



SCIENCE, TECHNOLOGY AND INNOVATION

Dr. Tazyn Rahman

Science, Technology and Innovation



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Science, Technology and Innovation

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Preface

In the twenty-first century, organizations are facing many new challenges. Some people would argue that society and the economy have changed so radically that the last century's management practices and theories are no longer relevant. The truth is management has become more important than ever. Almost everything we do today as individuals or organizations requires us to interact with large-scale institutions, such as government agencies, banks, health-care providers, insurance companies, school systems, universities, online retailers, and technology service providers. How has management theory and practice evolved to manage this new organizational and business environment? Interestingly, it has become both more specific and more general.

Several forces are significantly shaping management practices today, including the pace of change, technology, globalization, diversity, and social expectations. Keeping these things in mind this book was conceptualized with an objective to publish the researches being done on various Advances in Management, Social Sciences and Technology. conference.

We hope that this book will be prove to be helpful to students, research scholars, academicians and business executives in having a better understanding of the concept of Advances in Management, Social Sciences and Technology.

Acknowledgements

I am really feeling very honored and privileged to express my gratitude to all those who supported me in my Journey of publishing this Edited book on “Science, Technology And Innovation”.

Nothing can be possible without the Blessings of the Almighty. I bow to the supreme power for always being there with us in all our endeavors.

This Edited Book is the hard work of all the dedicated researchers. We are indebted to all of them for their quality work and for making this book a possibility.

I am thankful to my parents Ms. Nazma Rahman & Mr. Nakibur Rahman for making me understand the importance of education and for making me a confident individual.

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My deepest gratitude is towards my Husband Dr. Akhter Alam and my Son Irfan Alam for always coping up with my erratic work schedules. They have been my pillar of strength. Without their motivation and support I would not have been able to complete this project.

Last but not the least, I express special thanks from the core of my heart to Mr. Arvind Kumar and Empyreal Publication House for their support to print and publish this book in a very short span of time.

Dr. Tazyn Rahman

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**ENVIRONMENTAL/ECONOMIC DISPATCH (EED) OPTIMIZATION PROBLEM
USING AN IMPROVED ARTIFICIAL BEE COLONY ALGORITHM****Ismail Marouani¹, Chefai Dhifaoui² and Hsan Hadj Abdallah³**¹Associate Professor, ²Assistant Professor and ³ProfessorControl & Energies Management, (CEM-Lab) National Engineering, School of Sfax, ENIS
Sfax, Tunisia**ABSTRACT**

In this paper, an improved Artificial Bee Colony algorithm applied to the Environmental/Economic Dispatch (EED) optimization problem is presented. It consists to find the optimal solution taking into account the characteristics and constraints on the system. This problem is formulated as a multi-objective problem and which aims to minimize certain objective functions such as the production cost, the total emission function and the active power losses in the transmission line of electrical network. The results obtained are compared with those obtained with other meta-heuristic methods recently proposed for the resolution of this kind of problem. The effectiveness of the proposed approach is verified on the standard power system with six thermal units.

keywords: *Environmental/Economic Dispatch, multi-objective optimization problem, costs of generation, demand power, emission, power losses.*

I. INTRODUCTION

The problem of the optimal distribution of power between thermal power plants, in order to meet the electrical energy needs of customers, has received considerable attention since the 1920 or even earlier [1]. Several studies have considered this problem to be a minimization problem where the total cost of production function is taken into account [1]. However, amendments to the 1990 global Clean Air Act Amendment [2] forced power generation companies to change their operational design to reduce polluting emissions into the atmosphere. Therefore, the electric power generation industries must not only consider the problem of minimizing the cost of fuel, but also consider the problem of minimizing the emission of polluting gases at the same time. This type of problem is then called the problem of economic and environmental dispatching (DEE) [3-4]. Due to the dynamic nature of current network loads, it is necessary to schedule the outputs of thermal units in real time based on the variation in power demand, over a period of time. This problem is known in the literature under the name of dynamic economic and environmental dispatching (DEED) [5].

To solve this problem, several mathematical formulations have been suggested [5-6]. In most of these references, the DDEE problem is seen as a dynamic multi-objective optimization problem having the same objective functions as the DEE over a period of one day, subdivided into time intervals of one hour. The constraints imposed by the ramp limits of the generators must be considered in this problem. Thus, the optimal solution in a given time interval is influenced by the solution in the previous interval. Other constraints, such as the prohibited operating zones (POZ-Prohibited Operating Zones) and the effect of opening the steam inlet valves (VPLE-Valve Point Loading Effect), have been considered in several research studies. research [7-9]. However, the incorporation of the VPLE constraints introduces ripples into the fuel cost function, and hence the problem will be with minimum multiples. On the other hand, if the POZ constraints are taken into account, the objective functions of the problem become discontinuous. Thus, DEED becomes a highly nonlinear problem with non-convex and discontinuous fitness functions. A considerable amount of research has been suggested to resolve this kind of

problem. Some publications have used classical methods, such as dynamic programming [8], linear programming [10] and the λ -iteration method [11]. The application of these techniques forced the ignorance of the VPLE and POZ constraints, in order to make the problem convex and continuous. Which is in contradiction with the practical case. Moreover, these techniques are iterative and require an initial condition, the wrong choice of which leads to local optima and even the divergence of the algorithm. In order to overcome these drawbacks, new techniques based on artificial intelligence have been proposed for the resolution of DEED.

In [12-13], approaches based on neural networks were applied for the optimal distribution of powers by considering economic and / or environmental constraints. These techniques have shown their effectiveness compared to conventional methods. However, they have weak points. Using these techniques, the computation time is strongly linked to the size of the power network. In addition, their performance is very sensitive to the quality and size of the training data set. Recently, meta-heuristic search algorithms have shown good performance and high efficiency in complex optimization problems. These optimization procedures are classified into different groups in terms of optimization methodology. Population-based evolutionary algorithms such as AG [14,15], PSO [16,17], SA [18,19], ABC [20], the taboo search method [21], the evolution algorithm differential [22] and BFA [23] are the most applied in the literature. Although these techniques have proven to have a clear advantage over traditional methods, they are criticized in later work [24]. Among their disadvantages is that their efficiencies are sensitive to the form of the constraints of the problem and to the number of units.

Therefore, scientific research and technological developments, although they seek to solve these kinds of problems, are finding the best solutions. The problem of load balancing is among the most studied problems [25-26]. This problem of economic dispatching has been solved in this work using an optimization approach based on Artificial Bee Colony algorithm.

II. PROBLEM FORMULATION

In this EED problem, two objective functions to be minimized simultaneously, which are the total emission and the total cost of the fuel in order to find the power production of the thermal power plants according to expected load demands. The description of objectives and constraints is as follows.

2.1 Objective functions

The higher nonlinearity due to the VPLE which has been neglected in conventional methods, and which is caused by the sequential operation of thermal units with multi-steam intake valves, is considered constrained in this study. For this reason, a sinusoidal form will be included in the non-smooth total cost function expressed in (\$ / h), as shown in equation (1). The total emission in (ton / h) is described by equation (2) corresponding to the second objective.

$$C_T = \sum_{i=1}^N a_i + b_i P_i + c_i P_i^2 + \left| d_i \sin \left\{ e_i \left(P_i^{\min} - P_i \right) \right\} \right| \quad (1)$$

$$E_T = \sum_{i=1}^N \alpha_i + \beta_i P_i + \gamma_i P_i^2 + \eta_i \exp(\lambda_i P_i) \quad (2)$$

Where,

a_i, b_i, c_i, d_i and e_i are the cost coefficients of the i -th unit. While, $\alpha_i, \beta_i, \gamma_i, \eta_i$ and λ_i are the emission coefficients. P_i is the output power in MW at the the i -th unit.

In our study, the EED bi-objective problem is converted to a mono-objective optimization problem [27], as it is considered in several works. Using the price penalty factor (PPF) method, equation (3) describes the combined economic emission goal function F_T expressed as follows

$$F_T = \mu C_T + (1 - \mu) \lambda E_T \quad (3)$$

Where, $\mu = rand(0,1)$. The generated value of optimal solution, which can be a candidate solution in the Pareto front, is obtained by minimizing the F_T function for each value of μ . λ is the average of the PPF of all thermal units. The PPF of the i -th unit is the ratio between its fuel cost and its emission for a maximum production capacity, described by equation (4).

$$PPF_i = \frac{C_{i_{\max}}}{E_{i_{\max}}} \quad (4)$$

2.2 Problem constraints

The resolution of the problem DEED is obtained by minimizing the F_T function that is defined by equation (3) subject to the following constraints.

- Generation capacity

Depending on the unit design, the output active power of each unit must fall between its minimum and maximum limits respectively P_i^{\min} and P_i^{\max}

$$P_i^{\min} \leq P_i \leq P_i^{\max}, i = 1, \dots, N \quad (5)$$

- Power balance constraints

Respecting the balance of power constraints given by equation (6), the total electricity production must cover the total power required more total transmission losses P_L^t for each period t .

$$\sum_{i=1}^N P_i - P_D - P_L = 0 \quad (6)$$

Where P_L can be calculated using constant loss formula [28], as given below.

$$P_L = \sum_{i=1}^N \sum_{j=1}^N P_i B_{ij} P_j + \sum_{i=1}^N B_{oi} P_i + B_{oo} \quad (7)$$

Where, B_{ij} , B_{oi} , B_{oo} are the loss parameters also called B -coefficients.

- POZ constraints

The POZ constraints are described as follows.

$$P_i \in \begin{cases} P_i^{\min} \leq P_i \leq P_{i,1}^{\text{down}} \\ P_{i,k-1}^{\text{up}} \leq P_i \leq P_{i,k}^{\text{down}}, k = 2, \dots, z_i \\ P_{i,z_i}^{\text{up}} \leq P_i \leq P_i^{\max} \end{cases}$$

(8)

Where, $P_{i,k}^{\text{down}}$ and $P_{i,k}^{\text{up}}$ are down and up bounds of POZ number k . z_i is the number of POZ for the i -th unit due to the vibrations in the shaft or other machine faults. Where, the machine has discontinuous input-output characteristics [29].

Equation (9) describes the minimum and maximum limits of power generation P_i of the i -th unit taking into account the production capacity and POZ constraints.

$$P_i \in \begin{cases} P_i^{\min} \leq P_i \leq \min(P_i^{\max}, P_{i,1}^{\text{down}}) \\ \max(P_i^{\min}, P_{i,k-1}^{\text{up}}) \leq P_i \leq \min(P_i^{\max}, P_{i,k}^{\text{down}}), k = 2, \dots, z_i \\ \max(P_i^{\min}, P_{i,z_i}^{\text{up}}) \leq P_i \leq P_i^{\max} \end{cases}$$

(9)

III. Original ABC algorithm overview

Recently, ABC algorithm [30] has been classified as an efficient and robust technique for several optimization problems. As all swarm-based techniques, ABC algorithms start by generating randomly an initial population of SN solutions. Each solution is considered as food source and it corresponds to an employed bee. SN is half of the entire population size (PN). The onlooker bees constitute the second half. If D is the number of the decision variables, an i -th solution X^i will be represented by $X^i = [x_1^i \ x_2^i \ \dots \ x_D^i]$.

The fitness function evaluated at the solution X^i , expressed by equation (10), signifies the nectar quantity of the corresponding food source estimated by an employed bee.

$$fit(X^i) = \begin{cases} \frac{1}{1 + f(X^i)}, f(X^i) \geq 0 \\ 1 + |f(X^i)|, f(X^i) < 0 \end{cases}$$

(10)

Where $f(X^i)$ is the objective function estimated at X^i .

The probability P_i to choose the candidate solution X^i by an onlooker bee is expressed as follows.

$$p_i = \frac{fit(X^i)}{\sum_{n=1}^{SN} fit(X^n)} \quad (11)$$

The onlooker bees update the selected food source X^i to discover a new one. The new solution V^i is generated by modifying only one parameter x_j^i of X^i as follows.

$$v_j^i = x_j^i + \varphi_j^i (x_j^i - x_j^k) \quad (12)$$

Where, indices k and j are chosen randomly respectively from $\{1, 2, \dots, SN\}$ and $\{1, 2, \dots, D\}$. The index k must be different to i . φ_j^i is a real number in the range of $[0, 1]$ generated from the uniform distribution. During the onlooker phase, a greedy selection between food sources V^i and X^i will be done. Then, if an employed bee whose food source cannot be improved through a pre-specified triggering threshold called LIMIT, it becomes a scout and its solution will be abandoned. If X^i is an abandoned solution, the converted scout bee starts to search for new solution randomly according to the following equation.

$$x_j^i = X_j^{\min} + rand(0, 1)(X_j^{\max} - X_j^{\min}) \quad (13)$$

Where, X_j^{\max} and X_j^{\min} are bounds of the food source in dimension j .

IV. Proposed optimization algorithm

In this section, an enhanced version of the classical ABC technique is presented to enhance its exploitation and exploration abilities related respectively to the onlooker and scout bees. In [30], the ABC method has been criticized for the random selection of the j -th dimension. Since the random selection of this crucial parameter may slow the convergence of the ABC algorithm and it increases the risk of convergence of the search phase to a local optimum. To avoid these limitations, Ahrari et al. [31] have incorporated a new grenade explosion based method (GEM) into the employed bee and onlooker bee phases. The idea of this technique mimics the grenade explosion principle where the fitness function is the overall damage due to the explosion. In each cycle of the proposed method, it is assumed that there is only one grenade with one piece of shrapnel for each decision parameter. A procedure guideline for tuning parameters of GEM is illustrated in [31]. These pieces are thrown in all the dimension t to collect information about the area of the explosion which is considered as the old food source as given in equation (18). Then, a set of new food sources is proposed by the onlooker bees based on the damage-per-shrapnel degree. This allows reaching the global solution more quickly. As given in equation (19), the optimal search dimension (OSD) of the new candidate V_{OSD}^i corresponds to the maximum damage in all directions.

$$v_t^i = x_t^i + \varphi_t^i (x_t^i - x_t^k) \quad (14)$$

Where, $k \in \{1, 2, \dots, SN\}$ is a randomly chosen index and $k \neq i$ and $t \in \{1, 2, \dots, D\}$. $\phi_t^i \in [0, 1]$ is a random number.

$$fit(V_{OSD}^i) = \max \{ fit(V_t^i) | t = 1, 2, \dots, D \}$$

(15)

As given above, a greedy selection between the new solution V^i and the old one X^i is applied. In order to improve the global and local exploration abilities of the optimization algorithm and ensure the convergence into the global solution within a short calculation time, the Cauchy operator is embedded in the scout bees' phase. The incorporation of a Cauchy operator in optimization techniques has been employed to some algorithms to enhance the global search ability [32]. This is caused by the long tail of Cauchy distribution compared to other operators such as Gaussian distribution. Nevertheless, it is possible to make larger jumps in the search space using Cauchy operator.

In this study, the origin-centered Cauchy distribution with unit scale parameter is used. Thus, the new solution provided from an abandoned solution X^i will be obtained using equation (16) instead equation (13).

$$x_j^i = x_j^i CAUCHY(0, 1)$$

(16)

Where,

$$CAUCHY(0, 1) = \frac{1}{\pi(1 + (x_j^i)^2)}$$

(17)

V. RESULTS AND DISCUSSION

Having been applied for the first time to solve one of the main power system problems which is the DEED problem, the GCABC will be tested in this section on three well-known benchmark power systems. In order to demonstrate the effectiveness of the proposed optimization technique, a comparison with ABC algorithm and more than ten metaheuristic-based techniques used for solving the power dispatch problem is presented. Three cases with different complexities have been considered. For fair comparison, GCABC and ABC algorithms have been implemented with same parameters. Results have been obtained using MATLAB R2009a installed on a PC with i7-4510U CPU @ 2.60 GHz, 64 bit.

The six-unit system with quadratic cost and emission functions is used to test the GCABC algorithm in solving the SEED problem. The system data are taken from [3-4]. The B-loss matrix of this system is given below.

$$B = 10^{-6} \begin{bmatrix} 140 & 17 & 15 & 19 & 26 & 22 \\ 17 & 60 & 13 & 16 & 15 & 20 \\ 15 & 13 & 65 & 17 & 24 & 19 \\ 19 & 16 & 17 & 71 & 30 & 25 \\ 26 & 15 & 24 & 30 & 69 & 32 \\ 22 & 20 & 19 & 25 & 32 & 85 \end{bmatrix}$$

(18)

Power production cost and emission have been optimized simultaneously by minimizing the combined objective function described by equation (3). The PPF of the six thermal units are given in Figure 1; hence, the average of these factors is $\lambda = 51.3073$ \$/ton . To collect the required number of non-dominated solutions, the proposed optimization algorithm has been performed several times. Figure 2 depicts the distribution of the fitness function corresponding to the best solution value for 200 random values of μ with power demand of 700MW.

The convergence of the proposed algorithm is depicted in Figure 3. It is clear that the GCABC algorithm converges into the optimum solution at the iteration 80 for the best cost and at the iteration number 54 for the best emission. Pareto fronts for both GCABC and classical ABC algorithms are given in Figure 4. It can be clearly seen that Pareto solutions obtained using GCABC are well distributed as compared to those obtained using ABC algorithm. In addition, GCABC gives the best solutions whether for production cost or for emission.

Optimum power generation of all units for minimum cost and minimum emission using GCABC, ABC and other metaheuristic techniques used in the literature [32] are summarized respectively in Tables 1 and 2. These tables show that the GCABC, FA (Firefly algorithm), BA (Bat Algorithm) and HYB (Hybrid algorithm) outperform the classical ABC algorithm for different values of the demand power and they provide almost the same optimum cost and optimum emission. However, the investigation of the equality constraint described by equation (7) for each method shows that GCABC is more accurate as compared to FA, BA and HYB techniques.

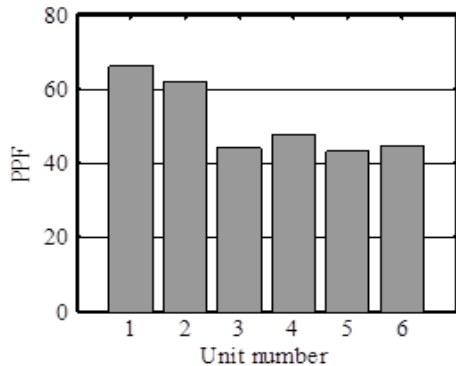


Figure 1: PPF for the six-unit system

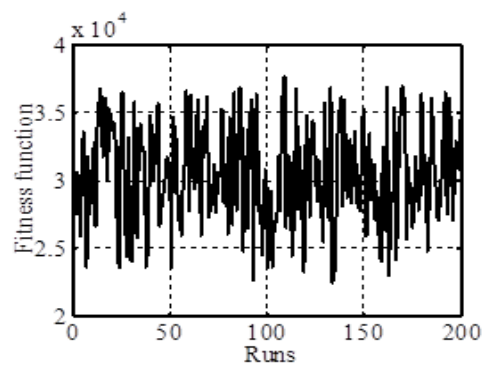


Figure 2: Distribution of the best fitness for 200 runs

for PD = 700 MW

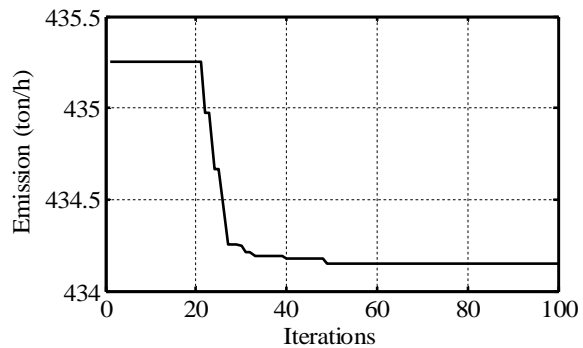
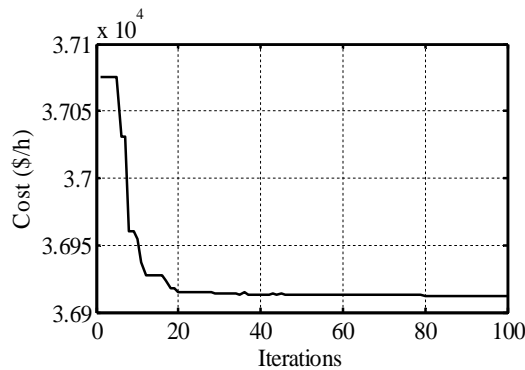


Figure 3: Convergence of the proposed algorithm

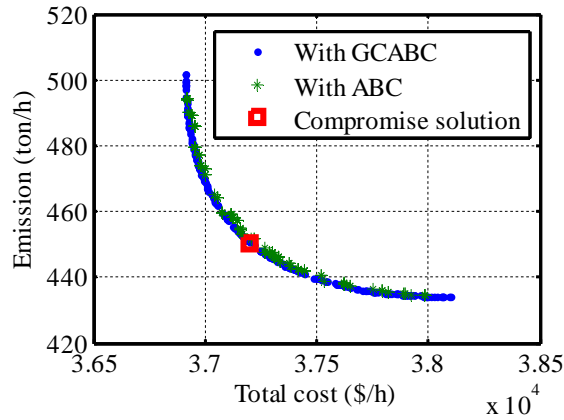


Figure 4: Pareto solutions.

Table 1 Best solution for minimum cost.

PD (MW)	Method	P ₁ (MW)	P ₂ (MW)	P ₃ (MW)	P ₄ (MW)	P ₅ (MW)	P ₆ (MW)	Losses (MW)	C _T (\$/h)	E _T (ton/h)
700	GCAB	28.156	10.000	119.269	119.357	229.432	213.204	19.420	36912.2	500.53
	C	2	0	5	8	2	5	2	4	
	ABC	31.844	10.000	127.072	120.164	226.976	203.074	19.132	36918.5	494.25
		2	0	0	7	8	8	5	6	
	FA	28.315	10.000	118.821	118.832	230.980	212.481	19.431	36912.1	501.02
	1	0	6	9	1	1	1	9		
	BA	28.286	10.000	118.933	118.676	230.761	212.773	19.432	36912.0	501.02
		2	0	3	0	4	1	4	8	
	HYB	28.249	10.000	118.883	118.577	230.509	213.217	19.437	36912.1	501.08
		1	0	3	8	0	8	3	9	
800	GCAB	32.621	14.193	141.312	136.190	257.379	243.651	25.348	41896.6	649.33
	C	8	2	1	7	1	5	3	9	
	FA	32.580	14.479	141.553	136.025	257.664	243.027	25.331	41896.6	649.00
		2	9	1	9	7	4	5	9	
	BA	32.588	14.483	141.552	136.041	257.664	242.998	25.330	41896.5	648.98
		1	7	2	4	4	3	6	7	
	HYB	32.594	14.481	141.542	136.041	257.667	243.002	25.330	41896.6	648.98
		8	3	2	7	6	9	9	9	
900	GCAB	36.747	21.592	165.060	153.277	283.767	271.485	31.930	47045.3	820.83
	C	2	3	1	8	5	3	2	2	
	FA	36.853	21.080	163.932	153.215	284.173	272.732	31.987	47045.2	821.97
		3	8	3	4	3	5	9	4	
	BA	36.845	21.079	163.928	153.222	284.181	272.733	31.988	47045.1	821.98
		1	8	1	8	4	1	2	2	
	HYB	36.847	21.075	163.934	153.231	284.158	272.740	31.988	47045.2	821.98
		7	1	9	7	3	1	0	4	
1000	GCAB	41.049	27.729	186.590	171.217	310.002	302.888	39.477	52361.2	1022.36
	C	4	8	0	5	4	5	5	6	
	FA	41.157	27.785	186.564	170.579	310.819	302.574	39.482	52361.2	1022.48
		7	6	1	7	7	9	0	5	
	BA	41.168	27.783	186.95	170.578	310.825	302.553	39.481	52361.1	1022.46
		3	5		7	7	0	3	2	
	HYB	41.165	27.781	186.571	170.583	310.812	302.565	39.481	52361.2	1022.47
		7	8	8	8	8	4	6	5	

Table 2 Best solution for minimum emission.

PD (MW)	Method	P ₁ (MW)	P ₂ (MW)	P ₃ (MW)	P ₄ (MW)	P ₅ (MW)	P ₆ (MW)	Losses (MW)	C _T (\$/h)	E _T (ton/h)
700	GCABC	80.4827	82.2259	114.0623	113.7692	163.1220	162.8759	16.5378	38105.00	434.13
	ABC	76.7280	79.7532	109.7203	118.2489	169.5130	162.6760	16.6394	37987.80	434.66
	FA	80.1523	82.4019	113.9655	113.4758	163.4493	163.0944	16.5398	38101.09	434.13
	BA	80.1431	82.4033	113.9684	113.4763	163.4530	163.0950	16.5397	38100.95	434.13
	HYB	80.1506	82.4054	113.9570	113.4851	163.4436	163.0975	16.5397	38101.13	434.13
800	GCABC	100.8055	103.4217	126.8581	126.4619	182.4474	181.5975	21.5920	43718.10	548.70
	FA	100.5399	103.7475	127.0118	126.3499	182.1959	181.7376	21.5833	43719.20	548.70
	BA	100.5295	103.7579	127.0076	126.3466	182.2088	181.7321	21.5831	43719.15	548.70
	HYB	100.5207	103.7662	127.0024	126.3547	182.1999	181.7385	21.5830	43716.14	548.70
900	GCABC	120.6676	124.9850	140.4396	139.3747	201.5393	200.3652	27.3714	49633.33	682.63
	FA	120.9389	125.3301	140.1958	139.3394	201.0812	200.4822	27.3684	49650.29	682.62
	BA	120.9330	125.3313	140.1994	139.3392	201.0855	200.4791	27.3682	49650.14	682.62
	HYB	120.9357	125.3202	140.1992	139.3479	201.0706	200.4940	27.3685	49649.97	682.62
1000	GCABC	124.8406	150.0000	156.9141	156.5440	222.2870	223.1133	33.6990	55457.18	837.80
	FA	125.0000	150.0000	156.2191	155.2644	224.0618	223.1839	33.7301	55456.64	837.77
	BA	125.0000	150.0000	156.2704	155.1559	224.0577	223.2458	33.7306	55456.49	837.77
	HYB	125.0000	150.0000	156.0719	155.2412	224.2263	223.1934	33.7337	55456.24	837.77

VI. CONCLUSION

An improved Artificial Bee Colony technique GCABC for solving the combined economic and emissions dispatch has been presented in this paper. This environmental/economic dispatch EED is a difficult optimization problem in the operation of the electrical system. The quality of its optimal solution is influenced by the operating constraints, such as the prohibited operating zones and the load effects of the valve. All the above constraints have been considered. In addition, the power balance constraint was considered. The validation of the proposed optimization algorithm has been verified on six-unit test system. The results of comparison with more than ten metaheuristic techniques used recently in the literature show that the proposed algorithm gives the best optimal solutions. Therefore, according to the results, GCABC can be presented as an algorithm capable of EED problem.

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A STUDY ON THE INNOVATIVE TECHNOLOGY OF SMART ROAD CONSTRUCTION

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ABSTRACT

In today world the traffic is a main problem for every people. This traffic occurs due to increasing availability of vehicle on the road.

Typically, there is very little technology that goes into roads. They tend to be made of asphalt or concrete, which is compacted into a smooth, solid surface and painted upon to indicate certain restrictions and routes information.

The automated highway system is defined as "a lane or set of lanes where specially equipped cars, trucks and buses could travel together under computer control. It is one aspect of intelligent transportation systems (ITS), which apply electronics, computers and control technology developed for aviation, the space program and defense to the improvement of highways, vehicles, and public transportation.

This paper studies into recent developments and research trends in collision avoidance/warning systems and automation of vehicle longitudinal/lateral control tasks. Based on diversely selected research, this paper explains the initiatives for automation in different levels of transportation system with a specific emphasis on the vehicle-level automation. Relying on an analytical survey of the published research, we will try to provide a clear understanding of the impact of automation/warning systems on each of the above-mentioned factors.

The concept of smart Road is in the Fusion of technology it includes information technology(IT), intelligent transportation system(ITS) include sensor based detecting system, health monitoring system to caution accident in the road, Electronic digital media to transfer information to Road user, smart energy converters such as photovoltaic payments to build Road which converts solar energy to electrical, radioactive elements for Road marks which display in night, Road divider concept which increase the road usability. Waterproof routes for those area where monsoon season is present whole year, use of Global Positioning System (GPS) to allocate Road driver where they are currently and where they go through digital robots and liquid electronic display (LED) use off Internet of Things (IoT) technology to build Road smart. If we use this technology to build Road, we can minimize all the problems related economy, energy and time and the Road become Smart.

Key Word - Smart parking, Magnetic sensors, forward-looking sensors, Drones, Automatic control

INTRODUCTION

Vehicle and highway automation are believed to reduce the risk of accidents, improve safety, increase capacity, reduce fuel consumption, and enhance overall comfort and performance for drivers. There has been enough reason to assume that more automated automobiles relieve the driver from many undesirable routines of driving task. It has also been known that many of the car accidents are due to human errors. Therefore, the conclusion has been that with a robust automated system the chance of car accidents can be reduced. With the overwhelming increase in the number of vehicles on the road another concern has been road capacity. Automation that would help to safely increase traffic flow has been considered as one potential solution to

Congested Highways a smoother cruise with an automated system can reduce fuel consumption and engine wear[1].

The potential of connected smart roads is huge. Not only will they keep us safe by regulating the speed of our vehicles and implementing warning systems, but also transmit real time data and share information across the network, making it simpler and quicker to get around, to find parking, to commute effectively and communicate with each other.

Pavement Environmental Factors

Pavement structures and their surrounding environment are in continuous interaction. Like their surrounding environment, pavement structures can also be characterized by temperature, moisture content and acting pressure regimes which are governed by the physical laws of the pavement porous mineral system. These parameters undergo daily and seasonal variations as well as a spatial distribution as they are interconnected to the constantly evolving environment that surrounds the pavement system. The two main environmental factors in pavement engineering are temperature and moisture content.

➤ **Pavement temperature regime**

Pavement temperature is mainly governed by the pavement system boundary conditions and the system's available energy. The temperature of the materials of the pavement layers and its variation highly depends on the surrounding environmental conditions, the location within the pavement system and the thermodynamic properties of each material[2]. While the temperature at the lower depths in the pavement system is almost constant throughout the year, being nearly equal to the mean annual atmospheric temperature, the temperature in the top part of the system usually shows considerable daily and seasonal variations due to a more direct pavement-atmosphere interaction as well as exposure to surface solar radiation. The pavement temperature regime therefore varies between a nearly stable bottom temperature and a constantly fluctuating surface temperature.

➤ **Pavement moisture regime**

Moisture condition in pavement structures continuously evolves throughout the year. The moisture content of the unbound material that is usually set close to the optimum during the compaction in the construction phase will eventually change towards a natural equilibrium state. Similar to the temperature condition of the pavement, the moisture regime is also governed by the boundary conditions of the system. The natural equilibrium moisture content is greatly dependent on the material properties and distance to the groundwater table level and its variation. Generally, the moisture condition at the bottom of the pavement system is relatively stable[3]. However, at the upper sections in pavement systems, moisture condition can vary widely from very dry conditions to fully saturated states due to climatic events. The moisture condition of the upper section of the pavement greatly depends on the surface characteristics as well as its longitudinal and transverse position within the pavement system. The moisture content of the materials closes to the pavement edges and in the vicinity of surface cracks usually shows higher variations due to climatic events such as rainfall.

STRUCTURAL CRACK MONITORING

Cracks typically originate from tensile (pulling) forces that overcome the tensile strength of materials under load, revealing patterns, inclinations and typologies that yield forensic clues to possible causes. While sometimes such determinations are clear and obvious, other times they are ambiguous. The presence of crack patterns (fissures spreading into a structure) may signal a reduction in localized or global safety margins[4]. Without proper investigation and remediation, significant shear cracks could portend severe—if not near-term—structural failure, particularly if exposed to sudden live loads, such as vibration from

nearby pile driving or seismic-induced ground acceleration. However, the presence of multiple, more significant cracks often signifies deeper structural shifting. The crack patterns give forensic clues in relation to their shape, width, depth, direction and position—critical information on the nature and possible causes of structural movement[5]. Outfitting the structure with permanent, accurate and smart monitoring facilitates construction-health assessments and mitigates situations that could deteriorate to structural failure.

SELF HEALING CONCRETE ROADS

Self Healing Concrete is a term that is used for cement-based materials that repair themselves after structure gets damaged due to some sort of deterioration mechanism as shown in figure 1.

Microbiologist Hendrik Jonker set his mind to solve this problem. Whilst thinking about how the body can heal bone through mineralization, he looked into whether a similar method could be used with concrete. By mixing it with limestone-producing bacteria, he found that any cracks that formed in the concrete were patched over. He called that material as '**BioConcrete**'.

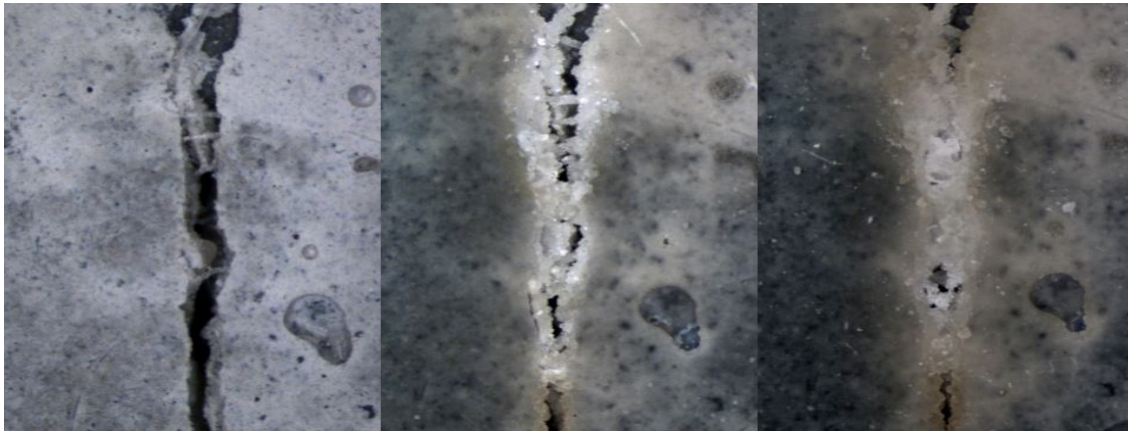


Fig1. Self-Healing Concrete Process

The bacteria, either **Bacillus pseudofirmus** (or) **Sporosarcina pasteurii**, are found naturally in highly alkaline lakes near volcanoes and are able to survive for up to 200 years without oxygen or food[8]. They are activated when they come into contact with water and then use the calcium lactate as a food source, producing limestone that, as a result, closes up the cracks.

When the concrete cracks and water enters the gaps, it comes into contact with the bacteria and the food source, setting the healing process off. The bacteria then feed on the **calcium lactate**, joining the calcium with carbonate to form limestone, fixing the crack.

This sounds quite good but we also have to take care of the **cost**. The process has been proven to work effectively, and can even be added to a liquid that could then be sprayed onto existing buildings. It is currently twice the cost of traditional concrete. This is mainly due to the price of the calcium lactate, and if they can get the bacteria to use a sugar-based nutrient instead, the price would be dramatically reduced.

This great invention can change present scenario. Bio Concrete (self-healing material) being used in bridges, tunnels, roads and other buildings, with the bacteria laying dormant for centuries and only 'coming to life' when needed[9].

This is also known as '**living concrete**' as it heals its cracks like the human body. In the future, we may be surrounded by concrete structures, which are able to self-heal cracks in their

structure, with special bacteria doing the job for us. This new self-healing concrete is being trialed in the UK.

OVERVIEW

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Intelligent transportation systems usually refer to the use of information and communication technologies (rather than innovations in the construction of the roadway) in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport.

Despite new innovations being injected into energy-efficient cars, the same doesn't seem to apply for the roads they drive on[6]. But this looks all set to change with smart technologies signaling the roads of our future will look very different.

From solar powered roads and law enforcement drones to glow-in-the-dark motorways; we explore the ways in which technology might change our roads in years to come.

With the steep increase in car numbers over recent years, there is an increasing need for efficient traffic management, to avoid traffic jams and optimize traffic flow, especially at intersections. A conventional way to regulate traffic flow is through the use of traffic lights. These typically have fixed switch interval times (i.e., from red to green and to yellow), which are not adjustable to traffic conditions. Traffic jams have significant impacts on fuel consumption due to the frequent starts and stops, as well as increased carbon emissions[7]. An adaptive scheme, dependent on traffic conditions, is more attractive. In this context, a method to estimate the number of cars approaching an intersection could generate information for switch interval times to be dynamically adjusted based on traffic conditions. For such an intelligent system to be realized, efficient methods to detect traffic (i.e., count the number of cars) are required. Approaches where traffic lights and stop signs are completely removed have also been proposed, as described. Such an approach is based on an intelligent intersection where vehicles, which are wirelessly connected to each other, can communicate with each other and use decision-making for collision avoidance. Using a time-slot for each vehicle, crossing of intersections is coordinated amongst vehicles. A vehicle which misses its time-slot has to stop when it reaches the intersection and wait for a new time-slot. The wireless communication can be performed through RFID[8], as proposed in. In a system to control a vehicle's speed autonomously based on the traffic signs is described. RFID was used for communication between the vehicle and traffic signs, with RFID tags placed on traffic signs and RFID readers placed on the side of the doors of the car, and a Hall Effect sensor placed on the vehicle's wheels for speed control.

Less intrusive (but not as accurate) and more sophisticated methods involve video cameras. These approaches are more attractive mainly because cameras can be easily installed and the level of required maintenance is low, compared to previously described approaches. Furthermore, in instances where there is surveillance cameras installed, these can be used for intelligent transportation applications. A wireless real-time traffic monitoring system. The system consists of multiple standard CCTV cameras and personal computers (PCs), which process the captured data from the cameras[9]. Each camera is controlled by the PCs, and each PC implements all the necessary algorithms for recognition and tracking. The system was tested in different environments, such as airports and tunnels. One of the drawbacks of computer vision-based methods is their performance dependency on environment conditions, such as lighting and occlusions. Dealing with occlusions or weather conditions is challenging in computer vision, so such scenarios have to be handled with care. For instance, in the presence of fog or rain, vehicle detection or counting is more challenging. For night-time scenarios, street

lamps and vehicle lights also have to be considered. In particular, street lamps, traffic lights can be used for vehicle sensing.

TECHNOLOGY

The automated highway system is defined as "A Lane or Set of Lanes" where specially equipped cars, trucks and buses could travel together under computer control. It is one aspect of intelligent transportation systems (ITS), which apply electronics, computers and control technology developed for aviation, the space program and defense to the improvement of highways, vehicles and public transportation. Automated highway systems shown in figure 2 combine magnetic sensors, computers, digital radio, forward-looking sensors, video cameras, and display technologies.



Fig2. Automated Highway System

Various combinations of these technologies [9] are being applied in different pilot tests: -

Magnetic sensors: Magnetic sensors could be imbedded along the highway lanes. Magnetometers under the car's bumpers would sense the magnets and automatically keep the cars in the center of the lane.

Networked Computers: The system would not rely on a central computer to direct the movement of all vehicles. Rather, networks of small computers would be installed in vehicles and along the sides of roadways to coordinate the flow of traffic.

Digital radio: Digital radio equipment in each car would allow the computer on board to Communicate with other vehicles in the vicinity and with supervisory computers monitoring the roadway.

Forward-looking sensors: Using radar or an infrared laser, these sensors would detect dangerous obstacles and other vehicles ahead.

Video cameras: Linked to computers that process images rapidly, video cameras could detect dangerous obstacles and other vehicles ahead. They could also be used along with or instead of magnets to track lane boundaries.

Visual Displays: Mounted on the dashboard or projected onto the windshield, it would give the driver information about the operation of the vehicle.

Sensing Platforms

With the advent of ubiquitous sensing, various devices and platforms are currently available for this purpose. Although ideas to implement these platforms have been around for decades, only recently have these systems been feasible from a cost perspective, driven by reduced manufacturing costs as well as low-cost electronic components such as radio transceivers, microcontrollers, microprocessors and sensors. Sourcing these components in bulk becomes

increasingly less expensive as technology progresses. Sensor nodes can be interfaced to a number of sensors[8]. The most common include humidity, light and temperatures sensors. These platforms are built in such a way that the sensed data is collected by the sensors, sometimes pre-processed, and then transmitted to a sink node via other sensor nodes; hence they are usually set up in a network, also known as a **Wireless Sensor Network (WSN)**.

SMART PAVEMENT

Smart roads use Internet of Things (IoT) devices to make driving safer, more efficient, and greener. Smart roads combine physical infrastructures such as sensors and solar panels as shown in figure 3. Smart road technologies are embedded in roads and can improve visibility, generate energy, communicate with autonomous vehicles, monitor road conditions[2]. Few examples are:

- **IoT connectivity:** Cities can connect roads to IoT devices, and gather traffic and weather data. This type of connectivity can improve safety, traffic management, and energy efficiency.
- **Traffic management networks:** For improving safety and reducing congestion. The network uses speed cameras to provide warning signs for hazardous conditions, and sends automated traffic diversion signals that control traffic.
- **Traffic lights optimization:** Systems that use data from closed-circuit television (CCTV) cameras or smart vehicles to optimize traffic lights and update commuters on jams or bottlenecks.

Most transport-related smart tech focus on individual vehicles, although there have been major advances in technological solutions for smart infrastructure at scale. Worldwide experiments in Vehicle to Infrastructure (V2I), Vehicle to Vehicle (V2V) and Vehicle to Pedestrian (V2P) technologies are expected to make urban transport smarter.

- **Interactive lights**

Road Lights Activated By Motion Sensors to Illuminate a Particular Section of the Road as a Car Approaches. The lights dim once the car passes. Suited for roads with less traffic, interactive lights provide night visibility as needed and reduce energy wastage when there are no cars. One design, developed by the Dutch Studio Roosegaarde, uses wind generated by passing vehicles to power lights.

The Missouri Department of Transportation (MoDoT) began testing out “smart pavement” at a rest stop outside of Conway, Missouri along historic Route 66 late in 2016. The pilot program currently covers about 200 square feet of sidewalk at the visitor center and cost \$100,000 (Landers), largely subsidized by the Federal Highway Administration. It’s all part of Missouri’s Road to Tomorrow initiative to find new innovations in their transportation infrastructure. Missouri wants to take advantage of these roadways to implement other, related technologies. The panels will heat the road and keep snow and ice from accumulating. They will also feature LED diodes that will increase the visibility of road lines[7]. The LEDs would also double in helping prevent paint from inhibiting solar power generation. The panels have not had enough time to determine durability, energy efficiency, or cost effectiveness in a real world sense yet, so MoDoT has not reach any conclusions about feasibility and future application yet.

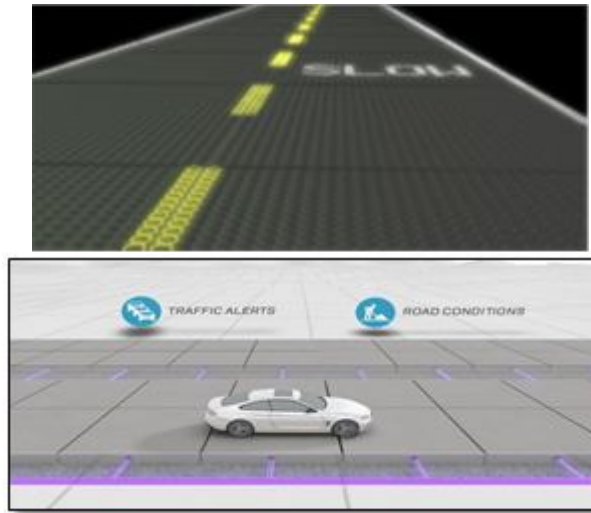


Fig3 . Smart Pavement

Merits

- Smart highways are a crucial link in improving road transportation landscape in the country.
- It is a splendid solution for less-travelled highways, providing night visibility on demand and proving the best for road safety.
- It promises to fight against congestion and carbon emissions and can serve as viable sources of renewable energy.
- It can yield significant improvements in the driving experience.

Demerits

- High initial cost.
- Seasonal Efficiency
- High Maintenance Cost
- Seasonal efficiency

Technologies to be implemented for Environment sustainability When it comes to environment conservation, various transportation technologies which is must have to be adopted such as: Electronic Road Tolling This would enable in reduced waiting time, increased mobility and reduced fuel consumption. Advanced Driver Assistance System This would increase the safety of vehicle mobility, driver would be assisted on demand irrespective to time for any situation and hence the emergency time can be tackled easily. Human machine interface onboard This would enhance and involve the human with the intelligent transportation system, and there will be much interactive way of communication between human and machines. Vehicle to vehicle communication system This would lead to safe understanding between vehicles and infrastructure and increase mobility based on the knowledge of surrounding infrastructure.

CONCLUSION

Advancement of sensing in smart road was discussed. Arrays of applications in smart road which can benefit from advanced sensing were described. These include infrastructure health

monitoring, electricity and water distribution systems, transportation systems and surveillance, amongst others. The state of the art in each of the considered applications is reviewed and inherent challenges are highlighted. In a world where carbon emissions have to be reduced for greener living and sustainability is promoted, there are a still many challenges to be resolved.

It is evident that the evolution of technology will play a major role in advanced sensing, as the evolution of hardware required for sensing applications will certainly be driven by these technological advances. Even though there are pilot projects for smart road, there are various challenges. These challenges require a holistic approach for solving, which will involve multi-disciplinary collaborations. For instance, standardization efforts should consider all involved parties, such as municipalities, utilities and other services providers so that unified solutions in terms of sensing and communication infrastructures are put in place. It will be inefficient to have separate infrastructures (in terms of sensing platforms), but it will also be challenging to unify these services under a single infrastructure

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GROUND IMPROVEMENT USING ENCASED STONE COLUMN

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ABSTRACT

There are different ground improvement techniques that are present to strengthen the weak and soft soils based on the kind of application. One among the foremost extraordinarily used ground improvement techniques may be a stone column technique for weak and soft soils. During this article, experiments on three varieties of stone columns have been performed. Firstly experiment on unreinforced column installed in sand, secondly Experiment on vertically reinforced column installed in sand and thirdly experiment on Horizontally reinforced stone column installed in sand have been performed. This paper studies the results of geosynthetics reinforcement which is provided to the stone columns i.e. vertically reinforced and horizontally reinforced and the failure mechanism of stone columns in all the three conditions is determined. The experimental have been been performed. The results shows that the stone columns which is reinforced proved to be more effective in increasing the bearing capacity of the soil in comparison with the stone columns which is unreinforced. The results also showed that the bearing capacity of horizontally reinforced stone column is proved to be more than that of vertically reinforced stone columns. Also, the failure mechanism in all the three cases is due to bulging.

INTRODUCTION

Stone columns is a ground improvement technique which is used to increase the load bearing capacity of the soil and it also reduces settlement. Stone columns is mainly used in improving the ground properties. Installation of stone column can be done by using replacement method, displacement method and rammed column method. This paper deals with the ground improvement technique which is being done by using stone column and their failure mechanism is analysed. To increase the strength of the stone columns reinforcements is provided.

Stone columns is widely used as a ground improvement technique for weak and soft soils. When load is applied to the structures, the columns gets deformed and settled into the soil. Due to the deformation of the stone column the failure occurs due to bulging of the stone columns. The strength of the stone column is achieved by the movement of lateral earth pressure of the surrounding soil. Reinforcements are used to acquire strength in case of terribly weak and soft soil. Thus we found that loose specimen shows higher reduction in volumetric strain as compared to the dense one (Wu and Hong,2009). From the obtained results we also came to know that while introducing the reinforcement to the columns, the load carrying capacity of the stone columns is increased by 3-5 times. The study shows that bulging length of the reinforced stone column is reduced up to 50% than that unreinforced stone columns. With the help of this technique load carrying capacity of soil is increased and it reduces settlement. This technique is mainly used due to its low cost and versatility.

Experimental Program

For this experiment, three unit cells have been designed of isolated stone columns by varying the arrangements of the reinforcements. The following tests on soil sample specific gravity,

particle size distribution and $c-\Phi$ limits, the aggregates particle size distribution was carried out. For modeling of stone columns, two model tanks of 300mm X 300mm X 550mm were made, three faces of iron and one face of acrylic sheet were created. The Fig. 1. shows the Schematic view of isolated stone column.

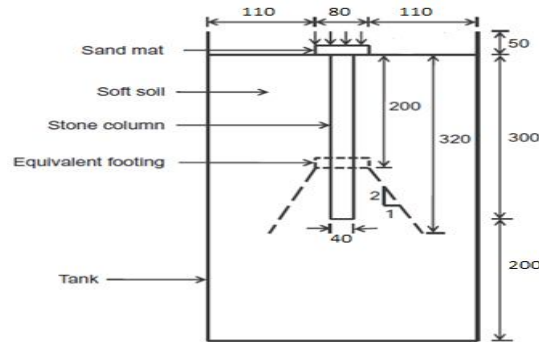


Fig. 1. Isolated stone column Schematic view

Properties of Materials

Soil

The soil which is used was procured from Jaypee University of Information Technology. The Direct shear test, Moisture content test, Specific gravity test, Proctor compaction tests on soil are conducted & their consolidated results are shown in Table1.

Properties	
C	0.02 kg/cm sq.
Φ	20 degree
Water Content	3.44%
Specific Gravity	2.65
OMC	8.40%
Dry Density	1.6 g/cc

Table 1. Tests results conducted on the soil.

The sieve analysis or gradation tests have been performed for the evaluation of particle size distribution of granular material by allowing the material to pass through the sieve which is arranged in decreasing order of 10 mm, 4.75mm, 2.36mm, 1.18mm, 600 microns, 300 microns & 150 microns. the amount of material which is passed & retained on the sieve & corresponds to that graph is plotted. the soil sample which is used in the testing is sandy soil. Particle size distribution curve of soil sample is shown in Fig. 2.

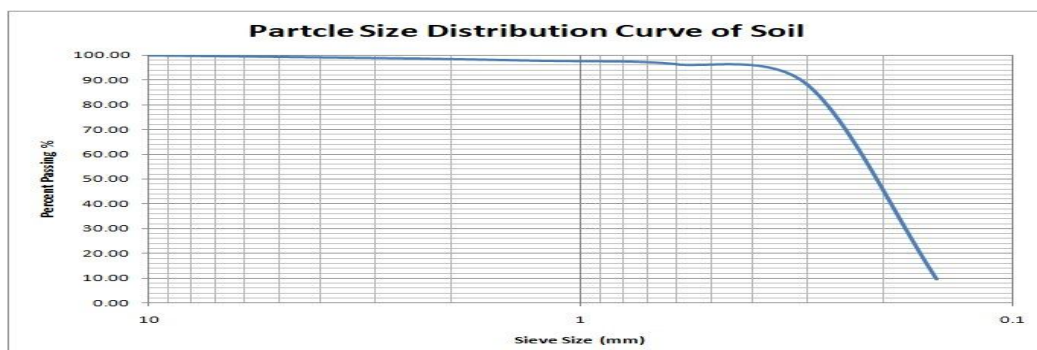


Fig. 2. Particle size distribution curve of soil sample

Aggregates:

The aggregates used for the experimental testing of the stone column could be between 6mm-40mm (K. Ali et al 2014). The aggregates passing through 10mm sieve is chosen. The aggregates which is taken is 25% of the aggregates, retained on 10mm sieve & 63% of the aggregates, retained on 4.75mm sieve as shown in Fig. 3.



Fig. 3. Aggregates

Geotextile:

Geotextile is used for providing separation, Soil reinforcement, filtration of soil particles, drainage and an amalgamation of these functions. This paper deals with the use of Geotextiles as reinforcement. Geotextiles is a permeable fabric which is used in association with soil, the ability to separate, filter & drain. The Geotextile which is used for the testing or for reinforcing the stone column is Woven Polypropylene Geotextile which can bear high amount of load but it is not porous hence it is poor in drainage. The Geotextile is used in roads, airfields, reservoirs and retaining walls. These Geotextiles improve soil strength at a lower cost and they also allow planting on steep slopes. The properties of Geotextile is shown in Table 2.

S.No.	Property	Particular	Unit	Test Method	Quality No.
1	Tensile Strength	WARP	kN/m	IS 1969	45
		WEFT	kN/m	IS 1969	34
2	Elongation at Break	WARP	%	IS 1969	30
		WEFT	%	IS 1969	28

Table 2. Properties of Geotextile (Woven Polypropylene)

Construction of stone column

The behaviour of stone column, their resultant effects on ground and its properties are find out by casting the isolated floating stone column. In order to minimise the induced stresses at tank boundaries, such boundaries are selected which do not affect the behaviour of stone columns. The area replacement ratio is taken as 25% (K.Ali et al. , 2013). By using isolated stone column approach greater area in comparison with stone column is loaded. As horizontal stresses at the lateral boundaries of column is increased due to loading the surroundings of the columns(Castro, 2017).

In construction of unreinforced stone column firstly soil is filled in layers and each layer is having the thickness of 10cm. 15 number of blows is provided to each layer with the help of rammer in order to compact the soil. When soil is filled up to the height of 20cm a hollow cylindrical pipe is inserted in the model tank. Casting of 8stone column is done simultaneously until a height of 50 cm is reached. Aggregates are also filled in layers, tamping rod is used to compact the aggregates lightly. As aggregates are filled up to the top level of the tank the pipe is withdrawn simultaneously.

In construction of vertical reinforced stone column, a geotextiles encasement is to be provided. The encasement is stitched to size of cylindrical pipe. The soil is filled in successive layers having thickness 10cm each. Compaction is done in same manner as done in case of unreinforced stone column. As the filling of soil is reached to a height of 20cm, the pipe is inserted. The pipe enclosed with geotextile is placed in the tank. Grease is applied to the external sides of the pipe to minimise the friction. After pouring the aggregates a tamping rod is used and it is gently tamped. While tamping pipe is withdrawn simultaneously. As a result of this procedure geotextiles acts as a sac to hold the aggregates. In construction of horizontal reinforced stone column, a circular discs having diameter of 4cm is cut out from the geotextiles. The distance between two adjacent discs is 3cm. The spacing is chosen very carefully because increase in the strength of the stone column is dependent upon the spacing. As the spacing between the discs is decreased higher strength is achieved. The pipe is marked at every 3cm with a paint so as to place the disc according to specified spacing. Disc having diameter 4cm were cut out from geotextile. Placing of pipe in soil is done up to a height of 20cm from bottom. Aggregates are filled and tamping is done. After that circular discs are placed at each marked point with the help of a pipe, pipe is so chosen that the diameter of the pipe is smaller than the diameter of the casting pipe as shown in Fig. 6. Withdrawal of the pipe is done simultaneously.

Test Procedure

After the construction of stone column, the load settlement behaviour of the stone column was studied by applying the load in vertical direction. While Loading a stone column an iron cylinder of diameter 80 mm and height 20 mm is used for testing. The testing cylinder's diameter was chosen such that the dimension of the tank is 3-5 times the diameter of the loaded area. This is done to ensure that the tank walls do not exert any forces on the column. Universal Testing Machine(UTM) is used for the testing of stone column. UTM is the machine which is used to test the tensile and compressive strength of material. Load is applied continuously at a rate of 1kN/min. until 60mm settlement is reached. Analysis of strength increment is done while comparing the columns. The effect of varying reinforcement arrangements is to increase the bearing capacity of soil which results in the failure of stone column at different loads. In case of floating stone column when development of significant hoop stresses takes place, early penetration of soil is experienced. Failure pattern of stone column is studied with the help of excavation of columns after loading. The expected failure pattern is found due to bulging at neck (K.Ali et al, 2013). In Unreinforced Stone columns partial excavation is started from the time of possible disintegration of unreinforced stone column as a result of complete excavation as shown in Fig. 4.(a). Failure pattern is studied by measuring the perpendicular distance between the neck and at the bottom of the column from the wall. The observation made from Fig. 4.(b), value of perpendicular distance between the neck of the column and wall of the tank comes to be 14cm. On the other side 15cm is the observed distance between the bottom of the column and wall of the tank. The results made from above observations shows, failure due to bulging is experienced by stone column as later distance is more than the former one. In Vertically Reinforced Stone Column the disintegration of stone column is prevented as reinforcements behaves as sac. Excavation of stone column is carried out, it starts from top and proceeds further towards bottom of model tank. The failure pattern of vertically reinforced stone column takes place due to bulging at neck is shown in Fig. 4.(c). In excavation of Horizontal Reinforced Stone Column is carried out in same manner as that for vertical reinforced stone column. After some time disintegration of stone column takes place and the imprint left behind the surrounding soil is used to study the failure pattern. The same is shown in Fig. 4.(d). Thus its proved that the failure in all the three types of stone column occurs due to bulging at neck as ascertained by K.Ali et al, 2013. This failure pattern is according to Wood et al, it shows that the stone column bulge more in the higher zone of soil as

the area replacement ratio is increased, after that load is transferred to a greater depth. Before the bulging failure, a floating column could fail at end bearings, as underlying layer is weak. Thus in actual practice the most dominant failure mechanism is bulging, in case of sub surface conditions

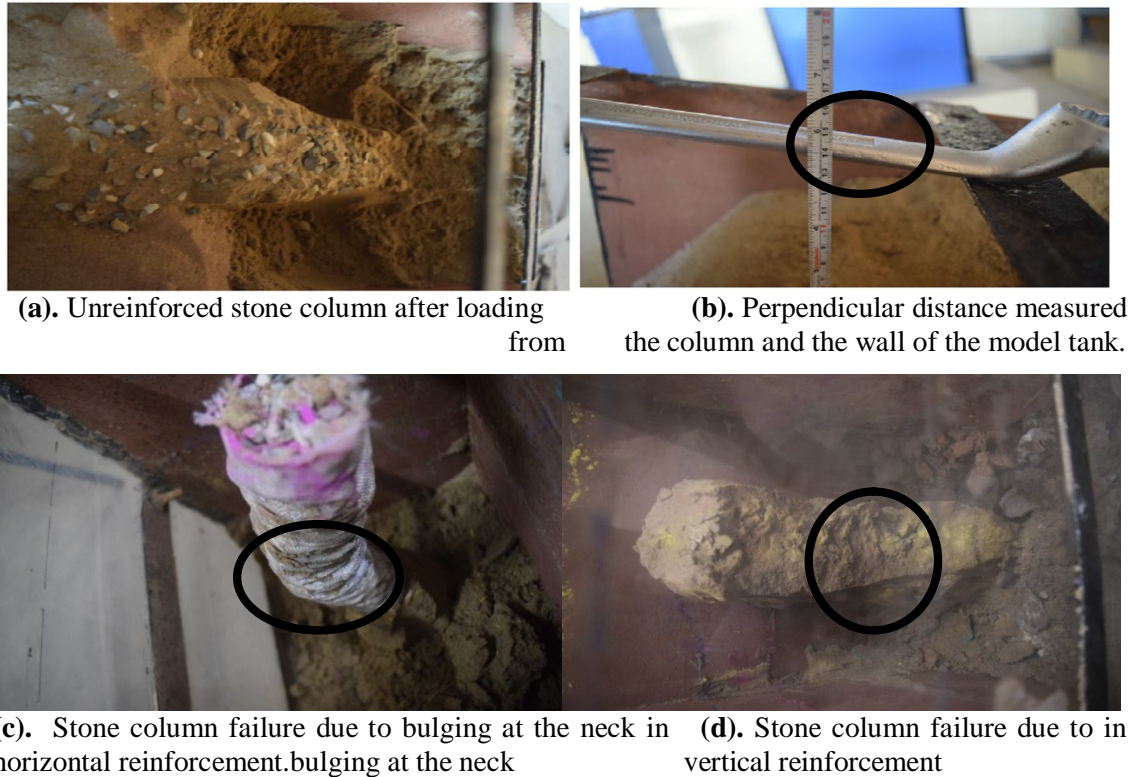


Fig. 4.

Model Testing Results

Bulging at neck is the main reason of failure in all the three stone columns. The main reason of penetration in case of floating columns is due to applied vertical stress. The significant failure of stone column is observed due to the net outward force and thus it causes bending(K.Ali et al, 2013). The failure of unreinforced stone column is found to be at lower load when compared with reinforced stone column, hence bearing capacity is increased with lesser amount. This happens as a result of geotextiles transfers load to the edges likewise to the bottom of the tank by developing the hoop stresses and by mobilizing friction.

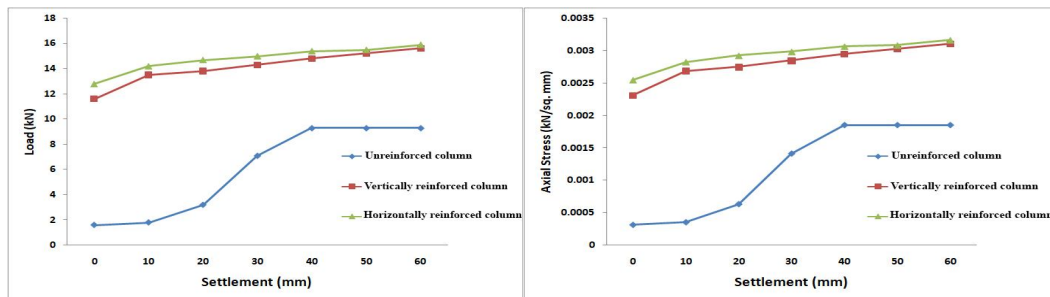


Fig. 5.

The Fig. 5. shows the behaviour of load versus settlement and variation of axial stress versus settlement for various stone columns. The settlement of unreinforced stone columns is experienced terribly early under a loading of 2 kN and axial stress of under 0.5 kN/mm sq. When the settlement is about 40mm, the unreinforced stone column experienced 9.8 KN load and a axial stress of 1.9 kN/mm sq. Therefore, the column constantly starts experiencing settlement without bearing any load. As the graph between the load and axial stress becomes constant, it shows that failure of unreinforced stone column occurs at a loading of 9.8 kN. In case of vertically reinforced stone column, it does not experience any settlement upto a load of 9.8 kN and at a axial stress of 2.3 kN/mm sq, beyond this column starts settling. At a loading of 15.8 kN and at a axial stress of 3.1 kN/mm sq a settlement of 60mm is achieved, the vertically reinforced stone column does not fail as unreinforced stone column does. Hence this shows that the bearing capacity of the soil for vertically reinforced stone columns is more than that of the unreinforced stone columns. In case of horizontally reinforced stone columns with equidistance circular discs, does not experience settlement upto a load of 12.5 kN and a axial stress of 2.5 kN/mm sq. At a loading of 15.9 kN and at a axial stress of 3.2 kN/mm sq. settlement of 60mm is achieved. The horizontally reinforced stone column does not fail as vertically reinforced stone column does. Hence this shows that the bearing capacity of the soil for horizontally reinforced stone column using circular discs is more than that of vertically reinforced stone columns. Various studies on soils like clay shows that(K.Ali et al, 2013 and Murugesan et al, 2007), the bearing capacity of the soil for vertically reinforced stone column is more than horizontally reinforced stone column. However in our case soil is sandy in nature, the bearing capacity of the soil having horizontally reinforced stone column is more than that of vertically reinforced stone column.

Stone Column	Load Applied (kN)	Axial Stress (kN/mm ²)
Unreinforced stone column	9.8	0.002
Vertical reinforced stone column	15.8	0.003
Horizontal reinforced stone column	15.9	0.003

Table 3. Results acquired from model testing and Finite element modeling

CONCLUSIONS

The following conclusions have been made on isolated stone columns for unreinforced stone column, vertically reinforced stone column and horizontally reinforced stone column from model testing and numerical modeling.

1. From model testing results increment in bearing capacity of 61.2% for Vertically reinforced stone column and 62.2% for Horizontally reinforced stone column is achieved.
2. The stiffness improvement factor of **87.72** for vertically reinforced column and **103.6**. for horizontally reinforced column is achieved.
3. For sandy soils Horizontal reinforcement is more effective for stone columns as a ground improvement technique.

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BIOFERTILIZER POTENTIAL OF FARM POND ALGAE ON SEED GERMINATION AND SEEDLING GROWTH IN *CUCUMIS SATIVUS* L. USING AQUEOUS AND COW URINE EXTRACTS.

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ABSTRACT-

*Agriculture has been a main contributor in the GDP of the country and it also provides a major source of income to around 70 percent of population. In the process of increasing the food grain production from agriculture, the green revolution technologies have put tremendous pressure on health and environment. Hence, the alternative sources of fertilizers can be promising solution. Present study reflects upon the use of farm pond algae as biofertilizer on seed germination and seedling growth of *Cucumis sativus* L. Two algal samples were tested with aqueous and cow urine extract on the seed, germination, shoot length, root length and total height of *Cucumis sativus* L. Promising results have been reported using algal extracts over control in both the samples. However, the algal cow urine extract has shown better results over algal aqueous extract.*

Keywords- Farm pond algae, algal biofertilizer, cow urine extract, *Cucumis sativus* L

INTRODUCTION

Seventy percent of India's rural population is dependent primarily on agriculture for their livelihood. The total food grain production of Indian agriculture in the year 2018-19 was 283.37 million tonnes which was instrumental in GDP of the country. The ultimate goal of agriculture is to meet the increased food demand by boosting agriculture productivity. The green revolution technologies like chemical pesticide and fertilizer application in agriculture have achieved the desired level of food production. However, the long lasting impacts of chemical inputs in the agriculture have drawn attention of the policy makers. Occupational and environmental exposure to pesticides results in a range of health issues. Long term exposure to pesticides is linked to changes in the hormones, reproductive problems, suppression of immunity and deadly cancer in the human being (Yadav and Dutta, 2019). The direct and indirect transmission of pesticides in the corns and vegetables affects human health directly. Many diseases are induced due to pesticide (Asghar *et.al.*, 2016).

The nitrogen fertilizers that are not absorbed and then pollutes groundwater, results in an increase in nutrients and leads adverse effects on the overall quality of the environment. (Glibert *et.al.* 2006; Howarth 2008). The water containing nitrate can immobilize hemoglobin of blood. Researchers across the world have reported that the detrimental agricultural habits and excessive use of the chemicals have allowed the contamination of the food chain and the environment. (Wimalawansa and Wimalawansa, 2014). The pesticide and fertilizer use are altogether contributing to the large scale morbidity and mortality every year.

Hence, the researchers are looking for the sustainable and reliable solution in the agriculture. In this view, an attempt was made to test the potential of farm pond algal fertilizer on the seed germination and seedling growth in *Cucumis sativus* L. using Aqueous and Cow Urine extracts.

MATERIAL AND METHODS

Experimental Material- Seeds of *Cucumis sativus* L., freshwater algae and cow urine was collected from local sources. Two samples of algae were collected from two farm ponds at village Sawargaon Tal, Tal-Sangamner (named as Sample 1) and Village Wakadi, Tal- Rahata (named as Sample 2) of Ahmednagar district, Maharashtra, India.

Preparation of Algal Extract - The algae was dried and powdered (C. Kalaivanan *et.al.* 2012) for preparation of algal extract. The algal extracts were prepared in the concentrations of 1 %, 5 %, 10 %, 15 %, 20 % and 25 %. The distilled water was used as control. (Bhosale *et. al.*,1975). Same concentrations were prepared using cow urine for both samples and only cow urine was treated as control.

Seed Treatment- The seeds of *Cucumis sativus* L. were soaked in various aqueous/cow urine algal extracts of Sample 1 and Sample 2 and control for 24 hrs.

Germination Study - Paper Towel method was used (ISTA Rules, 1966) to study the effect of different algal extracts on seed germination and early seedling growth. The experiment was conducted in triplicate.

Study Parameters - The Study parameters measured are seed germination in percentage, Root length, Shoot length and total height of seedling in centimeters.

RESULTS AND DISCUSSION**Effect of algal extract on Seed Germination in *Cucumis sativus* L.**

The algal aqueous extract of sample 1 reported minimum seed germination 80 percent at 5 % and maximum seed germination 92.2 percent at 15 %. The algal cow urine extract of sample 1 reported average minimum seed germination 80 percent at control and maximum 93.3 percent at 15 %. In algal aqueous extract of sample 2, minimum seed germination was observed between 78.9 percent at control and 1 % and 88.9 percent at 15 %. The algal cow urine extract of sample 2 reported the seed germination range from 88.9 at 1 % and control and 95.6 percent at 15 %. (Table 1)

Table 1- Effect of algal extract on percent seed germination in *Cucumis sativus* L.

		Percent Seed Germination									
		Algal Aqueous Extract					Algal Cow Urine Extract				
	Algal Conc ⁿ	Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	70	86.7	90	82.2	0.38	76.7	83.3	86.7	82.2	0.38
	5%	63.3	90	86.7	80	0.4	76.7	83.3	90	83.3	0.37
	10%	53.3	96.7	96.7	82.2	0.38	80	93.3	93.3	88.9	0.32
	15%	80	96.7	100	92.2	0.27	90	93.3	96.7	93.3	0.25
	20%	70	93.3	96.7	86.7	0.34	83.3	90	93.3	88.9	0.32
	25%	73.3	93.3	93.3	86.7	0.34	76.7	86.7	90	84.4	0.36
	Control	73.3	90	86.7	83.3	0.37	73.3	80	86.7	80	0.4
Sample 2	1%	80	70	86.7	78.9	0.41	90	90	86.7	88.9	0.32

	5%	83.3	76.7	80	80	0.4	90	93.3	90	91.1	0.29
	10%	83.3	80	83.3	82.2	0.38	93.3	93.3	90	92.2	0.27
	15%	83.3	83.3	100	88.9	0.32	96.7	96.7	93.3	95.6	0.21
	20%	80	76.7	90	82.2	0.38	96.7	90	86.7	91.1	0.29
	25%	80	83.3	90	84.4	0.36	90	93.3	90	91.1	0.29
	Control	80	73.3	83.3	78.9	0.41	90	86.7	90	88.9	0.32

Hence, the results revealed that the 15 % algal and cow urine extract showed maximum seed germination of *Cucumis sativus* L. as compared to other concentrations under study. The algal cow urine extract of sample 1 had shown 1.1 % more germination at 15 % concentration as compared to algal aqueous extract; however the algal cow urine extract of sample 2 has 6.7 % more germination than the algal aqueous extract. The results are similar to that of reported by various researchers who noted significant increase in the percent seed germination followed by treatment of seed using algal extract. Enhanced seed germination in *Medicago sativa* L. was reported by Brahmhatt and Kalasariya in 2015 after soaking the seeds soaked algal extract of fresh water algae. Noteworthy promotive effects were reported in the germination of seeds treated with 5 % extract of *Chroococcus* sp. by Pandey *et. al.*, 2013. Maximum seed germination in the okra at 5 % concentration of sea weed liquid fertilizer is reported by Divya *et. al.*, in 2015.

Effect of algal extract on shoot length in *Cucumis sativus* L.

The shoot length for *Cucumis sativus* L. in algal aqueous extract for sample 1 was from 5.54 cm at 1 % to 8.27 cm at 15 %. On the other hand the algal cow urine extract showed the shoot length ranging from 7.4 cm at 1 % to 12.33 cm at 15 %. (Table 2)

Table 2 – Effect of algal extract on shoot length in <i>Cucumis sativus</i> L.											
		Shoot Length in cm									
		Algal Aqueous Extract					Algal Cow Urine Extract				
	Algal Conc ⁿ .	Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	3.92	4.58	7.8	5.54	2.71	6.91	6.52	8.67	7.4	3.37
	5%	3.66	6.35	7.79	6.18	2.62	7.89	9.21	11.03	9.46	3.37
	10%	4.34	6.91	8.48	6.97	2.67	7.4	9.11	12.12	9.65	4.09
	15%	5.47	9.3	9.5	8.27	3.19	10.93	13.37	12.63	12.33	2.96
	20%	6.09	7.16	8.44	7.35	2.5	9.2	10.31	10.18	9.92	2.99
	25%	5.41	6.69	7.83	6.74	2.68	7.04	10.11	9.99	9.14	3.22
	Control	5.58	7.62	8.3	7.26	2.54	8.74	10.4	8.82	9.32	3.83
Sample 2	1%	8.03	5.21	6.07	6.48	3.1	10.86	9.59	10.08	10.18	3.39
	5%	7.68	6.8	6.06	6.86	2.81	10.99	9.89	11.16	10.67	3.42
	10%	8.32	6.3	7.94	7.54	2.33	12.4	10.88	10.9	11.4	2.78
	15%	9.76	8.73	8.17	8.84	3.01	13.6	11.39	11.86	12.29	3.07

	20%	8.68	7.13	8.35	8.08	2.49	11.9	10.35	11.36	11.22	2.55
	25%	8.05	6.9	6.74	7.21	2.96	10.81	10.57	10.93	10.77	3.48
	Control	9.48	7.34	9.07	8.67	2.78	10.38	8.9	9.66	9.66	2.95

The shoot length in sample 2 was ranging from minimum 6.48 cm at 1 % and maximum was 8.84 at 15 %, however in cow urine extract of sample 2 shoot length was 9.66 cm at control and 12.29 cm at 15 %. In this experiment, it was reported that the maximum shoot length for *Cucumis sativus* L. was 12.33 at cow urine extract of sample 1 which is 49.09 % more than the algal aqueous extract. In the same way, the cow urine extract of sample 2 also reported 39.02 % more shoot length in *Cucumis sativus* L. Arun *et.al*, 2014 reported 60% concentration of seaweed liquid fertilizer to be more effective in enhancing the shoot length. Pandey *et.al*, 2013 mentioned stimulating effect on roots and shoots in Okra seeds treated with 5% extract of *Chroococcus* sp.. The shoot length of okra was reported to be increased due to stimulatory effect of seaweed as mentioned by Divya *et.al*, 2015.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	2543.08	6	423.85	25.16	0.00	0.06
Extract	5762.41	1	5762.41	342.11	0.00	0.12
Algal Concentration * Extract	318.33	6	53.05	3.15	0.00	0.01
Error	42209.80	2506	16.84			
Total	196673.19	2520				
R Squared = .170 (Adjusted R Squared = .165)						

For the shoot length of *Cucumis Sativus* L. from the two way ANOVA (Table 3) we see that there is a significant interaction between Algal concentration and Extract, $F(6,2520) = 3.15$, $p = 0.00$ so we moved ahead to extract the simple effects of the variable i.e. Algal concentration on Extract (Aqueous vs Cow Urine).

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	976.37	6	162.73	11.97	0.00	0.05
Error	17027.30	1253	13.59			
Total	64815.22	1260				
R Squared = .054 (Adjusted R Squared = .050)						

For the shoot length of *Cucumis Sativus L.* from the ANOVA (Table 4) we see that Algal concentration for Aqueous extract was significant, $F(6,1260) = 11.97$, $p = 0.00$, $np2 = 0.05$. The post hoc test with Tukey HSD indicated that the 15% was significantly different from 1%, 5%, 10%, 20%, 25% and Control.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	1885.05	6	314.17	15.63	0.00	0.07
Extract	25182.50	1253	20.10			
Total	131857.97	1260				

R Squared = .070 (Adjusted R Squared = .065)

For the shoot length of *Cucumis Sativus L.* from the ANOVA (Table 5) we see that Algal concentration for Cow Urine was significant, $F(6,1260) = 15.63$, $p = 0.00$, $np2 = 0.07$. The post hoc test with Tukey HSD indicated that the 15% was significantly different from 1%, 5%, 10%, 20%, 25% and Control.

Effect of algal extract on root length in *Cucumis sativus L.*

Minimum root length was 6.82 in 1 % and maximum was 10.13 cm in 15 %. On the other side, average minimum root length in this experiment was 6.18 cm at control and average maximum root length was 9.95 cm at 15 %. (Table 6)

	Algal Conc ⁿ	Algal Aqueous Extract					Algal Cow Urine Extract				
		Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	5.95	6.25	8.1	6.82	2.77	6.38	6.14	7.46	6.68	2.65
	5%	4.75	7.54	12.99	8.83	4.85	6.36	8.19	10.03	8.29	2.57
	10%	5.59	9.1	13.32	9.99	4.19	6.85	8.89	10.35	8.79	3.88
	15%	7.36	8.91	13.51	10.13	3.72	9.2	8.52	12.04	9.95	3.57
	20%	7.95	9.96	11.05	9.82	3.31	7.62	6.07	12.45	8.79	3.87
	25%	7.08	9.0	9.95	8.8	3.33	6.75	8.72	9.74	8.48	2.37
	Control	6.9	8.91	8.05	8.02	2.86	4.43	7.6	6.34	6.18	3.29
Sample 2	1%	8.57	7.96	11.27	9.38	3.8	9.53	8.8	9.03	9.12	3.01
	5%	13.24	11.01	11.41	11.92	4.84	10.57	9.54	9.17	9.75	3.14
	10%	13.34	11.28	9.64	11.42	4.03	11.19	10.07	9.6	10.29	2.93
	15%	12.72	11.12	14.04	12.71	3.66	11.58	10.02	11.16	10.92	3.18
	20%	10.88	11.18	9.69	10.54	3.15	9.96	10.33	10.57	10.27	2.4
	25%	9.31	11.68	8.76	9.89	3.4	9.52	9.93	10.81	10.08	2.24
	Control	9.71	10.2	10.32	10.08	2.86	9.7	9.23	9.37	9.44	2.35

The algal aqueous extract of sample 2 showed a root length between 9.38 cm at 1 % and 12.71 cm at 15 %. Algal cow urine extract of sample 2 showed root length between 9.12 cm at 1 % and 10.92 cm at 15 %. The algal aqueous extract of sample 1 showed 1.8 % extra growth in root of *Cucumis sativus* L. as compare to cow urine extract however it was 16.39 % in sample 2. Various other researchers also reported similar results in various crops using different algal concentrations. The study conducted by Divya *et.al.*, in 2015 reported the stimulating effect of seaweed liquid fertilizer on root length in Okra. They observed maximum root length of 15.26 ± 0.60 cm in Okra after application of seaweed fertilizer. The results are also in conformity with Panday *et.al.*, 2013 where they reported the maximum root length of 3.39 ± 0.02 cm after application of algal extract on Okra seedling.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	2858.19	6	476.37	22.56	0.00	0.05
Extract	18.34	1	18.34	0.87	0.35	0.00
Algal Concentration * Extract	72.29	6	12.05	0.57	0.75	0.00
Error	52910.38	2506	21.11			
Total	224344.80	2520				

a. R Squared = .053 (Adjusted R Squared = .048)

For the root length of *Cucumis Sativus* L. from the two way ANOVA (table 7) we see that there is a significant main effect of Algal Concentration on the overall root length, $F(6, 2520) = 22.56$, $p = 0.00$, $\eta^2 = 0.05$. The Extract i.e. aqueous vs Cow Urine did not have any significant effect, $F(1, 2520) = 0.87$, $p = 0.35$, $\eta^2 = 0.00$. The post - hoc test for the algal concentration using Tukey HSD indicated that the 15% had the longest root length in comparison to 1%, 5%, 10%, 20%, 25% and Control which was statistically significant.

Effect of algal extract on total height in *Cucumis sativus* L.

Total height of the crop plant is an overall outcome of the growth promoting substances taken up by plants. The total height was between 12.36 cm at 1 % and 18.39 cm at 15 %. However, in algal cow urine extract it was 15.5 cm at control and 22.29 cm at 15 %. (Table 8).

Table 8 - Effect of algal extract on total height in *Cucumis sativus* L.

	Algal Conc ⁿ	Algal Aqueous Extract					Algal Cow Urine Extract				
		Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	9.87	10.83	15.9	12.36	4.81	13.29	12.66	16.13	14.07	4.88
	5%	8.41	13.89	20.78	15.01	6.86	14.25	17.4	21.06	17.75	4.9

10%	9.94	16.01	21.8	16.96	6.33	14.25	18.0	22.46	18.44	7.24	
15%	12.83	18.21	23.01	18.39	5.79	20.13	21.89	24.68	22.29	5.12	
20%	14.04	17.12	19.49	17.17	4.98	16.82	16.38	22.63	18.71	5.22	
25%	12.49	15.69	17.77	15.53	5.21	13.79	18.83	19.73	17.62	4.76	
Control	12.48	16.53	16.34	15.28	4.6	13.17	17.99	15.16	15.5	5.46	
Sample 2	1%	16.59	13.18	17.33	15.85	5.28	20.39	18.4	19.11	19.3	5.47
	5%	20.92	17.82	17.47	18.78	6.9	21.56	19.42	20.33	20.42	5.35
	10%	21.67	17.59	17.58	18.96	4.79	23.59	20.95	20.49	21.69	4.08
	15%	22.48	19.85	22.21	21.56	5.17	25.18	21.41	23.02	23.2	4.74
	20%	19.56	18.31	18.04	18.62	4.67	21.86	20.68	21.93	21.49	3.56
	25%	17.36	18.57	15.5	17.1	4.9	20.33	20.49	21.74	20.85	4.65
	Control	19.19	17.54	19.39	18.75	4.83	20.08	18.13	19.04	19.1	4.08

The height of the plant in algal aqueous extract of sample 2 was 15.85 cm at 1 % 21.56 at 15 %. Algal cow urine extract of sample 2 showed variation between 19.1 cm at control 23.2 cm at 15 %. Algal Cow urine extract showed 21.20 % more height as compare to algal aqueous extract in sample 1 however it was 7.60 % more in sample 2. Researchers across the globe also reported increase in height followed by application of algal extract as a biofertilizer. Pandey *et.al.*, 2013 reported positive effect of algal extract on seedling development in Okra and reported maximum height of seedling of 11.23 ± 1.62 cm in Okra after application of *Chroococcus* sp. extract. Anisimov *et.al.*, 2013 have also reported the findings in conformity with the present results showing the stimulating effect of algal seaweed extract on the total height of the Buckwheat.

Table 9 - ANOVA: Two Way - Cucumis Sativus L - Total Height						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	10383.98	6	1730.66	27.31	0.00	0.06
Extract	5130.60	1	5130.60	80.96	0.00	0.03
Algal Concentration * Extract	408.59	6	68.10	1.07	0.38	0.00
Error	158811.62	2506	63.37			
Total	802568.27	2520				
R Squared = .091 (Adjusted R Squared = .086)						

For the Total height of Cucumis Sativus L. from the two way ANOVA (Table 9) we see that there is a significant main effect of Algal Concentration on the overall Total height, $F(6, 2520) = 27.31$, $p = 0.00$, $\eta^2 = 0.06$. The Extract i.e. Aqueous vs Cow Urine had a significant effect, $F(1, 2520) = 80.96$, $p = 0.00$, $\eta^2 = 0.03$. The post - hoc test using Tukey HSD indicated that the for algal concentration 15% had the longest Total height in comparison to 1%, 5%, 10%, 20%,

25% and Control which was statistically significant. Lastly, for the Extract: Cow Urine extract (Mean [CI]): (17.21 [16.77, 17.65]) was significantly better than Aqueous Extract (14.36 [13.92, 14.80]).

