption tests were carried out and specimens were prepared accordingly. Results showed that as the percentage of WF increased in the composite, water uptake increases. The neat GF reinforced epoxy composite exhibited minimum water uptake. The Composite fabricated reinforced with 7.5 wt % WF absorb maximum energy and exhibited highest tensile strength.

Keywords: Wood flour, Glass fiber reinforced epoxy polymer, Tensile strength, Water absorption.

I INTRODUCTION

Processing of wood for the construction of civil structure and house hold equipment produces a huge amount of waste [1-4]. This waste is technically termed as wood flour (WF) [5-8]. WF is generally scrapped or used to form light weight material like cover of notebook, panels in cars, decking, fencing etc. [9, 10]. For the manufacturing of composite structure WF can be used as a filler material in the thermoplastic and thermoset plastic as it can provide strength and stiffness to the structure [11-13]. WF is called as economical filler to fabricate cost effective composites [14-16]. Furthermore, its natural occurrence leaves no traces which affect the environment [17-18]. Moreover scarcity of synthetic filler and fiber is another issue which ends up in using the natural wood flour filler in the composite field [19-21]. Till now in the earth crust thousands of variety of wood is found [22]. Founders and researchers have named them according to their physical, chemical, adoptability and behavioral order [23-24]. It would be the toughest part for anybody to name all types of known woods but some of the common wood and their chemical properties have been listed in table 1.

Table 1
List of most common wood and their chemical composition

Species	Cellulose	Hemicellulose	Lignin	Extractives	Ash
Loblolly Pine	45	23	27	4	0.2
Red Maple	47	30	21	2	0.4
White Oak	47	20	27	3	0.4
Southern Red Oak	42	27	25	4	0.4
Incense Cedar	37	19	34	3	0.3
Ponderosa Pine	41	27	26	5	0.5
Mahogany wood	41.9	15.4	26	5.7	0.3
Bagasse	43.4	21.5	35.1	8.4	0.3
Redwood	42.1	18	38	15.4	0.2
Bitter wood	48.5	19.5	32	2.1	0.3
Marina	52	18.7	29.4	2.3	0.5
Locust Wood	42.6	25.8	31.4	8.5	0.3

The application of WF as filler in composite material is an interesting fields because of its uncountable variety and it is very difficult to conclude their specific effect on the composite material [16, 25-

27]. Literature survey suggested that species, percentage, grain size and the matrix with which WF is used have different effect on the composite [29, 30]. WF is also a hydrophilic material thus absorbs lot of moisture. This moisture content has negative effect on the composite and can be reduced by various treatment techniques [31-32]. Neat WF-polymer composite does not achieve good mechanical strength. WF when used with fiber leads to enhanced mechanical properties especially synthetic fiber while replacing matrix material. Synthetic fiber are hydrophobic in nature thus does not form adhesive bond with the WF and performs the desired duty of strengthening the composite [18, 33-37]. Improvement in the mechanical properties is mostly obtained with treated WF rather using untreated WF [38-40]. Highly stiff and strengthen composite is obtained using recycled paper with plastic due to the enhancement of adhesion between fiber and matrix. Compatibilizer increases the compatibility of WF with light density polyethylene (LDPE) and significant improvement in the impact and tensile strength is noticed [41-45]. Incorporation of WF with high density polyethylene (HDPE) improves strength and toughness of composite up to the loading percentage of 60% WF. Treating WF with maleic anhydride polypropylene (MAPP) resulted in composite having good mechanical properties. MAPP also enhances Flexural and tensile strength of WF- polypropylene composite for the filler weight percentage of 40%, 50% and 60% [46-51]. Silane treated WF- poly vinyl chloride (PVC) also increases tensile and impact strength of composite. WF having mesh size of 60 up to 30% filler percentage was found to be suitable to achieve good mechanical properties with the matrix of polystyrene [52-55]. WF-Polymethyl methacrylate (PMMA) composite leads to enhancement in young modulus of composite when treated with keratin [56-58]. Hybrid composite of WF filled glass fiber polymer matrix further increases the strength based properties. Introduction of chopped glass fiber to the WF filled polymer composite contribute to the increase in mechanical properties of composite [59-

61]. Water absorption behavior of WF polypropylene composite is investigated and concluded that water absorption rate increases as the percentage of WF increases till 20% WF content. Further adhesive bonding increases with the incorporation of glass fiber in the composite. Properties like tensile and flexural are also enhanced when recycled poplypropylene is used with WF and glass fiber mat. It is also shown that compatibility of WF and glass fiber increases as the WF content increases [62-64]. Mesh size of WF also have significant effect on mechanical properties of composite. With 40 phr mesh size of WF the composite exhibit better tensile and flexural strength. Having the matrix material poly vinyl chloride. WF with the glass fiber mat composite exhibit improved impact strength. Glass fiber is kept at 20 wt. %. Increasing the content of WF beyond 30 wt. %., decreases the mechanical property of composite [5, 61]. It is thus being given special attention to the content of WF used in the present study. The present investigation is henceforth an approach by the author to fanfare the property of WF and glass fiber for the hybrid composite with the epoxy matrix. Mechanical and water absorption test are carried out for the composite specimen and results are discussed accordingly.

II MATERIAL AND METHODS

(a) **Materials** - Epoxy (E-21) as resin and suitable hardener is brought form the Amtech Esters Pvt. Ltd. Delhi as shown in figure 1 (a and b). The necessary properties such as density, moisture content, viscosity etc. of epoxy are listed in table 2. Procured epoxy has the molecular formula - $C_{21}H_{25}ClO_5$ which is basically the chemical combination of glycidyl ethers and amines. Epoxy material has some advantages like high corrosion, high chemical resistance and good mechanical and thermal properties. Hardener to be used has been characterized by its curing time. Proper mixing of epoxy and hardener has been properly taken care of

Fig. 1: Material used for the fabrication of composite (a) epoxy, (b) hardener, (c) wood flour, (d) sieve and (e) glass fiber mat

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Table 2
Properties of Epoxy E-21

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Appearance	Colourless to light yellow liquid.
Epoxy Equivalent weight	185-194 G/EQ
Viscosity 25°C	11,000-14000 cP
Hydrolysable Chlorine	0.05% max.
Epoxide Value	5.15-5.40
Density at 25°C	1.16 g/ml
Moisture content	0.1% max.
ECH content	10ppm max.
Non-volatile content	100%
Flash point	>150°C.

Dalbergia sissoo WF as filler material is procured from local market of Srinagar Pauri Garhwal and it sieved by the sieve having mesh size of 300-355μm as shown in figure 2 (c and d). Some physical and chemical properties of WF are listed in table 3. Janka scale is used to ranks the woods on the basis of density and hardness. As per comparison on the scale, red oak is soft than Sheesham wood, its ranking is 1290 according to the scale. The wood ranges from dark amber to reddish brown, similar to mahogany or teak. The grain pattern is relatively straight, but has interlocking patterns that turn or swirl at 90 degrees, and can cause chipping or blowout on woodworking machinery. Sheesham cuts relatively easily, but the coarse texture dulls blades and cutters. Carbide-tipped tools are advisable when working with Sheesham lumber. For the completion of hybrid composite, glass fiber mat is also brought from Amtech Esters Pvt. Ltd. Delhi as shown in figure 2 (e). Glass chopped strand mat fiber is selected as a reinforced fibre material for the composite, which has specific thermal and mechanical properties.). Glass fibers are formed when very thin filaments of glass are extruded in fibers with very fine diameter convenient for textiles processing. Some common thermal and mechanical properties of glass fiber mat have been listed in table 4.

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Table 3
Physical and chemical properties of Wood flour

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Common Name(s)	Sissoo (Hardwood)
Scientific Name:	Dalbergia Sissoo
Distribution	Primarily northern India, Nepal, and Pakistan
Tree Size	35-65 ft. (10-20 m) tall, 2-3 ft. (.6-1 m) trunk diameter
Average Dried Weight	48 lbs/ft³ (770 kg/m³)
Specific Gravity	0.63-0.77
Hardness	1,660 lb$_f$ (7,380 N)
Modulus of Rupture	14,140 lb$_f$/in² (97.5 MPa)
Elastic Modulus	1,508,000lb$_f$/in² (10.40 GPa)
Crushing Strength	8,050 lb$_f$/in² (55.5 MPa)
Shrinkage	Radial: 3.1%, Tangential: 5.3%, Volumetric: 8.4%, T/R Ratio: 1.8

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Table 4
Thermal and mechanical properties of glass fiber mat

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Glass Fibre	Properties
Tensile Strength (MPa)	1590
Modulus (MPa)	72.45
Elongation at break (%)	3-4
Linear Coefficient of Thermal Expansion (10^{-6}/K)	5.0-6.0
Density (g/m³)	2.59

(b) Mould preparation - Prior to starting the hand lay-up process an appropriate mould has been prepared. The mould is washed and cleaned before bring it to use. Appropriate releasing agent is applied to the myler sheet to avoid the sticking of epoxy to the mould surface. For the sake of simplicity and fine finishing wood and glass material is used for the mould. Resin and hardener ratio is measured by weight or by the volume ratio in the exact ratio. All the components are kept in the exact proportions and all the chemical reactions of the components are executed completely for the greater strength achievement of the final product.

(c) Fabrication - The process used in the fabrication is hand lay-up. The size of the mould is taken as 300mm×300mm×25mm. WF of size 300-355μm is segregated by sieve from the raw material and

is kept in separate beaker. WF is exposed to drying in an oven for around 12 hours. It is found that WF contain around 2-8% moisture. This is proved by the after drying weight of WF obtained as 188 grams of WF remained against the 200 grams WF after drying. Epoxy resin with hardener in the ratio 10:1 is taken in the beaker and stirred for around 10 minutes. Meanwhile myler sheet is placed above the mould surface and silicon spray is used to avoid sticking of epoxy and mould surface. WF is also mixed in the mixture so that a homogeneous mixture is achieved. Glass fiber mat is placed on the mould having weight ratio of 25% which is kept fixed for the entire composite panel prepared. Mixture is then poured above the surface of glass fiber and properly spread over the entire space of glass fiber. Myler sheet is again kept over the material and static load of 15 kg is applied on it. The material is left for curing for 20 -24 hours. For the comparison of mechanical properties of composite, ratio of WF is varied from 0 to 10 wt.% with the difference of 2.5% as shown in table 5. Neat mould and the fabrication process are shown in figure 3.

Table 5
Composition of wood flour and glass fiber in the composite fabrication

Sr. No.	Sample Name	Designation	Glass fibre %	Wood flour %
1	Neat GF	S-1	25	0
2	2.5% WF-GFRP	S-2	25	2.5
3	5% WF-GFRP	S-3	25	5
4	7.5% WF-GFRP	S-4	25	7.5
5	10% WF-GFRP	S-5	25	10
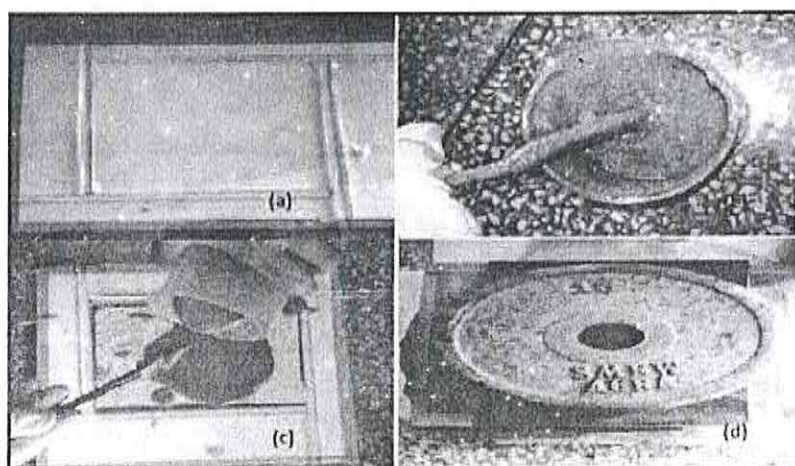
Fig. 3: (a) Mould of wood and glass, (b) preparation of mixture of WF, epoxy and hardener, (c) pouring of mixture on the glass surface and (d) curing of composite with applied load.

(d) **Test specimen** - Specimens for the tensile test cut according to the ASTM D-3039 standard rectangular shape. Testing is carried out computerized universal testing machine (UTM cross head speed of 2 mm/min. dimension of the specimen is 150mm×15mm×4mm (lxb Maximum and minimum load capacity is kept at KN and 4 KN respectively. Ambient pressure temperature is kept during the testing with relative humidity of 35%. UTM and test speci are shown in figure 4.
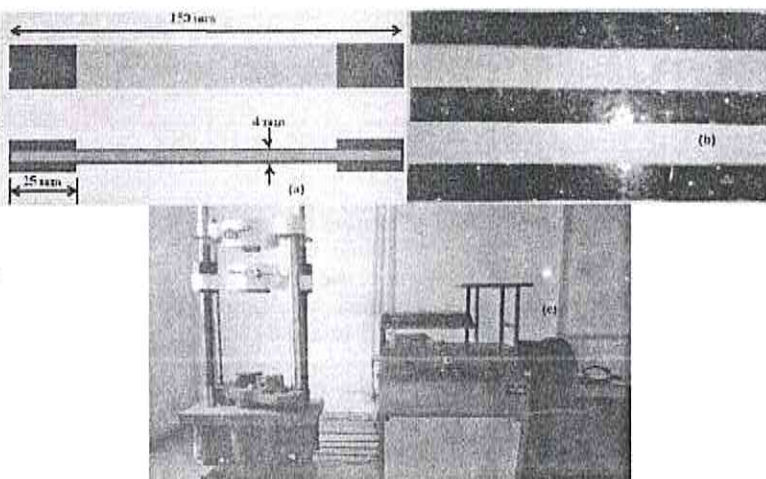
Fig. 4: Test sample for tensile testing (a) drawing of specimen with dimensions, (b) test sample prepared using hand lay-up technique. (c) Computerized universal testing machine

Test specimens for impact testing are cut according to the ASTM D-6110 standard. Charpy test is appied to calculate the impact energy of the specimen using the digital model AIT 300 D machine which is normally called impact tester. Pendulum is used to apply the swinging weight which brings the impact on the specimen. Test specimen and impact testing machine is shown in figure 5.
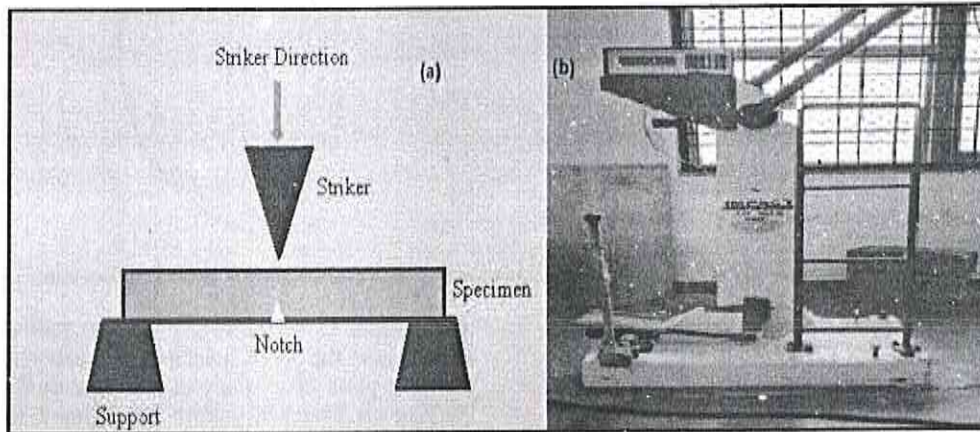
Fig. 5: (a) specimen sample and (b) Impact tester (AIT tester 300 D Digital)

Water absorption test is performed according to the standard ASTM D-570. Weight of the specimens is taken before and after test by the electronics balancer model Aczet CY 124C, Max 120g/0.00001g. Specimen is measured after a cyclic interval of 24 Hrs. such as 24, 48, 72, 96, 120, 144, 168, and 192 h. the weight absorption of the samples is calculated by weight changes. The weight percentage change is measured by the given equation 1. Test specimen and weighing machine are shown in figure 6.

$$W\% = \frac{(W_w - W_d)}{W_d} \times 100$$
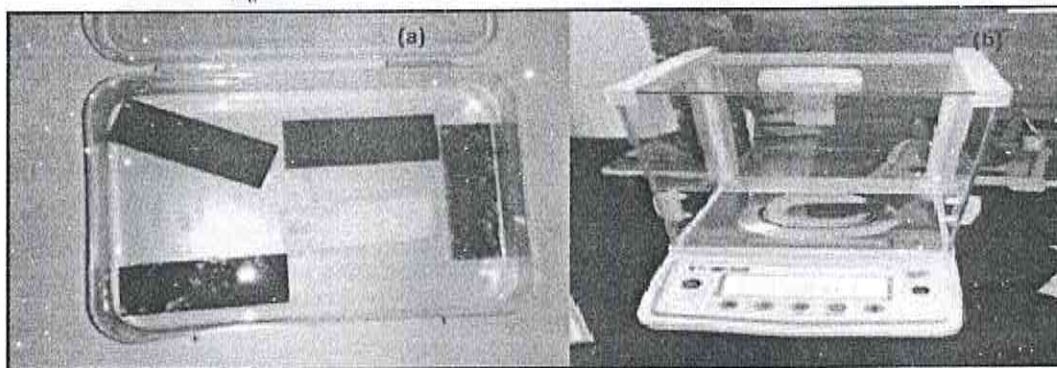
Fig. 6: (a) Specimen for water absorption test and (b) weighing machine to check the water content

ASTM E-92 is adopted to conduct the hardness testing samples (size 10mm×10mm×4 mm). Vickers hardness tester as shown in Figure 7 (a) is used to conduct micro hardness test which have a diamond shape intender having apical angle of $136°$. This intender is allowed to penetrate in the surface of sample under a load of 5Kg for the time period of 15 seconds. Two diagonals line impressions as shown in figure 7 (b) are left in the specimen surface of the material after removal of the applied load and the impressions are measured by using microscope and there average is calculated. Vickers hardness is the quotient obtained by dividing the kgf load by the square mm area of indentation The Micro hardness methods can be used to test metals. composites. ceramics. and almost any type of material.
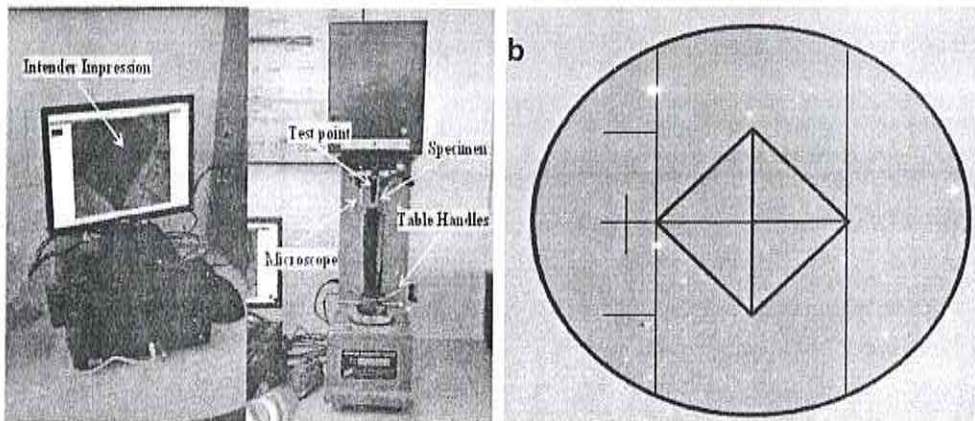
Fig. 7: (a) Vickers Hardness Testing Machine (b) Diagram for Vickers micro hardness indentation

III RESULT AND DISCUSSION

(a) **Morphology of the sample** - To understand the internal chemistry of the composite samples, scanning electron microscopy -(SEM) is performed on the samples. SEM is carried out at 600 X. 300X and 200X zoom. Voltage is kept at 2000 kV to 500 kV. It is clear from the images shown in figure 8 (a) to (e) that as the percentage of WF increases, the voids in the composite samples decrease. Neat glass fiber epoxy composite i.e. figures 8 (a) shows the fiber pull-out formation from the sample which is not the case in the remaining sample. This may be attributed to the WF which takes the voids remain in the neat glass fiber epoxy matrix. The surfaces are very much clear and uniform for figure 8 (b-d) as adding WF completely mixes with the epoxy matrix. Further, increasing wood flour percentage beyond 7.5 wt. % encourages the debonding between the glass fiber and epoxy matrix due to the agglomeration of wood flour. This leads to coming out of wood flour in flake form the matrix as shown in figure 8 (e)

(a)

(b)
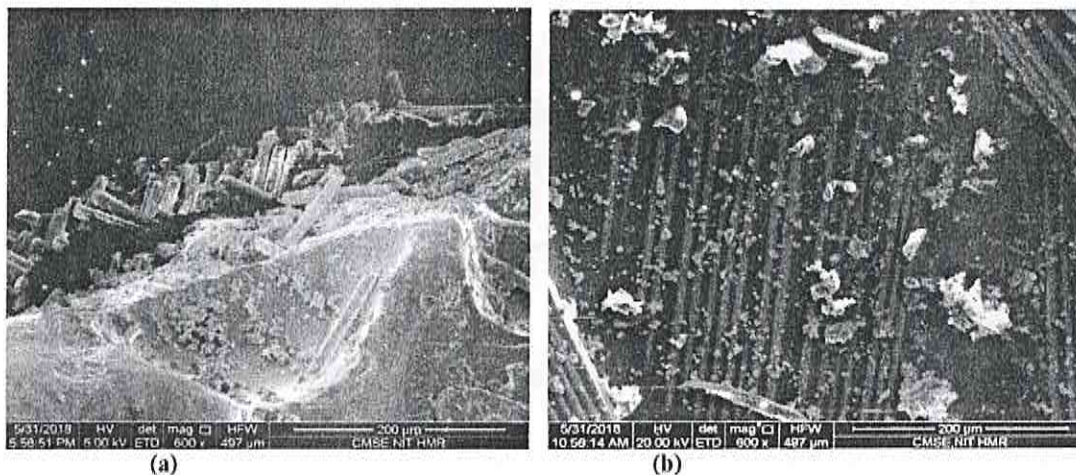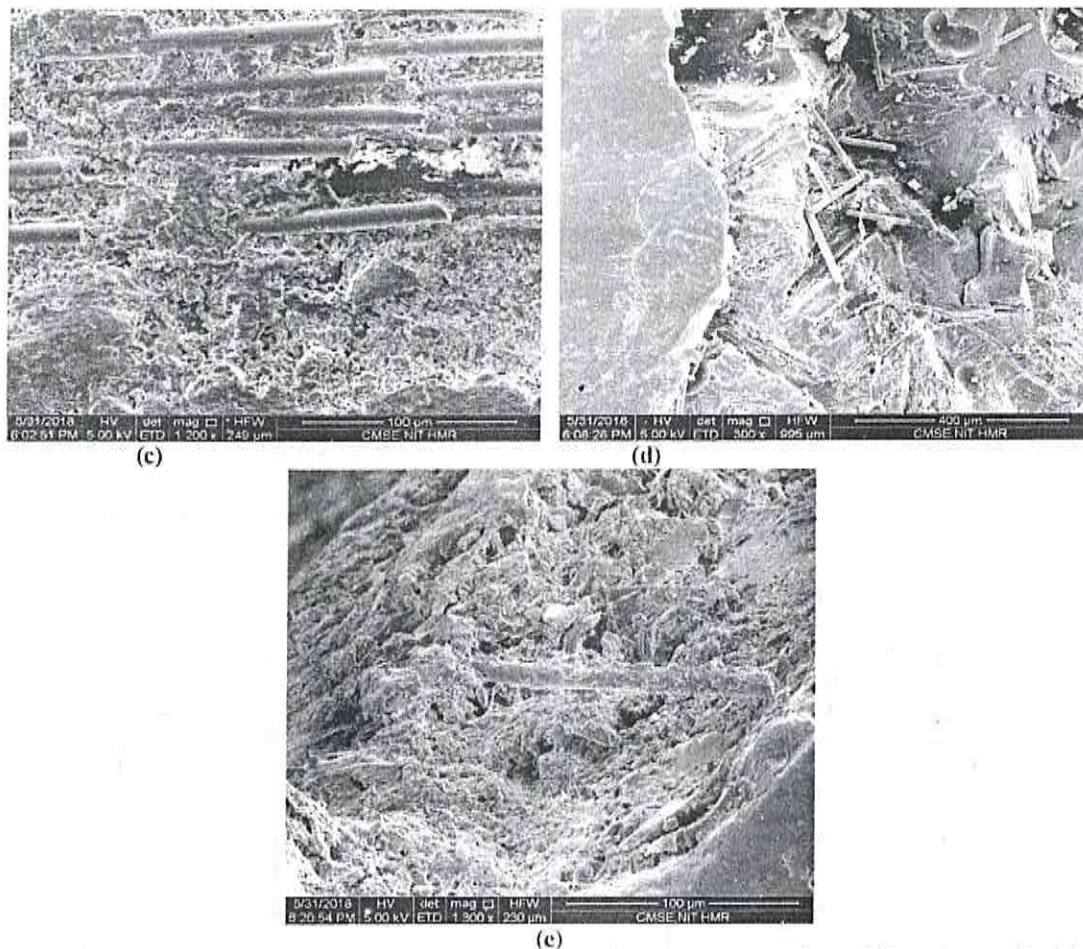
Fig. 8: SEM images of GF reinforced composites with various percentages of wood flour denoted by (a) Neat GFRC, (b) 2.5% wood flour GFRC, (c) 5% wood flour GFRC, (d) 7.5% wood flour GFRC, (e) 10% wood flour GFRC