CONCLUSION

It is concluded from present study that the farm pond algae shows promising effect on seed germination and seedling growth in *Cucumis sativus* L. The algal extract of both the samples in algal aqueous and cow urine extract have shown increased germination, shoot length, root length and total height of the test plant as compare to control. However, the algal cow urine extract has shown better results over algal aqueous extract. Hence, the study finding recommends the use of algal cow urine extract of farm pond algae as a biofertilizer as a reliable source of nutrient inputs.

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CONTACTLESS DIAGNOSTICS OF THE TECHNICAL STATE OF THE VALVE MECHANISM OF THE INTERNAL COMBUSTION ENGINE**V. A. Voitov¹, Yurii. V. Chepurnyi² and M. M. Sheludko³**¹⁾ The Petro Vasilenko Kharkov National Technical University of Agriculture,^{2), 3)} The Ivan Kozhedub Kharkov National University of the Air Force, 77/79, Sums'ka**ABSTRACT**

The aim of the study is to analyze the possibilities of developing a contactless diagnostics system of the technical state of the valve mechanism, which excludes mounting sensors on the body of the diagnosed equipment, by using a directional microphone as a sensitive element. In order to test the proposed hypothesis, a directional microphone designed to measure the level of acoustic noise, sound pressure level and to obtain amplitude-frequency characteristics in the range of 10-10 kHz has been used. In the work, an experimental determination of the spectrum of the valve mechanism acoustic vibration and its comparison with the spectrum obtained from an accelerometer has been carried out; the principle of building an automated diagnostic system using a directional microphone has been formulated.

Keywords: *acoustic vibration, diagnostics, directional microphone, monitoring, spectral analysis.*

INTRODUCTION

Using the example of diagnostics of the technical state of diesel power units, we consider the formation of the vibroacoustic characteristics of an internal combustion engine and the features of an extended analysis of vibration parameters, as well as identification of typical equipment defects.

Analysis of vibration parameters is the only non-destructive testing method that makes it possible to define the actual technical state of a dynamically operating unit without lingering downtime. That is why vibration diagnostics is a mandatory procedure when implementing industrial safety expertise of technical devices.

Today, there are many ways to measure and to analyze the vibration parameters of process equipment. They can be divided into two groups: contact and contactless methods. Contact methods involve direct contact of the sensor with the diagnostic object. When using the contactless method, the sensor is placed at a distance from the object. The technical literature describes many systems for monitoring and diagnosing the technical state of technological units, using both contact and contactless methods.

The work [1] considers the principle of constructing systems for continuous monitoring and diagnostics of the technical state of the rotor equipment of metallurgical production units. The works [2] describe vibration diagnostics systems for electric motors and rotary equipment. In the works [3], the principle of constructing a system for diagnosing the technical state of gearboxes is discussed. In the works [4], diagnostic characters of defects in bearings and gearboxes are analyzed. The work [5] gives an overview of the experimental operation of the vibration control and vibration diagnostics system for various equipment in the metallurgical industry. The work [6] describes a radio-wave contactless method for measuring the parameters of movement and vibration of equipment. In the work [7], a system for diagnosing and detecting defects in rolling bearings and defects in the stator of a single-phase motor at an early stage of their development was developed using acoustic vibration.

Contact methods of vibration diagnostics are not always possible to apply due to the fact that there is a possibility to install sensors directly on the object of diagnostics not on all units, or the severe environment for the equipment can lead to a quick failure of the sensors. Moreover, if the task is to diagnose a new mechanism that is under manufacturer's warranty, mounting the sensors by welding or drilling will void the warranty. Therefore, contactless vibration measurement methods, eliminating the described disadvantages, are preferable when supplementing a stationary diagnostic system or developing a new automated one for diagnosing the technical state of equipment by its acoustic vibration.

Experimental measurement of the acoustic vibration spectrum with a directional microphone

Due to the fact that vibration, by which it is possible to diagnose defects in a technical system, is of acoustic nature, it is proposed to use a directional microphone as a sensitive element of the diagnostic system, which has an appropriate degree of protection when working in noisy conditions.

The authors have conducted an experiment to obtain the vibration spectrum of the valve mechanism using a laser directional microphone developed by them.

A laser directional microphone is designed to measure acoustic noise level, sound pressure level and to obtain an amplitude-frequency response in the sound range from 10 Hz to 20 kHz. The frequencies of the defects of the valve mechanism are in the high frequency range of 4–5 kHz.

The laser microphone developed has a wide dynamic measuring range of 70 dB and a high ultimate SPL of 150 dB. When the emitted beam is reflected from the diagnosed surface covered with a reflective spray consisting of a water-based polymer and a reflective material, it is modulated with an audio frequency. The reflected modulated beam hits the photodetector. After special processing (demodulation), the signal from the photodetector is amplified and fed to the input of the sound card of a personal computer.

In order to take measurements, the laser beam of the directional microphone should be directed at the cover of the valve mechanism of the internal combustion engine. The microphone is connected with a USB cable to a computer or a laptop with running SpectraLAB software to read data from the laser directional microphone and to perform subsequent calculations, such as identifying its spectrum from the signal (Fig. 1). SpectraLAB automatically calculates the direct spectrum of acoustic vibration measured by a microphone over the entire frequency range from 10 Hz to 20 kHz.

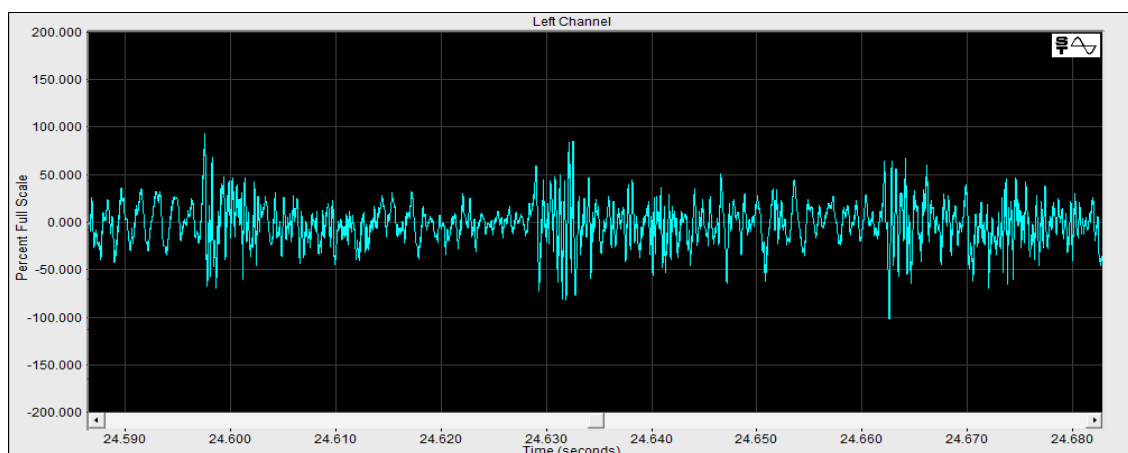


Fig. 1.

In order to carry out the experiment, we used a laboratory setup consisting of the valve mechanism block of the internal combustion engine (Fig. 2).

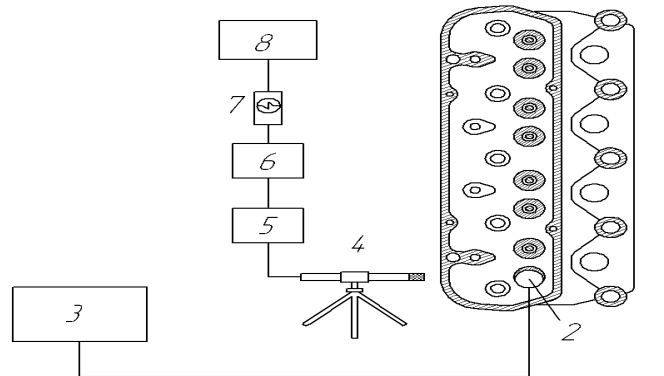
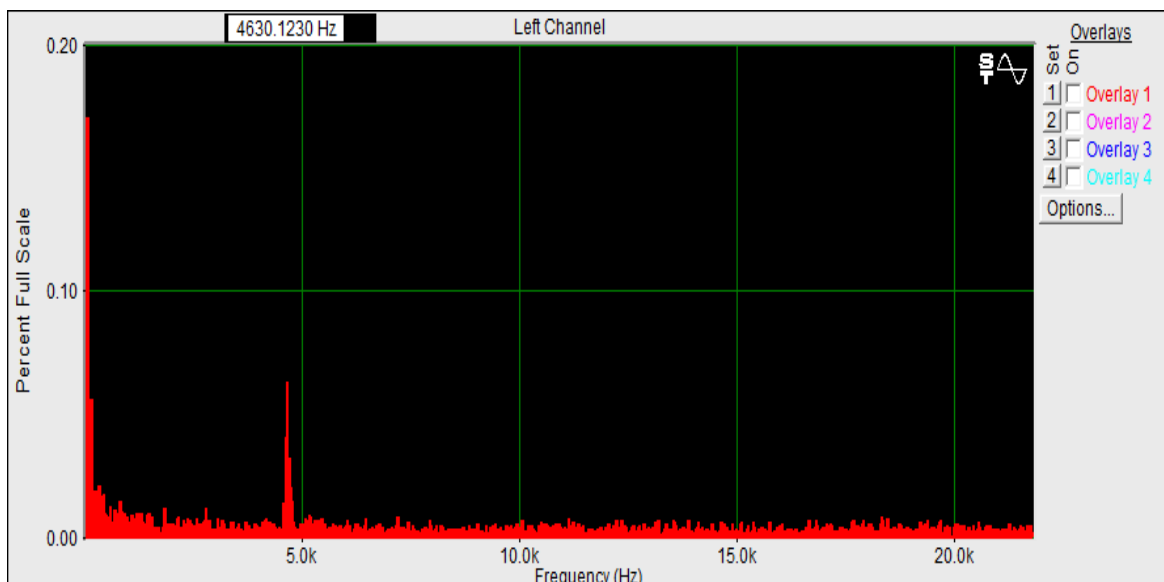


Fig. 2.

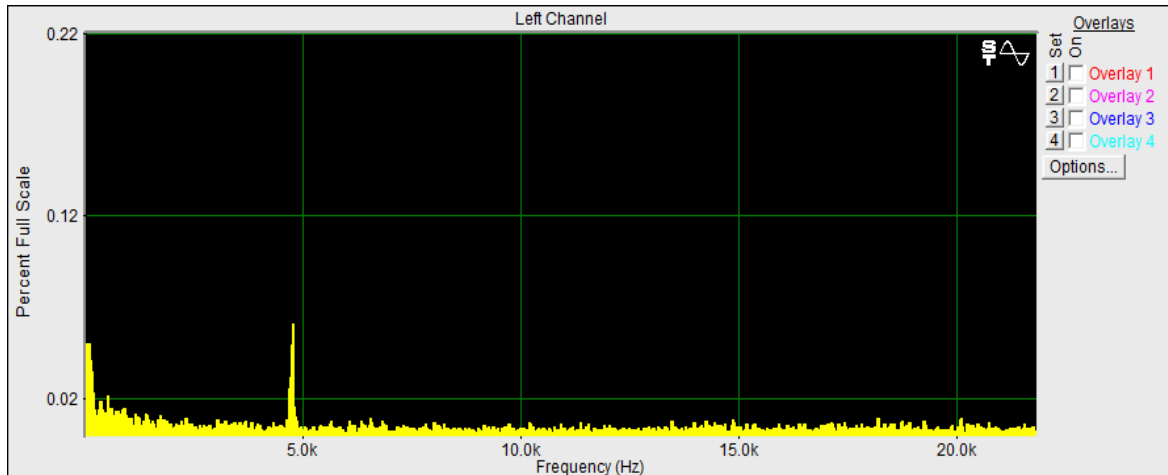
The signal, which is measured with the laser directional microphone 4, is fed to the input of the preamplifier 5. After amplification, the signal is filtered with a low-pass filter 6. This filter is necessary to exclude vibration components with frequencies higher than the sampling frequency from entering the adaptation channel. Also, the diagram (Fig. 2) shows a frequency sound generator 3 and an external source of acoustic vibration 2.

On the valve cover of the valve mechanism of the internal combustion engine, an accelerometer T77 manufactured by SCHENCK is installed with a magnet and connected to a VIBROMETER 25 of the same manufacture. The vibrometer reads the time signal from the sensor and calculates the direct spectrum in a given frequency range and with a given resolution (Fig. 3a).

This made it possible to compare the spectra of the measured vibration obtained in two different ways: by a contact method—using a standard accelerometer and a contactless method—using the laser directional microphone (Fig. 3b).



a



b

Fig. 3.

So, in the spectrum of the acoustic signal, measured by a directional microphone, one can distinguish the frequency of natural oscillations of the exhaust valve, at which the vibration amplitude is increased: this is the frequency of 4,630.12 Hz, as well as low-frequency rotor vibrations. Increased rotor vibration causes imbalance in the rotor of the engine.

In the spectrum of the acoustic signal measured by the accelerometer, in addition to the natural frequency of the exhaust valve, insignificant low-frequency rotor vibrations can be distinguished.

Thus, we can conclude that when developing a stationary diagnostic system using a laser directional microphone, a smaller number of microphones can be used to obtain the same completeness of diagnostic information compared to the number of accelerometers.

Diagnostic principle of the valve mechanism using a laser directional microphone

Using a laser directional microphone, it is possible to build a system for monitoring and controlling the technical state of automotive equipment, the principle of which is based on measuring the overall level of acoustic noise. However, the most promising is the use of a laser directional microphone for the problem of diagnosing the technical state of equipment, using information obtained by decomposing the acoustic vibration emitted by the diagnostic object into a spectrum.

Exhaust valve defects, as well as other defects of the valve mechanism, have characteristic frequencies in the spectrum by which these defects can be diagnosed. Fig. 4 illustrates the principle of diagnosing exhaust valve defects using the acoustic vibration spectrum.

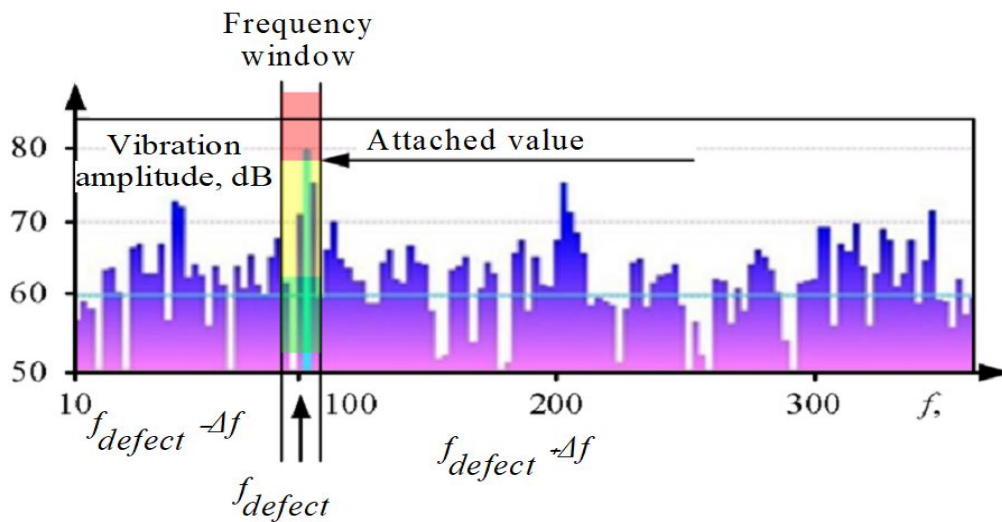


Fig. 4.

First, we need to find all the defect frequencies for the diagnosed mechanism. This can be done by the modal analysis of the 3D model of the exhaust valve in the ANSYS program (Fig. 5). Defect rates are unique to different mechanisms.

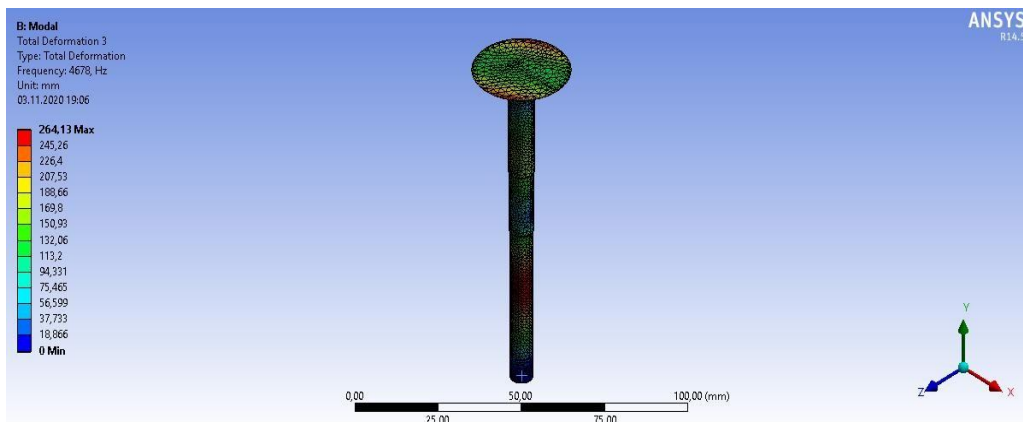


Fig. 5.

After the frequencies of all possible defects have been calculated, the diagnostic system should wait for the occurrence of a defect within the frequency window $f_{defect} \pm \Delta f$. The value Δf is chosen empirically depending on the possible variation in the engine speed. If the engine speed is constant, then it is necessary to select the size of the frequency window based on the range of possible changes in the engine speed under conditions of load changes that occur during its operation.

Further, within a given frequency window, it is necessary to determine the maximum amplitude of acoustic vibration and to compare it with two threshold values corresponding to the defect development degree. The defect development degree can be illustrated, according to the traffic light principle: green color (equipment is in a good technical state), yellow one (warning), red one (danger). The main vibration threshold value—the limit value (beginning of the red zone)—corresponds to a developed defect, at which further operation of the equipment is undesirable and can lead to an accident. The second, additional, threshold value of vibration (the beginning

of the yellow zone) corresponds to a situation when the defect is sufficiently developed, but the operation of the equipment is still allowed until it is stopped for scheduled repair.

Threshold values are determined empirically, depending on the power of the installation and data on vibration levels for similar equipment.

When the amplitude of acoustic vibration falls within the frequency window into one of the three zones (green, yellow, red), the diagnostic system should conclude that there is a defect in one or another unit and the degree of its development.

CONCLUSION

The paper proposes a method of contactless diagnostics of the technical state of the valve mechanism of the internal combustion engine on acoustic vibration using a laser directional microphone. The use of a directional microphone will eliminate the disadvantages of stationary diagnostic systems associated with the installation of vibration sensors directly on the object, as well as supplement the diagnostic system if it is impossible to install accelerometers on the equipment.

The paper shows that the main types of exhaust valve defects of the valve mechanism of the internal combustion engine can be diagnosed using a directional microphone. The principle of diagnostics of the technical state of the valve mechanism using a directional microphone has been formulated.

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FACTORS INFLUENCING RETAIL INVESTMENT DECISIONS

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ABSTRACT

Investments by individuals, once committed through funds which are saved from current consumption, are made with the hope that some benefits may be attained in future (Ankurita Bansal 2019) [1]. Investment decisions acquired significance on account of increase in employment opportunities and economic development of a nation (Aruna, P. et al., 2016) [2]. The changing demographic characteristics and investment avenue awareness led investors to earn more, save more and invest more for returns. The volatility in the markets and the challenge faced by efficient markets is to be understood well to know the reasons driving irrationality in the markets.

Neo-classical and Marxist economists in their arguments and literature have given prominence to capital accumulation as the engine of economic growth. The production and consumption of capital goods enhances growth of income (Sundrum 1993).[3] Behavioral finance attempts to answer what, why and how of finance and investing from a human perspective. There exists wide debate over the real definition of and validity of behavioral finance since the field itself is developing and subjected to the development of a new definition and refining itself (Victor Ricciardi et al., 2000).[4] This paper will discuss factors driving retail investment decisions and provide individual investors with a resolution of the socio, economic and psychological errors by suggesting the most selected options of investments.

Keywords: *Investment, social factors, ego, error, behavioral finance.*

INTRODUCTION

The domain of investment today is more dynamic than before. There exist a multiple number of options relevant to the investors. The key to succeed in retail investment is for the investor to be diligent and exercise intelligence while investing. The general intelligence reveals that the turnover in the investments should exceed inflation rate and ought to cover tax to earn returns from risk taking. Investment decision is an activity that follows proper evaluation of all the alternatives from several alternatives (Subramani et al., 2003) [5]. Decision relating to investment depend on the different type of investors, family background, age, occupation, sex, income, marital status, risk bearing tolerance, education, demographic environment, and other factors (Jeetsingh & Preeti Yadav, 2016).[6] The identification or recognition of impacting factors are deemed to be decisions of investment choice. Investors commonly analyze the intrinsic value of a security by doing investment analysis that makes use of fundamental analysis, technical analysis, and judgement (Ambrose Jagongo et al., 2014) [7].

Behavioral finance deals with the individuals' attitude towards investment decisions and market behaviour. Research in behavioral finance had developed rapidly in recent years and provides evidence that investors' financial decisions are also affected by internal and external behavioral factors (Shefrin, 2000) [8]. Factors such as emotion and not logic, act as strong impactors and most investors buy high on speculation and sell low on panic mood. Fear and greed among the other causes of practical behaviour strictly act and impact decision making (Muralidhar Panga, 2018) [9]. Researchers such as Shefrin, (2000) [8] stated that behavioral finance is growing rapidly and deals with the impact of psychology on the behaviour of financial practitioners.

Significance of the study

The investors behaviour is variable and influenced by innumerable factors. Since it varies from one to another region and from one to another financial investment, it becomes essential to recognize the influencing factors of investment decision. Investment decision impactors behave strongly, and they are the strong reasons behind employment creation, economic growth, and induce economic prosperity and welfare improvement. The investment horizon shall need to be well understood to boost up the investment and hence motivation behind investment is essential. To encourage more investment and formulate theories of investment, it is necessary to know how the individuals act, behaves and invests in developmental activities.

Keynes theory of investment expresses that investment is the most important economic factor for a nation. Investments are highly essential for any economic development. Investment in the business concern, either in the form of technology, or in the money form, improves the economic development. If business houses have sufficient cushion of financial resources, they will provide more goods and they can provide more employment opportunities. Investment in technology is used to provide better goods and services and hence investment in technology is essential.

OBJECTIVES OF THE STUDY

1. To identify the factors influencing investment decisions of retail investors.
2. To recommend to policy makers innovative investment avenues based on the factors driving investment decisions of retail investors.

SCOPE OF THE STUDY

The study is confined to retail investors only. This paper focuses on the factors that influence retail investors' investment decisions based on the extensive review of literature.

REVIEW OF LITERATURE

Khanifar, H. et al., (2012) [10] stated that factors like financial statement elements, real earnings per share, are considered more important than economy and industry related factors.

Riaz, L, et al. (2012) [11] found that the quantum of risk taking, the access to information and presentation very much impacts the mind of investors' decision making.

Geetha and Ramesh (2011) [12] examined the investors choice in investment avenue. The authors conclude that respondents are mediumly aware about investment choices but are less aware of the stock market as well as equity, bonds, and debentures. The findings show that investors are interested in traditional asset classes such as insurance, PPF, NSC, and bank deposits.

Viswanathan et al. (2014) [13] in their study identified the factors responsible for the buying behaviour of investors in the Tanzania equity market. It was found that listed companies lend significance to the factors such as quality management decisions, building brand and clarity in settlement issues.

Parimalakanthi (2015) [14] reported that investor education is significant dimension of financial literacy among investors. Fixed income and safety factors were also found to be dominant factors of investment decision.

Srinivasa et al. (2011) [15] examines the correlation between the behavioral finance theory and the individual behaviour of active investors in the Bombay Stock Exchange.

Factors driving retail investment decisions

The individual attitude and behaviour needs to be well-gauged in understanding the drivers of retail investment decision making. To some, the investor's investments may be fascinating as they indulge in decision making and find final consequences of their choices. Not all investments are profitable since the investor is always not right about judgment (Gaurav Kabra, 2010) [16]. An further study is required to study variability among the investors. Also, factors driving retail investment must be studied systematically. Figure 1 delineates the factors influencing retail investor behaviour.

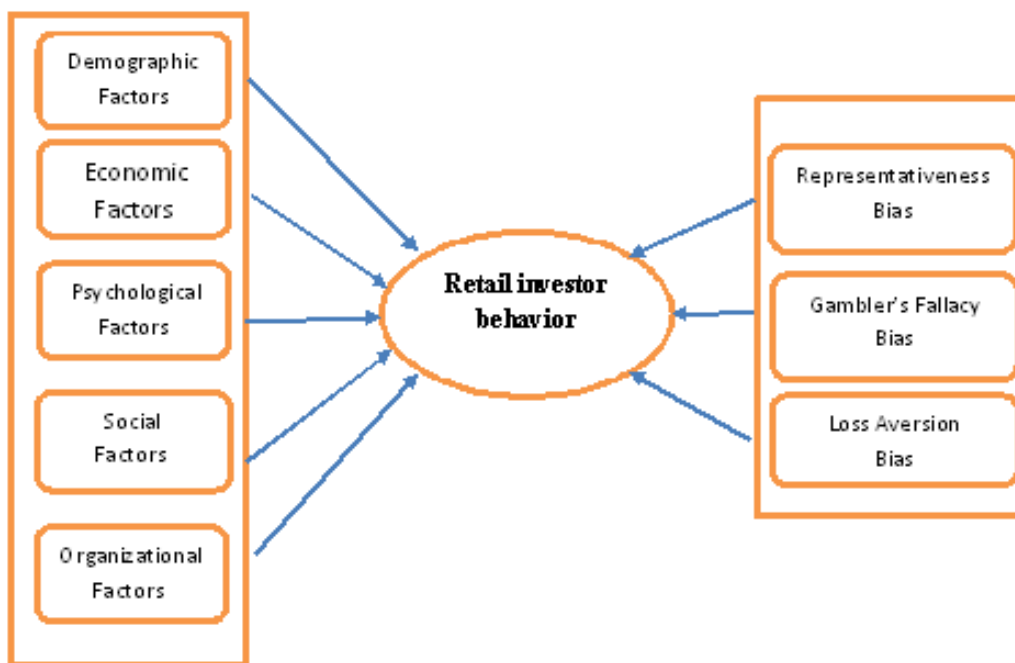


Fig. 1. Factors influencing investment decisions: a conceptual framework

Demographic factors

These are personal socio economic and psychological characteristics are helpful in collecting the required data from the people from a recognized area. These includes gender, marital status, age, income, qualification, occupation, experience in the investments etc., Each demographic variable influences the investor to take a decision and such impacts differs from one to another.

Economic factors

Economic factors are the group of fundamental data which impacts an investors mind. A multiple number of economic-based factors must be considered at the time of deciding the present and future value of an investment portfolio. These economic factors comprise income, price, rate of interest, government policy, taxation, and management.

Psychological factors

Psychology in brief refers to the study of the mind, which covers all kind of human experience. The instinct and emotional behaviour of an individual or group may be also called as psychology. The exact prediction is not possible as it varies from one to another, but a generalization of psychological impact factors assists in making a good investment decision making.

Social factors

Social factors strongly influence either to decide on investment or not. These factors indicate why human behaviour goes wrong or right. Social factors also indicate the investors region and social background. These factors assist in designing the investment plan, thoughts, and belief. These social factors include ego, procrastination, educational setting, religion elders' pressure, social responsibility of the firm towards society, firm's ethical belief, social belongingness, image at the international level, brand popularity, among others, which affects the investors decision making process.

Organizational factors

These factors refer to working conditions, incentives, pay scale, retirement benefit and so on, available to the employees. The organizational factors that impact much decision making are in the security, pay scale and retirement benefits, working atmosphere and, system of promotion processes.

Representativeness bias

It means when the investor follows the recent experience and forgets the previous things about taking the investment decision. Representativeness has a positive impact on investment decision.

Gamblers fallacy bias

It is the investors perception that if something happened frequently it will not happen next time. It also refers to if something is not happening in the present, it can happen in future. Hence this concept of gamblers fallacy influence stock investment decision.

Loss aversion bias

If an investor gains more profit, the investor will be satisfied and, conversely, if incurs loss, the investor feels unhappy on account of less or no profit and that leads to a mental status called loss aversion.

Other factors

The other factors like size of the company, growth potential diversification of investment, attraction of real estate, foreign ownership of the company, liquidity of shares, etc., also impact individual decision to invest in manufacturing firms.

CONCLUSION

Behavioral finance is attracting the attention of researchers at present. Behavioral finance reveals that the investment decision is not dependent upon a single factor but multiple factors. Every individual with variable in nature, foresightedness about the investment market is different on account of a set of demographic factors, gender, religion, education, social and economic background. Investors are influenced by certain biases at the time of making an investment decision. The extant literature illustrates that innumerable factors influencing investment decision making. Economists, social scientists, and wealth managers must understand the reasons behind driving the investment decision. This paper concludes that investors behaviour depends on the availability of right information, the ability to take the risk and the influence of biases in their investment decisions.

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RELATIONSHIP BETWEEN ORTHODONTICS AND TEMPOROMANDIBULAR DISORDERS

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ABSTRACT

According to the American Academy of Orofacial Pain, the term TMD refers to a set of clinical problems that involve the masticatory musculature, the TMJ and associated structures, or both, being identified as the leading cause of non-dental pain in the orofacial region and is considered a subclass of musculoskeletal disorders. This condition can be known by a variety of terms including craniomandibular disorders (CMD) and is a frequent cause of facial pain problems. The interest of the orthodontic speciality and of other disciplines of dentistry and medicine concerning the association, or lack of association between orthodontic treatment and TMD has increased dramatically during the past decade. Despite the compelling current evidence, some professionals in orthodontics are reluctant to change and continue to still hold onto past unscientific beliefs that lead to the use of outdated treatment approaches. It is critical that orthodontists continually pay attention to the new research developments so that they can ultimately provide their patients with the best and most appropriate possible care.

Keywords: TMD, orthodontics, multifactorial.

INTRODUCTION

The temporomandibular joint (TMJ) is the joint between the lower jaw and the base of the skull. TMJ disorders (TMD) refer to a group of disorders with symptoms that include pain, clicking, grating in the jaw joint and/or problems with chewing or opening the jaw. According to the American Academy of Orofacial Pain, the term TMD refers to a set of clinical problems that involve the masticatory musculature, the TMJ and associated structures, or both, being identified as the leading cause of non-dental pain in the orofacial region and is considered a subclass of musculoskeletal disorders. This condition can be known by a variety of terms including craniomandibular disorders (CMD) and is a frequent cause of facial pain problems.¹

Temporo-mandibular problems are frequently occurring disorders with 45 to 70% of the general population showing some signs of it, 30% being aware of its presence, but only 3 to 12% seeking treatment for it. These disorders are quite common in the general population. In fact, after dental pains, TMDs are the next most common pain complaint reported by patients in the dental office. TMD is recognised as a non-specific term representing a wide variety of painful and/or dysfunctional jaw conditions. These conditions include symptoms and disorders of the muscles of mastication, the TMJ, the nervous system and behaviour. Most cases of TMD are recognized as instances of mild, self-limiting disorders that resolve without active treatment. The most common TMD by far, comprising 90-95% of all cases is a condition with multiple musculoskeletal facial pain complaints and a variety of jaw dysfunction and without an identified structural cause.²

The signs and symptoms that indicate any abnormality of the TMJ are alteration of the mandibular movement, limitation of mouth opening, constraint function, joint noises, asymptomatic changes of the joint and jaw locking with open mouth and closed mouth. The most common symptom associated with TMD is pain, usually located in the masticatory muscles, pre-auricular area and/or TMJ. The pain is often aggravated by chewing or other

functional activities. Limitation of mouth and opening and movement, and the presence of joint noises are other common complaints in patients with TMD.³

The interest of the orthodontic speciality and of other disciplines of dentistry and medicine concerning the association, or lack of association between orthodontic treatment and TMD has increased dramatically during the past decade. Although long recognized by orthodontists as a clinical problem, the diagnosis and treatment of TMD was not emphasized within the speciality until the mid-1980's. Prior to the late 1980's, a very limited number of well-designed clinical studies focusing on this subject were available. The attention of the orthodontic community regarding TMD was heightened in the late 1980's after litigation involving orthodontic treatment as the cause of TMD in orthodontic patients.

Two main questions about TMD in relation to malocclusion and orthodontic treatment seem to be of interest. The first concerns correlation between TMD and different kinds of functional and morphological malocclusions. The other seeks to determine whether the severity and prevalence of TMD are influenced or even caused by orthodontic treatment. Therefore, a correct diagnosis of TMD therefore requires a subset of specific diagnosis for appropriate understanding of the individual patient condition.⁴

ETIOLOGICAL FACTORS FOR TMD

Over the years there has been significant controversy regarding the aetiology of TMDs. Early on dentists were very convinced that temporomandibular disorders were primarily caused by occlusal factors. Many dentists directed their therapies toward changing the patient's occlusion; and if that failed, the operator was thought to be incompetent or the patient was considered to have major psychological problems. By the mid-1980s and 1990s, however, the profession demanded more research evidence, which provided a much broader look at TMDs. Over the last 20–30 years we have learned that there are at least five known TMD etiologic factors that need to be considered. Occlusal factors remain as one of these factors, thereby maintaining TMDs as conditions that need a dental evaluation, but the manner by which the occlusion can affect the onset of a TMD must be revisited. Epidemiologic studies do not reveal a strong association between the static relationship of the teeth, such as Angle Class II or III, and the presence of a TMD.

As mentioned earlier, occlusal factors have been thought to be associated with TMDs for many years. Even today this relationship is continuously debated, with proponents remaining on both sides of the discussion. Recent data do not support the traditional belief that the static relationship of the teeth is strongly associated with TMD (e.g., deep bites, class II, cross bites, eccentric contacts). There appears to be two ways the occlusal relationship of the teeth may be associated with TMD symptoms. The first is related to an acute change in the occlusal condition, and the second is related to loading of the masticatory structures in the absence of TM joint stability.

Epidemiological studies generally document a greater frequency and severity of TMD in females than in males. In effect, TMD is seen to be up to four times more frequent in women, and these tend to seek treatment for their TMJ problems three times more often than males. Attempts have been made to explain these differences in terms of behavioural, psychosocial, hormonal and constitutional differences, though no conclusive results have been drawn to date. It has been suggested that the presence of estrogen receptors in the TMJ of women modulates metabolic functions in relation to laxity of the ligaments, and this could be relevant in TMD.

The presence of more than one symptom may be interdependent and act as a confounding factor. Further studies to identify genes associated with TMDs will enable us to specifically

diagnose TMDs and improve the quality of treatment. Future research with larger sample sizes will enable us to better understand genetic association with TMDs. Recent advances have introduced new techniques like GWAS that can help us discover genes associated with TMDs

Kavuncu et al.⁶ evaluated the risk of TMD in patients with systemic and TMJ hypermobility. Local hypermobility was diagnosed in the presence of condylar subluxation, while systemic hypermobility was assessed by means of the Beighton test. The authors found that both local and general hypermobility are more frequently detected in patients with TMD than in the controls, and that the risk of TMJ dysfunction is greater if the patient presents both alterations simultaneously. The investigators concluded that both situations may play a role in the aetiology of TMD. Certainly, trauma is a known aetiology of certain TMDs. A single blow to the face can immediately change the structures of the joint, resulting in an intracapsular issue. Trauma seems to be more related to intracapsular disorders than muscle disorders. It is common to hear a patient report that “ever since I received the blow to my face, my TMJ has been clicking.” Once joint pain begins, muscles protectively respond and then it may be difficult to separate the painful conditions.

Dorland’s Medical dictionary defines parafunction as disorderly or perverted function. Although the relationship between parafunction and muscle pain is biologically plausible, and there is some evidence to suggest a chronological relationship between the two, the fact is that controversy exists regarding this purported causal relationship. Chewing gum has been used in a number of studies to evaluate the appearance of muscle pain with over function. Karibe et al.⁷ after inducing the chewing of gum for 6 minutes, found pain to increase in both males and females in the patient group, though unexpectedly it also increased among the women in the control group – thus supporting the hypothesis of increased female susceptibility. Regarding the aetiology of bruxism, the intervention of occlusal interferences was initially postulated, though at present emotional stress is considered to be the principal triggering factor.

The possibility that orthodontic treatment could cause TMJ pathology has been extensively dealt with in the scientific literature. Despite the diverse methodological approaches involved, the great majority of studies conclude that orthodontic treatment neither improves nor worsens TMD. Kim⁸ reviewed 31 publications on orthodontics and TMD. He drew attention to the heterogeneity of the methodologies involved in these studies, and pointed out that only one of the reviewed articles found tooth extraction during orthodontic treatment to change the prevalence of TMD. The author concluded that orthodontic treatment does not increase the prevalence of TMD. Mohlin et al.⁹ is of the same opinion. In a study conducted in Gothenburg (Sweden) involving 337 patients followed-up on between 11 and 30 years of age, they found that orthodontic treatment neither prevents nor improves dysfunction of the TMJ.

DIAGNOSIS OF TMD

The gold standard¹⁰ of diagnosis in TMD consists of

- (1) patient history,
- (2) physical evaluation, and, in most chronic cases,
- (3) behavioural or psychologic assessment.

This evaluation should include a detailed pain and jaw function history as well as objective measurements of such jaw functions as interincisal opening, opening pattern, and range of eccentric jaw motions. TMJ sounds should be described and related to symptoms. Techniques for muscle evaluation should also include control (sham or placebo) site evaluation. Psychosocial and behavioural factors are important, as are physical alterations; the former relate

specifically to our current understanding of pain. Because dentists' recognition of psychologic factors is inaccurate, use of a valid screening instrument or referral to an appropriate professional may help in formulating a complete diagnosis.

A "dual diagnostic" approach, detailing physical findings in muscle, joint, and disk as well as behavioural and psychosocial findings, is the present science-based standard of care in the diagnosis of TMD. The panoramic radiograph is the standard screening radiograph for bony jaw structure in TMD, and more advanced techniques may be indicated on the basis of the panoramic film or the clinical factors. The use of tomography or computed tomography and magnetic resonance imaging are current standards for hard and soft tissue TMJ imaging, respectively. The following baseline records should normally be made for patients suspected of having a TMJ disorder: medical and dental histories, clinical examination, radiographic examination of the teeth and TMJ, and diagnostic casts. In addition, newer techniques of soft tissue radiation or sonics, arthrography, and mandibular motion data can prove to be of important diagnostic value. A thorough history may be the most important means of diagnosing TMJ disorders, and the dentist must be willing to spend the necessary time to make a comprehensive history.¹¹

TMD signs were examined during initial orthodontic diagnosis following the methods proposed by Helkimo¹² and Krogh-Poulsen.

- 1) Temporomandibular joint sounds, including clicking and crepitation, were determined on palpation of both TMJs laterally and posteriorly during opening and closing of the mandible.
- 2) Temporomandibular pain was examined on palpation of both TMJs from the lateral and posterior sides.
- 3) Muscle tenderness was determined on palpation of the temporalis, masseter, and medial and lateral pterygoid muscles.
- 4) Maximum pain-free mouth opening was measured by use of callipers. Difficulty of jaw movement was defined as mandibular opening of 35 mm or less.

TREATMENT MODALITIES

The first step in treatment is symptomatic care which usually consists of (1) a soft diet, (2) mild anti-inflammatory agents, (3) moist heat packs and/ or ice, and (4) voluntary self-disengagement of the teeth. For some patients this may be the only treatment necessary to relieve their symptoms. The current standard of care for common chronic non-structural TMD is management with multidisciplinary cognitive behavioural therapy and muscle relaxation measures. Dentistry plays a cooperative, coordinating, and supportive role in managing these patients. Educating and advising the patient is paramount because of the recognition that most instances of TMD are not oral or tooth-related disorders. Treatment of a TMJ sound is not indicated unless pain and/or dysfunction requires treatment; treatments are primarily aimed at pain and/or dysfunction.¹³

The most common dental treatment in TMD is a **splint or interocclusal orthosis**, an intraoral device that is designed to fit over either the maxillary or the mandibular teeth and provide an artificial occlusal surface. The current standard of care recognizes that a dental splint should not permanently alter tooth or jaw position. The dental literature has documented harmful splint effects. Patients generally perceive a splint to be at least partially effective in symptomatic improvement; however, a scientific basis for the efficacy of dental splints is lacking. It is reasonable to consider an oral splint to be an adjunct for pain management—a "healing aid"

rather than a definitive treatment. In general, patients with TMD improve in time without intervention. Predictors of outcome for treatments of TMD are behavioural, psychological, and psychosocial factors rather than physical or structural factors. Long-term outcomes in pain may be independent of clinical signs, and improvement in pain may correlate with improvement in psychological status. Assessing a prognosis for TMD cases therefore requires a behavioural or psychological assessment and multifactorial diagnosis according to the current standard of care for diagnosis. Predictors of poor outcome relate to depression, somatization, anxiety, and low self-esteem.¹⁴

RELATIONSHIP OF ORTHODONTICS AND TMD

Orthodontic patients presenting with painful clicking and popping sounds in the temporomandibular joint should always be managed medically at first. The objective is to eliminate the pain, and this is accomplished by allowing the retrodiscal tissues to heal and function as a new “disc”. The clicking and popping can only be eliminated surgically, and this is indicated only if medical management does not stop the pain. Persistent locking may also respond favourably to medical management and jaw exercises in some patients. For those who do not respond to such treatment in a reasonable period, arthrocentesis should be the initial therapy; arthroscopic surgery, discoplasty, or discectomy should only be done if this fails. It is evident that orthognathic surgical treatment can sometimes produce TMDs in patients who did not have such problems presurgical. Such problems can be minimized by an understanding of the various contributing factors, but are probably not completely preventable. Therefore, patients need to be informed of these potential risks as well as of the benefits of orthognathic surgery. It is also evident that orthognathic surgery is not a predictable treatment approach for TMDs. Thus, there must always be indications for performing orthognathic surgery in these patients other than the treatment of a TMD.

Orthodontic treatment in general has not been found to cause TMD. Orthodontics is generally described as TMD “neutral,” in that it neither causes nor cures (or mitigates) TMD. Orthodontics does not prevent the development of TMD in patients who have malocclusion. Therefore, it is not evidence based for orthodontists or others in the dental profession to advise patients and parents of young children that orthodontic treatment is indicated to address a child’s malocclusion to mitigate the risk of TMD developing in the future. The utilization of any specific type of orthodontic treatment, or appliance, such as headgear, elastics, chin cup, or whether extractions are performed, has not been shown to lead to any increased risk for TMD.

The need to investigate on the relationship between orthodontics and TMD came from the occurrence of legal cases in which patients blamed orthodontists for causing TMD symptoms during or after orthodontic treatment. From the late 1980s, the orthodontic community was alerted and gave funds to investigate the relationship between orthodontic treatment and TMD. In 1995, a review of this topic by McNamara, Seligman and Okeson listed eight conclusions that refute this possible association.

- 1) Signs and symptoms of TMD occur in healthy individuals
- 2) Signs and symptoms of TMD increase with age, particularly during adolescence. Thus, TMD that originates during orthodontic treatment may not be related to the treatment.
- 3) Orthodontic treatment performed during adolescence generally does not increase or decrease the chances of developing TMD later in life.
- 4) The extraction of teeth as part of an orthodontic treatment plan does not increase the risk of developing TMD.

- 5) There is no elevated risk for TMD associated with any particular type of orthodontic mechanics.
- 6) Although a stable occlusion is a reasonable orthodontic treatment goal, not achieving a specific gnathologically ideal occlusion does not result in TMD signs and symptoms.
- 7) No method of TMJ disorder prevention has been demonstrated.
- 8) When more severe TMD signs and symptoms are present, simple treatments can alleviate them in most patients.

The hypothesis that different orthodontic techniques (e.g. functional appliances, class II or class III elastics, chin-cup, headgear, fixed or removable appliances) and treatment plans can be involved as aetiological factors for TMD has also been tested in recent decades. Dibbets and van der Weele¹⁵ compared groups of children who were treated with different orthodontic treatment procedures, functional appliances, Begg light wire, chin cups, four- first premolars extracted, all other types of extraction and no extraction. Patients were monitored for a 20-year period after the start of orthodontic treatment. Although signs and symptoms of TMD increased with age, after 20 years neither orthodontic treatment nor extraction showed a causal relationship with the signs and symptoms of TMD. Therefore, the authors concluded that neither orthodontic treatment nor extraction had a causal relationship with the signs and symptoms of TMD.

This topic of whether orthodontic treatment prevents TMD is the most difficult to investigate, given the prevalence of signs and symptoms of TMD in healthy persons and the many types of orthodontic treatment philosophies, goals, and techniques in existence today. The question of whether orthodontic treatment can prevent TMD is complicated further by many of the unsubstantiated viewpoint articles that claim preventive capabilities of non-extraction treatment, functional appliances, and some of the more non-traditional orthodontic treatment protocols (e.g., extraction of the second molar extraction and replacement of the third molar) that have been advocated vigorously. As previously discussed, most studies that have compared treated and untreated populations have found no differences between groups in the occurrence of TMD signs and symptoms.

The term TMD encompasses a number of clinical problems of multifactorial aetiology that involve the masticatory musculature and the TMJs. The historic mechanical and dental-based model has been gradually replaced by a medical model used in the treatments of TMD and other acute and chronic musculoskeletal disorders. The contemporary biopsychosocial approach to TMD management focuses on the integration of biologic, clinical, and behavioural factors that may ultimately account for the onset, maintenance, and remission of TMD. Genetics (vulnerabilities related to pain), endocrinology, behavioural risk- conferring factors, and psychosocial traits and states appear to be the variables currently being researched and receiving the most attention. Despite the compelling current evidence, some professionals in orthodontics are reluctant to change and continue to still hold onto past unscientific beliefs that lead to the use of outdated treatment approaches. It is critical that orthodontists continually pay attention to the new research developments so that they can ultimately provide their patients with the best and most appropriate possible care.

CONCLUSION

The findings of current research on the relation of orthodontic treatment to the TMDs can be summarized as follows:

1. Signs and symptoms of TMD may occur in healthy persons.

2. Signs and symptoms of TMD increase with age, particularly during adolescence, until menopause. Therefore, TMDs that originate during orthodontic treatment may not be related to the treatment.
3. In general, orthodontic treatment performed during adolescence does not increase or decrease the odds of developing TMD later in life.
4. The extraction of teeth as part of an orthodontic treatment plan does not increase the risk of TMD.
5. There is no evidence of an elevated risk for TMD associated with any particular type of orthodontic mechanics.
6. Although a stable occlusion is a reasonable orthodontic treatment goal, not achieving a specific gnathological ideal occlusion does not result in the development TMD signs and symptoms.
7. Thus far, there is little evidence that orthodontic treatment prevents TMD, although the role of unilateral posterior crossbite correction in children may warrant further investigation.

Orthodontic treatment does not seem to predispose subjects to TMD problems nor is it indicated as an initial therapy for TMD patients.

Based on this concept, orofacial pain and TMD require a comprehensive team approach. It is important to rule out other causes of facial pain before investigating the teeth as the potential aetiological factor. According to evidence-based dentistry, dental practitioners should use current best evidence when making decisions about the treatment of each patient, integrating individual clinical expertise with the best available clinical evidence.

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REMOVAL OF NICKEL FROM WATER BY ADSORPTION METHOD USING CLAM SHELLS

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ABSTRACT

This study involves the applicability of clam shell particles as an adsorbent for the removal of nickel from the water. Adsorption is a promising technology for the removal of heavy metals which have hazardous effects on the aquatic system and also on human beings. The aim of this work is to use clam seashells in the powder form for the removal of nickel. The Clam shell particles selected for the experiment has shown good adsorption capacities in the adsorption of Nickel. The mechanism of interaction between clam shell particles with Ni^{2+} was investigated using UV-Visible Spectrophotometer. Batch adsorption experiments were carried out to optimize the influencing parameters such as contact time, adsorbent dosage, pH, concentration and speed. The removal efficiency of nickel was found to be 90 % with a dosage of 0.50 g at a pH 6 for a contact time of 10 minutes with concentration of 50 mg/l at 150 rpm. Carbonaceous nanoparticles prepared through the Top-Down approach method were used to remove metal inorganic nickel ions in solution, by the adsorption of nickel ions. Nickel removal has been possible by using nano sized carbonaceous nanoparticle. The absorptivity of the flocs determined by the UV-Spectrophotometer shows that the process is efficient when dealing with aqueous nickel solution.

Keywords: Adsorption, Nickel, clam shell, UV-Visible Spectrophotometer.

1. INTRODUCTION

Water resource pollution with industrial effluents causes a serious environmental problem. Nickel is considered as a toxic heavy metal in aquatic environments due to its accumulation in bodies of living organisms and exposure to nickel may lead to different toxic effects in humans including damages to lungs, cause kidney diseases, contact dermatitis, and allergic sensitization. Nickel is an extremely toxic metal and found in the environment that causes the various types of damages in human health like lung cancer, nasal tumours, sinus, dermatitis, etc. Nickel in small doses (<0.1mg/lit) is harmless but when exposed to large doses (>0.5 gm), it has harmful effects. Based on the World Health Organisation (WHO) guidelines, the maximum allowable concentration of nickel in industrial wastewater is 2mg/l equivalent to 2 ppm or 2000 ppb, while that in drinking water the permissible limit water should be less than 0.1 mg/l equivalent to 0.1 ppm or 100 ppb.

Mitchell (1957) was explained during washing of the electroplating tanks, considerable amounts of the metal ions find their way into the effluent. Goyer et.al, (1979) explains the toxicity consequent upon excessive intake of this metal is rather uncommon. Gastrointestinal distress and diarrhea have been reported following intake of liquids stored in galvanized cans or from the use of galvanized utensils. After ingestion of about 12 gm of elemental zinc, evidence of haemolytic, hepatic, and renal damages has been noticed in humans barely within two hours after the intake. Rao et al., (2001) says these industries acquire established waste water regulations to minimize the human and environmental exposure to hazardous heavy metals. Some of other industrial processes that contribute to the presence of nickel are bakery (0.43 mg/l), soft drinks and flavoring (0.22 mg/l), ice cream (0.11 mg/l), textile dyeing (0.25 mg/l), laundry (0.1 mg/l), car wash (0.19 mg/l) and miscellaneous foods (0.11 mg/l) . Ni(II) is

an essential nutrient needed by the body in trace amounts because it takes part in the synthesis of vitamin B12.

Cempel and Nike, (2006) says the Discharge of industrial, domestic and agriculture waste in rivers and lakes cause deposit of pollutants in sediments. Such pollutants include heavy metals, which danger for human health after being incorporated in food chain. Kishore et.al, (2008) was carried out of Severe lead toxicities have long been associated with sterility and gameto-toxic effects in both male and female animals. Lead is capable of passing through the placenta to foetus to cause developmental anomalies and still births. Kapadia et al, (2000) and Rout et al, (2008) found to be expensive and cited that during past few decades different low-cost adsorbents such as Chitosan, agricultural waste, marine algae, peanut hull, treatment mangrove root, biomass and crop shell have been tested for copper removal. Shiva Kumar D. and Sri Kantaswami S, 2012 was studied about the essential to remove Ni^{2+} from industrial wastewater before being mixed with natural water sources. The main objective of the present study is removal of Nickel from water by adsorption method using Clam Shells from Ennore to Pulicat (Bay of Bengal).

2. STUDY AREA

Ennore Creek traditionally influences the livelihood of the stakeholders inhabited near the creek. A preliminary field investigations and interactions with local population indicated the quantum of environmental and health risk associated with it. The severity of the environmental degradation of Ennore creek could reflect upon the health and living conditions of the stakeholders of the area. There have been several incidents and studies which indicate pollution induced fish killing and health hazards among the fisher folk of Ennore. Many respondents during preliminary investigations felt that the highly polluted Ennore Creek spoils the feature of the fishing products. Some had apprehension about the migration potential of fishes throughout the belt. There have been encroachments for new constructions which would replace traditional fisher folk. There were occasional strong protests released by fisher folk over the Ennore Power Plant after witnessing thermal water killing the fish. The agitations also led to manpower loss and economic loss. In the back drop of the strong ecological pressure exerted on the coastal resources particularly on the livelihood of fishing folk, the study has been undertaken to examine the socio-economic conditions of fishermen in Ennore Creek.

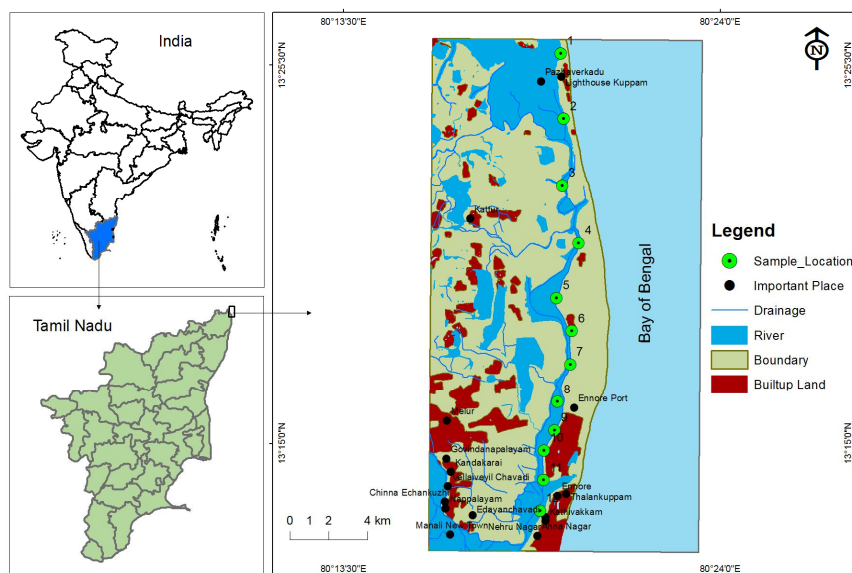


Figure 1 Location of the study Area

3. METHODOLOGY

The methodology adopted in the study is to Synthesis the carbonaceous nanoparticles by adsorption method. To determine the surface morphology and size of the clam shell particles by performing SEM and TEM-characterization tests. To evaluate the efficiency of the synthesized nanoparticles as an adsorbent through batch experiments and to study the process control parameters such as contact time, dosage of the adsorbent, pH of the solution, concentration of the adsorbate and agitation speed. The sample details collected in the field are given in Table 1.

Table 1 Sample details collected in the field

S. NO	Test Name	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
1	PH	7.5	7	7.5	7	7	7	7	6.5	7	7	7.5	7
2	Alkalinity	200	140	220	250	240	350	180	140	160	10	220	90
3	COD (mg/L)	520	1240	1120	1720	1640	1920	2080	2000	1320	1000	800	480
4	Fluoride (mg/L)	2	0.5	1	0	0.5	0	0	1	1	0.5	1	0.5
5	Iron (ppb)	0	0.3	2	3	2	1	2	2	0.3	0.3	2	2
6	Ammonia	1	2	1	5	5	5	1	1	1	2	1	0.5
7	Nitrite (mg/L)	1	1	0.5	0.5	1	1	1	1	1	1	0.5	0.5
8	Phosphate (mmol/L)	0	1	2	3	1	2	2	1	0.5	1	2	0.5
9	Residual chlorine (mg/L)	0	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.2	0

3.1 Adsorption

Adsorption is a process of accumulating substances that are in solution on a suitable interface. Adsorption, is a mass transfer operation in that a constituent in the liquid phase is transferred to the solid phase. The adsorbate is the substance that is being removed from the liquid phase at the interface. The adsorbent is the solid, liquid, or gas phase onto which the adsorbate accumulates. Although adsorption is used at the air-liquid interface in the flotation process, only the case of adsorption at the liquid-solid interface will be considered in this work. Adsorption occurs extensively in the natural environment. Random contacts between molecules and particles occur throughout the hydrologic cycle and in many kinds of aquatic systems. For engineered adsorption systems, the context for “contacts” is a reactor and the solid is usually an adsorbent. Applications of adsorption include drinking water treatment, tertiary treatment of wastewaters, treatment of high purity industrial process waters, pretreatment of industrial wastewaters prior to discharge to municipal sewer systems, pump-and-treat ground water treatment, etc.

Procedure for removal of Nickel from the Water by Adsorption Method: Initially prepare a stock solution of Nickel Chloride solution of concentration 1000 ppm by adding the 5gms of Nickel Chloride in the distilled water, to which sodium hydroxide pellets is added for increasing the basic nature of distilled water. Then nickel chloride solution of different concentrations 20 ppm, 40 ppm, 60 ppm, 80 ppm and 100 ppm are prepared by using the dilution formula $X_1Y_1=X_2Y_2$. After different solutions are prepared, absorbance of each of them is known by using Ultra violet spectrophotometer with the wave length of 375 nm. The values obtained are noted down. Then 0.50gms of powdered clam seashell is added to each conical flask, they are covered with the non-adsorbent cotton. Five conical flasks are kept in orbital shaker and it runs at a speed range of 150 to 200 rpm for range of 10 to 30 minutes after which the conical flasks are taken out. The Figure 2a shows the orbital shaker in which conical flasks

are kept. Solution in each conical flask is filtered with the help of filter paper and they are collected in separated conical flask. The Figure 2b shows the different ppm concentration of Nickel Chloride solution. The Fig 3.6 shows the different ppm after filtration. The value of absorbance is checked for each solution after filtration. Then after plotting the standard graph we came to know that Nickel can be removed by using the powdered clam seashell.

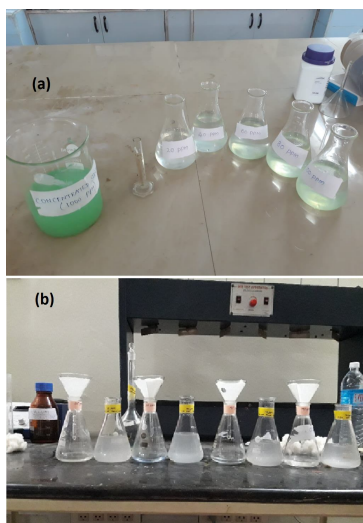


Figure 2 (a) Stock solution with different ppm and (b) different ppm after filtration

3.2 Ultraviolet Visible Spectrophotometer

Because only small numbers of absorbing molecules are required, it is convenient to have the sample in solution (ideally the solvent should not absorb in the ultraviolet/visible range however, this is rarely the case). In conventional spectrometer electromagnetic radiation is passed through the sample which is held in a small square-section cell (usually 1 cm wide internally). Radiation across the whole of the ultraviolet/visible range is scanned over a period of approximately 30s, and radiation of the same frequency and intensity is simultaneously passed through a reference cell containing only the solvent. Photocells then detect the radiation transmitted and the spectrometer records the absorption by comparing the difference between the intensity of the radiation passing through the sample and the reference cells. The Figure 3 shows the Ultra violet visible spectrophotometer used for the experiment.



Figure 3 Ultra Violets Visible Spectrophotometer

3.3 Orbital Shaker

An orbital shaker has a circular shaking motion with a slow speed (25-500 rpm). It is suitable for culturing microbes, washing blots, and general mixing. Some of its characteristics are that it does not create vibrations, and it produces low heat compared to other kinds of shakers, which makes it ideal for culturing microbes. Moreover, it can be modified by placing it in an incubator to create an incubator shaker due to its low temperature and vibrations. During the batch studies orbital shaker (Lawrence and Mayo) was used to bring a close relationship between the adsorbates and the adsorbents in terms of rate of contact. The Figure 4 shows the Orbital shaker used for the experiment.



Figure 4 Orbital Shaker

3.4 Weighing balance

An analytical balance often called a "lab balance" is a class of balance designed to measure small mass in the sub-milligram range. The measuring pan of an analytical balance (0.1 mg or better) is inside a transparent enclosure with doors so that dust does not collect and so any air currents in the room do not affect the balance's operation. This enclosure is often called a draft shield. The use of a mechanically vented balance safety enclosure, which has uniquely designed acrylic air foils, allows a smooth turbulence-free airflow that prevents balance fluctuation and the measure of mass down to 1 μg without fluctuations or loss of product. The Figure 5 shows the Weighing balance used for the experiment.

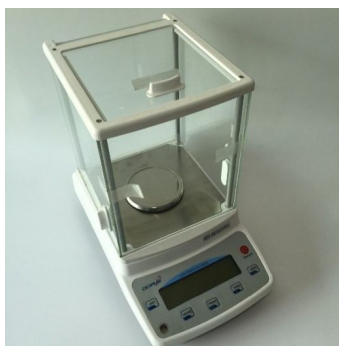


Figure 5 Weighing Balance

3.5 pH meter

A pH meter is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH. The pH meter measures the difference in electrical potential between a pH electrode and a reference electrode, and so the pH meter is sometimes referred to as a "potentiometric pH meter". The difference in electrical potential relates to the acidity or pH of the solution. The pH meter is used in many applications ranging from laboratory experimentation to quality control. The Figure 6 shows the pH meter used for the experiment.



Figure 6 pH meter

3.6 Characterization of Adsorbents

The nanoparticles are characterized by Scanning electron microscopy (SEM), and transmission electron microscopy (TEM), the molecular structure of the nanoparticles can be modelled through these methods. The Clam shell nanoparticles were characterized using Scanning electron microscopy (JSM-7600F) and Transmission electron microscopy (Philips CM200) at SAIF-IIT BOMBAY to study the surface topography and also to determine the diffraction pattern and particle size. The working principles of these instruments have been given below:

3.6.1 Scanning Electron Microscopy

Scanning Electron Microscopy (SEM) is primarily used for imaging the surface of materials. Usually samples observed have, typically, dimensions up to 1x1x1 cm and can be made of any material. However if the material is not conductive, a thin coating of gold or carbon is applied to avoid electron charging and image degradation. The basic layout of a SEM and the SEM which has been used in this research works shown in Figure 7. The backscattered mode is inferior (around 10nm) to that in secondary mode because of the larger penetration depth from which the electrons are emitted.(Bogner 'et al.' 2007).

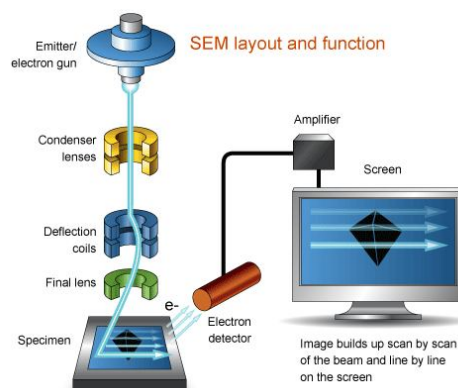


Figure 7 Schematic picture of the operation of an SEM

3.6.2 Transmission Electron Microscopy

Transmission electron microscope (TEM) is rather different from the scanning electron microscope. It operates at considerable high voltages (100kV to 3MV). The basic layout of a TEM is shown in the Figure 8. In general, the TEM can be operated in image mode versus diffraction mode. The first mode to master is diffraction mode. It is here that the electrons are selected to form the images. To obtain the diffraction pattern on the screen the lens need to be adjusted so that the back focal plane of the objective lens acts as the object plane of the intermediate lens. However, if we produce a diffraction pattern by allowing all electrons to reach the screen, the high intensity of the beam can damage the viewing screen and the information. In image mode, the transmission electron microscope can be operated under a variety of contrast mechanisms. The most general image contrast is called mass- thickness contrast. It arises from incoherent scattering of electrons. Because elastic scattering is a strong function of the atomic number as well as the thickness of the specimen, regions of the specimen with high mass will scatter more electrons than regions with low mass of the same thickness. Similarly, thicker regions will scatter more electrons than thinner regions (McIlveen et. al., 1994).



Figure 8 Transmission Electron Microscopes

4. RESULTS AND DISCUSSION

4.1 Effect of Contact time

Equilibrium time is one of the most important parameters in the design of economical wastewater treatment system. 0.05g of Carbonaceous nanoparticles was added into a 50ml of nickel solution with a concentration of 50mg/L. The residual nickel concentration in the solution was determined from Ultra violet Spectrophotometer. The Contact time was varied from 10 to 120 min at interval of 10 min. Rapid uptake and quick establishment of equilibrium time imply the efficiency of particular adsorbent in terms of usage in wastewater treatment. The Figure 9 shows the effects of contact time on adsorption of nickel by Carbonaceous nanoparticle and it was observed that the adsorption rate was rapid at the initial stages and then gradually decreased with the progress of adsorption. The maximum removal efficiency was found to be 90% at contact time of 10minutes. Further batch studies were carried out at this optimum contact time. The experiment was carried out from 0-120 minutes. After 10 minutes there was a steady gradual decrease. From this experiment 10 minutes was taken as optimum contact time and this value was given consideration for further experiments (Table 2).

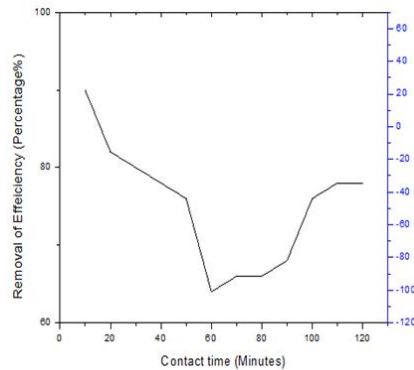


Figure 9 Effect of contact time

Table 2 The effects of contact time efficiency details

SN o	Time (minutes)	Initial Concentration (mg/l)	Final Concentration (mg/l)	Efficiency %
1	10	50	5	90
2	20	50	9	82
3	30	50	10	80
4	40	50	11	78
5	50	50	12	76
6	60	50	18	64
7	70	50	17	66
8	80	50	17	66
9	90	50	16	68
10	100	50	12	76
11	110	50	11	78
12	120	50	11	78

4.2 Effect of adsorbent dosage

One of the most critical parameters for rapid and efficient metal removal is size and amount of adsorbent which must be optimized. The adsorbent dose is an important parameter in adsorption studies because it determines the capacity of adsorbent for a given initial concentration of nickel solution. The effect of carbonaceous nanoparticles on the nickel removal is shown in Figure 10. The quantity of nickel solution was 50ml. It was observed that the removal efficiency gradually decreased in the beginning due to the availability of the active sites and then the removal was little increased throughout the range 0.05-0.50g. The optimum dosage was found to be 0.50g. The contact time employed was 10 minutes (Table 3).

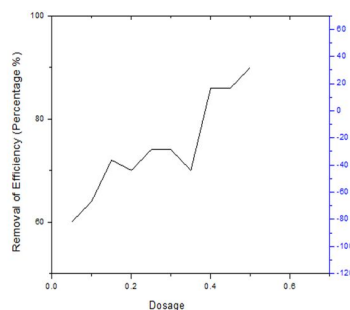


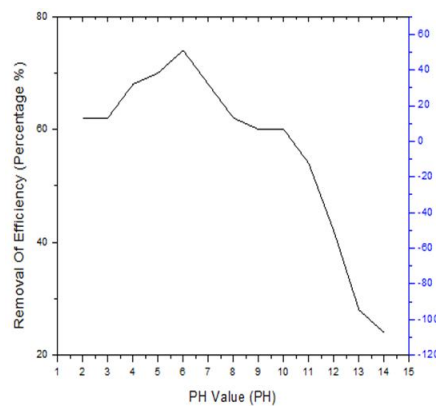
Figure 10 Adsorbent dosage

Table 3 The effects of absorbance dosage efficiency details

S.NO	Absorbance(g)	Initial Concentration (mg/l)	Final Concentration (mg/l)	Efficiency %
1	0.05	50	20	60
2	0.1	50	18	64
3	0.15	50	14	72
4	0.2	50	15	70
5	0.25	50	13	74
6	0.3	50	13	74
7	0.35	50	15	70
8	0.4	50	7	86
9	0.45	50	7	86
10	0.5	50	5	90

4.3 Effect of pH value

The wastewater from plating industries usually has a wide range of pH values. Thus, pH of the system plays an important role in the plating waste treatment. The value of pH affects both aqueous chemistry and surface bonding sites of the adsorbents. Similar to pH the effluents coming out from the industries will have concentration variation. The above two important design parameters have to be optimized. It was also observed that as the pH was increased from 2 to 14 the removal efficiency gradually increased and then gradually decreased at higher pH value (Figure 11). This phenomenon can be explained from the fact that as the pH increases, more negatively charged surface become available, thus, facilitating greater metal uptake. From the experimental observation the optimum was found to be 6 and initial concentration of 50mg/l (Table 4).

**Figure 11 Effect of pH value****Table 4 The effects of pH value efficiency details**

S.NO	pH Value	initial concentration (mg/l)	final concentration (mg/l)	Efficiency %
1	2	50	19	62
2	3	50	19	62
3	4	50	16	68
4	5	50	15	70
5	6	50	13	74
6	7	50	16	68

7	8	50	20	60
8	9	50	19	62
9	10	50	20	60
10	11	50	23	54
11	12	50	29	42
12	13	50	36	28
13	14	50	38	24

4.4 Effect of concentration of nickel:

The effect of initial concentration was tested between the range 10mg/L to 100mg/l (Table 5). The experiment was carried out for an optimized contact time of 10 min with a dosage of 0.50g and the pH value of 6. Here the time of relationship, dosage of adsorbent, pH of the aqueous. Solution optimum values were taken from the previous experiments and the remaining agitation speed candidate value was taken as constant. From the experimental observation the optimum concentration was found to be 50mg/l. The Figure 12 shows the concentration of nickel.

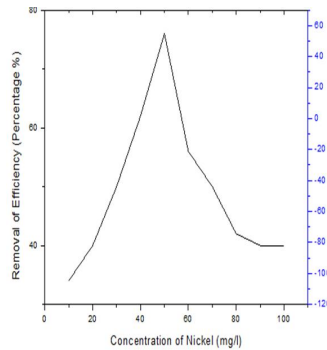


Figure 12 Concentration of nickel

Table 5 represents the effects of concentration of nickel efficiency details

S.N O	Solution Of Nickel (mg/l)	initial concentration (mg/l)	final concentration (mg/l)	Efficiency %
1	10	50	33	34
2	20	50	30	40
3	30	50	25	50
4	40	50	19	62
5	50	50	12	76
6	60	50	22	56
7	70	50	25	50
8	80	50	29	42
9	90	50	30	40
10	100	50	33	40

4.5 Effect of Speed of Agitation:

The speed is one of the important design parameters for the design of adsorption system. The rate of contact between the adsorbent and the adsorbate is an important governing parameter for optimum removal. Agitation speed is one of the important design parameters in terms of removal efficiency since it indicates the level and rate of interaction between the adsorbent and

adsorbate - David Hendricks (2011). The experiment was carried out in the operating speed range of about 50-300rpm (Table 6). With other optimized parameter values of adsorbent dosage of 0.50g contact time of 10 min, pH value of 6 and initial lead concentration of 50mg/l respectively (Table 7). From the experiment the optimum value of speed was found out to be 150 rpm. The Figure 13 shows the agitation speed.

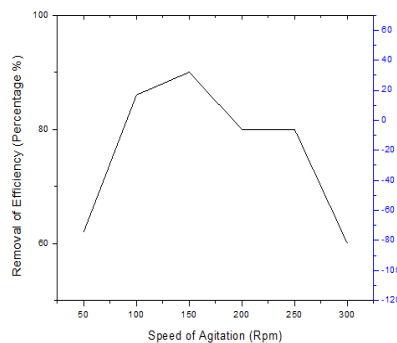


Figure 13 Speed of agitation

Table 6 The effects of agitation speed efficiency details:

S.NO	Speed (rpm)	Initial Concentration (mg/l)	Final Concentration (mg/l)	Efficiency %
1	50	50	19	62
2	100	50	7	86
3	150	50	5	90
4	200	50	10	80
5	250	50	10	80
6	300	50	20	60

Table 7 Optimization of process of batch study parameters for nickel removal using Carbonaceous Nanoparticles

SNo	Parameters	Experimental Range	Optimized Value
1.	Contact time	0-120 minutes	10 minutes
2.	Dosage of Adsorbance(carbonaceous nanoparticles)	0.01-0.50g	0.50g
3.	pH of the nickel Solution	2-14	6
4.	Concentration of nickel in the solution	10-100mg/l	50mg/l
5.	Speed of agitation	50-300rpm	150 rpm

5. CONCLUSION

From the experiment conducted, we have found that the carbonaceous nanoparticle i.e., powdered clam seashells (a calcium-based nanoparticle) is an effective adsorbent. Carbonaceous nanoparticles prepared through the Top-Down approach method were used to remove metal inorganic nickel ions in solution, by the adsorption of nickel ions. Nickel removal has been possible by using nano sized carbonaceous nanoparticle. The absorptivity of the flocs determined by the UV-Spectrophotometer shows that the process is efficient when dealing with aqueous nickel solution. In view of their chemical properties the carbonaceous nanoparticles can remove extremely low or high concentration of nickel. The proposed method is applicable for removing soluble metal nickel from water. Nickel can also be removed by different materials. Various materials and methods used for the execution of nickel using

carbonaceous nanoparticles are discussed by initiating with the ground work preparation of nickel working solution. Further, synthesis of nanoparticles and instrument characterization procedure were discussed. After synthesis and characterization, batch study experiments procedure was studied.

In the batch studies importance was given to the operating parameters which include Contact time, adsorbent dosage, pH of the solution, initial concentration of the adsorb ate and the agitation speed.

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**LEAK ELIMINATION WITH AN INNOVATIVE MAINTENANCE TECHNIQUE IN
PROCESS INDUSTRY (CLOSE DRAIN SYSTEM) BY DEVISING A NEW DESIGN
CONCEPT AND SAFE EXECUTION**

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ABSTRACT

Monitoring and maintaining the oil and gas infrastructure is critical to ensuring safe and efficient operations. But maintaining thousands of kilometers of pipes and other facilities, some in remote and hostile locations, is not an easy task. Maintenance of oil and gas industry facilities and infrastructure usually takes about 40% of the total budget and may be higher for complex systems. Focus on improving productivity and operational maintenance Innovative technologies are vital in the oil and gas industry. There is a critical leak on 2 inches Drain Line which is interconnected to Closed Drain system in a Process Industry. Closed Drain is a drain system that receives liquid from Pressure vessels into one common drain header and transports it to Effluent treatment systems in Production process plants .This Critical leak is focalized on a 2 inch 90 deg Elbow. Process Isolation is not feasible to commence repairs on the Ruptured Elbow as many other process equipment's are interconnected .This nature of problem is a unique case and this problem-solving technique shall impart new scientific knowledge to the existing knowledge hub. A total shutdown of the process plant is further required to effect maintenance repairs as there are no isolations on the network.

*Present research work attributed to a prevailing leak in a close drain network conveying water with a mixture of hydrocarbon that has direct impact to Production assets. The main objective is to eliminate the leak with an innovative Maintenance technique whereby there is no impact to production during the closure of leak. Maintenance mission is to provide effective solutions to meet operational requirements in compliance with Heath safety and environmental regulations, and to take **action to improve reliability of plant and equipment via problem solving integrated methods analyzing Failure and Root cause analysis which is a process of continuous improvement.***

Keywords: Closed Drain System, Problem Solving Technique.

I. INTRODUCTION

Hydrocarbon leak detection is mandatory for the oil and gas processing industry. Such leaks can create explosive conditions, if ignited, putting workers at risk and releasing hydrocarbons (HC) that jeopardize air quality and pose a public health hazard. Also, there is a cost factor. Large leaks can force all facilities to close until resources are repaired. The long unplanned period of time to resume operations means very high financial expenses while the plant, or parts of it, are still idle. Everything from water to crude oil to hard capsule is transported over millions of miles from pipelines around the world. The transmission and distribution network is very complex and is constantly growing. This network is subject to many risks, as pipes are vulnerable to loss of functionality due to internal and external wear, cracks, damage to third parties and manufacturing defects [1]. But pipes are among the safest transportation. The main threat that occurs in pipelines is leakage. The effects of the spill exceed the repair costs and the cost of oil or gas loss, and also greatly affects human life and the environment. To discourage these high costs, it is essential to design a reliable leak detection technology. However, more information is required to achieve a reliable system. Before deciding on any corrective action,

you must know the location and size of the leak. Numerous investigations have been conducted in recent decades to find the exact location and magnitude of the spill.

II. LITERATURE SURVEY

Xiao-Jian Wang et al. [1] offers various survey methods for leak detection. The advantages and disadvantages of each method are highlighted, focusing on choosing appropriate solutions for different piping systems. Recent research on transit leak detection techniques currently underway at the University of Adelaide is also described. In particular, the reverse method is considered in detail. R. Muthiah [2] Developed system detects acoustic emission signals of leaks. The specific characteristics of the system are discussed. The system was tested in a two-stage flow circuit with a closed field meter. The results of the test results have been reported. The document was completed with conclusions and a discussion of possible applications of the system. Klepka et.al [3] Investigate the leak detection system for water supply lines. The examination system is provided based on methods for detecting transient leaks. The waves in the pipeline were excited by the very fast on / off valve system. Prof. Yuvaraj T, Nithin Krishna, Poojary Manish, Priya Naik, Varsha P [4] Present the review on water monitoring and leak detection. Given that water leakage is a global problem that has already become a critical problem in many areas, the main objective of the document is to develop a leakage and water monitoring system, using the concept of the Internet of Things, and flow sensors that can be used to detect leaks and spiral valves placed on different parts of the cam The tubes impede the flow of water until the defective part of the tube is fixed. Additionally, the leak that occurred will wirelessly inform the relevant authorities. Samer El-Zahab [5] This article also outlines a new approach to identifying leak detection phases, i.e. location and location. In addition, two categories of leak detection systems have been identified, fixed leak detection systems and dynamic leak detection systems. The two systems are defined, as well as the capabilities of differentiation between them. Finally, this article provides an overview of common leak detection techniques to provide a broad sense of understanding in the field of leak detection research. MohdAsyadi Azam [6] This study aims to the effect of the concentration of sulfuric acid electrolytes (H₂SO₄) on the corrosion behavior of the surface of the natural gas pipeline using the Tafel induction method. The surface shape of the samples was studied using an optical microscope and an electronic scanning microscope to verify the relationship between wear rate and surface morphology. U.S.Ramakanth, Dr.Putti Srinivasa Rao [7-9] investigate the new material of AA 7075 reinforced with SiC and fly ash with different weight ratios, which new invented material is highly corrosion, wear resistance material. P. Jmaleswara Kumar, Addanki Venkata Vishnu [10] This document refers to the experimental study of the use of vegetable oil as a cutting fluid in the manufacture of EN 353 alloys to reduce the cutting temperature under different lubrication conditions, i.e. dry, floods and minimum quantitative lubrication conditions. P. Jmaleswara Kumar et.al [11] This document provides an overview of the automotive metal models. Implementation in the automotive industry for future metallic prototyping includes 1 redesign of a generation of two-wheel, three and four-wheel auto parts, 2. Mathematical simulation and software using FEM technologies, 3.3D printing, 4. Metal models despite 3D /4D printing, 5. The prototype test and research laboratories are described in detail. Finally, this review provides an overview of the future automobile industry through metallic models.

III. PROBLEM IDENTIFICATION

a) Cause and Effect

A Rupture Occurred on 2" 90 Deg. Elbow with a shear on the Elbow owing to strain. The Curvature of Elbow is found sheared. The photograph below signifies the nature of the persisting Problem as presented in (Figure-1)

A typical Shear on an Elbow rupture is illustrated in Figure 2 and Figure 4.



Figure 1 (Nature of Problem)



Figure 2(Typical Shear on the Elbow)

b) Failure Analysis

A Rupture Occurred on the 90 deg. Elbow with a shear (35 mm in length and abnormal shape localized) at Bend Radius of the Elbow towards the flow as in Figure 3

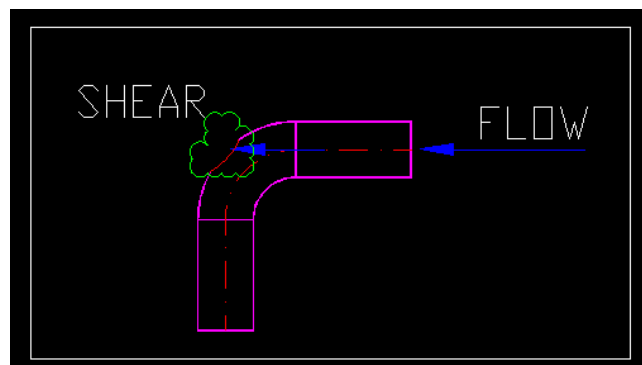


Figure 3 (Shear on the curvature of Elbow)

Figure 3 signifies the Flow direction and Fluid velocity towards the curvature of the 90 Deg Elbow. This is the weakest point on any Elbow causing this rupture, resulting to huge loss of production to shut down the process Facilities as this network is a common closed drain system. Table 1.1 (Technical Specifications of Ruptured Elbow).

Table 1.1 Technical specifications of the Ruptured Elbow

Required Material	Specifications
Size of the Elbow	2"
Outside diameter	60.3 mm
Wall thickness	3.91 mm
Material of Elbow	Carbon Steel A 234 Gr.WPB
Material of the Pipe	API 5L Gr.B
Diameter of the Pipe	60.3 mm

Fig 4 signifies the Rupture of the pipe due to erosion in Closed Drain System. Table 1.1 represents the diameter and wall thickness of the Elbow and pipe. An ultrasonic thickness test was carried out on the ruptured Elbow and the pipe downstream ruptured below to evaluate the integrity as tabulated in Table 1.2 and 1.3

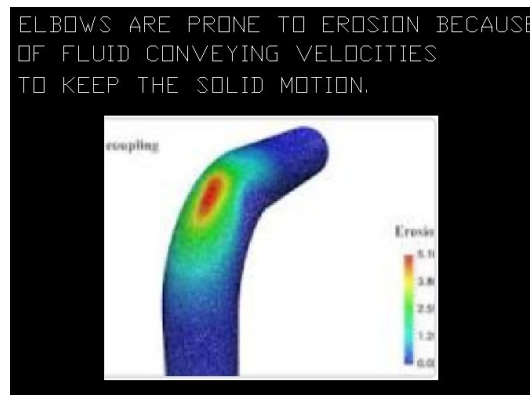


Figure 4 (A Typical Shear on the Elbow)

Table 1.2 Ultrasonic thickness test results on ruptured Elbow

Ultrasonic Thickness Test Results in millimetres				
Description	A	B	C	D
Elbow	1.12	1.22	1.41	1.01
Elbow	1.02	1.35	1.23	1.22
Elbow	1.22	1.22	1.15	1.3

Table 1.3 Ultrasonic thickness test results on Pipe downstream the ruptured Elbow

Ultrasonic Thickness Test Results in millimetres				
DESCRIPTION	A	B	C	D
PIPE	3.7	3.8	3.72	3.68
PIPE	3.68	3.71	3.67	3.71
PIPE	3.68	3.71	3.67	3.71

From the Above ultrasonic thickness test results, it is quite evident that the 2" 90 Deg Elbow is prone to severe erosion induced by the fluid velocity towards the Curvature of the Elbow. Ultrasonic thickness test results of the Pipe are in acceptable condition and are within the acceptable corrosion allowance of 1.0 mm. Based on the Nature of the Problem A new Design concept has been evaluated to mitigate this scenario in Process Industry. Please find Schematic Diagram of the loop due to erosion in Figure5.0 And the Process fluid operating parameters are tabulated here below in Table 1.40.

Table 1.40 - operating parameters

Required Material	Specifications
Size of the Pipe	2 inches
Out Side Diameter	60.3mm
Wall Thickness	3.91mm
Material of the pipe	API 5L GR, B
Material of the ruptured elbow	A234GR WPB
Nature of the fluid	Water mix with hydrocarbon
Operating Pressure	3 Bar
Flow Rate	25m/s
Reference API Code	ANSI B 31,3

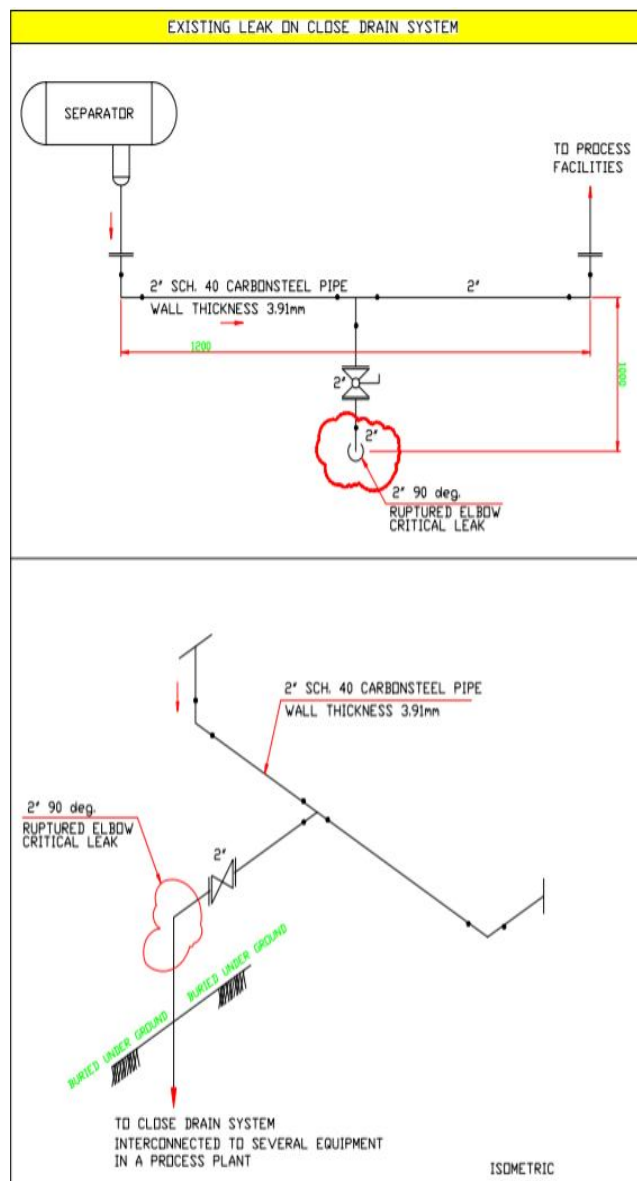


Figure 5.0 Schematic Line diagram damage of the pipe due to erosion in Close Drain System.

IV. DESIGN AND VALIDATION TO MITIGATE EROSION ON ELBOW IN CLOSE DRAIN SYSTEMS IN PROCESS INDUSTRY

Below are the leak detection methods commonly used in large pipelines. Direct methods, pressure wave detection, mass balance concept, gradient method and analytical methods. Each detection method has its advantages and disadvantages. For example, the sensitivity of analytical methods increases significantly along with increased flow velocity of the pipeline, due to the square relationship between pressure drop and flow velocity. This paper presents a new design according to that a system was developed to overcome the erosion problems in the Close drain system.

The Close Drain system is subjected to risks. Pipelines are vulnerable to job losses through internal and external wear, and manufacturing defects that lead to large hydrocarbon losses also greatly affect human life and the environment. To prevent these high costs, it is very important to design a reliable leak elimination technology. In many ways, the supply chain is integrated with every stop in the journey, be it transport, production or storage. Maintenance failure can be through the supply chain. We all know how delays in any part of the supply chain can cause major problems and cause additional delays between the rest. The supply chain often breaks down. The research involves designing new innovative maintenance technology for the pipeline leak repair system, which improves production. In this regard, I would like to explore a new technology to eliminate leakage.

Elbows are prone to Erosion because of fluid conveying velocities to keep the solid motion The Flow has direct impact on the curvature as shown in Figure 6.0

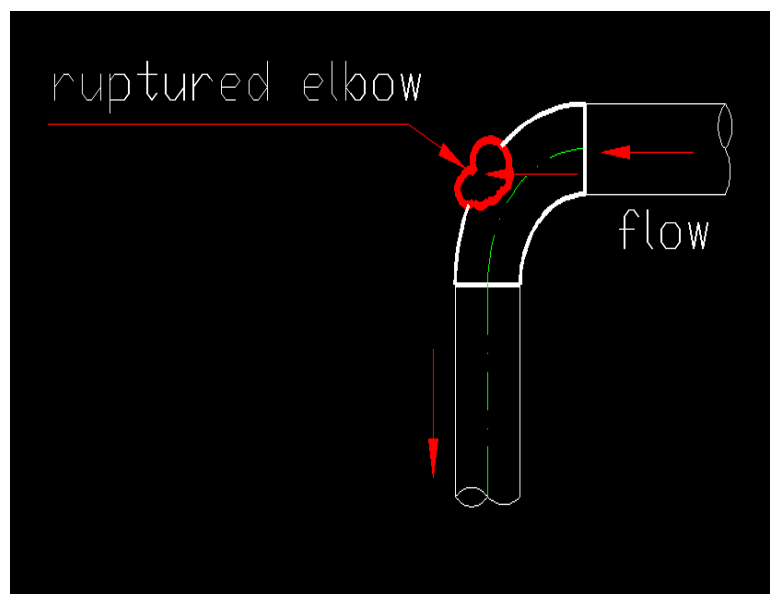


Figure 6.0 - Elbow Prone to Erosion Due to Fluid Conveying Velocities

The Conceptual design to mitigate these types of problems are as follows.

1. 2 “90 Deg Elbow have to be eliminated totally to avoid future repetition prone to erosion.
2. Ellipsoidal Pipe caps are integrated in the piping loop so as to act as a protective device for hydraulics. This Pipe fitting substitutes / replaces the Elbow that is prone to erosion. Fluid conveying velocities are negligible when compared to 90 deg elbow.

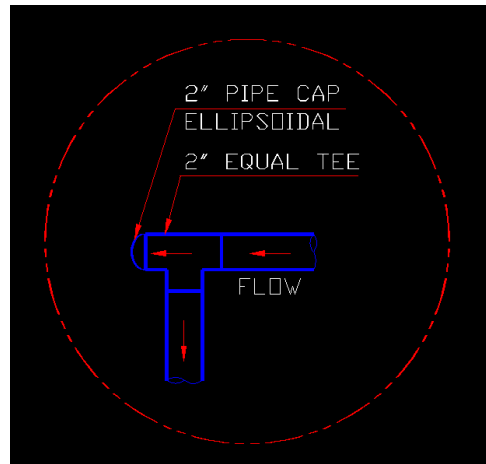


Figure 7.0 - Ellipsoidal Pipe Cap with to Severe Erosion that Induced Rupture

a) **Upgrade in integrity of piping components ellipsoidal cap, and equal tee.**

Furthermore, the wall thickness of the Piping components Has been increased from 3.91 mm to 5.54mm to prevent any type of re-occurrence in the future. Validation of new design concept without shutdown of process facilities. Optimizing. Productivity and Cost Reduction with Effective Supply Chain Management by Elimination of Hydrocarbon Leak. The following are the itemized structured phases of validation.



Figure 8.0 (2-inch Ball valve closed and blinded)

- To Carry out repairs on 90 Deg Elbow, there is further need to shut down the process plant since the induced rupture is on a close drain system. And as such there are no isolations
- The objective is to carry out the repairs with no production losses without any SD.
- Ultrasonic thickness test was carried out downstream the ruptured Elbow to mark up a healthy point to perform Cold cutting.

- d) A Cold cutting machine was utilized to cut the pipe at the marked point
- e) The ruptured Elbow part was removed
- f) 1 1/2" (Pipe outside diameter 48.3mm) x 4 m length C.S. Pipe have been inserted in 2" pipe inside diameter (52.48 mm) in vertical position.
- g) By inserting this 1 1/2" pipe into 2" pipe, the hydrocarbon will vent at 4 meters high.
- h) Process plant to be informed not to carry out draining of liquids into close drain system during the window of this line of action.
- i) The estimated time duration for process vessels not to drain any liquid into the close drain system is estimated at 2 hours.
- j) A NPT pipe threading machine is further utilized to prepare 2" NPT Thread on the outside diameter of the main 2" parent pipe.
- k) The 1 1/2" pipe is now retrieved the way inserted.
- l) A Screwed Flange of 2" 150 RF is now screwed to the Parent pipe.
- m) A 2" 150 RF Ball valve is now then installed on the screwed flange with the valve in open position.
- n) The Valve need to be closed and blinded as can be seen in the Figure 8.0
- o) The first phase of the activity is completed by validating the innovative technique of Maintenance Engineering.
- p) All the process plant equipment's can now be draining into the closed drain system as deemed necessary.
- q) The New design concept has to be implemented now at this stage as shown in Figure 9.0

b). After Validation of New Design

Finally, the Leak eliminated with creativity of New Design as prefabricated in Figure 10.0

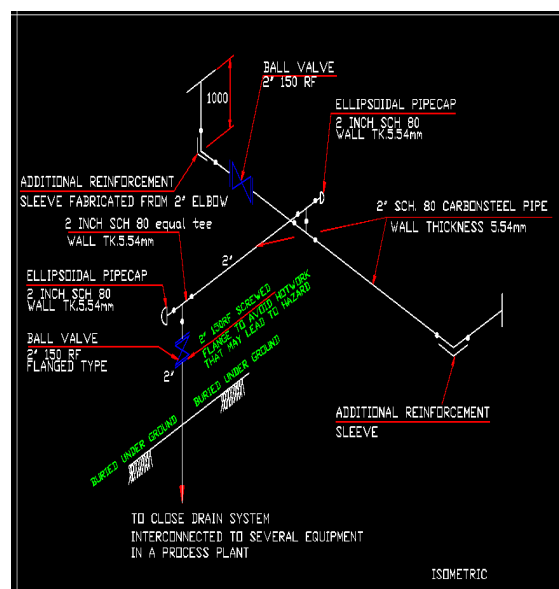


Figure 9.0 (New Design Concept)



Figure 10.0 Prefabricated Loop S as Per New Design Concept Eliminating the Elbow Prone to Erosion

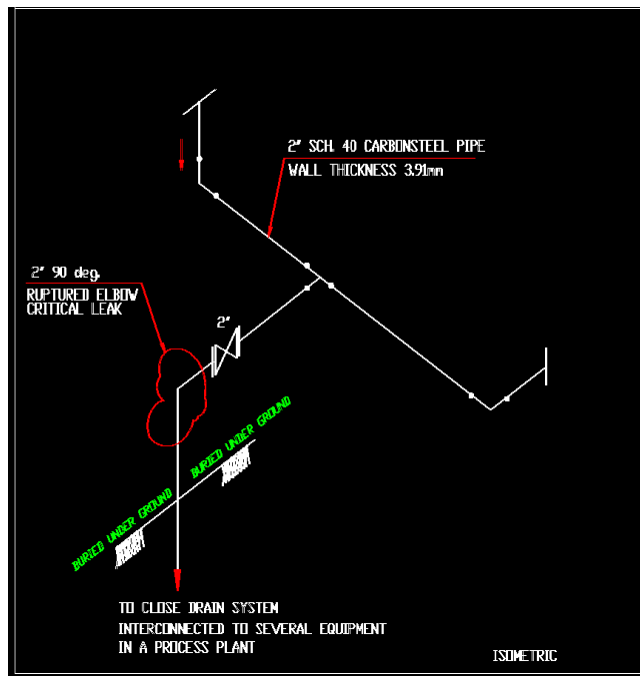


Figure 11.0 (Situation of Loop prior to Validation of New Design Concept)



Figure 12.0 (Ruptured Elbow Eliminated)



Figure 13.0 (2" 150 RF Screwed Flange to Parent Pipe fit up)

c) Hazardous operational Analysis (HAZOP STUDY)

Mainly it is carried out a detailed HAZOP study (Hazardous operation Analysis) of the prevailing critical problem. To resolve with a technical expertise problem solving concepts integrated with maintenance management policy with zero Production losses to the organization in elimination of Hydrocarbon leak. Experimentally to identify the suspected highly vulnerable section of a pipeline based on corrosion monitoring or other related technologies. The leakages are mostly prone to internal corrosion. Regular periodic monitoring of the pipeline is mandatory to avoid the leaks. Newly developed design system (Fig 14.0) to overcome the erosion in Close Drain System. Wall thickness has been increased to 5.54mm from 3.91mm to avoid the depletion of the same nature of the problem in future. The elbow has been replaced with Ellipsoidal dished End Cap so the flow impact was negligible.



Fig 14.0 Newly developed design system to overcome the erosion in Drain network System

V. CONCLUSIONS

Erosion on 90 deg elbow (Radial Curvature) is substituted with new Design and validated with nil production losses. The activity is carried out by design, Construction and validation. This is a innovative maintenance Technique in Energy Sector optimizing productivity and cost reduction with Effective Supply chain management in place.

The following conclusions are made:

1. Successfully identified the highly vulnerable section
2. Carried out a detailed HAZOP study successfully.
3. Leak Elimination of the same together with subsequent experimental techniques carried out both theoretically and experimentally.
4. The flow impact was controlled on the elbow pipe with no production losses.
5. Additional reinforcement sleeve as mitigation for future.
6. Effective Supply chain management.

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**POLLUTION MONITORING AND THEMATIC MODELING IN AND AROUND
MINING AREAS USING GIS & SATELLITE REMOTE SENSING APPLICATION**

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ABSTRACT

Currently, modeling and monitoring of pollution has become a very important activity. Environmental quality assessment and mapping has become an important research area and requires a systematic approach using multi-criteria analysis with the help of GIS and remote sensing applications. Hazardous and rare areas of environmental degradation can be easily identified and determined through satellite remote sensing application. Polluted areas of the mining area can be mapped with the help of interpretation elements such as form, shape and texture, association and shadow using visual interpretation on satellite images. Digital image analysis can go a long way in mapping the environment by methods such as contrast analysis, density slicing, filtering, NDVI, principal component analysis, supervised classification, etc. using various enhancement techniques. Digital data models can be studied and surveyed with regional diffusion of remote sensed data via satellite. Interpretation of multi-date images of different seasons reveals changes in the environment in different seasons. Training sets in digital satellite data are selected through digital image analysis and mapping of classification techniques can be performed. GIS software can be effectively stored in the system's geo-database. The mine environment requires an environmental management and information system that stores information related to satellite data stored in the geo-database of the GIS software system and can systematically manage all information related to it. This research work reviews the application of satellite remote sensing data for monitoring and contextual modeling using GIS techniques and environmental management information systems for mining areas and surrounding environmental pollution.

Keywords: *Satellite data, GIS & remote sensing, coal mining environment, pollution modeling, data analysis, multi-criteria decision analysis*

1. INTRODUCTION

Earth's environment has been continuously emphasized by various types of human developmental activities. Natural resources have declined due to various man-made activities. In turn, huge amounts of waste products have been generated that degrade the environment in countable measures. In this context, monitoring environmental degradation is essential to control the degree and rate of amplitude of pollution. Several traditional methods are available for monitoring the environment. But each has its own limits. The advent of satellite technology has highlighted the complexity in real-time environmental monitoring in regional areas, including irresponsible areas through traditional surveys. A geographic information system (GIS) is a conceptualized framework that provides the ability to capture and analyze spatial and geographic data^[1]. GIS applications (or GIS apps) are computer-based tools that allow the user to create interactive queries (user-created searches), store and edit spatial and non-spatial data, analyze spatial information output, and visually share the results of these operations by presenting them as maps^[1]. Remote sensing modifies the activities of recording, observing and behaving objects or events at far-off (remote) locations^[2]. A system for capturing, storing, checking, integrating, manipulating, analyzing, and displaying data which are spatially referenced to the Earth^[3]. In remote sensing the sensor is not in precise contact with the object or events^[2]. An information system that is designed to work with data referenced by spatial or

geographic coordinates. Remote sensing is defined as a technique to collect satellite-spatial information about the characteristics of objects on the surface of the earth without physical contact with them, as demonstrated in **Figure-1**, data collection by remote sensing.

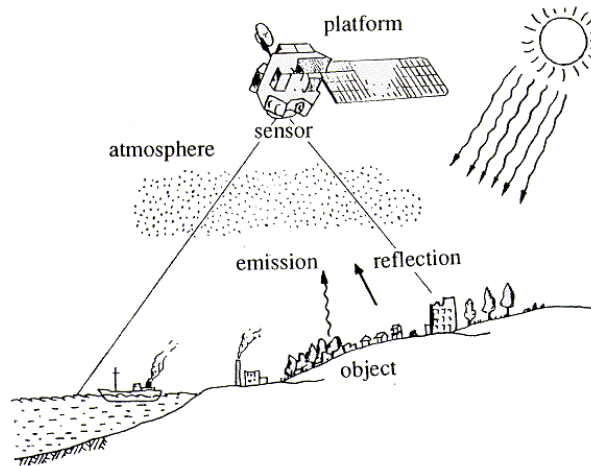


Figure-1: Data collection by remote sensing

(Source: http://sar.kangwon.ac.kr/etc/rs_note/rsnote/cp1/1-1-1.gif)

An integrated GIS and remote sensing application provides a rapidly expanding as well as systematic multi-criteria analysis with automated and integrated geographic information systems are rapidly. It also facilitates a well integration of decision support systems with GIS application. Regional coverage (large-scale data available for the local area), Multispectral data, Multi-time data (repetitive coverage), Stereoscopic data (model study of digital terrain), Digital data (aided by computer enhancement), any small data (geo-coded data) and Data on difficult areas are advanced special features of remote sensed data via satellite.

2. LITERATURE SURVEY

In this section, we provide brief details of different configurations of satellites with their several observations and spatial patterns. The sensitivity features and optimization patterns are used for earth resources and environmental studies & inventory programs. A variety of satellites have been launched for identified applications such as meteorology, communications, military and defense, ocean studies, earth resource inventory, environment etc. which are specialized for earth resources and environmental mapping are shown in **Figure-2 to 4**

Mission	LANDSAT 1&2	LANDSAT-3	LANDSAT-4/5	SPOT-1/SPOT-2/ SPOT-3	MOS-1a/ MOS-1b	JERS-1
Launch Year	1972,1975	1978	1982,1984	1986,1990,1993	1987, 1990	1992
Altitude (km)	919	919	705	830	908.7	568
Inclination	99.1°	99.1°	98.2°	98.7°		98°
Spectral band(s) in µm	RBV B1:0.475-0.575 B2:0.580-0.680 B3:0.698-0.830	RBV 0.505-0.75	MSS 5 TM 0.45-0.52 0.52-0.60 0.63-0.69 0.76-0.90	Panchromatic 0.51-0.73 Multispectral (XS) 0.50-0.59 0.61-0.68 0.79-0.89	MESSR B1:0.51-0.59 B2:0.61-0.69 B3:0.72-0.80 B4:0.8-1.1 VTIR B1:0.5-0.7 (stereo) B2:6.0-7.0 B3:10.5-11.5 B4:11.5-12.5 MSR	Optical Sensor 0.52-0.60 0.63-0.69 0.76-0.86 0.76-0.86 (stereo) 1.60-1.71 2.01-2.12 2.13-2.28 2.27-2.40
Spatial resolution	MSS4:79m	MSS1:79m MSS (B8):240m RBV:30m	TM 30m 120m for B6	10m in PAN 20m in XS	MESSR-SOM VTIR-B1:900m VTIR-B2,3,4: 2700m	18.3×24.2 (R×A)
Swath (km)	185	185	185	117	MESSR-100 VTIR-1500	75
Repeat cycle (days)	18	18	16	26 (with steering)	5-6*	44
Equatorial crossing in LST	9:30 am	9:30 am	9:45 am	10:30 am	"non-synchronous"	
Quantization level (bits)	6	6	8	PAN-6/B XS-8		

LST : Local Solar Time XS : Multispectral RBV : Return Beam Videon (RBV)
* : not an integral multiple of day

Figure-2: Earth Observation Systems (VNIR, SWIR, TIR) launched till date (Jan. 1996)

	<i>Seasat</i>	<i>SIR-A</i>	<i>Shuttle/ Space Lab</i>	<i>SIR-B</i>	<i>SIR-C</i>	<i>ERS-1 ERS-2</i>	<i>JERS-1</i>	<i>Radarsat</i>
Year of launch	1978	1981	1983	1984 1995	1994 1995	1991	1992	1995
Altitude (km)	794	252	250	250	250	785	568	793-821
Inclination	98.5°	38°	57°	57°	57°	98.5°	98°	98.6°
Band	L	L	X	L	CLX	C	L	C
Frequency (GHz)	1.275	1.275	9.4	1.275	5.289, 1.239, 9.602	5.3	1.275	5.3
Wavelength (cm)	23.5	23.5	31.7	23.5	5.8, 23.5 31	5.6	23.5	5.6
Nominal Resolution (m)	25	40	25	15-50	10-200	26 × 28	18 × 18	9 × 9 to 100 × 100
Incidence Angle	20°	47°	31-54°	15-60°	17-60°	23°	35°	10-50°
Polarisation	HH	HH	HH	HH	HH,VV HV,VH	VV	HH	HH
Swath Width (km)	100	50	8.5	20-50	15-90	100	75	45/510
Repeat Cycle (days)	17	—	—	—	—	3/35/168	44	27/7/17

Figure-3: Synthetic Aperture Radar (SAR) Missions launched till date (Jan. 1996)

<i>Mission</i>	<i>TIROS-N</i>	<i>NOAA-9,10,11,12,14 (F,G,H,D)</i>	<i>CZCS</i>
Launch year	1978, 1979, 19--., 1983	1985, 1986, 1988, 1991, 19--	1978-86
Altitude (km)	833	833	955
Inclination	98.9° AVHRR	98.9° AVHRR	99.3° CZCS
Spectral band(s) in μm	0.55-0.9 0.725-1.1 3.55-3.93 10.5-11.5 10.5-11.5	0.58-0.68 0.725-1.1 3.55-3.93 10.3-11.3 11.5-12.5	0.433-0.453 0.510-0.530 0.540-0.560 0.660-0.680 0.70-0.80 10.5-12.5
Spatial resolution	1.1 km at nadir, offnadir monimoms: along track 2.4 km	across track = 6.9 km	825 m at nadir
Swath (km)	2400 cross track scan $\pm 55.4^\circ$ from nadir	2400 cross track scan $\pm 55.4^\circ$ from nadir	1640
Repeat cycle (days)	Twice a day	Twice a day	2 (repetivity) 6 (revisit period)
Ascending node equatorial crossing in LST	1500, 1930, 1430, 1930	1420, 1930, 1340, 1930, 1340	
Descending node equatorial crossing in LST	0300, 0730, 0230, 0730	0220, 0730, 0140, 0730, 0140	2400
Quantization level	10	10	8

AVHRR : Advanced Very High Resolution Radiometer
CZCS : Coastal Zone Colour Scanner

Figure-4: Environmental Earth Observation Systems launched till date (Jan. 1996)

(Source: Figure-2 to 4 are taken from R R. Navalgund et al. (1996)^[4])

3. Application of remote sensing in environmental studies

The following are the applications of remote sensing in environmental studies to different environments:

3.1. *Land environment*: Geology, Geomorphology, Landuse mapping, Waste land mapping, Urban spread mapping, Soil and agricultural landscape mapping, Updating of cultural facilities, Transport network mapping and Land degradation mapping

3.2. *Air environment*: Zonal density mapping of areas under air pollution, Wind direction mapping and Mapping area of air pollution effects

3.3. *Water environment*: Surface water list update, Water logging area mapping, Hydro morphological mapping, River environment mapping, Watershed mapping and Water pollution study

3.4. *Botanical cover study*: Crop pattern mapping, Vegetable density, Biomass resource mapping, Temperature study, Zonal mapping of temperature anomaly regions, Underground mine fire mapping and Geothermal mapping

4. Application of remote sensing in mining environments

The mining environment is a complex situation. Environmental conditions often change with the ongoing mining operations at the mine. The effects on land, water, air, vegetation and temperature in both open quarry and underground mining are notable. The applications of remote sensing in environmental studies are described in **Figure-5**. An indication of declining open quarry and underground mining is manifested through various effects in the ambient atmosphere. Table-1 shows the outline of corrosion that can be mapped and analyzed using remotely understood satellite data. Hazardous areas of environmental degradation can be easily identified and determined. Polluted areas of the mining area can be mapped with the help of interpretation elements such as form, shape and texture, association and shadow using visual interpretation on satellite images. Digital image analysis opens a wide panorama for satisfactory interpretation using various enhancement techniques. Methods such as contrast analysis, density slicing, filtering, NDVI, principal component analysis (PCA), supervised classification, etc. can greatly help in environmental mapping. Interpretation of multi-date images of different seasons reveals changes in the environment in different seasons. In the study of the mine environment, satellite imagery is used to explain some important topics of land, air and water systems in and around mining areas. Aerial photographs help a lot to study these characteristics in detail. Thermal infrared imagery is very useful in coal fires and related studies. CCT tapes are useful in digital analysis of data.

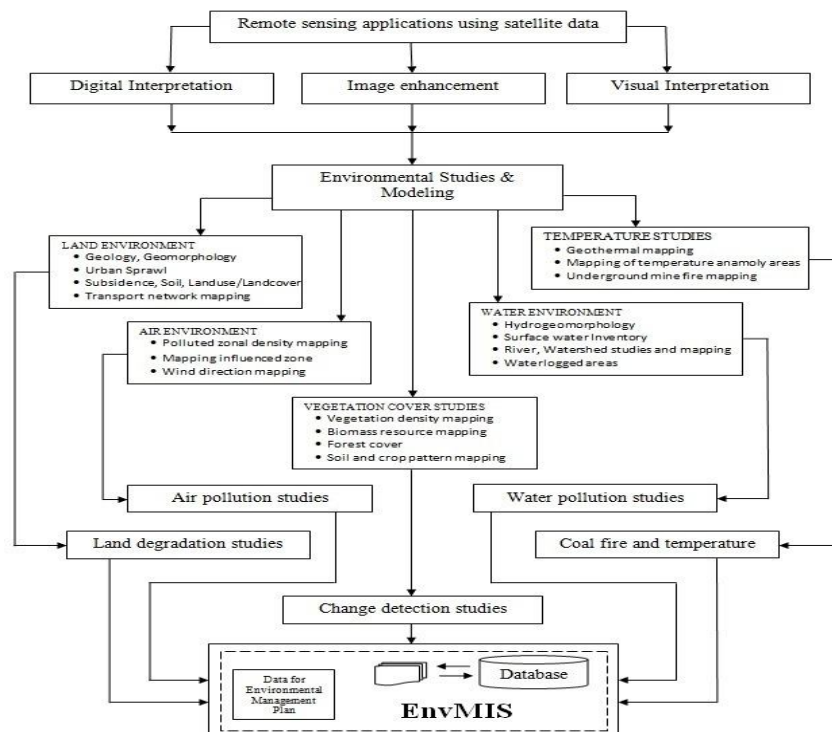


Figure-5: Application of remote sensing in environmental studies

Table-1: Possible application of remote sensing in the identification of various polluted zones due to mining and allied operations

S. No.	Environment	Allied Industrial Operations	Allied Mining Operations	
			Opencast (OC)	Underground (UG)
1.	Land Environment			
	a) Scars on the ground	*	x	#
	b) Soil loss	*	#	#
	c) Changes in geomorphology	*	*	#
	d) Changes in land use	*	#	*
	e) Subsidence	#	*	#
	f) Overdump mapping	*	#	#
2.	Water environment			
	a) Changes in drainage pattern	*	#	*
	b) Water logged areas	*	*	*
	c) Surface water pollution	*	#	*
	d) River or stream pollution	*	#	*
3.	Air environment			
	a) Zones of influence	*	#	*
	b) Extent of polluted areas	*	#	*
	c) Density of air pollution	*	#	*
4.	Thermal environment			
	a) Coal fire detection and mapping	#	*	#
	b) Coal overdump fire detection & mapping	*	#	*
5.	Vegetation environment			
	a) Loss of agricultural land	*	*	*
	b) Loss of forest land	*	#	*
	c) Stress vegetation mapping	*	#	#
	d) Area for afforestation	*	#	*

Note: * (Possible to interpret), x (Not possible), # (Not applicable)

5. Monitoring and Mapping

Identification and mapping of degraded areas and associated processes are essential to assess environmental impacts. Following are some factors that can be identified and mapped for environmental assessment of mining areas using remotely understood data.

5.1. Soil erosion measurement

5.1.1. Geomorphology: Generally, the areas around the mining areas are comparatively rough in nature. Due to mining operations and dumping of mines on the land surface, it has been observed that there are frequent changes in the micro-geomorphology of the area. Due to which the land loses its use and values. In addition, local drainage pattern extraction can occur, resulting in a lack of drainage and water logs in these areas. Reliefs in the surrounding areas are being changed, leading to a level of soil erosion, which is important in the reclamation of land and management systems of mining areas. Quantification of this aspect with multi-time imagery analysis helps in achieving an effective and optimal management plan. Concave is also one of the land degradation caused by underground mining. In suboptimal studies remotely sensed data, especially aerial photographs, can be quite useful

in delimiting the aerial extent of such areas to properly assess management plans in the context of field views.

5.1.2. Land use: The erosion of the landscape ends with changes in the landscape. Apart from the loss of land for mining activities, the waste of the mine also degrades the surrounding agricultural areas. In addition, these activities are further enhanced during the rainy season, as rain water also reaches a considerable amount on that land. This change in land use incidents has to be monitored regularly and remote sensing is an appropriate technique for this purpose. Such land degradation conditions in land use patterns in each particular time frame can be effectively mapped through remotely sensed data with good segmentation. A change in the land use map of the multi-time mode assures an environmentalist to make their management plan more effective.

5.1.3. Barren: Identifying and mapping wastelands in quantitative terms not only helps in understanding the levels of land degradation processes around mining areas, but also to assess the current and actual situation, so that a comprehensive regeneration methodology is developed. Could. The extent of mapping different types of waste lands allows one to appropriate environmental protection. In this line the remote sensing technique is considered a parallel device. Extensive studies regarding wastelands are inevitable as part of the reclamation process to develop a suitable ecosystem in mining areas.

5.2. Hydrology and Water Pollution

Mapping Many times the surface hydrology around mining areas gets polluted due to mine waste and associated industrial outlets accessing surface water sources. In this case, harmful and toxic chemicals are increased in water. As a result, water quality deteriorates further and becomes unsuitable for domestic and agricultural uses. Changes in water quality result in damage to the area's water balance and deteriorate good land mapping of such pollution levels and with multi-time digital remote sensitive data to take the necessary action in a dangerous situation will be helpful.

5.3. Air pollution mapping

However it is a little difficult to map air pollution zones to the precise extent through conventional methods at frequent intervals of time. Satellite data helps to carry out this work admirably and efficiently. The boundary of the air pollution zone can be easily mapped using spectral signatures. Band-7 of IRS satellite imagery in particular shows a good picture with respect to such regions. Band ratio composites enlighten the mapping of air polluted areas. After providing the test site with parameters it is possible to limit the different density levels of air pollution around the mining areas.

5.4. Vegetative environment

Studies show that the mapping of areas of stress vegetation due to air pollution from mining and allied industries gives satisfactory results. Analyzes such as NDVI and then Gaussian optimization show different types of vegetation around mining areas. The loss of agricultural land and forest land can be efficiently mapped and analyzed through multi-date satellite images of different seasons applying change detection techniques.

6. Thematic modeling of polluted areas

The main objective of environmental degradation in air, water and land area is to identify hazardous areas. Areas such as highly degraded, highly polluted (air and water areas) and different levels can be separated based on information obtained from remotely sensed data. Extensive field work and subsequent laboratory tests should be carried out to confirm the pollution status. These areas must be monitored regularly using real-time satellite data before being declared as hazardous areas. The field data is extremely helpful in confirming the hazardous nature of the area. For satisfactory results field data can be used to select training sets in digital satellite data through digital image analysis and classification techniques can be attempted. Implementation of various interpreted data from satellite

data sources such as geomorphology, land use, wastelands, slopes, relief, etc. are isolated from highly degraded and hazardous areas for additional study in management. Digital analysis plays a very important role in water pollution studies. Implementing the results of water analysis from different locations of the water body on digital data and running the appropriate algorithm with the digital number (DN) value of the surface data related to those surface different levels of pollution of water bodies will be found. The same situation is with air pollution studies and thermal mapping. Identification and mapping of the above mentioned characters or features will help in assessing the impacts in the mine fields. Recent geological maps give information about the current status of land degradation through which the area of land can be easily accessed on the environment. In addition, large-scale mapping will yield good results with acceptable resolution, and possibly mapping at a 1:1,000 scale may provide information at the village's sector level. As a result, a sustainable land management system can be developed even at the village level. Similarly estimation of impacts through detailed maps obtained from remotely sensed data on the water and atmosphere area in large format can be useful to generate a sustainable environmental protection system.

7. CONCLUSION

As seen earlier, remote sensing techniques are helpful in estimating, managing and planning mining environments. A synonym view of regional coverage with multi-time data information gives such information to remote sensing. Regional planning and management can be more effective after identifying such hazardous areas. The recapture of the eroded areas and nature of such lands extracted from satellite data will help in the action and the corresponding land management. Isolation of air and water polluted areas can help protect and improve such areas by appropriate management measures. The high resolution satellite imagery data provides an indicator of pollution levels as well as diffusion patterns over entire extended regions or areas through spatial mapping of tropospheric airborne particulate matter. The maps produce on the basis of high-spectral horizontal distribution of the aerosol loads over entire polluted regions with the help of high resolution satellite data. In the stream line of routine monitoring processes, as remote sensing data can often be, information on the environment will accumulate. All these real-time as well as recent times can be effectively stored in the geo-database of GIS software systems. The system enables one to be stored, retrieved, and manipulated with systematic analysis of environmental data from real geographic points. With the help of multi-time information, spatial changes in land use, agriculture, polluted areas, etc. can be mapped for efficient and optimal environmental management system. The efficiency of such an information system depends entirely on the number of characters and parameters considered in the system. Currently such an approach is urgently needed to create a common geo-database and operating procedure for pollution monitoring and generating thematic modelling & visualizations in and around mining areas in the mine environment.

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**A STUDY ON IMPACT OF OCCUPATIONAL STRESS OF TEACHERS ON
LEARNING PROCESS OF STUDENT: WITH SPECIAL REFERENCE TO PRIVATE
UNIVERSITIES IN HIMACHAL PRADESH**

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ABSTRACT

If the working conditions of a given institution are evaluated it can be seen that in most of the cases teacher are taking up all the assignments along with teaching and it is expected that they should perform with same efficiency as they use to do in teaching, even some of the teachers are able to do so but then again their teaching efficiency is affected by the same. There are a number of studies that have stated that stress is not conceived only from work environment rather a number of personal factors are responsible for the same. It is very clear from the previous studies that if the perceived stress is taken to a classroom then it is going to affect the learning process and even the desired outcome of the same. This present study will try to evaluate the stress condition of teachers in their assignments and effect of the same on their respective students. This study will also suggest means and ways to minimize the stress conditions and coping strategies with the same. The sample size of the study is 400 respondents i.e. 200 teachers and 200 students from private universities of Himachal Pradesh. SPSS Ver. 22.0 is used to analyze the data and ANOVA (one way) to express results.

Keywords: Occupations stress, Teachers, Private Universities, Students, Himachal Pradesh.

INTRODUCTION

Overview of Work Related Stress

The term 'stress' was first coined by Selye in early 1920, it is not so that prior to this stress was not a recognized feeling, as a matter of fact a number of experts in the field have identified this as a behavioral feeling and as an integral part of the routine life of individual. In the earlier days stress was very closely identified with work and family related pressure i.e. when a person was not able to maintain a proper work life balance and strive to attain quality of work life. Most of the experts and scholars have given a major thrust on findings reason and causes of stress and the psychological outcome of the same. **Mason (2011)** stated that not even human beings but also the animals are liable to feel the state of stress, Mason conducted an experiments on monkeys and created such situations where the reaction timing and physiological balance changed, when more stronger positive situation were created monkeys behaved positively and even started to play. Though this experiment was conducted on animals but the results of the same can be normalized with human beings i.e. the external environmental conditions exert pressure on an individual and people start to feel stressed, the state of stress the decision making ability of the person is most affected.

In the present competitive scenario, stress has become the way of life and an unavoidable condition and most of the people are having their own way to deal with the same. It is not so that in personal life people do not feel stress but then again there are number of ways to deal with the same at personal level, as far as professional life is concerned people get more affected by the stress conditions. In case of stress related to professional life, there can be a number of reasons for the same i.e. introduction of new technology, change in work culture, economic turbulence, peer level contradiction, departmental politics, salaries, workload, etc. this is an endless list because each and every individual is having his or her own criteria of stress and

anything & everything can exert stress on an individual. Once the feeling of getting stressed is recognized it is having a direct impact on working efficiency and productivity of an employee and if the productivity is affected then revenue or profit of the respective organization is also affected. In continuation of the same we can classify the state of stress as sociological and psychological phenomenon, the sheer difference lies in the factors responsible for the same and capability of a person to deal with the same.

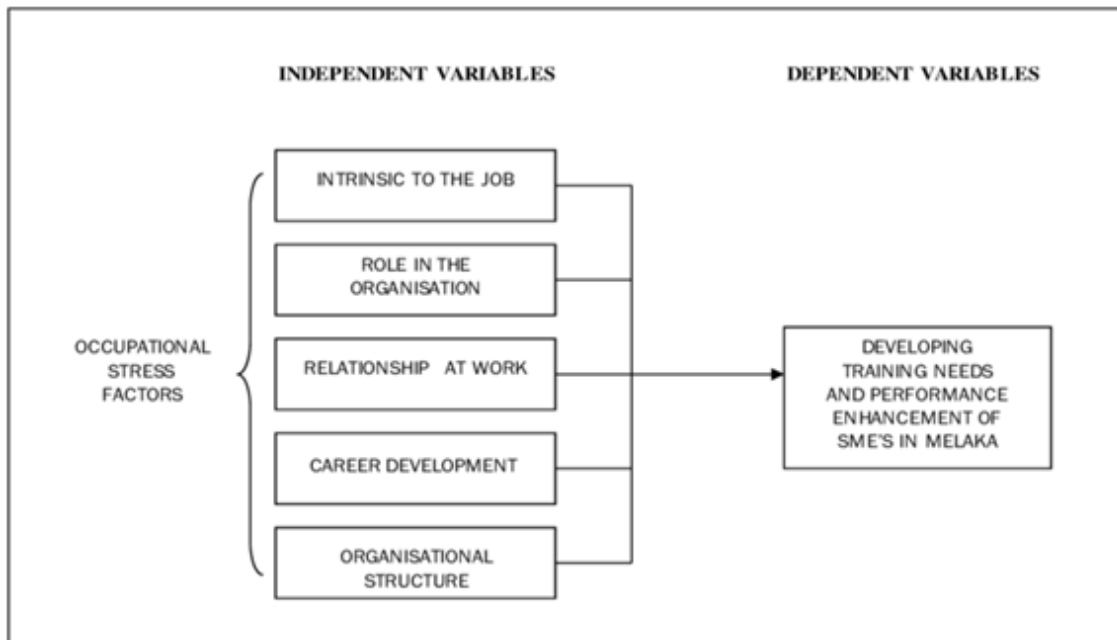


Figure 1: Factors of occupational Stress

Here it is very important to mention that people perceive a number of emotions in their routine life and in the process, stress (if considered as emotion) is the result of positive or negative perception of a person apparently it can also be stated as increased anxiety. It is not so that people who can feel the stress are undergoing such conditions but then again most of the people are under stress in their routine life but they may not recognize the same in real sense. In order to clarify the scenario we can compare the stress level of public and private sector employees, in public sector organization the routines work is fixed and even the salaries are fixed and assured including a number of benefits, it can be said that 50% of the stress is minimized in such a case, then on the other hand for private sector employees stress is 50% extra because everything is related to performance of the employee i.e. salaries, promotions, workloads, etc. are distributed according to performance and caliber of a person. An employee of private sector has to prove him or her on each passing day and on every next day he or she is judged on the basis of the same.

Stress in Teaching Fraternity

There was a time when being a teacher means 'replica of perfection' and judgment criteria was the teaching capability but in the present scenario situation has changed, now a teacher has to keep up the pace of employability as per the mission and objective of the respective organization. This is a difficult task altogether, because in the process of teaching a person has to become an expert of the subject and keep on updating oneself as per the requirement of students and related environment. If the working conditions of a given institution are evaluated it can be seen that in most of the cases teacher are taking up all the assignments along with

teaching and it is expected that they should perform with same efficiency as they use to do in teaching, even some of the teachers are able to do so but then again their teaching efficiency is affected by the same. A number of studies are being conducted in this regard and results stated that there is a difference in stress level of male and female teachers, this is because of the reason that females are emotionally more attached with their work as compared to males and are willing to change their jobs less frequently.

Here again it is important to mention that there is a difference in private and public sector institutions i.e. in public sector institutions the parameter of assessment is teaching capability of a person and in private sector multi-tasking is important. Researcher do not suggest that a given person may not work in private institution but then again performance of a teacher may be judged on the basis of teaching capability and research and not on administrative jobs.

Effect of Teacher's Stress on Students

It is said that students are reflection of their teachers and if a teacher is stressed then there is some or the other effect on the learning process of students. There are a number of studies that have stated that stress is not conceived only from work environment rather a number of personal factors are responsible for the same. It is very clear from the previous studies that if the perceived stress is taken to a classroom then it is going to affect the learning process and even the desired outcome of the same.

The researcher is herself a teacher and felt that at times the teaching performance is affected under stress condition to a certain extent, and this extent depends on the cause and complexity of stress. Based on the previous studies the researcher has tried to relate to stress condition and effect of the same on performance, as given in figure 2.

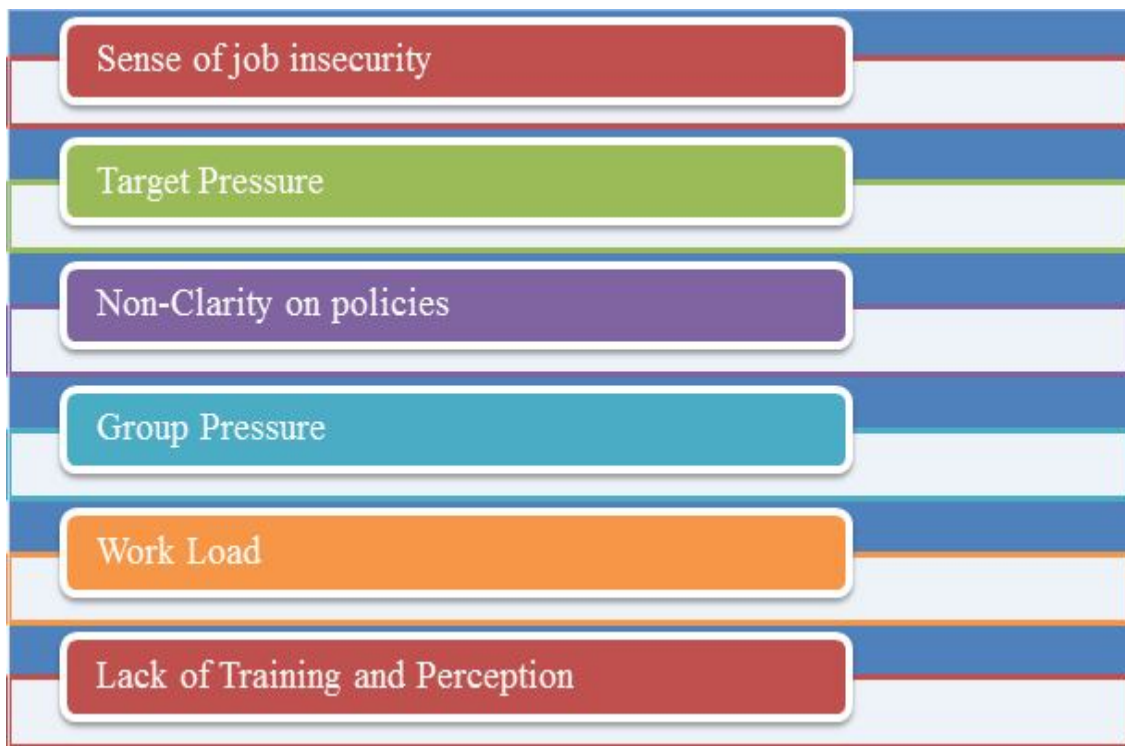


Figure 2: Reasons of Stress Conditions

All the above mentioned reasons are relevant to justify the stress related conditions of teachers. As mentioned above the main role of a teacher is to teach and mentor he students, but in a given

organization, especially in private sector institutions it is expected that teacher should take up more assignments other than teaching and along with the same they should also show expertise in their teaching assignments. At the second level if personal issues are mixed with job related assignments then the condition becomes even worse because this affects the quality of work life of a person and the same can affect the efficiency of a person to perform in all respects.

This present study will try to evaluate the stress condition of teachers in their assignments and effect of the same on their respective students. This study will also suggest means and ways to minimize the stress conditions and coping strategies with the same.

REVIEW OF LITERATURE

Husain and Khan (2016) the researchers have studied the response of students, as far as their connection with teachers is concerned on the other hand the effectiveness of teaching and learning process were the main components. As a matter of fact this study was conducted on medical students in Pakistan. The findings of the study stated that increasing pressure on teachers is being reflect on their classroom effectiveness and sometimes even classes are consumed due to administrative engagement of the teachers. On the other hand some of the findings stated that there should be regular feedback of the students to find the gap between perception and expectations of the students.

Deswal and Rani (2016) this study tries to evaluate perception related components of teachers in the state of Haryana, India. The study includes the responses of 200 school teachers from the different schools of the city. Though the respondents were randomly selected but then again the researchers have defined the parameters of the same. The findings of the study stated that there are more than 70% of the respondents who were having positive perception against their work profile and around 30% of the respondents were negative to the point in question. Most of the respondents feel that teaching is still considered as one of the most noble profession and share the same position with doctors in the society. Some amount of variation was found on the basis of gender.

Anand (2016) this study evaluates the efficiency and effectiveness of teachers. The study was conducted in private schools of Mumbai city. The study includes about 400 respondents and Kulsum teacher effectiveness scale was used to collect and evaluate data. Findings of the study stated that 36% of the senior teachers were positive about the work profile and assignments other than teaching whereas more than 50% of the respondents were not much positive about the point in question. Then on the other hand there were minimum variation on the basis of gender of the respondents.

Furudi (2017) this study evaluates the state of occupational stress of the selected teachers. The study included around 600 respondents and was taken from secondary schools of Sikkim in Assam. Findings of the study stated that both the male and female respondents share the same percentage of stress and feel the same level of stress in common situations. Then on the other hand it was also found that there is a vast difference of opinion between private and public sector secondary school teachers i.e. the private school teachers feel more stressed as compared to public school teachers. Then on the other hand primary school teachers experienced more stress than secondary school teachers.

Saravanan and Muthulakshmi (2018) this study was conducted on the teachers of higher secondary school in Karnatka, total sample of the study was around 120 respondents. As a matter of fact equal number of respondents was taken from public and private sector school of same stature. The researchers exercised a self-sustained scale for recording the job related stress of the respondents. The findings of the study stated that between private and public sector

secondary school teachers, private sector school teachers are feeling high level of stress and are subject of long lasting social and psychological effects. Main issues were, salary, work load, training issues and research opportunities.

Objectives

The main objective of the study is to evaluate the impact of occupational stress of teachers on learning capability of students and stress related factors of the selected respondents. The study will be carried in the Private universities in Himachal Pradesh.

Hypothesis

H₀: Occupation stress of teachers is having significant effect on learning process of the students of private universities.

H₁: Occupation stress of teachers is having significant effect on learning process of the students of private universities.

RESEARCH METHODOLOGY

Data Collection

As discussed above this present study is based on primary data and in lieu of the same a sample of 200 university teachers is collected. In order to get into the skin of research topic the researcher has considered a sample of 200 students as well, from the same universities. Five universities were chosen according to their popularity in general people and on the basis of various reports published in top rated magazines and newspapers.

Considering the very nature of the study the researcher has constructed a questionnaire, this questionnaire contains basic demographic information of the respondents and a 5 point scale to record the responses of the selected respondents. Most of respondents were contacted personally, but then again due to the pandemic of COVID-19 some of the respondents asked for softcopy of the questionnaire, hence the researcher has collected and considered responses via E-mails as well.

Along with the primary data some of the secondary data was also referred to get the concept of occupational stress and involvement of the same among the teachers and also effect of this stress on learning process of students. Some of the used resources are as follows:

- Online journals
- Published national and international journals
- Articles from newspapers and magazines
- Freelance expert reports from different agencies.

Sample Size

Data of 400 respondents was considered for the study, where 200 were private university teachers and 200 of PG courses from same universities. .

Statistical Measure

- ANOVA test.

Result of One Way ANOVA

On the Basis of Age	F	Sign.
Family issues are the main cause of stress	3.915	4.199
Work place politics is effecting work efficiency	4.977	5.022
Work load is more than expected	1.162	.344

Administrative work exceed over teaching load at times	1.901	2.151
Salary is not as expected	.378	.249
Less opportunities for research	2.941	.782
Less efforts from supervisors	1.154	1.932
On the Basis of Education		
Family issues are the main cause of stress	2.199	2.055
Work place politics is effecting work efficiency	1.144	1.398
Work load is more than expected	1.522	2.089
Administrative work exceed over teaching load at times	2.158	2.940
Salary is not as expected	1.167	2.951
Less opportunities for research	2.177	3.190
Less efforts from supervisors	3.052	3.578
On the Basis of Designation		
Family issues are the main cause of stress	1.150	2.367
Work place politics is effecting work efficiency	2.153	2.922
Work load is more than expected	3.167	2.967
Administrative work exceed over teaching load at times	4.100	3.941
Salary is not as expected	1.948	2.971
Less opportunities for research	3.510	2.188
Less efforts from supervisors	3.173	2.918
On the Basis of Work Experience		
Family issues are the main cause of stress	1.955	2.949
Work place politics is effecting work efficiency	2.911	1.599
Work load is more than expected	5.754	6.188
Administrative work exceed over teaching load at times	4.914	3.153
Salary is not as expected	1.921	2.334
Less opportunities for research	1.577	2.144
Less efforts from supervisors	1.146	2.350

INTERPRETATION

As mentioned in the above given table of ANOVA results, it is clear that most of the respondents are agreed to the point in question; the researcher has included the thumb rule of ANOVA test i.e. if the 'F' value is greater than the 'Sign.' Value then hypothesis is rejected and vice versa. So as can be seen in the above given table in most of the cases the difference between the 'F' and 'Sign.' Value is minimum and this states that in most of the cases the respondents were agreed to the point in question. Rather in some of the cases the difference is more which shows that as the experience of a teacher increases and he or she becomes more and more used to the unexpected situation in the process of job. On the other hand where the difference between the 'F' and 'Sign' value is more it shows that respondents are not agreed to

the point in question, like in case of work load and salary. This shows that occupational stress is the outcome of most of the above stated components and the same applies to most of the private sector employees.

CONCLUSION

As it is clear from the above discussion that job related stress is considered as a very important component for any given person, including teachers. As a matter of fact it is a difficult task to distinguish between the factors that are responsible for causing stress to a given individual, it greatly depends on the perception of a person and ways to carry a respective job. In most of the cases the occupational stress is related to job satisfaction, role ambiguity and even nature of job. For teachers the main issues are work load, salary, research opportunities, etc. as a matter of fact this stress is exerting some amount of influence on the learning process of the students and the major factors are changed behavior in class, deviations from study topic, less explanation, reduced focus and even language at times.

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STREAMING ON DEMAND WITH ENHANCED QUALITY OF EXPERIENCE VIA SATELLITE BACKHAUL IN 5G NETWORKS

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ABSTRACT

5G has evolved in the enhancing telecommunication service with the use of satellite communication for the enhanced mobile broadband (eMBB) applications. In this paper, we propose the system which ensures the 5G network with the support of HTTP based video streaming where the main objective is to minimize the hopping and to enhance the quality of video in terms of throughput, delay, and buffering delay of video(MPEG) segments at 5G mobile edge.

INDEX TERMS: Buffering, Delay, Quality of video, Satellite communication, Throughput, Video streaming, 5Gnetwork.

INTRODUCTION:

Satellite communication has been introduced into 5G network as it plays a key role in 5G backhauling technologies, by providing its high efficiency and performance of supporting content delivery at scale area to geographically-distributed locations. A satellite is simply anybody that moves around another one in a path called orbit. If two stations on earth want to communicate through radio broadcast but are too far away to use conventional repeaters. Hence, the two stations can use a satellite as a relay station for communication (the earth station transmits the signals to the satellite (uplink frequency), the transponder of the satellite converts the signal and sends it down to the second earth station (downlink frequency). Satellite can be distinguished into three primary categories based on the type of orbit they placed on categories, based on the type of orbit they placed as

- (i)LEO[lower earth orbit]satellite.
- (ii)MEO[middle earth orbit]satellite.
- (iii)GEO[geosynchronous earth orbit]satellite.

In this paper, we experience for the first time in the literature survey to upgrade the system by GEO satellite. Where , GEO satellite provides more area of coverage as it is provided over 30000 km to 40000 km. Delivering the message in terms of peak data rate, and mobility.

METHODOLOGY

MEC application server:

MEC technology is designed to be implemented at the cellular base stations or other edge nodes, and enables flexible and rapid deployment of new applications and services for customers.

HTTP Via TCP mechanisms

Streaming media is constantly received by and presented to the end-users while using delivered by the providers. We use HTTP based live streaming (HLS) which works by breaking the overall stream into a sequence of small HTTP-based file downloads. Each downloads loading one short chunk. as the stream is played, the client may select from a number of different

alternate streams containing the same materials encoded at a variety of the data rate, allowing the streaming session to adapt to the available data rate.

Table 1. Comparison Of Geo And Leo Satellite

satellite	Propagation(up+down+ISL)	Buffering (N queuing points)	Total delay
GEO (ms)1 satellite	250	0 to N*250	250 to 500
LEO (ms)10 satellites	770	0 to N*770	770 to 9240

We use the techniques of satellite backhaul, where the backhaul is to intermediate links between the core network and the small sub-network of the edge. In our system, we have the blocks of the mobile user (5G) MEC server, GEO satellite backhaul, terrestrial 5G backhaul to the content source in the ground station to 5G core. Then 5G core network, it is then transmitted to terrestrial backhaul and to MEC server at the mobile edge and to the consumer. The satellite backhaul includes a satellite terminal the satellite link and the satellite gateway. All the requests from users from the stream and video segment files are handled by the MEC serve. This provides a chance for the MEC server to download those hold back segments from the live stream origin before using TCP connections, so that, it will be available before the client’s request.

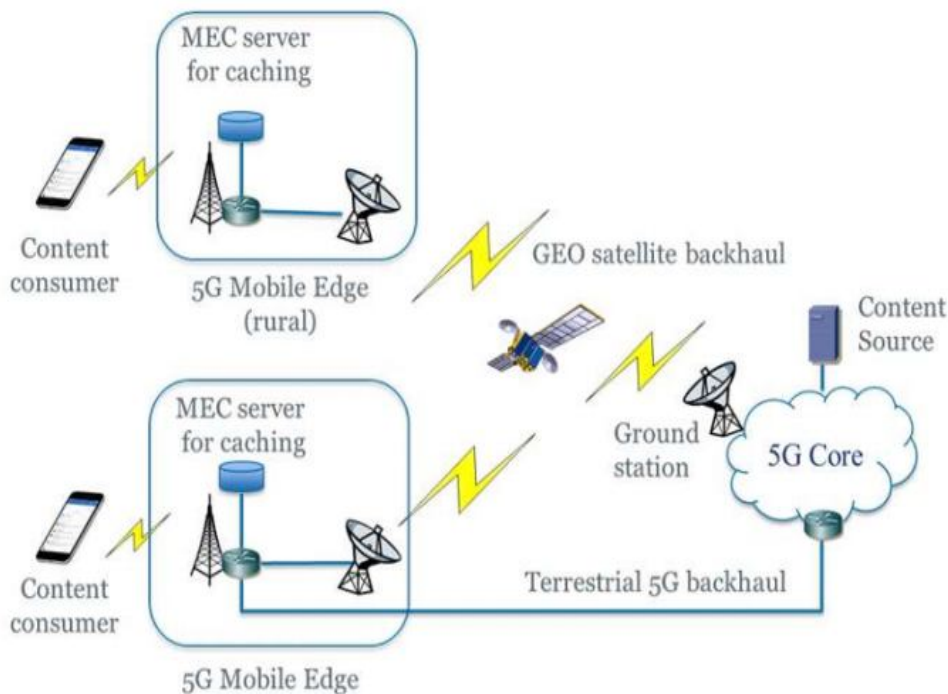


Fig 1. A GEO satellite link connects the central 5G core network and multiple remote 5G mobile edges.

Our main objective from the figure 2 is that every video segment is downloaded by the MEC server from the live video origin. This will not affect even the density of users is high.

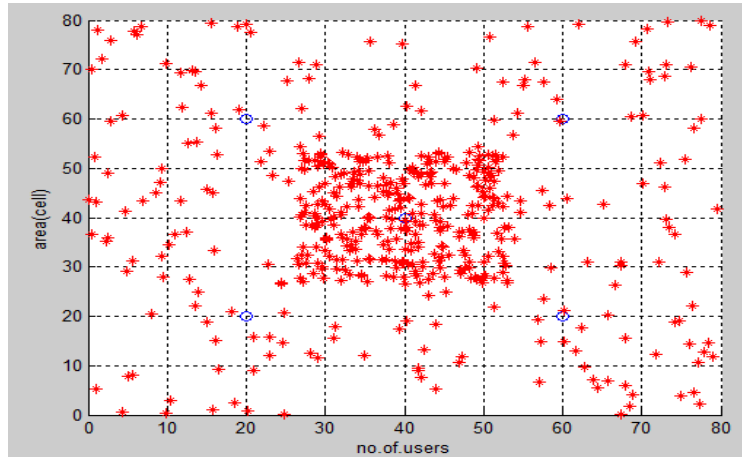


Fig 2. Distribution of users' density in cell

As we use TCP mechanisms, the downloading process of several video segments simultaneously occurs their transmission will not be in order. Hence, it will be adjusted dynamically by its transient holding segments schedule this is very important for satellite backhaul where the resources of bandwidth are limited.

We ensure the performance by the following metric, for evaluation.

- (i) Delay (based on delivered chunks and receptions of chunks)
- (ii) Throughput (hold wise segments).
- (iii) Buffering time.

The video delay is caused by the processing stages (it will be in terms of bits per second).

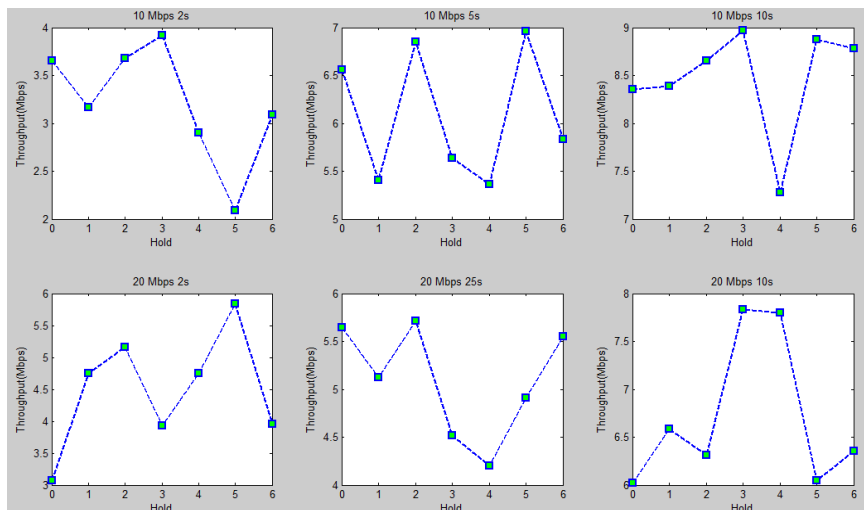


Fig 3. Hold wise throughput

Buffering is the process of preloading data into a reserved area of memory , when downloading the data before it begins to play the video or music.

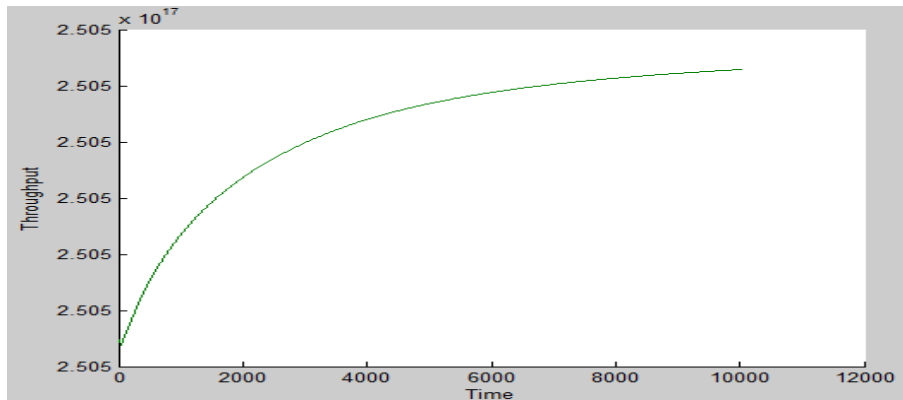


Fig.4 Graphical simulation result of throughput

Throughput is how much information actually gets delivered in a certain amount of time. We subsequently determine throughput that is experienced by the user end and the MEC server.

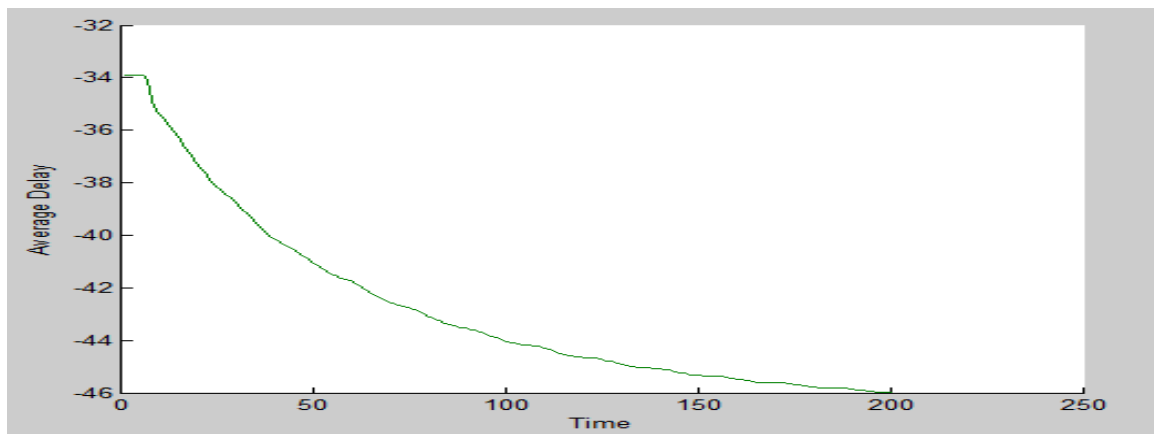


Fig 5. Graphical simulation of delay over time

When MEC server downloads the video segments from the live stream over the satellite communication, the throughput performance is evaluated in video segments (in bytes) and length (in seconds).

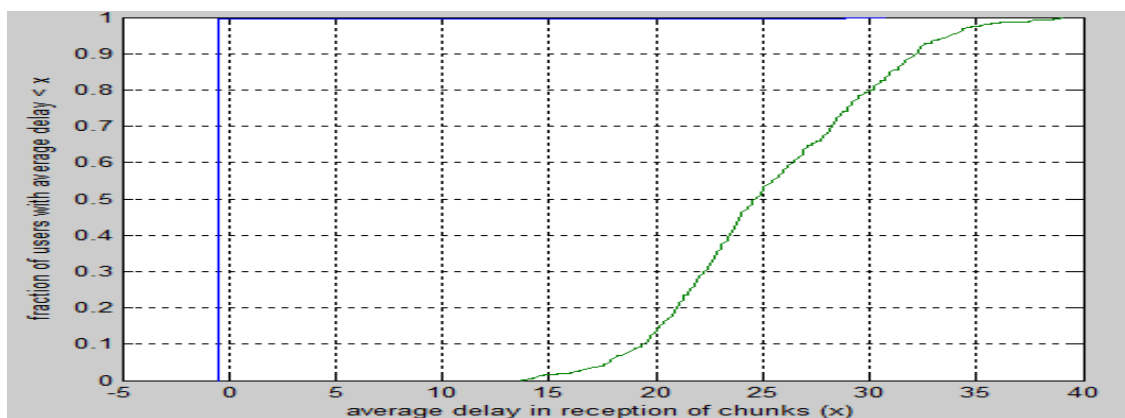


Fig6. Simulation result for the average delay in reception

As we use TCP connections, the initial startup delay causes buffering, due to a slow start and retransmission mechanisms lead to more buffering time.

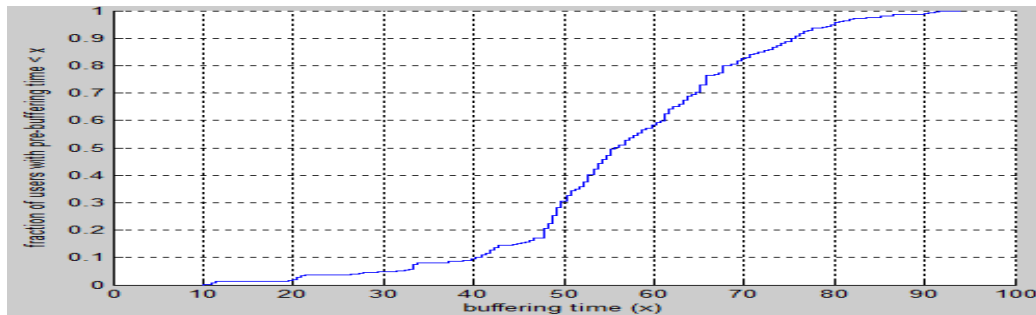


Fig 7. Simulation output of buffering time

Hold wise throughput via the client streamed for certain minutes ie., (5 min) without any delay(buffering).We evaluate through the average medians of hold at 3 stages of 10mbps scenarios ,We have, the values, 2.76 Mbps,5.32 Mbps,7.68Mbps respectively and for 20mbps scenarios, we have the values 5Mbps,4.68Mbps and 7.4Mbps respectively, which is more are less they are approximate to each other.here,10mbps scenarios shows the QOE, despite TCP performance, but we evaluated the higher bit rate(20Mbps) scenarios with same speed (approx) without TCP by using MEC server backhaul.

CONCLUSION

We proposed this system from the previous work (24) with the enhancement of minimising hopping and the future work paves the knowledge of upgradation of the protocols to enhance the throughput further.

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SOURCE SELECTION SCHEME FOR HYBRID RENEWABLE ENERGY SYSTEM IN TRACTION SYSTEMS USING ARTIFICIAL NEURAL NETWORKS

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ABSTRACT

The concept of sustainable development has evolved during a last decade. Accordingly, the practice of catering electric supply to the auxiliary loads of railway wagons using renewable energy systems is under consideration at number of metro rail projects. For this purpose, the solar and wind generation hybrid systems are generally preferred. In such systems the selection of source of supply from available sources is a matter of concern. The existing schemes of source selection are mostly hardware oriented that invite problems such as delay in selection, components becoming sluggish and insensitive and loose connections. This paper suggests a novice neural network based approach for source selection as a replacement against the existing schemes. Using IoT based technology, the data communication and control can be established through monitoring system. The software based priority encoder for configuring priorities to solar and wind generations are also proposed. The proposed method of software abstraction is simple, low cost and accurate.

Keywords activation function, back propagation, neural networks, railway traction, sigmoid function, solar power, wind power

I INTRODUCTION

In the advent of upcoming green energy technology, the use of renewable energy systems specifically wind and solar based generation is under consideration at number of metro rail projects. The electric supply to the auxiliary loads of railway wagons can be catered through three sources namely wind generation, solar generation and 25 kV/430 V Traction Transformer. The wind generator and solar PV cells are installed on the roof top of railway wagon. The 25 kV AC supply is availed from utility substation through Scott connection circuit [1]. The load pattern is matched with Renewable Energy System (RES) generation. It is required to select one source out of these three to cater the auxiliary load inside the wagon such as tube lights, lamps, air conditioners and fans. The traditional source selection scheme is either manual or hardware oriented. The existing hardware system has some limitations such as delay time, sluggishness and insensitive behavior due to aging and loose connections. This paper discusses an alternate method of implementing selection scheme using neural networks. It is a software abstraction against the traditional physical system of source selection [3][4].

II SOURCE SELECTION SCHEME

In order to avail one option out of the three the following methodology is proposed 1. During the daytime, solar PV can be used keeping wind and AC auxiliary supply isolated. 2. During night time, obviously, the solar generation would not be there. Under these circumstances, wind generation would be the choice. 3. In case, both wind and solar generations are absent, AC auxiliary supply would be the last resort. In case all the three

sources are available, the source selection would be exercised using software based priority encoder. This entire schematic is shown in fig 1.

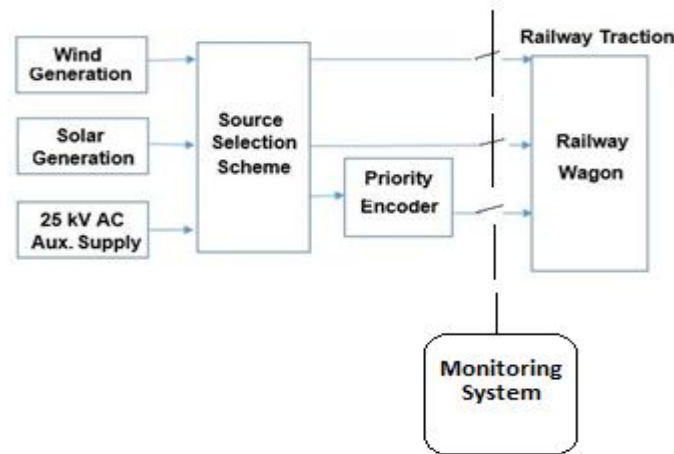


Fig. 1. Schematic of proposed selection scheme

This philosophy of selection can be modeled using 2 bit XOR gate. The configuration of four outputs of XOR gates is illustrated in the truth table [2]. Please refer table I.

TABLE I. XOR SELECTION SCHEME

Wind, x2	Solar, x1	Output, y	Selection
0	0	0	Enable AC auxiliary supply
0	1	1	Enable solar generation
1	0	1	Enable wind generation
1	1	0	Enable Priority encoder

The output mentioned in the above table is an ideal output. It differs from actual output obtained through successive iterations as shown in table II. Software abstraction of the priority encoder is also proposed.

III DATA COMMUNICATION AND OPERATION

The sensor actuator system is provided at the ON/OFF switch of Solar, Wind and AC Auxiliary supply. Each switch is provided with unique IP address. The Monitoring System reads these addresses and have access to data communication and control as shown in Figure 1. Thus the data in respect of all the wagons will be monitored by the Monitoring System. The monitoring system and be installed at any location in a train preferably Guard Cabin. It will also communicate with the central server. The data communication takes place on Client-Server communication model. The sensor-actuator plays the role of client whereas the monitoring systems work as server. The Python or Java is generally preferred as a programming language for data communication and operation. The data communication is initiated and server which is provided at monitoring station. The client acknowledges the server request and starts sending data. Based on this data, the XOR based neural network model installed in monitoring station takes the decision. The neural network based approach is explained in the following section.

IV THE NEURAL NETWORK BASED APPROACH

Neural network is the network of neurons. These neurons may be biological neurons as of human brain or artificial neurons as software abstracts [5][6]. Thus an Artificial Neural Network (ANN) is taking shape under artificial intelligence. The ANNs are massively parallel computing systems comprising of large number of processors having interconnections as inspired by BNNs. The ANN modeling can be made feasible by using state of art hardware such as VLSI, microcontroller or PC based monitoring systems.

The connections of biological neurons are modeled as weights. All inputs are modified by a weights (e.g. multiplied by weights) and then added. Finally, an activation function controls output[7][8].

The difference between actual output and desired output is called as error. Obviously, the error should tend to zero. The error is calculated using one of the following three methods-

1. Mean Square Error (MSE) = $(i_1-o_1)^2 + (i_2-o_2)^2 + \dots + (i_n-o_n)^2$
2. Root Mean Square Error (RMSE) = $\sqrt{((i_1-o_1)^2 + (i_2-o_2)^2 + \dots + (i_n-o_n)^2)/n}$
3. ArcTan Error (ATE) = $\arctan^2((i_1-o_1) + (i_1-o_2) + \dots + (i_n-o_n))/n$

TABLE II XOR SELECTION SCHEME

Inputs		Ideal Output	Actual output	Error	Error square
a	b	i	O	o-i	(i-o) ²
0	0	0	0.2	0.2	0.04
0	1	1	0.3	0.7	0.49
1	0	1	0.4	0.6	0.36
1	1	0	0.5	0.5	0.25
MSE=0.285		RMSE=0.533		ATE=0.2297	

The neural network is formed from the combination of hidden layer, input layer and output layer comprising of neurons connected by weights [3]. The output obtained through interaction between nodes and weights is called as actual output. The difference between actual output and ideal output is called error. The error is minimized through successive iterations of weights. The various errors namely MSE, RMSE and ATE are calculated as shown in Table II. The neurons are trained in such a manner as to minimize these errors[9].

A sigmoid function is a bounded, differentiable, real function that is defined for all real input values and has a non-negative derivative at each point. A sigmoid "function" and a sigmoid "curve" refer to the same object. In general, a sigmoid function is monotonic, and has a first derivative which is bell shaped. See fig 2. Sigmoid is one of the activation functions [10].

The Sigmoid function for a variable x is expressed mathematically as follows.

$$f(x) = \frac{1}{1 + e^{-x}}$$

The output f(x) lies between numbers 0 and 1. It is passed to the next neuron.

When $x = \infty$, $f(\infty) = 1/(1 + e^{-\infty}) = 1/(1 + 0) = 1$

When $x = 0$, $f(0) = 1/(1 + 1) = 0.5$

When $x = -1$, $f(-1) = 1/(1 + e^{-(-1)}) = 0.26$

When $x = -\infty$, $f(-\infty) = 1/\infty = 0$

V THE NEURAL NETWORK IMPLEMENTATION

The neural network can be created in such a way that signals x1 and x2 form input layers and signal y, an output layer. The hidden layer between input and output layers comprises of the XOR logic. The output signal y indicates the selected source of generation. Refer figure 3.

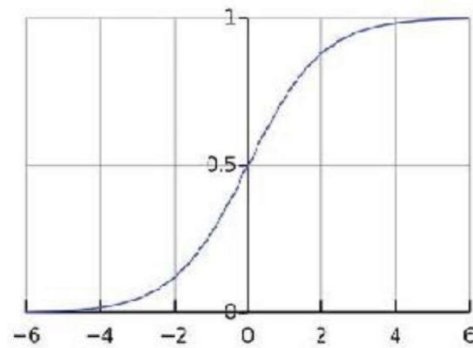


Fig. 2. Sigmoid function

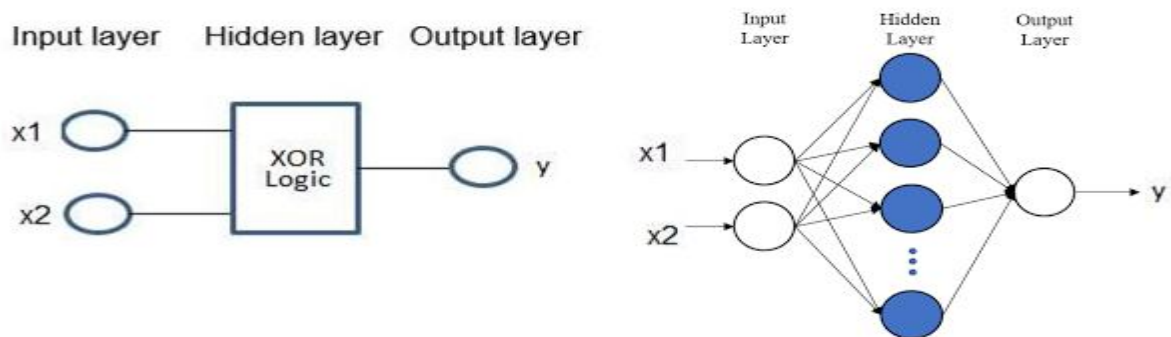


Fig. 3. Neural network based XOR Model for source selection

The data given in truth table is a training data. The training data is used to train the neural networks. This is done by continuous execution of iterations till the desired output is obtained. The inputs, outputs and iterations are stored in a file called CSV file. The CSV files are very large in size. Gradient is the rate of change of error with respect to the weight (de/dw). From the graph based on gradient, a lowest possible error at a particular weight can be found out.

Now, let us model XOR gate using neural networks. The conventional linear models cannot solve this problem. If we use more than one neuron, we can form a model using XOR Gate. The input layer comprises of two input nodes x_1 and x_2 which generate $2^2=4$ outputs. As shown in figure 4, signals x_1 and x_2 are connected to h_1 and h_2 , the nodes in hidden layer through four weights namely w_1 , w_2 , w_3 and w_4 . The bias values of the hidden layer nodes h_1 and h_2 are -10 and 30 respectively. The signals from hidden layer namely h_1 and h_2 are expressed in terms of function as follows-

$$h_1 = w_1.x_1 + w_2.x_2 - 10 \quad (1)$$

$$h_2 = w_3.x_1 + w_4.x_2 + 30 \quad (2)$$

The following expressions can be generated using 4 combinations of x_1 and x_2 i.e. 00, 01, 10 and 11 respectively. The bits x_1 and x_2 denote solar and wind generations respectively as shown in Table I. The bit values 0 and 1 indicate off and on status respectively [11][12].

- o $x_1=0, x_2=0$ yields $h_1=-10$ and $h_2=30$ (both, wind and solar generations are off)
- o $x_2=0, x_1=1$ yields $h_1/h_2=w_1-10/w_2+30$ (wind generation is off and solar generation is on)

o $x_2=1, x_1=0$ yields $h_1/h_2=w_2-10/w_1+30$ (wind generation is on and solar generation is off)

o $x_2=1, x_1=1$ yields $h_1/h_2=w_1+w_2-10/w_1+w_2+30$ (both, wind and solar generations are on)

Through number of iterations executed using Python source code, the values of weights w_1, w_2, w_3 and w_4 are found as 20,

- 20, 20 and -20 respectively. Substituting these values of w_1, w_2, w_3 and w_4 and expressing in terms of sigmoid function we get following four equations for h_1 and h_2 each-

$$h_1 = w_1.x_1 + w_3.x_2 - 10 = 20.x_1 - 20.x_2 - 10$$

For various values of x_1 and x_2 as given in Table I, the node h_1 in a hidden layer is calculated as follows.

$$\begin{aligned} h_1 &= \sigma(20*0 + 20*0 - 10) \approx 0 \\ h_1 &= \sigma(20*1 + 20*1 - 10) \approx 1 \\ h_1 &= \sigma(20*0 + 20*1 - 10) \approx 1 \\ h_1 &= \sigma(20*1 + 20*0 - 10) \approx 1 \end{aligned}$$

On similar lines the values of h_2 are found out using the following expression.

$$h_2 = w_2.x_1 + w_4.x_2 + 30 = -20.x_1 - 20.x_2 + 30$$

For various values of x_1 and x_2 as given in Table I, the node h_2 in a hidden layer is calculated as follows.

$$\begin{aligned} h_2 &= \sigma(-20*0 - 20*0 + 30) \approx 1 \\ h_2 &= \sigma(-20*1 - 20*1 + 30) \approx 0 \\ h_2 &= \sigma(-20*0 - 20*1 + 30) \approx 1 \\ h_2 &= \sigma(-20*1 - 20*0 + 30) \approx 1 \end{aligned}$$

The final output y of the XOR gate is generated as follows-

$$\begin{aligned} y &= \sigma(20*0 + 20*1 - 30) \approx 0 \\ y &= \sigma(20*1 + 20*0 - 30) \approx 0 \\ y &= \sigma(20*1 + 20*1 - 30) \approx 1 \\ y &= \sigma(20*1 + 20*1 - 30) \approx 1 \end{aligned}$$

The output indicates that the appropriate source of generation as per configuration given in table I, is made available to cater electric supply to the railway wagon.

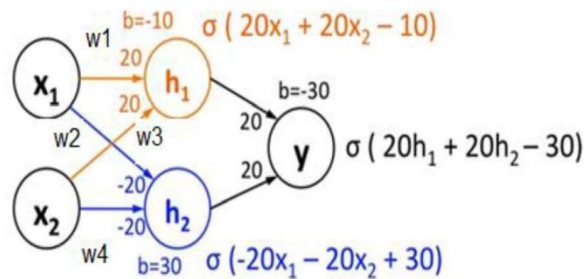


Fig. 4. Neural network based source selection model

VI PYTHON SOURCE CODE

Python is an interpreted, high level, general purpose, object oriented, platform independent, web enabled dynamically typed programming language developed by Guido Van Rossum at National Research Institute for Mathematics and Computer Science in Netherlands. As of today, it is one of popular programming languages all over the world. It is widely used in new technologies such as data science, big data, machine learning, Internet of Things, cloud computing and modern artificial intelligence. Google, You Tube, Instagram, Dropbox, Quora, Big Torrent, Delug, Cinema 4D and Mozilla Firefox are some of famous and globally used applications based on Python [4].