(b) **Water absorption behavior** - Composites, which are manufactured with the help natural filler or natural fibers, are susceptible to water. It is due to the hydrophilic nature of the filler. This hydrophilic nature is not favorable for long term durability as swelling occurs in the composite. This leads to creation of voids which results in micro cracks. This affects the mechanical properties of the composite. Hence in order to achieve the optimum properties, the composite is tested for the water absorption test. Test specimens are subjected to Alaknanda river water for every 24 hours up to 216 hours. Results show that sample S1 shows minimum water absorption content which is 0.87 wt. % of the sample while S5 absorbs 3.07 wt. % of sample. This clearly shows that as the filler content increases, the water absorption increases. As S1 sample contain 0% wood flour and S5 sample contain 10% wood flour which is maximum percentage among the entire sample. As it is well known fact that water uptake increases as the wood flour increases but the percentage of maximum and minimum water absorption is the main concern for particular wood flour. Water absorption for samples for every 24 hours and total water absorption is shown in figure 9 (a) and (b) respectively.
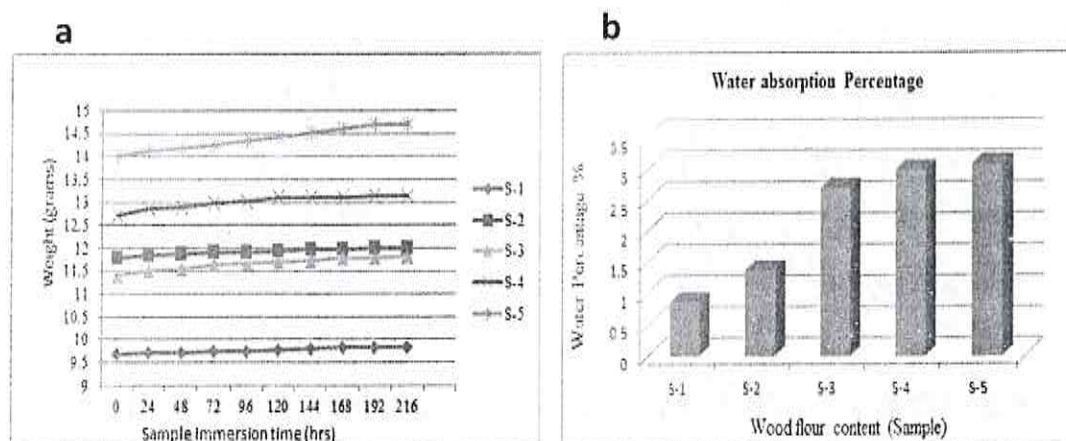
Fig. 9: (a) Water absorption rate of samples for every 24 hours and (b) Total water absorption by the samples after 216 hours

(c) **Tensile strength** - To predict the tensile behaviour, stress-strain graph is used as shown in figure 10. It can be stated form the figure 9 that adding wood flour to the glass fiber helps in enhancing the tensile strength of the composite. The increasing trend of the figure shows that addition of WF increases the tensile strength but after certain percentage it shows no effect on tensile strength. Maximum tensile strength is obtained at 5% WF and minimum for neat glass fiber as 0% WF. This may be attributed to the combined effect of glass and natural filler as the area under the curve for 5% WF sample comes out to be the largest. Adhesive bonding of WF, glass and matrix may also be the reason for this increasing trend of tensile strength.
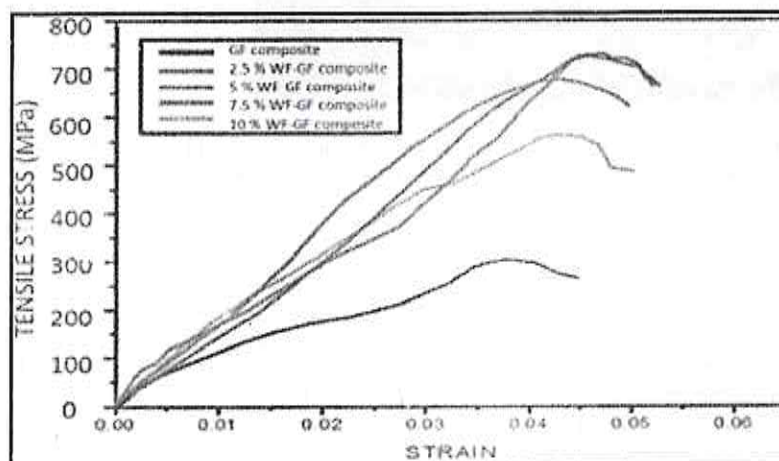
Fig. 10: Stress strain curve for the composite samples

(d) **Impact behavior** - Addition of WF in the neat glass fiber epoxy composite shows positive results in case of impact behavior. Figure 11 (a and b) is the graph presented to analyze the maximum energy stored and strength of the composite respectively. From the figure it can be concluded that as the WF content in the composite increases both maximum energy and strength increases. The increasing rate is noticed till the percentage of WF reached to 7.5% and further increasing the WF content leads to show the decreasing trend. The probable reason for this trend may be the voids that are created in the composite by the WF. This is due to the hydrophobic and hydrophilic nature of glass and WF respectively. The voids created in the composite does not helps in much increase in tensile strength but have significance dominance in improved impact strength.
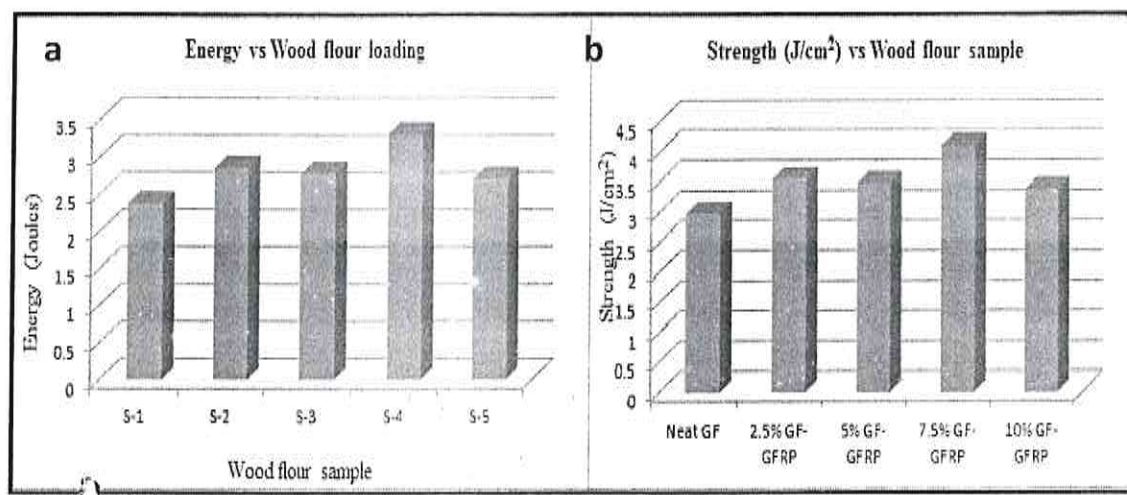
Fig. 11: (a) Maximum energy stored by the composite (b) specific strength of composite

(c) **Hardness** - From the triboligical point of view, it would not be worth adding WF to the neat glass fiber epoxy composite. As the figure 12 suggested that increasing WF content decreases the hardness of the composite. This may be attributed to the low density of WF which generally gathered at the surface of the composite during the solidification. This leads to more and more segregation of WF at the surface of the composite. Hardness, being a surface property tends to show more particles removal and thus more wear. Maximum hardness 46.73 HV is observed for the neat glass fiber composites samples and a minimum micro hardness 40.17 HV is observed in 10 wt. % WF filled glass fibre.
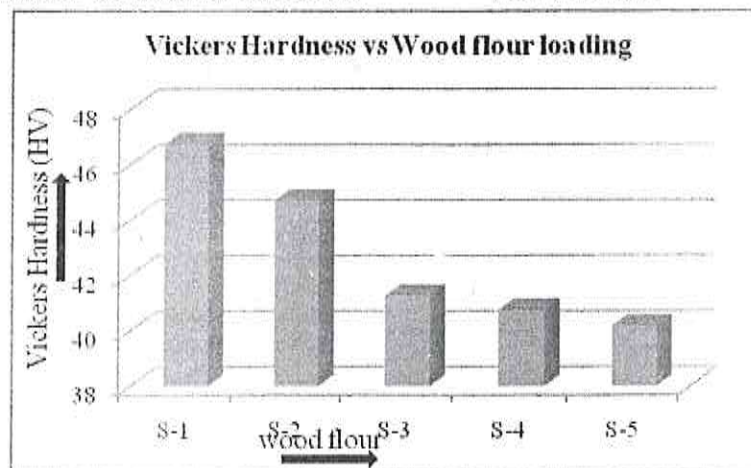
Fig. 12: Effects of WF on hardness

IV CONCLUSION

Wood flour filled glass fiber reinforced epoxy hybrid composite has been successfully fabricated with the varying percentage of WF keeping the glass fiber constant. Water absorption increases with the increasing rate of addition of WF and it is lowest for neat glass fiber composite. Tensile results showed that adding wood floor in neat glass fiber composite helps in increasing the tensile strength up to the percentage of 5 wt. % of WF. Further addition of WF decreases the tensile strength. Improvement in the impact strength of the composite is also noticed due to the addition of WF. Impact strength is found to be highest sat 7.5 wt. % of WF and further increasing the WF content decreases the impact strength of the composite.

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Optimizing the Location of Distributed Generation using Different Optimization Algorithms: A Review

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ABSTRACT

Electrical Power Distributed Generations are used for improvement of the voltage level and minimization of the power line loss in electrical power distribution network. This paper presents a review on optimizing the location of distributed generation using different Optimization Techniques. Various meta-heuristic optimization techniques are discussed to reconfigure the distribution system, obtain the optimized location, sizing of Distributed Generations, minimization of the line losses and cost of the electrical network. The paper presents the review on the development of distributed generation model, problem formulation in distributed generation, different optimization techniques etc.

Keywords — Primary power distribution system, Teaching Learning Based Optimization Technique, Genetic Algorithm, butterfly particle swarm optimization, Distributed Generation

I INTRODUCTION

Electricity is one of the most important blessings of science to mankind. Today electricity plays an important role in all walks of life and life without electricity is difficult to imagine. Technology is advancing in various sectors including power sector. New concept is coming in Indian power sector such as smart grid .smart grid means make the grid smarter the main problem of current scenario in India is to supply quality power to the consumers. quality of power means minimum line loss, balanced power supply (active power and reactive power), uninterrupted power at lower cost. Power engineers are involved to develop new ideas in the field of smart grid. At present in India engineers are facing the challenges of load shedding problem for continuous power supply power constraint is generation should meet the load demand for this theory they are focused on renewable source of energy .renewable source of is used for generation and supply to the grid. The new concept is to make the grid smarter means new network relocation capacitor location and distribution generation. To find Distributed Generations suitable location and sizing, engineers use various optimization techniques. Heuristic methods like teaching Learning based Optimization (TLBO) which is based on nature [1]. Genetic Algorithm (GA) is based on natural genetic [2]. Butter fly Particle swarm Optimization (BPSO) based on nectar probability and sensibility [3]. Simulated Annealing (SA) is not based on reconfiguration but it is modification to some other basic algorithm [4] etc. are used for solving the problem of electric power distribution network. For optimal location of DG in power system a conventional technique is presented [5]. Seeker Optimization Algorithm (SOA) based on weighted aggregation [6]. The effect of DGs on voltage profile, reliability and losses to design an Electric Power Distribution System is presented [7] An Artificial Bee Colony (ABC) is meta heuristic method

modified for Distributed Generation location with network relocation [8].A simultaneous relocation with DG location on different bus systems is done by harmony search method [9]. Optimal location and sizing of DGs to minimize the power loss is calculated by an analytical method [10]. DGs work like a capacitor but the only difference is capacitor supply reactive power only where as DGs supplies both active and reactive power. But DGs must be placed at an optimal location otherwise desired output will totally get changed (system loss will increase). This paper presents review on various optimization techniques including a new version of Teaching Learning Optimization algorithm (TLBO) to design Distributed Generations location with primary distribution relocation. The organization of the paper is as follows: Problem model for Distribution Generation location (section II), Problem formulation in Distribution Generation (section III), optimization technique for DG location (section IV), and the Conclusion (section V).

II MODELLING OF PROBLEM FOR D.G. LOCATION

In radial the network a relocation problem is for optimum location of power flow without violating the network constraints .power flow between the branches is different

In mesh distribution network as compare to radial network. Relocation always finds the best location of power flow in the branch. In optimization technique two switches are used one switch is for open and other switch is for closed .switch to present the total network as combination of one and zero.

For designing a suitable network the binary shifting of branches is considered to handle different parameter and solve the network relocation problem. Open switch and closed switch are used in the branch. If U number of sectionalize switch is available and V number of tie switch is available the

total number of switch is represented by S then it is represented by (S=U+V),In teaching learning based optimization technique a binary array is used for number of radial network. Fig1 shows the simple radial network in this network there are 10 sectionalizing switches and one tie switch. Sectionalizing switches are [1 2 3 4 5 7 8 9 10 11]

which is represented by 1 in binary. Where 6 is tie switch is represented by 0.the whole network in binary is [1 1 1 1 1 0 1 1 1 1 1] Fig 2 shows a graphical presentation of Small Primary meshed distribution system consisting of 33 node and 1 substation.
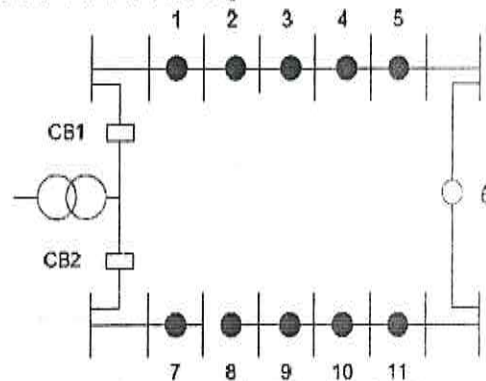
Fig.1 Simple Radial Distribution Network
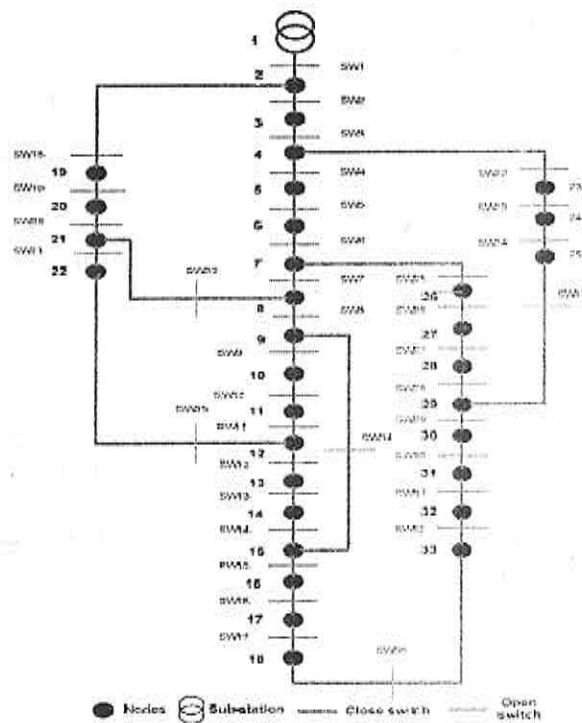
Fig.2: Simple Mesh Distribution Network

III PROBLEM FORMULATION IN DISTRIBUTED GENERATION LOCATION

In Distribution generation problem formulation a two bus system with D.G is considered as an example

which is shown in Fig3.an objective function is also considered for optimization technique which minimizes the total power line loss while satisfying all type of equality and non equality constraints.
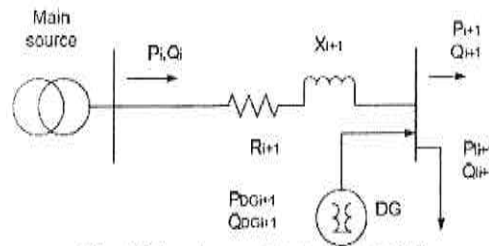
Fig. 3 Two bus system with a D.G.

The mathematical representation of the objective function is as follows:

$$F = min\sum_{i=0}^{n}[\{\frac{P_i^2+Q_i^2}{v_i^2}\}X\ r_{i+1}]\tag{1}$$

The distribution generation problem is subjected to some equality and non-equality constraints such as:

$$P_i-[\{\frac{P_i^2+Q_i^2}{v_i^2}\}X\ r_{i+1}]-P_{l,i+1}+\mu_p\alpha P_{i+1}-P_{i+1}=0\tag{2}$$

$$Q_i-[\{\frac{P_i^2+Q_i^2}{v_i^2}\}X\ X_{i+1}]-Q_{l,i+1}+\mu_q\beta P_{i+1}-Q_{i+1}=0\tag{3}$$

$$V_{i+1}^2=V_i^2-2(r_{i+1}P_i+X_{i+1}Q_i)+(r_{i+1}^2+X_{i+1}^2)\{\frac{P_i^2+Q_i^2}{v_i^2}\}\tag{4}$$

where

μ_p multiplier of real power which indicates 1 when there is   active source in the line, otherwise 0.

μ_q multiplier of reactive power which indicates 1 when there is a reactive source in the line, otherwise 0.

αP_{i+1} active power component.

βQ_{i+1} injected reactive power component.

In equality constraints
    (a) Voltage Limit
    limit of ± 5% of the nominal voltage value of the voltage system limit

$$|V_{min}^{spec}|\leq|V_i^{sys}|\leq|V_{max}^{spec}|\tag{5}$$

    (b) Thermal capacity limit

$$|S_{Li+1}^{sys}|\leq|S_{Li+1}^{rated}|\geq|S_{i+1,1}^{sys}|\tag{6}$$

Distributed Generation unit size and power Factor Limit

    (c) $|S_{iDG}^{min}|\leq|S_{iDG}|\leq|S_{iDG}^{max}|$ (7)
    where.
      S_i size of DG

The DG size and power factor are practically considered. DG unit sizes are from 30-40% of total system demand. The DG power factors are set to operate at 0.85, 0.9, 0.95 and unity and may be different from the bus load power factor where DG unit is placed.

IV OPTIMIZATION TECHNIQUES FOR DECIDING D.G. LOCATION

(a) Basic Teaching Learning Based Optimization algorithm

This method is global search algorithm. This is developed by Rao.et.al. TLBO algorithm is a nature-inspired Meta -heuristic population based optimization technique. it works on the philosophy of teaching and learning in the class room. The teacher and learner are two key component teacher teach the

students to improve their grades or result. Teacher efficiency is determined by learner result. Student also learns through interaction among themselves which also aid to improve learner result. In TLBO for initialization group of students are termed as population and marks obtained in different subjects are termed as design variable. Technique updates the present learner by comparing with best learner. The existing solution in terms of Teacher and students is updated in teacher phase as below:

$$X_{N,i} = X_{o,i} + D_M$$

where, D_M is the difference between the result of teacher and the mean result of whole class .

$$D_M = r_i (M_n - T_i * M_i)$$

$$X_{N,i} = X_{o,i} + r_i(X_i - X_i) \quad f(x_j) < f(x_j)$$

$$X_{N,i} = X_{o,i} + r_i(X_j - X_i) \quad f(x_j) > f(x_j)$$

(b) Modified Teaching Learning based optimization
  (i) Technique: In Problem model a bit Switch relocation of primary network is shown where optimal power flow location is found

by closed switches. In modified TLBO some binary array is chosen. A bit shift operator name as bit shift locator is used to change the normally open switch location to update the population

(ii) Bit Relocate Operator- A Switch position of network is shifted by a bit relocate operator to relocate the new path of network. Switch position relocate from right to left and left to right. The direction of relocation is evaluated by basic equation of TLBO Fig 4 depicts the general bit shift relocation. Let M be an array containing 10 binary bits. if relocate operator is operated on M then each bit of M will relocate in right direction with relocation length of 2 and is represented as M. if relocate operator is applied on M the particular bit relocate in left direction by single bit length and is represented as M. two case is consider one all the switch relocate by two position in the right direction and other one when all switch relocate one position to left direction.
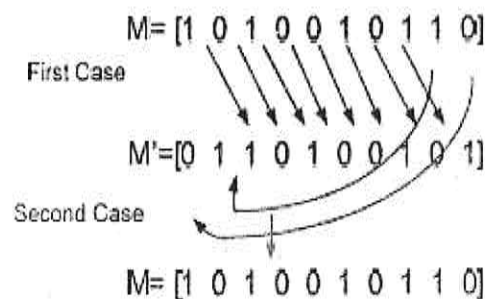
Fig. 4 Operation of basic Bit Shift Locator

Bit Shift operations relocate the problem with an example that electric distribution network is shown in Fig. 5(a) have 7 nodes and 10 connecting branch of

power flow. Different technique make a radial network in Fig. 5(b) and change it in a binary array [1 1 11 0 0 1 0 0 1]
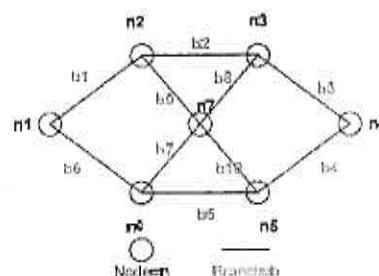
Fig. 5(a) Radial Topology for 7 node and 10 connecting path
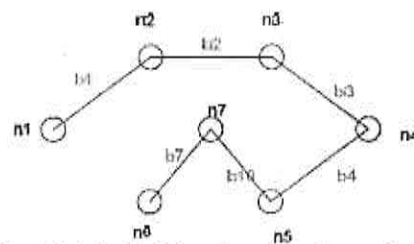
Fig. 5(b) Radial Topology for change in path
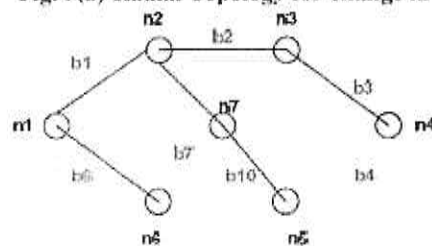
Fig. 6(a) Radial Topology for left shift
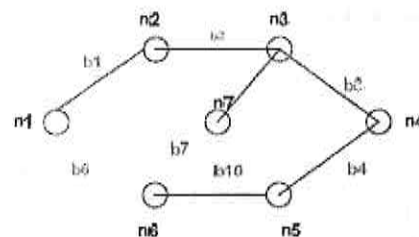
Fig. 6(b) Radial Topology for right shift

On the basis of relocation of switch is relocated left to right direction by bit shift locator. If a left relocation occurs, the radial topology of Fig. 5(b) is changed to | 1 1 1 00 1 0 0 1 1| i.e. Fig. 6(a) or if right relocation occurs than the radial topology changes to | 1 1 1 1 1 0 0 1 0 0| i.e. Fig. 6(b).

(c) **Genetic Algorithm** - Genetic algorithm is globally nature based algorithm. It is based on Darwin theory and the parent child relationship. If product of parent is son. It is not necessary that nature of child will be same as parent. Genetic algorithm starts with reproduction and end with fitness value. In reproduction the new string is generated. This is the artificial version of natural selection based on Darwin survival of the fittest among string .it can be implemented in number of ways. After reproduction cross over operates in cross over two new population generate or string from two existing ones by genetically recombining randomly formed by randomly chosen crossover point. Mutation changes the value of a string position. Fitness function is for evaluation it is defined over genetic representation and measure the quality of the represented solution. There are two basic parameter of G.A one is cross over probability other is mutation probability.

(d) **The Butterfly Particle Swarm Based Optimization (BF-PSO) Technique** -The Butterfly-PSO (BF-PSO) algorithm is basically based on the nectar probability and the sensibility of the butterfly swarm. The optimal quantity of ambrosia is searched by the help of butterfly intelligent behavior. The butterfly particle swarm optimization learning algorithm (BFPSO) is based on random parameter and acceleration parameter and utilizes the result of sensitivity and other parameter for more accurate result and fast convergence for best optimal solution. for the best optimal result the butterfly every flight is treated as one flight because at each trajectory counts maximum connectivity the search process investigate the best location on sensitivity of the butterfly flight towards flower and probability of the nectar. The communication intelligence such as (dancing. colors, chemical, sound, action and natural process) between all the butterfly gives the information of the optimal solution. The random parameters, acceleration coefficients, probability, sensitivity, lbest and gbest are included in the butterfly learning based particle swarm based optimization to evaluate the optimal solution. In the Butterfly-PSO, individual's best solution denotes the lbest solution. After that, fitness congestion gives the g best solution.

V CONCLUSION

There are numerous publications in the distribution generation placement. With the use of distributed generation and optimization technique, the active and reactive power losses are reduced significantly. With the proper distribution of load and distributed generation, there will be an improvement in system voltage profile that is reduction in voltage deviation of distribution network. The Location of DG in the system reduces the cost of generation which will be helpful in reducing the power cost. Further challenges will be to improve optimization by modeling of distribution network for which more details will have to be considered.

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Maggi Noodles: Ban and Revival

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ABSTRACT

Maggi is a name which needs no introduction as it is a world-renowned brand. Maggi noodles were introduced into the Indian market by its parent company Nestle India in 1983. Maggi, ever since it had entered the Indian market was one of "The Most Powerful & Influential Brands in India". This case is a study of ban and revival of the famous Maggi Noodles in India. The Maggi controversy broke the trust of many consumers because MSG (Monosodium Glutamate) and Lead were reported to be beyond the prescribed level. It was found in the year 2015 that MSG and Lead were found beyond prescribed limit in some of the tests conducted on Maggi samples in India. Bombay High Court directed to take away and destroy all the types of Maggi variants throughout the country. The Brand value worth Rs. 1300 crore was affected due to recollection of Maggi instant 2 minutes Noodles. Maggi 2-Minute Noodles, a brand sustained for more than three decades in India and loved by everyone, be it hostellers or housewives, had crumbled. The case discusses the ban scenario along with the timeline of events that occurred after it was found that "MSG and Lead levels" were beyond prescribed limit in "2- Minute Maggi". Further the case deals with the revival of the brand after the removal of the ban. Several strategies were employed for the revival of the brand like use of emotional touch, television promotion and exclusive availability at stores.

Keywords: Controversy, India, Maggi ban, Ready-to-Eat, Revival

I INTRODUCTION

Ready-to-Cook (RTC) food industry includes all those companies that manufacture foods that can be eaten & cooked instantly and the foods that do not require any additional cooking or ingredients upon opening. It is one of the most dynamic and largest sectors of the food industry. Ready-to-Eat foods are packaged in air tight sealed solutions and are manufactured to last fresh for long time in packed lunches, frozen food, home meal replacements, ready meals and more. Frozen food is an alternative to fresh, canned and cooked foods (Poojara, 2014).

In the 1980s Ready-to-Eat (RTE) food segment was launched for the first time in the Indian Market but was not well received by Indian consumers due to their inclination towards the method of traditional cooking. Once again in the early 2000s, RTE gained popularity in the Indian market with the introduction of new technological advancements in the field of boosting or improving the shelf life of a product. There was also a tremendous growth in the number of storage and distribution centre (warehouses) due to which once again RTE products gained popularity. Various segments in the industry were introduced resulting in an increase in product differentiation. One of these segments was developed by using retort technology and came to be known as the Heat and Eat Food Industry (Singh, 2017).