Python can be effectively used to train neural networks by undergoing number of iterations. The following small piece of Python code illustrates generation of sigmoid activation function.

```

1 # Sigmoid function
2 import math
3 x=int(input('x=?'))
4 e=math.exp(-x)
5 s=1/(1+e)
6 print(s)

```

The main reason why sigmoid function is used is because it gives output between 0 to 1. Therefore, it is especially used for models where we have to predict the probability as an output. Since probability of anything exists only between the range of 0 and 1, sigmoid is the right choice. There are other methods of computation of activation functions such as tanh (hyperbolic tangent), ReLU (Rectified Linear Units), soft-max function etc. In this paper, the Python programming is used to compute activation function and train the neural network through successive iterations in hidden layer.

The following pseudocode illustrates software abstraction of priority encoder. The code is written in Python language. The user is required to configure priority in a sequential manner. Accordingly, the generation having top priority will be taken in service.

```

# Pseudocode for priority encoder
# Set priority - First Priority Solar (1) , Second priority Wind (0)
# read solar status : x1 (1: Available, 0: Not available)
# read wind status : x2 (1: Available, 0: Not available)
if x1==x2==1:
    # select solar generation
    print ("connect solar generator")
else:
    # select wind generation
    print ("connect wind generator")

```

VII CONCLUSION

The role of source selection scheme is vital in case of hybrid generations such as Wind-solar. The additional source of AC auxiliary supply is also available. It is required to select one of these three sources to feed the auxiliary load of the railway wagon. Traditionally, the selection is done through a manual operation or hardware

based selection scheme which has certain limitations such as delay in selection, contact insensitivity and loose connections. This paper has put up a novice method of software abstraction as a replacement against an existing physical source selection schemes. The selection is based on neural network system modeled on XOR logic. The proposed neural network is trained using Python source code. The results obtained through back propagation have been found to be appropriate. It is proposed to install XOR based Neural Network with priority encoder in a monitoring station which is location unspecific.

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DESIGN HYBRID TECHNIQUE FOR MISSING DATA CLASSIFICATION USING MACHINE LEARNING

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ABSTRACT

Reliable data transmission relies on the latest creation of the Internet of Things (IoT), where data sharing the data device be reliable and quick to maintain high efficiency for IoT applications. Due to many reasons, such as link failures, sensor faults, or security threats, IoT apps may suffer from poor data delivery efficiency. Poor data delivery consistency limits the efficiency of IoT applications since it will potentially be worthless if the obtained data is incomplete. In this article, we suggest a Concept Hybrid Methodology for Missing Data Classification to impute missing data for medical IoT applications utilising the Machine Learning algorithm. A deep learning neural network is used as a model to replicate the missing data, whereas the genetic algorithm is used to maximise the weight of the neural network.

Keywords: Support vector machine , Internet of Things , missing data , deep learning

I. INTRODUCTION

Missing data are observations which exist however were not recorded or recorded and after that lost. In clinical examinations missing data regularly result from withdrawal, wearing down and misfortune to development. In different settings the missing data could be created through a coarsening plan. Fragmented data may emerge because of a few unique reasons including refusal, whittling down, estimation errors or just numbness about of the individual made inquiry. Regardless of what the reason is, missing observations is an issue that must be managed in every single measurable territory. Regularly there is some data concerning why data are missing, however the data is by and large not authoritative. The most ideal approach to abstain from missing data issues is to have a decent report outline which lessens the possibility of missing data happening. Regularly the least complex technique for dealing with missing data in the

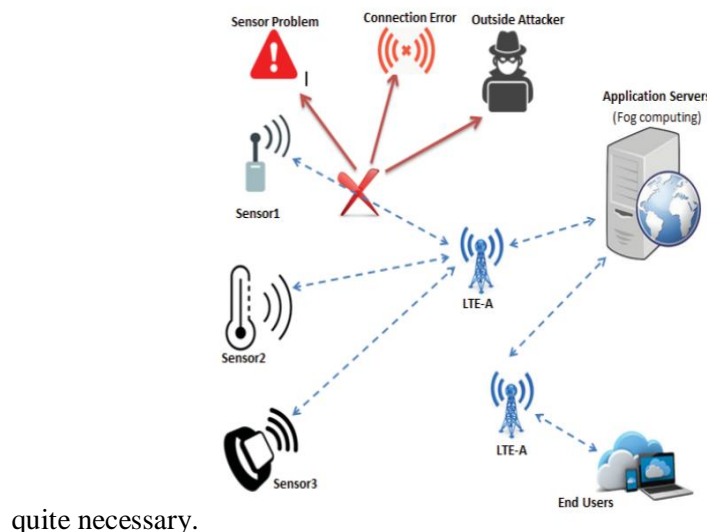
analysis is essentially to utilize just those records which have been completely watched. A case of a coarsening configuration is when ceaseless data are purposely gathered in interims to expand the shot of reaction. Other than ensuring that the missing observations truly are missing observations, presumptions, expressly or verifiably, about the missing data component are constantly made.

Accepting an insignificant The missing data system streamlines the interpretation of the missing data, since it suggests that it is not appropriate to explicitly model the mechanism affecting the missing observations. In this paper offers several theoretical findings for strategies that involve the most popular and well-known methods focused on missing data estimation. Imputation is commonly used since missing details can not be treated by most industrial decision-making applications, and so the classification process involves a prior imputation phase. As has been seen in the results obtained, for each classification domain, there is no particular approach that offers the best results. Generally, a thorough analysis is needed in real-life situations to determine which missing data calculation may assist to boost the quality of the classification. It

is clear that it is already important to extend the study path as there are several unanswered then question are need to the addressed, such as 'Will an appropriate imputation approach boost the process of decision making.

The aim of an imputation approach in classification activities with missing values must be to further increase the precision of the classification. Some studies have been established in recent years to give missing value data estimates based on on the classification value, error are reduce and accuracy high and the values of " true ". As the comparison of various approaches remains very challenging, some pending questions to be asked are the creation of a standardised assessment standard and an open access registry for missing datasets. For contrast, considerations of operating time and memory specifications must also be taken into consideration. The pace specifications range from one programme to the next. Missing values tend to be measured in the shortest possible period in fast-moving results, to the based on stock market, although this criterion is less relevant for an opinion survey.

A complicated and complex process is the correct option of a missing data treatment, since the output of a system relies on the type, i.e. a algorithm are work well for certain issues, and on the opposite, with some applications, the findings may be inappropriate. Thus, the order are based on effective missing data procedure, a prior review of the classification issue to be solved is



quite necessary.

Figure 1:IoT Data Source [1]

II. RELATED WORK

M. Albayrak, et al[1]In the final stage, the missing data for these clusters is complemented by an MLE approach by inserting features with missing values and fusing the clusters into the maximum data collection. New data sets were contrasted with the initial data set based on the (root mean square error) RMSE criteria and were collected in 3 stages as a result of completed operations (data elimination, clustering and data completion) and reached an overall success rate of 96.5%.

F. u. Rehman et al[2]The findings indicate an immense improvement in the exact classification of a replica of an algorithm-filled data set and show that the accuracy of the dataset has been increased. The suggested algorithm can also be checked for the (zero) skipped values on other datasets and can be generalised to eradicate other incoherence.

D. Zeng et al.[3]The exactness of the three algorithms is compared at various missed frequencies. The efficiency of the Pearson correlation coefficient based on KNN is obviously higher than that of Euclidean metric based on KNN and mean imputation. And the efficiency of these three filling algorithms in the expected model is the same as in the filling test. However, the difference is not quite big.

G. Madhu et al.[4]Continuous attribute imputations for continuous and distinct data attributes are suggested approaches. By estimating their data value from non-missing data attributes, we deduce each missing attribute value in this method.

İ. Kök et al.[5]The proposed protocol will operate on IoT devices and cloud and fog servers that are space limited. Furthermore, we build a true DeepArch testbed architecture with edge, fog, and cloud layers to validate the proposed protocol. We test the efficacy of DeepMDP on the DeepArch network under many implementation scenarios.

Y. Liu, et al.[6] Using sensor data obtained from real Australian manufacturing plants, we validate the solution proposed and comparative results indicate that the proposed Itr-MS-STLecImp outperforms state-of-the-art root-middle-square error approaches.

III. SUPPORT VECTOR MACHINES

Bhattacharyya et al. Some works in recent years have expanded traditional formulations of SVMs to cope with input data ambiguity. A mathematics approach for coping with ambiguity in observations of a classification issue is suggested by They assume with confidence a regular SVM classifier expanding Variable are used for data in fact, the input data obtained from a distribution in Gaussian. In addition, the model parameters (mean and covariance patterns) are determined using the EM algorithm. It demonstrates in Smola et al. how SVMs and Gaussian (GP) processes will manage data that are lacking. It is based on Kernal method in an exponential value can be written as estimators. More specifically, the negative log-after can be shown to increase the natural exponential density parameter below a standard level before that, while the SVMs maximise the probability ratio. This methodology allows it challenging to measure marginalisations and find effective optimization approaches, such as the restricted constrained.

Pelckmans et al. Propose an updated risk function that takes into work expected performance volatility when missing values are concerned. The effect is a probabilistic model for the data that is not available. This procedure generalises the mean imputation approach to the linear case and reduces the suggested machine learning algorithm are regular SVM if no input values are lacking. Additional responses to loud inputs have been suggested. Subject to the idea that additives and develop a new formula of the support vector machine. that facilitates ambiguity in input results. The system uses an objective function that is geometrically inspired, addressing two optimisation approaches: the linear case, improved. This process provides substantial computational savings and, more significantly, provides a fine way to manage complicated patterns of missed values by avoiding an earlier imputation step.

IV. PROPOSED APPROACH

Creating Imputed Data Sets The underlying stage in different imputation is to make esteems ("traits") to be substituted for the missing data. To make attributed values, we need to recognize some model (a regression line) which will allow us to make credits considering different factors in the data set(predictor factors). Since we need to do this various circumstances to make copy credited datasets, we will recognize a plan of regression lines which resemble yet one of a kind in connection to each other. We can consider these regression lines as demonstrating different variants of what the genuine condition for the missing data might be possible, sensible

regression lines. Conveying several dependable forms of the data will allow us to typical over these adaptations later, making better gauges. The amount of attributed datasets to make is up to the examiner. Our regression lines will require pointer factors to ensure connections in the data. These factors should be picked either in light of the way that they are related with the missing variable, the purpose behind missingness, or Bootstrapping the d.

In this value pattern classification are show (continuous or discrete) d characteristics or attributes, i.e. $x = [x_1, x_2, \dots, x_i, \dots, x_d]^T$. In addition, each value are divide on c groups or divisions that are possible: C1, C2,..., Cc. In general, there are two modes of the pattern classification system[5]: teaching (learning) and classification (testing). The method is entirely developed during the training process, depending on its characteristics, the qualified method assigns the pattern of input method are under consideration. The efficiency of the classifier depends both on the amount of the smaple training on the particular type of the input data.

Around the same period, the purpose of the classification method architecture is to identify potential research samples that have not been used during the training process. A general pattern classification issue is seen in Figure 2, Input patterns may have certain undefined attribute values in the classification tasks described in this article.one sample might be absent, whereas the same attribute is identified in another example).The missing meaning is referred to as '?' A icon of the MTL neural network method that incorporates data missing and classification of patterns is suggested. This technique utilises as secondary tasks the missing features are show them in tandem with the key task of_classification.

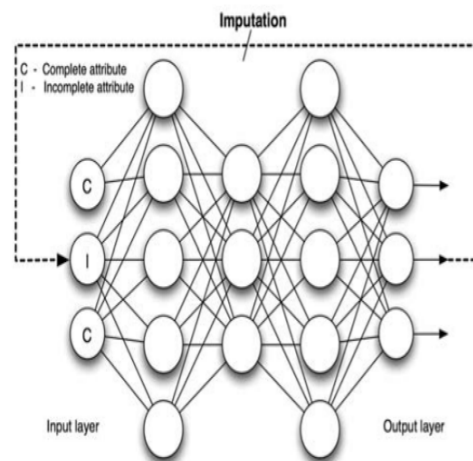


Figure 2: deep learning approach

MTL-based attribute network to solve a resolution problem with missing x_2 and x_3 values. This neural system has three distinct functions, one classification task linked to the y network output and two imputation tasks linked to the $x_{\sim 2}$ and $x_{\sim 3}$ outputs. There is an input unit for each element in the input layer and an additional input unit aligned with the classification purpose. This supplementary feedback is used to which used for second task. This classification goal. The secret neurons in this method are not as working as normal neurons, as the multiple outcomes for the various activities to be learned are determined.

The input signal that you have to understand does not exist in the sum product in their respective output unit. For instance the $x_{\sim 2}$ output can be learned using the details in the x_1 , x_3 , and x_4 attributes, and the aim t classification, but not the x_2 . During the training process, imputation effects are used to approximate the missing values. In this way, missing data

calculation is directed at solving the classification challenge, as classification learning influences tasks. This method, according to, outperform other popular methods, such as GMM trained with EM and K-nn. However, its key downside the main value of the vector is used as a cost function, which does not allow for the distribution of the input data, to be reduced during training.

V. CONCLUSION

IoT software can provide end-users with a high-quality service. For this reason, it is important to achieve a high level of data transmission to ensure that IoT applications are working correctly. The shortage of data would decrease Availability and service level of the IoT device for end users. An intelligent approach for the distribution of lost data is needed. In this article, we indicated that the missing IoT data should be imputed. After costing missing data depending on meaning and based on accuracy values this proposed solution will boost the efficiency of the IoT programme. In our future work we will explore a complex model that will suit IoT applications in the structure of the neural network.

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AYURVEDA WITH YOGA: PREVENTIVE ASPECTS FOR EMERGING INFECTIOUS DISEASES- THE NOVEL CORONAVIRUS 19 PANDEMIC

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ABSTRACT

The novel coronavirus disease 19 pandemic is unique and unprecedented in several aspects and has challenged health care systems. Pathogens can evolve naturally or artificially and become resistant to various medicines. The novel corona virus is such evolved pathogen of corona virus group. The experience and lessons learnt from the earlier severe acute respiratory syndrome (SARS) epidemics appear inadequate and call for better approaches and strategies in public health and medical care. This review a brief recent updates regarding prevention of COVID-19, Ayurveda aspect toward infectious diseases and Ayurveda ways towards prevention of infectious diseases with special reference to COVID-19. Person with impaired immunity is more susceptible for COVID-19 and thus immunity is an important preventing factor. Ayurveda Rasayana (rejuvenation) herbs, Yoga exercises, Pranayama, daily regimens and personal hygiene guidelines can be helpful strategies in controlling the spread of COVID-19. The preventive aspects of pandemic situations are narrated in Ayurveda with enough details. Enough strong immunity is needed to prevent or survive from COVID-19 pandemic. Ayurveda provides ways for evolving physiological responses to built immunity.

Keywords- COVID-19, Ayurveda, Yoga, Rasayana, Herbal, Immunity

INTRODUCTION

Ayurveda and Yoga's knowledge and practices might be effectively utilized in the prophylaxis and adjuvant therapy of COVID-19. It can't be an exaggeration to mention that almost all visible living species on the earth are surrounded by tiny species which are invisible to naked eyes and those are called as micro-organisms. Few species of micro-organisms are living synergistically in the body of macro-organisms. On the other hand, few species are responsible for causing various illnesses in immune compromised or even in healthy ones. The human body is a host for Bacteria- *Actinomyces viscosus*, Cyanobacteria- *A. naeslundii*,

lactobacillus species etc. Archaea- *Methanobrevibacter smithii*, *Methanosphaera stadtmanae* etc [1]. Fungi- *Candida* spp. [2, 3], and Viruses- Aichi virus, Cosavirus-A, Dengue virus, Hepatitis- A, B, C, and E virus etc [4]. This leaves aside the consideration of the host—one of the most important factors in disease dynamics. Ayurveda pays particular attention to the host and recommends measures for a healthy lifestyle rather than the mere prescription of medicine.

The classic of Ayurveda, describes epidemic management and defines immunity as the ability to prevent disease and arrest its progress to maintain homeostasis [5]. The concept of building strength of mind and body to cope with various stressors, including infection, is a cornerstone of Ayurveda practice. Similar to innate and acquired immunity, the Ayurveda concept of immunity (Bala or strength) is classified as natural (Sahaja), chronobiologic (Kalaja), and acquired (Yuktikrut). The holistic approach of Ayurveda toward promoting health (Swastha vritta) includes personalized interventions based on host and environmental factors. The interventions include therapeutic cleansing procedures known as Panchakarma and Rasayana [6, 7].

The current prophylactic measures are insufficient, and suggested options such as hydroxychloroquine (HCQ) are still under investigation [8, 9]. The prophylactic and therapeutic potential of traditional and complementary medicine systems such as Ayurveda and Yoga is not really being considered during this crisis and global hunt for effective preventive and treatment measures. At present, the global momentum is unabated, and a second wave is anticipated [10]. The recent outbreak of Anthrax, H1N1, SARS, and novel corona virus has highlighted the risk caused by genetically engineered viruses in various virology laboratories. Indeed, there are few significant positive outcomes from such researches, but the risk cannot be ignored.

Poor mental health conditions, including stress and depression, are known to increase the risk of acute respiratory infections [11]. Rising numbers of COVID-19 cases and deaths possibly raise stress and anxiety, while loneliness and depressive feelings are likely due to mandatory social distancing measures. Consideration of the mind is another distinction of Ayurveda and Yoga. Several measures for mental health are described, including pranayama and meditation. Pranayama is known to improve lung function [12]. Meditation is found to reduce inflammation markers and influence markers of virus-specific immune response. 40 Yoga including meditation could be a simple and useful home-based practice for the prevention and post-recovery management of COVID-19.

MATERIAL AND METHODS

Ayurveda and Yoga as an add-on therapy may support patients of COVID-19 by improving the quality of standard care Research and therapeutic strategies for COVID-19 have focused on agents to attack the virus or immunize against it and it is intentionally avoided due to lack of direct strong scientific evidence. The present review was done based on recent updates regarding prevention of COVID-19, Ayurveda aspect towards infectious diseases, and Ayurveda ways towards prevention of infectious diseases with a special reference to COVID-19. Information collected from WHO, Ministry of AYUSH, news updates, and opinions of experts are utilized as sources for this review. As immune-compromised persons have a higher risk of COVID-19, the herbal *Rasayana* drug, which has proven immunomodulatory activity, is also compiled in the present review.

OBSERVATIONS AND RESULTS

World has faced 13 pandemics caused by different viruses and resulted in a few thousand to million deaths as Cholera Pandemics-1817-1923; Third Plague-1885; Yellow Fever-Late 1800s; Russian Flu-1889-1890; Spanish Flu-1918-1919; Asian Flu-1957-1958; Hong Kong Flu-1968-1970; HIV/AIDS-1981-present; Swine Flu-2009-2010; SARS-2002-2003; Ebola-2014-2016; MERS-2015-Present; COVID-19-2019-Present. The world is currently facing COVID-

19, and most of the countries have been completely locked down to stop the spreading of the infection. The death rate due COVID-19 is the highest among ecumenically top countries with the best health facilities such as Italy (16,523), Spain (13,798), USA (10,943), and France (8,911) [13]. Personal hygiene, social isolation, few Yoga exercises, and administration of immunity booster medicines are the preventives aspects [14]. The detailed treatment guidelines for mild to severe symptoms of COVID-19 have been provided by the WHO on March 13, 2020 [15].

Considering the significant role of immunity in the prevention of COVID-19, the Ministry of AYUSH, Government of India has published guidelines for Ayurveda's immunity-boosting measures for self-care during COVID-19 crisis [16]. In Ayurveda, there are several daily practices which are mediated water drinking, bath, doing yoga such as *Suryanamaskara*, *Halasana*, *Chakrasana*, *Bhastrika*, *Ujjayi*, *Anulom-vilom*, *sunbath*, drinking *Kadhas-Rasayana* herbs, exposure to *Dhupana*, *Hasta-pada Dhavan*, *Aushadhi youkta jal snana*, *Abhyaga snana*, *Kavala-Gandusha*, *Nasya*, *Trividha kukshi ahara* and Meditation are easy to follow. These practices may help avoid exposure, reduce risk, and increase local and general immunity, which are major aspects for the prevention of COVID-19.

In Ayurveda, there are so many commonly utilized herbs like, *Hibiscus rosasinensis*, *Asparagus racemosus*, *Cleome gynandra*, *Boerhaavia diffusa*, *Tinospora cordifolia*, *Curcuma longa*, *Balanite roxburghi*, *Eclipta alba*, *Aloe vera*, *Mangifera indica*, *Picrorhiza scrophulariiflora*, *Withania somnifera*, *Tinospora cordifolia*, *Azadirachta indica*, *Ocimum sanctum*, *Boswellia carterii*, *Bauhinia variegata*, *Tinospora cordifolia*, *Citrus aurantifolia*, *Emblica officinalis*, *Tinospora cordifolia*, *Centella asiatica*, *Aloe vera*, *Piper longum*, *Allium sativum*, *Terminalia arjuna* and *Andrographis paniculata* which have proven immunomodulatory activity. Rasayana, a specialty of Ayurveda, deals with measures for rejuvenation. Rasayana therapy comprises lifestyle, diet, and medicine that have properties to enhance growth, retard aging, induce tissue regeneration, and stimulate immunity. Due to its effects on improving immunity, Rasayana therapy may have direct relevance to the prophylaxis and management of SARS-COV-2 infection.

DISCUSSION

It is clear from the history of infectious diseases that pandemic infectious diseases such as COVID-19 are results of evolved viruses. The evolution is either nature by law of survival of the fittest or by artificial i.e. by induced by research laboratories with aim to find solution for some diseases. In both case it is vivid that the microorganisms are evolved but not human beings. Neither immunity nor the daily life of human beings is prepared to fight against such infections. It is because of the too much increased dependence on medicines and very less focus on development of body. This is where Ayurveda holds its far major focus compared to other medical sciences. According to Ayurveda principles, prevention of diseases by increasing immunity is of first priority and second priority is given to treating the disease.

The distinguishing feature of Ayurveda in increasing body strength is the utilization of simple daily ways most of which are without medicines. For example daily Yoga exercise, rules regarding diet, personal hygiene's, guidelines regarding awaking as well as sleeping etc. These ways helps in maintaining strength of body (immunity) which in turn helps in combating pandemic conditions such as COVID-19. Ayurveda has clearly narrated pandemic diseases under the heading *Janapadodh wansa*. The cause varies but the medium through which such pandemics spread are same which humanity has faced in the history of pandemic i.e. water, air, soil and living beings. Ayurveda has recommended boiling of water before its utilization for any purpose (disinfection of water), *Yadnya's* (rituals done with hymens in

front sacred fire) were done to control spread of air born infections. Cow urine mixed with ash of specific herbs was utilized to control infection spreading through soil.

Ayurveda daily regimens three are followed to avoid infection through contact. Therefore it can be claimed that Ayurveda deals with evolving physiological functioning of body and mind towards strengthening immunity and thereby prevention of pandemic infections such as COVID-19. These modalities have limitation that their exact extent of utility is not known and it can be discovered by undertaking retrospective survey studied during or after the pandemic is over. Human corona virus has been known since long time but the RNA of the current pandemic causing virus has been evolved and thus it has been resistant to the medicines which are generally indicated for human corona virus. The fact highlight that there is faster process of evolution among microbes either in artificial or natural environment.

In fact, the industrialization done by human has much changed the environment. It is simple assumption that body of every living organism is attempting to adopt with these changes. However, in case of human beings, the assumption varies based on developmental state of individual countries. The well developed countries have enough facilities to avoid continuous long contact with changed environment and thus peoples of such countries have less chances or slower rate of adoption. On the other hand peoples of developing and underdeveloped countries are living more with nature. The difference in incident and mortality rate among developed, developing and under developed countries is supportive of the assumption of adoption. Ayurveda emphasizes on utilization of natural resources in natural forms and living with nature. In other words, Ayurveda recommends ways for adoption and thereby evolution to make us enough suitable to face pandemics.

ANTI-OXIDANT AND IMMUNOMODULATORS

Large numbers of immunomodulator herbs has been discovered and readily available in Ayurveda treatise. Scientific researches on immunomodulatory action have been done with positive results. This is significant gift of Ayurveda to increase the immunity especially in current pandemic situation for the healthy individuals. Administration of these herbs in specific dosage forms or the formulations prepared from them under Ayurveda physicians guideline can be a strong measure for prevention of further spread of COVID-19 among healthy individuals [18, 19, 20]. In other words, *Rasayana* herbs can be a strong effective tool in avoiding as well as fighting stage third of this pandemic.

YOGA AND IMMUNITY

Poor mental health conditions, including stress and depression, are known to increase the risk of acute respiratory infections [11]. Rising numbers of COVID-19 cases and deaths possibly raise stress and anxiety, while loneliness and depressive feelings are likely due to mandatory social distancing measures. Consideration of the mind is another distinction of Ayurveda and Yoga. Several measures for mental health are described, including pranayama and meditation. Pranayama is known to improve lung function [11]. Meditation is found to reduce inflammation markers and influence markers of virus-specific immune response [13]. Yoga including meditation could be a simple and useful home-based practice for the prevention and post-recovery management of COVID-19.

Ayurveda clearly states that properties and applications of knowledge, vapors, and water are depending on who is holding them. Ayurveda has already discovered and strongly recommended living harmonically with the rules of nature, and the same way has been found applicable in the pandemic conditions caused by the new strains of viruses. The *Rasayana* (rejuvenating drugs) of Ayurveda are significantly helpful in strengthening the immune system and thereby offers a natural way for the prevention of pandemic diseases. Considering

these aspects, an attempt has been made to present the relationship between evolution in living beings, Ayurveda, and prevention of emerging infectious diseases such as COVID-19.

CONCLUSION

Ayurveda offers simple natural ways as daily regimens, herbal combinations, herbo-mineral formulation and exercises such as Yoga for prevention of COVID-19. The curative role of Ayurveda needs to be systematically studied. However based on the precision in Ayurveda principles, it can be claimed that Ayurveda may have a definite cure for COVID-19 and there is great need to find and establish it. Ayurveda can play significant role in future strategies because most of the preventive strategies for COVID-19 has clearly showed that the ancient seers of Ayurved had already provided those guidelines and few more too which are yet to be accepted and recommended by world scientific committees.

FUTURE STUDY ASPECTS

Currently world is facing COVID-19 pandemic and thus it is difficult to follow preventive guidelines and ensuring the safety. Ayurveda guidelines offers a way to prepare mankind to get possible safety in current situation but these guidelines promises much more safety in prevention of similar pandemic in future. Along with fighting current situation, the scientific minds in the world are expected to start preparing strategies for future too.

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Conflict of Interest

There is no conflict of interest.

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ETHANOBOTANICAL STUDY OF MEDICINAL PLANTS USED TO TREAT SKIN DISEASES IN CUDDALORE DISTRICT, TAMILNADU, INDIA

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ABSTRACT:

India is called "Botanical Garden of the world" as it is having the highest number of medicinal herbs. Many plant species are widely applied in traditional medicine to treat several diseases. There is a frequent instance of skin diseases among the people so attempts are made to discover the traditional therapeutic plants. Our present study is to focus on the medicinal plants used to cure skin diseases in Cuddalore district, Tamilnadu, India. In this study, we have found that 78 plant species belonging to 70 genera and 40 families which are used to cure various skin diseases like itching, inflammation, wounds, scabies, swelling, cuts, boils, blisters, rashes, leukoderma etc. Different parts of medicinal plants such as leaf, whole plant, bark, root, stem, seed, fruit, herb and shrub are taken in different forms. The most frequent parts used to treat skin diseases are leaf (50%), whole plant (20%) and seed (8%). The highest numbers of species found in the family are Fabaceae, Solanaceae and Asteraceae. Further research on these medicinal plants will lead to the discovery of new drug compounds.

Keywords: Cuddalore district, Medicinal plants, Skin disease, Traditional medicine.

INTRODUCTION:

Ethanobotanical is the study of relationship between primitive human society and their plant environment. It is anthropological approach to botany and for several thousand years plants are used in traditional medicine [1]. It is a vital step in the identification, selection and development of therapeutic agents from medicinal plants [2]. From Ancient time, plants are used as medicines [3]. World health organization has stated approximately 80% of the world's population relies on traditional medicine to carry out their health needs. The custom of herbal medicine is wide spread in India, Pakistan, Thailand, China, Srilanka and Japan. India is a resourceful emporium of medicinal plants and aromatic plants [2]. About 2,500 plant species are used for medicinal purpose in India by traditional healers [4]. In India, through medicinal and aromatic plants annually Rs.200 crores are profitable [5].

Phytochemical are naturally arising in all medicinal plants having a defence mechanism to cure and protect from various diseases which have two categories such as primary and secondary constituents. Secondary constituents exhibit various important pharmacological activities such as anti-inflammatory, antitumour, antioxidant, antiviral, antibacterial, antimutagenic and anticarcinogenic activities [6]. In worldwide, skin diseases are the most common health problem associated with a considerable burden [7]. Skin disease affects all age genders. Climatic conditions like cold and hot affects the skin easily and causes skin infections. Skin diseases are also caused by bacterial and virus. In recent years, skin diseases have gained the attention due to association with AIDS OR HIV [8]. The objective of this present study was to conduct an ethno botanical study about medicinal plants which are used to cure various skin diseases in Cuddalore district, Tamilnadu, India.

STUDY AREA:

Cuddalore is one of the largest towns in Tamil Nadu. Cuddalore district is full of natural vegetation and it is surrounded by Villupuram district in the west, Kanchipuram district in the north, Nagapattinam district in the south and it is lined by Bay of Bengal on eastern side [4]. It

is located at 11°43'N and 79°49'E [9]. The area of the district is 3,648 km² and the population present in the district is 22,85,395 [1]. It contributes significantly to the production of cashew nut and jackfruit to Tamil Nadu [2]. In Cuddalore district, 22 aquatic plants are identified as medicinally important species [10]. In this region, there are several types of soils are present like coastal alluvium, red laterite, deep black, red loamy, delta alluvium and red sandy [9]. The maximum and minimum temperature is 33.64 °C and 22.75 °C [11].

METHODOLOGY:

In this study area, the information was collected from non tribal and tribal inhabitants and herbalists called nattuvaidyars and ayurvedic doctors. All plants used for the treatment for skin diseases in cuddalore district are collected and identified. All plants used for the skin diseases were collected and taxonomical uses were identified with help of floristic treatises published by presidency of Madras Gamble (1915-1936), Flora of Tamil Nadu (Mathew,1991) [12]. The collected information are the plant local name, botanical name, family name, plant parts used and the mode of formation used for the skin diseases are noted [5].

DISCUSSION:

In this study, about 78 medicinal plants are used for various forms of skin diseases. These medicinal plants are used in single form or in combination of medicinal plants with some additives. The detailed information of medicinal plants collected are listed in **Table 1**. These medicinal plants belonging to 40 families which are used to treat various skin diseases are listed in **Table 2**.

BASED ON PARTS USED:

The most frequent plant part used to treat skin diseases in cuddalore district are leaves (50%) and whole plant (20%). Other plant parts are also used and it was very less when compared to leaves. For herbal medicine preparations, different parts of plants can be used such as leaves, whole plant, bark, root, stem, seed, fruit, flowers, shrub and herb. The percentage of plant part used to treat skin disease was shown in **Figure 1**.

BASED ON MODE OF FORMULATION:

The formulation of plant parts used for the treatment are paste (54%) and juice (21%). Other formulations of plants are used in equal percentage. Different parts of plant used are paste, juice, powder, extract and raw. The percentage based on the formulation of plant to cure skin diseases are mentioned in **Figure 2**.

CONCLUSION:

The attaining information in the study reported that the bioactive compounds in some plants have pharmacological effects in regulating biological process which can promote healing, improving health effects and reducing inflammation. Seventy-eight medicinal plants belonging to 70 genera and 40 families which are used for treating skin diseases in the study area. Thus, the present study helps us to understand the traditional knowledge on Medicinal plants and their values. The conservation and use of medicinal plants should be enhanced for the betterment of our lives. Further research on these medicinal plants will lead to the discovery of new drug compounds.

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CONFLICTS OF INTERESTS:

The authors declare that they do not have any Conflicts of Interests.

Table 1: Classification of plants

Sl.no	Botanical name	Family name	Local name	Parts used	Mode of application
1.	<i>Acalypha indica</i> L.	Euphorbiaceae	Kuppaimeni	Leaves	The sap of crushed leaves mixed with salt, or decoction of plant is used. Leaves powder are applied to the infested wounds.
2.	<i>Abrus precatorius</i>	Fabaceae	Kundumani	Seeds	Seeds paste is used externally.
3.	<i>Acacia caesia</i>	Mimosaceae	Soap bark	Bark	Barks are directly applied to skin.
4.	<i>Acanthus ilicifolius</i> L.	Acanthaceae	Kazhimulli	Shrub	The whole plant extract and paste is used.
5.	<i>Achyranthes aspera</i> L.	Amaranthaceae	Nayuruvi	Leaves	Leaf paste is applied topically to treat cuts and wounds.
6.	<i>Aegle marmelos</i> (L.) Correa. Ex. Roxb.	Rutaceae	Vilvam	Fruit, Leaves	Fruits crushed with seed of <i>Strychnos nux-vomica</i> and <i>Pongamia pinnata</i> , boiled with coconut oil is applied on the affected parts, leaf paste is applied topically to treat wounds.
7.	<i>Aloe barbadensis</i> Mill.	Liliaceae	Sothukathalai	Leaves	To kill ticks and parasites fresh leaf juices are applied to the skin.
8.	<i>Ammania baccifera</i> L.	Lythraceae	Cirukalluruvi	Leaves	Leaves are mixed in water and paste applied on the affected area and repeated for 3 days
9.	<i>Andrographis paniculata</i>	Acanthaceae	Sirianangai/ Nilavembu	Whole plant	Plant paste is applied externally.
10.	<i>Anisomeles malbarica</i> . R. Br.	Lamiaceae	Peyamiratti	Leaves	Leaf of its plant along with leaf of <i>Alangium salvifolium</i> is made into paste and applied to chronic wounds.

11.	Argemone Mexicana L.	Papaveraceae	Pramathandu/ Narimirati/ Kudiyottipoon du	Seed	Pounded seeds along with the ribosomes of Curcuma aromatica and Acorus calamus are made into paste and applied to skin.
12.	Asystasia gangetica (L.) Anderson.	Acanthaceae	Valukkaikeera i/ chilanthinayag am	Leaves	Leaf powder is mixed with coconut oil and applied topically to heal wounds (burns)
13.	Azadirachta indica A Juss.	Meliaceae	Vembu	Leaves, seed	Leaves paste is applied topically on the body. Seed oil are applied on the affected area.
14.	Bacopa monnerii (L.) pennenn	Scrophulariaceae	Nee brahmi	Leaves	Leaf paste is applied on the affected portion to treat scabies.
15.	Calophyllum inophyllum L.	Clusiaceae	Punni	Seed	Seed oil applied externally.
16.	Canthium dicocum (Gaertn.) Teijsm and Bin.	Rubiaceae	Nallakarai	Root	Root pastes are used.
17.	Calotropis gigantea	Asclepiadaceae	Erukku	Leaves, Root	Root paste is applied on boils, pimples. Leaves are tied around wounds. Root powder is sprayed locally in leukoderma.
18.	Cassia auriculata	Fabaceae	Avaram poo	Leaves	Leaves paste is applied to affected area.
19.	Cassia occidentalis L.	Caesalpinaceae	Peithagarai/ Oolanthavarai	Leaves	Leaves paste is applied topically to treat scabies.
20.	Cassia senna (L.) Roxb.	Caesalpinaceae	Ponavaarai	Leaves	Leaves paste is applied against scabies and ringworm.
21.	Centella asiatica (L.) Urban	Apiaceae	Vallarai	Leaves	Leaves juice are taken.
22.	Cissus vitigenia L.	Vitaceae	Cempeirantai	Root	Root paste was applied on swellings.
23.	Citrus limon	Rutaceae	Lemon	Leaves or	Root paste and fruit

				Fruits	juices is applied in pimples
24.	<i>Chamaesyce hirta</i> Mill. Sp.	Euphorbiaceae	Amman patcharasi	Whole plant	The latex is applied topically to treat wounds.
25.	<i>Cleome viscosa</i> Linn.	Capparidaceae	Naivelai/ Naikadugu	Leaves	Leaf paste is topically used to heal wounds.
26.	<i>Clerodendron inerme</i> Gaertn.	Verbenaceae	Sangam	Shrub	Leaf extract and paste are used.
27.	<i>Clitoria ternatea</i>	Fabaceae	Sangu pushpam	Leaves	Leaves Paste used for swellings
28.	<i>Coccinia grandis</i> (L.) J.Voigt	Cucurbitaceae	Kovai	Leaves	Leaves juice is mixed with butter and applied topically.
29.	<i>Coriandrum sativum</i>	Apiaceae	Kothhumalli	Leaves	Leaf paste is applied to allergic inflammation.
30.	<i>Curcuma longa</i>	Zingiberaceae	Manjal	Rhizome Powdered	Powdered rhizome with milk is given in internal injuries. Rhizome paste is applied to reduce body swelling and for healing of wounds.
31.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae/ Gramineae	Arukampullu	Whole plant	Leaves boiled in coconut oil are applied.
32.	<i>Cyperus rotundus</i>	Cyperaceae	Korai pul	Root	Root extract used to treat wounds.
33.	<i>Datura metal</i>	Solanaceae	Umathai	Root/leaf	Leaves paste are applied to the affected area.
34.	<i>Dodonaea viscosa</i> L.	Sapindaceae	Virali	Leaves	Leaves paste are used to treat swelling, wounds and burns.
35.	<i>Eclipta alba</i>	Asteraceae	Manjal karisalanganni	Whole plant/leaves	Leaf paste is applied topically on the body.
36.	<i>Eclipta prostrate</i>	Asteraceae	Karisalanganni	Whole plant/leaves	The whole plant is used for healing wounds and cuts.
37.	<i>Ficus microcarpa</i> L.f.	Moraceae	Nintamaravak ai	Fruit	Fruits mix with pepper, applied on wounds and swellings.

38.	Garcinia spicata (Wight and Arn.) J.D.Hook.	Clusiaceae	Kaattuppinnai	Root	Root paste applied for swellings.
39.	Heliotropium indicum L.	Boraginaceae	Thelkoodukku	Whole plant	Paste of whole plant is applied topically to body
40.	Hemidesmus indicus	Asclepiadaceae	Nannari	Whole plant	It is taken as tonic against skin troubles.
41.	Hibiscus rosa sinensis	Malvaceae	Semparuthi	Leaves	Leaves paste are applied.
42.	Hygrophila auricula	Acanthaceae	Neerumuli	Whole plant	Whole plant paste is applied to treat body swellings.
43.	Ipomoea carnea	Convolvulaceae	Neyveli kattamanakku	Leaves	Leaves paste is applied to over boils.
44.	Ipomoea pescaprae L.	Convolvulaceae	Adappankodi	Herb	The whole plant paste is used.
45.	Jasminum angustifolium(L) Wild	Oleaceae	Kattumalligai	Leaves	Leaf juice used for rabies.
46.	Lantana camara L.	Verbenaceae	Unnisedi	Leaves	Leaves paste are applied.
47.	Lawsonia intermis L.	Lythraceae	Maruthani	Leaves	Leaves made into paste are applied on the affected parts.
48.	Mangifera indica	Anacardiaceae	Maa	Seed	Seed kernel is taken internally to cure ring worm infections.
49.	Mimosa oudica L.	Mimosaceae	Thottasurungi/ Sottavatti	Leaves	Fresh leaves are eaten to cure skin disorders.
50.	Mimosa pudica	Fabaceae	Thottalsurungi	Leaves	Paste applied for pimples
51.	Momordica charantia	Cucurbitaceae	Pavakai	Leaves	Leaf juice used to remove worms.
52.	Musa paradisiaca Linn.	Musaceae	Vazhai	Stem	A plant extract is used to cure burns.
53.	Ocimum basilicum	Lamiaceae	Thulasi	Leaves	Leaves paste are applied.
54.	Ocimum sanctum L.	Lamiaceae/ Labiatae	Thulasi/ Tulsi	Leaves	Leaves along with curcuma aromatica rhizomes are applied on affected parts . Once a day in the night till it is cured skin.
55.	Opuntia dillenii	Cactaceae	Sapathikalli	Stem	Stem Paste applied

					for wounds.
56.	Phyllanthus amarus Schum. and Thonn.	Euphorbiaceae	Kizhanelli	Leaves	Pastes are remedy against scabies.
57.	Pongamia pinnata (L.) Pierre	Fabaceae/ Papilionaceae	Pungam/ Pungu	Root bark seed	Crushed barks boiled in gingelly oil are applied on the affected parts twice a day for 4 days to cure skin diseases, seed oil is used to treat swellings.
58.	Portulaca oleraceae	Portulacaceae	Paruppukeerai	Leaves	Leaves Paste reduces burns and wounds
59.	Rhynchosia minima	Fabaceae	Kaliyan thuvarai	Leaves	Leaves paste are used to heal wounds.
60.	Salicornia brachiata Roxb.	Chenopodiaceae	Kattumari	Whole plant	Whole plant ash is applied to treat itches.
61.	Senna alata	Fabaceae	Vandu kadi leaf	Leaves	Shade dried stem bark is crushed with water/ coconut oil is used externally for chronic inflammation caused by insect bites.
62.	Sida cordata, (Burmn.f.) Borssum	Malvaceae	Nila thutthi	Leaves	Pounded leaves are applied locally to relieve cuts bruises.
63.	Solanum nigrum Linn.	Solanaceae	Manathakkalai	Leaves	Leaf paste is used to cure rabies.
64.	Solanum torvum	Solanaceae	Sundai	Fruits	Unripe cooked fruits are taken orally to eradicate intestinal worms.
65.	Solanum trilobatum Linn.	Solanaceae	Thuthuvalai	Leaves	Leaf juice is used to treat itching.
66.	Tamarindus indica	Fabaceae	Puli	Fruit/Bark	Fresh fruit pulp paste mixed with lime is applied on the painful muscle swelling. Bark ash and coconut oil applied on burns
67.	Thespesia populnea	Malvaceae	Puvarasu	Flower/leaves	Flower or leaves paste are applied.
68.	Thevetia neriifolia	Apocynaceae	Manja arali	Leaves / Roots	Leaves and roots paste are applied.

69.	Tinospora cordifolia (wild) Hook.f. and Thom.	Menispermaceae	Seendil/shindikodi	Leaves	Leaf paste is applied to heal wounds.
70.	Trigonella foenumgraecum	Fabaceae	Vendayam	Seeds	Powder, decoction for injuries.
71.	Tridax procumbens L.	Asteraceae	Vettukkaayath azhai	Leaves	Leaves juice is applied externally for healing wounds.
72.	Ventilago madaraspatana Gaertner	Rhamnaceae	Vembadam	Leaves	Leaves paste are applied.
73.	Vernonia cinerea	Asteraceae	Mukuthipundu	Whole plants	Extracts are used for skin diseases.
74.	Wedelia chinensis (osbeck) Merrill	Asteraceae	Manjalkarilam kanni	Whole plant	Leaves are considered as tonic alternative.
75.	Withania somnifera (L.) Dunal	Solanaceae	Ashwakantha	Root	Root paste is applied to cure scabies
76.	Wrightia tinctoria	Apocynaceae	Veppallai	Leaves	Leaves juice mixed with lime and turmeric powder is applied externally to the swellings.
77.	Ziziphus jujuba Lam.	Rhamnaceae	Ilanthai	Fruit, Bark	Paste are used for heal wounds.
78.	Zizyphus mauritiana	Rhamnaceae	Ilanthai	Leaves / fruits	Extracts are used to treat wounds.

Table 2: Number of plants and families used by local people in cuddalore district

Sl.no	Families	Number of plants
1.	Acanthaceae	4
2.	Amaranthaceae	1
3.	Anacardiaceae	1
4.	Apiaceae	2
5.	Apocynaceae	2
6.	Asclepidaceae	2
7.	Asteraceae	5
8.	Boraginaceae	1
9.	Cactaceae	1
10.	Caesalpinaceae	2
11.	Capparidaceae	1
12.	Chenopodiaceae	1
13.	Clusiaceae	2
14.	Convolvulaceae	2
15.	Cucurbitaceae	2
16.	Cyperaceae	1

17.	Euphorbiaceae	3
18.	Fabaceae	9
19.	Lamiaceae	3
20.	Liliaceae	1
21.	Lythraceae	2
22.	Malvaceae	3
23.	Maraceae	1
24.	Meliaceae	1
25.	Menispermaceae	1
26.	Mimosaceae	2
27.	Musaceae	1
28.	Oleaceae	1
29.	Papaveraceae	1
30.	Poaceae	1
31.	Portulacaceae	1
32.	Rhamnaceae	3
33.	Rubiaceae	2
34.	Rutaceae	1
35.	Sapindaceae	1
36.	Scrophulariaceae	1
37.	Solanaceae	5
38.	Verbenaceae	2
39.	Vitaceae	1
40.	Zingiberaceae	1

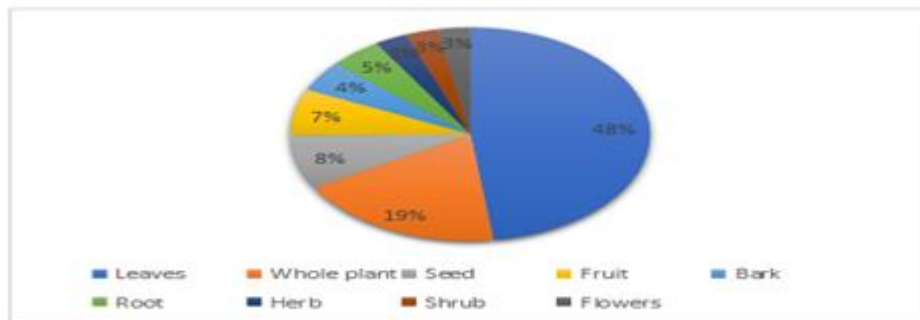


Figure 1: Use of medicinal plants according to the used part

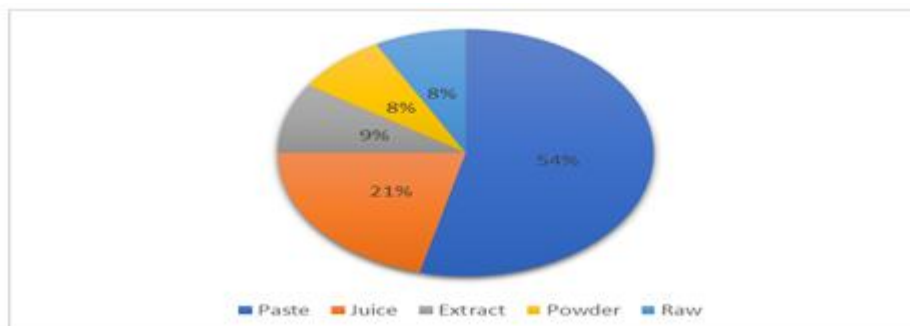


Figure 2: Use of medicinal plants according to method of preparation

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SYNTHESIS AND EVALUATION OF CURCUMIN –CHITOSAN NANOPARTICLES**Mrs. N. Karthiha**

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INTRODUCTION

Chitosan is a sugar that is obtained from the hard outer skeleton of shellfish, including crab, lobster, and shrimp. It is a linear polysaccharide comprised of randomly distributed β -(1 \rightarrow 4)-linked D-glucosamine (deacetylated unit) and *N*-acetyl-D-glucosamine (acetylated unit). Chitosan is widely used in the field of medicine. Chitosan and chitin are biopolymers and both are obtained from the waste by-products remaining in edible crustaceans such as shrimps and crabs. The chitosan polymer often consists of about 20% of the *N*-acetyl glucosamine sugar residues of chitin while chitin often consists of about 20% of the glucosamine residues of chitosan (Hadwiger, 2013).

Curcuma longa (turmeric) is a curry spice and a traditional Chinese curative herb, used to consume to overcome inflammatory conditions in Southeast Asia and China (Lestari and Indrayanto, 2014). Turmeric is used to cure various other common maladies including skin and eye infections, acnes, sprains, wounds, arthritis, dysentery, ulcers, flatulence, and stomach upset (Singh and Singh, 2009, 2010). Turmeric comprises of carbohydrates (69.4%), moisture (13.1%), minerals (3.5%), fat (5.1%), and protein (6.3%). Turmeric includes three curcuminoids (bisdemethoxycurcumin, curcumin, and demethoxycurcumin), volatile oils (tumerone, natlantone, and zingiberone), sugars, proteins, and resins.

AIM

The present study focusses on the synthesis of the Curcumin-chitosan nanoparticles and its potential applications in antioxidant activity.

OBJECTIVE

To Synthesize chitosan –curcumin Nano particle

To determine the invitro Antioxidant Activity

MATERIALS AND METHOD**1. SAMPLE COLLECTION**

Sample 1: Curcumin

The sample which is used for this study was the Curcumin powder. The dried powders were purchased commercially from a Supermarket (Drug Store) in Coimbatore.

Sample 2: Chitosan

Chitosan powder was purchased commercially from a Supermarket (Drug Store) in Coimbatore.

2. SYNTHESIS OF NANOPARTICLES

Chitosan-Curcumin nanoparticles (CCN) were prepared using ionic gelation method. Different concentrations of chitosan (1-5 mg) was added to 1 % acetic acid (v/v) and mixed well using magnetic stirrer and add 10 % of curcumin. The CCN were formed by adding 1 % TPP (w/v) drop by drop under magnetic stirring. Then the solution was centrifuged at 10,000 rpm for 10 minutes to remove residual TPP and the particles were freeze dried. Practical yield was calculated from the following equation.

3. IN-VITRO ANTIOXIDANT ACTIVITY

3.1 DPPH radical scavenging activity

The free radical scavenging activity of synthesized CCN was measured by using 2, 2-diphenyl-1-picrylhydrazyl (DPPH). The scavenging activity for DPPH free radicals was measured according to the procedure described by (Braca *et al.*, 2001). An aliquot of 3 ml of 0.004% DPPH solution in methanol and 0.5 to 2.5 μ l of CCN and ascorbic acid at various concentrations were mixed. The mixture was shaken vigorously and allowed to reach a steady state at room temperature for 30 min. Decolorization of DPPH was determined by measuring the absorbance at 517 nm. A control was prepared using 0.1 ml of respective vehicle in the place of CCN/ascorbic acid. The percentage inhibition of DPPH radicals by the compound was determined by comparing the absorbance values of the control and the experimental tubes.

$$\text{Scavenging activity \%} = \frac{A_{518}(\text{sample}) - A_{518}(\text{control})}{A_{518}(\text{control})} \times 100$$

3.2 Ferric reducing/antioxidant power (FRAP) assay

The antioxidant capacity of CCN sample was estimated according to the procedure described by Benzie and Strain (1996) and as modified by Pulido *et al.* (2000). FRAP reagent (900 μ l), prepared freshly and incubated at 37 $^{\circ}$ C, was mixed with 90 μ l of distilled water and 30 μ l of test sample, or acetone (for the reagent blank). The test samples and reagent blank were incubated at 37 $^{\circ}$ C for 30 minutes in a water bath. The FRAP reagent contained 2.5 ml of 20 mmol/l TPTZ solution in 40 mmol/l HCl plus 2.5 ml of 20 mmol/l $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ and 25 ml of 0.3 mol/l acetate buffer, pH 3.6 (Benzie and Strain, 1996). At the end of incubation period the absorbance readings were recorded immediately at 593 nm using a spectrophotometer. The known Fe (II) concentration ranging between 100 and 2000 μ mol/l ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) was used for the preparation of the calibration curve. The parameter Equivalent Concentration (EC1) was defined as the concentration of antioxidant has a ferric- TPTZ reducing ability equivalent to that of 1 mmol/l $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. EC1 was calculated as the concentration of antioxidant giving an absorbance increase in the FRAP assay equivalent to the theoretical absorbance value of a 1 mmol/l concentration of Fe (II) solution determined using the corresponding regression equation. Ascorbic acid was used as standard.

$$\text{Percentage of inhibition} = \frac{A_{\text{control}} - A_{\text{test}}}{A_{\text{control}}} \times 100$$

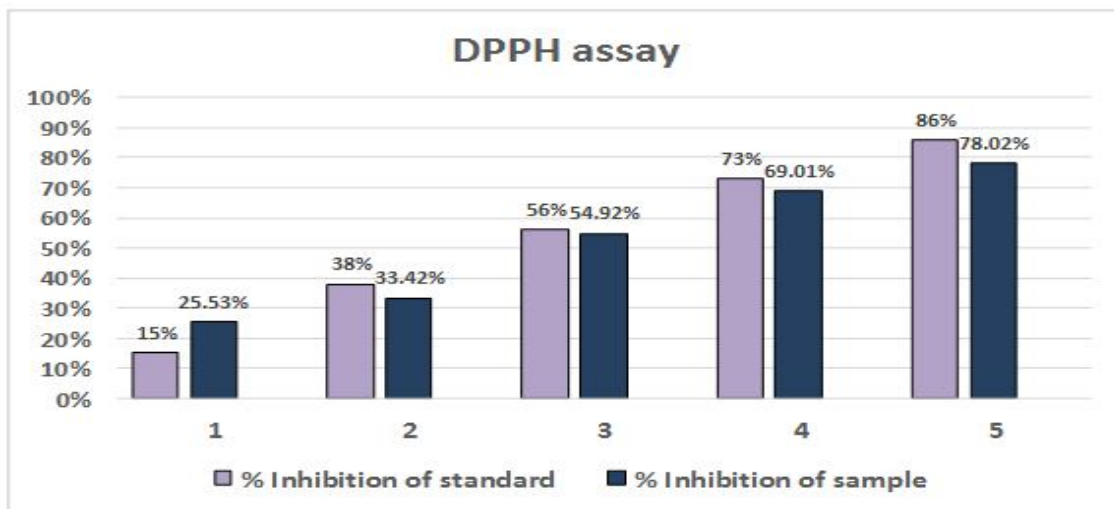
4. RESULT:

4.1 DPPH radical scavenging activity:

From the results of DPPH method, the free radical scavenging capacity of CCN sample was confirmed. Figure 8 shows the in vitro antioxidant activity of synthesized nanoparticle at different concentrations. The antioxidant activity using 1,1 - diphenyl -2picryl-hydrazil (DPPH) of sample showed significant amount of antioxidant activity as that of the standard. The percentage inhibition of DPPH increases with increasing concentration. Ascorbic acid was taken as standard.

Comparison of free radical scavenging capacity of sample at five different concentrations.

Concentration	% Inhibition of Standard (Ascorbic acid)	% Inhibition of Sample
S-1	15 %	25.53 %
S-2	38 %	33.42 %
S-3	56 %	54.92 %
S-4	73 %	69.01 %
S-5	86 %	78.02 %

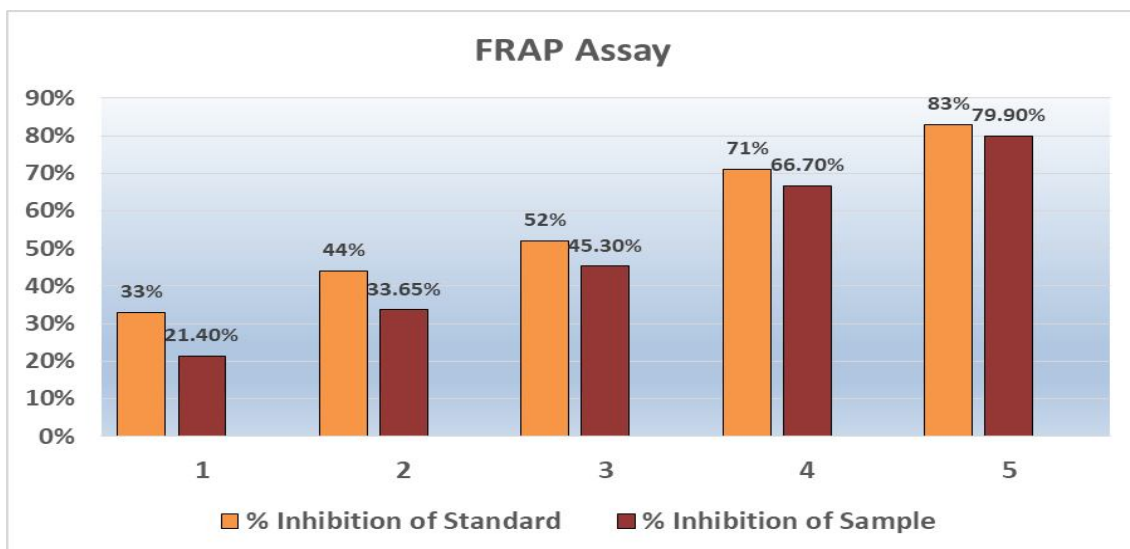


4.2 Ferric reducing/antioxidant power (FRAP) assay

The antioxidant capacity of CCN sample was estimated using FRAP assay. The ferric reducing antioxidant power (FRAP) mechanism is based on electron transfer rather than hydrogen atom transfer (Prior et al., 2005). The antioxidant activity using FRAP of sample showed significant amount of antioxidant activity as that of the standard. The percentage inhibition of this assay increases with increasing concentration. Ascorbic acid was taken as standard.

Comparison of ferric reducing antioxidant power of sample at five different concentrations.

Concentration	% Inhibition of Standard (Ascorbic acid)	% Inhibition of Sample
S-1	33 %	21.40 %
S-2	44 %	33.65 %
S-3	52 %	45.30 %
S-4	71 %	66.70 %
S-5	83 %	79.90 %



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A REVIEW OF MANAGING SEAWATER INTRUSION IN COASTAL AQUIFERS**V. M. Priyanka¹, M. Ramesh² and Y. Srinivas²**¹Ph.D Scholar, Department of Civil Engineering, ²Professor, Department of Civil Engineering,³Professor, Department of CSE, GITAM Deemed to be University, Visakhapatnam**ABSTRACT**

Seawater intrusion has become a challenging and wide-spread environmental topic. Groundwater overexploitation, lack of natural groundwater recharge, population growth, climate change, and land-use change are the major factors affecting seawater intrusion. This paper mainly focuses on a comprehensive review of available scenarios to predict seawater intrusion and its management. Different studies have been done to analyze and manage strategies that can be used to reduce or control the seawater intrusion in coastal areas. Numerical modeling is a tool that will help to understand and to predict the seawater intrusion. It is tough to change the intruded groundwater aquifer to normal; for this scenario, seawater intrusion prediction will help to take the preventive measures.

Keywords: Artificial recharge, Coastal aquifer, Intrusion prediction, Numerical modeling, Seawater intrusion.

INTRODUCTION:

Groundwater is essential for coastal regions, but excess usage makes the groundwater endangered due to the intrusion of seawater into the coastal aquifers. Most of the coastal areas are experiencing seawater intrusion due to natural and anthropogenic activities. In India, coastal areas are developing very fast; due to this development, Residential and industrial structures are also increasing along the coast. Usages of groundwater for domestic as well as industrial have been increases day by day. Due to natural and humanmade causes, groundwater pumping is not balancing with the groundwater recharge, leading to depletion of groundwater. Reduction in groundwater levels along the coast is causing impacts on groundwater quality and seawater intrusion.

CAUSES OF SEAWATER INTRUSION:

Seawater intrusion is a significant and wide-spread process that degrades groundwater quality by increasing the salinity levels more than acceptable drinking water standards. Saline water intrusion mainly due to up-coning of saline water owing to over-drafting of groundwater (U A Lathashri et al. (2016) and S. Gopinath et al. (2016)). The factors that contribute to the increase of salinity in freshwater (Mohamed El Mokhtar et al. (2018)) are the water resource geographical location, the geology of the aquifer, climate, and over-exploitation of groundwater. Overexploitation is the most critical factor (S. M. Praveena et al. (2011)) to cause seawater intrusion. This is crucial to protect the freshwater resources in the coastal aquifer. Fluctuations of hydraulic heads are dependent on seasonal variation in recharge from natural infiltration of precipitation and irrigation (N.Sridhar et al. (2018)). Depletion in groundwater level varied according to the variation in recharge (Nagireddy Masthan Reddy et al. (2019)). For 75% recharge, there was a decline of 1.40m, and for 50% recharge, there was a decline of 2.25m. For an annual average recharge, there was a decline of 0.626m.

PREDICTION AND ANALYSIS OF SEAWATER INTRUSION:

Three-dimensional numerical models are constructive for better understanding and prediction of seawater intrusion. The seawater intrusion analysis needs to be coupled with the groundwater flow equation and the solute transport equation. There are many tools to simulate and predict the seawater intrusion like SUTRA, FEFLOW, and SEAWAT.

SUTRA(Saturated-Unsaturated TRAnsport) is used to simulate the vertical section of the aquifer when subjected to seawater intrusion. Mohammed S. Hussaion et al. (2015) constructed a three-dimensional numerical model calibrated and used to simulate the aquifer's future salinity level. In this study, the aquifer is simulated using the finite element-based flow and solute transport model SUTRA. The model employs a hybrid finite element and integrated-finite difference method to solve the governing equations, which describe the variable-density groundwater flow and transport processes of either solute or energy in the aquifer system under saturated and unsaturated conditions.

FEFLOW is a tool used to simulate two-dimensional and three-dimensional contaminant mass and heat transport of the subsurface. M. M. Sherif. et al.(2012) conducted a simulation for a horizontal view at the mean seawater level. In this analysis, a simulation was performed under the transient condition and continued until reaching the steady-state. The effect of the recharge on the transition zone and retardation of seawater is observed.

U.S. Geological Survey developed MODFLOW, SEAWAT is the standard code to use seawater intrusion package coupled with MODFLOW and MT3DMS. SEAWAT code is used to simulate three-dimensional variable density, finite difference, and saturated groundwater flow. Many case studies on seawater intrusion in coastal areas have been done by using variable density theory. Lakshmi Priya C. et al. (2015) studied groundwater modeling of aquifers using Visual MODFLOW. This study discusses how to use the software, the type of data required, and the expected output from the software. In addition to simulating the groundwater flow, the software has capabilities such as solute transport and parameter estimation. The input data required are a base map of the study area, Specific yield, Specific storage, effective porosity, total porosity, horizontal and vertical hydraulic conductivities. It is also mentioned that the rainfall data, lithology data, topography, groundwater level data, aquifer properties, and pumping rate are also important parameters. The boundary conditions are allowed in Visual MODFLOW includes the constant-head, rivers, general head, drains, walls, recharge, evapotranspiration, constant concentration, recharge concentration, evapotranspiration concentration.

L. F. Konikow et al. (2007) proposes a simplified method for computing estimates of confining layer depletion, as well as procedures for approximating confining layer hydraulic conductivity (K) and specific storage (Ss) using geologic information. This makes the technique useful in developing countries where minimal data are available and for estimating the global transfer of groundwater to surface water.

Namitha MR et al. (2019) used MODFLOW for the prediction of the aquifer system in drought-prone areas. The present study is carried out in a representative river basin, namely the Nileshwar of Kasargod district of northern Kerala. The average annual rainfall of the region is 3,600 mm. Since a major portion of it is confined to only three to four months in a year, the rest of the year was particularly dry. The project area is rectangular with 22.04 km long and 18.53 km wide. The principal geologic formation of the basin includes red soil, lateritic soil, clay, weathered rock, hard rock, and sandy soil. MODFLOW 2000 was the software used for the study. The input data required for the software are discussed, and groundwater conditions after two years were predicted for the study area. Wells, boundaries, and recharges were added, and it was analyzed. The model was calibrated and validated. The results showed that there were no appreciable changes in the water table level after two years.

Lasya C.R. et al. (2015) and N.Sridhar et al. (2018) constructed models that were run with four phases that were model design, calibration, validation, and prediction. The model was calibrated in two stages, which involved a steady-state calibration and transient state calibration using

observed groundwater levels, and the validation was also done. The spatial distribution of hydraulic conductivity and storage properties were optimized using a combination of trial and error method. Conceptualization was done to organize the field data and simplify the flow problem with assumptions so that the system can be synthesized and analyzed easily. Nagireddy Masthan Reddy et al. (2019) developed a model to predict groundwater heads for different recharge scenarios. The steady-state analysis was done for a period of 12 months, and the transient model analysis was done for three years.

Fei Ding. et al. (2014) used SEAWAT for modeling seawater intrusion in Liao Dong Bay Coastal plain, China. About 50% of the city water and 100% of industrial water depend on the groundwater in this area. Significant groundwater source occurrences in the study area are in the Quaternary layer with unconsolidated rock porosity and in the upper Neozoic elastic rocks layer with the fracture and the pores. The regional groundwater flow is mainly from north to the Liao Dong Bay Sea, from western and eastern mountain areas to the middle plain area. A numerical model for variable-density groundwater flow was developed. The simulation was carried out for 55 months. The prediction of seawater intrusion was made for the next 40 years. The results showed that the extent of seawater intrusion area would increase in all geological layers with almost 6.2km in the upper aquifer and 4.3km in the lower aquifer.

Gopinath et al. (2016) discussed the saline water intrusion modeling in Nagapattinam coastal aquifers, Tamilnadu, India. In this study, groundwater levels were measured at 61 locations in Nagapattinam and Karaikal coastal region, identified flow direction pointing toward the coast with no significant change in the groundwater table. Groundwater samples were collected and analyzed for parameters such as conductivity, total dissolved solids, sodium, and chloride, along with the coastal parts of the study area. A computer package for the simulation of dimensional variable-density groundwater flow, SEAWAT, has been used to model the seawater intrusion in the coastal aquifers of the study area. The model was simulated to predict the amount of seawater incursion in the study area for a period of 50 years.

U A Lathashri et al. (2016) studied groundwater sustainability assessment in coastal aquifers. An attempt was made to simulate the unconfined aquifer response to future anticipated scenarios arising out of increasing freshwater demand and climate change. The study area was the aquifer system between the rivers Shambhavi and Pavanje, located in coastal Karnataka, India. The simulation was carried out by Mohamed El Mokhtar et al. (2018) using MODFLOW and SEAWAT. The aquifer parameters were selected based on earlier investigations, which were subjected to quick calibrations. The zone-wise aquifer parameters after calibration were used for the simulation. The MODFLOW model estimates huge flow out of the aquifer into the sea/river during the monsoon, highlighting the perviousness of the aquifer. The river-aquifer interaction indicates constant inflow into the system, indicating a potential threat of saltwater contamination into the aquifers. The spatial and temporal variation of the groundwater table and groundwater salinity were estimated for five future anticipated scenarios over 20 years.

S. M. Praveena et al. (2011) discuss the numerical modeling of seawater intrusion in Manukan Island's aquifer. The study area is located offshore of Kota Kinabalu, Sabah, East Malaysia, on the island of Borneo cover by the South China Sea. Eight observation wells and nine boreholes were distributed across the study area to provide an excellent horizontal and vertical spatial distribution of hydrologic data. Groundwater samplings were done from the observation wells and boreholes. Hydraulic heads were also measured at observation wells and boreholes using Solinst water level meter. Analysis of chloride was done using the Argentometric method. A numerical model SEAWAT-2000 was developed to investigate the current seawater intrusion status.

S. K. Pramada et al.(2015) studied the stochastic simulation of seawater intrusion into freshwater aquifers. A methodology is developed for the effect of heterogeneity on seawater intrusion modeling based on stochastic simulation of the system. The heterogeneity has been modeled by coupling the Monte-Carlo simulation to a seawater intrusion model. It also leads to a better understanding of the transport mechanism in heterogeneous formations in coastal aquifers. A case study was conducted in the Thiruvanmiyur-Injambakkam aquifer, a part of the South Chennai aquifer. Due to overexploitation of coastal aquifers, the interface starts moving towards landward. To prevent/control this landward movement, better and efficient management of coastal aquifers is very much necessary. For a small variation of hydraulic conductivity, it was found that the error in the prediction of length of intrusion is 14 m.

REMEDIAL MEASURES OF SEAWATER INTRUSION:

Following are some of the criteria considered to increase the groundwater recharge:

Seawater intrusion in an aquifer can be controlled by (Mohammed S. Hussain et al. (2015)) using pond treated wastewater; i.e., pond treated wastewater has been used for artificial recharge. The utilization of reclaimed water or rainwater through surface ponds can be quickly followed in such areas that experience seasonal flood pulses. This showed a decrease in the salinity levels throughout the aquifer. It was seen that a higher level of efficiency could be achieved by designing various surface recharge basins around the affected area. In addition to this, direct collection of the treated wastewater, rainfall, and excess surface flow in these basins can be considered as reliable sources for recharging and feeding of the aquifer.

Mohanavelu Senthilkumar et al. (2019) proposed a Remote sensing and geographic information system (GIS) approach is used to identify the favorable regions for constructing artificial recharge structures to increase the sustainability of the wells and arrest the declining groundwater level. Geology, geomorphology, slope, soil, land use, post-monsoon water level, weathering depth, and water bodies/drainage were integrated for GIS overlay analysis. According to this masonry check dams, Nala bunds, recharge shafts, and percolation ponds can improve the aquifer recharge rate. Adjustment of a groundwater pumping scheme for the future can also control the seawater intrusion (S. M. Praveena et al. (2011)).

The construction of a subsurface physical barrier is one of the techniques to prevent seawater intrusion. A mixed physical barrier combines an impermeable cutoff wall and semipermeable subsurface dam for various hydraulic gradients (Antoifi Abdoulhalik et al. (2017)). These were yield more reduction of seawater intrusion length than traditionally used barriers.

CONCLUSION:

This study focuses on the various management techniques that can be considered for coastal aquifer seawater intrusion analysis. Simulation tools will provide an optimal solution to the seawater intrusion problem. Prediction of the seawater intrusion can be made by numerical modeling; multiple authors mention the input parameters needed for modeling. This study identified the factors affecting the seawater intrusion and also measures that can be implemented to prevent seawater intrusion in the coastal aquifers. Depending on several factors like seawater intrusion level and groundwater quality of the coastal aquifer, combinations of the control measures can be implemented. The primary factor affecting the seawater intrusion is overexploitation. Various recharge techniques are mentioned to counteract the overexploitation. Implementation of the type of artificial recharge technique, several parameters like the Geology, geomorphology, and rainfall of a particular coastal region plays an important role.

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CHANGING PARADIGM OF LIBRARIES: HOW TECHNOLOGY TRANSFORM HUMAN RESOURCE NOMENCLATURE AND WORK CULTURE?

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ABSTRACT

The changing paradigm, due to technology impacts almost every domain. Libraries are not the exceptions in this case. Therefore the study is an attempt to highlight the insights lead by technology on libraries. The study discussed the overview of libraries, role, and human resource of libraries. Moreover, the study briefly delivered upon the earlier jobs and roles of libraries and human resource working in these libraries. Further, the study revealed the new roles and jobs of human resource under the current discourse.

INTRODUCTION

The present scenario of technology and advancement revolutionized each and every sector, weather it may be social science, arts and humanities, behavioral sciences, pure science or applied science. There is a drastic change in every aspect and every domain due to advancement and emergence of new technologies like Nanotechnology, artificial intelligence, robotics, cloud computing, and internet of things. This leads the working professionals towards new arena of work culture and transformed the nomenclature of human resources also. It is evident from the ongoing global pandemic that how much technological advancements has had made the human beings lively to interact with each other, work with each other, and most importantly collaborate with each other, it was possible only because of the advancements in science and technology. Simultaneously, smart technologies prioritized the needs of the human beings and transformed the physical identity of the man to virtual identity, man is now thinking, working, talking, moving, controlling and coordinating things virtually.

Same drastic transform happened in the libraries across the globe, earlier there were the traditional jobs of the library human resources but these days smart user needs and global competition of survival of fittest leads the libraries to embrace the technology. Moreover, in the present era of 21st century user needs and expectations also changed that furthermore leads the libraries to revisit the work culture and human resource roles. There are profound changes for “libraries and information centers” especially changing the nomenclature of “intelligentized libraries to smartened libraries or digital libraries” (Du and Liu, 2014; Sun, 2014; Xu, 2014). Li (2013) believes that libraries have achieved the new heights in terms of transformation of sources and services.

LIBRARIES

A library is a curated collection of information sources and related services, collected by experts and made available as a guide or borrowing for a given group often in a quiet research setting. It offers access to materials directly or online which may be interactive or virtual, or both. A library's book collection can be found in books, journals, manuscripts, movies, maps, prints, materials, microforms, cassettes, cassettes, videotapes, DVDs and Blu-ray Discs. Libraries range to millions of objects in number. Apart from there are various definitions of libraries few of them are mentioned below:

“Library is an organization, or part of an organization, the main aim of which is to facilitate the use of such information resources, services and facilities as are required to meet the informational, research, educational, cultural or recreational needs of its users. Administrative unit is any independent library, or group of libraries, under a single directorate or a single administration. It typically contains a central/main library, branch libraries and administrative functions. Library service point is a fixed or mobile facility through which library provides a service to its users. Central libraries, branch libraries, mobile libraries, and external service points located in different geographical locations and managed by one administrative unit are all each individual service points” (IFLA).

On the other hand Merriam Webster defined library as:

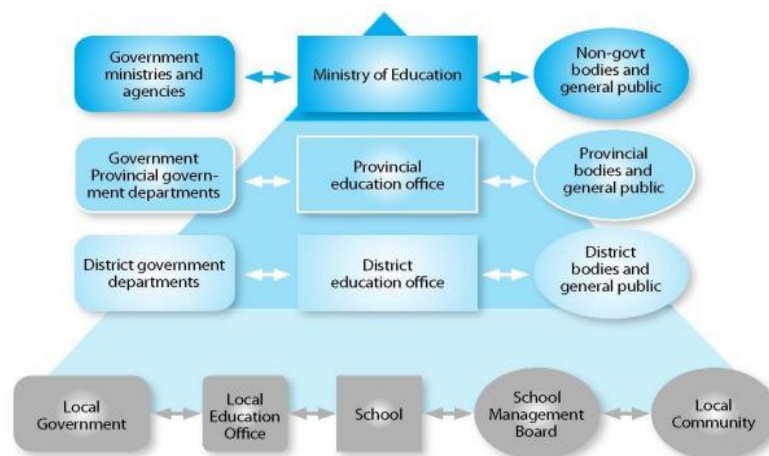
“A place in which literary, musical, artistic, or reference materials (such as books, manuscripts, recordings, or films) are kept for use but not for sale”

One more definition of UNESCO explained the discourse of library as:

“Organisation, or part of an organisation, whose main aims are to build and maintain a collection and to facilitate the use of such information resources and facilities as are required to meet the informational, research, educational, cultural or recreational needs of its users; these are the basic requirements for a library and do not exclude any additional resources and services incidental to its main purpose (ISO, 2006). It includes any organized collection of books and periodicals in electronic or in printed form or of any other graphic or audio-visual materials (based on UNESCO, 1970). It includes virtual libraries, digital catalogues”.

Keeping in view all the definitions of library mentioned in above sections, one should conclude that the libraries are important for the success of any academic and non academic institutes. Apart from that libraries are associated with the different organisations and definitely playing an important role in every academic and research related activities (Figure 1).

Figure 1. **Horizontal Information Dissemination by libraries**



Source: <http://www.unescobkk.org>

TECHNOLOGICAL INNOVATIONS TO LIBRARIES

According to Brey (2009), while it is difficult to establish a concept for technology people do indeed know what it is and can distinguish between those that are human-made and those that exist naturally. Examination of the preceding sentence demonstrates the obvious connection

between information with technology and one's ability to distinguish between that which takes place in nature and that which is developed. That aside, this partnership might not be as clear as one might expect, due to the uncertainty of the argument by Brey. The lack of consistency in conveying what is said by the declaration comes from being able to view it in one of two ways, with respect to all information and distinction.

As Volti (2009) has introduced the term "technology" to mean "skill" and "art." A recall is facilitated to the reconciliation between the two meanings of the Greek term the logical relation between them: everything takes talent and art to make. The two competences the art and the metonyms for output should be considered. However, they need not be metonyms be misconstrued.

While looking towards the libraries, there are vivid changes in the various technicalities of human resources. Moreover, changes and transformations from services and user expectations. Therefore below mentioned key elements of libraries are the results of techno sphere of libraries.

1. Development of a flexible bibliographic instruction course structure.
2. Provision of mobile access to the library website.
3. Transition to a bookless (i.e. no print books) library for certain discipline.
4. Outsourced reference service to another organization.
5. Library liaisons with students and the instructor in course management systems.
6. Collaboration with faculty/academic departments to publish student research.
7. Provision of a service for archiving, preservation, and access to research data and liaison support to researchers.
8. Wi-Fi service to the local community.
9. Provision of a platforms to support multimedia creation and publication for faculty and students.
10. Service to digitize and provide online access to course catalogs.
11. Providing personal librarian service to freshman.
12. Reconfiguration of physical space and redesigned services to provide information commons .digital exhibits for special collections/unique materials owned by the library.
13. Creation of an institutional repository to contain the research output.
14. Creation of a publishing services.
15. A collaboration with another library to share collection development.
16. Collaboration with another library to share collection development.
17. Provision of federated searching across the library OPAC.
18. Provision of a service to publish e-journals.
19. Creation of website/portal for faculty to deposit article into the institution's repository.
20. Mapping application in OPAC to provide directional information.
21. Use of DOIs to create long term, stable links to digital resources that should be preserved.

22. Access to library information using mobile devices and QR barcodes, enabling users to access online information.
23. Sharing of a major technology platform.
24. Service for submission, access and preservation of ETDs.
25. Live chat and instant messaging for reference service.
26. Delivery of bibliographic instruction using online tutorials.
27. Provision of a GIS service to students and faculty.
28. Installation of a coffee bar/restaurant/café in the library.
29. Replacement of stack book storage/preservation with digital book storage/preservation.
30. Lending service (laptops, netbooks, iPADs, etc.)
31. Provision of a service to inexpensively print, bind and trim from digital book.
32. Use of RSS feeds etc. to provide library news/event descriptions to library users.
33. Device and associated service to allow students and faculty to check out their own books.
34. Mobile services to access information about the library.

WORK CULTURE

In recent years there has been a considerable raise in demand for skilled experts in the managing of multimedia and goods, and currently, the capabilities of most companies are lacking. New competences are required, however to produce new and exciting goods to make company competitive. This is also an important concern for the cultural industry, which wants retraining workers to compete in the supply of information with other industries. This includes preparation and additional training for information specialists and experts and a wide-ranging certification campaign. In order to face modern demands and prospects, new credentials are required in the traditional cultural sectors and organisations – individuals with professional expertise as well as lifelong learning.

WHAT WERE THE EARLIER JOBS OF WORKING PROFESSIONALS OF LIBRARIES?

Earlier there were different roles of working professionals in libraries across globe. These are Classification/ cataloguing bibliography creation, Conservation of manuscript, Collection/issues, Archives management, Indexing, Library planning, etc. Although these are the jobs still existing in librarianship but the ways and means of performing these jobs are transformed because of the advancement of technologies like artificial intelligence, automation, social networking, consortium, online resource sharing etc. Earlier there were library professionals performing the task of preparing catalogue cards, classifying books and journals manually, searching and creating a bibliography for researchers manually and the other mainstream tasks. By the advent of innovations and impact of technological sector, libraries demand new roles to play to survive and sustain the credibility and essence. Libraries has had attained embedded approaches and gave birth to new roles of human resources.

WHAT ARE THE CURRENT ROLES OF HUMAN RESOURCE OF LIBRARIES?

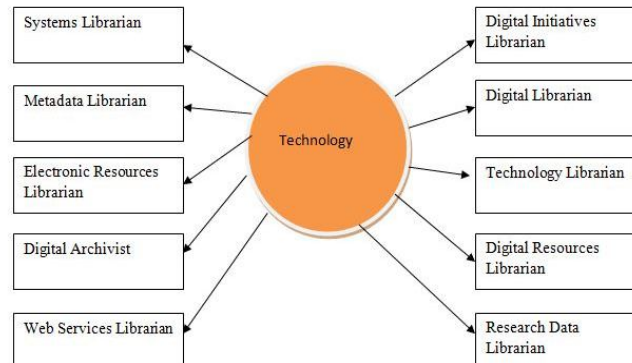
The current era is the era of smart technologies and the continued existence of any organization is to embrace smart technologies. Libraries have gone through many different roles from preserving of cave paintings and inscriptions to adaptation of cloud computing and block chain technologies. So, far as the current roles of human resources working in the libraries associated

with the different institutions and organizations are advanced database management, advanced web technology, content management system, data interoperability, development of web applications, digital library technology/software, encoded archival description, information architecture for the web, information visualization, introduction to database management, introduction to web design, introduction to web programming, mobile application development, usability, Web 2.0, Web archiving, Digital preservation and access etc.

WHAT IS THE CURRENT NOMENCLATURE OF HUMAN RESOURCE?

With the advent of smart technologies the nomenclature of the human resources also changed in the libraries. When there comes concept of role of library human resource at the same instance there comes the management of the roles. As discussed in earlier sections that there comes emergence of various tasks in librarianship, now the days are gone when human resource of libraries were considered as just bookkeepers. Information communication technology gives birth to new sources and services of information in electronic format, in this connection there comes need of “Electronic Resources Librarian” one who will look towards the better management of electronic resources weather it will be electronic books, electronic journals, electronic news papers, e-zines etc. Similarly there comes other tasks as well under different settings of library operations and there comes need of skilled and qualified human resources to look forward and manage the tasks, like to create and maintain the digital library, to manage the scholarly content, to give information literacy to users, to assign the metadata to objects under digitization etc. Hence, lots of new roles lead the etymological changes to the nomenclature of the human resources. It is more precisely mentioned in the Figure 2.

Figure 2. New Nomenclature of Human Resource of Libraries



DISCUSSION

In order to navigate the modern climate, librarians need to innovate. Innovation here is described as an act or mechanism by which new concepts or goods that were not recently created in libraries were implemented. At that time, we have seen the shift of these data storage systems and other electronic storage media to existing books. However the scientific study of such inventions in the form of library technologies can be seen as a comparatively recent phenomenon. It was only in the last decade that the scientists of libraries and information sciences had been taken seriously and this new but critical field of the use of knowledge was given due priority. In addition, Fowler (1998) projected that the use of libraries would be restricted within a few years. It is also important that technologies be implemented for little other than meaningful purposes. Thompson (1982) also stressed the use of university libraries and the use of libraries has been limited considerably by modern technologies. Researchers claimed in their hypotheses that most people did not communicate their outrage about library facilities' low quality, but then became a significant explanation for academic books' loss.

It is also necessary to illustrate creativity, since the more involved, multi-task and technologically knowledgeable younger generations of study books now represent than anybody else. In addition, some university libraries encourage the transition to take place as an institution, as they modernize and restructure themselves to address the current demands and competitive challenges in the higher education department. Their libraries also adapt to suit the universities' future needs, priorities and goals (O'Connor and Malhan, 2006)

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CONDITION MONITORING OF DIESEL GENERATOR SET BASED ON SOUND LEVEL MEASUREMENT

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ABSTRACT

The condition monitoring of a five year old 250 KVA diesel generator set (DGSet) was carried out by measuring the sound levels at predefined locations on four sides (front, back, left and right side) of the DGSet at no load when all the doors of the DGSet were closed and when all the doors were kept open. The measured sound levels were compared with the norms prescribed by regulating agencies. From the studies carried out it was observed that, the sound level on left side (engine end) was 87.7 dB when the DGSet enclosure doors were kept closed and the sound level was 99.6 dB (left side, engine end) when the enclosure doors were kept fully open. It was observed that these sound levels are more by 13 dB and 25 dB than the prescribed norms which is 75 dB (LAeq) at 1 meter for DGsets up to 1000 KVA by the Central Pollution Control Board (CPCB). Further, a systematic root cause analysis was carried out to know the exact problem. After thorough analysis it was found that, the DGSet was not undergone annual maintenance/services. The servicing of the DGSet as per the manufacturer's guidelines was done and sound levels were once again measured. After, proper servicing, the sound level on left side (engine end) was found to be 77.6 dB and 86.6 dB respectively when enclosure doors were closed and were kept open fully. Thus, through proper maintenance a reduction of 10.1 dB and 13 dB was attained (for the conditions mentioned above).

Key words- Acoustic emissions, Acoustic enclosure, Condition monitoring, DGSet, Sound level

I INTRODUCTION

The health of any machinery or equipment may be predicted by measuring either the vibration levels or sound levels using standard sensors and standard test procedures. Monitoring the health of any equipment continuously by using standard procedures will definitely help the equipment attendant/operator to monitor various critical parameters and take necessary preventive measures if any deviations beyond the permissible limits are observed in the parameters. This will help prevent the failure of parts and eventually the breakdown of the equipment. This practice will also cut down drastically the repair and servicing costs. The generator sets popularly called as DGsets are used in almost all establishments; small to big organizations as an alternate source of power in case of power cuts or power failures. In case of big business establishments and institutions, DGsets of capacity 1000 KVA are installed. If the generator sets are not properly maintained as per the maintenance schedule/guidelines, the sound level emitted from the source will be a nuisance to the people around and also, high decibels of sound level is detrimental to the environment including birds and insects. Regulating agencies prescribe the maximum sound level that is permitted for different type of equipment. According to the Central Pollution Control Board (CPCB), Ministry of Environment & Forests, Government of India has specified a maximum limit of 75 dB (LAeq) measured at a distance of one meter from the DGSet enclosure for the generators up to a 1000 KVA capacity. The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or meeting the ambient noise standards [1][2]. Hence, in order to keep the acoustic emissions within the limits prescribed by regulating boards / agencies it becomes necessary to make measurement of acoustic emissions from the DGsets during initial period of operation (after 2-3 years) so that the actual sound level can be noted and corrective measures

can be taken if values are above the specified limits. By carrying our condition monitoring checks, the life and performance of DGsets can be improved or enhanced. In this work, the condition monitoring of a five-year-old 250 KVA DGSet was taken up by using standard sensors and data acquisition systems. The measured sound levels are analyzed and fault diagnosis is carried out using standard procedure. Then, corrective measures are suggested to reduce the sound level.

II METHODOLOGY

A. DGSet and Measurement System.

The photograph of the Cummins Powerica 250 KVA DGset (with enclosure doors closed) which was chosen for testing / condition monitoring is shown in Fig. 1. The DGSet with its enclosure doors opened is shown in Fig. 2. Fig. 3 is the schematic of the DGSet showing the overall dimensions and sides of the same. The DGSet installed at the college campus of the authors is in operation since last five years.

For measuring the sound level, a general-purpose array microphone having a sensitivity of 50mV/Pa was used. A four-channel data acquisition system was used for the purpose of capturing and noting the sound levels. As per the standard guidelines, a 10 x 6 grid as shown in Fig. 4 (for right and left side of DGSet) was prepared and placed at a distance of one meter from enclosure surface of the DGSet. Similarly, a 6x6 grid as shown in Fig. 5 was prepared and placed on the front and back sides of the DGSet.



Fig 1. DGSet (with enclosure doors closed)

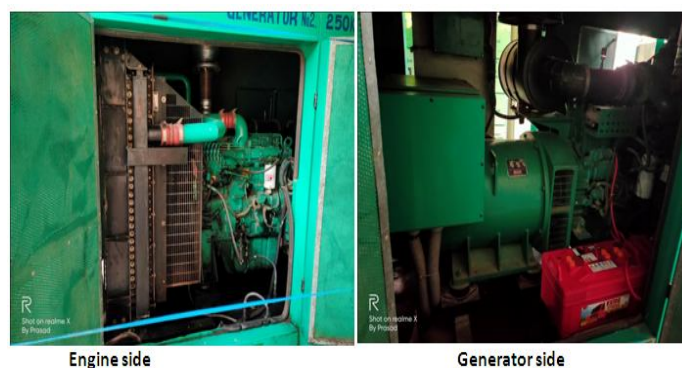


Fig 2. DGSet (with enclosure doors opened)

B. Sound Level Measurement.

In the first trial, all the doors of the enclosure of the DGSet were completely closed. Before running the DGSet, the ambient sound level was measured and it was found to be 51.4 dB. Then, the DGSet was started and run with no load. Using the sensor and data acquisition system, sound level was measured at every grid point (intersection of vertical and horizontal lines of Fig.4 and Fig.5) and on all the four sides of DGSet. The measured sound levels are shown in Table I. The Table I lists the averaged sound level values on engine end, generator end, and front and back of the DGSet. From the data of Table I it is observed that, maximum sound level of 87.7 dB was observed on the left side (engine end of DGSet). The reason for this is the presence of cooling fan. This level is approximately 13 dB more than the CPCB norms (75 dB). Also, a sound level of 87.4 dB is observed on the generator end of the DGSet.

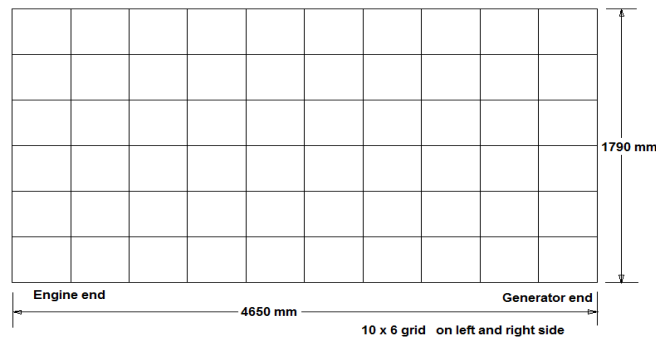
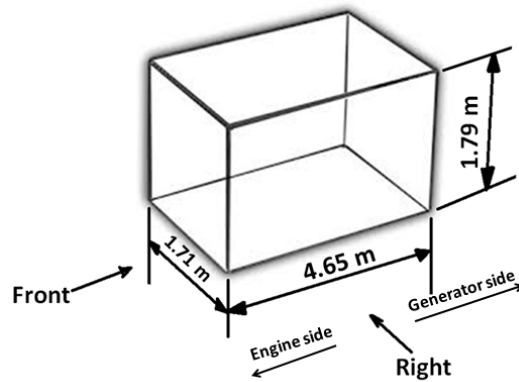


Fig 3. Schematic of DGSet

Fig 4. Grid on right and left side of DGSet

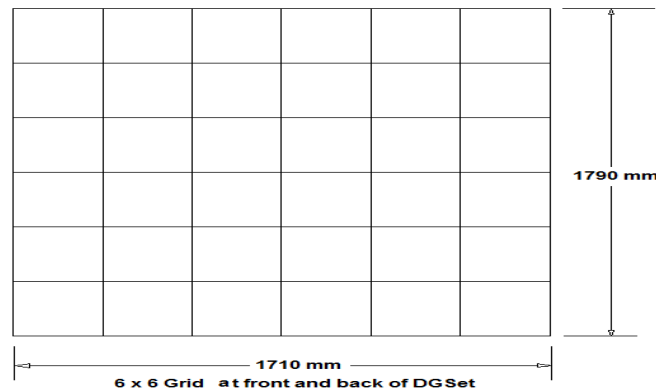


Fig 5. Grid on front and back of DGSet

In the second trial, all the doors of the DGSet enclosure were completely kept open and sound level measurements made while the DGSet was running (with no load). Table II shows the measured sound levels for the second trial. From Table II data it is observed that, a maximum sound level of 99.6 dB was again on the left (engine end) of DGSet. This level is approximately 25 dB more than the CPCB norms which is 75 dB. Thus, from the measured data it is observed that, maximum sound level is on the left side and engine end of DGSet. Also, a sound level of 99.4 dB is observed on the front side (engine end). From this data it is concluded that problem(s) exist on the engine end which are to be corrected.

TABLE I. SOUND LEVEL MEASUREMENT (ALL DOORS CLOSED)

Ambient sound level : 51.4 dB Load on generator: NIL		ALL DOORS CLOSED	
Front		87.7 dB	
Back		86.4 dB	
Left		Engine end	87.7 dB
		Generator end	87.4 dB
Right	Engine end	87.1 dB	
	Generator end	86.8 dB	
		13 dB > than norms	

(Note: All the sound levels are in LAeq)

TABLE II. SOUND LEVEL MEASUREMENT (ALL DOORS OPENED)

Ambient sound level : 51.4 dB Load on generator: NIL		ALL DOORS OPEN	
Front		99.4 dB	
Back		94.9 dB	
Left		Engine end	99.6 dB
		Generator end	98.9 dB
Right	Engine end	99.4 dB	
	Generator end	98.1 dB	
		25 dB > norms	

The overall picture of the sound levels on all sides of the DGSet, measured when all the doors are kept closed and are kept open is shown in Fig. 6. The numbers in the bracket in Fig. 6 indicate the sound levels when all the doors are kept open.

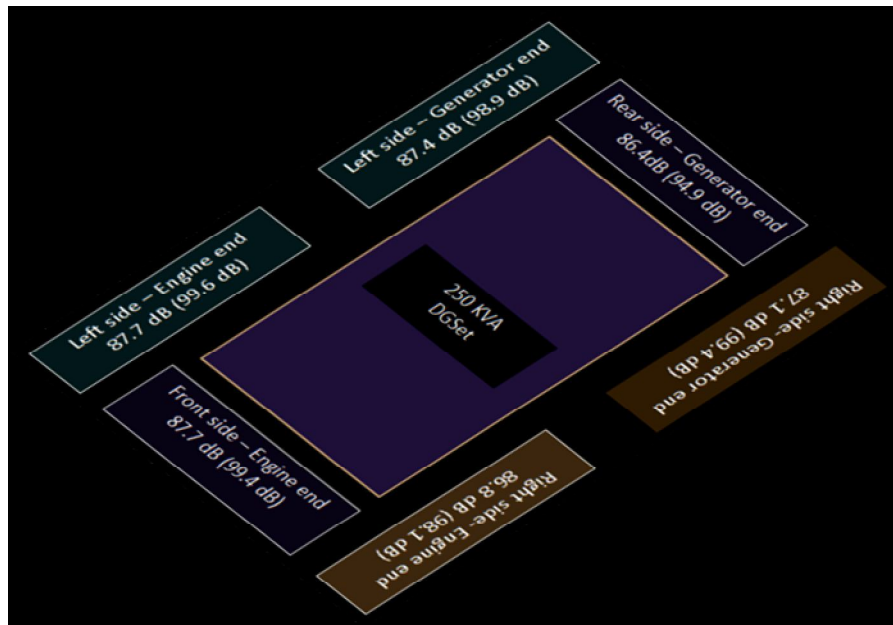


Fig 6. Sound levels on all sides of the DGSet

C. Fault Diagnosis and Corrective Measures.

After the measurement of sound levels and making a note of on which side of DGSet maximum sound is being emitted, a diagnostic check was carried out. The engine end of the DGSet was diagnosed for the following: pre cleaner for dirt/dust, oil lube pressure, lube oil level, coolant condition, loose parts and muffler clogs in the exhaust line. Then servicing of the engine was done i.e., replacing the pre cleaner element, changing the lube oil and coolant, draining contaminated water and sediments and finally tightening all the foundation bolts and all other nuts and screws.

After the servicing of the DGSet, again the DGSet was run and readings of sound level were taken on left and engine end by keeping the doors of the DGSet enclosure closed as well as by keeping them completely open. This time, when all the doors of enclosure were closed the maximum sound level was found to be 77.6 dB and when all the doors were kept open, the maximum sound level was 86.6 dB. Thus, a reduction of 10.1 dB was attained when the enclosure doors were closed and a reduction of 13 dB was attained when the enclosure doors were kept open. Thus, condition monitoring of the equipment (in general) is one of the preventive tool for checking the health of the equipment as it helps to take preventive measures in the event of problems identified by condition monitoring.

III CONCLUSIONS

Monitoring the health of the equipment (DGSet) help to: (i) Identify the faults in the equipment due to usage of the equipment, (ii) know the possible reasons for high sound (dB) levels and (iii) take corrective measures to fix up the problems. In the present study, it is observed that the measured sound level is high on the engine end compared to generator end. The measured sound level exceeded by 13 dB (all doors closed) and 25 dB (all doors opened) in comparison to the prescribed norms. After fault diagnosis and maintenance of the DGSet, a reduction of 10.1 dB (all doors closed) and 13 dB (all doors opened) was attained. Hence, condition monitoring by measuring the sound level will be one of the effective tool for monitoring the health of the equipment.

ACKNOWLEDGEMENT

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**NEURAL NETWORK (NN): AN EXPERT SYSTEM BASED TECHNIQUE FOR
FORECASTING THE SELL QUANTITY OF CHEMICAL FERTILIZER DATA**

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ABSTRACT

Since beginning, agriculture play an important role in Indian economy and it continues to be mainstay for live hood of rural people. However, the fertilizer is being considered an essential input to Indian agriculture in order to meet the food gain requirements of the growing population of the country. Forecasting the accurate prediction of demand and supply needs is an important concern. In the past, various statistical tools and techniques are used for this purpose. In present scenario, there are various approximations are made on fertilizer quantity as well as type of crop to be grown or planned. These tools and techniques are not adequate in present situation. In this way, expert system based neural network technique has adopted to forecast the supply needs of fertilizer. In this study, real dataset collected from MP state cooperative marketing federation LTD., Bhopal. Finally, experimental results had shown that proposed model had achieved more accurate performance i.e. in terms of error measures like MAD, MAPE, RMSE.

Keywords-Agriculture, Expert System, Neural Network, Fertilizer, MATLAB R2017a.

INTRODUCTION

In India, 70% population lives in rural areas and relies on agriculture. However, agriculture is being considered as main source of income and survival in India for majority population [1] [2]. Agriculture is mainly depends on various factors like or there are various parameters which affect the agriculture performance.

Measuring fertilizer quantity is an effective research problem and being considered a major task of agriculture production. Therefore, an excessive use fertilizer has an adverse effect on environment as well as impact crop growth performance [3].

For the couple of years, an expert system has proved its importance in agriculture sector. Expert system is domain-specific computerized programs that have capability to behave like human being [4]. However, Neural Network (NN) is one kind of expert system technique which has ability to map the input pattern into desired output pattern [4]. Moreover, the NN consisting of various layers in order to map the output. These layers are input layer, hidden layer and output layer. Each layer consisting of various neurons. Therefore, input passes from these input neurons to hidden neurons where some computation performed at this layer and finally passes to output layer where output is generated [5]. Fig. 1 states the structure of neural network.

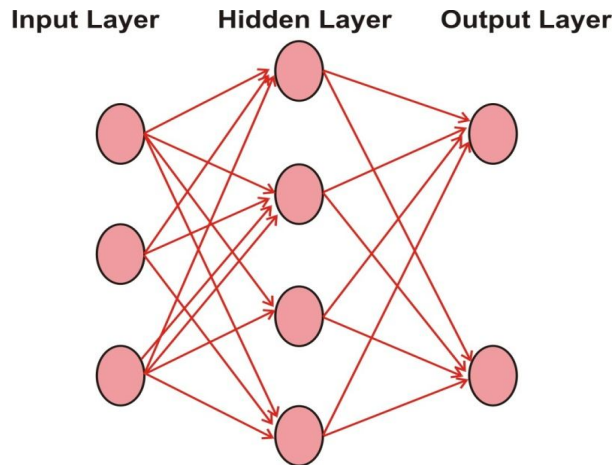


Fig.1. Structure of Neural Network [4] [5]

This study mainly focuses on the region wise/ state wise analysis of sell quantity of various fertilizer that affect the agriculture performance. The fertilizers components are considered for study purpose like urea, MOP, NPK, DAP etc. Rest of the paper is organized as follows. Section 2 discusses about the brief literature of some significant researchers; Section 3 describes the Data pre-processing process in brief; Section 4 describes proposed methodology in detail; Section 5 discusses about the experimental results generation and at last conclusion and future scopes of the study described by section 6.

LITERATURE REVIEW

This section presents a some significant researcher work in brief.

Baskar et al. (2013) [6] have presented the comparative study of various classification techniques like J48, JRip and Naive Bays for soil fertility prediction. Their experimental results stated that J48 had secured highest performance accuracy i.e. 93.48% than others.

Phand et al. (2016) [7] have designed a smart agriculture system based on decision tree model which help the farmer to cultivate the crops for high production and giving awareness about the organic farming and disadvantages of inorganic farming.

Majumdar et al. (2017) [8] have presented the comparative study of various data mining techniques like PAM, CLARA, DBSCAN and multiple linear regression in order to analyze agriculture data. In their study, they have found some optimum parameters for crop yield production.

Chaochong (2008) [9] have designed Generalized Regression Neural Network (GRNN) Model for prediction of agriculture crop production. Their experimental results had shown that proposed model had excellent performance over other approaches and better technique for prediction of gain production in rural areas. They have also added that proposed model is well suitable for multi-variate, multi-objective and non-linear forecasting.

Utkarsha (2014) [10] has suggested modified K-means clustering algorithm for crop yield prediction. However, the proposed model performance is compared with k-means clustering algorithm. Finally, they had reported that proposed model had achieved the maximum no. of high quality clusters and secured highest performance accuracy.

Pranjneshu (2008) [11] has designed Multilayer Feed- Forward Neural Network (MLFFNN) model for maize crop forecasting. In their study, total human labor, farm power, fertilizer

consumption, and pesticide consumption considered as input parameters and maize crop yield data as output parameter. The experimental results stated that proposed model outperformed than other existing approaches.

Manjula and Djodiltachoumg (2017) [12] have presented Association Rule Mining (ARM) technique for crop yield prediction for selected region in Tamilnadu district, India. Their experimental results stated that proposed model could be succeeded to generate more frequent rules and successfully predict the crop yield prediction.

Kommineni et al. (2018) [13] have survey the comparative study of various data mining techniques like Support Vector Machine (SVM), Naïve Bays (NB), J48, Artificial Neural Network (ANN) and K-means clustering etc. and their role in context of soil fertilizing and nutrient analysis.

Finally, based on literature survey this study is enhanced by using Back Propagation Neural Network (BPNN) technique for fertilizer data, Bhopal.

DATA PRE-PROCESSING

The MP state Cooperative Marketing Federation (MPSCMF) LTD, Bhopal, sell data of four years (2015-2019) is considered for study purpose [14]. The dataset contain various components like Urea, Muriate of Potash (MOP), Nitrogen Phosphate and Potash composition (NPK), Diammonium Phosphate (DAP) etc. Therefore, the dataset contains 1500 records and containing 13 attributes like Session, Year, RO amount, GDId, D id, SR, SPMQ, CGST and SGST tax, SGT, RO bags, SNB and SQ [14]. Table 1 shows description of attributes in abbreviated form.

Table I. Description of Attributes in Abbreviated Form [14]

S.No.	Attributes	Description
1	Session	Rabi, Kharif (1, 0}
2	Year	2015-2019
3	RO Amount	Release Order Amount
4	GD Id	Go-Down Id
5	DID	District Id
6	SR	Supply Rate
7	SPMQ	Supplier Multi Quantity
8	CGST	Central Goods and Services Tax
9	SGST	State Goods and Services Tax
10	SGT	Supply Grand Total
11	RO Bags	Release Order Bags
12	SQ	Sell Quantity
13	SNB	Sell No. of Bags

Data pre-processing is one of the essential step in data mining process which is used to identify irrelevant, noisy, redundant and missing values from dataset [15] [16]. In order to apply NN prediction, we have pre-processed data in an appropriate form. Table 2 shows MPSCMF data in pre-processed form. Table 2 is too much long so we are showing only some attributes.

Table II. MPSCMF Data in Pre-processed Form [14]

Session	Year	RO Amount	SQ	SGT	DID
1	2015-16	3464.25	0.3	3464.25	36
1	2015-16	5837.08	1	5837.08	36
1	2015-16	885	0.15	885	11
1	2015-16	19470.01	3.3	19470.01	11
Table II. Conti...					
1	2015-16	577.37	0.05	577.37	11
1	2015-16	9815.38	0.85	9815.38	11
1	2015-16	16166.5	1.4	16166.5	11
1	2015-16	60475.02	10.25	60475.02	11
1	2015-16	2886.88	0.25	2886.88	37
0	2015-16	163430.07	27.7	163430.07	11
0	2015-16	504155.21	85.45	504155.21	11
0	2015-16	312700.13	53	312700.13	4
0	2015-16	1203.3	0.2	1203.3	4
0	2015-16	2105.78	0.35	2105.78	4
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PROPOSED METHODOLOGY: BACK PROPAGATION FEED FORWARD NEURAL NETWORK (BPFNN)

Back propagation is one of the most prominent systematic methods of training feed-forward artificial neural networks. However It comes under the category of supervised learning algorithm that calculates an error at output layer and propagates in the “backwards” direction at hidden layers, so it is named as back propagation [5] [16] [17]. In this study, we have used BPFNN learning algorithm with thirteen input variables one hidden layer and one output variable. The following algorithm shows step by step procedure of back propagation learning algorithm [5] [18].

Step 1: Select No of attributes and prepare dataset for Data Pre-processing.

Step 2: Apply data pre-processing steps i.e. normalize data in [0, 1] format.

Step 3: Select input and output pattern for network i.e. no. of input variables and output variables.

Step 4: Set training parameters i.e. no of epochs, hidden layer neurons, training function sigmoid or tangent etc.

Step 5: Initialized weights and biases with random no. (between -1 to +1).

Step 6: Start network training and check training, validation and testing performance in terms of errors.

Step 7: If errors are acceptable

7.1: Stop network training and calculate network output.

7.2: Otherwise adjusts the weights and biases for input layer and hidden layer at backward direction (go to step 4) and again performed network training until errors are acceptable.

Step 8: Finally get the desired output and make prediction based on output.

In this study, we have considered 10 hidden neurons at hidden layer and binary sigmoid activation function (also called logistic function) is used for output computation which is shown by equation (1) [5] [19].

$$f(u) = \frac{1}{1+e^{-z}} \quad (1)$$

Where, e defines the steepness parameter.

EXPERIMENTAL RESULTS

In this study, a proposed prediction model uses back propagation method of neural network and fertilizer data set of MP state Cooperative Marketing Federation (MPSCMF) LTD, Bhopal, from Oct. 2015 to Oct. 2019 is used for training and testing purpose [14]. The artificial neural network model is used to predict sell quantity of fertilizer from session, year, RO amount, GDid, Did, SR, SPMQ, CGST tax, SGST tax, SGT, RO bags, SNB. The MATLAB R2017a tool is used for result generation purpose.

In MATLAB environment, firstly input and target data from workspace is selected where input data consists of 1506 samples (i.e. 12 elements) and output data consists of 1506 samples (i.e. 1 elements). After selecting data divided into training, validation and test dataset. Here we have used 70% of data for training (1054 samples), 15% for validation (226 samples) and 15% for testing (226 samples). However, 10 hidden neurons at hidden layer 1 are considered for study. The "TRAINLM" is used as training function i.e. Levenberg-Marquardt algorithm and "TRAINGD" is used as learning function while "MSE" is used as performance function. Following error measures like Root Mean Square Error (RMSE), Mean Absolute Percentage Error (MAPE) and Mean Absolute Deviation (MAD) are formulas are used to evaluate performance of proposed model which is shown by equation no. (2), (3) & (4) respectively.

$$RMSE = \sqrt{\frac{1}{m} \sum_{j=1}^m (P_j - \overline{Q_j})^2} \quad (2)$$

$$MAPE = \frac{1}{m} \sum_{j=1}^m \left| \frac{P_j - Q_j}{P_j} \right| \quad (3)$$

$$MAD = \frac{1}{m} \sum_{j=1}^m |P_j - Q_j| \quad (4)$$

Here $(P_j - \overline{Q_j})$ is difference between actual and predicted observation and n denotes no. of samples or observation. Fig. 2 states the training state of network.

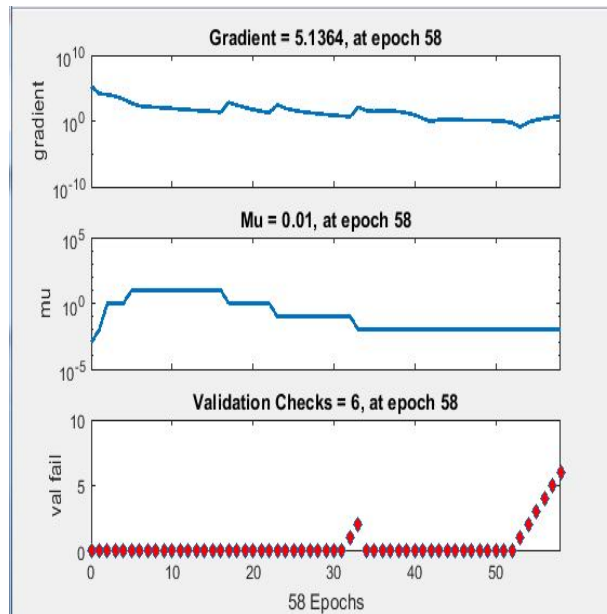


Fig. 2. Training of network

The Fig. 3 shows the performance measure in the form of mean squared error (MSE) against number of epochs. The numbers of epochs are set to 1000 and we got the best validation performance at epoch number 52 which is 0.043211.

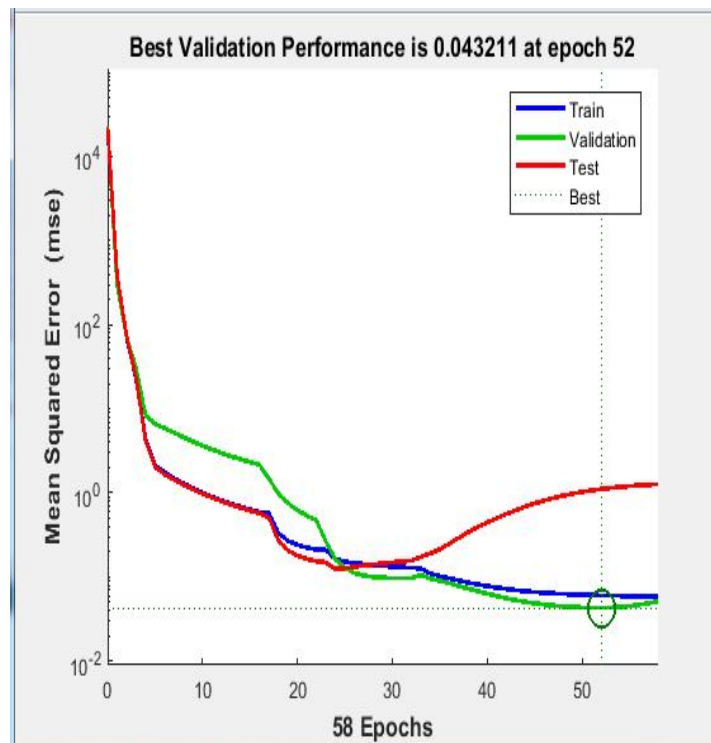


Fig. 3. Performance Plot of Network

Training, testing and validation performance based on the regression plot of the network is shown by Fig. 4.

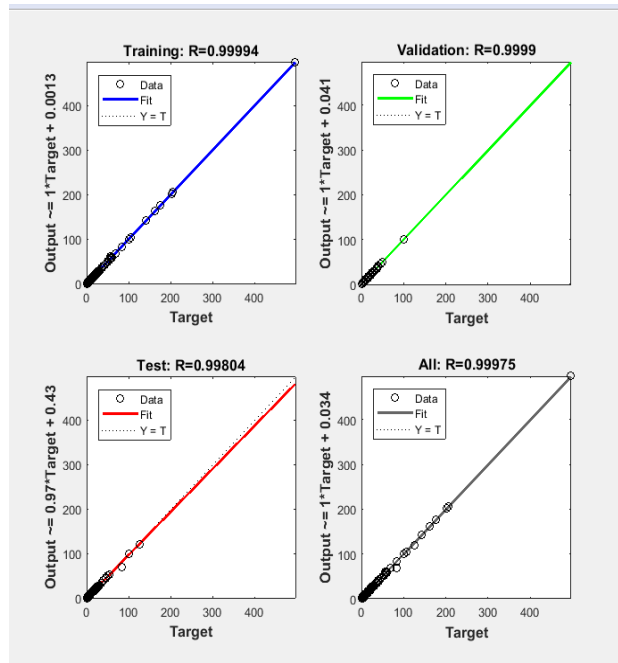


Fig. 4. Regression Plot of Network

Fig. 4 depicts the relationship between output and target responses. Therefore, the data is scattered clearly which is shown by blue, green, red and black lines. Moreover, the correlation coefficient value between output and target variables (sell quantity) and predicted sell quantity are very close to 1 which shows the superb relationship between variables. Fig. 5 shows error histogram between targets (actual outputs) and outputs (predicted outputs).

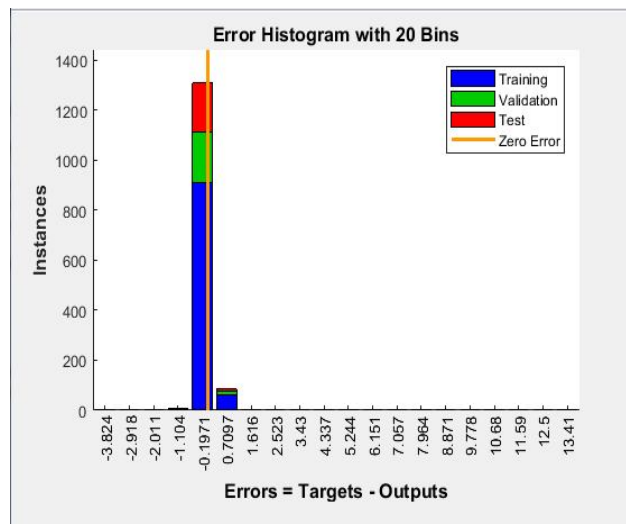


Fig. 5. Error Histogram between Actual Vs Predicted Output

Fig. 5 depicts that error plot against output and target values. However, the difference between the output and target values are positive, negative and zero which is shown by three different color combinations i.e. blue, red and green. The yellow color line shows the zero error that is

the best response between output and target values. Table III shows sample of performance comparasion based on sell quantity and predicted sell quantity. However, the Table III is too much long here we giving only samples.

Table III Sample of Performance Comparasion based on Sell Quantity (SQ) and Predicted Sell Quantity (PSQ)

S.No.	Actual Output (SQ)	Predicted Output (PSQ)	Error
1	10.25	10.20	0.0421
2	22.8	23.07	-0.27
3	1.25	1.189	0.060
4	2.75	2.68	0.069
5	2.8	2.729	0.0701
6	5.6	5.525	0.074
7	15.65	15.703	-0.053
8	16.55	16.624	-0.0749
9	1.25	1.189	0.0602
10	43	42.88	0.1111
11	0.2	0.331	-0.131
12	0.1	-0.056	0.156
13	0.2	0.0418	0.158
14	0.3	0.142	0.157
15	0.3	0.429	-0.1294
16	0.1	0.229	-0.129
17	0.4	0.303	0.0963
18	12	11.897	0.1028
19	1.1	1.212	-0.1128
20	0.3	0.431	-0.131
21	0.35	0.4705	-0.120
22	1.55	1.640	-0.090
23	1.6	1.613	-0.0135
24	5.85	5.789	0.0604
25	0.05	0.173	-0.1235

In Table III, out of 226 testing samples, network was able to correctly classified instances is 197. However, MAD, MAPE and RMSE recorded upto 9.78, 8.73 and 4.64 respectively which may be acceptable.

CONCLUSION AND FUTURE SCOPES

Agriculture is considered as one of the foremost area in developing country like India. In this study, Back Propagation Feed Forward Neural Network (BPFNN) is adopted for forecasting the sell of chemical fertilizer data. However, 12*10*1 network architecture is used to forecast the sell quantity of fertilizer. Therefore, proposed model gives more accurate performance i.e. in terms of error measures (below ten). However, this study will be helpful to bring new trends in agriculture field as well as help farmers to know sell quantity in advance i.e. how much fertilizer is required for agriculture so that they could be purchase required fertilizer on time in order to improve crop yield planning. The major drawback of study found that proposed model faces the problem of over fitting.

In future, more records will be considered and hybrid approach like neuro-fuzzy will be adopted to improve the performance.

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ASSESSMENT OF INHIBITIVE PROPERTIES OF ORGANIC CORROSION INHIBITOR FOR CARBON STEEL IN DIFFERENT H₂SO₄ ENVIRONMENTS**¹Pariajt Burhagohain and ²Gitalee Sharma**¹Department of Chemistry, Dibrugarh University, Dibrugarh, Assam²Department of Engineering Chemistry, DUIET, Dibrugarh University, Dibrugarh, Assam**ABSTRACT**

Corrosion in modern society has been considered as one of the most ubiquitous challenges. Among the various precautions, application of an organic inhibitor is very approachable one. In the paper, two organic corrosion inhibitor viz., two oxazolone derivatives have been studied with varying concentrations of 50 to 200 ppm for API 5L carbon steel transportation pipeline in H₂SO₄ condition. The compounds were synthesized at ease and in high yield. The corrosion studies were performed on carbon steel in three different H₂SO₄ concentrations, 1 N, 1.5N and 2N H₂SO₄ with the help of gravimetric weight loss coupon methods. Electrical resistance and pH measurements were also performed. The compound showed highest inhibition efficiency against test solution 1N H₂SO₄ at 200 ppm inhibitor concentration. The results established Oxazolone derivatives as promising corrosion inhibitors against H₂SO₄ acid corrosion.

Keywords: Carbon steel; corrosion; inhibitor; Oxazolone.

INTRODUCTION:

Corrosion is a destructive phenomenon caused by any aqueous environment to material in close contact leading to degradation of material characteristics [1]. In oil and gas industry, carbon steel is invariably used in transportation pipelines due to its advantageous and excellent mechanical properties over other materials [2]. Even though, presence of any acidic environment can cause corrosion of carbon steel. During transportation, the pipelines come in contact with harsh condition that can cause material damage. Various mitigation techniques are employed to prevent corrosion including cathodic and anodic protection, internal and external coatings, use of inhibitors, material design etc. among which use of inhibitor is the most popular worldwide. Both organic and inorganic compounds can be used for the purpose of inhibition of corrosion. Since organic compounds are supposed to be less toxic for application or synthesis, organic compounds are preferred over inorganic one. A review on literature have showed that organic compounds having heteroatoms like N, S or O with conjugated multiple bond in the system can efficiently decrease corrosion rates of carbon steel. They are supposed to form a preventive layer on the surface of the material by adsorption thereby acting as a barrier between the corrosive medium and the material which can thus reduce corrosion. Previous researches reports the use of organic compounds like amines, amides, aminopyrimidine, imidazolins, thiazolins, aromatic hydrazide etc. derivatives against acid corrosion of carbon steel [9-11]. Derivatives of benzimidazole, benzothiazole, pyridine and pyrrole was also studied as effective corrosion inhibitor [12-18]. Nanomaterials has also played its key role as efficient corrosion inhibitor [19].

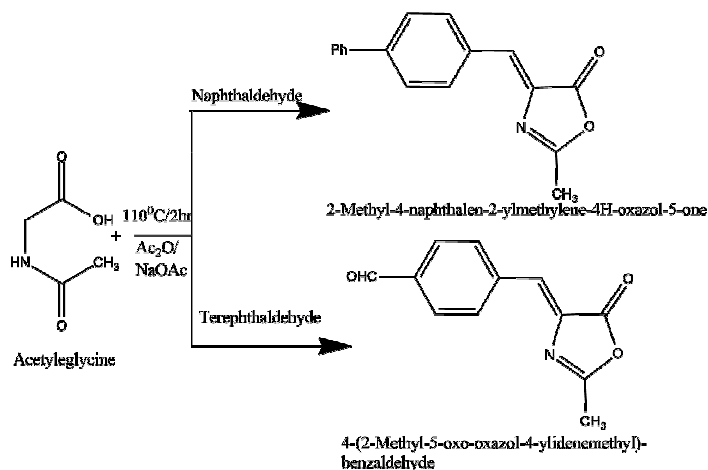
Oxazolones are class of organic compounds having N and O heteroatoms with conjugated double bonds. They exhibit wide range of therapeutic actions that includes anticancer, antimicrobial, antifungal, tyrosinase inhibitory etc. [20]. Consequently, Oxazolone derivatives are biocompatible and eco-friendly. In this paper, the corrosion inhibitive properties of two oxazolone derivatives namely 2-Methyl-4-naphthalen-2-ylmethylene-4H-oxazol-5-one (I) and 4-(2-Methyl-5-oxo-oxazol-4-ylidenemethyl)-benzaldehyde (II) and has been studied for carbon steel against different H₂SO₄ acidic environment. The corrosion inhibition properties of these

derivatives were studied in three different acidic test solutions, viz. 1N, 1.5N and 2N H₂SO₄ with the help of gravimetric weight loss measurements.

2. MATERIALS AND METHODS

2.1. Preparation of Inhibitors

The two oxazolone derivatives were synthesized using previously reported procedure by Sharma et.al, with 90-95% yield [21,22] as depicted in **Scheme 1**.



(Inhibitor I): 2-Methyl-4-naphthalen-2-ylmethylene-4H-oxazol-5-one;

(Inhibitor II): 4-(2-Methyl-5-oxo-oxazol-4-ylidene)methyl-benzaldehyde

Scheme 1

Four different inhibitor concentration, viz. 50, 100, 150 and 200 ppm were prepared in ethyl alcohol to study its inhibitive properties for steel.

2.2. Sample Preparation

Carbon steel of composition: C= 0.28, Mn = 1.4, P= 0.3, S=0.3, V-Nb = Ti ≤ 15%, have been chosen for weight loss measurements. steel coupons of dimension 4.4cm x 4.2 cm x 0.7 cm having exposed surface area of 19.8cm² were used for study. The steel coupons were polished with different grades of emery papers, washed with double distilled water, degreased with acetone and then dried at 60-70⁰C prior to the start of experiment. The test solutions of HCl and H₂SO₄ were prepared using double distilled water. Analytical grades of chemicals from Merck were used to perform the experiments.

2.3. Gravimetric Method

In the Gravimetric weight loss measurement, steel coupons of dimension 4.4cm x 4.2 cm x 0.7 cm and exposed surface area, 18.48 cm² was first immersed in 100 mL 1N, 2N and 2.5N H₂SO₄ in uninhibited condition at room temperature. They were then allowed to stand for a specific time interval of 48 hours. The samples were then coated with different concentration of inhibitor and similar procedure is followed to the test solution. Percentage Inhibition efficiencies (%IE) for different inhibitor concentration was then calculated from the difference in weight loss before and after addition of inhibitor to the steel specimens using the formula given below [3].

$$IE = \left[\frac{(W - W_i)}{W} \right] \times 100$$

Where, W = average weight loss in uninhibited condition, and

W_i = average weight loss in inhibited condition

The corrosion rate (CR) is also calculated from the weight loss measurements using the formula given below [3].

$$CR = (K * \Delta W) / (A * t * d)$$

Where, K = constant (8.76×10^4) that allows to represent CR in mm/yr

A = surface of metal sample (in cm^2)

t = immersion time (hours)

d = density of the metal (g/cm^3)

ΔW = average weight loss

2.4. Electrical Resistance Measurements

Ohm's law suggests that resistance is inversely proportional to current. For a material with higher electrical resistance, cross-sectional area decreases and which in turn results in lower corrosion current, indicating lower corrosion rate. To establish the fact, electrical resistances of steel samples in different acid environment both inhibited and uninhibited, electrical resistance measurements were conducted using Multimeter DT830D UNITY model.

2.5. pH measurements

The test solutions (1.0N, 1.5N and 2N H_2SO_4) were subjected to pH measurements using pH meter before and after immersion of the steel samples into the test solutions in both inhibited and uninhibited condition and with different inhibitor concentration.

3. RESULTS AND DISCUSSION

3.1. Weight –loss measurements

Weight loss for the steel coupons in absence and presence of synthesized inhibitor in the concentration range 50-200 ppm was calculated in 1.0N, 1.5N and 2N H_2SO_4 for an immersion time of 48h. All the measurements were performed in triplicate and the average weight loss values were taken for calculation of corrosion rates and inhibition efficiencies. The results obtained are tabulated in table 1

Table 1: Corrosion Properties of the Samples with Uninhibited and inhibited condition

Sample	Test Solution concentration	IC (in ppm)	Wt loss (in g)	CR ($\text{mg cm}^{-2} \text{h}^{-1}$)	% IE
Steel Coupon with Inhibitor I	1 N H_2SO_4	0	2.26	18.51	0
		50	0.88	8.21	61.06
		100	0.54	5.04	76.10
		150	0.31	2.13	86.28
		200	0.21	0.94	90.70
	1.5 N H_2SO_4	0	4.62	26.51	0
		50	3.01	12.32	34.84
		100	1.99	8.14	56.92
		150	1.65	6.34	64.28
		200	1.01	3.11	78.14
2N H_2SO_4	0	6.99	31.12	0	
	50	5.12	15.80	26.75	

		100	3.97	10.11	43.20
		150	3.01	7.13	56.93
		200	2.76	5.21	60.51
Steel Coupon with Inhibitor II	1 N H ₂ SO ₄	0	2.26	18.51	0
		50	0.94	8.41	48.90
		100	1.23	4.65	61.74
		150	1.01	3.12	65.01
		200	0.89	2.06	69.80
	1.5N H ₂ SO ₄	0	4.62	26.51	0
		50	3.34	13.97	27.46
		100	2.95	8.80	36.14
		150	2.13	5.66	53.89
		200	1.78	4.56	65.52
	2NH ₂ SO ₄	0	6.99	31.12	0
		50	5.78	17.01	17.31
		100	4.11	11.31	41.20
		150	3.23	9.23	53.79
		200	2.41	6.70	61.9

*IC=Inhibitor Concentration, CR=Corrosion Rate, IE=Inhibition Efficiency

The results from Table 1 showed corrosion rates were higher in case of 1N H₂SO₄ than in case of 1N HCl. Further addition of inhibitors decreased the corrosion rate. The % Inhibition efficiency seems to be higher in case of compound I compared to that of compound II implying greater adsorption of compound I on steel surface than compound II. For both the compound % IE increased with increase in inhibitor concentration. The increased adsorption is due to the presence of heteroatoms O and N in the oxazolone molecules, which forms coordinate bonds with the metal surface. Conjugation in the oxazolones is another reason for their increased % inhibition efficiencies. The change in corrosion rate and % inhibition efficiency with change in concentration can be explained more precisely in the figure 1 shown below.

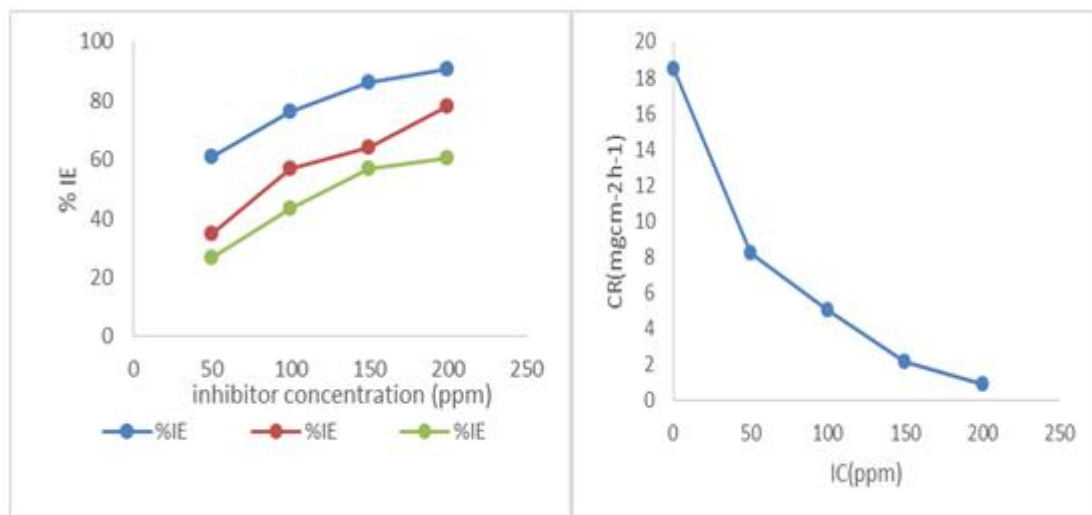


Fig.1(a)

(b)

Fig. 1: (a). variation of % inhibition efficiencies with inhibitor concentration for Inhibitor I and Inhibitor II (b) Variation of corrosion rate with inhibitor concentration for Inhibitor I

Figure 1 (a) shows that the inhibition efficiency increases with increase in concentration of inhibitor for Inhibitor I. Similar will be the case with Inhibitor II. However, inhibition efficiency decreases with increase in H_2SO_4 concentration, being lowest for 2N H_2SO_4 . This shows that both the inhibitors I and II work better in lower H_2SO_4 concentration. Fig.1(b) establishes the decrease in corrosion rate after application of inhibitor for inhibitor I. corrosion rate further decreases with increase in inhibitor concentration.

3.2. Electrical Resistance Measurements

The results obtained from Electrical resistance measurements are tabulated in table2.

Table 2: Electrical Resistance Measurements for Steel Sample Coated with Inhibitor I

Test solution concentration	Inhibitor concentration (ppm)	Resistance in ohm
1 N	0	1.9
	50	3.4
	100	4.0
	150	5.1
	200	7.99
1.5 N	0	1.5
	50	3.0
	100	5.8
	150	7.7
	200	8.0
2 N	0	1.1
	50	2.1
	100	2.9
	150	3.3
	200	5.0

The results showed that with increase in inhibitor concentration from 0 to 200 ppm, the electrical resistances increases, which is inversely related cross-sectional area of the metal. The cross-sectional-area again is directly related to corrosion rate. Thus we can say that corrosion rate decreased with increase in inhibitor concentration. The increase in resistance is higher in case of 1N H_2SO_4 . The variation of electrical resistance with inhibitor concentration is shown in fig.2

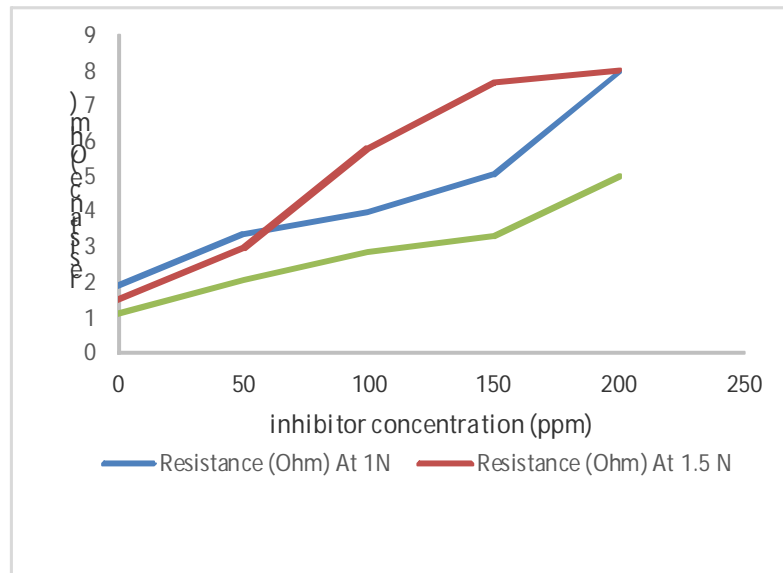


Fig.2. Variation of electrical resistance with inhibitor concentration for inhibitor I

3.3. pH Measurements

The results obtained by measurements of pH for the test solutions are tabulated in table 3 below

Table 4: pH Measurement of Test Solution Before and After Addition of Coated Steel Samples for Inhibitor I.

Test solution concentration	Inhibitor concentration (ppm)	pH before immersion of sample	pH after immersion of sample
1 N	0	1.4	1.9
	50	1.4	2.1
	100	1.4	2.5
	150	1.4	2.2
	200	1.4	2.3
1.5 N	0	0.8	1.3
	50	0.8	1.5
	100	0.8	2.5
	150	0.8	2.9
	200	0.8	2.5
2 N	0	0.5	1.2
	50	0.5	1.5
	100	0.5	1.1
	150	0.5	2.2
	200	0.5	2.0

The pH measurement results showed that pH increases considerably with increase in the inhibitor concentration after immersion of the steel sample coated with inhibitor I. Before coating the pH was constant for the test solutions. The variation in pH of the inhibitor coated steel samples was due to the uneven dissolution of the inhibitor compound in the H_2SO_4

4. CONCLUSION

Organic inhibitors are efficient corrosion mitigators in oil and gas industry. In this paper, we report two oxazolone derivatives, synthesized by previously reported procedures and their inhibiting properties for carbon steel in varying acid corrosion was studied. 1N H₂SO₄ concentration showed significant result in terms of % corrosion efficiency for both the inhibitors I and II. Compound I was found to be more effective than compound II with an % IE of 90.70% with 200ppm inhibitor concentration. The results of Gravimetric analysis and Electrical resistance corrosion monitoring methods established the decreased corrosion rate on application of the inhibitors on the steel samples. pH studies of the test solution with and without inhibitor coated steel revealed slight dissolution of the inhibitor in test solutions. As a concluding remark, it can be said that oxazolone and its derivatives are promising compounds to be act as corrosion inhibitors in oil and gas industry.

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**PROPOSED FEATURE-BASED ENHANCEMENT METHOD TO REDUCE BLUR
FACE FRONTALIZATION FOR BETTER DETECTION IN UNCONSTRAINED
IMAGES**

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ABSTRACT

Face plays a significant part in social interaction to express a person's personality and feelings. It has become the most widely used and accepted biometric method because of its uniqueness and universality. There is an important role for automatic face systems especially in facial expression recognition, face recognition, human-computer interaction, and head-pose estimation. Face detection is a computer technology that determines the size and location of a human face in a digital image and it being a standout amongst topics in computer vision literature. This paper proposed a feature-based enhancement method to reduce blur face frontalization for better detection in unconstrained images.

Keyword: Viola-Jones, Haar features, face detection, face recognition, and face analysis

INTRODUCTION

Numerous studies focus on face detection such as X. Su et. al (2018) proposed a new face detection scheme using deep learning which is improve the state-of-art Faster RCNN framework and Q. Tao et al (2016) proposed a locality-sensitive support vector machine using kernel combination (LS-KC-SVM) algorithm because of the need for identity verification in the digital world, rising public concern for security, face analysis and modeling techniques in multimedia data management and computer entertainment. In general, face detection is considered as a special type of object detection task in computer vision that an important part of face-related applications such as face clustering, face recognition, and face verification. Face detection has two methods namely the image-based method and the feature-based method. Compared to the image-based method, the feature-based method is of higher quality because of its scale independence, quick execution time, and rotation independence. Face detection for unconstrained images regularly round issues like pose variation, noise, lighting conditions, background vibration, occlusion, and facial expression.

This study will focus on noise challenges and pose variation of unconstrained images and cover a few techniques for Viola-Jones detections such as a combination of V-J fac detection with rotation enhancements. 50 Carnegie Mellon University (CMU) dataset with 12 rotations will be used for testing to produce a permutation of 600 test pattern images and 600 test pattern image from Face Detection Data Set and Benchmark (FDDB). The result from these measurements will indicate that the proposed feature-based face detection technique, which focuses on the V-J face detection method, in unconstrained images can detect rotated faces with high detection accuracy which in turn reduces false detection.

Face recognition or face detection is the most popular nowadays because of demand in security, modern systems, video surveillance, and access control. The speed of facial detection and recognition algorithm is a factor that determines the possibility of using it for solving some specific problems. According to M. Alyushin et al (2018), the main limitation in the face detection process is the rotation of the head or image and the brightness of the face area. The most important for optimizing the error is the angle of rotation of the head is identified. The facial feature which includes nose, mouth, and eye of a person differs greatly from ordinary objects, thus making face detecting become a complex process. However, the feature-based face detection has some limitations in the detection of a face in unconstrained images. This research will focus on the following problems:

1. Feature-based face detection method has limitations at certain rotation angles of the pose on the front face in unconstrained images.
2. Feature-based face detection method has limitations because of false detection due to noise and abnormalities in unconstrained images.

This research will use an image file in JPG or PGM extensions. Used 2D-image that only cover frontal image which is can be in color or grayscale. Used CMU datasets with 12 rotations on each image and various permutations resulted in 600 test pattern images from FDDB.

2.0 LITERATURE REVIEW

These research studies discuss the literature review which is related to the previous work and other information that is related to this project. The main idea of this chapter is to study and analyze the advantage and limitations of the HAAR-like feature, Viola-Jones method, and a few other methods that have been used for face detection. Also, research into face detection for unconstrained images focused on rotation invariant illumination, noise, and blur as well as speed detection. There are many advantages from the combination method and that method can be improving face detection in unconstrained images. Table 1 below shows the summary of the study and analysis from the previous work.

M. Rezaei et. al (2014) have proposed new face detection to control the problem of noise images and illumination artifacts. Global HAAR-like features and dynamic global HAAR-like features had been proposed. These features support faster calculation and provide a new level of global information from the query patches. Besides, R. Paulsen et al (2015) proposed the comparison of compression on face detection using JPEG, JPEG2000, and JPEG XR and HAAR-like features to explore the impact to the image such as the detected area and compressed image gain the average coverage, false negative and false positive area. The objective of this study to investigate the robustness of face detection to the three types of compression to measured image quality. The conclusion from the comparison of compression image shows the JPEG2000 and JPEG XR get the good result meanwhile JPEG performance is worse.

In addition, T. Soon et al (2014) proposed the enhancement Viola-Jones face detection for inappropriate images and scale-invariant feature transform (SIFT) for the image duplication method. The advantage of the enhancement method is the accuracy of rotated V-J face detection better than the original V-J method and the improvement in detect inappropriate images and near duplication images. The limitation or the further study that can improve is the enhancement for illumination invariant image and occluded face detection. Also, P. Irgens et al (2017) present field-programmable gate arrays (FPGA) based implementation of the Viola-Jones faces detection algorithm that studies the achievable performance with a low-end FPGA chip-based implementation. Other than that, the enhancement approach for face detection and identifying

human body proportionality using the v-j algorithm proposed by S. Patil et al (2018). That method achieved high accuracy in detecting the human body. For future study, need to discover a front face with better light circumstances for better face detection.

Furthermore, M. Alyushin et al (2018) proposed an integrated form for image frame data representation in the Viola-Jones algorithm. These forms are oriented to the fast processing of information in the presence of a significant rotation of the head. One of the limitations is an error in determining the brightness indicator for the informative area of the face depend on the rotation of the head. Then, T. Soon et. al (2018) proposed the Viola-Jones face detection technique in unconstrained images with invariant rotation. The advantage of this method for unconstrained images, the V-J face detection is a considerably higher accuracy than the previous method, that demonstrated by the number of unconstrained images. The further works that can be improved are the combination of interpolation and rotated face to enhance the rotation accuracy.

Moreover, M. Prasad et. al (2018) proposed an online learning framework that is used to detect the various type of objects with a small initial training set. The method that has been used is a cascade boosting-based classifier with HAAR-like features. Their approach can adapt to real-world scenarios because of the comparable precision rate and F-measure. The limitation of their approach does not perform well in recall measure due to its less positive update. Then, I. Dagher et. al (2019) proposed the enhancement recognition capabilities of the facial component-based technique using better Viola-Jones component detection and weighting facial components. The advantage that enhances the recognition capability of the facial component-based techniques is improved recognition accuracy by combining multiple classifications using majority voting and excellent accuracy in detecting facial components during all pose-changing circumstances.

Further, S. Elias et al (2019) proposed an automatic save student's attendance system into the database using the Viola-Jones algorithm and local binary pattern (LBP) method. That system will ensure the attendance process will be faster and more accurate. The limitation of that system makes the process of face detection and recognition harder which is background movement or dynamic background, enough lighting, and facial changes. Then, R. Shukla et al (2019) proposed facial emotional recognition using HAAR cascade classifier and Deep Neural Network to predict the emotions of the face. This combination method gives better accuracy compared to another method. The further study that can be improved in this case study classifies the emotions on the images which contain faces other than the frontal perspective and can be integrated with the speech of the user to get an accurate result.

Other than that, G. Guo et al (2019) proposed a fast face detection method based on discriminative complete features (DCF) extracted by an elaborately designed deep CNN to obtain the feature based on the complete feature maps. This method more efficient compares to the state-of-the-art face detection method using CNN because it can efficiently detect small-size faces by using the sliding window strategy on DCFs. According Y. Tsai et al (2018) proposed a novel, robust color face detection algorithm which is robust to face rotation and accurately detects a face in both in-plan and out-of-plane cases. This algorithm does not require the additional training images with different angles of view and only needs the training data from the frontal face case and one frontal face detector.

Furthermore, Q. Tao et al (2016) proposed a locality-sensitive support vector machine using kernel combination (LS-KC-SVM) algorithm to improve the generalization ability by measure the details and rough similarity. This method more robust than the global kernel and obtain robust local facial features. Also, X. Sun et al (2018) proposed a new face detection scheme

using deep learning which improves the state-of-art Faster RCNN framework and Faster RCNN algorithm. The improvement for further study is improving the scalability and efficiency of the proposed method for real-time face detection.

Besides, T. Zhang et al (2018) proposed a fast and robust face occlusion detection algorithm for ATM surveillance to be efficient and effective to handle arbitrarily occluded faces. They also develop a fast and robust head tracking algorithm. Their experiment result shows 98.64% accuracy on face detection and 98.56% accuracy on face occlusion detection on real-world data. Moreover, J. Jin et al (2015) proposed a face detection and location method based on Feature Binding (FB) that can improve the accuracy rate and good detection effect on obscured faces. Further study on this FB is can be robust when faces rotate substantially and can detect face correctly when more than one user in the image.

Then, Z. Zakaria et al (2018) proposed a novel algorithm, hierarchical skin-AdaBoost-neural network (H-SKANN) which is a combination of the beauty of each skin color, AdaBoost, and Network in a hierarchical manner to deal with the problem for example illumination changes, multiple face size, connected face, face appearance and accessories in the multi-face detection process. Performance of H-SKANN is better compare to other approaches for IM, Georgia, Talking-PIE, and FERET database but not in the AR database. In addition, S. Chaudhry et al (2017) proposed a visual assistive system that features mobile face detection and recognition in an unconstrained environment using a convolution neural network (CNN). This system to detect effectively individual who approaches facing towards the person equipped with the system. The result of performance is better when in daylight and artificial lighting compare to moonlight conditions which are needed to reduce false positives in order to develop a robust system.

Finally, A. Soula et al (2020) proposed a novel incremental Nonparametric Support Vector Machine model (iKN-SVM) that improves the decision boundary of incremental SVM and limited its sensitivity to the spread of data. The function of kernel SVM-based is to handle dynamic and large data effectively and to reduce the computation time. The iKN-SVM has outperformed the batch and incremental classifiers on almost all artificial, face images dataset and real-world

Table 1 (a). Analysis Face Detection Method

Reference	Method	Advantage	Limitation
M. Rezaei, H. Ziaei Nafchi, S. Morales (2014)	Global HAAR-like features & Dynamic Global HAAR-like features	Support faster calculation and provides a new level of global information query patches	
E. Tyge, J. Pallisgaard, M. Lillethorup et al (2015)	Compress Image using HAAR-like feature	JPEG2000 and JPEG XR compression provide quite equal and good result compare to JPEG	Performance JPEG based on compression standard is worse
T. Soon, A. Basari, B. Hussin (2014)	Enhance V-J face detection for scale-invariant feature transform (SIFT) and inappropriate image for image duplicated method	The performance speed and accuracy of rotation better than the original V-J method	Limitation of rotation face detection
P. Irgens, C. Bader, T. Le et al. (2017)	Viola-Jones algorithm on a low-end FPGA	Run multiple images on FPGA from the pyramid of scale image	RAM not enough for larger image

	chip		size
S. Patil, N. Ramakrishnaiah, S. Laxman Kumar (2018)	Viola-Jones	High accuracy in detecting the human-object moment	The motivation for discovering a front face with better light circumstances
M. Alyushin, V. Alyushin, L. Kolobas (2018)	Integrated forms for image frame data representation in Viola-Jones Algorithm	Increase the speed and more efficiency of the facial recognition algorithm	Error in determining the brightness indicator for the informative area of the face depends on the rotation of the head.
T. Soon, A. Basari, N. Ibrahim et al. (2018)	Detection of unconstrained images and invariant rotation using Viola-Jones detection	For unconstrained images, the V-J face detection is a considerably higher accuracy than the previous method, that demonstrated by the number of unconstrained images.	
M. Prasad, D. Zheng, D. Mery (2018)	Cascade boosting-based classifier with HAAR-like features	Detect various types of object with a small initial training set	Does not perform well in recall measures due to its less positive updates
I.Dagher, H. Al-Bazzaz (2019)	Enhance Viola-Jones face component detection and cropping component, a histogram of oriented gradients (HOG)	Enhance the recognition capability of the facial component-based techniques. Improved recognition accuracy by combining multiple classifications using majority voting. Excellent accuracy in detecting facial components during all pose-changing circumstances	

Table 1 (b). Analysis Face Detection Method

Reference	Method	Advantage	Limitation
S. Chaudhry, R. Chandra (2017)	convolution neural network (CNN)	Performance in daylight and artificial lighting conditional better	For the moonlight conditional need to reduce false positive in order to develop a robust system
S. Elias, S. Hatim, N. Hassan et al. (2019)	Local Binary Pattern (LBP), Viola-Jones algorithm	The process take attendance by recognized face faster, accurate and more reliable	Illumination of the environment, the movement of background, and enough light
R. Shukla, L. Agilandeewari, M. Prabhkumar (2019)	Haar Cascade classifier	The lower proportion of data, the output gives better accuracy	

G.Guo, H.Wang, Y.Yan et al. (2019)	DCF-based face detection	Effectively detect small-size faces by using the sliding window strategy on DCFs	
Y. Tsai, Y. Lee, J. Ding et al (2018)	The robust color face detection algorithm	Accurate detect faces in both in-plane and out-of-plane cases. Does not require additional training image with different angles of view	
Q. Tao, S. Zhan, X. Li et al (2016)	a locality-sensitive support vector machine using kernel combination (LS-KC-SVM) algorithm	More robust than global kernel and obtain the robust local facial features	
X. Sun, P. Wu, S. Hoi (2018)	Faster RCNN framework deep learning	The scheme obtain state-of-the-art face detection performance	
T. Zhang, J.Li, W. Jia et al (2018)	Fast and robust head tracking algorithm combines with AdaBoost algorithm	98.64% accuracy on face detection and 98.56% accuracy on face occlusion detection on real-world data.	
J. Jin, B. Xu, X. Liu et al (2015)	Feature Binding used in HAAR feature and ASM feature	can improve the accuracy rate and good detection effect on obscured faces	Cannot detect correctly when more than one user in the image and not robust when faces rotate substantially
Z. Zakaria, S. Suandi, J. Mohamad-Saleh (2018)	H-SKANN method	Perform well in IM, Georgia, Talking-PIE, and FERET database	Not perform well in the AR database
A.Soula, K.Tbarki, R. Ksantini et al (2020)	iKN-SVM method	Average training time on real data set lower than average training times needed for the batch classifiers.	

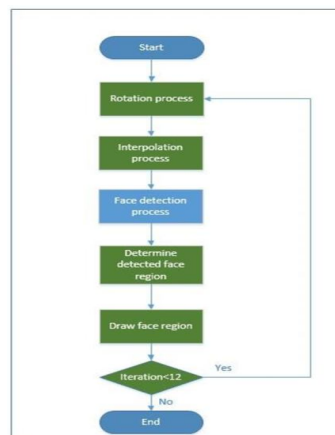
3.0 RESEARCH METHODOLOGY

The methodology for this study started with pre-processing that enhance the in-plane rotation image file to ensure that the faces at different angles could be detected. The next step is the Bicubic interpolation process to correct the in-plane rotation image file to enhance the blurred image. Feature extraction from Viola-Jones face detection is able to detect the face in

unconstrained images but still caused false detection. In that case, to determine whether the object is in the face region, classification is required. This research proposes the ratio Scale-Invariant Feature Transform (SIFT) to minimize detection. Finally, the V-J face detection will be evaluated to establish a data set to prove that it has more accurate in the detection of unconstrained images.

Figure 1 shows the research design of V-J face detection for the unconstrained image which has two main parts. The first part involves the enhanced rotation V-J face detection and the second part involved the proposed ratio SIFT to minimize false positives. The enhanced rotation V-J face detection will consist of 3 processes. The first process is the rotation process, then the interpolation process and the last is the face detection process. Besides, the proposed ratio SIFT consists of two processes. The first is to determine the face region and then draw face regions.

Figure 1 Research Design of V-J Face Detection for Unconstrained Images



4.0 EXPECTED OUTCOMES

The expected contributions of this research are:

An enhancement method to detect a face frontalization in unconstrained images

New method to reduce the blurred image in order to detect the face in the images.

A method to support police and security guard in crime investigation, automatically capture the human face for attendance and medical image purposes

5.0 CONCLUSION

This research mostly covers V-J face detection for unconstrained images and another method to reduce blur and to increase the efficiency of the face detection procedure which is to increase the reliability of the functioning of the modern system of personal identification, access control, security, and video surveillance. Hopefully, this research will satisfy the growing needs of technological advancement in the face detection process since there have many flaws that need to be covered.

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**STUDIES ON FISH PROTEIN CONCENTRATE (FPC) OF INDIAN MAJOR CARPS
BY VARIOUS SOLVENT SYSTEMS**

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ABSTRACT

Fish protein concentrate was made from the Indian major carps, Catla (Catla catla), Rohu (Labeo rohita) and Mrigal (Cirrhinus mrigala) by various solvent extraction systems. The aim of this research is to evaluate the sustainability of fish protein concentrate produced from Indian major carps and the highest content was determined in the order of Cirrhinus mrigala > Catla catla > Labeo rohita. According to chemical analysis performed, in Cirrhinus mrigala, the protein, fat, ash and moisture contents were found 95.11%, 0.05%, 3.97% and 5.68% respectively. The amino acid composition for human nutrition was complete, approaching the model chart also determined. The nutritional quality of the trial- fish protein concentrate was near to that of cheese, egg and milk, and exceeded that of soybean and wheat. Hence the present work confirms that the quality of fish protein concentrate was better than that of fish protein concentrate-A as defined by FAO.

Keywords: Fish Protein Concentrate, Indian Major Carps, Sustainability, Vaijapur Tehsil

INTRODUCTION

Fish Protein Concentrate (FPC) is a healthy, sustainable and high nutritive product that produced from fish and protein and other nutrients are more concentrated than in the fresh fish. For many years research on the production of FPC has been conducted in various countries and a number of factories have been established. FPC can be made by physical, chemical and microbiological methods. FPC is a healthy, sustainable and high nutritive product that is sanitized produced from fishes in which, protein and other nutrients are more concentrated than in fresh fishes [1]. FPC was first publicized widely in the late 1960s, as the most promising way to eliminate worldwide malnutrition [2]. International Food and Agriculture Organization (FAO) (2006) defined FPC as any stable fish preparation, intended for human consumption, in which the protein is more concentrated than in the original fish and divided that into three types: Type A: a virtually odorless and tasteless powder having a maximum total fat content of 0.75%;

Type B: a powder having no specific limits as to odor or flavor, but definitely having a fishy flavor and a maximum fat content of 3 %; Type C: normal fish meal produced under satisfactorily hygienic conditions [3].

FPC can play an effective role in decreasing protein deficiency in some crowded parts of the world that suffers from malnutrition. Studies have shown that adding FPC to human diets has positive effects specially for growing babies and pregnant women [3]. FPC is a low cost animal protein with high quality, so it can be used as a protein supplement to increase nutritive value of foods [4]. Considerable works were done to develop FPC production methods and use it in different foods, but unfortunately there is little information about sustainability of FPC during storage at different environmental conditions [5]. Asian production of the three Indian major carps, namely rohu (*Labeo rohita*), catla (*Catla catla*) and mrigal (*Cirrhinus mrigala*), was 4412078 tonnes, of which rohu comprised 1133233 tonnes; catla 2976820 tonnes and mrigal 302025 tonnes [6].

About 70 percent of the production of the three Indian major carps is associated with India. Both monoculture and polyculture systems are described in this report. The scientific and common names of the fish species used in these systems. Indian major carps are widely cultured across Bangladesh, Myanmar, Nepal and Pakistan. Both rohu and catla have been introduced as exotic species into nine nonnative countries and mrigal into seven countries [7]. Until the nineteenth century, carp culture was confined to backyard ponds in the eastern Indian states of West Bengal, Orissa and Bihar. At the time, the seed was harvested from the local rivers. In 1957, hatchery and hypophysation breeding technologies were developed, and this provided the impetus for a new era of carp culture in the country.

Between 1963 and 1984, the successful demonstration of polyculture systems based on Indian and Chinese carps by the Central Inland Fisheries Research Institute in West Bengal and a successful demonstration programme by the Fish Farmer Development Agencies resulted in the commercialization of the technologies [8]. This demonstrated that trial-FPC was rich in protein and essential amino acids and that its quality reached the standards of FPC-A as defined by FAO. Used to fortify food, FPC could contribute to improving the nutrition of babies and young children and to raising the health level of people.

MATERIAL AND METHOD

The Indian major carps, *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* were collected from fresh water stream around Vaijapur Tehsil, Aurangabad District. The fish brought to the laboratory and following studies were carried out.

EXTRACTION OF SAMPLES

The internal organs of all Indian major carps, *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* samples were removed, and the fishes washed and minced by a mincing machine. The extracting solvent was added to the fish meat, followed by dehydration. After de-fatting (including removing of smell and colour) and refining for different temperatures and times, the product was dried, ground and packed.

EXTRACTING SOLVENT

Different kinds of extracting solvent were used for better extraction like, isopropanol, alcohol, isopropanol+ethyl acetate, alcohol+ethyl acetate were used in the experiments on all Indian major carps, *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*.

ANALYSES OF SAMPLES

Protein content of Indian major carps, *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* was determined by Kjeldhal method [9] and lipid content by scientific standard method [11], moisture content by oven method [12], ash content by electrical stove [10].

RESULTS AND DISCUSSION**EXTRACTING SOLVENT**

The results of moisture, fats, yields, smell and colour with four extracting solvents with three Indian major carps, *Catla catla*, *Labeo rohita* and *Cirrhinus mrigala* of fish protein concentrate was different and shown in table 1. For better extracting effects, isopropanol, alcohol, isopropanol+ethyl acetate, alcohol+ethyl acetate were used in the experiments for comparison. The results were shown in table- 1.

Table- 1) The results of moisture, fats, yields, smell and colour with four extracting solvents.

Extracting Solvents	Test	Fish Name		
		<i>C. catla</i>	<i>C. mrigala</i>	<i>L. rohita</i>
Isopropanol	Moisture	77.9	81.2	81.49
	Fat	3.52	4.67	4.89
	Colour	White	White	Pale yellow
	Smell	No	No	Yes
	Yield	12.7	16.84	13.4
Alcohol	Moisture	88.2	85	84.1
	Fat	4.08	4.25	3.28
	Colour	Yellow	Pale Yellow	Yellow
	Smell	No	Little	Yes
	Yield	11.9	13.1	13.5
Isopropanol+ Ethyl acetate	Moisture	84.1	82	82.4
	Fat	7.51	7.99	9.99
	Colour	Pale yellow	Grey	Grey
	Smell	Yes	No	No
	Yield	11.0	15.7	10.4
Alcohol+ Ethyl acetate	Moisture	99.3	79.68	84.7
	Fat	3.14	1.67	1.78
	Colour	Grey	Grey	White
	Smell	Yes	No	Yes
	Yield	10.04	17.11	14.1

The highest results was shown in *C. mrigala* that the isopropanol content was moisture-81.2; fat-4.67; colour-white; smell-no; yield-16.84. In alcohol moisture-85; fat-4.25; colour-pale; yellow; smell-little and yield- 13.1, In isopropanol+ethyl acetate, moisture-82; fat-7.99; colour-grey; smell-no and yield-15.7 and the alcohol+ethyl acetate show moisture-79.68; fat-1.67; colour-grey; smell-no; yield-17.11. The highest content was determined in the order of *Cirrhinus mrigala*> *Catla catla*> *Labeo rohita*.

NUTRITIVE VALUE OF FISH PROTEIN CONCENTRATE

The protein of trial fish protein concentrate was higher and fat, moisture and ash was lower than those of fish protein concentrate-A as defined by FAO shown in table- 2. The quality of trial fish protein concentrate exceeded that of fish protein concentrate -A. The rates of protein of trial fish protein concentrate to that of egg, milk, and soyabean were 10.97, 4.9, and 34.8 respectively.

Table- 2) Comparison of the standards of trial fish protein concentrate with fish protein concentrate-A (FAO, 2006)

Extracting Solvents	Test	<i>Cirrhinus mrigala</i> (Percentage)			
		Protein	Fat	Moisture	Ash
Isopropanol	Trial-FPC	99.4	0.10	5.71	2.18
	FPC-A (FAO, 2006)	>77	<0.9	<11.5	<16.1
	Milk	4.9	7.6	96.14	-
	Eggs	10.97	16.72	64.1	-
	Soyabean	34.8	22.6	4.12	-

The essential amino acid requirements for humans were met by trial fish protein concentrate, indicating that the human body can easily absorb it. Its nutritive quality is close to that of cheese, egg and milk and better than that of soybean and wheat. Therefore the trial fish protein concentrate was an excellent protein for people, especially babies and children. Nutritional composition of fish protein concentrate was shown in tables 2 and 3.

Table- 3) Essential amino acid contents of a few proteins and essential amino acid requirements for humans

	Test	Essential Amino Acids (mg/gm protein)							
		Lys	Trp	Val	Thr	Iso-lu	Leu	His	Phe
Experimental setup	Trial-FPC	98.1	16.2	59.7	44	54.9	92.7	33	79.2
	Wheat	19.79	9.4	14	33.7	37.1	76.7	-	43.7
	Milk	83.1	11.7	72.4	51.6	59.1	88	29.1	97
	Eggs	78.4	12.6	51.9	40.7	67.3	88.7	19.6	90.8
	Soyabean	64.9	10	45	31.4	58.74	70.48	-	52
As per FAO, 2006	Child	75	4.6	41	44	37	56	-	34
	Adult	22	6.5	18	13	18	25	-	25
	Model-Chart	55	10	50	40	40	70	-	60

Lys-Lysine; Trp-Trpsine; Val-Valine; Thr-Threonine; Iso-lu-Isolucien; Luc-Lucien; His-Histidine

CONCLUSION

The sustainability of fish protein concentrate produced from Indian major carps and the highest content was determined in the order of *Cirrhinus mrigala* > *Catla catla* > *Labeo rohita*. The nutritional quality of the trial- fish protein concentrate was near to that of cheese, egg and milk, and exceeded that of soybean and wheat. Hence the present work concluded that the quality of fish protein concentrate was better than that of fish protein concentrate-A as defined by FAO.

The fish protein concentrate have a normal smell and its quality exceeded that of fish protein concentrate-A as defined by FAO.

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A HYBRID TECHNIQUE WITH MICRO-GIRD USING VIRTUAL INERTIA FOR SMALL SIGNAL AND TRANSIENT RESPONSE

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Abstract—This paper introduces the adaptive control scheme for the varying parameters of the plant to obtain the desired output. Self-Tuning Regulator (STR) is a part of adaptive control scheme. It consist of two blocks; parameter estimation block for the online parameter estimation either of controller parameters directly (Implicit STR) or plant parameters, which will further used to calculate the controller parameters (Explicit STR), and the controller design block to provide the controller design solution for the known parameters. The design of explicit Self-Tuning Regulator using Minimum Degree Pole-Placement (MDPP) and Recursive Least Square (RLS) estimation technique is presented. The performance analysis of the designed STR is discussed subsequently based on the simulation results obtained using S-Function and Simulink Block of MATLAB.

Keywords— Adaptive control, Self-Tuning Regulator (STR), Pole-Placement technique, Recursive Least Square estimation technique, S-Function.

I. INTRODUCTION

Most of the techniques to design control system are based on knowledge of the plan and the environment. In many cases, the information is, however not available. The reason is that the plant is too complex or that the basic relationship is not fully understood, or that the process and the disturbances may change with operating conditions. Different possibilities to overcome this difficulty exist.

Adaptive control is one possibility to tune the controller. In control theory engineering field an adaptive controller is “intelligent” controllers that can alter its behavior correspond to the variation in the process dynamics and the disturbance character. Closed loops are important in adaptive control system and the number of closed loops in this system is too (Fig-1). These loops plays important role and are used for different functionalities. Normal feedback control with plant and controller are managed by one loop and another loop is used as parameter adjustment.

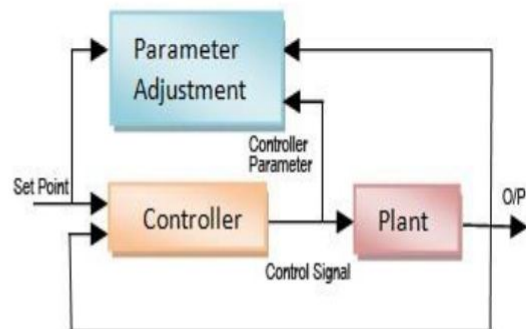


Figure (1): Block Diagram of an Adaptive System

In adaptive control schemes mainly four schemes exists: Self –tuning regulators, Model reference adaptive control, and gain scheduling and dual control. This paper chooses the STR due to inherent advantages of this technique over the others.

The Fig-2 represents block diagram of the STR. The block "Estimator" shows an on-line determination of the process-parameters for which least-square method or projection algorithms has been used. The block labeled as "Controller Design" provides an on-line solution to a design problem for a type of system with known parameters or with estimated parameters. The block labelled as "Controller" is used to calculate all the control actions with the controller parameters which is calculated by its proceeding block.

The system can be perceived as an automatic system of processing modelling/estimation and designing, where the process model and the control designs are changed at each sampling interval. Sometimes the STR algorithms are simplified by re-parameterizing and directly estimating the controller parameters instead of process parameters alone. In the designing of Self- Tuning regulator there is a known system at starting. For the development of control algorithm there is need of recursive parameter estimator because it is

used in the development of control algorithm. Then the true parameter values are replaced by their estimated values to determine the control law. That is why this control strategy is certainly equivalent control.

On-line process parameter estimation is important in adaptive control. In an adaptive control system, the basis of adaptive mechanism is identification of the system first.

In fig. 2 a recursive parameter estimator is included in self tuning regulator explicitly.

In simple words system identification consist process parameter estimation as its one of the part. If we perceive system identification descriptively then it is selection of, parameter estimation, structure of model, experiment design and validation.

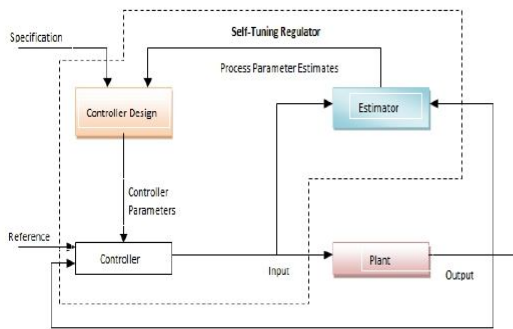


Figure (2): Self-Tuning Regulator

II. SYSTEM IDENTIFICATION SCHEME

Let the procedure is explained with the needed single-input, single output (SISO) system as.

$$A(z^{-1})y(t) = B(z^{-1})(u(t - d_0) + v(t - d_0)) \quad (2.1)$$

Where,

$$A(z^{-1}) = 1 + a_1z^{-1} + \dots + a_nz^{-n} \quad (2.1a)$$

$$B(z^{-1}) = b_0 + b_1z^{-1} + \dots + b_mz^{-m} \quad (2.1b)$$

With $m = n - d_0$. Least Square method is the most commonly method used in this system identification. Here all parameter is unknown with principles which are defined in mathematical model; choosing way is very important role in this system. So difference between observed values and actual with output consume possible weighting is minimum. Quadratic criteria are least square which are analytic with problems. It is measuring variable with unknown parameter with linear system. Real time observation in a pattern generate with adaptive control system. Computation time reduces in recursive least square estimation method. The process model (2.1) can be written as

$$y(k) = -a_1y(k-1) - a_2y(k-2) - \dots - a_ny(k-n) + b_0u(k-d_0) + \dots + b_mu(k-d_0-m) \quad (2.2)$$

The model is linear in the parameters and can be written in the vector form as

$$y(k) = \Phi^T(k)\theta$$

Where,

$$\theta = [b_0, b_1, b_2, \dots, b_n, a_1, a_2, \dots, a_n]^T$$

$$\Phi(k) = [u(k-d_0), \dots, u(k-d_0-m), -y(k-1), \dots, y(k-n)]^T$$

Then recursive least square estimator is given by

$$\hat{\theta}(t) = \hat{\theta}(t-1) + K_p(t)[y_p(t) - \Phi(t-1)\hat{\theta}(t-1)] \quad (2.3)$$

Where,

$$K_p(t) = P(t-1)\Phi(t-1)^T[\sigma^2 + \Phi(t-1)P(t-1)\Phi(t-1)^T]^{-1}$$

$$P(t) = P(t-1)Q_p - K_p(t)[\sigma^2 + \Phi(t-1)P(t-1)\Phi(t-1)^T]K_p^T(t)$$

Where Q_p is the covariance matrix. Generally, we do not have advance knowledge of the parameter noise, and often assume that the parameter is constant. In that case Q_p is zero. We can also assume that the variance σ^2 is unity. $K_p(t)$ is called the kalman gain. Equation (2.3) can be interpreted thus:

$$\text{(New estimate)} = \text{(Old estimate)} + \text{(Kalman gain)} * \text{(Prediction error)}$$

The calculation is performed in the following order:

$$P(t-1) \longrightarrow K_p(t) \longrightarrow \hat{\theta}(t) \longrightarrow P(t)$$

This method of parameter estimation is called Recursive Least Square (RLS) method, as the estimate $\theta(t)$ is found by minimizing the given below quadratic cost criterion w.r.t the parameter vector θ :

$$V(t) = \sum_{s=1}^t \|y_p(s) - \hat{y}(s)\|^2 \quad (2.4)$$

Forgetting factor:

The algorithm discussed earlier would be acceptable if the “true” parameters were constant. But we find that in practice plant parameters vary slowly with time. Hence the algorithm should track such slowly varying parameters, so that the self-tuners stay in tune. This is possible with the use of a forgetting factor β , which is slightly less than unity. By using this we obtain exponential forgetting of the past data. Instead of giving equal weight to the errors in the RLS, we give more weight to more recent data. This achieved by artificially inflating the priori covariance $P(t)$ at each time instant.