Almost a decade back or more, the homemakers or the housewives enjoyed cooking for their family and took it as a pride while preparing something delicious for the family despite using cooking aids that cut down cooking preparation time like using chopped and peeled veggies or readymade idli-dosa batters. This made the ready-to-cook (RTC) item market wide and numerous brands selling such products entered the market. In today's scenario young generation who is busy in earning their livelihood is rather more interested in Ready-to-Eat (RTE)food segment than Ready to Cook(RTC). The shift of consumers from the Ready to Cook items to the Ready-to-Eat category is because of the changing lifestyles of consumer, high income of families, home delivery facilities, disinterest in cooking of the youth, etc. Various studies in developing countries have shown that the interest of youth towards cooking and enhancing their culinary skills is decreasing. It is the older generation that is keen in serving their families and showing their culinary skills as a result of love for family. The heat and eat food industry in India, valued at INR 2,370 million (USD 39.5 million) in FY 2016, has been growing at a CAGR 18 per cent for the last three years. There is an expectation in regard to industry that it might grow up to 22 per cent CAGR in the upcoming five years because of changing lifestyles of consumers, development in the retail industry, urbanisation, etc (NIIR Project Consultancy Services, 2018).

Major players in Ready-to-Eat industry are:
   (a) Nestle
   (b) Kelloggs

(c) H.J Heinz
(d) ConAgra
(e) ADF Foods Ltd
(f) ITC Ltd
(g) Kohinoor Foods Ltd
(h) Haldiram Manufacturing Company Pvt
(i) MTR Foods Pvt. Ltd
(j) McCain

II TRENDS IN INDUSTRY

As per a research done by Tech Science "Research on Indian Ready-to-Eat Food Market Forecast and Opportunities, 2019", there is an expectation in regard to industry that it might grow up to 22 per cent CAGR in the upcoming five years because of changing lifestyles of consumers, development in the Retail Industry, urbanisation, etc. Desires of consumers towards RTE category is increasing in India as per the predictions by the various studies for the projected time period due to employment generation and changing lifestyles of the consumers. India has a large youth segment that forms majority of the country's workforce. Youth in India creates a significant potential for Ready-to-Eat market due to busy lifestyles and lack of interest in cooking. Providing pocket friendly product for the price conscious consumer despite rising disposable expenditure of the Indian consumers is big challenges for the producers of Ready-to-Eat food products. Indian consumers are very price conscious and they make their best effort in saving the money so even a slight change in the pricing strategy of the product can affect the brand switching of the customers. In order to overcome this problem, manufacturers are constantly offering competitive prices along with the best quality. Retail chains play a major role in educating and spreading awareness about the RTE products. Retail players such as Reliance Smart, Vishal Mega Mart, Easy day etc. that offer display of each product item offered for sale are a great contributor for the increasing demand of the RTE products in the country (TechSci Research, 2014).

Growth Leading Factors
(a) Changing Lifestyle
(b) Rising Dual-Income Families
(c) Diminishing Culinary Skills
(d) Technological Advancements
(e) Rapid Urbanisation
(f) Increasing Disposable Income
(g) Improving Retail Sector
(h) Consumer Behaviour
(i) Time Saviour

III NESTLE

Nestle, headquartered at Vevey, Switzerland is a swiss international food and drink company founded by Henri Nestle. The growth of the Nestle took place in the time period of 1st world war and by the time of 2nd world war the company expanded their product line apart from baby food items& condensed milk. Nestle has its presence in more than 200 countries around the world and has over 2000 brands under its flagship (Nestle official website).

(a) **Nestle India**-NESTLÉ's relationship with Indian Market relates back to 1912, the year in which Nestle started operating as 'The NESTLE Anglo-Swiss' in 1947, the schemes of the bureaucrats at that time aimed at the economic welfare of the country which led to entrance of Nestle in India. NESTLÉ in response to the Indian economic policies then formed and established its business in India and set up its first Manufacturing Plant in the year 1961 at Moga District of Punjab, where Nestle was asked to build and grow the milk economy of India by the government by introducing technologies in the Indian market that yielded high production of milk. NESTLÉ has always been a support factor for the growth of the country ever since it entered the Indian market and has developed various manufacturing plants, units and companies like Condensed Milk Company (Export) Limited is a company established by Nestle that imports and sells finished products for the Indian market. After the independence of India Nestle developed a special bond of trust, commitment to serve and loyalty with the citizen of India. The Company's growth in the Indian market has contributed to direct as well as the indirect employment affecting the livelihood of approximately 1 million people by giving them opportunity to be employed. Employed persons include farmers that provide farm yields, suppliers of packaging materials, the organisational staff, etc. The Company continuously aims at understanding and adapting to the changing needs and wants of the Indian consumers and making such products to match their changing lifestyle which is tasty and full of nutrition (Nestle official website).

(b) **Nestle Maggi**-Maggi is a world renowned international brand that offers variety of products like tomato ketchup, noodles, soups, etc. Since 1947 Maggi is a brand under Nestle. The founder of the company is Julius Maggi who founded it in the year 1886. Quality and innovation are the two main aspect for which Maggi is known for all over the world. Its parent company Nestle offers a huge range of product line to its consumer making it one of the top companies in the world. The concept of

instant 2 minutes Maggi noodles was introduced during the 1980's (Nestle official website). According to Maarten Geraets, General Manager, "MAGGI is like our Mothers who are constantly understanding our

lifestyles as we grow, anticipating our needs, preparing for them and nurturing them, sensing the change in our personalities and speaking our language."

Table 1
Product Mix of Maggi

S.No	Product	Sub Category Product

1.	MAGGI 2 MINUTE NOODLES	a. Veg. Atta noodles
		b. Maggi Oats Noodles
		c. Maggi 2-minute masala noodles
		d. Maggi cuppa mania
		   ✓ Cuppa Masala
		   ✓ Chilly Chow
		e. Maggi Hot Heads
		f. Maggi Chicken Noodles

2.	MAGGI PAZZTA	a. Masala Penne b. Cheese Macaroni c. Tomato Twist d. Mushroom Penne
3.	MAGGI SAUCES	a. Rich Tomato Ketchup b. Tomato Chilli Sauce(Hot & Sweet) c. Masala Sauce d. ImliPichkooo
4.	MAGGI CUP-A- LICIOUS SOUPS	a. Tomato Margherita b. Winter Vegetables c. Vegetable with Chilli Pepper d. Green Pea with Coriander e. Dal Shorba f. Cream of Corn

5.	MAGGI COOKING AIDS	a. Maggi Bhuna Masala
		   ✓ For Makhani Dishes
		   ✓ For Korma Dishes
		   ✓ For Gravy Dishes, Dals &Vegetables
		b. Maggi Magic Cubes
		   ✓ Vegetarian Masala
		   ✓ Chicken Masala
		c. Maggi Masala-E-Magic
		d. Maggi Coconut Milk Powder

Source: Dhillon et al. (2015)

IV MAGGI: SWOT ANALYSIS

(a) Strengths

(i) **High Share in the Market**: Maggi had the highest market share in the Indian market when it came to the noodles. When it comes to noodles a customer always recalls of Maggi. Such was the brand image of Maggi before the ban.

(ii) **Image of Brand**: Maggi in India is known as "Family Brand" as everyone, no matter what age they are can enjoy a bowl of Maggi anytime and anywhere. With an enormous product mix of the Maggi, it has an advantage over its competitors in the market.

(iii) **Leader of the Market**: Maggi was the leader of the market in field of instant 2 minutes noodles. And despite the ban Maggi revived its brand and once again became the market leader.

(iv) **Pull Strategy**: Maggi has a pull strategy to attract its customer which acts as great strength for the company.

(v) **Distribution Channel**: a well networked distribution channel is the key for its success (Fazeelath. 2016).

(b) Weaknesses

(i) **Maggi Controversy Affected its Brand Value**: The ban controversy affected its brand value to the extent the its market share in the Indian market decreased from 70 per cent to nil. Its competitors gained the advantage of the crisis and managed to gain

market share in that period of time. Yippie Noodles was the first to target Maggi crisis situation. But after 5 months to ban Maggi with its strong marketing campaigns and strategies revived its brand value in the minds of Indian consumers by targeting their emotional intellect.

(ii) **Dependency on one brand:** Nestle's earns most of the profit from its Maggi brand so it has a risk of over dependence on it.

(iii) **Health Awareness:** Now a day's people are becoming more health conscious which is a weak point for Maggi (Fazeelath, 2016).

(c) **Opportunities**

(i) **Expansion:** Expanding its product line is one of the opportunities for Maggi. Maggi can expand its business in the field of cereals, pickles, etc.

(ii) **Repositioning the Maggi:** Maggi's repositioning was tough and easy at the same time because Maggi has been a well-known brand in India for year and tough because its image was distorted and it is not something that doctors would advise its patient include in their diet. It has such a reach that many even admit that it is the third staple of India after wheat and rice. As per sources it assumed as Rs 16,000 crore brands in India itself and is one of the top five brands of India but feared for the first time by competition after the ban (Fazeelath, 2016).

(d) **Threats**

(i) **Competitors:** There are various competitors of Nestle nationally and international, many of whom are major market players which are a major threat for Nestle.

(ii) **Word of Mouth (WOM):** Negative word of mouth through social media platform and other medium is a major threat for the company which can damage its image.

(iii) **Commoditized name:** Maggi itself has become a brand in itself. When it comes to Noodles everybody asks for Maggi. Just like in case of washing detergents everybody in India say surf (Fazeelath, 2016).

V BRAND IMAGE OF MAGGI

Maggi was ranked number 18 in the Brand Z Top 50 Most Valuable Indian Brands study, conducted by Millward Brown and commissioned by WPP in the year 2014, with a valuation of $1.127 million. Even after 25 years of dominance with more than 70 per cent of the market share—there was literally no competition for this brand. This is exactly what a strong branding does over the years to the product. Maggi is the name, which showed the power of branding (Webchirpy, 2018). Maggi had a market share of 70 per cent of instant noodles with all the brands heating up in competition, as with such a huge market share there is a lot of brand loyalty and trust, that had to be protected (Sharma, 2015).

Global Maggi Sales by Category, 2014
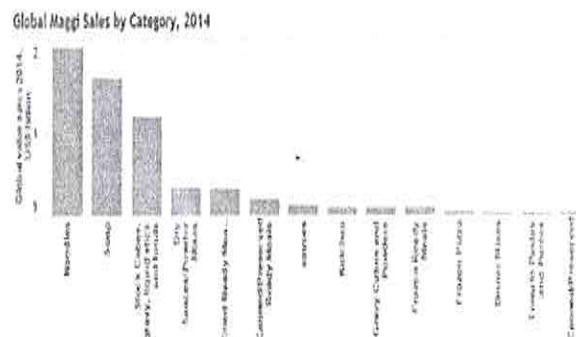
Source: Euromonitor International
Fig. 1 Global Maggi sales before ban

VI THE MAGGI BAN

Nestle's flagship brand or the most important brand under its flagship Maggi Noodles had over Rs 2000 crore sales prior to its ban. The recall of Maggi from the retail shelves and those in the process of reaching the shelves costed the brand around Rs 3200 crore and brand devaluation of Nestle has accounted another loss of Rs 1,270 crore. A UP(Uttar Pradesh) officer of FSDA(Food Safety and Drug Administration) once noticed the word MSG on the pack of Maggi and sent dozens of Maggi instant noodles for the lab testing to find out about the MSG contents in Maggi. The test was conducted in UP and repeat test were conducted to cross check in Kolkata which is a referral lab. The Gorakhpur lab tested for Monosodium Glutamate in the Maggi that company claimed that it had neither the MSG nor the Lead. "Both tests found MSG; in addition, the Kolkata lab found very high quantities of lead — 17.2 parts per million. Based on the findings, a complaint was filed against Nestle Maggi by UP FDA (Food and Drug Administration) in Barabanki Court. On 8 June 2015, Union Food Minister addressed the statutory regulator, Food Safety and Standards Authority of India (FSSAI), to conduct nationwide tests on Maggi according to Food Safety and Standards Rules, 2011. MSG is a flavour enhancer that should not be added in any food item that is made for infants below 12 months of age, for example cerelac which is another product of Nestle made for infants." (Chatterjee, 2015)

The series of events that took place before the ban are as follows:

21ˢᵗMay, 2015
MSG and Lead was found in Maggi Noodles samples tested by FSSAI authorities in Barabanki, a district of Uttar Pradesh (UP).

3ʳᵈ June, 2015
Maggi Noodle was banned in New Delhi as per the order of government for period of 15 days.

4ᵗʰ June, 2015
Later many other in India also banned Maggi. The first amongst them was Gujrat which had reported 27 out of 39 samples of high Lead content in the Maggi 2 Minute Noodles. Meanwhile Assamimposed ban on "Maggi's Xtra-Delicious& Magic –AE- Masala Noodles"variant for time period of one month. Many retail outlets like Big Bazaar and easy day also banned the sale of Maggi Noodles in their retail outlets. Thiswas followed by series of bans in India of Maggi being banned for more than 5 states (States that have banned, 2015).

5ᵗʰ June, 2015
13 tastemaker sachet samples were collected from Uttar Pradesh and tested by Delhi authorities for lead content in it. 10 out of 13 tastemaker sachet samples were reported to contain high percentage of lead content. It had 17.2 ppm of lead. Simultaneously, In Andhra Pradesh Maggi Noodles and all the products under the flagship of Maggi were banned in the state. Maggi was recalled from all over India (Booshan and Das, 2016).

6ᵗʰ June, 2015
A ban for unlimited time period was imposed on the Maggi Noodles by the Central Government of India.

4ᵗʰAugust, 2015
No unhealthy content was found in Maggi exported to US from India. The test report indicated no Lead content.

13ᵗʰ August, 2015
Ban over Maggi Noodles was removed temporarily by the Bombay High Court and inquired about the previously conducted test reports that resulted in country wide ban of the product. These tests were not done in the laboratories recognized by "National Accreditation Board Testing & Calibration Laboratories (NABL)" (Booshan and Das, 2016).

19ᵗʰ October, 2015
It was revealed in a sting operation that was done by India today that FSSAI passes sample without testing in exchange for bribe.

20ᵗʰ October, 2015
Ban was removed by Bombay HC.

9ᵗʰ November, 2015
From all over India ban was removed.

30ᵗʰ November, 2015
Manufacturing resumed in all five manufacturing units of Maggi

Maggi produced by Nestle India is currently exported to Canada, UK, Singapore and Kenya, etc. The same noodles that are made for Indian market are exported to other countries except for Canada. Maggi for Canada has a different type of salt in its seasoning. Packaging materials are designed as per the marketing strategies of individual country and as per the legal bindings of the importing country. Food standards authorities in USA, Canada, UK, Singapore, Australia and New Zealand have also tested the Maggi samples from India. After the ban countries to which India exports Maggi were worried and tested the Maggi samples. Although the tests were negative and the Maggi" exported ;to these countries is the same Maggi as produced for the Indian market (States that have banned, 2015).

THE INTERNATIONAL TESTS

UK
On 1 July, the Food Standards Authority of UK announced that it had carried out tests on samples of Maggi noodles and found levels of lead in the product well within EU permissible levels. Nestle informed the FSA that the only variety of Maggi noodles they import into the UK from India is the 'masala flavour'.

SINGAPORE
On 11 June, Nestle in a press release stated that results from the Agri-Food and Veterinary Authority's on Maggi noodles available in Singapore, including those produced in India, showed that it met Singapore's food safety standards.

US
On 12 August, it was widely reported in the media that the USFDA found Maggi noodles to be safe for consumption. There was no press release issued by USFDA. An email sent to the agency did not elicit any reply. Nestle India has not informed BSE of any such development.

AUSTRALIA
On 19 June, Nestle Australia issued a press release stating that testing by the National Measurement Institute in Australia confirmed that Maggi noodles imported from India are safe to eat.

CANADA
On 2 July, the Canadian Food Inspection Agency (CFIA) tested Maggi noodles sold in Canada but its investigation did not find any health risk.

Source: Afaqs! News Bureau, (2015)
Fig. 2 Reports of Test Conducted by Other Countries

(a) Dent on the Brand Image
Maggi is expected to have eroded in brand value by at least 30-40 per cent, say brand specialists. Sales have dropped by at least 60-70 per cent with a loss of over Rs 1,000 crore, say retail analysts (Chandran, 2015).Nestle had said that growth of its Zone AOA (Asia, Oceania and Africa) region, at 0.5 per cent, was "seriously impacted by the Maggi noodles issue in India". It could take three years for Nestleto completely recover its India revenues following the impact of the Maggi episode as per conventional wisdom but the Swiss foods giant is looking to do it faster, its Asia head has said (Bhushan, 2016). The following section covers the events taking place during the revival of the brand.

VII MAGGI REVIVAL: TIMELINE OF EVENTS

As said by Suresh Narayanan, "bringing the instant noodles brand back to the market is his top priority as he sought to strike a conciliatory note with authorities". There were many different strategies adopted for the revival of the brand in the Indian market. The entire episode can be seen as a positive reinforcement strategy that will help Maggi pull back its lost customers who went on to try other brands such as Yippee, Knorr and Wai Wai. This Maggi affair can surely help Nestle in reintroducing the brand with a stronger advertising appeal, this time an emotional one to connect and bond with their innumerable fans (Mitra, 2015).

(a) Timeline of Events of Revival
9th November, 2015
Maggi sales resumed once again (Nestle).

4th November, 2015
New Maggi samples were tested and reported safe to eat by laboratories (Nestle).

16th October, 2015
"Test results from all three laboratories mandated by the Bombay High Court show MAGGI Noodles to be safe, with lead content well within the permissible limits." (Nestle).
Manufacturing at Maggi plants resumes for again testing.

13th August, 2015
"The Bombay High Court overturns the government's ban on MAGGI Noodles, arguing that the move was arbitrary and that principles of natural justice were not followed."The court directed"Nestlé India can bring the product back to the market if fresh tests – conducted in three accredited laboratories on the existing samples and subsequently on the freshly manufactured product– find the product safe". (Nestle).

VIII STRATEGIES TO REVIVE MAGGI

(a) Emotional   Touch-Maggi's   advertisement campaigns always have emotional touch in it to attract its customers. This time as well for the revival of the brand Maggi chose to include emotions in their ads (Ray 2016).

We are touched by your love!
#WeMissYouToo

Source: Parande (2015)
Fig. 3 Revival of Maggi

(b) Television Commercials-There was huge campaigning done through the medium of television and Maggi spent a lot of money on it in order to gain back customer's trust (Ray, 2016).

Your MAGGI is SAFE, has always been.

Source: afaqs! News bureau (2015)
Fig. 4 Commercials showing Maggi is safe

(c) Various Sources for Promotion

There were various efforts made by Nestle to revive its brand. Social media interaction was done and new commercials were aired (Ray, 2016).

pushkarhate
@pushkarhate   2 Jun 15
I don't mind to start buying it again if they get all the tests done and have all the certifications twitter.com/MaggiIndia/sta ..

Maggi India
@MaggiIndia   Follow

Dear @pushkarhate we are glad to inform you that lab tests have cleared MAGGI of excess lead. To know more visit bit.ly/1JDT8zN
12:08 PM - 2 Jun 2015

Source: https://twitter.com/MaggiIndia
Fig. 5 Twitter responses

(d) Exclusive Availability- Maggi made its Noodles available exclusively through Snapdeal to create curiosity and demand in the market. This was a very smart move by Maggi. This was a strategic move. Snapdeal was the only platform where Maggi was available until stock lasted and the stock lasted for few minutes as it was a time bound sale (Ray, 2016).

Source: https://www.nestle.in/aboutus/ask-nestle

Fig. 6 Exclusive availability at Snapdeal

IX ANALYSIS OF EFFECTS OF MEASURES FOR REVIVAL

After Nestle India adopted several strategies for revival of Maggi noodles, some drastic changes were seen. Earlier, Nestle India used to spend only 4.2-4.8% of its total income on advertising and sales promotion but after 2015 the company spent Rs 525.21crore or approximately 6.42% of its total sales on promotions which is a significant increase. The company has also tried to cut down the complexities in its organizational structure by reducing layers in order to decrease the processing time by 30-40%, using strategies such as empowerment in decision making. Before the Maggi fiasco the company was very confident and this confidence turned into complacency. The Maggi crisis has changed their perspective and they have become more flexible with it becoming easy for others to do business with the company. Another major change that was seen was the company's entry into new product categories like coffee, pet care, healthcare and skincare. For example, the company entered in cereals market with Nestle Ceregrow. The company wants to tap middle class and working women in order to maintain its profitability (Mitra, 2017).

X THE RIDE AHEAD

The company's overall market shares almost halved to around 15 per cent in the four-five years (2013-17) due to stiff competition from both multinationals and home-grown brands, the latest being yoga-guru-turned-businessman Baba Ramdev's Patanjali Ayurved Ltd. Besides directly attacking Nestle on various issues, Ramdev launched noodles just a week after Nestle India relaunched Maggi noodles in the market. During the period when sale of Maggi noodles was banned, ITC Ltd's Yippee noodles and Wai Wai noodles from Nepal's CG Foods gained market share, filling a gap in a Rs3,182-crore noodles market. Given the competitive landscape and the fast-changing consumer behaviour, the local arm of the Swiss company is trying to spot at least one, if not two, brands that could emerge as big as Maggi noodles, at least in terms of sales numbers. According to Suresh Narayanan, Chairman and Managing Director of Nestle India, over the next 10 years Nestle will slowly move from packaged food to focus on health and nutrition products (Mitra, 2017).

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DIL for HR: The Need of the Hour

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"Give of yourself every day-a smile, a compliment, a moment of your time, a listening ear or a kind word. There is always something you can give others". -Anonymous

I INTRODUCTION

Given the fact of equal availability, affordability and accessibility of all other resources, it is the only human resource which can provide the required cutting edge in today's highly competitive environment. Further, recent times have heralded an unprecedented change (from barter to tangible to intangible and now experiential) in the overall environment in which organizations work. Within this ever changing environment one critical party that is often overlooked is employee.

Increased competition requires all organizations to get better at what they do. In this regard attracting and retaining the right talent, coupled with nurturing, hardly needs any emphasis. Rather than just complying with bare minimum standards, employees are now looking for organizations that offer more.

II WHAT IS THE ISSUE?

In VUCA (volatile, uncertain, complex & ambiguous) world of today, HR managers are confronted with so many challenges like workforce diversity, technological changes, information technology changes etc. As a result, there's lot of pressure on HR managers not only to attract but to nurture and retain the taken. The challenge all the more serious because given the equal accessibility, availability and affordability of all other resources it's the only talented human resource that could provide the required cutting edge to the organizations to grow.

Given the cutthroat completion within which the companies are operating, the HR professionals can't afford to ignore these challenges and should come forward with necessary initiatives for developing the skills & competencies of their employees and prepare them to face the emerging challenges.

Today diversity is one of the major challenges for the organizations. Added to these changes in the workforce composition, globalized markets, internal competition. All these bring immense pressure and to survive and prosper companies need to take competitive advantage of diverse workforce. There comes the role and opportunity for the HR managers.

III HR'S RESPONSE AND THE CHALLENGE

HR departments in the 70s and 80s ran everything in a company, from canteen to travel services to cars to managing drivers. This era was full of forms and the HR department was the original bureaucracy. Over time, HR became a strategic partner, by outsourcing the repetitive and mundane operations and focusing more on aligning its policies with that of organization, i.e., synchronizing its strategy with that of business. In other words, focus was more on adding value by enabling others to do better.

In fact, organizations, given these diverse backgrounds, lifestyles etc., would be in a better position to respond to the emerging challenges. But the problem is now a day's company is challenged both on performance and people. And a company's growth depends on its ability to innovate and separate itself from commoditization. There is no other way except to innovate to stay ahead and to innovate one need a different type of employee and a different type of culture.

As we all know, companies chase ideas to be innovative and ideas are one part of the innovation challenge. Ideas are like seeds that you plant and the soil is the culture. If culture in the organization is arid and dry, no idea will ever grow. Here comes HR's role-HR teams can help in building a fertile soil base. This is no easy task and there are no easy answers. HR teams with outside experts help have come up with many studies, many indices for every important activity such as scores for engagement, belongingness, enthusiasm, staying and leadership. But we have to accept the bitter truth that HR departments with their consultants measure a lot of irrelevant stuff and seek solace in a few numbers. In the process, they also start throwing lot of jargon which neither they nor the employee understand.

So the challenge for the HR is to go back to its roots, the roots being bringing meaning to the workplace and not numbers / jargon. In other words, they must work on DIL — Diversity, Inclusion and Loyalty. Let's briefly reflect on these three elements:

(a) Diversity:

According to Thomas (7) workforce dimensions cover age, gender, physical abilities, sex, geographical location, religious beliefs etc. In the times to come, if the organizations have to survive and prosper, they

have no other go except to manage these diversities by successfully leveraging the innovative ideas, perspectives this diversity brings along.

In fact, organizations, given these diverse backgrounds, lifestyles etc., would be in a better position to respond to the emerging challenges. According to Prof Roy, (3) diversity creates a more harmonious workplace and organizations could reap the creative benefits of having a diverse workforce. Most of the studies conducted hitherto tell us that diverse workforce on board brings creativity and critical thinking to the table. But if the organizations don't take cognizance if this Golden opportunity they might lose the much required talent to competitors.

So the need of the hour is to think global but act local. And for this to happen organizations need to train their HR professionals in culture related matters do that they could inspire and motivate fellow professionals who are culturally diverse. Further, they need to assure and reassure the locals that they need not worry about the foreign talent as their interests would be protected. In other words, how skillful are the HR managers determines and decides the effectiveness of diversity management.

(b) Inclusion

Inclusion means no one entertains the feeling of being left out on account of gender, age, race etc.. An organization might put several policies in place to promote equality and diversity. But if inclusion is not taken care of, all those efforts would be in vain. So creating an all-inclusive work environment is more than giving equal opportunities. It's all about valuing their individual differences; respecting their views and making them feel they matter.

IV WHY INCLUSION IS IMPORTANT?

An inclusive work environment brings cohesion and value creation to the Organization. When people feel valued, respected, fair treatment is meted out they give their best. A saying goes people may forget what you say or do but never the way you make them feel. In an inclusive work environment people work more effectively as a team and bring laurels to the organization.

Last but not the least legal issues that cause a drain on the exchequer, will come down. So Organizations should focus on creating such an environment where discrimination is a non- issue and even if one arises the same would be resolved amicably.