Let us define, following

$$P(t) = P(t) * \beta / \sigma^2 \quad (2.5)$$

Then the recursive relations (2.3) become, for $Q_p = 0$:

$$K_p(t+1) = P(t) * \Phi(t)^T / \mu^2(t) = P(t+1) \phi(t)^T \quad (2.6)$$

$$P(t+1) = \beta^{-1} [P(t) - P(t) \phi(t)^T] \phi(t) P(t) / \mu^2(t) \quad (2.7)$$

Where

$$\mu^2(t) = \beta + \Phi(t) P(t) \phi(t)^T \quad (2.6)$$

with

$$0 < \beta < 1$$

The calculations are done in the following order:

$$P(t) \rightarrow K_p(t+1) \rightarrow \theta(t+1) \rightarrow P(t+1)(t+1)$$

III. CONTROLLER DESIGN

The process model is described in (2.1) as

$$A(z^{-1})y(t) = B(z^{-1})(u(t - d_o)) + v(t - d_o) \quad (3.1)$$

Assume that the polynomials $A(z^{-1})$ and $B(z^{-1})$ are co-prime, i.e. they do not have any common factors. Furthermore, $A(z^{-1})$ is monic. That is the coefficient of the higher power is unity.

This general linear controller can be describe by

$$R(z^{-1}) u(t) = T(z^{-1})u_c(t) - S(z^{-1})y(t) \quad (3.2)$$

Where,

$R(z^{-1})$, $S(z^{-1})$, and $T(z^{-1})$ are polynomials in the backward shift operator z^{-1} . B this controller consists of fed forward with the transfer operator $\frac{T(z^{-1})}{R(z^{-1})}$ and a feedback

with the transfer operator $\frac{S(z^{-1})}{R(z^{-1})}$.

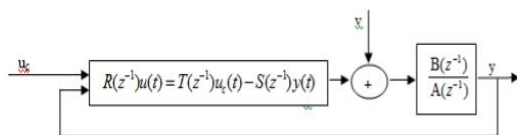


Figure (3): A General Linear Controller with Two Degree of Freedom

From equation (2.1) and (3.2), we can obtain the following equations of the following closed loop system.

$$y(t) = \frac{B(z)T(z)}{A(z)R(z) + B(z)S(z)} u_c(t) + \frac{B(z)R(z)}{A(z)R(z) + B(z)S(z)} v(t) \quad (3.3)$$

$$u(t) = \frac{A(z)T(z)}{A(z)R(z) + B(z)S(z)} u_c(t) - \frac{B(z)S(z)}{A(z)R(z) + B(z)S(z)} v(t) \quad (3.4)$$

Thus, the closed loop characteristic polynomial is (for simplicity, the operator is omitted)

$$A_c = AR + BS \quad (3.5)$$

The principal concept behind the controller pattern is to predict the desired closed-loop characteristic polynomial A_c as a design parameter. To calculate the polynomial T in the controller (3.2) there must be some other methods and to perform this it is required that the command signal to output response follow the model.

$$A_m(t)y(t) = B_m u_c(t) \quad (3.6)$$

From equation (3.3), the following condition must take.

$$\frac{BT}{AR + BS} = \frac{BT}{A_c} = \frac{B_m}{A_m} \quad (3.7)$$

Then it follows from model-following condition (3.7) that the response of the closed loop system is command signal is as specified by the model (3.6)

Based on the model-following condition, some constructive conclusions can be deduced. Equation (3.7) implies that there are cancellations of factor BT and A_c . factorize the polynomial B as

$$B = B^+ B^- \quad (3.8)$$

Where B^+ is a monic polynomial, and its zeros are stable, which are well damped and they can be cancelled by the controller and B^- corresponds to the unstable or poorly damped factors that cannot be cancelled. Since B^+ remains unchanged, it thus holds a B^- is the factor of beam. Therefore

$$B_m = B^- B_m' \quad (3.9)$$

The closed loop characteristic polynomial A_c thus can be written as

$$A_c = B^+ A_m A_0 \quad (3.10)$$

Since A_c and B have common factor B^+ , it follows from the equation (3.5) that it must be a factor of R . hence

$$R = B^+ R' \quad (3.11)$$

The Diophantine equation (3.5) then can be simplified as

$$AR' + B'S = A_m A_0 = A_c' \quad (3.12)$$

Substituting equation (3.8), (3.9) and (3.10) into equation (3.7), There holds

$$T = \beta A_0 \quad (3.13)$$

Compatibility Condition

To have a control law that is causal in the discrete-time case, we must impose the following conditions upon the polynomials in the control law (3.2)

$$\deg S \leq \deg R \quad (3.14)$$

$$\deg T \leq \deg R \quad (3.15)$$

In the case of no constraints the degree of the polynomial, the Diophantine equation (3.5) has many solutions because if R^* and S^* are two specific solutions, then so are

$$\mathbf{R} = \mathbf{R}^* + \mathbf{M}\mathbf{B} \tag{3.16}$$

$$\mathbf{S} = \mathbf{S}^* - \mathbf{M}\mathbf{A} \tag{3.17}$$

Where, M is an arbitrary polynomial with any degree. Since there are so many solutions, it is desirable to seek the solution that gives a controller with the lowest degree, i.e. the minimum-degree controller. Given $\deg A > \deg B$, it then follows from equation (3.5) that

$$\deg \mathbf{R} = \deg A_c - \deg \mathbf{A} \tag{3.18}$$

From equation (3.4), it can be easily find out a solution in which the degree of S is at most $\deg A - 1$. This is specified as the minimum-degree solution to the Diophantine equation (3.4). The condition $\deg S \leq \deg R$ thus implies that

$$\deg A_c - \geq 2 \deg A - 1 \tag{3.19}$$

It means that the polynomials R, S and T have the same degrees. Then we have the following algorithm.

Minimum-degree Pole Placement (MDPP) Algorithm

Data: polynomial A and B

Specification: polynomials A_m , B_m and A_0 .

Compatibility Conditions:

$$\deg A_m = \deg A$$

$$\deg B_m = \deg B$$

$$\deg A_0 = \deg A - \deg B^* - 1$$

$$B_m = B^* B'$$

Step 1: decompose B as $B = B^* B'$

Step 2: solve the Diophantine equation below to get R' and S with $\deg S < \deg A$.

$$AR' + B'S = A_0 A_m$$

Step 3: from $R = B^* R'$ and $T = A_0 B_m'$, and compute the control signal from the control law

$$Ru = Tu_c - Sy$$

The paper considers only one special case where no zero is cancelled. Then we have

$$B^* = 1$$

$$B' = B \text{ and}$$

$$B_m = 2B, \text{ where}$$

$$2 = \frac{A_m(1)}{B(1)}, \text{ and } \deg A_0 = \deg A - 1,$$

$T = 2A_0$. The Diophantine equation in step 2 becomes

$$AR + BS = A_c = A_0 A_m$$

IV. SIMULATION AND RESULTS

We simulate the RLS estimator algorithm and the MDPP controller algorithm by developing the S-function code in MATLAB. S-function is a powerful and useful instrument which enables us to add our customized algorithm block into

the Simulink models. We will discuss what the S-function is and how to code with it.

In simulation, we use a data structure of matrix for as below.

$\beta_0(t)$	$p_{11}(t)$	$p_{(n+m+1)}(t)$	$u(t-d)$
$\beta_1(t)$	$p_{21}(t)$	$p_{2(n+m+1)}(t)$	$u(t-d-1)$
\vdots	\vdots		\vdots
\vdots	\vdots		\vdots
$\beta_m(t)$	\vdots		$u(t-d-m)$
$\alpha_1(t)$	\vdots		$-y(t-1)$
\vdots	\vdots		\vdots
\vdots	\vdots		\vdots
α_n	$p_{(n+m+1)}$	$p_{(n+m+1)(n+m+1)}(t)$	$-y(t-1)$
$\theta(t)$	P(t)		$\Phi(t)$

Only the three parameter d, m, n are required to estimate the unknown parameter.

Example 1: The transfer function given below is taken from the J.V. Ringwood and A. O'Dwyer pp.4.

$$G_p(z) = \frac{0.1123z + 0.0897}{z^2 - 1.5943 + 0.6526}$$

So, it could be written as

$$G_p(z) = G_p(z^{-1}) = z^{-1} \frac{0.1123z^2 + 0.0897z}{z^2 - 1.5943z + 0.6526}$$

Then $d=1, m=1, \text{ and } n=2$.

Table-1: Result of Plant Parameter for Second order

Parameters		a_2	b_0	b_1
True value	-1.5943	0.6526	0.1123	0.0897
Estimated	-1.594	0.6525	0.1123	0.0.8974

Example 4.3: The transfer function is given bellow taken from the Zhongshan Wu B.S.E.E., Northeastern University, China, pp.36.

$$G_p(z^{-1}) = z^{-1} \frac{0.3769z^{-1} + 0.2642z^{-2}}{1 - 1.3679z^{-1} + 0.3679z^{-2}}$$

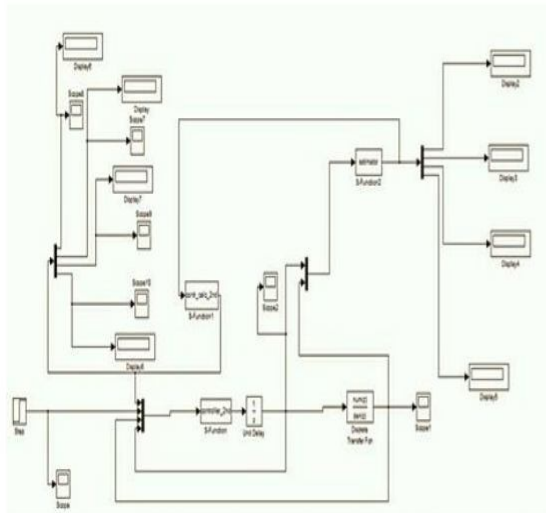
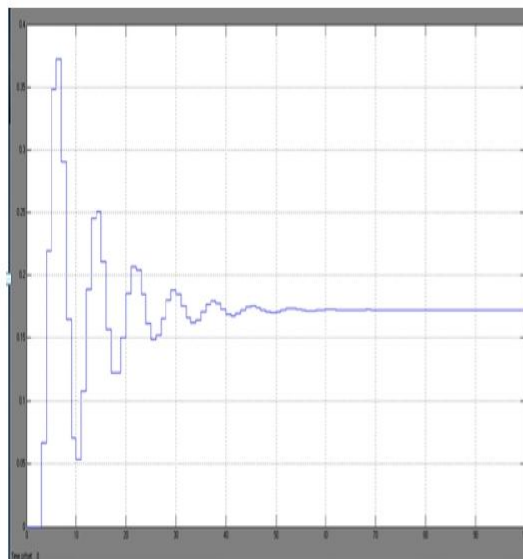
paper specify the reference model as B_m/A_m , where

$$A_m = z^2 - 1.3205z + 0.4966;$$

$$\beta = \frac{1 + \alpha_{m1} + \alpha_{m2}}{b_0 + b_1} = \frac{1 - 1.3205 + 0.4966}{0.3769 + 0.2642}$$

$$B_m = \beta B = 0.2786 * (0.3769z + 0.2642);$$

$$A_0 = z + 0.8;$$

Figure-6: Block Diagram of STR for 3rd OrderFigure-7: Output (y) of the 3rd Order controller

V. CONCLUSION

STR is one of the widely acceptable approaches for adaptive control. With the invention and advancement of microprocessors and computers the complexity of STR algorithm reduced to greater extends. STRs are mainly classified as a 'Implicit' and 'Explicit' STR. In implicit STR parameter estimation is done for estimating the parameters of controller directly. While in Explicit STR estimation of plant parameters are done, this treated as true parameters in designing of controller.

Pole placement approach comes under the explicit category. So named it 'minimum degree' because when stability of controller is considered so, its solution that gives the controller with lowest degree. Hence, Diophantine equation is solved for minimum degree controller. From compatibility conditions it is also needed that the model must be at least as large as time required of the process.

S-function and Simulink Block is used for simulation of my results. And from the work it emerged out as the important and successful tool for simulation work. Different examples are taken for simulation work and the result of simulation shows that the parameter estimated for both plant and controller are accurate and controller performance is good

VI. FUTURE SCOPE

The estimated parameter is also applied for higher order systems and extended for the MIMO system also. The parameter of plant and controller can be estimated under the un-modeled dynamics and existence of noise signal and disturbance.

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SPECTRA OF SG - VERTEX CORONA OF GRAPHS

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ABSTRACT

Let $S(G)$ be the subdivision graph of G . Given two graphs G_1 and G_2 , the SG – vertex corona, $G_1 \blacklozenge G_2$ is the graph obtained from $S(G_1) \cup G_1$ and n_1 copies of G_2 , all vertices distinct, by joining i^{th} vertex of G_1 to every vertices in the i^{th} copy of G_2 . In this paper, we determined the adjacency spectrum (respectively Laplacian and signless Laplacian spectrum) of $G_1 \blacklozenge G_2$ for a regular graph G_1 and an arbitrary graph G_2 in terms of the corresponding spectra of G_1 and G_2 . Finally, as an application of these result, we constructed infinitely many pairs of cospectral graphs. In addition, the Kirchhoff index and the number of spanning trees of $G_1 \blacklozenge G_2$ are also calculated.

Keywords: spectrum, corona, cospectral graphs, Kirchhoff index, spanning trees.

AMS Subject Classification (2010) : 05C50

1 INTRODUCTION

Only simple and undirected graphs were described in this paper. Let $G = (V, E)$ be a graph with vertex set $V = \{v_1, v_2, \dots, v_n\}$ and edge set $E = \{e_1, e_2, \dots, e_m\}$. The adjacency matrix of G denoted by $A(G) = (a_{ij})_{n \times n}$ is an $n \times n$ symmetric matrix defined as $a_{ij} = 1$ if v_i and v_j are adjacent in G , 0 otherwise.

Let d_i be the degree of the vertex v_i in G and $D(G) = \text{diag}(d_1, d_2, \dots, d_n)$ be the diagonal matrix of G . The Laplacian matrix and signless Laplacian are defined as $L(G) = D(G) - A(G)$ and $Q(G) = D(G) + A(G)$ respectively. The characteristic polynomial of G is defined as $f_G(A; x) = \det(xI_n - A)$, where I_n is the identity matrix of order n . The roots of the characteristic equation are called the eigenvalues of G . It is denoted by $\lambda_1(G) \geq \lambda_2(G) \geq \dots \geq \lambda_n(G)$ and are called A – spectrum of G . The eigen values of $L(G)$ and $Q(G)$ are denoted by $0 = \mu_1(G) \leq \mu_2(G) \leq \dots \leq \mu_n(G)$ and $\nu_1(G) \geq \nu_2(G) \geq \dots \geq \nu_n(G)$. They are called the L – spectrum and Q – spectrum of G . Since three matrices defined here are real and symmetric, their eigenvalues are all real numbers.

The incidence matrix [2] of G is the 0-1 matrix $R = (r_{ve})$ with rows indexed by vertices and column by edges where $r_{ve} = 1$ when the vertex v is an end point of the edge e and 0 otherwise.

The adjacency spectrum of a graph consist of the eigen value (together with their multiplicities) and the Laplacian (signless Laplacian) spectrum of G consist of the Laplace (signless Laplace) eigen values together with their multiplicities. Cospectral graphs are those whose spectrum are identical. A graph is A – integral if the A – spectrum consist only of integers [2]. The idea of spectral graph theory is to exploit numerous relations between graphs and matrices inorder to study problems with graphs by means of eigen values of some graph matrices. It is a theory in which graphs are studied by means of the eigen values of some matrix (based on adjacency, Laplacian matrices etc).

Harary and Frucht [3] was the mathematicians who introduced corona of two graphs in literature. Some other graph operations such as disjoint union, neighbourhood corona, edge corona etc have been introduced and their spectra are calculated [1,4,7-9]. The subdivision graph $S(G)$ [2] of G is the graph obtained by inserting an additional vertex in each edge of G .

Based on the subdivision graph, [1] subdivision vertex and subdivision edge corona are defined and their spectrum are calculated. In [7] SG - vertex join of graph is defined and their A - spectra, L- spectra and Q - spectra are calculated.

Motivated by these works, we define the new graph operation based on the subdivision graph as follows.

Definition 1.1 *The SG – vertex corona of two vertex disjoint graphs G_1 with vertex set $V(G_1) = \{v_1, v_2, \dots, v_{n_1}\}$ and G_2 , denoted by $G_1 \blacklozenge G_2$, is the graph obtained from $S(G_1) \cup G_2$ and n copies of G_2 , all vertices distinct, by joining v_i to every vertex in the i^{th} copy of G_2 .*

If G_1 is a graph on n_1 vertices and m_1 edges, then $G_1 \blacklozenge G_2$ has $m_1 + n_1(n_2 + 1)$ vertices and $3m_1 + n_1(n_2 + m_2)$. In this paper we define SG – vertex corona of two graphs and also find the three different spectrum of $G_1 \blacklozenge G_2$ with the help of coronal of a matrix and the Kronecker Product. Further we construct some classes of cospectral graphs. Also we give the Kirchhoff index and the number of spanning trees of $G_1 \blacklozenge G_2$.

2 Preliminaries

Lemma 2.1 [2] *Let G be a r -regular graph with an adjacency matrix A and an incidence matrix R . Let $\mathcal{L}(G)$ be its line graph. Then $RR^T = A + rI$ and $R^T R = A(\mathcal{L}(G)) + 2I$.*

Proposition 2.2 [10] *Let M_1, M_2, M_3, M_4 be respectively $p \times p, p \times q, q \times p, q \times q$ matrices with M_1 and M_4 are invertible then,*

$$\begin{aligned} \det \begin{pmatrix} M_1 & M_2 \\ M_3 & M_4 \end{pmatrix} &= \det(M_1)\det(M_4 - M_3M_1^{-1}M_2) \\ &= \det(M_4)\det(M_1 - M_2M_4^{-1}M_3), \end{aligned}$$

where $M_4 - M_3M_1^{-1}M_2$ and $M_1 - M_2M_4^{-1}M_3$ are called the schur complements of M_1 and M_4 respectively.

Let G be a graph on n vertices, with the adjacency matrix A . The characteristic matrix $xI - A$ of A has determinant $\det(xI - A) = f_G(A; x) \neq 0$, so is invertible. The A – coronal, $\Gamma_A(x)$ of G_1 [6] of G is defined to be the sum of the entries of the matrix $(xI - A)^{-1}$. This can be calculated as,

$$\Gamma_A(x) = \mathbf{1}_n^T (xI - A)^{-1} \mathbf{1}_n.$$

Let G be r - regular graph on n vertices. Then,

$$\Gamma_A(x) = \frac{n}{x-r}. \tag{2.1}$$

Since for any graph G with n vertices, each row sum of the Laplacian matrix $L(G)$ is equal to 0, we have

$$\Gamma_L(x) = \frac{n}{x}. \tag{2.2}$$

Let G be the bipartite graph $K_{p,q}$ where $p + q = n$ then,

$$\Gamma_A(x) = \frac{nx+2pq}{x^2-pq}. \tag{2.3}$$

Let $A = (a_{ij})$ and B be matrices. Then the Kronecker product [2] of A and B is defined as the partition matrix $(a_{ij}B)$ and is denoted by $A \otimes B$. This is an associative operation with the property that $(A \otimes B)^T = A^T \otimes B^T$ and $(A \otimes B)(C \otimes D) = AC \otimes BD$ whenever the product

AC and BD exist. Also $(A \otimes B)^{-1} = A^{-1} \otimes B^{-1}$ for the non singular matrix A and B . Moreover if A and B are $n \times n$ and $p \times p$ matrices, then $\det (A \otimes B) = (\det A)^p (\det B)^n$.

Based on these argument we can verify that,

$$(1_n^T \otimes I_n)(xI_n - A)^{-1} \otimes (1_n \otimes I_n) = \Gamma_A(x)I_n,$$

$$(1_n^T \otimes I_n)((x - 1)I_n - A)^{-1} \otimes (1_n \otimes I_n) = \Gamma_A(x - 1)I_n.$$

The following figure illustrate Definition 1.1.

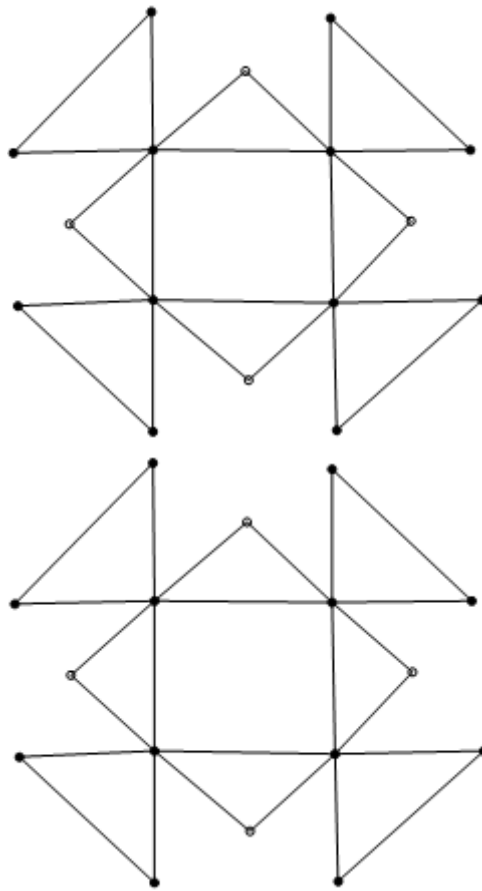


Fig 1. $C_4 \diamond K_2$

3 Spectrum of $G_1 \diamond G_2$

Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges. G_2 be an arbitrary graph on n_2 vertices. $V(G_1) = \{v_1, v_2, \dots, v_{n_1}\}$ and $I(G_1) = \{e_1, e_2, \dots, e_{m_1}\}$. The vertex in the i^{th} copy of G_2 be $\{u_1^i, u_2^i, \dots, u_{n_2}^i\}$ and $W_j = \{u_j^1, u_j^2, \dots, u_j^{n_2}\}$ is a vertex partition of $G_1 \diamond G_2$. The degree of the vertices of $G_1 \diamond G_2$ are $d_{G_1 \diamond G_2}(v_i) = n_2 + 2d_{G_1}(v_i)$, $i = 1, 2, \dots, n_1$, $d_{G_1 \diamond G_2}(e_i) = 2$, $i = 1, 2, \dots, m_1$, $d_{G_1 \diamond G_2}(u_j^i) = d_{G_2}(u_j)$, $j = 1, 2, \dots, n_2$.

3.1 Adjacency spectrum of SG - vertex corona

Theorem 3.1 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and G_2 be an arbitrary graph on n_2 vertices. Then,

$$f_{G_1 \blacklozenge G_2}(A: x) = f_{G_2}(A_2: x)x^{m_1-n_1}(f_{G_2}(A_2: x))^{n_1} \prod_{i=1}^{n_1} \left(x^2 - x\Gamma_{A_2}(x) - x\lambda_i(G_1) - r_1 - \lambda_i(G_1) \right).$$

Proof. The adjacency matrix of $G_1 \blacklozenge G_2$ is ,

$$A = \begin{bmatrix} A_1 & R & 1_{n_2}^T \otimes I_{n_1} \\ R^T & 0_{m_1 \times m_1} & 0_{m_1 \times n_1 n_2} \\ 1_{n_2} \otimes I_{n_1} & 0_{n_1 n_2 \times m_1} & A_2 \otimes I_{n_1} \end{bmatrix},$$

where A_1 and A_2 are the adjacency matrix of G_1 and G_2 and R is the incidence matrix of G_1 respectively.

The characteristic polynomial of $G_1 \blacklozenge G_2 = f_{G_1 \blacklozenge G_2}(A: x)$

$$= \begin{vmatrix} xI_{n_1} - A_1 & -R & -1_{n_2}^T \otimes I_{n_1} \\ -R^T & xI_{m_1} & 0 \\ -1_{n_2} \otimes I_{n_1} & 0 & (xI_{n_2} - A_2) \otimes I_{n_1} \end{vmatrix},$$

$$= (\det (xI_{n_2} - A_2) \otimes I_{n_2}) \det S,$$

where ,

$$\begin{aligned} S &= \begin{pmatrix} xI_{n_1} - A_1 & -R \\ -R^T & xI_{m_1} \end{pmatrix} - \left(\begin{pmatrix} -1_{n_2}^T \otimes I_{n_1} \\ 0 \end{pmatrix} ((xI_{m_2} - A_2) \otimes I_{n_1})^{-1} (-1_{n_2} \otimes I_{n_1} \quad 0) \right) \\ &= \begin{pmatrix} xI - A_1 & -R \\ -R^T & xI \end{pmatrix} - \begin{pmatrix} \Gamma_{A_2}(x)I_{n_1} & 0 \\ 0 & 0 \end{pmatrix} \\ &= \begin{pmatrix} xI_{n_1} - A_1 - \Gamma_{A_2}(x)I_{n_1} & -R \\ -R^T & xI_{m_1} \end{pmatrix}. \end{aligned}$$

$$\det S = \det(xI_{m_1}) \det((x - \Gamma_{A_2}(x))I_{n_1} - A_1 - R(xI_{m_1})^{-1}R^T),$$

$$\det S = \det(xI_{m_1}) \det \left((x - \Gamma_{A_2}(x))I_{n_1} - A_1 - \frac{RR^T}{x} \right),$$

$$= x^{m_1} \prod_{i=1}^{n_1} \left(x - \Gamma_{A_2}(x) - \lambda_1(G_1) - \frac{r_1 + \lambda_i(G_1)}{x} \right),$$

$$= x^{m_1-n_1} \prod_{i=1}^{n_1} (x^2 - x\Gamma_{A_2}(x) - x\lambda_1(G_1) - r_1 - \lambda_i(G_1)x).$$

Also,

$$\begin{aligned} \det (xI_{n_2} - A_2) \otimes I_{n_1} &= (\det(xI_{n_2} - A_2))^{n_1} (\det I_{n_1})^{n_2} \\ &= (f_{G_2}(A_2;x))^{n_1}. \end{aligned}$$

Hence,

$$f_{G_1 \blacklozenge G_2}(A;x) = f_{G_2}(A_2;x)x^{m_1-n_1}(f_{G_2}(A_2;x))^{n_1} \prod_{i=1}^{n_1} (x^2 - x\Gamma_{A_2}(x) - x\lambda_i(G_1) - r_1 - \lambda_i(G_1)x).$$

Corollary 3.2 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and G_2 be an r_2 - regular graph on n_2 vertices. Then the A - spectrum of $G_1 \blacklozenge G_2$ consists of

(i) 0, repeated $m_1 - n_1$ times;

(ii) $\lambda_i(G_2)$, repeated n_1 times, for $i = 2, 3, \dots, n_2$;

(iii) Three roots of the equation ,

$$x^3 - (r_2 + \lambda_i(G_1))x^2 + (r_2\lambda_i(G_1) - n_2 - r_1 - \lambda_i(G_1))x + r_1r_2 + r_2\lambda_i(G_1) = 0,$$

for $i = 1, 2, \dots, n_1$.

Proof. Since G_2 is r_2 - regular,

$$\Gamma_{A_2}(x) = \frac{n_2}{x-r_2}.$$

The characterestic polynomial,

$$\begin{aligned} \det(xI - A) &= x^{m_1-n_1} \prod_{i=2}^{n_2} (x - \lambda_i(G_2))^{n_1} \\ &\prod_{i=1}^{n_1} (x^3 - (r_2 + \lambda_i(G_1))x^2 + (r_2\lambda_i(G_1) - n_2 - r_1 - \lambda_i(G_1))x + r_1r_2 + r_2\lambda_i(G_1)). \end{aligned}$$

Corollary 3.3 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and $G_2 = \bar{K}_{n_2}$ (Totally disconnected). Then the A - spectrum of $G_1 \blacklozenge G_2$ consists of,

(i) 0, repeated $m_1 - n_1 + n_1n_2$ times;

(ii) Two roots of the equation, $x^2 - \lambda_i(x) - n_2 - r_1 - \lambda_i = 0$, for $i = 1, 2, \dots, n_1$.

Corollary 3.4 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and $G_2 = K_{p,q}$. Then the A - spectrum of $G_1 \blacklozenge G_2$ consists of,

(i) 0, repeated $m_1 + n_1(p + q - 3)$ times;

(ii) Four roots of the equation,

$$x^4 - \lambda_i x^3 - (p + q + pq + r_1 + \lambda_i)x^2 + pq(\lambda_i - 2)x + pq(r_1 + \lambda_i) = 0,$$

for every $i = 1, 2, \dots, n_1$.

Proof. Since $G_2 = K_{p,q}$,

$$\Gamma_{A_2}(x) = \frac{(p + q)x + 2pq}{x^2 - pq}.$$

The characteristic polynomial can be calculated as,

$$\det(xI - A) = x^{m_1 + n_1(p+q-3)} \prod_{i=1}^{n_1} (x^4 - \lambda_i x^3 - (p + q + pq + r_1 + \lambda_i)x^2 + pq(\lambda_i - 2)x + pq(r_1 + \lambda_i)).$$

Corollary 3.5 (i) If G_1 and G_2 are A - cospectral regular graphs and H is any arbitrary graph, then $G_1 \blacklozenge H$ and $G_2 \blacklozenge H$ are A - cospectral.

(ii) If G is a regular graph and H_1 and H_2 are A - cospectral graphs with $\Gamma_{A(H_1)}(x) = \Gamma_{A(H_2)}(x)$ then $G \blacklozenge H_1$ and $G \blacklozenge H_2$ are A - cospectral.

3.2 Laplacian spectrum of SG - vertex corona

Theorem 3.6 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and G_2 be an arbitrary graph on n_2 vertices. Then L - spectrum consists of,

(i) 0;

(ii) 2 , repeated $m_1 - n_1$ times;

(iii) $1 + \mu_i(G_2)$ repeated n_1 times for $i = 2, 3, \dots, n_1$;

(iv) Two roots of the equation $x^2 - (3 + r_1 + n_2)x + r_1 + 2n_2 + 2 = 0$;

(v) Three roots of the equation,

$$x^3 - (3 + r_1 + n_2 + \mu_i(G_2))x^2 + (r_1 + 2n_2 + 2 + 4\mu_i(G_1))x - 3\mu_i(G_1) = 0, \quad \text{for } i = 2, 3, \dots, n_1.$$

Proof. The Laplace adjacency matrix of $G_1 \blacklozenge G_2$ is

$$L = \begin{bmatrix} (r_1 + n_2)I_{n_1} + L_1 & -R & -1_{n_2}^T \otimes I_{n_1} \\ -R^T & 2I_{m_1} & 0 \\ -1_{n_2} \otimes I_{n_1} & 0 & (L_2 + I_{n_2}) \otimes I_{n_1} \end{bmatrix},$$

where L_1 and L_2 are the Laplacian matrices of G_1 and G_2 respectively.

The Laplacian characteristic polynomial of $G_1 \blacklozenge G_2 = f_{G_1 \blacklozenge G_2}(L; x)$

$$= \begin{vmatrix} (x - r_1 - n_2)I_{n_1} - L_1 & R & 1_{n_2}^T \otimes I_{n_1} \\ R^T & (x - 2)I_{m_1} & 0 \\ 1_{n_2} \otimes I_{n_1} & 0 & ((x - 1)I_{n_2} - L_2) \otimes I_{n_1} \end{vmatrix},$$

$$= \det \left((x - n_1)I_{n_2} - L_2 \right) \otimes I_{n_1} \det S,$$

where

$$\begin{aligned} S &= \begin{pmatrix} (x - r_1 - n_2)I_{n_1} - L_1 & R \\ R^T & (x - 2)I_{m_1} \end{pmatrix} \\ &- \left(\begin{pmatrix} 1_{n_2}^T \otimes I_{n_1} \\ 0 \end{pmatrix} \left((x - n_1)I_{m_1} - L_2 \right)^{-1} \begin{pmatrix} 1_{n_2} \otimes I_{n_1} & 0 \end{pmatrix} \right), \\ &= \begin{pmatrix} (x - r_1 - n_2)I_{n_1} - L_1 & R \\ R^T & (x - 2)I \end{pmatrix} - \begin{pmatrix} \Gamma_{L_2}(x - 1)I_{n_1} & 0 \\ 0 & 0 \end{pmatrix}, \\ &= \begin{pmatrix} (x - r_1 - n_2 - \Gamma_{L_2}(x - 1))I_{n_1} - L_1 & R \\ R^T & (x - 2)I_{m_1} \end{pmatrix}, \\ &= (x - 2)^{m_1} \det \left((x - r_1 - n_2 - \Gamma_{L_2}(x - 1))I_{n_1} - L_1 - \frac{RR^T}{x-2} \right). \\ \det S &= (x - 2)^{m_1} \prod_{i=1}^{n_1} \left(x - r_1 - n_2 - \Gamma_{L_2}(x - 1) - \mu_i(G_1) - \frac{r_1 + \lambda_i(G_1)}{x - 2} \right). \end{aligned}$$

Using equation (2.4) we have,

$$\Gamma_{L_2}(x - 1) = \frac{n_2}{x-1}.$$

$$\begin{aligned} \det S &= \frac{x(x - 2)^{m_1 - n_1}}{(x - 1)^{n_1}} (x^2 - (3 + r_1 + n_2)x + r_1 + 2n_2 + 2) \\ &\prod_{i=2}^{n_1} \left(x^3 - (3 + r_1 + n_2 + \mu_i(G_2))x^2 + (r_1 + 2n_2 + 2 + 4\mu_i(G_1))x - 3\mu_i(G_1) \right). \end{aligned}$$

Hence,

$$\begin{aligned} f_{G_1 \blacklozenge G_2}(L : x) &= x(x - 2)^{m_1 - n_1} (x^2 - (3 + r_1 + n_2)x + r_1 + 2n_2 + 2) \\ &\prod_{i=2}^{n_2} (x - 1 - \mu_i(G_2))^{n_1} \prod_{i=2}^{n_1} (x^3 - (3 + r_1 + n_2 + \mu_i(G_2))x^2 + (r_1 + 2n_2 + 2 + \\ &4\mu_i(G_1))x - 3\mu_i(G_1)) \end{aligned}$$

Corollary 3.7 (i) If G_1 and G_2 are L - cospectral regular graphs and H is any arbitrary graph, then $G_1 \blacklozenge H$ and $G_2 \blacklozenge H$ are L - cospectral.

(ii) If G is a regular graph and H_1 and H_2 are A - cospectral graphs then $G \blacklozenge H_1$ and $G \blacklozenge H_2$ are L - cospectral.

Let $t(G)$ denote the number of spanning trees of the graph G , the total number of distinct spanning subgraphs of G that are trees. The number of spanning trees of the graph describing the network is one of the natural characteristics of its reliability. If G is a connected graph with n vertices and the Laplacian spectrum $0 = \mu_1(G) \leq \mu_2(G) \leq \dots \leq \mu_n(G)$ then [2]

$$t(G) = \frac{\mu_2(G)\mu_3(G) \dots \mu_n(G)}{n}.$$

Corollary 3.8 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and G_2 be an arbitrary graph on n_2 vertices. Then,

$$t(G_1 \blacklozenge G_2) = \frac{2^{m_1-n_1} 3^{n_1-1} (r_1 + 2n_2 + 2) \prod_{i=2}^{n_2} (1 + \mu_i(G_2))^{n_1}}{n_1 + m_1 + n_1 n_2} t(G_1).$$

Klein [6] conceived the *resistance distance* defined in terms of electric resistance in a network corresponding to the considered graph, in which the resistance distance between any two adjacent nodes is 1 ohms. The sum of the resistance distance between all pairs of the vertices of a graph was conceived as a new graph invariant. The electric resistance are calculated by means of the Kirchhoff laws, called *kirchhoff index*. Kirchoff index of a connected graph G with $n(n \geq 2)$ vertices is defined as,

$$Kf(G) = n \sum_{i=2}^n \frac{1}{\mu_i}.$$

Corollary 3.9 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and G_2 be an arbitrary graph on n_2 vertices. Then,

$$Kf(G_1 \blacklozenge G_2) = (n_1 + m_1 + n_1 n_2) \left[\frac{3m_1 + 5n_1 - 8}{6} + \frac{3 + r_1 + n_2}{2 + r_1 + 2n_2} + \frac{2+r_1+2n_2}{3n_1} Kf(G_1) + \sum_{i=2}^{n_2} \frac{n_1}{1+\mu_i(G_2)} \right].$$

3.3 Signess Laplacian spectrum of SG - vertex corona

Theorem 3.10 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges and G_2 be an arbitrary graph on n_2 vertices. Then,

$$f_{G_1 \blacklozenge G_2}(Q; x) = (x - 2)^{m_1-n_1} \prod_{i=2}^{n_2} (x - 1 - v_i(G_2))^{n_1} \prod_{i=2}^{n_1} (x^2 - (2 + r_1 + n_2 + \Gamma_{Q_2}(x - 1) + v_i(G_1))x + 2r_1 + 2n_2 + \Gamma_{Q_2}(x) + \mu_i(G_1)).$$

Proof. The Signless Laplace adjacency matrix of $G_1 \blacklozenge G_2$ is

$$Q = \begin{bmatrix} (r_1 + n_2)I_{n_1} + Q_1 & R & 1_{n_2}^T \otimes I_{n_1} \\ R^T & 2I_{m_1} & 0 \\ 1_{n_2} \otimes I_{n_1} & 0 & (Q_2 + I_{n_2}) \otimes I_{n_1} \end{bmatrix},$$

where Q_1 and Q_2 are the Laplacian matrices of G_1 and G_2 respectively.

The proof of the theorem remaining is on similar lines as that of Theorem 3.4.

Corollary 3.11 Let G_1 be an r_1 - regular graph on n_1 vertices and m_1 edges. G_2 be an r_2 - regular graph on n_2 vertices. Then,

$$f_{G_1 \blacklozenge G_2}(Q; x) = (x - 2)^{m_1-n_1} \prod_{i=1}^{n_2-1} \left(x - 1 - v_i(G_2) \right)^{n_1} \prod_{(c)} x^3 - ax^2 + bx - c,$$

where, $a = 3 + r_1 + r_2 + n_2 + v_i(G_1)$,

$$b = 2 + 2r_1 + 4r_2 + 2n_2 + 2r_1r_2 + 2n_2r_2 + 2r_2v_i(G_1) + 2v_i(G_1),$$

$$c = 2r_1 + 4r_1r_2 + 4n_2r_2 + 2r_2v_i(G_1) + v_i(G_1).$$

Corollary 3.12 (i) If G_1 and G_2 are A - cospectral regular graphs and H is any arbitrary graph, then $G_1 \blacklozenge H$ and $G_2 \blacklozenge H$ are Q - cospectral.

(ii) If G is a regular graph and H_1 and H_2 are Q - cospectral graphs with $\Gamma_{Q(H_1)}(x) = \Gamma_{Q(H_2)}(x)$ then $G \blacklozenge H_1$ and $G \blacklozenge H_2$ are Q - cospectral.

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DISTINCT SIMILARITY MEASURES ON FUZZY NUMBERS

D. Stephen Dinagar¹ and E. Fany Helena²¹Associate Professor, ²Research Scholar PG and Research Department of Mathematics T.B.M.L. College (Affiliated to Bharathidasan University), Porayar, Tamil Nadu, India**ABSTRACT**

In this article, we reviewed the similarity measure of intuitionistic fuzzy sets and then we have extended this to generalized trapezoidal intuitionistic fuzzy numbers. The distinct notion namely 'Ranking Distance Measure' is proposed. Few more properties are also studied. Some relevant numerical illustrations are solved to justify the proposed method.

Keywords:- Fuzzy Set, Trapezoidal Intuitionistic Fuzzy Number, Similarity Measure, Ranking Function, Ranking Distance Measure.

1. INTRODUCTION

The concepts of similarity measure is fundamentally important in almost every scientific field. Fuzzy set theory has also developed its own measures of similarity. Which find application in areas such as management, medicine and meteorology. As a generalization of fuzzy sets introduced by Zadeh [13]. Atanassov [1] introduced the concept of intuitionistic fuzzy sets (IFSs). The concept of vague sets introduced by Gau and Buehrer [5] is another generalization of fuzzy sets. Chen [3] introduced the concepts of similarity measure between vague sets. Bustince and Burillo [2] pointed out that the notion of vague set is the same as that of intuitionistic fuzzy set. Chen [4] proposed a set of methods for measuring the degree of similarity between vague sets. Hong and Kim [6] introduced a set of modified similarity measures. By means of the geometrical representation of an intuitionistic fuzzy sets and the distance IFSs was proposed by Szmidt and Kacprzyk [12]. Recently Li and Cheng [7] proposed several new similarity measures between IFSs. Stephen Dinagar and Fany Helena [8] [9] has introduced the similarity measure using value and ambiguity and also using the centroid ranking of TrIFNs. Stephen Dinagar and Fany Helena [10][11] proposed a similarity measure on generalized interval-valued trapezoidal intuitionistic fuzzy numbers and also using geometric distance and graded mean we proposed the similarity measure. A similarity measure can represent the similarity between two documents, two queries, two images, two objects ect. A similarity measure is a function which computes the degree of similarity between them. Based on these similarity measures between intuitionistic fuzzy sets. We proposed similarity measures for trapezoidal intuitionistic fuzzy number.

This paper is organized as follows: we gave the basic definitions of fuzzy set, similarity measure and generalized trapezoidal fuzzy number, in section 2. Section 3 we revised the similarity measure between IFSs. In section 4 we extend it to GIFNs and proposed a new method to calculate the similarity measure. In section 5 we discussed some properties. In sections 6 we proposed a ranking distance between the fuzzy numbers and its illustrations. Finally the conclusion is given in section 7.

2. PRELIMINARIES**Definition :2.1**

Let $F(U)$ denote the fuzzy set with domain U . For $\tilde{A} \in F(U)$ and $u \in U$, $\mu_{\tilde{A}}(u)$ is defined as the membership function of u for \tilde{A} and \tilde{A}^c denote the supplementary set of \tilde{A} , which is given by $\mu_{\tilde{A}^c} = 1 - \mu_{\tilde{A}}(u)$.

Definition :2.2

A real function $S: F(U) \times F(U) \rightarrow [0,1]$ is defined as the fuzzy similarity measure of $F(U)$, if s satisfies following properties.

- 1) $\forall \tilde{A}, \tilde{B} \in F(U), S(\tilde{A}, \tilde{B}) = S(\tilde{B}, \tilde{A})$
- 2) If $\tilde{A} \in F(U)$, then $S(\tilde{A}, \tilde{A}^c) = 0$
- 3) $\forall \tilde{A} \in F(U), S(\tilde{A}, \tilde{B}) = 1$
- 4) $\forall \tilde{A}, \tilde{B}$ and $\tilde{C} \in F(U)$, if $\tilde{A} \subseteq \tilde{B} \subseteq \tilde{C}$, then $S(\tilde{A}, \tilde{B}) \geq S(\tilde{A}, \tilde{C}); S(\tilde{B}, \tilde{C}) \geq S(\tilde{A}, \tilde{C})$

Definition:2.3

A generalized trapezoidal intuitionistic fuzzy number (GTIFN) $\tilde{A}^i = [(a_1, a_2, a_3, a_4; w_{\tilde{A}^i})(b_1, b_2, b_3, b_4; u_{\tilde{A}^i})]$ is an intuitionistic fuzzy set on R , with the membership function $\mu_{\tilde{A}^i}$ and the non – membership function $\nu_{\tilde{A}^i}$ defined as

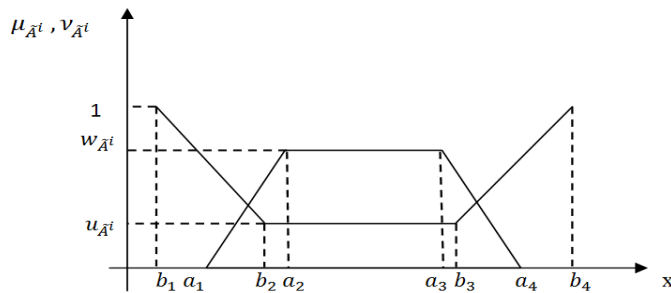


Figure 3

$$\mu_{\tilde{A}^i}(x) = \begin{cases} 0 & \text{if } x < a_1 \\ w_{\tilde{A}^i} \left(\frac{x-a_1}{a_2-a_1} \right) & \text{if } a_1 \leq x \leq a_2 \\ w_{\tilde{A}^i} & \text{if } a_2 \leq x \leq a_3 \\ w_{\tilde{A}^i} \left(\frac{a_4-x}{a_4-a_3} \right) & \text{if } a_3 \leq x \leq a_4 \\ 0 & \text{if } x > a_4 \end{cases} \quad \nu_{\tilde{A}^i}(x) = \begin{cases} 1 & \text{if } x < b_1 \\ \frac{(b_2-x)+\mu_{\tilde{A}^i}(x-b_1)}{b_2-b_1} & \text{if } b_1 \leq x \leq b_2 \\ u_{\tilde{A}^i} & \text{if } b_2 \leq x \leq b_3 \\ \frac{(x-b_3)+\mu_{\tilde{A}^i}(b_4-x)}{b_4-b_3} & \text{if } b_3 \leq x \leq b_4 \\ 1 & \text{if } x > b_4 \end{cases}$$

Where $0 < w_{\tilde{A}^i} \leq 1$, $0 \leq u_{\tilde{A}^i} \leq 1$ and $0 < w_{\tilde{A}^i} + u_{\tilde{A}^i} \leq 1$.

Definition :2.4

The similarity measure of two fuzzy numbers $S(A,B)$ can be justified by : If the distance is small, it will be the high degree of similarity where the larger distance will be the low degree of similarity.

3. Similarity Measures between Intuitionistic Fuzzy Sets

In this section, we review the similarity measures proposed by Chen by Hong and Kim by Li and Chen by Szmidt and Kacprzyk.

Definition:3.1

Let $x = \{x_1, x_2, x_3, x_4, \dots, x_n\}$ be the universe of discourse. \tilde{A}, \tilde{B} be two intuitionistic fuzzy sets in X , where

$$\tilde{A} = \{(x_i, \mu_{\tilde{A}}(x_i), \nu_{\tilde{A}}(x_i))/x_i \in X\} \text{ and } \tilde{B} = \{(x_i, \mu_{\tilde{B}}(x_i), \nu_{\tilde{B}}(x_i))/x_i \in X\}$$

Chen proposed the following similarity measure between \tilde{A} and \tilde{B}

$$T_c = 1 - \frac{1}{n} \sum_{i=1}^n \frac{|(\mu_{\tilde{A}}(x_i) - \mu_{\tilde{B}}(x_i)) - (v_{\tilde{A}}(x_i) - v_{\tilde{B}}(x_i))|}{2}$$

Where n denotes the number of terms.

Hong and Kim suggested a modified similarity measure between IFSs \tilde{A} and \tilde{B} as follows

$$T_H = 1 - \frac{1}{n} \sum_{i=1}^n \frac{|(\mu_{\tilde{A}}(x_i) - \mu_{\tilde{B}}(x_i)) + (v_{\tilde{A}}(x_i) - v_{\tilde{B}}(x_i))|}{2}$$

Li and Cheng defined the degree of similarity between intuitionistic fuzzy sets \tilde{A} and \tilde{B} as follows

$$T_L = 1 - \sqrt[p]{\frac{1}{n} \sum_{i=1}^n \left[\frac{|(\mu_{\tilde{A}}(x_i) - \mu_{\tilde{B}}(x_i)) - (v_{\tilde{A}}(x_i) - v_{\tilde{B}}(x_i))|}{2} \right]^p}$$

Where $1 \leq p \leq +\infty$

Szmidt and Kacprzyk proposed a measure to calculate the degree of similarity between IFSs as follows

$$T(\tilde{A}, \tilde{B}) = 1 - \sqrt[p]{\frac{1}{2n} \sum_{i=1}^n \left[|(\mu_{\tilde{A}}(x_i) - \mu_{\tilde{B}}(x_i))|^p + |(v_{\tilde{A}}(x_i) - v_{\tilde{B}}(x_i))|^p + |(\pi_{\tilde{A}}(x_i) - \pi_{\tilde{B}}(x_i))|^p \right]}$$

Where $\pi_{\tilde{A}}(x_i) = 1 - \mu_{\tilde{A}}(x_i) - v_{\tilde{A}}(x_i)$; $\pi_{\tilde{B}}(x_i) = 1 - \mu_{\tilde{B}}(x_i) - v_{\tilde{B}}(x_i)$ and $1 < p < +\infty$

4. Proposed Similarity Measures for Generalized Trapezoidal Fuzzy Number

We proposed the similarity measure for two generalized trapezoidal intuitionistic fuzzy numbers based on Chen, Hong and Kim, Li and Cheng, Szmidt and Kacprzyk.

Let $\tilde{A}^i = [(a_1, a_2, a_3, a_4; w_{\tilde{A}^i})(b_1, b_2, b_3, b_4; u_{\tilde{A}^i})]$ and

$$\tilde{B}^i = [(c_1, c_2, c_3, c_4; w_{\tilde{B}^i})(d_1, d_2, d_3, d_4; u_{\tilde{B}^i})]$$

Where $b_1 \leq a_1, b_2 \leq a_2, a_3 \leq b_3$ and $a_4 \leq b_4, d_1 \leq c_1, d_2 \leq c_2, c_3 \leq d_3$ and $c_4 \leq d_4$
 $w_{\tilde{A}^i} + u_{\tilde{A}^i} \leq 1; w_{\tilde{B}^i} + u_{\tilde{B}^i} \leq 1.$

By Chen’s method based on IFSs for TrIFNs

$$S_c(\tilde{A}^i, \tilde{B}^i) = \left[1 - \frac{1}{2n} \sum_{i=1}^n \frac{\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) - (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|}{4} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where n = 4

By Hong and Kim method based on IFSs for TrIFNs

$$S_{HK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \frac{1}{2n} \sum_{i=1}^n \frac{\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) + (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|}{4} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where n = 4

By Li and Cheng method based on IFSs for TrIFNs

$$S_{LC}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{2n} \sum_{i=1}^n \left[\frac{\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) - (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|}{4} \right]^p} \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $1 \leq p < +\infty$, n = 4

By Szmjdt and Kacprzyk method based on IFSs for TrIFNs

$$S_{SK}(\tilde{A}, \tilde{B}) = \left[1 - \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left(\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) \right|^p + \left| (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|^p + \left| (\tilde{A}^i_\pi(x) - \tilde{B}^i_\pi(x)) \right|^p \right)} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $\tilde{A}^i_\pi(x) = 1 - \tilde{A}^i_\mu(a_i) - \tilde{A}^i_\nu(b_i)$; $\tilde{B}^i_\pi(x) = 1 - \tilde{B}^i_\mu(c_i) - \tilde{B}^i_\nu(d_i)$; $1 < p < +\infty$ and n = 4

4.1 Illustrations

Example:1

$\tilde{A}^i = [(0.65, 0.74, 0.75, 0.81; 0.3)(0.6, 0.7, 0.77, 0.84; 0.4)]$ and $\tilde{B}^i = [(0.59, 0.69, 0.7, 0.8; 0.2)(0.58, 0.65, 0.72, 0.82; 0.6)]$ be two IFNs then the similarity measure can be defined as

$$S_C(\tilde{A}^i, \tilde{B}^i) = \left[1 - \frac{1}{2n} \sum_{i=1}^n \frac{\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) - (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|}{4} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where n=4

= 0.8742

$$S_{HK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \frac{1}{2n} \sum_{i=1}^n \frac{\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) + (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|}{4} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where n = 4

= 0.8665

$$S_{LC}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{2n} \sum_{i=1}^n \left[\frac{\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) - (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|}{4} \right]^p} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $1 \leq p < +\infty$, n = 4, p=1

= 0.8482

$$S_{SK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left[\left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) \right|^p + \left| (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|^p + \left| (\tilde{A}^i_\pi(x) - \tilde{B}^i_\pi(x)) \right|^p \right]} \right] \\ \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $\tilde{A}^i_\pi(x) = 1 - \tilde{A}^i_\mu(a_i) - \tilde{A}^i_\nu(b_i)$; $\tilde{B}^i_\pi(x) = 1 - \tilde{B}^i_\mu(c_i) - \tilde{B}^i_\nu(d_i)$; $1 < p < +\infty$ and n = 4, p=2

= 0.7918

Example:2

$\tilde{A}^i = [(0.36,0.48,0.55,0.65; 0.2)(0.26,0.4,0.6,0.8; 0.7)]$ and $\tilde{B}^i = [(0.49,0.5,0.63,0.75; 0.3)(0.3,0.5,0.69,0.84; 0.5)]$ be two IFNs then the similarity measure can be defined as

$$S_C(\tilde{A}^i, \tilde{B}^i) = \left[1 - \frac{1}{2n} \sum_{i=1}^n \left| \frac{(\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) - (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i))}{4} \right| \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $n = 4$
 $= 0.8872$

$$S_{HK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \frac{1}{2n} \sum_{i=1}^n \left| \frac{(\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) + (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i))}{4} \right| \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $n = 4$
 $= 0.8722$

$$S_{LC}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{2n} \sum_{i=1}^n \left| \frac{(\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) - (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i))}{4} \right|^p} \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $1 \leq p < +\infty, n = 4, p = 1$
 $= 0.8504$

$$S_{SK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left| (\tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i)) \right|^p + \left| (\tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i)) \right|^p + \left| (\tilde{A}^i_\pi(x) - \tilde{B}^i_\pi(x)) \right|^p} \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

Where $\tilde{A}^i_\pi(x) = 1 - \tilde{A}^i_\mu(a_i) - \tilde{A}^i_\nu(b_i)$; $\tilde{B}^i_\pi(x) = 1 - \tilde{B}^i_\mu(c_i) - \tilde{B}^i_\nu(d_i)$; $1 < p < +\infty$ and $n = 4, p = 2$

= 0.7253

	Cheng Kim	Hong& Chen	Li& Kacprzyk	Szmidt &
Set A	0.8742	0.8665	0.8482	0.7918
Set B	0.8872	0.8722	0.8504	0.7253

Among these methods the similarity measures for generalized trapezoidal intuitionistic fuzzy number based on Szmidt & Kacprzyk has the lesser value comparing with the others. Therefore it has the high degree of similarity.

5. Some Properties of Similarity Measure based on Szmidt & Kacprzyk[12]

i) $0 \leq S(\tilde{A}^i, \tilde{B}^i) \leq 1$

$$S_{SK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left(\left| \tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i) \right|^p + \left| \tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i) \right|^p + \left| \tilde{A}^i_\pi(x) - \tilde{B}^i_\pi(x) \right|^p \right)} \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

It is clear that $0 \leq S(\tilde{A}^i, \tilde{B}^i) \leq 1$

(ii) $S_{SK}(\tilde{A}^i, \tilde{B}^i) = S_{SK}(\tilde{B}^i, \tilde{A}^i)$

$$S_{SK}(\tilde{A}^i, \tilde{B}^i) = \left[1 - \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left(\left| \tilde{A}^i_\mu(a_i) - \tilde{B}^i_\mu(c_i) \right|^p + \left| \tilde{A}^i_\nu(b_i) - \tilde{B}^i_\nu(d_i) \right|^p + \left| \tilde{A}^i_\pi(x) - \tilde{B}^i_\pi(x) \right|^p \right)} \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}$$

$$S_{SK}(\tilde{B}^i, \tilde{A}^i) = \left[\sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left(\left| \tilde{B}^i_{\mu}(c_i) - \tilde{A}^i_{\mu}(a_i) \right|^p + \left| \tilde{B}^i_{\nu}(d_i) - \tilde{A}^i_{\nu}(b_i) \right|^p + \left| \tilde{B}^i_{\pi}(x) - \tilde{A}^i_{\pi}(x) \right|^p \right)} \right] \times \frac{\min\left(\frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}, \frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}, \frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}\right)}$$

Where $\left| \left(\tilde{A}^i_{\mu}(a_i) - \tilde{B}^i_{\mu}(c_i) \right) \right| = \left| \left(\tilde{B}^i_{\mu}(c_i) - \tilde{A}^i_{\mu}(a_i) \right) \right|, \left| \left(\tilde{A}^i_{\nu}(b_i) - \tilde{B}^i_{\nu}(d_i) \right) \right| = \left| \left(\tilde{B}^i_{\nu}(d_i) - \tilde{A}^i_{\nu}(b_i) \right) \right|,$

$$\left| \left(\tilde{A}^i_{\pi}(x) - \tilde{B}^i_{\pi}(x) \right) \right| = \left| \left(\tilde{B}^i_{\pi}(x) - \tilde{A}^i_{\pi}(x) \right) \right|$$

$$\Rightarrow S_{SK}(\tilde{A}^i, \tilde{B}^i) = S_{SK}(\tilde{B}^i, \tilde{A}^i)$$

$$(iii) S_{SK}(\tilde{A}^i, \tilde{B}^i) = 1 \Leftrightarrow \tilde{A}^i = \tilde{B}^i$$

$$S_{SK}(\tilde{A}^i, \tilde{B}^i) = \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left(\left| \tilde{A}^i_{\mu}(a_i) - \tilde{B}^i_{\mu}(c_i) \right|^p + \left| \tilde{A}^i_{\nu}(b_i) - \tilde{B}^i_{\nu}(d_i) \right|^p + \left| \tilde{A}^i_{\pi}(x) - \tilde{B}^i_{\pi}(x) \right|^p \right)} = 1 \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)} = 1$$

$$\Rightarrow S_{SK}(\tilde{A}^i, \tilde{B}^i) = 1$$

Now if $S_{SK}(\tilde{A}^i, \tilde{B}^i) = 1$

$$\left[1 - \sqrt[p]{\frac{1}{4n} \sum_{i=1}^n \left(\left| \tilde{A}^i_{\mu}(a_i) - \tilde{B}^i_{\mu}(c_i) \right|^p + \left| \tilde{A}^i_{\nu}(b_i) - \tilde{B}^i_{\nu}(d_i) \right|^p + \left| \tilde{A}^i_{\pi}(x) - \tilde{B}^i_{\pi}(x) \right|^p \right)} \right] \times \frac{\min\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)}{\max\left(\frac{w_{\tilde{A}^i} + u_{\tilde{A}^i}}{2}, \frac{w_{\tilde{B}^i} + u_{\tilde{B}^i}}{2}\right)} = 1$$

$$\Rightarrow \tilde{A}^i_{\mu}(a_i) = \tilde{B}^i_{\mu}(c_i); \tilde{A}^i_{\nu}(b_i) = \tilde{B}^i_{\nu}(d_i); \tilde{A}^i_{\pi}(x) = \tilde{B}^i_{\pi}(x)$$

$$(i.e) \tilde{A}^i = \tilde{B}^i$$

6. Raking Distance Measure between Fuzzy Numbers

In this section we proposed a new ranking function and ranking distance measure for two Fuzzy numbers.

6.1 Ranking Function of Fuzzy Number

Let \tilde{A}^i be the generalized intuitionistic trapezoidal fuzzy number

$$(i.e) \tilde{A}^i = [(a_1, a_2, a_3, a_4; w_{\tilde{A}^i})(b_1, b_2, b_3, b_4; u_{\tilde{A}^i})]$$

then the ranking function can be defined as

$$R(\tilde{A}^i) = \frac{(a_1 + a_2 + a_3 + a_4 + b_1 + b_2 + b_3 + b_4)(w_{\tilde{A}^i} + u_{\tilde{A}^i})}{16}$$

6.2 Ranking Distance Measure

The ranking distance measure between any two intuitionistic fuzzy number is defined as

$$R_d = |R(\tilde{A}^i) - R(\tilde{B}^i)|$$

Where $R(\tilde{A}^i)$ and $R(\tilde{B}^i)$ denote the ranking function of fuzzy number \tilde{A}^i and \tilde{B}^i .

6.3 Illustrations

Example:1

$\tilde{A}^i = [(0.65, 0.74, 0.75, 0.81; 0.4)(0.6, 0.7, 0.77, 0.84; 0.3)]$ and
 $\tilde{B}^i = [(0.59, 0.69, 0.7, 0.8; 0.6)(0.58, 0.65, 0.72, 0.82; 0.2)]$ be two TrIFNs then their ranking distance is

$$R(\tilde{A}^i) = \frac{(a_1 + a_2 + a_3 + a_4 + b_1 + b_2 + b_3 + b_4)(w_{\tilde{A}^i} + u_{\tilde{A}^i})}{16} = 0.2564$$

$$R(\tilde{B}^i) = \frac{(c_1 + c_2 + c_3 + c_4 + d_1 + d_2 + d_3 + d_4)(w_{\tilde{B}^i} + u_{\tilde{B}^i})}{16} = 0.2775$$

$$R_d = |R(\tilde{A}^i) - R(\tilde{B}^i)| = 0.0211$$

Example:2

$\tilde{A}^i = [(0.36, 0.48, 0.55, 0.65; 0.7)(0.26, 0.4, 0.6, 0.8; 0.2)]$ and
 $\tilde{B}^i = [(0.49, 0.5, 0.63, 0.75; 0.5)(0.3, 0.5, 0.69, 0.84; 0.3)]$ be two TrIFNs then their ranking distance is

$$R(\tilde{A}^i) = \frac{(a_1 + a_2 + a_3 + a_4 + b_1 + b_2 + b_3 + b_4)(w_{\tilde{A}^i} + u_{\tilde{A}^i})}{16} = 0.2306$$

$$R(\tilde{B}^i) = \frac{(c_1 + c_2 + c_3 + c_4 + d_1 + d_2 + d_3 + d_4)(w_{\tilde{B}^i} + u_{\tilde{B}^i})}{16} = 0.2350$$

$$R_d = |R(\tilde{A}^i) - R(\tilde{B}^i)| = 0.0044$$

7. CONCLUSION

We proposed a similarity for trapezoidal intuitionistic fuzzy number, based on four different researchers, Cheng, Hong and kim, Li and Chen, Szmidt and Kacprzyk. Two sets of illustrations are given for the proposed method. Comparison is made between these methods. It is observed that among them szmidt and kacprzyk has the high degree of similarity and some properties for this method have also been derived. Furthermore we proposed a ranking function and ranking distance measure for an intuitionistic fuzzy number.

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A COMPARATIVE ANALYSIS OF SPEECH WATERMARKING FOR VARIANT FRAME SEGMENTATION BASED ON LINEAR PREDICTIVE ANALYSIS

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ABSTRACT

Speech watermarking is a functioning research area from the most recent decades. Digital speech watermarking is a hearty method to cover up and consequently secure the information such as speech and audio contents from any purposeful or accidental control over the transmission. As far as some signal attributes, including bandwidth, voice/unvoiced, and creation model, a digital speech signal is unique concerning audio, music, and other offbeat signals. It consistently guesses the hidden signals that should be robust and imperceptible within the cover data. To serve its robustness, and imperceptibility, the watermark data has accommodated the speech components. In this paper, we have presented a comparative analysis of the speech watermarking technique based on the LPA method. The results of the existing method have been discussed based on BER, SNR, and capacity for speech/audio signals. Based on these methods, we have also compared them with the existing audio and speech watermarking scheme. They have maintained the trade-off among robustness, imperceptibility, and capacity. The paper has also discussed open research concerns related to digital speech watermarking.

Keywords: BER, LP Residual, LPA, Speech watermarking, Speech production model, SNR.

I. INTRODUCTION

In the modern era, digital content is appropriated via the Internet by numerous set-up, associations, and users in the community. In any case, the safety, authentication, and copyright comfort of the media are consistently the principal concerns for them. Digital watermarking is the best possible procedure to ensure and screen digital media. The speech signals are having differences from audio concerning factors like creation model, recognition, data transmission, loudness, and intensity. Digital watermarking strategies have truly been utilized to guarantee security as far as possession assurance and tamper proofing for a wide assortment of information positions. This incorporates images, audio, video [1], natural language processing software, social databases [2], and that's only the tip of the iceberg.

The current watermarking strategies are founded on either the spatial or frequency domain. However, in both cases, the time and frequency characteristics of the watermark do not relate to the attributes of the speech signal. It might cause watermark discernibility because the watermark will be available in the time and frequency areas where speech segments do not exist. The watermark in that space is demonstrated to follow specific speech parts in the chosen region. The watermark is made by displaying the time and frequency characteristics of succession as per the specific time and frequency speech components. The primary issue in these applications is the reversal of time and frequency dissemination. The Wigner distribution has been utilized to make the time-shifting filter that identifies the help of a mono segment chirp signal. However, it cannot be utilized on account of multi-segment speech signals. Additionally, some fascinating ways to deal with signal components extraction from the time and frequency plane [3].

There is a trade-off among capacity, imperceptibility, and robustness in watermarking. Expanding one of the elements can diminish different elements. Although these variables must be viewed as when planning the digital speech watermarking method [4], contingent upon the application, one of them can be included. For instance, in air traffic control, the limit and payload are progressively significant because of the measure of data that must be sent. However,

for security improvement in speaker acknowledgment, more concern is on the robustness of watermarking.

The speech signal is analyzed to the audio signal from three perspectives, such as spectral structure, temporal structure, and semantic structure. The concise inequality is conferred as follows:

- 1) **Tonality:** In contradiction to the audio signal with numerous tones, each with appropriate dissemination of harmonics; speech has robust voice tonality.
- 2) **Substitute sequence:** The speech signal has a substitute sequence of sound segments which are assigned through its spectrum more randomly than in music because speech sound is noise-allied, whereas music is tonal in aspect.
- 3) **Bandwidth:** The potential of the speech frequency is usually positioned in the low frequency less than 5 kHz.
- 4) **Fundamental frequency:** Every person has unambiguous frequencies, which are accounted for speaker acceptance. Although the exclusive parameters for an unambiguous speaker are not strictly manifested in all cases, they can still influence the performance of speaker assimilation.
- 5) **Zero-Crossing Count (ZCC):** Zero Crossing Count is utilized in speech preparation. The speech signal has a thin data transmission (0 Hz to 4 kHz).

Speech veiling is regularly difficult to hear one sound when a much stronger sound is accessible. The articulation for this technique is disguising. The veiling sway is a property of the HAS which feasibly sets a sound level lower cut-off or edge on hear-able observation. Henceforth, any commotion or speech parts underneath as far as possible won't be seen by the crowd. Re-enactments and listening tests show that the measure of lessening from the first range be around 13 dB. In a wide-band speech, frequencies inside the extent of 50 Hz to 7 kHz are then able to embed data. The spread speech is partitioned into A equivalent casings of (4, 8, 16 or 20) milliseconds B test each, for example, $c_d(a, b)$, $a = 1, \dots, A$ and $b = 1, \dots, B$. The speech range is created by applying the DFT on $c_d(a, b)$ [5]:

$$C_d(a, t) = \sum_{b=1}^B c_d(a, b) e^{-2j\pi tb/B}, \quad 1 \leq t \leq B \quad (1)$$

$$= |c_d(a, t)| e^{j\varphi(a, t)} \quad (2)$$

Presently, $c_d(a, b)$ being real esteemed, its Fourier transform signal fulfils the symmetrical condition.

$$|C_d(a, t)| = |C_d(a, B - t)| \quad (3)$$

For a sampling frequency of 16 kHz, a 4 ms frame time produces 64 samples. The resolution of every frequency extent segment is equivalent to $16000/64 = 250$ Hz. Hence, the primary frequency segment that could be utilized for concealing information will be 250 Hz rather than 50 Hz. If consider the Fourier symmetry feature of the spectrum, the number of standardized frequencies or the number of areas to conceal secret information inside each frame will be from F_{\min} to F_{\max} and it has calculated using eq. 4 and 5 [5] [6].

$$F_{\min} = \frac{64 \times 250}{8000} = 1 \quad (4)$$

$$F_{\max} = \frac{64 \times 7000}{8000} = 28 \quad (5)$$

Subsequently, every frequency segment area, a character or part of a character could be inserted. There are four key parameters control which are listed as follows.

- 1) Threshold: It is picked to set a balance between as far as possible and the watermarked speech quality. High edge regard is expected to decrease the hiding limit of an edge yet notwithstanding upgrade the watermarked speech quality and the other way around.
- 2) Frequency mask: To make the noise made by the embedded information inaudible, we utilize a mask 13 dB beneath the energy of $|C_d(t)|$. Therefore, information embedded beneath the concealing masking threshold will not be perceived by audience members, $\text{Mask}(a, t) = 20\log(|C_d(a, t)|) - 13\text{dB}$. Presenting the covering properties of the speech ($\text{mask}(a, t)$) ought to be done cautiously. The mask figuring route in both procedures should prompt a similar worth.
- 3) FFT resolution: Diminishing the frame size will diminish the frequency resolution and leads consequently to higher energy frequency receptacles.
- 4) Hiding band capacity: Shifting the base and the most extreme concealing band areas influences firmly the concealing capacity.

Table 1 shows the fundamental contrasts between speech and audio watermarking necessities and it consists of three columns. The first column shows precedent in the watermarking filed, the second part of this table represent speech watermarking characteristics on each precedent, and the last column consists of audio watermarking characteristics on each precedent. Table 1 represents a comparison based on different characteristics. Thus, audio watermarking technology may not be a decent possibility to apply for watermarking the speech signal because of the need to utilize more bandwidth and more amount of distortion.

Table 1: Resemblance between speech and audio watermarking

Precedent	Digital watermarking	
	Speech Watermarking	Audio Watermarking
Channel noise	May be high	Must be very low
Bandwidth	Narrowband (4kHz)	Wideband (20kHz)
Allowed distortion	Low	Must not be perceivable
Processing delay	Very low	No concern
Frequency spectrum	Random and noisy	Noiseless and Tonal
Imperceptibility	May be low	Must be high

In this paper, theoretically, we have discussed a comparative study on speech watermarking techniques for variant frame segmentation based on the LPA method. Also, we have included the issues and various kinds of attacks like knowingly or unknowingly. It has been concluded that the LPA method may be more appropriate than other methods. The proposed method may give better results.

In this paper, we have mentioned different sections that contain related contents as follows: Section II represented a review of existing audio and speech watermarking approaches. The proposed work and it has related mathematical formula have discussed in section III. Results have been compared, and its discussion has explained in section IV. Finally, concluded our work in section V.

II. REVIEW OF EXISTING SPEECH/AUDIO WATERMARKING APPROACHES

Speech and audio watermarking schemes are working with different methodologies like spread spectrum (SS), auditory masking, patchwork, transformation, and parametric mod- elling. In addition to speech watermarking approaches, four primary embedding techniques are generally

applied for watermarking: Least Significant Bit (LSB) [7] substitution, quantization [8], addition, and multiplication. In this section, we have considered all the related aspect of speech and audio watermarking, which is as follows:

Wang et al. [9] have presented the watermarking technique for audio signal based on the multi-resolution analysis of Discrete Cosine Transformation (DCT) and Discrete Wavelet Transformation (DWT) methods. The transform-domain approach of audio watermarking can always cater to a higher audio aspect and much more robustness than audio watermarking positioned on time-domain. This is because they can entirely take lifting of signal essence and auditory equity. Singh et al. [10] presented the watermarking scheme of the audio signal for compacted space. The cover audio signal has been customized into two sub-segments, and the DCT factors of the sub-segments are sorted out. The coefficients appropriate to DCT has determined recurrence area are then isolated into various edge sets. The watermarks are implanted into the favored DCT outline combines by tweaking the coefficients.

Bhat et al. [11] have represented a blind, robust audio watermarking scheme based on the stuffy frequency transforms, such as Fast Fourier Transform (FFT), DCT, and DWT are appropriate to disintegrate a signal into a typical or essential set. DWT is the most prevailing or traditional technique for audio watermarking. DWT produces an analog signal in the time-frequency domain with sine and cosine functions, and the coefficients have been estimating using recursive algorithms, e.g., Mallat's pyramid algorithm. Hu et al. [12] introduced a blind speech watermarking technique have based on DWT and the adaptive mean modulation (AMM) method. In this, they have embedded the watermark bits and synchronization code into selected DWT sub-bands. Mean modulation has recursively derived from preceding DWT coefficients by using step quantization. The proposed alignment acquiesces for the direct assignment of embedding fortitude. The analysis of consequence spectacle is that the recommended DWT-AMM is capable of perpetuating speech quality at a level practically identical to that of two other DWT-based techniques, which additionally work at a payload limit of 200 bits for each second.

Hofbauer et al. [13] have presented a blind watermarking mechanism committed to speech signals, which they developed to exploit the fact that human ears are least sensitive toward the period of non-voiced speech. The approach was fixated on reinstating the excitation signal of an autoregressive depicted in non-voiced sections. They have evaluated the result using SNR, and BER on various speech files. Lei et al. [14] proposed a breath sound-based watermarking system. Their plan endorsed the utilization of lifting wavelet transform (LWT), DCT, singular value decomposition (SVD) alongside the utilization of particle swarm optimization (PSO) way to deal with upgrade the quantization ventures for dither modulation. The performed simulation work has based on SNR, BER, and NC.

Merrad et al. [15] have presented blind hybrid speech watermarking techniques based on DCT and DWT methods. This hybrid concept met all the digital requirements and the watermark insertion in the low-frequency area of the DWT sub-band where the human system is very less sensitive. The DWT has administered to each segment of the signal, and then, to get hybrid coefficients of each segment of the speech signal, DCT has applied to wavelet coefficients. Finally, they got the watermarked speech signal. They evaluated robustness and Imperceptibility using BER, SNR, and NC, and it shows the quality has high. Liu et al. [16] proposed a content authentication algorithm based on the Bessel Fourier method for speech signals. They provided a robust technique against de-synchronization attack and solve security issues. The simulation result shows that the methods give high robustness and detect the temper location very easily.

Sarreshtedari et al. [17] have introduced an advanced self-embedding and self-recovery speech watermarking scheme. Using this method, they have solved the tempering problems and easy to detect the modified location. They focused on hash and speech codec generation for achieving the efficient watermarking method. They also solve the issues of authentication and tampering detection. The empirical outcome appears that the self-embedding concept has more useful methods for high quality without any significant loss.

Yong et al. [18] have presented a new method using the SS-based sound watermarking approach. This procedure prevalent installing limit, which guaranteeing sufficient impalpable and robustness. The doubtful inserting limit has polished through after frameworks. First, installing different watermark bits in a solitary sound piece. Secondly, compacting host signal intercession on watermark extraction, and the last, adaptable obliging pseudo number course of action adequacy in watermark embedding subject to the estimation of sound areas. At the receiver side, the implanted watermark has separated by partner the watermarked signal with the spreading progression the watermark extraction system utilized to result in the signal impedance. This method has performed very well at high embedding capacity, and the result of factors like robustness and imperceptibility has high.

III. LPA based SPEECH WATERMARKING AND ITS MATHEMATICAL PRELIMINARIES

A. *Speech production model*

Speech has been spawn when air is exhaled from the lungs and passes through the esophagus, vocal bands, mouth, and nasal tract. This mechanism can be modelled as:

$$C(x) = O(x)P(x)Q(x) \quad (6)$$

Where, $C(x)$ is the original speech signal, $O(x)$ is an impulse train for voiced or white noise for unvoiced, $Q(x)$ is formulated in eq. 7, and $P(x)$ is the response of the vocal tract systems.

$Q(x) = 1 - \alpha x^{-1}$ (7) Where, α is a constant ($0.9 < \alpha < 1$), $x = re^{j2\pi f/F_s}$ and F_s is the sampling frequency. The excitation source and vocal tract can be abstracted from the speech signal by employing linear predictive analysis (LPA). LPA can show quasi-stationary (somewhere in the range of 20 and 30 ms) some portion of a speech signal as a linear combination of previous samples. LPA models the vocal tract framework with N^{th} order real linear predictive coefficients (LPCs) [$p_1, p_2, p_3, \dots, p_N$] as in eq. 8 and LP residual error brings information about the excitation source as in eq. 9.

$$S'(q) = \sum_{j=1}^N p_j s(q-t) \quad (8)$$

$$\text{LP residual error} = S(q) - S'(q) \quad (9)$$

N is delineating based on sampling frequency F_s .

$$N = (F_s/1000) + 2 \quad (10)$$

The speech production is conceptualized as the change of non-verbal subjective substance into verbal expressions. This change can be disintegrated into a multi-stage arrangement of sequence and execution forms. Speech production in a specific circumstance starts with the execution of the sequence deciphering program. The use of the program prompts the development of an intelligent portrayal of the situation. In addition to the stipulation of the situational boundaries significant for deciding the articulation the understanding of the pattern also prompts the initiation of explanatory information.

B. Linear Predictive Analysis (LPA)

Linear predictive analysis has been widely utilized in different applications of speech processing. The conventional linear prediction techniques, however, it has been known to possess different wellsprings of confinements. These impediments are for the most part seen during voiced portions of speech. Linear prediction strategy looks to locate an ideal fit for the log-envelop of the speech range in the least-squares sense. Since the source of voiced speech is quasi-periodic, the peaks of linear prediction spectral estimation are profoundly impacted by the frequency of pitch sounds. In high pitched speech signals, such estimation is troublesome because of the wide spacing of harmonics. To contemplate the acoustic attributes of either the vocal tract or the vocal crease, the resonance frequencies of the vocal tract must be assessed precisely. Thus, the various adjustments to the essential formulation of linear prediction analysis have been done.

The speech production component, including glottal excitation, vocal tract reaction, also stable radiation, can be demonstrated by a period differing digital channel whose system function $P(x)$.

$$P(x) = \frac{C(x)}{W(x)} = \frac{O(x)}{1 - \sum_{j=1}^n p_j x^{-j}} \quad (11)$$

Where $W(x)$ and $C(x)$ are z-transforms of the excitation $w(n)$ and the speech signal $c(n)$ the parameter G is a gain factor. The residual error is also known as prediction error $e(n)$ is given as:

$$e(n) = s(n) - \sum_{j=1}^n p_j s(n-j) \quad (12)$$

The energy of the error sequence that represents the total squared prediction error is E_{sq} .

$$E_{sq} = \sum_n e^2(n) = \sum_n \{s(n) - \sum_{j=1}^n p_j s(n-j)\}^2 \quad (13)$$

The coefficient of prediction p_k can be determined by minimizing the value of E_{sq} .

$$\frac{\Delta E_{sq}}{\Delta p_j} = 0, \quad 1 \leq j \leq n \quad (14)$$

C. LP Residual Speech Signal

The speech creation instrument can be exhibited as a moderate time contrasting vocal-lot structure invigorated by a speedy fluctuating excitation source. The vocal-parcel system is carried on as a resonator and the semi occasional progression of air beats from the vibration of the vocal folds is a wellspring of the excitation signal. The speaker-express vocal-plot assortments are reflected, for example, type of resonances, and the excitation credits by sounds. The LP investigation with sensible forecast demand models the vocal-lot characteristics to the extent desire coefficients, or through cepstral coefficients enlisted from LP range. The blunder in the expectation called as LP extra sign involves the excitation source information. The LP leftover sign is motivation like in nature and having about level range. In time-space similar kind of throbs is clear both in replay discourse and LP leftover signs, indicating the motivation for ghastly area dealing with towards recognizing replay signal. In phantom space, it will in general be seen that the LP range of certified and replay signals are a ton of comparability, basically undefined. The formants are practically flawless in replay signals. The genuine LP residual spectra are almost level however the general flatness nature is fundamentally disturbed in comparing replay range, especially in the lower range of frequency (0-700 Hz) and higher range of frequency (2.5-5 kHz) sub-bands.

D. Analysis of LPA Spectral Estimation

The stationary and non-stationary techniques for linear prediction were formulated from a time-domain detailing. The similar typical conditions can be derived from a frequency domain definition. It will turn out to be certain that linear prediction is fundamentally a correlation sort

of analysis which can be drawn closer either from the time or frequency domain. The bits of knowledge picked up from the frequency domain analysis will prompt new applications for LPA.

1) *Stationary module:* The difference between original signal and the predicted signal also implies an error $e(n)$ as given in Eq. 12. Implementing z-transformation on eq. 12

$$E(x) = [1 + \sum_{j=1}^n p_j x^{-j}] S(x) = B(x) S(x) \quad (15)$$

where $B(x)$ is termed as the inverse filter or the prediction error filter; $E(x)$ and $C(x)$ are the z transforms of $e(n)$ and $c(n)$ correspondingly. However, $e(n)$ can be seen as the consequence of passing $c(n)$ through the inverse channel $B(x)$. On applying Parseval's theorem the total error to be minimized can be given as

$$E(x) = \sum_{n=-\infty}^{\infty} e_n^2 = \frac{1}{2\pi} \int_{-\pi}^{\pi} |E(e^{jw})|^2 dw \quad (16)$$

by estimating $E(x)$ on $x = e^{jw}$ obtained $E(e^{jw})$.

$P(w) = |C(x)|^2 = |C(e^{jw})|^2$ (17) where, $P(w)$ implies the power spectrum of a signal. Eq. 15 can be written as

$$E = \frac{1}{2\pi} \int_{-\pi}^{\pi} P(w) B(e^{jw}) B(e^{-jw}) dw \quad (18)$$

The minimum squared error E_{sq} can be obtained by using Eqs. 17 and 18.

2) *Non-stationary module:* The original signal $c(n)$ and error signal $e(n)$ are assumed to be non-stationary. Suppose $r(t)$ be the non-stationary auto-correlation of original signal $c(n)$ can be given as

$$\sum_{j=1}^n p_k r(j-k) = r(j), \quad 1 \leq j \leq n \quad (19)$$

The non-stationary spectrum $N(w, w')$ of original signal $c(n)$ can be defined as

$$N(w, w') = \sum_{t'=-\infty}^{\infty} \sum_{t=-\infty}^{\infty} r(t, t') e^{-j(wt - w't')} \quad (20)$$

by reverse Fourier transform $r(t)$ can be recovered from $N(w)$. So in the time domain minimizing the error variance for time $n = 0$ given by

$$E = \left(\frac{1}{2\pi}\right)^2 \int_{-\pi}^{\pi} \int_{-\pi}^{\pi} N(w, w') B(e^{jw}) B(e^{-jw'}) dw dw' \quad (21)$$

This gives the error minimization in the time domain with the non-stationary module.

3) *LP Spectral Analogous:* The section deals with the analysis of signal spectrum $P(w)$ Eq. 17 is approximated by the all-pole model which can be written as

$$P(w) = |H(e^{jw})|^2 \quad (22)$$

Where, $x = e^{jw}$ applying in eq. 22, the power spectrum $P(w)$, finally written as

$$P(w) = \frac{|E(e^{jw})|^2}{|B(e^{jw})|^2} \quad (23)$$

This implies the genuine error signal $e(n)$, is being approximated by another signal that has a flat range, for example, a unit impulse, white noise, some other signal with a flat range. The filter $B(x)$ is at times known as a whitening filter since it endeavors to deliver an output signal $e(n)$.

IV. RESULT AND DISCUSSION FOR SPEECH WATERMARKING

The speech and audio signal is identified with vitality fixation, which varies from 4 kHz to 8 kHz for the speech signal and is stretched out to 20 kHz for the audio signal. Robustness against attack is a significant watermarking prerequisite. Predominantly robustness against every single imaginable attack and their consolidation might be difficult to accomplish. The analysis was made concerning the different attacks on the digital watermarking frameworks and their classification.

Table 2 shows different attacks and their descriptions on the digital watermarking field. Table 2 consists of two columns; the first column represents the type of attacks used in watermarking, and the second column consists of the description of the corresponding attack. Generally, attacks are performing by the intruders for removing, modifying, alteration, resizing, adding noise, etc. watermark bits from the contents.

Table 2: Attack categories and specifications

Attacks	Description
Requantization	Watermarked signal Quantized to 8bit/sample
Amplitude scaling	The watermarked signal is scaled by 0.85
Resampling	Up-sampling, down-sampling
High-pass filtering	High pass filter with cut-off frequency 1kHz
Noise corruption	Addition to zero-mean white Gaussian noise
Modification	Reverse, zero cross (zc), Exchange
Jittering	Deleting or adding sample randomly
Pitch shifting	Variation in frequency
MPEG compression	Coding/decoding performed with distinct bit rates
Random cropping	Samples get cropped
Echo addition	Lag by 50 ms and decay to 5%
G.722 speech coding	Encoding and decoding of the signal
Band-Pass Filter	Passage for particular band frequency
AWGN	Add uniform frequency Gaussian distribution
Denosing	Denoise the watermarked signal
Amplify	Increasing the amplitude of the watermarked signal

Table 3 represents a comparison of speech and audio watermarking techniques and their parameters. Table 3 contains four columns; each column shows the digital requirements of speech and audio watermarking techniques, i.e., robustness, capacity, and impermeability. The first column shows methods are used in watermarking, the second column is consists of robustness in terms of percentage of BER, the third column represents imperceptibility in terms of SNR, and the last column shows payload capacity in terms of bit per second. The percentage of BER has represented error between original and watermarked signals. When the percentage of BER has a lesser value, then it means that the error has become less. The SNR values show the imperceptibility/quality of watermarked and extracted watermark signals. When SNR values have a higher value, then it indicates high imperceptibility. The payload capacity represented the embedding strength. Robustness and imperceptibility values depend on strength of the watermark. The trade-off among these three parameters is more important for the optimal solution.

Table 3: The comparison of important speech and audio watermarking techniques and their related parameters

Speech watermarking			
Watermarking techniques	Robustness	Imperceptibility	Capacity
	BER %	SNR	bps
Spread spectrum [18]	5	22	24
Frequency masking [19]	0.004	28	140
Temporal masking [20]	26	40	360
Bitstream domain [21] [22]	N/A	20	1600
AR model [23]	8.5	32	680
Parametric modeling [24]	4	∞	5
Audio watermarking			
LWT and SVD [14]	15	22	170
SVD-DCT [25]	0.20	28.5	44
DWT [3]	1.9	24	28
Adaptive DWT-SVD [12]	13.5	24.56	46
LOT-RDM [26]	0	63	690
SVD-DWT [27]	0.58	38.10	260

In any case, different applications accentuate inaudibility and imperceptibility. In numerous applications, the perceptually superfluous portions of the speech are endeavored to be evacuated. This evacuation has an essential defy for speech watermarking techniques to save its robustness. The watermarking scheme ought to happen perceptually in each significant speech part. The impediment on the quantity of perceptually pertinent portions is another concern for watermarking. In certain applications, the capacity turns out to be increasingly imperative to accomplish. Moreover, the capacity of speech watermarking is decreased when contrasted with that of audio because of the strait useful bandwidth. This embedding capacity can be additionally decreased when the speech codec approach has been applied.

V. CONCLUSIONS

A comprehensive analysis of digital speech watermarking is administered in this paper. We efficiently categorized the extant speech watermarking techniques with meticulous analysis of the embedding as well as extraction patterns and significant features of each considered work utilizing conventional models. At that point, we competently explored the most significant exhibition criteria for speech watermarking frameworks, i.e., robustness, capacity, and imperceptibility. Specifically, all the current medications to ensure satisfactory imperceptibility properties are epitomized and investigated. To contemplate the robustness, we consider an extensive archive of attack which provide as an association set of exceptionally significant attack that has been considered in the current work. We affirm that this paper may be conducive for analysts who are engrossed in developing and devise new methods. Theoretically, we have explored the comparative analysis among various concepts and also proposed an LPA method. In the future, we have to focus on the implementation of the LPA method in the frequency domain, and it may give better results, compared to the existing method.

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A HYBRID TECHNIQUE WITH MICRO-GIRD USING VIRTUAL INERTIA FOR SMALL SIGNAL AND TRANSIENT RESPONSE

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ABSTRACT

A hybrid technique has been discussed in this paper for improving the transient and small signal response in microgrid (MG) using virtual inertia. The proposed hybrid technique is the combined performance of both the Whale Optimization Algorithm (WOA) and Ant Lion Optimization (ALO) algorithm and it is named as AWOALO. The mentioned techniques are the optimization techniques, which are used for enhancing the transient and small signal response in microgrid (MG). The objective of the AWOALO technique is to optimize the control parameters for regulate the changes occurred in the grid parameter such as voltage and frequency based on the variations of inertia. Here, the WOA is implemented to tune the parameters of the virtual synchronous generator (VSG) units in order to achieve the objective function. The searching behaviour of the WOA is modified by using the hunting behaviour of ALO. This hunting behaviour of ALO is used to achieve the objective function with less computational complexity. The AWOALO technique with the VSG control scheme ensures the smooth response, accurate performance while considering the constraints of voltage angle deviation. The AWOALO technique is actualized in MATLAB/Simulink and the results are examined with two test cases and compared with various solution techniques such as base method, ant lion optimization (ALO) and whale optimization algorithm (WOA). The comparison results demonstrate the superiority of the AWOALO technique and confirm its potential to solve the problem.

Keywords: Transient and small signal response, synchronous generator (VSG), smooth response, constraints of voltage angle deviation.

INTRODUCTION

Usage of renewable energy sources (RESs) for power generation is an expanding enthusiasm because of the environmental concerns. Distributed generation (DG) units including RESs or energy storage are a practical alternative to enhance the utilization and stability [1, 2]. Here, at distribution level the micro grids (MGs) give an appropriate infrastructure to coordinating RESs to the grid [3]. Regularly inverter based distributed generators (DGs), energy storage units, and distributed loads are found in the MG that may work in grid- connected mode or off-grid mode [4]. Through power electronic converters different sorts of DGs interconnection, for example, photovoltaic (PV) panels, wind turbines, fuel cells, micro turbines, and energy storage to the network is done [5]. Customarily, by frequency-real power and voltage-reactive power droop controllers the power sharing among these converters in a microgrid is acknowledged [6]. Additionally, primary worries for MG operation are as per the following, because of less inertia or insignificant kinetic energy of inverter based distributed energy resources (DERs), control of frequency and stability of the system [7, 8].

Inverter-based units has the most difficult issue is to inverter synchronization with the grid and notwithstanding when disturbances or changes happen to keep it in step with the grid [9, 10]. Inside the proper time interval because of the absence of satisfactory balancing energy injection a power system with a major segment of inverter based DGs are inclined to instability [11]. In the control scheme of inverter-based DGs the arrangement can be discovered [12]. It can imitate

the conduct of a real synchronous machine by controlling the switching pattern of an inverter. This control plot is called virtual synchronous generator (VSG) [13]. The power electronics interface of the DG unit is controlled in an approach to display a reaction like that of a synchronous machine to changes and disturbances in the system with the idea of VSG [14]. In view of its power command for its terminal voltage VSG control generates amplitude, frequency, and phase angle and it can add to the direction of grid voltage and frequency [15]. Likewise, synchronizing units, for example, phase-locked loops (PLLs) can be expelled [16]. Ordinarily, to compensate small disturbances and enhance the quality of the grid voltage in VSG different strategies and optimization algorithms are utilized. They are Lyapunov stability function, sliding discrete Fourier transform (SDFT), fuzzy logic controller, synchronization algorithm, genetic algorithm (GA), PSO algorithm and ABC algorithms [17]. Into the grid, a

precise synchronization algorithm conveyed the maximum power [18]. The solution is enhanced by utilizing fuzzy and GA [19]. The PSO has been demonstrated to have great global inquiry capacity [20]. Yet, still, a few complexities are displayed, for example, tedious as they are iterative and need heavy computation burden and slow convergence. A hybrid technique has been discussed in this paper for improving the transient and small signal response in microgrid (MG) using virtual inertia. The proposed hybrid technique is the combined performance of both the Whale Optimization Algorithm (WOA) and Ant Lion Optimization (ALO) algorithm and it is named as AWOALO. The mentioned techniques are the optimization techniques, which are used for enhancing the transient and small signal response in microgrid (MG). The objective of the AWOALO technique is to optimize the control parameters for regulate the changes occurred in the grid parameters such as voltage and frequency. Rest of the paper is isolated as takes after: Section 2 introduces the literature review and background of the research work is quickly portrayed. Section 3 depicts the structure of virtual synchronous generator (VSG). Microgrid (MG) with multiple VSG units is clarified in Section 4. Section 5 clears up the multi-VSG stability assessment tool. Section 6 depicts the VSG parameter tuning by proposed technique. Section 7 clears up the comparative investigation and appraisal. Conclusions are drawn in the Section 8.

STRUCTURE OF VIRTUAL SYNCHRONOUS GENERATOR (VSG) SYSTEM

The structure of VSG system and the swing equation of VSG are clarified. The control block diagram of VSG units is depicted. A distributed resource is associated with the main power system by means of an inverter controlled with the VSG concept is considered in this scheme [30]. The swing equation of synchronous generators (SGs) is utilized as the heart of the VSG model.

$$P_i - P_o = J\dot{\phi}_m (d\phi_m \div dt) + \delta\Delta\phi \quad (1)$$

Here, input power (as same as the prime mover power in a synchronous generator) as p_i , output power of the VSG as p_o , moment of inertia of the virtual rotor as J , virtual angular frequency of the virtual rotor as ϕ_m , damping factor as δ .

$$\Delta\phi = \phi_m - \phi_{grid} \quad (2)$$

Here, the grid frequency or the reference frequency when the grid is not available as ϕ_{grid} . The output power and frequency are calculated using voltage and current signals measured at the terminals of VSG. Based on the deviation of frequency the governor model is implemented for input power command tuning which is shown in Fig 1. In each control cycle by solving the above equation (1), by passing through an integrator the momentary

φ_m is calculated and the virtual mechanical phase angle φ_m is produced. In Fig.1, $v_{rms, rated}$ as the voltage reference that determines the magnitude of voltage at the terminal of inverter. At the VSG terminal the implementation of automatic voltage regulator results in a regulated voltage. The sinusoidal duty-cycle in the form of $v_{ref} \sin(\varphi_m)$ because of the phase angle φ_m and the voltage magnitude references v_{ref} which is fed to the block of PWM to be compared with a 14 kilo Hertz carrier.

MICROGRID AND VIRTUAL SYNCHRONOUS GENERATOR UNITS

The nominal value of generators terminal voltage is 2 kV. The inertia J together value with ω_0 decides the VSG unit time constant. Mimicking a synchronous generator (SG), J is determined dependent on the following equation,

$$J = 2M_{inertia} B_{machine} / \omega_0^2 \quad (3)$$

Here, machine inertia constant as $M_{inertia}$, base power of the machine is represented as $B_{machine}$, system frequency as ω_0 . The $M_{inertia}$ parameter tells that the machine is able to supply the nominal load for which period of time solely based on the energy stored in the rotating mass. Although it depends on the size of machine and power, for synchronous machines $M_{inertia}$ the value typically varies between 2 and 10sec. By parameters of its second order differential equation the response of VSG at a specific output power and voltage

is determined they are the Eigen values ϵ_i (real part) and the λ_i as the damping ratio. Through the following equation set these parameters are related to J and ω_0 are derived as follows,

$$\epsilon_i = -\omega_0 / 2J \quad (4)$$

$$\lambda_i = \sqrt{p_{max, i} \cos(\sigma_{ig})} / 2J \omega_0 \quad (5)$$

$$\lambda_i = -\epsilon_i / \omega_0 \quad (6)$$

Here, maximum transferable power from i -th VSG bus to the grid is the $p_{max, i}$, voltage angle of i -th VSG with respect to the grid is the σ_{ig} and un-damped natural frequency of i -th VSG is the ω_{ni} . The parameters corresponding to the desired response of the system can be achieved by tuning J and ω_0 at any working conditions.

MULTI-VSG STABILITY ASSESSMENT TOOL

The multi-VSG stability assessment tool is quickly portrayed. The difference between SG rotor angles concerning the COI angle is watched for stability and optimization purposes in the traditional power systems. The system will be inclined to instability if the SG relative rotor angle surpasses a critical value. In addition, to locate the optimum configuration of the system and optimization method keeps all SGs RADs beneath the RAD critical value. The angle between the internal electromotive force and the terminal voltage is the rotor angle in a SG.

The synchronous reactance, armature resistance, and the current magnitude and power factor are the rotor angle of the SG depended. From the swing equation in the VSG control, the virtual rotor angle is ascertained, and is executed specifically as the angle of the terminal voltage of VSG. As it were, in the VSG system, the electromotive force, synchronous reactance, and armature resistance are not characterized but rather dissimilar to a SG. Along these lines the VSG rotor angle isn't accessible to be utilized in the considerations of stability.

In any case, rather than the SGs RAD in the micro grid for all generators the distinction between the voltage angle of a generating node as for a reference angle can be executed as VAD basis for the investigation of transient stability. VSG units contribute in the calculation of the angle of COI as the reference angle dependent on this thought which having a particular value of inertia, and in this manner, the generators VADs can be ascertained. The voltage angles at the VSG connected buses are dictated by the VSG control. The voltage angle pursues the load angle or rotor angle of the SG varieties and can be figured by a PLL unit for the SG-connected buses. In the calculation of the angle of COI and VADs voltage angles at VSG and SG buses are utilized. The generating bus voltage angle is meant as pursues,

$$\sigma_l = \phi_l \tau + \sigma_{oi} \quad (7)$$

All of the generators comprise an amount of inertia in the study system. Based on the VSG concept is assumed not to contribute in the frequency and regulation of angle, the generating units are not controlled for general application of this method. But they have zero value of inertia.

Here, maximum allowable VAD as σ_{max} . To legitimize this criterion there are a few points are depicted.

It ought to be made reference to that there is no general technique for assessing the large disturbance stability region of a dynamic system comprising of swing and power flow equations.

After a disturbance, the angle of one or a group of generators goes diverges from the rest of the system. The system saves its stability if the relative angle between the two groups of generators stays beneath 180° [31].

In practical power systems, the generator is tripped by out-of-step relay if the generator rotor angle regarding the COI angle surpasses a threshold value [36].

The esteem relies upon the modelling precision of the system and is chosen as 100, 120, 70, and 110°

for the limit of RAD in [31-35].

VSG OPTIMIZATION BY PROPOSED HYBRID METHODOLOGY

A hybrid optimization technique is proposed for enhancing the transient and small signal response in micro- grid utilizing virtual inertia. The proposed hybrid technique has the combined operation of both the whale optimization algorithm (WOA) and ant lion optimization (ALO) algorithm and it is named as AWOALO. The objective of the AWOALO technique is to optimize the control parameters for direct the changes happened in the parameters of grid, for example, voltage and frequency based on the variations of inertia. Here, the WOA is actualized for parameters tuning of the VSG units with the end goal to accomplish the objective function.

The AWOALO technique with the VSG control scheme guarantees the smooth response, accurate performance while considering the voltage angle deviation constraints. To find the objective function, the steps of WOA algorithm is cleared up.

Whale Optimization Algorithm:

The WOA is a newly developed meta-heuristic optimization algorithm proposed by Mirjalili [28] for numeric optimization. The central complexity among WOA and distinctive algorithms is the rules that upgrade the hopeful arrangements in every progression of streamlining. The WOA is roused by the bubble- net hunting procedure of humpback whales. In this paper, the

WOA is actualized for parameters tuning of the VSG units with the end goal to achieve the objective function. The steps are as follows,

Step 1: Initialization

Initialize the input parameters of VSG unit such as $\varepsilon_l, \lambda_l, \sigma_{coi}, \Delta\sigma_l, v_{rms}, v_{grid}, f_o, f_{grid}$

Step 2: Random Generation

After initialization process, randomly generate the gain parameters of PI controller such as K_p and K_i .

Step 3: Evaluation

Here, the objective function *Fitness* is to minimize the error function. By utilizing the accompanying condition, the error minimization value is inspected; in an optimization problem the objective function is derived as follows,

$$F = \min (F_1, F_2) \quad (8)$$

Here $F_1 = v_{rms} - v_{grid}$ for controlling the deviation of voltage, $F_2 = f_o - f_{grid}$ for controlling the deviation of frequency. Once the minimum objective function is achieved the process gets optimized and the corresponding parameters K_p, K_i are tuned. The searching behavior of the whale's optimization algorithm will be modified by using the ALO algorithm effective hunting behavior [29].

This searching behavior enhancement procedure used to achieve the objective function with less computational complexity. Hence the combination of these two algorithms is named as AWOALO technique. The steps for the hunting behavior of ALO technique is derived as follows,

Step 4: Hunting Process using ALO

Layer 1- Constructing Trap: With the end goal to show the chasing capacity of ant-lion a roulette wheel is utilized. The ALO algorithm needs to use a roulette wheel operator for ant lions picking amid optimization as indicated by their fitness. This strategy gives better probabilities to the fitter ant lions to get ants.

Layer 2- Sliding Ants towards Ant-lion: Ant lions are fit for developing the traps in respect to their fitness and ants subjectively required to move. Nonetheless, when they comprehend that an ant is in trap outward the pit mid ant lions shoots the soil. This slides in the lead caught down the ant that is endeavouring to get away. To show this numerically the accompanying conditions are likened in such manner:

$$C^t = C^t / R \quad (9)$$

$$D^t = D^t / R \quad (10)$$

Here, C^t as minimum of variable at t^{th} iteration, D^t as maximum of variable at t^{th} iteration, R as a ratio.

Layer 3- Catching Prey and Pit Re-constructing: The base the majority of pit when an ant comes to and in the ant-lion's jaw is caught which is the last phase of chasing. Inside the sand the subterranean insect is hauled by the ant-lion and it expends. For impersonating this system, when ants end up being fitter (go inside sand) than its ant-lion analogous it is assumed that prey catching happen. To enhance the catching new prey risks the situation of ant lion refreshed, by taking the devoured position of ant.

Layer 4- Elitism: At each stage the best (fittest) position of ant lion is spared as elite to save the got best arrangement. To impact the every development of ant, the elite ant lion is considered. By roulette wheel the elitism guessed that every random walks of ant around an ant-lion especially and simultaneously elite as pursues.

Step 5: Final Process

Rehash the procedure until the point when it achieves the minimum error value or achieves the maximum number of iterations. When the previously mentioned process is finished, the AWOALO technique can be utilized to optimize the control signals of VSG unit dependent on the input parameters. The flowchart of the AWOALO technique is appeared in Fig.1.

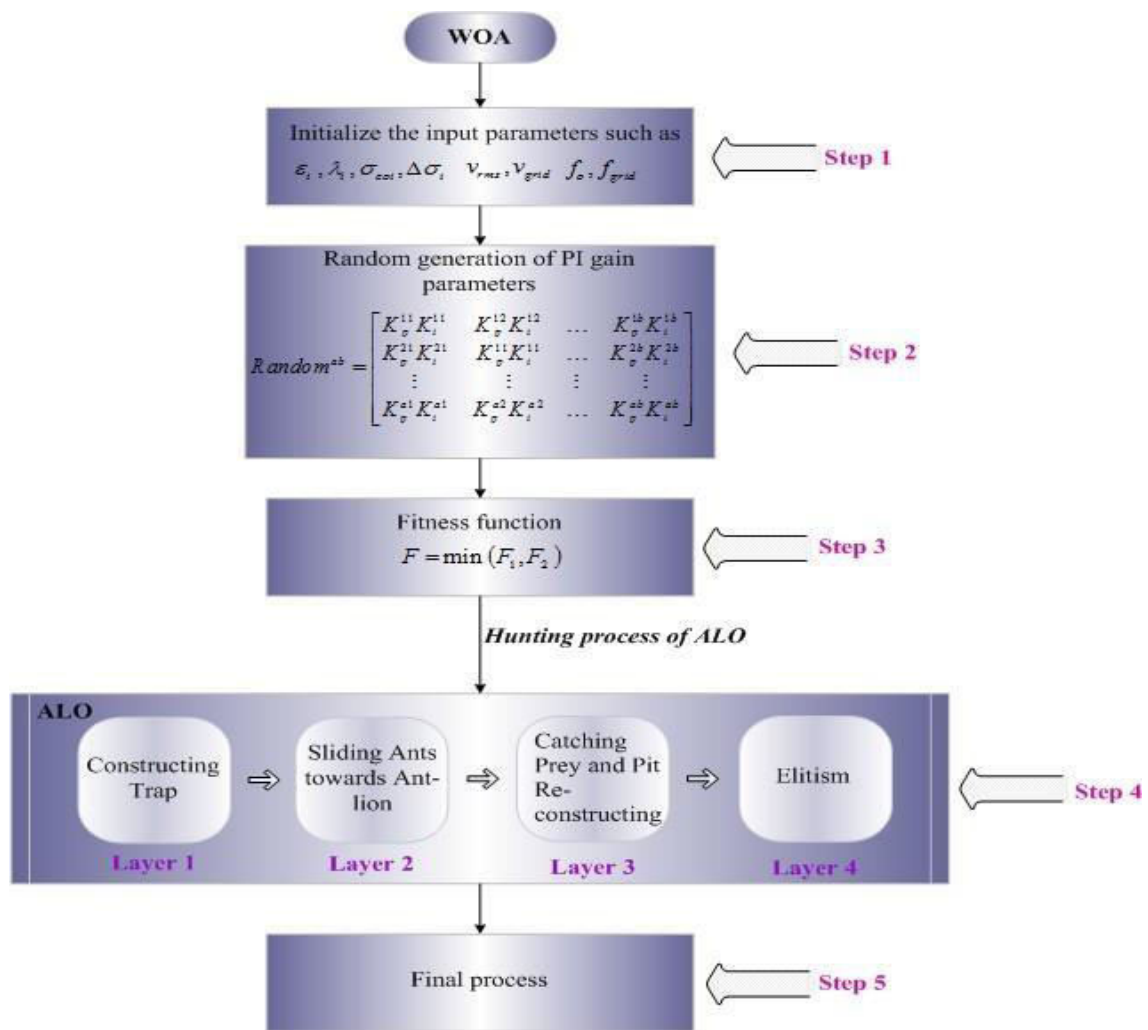


Fig.1: Flowchart of the AWOALO technique

SIMULATION RESULTS AND DISCUSSION

The simulation results and discussion is studied. In order to evaluate the AWOALO technique for improvement of transient and small signal response in MG using VSG is presented. The AWOALO technique is actualized in MATLAB/Simulink working stage and the performance has been compared with various techniques such as base, ALO and WOA. The following section reports the case studies to optimally improve the transient and small signal response in MG using AWOALO technique is explained below here. The proposed method is applied on the

IEEE 5 bus system which has been extensively tested for the improvement of transient and small signal response in MG using VSG. The single line diagram of IEEE-5- bus system is shown in Fig 3. The transmission line parameters, generation, and loads are given in per unit value [37]. The network details are: Number of lines = 7, Number of buses = 5 and Number of generators =

Here, two test cases are considered. They are irradiance change and load change condition. The simulation results of each case is plotted as follows,

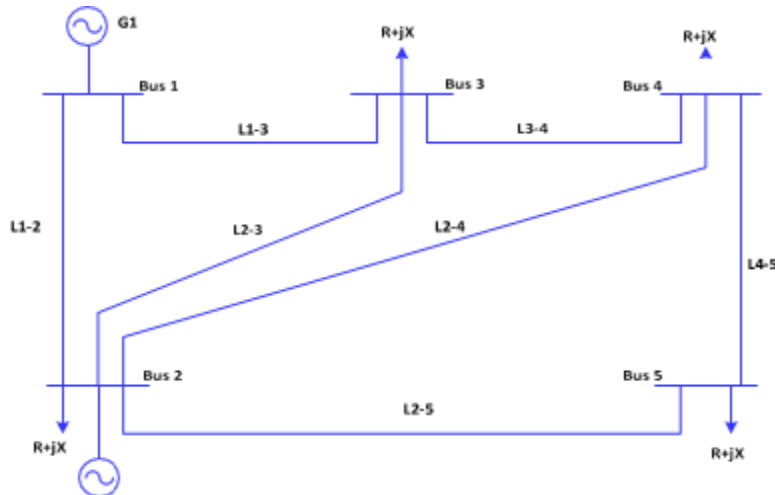


Fig.2.Single line diagram of IEEE 5 bus system

Case 1: Irradiance Change

In this case, the irradiance change condition is simulated. Fig 4 shows the analysis of solar irradiance and wind speed under irradiance change condition. At normal condition, the solar irradiance is constant with the irradiance range of 800 W/m². Fig 4 (a) shows that initially the irradiance at 800 W/m² at the time instant of 0 to

0.3 sec and after that time instant the value of irradiance vary.

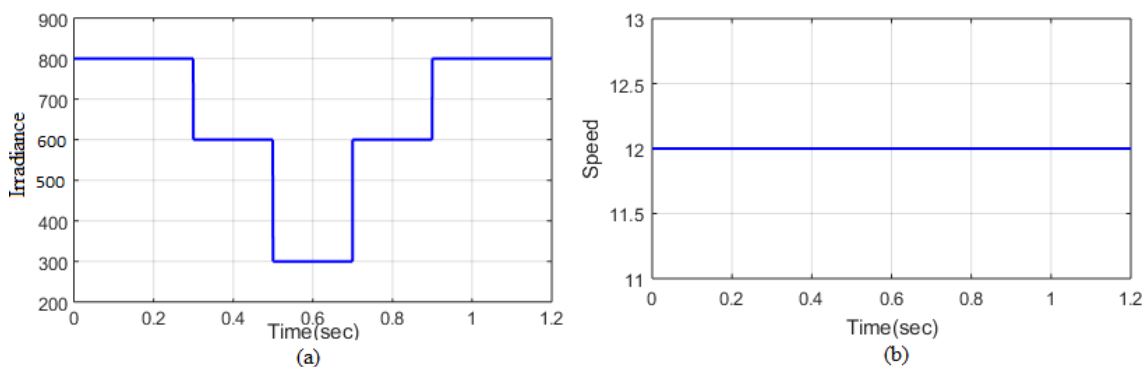


Fig.3.Analysis of (a) Solar irradiance (b) Wind speed

Fig 3(b) depicts the wind speed under irradiance change is kept as constant and the wind speed ranges from 12 m/sec which is under normal condition. Fig 4 (a) shows the analysis of grid power using AWOALO technique. Normally the grid power of AWOALO technique accomplishes 1100 w. But at this case, the proposed of grid power achieves 1000 w. Fig 4 (b) shows the load power of AWOALO technique. As seen from the Fig 4(b) the load power

achieves 14000 w. Fig 4 (c) shows the synchronous generator power versus time. The synchronous generator power of the AWOALO technique initially at the stage of 50 and it drops to 49.85 and goes to the normal condition at the time instant of $t=0.4$ to 1.2 sec. Fig 5 (a) shows the frequency versus time. The frequency of the AWOALO technique reaches the maximum power of 9500w. The comparison analysis of frequency of AWOALO with existing technique is depicted in Fig 5 (b). From the fig 5 (b), it shows that the AWOALO technique gives optimal solution than the existing techniques. Fig 5 shows the graph of value of Inertia (J) for AWOALO and the comparison graph of AWOALO and existing techniques.

By the fitness function (12), when the voltage deviation and the frequency deviation of a generator exceeds the limit, the AWOALO technique compromises between the smooth transition and keeping the voltage and the frequency deviation of generators below the limit. The AWOALO technique searches for the best values of J by evaluating the fitness function at each iteration until the maximum number of iterations is reached. Then the best value of J is extracted as the optimum values for the VSG parameters.

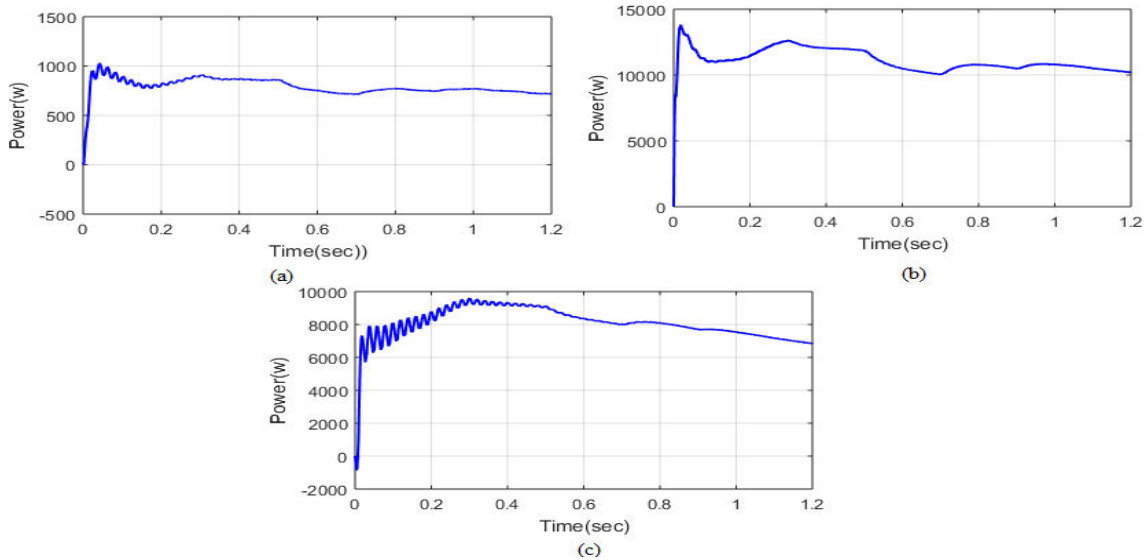


Fig.4. Analysis of (a) Grid power (b) Load power (c) Synchronous generator power using AWOALO technique

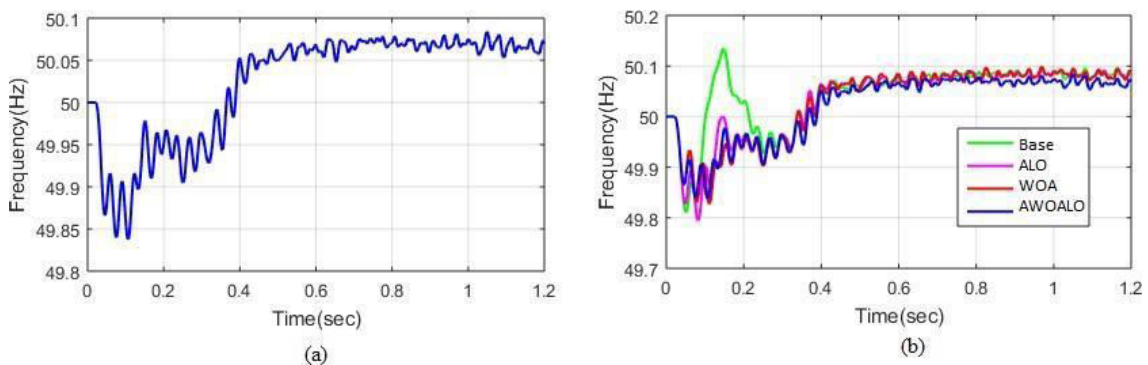


Fig.5. Frequency comparison of AWOALO and existing techniques

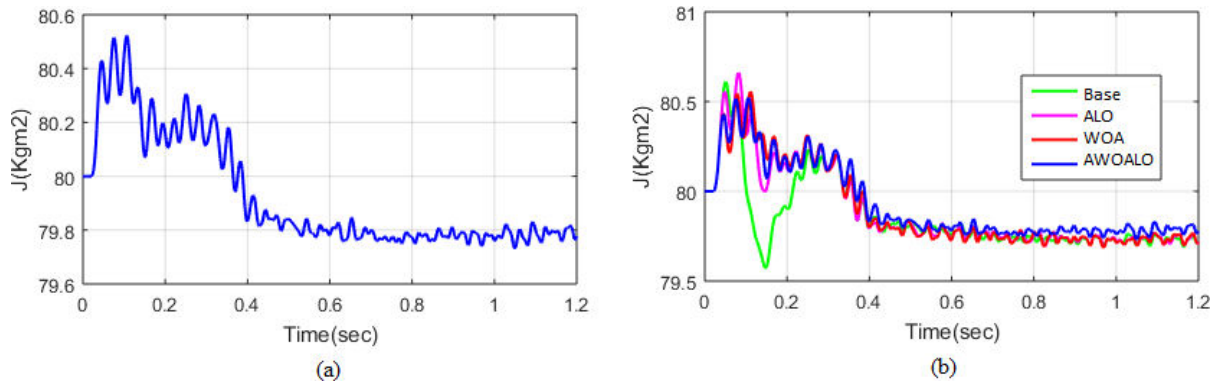


Fig.6. Frequency comparison of AWOALO and existing techniques

The wind power versus time is depicted in Fig 7(d). The wind power produces the power of w. The grid power of AWOALO technique is depicted. Also the grid power of AWOALO technique achieves better solution. Fig 8 shows the individual power comparison such as total power and load power of AWOALO technique and existing techniques. From the figure, it can be seen that the AWOALO technique produces optimal power than the existing techniques.

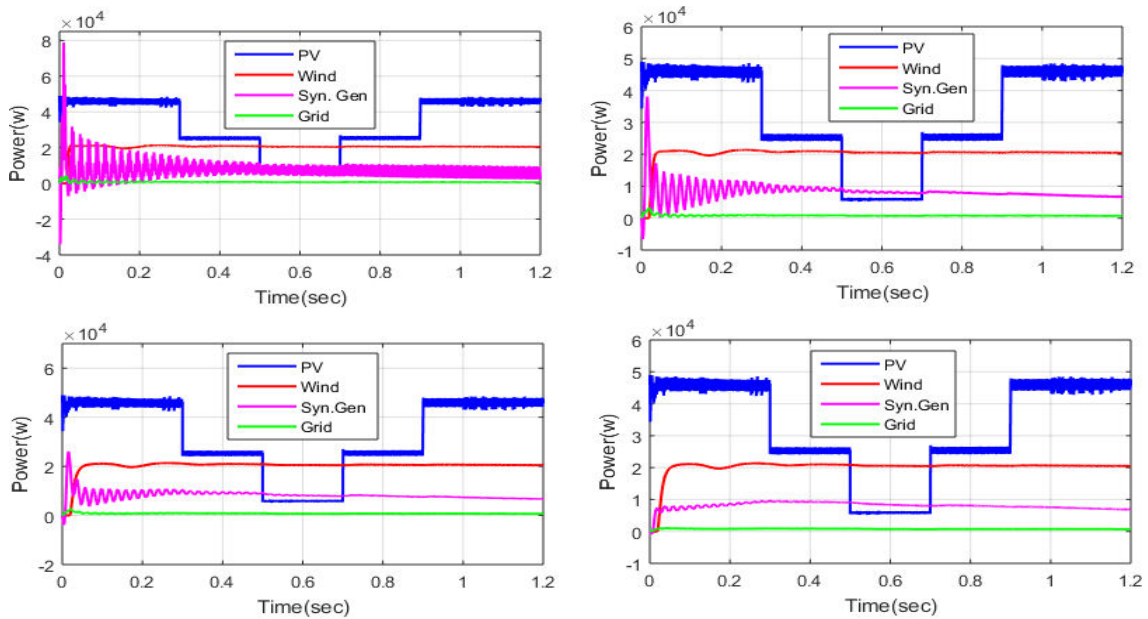


Fig.7. Individual power comparison of (a) Base (b) ALO (c) WOA (d) AWOALO technique

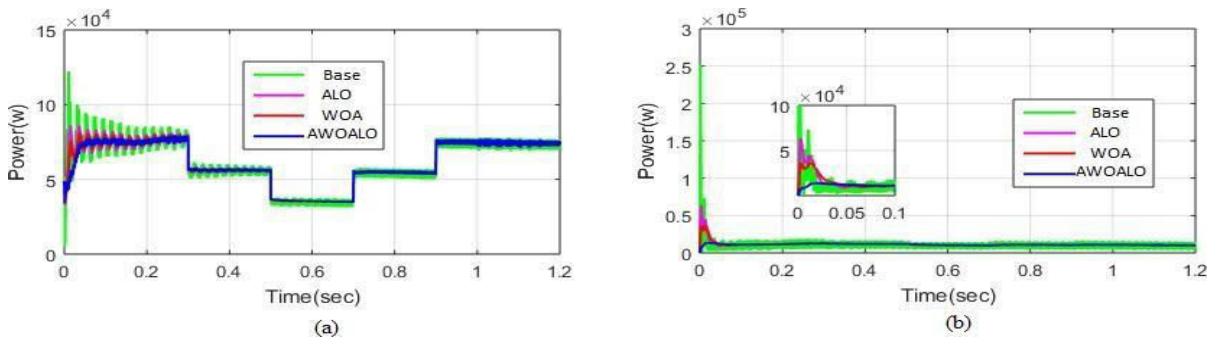


Fig.8. Comparison of (a) Total power (b) Load power of AWOALO and existing techniques

The fitness comparison of AWOALO technique under this case is depicted in Fig 9. The fitness of base method gives 20, ALO converges at 22, WOA at 24 and the AWOALO technique converges at the iteration of 30. The fitness comparison of AWOALO and existing techniques is depicted in Fig 9 (b). On the overall comparison, the AWOALO technique gives optimal result than the existing techniques. Because of the searching behavior parameters of ALO such as C^t , D^t and p^t the AWOALO technique gives the optimal solution. Table 1 shows the statistical comparison of AWOALO and existing techniques for irradiance change. As seen from the table 1, we have evaluated the mean, median and standard deviation (SD) of AWOALO and existing techniques for 100 iteration.

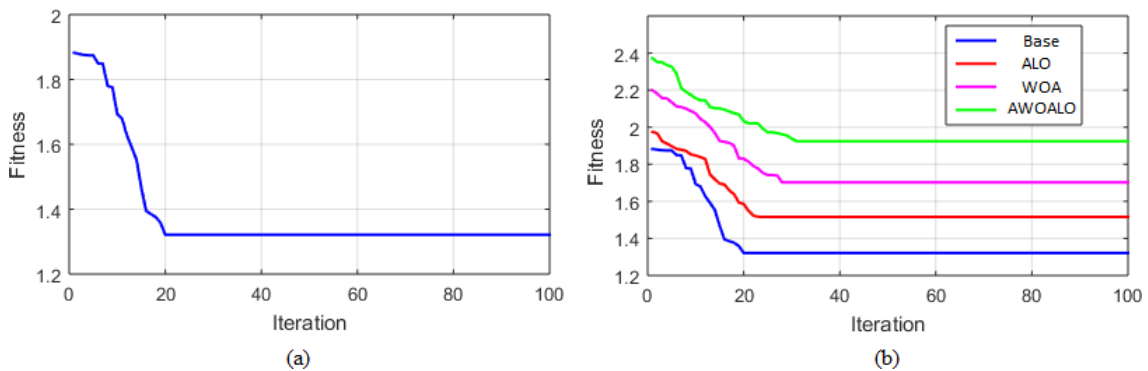


Fig.9. Fitness (a) graph of proposed (b) graph of AWOALO and existing techniques

Table 1: Statistical comparison between AWOALO and existing techniques with 100 iteration for irradiance change

Solution Techniques	Mean	Median	SD
AWOALO	50.0233	50.0601	0.0648
WOA	50.0322	50.0725	0.0717
ALO	50.0330	50.0710	0.0711
Base	50.0463	50.0735	0.0612

Case 2: Load Change

The load change condition is simulated in this case. Fig 10 shows the analysis of solar irradiance and wind speed under load change condition. Fig 10 (a) shows the solar irradiance is constant under this case with the irradiance range of 1000 W/m². Fig 10 (b) depicts the wind speed under load change is kept as constant and the wind speed ranges from 12 m/sec which is under normal condition.

Fig 11 (a) depict the grid power versus time. The grid power of AWOALO technique normally accomplishes 1100 w. But at this case, the AWOALO technique of grid power achieves the maximum power of 1000 w. The load power of AWOALO technique is depicted in Fig 11(b). As seen from the Fig 11 (b) the load power achieves 14000 w. Fig 11(c) shows the graph of synchronous generator power versus time.

The synchronous generator power reaches the maximum power of 10000w. Fig 12 (a) depicts the frequency versus time. At initial condition, the frequency system is 50 and due to this case the frequency drops to

49.81. In Fig 12 (b) the comparison analysis of frequency of AWOALO with existing technique is depicted. It shows that the AWOALO technique gives optimal solution than the existing techniques.

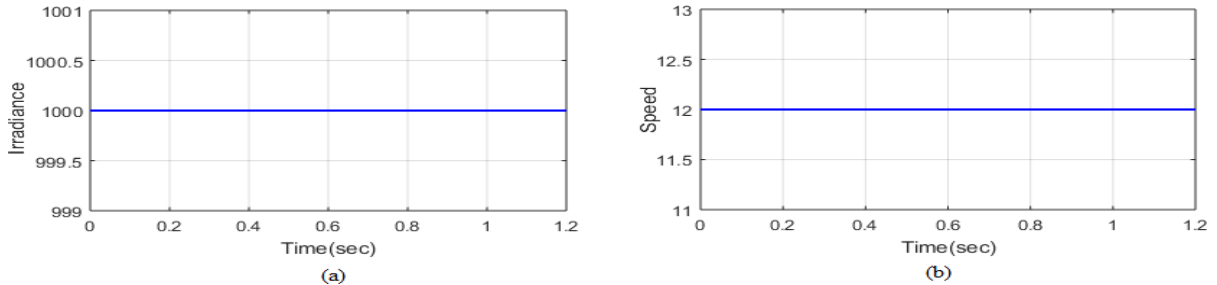


Fig.10. Analysis of (a) Solar irradiance (b) Wind speed

Graph of value of Inertia (J) for AWOALO and the comparison graph of AWOALO and existing techniques are depicted in Fig 13. As seen from the figure, by the fitness function (12), when the voltage deviation and the frequency deviation of a generator exceeds the limit, the AWOALO technique compromises between the smooth transition and keeping the voltage and the frequency deviation of generators below the limit.

Until the maximum number of iterations is reached, the AWOALO technique searches for the best values of J by evaluating the fitness function at each iteration. Then the J best value is extracted as the optimum values for the VSG parameters.

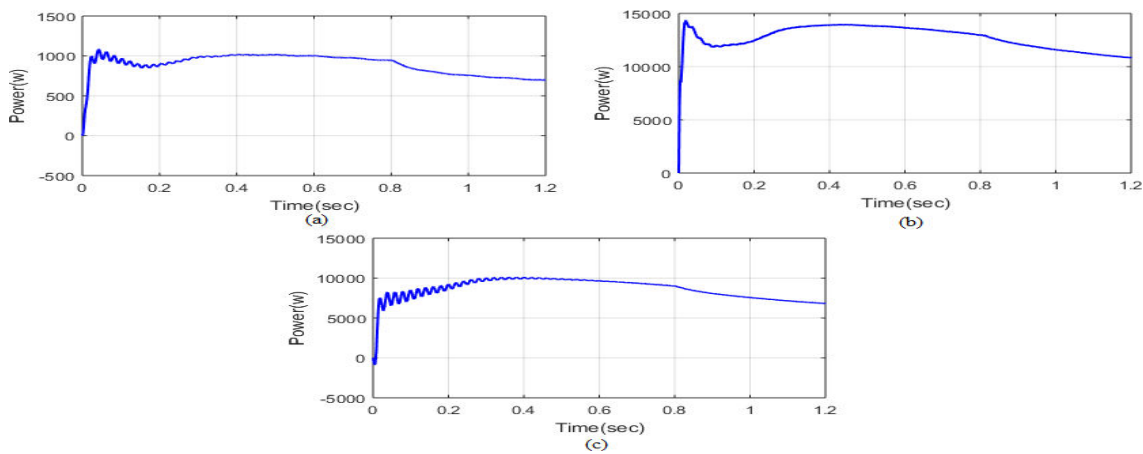


Fig.11. Analysis of (a) Grid power (b) Load power (c) Synchronous generator power using AWOALO technique

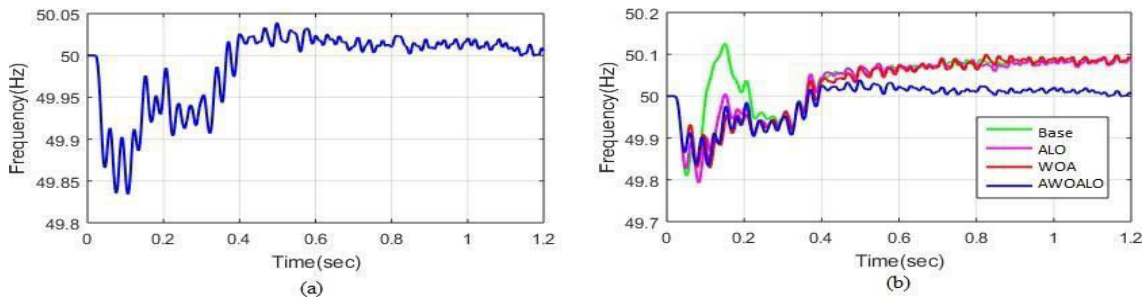


Fig.12. Frequency comparison of AWOALO and existing techniques

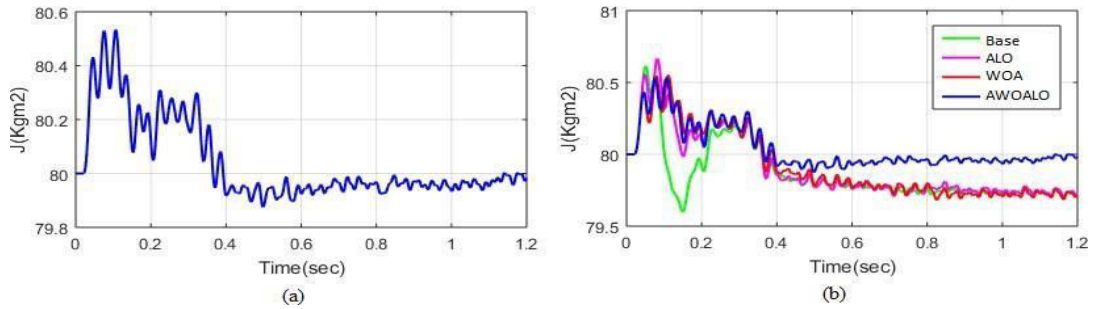


Fig.13. Value of Inertia (J) (a) AWOALO (b) comparison graph of AWOALO and existing techniques

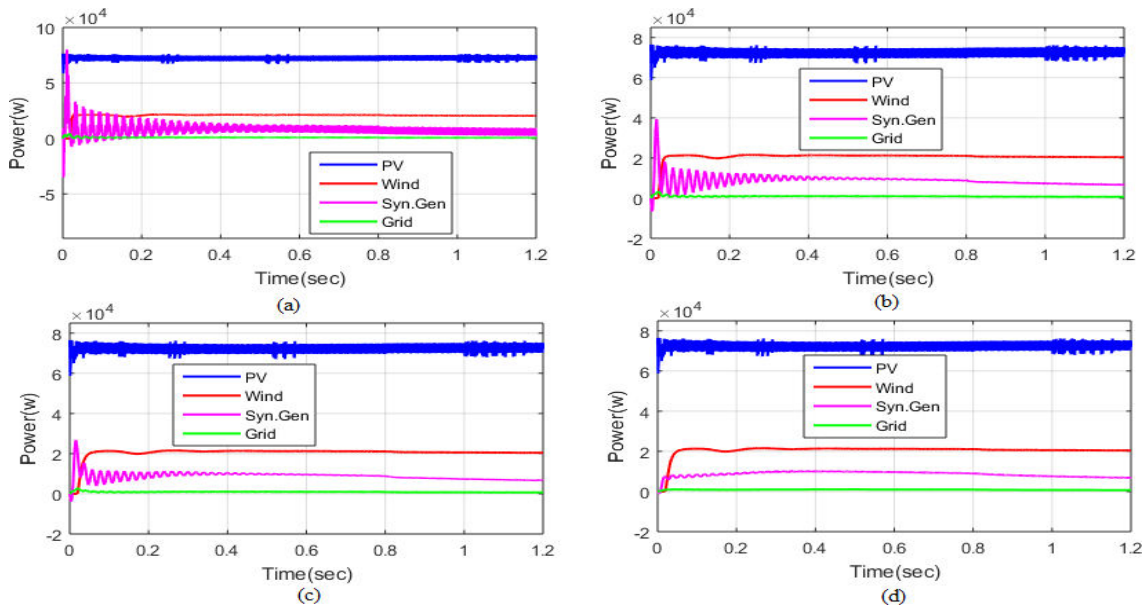


Fig.14. Individual power comparison of (a) Base (b) ALO (c) WOA (d) AWOALO technique

Individual power comparison using AWOALO and existing technique is depicted in Fig 14. At normal case, the PV power gives w but in this case, the PV power produces the maximum power of w. As seen from the fig 14 (d), the synchronous generator power gives the extreme power of 10000 w under load change condition.

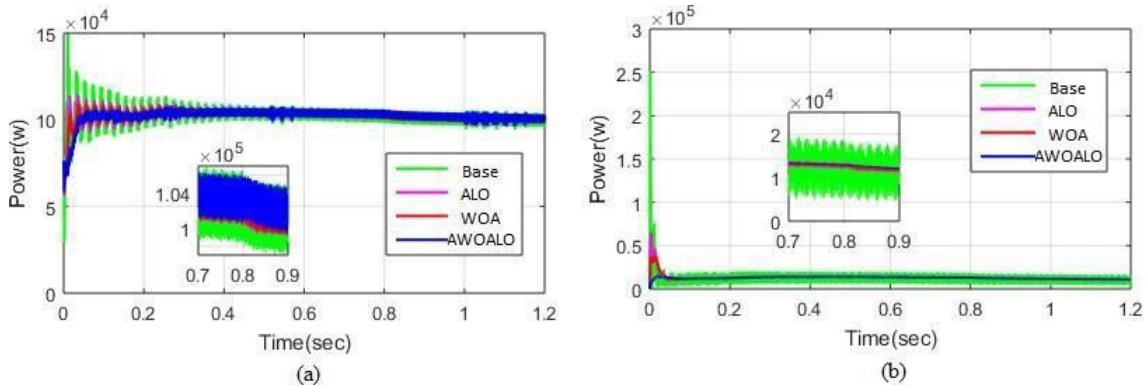


Fig.15. Comparison of (a) Total power (b) Load power of AWOALO and existing techniques

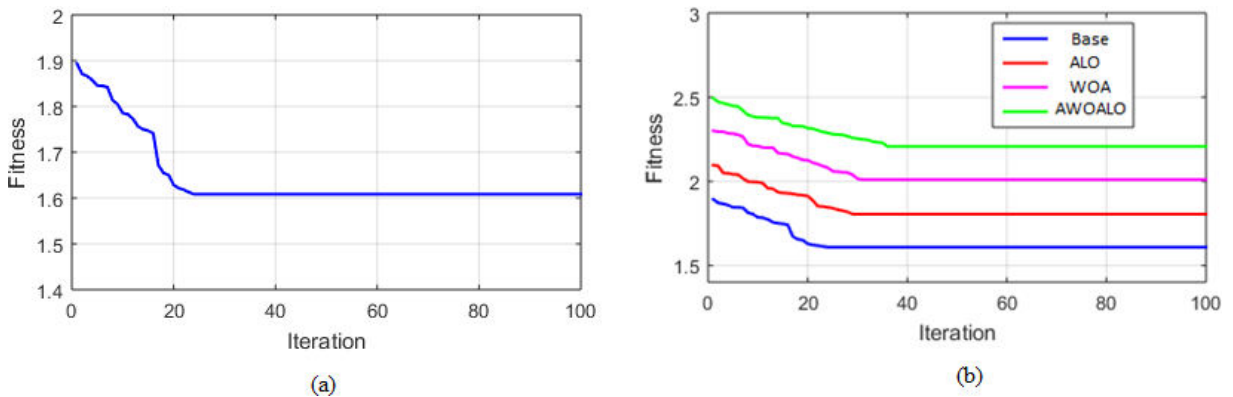


Fig.16.Fitness (a) graph of proposed technique (b) comparison graph of AWOALO and existing techniques

The wind power produces the power of w . Fig 15 shows the comparison of power of AWOALO and the existing techniques. Fig 15 (a) shows the total power of AWOALO technique and the existing techniques. Fig 15 (b) shows the load power of AWOALO technique and the existing techniques.

The fitness graph of AWOALO technique is depicted in Fig 16. As seen from the figure 16, the AWOALO technique optimally gives the solution than the other techniques. The fitness comparison of AWOALO with existing techniques under this case is depicted in Fig 16. The fitness of base method obtains 1.8, ALO achieves 2.2, WOA gives the result at 2.3 and the AWOALO technique converges at 2.49. On the overall comparison, the AWOALO technique converges as fast as the existing techniques.

Table 2 shows the statistical comparison of AWOALO and existing techniques for load change. As seen from the table 2, we have evaluated the mean, median and standard deviation (SD) of AWOALO and existing techniques for 100 iteration.

Table 2: Statistical comparison of AWOALO and existing techniques with 100 iteration for load

Solution Techniques	Mean	Median	SD
AWOALO	49.9878	50.0102	0.0462
WOA	50.0275	50.0645	0.0718
ALO	50.0296	50.0684	0.0701
Base	50.0434	50.0719	0.0617

CONCLUSION

This paper explains a hybrid AWOALO with VSG control scheme for improving the transient and small signal response in microgrid (MG). For re-establishing the normal operating condition of MG, the AWOALO technique is used. Here, the WOA optimally tunes the parameters of the VSG units with the end goal to accomplish the objective function. The seeking behaviour of ALO optimally accomplishes the objective function with less computational complexity. While considering the voltage angle deviation constraints, the AWOALO technique guarantees the smooth response with accurate system performance. Additionally, the AWOALO technique switches the value of the moment of inertia of VSGs considering the angular frequency of the VSG concerning the equilibrium point and its rate of change.

The AWOALO technique is executed in the MATLAB/Simulink platform. The proposed method is assessed by considering the two test cases i.e. irradiance and load change condition. The performance of the AWOALO technique is contrasted and the different existing technique. Moreover, the AWOALO technique yields the better performance than the various existing technique. The power quality, transient response and the stability of the system is enhanced by AWOALO technique. Likewise the generators optimization and the frequency deviation are directed by utilizing the AWOALO technique. From the comparison results we finalized that the AWOALO technique is the well effective technique to improve the transient and small signal response in MG, which is competent over the other techniques.

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SECURE DATA RETRIEVAL FOR SCALABLE MILITARY NETWORKS

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ABSTRACT

Wireless mobile nodes in military environments such as a battle field or a hostile region are possible to attack from intermittent network property and frequent partitions. Disruption-tolerant network technologies are turning into self-made solutions that permit wireless devices carried by troopers to communicate with one another and access the direction or command dependably by exploiting memory device nodes. A number of the foremost difficult problems in this state of affairs are the social control of authorization policies and the policies update for secure knowledge retrieval. Cipher text policy attribute-based encoding may be a promising cryptological answer to the access management problems. However, the matter of applying cipher text-policy attribute-based encoding in suburbanised disruption tolerant networks introduces many security and privacy challenges with relevancy the attribute revocation, key escrow, and coordination of attributes issued from multiple authorities. Secure knowledge retrieval theme is proposed to victimization cipher text-policy attribute-based encoding for suburbanised disruption-tolerant network wherever multiple key authorities manage their attributes severally and also demonstrate a way to apply the planned mechanism to firmly and with efficiency manage the confidential knowledge is confined within the disruption-tolerant military network.

IndexTerms - Access control, attribute based encryption (ABE), disruption tolerant network(DTN), multi-authority, secure data retrieval.

INTRODUCTION

In military networks, connection of mobile nodes can be disconnected by jamming, environmental factors and mobility and specially when they are operated in hostile field. Disruption Tolerant Network technologies able nodes to communicate with each other even in extreme networking environments [1]. When their is no connection between source and destination pairs, the messages sent from source nodes need to wait in the intermediate nodes for some time until the connection is established.

Storage nodes in DTNs [2] are introduced to store the data so that only authorized mobile nodes can access the information. To secure the confidential data it need high protection including access control methods that supports cryptographic schemes [3]. Data access policies are defined over user attributes which can manage key authorities. DTN architecture is also referred where multiple authorities issue and manage their own attribute keys independently as decentralized DTN [4].

Attribute-based encryption(ABE) [5] fulfills the requirements for secure data retrieval in DTNs. It enables access control over encrypted data using access policies and described attributes among private key and cipher text. Cipher text-policy ABE(CP-ABE) provides a scalable way for encryption where encryptor defines attribute set so that decryptor can easily decrypt the cipher text [6]. So, that different users can decrypt data with security policy.

The problem of applying the ABE to DTNs introduce security and privacy challenges so that users may change their attributes at some point or some private keys will be compressed, to need systems secure, key revocation is needed. This issue is more difficult in ABE systems,

since multiple users share the same attribute. This shows that revocation of that particular attribute would effect on each user in a group.

Key escrow is another challenge. In CP-ABE, key authority generates the private key of user by considering the authority master key to the user which is associated with set of attributes. So, the key authority can decrypt any cipher text which is assigned to user by using the general attribute keys. The compression of key authority the potential threat for privacy especially when the data is highly sensitive. This is a key problem even in multiple authority systems until each key authority have its own attribute keys with own master secrets. So, such key generation mechanism based on the single master secret removes key escrow in single or multiple authority CP-ABE.

The coordination of attributes issued from multiple authorities is the last challenge. Authorities can manage to issue attribute keys to the user independently by using their own master secrets. But the multiple authorities is impossible to issue an attribute and it is very hard to define fine grained access policy. The multiple authorities can use AND, OR logic schemes. But the OR logic scheme cannot be implemented. From this the different authorities can generate their own attribute keys using their own independent master secret key. Every authority have their own individuality. So, the “n-outof-m” scheme cannot be expressed in any previous schemes, because it is very practical and commonly required access policy logic.

RELATED WORK

In key-policy Attribute Based Encryption (KP-ABE), the encryptor only gets to describe a cipher text with set of attributes. Each user will be chosen a policy by the key authority that shows which cipher text the user can decrypt and issues key for each user by embedding the policy into the user’s key. The roles of cipher texts and keys are reversed in cipher text-policy Attribute Based Encryption (CP-ABE) that means the cipher text is encrypted by the policy that is chosen by encryptor, but the key is created related to the attribute set. CP-ABE is more appropriate to Disruption Tolerant Networks than KP-ABE because it allows encryptor to choose a policy on attributes and to encrypt secret information [2].

1) Attribute Revocation:

In order to overcome the problem of attribute revocation, the author proposed the Cipher-text policy based attribute based encryption scheme. This scheme provide selective structure secure based on the assumption of parallel Bilinear Diffie-Hellman Exponent. This carryoutthe performance analysis and experimental verification inorder to achieve attribute revocation without any participation of attribute authority [7].

A mediated Cipher text-Policy Attribute-Based Encryption (mCP-ABE) is also proposed which extends CP-ABE with instantaneous attribute revocation and also demonstrate the application of mCP-ABE scheme to securely manage Personal Health Records (PHRs) [5].

The Cipher text Policy Attribute primarily based secret writing (CP-ABE) system tend to target a very important issue of attribute revocation that is cumbersome for CP-ABE schemes. Particularly, to re-solve this difficult issue by considering additional sensible situations within which semi-trustable on-line proxy servers are offered. This tend to bring home the bacon this by unambiguously desegregation the authority to delegate most of hard tasks to proxy servers. Formal analysis shows that our planned theme is demonstrably secure against chosen ciphertext attacks and also tend to show that this technique also can be applicable to the Key-Policy Attribute primarily based secret writing (KP-ABE) counterpart [8].

2) Key Escrow:

The centralized approach is proposed where single key distribution center distributes the secret keys and also the attributes to all the users. This scheme resilient to replay attacks. This uses secure Hash algorithm for authentication purpose [9].

Group communication will take pleasure in scientific discipline multicast to realize ascendable exchange of messages. However, there's a challenge of effectively dominant access to the transmitted knowledge. The scientific discipline multicast by itself doesn't offer any mechanisms for preventing non-group members to possess access to the cluster communication though coding will be wont to shield messages changed among cluster members, distributing the cryptological keys becomes a difficulty. Researchers have projected many totally different approaches to cluster key management. Research approaches will be divided into 3 main classes: centralized cluster key management protocols, localised architectures and distributed key management protocols [10]

3) Decentralized ABE:

Routing is a critical issue in the intermittently connected networks. Maxprop, is a protocol for effective routing of Disruption Tolerant Network (DTN) messages. This prioritize the packets based on the routing to peers. Maxprop performs better than other protocols in scheduling the meeting between peers. Maxprop on simulated topologies are also evaluated to show the performance of various DTN environment [1].

Attribute based mostly cryptography (ABE) determines coding ability supported a user's attributes in a very multi-authority ABE theme, multiple attribute-authorities monitor completely different sets of attributes and issue corresponding coding keys to users, and encryptors will need that a user get keys from authority before decryption. Chase gave a multi-authority ABE theme victimisation the ideas of a trustworthy central authority (CA) and world identifiers (GID). However, the CA therein construction has the ability to decipher each cipher text, that looks somehow contradictory to the initial goal of distributing management over several probably untrusted authorities. Moreover, therein construction, the utilization of the same GID allowed the authorities to mix their data to make a full commoner with all of a user's attributes. Multi-authority encryption tend to propose an answer that removes the trustworthy central authority, and gives protection to the users' privacy by preventing the authorities from pooling their data on specific users, so creating ABE additional usable in observe.

SYSTEM ARCHITECTURE

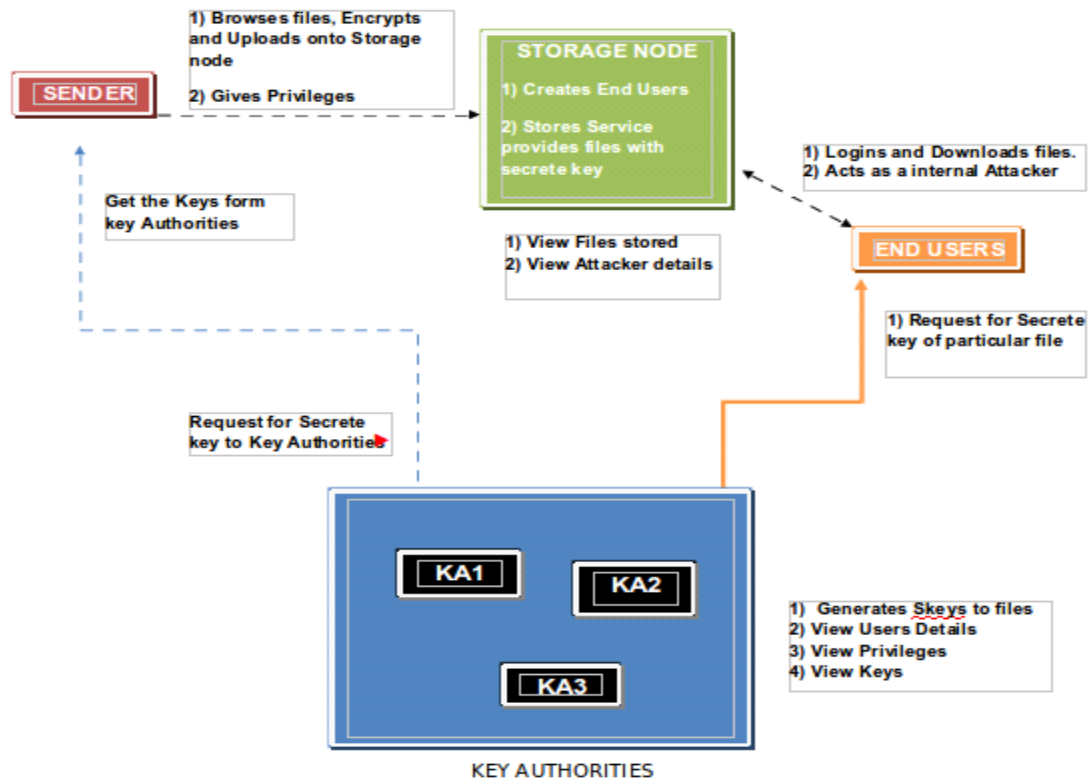


Fig1: Architecture of an efficient and secure data retrieval for scalable military networks

SENDER

In this module, the sender is responsible for registering the users by providing detailed Name, Password, Confirm Password, Battalion(b1, b2, b3), Region(R1, R2, R3). Sender browses the data file, encrypts it and gets the key from key authority server(KA1, KA2, KA3). Uploads their data files to the storage node and sender is authenticated to provide privileges for end user.

STORAGE NODE

The Disruption Tolerant Network Router (DTN) technologies are becoming successful solutions in military applications that allow wireless devices to transmit information between one another and protects the confidential information from attacking by external storage nodes [4]. In this module we introduced storage nodes in DTNs where data is stored or replicated such that the information can be access by authorized mobile nodes quickly and efficiently. In DTN encrypted data file and details will be stored Storage Node.

KEY AUTHORITY

The key authority (KA1, KA2, and KA3) is responsible to generate the secret key for the file belongs to the particular Battalion and region. The End User Request to the storage node using the file Name, secret key, Battalion and Region, Then storage node connect to the respective Key authority server. If all specified Details are correct then file will sent to the end user, or else he will be blocked in a storage node. The Key Authority server can view the users, privileges, keys. Thus, the key authority can decrypt every cipher text addressed to specific users by generating their attribute keys.

END USER

The End user can access the file details and end user who will request and gets file contents response from the DTN Router. If the credential file name and secret key is correct then the end user will get the file response from the router in Decrypted format.

SCHEME CONSTRUCTION**The Cipher – SubBytes:**

AES's single S-Box

Does a non-linear substitution which is invertible

For Each Byte of Input, {AB}

1. Let {XY} := the multiplicative inverse of {AB} in Galois field $GF(2^8)$
2. Let {AB}' := An affine transform of {XY}

The Cipher – ShiftRows:

Cyclical Shift of the rows of the state

The Cipher – MixColumns:

Each column is treated as a four-term polynomial.

Polynomial is applied to each column, returning a new polynomial.

$$a(x) = \{01\}x^3 + \{02\}x^2 + \{03\}x + \{04\}$$

The Cipher – AddRoundKey:

From Cipher Key K the key expansion is taken and makes $4 \cdot NR$ 32-bit words, where $NR =$ Number of Rounds

AddRoundKey takes 4 words and the next 4 Round Keys, and returns a new state

For each column, return $Col \oplus Key_{l+i}$, $l = Round\#, i = column\#$

The Cipher - Key Expansion:

Let the initial key size be 128, 196 or 256, and the number of rounds NR, will generate $4 \cdot (NR+1)$ 32-bit words

Uses SubWord function that applies SubByte to 4 bytes

Uses RotWord function that permutes a set of 4 words

First 4-8 Round Keys are cipher key

Later keys are generated based on the given functions.

THE CIPHER – INVERSION:

Every sub-function of the Cipher is exchangeable

SubBytes: Reverse the Affine Cipher, then find the Inverse of the result

ShiftRows: Shift the rows by reverse amounts

MixColumns: For each column, inverse matrix is applied.

AddRoundKey: AddRoundKey is used again with same key.

SECURITY OF AES:

Certain security attacks exist for the implementations of AES. These don't exploit the particular cryptography of the cipher, however instead attack however specific versions are enforced

Ex: victimization temporal order Attacks to guess Secure Socket Layer Keys

Usually, these attacks need the flexibility to run code on the victim machine. terribly robust options in-built to avoid DES-style attacks. Use of finite field inversion within the S-Box construction helps build Linear and Differential attacks tough. MixColumns helps make sure that there are not any "narrow" methods victimization solely some S-Boxes, once more preventing Linear and Differential attacks.

SECURITY:

A. Collusion Resistance:

In CP-ABE, the key sharing ought to be installed into the cipher text rather to the non-open keys of clients. much the same as the past ABE plans, the non-open keys of clients are unpredictable with customized irregular qualities hand-picked by the such they can't be joined inside the anticipated plan. in order to unravel a cipher text, the conniving assailant ought to recoup . To recuperate this, the attacker must attempt from the cipher text and from the inverse plotting clients' non-open keys for a quality. Be that as it may, this outcomes in the value dazzle by some arbitrary esteem, that is unambiguously selected to each client, regardless of whether the property amass keys for the properties that the client keeps are as yet legitimate. This cost are regularly visually impaired out if and on condition that the client has the enough key components to fulfill the key sharing plan implanted inside the cipher text. Another intrigue assault situation is that the plot between repudiated clients to get the legitimate characteristic bunch keys for a couple of properties that they are not affirmed to claim. The trait bunch key appropriation convention, that is finished subtree strategy inside the anticipated subject, is secure regarding the key indistinguishable quality. In this way, the conspiring repudiated clients can in no way, shape or form that get any substantial trait group keys for characteristics that they're not affirmed to convey. In this way, the predetermined esteem can not be recouped by intrigue assault since the cost is unpredictable from a chosen client's non-open key. Plot among the local experts may affirm the customized key piece of some client . In any case, each property key piece of the client is blinded inside the local experts' perused in that they're separated by the mystery, that is scarcely far-celebrated to the client and CA. Along these lines, the conspiring local experts can't determine the full arrangement of mystery keys of clients.

B. information Confidentiality:

In our trust model, the multiple key authorities don't seem to be any more totally certain what is more as a result of the storage node whether or not or not they're honest. Therefore, the plain data to be hold on must be unbroken secret from them what is more as from unauthorized users. knowledge confidentiality on the hold on data against unauthorized users are usually trivially secured. If the set of attributes of a user cannot satisfy the access tree inside the cipher text, he cannot recover the required worth throughout the cryptography methodology, wherever may be a random value unambiguously appointed to him. On the other hand, once a user is revoked from some attribute groups that satisfy the access policy, he cannot rewrite the cipher text either unless the access policy must satisfy remainder of the attributes . so as to rewrite a node for associate attribute , the user has got to mix from the cipher text and from its personal key. However, this cannot cause the price , that's desired to come up. Another attack on the hold on data are usually launched by the storage node and additionally the key authorities. Since they can't be whole sure, confidentiality for the hold on data against them is another essential security criteria for secure information retrieval in DTNs. The native authorities issue a set of attribute keys for his or her managing attributes to associate documented user u , that are blind by secret information that's distributed to the user from CA . They additionally issue the user a individualized secret key by liberal arts the secure 2PC protocol with CA . As we've got a bent to mentioned in Theorem one, this key generation protocol discourages each party to urge every

other's master data to determine the complete set of secret key of the user severally. whether or not the storage node manages the attribute cluster keys, it cannot rewrite any of the nodes within the access tree within the cipher text. this can be as a results of it's alone authorized to re-encrypt the cipher text with each attribute cluster key, but isn't allowed to rewrite it. Therefore, data confidentiality against the curious key authorities and storage node is to boot ensured.

C. Backward and Forward Secrecy:

When a user involves hold a group of attributes that satisfy the access policy at intervals the cipher text at ages instance, the corresponding attribute cluster keys are updated and sent to the valid attribute cluster members firmly. additionally, all of the elements encrypted with a secret key s within the cipher text are re-encrypted by the storage node with a randoms r , and conjointly the cipher text elements corresponding to the attributes are re-encrypted with the updated attribute cluster keys. whether or not or not the user has hold on the previous cipher text modified before he obtains the attribute keys and conjointly the holding attributes satisfy the access policy, he cannot rewrite the receptive cipher text. this will be as a results of, whether or not or not he can succeed computing from this cipher text, it'll not facilitate to recover the required value for the previous cipher text since it's blind by a random r . Therefore, the backward secrecy of the hold on data is secure at intervals the projected theme. On the alternative hand, once a user involves drop a group of attributes that satisfy the access policy at ages instance, the corresponding attribute cluster keys are updated and sent to the valid attribute cluster members firmly. Then, all of the elements encrypted with a secret key at intervals the cipher text are re-encrypted by the storage node with a random r , and conjointly the cipher text elements corresponding to the attributes are re-encrypted with the updated attribute cluster keys. Then, the user cannot rewrite any nodes such as the attributes once revocation due to the resulted from freshly updated attribute cluster keys. in addition, whether or not or not the user has recovered before he was revoked from the attribute groups and hold on that, it'll not facilitate to rewrite the next cipher text re-encrypted with a replacement random r . Therefore, the forward secrecy of the hold on data is secure at intervals the projected theme.

CONCLUSION

DTN technologies are becoming successful solution similar applications that permit wireless devices to speak with one another and access the confidential info reliably by exploiting external storage nodes. CP-ABE is a solution to the access control and secure data retrieval issues. An efficient and secure information retrieval technique exploitation CP-ABE is proposed for decentralized DTNs where multiple key authorities manage their attributes independently. The inherent key written agreement drawback is resolved such the confidentiality of the hold on information is secure even beneath the hostile setting wherever key authorities could be compromised or not totally sure. Additionally, the fine-grained key revocation will be finished every attribute cluster. we have a tendency to demonstrate a way to apply the projected mechanism to firmly and efficiently manage the confidential information distributed within the disruption-tolerant military network.

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ROBUST DIGITAL WATERMARKING TECHNIQUE FOR COPYRIGHT PROTECTION**Lakshman Ji**Department of Computer Science and Engineering, Sarvepalli Radhakrishnan University,
Bhopal, Hoshangabad Rd, Near Nissan Motors, Misrod, Bhopal, Madhya Pradesh**ABSTRACT**

Digital watermarking proposed a solution to the copyright of multimedia data (image, audio, and video). This paper is concerned with the creation of complete digital image watermarking algorithms for copyright protection. To start with the watermarking method, an outline will be given for watermarking applications and the survey of existing watermarking algorithms and attacks. Besides, the efficiency of watermarking point detectors is introduced. The efficiency of Watermarking detectors is considered outstanding, and a new class of invariant scale features is tested. The robustness of the watermark on geometric distortions is very critical for watermarking. In order to detect the parameters of an underground transformation, we propose a technique for registering pictures based on scale-invariant features. A recommended strategy for watermark synchronization is also the use of an invariant point scale detector. This method is not used to evaluate parameters such as rotation and scaling of the original image. The results for geometric distortions have been tested experimentally. This method has been studied. The wavelet domain contains two independent watermarking algorithms in this survey. The first algorithm is used for the identification of watermarks in additive algorithms with original images. This algorithm examines the impact of different error correction codes on watermarks. The second algorithm does not need the first image for watermark detection. The power of this algorithm is calculated by various filtering and compression attacks. To achieve geometric attack mobility, this algorithm is paired with the sync as described above. The new watermarking algorithm is developed in the wavelet field. The dynamic wave transition is discussed, and its advantages are demonstrated by historically isolated wave conversion. On various types of attacks, the proposed algorithm's robustness was tested. The analysis finishes and proposes critical avenues for further studies.

Keywords: Digital image watermarking, Scale-invariant feature point detectors, Image registration, Synchronization technique for watermark detection.

**UNVEILING HIDDEN HISTORIES: A MULTIDISCIPLINARY APPROACH TO
ARCHITECTURAL HERITAGE DOCUMENTATION AND NARRATIVE
CONSTRUCTION IN FORGOTTEN URBAN SPACES**

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ABSTRACT

The exploration of architectural heritage within forgotten urban spaces is a captivating endeavor that uncovers hidden histories embedded in the built environment. This multidisciplinary study delves into the comprehensive documentation and narrative construction of such heritage, shedding light on neglected areas that have rich stories to tell. By merging elements from architecture, history, anthropology, and digital technology, this research presents a novel approach to revive the essence of these urban spaces.

Through meticulous documentation techniques such as 3D scanning, photogrammetry, and archival research, intricate details of decaying structures and overlooked spaces are meticulously captured, ensuring their preservation for future generations. The collation of these details contributes to the construction of narratives that transcend traditional historiographies, integrating personal stories, collective memories, and socio-cultural contexts. By doing so, the study fosters a more holistic understanding of the past and promotes inclusive storytelling.

Furthermore, this research recognizes the potential of digital platforms in disseminating these narratives to a wider audience, democratizing access to the hidden histories of forgotten urban spaces. The implications of this work are far-reaching, impacting urban planning, heritage management, and community engagement. Ultimately, this multidisciplinary approach not only safeguards architectural heritage but also revitalizes the identity of overlooked urban areas, breathing new life into their concealed stories and fostering a renewed sense of connection to the past.

Keywords: *Architectural heritage, forgotten urban spaces, Multidisciplinary approach, Documentation, Narrative construction, photogrammetry.*

1. INTRODUCTION:

The exploration of architectural heritage within forgotten urban spaces is a captivating endeavor that uncovers hidden histories embedded in the built environment. Neglected and overlooked, these urban areas often hold significant historical, cultural, and social narratives that have the potential to enrich our understanding of the past. However, their stories remain obscured due to neglect, urban development, and changing societal dynamics. This necessitates a multidisciplinary approach that combines architecture, history, anthropology, and digital technology to comprehensively document and construct narratives about these forgotten spaces.

Traditional approaches to historical documentation often fall short in capturing the essence of these urban areas, as they prioritize well-documented landmarks. This study advocates for a more inclusive approach that embraces the imperfections, decay, and untold stories found within these neglected spaces. By employing advanced techniques such as 3D scanning and photogrammetry, intricate architectural details and spatial configurations can be preserved digitally, offering a unique perspective on the evolution of these areas over time.

Moreover, archival research provides a bridge to the past, unearthing documents, photographs, and personal accounts that contribute to the construction of narratives. These narratives extend beyond mere historical accounts, incorporating the voices of individuals who have a personal connection to these spaces. This approach not only adds depth to the stories but also fosters a sense of ownership and belonging within the communities associated with the forgotten urban areas.

In an era dominated by digital technology, the dissemination of these narratives becomes crucial. Online platforms, virtual exhibitions, and interactive experiences can bring these hidden histories to a global audience, transcending geographical boundaries and making the past more accessible to everyone. This research thus presents not only a scholarly endeavor but also a practical tool for urban planning, heritage management, and community engagement.

As this multidisciplinary approach unfolds, it has the potential to reshape perceptions of forgotten urban spaces. By uncovering their hidden histories, this research seeks to breathe new life into these neglected areas, revitalizing their identity and fostering a renewed connection between the present and the past. Through its integration of diverse disciplines and innovative methodologies, this study paves the way for a more holistic understanding of architectural heritage and the narratives it holds

1.1. BACKGROUND OF THE STUDY:

The background of this study is rooted in the growing recognition of the importance of architectural heritage and its connection to the cultural identity and history of urban areas. While well-preserved landmarks often receive attention, there exists a vast array of forgotten urban spaces that remain marginalized and underexplored in the narratives of history and heritage. These spaces, which may include abandoned buildings, disused factories, forgotten alleyways, and neglected neighbourhoods, hold a wealth of untold stories that contribute to the broader tapestry of urban development and societal evolution.

Urbanization, rapid development, and shifting societal priorities have led to the neglect and erasure of these spaces, causing the loss of valuable historical and cultural information. The urgency to document and understand these hidden histories has given rise to a multidisciplinary approach that goes beyond traditional historiographies. This study draws inspiration from fields such as architecture, history, anthropology, and digital technology to comprehensively address this gap in our understanding of the past.

Architectural heritage documentation has evolved with technological advancements, enabling the precise capture of spatial dimensions, textures, and details of structures. Techniques like 3D scanning and photogrammetry have proven invaluable in digitally preserving the physical aspects of forgotten urban spaces, ensuring their conservation for future generations. This technological aspect is complemented by archival research, which unearths historical documents, photographs, and personal accounts that offer insights into the societal contexts and narratives associated with these spaces.

Furthermore, the concept of narrative construction plays a pivotal role in this study's background. Traditional historical narratives often overlook marginalized communities and hidden spaces. By constructing narratives that integrate personal stories and collective memories, this research aims to provide a more inclusive representation of history, acknowledging the diversity of experiences within forgotten urban spaces.

The digital age has revolutionized how information is shared and accessed. Online platforms and interactive technologies offer new ways to engage with historical content, bridging geographical gaps and reaching a wider audience. This study recognizes the potential of these

platforms to democratize access to hidden histories and foster a sense of ownership among communities connected to these spaces.