V THAT BEING SAID LET'S SEE HOW INCLUSION NEEDS TO BE LEVERAGED

There's a legal obligation on every employer to stamp out discrimination from its workplace. That means required policies and procedures must be put in place, which is a major challenge, to create such an environment. And for ensuring inclusion effort is required on a continuous basis, as employees need to be monitored regularly to see that they work together.Organization should ensure that:

(a) Everyone gets involved in training sessions.
(b) Benefits and perks are accessible to everyone, without any discrimination.
(c) Employees freely express their needs, which are attended to.

If the Organization fails to ensure the above, employees feel devalued and may get dejected and demotivated there by affecting their performance on the worksite. For instance, Organization is organizing a seminar to improve effective team functioning. While doing so, to ensure collaboration and to avoid competition among employees, employer should keep following in view:

(i) Venue and timings of these sessions
(ii) Any clash with employee's prayer timings etc..
(iii) Do the timings fixed cause inconvenience to employees who have other obligations like picking up their children from crèche etc.,

In the same manner when the employer is running a canteen where people could socialize while having food, care should be taken to see that such facility is accessible to disable workers as well. Further, menu should be such that it caters to employee's specific beliefs &dietary requirements. Like this there could be so many initiatives for ensuring inclusion. But the most important thing to note is that, employer should think of the impact of such decisions and accordingly move forward. Further, continuous interaction with employees in a free and fair/ transparent manner will enable the management to know their needs and helps in creating an engaged inclusive work environment, where employees give their best.

VI NOW, A QUESTION MAY ARISE AS TO WHY DIVERSITY & INCLUSION?

(a) **Case for Diversity and Inclusion-** In the contemporary times of today, with competition ruling the roost a company's success to a large extent depends on how diversified & inclusive its workforce. In other words, does diversity & inclusive are part of its culture driving all towards accomplishment of organizational goals.

The benefits from such inclusive culture, characterized by diversity, are as under:

(i) Protection from legal issues/law suits.
(ii) Employees feelings of acceptance & inclusion.
(iii) Improves tolerance levels while reducing potential conflict.
(iv) Aids in recruitment, retention of talented workforce.
(v) Workforce composition gets enriched with talented employees being attracted.
(vi) Involvement of the local population, as a result of diversity & inclusion policy.
(vii) Company's brand image improves as people are fairly treated.
(viii) Adaptation to change becomes easy.

(b) Loyalty

It is common knowledge that, loyalty in India is more to individuals then to institutions and the challenge for HR and the CEO is to build institutional loyalty. Loyalty is two-way and we should actually start by asking if the organization is loyal to its employees, especially employees, who live, breathe and go beyond the call of duty for the company. In many Indian companies, owners value blind loyalty ahead of talent. Somehow the concept of a talented loyal employee is not understood or desired. Hence, in a departure from the prevailing practice HR has to take a new path in developing talented and loyal employees. Few steps to be taken in this regard are:

(i) Not to become a prisoner of policy [many times, HR itself drafts the policy].
(ii) Culture is the collective personality of the organization and not just the leadership team or HR team, hence focus on building that.
(iii) Look for signs of dis-engagement and intervene quickly.
(iv) Focus on staying interviews and not exit interviews. While doing staying interviews, tell the employee why he/she is special and why the company values her.
(v) Treat employees leaving the organization with respect and part as friends and the departing employee becomes an ambassador for your company.

All this is fine, but how to about? So let's look at the proposed Diversity, Inclusion and loyalty Framework:

(c) Diversity, Inclusion and loyalty Framework

The Department/Division entrusted with the responsibility of Diversity, Inclusion and loyalty should first conceptualize, concretize & implement a framework that will build diversity, creates aninclusive work environment resulting in employee's loyalty & commitment. First

management should identify the existing best practices in the area of inclusion and diversity. Once this is done task of accomplishing sustainable inclusion and diversity becomes easy. Because we know the best and what more remains to be done to improve the situation further. When the management adopts thus sort of approach a feeling of care and share approach gets created resulting in employee's loyalty. While identifying such elements individual differences have to be kept in view, as every human being is unique with his talent.

(i) **And the said elements include:**
- A well informed & committed leadership.
- Coverage of all goals and activities of the organization.
- Synchronization of departmental & organizational goals.
- Committed resources.
- A focused Learning & Development Program.
- Periodical review of policies /programs.
- Accountability and responsibility.
- Measuring the impact evaluating the same for improving.

(ii) **Purpose, Vision and Values**
- **Purpose:** Diversity, inclusion & loyalty are an integral part of Organizational processes, which are constantly to be reviewed and revised.
- **Vision** – To have a strong & vibrant work environment that attracts, develops and retains talented workforce.
- **Values:** We accept, respect and value individual differences and wish to work on their diverse backgrounds/experience of employees. Further, inclusion will be ensured by identifying and removing barriers, if any, in processes to attract, develop & retain talented employees. And our efforts in this regard will result in effective and meaningful participation of all in high performance of organization.

The Learning and Development program will be designed in such a way so as to meet diverse/specific needs of everyemployee. And this will help the employees to improve their skills and enable them to contribute better to the cause of organization. Since the employee's differences are respected & accommodated in designing & implementing the learning & development programs everyone chips in with their best. When all these steps are taken, a culture automatically gets created where people are respected; their problems are resolved while respecting individual differences and contribution is valued. In other words, when the Organization ensures required autonomy to express their views, enables their best contribution by respecting their

individual differences and starts valuing their contribution a strong and vibrant work environment gets created resulting in outstanding contribution from all the employees.

VII CONCLUSION

Many of us might have witnessed this:A senior police officialpassing through with his paraphernalia without even knowing the name and thought process of the traffic constable, who facilitates smooth passage of his vehicle. In Munnabhai MBBS movie, after Munna gives hug the janitor starts crying, because no one cared to recognize that he too is a part of the big picture. An employee's inclusion and involvement could be known from this anecdote:

On coming to know about a hospital being a Great place to work, a TV team visits the hospital for interviewing all the concerned to know the best practices which keeps the employees and visiting patients happy. After completing the work when they are about to leave, the team head notices a person in cramped clothes leaning to the wall. Then the head out of curiosity asks that person" what's up", the person doesn't respond. When the head repeats then the person, in an animated mood, realizes that he is being enquired, looks at himself and the background and says

"Can't you see: I am the person who saves 100-150 lives per day". Then the head realizes that he is a janitor and was standing outside ICU.So what he meant was he is a janitor entrusted with the responsibility of ensuring hygienic conditions in the ICU. The moral is when the employees are made to understand how they contribute to the Organization they give their best. Many of the managers just go by their job description. But there are few great managers who go beyond that to know their employees, their needs and do their best to resolve/ fulfill them.

The most important thing for the success of Diversity, Inclusion and loyalty initiative is top management's total support &commitment. Every action of theirs should send a message across the organization that a sincere effort is being made to create an equal opportunity atmosphere, where individual differences and their creativity would be leveraged for the benefit of organization. Needless to say successful organizations are those which capitalize on the diversity of their employees on a continuous basis with a regular review and revision of policies in the direction of ensuring a diverse – inclusive environment, which creates loyalty among its employees inspiring them to give their best for the organization's growth.

Lastly, let's not forget that, as rightly said by Maya Angelou, **people will forget what you said, people will forget what you did, but people will never forget how you made them feel.** We would like to conclude by reminding all our HR friends that Talent not only has to be attracted to join your company, but more important, it needs to be motivated to stay. So, **let's work to get DIL at work?**

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Integrating Value at Risk Concept in Risk Management Frame work- A Critical Review

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ABSTRACT

Participants in the financial Markets are prone to carried kinds of financial risks such as credit risk, operational risk, liquidity risk, systemic risk etc. It is most prudent on part of such financial institutions and market regulators to continually monitor risk, so that counter risk management strategies can be devised and implemented. For some years now the concept of Value at Risk has gained currency and has been adopted as one of the standard measures of financial risk measurement and analysis. This concept has the advantage of quantifying risk in single number which makes it highly appealing and it approximate the Highest expected loss in given time interval and desired confidence level. This paper intends to highlight the importance of the Value at Risk concept and then how risk management has assimilated the same in contemporary risk management practices and organizational paradigm.

Key words: Value at Risk (VAR), Risk Management, Basel Accord

I INTRODUCTION

Every type of business involves some extent of risk. Risk can be minimized but cannot be totally eliminated. The only way to totally eliminate risk is by stopping the business itself. Given this fact, a question which comes to the mind of a businessman is "How risky is the business I am undertaking and how can the risk be measured?" or "How bad can the affairs get in the course of business?" Value at Risk is the concept which can provide an answer to this question. Value at Risk has the advantage of quantifying the risk in single number which makes it highly appealing and it appears to measure the worst expected loss at given time interval and confidence interval.

II REVIEW OF LITERATURE

Reto R Gallati [14] defines Value at Risk as the predicted worst-case loss at a specific confidence level (e.g., 95 percent) over a certain period of time (e.g., 10 days).

According to **Philippe Jorion [17]** "Value at Risk measures the worst expected loss over a given horizon under normal market conditions at a given level of confidence"

Linsmeier and Pearson [19] have given the following formal definition for Value at Risk:

"Using a probability of x percent and a holding period of t days, an entity's Value at Risk is the loss that is expected to be exceeded with a probability of only x percent during the next t-day period." Value at Risk can thus be defined as the maximum loss a portfolio of securities can face over a specified time period, with a specified level of probability. For example, a Value at Risk estimate of $1 million for one day at a probability of 5% means that this security can expect loss of at least $1 million in value in one day with a 5% probability. Consequently, there is 95% probability that loss in value of portfolio in one day will not exceed $1million.

Various Authors like **Damodaran A (8), Dowd Kevin [10], and Holton G [15& 16]** have written elaborately on Value at Risk in its different perspectives and its relevance in contemporary scenario wherein risk management is central theme across financial organizations. Risk Management experts like **Reto R G [14], Jorion P [17] & Mark S Dorfman [9]** give the importance of Value at Risk and its rightful place in the risk management process.

Basel accord [6] & Risk metrics technical document [25] discuss Value at Risk as a central benchmark for risk estimation procedure in quantifying Risk. **Marshall C & M Siegel [20]** provide a means of Value at Risk implantation in entire risk management process. Financial Risks & their quantification are elaborately explained in various risk management works written by **Dowd Kevin [10], Mc Neil et al [22]** elaborates extensively on risk & its measures. **Tsai [29]** focuses on risk management via Value at Risk methodology. **William Fallon [12]** elaborates on Approximating Value at Risk in its most basic form. **K kuester et al. [18]** provides insight on calculation & predicting Value at Risk by various approaches. **Campbell et al [7]** give various econometric details of Value at Risk estimation. Extensive insight is provided by work of **Allen D, E et al [1, 2 &3]**. **Bao young et al [5]** shed insights on performance of Value at Risk concept specifically in emerging markets using various models of estimating it.

III EVOLUTION & CONCEPT VALUE AT RISK

(a) **Evolution:** "Value at Risk" was not used in common parlance prior to the decades of 1990s, its origin lies much back in time. The work of **Holton G A [15]** provides a detailed exposition of Value at Risk origin. The mathematics that underlies Value at Risk was largely conceptualised as part of portfolio theory by Harry Markowitz and others, though that was for

different purpose i.e. – devising optimal portfolios for equity investors.

The Focus on market risks and co relational effect from the crux of Value at Risk computation. Impetus for use of Value at Risk came from the various crises that have struck financial service firms over time and regulatory responses to above.

Regulatory compliance in terms of capital requirements for banks first came into scene after the Great Depression of 1928 and the subsequent bank failures. Securities Exchange Act came into force and Securities Exchange Commission (SEC) was formed which required banks to keep their borrowings below 2000% of their equity capital. Risk and control measures were then devised by to ensure that regulatory capital requirements.

Increased risk quotient created by the advent of derivatives and commissioning of floating exchange rates in the early 1970s, caused a redefining of capital requirements and hence SEC's Uniform Net Capital Rule (UNCR) was promulgated in 1975. Thus financial assets Categorization of banks was done in twelve classes, and based upon risk exposure, and requirement of different capital requirements for each of them ranging from 0% for short term treasuries to 30% for equities was mandated. Reporting by Banks on capital disclosure was made compulsory in quarterly statements.

Holton G A [15 & 16] explains that Value at Risk, first came into the use in 1980 with SEC mentioning in its rules , that capital requirements of financial service firms be ascertained on the basis of loss which can be incurred with a confidence interval of 95% over a 30 day horizon, in various asset classes. This was done on the basis of historical returns. These were initially named as Haircuts a term still in use, it was clear that the idea was to estimate one-month 95% Value at Risk and hold that much capital to cover losses. With the trading portfolios commercial banks larger and more volatile, there was a need to define more efficient risk control measures. First reference to Value at Risk came in form of bankers trust internal documents which gave a inherent perspective of Value at Risk for fixed income securities.

Down Kevin [10] explains that As 1990s arrived, financial firms began to use Value at Risk in its most basic and primitive forms with some variations. With the advent of Derivatives and the inherent risks involved a lot of capital was betted on for speculative positioning resulting in some catastrophic losses around the world markets leading to some major bankruptcies ex. Failure of Barings. Thus the need for more comprehensive risk measures arose.

In 1995, **J.P. Morgan [25]** made public access to its risk measurement tools & control, for the first time. This Package developed over a decade and used along with software was called Risk metrics, and it contained the concept of Value at Risk. Thus Value at

Risk was welcomed by regulatory experts in industry, mostly commercial and investment banks, who appreciated its basic appeal. Applications of Value at Risk analysis and reporting have extended from position/ portfolio Value at Risk, to nonfinancial organizations, to expanded application of the Value at Risk methodology, such as earnings at risk (EaR), earnings per share at risk (EPSaR), and cash flow at risk (CFaR) as explained in the work of **Artzner P et al. [24].**

(b) Context & Concept According to **Dowd Kevin [10]**, market risks can be subdivided into four classes: interest rate risks, equity price risks, exchange rate risks and commodity price risks. Financial Market Participants face many different kinds of risks, including market risks, credit risks, liquidity risks, operational risks and legal risks. Historically Banks and investment houses have balance sheets made up almost exclusively of financial assets whose value is subject to changes at any point of time. These changes are mostly as a result of changes in the interest rates.

Historically, these risk can be managed by matching them with similar risks on the liability side of the balance sheet, or in other words, matching the duration of the assets and liabilities. If done correctly and accurately, a change in interest rates would be nullified by change in the corresponding asset and liability. About ten to fifteen years ago, this was an ideal concept known as Asset/Liability Management (ALM) as Illustrated by **Mark S Dorfman [9].**

For the last few years, the balance sheets of banks have become too complex for simple matching of assets and liabilities and even for other hedging techniques like derivatives, without a proper measurement of risk Risk measurement standards on derivatives based Delta, Gamma and Vega as well as Interest Rate measures like Gap, Dollar Value on Basis Points and Convexity measures were used, but were not found sufficient. While these measures were quite accurate, they could not sum up different types of risk, did not allow for preventive control measures and could not measure capital or earnings at risk with precision. Value at Risk was originally developed to measure market risk, which is caused by movements in the level or volatility of asset prices - **Jorion P [17].**

Value at Risk is a statistical measure of the maximum potential loss from uncertain events in the normal business over a particular time horizon. It is measured in units of currency through a probability level. It is the loss measurement consistent with a confidence limit such as 99%, on a probability distribution (usually a normal distribution), implying that this is the measurement of a loss which has a chance of only 1% of being exceeded. In simple words, if a trader mis-hedges a deal, it is a must to know the chances of loss before they occur. Value at Risk is one such technique that allows the management to do so. One of the most important

aspects of Value at Risk is that Value at Risk actually assigns a probability to a dollar amount of happening of the loss.

This probability and its corresponding loss amount (5% and $1 million in the above example) are not associated with any particular event, but it could cover any event that could cause such a loss. For example, a Value at Risk estimate that only measures losses due to market risk will not be able to capture credit losses. -Allen D [2] & Mc Neil & Frey [22]

It is important to remember that Value at Risk is not the maximum loss that could occur, but only a loss amount that could expect to exceed only at some percentage of the time. The actual loss that may occur could be much higher than the Value at Risk. The concept of Value at Risk is to determine the probability distribution of the underlying source of risk and to identify that worst given percentage of outcomes. Thus the basic idea behind Value at Risk is straightforward since it gives a simple quantitative measure of portfolio's downside risk. The figure of a normal curve illustrates the principle behind computing VAR when the distribution of the change in portfolio value is continuous. The normal curve is widely used for computing Value at Risk though not necessarily appropriate in all the cases.

The biggest attraction of normality is that if the portfolio return is normal, the Value at Risk is the multiple of portfolio standard deviation and the normal value of the confidence level. Developed initially by JP Morgan, so as to study the maximum possible amount of losses on all portfolios, Value at Risk has gone from being merely being a risk measurement concept to a regulatory feature as proposed by Basel accord [6] to maintain capital adequacy requirement in banks, Holton G A [16] elaborates that Value at Risk has two important and appealing characteristics – First, it provides a common consistent measure of risk for different positions and instrument types. Second, it takes into account the correlation between different risk factors. This property is absolutely essential whenever computing risk figures for a portfolio of more than one instrument from a statistical point of view.

The estimation of Value at Risk entails the estimation of a quartile of distribution of returns. The fact that return distributions are not constant over time or normal provides exceptional challenge. When interpreting Value at Risk figures, it is essential to keep in mind the time horizon and the confidence level since without them, Value at Risk numbers are meaningless. Statistical models of risk measurement, such as Value at Risk, allow an objective, independent assessment of how much risk is actually being taken in a specific situation. Results are reported in various levels of detail by business unit and in the aggregate. It takes into account the corporate environment of an institution, such as accrual vs. mark-to-market accounting or hedge accounting for qualifying transactions. Furthermore,

the focus is now on the longer-term impact of risk on cash flows and earnings (quarterly or even annually) in the budgeting and planning process

IV VALUE AT RISK APPROACHES & METHODS

Value at Risk methods have been quantified as bellow: -

(a) **Parametric approach and Methods:** Variance-Covariance Method
(b) **Non parametric approach and Methods:** Historic Simulation & Monte Carlo Simulation
(c) **Semi parametric approach:** Combination of parametric and non parametric methods with/ or without additional refined techniques such as Neural networks / Extreme Value Theory.

Value at Risk calculation methods are divided into parametric and non-parametric approach and methods- **Willam F [12]**. **Parametric Approach and Methods:** These methods in statistics assume that data have been progressed from a type of probability distribution and thus inferences are made about parameters of distribution.

Parametric method use time series analysis from previous data to derive volatilities and correlations estimate on large financial instruments set. Assumptions in a Parametric methods are more than non-parametric methods and if these are correct, they produce accurate and precise estimates from their counterparts as they have high statistical power. In case these assumptions are wrong, parametric methods and their outcomes can be grossly flawed. **Dowd Kevin [10].**

(i) **Variance- Covariance Method:**
This approach allows an estimate to be made of the potential future losses of a portfolio through using statistics on volatility of risk factors in the past and correlations between changes in their values. Risk factors for Volatilities correlation are calculated from historical data for a selected period of holding the portfolio. Value at Risk calculation is done by multiplying expected portfolio volatility by a factor as per confidence levels. Variance-covariance approach inspired from assumption that under lying market factors comes from a multivariate normal distribution. Portfolio return comes from a linear combination of normal variables; it is assumed to be normally distributed - **Simon B et al [28].**

Normal Value at Risk is easy to handle because Value at Risk is a multiple of portfolio standard deviation, and the portfolio standard deviation is the linear functions of individual volatilities and covariance's. It is based on assumption that market parameters changes and portfolio values are distributed normally. The normality assumption is basic and straightforward. Thus it is ideal for simple portfolios consisting of only linear instruments - **Dowd Kevin [10].**

When implementing variance-covariance approach, the first step is to 'map' individual investments into a set of simple and standardized market instruments. Each instrument is then put as a positional set in standardized market instruments. For example, ten-year coupon bond is put as ten zero coupon bonds.

After identifying standard market instruments the variances and covariances of these instruments are estimated. Historical data helps statistics. Calculation of Value at Risk is last step for portfolio by using estimated variances and covariance's and the weights on the standardized.

While parametric approach assumes conditional normality of returns, estimation process for "normal" variance-covariance approach has to be refined to incorporate empirically proven fact that most return distributions show deviations from normal. Estimates of volatility and correlation are used as inputs in Value at Risk analytical models. Even though this method is easy to implement, the normality assumption causes problems. Financial assets sometimes show 'fat tailed' return distributions, meaning that in reality extreme outcomes are more probable than normal distribution would suggest. As a result, Value at Risk estimates may be understated. – **Holton G [15]**.

Problems grow even bigger when the portfolio includes instruments, such as options, whose returns are nonlinear functions of risk variables. Solution to this issue is to take first order approximation to returns of these instruments and then use the linear approximation to compute Value at Risk. This is delta-normal approach that's only; shortcoming is that it only works if portfolio contains limited non-linearity.

There is another set of advanced value at Risk quadratic Value at Risk methods. also known as delta-gamma models, which go even further as they use a second order approximation rather than a first order one. Obviously improvement over delta-normal method is improved, but its simplicity of the basic variance-covariance approach is lost. The advantage of variance-covariance approach is its simplicity. Value at Risk can be easily calculated if normality assumption is held as normal distribution properties help to estimate Value at Risk levels. - **Dowd Kevin [10]**.

Campbell et al [7] say that in using this approach it is necessary to take into consideration the following facts:

- Market prices and their returns not necessarily follow a normal distribution, evident in tailed distributions and extreme values
- Market Risks may not predict market risk arising from extreme events.
- Correlation from past may not always hold key to future.

Variance-Covariance Methods, assume that loss that can happen is proportional to standard deviation of return. We estimate Value at Risk through equation

$$\text{Value at Risk at time } t = \phi \cdot \tau \cdot \sigma_{TP} \quad (1)$$

Where Φ is the likelihood parameter; σ_{TP} is the return standard deviation for time t; and τ is a parameter used when we calculate Value at Risk for a time period with a different length from that used to estimate the standard deviation- **Campbell John Y. et Al [7]**.

Variance-Covariance Methods use various methodologies can to calculate the Value at Risk for computing variance (standard deviation) in different ways values:

- Constant Variance-Covariance Approach: Assumes price variance remains constant with time.
- EWMA (Equally Weighted Moving Average) Approach: Assumes variance in future can be predicted by using fixed amount of historical data and all historical observations carry equal weights.
- Exponentially Weighted Moving Average Methodology (EQWMA). The main difference between this and the previous methodology stems from the different weight associated with the historical observations used.

EQWMA Methodology is based on observations (current) by using exponentially weighted moving averages of squared deviations in the formula.

$$\sigma_t = \sqrt{(1-\lambda) \cdot \sum_{s=t-k}^{t-1} \lambda^{t-s-1} \cdot (x_s - \mu_t)^2}$$

Here

σ_t denotes forecasted standard deviation for time t;

Xs is equal to oil price return for time s;

μ_t is value of historical average for this return;

k is number of observations included in calculation procedure;

Parameter λ is decay factor determining rate at which weights on past observations decay as they become old.

The Variance covariance approach also uses different statistical models for the inherent variance calculation that is used for this calculation.

(ii) **Non-parametric methods** differ from parametric methods in the way that model structure is not specified before but is derived from data. i.e. their defining parameters are flexible. Non-parametric methods are widely used and in many respects are highly attractive approaches to calculate Value at Risk. They have a reasonable track record and are often superior to many parametric approaches based on simplistic assumptions such as normality.

They are also capable of considerable refinement to deal with some of the weaknesses of more basic nonparametric approaches. They work fairly well if market conditions remain reasonably stable, but pose a problem when dealing with extremes, particularly if we don't have a large sample size. The Calculation of Value at Risk using parametric approaches has, the distinguishing feature of that they require us to specify explicitly the statistical distribution from which our data observations are drawn.

Parametric methods are based on statistical parameters of risk factor distribution and non-parametric models are Simulation or historical models. Variance-covariance approach is thus based on assumption that change in market parameters and portfolio value changes are normally distributed.

Historic Simulation and Monte Carlo Simulation called as non parametric methods – **Allen D.E et al [3].** Historical Simulation standard approach focuses on deriving an empirical distribution from price changes over a period which is prior to time at which calculation is done. Calculation of Value at Risk is done from maximum loss in distribution pertaining to required likelihood percentile.

Monte Carlo Simulation Method also uses empirical distribution derived from price changes. This method does not use historical price changes. Series of pseudo random variables are generated from the assumption that they follows a determined statistical distribution. Value at Risk is quantified from the maximum loss in distribution of these pseudo random variables, pertaining to required likelihood percentile- **Campbell John Y. et Al [7].**

(iii) Historic Simulation Method
When it comes to non-parametric methods, Historical Simulation is probably the easiest approach to implement. Starting step of historical Simulation is to identify the instruments in the portfolio and to obtain time series for these instruments over some defined historical period. Then weights are used in current portfolio to simulate hypothetical returns that would have been realized if current portfolio was held over the observation period. Value at Risk quantities can be noted from histogram of the portfolio returns. The assumption here is that distribution of historical returns acts as a good compliment to returns over next holding period-

Thus Value at Risk calculation from historical Simulation starts from noting changes seen in market prices and risk factors are analyzed over a specified historical period, say, one to five years. The portfolio under examination is then valued, using changes in the risk factors derived from the historical data, to simulate and create the distribution of the portfolio returns. We then assume that this historical distribution of returns is also a good proxy for distribution of returns of the portfolio over the next holding period. Relevant percentile from historical returns distribution of helps to calculate expected

Value at Risk for current portfolio- **Allen D.E et al.[2].**

One important consideration for computing historical Simulation Value at Risk is the historical period used for calculation and it should be long enough to form a reliable estimate of the distribution, but small enough to avoid 'paradigm shifts'. Simulating' or constructing cumulative distribution function (CDF) of assets returns over time can be used for estimating Value at Risk by this procedure. Advantage of Historical Simulation is that it does not assume any distribution on the asset returns unlike most parametric Value at Risk models. Also, it is relatively easy to implement- **Allen D.E et al. [2].**

Historic Simulation Value at Risk forms from the assumption that historical distribution of returns will remain the same over the next periods; basically assuming that price changing behaviour replicates over time. Therefore the distribution of returns in future will be as ordained by empirical, historical return that will be used in estimating Value at Risk. As a result, Value at Risk from Historic Simulation will be the empirical quantile of distribution pertaining to confidence level - **Campbell John Y et al [07].**

$$\mathrm{VaR}_{t+1}, q = \mathrm{Quantile} \left\{ \{X_t\}_{i=1}^{n} \right\},$$

Historical Simulation also has some disadvantages. Out-of-sample Value at Risk estimate is difficult to derive historical Simulation Method. Historic Simulation ignores potentially useful information in the volatility dynamics.

Historical Simulation is based on the concept of rolling windows. First, one needs to choose a window of observations that generally ranges from 6 months to two years. Then, portfolio returns within this window are sorted in ascending order and the 0-quantile of interest is given by the return that leaves 0% of the observations on its left side and (1-0) % on its right side. If such a number falls in between two consecutive returns, then some interpolation rule is applied. Value at Risk is computed the following day, by moving forward the whole window by one observation and repeating procedure. Which means that implicitly it assumes portfolio returns distribution do not change within the window. From this implicit assumption several problems derive i.e. if it is assumed that all windows follow the same distribution, then by this it will mean that returns from these windows will be independent and identically distributed.

A convenient solution to lot of issues is to use weighted Historical Simulation which gives lower weights on observations that lie further in the past. This approach is free from calculation of correlations and volatilities. Instead it uses historical data of actual price movements to determine the actual portfolio distribution. In this way, the correlations

and volatilities are implicitly handled. In fact the most important advantage of this approach is that the 'fat-tailed' nature of security's distribution is preserved since there is no abstraction to a correlation and volatility matrix.

(iv) Monte Carlo Approach

The Monte Carlo method specifies statistical models for basic risk factors and underlying assets. The method simulates the behaviour of risk factors and asset prices by generating random price paths. Monte Carlo Simulation s provide possible portfolio values on a given date T after the present time t: $T > t$. The Value at Risk (VaR_T) value can be estimated from distribution of simulated portfolio values. The following algorithm is adopted-:-

- Specify stochastic processes and process parameters for financial variables and correlations.
- Simulation of hypothetical pricing trajectories for all interest variables. Price changes Hypothetical in nature are obtained by simulations drawn from specified distribution.
- Obtaining prices of assets at time T. P_{iT} . from the simulated price trajectories & Compute the portfolio value $P_{p,T} = \Sigma w_{iT} P_{iT}$

- Repeating steps 2 and 3 number of times to form the distribution of the portfolio value $P_{p,T.}$
- Measure VAR_T as the negative of the $(1-\alpha)^{th}$ percentile of the simulated distribution for P_{pT}

Thus to apply this approach, first we have to calculate the correlation and volatility matrix for the risk factors. Then these correlations and volatilities are used to drive a random number generator to compute changes in the underlying risk factors. The resulting values are used to re-price each portfolio position and determine trial gain or loss. This process is repeated with each random number generated and re-priced for each trail. The results are then ordered such that the loss corresponding to the desired confidence level can be determined.

Monte Carlo Simulation can thus be seen as hybrid of the variance-covariance approach and the historical Simulation approach. Variance-covariance matrix is used to drive a Simulation. The Simulation works similar to the Historical Simulation, but instead of using history, it creates history (known as path) based on variance/covariance matrix derived from the actual historic market data.

The greatest advantage of Monte Carlo Simulation is that Value at Risk derived from this method uses pricing models to revalue non-linear securities for each trial. In this way, the non-linear effects of option that were missed in the variance-covariance Value at Risk can be captured in this approach. Monte Carlo Simulation, having its roots in random number generation is exposed to sampling error. There is risk

of running less Simulations which adequately captures the distribution and this could result in an inferior answer.

One of its advantages is Monte Carlo Simulation generates the entire distribution and therefore it can be used, for instance, to calculate losses in excess of Value at Risk. The most significant problem with Monte Carlo approach is its computational time. The method requires a lot of resources, especially with large portfolios. As a consequence; the implementation may turn out to be expensive. Nevertheless, Monte Carlo will most likely increase its popularity in the future as the costs of computer hardware continuously decrease.

(v) Semi parametric Methods

These methods combine the parametric with non-parametric techniques with use of concepts like is Extreme Value Theory (EVT) and neural network approaches or traditional approaches with high reliability algorithms to generate data patterns from analyzing correlation between various data points and which give great results in the same domain with amazing ease of implementation. In sum, the semi-parametric approaches are more promising since they strike the balance between flexibility and tractability in risk modelling.

V APPLICATIONS OF VALUE AT RISK

The uses of Value at Risk fall broadly into three categories: determination of capital adequacy, performance measurement and supporting to the risk managers.

(a) **Uses of Value at Risk are:-**
   (i) Initially, Value at Risk was used as an information tool to communicate to the management a feeling of the exposure to changes in the market prices or rates. After market risk started being implemented in the actual risk control structure, Value at Risk is being used to calculate and measure the risk adjusted performance and compensation, in addition to remaining a very powerful management information system as far as the risks of investment are concerned.
   (ii) Firms with market risk measurement systems which apply portfolio diversification theory can lower their project risks.
   (iii) Value at Risk is also important in identifying the effects caused by substantial future movements to the value of the portfolio. Based on the measurement made by Value at Risk, the portfolio manager can compare it with the maximum acceptable risk and take appropriate measures either by using derivatives to hedge the position or by changing the portfolio components to reduce the risk in Trading.

(iv) In 1995, 10 major central banks realized the use of Value at Risk in order to assess the capital adequacy ratio for market risk and started their own in house Value at Risk modeling. Of course, now this has become a regular practice with most central banks in developed countries. Thus Value at Risk can be used in ALM to estimate the changes in the net interest income and economic value of portfolio equity.

(v) In addition, Value at Risk can be used in Corporate Applications to measure the risk of foreign exchange exposures, interest rate changes, effectiveness of hedging and derivatives portfolio, management of credit risks for each counterparty, evaluation of complex transactions to be undertaken and investment management in overall.

VI LIMITATIONS OF VALUE AT RISK

Value at Risk is often criticized as being over-hyped, based on forty-year-old ideas of risk management as said there is nothing new about Value at Risk as a way of measuring risk. The concept of Value at Risk is very simple but this is also one of the main sources of critique. Value at Risk reduces all the information down to a single number, meaning the loss of potentially important information. For instance, Value at Risk gives no information on the extent of the losses that might occur beyond the Value at Risk estimate. As a result, Value at Risk estimates may lead to incorrect interpretations of prevailing risks.

One thing that is particularly important to realize is that portfolios with the same Value at Risk do not necessarily carry the same risk. Experts suggest a method called Conditional Value at Risk to deal with this problem. Allen E D et al [3]. Conditional Value at Risk measures the expected value of the loss in those cases where Value at Risk estimate has been exceeded. Value at Risk has also been criticized for its narrow focus. In its conventional form it is unable to account for any other risks than market risk. Further criticism has been on the aspect that Value at Risk considers only the loss at the end of the estimation period, but at the same time many investors look at risk very differently. They are exposed to losses also during the holding period but this risk is not captured by normal Value at Risk models. To take into account for this, the authors suggest a method called continuous Value at Risk modelling.

In addition, every Value at Risk model is based on some kinds of assumptions which are not necessarily valid in any circumstances. Due to these factors, it is not a foolproof method- Allen E D et al [1]. Tsai [29] emphasizes that Value at Risk estimates should therefore always be accompanied by other risk management techniques, such as stress testing, sensitivity analysis and scenario analysis in order to obtain a wider view of surrounding risks. The choice of a methodology has some far-reaching impacts. The users should not view models as black boxes that produce magic numbers. It's important to realize that all three methodologies for measuring Value at Risk are limited by a fundamental assumption that future risk can be predicted from the historical distribution of returns. The **parametric approach** assumes normally distributed returns, which implies that parametric Value at Risk is only meant to describe losses on a "normal" day. Other types of days, such as crises (fat-tail events), which happen rarely but have a serious impact, do not exist within the "normal" view as said on econometric modelling by **Campbell et al [7]**. **Non parametric & Semi-Parametric approaches** rely on continuous & dynamic estimation of Value at Risk & use varied models to estimate the same. –**Allen E D et al [4]**. This means that all three approaches are vulnerable to structural changes or sudden changes in market behaviour. Value at Risk has these limitations which need to be kept in mind while in use:

(a) It cannot measure risk accurately in extreme market conditions, because modeling is never perfect to decipher risk under such conditions.

(b) It focuses on a single arbitrary point. The Assumptions are too simplistic. It cannot capture model risks, thus requiring the use of model reserves also. Volatility also keeps varying with time and is not stable. It uses many models with a wide variety of assumptions and methods of calculations, producing different results under different models.

(c) It is basically a statistical measure and not a managerial one. It is impossible to arrive at a decision using a single quantum of information. Another aspect is more important because Value at Risk is based upon probabilistic estimate, subject to certain assumptions. Sometimes, in real life even one percent risk may create disaster for institution.

(d) Event and Stability Risks: The main drawback of models based on historical data is that they assume that the recent past is a good projection of future randomness. Even if the data has been perfectly fitted, there is no guarantee that the future will not hide nasty surprises that did not occur in the past. On practical side, there are high costs of maintaining and operating a Value at Risk based system-computer hardware and software, obtaining price date, employing expertise analysis, etc. Thus the technique should be supplemented by Stress Testing, which is explained in the next paragraph.

(e) Parametric Risk: Also known as estimation risk, parameter risk stems from imprecision in the measurement of parameters. Even in a perfectly stable environment, we do not observe the true expected returns and volatilities. Thus, random errors are bound to creep in because of sampling variation. Distribution may not be normal distributions in all given circumstances.

Correlations may not be stable in all the given circumstances.

(f) Data Mining Risk: This is among the most insidious form of risk. It occurs when searching various models and reporting only the one that gives positive results. This is particularly a problem with nonlinear models (such as neural network or chaos models), which involve searching not only over parameter values but also over different functional forms.

VII RISK MANAGEMENT VALUE CHAIN (RMVC)

Weiner Z [30] & Risk Management experts like Dowd Kevin (10) elaborate that Value at Risk is not single function in the process of risk estimation and quantification. The level and amount of risk needs to ascertained and then documented comprehensively so as to fuel further action. Hence experts recommend the implementation of Value at Risk using in the **Risk Management Value Chain (RMVC)**. This process, termed as risk management value chain, will include the organizational considerations, role of senior management, IT requirements and Modeling VAR.

(a) **Organizational consideration** First important aspect of creating a risk management value chain in an institution is to assess whether the present organizational structure is suitable for risk control strategy. Two main factors that impact any assessment are:

  (i) **Size and geographical structure:** In this, two types of structures can be assessed: fully centralized and regional structure. A fully centralized risk control structure provides information on a detailed and consolidated basis to all those involved in derivative activities. This is usually best suited for regional or small commercial banks where there is degree of homogeneity is business operations across the different locations. All the important issues would be fully controlled at the centre. In case of regional structure, regional risk function coexists with a centralized function at the centre of the organization. This type of structure would be suited to large organizations with a wide geographical span of activities. The regional control area would look after and coordinate risk control activities of a routine nature on day to day level with the responsibility of limit reporting and control. Central office would control over all risk strategy like limit formulation, consolidation of risk profiles, performance analysis, reviewing risk strategy and assisting in goal formulation

  (ii) **Existing functional involvement:** The existing functional structure of an organization should be reviewed in the light of new changing orientation of the risk management area. Some rationalization of the existing function is inevitable. The review should be conducted over a reasonable period so that the potential barriers are removed.

(b) **Role of senior level management:** Another important consideration in establishing a risk management value chain is the role played by the senior management in this respect. The top management is primarily responsible for developing the notion of an integrated risk culture. Since derivative exposures are unique in nature and different from other risks, it is essential to create appropriate environment and culture in the organization. For this the top management should sponsor the risk culture, assume responsibility for risk factor and establish objectives.

(c) **Information & Technology requirements:** Information requirements of the participants in the risk management process are essential characteristics of an integrated risk area. Different levels of information are required to the participants for making decisions. Two inter-related aspects are considered such as, tactical vs. strategic user level and timeliness of information. Strategic level information relates to senior level management, which need information for taking strategic decisions. The information moves from top to bottom. All such matters regarding firm profits, level of expense, risk budget, trading limits and derivative performance are provided at the strategic level. Tactical level information relates to exposure supervision. The focus would be on detailed information, which includes product, pricing analysis, incremental risk calculation.

This also includes portfolio exposure breakdowns and mark to model risk calculations and so on. Both level of information is essential for integrated risk management.

The most important point in the risk estimation is that information must be provided as quickly as possible to the right person because risk information can be critical to making mitigating decision. In this respect, it is essential to develop real time systems. This system provides up to the minute market information for tactical information requirements. Provision of risk management information is a cost/benefit trade off, requiring careful analysis to ascertain the level and intensity of information required.

  (i) **Analytical choices:** After establishing a sound organizational structure and appropriate information network, another aspect which need to be considered in creating a risk control analytical functions, are as follows:

(ii) Constructing building block approach: The management of risk exposures is a complicated task which needs expertise, adequate sources and appropriate information requirement on various aspects like credit, market, liquidity, etc. Various methodologies and tools are used for risk analysis. Hence, in order to avoid duplication of efforts in constructing risk measurement approaches, a small number of analytical approaches should be followed to form the building blocks upon which further analytical method can be constructed.

(iii) The risk continuum: The basic objective of the risk continuum relates to compatibility with two main components of integrated risk system: a centralized risk management function and a performance measurement system, which computes return unit of risk using various methodologies. Key element in risk continuum approach is an awareness of creating efficiencies which can be measured in both time and cost.

(iv) Choosing the models or Methodology- Allen D.E and R.J. Powell [1, 2& 3] discuss that this relates to the selection of a particular suitable methodology or set of methodologies for the task of risk management. In this process various aspects like suitability to portfolio composition, flexibility in relation to different risk types; speed versus accuracy trade off and essential back-testing are taken into consideration. **Flexibility** is important because it needs to ascertain whether methodology is subject to desired or required adjustments or not because some models may not be so flexible to accommodate requirements. **Speed versus accuracy** consideration highlights the model efficiencies or the lack of it and need to be balanced for a thorough assessment. **Suitability** of particular methodology for managing a derivative position/exposure depends upon nature of the position and market is important. **Back-testing / stress testing** should be done carefully while selecting a particular model or methodology, as it is essential. If no back-testing plan is formulated, it is quite possible that misleading information be communicated not only to decision-makers but also to the regulators of the organization. Back-testing is concerned to evaluating the performance and its actual experience in the market to the risk model. There is no point in opting for a complex solution which does not lent itself to be benchmarked against actual results.

VIII CONCLUDING REMARKS

As the complexity in markets increases, firms are being forced to implement risk management systems and procedures to compete effectively in the market place. Risk Managers estimate that Value at Risk concept will be an effective tool for risk management in varied perspectives in all institutions of markets where risk interfaces with business operations. As a highly comprehensive risk measure, Value at Risk summarizes risk exposure through a single quantitative parameter. It is important that accurate estimation of Value at Risk is done for, as companies control and manage risk-bearing business activities. Despite weaknesses of Value at Risk concept, it is probably the best available technique for measuring the risk for a large and complicated portfolio.

Value at Risk has proved to be vehicle through which modern financial experts and economists rely. Users of Value at Risk should be aware of deciding level of return at particular degree of risk. Hence, it may be used with utmost caution and in conjunction with stress tests because it is highly mathematical methodology with a plethora of grade symbols, equations and derivatives. The Concept of Value at Risk is not like a black box. More than one approach to calculate Value at Risk should be followed to assess and predict Value at Risk. Further outputs from these systems should then be adjusted and followed by rigorous stress testing. Market Participants are still deciding about applications of this unique concept to manage risks, and it is expected that it is going to change the way forward.

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An Empirical Study of Long Run Relationship between Spot and Futures Prices in Indian Financial Market

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ABSTRACT

This paper aims to analyse the long run relationship between the futures and spot exchange rates of four currencies ("USD INR, EURO INR, GBP/INR and JPY/INR"). The data was tested for stationarity, cointegration and causality, and the results affirm that a long run relationship exists among the futures and spot exchange rates. The findings are very significant for policy makers, investors, and marketers since it provides a reliable forecast of exchange rates in the futures market which measures to effectively manage the risks.

Keywords: Futures. Vector Auto regression. Granger Causality. Engle-Granger and Johnson's Cointegration.

I INTRODUCTION

The price discovery function is dynamic in the markets, and the information dissemination, gathering and interpretation of news, among the investors affects the prices of the markets. The effective measurement of any price discovery process by the swift adjustments of the prices from an old equilibrium to the new equilibrium due to the arrival of new information in the market. Three main components of empirical research in international finance are the determination of floating exchange rates, the foreign exchange market efficiency and interest parity.

The importance of this topic to government policymakers, firms, investors, and economists and the ready availability of data have resulted in a large volume of research in this area. The importance of this topic for policymakers is significant for assessing the performance of alternative international financial systems. The current system of controlled floating differs significantly from the exchange rate system which existed before 1971 and from textbook descriptions of freely flexible rates. Governments no longer seek to maintain fixed parities; neither do they forego direct intervention in the foreign exchange markets. The majority of the extraordinary created economics glided their swapping scale in mid-1973, after the end of the post-war Bretton Woods arrangement of fixed trade rates. While there had been a broad scholastic question on the overall benefits of fixed and drifting trade rates, this exchange had been carried on at a generally speculative dimension. The summed-up skimming routine gave analysts the observational informational collection required to determine such scholastic question, just as raising increasingly quick approach issues. Much of the international finance literature produced in the decade after the move to generalized floating focused on the development and estimation of empirical models of floating exchange rates. Therefore, for evaluating the futures and spot market linkages, currency distortions and, efficient currency market diagnosis, the current study examines the four currencies long term relationship among their spot and futures market.

II REVIEW OF LITERATURE

Judge and Reancharoen (2014) analysed the lead-lag relationship in the Stock Exchange of Thailand (SET) and Thailand's derivatives market between the futures and spot market. The Granger causality test indicated that the SET50 index leads SET50 index futures. The results suggest that assimilation of new market-wide information in the Thai spot stock market was faster than the futures market. Kalantzis and Milonas (2013) examined the price correlation and impact of the introduction of electricity futures on the spot-price volatility of the French (Powernext) and German (EEX) electricity markets. Bivariate VECM-GARCH model results indicated that they had decreased spot price volatility. The study suggested that all stakeholders (i.e., producers, consumers, traders, investors) benefited from the volatility reduction. Kang, Cheong and Yoon (2013) analysed the volatility spillover in Korean spot and futures markets of KOSPI 200 spot and futures contracts by using three high-frequency intraday data. Bivariate GARCH models results indicated a strong bi-directional causal relationship between futures and spot markets, strongly suggesting that bi-directional volatility.

Kenneth and Sultan (1993) analysed the long-run cointegrating relationship between financial assets and the dynamic nature of the distributions of the assets on hedging for the British pound, the Canadian dollar, the German mark, the Japanese yen, and the Swiss franc. The risk-minimizing futures hedge ratios were estimated by using the bivariate error correction model with a GARCH error structure. The result suggests the dynamic hedging strategy proposed has the potential risk reduction to offset the transactions costs for most investors. Lien (1996) stressed on the importance of incorporating the cointegration relationship into statistical modelling of spot and futures prices. He found that Hedge ratios and hedging performance may change sharply when the cointegrating variable is mistakenly omitted from the statistical model. "The study concluded that a hedger who omits the cointegration relationship will adopt a smaller than optimal futures position, which results in a relatively poor hedge performance and derived that the hedger mis

specifies spot and futures price behaviour by modeling a partial cointegration system, instead of the complete cointegration system".

Rosenberg and Traub (2006) compared price discovery of foreign exchange spot and futures market at Chicago Mercantile Exchange. The study was conducted on data of "International Monetary Market division of CME and concluded that both foreign currency futures and spot respond to unique information relevant for exchange rate determination". Sehgal, Ahmad and Deisting (2014) examined the spot and futures prices price discovery and volatility spillovers of four currencies USD, EURO, GBP and JPY with Indian rupee at Multi-Commodity Stock Exchange (MCX-SX) and National Stock Exchange (NSE) in India. The results concluded that long-term equilibrium relationship between spot and futures and between futures markets, and in short run futures price leads spot price and the opposite is true in the long run. Tse, Xiang and Fung (2006) examined the price discovery of the floor and electronically traded euro FX, and Japanese yen futures markets and their corresponding foreign exchange spot markets. The Hasbrouck information share model (1995), and the Gonzalo and Cranger permanent-transitory model

III METHODOLOGY

It is a descriptive study to examine the long-term relationship between spot and futures prices of the four currencies by employing standard econometrics tools. The sample consists of the "USD/INR, EURO/INR, GBP/INR and JYN/INR". Sample period for the study is from the commencement of futures trading of the respective currency futures to 31 March 2016 in case of the futures and spot prices of currencies. Data Collection of Foreign exchange rates was collected from the database of NSE, RBI, Federal Reserve, United States, Bank of England, Bank of Japan, European central bank. Variables for the study are;

(1995) were used and results show that electronic trading facilitates price discovery more efficiently than floor trading.

Theissen (2012) used threshold error correction model (TECM) to analyse price discovery by using arbitrage opportunities to affect return dynamics. His Model estimated through quote midpoints, and time-varying transaction costs. He concluded that the futures market leads in the process of price discovery and the presence of arbitrage opportunities effect the subtleties of the price discovery. Gupta and Bhatia (2019) analysed the relationship between the spot and futures values of the indices of the national stock exchange. The result was in case of cnx nifty 50 there was a long-term unidirectional causality from spot to futures, for the other two indices there was bidirectional causality. Yang, Yang and Zhou (2012), Bohl, Salm and Wilfling (2009), Cabrera, Wang and Yang (2009), and Chen and Gau (2009) have established unidirectional causality from spot market to the futures market whereas Bohl et al. (2011), So and Tse (2004), and Kang et al. (2006) have concluded their study with unidirectional causality from futures to spot market.

(a) Daily closing price of the spot exchange market for "USD/INR, EURO/INR, GBP/INR and JYN/INR" during the sample period.

(b) Daily closing price of the futures exchange market for "USD/INR, EURO/INR, GBP/INR and JYN/INR" during the sample period.

For evaluating the long run relationship between the spot and future markets exchange rates, standard econometric tools are applied. The time series data of the four currencies of spot and futures were tested for stationarity by ADF and PP tests. The various analytical procedures include descriptive statistics, Engle-Granger, Johansen's co-integration test, VAR and causality test based on VECM.

IV RESULTS

Table 4.1
Descriptive Statistics

Variables	USD/INR		EURO/INR		GBP/INR		JYN/INR	
	Futures	Spot	Futures	Spot	Futures	Spot	Futures	Spot
Mean	54.295	54.160	71.088	70.914	87.472	87.259	58.412	58.255
Median	53.695	53.579	70.538	70.354	87.655	87.524	57.310	57.140
Maximum	69.063	68.778	91.375	91.468	106.765	106.028	71.920	72.120
Minimum	43.915	43.790	56.235	56.070	65.835	65.647	47.135	46.930
Std. Dev.	7.493	7.459	7.778	7.754	11.882	11.845	5.729	5.726
Skewness	0.246	0.246	0.284	0.283	-0.194	-0.193	0.555	0.570
Kurtosis	1.612	1.615	2.255	2.248	1.557	1.553	2.473	2.497
Jarque-Bera	164.421	163.903	54.298	54.882	138.254	138.850	93.605	96.272
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The descriptive statistics of the four foreign exchange currency prices are shown in table 4.1. The mean value of USD/INR futures is 54.295 and spot is 54.160. The skewness and kurtosis of USD/INR futures is 0.246 and 1.612 respectively, and skewness and kurtosis of the USD/INR spot market is 0.246 and 1.615 respectively, both the skewness and kurtosis of USD/INR futures and spot falls within the normal limits. The Jarque-Bera p-value suggests that the series do not follow normal distribution. The mean value of EURO/INR futures is 71.088 and spot is 70.914. The skewness and kurtosis of EURO/INR futures is 0.284 and 2.255 respectively, and skewness and kurtosis of the spot market is 0.283 and 2.248 respectively. Both the skewness and Kurtosis EURO/INR futures and spot fall in the normal limits. The Jarque-Bera p-value suggests that the series do not follow normal distribution. The mean value of GBP/INR futures is 87.472 and spot is 87.259. The skewness and kurtosis of GBP/INR futures is -0.194 and 1.557 respectively, and skewness and kurtosis of the spot market is -0.193 and 1.553 respectively. Both the skewness and Kurtosis of GBP/INR futures fall in the normal limits. The Jarque-Bera p-value suggests that the series do not follow normal distribution. The mean value of JYN/INR futures is 58.412 and spot is 58.255. The skewness and kurtosis of GBP/INR futures is 0.555 and 2.473 respectively, and skewness and kurtosis of the spot market is 0.570 and 2.497 respectively. Both the skewness and Kurtosis of GBP/INR futures fall in the normal limits. The Jarque-Bera p-value suggests that the series do not follow normal distribution.

Table 4.2
Results of Unit Root Test

Variables	ADF Test			Phillips-Perron Test		
At Level	Int.	Tre. & Int.	NI & NT	Int.	Tre. & Int.	NI & NT
USD/INR LFUT	-0.773	-1.947	1.733	-0.865	-2.169	1.576
USD/INR LSPOT	-0.841	-2.041	1.657	-0.881	-2.155	1.593
EURO/INR LFUT	-1.319	-1.759	0.550	-1.300	-1.737	0.560
EURO/INR LSPOT	-1.371	-1.790	0.516	-1.337	-1.779	0.508
GBP/INR LFUT	-1.116	-1.836	1.033	-1.133	-1.930	1.010
GBP/INR LSPOT	-1.030	-1.766	0.985	-1.096	-2.045	0.896
JPY/INR LFUT	-1.866	-1.873	0.405	-1.880	-1.887	0.405
JPY/INR LSPOT	-1.874	-1.881	0.379	-1.870	-1.876	0.384
At 1st Difference						
USD/INR LFUT	-31.310	-31.302	-31.245	-40.599	-40.588	-40.589
USD/INR LSPOT	-42.788	-42.777	-42.736	-42.814	-42.803	-42.773
EURO/INR LFUT	-35.024	-35.012	-35.027	-34.999	-34.987	-35.004
EURO/INR LSPOT	-35.589	-35.578	-35.593	-35.568	-35.556	-35.573
GBP/INR LFUT	-35.419	-35.412	-35.401	-35.508	-35.498	-35.505
GBP/INR LSPOT	-37.327	-37.320	-37.312	-37.436	-37.426	-37.433
JPY/INR LFUT	-37.508	-37.505	-37.515	-37.495	-37.492	-37.503
JPY/INR LSPOT	-38.271	-38.266	-38.279	-38.273	-38.268	-38.281

Int. = Intercept; Tre. & Int. = Trend & Intercept; NI & NT = No intercept & No Trend

The spot and futures prices of the four currencies were tested for stationarity by applying augmented Dickey-Fuller test (ADF) and Phillips-Perron (PP) test. The results of both the unit root tests are shown in table 4.2 both these tests were applied with intercept, trend and intercept, and no intercept and no trend at level as well as at first difference. It was analysed that at level for all the four foreign exchange currency prices in both spot and futures series, the unit root is present. So, both the tests were applied after first differencing of the series with intercept, trend and intercept, and no intercept and no trend. The results show that all the four-forex spot and futures prices become stationary at the first difference as no unit root is present in the spot and futures of the four currencies.

Table 4.3
Results of VAR Lag Order Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
			USD/INR		
0	12307.220	0.000	-16.321	-16.303	-16.315
1	136.697	0.000	-16.392	-16.362*	-16.381
2	21.688	0.000	-16.400	-16.358	-16.384
3	19.288*	0.000	-16.406	-16.352	-16.386*
4	9.251	0.000*	-16.406*	-16.340	-16.382
5	5.323	0.000	-16.405	-16.327	-16.376
6	8.691	0.000	-16.406	-16.315	-16.372
7	5.152	0.000	-16.404	-16.301	-16.366
8	12307.220	0.000	-16.321	-16.303	-16.315
			EURO/INR		
0	NA	0.000	-9.902	-9.895	-9.900
1	8794.981	0.000	-15.839	-15.818	-15.831
2	107.250	0.000	-15.907	-15.87086*	-15.893
3	18.457*	0.000*	-15.913*	-15.864	-15.895*
4	1.237	0.000	-15.909	-15.845	-15.885
5	9.325	0.000	-15.910	-15.831	-15.881
6	5.049	0.000	-15.908	-15.815	-15.874
7	7.443	0.000	-15.908	-15.801	-15.868
			GBP/INR		
0	NA	0.000	-9.366	-9.359	-9.364
1	9946.575	0.000	-16.073	-16.051	-16.065
2	113.113	0.000	-16.144	-16.107*	-16.130
3	22.778	0.000	-16.154	-16.104	-16.135*
4	2.123	0.000	-16.150	-16.085	-16.126
5	16.496	0.000	-16.155	-16.077	-16.126
6	8.950	0.000	-16.156	-16.063	-16.122
7	10.959*	0.000*	-16.158*	-16.051	-16.118
8	4.237	0.000	-16.156	-16.034	-16.111
			JPY/INR		
0	NA	0.000	-9.826	-9.819	-9.823
1	7685.411	0.000	-15.031	-15.009	-15.023
2	78.553	0.000	-15.079	-15.042*	-15.065*
3	9.494	0.000	-15.080	-15.029	-15.061
4	9.083	0.000*	-15.080*	-15.016	-15.056
5	5.376	0.000	-15.079	-15.000	-15.049
6	10.094*	0.000	-15.080	-14.987	-15.045
7	5.492	0.000	-15.079	-14.971	-15.038
8	2.484	0.000	-15.075	-14.953	-15.029

* indicates lag order selected by the criterion

Table 4.3 shows the results of Vector Auto Regressive Lag Order Selection Criteria selected by the various criteria's. The optimum lag length of 2 was selected by SC with values -16.362* for USD/INR, -15.87086* for EURO/INR, -16.107* for GBP/INR and -15.042* for JPY/INR. Therefore for further analysis, the optimum Lag length 2 is considered for calculating co-integration as well as causality among the spot and futures.

Table 4.4
Results of Engle-Granger Cointegration Test

Dependent	tau-statistic	Probability	z-statistic	Probability
USD/INR				
LFUT	-38.555	0.000	-1639.686	0.000
LSPOT	-38.559	0.000	-1639.883	0.000
EURO/INR				
LFUT	-32.223	0.000	-1225.452	0.000
LSPOT	-32.229	0.000	-1225.682	0.000
GBP/INR				
LFUT	-34.069	0.000	-1306.418	0.000
LSPOT	-34.070	0.000	-1306.482	0.000
JYN/INR				
LFUT	-36.759	0.000	-1415.435	0.000
LSPOT	-36.764	0.000	-1415.643	0.000

The Engle-Granger Cointegration Test results are shown in table Table 4.4 which reflects the long term cointegration of the spot and futures of the spot and futures prices of the four currencies. The test was applied considering futures as the dependent variable and also spot as the dependent variable. The tau statistics and z statistics values along with their p-values strongly suggest that the futures and spot values of the USD/INR, EURO/INR, GBP/INR and JPY/INR series are cointegrated in the long run.

Table 4.5
Results of Johansen's Cointegration Test

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	Critical Value (0.05)	Probability
Unrestricted Cointegration Rank Test (Trace)				
USD/INR None *	0.188	380.597	15.495	0.000
USD/INR At most 1	0.000	0.479	3.841	0.489
EURO/INR None *	0.201	336.143	15.495	0.000
EURO/INR At most 1	0.001	1.641	3.841	0.200
GBP/INR None *	0.187	308.817	15.495	0.000
GBP/INR At most 1	0.001	1.157	3.841	0.282
JYN/INR None *	0.211	355.881	15.495	0.000
JYN/INR At most 1	0.002	3.578	3.841	0.059
Unrestricted Cointegration Rank Test (Maximum Eigen value)				
USD/INR None *	0.188	380.117	14.265	0.000
USD/INR At most 1	0.000	0.479	3.841	0.489
EURO/INR None *	0.201	334.502	14.265	0.000
EURO/INR At most 1	0.001	1.641	3.841	0.200
GBP/INR None *	0.187	307.660	14.265	0.000
GBP/INR At most 1	0.001	1.157	3.841	0.282
JYN/INR None *	0.211	352.304	14.265	0.000
JYN/INR At most 1	0.002	3.578	3.841	0.059

* denotes rejection of the hypothesis at the 0.05 level

The results of Johansen's cointegration test are shown in table 4.5 of the spot and futures prices of the four currencies. The trace statistics and eigen values along with their p-values reject the hypothesis that no cointegrating equation which can be hypothesized in spot and futures of USD/INR, EURO/INR, GBP/INR and JPY/INR. And the result also suggests that there exist one cointegrating relationship between the spot and the futures values of USD/INR, EURO/INR, GBP/INR and JPY/INR.

Table 4.6
Results of Pairwise Granger Causality Test

Null Hypothesis:	F-Statistic	Probability
USD/INR spot does not Granger Cause USD/INR futures	8.140	0.000
USD/INR does not Granger Cause USD/INR spot	525.925	0.000
EURO/INR spot does not Granger Cause EURO/INR futures	4.973	0.007
EURO/INR futures does not Granger Cause EURO/INR spot	342.220	0.000
GBP/INR spot does not Granger Cause GBP/INR futures	4.454	0.012
GBP/INR futures does not Granger Cause GBP/INR spot	469.413	0.000
JPY/INR spot does not Granger Cause JPY/INR futures	9.289	0.000
JPY/INR futures does not Granger Cause JPY/INR spot	288.471	0.000

The results of pairwise granger causality test are shown in table 4.6. The analysis rejects the null hypothesis as the p-value is less than 0.05 in both the cases. Therefore, it is accepted that USD/INR spot causes USD/INR futures, and also USD/INR futures causes USD/INR spot whereby confirming the bidirectional relationship between the two variables. Similarly, the other three series show that there is bidirectional causality between the spot and the futures prices in the spot as well as futures market.

V CONCLUSION

In impeccable operational financial markets, ideally the arrival of new information should be reflected simultaneously in the underlying spot market and the corresponding derivative market. However, in reality, information may be spread in one market first and then transmitted to another market due to the limitation in the market. The study confirms the existence of long-run cointegration between futures and spot prices of the four currencies examined, and the study also concludes that in Indian currency market, futures and the spot prices of the investigated currencies have bi-directional causality which may provide important guidance on the understanding of information transmission among the market participants. Our results are in line with Jackline and Deo (2011), Pizzi et all (1998). Roope and Zurbruegg (2002) which also concluded that there is a bi-directional causality among futures and spot market. Hence the results indicate that in case of futures and spot market linkages, both trading platforms appear to be informationally efficient markets. However, it is evident that the currency distortions have continued for a long time, this may require a more fundamental and constructive correction, the regulators and the government need to re-address the inflation control policy by looking the problem more from supply side rather than from the demand side perspective. The focus can be on removing bottlenecks in production, controlling hoardings and matching the domestic demand in the line with exports. The future scope of the study can be combined with short-run dynamics and volatility analysis of these examined currencies.

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Identification of Factors Affecting Retail Marketing Strategies of Unorganized Pharmacy Stores

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ABSTRACT

Background and Objective: The marketing strategies used by retail stores cannot be adopted by a unorganized retail pharmacy store as such since it operates within a regulatory environment. In consideration of this in continuation of our previous study, an attempt has been made to identify factors which may be beneficial to unorganized retail pharmacy store. Method: A questionnaire consisting of twenty nine questions were designed. The responses were obtained unorganized retail pharmacy of Malwa Region of M.P. Total 145 unorganized pharmacy stores were randomly selected for the present study. The obtained responses were subjected to factor analysis. Results: The factor analysis identified four factors, have been termed as branding, customer service, ancillary services & Products and competitive pricing. Conclusion: It was found that among the four factors, customer service is one of the significant factors which affect the sustainable growth of the retail unorganized pharmacy store.

Key-words: Unorganized retail pharmacy, marketing strategies, customer service, branding.

I INTRODUCTION

The pharmaceutical sector in India is one of the fast growing sectors and retail pharmacy store is a live link between intermediate customer and customer/consumer. Retail pharmacy business is considered one of noble profession throughout the world. The increasing population, awareness about health issues, health insurance and Ayushman Bharat (Health Insurance Scheme of Government of India) scheme keep on retail pharmacy business lucrative. The retail pharmacy store operates under the regulatory environment; therefore, marketing strategies used by other business cannot be adopted in toto. Further, entry of organized and e-pharmacy are going to be a challenge before the unorganized retail pharmacy. A lot of studies have been made on marketing and sales strategies of retail business, but so far, few studies on unorganized pharmacy store were reported. (Chaganti, 2007, Ganesan et al., 2011,Ganjre2011)

In a study, Ayub et al. (2017) described that deficiency of employees in Food and Drug Administration department as well as on line pharmacy are the challenges. It was reported that it is difficult to keep watching approximate 90 million unorganized retail pharmacy stores. Similarly, the convince provided by the online pharmacy is also affects the business. Ayub et al. (2017) also reported consumer behavior and preference to a particular unorganized retail store. It was observed that geographical location and word to mouth publicity were the factors which contributed significantly. Further, preference among the nearby store was found to be affected by competitive price and availability of FMCG products. According to Rabbance et al. (2015), the employee of retail store had a significant effect on customers perceived value, trust and loyalty. Hamil et al. (2014) has reported that non replacement and non availability of expected brands were the major problems before the more

experienced retail pharmacy. The high over the counter sale and good rapport with nearby physician were found to be significant prospect of retail pharmacy. Bonnal et al. (2014) has described that competence, personnel relation, listening skill and stock of medicine were the key parameters for customer satisfaction. According to a study conducted by Sreedhara et al. (2013), unorganized retail pharmacy store never relied upon the big promotional activities. Linu et al. (2013) described that patients were satisfied with the availability of medicine, time taken for billing and dispensing, approach to pharmacist and location of the retail pharmacy. The interesting observation was that most of the customers were dissatisfied on services such as advices on current health problem, general advice on medicine and counseling services on side effects of drugs. Naryan et al. (2011) reported that availability and professional knowledge of pharmacists need to be enhanced and dress code for a pharmacist may create a professional image in society. Ganeshan et al. (2011) has described that consumer/customer would rely on the community pharmacist's choice when purchasing a non prescription medicine. Tripathi (2009) revealed that customers prefer to purchase medicines always from the same retail pharmacy that is situated at 0 to 3 km from their residence. In a study, Tripathi et al. (2009) has reported that choice of retail pharmacy is decided by family not an individual. Patil et al. (2008) has suggested that in the present scenario pharmacist must get involved in the patient counseling, drug information, advice on drug therapy in pregnancy, advice on smoking and drinking.

In consideration of above, we (Sharma et al. 2017) have identified eight factors, which affect the growth of the retail pharmacy store. The factors identified are based on the perceptions of the customers/consumers. In continuation of this, we have conducted a survey based study which was based on responses from the retail pharmacy.

II METHOD

Survey method was used for the present study. For the study, unorganized retail pharmacy stores of Malwa Region of Madhya Pradesh were targeted. Initially, self made questionnaires were designed on the basis of review of literature, discussion with pharmacist, medical representatives and academicians. The questionnaire hastwo parts namely Part 1 and Part 2. Part 1 consisted of demographic information of respondents (unorganized retail pharmacy) as geographical location (near clinic/hospital or in the colony or near Bank/Post office/Bus Station/ Railway Station/Main Road), duration of the operation (less than one year or 1-5 years or 5-10 years or 10 years and more), average daily sale (Upto Rs. 5000/- or Rs.5001-Rs,15000/- or Rs. 15,000- Rs. 30,000/- or Rs. 30,001and more), number of branches of retail pharmacy in the city, types of customers (Individual or Institutional or both and urban or rural or both). Part 2 consisted of twenty nine questions. For the purpose of gathering information, total 145 unorganized retail pharmacy stores of Malwa Region were randomly selected. Among the 145 respondents, eight respondents were denied to share their complete demographic information; hence responses of these eight were not included for the present study. Reliability of the questionnaire was found to be 0.79 with significant validity.

(a) **Factor analysis:** The factor analysis was performed for the identification of the marketing strategies ofunorganized retail pharmacy store[3]. The factors were extracted by principle component analysis applying Variax with Kaiser Normalization rotation method. The Barrlett test of Sphericity was significant at 406 degree of freedom which showed the presence of significant corrletaion among the variables. Kaiser-Meyer-Olikin (KMO) was also performed for sample adequacy which measures whether the distribution of values is adequate for conducting factor analysis. A high value (0.735) of this statistics indicated that appropriateness of the factor analysis for the data collected. (Table 1) Questions/statement with loading values more than 0.500 were considered statistically significant. (Table 2)

Table 1
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.735
Bartlett's Test of Sphericity	Approx. Chi-Square	2866.948
	df	406
	Sig.	0.000

Table 2
Factors and questions

S.No.	Factors	Questions/Statements
1	Branding	The established name of the pharmacy helps in increasing the business of medical store.
		Slogan helps in increasing the business of medical store.
		Logo helps in increasing the business of medical store.
		A printed carry bag or an envelope depicting information of medical store (opening time, information of discount, additional facilities etc.) helps in increasing the business of medical store.
		An own cosmetic brand helps in increasing the business of medical store.
		An own neutraceutical brand helps in increasing the business of medical store.
		It is necessary to analyze strengths/weakness of medical store from time to time.
2	Customer Service	Your medical store provides services according to customer requirement.
		Follow up of regular customers helps in increasing the business of medical store.
		It is necessary to consult doctor in case of any mistake or doubt in prescription.
		Sending wishes on special occasions of customers like birthday, marriage anniversary and festivals helps in maintaining a bond of customer with the medical store.
		Complaint/suggestion from customer helps in increasing the business of medical store.
3	Ancillary Services and Products	Pharmacist should be available round the clock on the medical store
		Providing facilities like weighing machine, blood pressure monitoring and drinking water to the customer helps in increasing the business of medical store.
		Free health check up camp by the medical store helps in increasing the business of medical store.
		Maintaining herbal medicines' stock on medical store helps in increasing the business of medical store.
		Facility of a poly clinic alongwith medical store helps in increasing the business of medical store.
		Sale of generic medicines increases turnover.
4	Competitive Pricing	Providing more discounts as compared to competitors helps in increasing the business of medical store.
		Bulk purchasing of medicines provides more profit.
		Adopting techniques from other retail business like gift card/ bonus point/ loyalty point etc. helps in increasing the business of medical store.
		Availability of medicines of lower price for customers sensitive to price is beneficial for business.
		Fixing the prices of medicines from time to time by National Pricing Authoring of India affects the profit of business.

II RESULTS AND DISCUSSION

The survey method used was appropriate for the present study. The responses were personally collected, which offers an opportunity to interact with respondents (pharmacist/manager/owner of the unorganized retail pharmacy stores).The approach adopted has served beneficial for obtaining accurate responses. The study was based on twenty nine questions /statements, thus in order to reduce number of variables, factor analysis was performed on SPSS. The Barrlett test of Sphericity was significant at 406 degree of freedom which showed the presence of significant correlation among the variables. Kaiser-Meyer-Olikin (KMO) was also performed for sample adequacy which measures whether the distribution of values is adequate for conducting factor analysis. A high value (0.735) of this statistics indicated that appropriateness of the factor analysis for the data collected. Questions/statements with loading values more than 0.500 were considered statistically significant. The factor analysis has generated four factors, which have termed as branding, customer service, ancillary services and products, competitive Pricing inconsideration of nature of questions/statements.

(a) **Branding**: Name is a game in every type of business. Similarly branding of retail unorganized pharmacy store has become an important positioning strategy in a cut throat competitive environment in India. Branding of an unorganized retail pharmacy store does not focus on creation of a private label but create unique store identity. In India unorganized retail pharmacy store sells multi brand pharmaceutical products as well as generic formulations. Here, the task becomes more difficult. For creating a brand a lot of continuous efforts are required as customer's memoryfor a good experience is short, but a negative experience such as non availability of particular brand prescribed by physicians will stay with him forever. This clearly indicates that unique identity of unorganized retail pharmacy store is very important. The Unique identity can be created by adopting level of consistency among the products and services available. This factor consists of seven questions/statements.

(b) **Customer Service**: A loyal customer is a source of income for many years. The loyal customer keep on purchasing drugs while the customer feels that he/she is getting better value than what could be achieved by switching to another retail pharmacy. In pharmaceutical marketing and selling, customer loyalty can be developed by not only selling quality products but selling in the quantity required, providing advice to patient and taking guidance from the prescriber, if required and information about manufacturing and expiry date of the product. Along with this continuous follow up to regular customers. This factor consists of five questions/statements.

(c) **Ancillary Services and Products**: In the present time number of patients suffering from life style diseases such as diabetes, hypertension, and depression are continuously increasing. Simultaneously, health awareness is also increasing. In the light of above facts, it is beneficial to offer ancillary services and products such as full time availability of pharmacist, facilities for measurement of weight, blood pressure and sugar level. More and more customers of India are using herbal medicines for preventive purpose so availability of a good range of herbal medicines helps in increasing and retaining customers. The present customer is more knowledgeable about the branded and generic products since the generic products are cheaper than branded so availability of generic products increases sales volume. however the overall profit decreases.This factor consists of six questions/statements.

(d) **Competitive Pricing**: Competitive price is the price when an unorganized retail pharmacy calculates its retail price for a product in reference of its competitor's price. Competitive pricing is one of the significant factors which affect the purchasing behaviour. therefore setting the right price is very important. Competitive pricing is based cost of products, services and overhead charges at retail pharmacy. This type of pricing considers a number of factors such psychological behaviour of customer. pricing strategies adopted by competitor, number of competitors in nearby area. ancillary services provided by retail pharmacy and its competitors, availability of pharmacist. availability of range of products etc. This factor consists of five even questions/statements.

III CONCLUSION

The present study identified four factors which could be adopted by an unorganized retail pharmacy store for sustainable growth An interesting observation was that most of the retail pharmacy store would not emphasize discounts. Although, it is a common perception that by providing an attractive discount, desirable growth can be achieved. It was also observed that customer satisfaction is one of significant factor. As per the regulatory requirement, a pharmacist should be available full time in the retail pharmacy store but in practice the scenario is different. Although. it was observed during the survey. full time availability and competence of pharmacist is a one of the significant variable.

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IPO Effect: Post Event Analysis

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ABSTRACT

Initial Public Offering (IPO) is a phenomenon when the company's shares become available to public for the first time in the market. This is done either after incorporation or conversion of private limited company to public limited company. IPO witnessed a sharp decline in collections during 2008 quarter. Announcement of IPO may give a positive signal to the stakeholders that the company is working towards their interest. It may also indicate that the firm has ample opportunities and projects. The present study caters to the needs of shareholders and other stakeholders by analyzing the impact generated by IPOs on their returns. The study has incorporated analysis of share prices of companies initiating the IPOs between 2009-2016 and thereby computing its daily abnormal returns using CAPM. The daily stock prices of 20 companies have been taken for the concerned period from website of National Stock Exchange along with Nifty50 index values to compute market returns. t-test has been used to test for significance of abnormal returns in three event windows. Paired sample t-test has been used to find out difference in performance of IPO in varied time periods. The event study methodology has been used to find out the performance of the respective stocks since IPO announcement taking 24780 observations.

Keywords: IPO, AR, AAR, CAAR, event study.

I INTRODUCTION

Announcements in the capital market are an important indicator about a company's performance. An investor is always keen to know latest developments taking place due to managerial decisions which may lead to restructuring of a firm. There may be a variety of information or precisely news floated in the market about a particular company. One of the most significant could be an initial public offer by the concern. An IPO is a signal for the stakeholders that the company is planning to expand and may have ample opportunities to invest shareholders' money.

There may be mixed reactions for such an announcement in the market creating an impact on the stock returns in post IPO period. This likely effect may be studied by analyzing the stock prices of companies which announced IPO with the help of event study methodology. The time period of event window for an IPO has been broken into different time frames to understand the impact of announcement with varied angles. Using t-test, the significance of IPO effect on stock returns has been tested in SPSS V.20

II LITERATURE REVIEW

Stephen C. Henry and Greg N. Gregoriou documented "IPO Firm Characteristics Pre-and Post-Financial Crisis"[11]. The variables analyzed in the study are three-month centered moving average. The IPO market has returned more or less to its pre-crisis deal volume measured by number of transactions. The IPO market still exhibits hot and cold periods but were of shorter duration than they were prior decade. Firms going public are highly clustered in relative handful of industries with extent not changing in post-crisis period. Firms going public in post-crisis period are larger in terms of sales volume that the pre-crisis counterparts.

Vijaya B Marisetty and Marti G Subrahmanyam conducted study on "Group Affiliation and the performance of Initial Public Offerings in the Indian Stock Market"[16]. Tool of regression is used to examine causal relationship between extent of under pricing and firm characteristics. The long term return performance of firms is tested using BHAR and CAAR measures. The certification hypothesis asserts that group affiliation is a positive signal resulting in low under pricing than for standalone companies. On the other hand, 'tunneling hypothesis asserts that group affiliations are negative signal resulting in greater under pricing.

PierraNjeriMaina documented "The Effect of Initial Public Offers on the Financial Performance of firms listed at thr Nairobi Securities Exchange" [15]. Variables like Current Ratio, Net Profit Margin Ratio and Debt Equity Ratio formed basis of study. The average profitability of the firms is greater before going public. Even after the IPO there is slight decline in first two years and increases from third year onwards. The average liquidity of the companies is greater before the companies go public but continue decreasing from year three. The study concludes that financial performance of companies improves after issuing of IPO.

Loughran and Jay R Ritter articulated "The New Issues puzzle" (1995) [14]. The variable used for conducting statistical test is the paper also shows that the traditional measure of risk, beta is higher for issuing firms rather than non-issuers. The three procedures used reject the null hypothesis. Investing the same amount in non-issuing firms would give a higher return as compared to issuing firms. The reason identified for the poor performance. The

markets in which firms take advantage of transitory windows of opportunity by issuing equity are overvalued.

Laura Casares field and Gordon hanka documented "The Expiration of IPO Share Lockups" (2001). The variables used in study are Cumulative Abnormal Returns, Abnormal Returns, and Abnormal Volume. It further shows that the abnormal returns are not large enough to provide short term profits for traders. Hypotheses were formed to explain the negative abnormal returns. The results of study conclude that there exists statistically prominent abnormal return of -1.5 % along with permanent 40% increase in trading volume. The abnormal return is found to be caused due to downward-sloping demand curves, resulting in more negative with higher trade volume. The abnormal return and volume around the unlock day is larger when firm is financed by venture capital.

Alok Pande and R. Vidyanathan conducted a study on "Determination of IPO under Pricing in the National stock Exchange" [17]. The paper represents the pricing of IPO in NSE. The control variables for applying descriptive statistics include degree of under pricing, Issue Size, Marketing Expenditure etc. The Degree of under pricing has reduced over the years proving a good signal for firms as they form the indirect cost for the company. Another parameter for positive under pricing is the listing delay. According to study money spent on marketing of IPO does not help to reduce the under pricing significantly.

Narasimhan Jagadeesh and Mark Weinstein and Ivo Welch conducted a study on "An Empirical investigation of IPO returns and subsequent equity offerings" [13]. The main explanatory variable used to test signaling hypothesis is stock returns, Cross-sectional Standard Deviation. The firms with large IPO date returns more likely issue larger seasoned equity within three years of their IPOs. The market prices in two 20-day periods are related to probabilities of subsequent seasoning offering and their size. Contrary to signaling hypothesis the issuers do not have to rely on costly under pricing mechanism for information relevant for future equity issues.

Dr. L.Ganesamoorthy and Dr. H Shankar conducted a study on "Performance of Initial Public Offerings in India during different market conditions-Empirical evidence" [10].The methodology of study includes variable like Market Return, Abnormal Return, Average Abnormal Return, Cumulative Average Abnormal Return and tests like t-test is applied on these variables. The study conducted reveals that Indian IPOs over performed during normal market conditions and under performed during growth and crisis market conditions. The study further reveals that the degree of underperformance is more severe during crisis and recovery than underperformance in growth market conditions.

Chang-Yi Hsu, Jean Yu and Shiow-Ying Wen conducted a study on "The Analysts' Forecast of IPO Firms during the Global Financial Crisis (2013)" [12]. The dependent variable for using regression is earning forecast error and independent variables include Size, Under pricing, IPO Number, Debt ratio, Rating of firms. The study identifies factors like number of IPO firms, the under pricing, the firm size and the listings on NYSE and NASDAQ affecting the analyst. While the analysts would make the predictions based on factors like under pricing, number of IPO firms in same year, the prior year earning change, rating of companies and whether listed on NYSE or NASDAQ during pre-crisis period. On the other hand during post-crisis period analysts consider only firm size.

Malcolm Baker and Jeffrey Wurgler conducted a study on "Investor Sentiment and the Cross-Section of stock returns (2003)" [2]. The study examines how investor sentiment can affect the cross section of stock returns. The research methodology consists of correlation analysis between its variables. The findings of the study is that cross-section of future stock returns is conditional upon beginning-of-period proxies for investor sentiment. When sentiments are high, stocks are relatively attractive to optimists and speculators and attractive for arbitrage.

Emmet King and Luca Banderet conducted a study on "IPO Stock Performance and the Financial Crisis" [2A]. The paper studies the impact of financial crisis on stock price performance of IPOs in short and long run. The variables used in study are Abnormal Return, Cumulative Abnormal Return, Buy-and-Hold Abnormal Return. The study finds that market as a whole does not significantly impact the level of under pricing. The level of under pricing was lowest in 2008 reaching above average in subsequent years. Firm going public during crisis have a higher three-year-return than other IPO firms.

Nurwati A. Ahmad-Zaluki, Kevin Campbell and Alan Goodacre conducted a study on "Earnings Management in Malaysian IPOs:the East Asian Crisis, ownership control and post-performance" [1]. The study provides evidence of earnings management decisions are significantly affected by environmental and company specific factors. Post IPO performance is found to depend on the benchmark adopted. Aggressive earnings management IPO companies performed less than their counterparts only during East Asia crisis period. For other periods, the performance is not affected by level of earnings management.

Sanjay Dessai conducted a study on "Post listing Performance of Initial Public Offer (IPOs) in Indian Capital Market" [4]. The paper deals with analysis of performance of IPO offered to public through BSE in period between 2010 and 2013. Analysis is conducted with the help of mean difference in return

and ANNOVA to test significant difference in return between sectors of industry. IPOs issued in first half of 2013 showed a positive return of 58%. Rest all the IPOs issued from 2010to 2012 showed negative returns. It further shows that in spite of Sensex moving up overall IPO of all sectors except gold has given negative returns. The IPO were overprices to take advantage of booming secondary market.

III RESEARCH METHODOLOGY

(a) **Event study** - Event study has been primarily used for the present study to investigate the impact of an IPO on stock returns. The day of announcement for IPO has been taken as the time period t for all sample companies. The event windows have been divided into three categories to look for very short, long term and very long-term impact of the event. These windows have been shown in the following table.

Table 1
Event Windows

Event Window	Time Period
t + 29	30 days
t + 245	1 year
t + 1239	5 years

(b) **Data** - The data for the study has been obtained from the website of National Stock Exchange. The data of IPO announcements, daily stock prices of companies and market data for Nifty has been taken from 2009-16. The risk-free rate has been assumed to be the interest rate on government bonds and their weighted average interest rates have been collected from the website of RBI.

(c) **Hypotheses of the study-**
  (i) H1: There is no significant effect of Initial Public Offering announcement on the abnormal returns of sample companies in short window.
  (ii) H2: There is no significant effect of Initial Public Offering announcement on the abnormal returns of sample companies in long window.
  (iii) H3: There is no significant effect of Initial Public Offering announcement on the abnormal returns of sample companies in very long window.
  (iv) H4: There is no significant difference between post performance of IPO in short and long window.
  (v) H5: There is no significant difference between post performances of IPO in short and very long window.

  (vi) H6: There is no significant difference between post performance of IPO in long and very long window.
(d) **Sample** - The companies have been randomly picked up with an objective to find out the impact of initial public offer announcement on their stock returns. However, in our next level study we may extend our research where a comparison can be drawn between different segments across companies.

There were forty-two companies picked up initially from the list of IPO announcement between 2009-2016 given on the website of National Stock Exchange. These companies were taken from different segments (ignoring the segment to which they belonged). In line with the time period chosen for the study, data was collected for a five-year window. Out of forty-two companies, twenty companies fulfilled the condition of data availability as per requirements in the study.

Further these companies were divided based on their current market capitalization into three categories; small cap, mid cap and large cap. 20 companies were finalized in the sample as per the requirement of event windows which required 30 days, 1 year and 5 years data.

Table 2
Showing list of sample companies

Company Name	Company Name
Coal India Limited	NHPC Limited
D.B. Corp Limited	NMDC Limited
D B Realty Limited	Oberoi Realty Limited
Infinite Computer Solutions (India) Limited	Oil India Limited
Intrasoft Technologies limited	Persistent Systems Limited
Jubilant Foodworks Limited	PG Electroplast Limited
Gujarat Papavav Port Limited	Talwalkars Better Value Fitness Limited
Mahindra Holidays & Resorts India Limited	TD Power Systems Limited
L&T Finance Holdings Limited	Ramky Infrastructure Limited

Table 3
Showing criteria for division of sample

Market Capitalization	Category
>1000 Cr	Small Cap
1000 Cr – 10000 Cr	Mid cap
<10000 Cr	Large Cap

(e) **Stock Return** - Stock return is the gain or loss during a particular period. It can be historical or expected return. The historical return of stock is calculated using below relation:

$$R_i = \frac{Pt-(Pt-1)}{Pt-1}$$

where,
Pt-1 = Previous Price
Pt = Current Price
Similarly, market returns are computed with the help of similar formula.

$$R_m = \frac{Pt-(Pt-1)}{Pt-1}$$

where,
Pt-1 = Previous Price
Pt = Current Price

(f) **Expected Return: E(r)** - It is the amount of profit or loss that the investor anticipates on an investment. It is based on the historical return of the stocks and is not guaranteed but may deviate from the anticipation. The expected return is computed using the CAPM model in the present study.

$E(r) = Rf + \beta (Rm-Rf) + e_i$

where, $E(r)$ is the expected return
β is the beta value of stock
Rm is the return on market
Rf is the risk-free rate
e_i is the error term

(g) **Abnormal Return (AR)** - Abnormal Return also called excess return is the fraction of a security's or portfolio's return not explained by the rate of return of the market. The abnormal return obtained can be positive or negative depending on where the actual return falls in relation to the expected return. It is calculated using following formula-

$AR_i = R_i - E(r)$

where AR_i refers to abnormal return on a specific stock
Ri refers to realized (actual) return on a specific stock
$E(r)$ refers to expected return on a specific stock

(h) Average Abnormal Return (AAR) - Average abnormal return refers to the combined average of all stocks taken together with the help of daily abnormal returns as calculated with the help of CAPM. The formula to compute this variable has been mentioned below:

$$AAR = \frac{\Sigma\ AR}{N}$$

Where, AAR refers to Average abnormal return for the respective day of observation

Σ AR refers to the sum of abnormal returns of all stocks for the respective day of observation

N refers to the number of stocks

(The number of observations in the study have been taken as 24780 i.e. 1239 observations for each stock with 5 years data after IPO)

(i) Cumulative Average Abnormal Return (CAAR) - The abnormal returns have been further converted into cumulative average abnormal returns for applying t-test in SPSS.

(j) Beta Values - Beta is the measure of volatility of the stock. It is the measure of systematic risk of a security or a portfolio in comparison to the market as a whole. Beta responds the tendency of a security's returns to respond to swings in the market.

$$Beta = \frac{Covariance\ (r_i,\ r_m)}{Variance\ (r_m)}$$

where,

R_i is the return of asset

R_m is the market return

A beta value equivalent to 1 indicates that security's price moves with the market, less than 1 means that the security is less volatile than the market and greater than 1 indicates that the security is more volatile than the market.

(k) The Model: CAPM - CAPM stands for Capital Asset Pricing Model. It is a model which describes the relationship between systematic risk and expected returns for assets particularly stocks. The model says that the expected return of a security or a portfolio equals the rate on a risk-free security plus the risk-premium. The expected return according to this model is given by the following formula-

$$\bar{r_a} = r_f + \beta_a(\bar{r_m} - r_f)$$

Where:

r_f = Risk free rate

β_a = Beta of the security

$\bar{r_m}$ = Expected market return

The model has been used to compute expected returns in the present study.

IV ANALYSIS & INTERPRETATION

(a) Abnormal Return (AR) - Abnormal returns for all the sample stocks from 2009-2016 for different event windows have been presented in this segment to obtain a quick glance of IPO performance in different time frames after IPO announcement. The values obtained with the help of CAPM provided platform to further investigate the impact of announcement on stock returns statistically.

Table 4
Showing AR values for 29th day, 245th day and 1239th day.

Stocks	29	245	1239
Bajaj Corpalln	-0.77066	-0.76461	-8.00385
Coal India	-3.86913	-3.86566	-2.12789
DB Corp	-2.74017	-2.74438	-4.33695
DB Realty	-1.96921	-1.99703	8.019049
GPPL	-1.52582	-1.55544	-1.23624
Infinite	-2.72694	-2.73657	-1.01289
ISFT	-2.2281	-2.38333	-2.57649
Jubilant	2.816398	2.785918	0.189752
L&T Finance	-2.44774	-2.47494	-0.03561
MHRIL	21.301	21.2879	-4.58126
Muthoot	-2.90979	-2.87771	-2.22166
NHPC	-3.47019	-3.47852	-0.81227
NMDC	-2.40662	-2.40598	-0.39776
Oberoi	-3.02889	-3.05716	0.026724
Oil India	-4.88333	-4.8895	-0.07935
Persistent	-2.536459	-2.562003	-2.947068
PGEL	-2.48469	-2.46858	0.55996
Ramky	-1.61019	-1.60305	2.790769
Talwalkars	-1.788436	-1.779099	1.4135699
TD Power	30.40956	30.42127	-1.70668

From the above table, it can be observed that DB Realty, Jubilant, Oberoi, PGEL, Ramky and Talwalkars provided returns to the investors beyond their expectations in the 5-year's time span. Jubilant, MHRIL and TD Power had shown a similar trend in a month which continued for a year's time after announcement of IPO.

(b) **Average Abnormal Returns** - The average abnormal returns as explained in the previous section of the paper for the respective days of investigation to understand the announcement effect from IPO have been presented below:

Table 5
Showing Average Abnormal Returns for respective windows

Day	AAR
29	0.556528
245	0.542577
1239	-1.15359

It may be observed from the above table that after 29 days of IPO announcement all the sample stocks taken on an average depicted positive abnormal returns. This phenomenon continued for a year (245 days) after announcement of IPO. However, in a time span of 5 years (1239 days) these abnormal returns turned negative indicating that IPOs may have provided abnormal returns for a year's time.

(c) **Beta Values** - The beta values of the sample companies are listed in table 4. Each company had different timing for the IPO announcement. Therefore, the beta values have been calculated for the time period around the announcement of IPO. The beta values for Coal India were highest in year 2013 making it the very risky stock. It shows the fluctuating trend throughout the 5 years under study. It may be due to increase in the net worth of the company in the period 2009-2013 and a subsequent decrease in the net profit of the company in the same time period. DB Realty had a fall in beta in initial years of IPO but it increased drastically from 2012 onwards.

The reason for the drastic change in beta value may be due to disturbance in the real estate industry in that decade. The fall of the industry as a whole might have impacted the stock prices of DB Realty making it a risky stock. Mahindra Holidays and Resorts India Limited started with the highest beta of 3.9 making it extremely risky as compared to other stocks. The reason for this is likely to be the growing position of company and investors being cheered on the release of IPO in that period. It is likely due to the expansion plans of the company to other areas for its operations. TD Power systems started its IPO with beta of 4.5 much higher risky with respect to the market. It may be due to the fact that TS Power systems raised a very huge amount through the IPO making it an expensive issue. Also, it may be due to a high ROE of 30% and high margins of 10%. The issue was not recommended by the research firms during that period.

Table 6
Beta Values of Sample Companies

Co Name	2009	2010	2011	2012	2013	2014	2015
BajCorp		0.90	0.41	0.49	0.62	0.05	
CoalIndia		0.51	0.65	0.38	1.2	0.74	
DB Corp		0.65	0.22	0.25	0.54	0.49	
DB Realty		0.75	0.70	1.10	1.42	1.94	
GPPL		0.80	0.50	0.09	0.46	0.85	
Infinite Sol		0.65	1.05	0.75	0.47	0.87	
ISFT		0.70	0.05	0.03	-0.13	0.69	
JublFood		1.35	0.91	0.80	0.36	1.01	

L&T Fin			0.70	1.09	1.07	0.95	0.99
MHRIL	3.9	0.66	0.70	0.42	0.45		
Muthoot Fin			0.66	0.17	0.96	0.70	0.72
NHPC	0.52	0.76	0.63	0.62	0.84		
NMDC		0.69	0.96	0.87	0.94	0.95	
Obe Realty		0.61	0.53	0.88	1.03	1.14	
Oil India	0.32	0.32	0.38	0.77	0.99		
Persistent		0.67	0.44	0.26	0.21	0.64	
PGEL			0.71	0.71	0.25	1.09	1.07
RAMKY		0.79	0.75	1.44	1.50	1.32	
TALWALKARS		0.77	1.11	0.65	0.88	1.16	
TDPOWER			4.5	0.17	0.62	0.77	0.78

(d) **Event Windows: Interpretation** - The t-statistics along with their significance value as obtained after applying paired sample t-test in SPSS V.20 have been demonstrated in this segment.

(i) **Short Window-** The first null hypothesis in the study stands to be rejected with the help of statistics shown in table 5 for 30 days window. It may be due to the investor's positive response towards the issues released after the financial crisis of 2008. It may have given a positive signal to the investors about the company and its stocks and may generate the desire to invest their money in the IPOs released. The results are significant at 5% level of significance. It may be likely to revive the companies after the financial crisis retaining their earlier positions in the financial markets.

(ii) **Long Window** - The p values of the sample companies have been found significant in the long window. Hence the second null hypothesis may be rejected and it may be said that IPO has affected the stock returns in the long window. It may be due to investors holding their investments in the companies for a long period of time. The investors might have seen the growth potential in the companies and may anticipate high returns in the future. The companies may likely to be in the expansion mode during the initial years of its release of IPO. The companies might also have been successful in generating expected returns for the investors giving them confidence to invest further in the stocks of the company.

(iii) **Very Long Window** - The results have been found significant in the very long window at 5% level of significance. The third null hypothesis may be rejected and IPO announcement may be found as an important indicator in the market which affected stock returns in five-year time frame. It may be possible that the stocks might have outperformed from the expectations of the investors. Investors might have gained confidence to keep their money being invested in the stocks of the company.

By statistically testing the cumulative abnormal returns of the sample companies it may be said that IPO has significantly affected the stock prices of the sample companies. These results have been found consistent in all the three windows of 30 days, 1 year and 5 years.

Table 7
t-statistics and p values

Companies	t- value			p-value
	30 days	1 year	5 years	0.000
Bajaj Corp Limited	-10.438	-27.749	-23.025	0.000
Coal India Limited	-10.418	-27.613	-61.462	0.000
D.B. Corp Limited	-10.418	-27.833	-43.384	0.000
D B Realty Limited	-10.412	-27.801	-42.97	0.000
Infinite Computer Solutions (India)	-10.401	-27.826	-32.377	0.000
Intrasoft Technologies limited	-10.445	-27.948	-31.586	0.000
Jubilant Foodworks Limited	10.385	27.779	-15.548	0.000
Gujarat Papavav Port Limited	-10.420	-27.655	-43.903	0.000
Mahindra Holidays & Resorts India	10.415	27.554	-42.174	0.000
L&T Finance Holdings Limited	-10.422	-27.663	-44.643	0.000
Muthoot Finance Limited	-10.420	-27.660	-43.637	0.000
NHPC Limited	-10.416	-27.558	-46.355	0.000
NMDC Limited	-10.440	-27.858	-43.395	0.000
Oberoi Realty Limited	-10.404	-27.666	-43.552	0.000
Oil India Limited	-10.408	-27.609	-36.053	0.000
Persistent Systems Limited	-10.409	-27.927	-42.841	0.000
PG Electroplast Limited	-10.502	-27.716	-43.318	0.000
Talwalkars Better Value Fitness	-10.385	-27.807	-32.167	0.000
TD Power Systems Limited	10.412	27.498	-39.748	0.000
Ramky Infrastructure Limited	-10.433	-27.675	-43.408	0.000

(e) **Performance of IPO: Event WindowsComparison** - The CAAR value in 29 days, 245 days and 1239dayshavebeenstatisticallycompared in thissectionusingpaired sample t test in SPSS. The resultsobtainedhavebeenpresentedbelow:

Table 8
Showingpaired sample t-test statistics for allwindowsat 5% level of significance

Showing results for Paired Sample t-test						
Pair	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
CAAR29-CAAR245	-0.981	0.345	0.022	-44.486	244	0.000
CAAR29-CAAR1239	-0.981	0.346	0.022	-44.373	1238	0.000
CAAR245-CAAR1239	3.661	2.385	0.068	54.018	1238	0.000

The abovetablepresents the results of paired sample t-test for alleventwindowstakentogether. Itmay be saidthatthereis a significantdifferencebetweenreturnsgenerated by stocks post IPO in different time periods. The abnormal stock returnsafter the announcement of IPO wasfound to be significantlydifferentbetween a month (29 days) and a year (245 days). Also, the p-valueindicatedthisdifference to be significantbetween 29 days and 1239days (5 yearswindow). The resultswerefound to be significantbetween 245 days and 1239days.

Thus, itmay be saidthat the nullhypothesesstands to be rejectedat 5% level of significance i.e.,
H4: There is no significant difference between post performance of IPO in short and long window.
H5: There is no significant difference between post performances of IPO in short and very long window.
H6: There is no significant difference between post performance of IPO in long and very long window.
From table 8, it may be interpreted that there were significant differences between three event windows taken pair wise. Hence, an investor may plan to invest his money in IPO depending upon his risk-taking capacity and return expectations. IPOs may give him different returns in varied time periods.

V CONCLUSION

IPO is regarded as an important structural change in the capital holdings of a company. It may bring a positive signal to potential investors that the company is on the rise and has various expansion plans and opportunities. However, it may also be done at a stage when the management strongly feels that the company is ready to dilute its ownership. This may be followed by mixed vibrations; on the one hand company gets easy access to funds but on the other hand common public becoming participative in decision making may pose interference. This kind of change in the structure may have an impact on the stock prices of the company in future after announcement of its IPO takes place. It has been examined in the study that IPO announcement significantly affected the stock returns for investors.

However, it has been observed that the results may be reflected with a high magnitude as the time period increases after IPO. It can be deduced that in the very long window IPO announcement may provide better returns as compared to smaller windows. The paired comparison between different time periods (windows) reflected possibility of varied abnormal returns at the time of announcement and afterwards; 29 days, 245 days and 1239 days. So, it may be said that the returns for an investor shall depend on the timing of his investment in an IPO. An investor entering an IPO at the start may receive different returns as compared to an investor who enters later. The study may be extended to a sector wise comparison of IPOs and their respective returns generated for investors.

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Phytoremediator Plants Tolerance Level by Showing Effect of Heavy Metal on Growth Pattern of a Plant

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ABSTRACT

Heavy metals (Pb,Cd,Cr etc) are hazardous to human beings, plants, animals. Due to industrialization, sewage human activities etc, they are dumped into the soil ,air, water Increase in concentration of heavy metals reduction in length of aerial parts roots, shoots of a plant is observed. Increase in dry weight is also observed in the presence of heavy metals. Reduction in length of aerial parts root, shoot of a plant is observed at160-170mg and above of heavy metal. The present study suggests that Phytoremediator Plants have 60%-95% of tolerance level. Decrease in length of root, shoot suggests that the heavy metal transferred to Root and shoot. Increase in dry weight suggests that heavy metal is affecting the seedling and removal of heavy metal from soil near root area. Reduction in lengths of aerial parts is observed at higher concentrations and the plants tolerance level is also high at particular concentrations which suggests that they have maximum Phytoremediation capacity.

Keywords-Phytoremediator, Heavy metals, Tolerance, Root, Shoot, Growth.

I INTRODUCTION

Phytoremediator Plants are involved in the technique of Phytoremediation (1-6).Heavy metals like Cd,Cr, Pb are harmful to the environment, human beings, plants and animals.(1-6) Heavy metal sources- Cadmium-Paints and pigments, Plastic stabilizer's electroplating, inceneration of cadmium containing plastic phosphate fertilizer. Chromium-Tanneries, steel industries, fly ash. Lead-Aerial emission from combustion of leaded petrol , battery manufacture, herbicides and insecticides.(1,5,6).

Phytoremediator plants-Brassica juncea (Mustard), Lycopersicon esculentum (Tomato), Helianthus Annus(Sunflower).

II AIMS AND OBJECTIVE

The present original study aim is to prevention of heavy metal contamination of soil and water. The present original study deals with the study of heavy metal removal by tolerance range or eradication by Phytoremediator Plants. The main objective is to show the potential of plants as Phytoremediator. Objective is to clean the environment, by tolerance II

III METHODOLOGY

Plants are treated with heavy metals like Pb,Cd,Cr at different concentration. Its length of aerial parts are measured. Slight reduction is observed at low concentration but at high concentration shows more reductions in length. The length and fresh mass of roots and shoots were measured using a meter scale. Plants are placed in oven at 80°C for 72 hours. The dried plants were weighed to record the plant dry mass.

IV RESULTS AND DISCUSSION

Decrease in length of root, shoot suggests that the heavy metal is transferred to root and shoot. Increase in dry weight suggests that heavy metal is affecting the seedling and removal of heavy metal from soil near root area.At0.6g decrease in root length of Brassica was observed from 5.9 to 5.0 and 13to 9.9under lead stress. Similarly Cd ,Cr also shows reduction in root and shoot length with increased dry wt in tomato, mustard and Sunflower at above 160mg of heavy metal..Tolerance level can be calculated by It=Ime/Ic×100 ie increase/decrease in root length in metal solution to control×100.Tomato Chromium treated control root 10.2,6.5,shoot 61.5,41cm, Brassica juncea lead treated root 21to 18, cadmium treated 16to 6 shoot 80 to 75,78-56cm at 93.75% tolerance level, Sunflower chromium treated 13to 12.5 root , ot 61to55,lead treated root 34to 8.9, shoot 53to1.6,90%tolerance level eicchornea crassipes leaf area 12.6 to 8.6 and 8.0 at 50 and 75ppm 68% tolerance.

Table 1
Length of Root, Shoot (cm) Ti of Phytoremediator

Control	13	61
Chromium 200ppm	12.5	55 Ti 90.16%
Control	34	53
Lead 200mg	2	15
	Root	Shoot

Table 2
Helianthus Annus

	Root	Shoot
Control	10.2 Ti 60.4%	61.5 Ti 66.06%
Chromium 150mg	6.5	41

Table 3
Lycopersicon Esculentum

Control	21	80
Lead 250mg	18 Ti 85.71%	75 Ti 93.75%
Control	16	78
Cadmium 100mg	6	56
	Root	Shoot

Table 4
Brassica Juncea

Cadmium	Leaf Area		
Control	12.7		
50ppm	8.6 Ti 68.25%		
75ppm	8.0 Ti 63.49%		
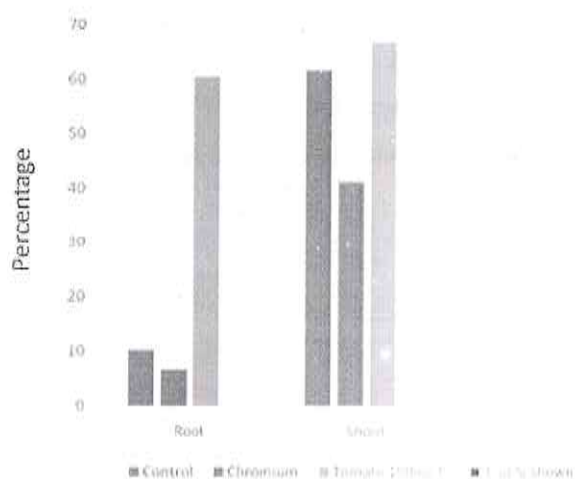
Fig. 1 Effect on Root and Shoot length – Phytoremediator Plant
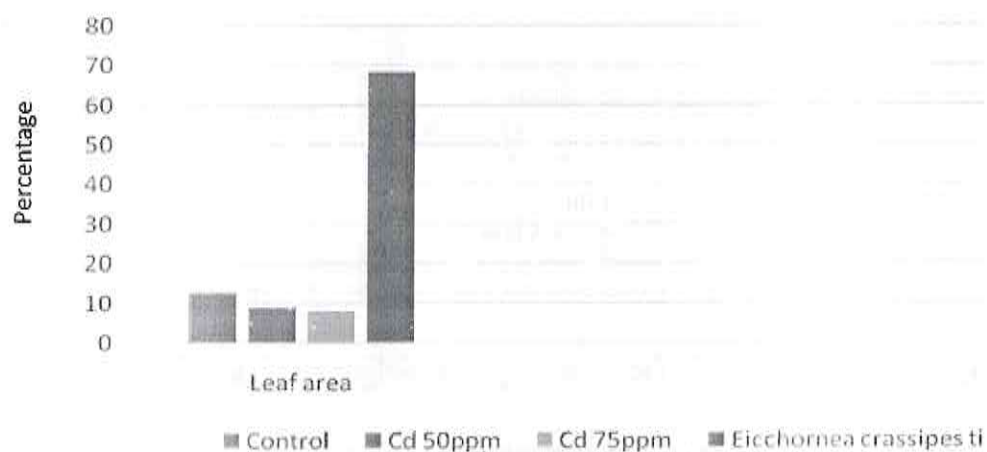
Fig. 2 Effect on Leaf area Eichornea Crassipies
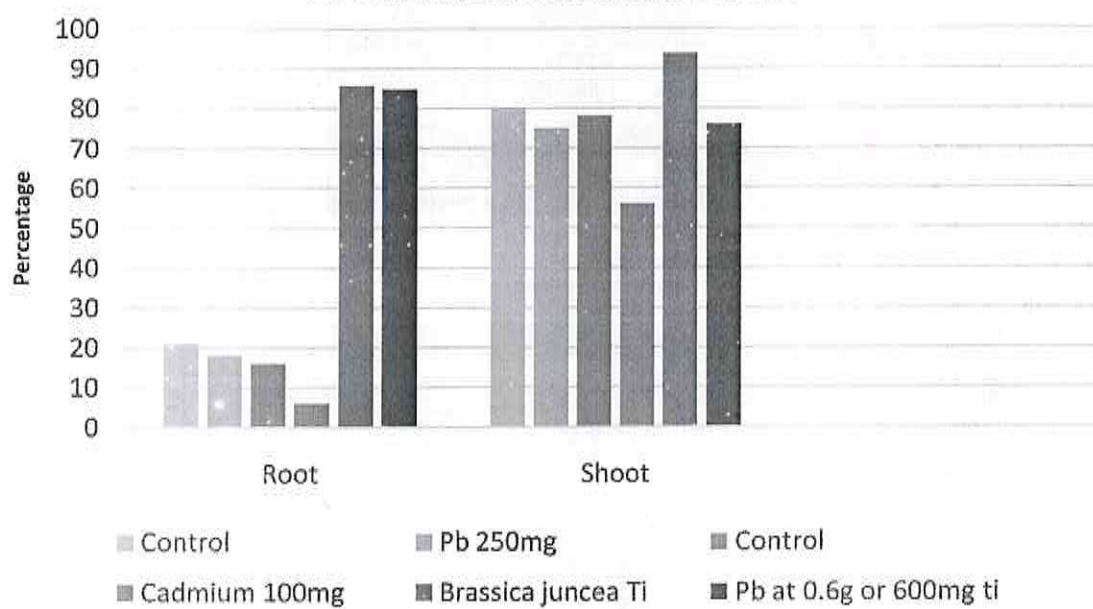
Fig. 3 Effect on Root and Shoot – Phytoremediator Plant Brassia juncea (Mustand)

Root Length (cm)-Graph1-Control, Graph 2-Pb 250 mg, Graph 3-Control,Graph 4-Cd 100mg, Graph 5-Ti, Graph 6-Pb at 0.6g or 600mg Ti.

Shoot Length (cm)--Graph1-Control, Graph 2-Pb 250 mg, Graph 3-Control,Graph 4-Cd 100mg, Graph 5-Ti, Graph 6-Pb at 0.6g or 600mg Ti.
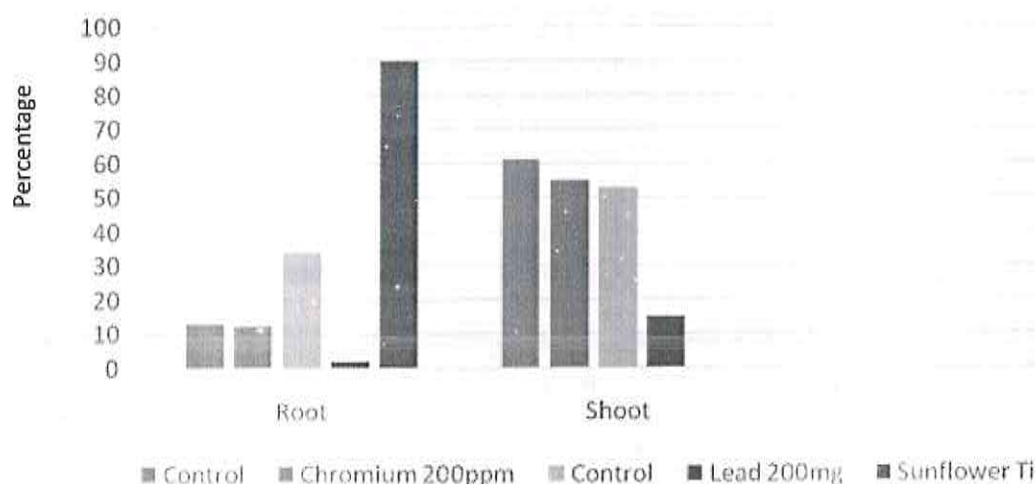
Fig. 4 Effect on Root Shoot length of Phytoremediator Plant Helian thus Annus (Sunflower)

Root Length (cm)-Graph1 Control, Graph 2-Chromium200ppm, Graph 3-Control,Graph 4-Lead 200mg, Graph-5 Ti.Shoot Length (cm)-Graph1 Control, Graph 2-Chromium200ppm, Graph 3-Control,Graph 4-Lead 200mg. Graph-5 Ti.

VIII CONCLUSION

By selected plants we can minimize heavy metal from soil and water and we can remove it also.By Phytoremediator Plants we can clean soil and water.

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BA-PSO Based Solar Power Prediction Using Environmental Features

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ABSTRACT

Photovoltaic systems have become an important source of renewable energy generation. Because solar power generation is intrinsically highly dependent on weather fluctuations, predicting power generation using weather information has several economic benefits, including reliable operation planning and proactive power trading. This study builds a model that predicts the amounts of solar power generation using weather information provided by weather agencies. Here BA-PSO (Butterfly Algorithm Particle Swarm Optimization) Genetic Algorithm is used to predict the solar power requirement. A set of environmental variables are collected and their effect on solar power generation is evaluated by BA-PSO. This work considers a set of environmental features with their impact ratio solar power prediction. The BA-PSO was applied on dataset of Raipur city in Chhattisgarh state of India and the results show reduction in MAE, RMSE and improvement in power prediction when compared with ground truth values taken from Indian railway top roof solar installation.

Index Terms— Electric power Grid, Renewable resources-Solar.

I INTRODUCTION

Power plants based on renewable energy have increased their integration in electrical power system in recent years. The independence from foreign sources, opportunities derived from the climatic change, and the energy policies carried out in most of the developed countries have driven the construction of power plants based on renewable resources. The renewable energy with greater integration in the electric power systems are wind and solar photovoltaic energy, and the integration continues to increase. By 2050, wind and solar energies are expected to provide 12% [1] and 11% [2] of the global electricity consumption respectively.

Photovoltaic (PV) systems are the most direct way to convert solar radiation into electric power. PV systems have been used to produce electricity for low power applications in isolated areas (isolated from electric power networks) and can be easily connected to electrical grids. In recent years, large PV power plants have been built all over world, connected to medium or high voltages electric networks, with capacity of hundreds of MW (new PV plants or parks) [3]. In developed countries, which have implemented an electricity market, large scale power plants based on renewable energies can act, as any other electricity producer, providing power generation sale bids to the electricity market. The most important session for the electricity market is the daily session, in which power producer must present sale bids for the hours of the following day.

To encourage better arranging and lower the boundary for expanding the division of renewable in the framework, this work centers around the issue of consequently creating models that precisely anticipate renewable power generation by utilizing National Weather Service (NWS) climate data [4]. This work explores Butterfly PSO algorithm (BA-PSO) for prediction of solar power by utilizing NWS dataset. Hence to estimate power for small region with available information gets easy and fast. When learning of models on recorded environmental parameters with respected

generated power is complete then, this works' expectation models use NWS values for a small region to predict future power production on scale of time as well. In this paper, examination is done to utilize solar based power as an intermediary for solar production, since it is relative to sun-based power harvesting [5].

II RELATED WORK

Hong et al. [6] provide an outline of various forecasting techniques used for energy forecasting. The study emphasizes that many different time series and ML techniques have been used in various energy contexts. The study shown the technique's comparison for energy forecasting and evaluates the methods used in the forecasting

Davò et al. [7] used PCA combined with the techniques ANN and Analog Ensemble (AnEn) to predict solar irradiance. With the aim to reduce the dimensionality of the dataset, PCA was used as a feature selection method. The dataset consists of the aggregated daily energy output of the solar radiation, measured over eight years. A comparison between using and not using PCA showed that using PCA in combination with ANN and AnEn enhances the prediction accuracy.

Chen et al. [8] present results on long-term (up to 100 hours) forecasting. The authors employed an ANN as their forecasting method with NWP data as input. The model was sensitive to prediction errors of the NWP input data and also showed deterioration when forecasting on rainy days in particular. During cloudy and sunny days, the ANN model produced results with MAPEs of around 8 %.

Persson et al. [9] used Gradient Boosted Regression Trees (GBRT) to forecast solar energy generation 1-6 hours ahead. The data used was historical power output as well as meteorological features for 42 PV installations in Japan. Concerning RMSE, the GBRT model performed better than the adaptive recursive linear AR time series model, persistence model and climatology model on all forecast horizons. For shorter

forecast horizons, it was shown that lagged power output values had a larger predictive ability. Similarly, for longer forecast horizons, the weather forecasts increased in importance.

Yordanos et. al. in [10] Multi day-ahead, hourly mean PV control production estimating strategy dependent on a mix of genetic calculation (GA), molecule swarm enhancement (PSO) and versatile neuro-fluffy derivation frameworks (ANFIS) is displayed in this examination. Parallel GA with Gaussian procedure regression display based wellness work is utilized to decide imperative info parameters that essentially impact the measure of yield intensity of a PV production plant; and an incorporated crossover calculation consolidating GA and PSO is utilized to advance an ANFIS based PV control estimating model for the plant. The proposed displaying method is tried dependent on power production information got from Goldwind microgrid framework found in Beijing.

Mandal et al. [11] utilized wavelet change related to RBFNNs. They right off the depreciated values exceedingly fluctuating PV control time arrangement information into various time-recurrence segments. The one hour ahead disintegrated PV control yield was then anticipated utilizing the deteriorated segments, just as past solar powered light and temperature information. The last forecast was created by applying the inversed wavelet change. The outcomes demonstrated great precision, with the mix of wavelet change and RBFNN beating RBFNN without wavelets.

III METHODOLOGY

Prediction of solar power is highly dependent on the environmental conditions. This work focuses on the selection of highly affecting surrounding variables like (air, humidity, temperature, sky condition, etc.) taken from region shown in fig. 1 and 2. Whole work was divided into two module first module predicts features ratio by using Butterfly Particle Swarm Optimization algorithm. While second module predicts the solar power from the environmental parameters used in same ratio as identified in first module. Block diagram of whole work is shown in fig. 3.
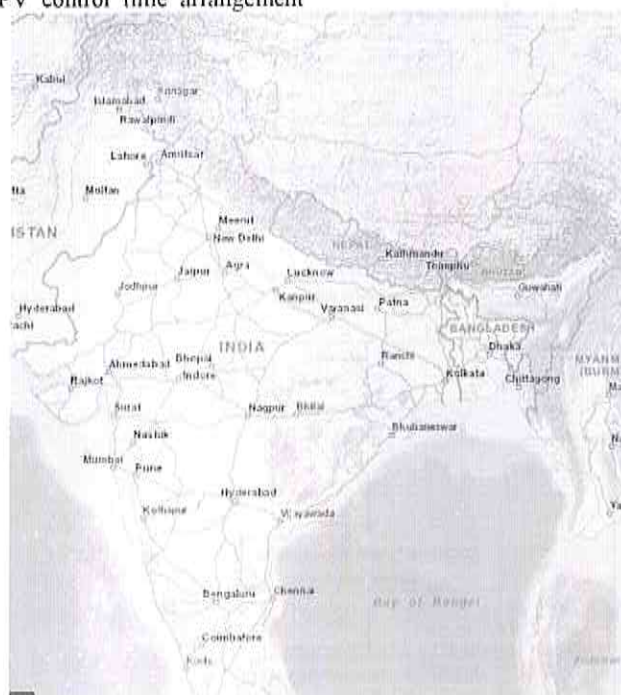

Fig. 1 Climatologyenvironmental map for India[12].
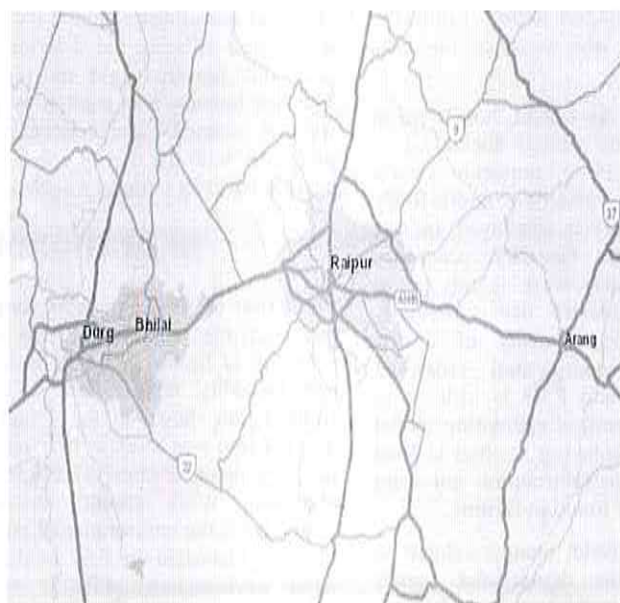
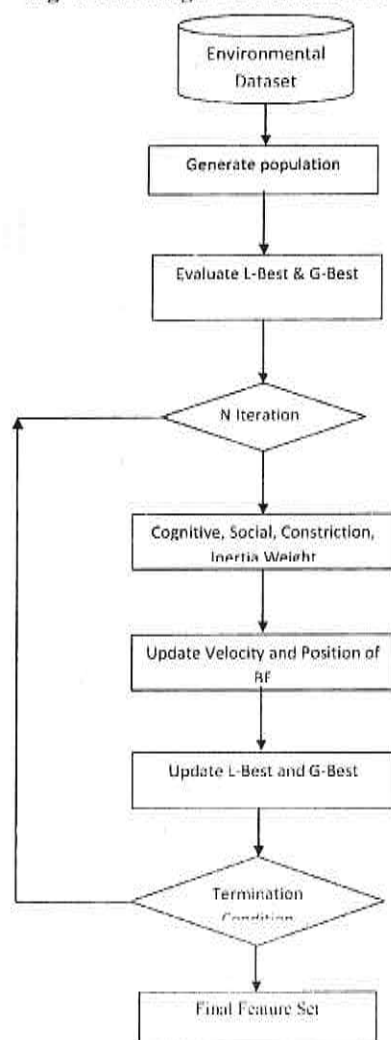**Fig. 2 Chhattisgarh environmental region [12].**

Fig. 3 Block diagram of BA-PSO genetic algorithm.

(a) **Generate Population:** In this step different chromosome set were generated, which have environmental feature set ratio between 0 to 1. This can be understood as if any feature value is 0 than that feature is not involved.

So each environmental feature set acts as the chromosome(Cc) while collection of all set is termed as population(P). This can assume as let $Cc = [r_1, r_2, ...r_m]$ as the chromosome set where m is number of features in

a set. While $P = [Cc_1, Cc_2,...Cc_n]$, n is number of chromosomes.

$$P \leftarrow Random\ (n, m) \text{---------(1)}$$

(b) **Fitness Function:** Selection of best solution from population set is done by this step where previous year environmental data were evaluated to generate power from current ratio by using equation (2) to (4).

Table 1
Notation used feature collection

Symbol	Meaning
A	Solar Panel area in m^2
γ	Solar Panel Yield Efficiency
I_r	Irradiance
A^T	Ambient Temperature(C)
C^T	Solar Panel Cell Temperature(C)
Cc	Genetic Algorithm Chromosome
σ	Solar Module Efficiency
β	Maximal Power Temperature Coefficient
θ	Hour Angle
δ	Declination Angle
F	Environmental Feature Set
I_0	Clear Sky Insolation
I_n	Insolation after orientation calculation
W	Wind Speed at 10 m above ground level+ Wind Speed at 50 m above ground level mm/sec
T	Temperature Range at 2 m above ground level + Earth Skin Temperature (C)
T_e	Cell Temperature(C)
P_1	Surface Pressure (kPa)
P_s	Solar Panel Power, Watt

$$[I_0\ W\ T\ P_1] = Cc*F\text{---------(2)}$$

In equation (2) Cc is chromosome having ratio of m values. while F is average value of m features obtained from environmental dataset. It gives I, W, T, P, output which is a summation of similar types of features present in F. In this work solar orientation feature was considered to get more effective values as per geographical location.

Solar Insolation value for fixed panel is denoted by I_n. The equation of calculating solar insolation for fixed panel is.

$$I_n = I_0 * Cos\ (\delta) * Sin\ (\theta) \text{............(3)}$$

Here. θ= Hour Angle, δ = Declination Angle

$$T_c = T + \left[\left(\frac{I_n}{I_r} \right) (C^T - A^T) \frac{C_1}{W} \left(1 - \frac{\sigma}{C_2} \right) (1 - \beta \times C_3) \right] \text{--(4)}$$

$$P_s = A \times \gamma \times T_c \times P_r \text{---------(5)}$$

Output from eq. (2) are transferred in equation (3) obtained from [16], where insolation values get changed as per solar orientation. While eq. (4) obtained from [17] gives Cell temperature value. In eq. (4) c1, c2 are constant whose value range between 0-1, while C_3 range between 5 to 45. Finally, eq. (5)[13, 14] gives power of a solar panel having surface area A, with yield efficiency γ.

(c) **Evaluate L-Best and G-Best :** This step finds best chromosome from the population and fitness value of this best solution act as Local best and Global best value. Here it was obtained by evaluating the fitness value of each probable solution in the population. After this iteration of the algorithm starts where L-Best and G-Best update regularly.

(d) **Iteration Steps:** This involve calculation of Sensitivity of Butterfly by eq. (6) than cognitive values with constriction factor and inertia weight were evaluated using eq. (6) to (12) obtained from [18]. Here velocity and position of the butterfly also get update which are parameters of BA-PSO. So as per position matrix crossover is done to update population.

Table 2
Notation used in Butterfly algorithm

Symbol	Meaning
S	Sensitivity
r	Genetic algorithm Iteration
M_r	Maximum iterations
C_r	Current iteration
C_1	Cognitive parameters
C_2	Social parameters
C_{sq}	Constriction Factor
N	Number of Iteration
W_t	Inertia Weight
V	Velocity
X	Position
L_{best}	Local Best solution
G_{best}	Global Best solution
P	Probability of Nectar Selection

(i) **Sensitivity of Butterfly**

$$S = e^{-(M_r - C_r)/M_r} \text{----(6)}$$

Where S is sensitivity of rth iteration where M_r is maximum number of iterations takes place and C_r is current iteration of this BA-PSO algorithm.

(ii) **Cognitive and Social parameters**

$$C_1 = y * \left(\frac{C_r}{M_r} + x \right) \text{----------------(7)}$$

$$C_2 = x * \left(\frac{C_r}{M_r} \right) \text{-------------(8)}$$

Where x, y are constant range between 0 to 1.

(iii) **Constriction Factor C_{eq}**

$\alpha = C_1 + C_2$

$$C_{eq} = 1 - \alpha - \sqrt{\alpha^2 - 4\alpha} ----(9)$$

(iv) Inertia Weight

$$W_t = y + \frac{(M_r - C_r)}{M_r} ----(10)$$

(v) Update velocity V and position X of each probable solution

$$V_{i+1} = C_{eq} * (W_t * V_i + S * (1 - P) * R * C_1 *$$
$$(L_{best} - C_r) + P * R' * C_2 * (G_{best} - C_r)$$
$$------------(11)$$

$$X = R*P*V_{i+1} -----(12)$$

In above equation V is velocity, X is position while R and R' are random number whose values range between 0-1. P is probability of nectar for the butterfly selection. So as per X and V values crossover operation were performed.

(e) Crossover: In this work population P is updated as per X column wise and V values update P row wise. Change in column help to assign new position for the cluster center in same probable solution [15]. While changes in row value as per L_{best}(where is L-best)solution increase the chance of generation of better fitness probable solution.

(f) Update G-Best : After each iteration values of G-Best get optimize if new solution probable solution fitness function values are better than previous G-Best values. Hence if two iteration shows same values than iteration will break or if N number of iteration complete.

(g) Solar Power Prediction
In this phase features of geographical location are read where solar power is predicted for that location. Here feature ratio is multiplied with environmental values and obtained values are used in equation (4) and (5).

IV RESULTS AND DISCUSSION

This area exhibits assessment of the proposed procedure for management of smart grid system. All calculations and utility measures were executed by utilizing the MATLAB 2012a software. The tests were performed on a 2.27 GHz Intel Core i3 machine, outfitted with 4 GB of RAM, and running under Windows 7 Professional.

(a) **Dataset:** Analysis done on actual dataset (Ground Truth Values) for Raipur city in Chhattisgarh state of India having Longitude: 21.2514° N, Latitude: 81.6296° E. Various environmental features used in the calculation are given in Table 3 and it was obtained from [12] for Raipur.

Table 3
List of features used (F).

Feature Name
Clear Sky Insolation Clearness Index
All Sky Insolation Incident on a Horizontal Surface (kW-hr/m²/day)
Insolation Clearness Index
Clear Sky Insolation Incident on a Horizontal Surface (kWh/m²/day)
Declination Angle, Hour Angel (Degree)
Temperature Range at 2 m height (degree C)
Earth Skin Temperature(degree C)
Wind Speed Range at 10 m above ground level(m/s)
Wind Speed Range at 50 m above ground level(m/s)
Surface Pressure(kPa)

(b) **Results** : From fig. 4 it is observed that BA-PSO power requirement values is more nearer (Actual)

to ground truth values as compared to GA-PSO-ANFIS values [10], under required power evaluation parameters. In this work initial solution

generation and crossover operation increases the accuracy of the work.
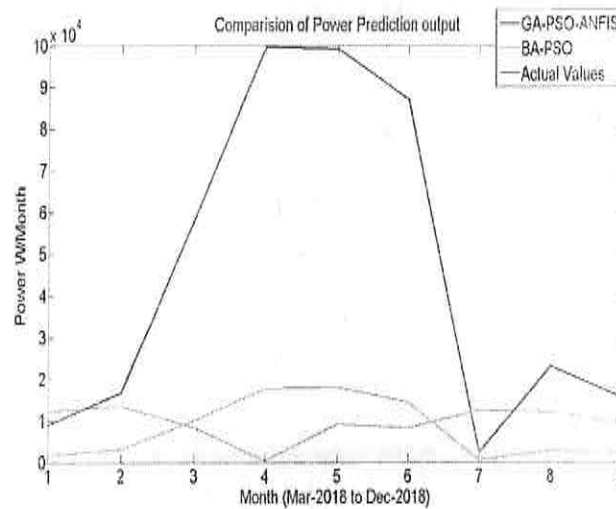

Fig. 4 Comparison of predicted and actual power output

(c) **Evaluation Parameters:**
(i) **Root Mean Square Error**

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n} X_{obs,i} - Y_{model,i}}{n}} \text{-------}(13)$$

where X_{obs} is observed (ground truth values) values and X_{model} is predicted power by modelfor n instances.The smaller the root means square error, the closer to the ground truth values.

(ii) **Mean Average Error**

$$MAE = \frac{\sum_{i=1}^{n} | X_{obs,i} - X_{model,i} |}{n} \text{---}(14)$$

where X_{obs} is observed (ground truth values) values and X_{model} is predicted power by model for n instances. The smaller the means average error, the closer to the ground truth values.

Table 4
MAE Based Comparison between BA-PSO and GA-PSO-ANFIS.

MAE Based Comparison		
Months Year 2018	BA-PSO	GA-PSO-ANFIS[10]
Feb-Apr	7479	18649
May-Jul	10913	89386
Aug-Oct	9405	9169

From Table 4 it is observed that BA-PSO is better as compared to GA-PSO-ANFIS[10], under MAE evaluation parameters. As BA-PSO genetic algorithm

has generated different combinations and performed two type of learning. first was sensitivity of butterfly while second was particle velocity and position.

Table 5

RMSE Based Comparison between BA-PSO and GA-PSO-ANFIS.

RMSE Based Comparison		
Months Year 2018	BA-PSO	GA-PSO-ANFIS [10]
Feb-Apr	8545	28720
May-Jul	11900	89779
Aug-Oct	9608	9404

From table 5 it is observed that BA-PSO is better as compared to GA-PSO-ANFIS [10]. under RMSE evaluation parameters. As BA-PSO genetic algorithm has generated different combinations which perform two type of learning, first was sensitivity of butterfly while second was particle velocity and position.
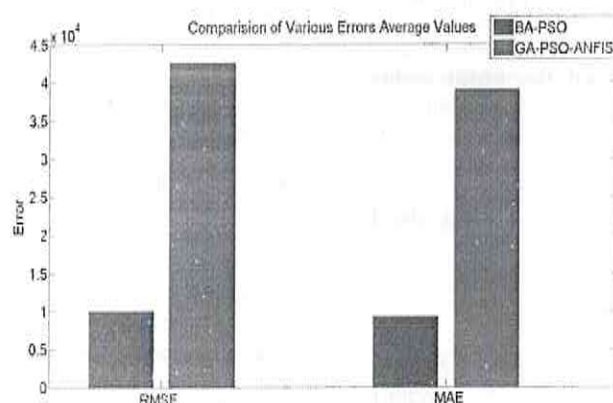
Fig. 5. Average error Comparison of solar power prediction.

From fig. 5 it is observed that BA-PSO feature selection ratio involved each environmental parameter for solar PV power prediction, so average error for various months was less as compared to [10]. While selection of some features was done in GA-PSO-ANFIS[10],which reduces its accuracy. As BA-PSO genetic algorithm has generated different combinations which perform two type of learning, first was sensitivity of butterfly while second was particle velocity and position.

Table 6

Execution time Based Comparison between BA-PSO and GA-PSO-ANFIS.

Execution time (seconds) Comparison		
Iteration	BA-PSO	GA-PSO-ANFIS [10]
10	1.245	1.8765
20	1.7921	3.0678
30	2.0976	3.7803

From Table 6 it is observed that BA-PSO is better as compared to GA-PSO-ANFIS [10]. under execution time evaluation parameters. As BA-PSO genetic algorithm has generated different combinations and

performed two type of learning, first was sensitivity of butterfly while second was particle velocity and position. So better results obtained in short time and iteration loop get break.

V CONCLUSION

Solar is a promising renewable source that is experiencing a fast pace of growth in the recent years. An inherent feature of these resources is that the energy production capacity is not fully controllable, thus necessitating the use of proper forecasting and management techniques to ensure smooth integration with the power grid. So this work proposed a genetic algorithm that forecast solar power as per environmental parameters like, insolation, solar orientation, temperature, etc. Real dataset obtained from NASA resource library for Raipur, India, Chhattisgarh region is used. The results show that MAE and RMSE for the BA-PSO system is quite low as compared with previous approaches. BA-PSO has reduced the RMSE value 4.255 times, while MAE was reduced by 4.21 times as compared to GA-PSO-ANFIS. This high reduction in error was obtained by estimating proper ratio of the environmental parameters. In future research can be pursued to further minimize the error in a day-ahead prediction.

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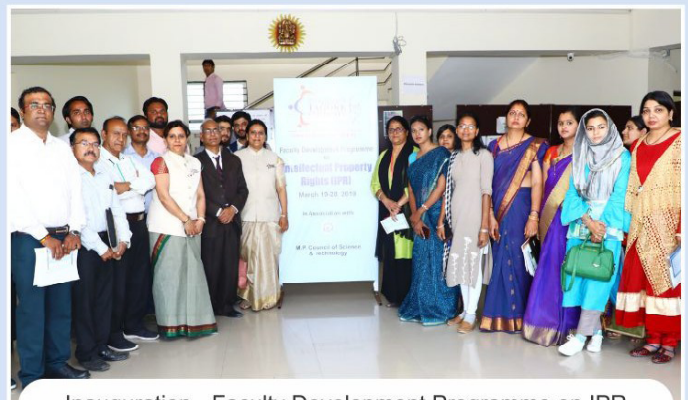
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