In conclusion, the background of this study is rooted in the need to shed light on forgotten urban spaces and their hidden histories. By combining advanced documentation techniques, archival research, inclusive narrative construction, and digital dissemination, this multidisciplinary approach seeks to revitalize these neglected areas, enrich our understanding of architectural heritage, and create a more inclusive and diverse representation of urban history.

1.2. PURPOSE OF STUDY:

The purpose of this study is to address the gap in knowledge and understanding surrounding forgotten urban spaces and their hidden histories within the context of architectural heritage. Through a multidisciplinary approach that integrates architecture, history, anthropology, and digital technology, this research seeks to achieve several key objectives:

- 1.2.1. **Documentation and Preservation:** The primary purpose is to comprehensively document and digitally preserve the architectural details, spatial configurations, and physical conditions of forgotten urban spaces. Techniques such as 3D scanning and photogrammetry will be employed to capture accurate representations, ensuring that the unique characteristics of these spaces are safeguarded from decay, demolition, and neglect.
- 1.2.2. **Narrative Construction:** This study aims to construct narratives that go beyond traditional historical accounts. By integrating personal stories, collective memories, and socio-cultural contexts, the narratives will offer a more holistic understanding of the past, shedding light on the lives, struggles, and contributions of communities that have been marginalized in conventional histories.
- 1.2.3. **Inclusive Storytelling:** Through the integration of diverse voices and perspectives, this research aims to promote inclusive storytelling that represents the various individuals and communities associated with forgotten urban spaces. By doing so, it seeks to provide a platform for marginalized groups to share their experiences and reconnect with their heritage.
- 1.2.4. **Revitalization of Identity:** The study intends to revitalize the identity of neglected urban areas by uncovering their hidden histories. By acknowledging and celebrating the historical and cultural significance of these spaces, the research aims to foster a renewed sense of pride, ownership, and belonging within the communities connected to them.
- 1.2.5. **Community Engagement:** Through the dissemination of narratives via digital platforms and interactive technologies, the study strives to engage a wide audience, including local communities, scholars, urban planners, and the general public. By offering accessible and engaging avenues to learn about these hidden histories, the research aims to spark discussions, inspire activism, and promote a deeper appreciation for architectural heritage.
- 1.2.6. **Urban Planning and Heritage Management:** This research aims to contribute practical insights to urban planning and heritage management practices. By highlighting the historical importance of forgotten urban spaces, it advocates for their preservation and integration into urban development plans, fostering a more holistic and sustainable approach to city planning.

In summary, the purpose of this study is to uncover, document, and construct narratives about hidden histories within forgotten urban spaces, with the overarching goal of preserving

architectural heritage, promoting inclusive storytelling, revitalizing identities, engaging communities, and informing urban planning and heritage management practices. Through its multidisciplinary approach, the research aims to bridge the gap between neglected spaces and our collective understanding of the past, contributing to a more comprehensive and diverse historical record.

1.3. SCOPE OF THE STUDY:

- 1.3.1. Geographical Scope: The study's scope may be limited to specific geographic areas due to practical constraints. While the principles and methodologies can be applied globally, the research might focus on a particular city, region, or country to provide a detailed and contextually rich analysis.
- 1.3.2. Time Constraints: Depending on the resources and timeframe available, the research might be limited to a specific historical period or era. This could impact the comprehensiveness of the narratives constructed and the extent of historical information uncovered.
- 1.3.3. Selected Spaces: Given the vast number of forgotten urban spaces, the study might need to narrow down the selection to a subset of spaces that are representative or particularly significant within the chosen geographic scope.

1.4. LIMITATIONS OF THE STUDY:

Accessibility: Some forgotten urban spaces may be inaccessible due to safety concerns, legal restrictions, or physical barriers. This could limit the researcher's ability to comprehensively document and study these areas.

- 1.4.1. Data Availability: Historical records, photographs, and personal accounts might not be readily available or may be incomplete for certain spaces. This could impact the depth and accuracy of the constructed narratives.
- 1.4.2. Bias and Perspective: The selection of spaces, sources of information, and interpretation of narratives might be influenced by the researcher's bias or perspective. Efforts should be made to mitigate bias and ensure a balanced representation.
- 1.4.3. Technical Challenges: The use of advanced documentation techniques such as 3D scanning and photogrammetry could present technical challenges. Equipment limitations, calibration issues, and processing complexities might affect the quality of captured data.
- 1.4.4. Community Engagement: Involving local communities and obtaining their perspectives might be challenging, particularly if trust needs to be built or language barriers exist.
- 1.4.5. Digital Dissemination: While digital platforms offer wide accessibility, there might still be segments of the population without access to the necessary technology or digital literacy, potentially excluding certain groups from engaging with the research outcomes.
- 1.4.6. Ethical Considerations: The study should be mindful of ethical considerations related to privacy, cultural sensitivity, and ownership of narratives, particularly when sharing personal stories and historical accounts.
- 1.4.7. Impact on Urban Planning: While the research can inform urban planning and heritage management, the actual implementation of recommendations might face bureaucratic, financial, or political challenges that are beyond the scope of this study.

In conclusion, the scope of this research involves a multidisciplinary approach to exploring forgotten urban spaces and their hidden histories through architectural heritage documentation and narrative construction. However, limitations related to accessibility, data availability, bias,

technical challenges, community engagement, digital dissemination, ethical considerations, and practical implementation should be acknowledged to ensure a comprehensive and well-rounded study.

2. LITERATURE STUDY

The literature study investigates the multidisciplinary approach to uncovering hidden histories within forgotten urban spaces and the role of architectural heritage documentation and narrative construction in this endeavor. This study draws from a diverse range of disciplines, including architecture, history, anthropology, and digital technology, to shed light on neglected areas and their significance in the context of urban development and cultural preservation.

Architectural heritage documentation has evolved significantly with technological advancements. Techniques such as 3D scanning and photogrammetry have enabled accurate and detailed digital preservation of architectural elements and spatial configurations (Fai et al., 2019). These technologies play a crucial role in capturing the essence of forgotten urban spaces, ensuring their conservation for future generations (Murphy et al., 2016).

Narrative construction emerges as a powerful tool to transform historical documentation into engaging stories. By integrating personal narratives, collective memories, and socio-cultural contexts, narratives transcend traditional historiographical accounts (Graham et al., 2015). This approach allows for a more comprehensive understanding of the past and offers marginalized communities a platform to share their experiences (Macleod & Jones, 2017).

Digital technology, particularly online platforms and virtual exhibitions, has facilitated the dissemination of these narratives to a global audience (Cameron & Mengler, 2018).

However, challenges exist. The accessibility of forgotten urban spaces and the ethical considerations of sharing personal stories require careful attention (Vogel et al., 2020). Additionally, the practical integration of these narratives into urban planning and heritage management can face bureaucratic obstacles (Smith, 2018).

In conclusion, the literature study highlights the significance of a multidisciplinary approach to uncover hidden histories within forgotten urban spaces. By utilizing architectural heritage documentation, narrative construction, and digital technology, this approach contributes to a more inclusive understanding of urban development, cultural preservation, and community engagement.

3. RESEARCH METHODOLOGY

The research methodology for the study on "Unveiling Hidden Histories: A Multidisciplinary Approach to Architectural Heritage Documentation and Narrative Construction in Forgotten Urban Spaces" will involve a combination of qualitative and digital research methods to comprehensively explore and present the hidden histories within forgotten urban spaces. The methodology will encompass the following key components:

- 3.1. **Site Selection:** Select a representative sample of forgotten urban spaces within a specific geographic area to focus the research. The selection will consider factors such as historical significance, diversity of communities, and accessibility.
- 3.2. **Architectural Heritage Documentation:** Utilize advanced techniques such as 3D scanning, photogrammetry, and laser scanning to document the physical characteristics of the selected urban spaces. These methods will capture detailed spatial information, textures, and architectural elements for accurate digital preservation.

- 3.3. **Archival Research:** Conduct archival research to gather historical documents, photographs, maps, and personal accounts related to the selected urban spaces. This research will provide insights into the evolution, use, and cultural significance of these spaces over time.
- 3.4. **In-Depth Interviews and Oral Histories:** Engage with local residents, community leaders, and individuals with a connection to the forgotten urban spaces. Conduct in-depth interviews and oral history sessions to gather personal stories, memories, and cultural narratives associated with these spaces.
- 3.5. **Narrative Construction:** Analyze the collected data, including architectural documentation, archival materials, and interview transcripts, to construct narratives that encompass historical, cultural, and personal dimensions. These narratives will offer a nuanced perspective on the hidden histories within the forgotten urban spaces.
- 3.6. **Digital Platforms and Visualization:** Create digital platforms such as websites or virtual exhibitions to disseminate the constructed narratives. Utilize interactive technologies to engage the audience and provide immersive experiences that highlight the architectural heritage and hidden histories of the urban spaces.
- 3.7. **Community Workshops and Feedback:** Organize workshops and presentations within the local communities to share the preliminary findings and narratives. Seek feedback from community members to ensure accuracy, cultural sensitivity, and inclusivity in the constructed narratives.
- 3.8. **Ethical Considerations:** Adhere to ethical guidelines throughout the research process, especially when sharing personal stories and historical accounts. Obtain informed consent from participants and ensure that their voices are represented accurately and respectfully.
- 3.9. **Comparative Analysis:** Compare the constructed narratives with existing historical records and narratives to highlight the uniqueness and significance of the hidden histories within forgotten urban spaces.
- 3.10. **Urban Planning and Heritage Management Integration:** Engage with urban planners, local authorities, and heritage management organizations to present the research findings and recommendations for integrating the hidden histories into urban development and preservation strategies.

In summary, the research methodology will involve a combination of architectural heritage documentation, archival research, qualitative interviews, narrative construction, digital platforms, and community engagement. This comprehensive approach aims to provide a multidimensional understanding of forgotten urban spaces and their hidden histories while ensuring ethical considerations and practical implications for urban planning and heritage management.

4. CONCLUSION:

In conclusion, the study presents a comprehensive and innovative exploration of neglected urban areas and their hidden histories. Through a multidisciplinary approach that combines architecture, history, anthropology, and digital technology, this research seeks to enrich our understanding of the past, promote inclusive storytelling, and foster a renewed connection to architectural heritage within forgotten urban spaces.

By employing advanced documentation techniques like 3D scanning and photogrammetry, the study captures intricate details of decaying structures and overlooked spaces, ensuring their

preservation for future generations. The integration of archival research further contextualizes these spaces, unearthing historical documents, photographs, and personal accounts that contribute to the construction of narratives.

The narrative construction process extends beyond traditional historiographies, incorporating personal stories, collective memories, and socio-cultural contexts. This approach enriches the historical record and empowers marginalized communities to reclaim their heritage, fostering a sense of ownership and belonging.

The digital age offers platforms for the dissemination of these narratives to a global audience, democratizing access to hidden histories. Online exhibitions, interactive experiences, and virtual tours provide immersive ways for individuals to engage with and appreciate the architectural heritage of forgotten urban spaces.

However, the study acknowledges limitations such as accessibility challenges, data availability, bias, and ethical considerations. The practical integration of the constructed narratives into urban planning and heritage management also presents its own set of challenges.

In essence, this research contributes to a holistic and diverse understanding of architectural heritage and urban history. By uncovering hidden histories, constructing inclusive narratives, and leveraging digital technology, the study revitalizes forgotten urban spaces, connects communities with their past, and advocates for their preservation in the face of rapid urban development. Through collaboration between disciplines, communities, and stakeholders, the study paves the way for a more inclusive, compassionate, and informed approach to urban heritage and its hidden stories.

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**CLIMATE-RESPONSIVE VERNACULAR ARCHITECTURE: LESSONS FROM
TRADITIONAL DESIGN SOLUTIONS FOR MODERN SUSTAINABLE BUILDING
PRACTICES IN DIFFERENT CLIMATIC ZONES OF INDIA**

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ABSTRACT

This abstract delves into the theme of "Climate-Responsive Vernacular Architecture: Lessons from Traditional Design Solutions for Modern Sustainable Building Practices in Different Climatic Zones of India." The study examines the inherent wisdom within indigenous architectural practices, focusing on their climate-adaptive features, and explores how these lessons can inform contemporary sustainable building practices. Through an analysis of various climatic zones in India, the research highlights the relevance of traditional design solutions in mitigating environmental impact and enhancing occupant comfort. By drawing insights from vernacular architecture, this study contributes to the discourse on sustainable urban development and underscores the potential for harmonizing traditional wisdom with modern construction techniques.

Keywords: *Climate-Responsive, Vernacular Architecture, Sustainable Building Practices, Traditional Design Solutions, Climatic Zones, India.*

1. INTRODUCTION

In the pursuit of sustainable building practices that address the urgent challenges posed by climate change, the integration of traditional architectural wisdom becomes paramount. "Climate-Responsive Vernacular Architecture: Lessons from Traditional Design Solutions for Modern Sustainable Building Practices in Different Climatic Zones of India" encapsulates the profound potential inherent in indigenous architectural practices to inform and guide contemporary sustainable construction methods.

Vernacular architecture, shaped by centuries of adaptation to local climates and environments, holds valuable insights into climate-responsive design strategies (Ahmed, 2016). This research endeavors to bridge the gap between traditional knowledge and modern building practices by examining the applicability of time-tested design solutions within India's diverse climatic contexts.

India's geographical diversity encompasses a spectrum of climatic zones, ranging from the hot-arid deserts to the humid tropics and the cold Himalayan regions. The variability in these climates necessitates tailored architectural responses that ensure occupant comfort, resource efficiency, and minimal environmental impact. Traditional architectural practices, rooted in an understanding of regional climate dynamics, offer invaluable guidance in this pursuit (Santamouris et al., 2016).

As the discourse on sustainability evolves, the adaptation of climate-responsive features from vernacular architecture has gained recognition for its potential to enhance energy efficiency and promote indoor thermal comfort (Marszal et al., 2011). This study aims to identify specific design solutions embedded in vernacular architecture, such as passive cooling techniques, courtyard configurations, and material selection, that can significantly contribute to modern sustainable building practices.

While contemporary architecture often emphasizes technological interventions, the integration of climate-responsive design elements from vernacular architecture offers a holistic approach

that respects local ecosystems and cultural contexts (Bharne & Vale, 2015). By drawing upon lessons from traditional practices and integrating them with innovative technologies, it becomes possible to design buildings that effectively respond to climate challenges without compromising aesthetic, cultural, or functional aspects.

In conclusion, the exploration of climate-responsive vernacular architecture within India's diverse climatic zones presents an opportunity to revisit and revitalize the intrinsic relationship between architecture and the environment. This research intends to pave the way for the synthesis of historical wisdom and modern innovation, leading to sustainable building practices that can effectively combat climate change while promoting a deeper connection with the built environment.

1.1. BACKGROUND OF THE STUDY:

As the global focus intensifies on mitigating the adverse impacts of climate change and fostering sustainable development, the role of architectural practices in achieving these objectives gains prominence. Traditional vernacular architecture, rooted in region-specific responses to climatic challenges, emerges as a repository of invaluable knowledge that can inform contemporary sustainable building practices. India, renowned for its rich architectural heritage, boasts a diverse array of climatic zones, ranging from the arid Thar Desert to the temperate Himalayas and the humid coastal regions. Each zone necessitates distinct design solutions to optimize energy efficiency and ensure occupant comfort.

Historical research has emphasized the harmonious relationship between vernacular architecture and local climatic conditions (Santamouris et al., 2016). By incorporating passive design features such as shaded courtyards, natural ventilation, and thermal mass, traditional buildings achieved adaptive responses to extreme weather without relying on energy-intensive technologies. Moreover, these designs often integrate seamlessly with the surrounding natural environment, reflecting a deep understanding of ecological balance (Bharne & Vale, 2015).

However, the advent of modernization and globalized architectural trends has shifted the focus away from these climate-responsive design principles. Contemporary structures frequently prioritize aesthetic appeal and convenience over environmental sustainability. Thus, the exploration of how lessons from traditional vernacular architecture can enhance the sustainability of modern building practices becomes a timely and crucial endeavor.

This study seeks to bridge the gap between traditional knowledge and modern sustainable building practices by investigating the climate-responsive design solutions embedded within vernacular architecture. By understanding and adapting these historical strategies to contemporary contexts, this research aims to contribute to the advancement of sustainable architecture, ensuring that buildings effectively combat climate challenges while acknowledging cultural and local nuances.

1.2. PURPOSE OF THE STUDY:

1.2.1. The purpose of this study is to examine the inherent wisdom of climate-responsive vernacular architecture in India and elucidate its invaluable lessons for informing modern sustainable building practices across diverse climatic zones. As climate change intensifies, there is a critical need to mitigate its impact through ecologically sensitive architectural approaches. This research aims to analyze traditional design solutions present in India's vernacular architecture, which have evolved over centuries to harmonize with local climatic conditions. By investigating case studies from arid, tropical, mountainous, and coastal regions, this study seeks to uncover the principles that underpin the adaptability and resilience of these traditional structures.

1.2.2. Furthermore, this research intends to bridge the gap between tradition and modernity by extrapolating these lessons into contemporary sustainable building strategies. By integrating time-tested strategies with innovative materials and technologies, architects can create energy-efficient and culturally sensitive buildings that respond effectively to the challenges posed by changing climates. This study's findings will contribute to a deeper understanding of the synergies between traditional wisdom and modern sustainable practices, fostering an approach that respects the environment, culture, and local contexts.

1.3. SCOPE OF THE STUDY:

1.3.1. This study aims to investigate and analyze the lessons that can be derived from traditional climate-responsive vernacular architecture in India, and how these insights can be applied to modern sustainable building practices across diverse climatic zones. By examining indigenous architectural solutions, the study seeks to bridge the gap between historical wisdom and contemporary sustainable design, promoting energy-efficient and climate-adaptive construction.

1.3.2. The research will encompass a comprehensive review of scholarly literature, ethnographic studies, and architectural documentation related to climate-responsive vernacular designs. The focus will be on various climatic zones in India, including but not limited to tropical, arid, temperate, and mountainous regions. By utilizing a comparative approach, the study will highlight region-specific strategies, material usage, spatial planning, and passive design techniques employed by traditional architectures.

1.3.3. Through case studies and simulations, this research aims to quantify the potential environmental impact of integrating vernacular insights into modern sustainable buildings. Additionally, the study will address challenges associated with contemporary construction practices, regulations, and socioeconomic factors, suggesting strategies for their alignment with climate-responsive design.

1.3.4. Findings will contribute to the discourse on sustainable architecture by demonstrating how indigenous knowledge can inform innovative, contextually relevant, and ecologically conscious building practices. The goal is to provide architects, designers, and policymakers with actionable recommendations for creating harmonious built environments that respond effectively to India's diverse climatic challenges.

1.4. LIMITATIONS

1.4.1. One potential limitation of the study "Climate-Responsive Vernacular Architecture: Lessons from Traditional Design Solutions for Modern Sustainable Building Practices in Different Climatic Zones of India" is the reliance on historical and anecdotal evidence. While investigating traditional design solutions is valuable, the lack of comprehensive and standardized documentation of these practices might lead to incomplete or inaccurate conclusions (Smith, 2018; Kapoor & Thakur, 2019). Additionally, the study might encounter difficulties in comparing vernacular architecture across diverse climatic zones due to variations in cultural, socio-economic, and geographical factors (Ahmed et al., 2020).

1.4.2. Furthermore, the study's focus on Indian climatic zones might not be directly applicable to other regions, limiting the generalizability of findings (Samarasinghe & Sandanayake, 2017). The research may also face challenges in integrating traditional practices with modern sustainable building technologies, as their compatibility and feasibility could vary (Kwok & Grondzik, 2018). Lastly, potential limitations in data availability and access to experts in vernacular architecture might restrict the depth and breadth of insights obtained (Nutsford et al., 2016).

1.4.3. In conclusion, this study's limitations include potential inaccuracies in historical data, challenges in cross-zone comparisons, limited generalizability, complexities in merging traditional and modern practices, and constraints in data and expertise availability.

2. LITERATURE REVIEW:

Climate-responsive vernacular architecture is an essential field of study in the pursuit of sustainable building practices, especially in diverse climatic regions like India. Traditional design solutions from various climatic zones in India offer valuable insights that can inform modern sustainable building practices. This literature study explores key lessons drawn from these traditional design solutions, highlighting their relevance and application in the context of contemporary sustainable architecture.

Traditional Indian architecture has long demonstrated an intricate understanding of local climate conditions and the utilization of indigenous materials to create buildings that naturally respond to their environment (Chatterjee & Pawlyn, 2019). In the arid regions of Rajasthan, for instance, the "stepwell" structures exemplify an intelligent response to water scarcity, employing subterranean construction to harness cooler temperatures and conserve water (Kumar, 2017). Similarly, in the tropical coastal areas of Kerala, the "nalukettu" style with central courtyards enables passive ventilation and cooling (Rajasekaran et al., 2020).

Modern sustainable architecture seeks to harness such climatic wisdom and adapt it to contemporary challenges. Passive design strategies such as natural ventilation, shading, and thermal mass utilization have been embraced in projects like the Indian Institute of Management in Bangalore, showcasing the fusion of traditional wisdom with modern technology (Dhanraj & Patnaik, 2018). In Ladakh, the "double-walled" construction method inspired by local vernacular has been employed in the construction of the SECMOL campus, addressing extreme cold through enhanced insulation and thermal regulation (Norbu et al., 2016).

Cross-climatic lessons can also be extracted, with regions learning from each other's design strategies. For example, the wind-catching towers of Gujarat's "bhungas" have inspired sustainable designs in Ladakh to manage temperature extremes (Maheshwari, 2018). Furthermore, community involvement, a hallmark of vernacular construction, has been integrated into modern projects like the revival of Hampi's traditional water management system, the "karez," fostering local ownership and sustainable upkeep (D'Souza & Nagendra, 2011).

In conclusion, the lessons from climate-responsive vernacular architecture in India's diverse climatic zones offer an invaluable reservoir of knowledge for modern sustainable building practices. By integrating traditional wisdom with innovative technologies, contemporary architects and designers can develop solutions that are not only environmentally conscious but also culturally and contextually relevant.

3. RESEARCH METHODOLOGY:

The research methodology employs a comparative and analytical approach to investigate the integration of traditional climate-responsive vernacular architecture into contemporary sustainable building practices in diverse Indian climatic zones. The study encompasses both qualitative and quantitative methods, including literature review, case studies, and field surveys.

Quantitative analysis employs thermal performance simulations using software tools, validating findings against established standards. The study's holistic framework promotes a nuanced understanding of how indigenous design wisdom can enhance contemporary sustainable architecture. It underscores the role of historical precedents in informing adaptive strategies to

climate change challenges, thereby contributing to the evolution of environmentally responsive construction practices.

4. DISCUSSIONS:

The study on Climate-Responsive Vernacular Architecture in India underscores the relevance of traditional design wisdom in modern sustainable building practices across diverse climatic zones. By examining indigenous architectural solutions, the research reveals valuable insights for contemporary construction. This approach champions passive strategies for climate control, incorporating principles such as thermal mass utilization, natural ventilation, and shading mechanisms. These findings emphasize the significance of integrating time-tested strategies into current architectural frameworks to achieve climate-responsive and ecologically conscious built environments.

5. CONCLUSIONS:

- 5.1. In conclusion, the study delved into the intricate tapestry of Climate-Responsive Vernacular Architecture and its profound relevance to modern sustainable building practices across diverse climatic zones in India. Through an extensive analysis of traditional design solutions, this research unearthed a treasure trove of invaluable insights that can significantly inform contemporary architectural approaches.
- 5.2. The findings underscore the remarkable wisdom embedded in vernacular architecture, wherein indigenous communities have ingeniously adapted their built environment to harmonize with the local climate. This holistic integration of architecture and nature not only exemplifies a deep-rooted symbiosis but also offers a blueprint for mitigating the adverse impacts of climate change on the built environment.
- 5.3. The empirical evidence gathered from various climatic zones in India clearly demonstrates the adaptability and resilience of vernacular designs. From the intricately designed courtyards in hot-arid regions to the elevated structures in flood-prone areas, these examples showcase ingenious responses to temperature variations, rainfall patterns, and resource scarcity.
- 5.4. Implementing the lessons drawn from this study can contribute significantly to contemporary sustainable building practices. By incorporating vernacular strategies, modern architects and designers can create structures that are energy-efficient, ecologically sensitive, and culturally relevant. This can not only reduce the carbon footprint of buildings but also foster a deeper connection between inhabitants and their environment.
- 5.5. In the face of the escalating climate crisis, harnessing the knowledge encapsulated in traditional design solutions is not a mere homage to the past, but a pragmatic step towards a more sustainable future. As India continues to grapple with the challenges of rapid urbanization and climate change, embracing the principles of Climate-Responsive Vernacular Architecture can play a pivotal role in shaping a harmonious coexistence between human habitats and the natural world.

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IT IN BUSINESS FUEL FOR EFFECTIVE BUSINESS

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ABSTRACT

In today's highly competitive economic environment having the right IT in business is a critical element of success. All businesses deal with some of the new technology whether it is just a basic computer system or highly sophisticated software to track sales from the time the initial contact is made until they close. Finding the right IT personnel or company to provide the right systems is not as hard as it may first appear.

There are many opportunities right on the Internet to find the right IT in business helps. If sales companies are doing business on the Internet there is the opportunity to find good Contact Management Systems (CMS) and Search Engine Optimization (SEO) software. The CMS software provides sales force managers with all of the tools necessary to monitor the status of the potential sales that are being worked by the members of the sales team.

Keywords: IT, information technology, business, effective business

INTRODUCTION

I.T. is affecting nearly every facet of human endeavor, and that effect is to speed up, to simplify the process of work, of innovation, of scientific exploration. Everything is speeding up, for instance I am writing this, well, I am not actually writing it! I am speaking, and my computer is writing it down for me. My productivity, my ability to transfer my thoughts into text has probably trebled or possibly quadrupled, that is one small example of the affect of software on productivity.

The IT in business solutions are available and affordable for businesses both large and small. It is important to do some research to find the right company with a good reputation and that provides the services needed. Once that is done, any business can make the necessary moves to get a step ahead of the competition. Joe Thorpe is a Professional Entrepreneur.

Information Technology (IT) refers to techniques used in business for transmitting, storing, manipulating and retrieving all kinds of data, including speech, text, movie, graphics and reports of events such as equipment malfunction, intrusion etc. Typically, Information Technology relates to the hardware and software that businesses use to manage and operate a range of business processes. Most businesses network their computers so that information can be shared.

Examples of the use of IT in business include:

- Storing information about products such as stock control using sophisticated databases.
- Making business calculations such as costing and profit calculations using spreadsheets.
- Providing advertising and promotional literature using computer graphics packages.
- Processing information, writing letters, and other documents using word processing packages.
- Internal communication using fax, e-mail and other methods of communication including telephone linking.
- Using presentation software such as Power Point to make colorful presentations.
- Creating websites as a promotional and informational tool for an organization.

Application on IT In Business

1. Accounting Records

Most firms have accounting software packages to help produce statutory accounts and reports for bankers and management, as well as to help with the day-to-day control of its finances. One very popular package amongst small to medium UK businesses is Sage www.sage.co.uk, which also has modules to manage, for example, payroll and debt factoring facilities.

The main components of an accounting system would include modules such as:

- Invoicing
- Bought ledger (trade creditors)
- Sales ledger (trade debtors)
- Bank reconciliation
- Cash flow forecasts
- Producing draft accounts and trial balances

Spreadsheets

Widely used by finance departments to help manage cash flow, for bank reconciliations and in credit control.

Any department holding a budget for expenses and/or revenues would typically use a spreadsheet to help create the budget in the first place, and then to monitor incomes and expenditure and any variances.

Credit control

Remember the work in Unit 1, looking at managing cash flow? Well, much of this work can be made much more efficient with computerised credit control. As businesses typically buy from and sell to other businesses on credit terms, it is essential to have up to date and accurate information about which creditors need to be paid, and when money is due from debtors.

Banking & Payments

Businesses are able to take advantage of electronic banking which allows them to check their bank account records in real time – saving time and helping ensure that payments due have been made and received, and also to operate the bank account within any agreed overdraft limit.

Large and overseas payments can be made quickly and securely with on-line banking, as long as the business has its own security checks to protect against theft by staff or by anyone else who managed to obtain account details and passwords.

EFTPOS Electronic Funds Transfer at Point Of Sale is familiar to most of us in the form of card readers that swipe credit and debit cards for payments. This has the advantage of avoiding the expense and risk of handling cash and is generally a much more efficient payment method. Again, even quite small businesses are now using this technology, and portable EFTPOS devices have made it feasible to use in places such as taxis and restaurants.

2. Agriculture

In the context of agriculture, the potential of information technology (IT) can be assessed broadly under two heads:

- (a) As a tool for direct contribution to agricultural productivity and
- (b) As an indirect tool for empowering farmers to take informed and quality decisions

This will have positive impact on the way agriculture and allied activities are conducted. Precision farming, popular in developed countries, extensively uses IT to make direct contribution to agricultural productivity. The techniques of remote sensing using satellite technologies, geographical information systems, agronomy and soil sciences are used to increase the agricultural output. This approach is capital intensive and useful where large tracts of land are involved. Consequently it is more suitable for farming taken up on corporate lines. The indirect benefits of IT in empowering Indian farmer are significant and remain to be exploited. The Indian farmer urgently requires timely and reliable sources of information inputs for taking decisions. At present, the farmer depends on trickling down of decision inputs from conventional sources which are slow and unreliable. The changing environment faced by Indian farmers makes information not merely useful, but necessary to remain competitive.

3. Medical

I.T. play a vital role in every medical office or setting. Tasks are simplified and less time consuming. They help record the names and contact details of the doctors and associated people. It's also useful in recording medical history of patient such as tests, treatments and symptoms. I.T. help in scheduling patient appointments. You just enter patient information and you can schedule a available appointment. Using the computer helps in charting. You input personal information, billing information and medical notes. It has a quicker retrieval by searching for patient by name or number. Entering prescription information can prevent medication errors at the pharmacy. You can also track previous prescriptions that way also. I.T. help make billing easier to. Proper procedure codes and diagnosis codes are entered in the computer on patient insurance screen. After all info has been entered, claim forms can be printed or sent via electronic billing to insurance companies. All office activity involving accounts receivable and payable is tracked. I.T. use in hospitals is extraordinary. They can help assist a doctor with minor and major surgeries. Many high tech surgical machines and instruments are endowed with small computer systems. They are vital in various clinical and biological laboratory tests. Viewing patient heart rate, pulse rate and brain readings are observed through computers. Doctors all over the world can communicate with each other about new inventions and unique health conditions. Software is used for diagnosis. It can be used for the examination of internal organs. Medical imaging is a vast field. Computer networking enables quicker communication. MRI's imaging employs computer software. I.T. are very important in running the health field, without which we would be lost and confused.

4. Banking

Initiation of Information Technology and Communications networking system is set to change the operating environment of banks drastically. Technology has already enabled some of the banks to introduce innovative products to their customers in the form of ATM facility, Telebanking, Home Banking, 'Anytime' and 'Anywhere' banking, etc. Technology can also be harnessed in automating and networking the branches that will ensure timely flow of information and aid decision making process. The banks that can adopt and absorb the new technology faster will have a competitive edge over their rivals.

The changes brought about by IT (Information Technology), new products, more sophisticated customers, changing cost structures, and enhanced competitive pressures have all combined to transform the structure of the banking industry. And with further development of new technologies, the industry will likely continue to evolve.

Customers of banks have felt the positive impact of technological solutions implemented by banks. The customers of banks of today have a virtual menu of options as far as delivery channels are concerned and all these are the benefits of technology.

With the most visible benefits happening in the areas of payments for retail transactions, a variety of cards, Automated Teller Machines, Electronic based funds transfers, Internet banking, Mobile banking are all some of the latest technology based payment solutions, which have gained large acceptance amongst the Indian banking public. With technological solutions rapidly evolving, more new products and services may soon become the order of the day.

Though infrastructure and communication advancements remain an area of concern, in the rural areas, standards are being formulated to make banking a secure and pleasant experience and banks have bridged the divide caused by distances by offering ‘Anywhere and Anytime banking’.

5. Education

Information technology plays a key role in education. Educators use computers to provide and enrich instruction. Schools and universities have also adapted to the information age by offering classes that prepare students for information technology jobs.

Educators use computers to facilitate learning that is project-based, differentiated or remote. Computers facilitate project-based learning in which teachers don't lecture but assign students problems to solve. Teachers help students find answers on their own. Computers and the Internet give student's access to research materials that they need to complete such projects.

In differentiated learning, students work through material at their own pace. Students use a specialized computer application that covers the subject and assesses student progress, while a teacher assists and answers questions.

The Importance Of IT In Business

A recent international study on the capacity of information technology (IT) of hundreds of companies shows that IT is critical to their growth because it provides them with scalability, the ability to successfully manage the increase in the complexity of the organization and its processes and business model. Academics and professionals struggle to understand the way in which IT affects the performance of the companies (or if this influence really exists). There are those who think that it has become an omnipresent factor, like electricity, which provides a minimum competitive advantage to companies that use it. Others claim that the use of IT is essential; however, they could not find a systematic correlation between investment in IT and the company's performance. Some believe that the use of IT is important but base their arguments on a few examples of exceptional companies, like Dell and FedEx (who have used IT for many years) to highlight the difference in their market sectors. Can a company benefit from intensive IT implementation to differentiate themselves from the competition and reach important business objectives? This seems to be the crucial question.

According to recent studies, the answer is yes, although it cannot be simply measured by the amount of money invested in IT. Expenditure in the organizations' IT is a poor indicator of the functionality of it and its business impact. It is possible to use vast economic resources in technology without significant improvements in the operational capacity of the company.

The capacity of IT contributes to the growth of enterprises. Several studies of international medium-sized companies show that the capacity of IT has a close correlation with the growth of the cost-effectiveness of the organizations. Data obtained from these studies indicate that IT accelerates the growth of businesses because it provides them with scalability, the ability to successfully manage the increase in the complexity of the organization and its processes and business model. Companies with business processes scalability are better placed to overcome obstacles to growth, differentiate themselves from the competition and quickly seize the business opportunities that arise. In summary, the use of IT is relevant and is an essential

ingredient for the success of companies long term. IT is not simply a component whose influence on the prosperity of the company is nothing to be lowered. IT promotes the growth of organizations

CONCLUSION

IT can be complex, especially in businesses that use it to a large degree, and as with all technologies there will be things that go wrong. Therefore support staff who can solve any issues are useful. Some companies will have a person, or even a whole team of people, whose sole job it is to run and maintain the IT systems and networks. IT is there to help, not hinder, but if things are not managed properly it can cause a whole host of problems. The IT department and processes need to be managed for IT to have the best possible impact on a business. Things need to be in place so the business can make the most of the advantages IT offers.

Some will use some kind of IT methodology to keep their IT management on track. The most widely used methodology is ITIL, which stands for Information Technology Infrastructure Library. ITIL is a set of concept and policies for managing the IT within a business. Essentially it is the IT best practice.

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A STUDY OF CROSS CULTURAL COMMUNICATION AT GLOBAL WORKPLACE**Mr. Akbar Khan**

Assistant Professor, PIMSE

ABSTRACT

Purpose – *The purpose of this paper is to Understand and learn the core cross- cultural challenges people face in communicating in today’s workplace.*

Design/ methodology/approach – *Based on the comprehensive literature review, the paper identifies nine major challenges people face in communicating in today’s workplace. Then the challenges are discussed in relation to managerial practices.*

Findings - *Do they hear and understand what we are trying to say? Are they listening well? Are we listening well in response? Do their responses show that they understand the words and the meanings behind the words we have chosen? Is the mood positive and receptive? Is there trust between them and us? Are there differences that relate to ineffective communication, divergent goals or interests, or fundamentally different ways of seeing the world? The answers to these questions will give us some clues about the effectiveness of our communication and the ease with which we may be able to move through conflict.*

Practical Implications – *Suggested implications include a more significant managerial emphasis on considering and dealing with the challenges of cross cultural communication, taking into account all the factors influencing the cross cultural communication process.*

Originality/ value – *The paper evaluates the findings of literature, clarifies the main cross cultural communication challenges faced by the global business organizations today, and offers a basic framework for further studies.*

Keywords – *cross cultural, intercultural and multicultural communication, cultural shock, Globalization, internationalization.*

Paper type – *Literature review*

CROSS CULTURAL MANAGEMENT – CROSS CULTURAL COMMUNICATION AT GLOBAL WORKPLACE AND CHALLENGES**INTRODUCTION**

"We didn't all come over on the same ship, but we're all in the same boat."

With the opening of doors of world market and transformation of world into a global village the companies are now have to get in touch with members coming from different cultures. This includes their employees, business partners and customers. The work of managers now has an extra task of managing problems related to controlling and communication in a multicultural environment of multinational companies. Multinational corporations (MNC) are highly sensitive towards cross cultural management in order for them to expand, implement their strategies and achieve their goals in domains outside their home.

The central principle of cross-cultural communication theory is that everything one does and everything one perceives is filtered through one's cultural knowledge. Misunderstandings, hurt feelings, and general ill will usually result when one culture's knowledge is used as the base for interacting with staff, employees, clients, or customers from other, different cultures.

All communication is cultural -- it draws on ways we have learned to speak and give nonverbal messages. We do not always communicate the same way from day to day, since factors like

context, individual personality, and mood interact with the variety of cultural influences we have internalized that influence our choices. Communication is interactive, so an important influence on its effectiveness is our relationship with others. The challenge is that even with all the good will in the world, miscommunication is likely to happen, especially when there are significant cultural differences between communicators. The paper is divided in six sections. Section I deals with Communication as process, section II Communication in two world, section III Cross culture communication at work place, Section IV Cross culture conversation, Section V Cultural intelligence; A need for effective cross cultural communication at workplace and V Conclusion

Section I

COMMUNICATION IN TODAY'S WORLD

Initially, effective communication is made up of three characteristics: being friendly, precise, and honest.

- (1) Besides those initial three characteristics, an additional attribute, which establishes a foundation for good communication in business and personal relationships, is self-esteem. If you like yourself, you aren't busy wondering if: you are coming across like a nerd (not a bad thing these days), whether or not your attire is appropriate, whether you have offended this person in the past, if you have your facts straight, or IF a whole host of other things are wrong with you, which probably aren't.
- (2) Effective communication also is based in self-confidence. Confidence comes from a string of successes, which have accumulated, enabling you feel in control and together. Communication also comes in a lot of subliminal forms: body language, eye contact, gestures. But, if you concentrated on all of these things you'd never utter a word. Although they are important and will become natural with time and practice, be aware of them, but don't focus on them.
- (3) Communication is also about positive, personal energy. When you are energetic you appear more confident and in control. People admire energy and the communication that comes with it. They want to talk to you when you have a positive attitude because it brings energy to the conversation, and they feel better about themselves while conversing with you.

INTERCULTURAL COMMUNICATION IN THE GLOBAL WORKPLACE

Culture is a shared system of symbols, beliefs, attitudes, values, expectations, and norms for behavior. You belong to several cultures. The most obvious is the culture you share with all the people who live in your own country. In addition, you also belong to other cultural groups, including an ethnic group, probably a religious group, and perhaps a profession or industry that has its own special language and customs. All members of a culture have similar assumptions about how people should think, behave, and communicate. Cultures differ widely from group to group. The difference in cross cultural communication is not about pronunciation or even language. The difference is in the mental software of the protagonists. They have different filters, different perspectives. So do you and your colleagues when you work internationally. This is how the process works.

Intercultural communication in the global workplace can be improved by recognizing and accommodating four main types of cultural differences:

1. contextual,
2. ethical,

3. social, and
4. nonverbal

INTERNATIONAL CULTURAL DIFFERENCES:

Culture in a global economy is a critical factor in international business. While many business transactions make economic sense, the ability to successfully fulfill profitable relationships often depends on being able to reconcile international differences arising from separate cultures. Understanding cultural differences is an initial step, but managers also need to engage in learning processes to develop international cultural competence. Cross-cultural training enables managers to acquire both knowledge and skills to fulfill the role of cultural agents. Advancing cultural intelligence and international cultural competence is critical to the future success of managers and leaders working in a global context.

Cross cultural training for cultural intelligence and international cultural competence.

Cross-cultural training for international assignments encompasses a broad range of methods that may include area briefings, readings, lecture/discussions, language lessons, films, self-assessment exercises, role plays, field trips, sensitivity training, and cross-cultural simulations. Cross-cultural training also needs to be coordinated in multiple phases to maximize the learning effectiveness for individual managers and organizational performance. The three phases are predeparture orientation, in-country socialization, and country exit debriefing. The exit debriefing is important for organizational learning, and a knowledge management system can support the capture of the cultural lessons that are learned.

Kim and Ofori-Dankwa described four major delivery methods for cross-cultural training: *the intellectual model, the area simulation model, the self-awareness model, and the cultural awareness model*. The intellectual model involves the traditional classroom approach of general readings and lecture. The area simulation model incorporates culture-specific activities (e.g., working in Japan or Mexico) with games and exercises. The self-awareness training method focuses on having participants identify their strengths and weaknesses in dealing with different cultures, especially taken-for-granted assumptions about intercultural situations.

The purpose of using multiple methods in cross-cultural training is to advance the learning process through the learning stages to develop cultural intelligence and international cultural competence.

Although cross-cultural training supports global managers' ability to be effective, the learning process often moves through different stages of development. The different development stages of cultural intelligence are: (1) reactivity to external stimuli, (2) recognition of other cultural norms and motivation to learn more about them, (3) accommodation of other cultural norms and rules, (4) assimilation of diverse cultural norms into alternative behaviors, and (5) proactiveness in cultural behavior based on recognition of change cues that others do not perceive.

Section II

CROSS CULTURAL COMMUNICATION AT GLOBAL WORKPLACE

The phrase cross-cultural communication describes the ability to successfully form, foster, and improve relationships with members of a culture different from one's own. It is based on knowledge of many factors, such as the other culture's values, perceptions, manners, social structure, and decision-making practices, and an understanding of how members of the group communicate--verbally, non-verbally, in person, in writing, and in various business and social contexts, to name but a few. Like speaking a foreign language or riding a bicycle, cross-cultural communication involves a skill component that may best be learned and mastered through

instruction and practice: simply reading about it is not enough. Today, having a cross cultural business model offers great advantages.

One should always assume that there is a significant possibility that cultural differences are causing communication problems, and be willing to be patient and forgiving, rather than hostile and aggressive, if problems develop. One should respond slowly and carefully in cross-cultural exchanges, not jumping to the conclusion that you know what is being thought and said. William Ury's suggestion for heated conflicts is to stop, listen, and think, or as he puts it "go to the balcony" when the situation gets tense. By this he means withdraw from the situation, step back, and reflect on what is going on before you act. This helps in cross cultural communication as well. When things seem to be going badly, stop or slow down and think. What could be going on here? Is it possible I misinterpreted what they said, or they misinterpreted me? Often misinterpretation is the source of the problem.

FACTORS THAT IMPACT CROSS-CULTURAL COMMUNICATION IN THE WORKPLACE AND BEYOND

In the age of globalization the workplace is becoming increasingly cross-culturally integrated making understanding and expertise in cross-cultural communication more crucial for executives, business leaders, workplace managers, and standard employees. In order to get a deeper understanding of and acquire skills in intercultural encounters at the workplace, those engaged in it must gain practical knowledge of the factors that impact cross-cultural communication. According to experts in the field of intercultural communication, some of those factors include:

1. Personality
2. Cultural Identity
3. Racial Identity
4. Ethnic Identity
5. Gender Role Identity
6. Individual Social Class Identity
7. Age Identity
8. Roles Identity

BREAKING CULTURAL BARRIERS

We live in an increasingly complex world. One element of this complexity is the mixing of different cultures, languages and faiths. Within the business world intercultural communication is vital for success. Effective communication between colleagues from different cultural backgrounds ensures a team is working harmoniously.

The six steps to intercultural communication are basic pointers that all working in intercultural teams should be aware of to ensure culture becomes a vehicle for positive advancement rather than a barrier.

1. Break Assumptions

Everyone makes or has assumptions about others. Assumptions are beliefs rather than objective truth and are usually influenced by a number of subjective factors. For intercultural communication to truly work, people need to assess their assumptions and ask themselves why they hold those ideas or beliefs. By doing so and even openly examining them with others, the initial barrier to intercultural communication is overcome.

2. Empathise

In order to come to appreciate and understand people from different cultures, empathy is vital. Through putting yourself in someone else's shoes you come to see or appreciate their point of view.

3. Involve

Involving others in tasks or decision making empowers and builds strong relationships. Using intercultural diversity is in essence a more creative approach to problem solving as it incorporates different points of view.

4. Discourage Herd Mentality

Herd mentality refers to a closed and one dimensional approach. Such ways of thinking curbs creativity, innovation and advancement as people are restricted in how to think approach and engage with people or challenges. Intercultural communication can only flourish and therefore contribute if people are encouraged to think as individuals, bring their cultural influences to the table and share ideas that may be outside the box.

5. Be Wise

Wisdom is not called wisdom for nothing. People need to be aware how to interact with people with respect and knowledge. Intercultural communication is essentially founded upon wisdom, i.e. showing maturity of thought and action in dealing with people. Through thinking things out and have background knowledge to intercultural differences much of the communication problems witnessed within business could be avoided.

SECTION III**CULTURAL INTELLIGENCE: A NEED FOR EFFECTIVE CROSS CULTURAL COMMUNICATION AT GLOBAL WORKPLACE**

The internet and technological innovation in faster modes of travel has truly made the world a global village. Now it is possible to communicate beyond boundaries at a click of a button. Video conferencing, short message services and emails have created an environment where information transfer is almost at the speed of your thought. Given this scenario, we are now in a new uncharted realm of human endeavor and existence. From the comfort of your office or home you have now the ability to talk to someone in the far-reaching corners of the world. Further, many companies and organizations are now welcoming foreign talents to join their ranks of staff and contribute towards the achievement of its goals. When you work in such a culturally diverse environment it is sometimes easy to forget that the people you are communicating with have different perspectives and perceptions from yours. Therefore it is important that you develop a sense of cultural intelligence to learn how you can engage positively with people from different cultures.

Cultural Intelligence (CI) is the ability to make oneself understood and the ability to create a fruitful collaboration in situations where cultural differences play a role.

CI consists of three dimensions that correspond to the classical division between emotion, understanding and action:

The emotional dimension – ‘intercultural engagement’

This dimension relates to the emotional or feeling component of the situation and the motivation to generate solutions. This dimension is the 'touch paper' in the intercultural encounter - the

thing that changes fuel into fire and contains both the creative potential and the 'danger'; the positive driving forces and the stumbling blocks that can destroy or enliven the contact. 'Intercultural engagement' includes the motivation we have to achieve a fruitful inter-cultural encounter. Our motivation comes from external drivers, goals and objectives such as the need to develop a strategy for innovation and internal drivers such as curiosity or an attraction to things or people who are different. These drivers determine how much of an investment we are prepared to put into any situation.

The cognitive dimension – 'cultural understanding'

The cognitive component is the objective or rational component. It is based on reason and the capacity to develop mental structures which enable us to understand the encounter, to think about what is going on and to make judgments based on conceptual frameworks and language. It consists of understanding oneself as a cultural being as well as understanding people with a different cultural background. This dimension requires knowledge about what culture is as well as knowledge about the characteristics of our own and others' cultures. It also consists of cognitive flexibility and the ability to transfer experience from one kind of cultural encounter to another.

The Action dimension – 'intercultural communication'

This component is about what happens during an encounter, what we decide to do based on our judgments about the situation coming from the emotional and rational data we have collected. The action dimension is the activity and communication during the cultural encounter, what each participant actually *does* in this encounter. It consists of various types of interpersonal communication, for example, listening, questioning, summarizing, agreeing or disagreeing etc. as well as skills which we have learned to manage relationships in general involving body language, etiquette, rituals, rules and techniques.

The action dimension brings the other two dimensions of cultural intelligence into play. Cultural intelligence involves a combination of the three dimensions and they influence each other. The three dimensions are all equally important and form the structure which helps us to gain a deeper understanding of the intercultural encounter and give us some options for improving the outcome.

SECTION IV

CONCLUSION

We live in a culturally diverse world. People will encounter individuals from different races, religions, and nationalities in their day to day encounters. There is often anxiety surrounding unfamiliar cultures. What manners are acceptable? What will offend a person from a very different background? It can be paralyzing to deal with other people if we do not know what to expect. The desire to communicate is the first step in being effective. No matter what tools you gain in cross cultural communication. The desire to connect with another human being is the bond that will express itself clearly. A genuine effort to understand another person goes along way in the path to communication.

Knowing about other cultures will help you develop your skills. Be proactive when approaching a new culture. This is a learned skill which means it will require research, practice, and growth. People from different backgrounds may have varied approaches to conflict management, learning styles, family structure, religion, and most other aspects of life. It is impossible to know the varied systems of all cultures, so approach this process one culture at a time as you meet and deal with new people. When dealing with diverse people look for similarities. Our goals, dreams, and aspirations may be more alike than our skin color. Parenting approaches may differ, but the common bond of a mother and a child crosses many barriers. Most people have basic

needs in common, like Maslow's hierarchy of needs that suggest all people have physiological, safety, acceptance, self-esteem, and self-actualization needs. Considering these things it is easy to see our essential common ground. And this is where we can begin our comprehension of others. Put your new information about other people into action. Make a personal inventory of your own biases. Where has your ignorance held you back from appreciating other people? What have you learned that makes this old paradigm obsolete? Help to educate people in your family and group of friends about your new leanings. Be careful. People become attached to their ignorance, and have difficulty accepting new ideas. It may have taken you a while to gain the knowledge necessary to deal with people. Encourage others to be open, but know that information is integrated when a person is ready to accept it. Form alliances with people from different cultures to know what challenges they have dealing with your culture. Help the general community to grow by raising awareness and promoting fair treatment for all people.

It is important as you become a promoter of cross cultural communications that you reach beyond stereotypes. These do not represent the population they seek to identify. It is necessary to evaluate people on an individual basis. Stereotypes often reflect the differences in socioeconomic status, religion, or dialect. These differences are apparent in all races and cannot identify one specific group of people. It is important to suspend judgment, avoid misconceptions, narrow perspectives, and immature reactions. Stereotypes often contain a granule of truth, but this tiny truth cannot characterize an entire culture. Getting the whole picture is being active, and thinking critically about people and their behavior.

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WOMEN ENTREPRENEURSHIP: ISLAMIC PERSPECTIVE

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Why the world needs women entrepreneurs?

Islam is a complete way of life. So there is no separation between business and religion. Islam has its own entrepreneurship culture and guiding principles to guide business operation.

According to the study it can be said that Islam is not against women working or engaging themselves or contributing their worth in business related activities. Many Sahabiya (Women companions) of Prophet (PBUH) were involved in various business activities which are allowed in Islam. The Holy Qur'an and Sunnah invite people (Men/Women) to work to earn lawful money i.e **Women entrepreneurship is allowed.**

It is also to be noted that the Muslim woman was given a role, duties and rights more than 1400 years ago that most women do not enjoy today, even in the West. These are rights granted by Allah and are designed to keep balance and peace in the society.

The status of women in Islam is unique having no dissimilarity. Islam announces the equilibrium women rights and status in order to preserve social balance. In all spheres of life the women are absolutely secured by Islam.

Islam gives women equal rights of religious independence, status and spiritual development compared to men. The Quran says; —and not whoever does righteous good deeds, male or female and is a (true) such will enter paradise and not the least injustice, even to the size of a speck on the back of date-stone, will be done to them (**Nisa-124**).

In other words, **women entrepreneurs can play an important role in promoting social and economic development of a country both in the rural and urban areas.** More importantly, the active involvement of women in economic activities outside home, not only as wage-paid workers as they are widely found in labor-intensive industries in developing countries such as textile and garments, handicraft sectors, leather products, food and beverages, and tobacco products, but also as business owners or entrepreneurs would have a significant effects on poverty reduction in those countries. Moreover, in relation to the UN-initiated Millennium Development Goals (MDGs), development of women entrepreneurship should be seen as a crucial element of women empowerment as among the goals.

Islam endorses entrepreneurship regardless of its being opportunity or necessity driven as long as it stands on moral and ethical grounds and conforms to the Islamic code of conduct. Stimulating entrepreneurship is mainly driven by the prospect of material rewards (Kayed, 2010).

Entrepreneurs (Women and Men) embrace positive perceptions and attitudes regarding the role of Islamic values in promoting productivity through entrepreneurship (Nayeam, 2006). Positive correlation of women and earnings is an clear message of the Holy Quran which is quoted below:

“Men shall have a benefit from what they earn, and women shall have a benefit from what they earn.” (Surah An- Nisa: Ayat 32)

This is also in line with Islamic point of view that all human beings should endeavor to become successful.

“Allah will not change what is any nation (the fate of the nation) until they all collectively make a change occur in what is in themselves” (Surah Ar--Ra’ad; Ayat 11).

There is an incident that illustrates the equal and active status of women in Islam which is mentioned in the Qur’an. When the Prophet was selected to lead the Muslims, women participated in that selection. They came to the Prophet as a delegation of the women of Arabia and extended to him their bay‘ah (vote of confidence).

The Qur’an refers to this event as well as to the words of the Prophet on that occasion (al-Hibri, 1997). **Thus Islam encourages participation of women in socio economic activities.**

An opposite perception is not in conformity with guidance provided by Allah in The Holy Quran. It is noted that Islam protects the woman. Islam liberated woman over 1400 years ago. Al-Sheha (1997) stated that **Islamic law does not deprive a woman from the right to work within the limits that protect her honor and dignity.**

Islam permits the woman to personally conduct her business contracts and financial transactions. All such contracts and transactions are sound and valid in the view of Islamic jurisprudence.

Women’s empowerment will be front and centre in 2014 and ahead as more companies, communities and countries invest in women’s entrepreneurship. Increasingly, they recognize what organizations from the World Bank to Coca-Cola already know: that woman is crucial to economic growth around the world.

Women entrepreneurs see the world through a different lens and, in turn, do things differently. Estée Lauder, who turned a passion for skincare and make-up into a beauty empire, or Oprah Winfrey, whose media business focuses on helping women to reach their potential.

The study was conducted reflecting responses from 153 women entrepreneurs across the country. This will be of interest to entrepreneurs, entrepreneurs-in-the-making, mentors, advisors, funding firms and anyone with an interest in the story of women and entrepreneurship in India.

Women entrepreneurs in India: Who, where, how big?

A significant chunk (58%) of the entrepreneurs, surveyed had started their businesses **between the ages of 20 and 30**; interestingly, 25% had started up even before turning 25. It raises the possibility of at least some women starting up businesses without first holding a job, right after their education. As expected, most were either graduates or post-graduates.

Which cities are producing India’s women entrepreneurs?

Bangalore leads all other cities head and shoulders in the presence of women entrepreneurs. With all the others such as Chennai, the National Capital Region (NCR), Pune, Mumbai and Hyderabad figuring in the list.

As for **industry type**, Professional services, IT/ITES, Apparel/accessories and Food & Beverages are the four major sectors in which women own businesses (59% of those surveyed).

The majority of women-owned businesses are **micro-enterprises or small/mid-sized businesses**, with 73% reporting a revenue of under Rs.10,00,000 (Rs. Ten lakh or One million) in the last financial year*.

Women need entrepreneurial education. Winning business concepts are just as likely to be conceived at the kitchen table as in the garage or at business school, but research shows women doubt their capabilities and fear failure more than men. Training can equip women with the confidence to see bold ideas through. Goldman Sachs’s 10,000 Women programme, for

example, provides underserved women with business and management education. Eight out of ten of the programme's graduates have boosted revenues; nine out of ten have paid it forward by mentoring other women.

Narrowing the gender gap in employment will increase global income per person by as much as 20% by 2030.

But the benefits go beyond the bottom line. **Women business leaders inspire other women to pursue their dreams.** They may also find it easier to balance work and family outside the traditional corporate world. In emerging markets, women reinvest 90% of their earnings in their families and communities—which means that investing in women is an investment in our collective future.

The world needs women entrepreneurs, and women entrepreneurs need all of us.

It is time to provide the support and tools to ensure that, in 2014 and beyond, women-led businesses flourish.

Lastly, I would like to thank here the many people sharing their views and encouraged me to structure the information in constructive way to reach the people to think on the **WOMEN ENTREPRENEURSHIP.**

POSSESSION, FEELING OF OWNERSHIP AND ITS ROLE IN EMPLOYEE WORK INVOLVEMENT AND ENGAGEMENT

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ABSTRACT

Under the present market forces and strict competition, IT companies are forced to be competitive. The traditional ways of gaining competitive advantage have to be supplemented with organizational capability to manage people, which have been unsuccessful. Employee engagement and involvement is now seen in many firms as an alternative approach that can help counteract these trends and create a sense of ownership and possession which influence employee attitude towards work. Employers recognize that business success depends on the human capital that drives and supports company objectives. But what happens when the individuals who comprise the human capital – employees – aren't meaningfully involved in their work. Today, employee engagement and involvement are more vital than ever before to an organization's success and competitive advantage. Gone are the days when a youthful person starting out in his or her career joined a company and stayed until retirement – in today's changing business environment nothing can be certain. The initiatives taken for the employees work involvement and engagement is only few and less impactful. The companies need to focus on engagement and involvement of employees in their work because retention of workforce is difficult. The concept of employee work engagement describes the extent to which workers are involved with, committed to, and passionate about their work. The following brief report provides a research-based review on what is the status of employees work engagement in IT sector & why it matters for the mental health and organization success. This research study four basic dimensions of possession and ownership; self – efficacy, accountability, sense of belongingness and self identity.

Keywords: Ownership, possession, employee work engagement, employee work involvement, IT industry.

RESEARCH PURPOSE

In the workplace, employee turnover carries both negative and positive connotations. It depends on the nature of environment they usually get. Negative connotations may cost an organization to have high employees' turnover ratio. Turnover can be costly to a firm because the organization loses its investment in human capital. Though, the employers continually work to reduce voluntary turnover costs through various human resource functions including training, performance management, compensation strategies, and selection methods. However employees still feel disconnected with the organization. There might be several reasons to it some of them are, repetitive nature of work and they have no real inputs in how things are done. However an employee who has responsibility and accountability if allowed to make decisions by self will feel more important and involved within the organization. We noticed that there is a high churn rate in the IT industry. There is no day that goes chaotic. IT pros kind of know going into their line of work that stress is going to be part of the bargain.

When employees are concerned about the possibility of being laid off from their jobs, there may be an initial tendency to respond by working harder and longer to show value to their employer in hopes of not being the next to be let go. Overwork can also contribute to mental health problems such as increased stress, anxiety and depression. Some employees with very low levels of engagement, who may be defined as having active disengagement, may even try to

create unhappiness at work for others and thus can undermine what their more highly engaged coworkers are trying to accomplish. Clearly, developing and encouraging employee work involvement and engagement is *prima facie*. All these raise the question of possession and feeling of ownership amongst the employees in IT sector.

PROBLEM STATEMENT

In today's competitive business environment, employee work involvement and engagement has become a very popular managerial concept. Organizations use different involvement and engagement building tools in order to stay competitive and improve performance. The aim of this paper is to contribute to the research regarding the work involvement and engagement of employees within IT organizations through significant notion of possession and feeling of ownership which defines individual psychological relationship with the organization.

SIGNIFICANCE OF THE STUDY

Studies explore the effect that improving employee work involvement and engagement has on overall business success. As companies emerge from the recessionary economic climate; there has been a shift towards growth and away from cost reduction. Many companies, though, are hedging their bets, cautiously entering growth mode while still maintaining a rigorous focus on cost containment. Given the renewed emphasis on growth and investment, which factors do business leaders view as most critical to success? People oriented "soft" factors dominate this list. This is not surprising. For the past several years, companies have been increasingly monitoring their engagement levels, demonstrating that having a highly engaged and involved workforce not only maximizes a company's investment in human capital and improves productivity but it can also significantly reduce costs, such as turnover, that directly impact the bottom line. Thus creating engagement and involvement strategies is one of management's big goals. But managers who have developed successful strategies for retaining talent are going to have put those strategies in the corporate archives. Creating strategies to engage employees requires a whole different approach – and strategy. One of the strategies is Psychological Ownership.

OBJECTIVES OF THE STUDY

- 1) To explore and describe psychological ownership and its defining elements.
- 2) To review the state of employee engagement
- 3) To study the current level of work involvement and engagement of IT companies

RESEARCH METHODOLOGY

Information has been sourced from books, articles and various websites. This research paper is based on secondary data for finalization of views and opinions.

STATE OF ENGAGEMENT

The biggest question is whether today's Workforce is hostile or engaged? Engagement continues to rise. According to 2013 Employee Engagement Trends Report Engagement within various companies reached its lowest point in 2010 with only 66.7 percent of employees who were ranked as engaged. However, since then engagement has gradually been making a return. From 2011 to 2012, engagement increased by 6 percent. Marking the changes in engagement, it is apparent that as you move from hostile to engaged, the amount of difference increases. For example, over the past six years, the highest level of hostile employees was 3.5 percent in 2010, and the lowest was 2.8 percent in 2009. Global employee engagement continues to rebound since the lows of 2010, and rose 1 percentage point from 2012 to 2013 to a global average of 61% in 2014. The global economy continues to stabilize in the wake of the Great Recession. According to data from the Conference Board, global GDP grew at a rate of approximately 2%–

3% in 2013, and is forecasted to grow 3% in 2014(2014 Trends in Global Employee Engagement).

Also, keep in mind that perception of excellence is more likely to shift over something small or based on how someone is feeling that specific day. Organizations should spend their efforts on those who are in a dilemma. This is the area where engagement strategies can have the most positive impact. Once you shift your employees to engaged employees, it'll be easier to bring those hostile employees around because you'll have the rest of your employees on board to influence perception. According to the 2012-2013 Kenexa Work trends Report the engagement index score in India is 77 percent which is higher than other countries in the world thus marking the need for these countries a clear agenda towards developing a productive and fulfilling work environment.

Effective involvement and engagement fosters a culture that is participative; this helps bring employees and leaders closer together on an open platform and also reinforces a culture of transparency and ownership. HR practitioners and business leaders also Engagement targets are important performance criteria for our HR practitioners and achievement on these is monitored and reviewed regularly. Many companies has taken the initiative to engage employees in their work as a major task of H.R department where they drive customized team and individual engagement initiatives targeted at specific stakeholder groups, to create higher impact. Some of the major IT Company in Pune is also taking up the employee work involvement and engagement activities in a warm way to indulge in the company (Swathi.S, 2012). The activities such as 'Wipro Meets' , training and certification, policies on Diversity and Inclusion, Prevention of Sexual Harassment, , Trust based relationship (inclusive approach by TCS) and its engagement programmes such as Maitree (which means friendship), Proactive Employee Engagement Programme (PEEP), KPIT Annadan - Food/Grain donation drive, Retention, Alignment With Goals, Feeling Valued, Individual Contribution, Job Satisfaction, Benefits, etc. has made the employee feel more and more comfortable at their workplace.

REVIEW OF LITERATURE

Psychological Ownership

The idea of Psychological Ownership for the organization i.e. Psychological Ownership is the psychologically experienced phenomenon in which an employee develops possessive feelings for the target. Building on Furby (1978) and Dittmar (1992), Pierce and colleagues (2001) linked feelings of possession with feelings of ownership and defines psychological ownership as the state in which an individual feels that an object (i.e., material or immaterial) is experienced possessively (i.e., it's 'MINE' or it is 'OURS').

Psychological Ownership asks "What is mine?" and defines individual's psychological relationship with the target. Possessiveness is at the core of the concept of Psychological Ownership and defines the psychological attachment with the target. To have possessions and to increase our possessions generates a positive and enriching effect. It enhances our sense of identity and belonging, which has a positive impact on our well being, while the loss or lack of possessions often produces negative states of consciousness.

FOUR DIMENSIONS OF PSYCHOLOGICAL OWNERSHIP

Self – efficacy: The self efficacy component of psychological ownership seems to say, "I need to do this task, I can do it, and therefore own the responsibility for achieving success" self efficacy may be positioned as something that plays a moderating role in the process through which psychological ownership emerges, but here we refer it to the need for personal mastery, and feeling of personal competence over one's environment (Bandura, 1997).

Accountability: Accountability as a component of psychological ownership is the “implicit or explicit expectation that one may be called on to justify ones beliefs, feelings, and actions to others” (Lerner & Tetlock, 1999, p. 255). Accountability is manifested in expected rights and responsibilities, such as the expected right to hold other accountable and at the same time in the expectation for oneself to be held accountable Pierce et al.’s (2003). Individual who experience increased feelings of psychological ownership will act as the conscience of others and will call others to account for influences on their target of ownership.

Belongingness: Belongingness as a component of psychological ownership to say, “I have a place in the organization”. The first need (to have a ‘place’ or home) is the basic need to have a sense of belonging. Ardrey (1966), Duncan (1981), and Porteous (1976) argued that possessions such as those captured symbolically by ‘home’ provide individuals with a sense of place. Employees who experience a sense of ownership at work are more positive and report that they occupy a place in the organizational context where they belong. The need of the individual to belong in the place of work can be satisfied by a particular job, work team, division or even organization as a whole (Pierce et al., 2001).

Self identity: Feelings of psychological ownership over object may prove a foundation from which individual can identify them as being unique, thus contributing to their personal identity. It refers to personal cognitive connection between an individual and an object or target example an organization and reflects the individual’s perception of oneness with the target (Belk, 1988). Interaction with their possessions provides people with comfort, autonomy, pleasure and opportunity, all of which facilitate the development and cultivation of their identity.

ROLE OF PSYCHOLOGICAL OWNERSHIP IN EMPLOYEE WORK INVOLVEMENT AND ENGAGEMENT

The psychology of possession shows that possessions give people a sense of place, belonging, and personal space (Porteous, 1976). Thus, possessions and feelings of ownership satisfy the basic human need for place. According to Beggan (1992) and the ‘mere ownership effect,’ people generally become more attached to things they feel they possess than similar things that they do not feel they possess. Since feeling a sense of attachment and belonging are the essence of organizational commitment, it seems reasonable to predict its impact on employee work involvement and engagement. In other words, feeling possessive toward the organization (psychological ownership) should lead to high levels of organizational commitment. Through a sense of possession for the organization, employees view it as a place in which to dwell (‘home’)—a place that provides a psychic comfort and security (Dittmar, 1992; Furby, 1978; Pierce et al., 2001).

Employees may unfortunately be understood as just a resource; trading their time for money, with no wills energy or passion for their work. This is in contrast that when managers talk about ownership, what they typically want to instill is not financial ownership but psychological ownership a feeling on the part of the employees that they have a responsibility to make decisions that are in the long term interest of the company O’Reilly (2002). Results here provide beginning support that having employees who feel like owners is beneficial in terms of their work attitudes such as commitment, intentions to stay with the organization, and job satisfaction. Human resource practitioners have typically been limited to employee stock ownership plans, stock options, or compensation schemes (e.g. Wagner et al., 2003) to promote feelings of ownership. However, these techniques appear to have contributed relatively little to the understanding of psychological ownership or to developing psychological ownership in employees (Rousseau, 2003). A broader understanding and perspective of psychological ownership as presented may yield fruitful research in examining the issue of fostering and

maintaining employee psychological ownership and satisfaction. For the future, development processes and applications for psychological ownership need to be given focused attention. Just as the positive resource of psychological capital development has been recently demonstrated (see Luthans, Avey, Avolio, Norman, & Combs, 2006; Luthans et al., 2007) the identified components of the positive form of psychological ownership (i.e., self-efficacy, accountability, sense of belongingness, and self-identity) may also be developed in carefully designed and executed training interventions and, in turn, performance impact in organizations. Hence involvement and engagement of employee can be targeted through higher self efficacy followed by accountability, sense of belongingness and finally self identity.

CONCLUSION

Most employees report that they simply enjoy the work they do—it's no wonder the job itself can affect employees work involvement and engagement levels. These levels have penetrated in the employees. The above study reports that high levels of psychological possession will lead to enhanced organizational commitment, increased job satisfaction, lower absenteeism and turnover rates, improved health and well being, more extra role behaviors, higher performance and a greater exhibition of personal initiative, proactive behavior and learning motivation. However still efforts are to be taken in this locale as it is considered as a trivial activity. HR practitioners need to understand that involvement and engagement is just not an orientation or a training activity. The companies need to focus on psychological well being and satisfaction of employees in their work because retention of workforce is difficult. On the positive note we can say that in future the companies will be taking more initiative for employees work engagement & involvement so that they can contribute their head heart and hand at workplace.

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MITIGATING CYBER CRIME IN MAHARASHTRA: A CHALLENGE

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ABSTRACT

Cyber crime a criminal activity with the help of computers or computer networks is increasing day by day. The ways and means keep changing from time to time with the advent of technological upgradation round the world. Maharashtra is not exception where cyber crime is on rise every day. The paper focuses on the types of cyber crime in Maharashtra is a cause of concerns discussed with facts in the paper

Key Words: - spectrum, cyber stalking, spoofing, computer vandalism.

INTRODUCTION

Cyber crime is a term used broadly to describe criminal activity in which computers or computer networks are a tool, a target, or a place of criminal activity and include everything from electronic cracking to denial of service attacks. It is also used to include traditional crimes in which computers or networks are used to enable the illicit activity. The computer or device may be the agent of the crime, the facilitator of the crime, or the target of the crime. The crime may take place on the computer alone or in addition to other locations. The broad range of Cybercrime can be better understood by dividing it into two overall categories, defined for the purpose of this research as Type I and Type II.

Type I Cybercrime

1. It is generally a single event from the perspective of the victim. For example, the victim unknowingly downloads a Trojan horse which installs a keystroke logger on his or her machine.

Alternatively the victim might receive an e-mail containing what claims to be a link to known entity, but in reality is a link to a hostile website.

2. It is often facilitated by crimeware programs such as keystroke loggers, viruses, rootkits or Trojan horses.

3. Software flaws or vulnerabilities often provide the foothold for the attacker. For example, criminals controlling a website may take advantage of

Type II Cybercrime

At the other end of the spectrum, includes activities such as cyber stalking and harassment, child predation, extortion, blackmail, stock market manipulation, complex corporate espionage, and planning or carrying out terrorist activities.

The characteristics of Type II Cybercrime are

1. It is generally an ongoing series of events, involving repeated interactions with the target. For example, the target is contacted in a chat room by someone who, over time, attempts to establish a relationship. Eventually, the criminal exploits the relationship to commit a crime. Or, members of a terrorist cell or criminal organization may use hidden message to communicate in a public forum to plan activities or discuss money laundering locations, for example.

2. It is generally facilitated by programs that do not fit into under the classification crimeware. For example, conversations may take place using IM (instant messaging) clients or files may be transferred using FTP.

Classification

The cyber crime may be broadly classified under the following three groups. They are

1. Against Individuals
 - a. their person &
 - b. their property of an individual
2. Against Organization
 - a. Government
 - b. Firm, Company, Group of Individuals.
3. Against Society at large

The following are the crimes, which can be committed against the following groups

Against Individuals:

- i. Harassment via e-mails
- ii. Cyber-stalking
- iii. Dissemination of obscene material.
- iv. Defamation.
- v. Unauthorized control/access over computer system.
- vi. Indecent exposure
- vii. Email spoofing
- viii. Cheating & Fraud

Against Individual Property:

- i. Computer vandalism.
- ii. Transmitting virus.
- iii. Netrespass
- iv. Unauthorized control/access over computer system.
- v. Intellectual Property crimes
- vi. Internet time thefts

Against Organization:

- i. Unauthorized control/access over computer system
- ii. Possession of unauthorized information.
- iii. Cyber terrorism against the government organization.
- iv. Distribution of pirated software etc.

Against Society at large:

- i. Pornography (basically child pornography).
- ii. Polluting the youth through indecent exposure.
- iii. Trafficking
- iv. Financial crimes

- vi. Sale of illegal articles
- vii. Online gambling
- viii. Forgery

Cyber Crime Includes

1. Harassment Via e-mails:

Harassment through e-mails is not a new concept. It is very similar to harassing through letters. Recently A mail from a *lady wherein she complained* about the same. Her former boy friend was sending her mails constantly sometimes emotionally blackmailing her and also threatening her. This is a very common type of harassment via e-mails.

2. Cyber-Stalking:

The Oxford dictionary defines stalking as "pursuing stealthily". Cyber stalking involves following a person's movements across the Internet by posting messages (sometimes threatening) on the bulletin boards frequented by the victim, entering the chat-rooms frequented by the victim, constantly bombarding the victim with emails etc.

3. Dissemination of Obscene Material/ Indecent Exposure/ Pornography (basically child pornography) / Polluting through indecent exposure:

Pornography on the net may take various forms. It may include the hosting of web site containing these prohibited materials. Use of computers for producing these obscene materials. Downloading through the Internet, obscene materials. These obscene matters may cause harm to the mind of the adolescent and tend to deprive or corrupt their mind. Two known cases of pornography are the *Delhi Bal Bharati case* and the *Bombay case* wherein two Swiss couple used to force the slum children for obscene photographs. The Mumbai police later arrested them.

4. Unauthorized Control/Access over Computer System:

This activity is commonly referred to as hacking. The Indian law has however given a different connotation to the term hacking, the term "unauthorized access" interchangeably with the term "hacking" to prevent confusion as the term used in the Act of 2000 is much wider than hacking.

5. E mail Spoofing:

A spoofed e-mail may be said to be one, which misrepresents its origin. It shows it's origin to be different from which actually it originates. Recently spoofed mails were sent on the name of Mr. *Na.Vijayashankar* (naavi.org), which contained virus.

Rajesh Manyar, a graduate student at Purdue University in Indiana, was arrested for threatening to detonate a nuclear device in the college campus. The alleged e- mail was sent from the account of another student to the vice president for student services. However the mail was traced to be sent from the account of *Rajesh Manyar*.

6. Computer Vandalism:

Vandalism means deliberately destroying or damaging property of another. Thus computer vandalism may include within its purview any kind of physical harm done to the computer of any person. These acts may take the form of the theft of a computer, some part of a computer or a peripheral attached to the computer or by physically damaging a computer or its peripherals.

7. Transmitting virus/worms:

A program that has capability to infect other programs and make copies of itself and spread into other programs is called virus. Programs that multiply like viruses but spread from computer to computer are called as worms. E- Mail & IRC related crimes. Email Spamming Email

“spamming” refers to sending email to thousands and thousands of users - similar to a chain letter. Sending malicious codes through email E- mails are used to send viruses, Trojans etc through emails as an attachment or by sending a link of website which on visiting downloads malicious code.

8. Intellectual Property crimes / Distribution of pirated software:

Intellectual property consists of a bundle of rights. Any unlawful act by which the owner is deprived completely or partially of his rights is an offence. The common form of IPR violation may be said to be software piracy, copyright infringement, trademark and service mark violation, theft of computer source code, etc.

Example :-The *Hyderabad Court* has in a land mark judgement has convicted three people and sentenced them to six months imprisonment and fine of 50,000 each for unauthorized copying and sale of pirated software.

9. Cyber terrorism against the Government Organization:

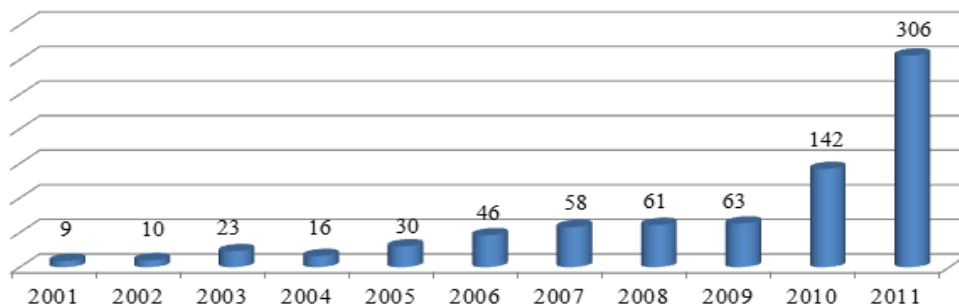
At this juncture a necessity may be felt that what is the need to distinguish between cyber terrorism and cyber crime. Both are criminal acts. However there is a compelling need to distinguish between both these crimes. A cyber crime is generally a domestic issue, which may have international consequences, however cyber terrorism is a global concern, which has domestic as well as international consequences. The common form of these terrorist attacks on the Internet is by distributed denial of service attacks, hate websites and hate emails, attacks on sensitive computer networks, etc. Technology savvy terrorists are using 512-bit encryption, which is next to impossible to decrypt. The recent example may be cited of – *Osama Bin Laden*, the *LTTE*, attack on *America's army deployment system* during Iraq war.

Cyber terrorism may be defined to be “ *the premeditated use of disruptive activities, or the threat thereof, in cyber space, with the intention to further social, ideological, religious, political or similar objectives, or to intimidate any person in furtherance of such objectives* ”

Volume of Cyber Crime Cases Registered

The increased usage of Information Technology, the volume of cybercrimes is also Increasing. The following graph depicts the number of cyber-crime cases registered under IT Act 2000 in Maharashtra over the years. The report “State E- governance in Maharashtra 2013”, published by Director of information technology of government of Maharashtra, says that across Maharashtra, 306 case registered under the IT Act during 2011 against 142 in 2010, showing an increasing of 115 %.

Volumes of Cyber crime cases registered under IT Act 2000 in Maharashtra



Status of Cyber Crime in Percentage from year 2001-2011

Sr. No	Year to Year	Crimes	Increment / Decrement in %
1	2010-2011	142-306	115% Increment
2	2009-2010	63-142	125% Increment
3	2008-2009	61-63	3% Increment
4	2007-2008	58-61	5% Increment
5	2006-2007	46-58	26% Increment
6	2005-2006	30-46	53% Increment
7	2004-2005	16-30	87% Increment
8	2003-2004	23-16	- 69% Decrement
9	2002-2003	10-23	130% Increment
10	2001-2002	09-10	11% Increment

Source: - Compiled from E-Governance Report of Maharashtra-2013

Above Graph and Table showing years from 2001 to 2011 continuously growth in cyber crimes exceptional case in year 2003-2004 decrements 69% in cyber crime.

Ten Steps to Help Stop Cybercrime: How Organizations can gain Competitive Advantage: Dell & McAfee Inc. have suggested following 10 recommendations to help stop cybercrime and gain competitive advantage by prohibiting cybercrime.

According to Dell & McAfee Inc.

You've probably heard the adage "information is power," and that is certainly true when it comes to cybercrime. If this personal information is saved in proper manner then the cyber crime can be averted.

10 steps can help us in preventing from being victim of cyber crime:

1) Education - Hackers aren't the only ones who can gain power from information. By educating yourself about the types of scams that exist on the Internet and how to avert them, you are putting yourself one step ahead of the cybercriminals. The common attraction these days are fake mails burning an individual to become business partner of property which is unattended or widow asking you to help her regained her property for a 50-50 partnership.

2) Use a firewall - Firewalls monitor traffic between your computer or network and the Internet and serve as a great first line of defense when it comes to keeping intruders out. Make sure to use the firewall that comes with your security software. And if you have a home wireless network, enable the firewall that comes with your router.

3) Click with caution - When you're checking your email or chatting over instant messenger (IM), be careful not to click on any links in messages from people you don't know. The link could take you to a fake website that asks for your private information, such as user names and passwords, or it could download malware onto your computer. Even if the message is from someone you know, be cautious. Some viruses replicate and spread through email, so look for information that indicates that the message is legitimate.

4) Practice safe surfing - When navigating the web, you need to take precautions to avoid phony websites that ask for your personal information and pages that contain malware. Use a search engine to help you navigate to the correct web address since it will correct misspellings.

5) Practice safe shopping / Business - In addition to practicing safe surfing, you also need to be careful where you shop online. Be cautious when shopping at a site that you've never visited before and do a little investigation before you enter your payment information. And when

you're on a payment page, look for the lock symbol in your browser, indicating that the site uses encryption, or scrambling, to keep your information safe. You also want to look at the address bar to see if the site starts with "https://" instead of http:// because this is another way to see if the site uses encryption.

When it comes time to pay, use a credit card instead of a debit card. If the site turns out to be fraudulent your credit card issuer may reimburse you for the charges, but with a debit card your money is gone.

Finally, evaluate the site's security and privacy policies in regards to your personal data.

6) Use comprehensive security software and keep your system updated - Because hackers have a wide variety of ways to access your system and information, you need comprehensive security software that can protect you from all angles. Just make sure that you keep your security software up to date by selecting the automatic update function on your security control panel. And don't forget to perform regular scans. You also want to update your operating system (OS) and browser with the latest security patches. If you are a Microsoft Windows user, you can enable automatic updates to keep your OS safe.

7) Secure your wireless network - Hackers can access data while it's in transit on an unsecured wireless network. You can keep the hackers out by enabling the firewall on your router and changing the router's administrator password. Cybercriminals often know the default passwords and they can use them to hack into your network.

8) Use strong passwords - Although it may be easier for you to remember short passwords that reference your birthday, middle name, or pet's name, these kinds of passwords also make it easy for hackers. Strong passwords can go a long way in helping secure your information, so choose a password that is at least 10 characters long and consists of a combination of letters, numbers and special characters. Also consider changing your password periodically to reduce the likelihood of it being compromised.

9) Use common sense - Despite the warnings, cybercrime is increasing, fueled by common mistakes people make such as responding to spam and downloading attachments from people they don't know. So, use common sense whenever you're on the Internet. Never post personal information online or share sensitive information such as your social security number and credit card number. Exercise caution when clicking on any links or downloading any programs.

10) Be suspicious - Even if you consider yourself cyber savvy, you still need to keep your guard up for any new tricks and be proactive about your safety. Backup your data regularly in case anything goes wrong, and monitors your accounts and credit reports to make sure that a hacker has not stolen your information or identity.

By following the above mentioned simple steps one can help the organization to secure their valuable data and information, which definitely help in gaining competitive advantage.

CONCLUSION

Criminal Activity with the help of computers or computer networks put its eye not only on the understanding of the cyber crimes but also explains the impacts over the Maharashtra. This shows that the society is in danger and critical the entire task related to computer and electronic media, which are not safe due to such cyber crimes. The understanding of the behavior of cyber criminals and impacts of cyber crimes on society needs to be redressed at earliest.

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**TOWARDS DEVELOPING ENTREPRENEURSHIP AND BUILDING
ENTREPRENEURIAL SOCIETY – A CONCEPTUAL STUDY**

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ABSTRACT

Literature of the psychological sciences clearly shows that innovativeness develops from early childhood, where parents, senior members of the joint family, teachers, role models and ideals, peers of the similar value framework and overall environment play an important role in the molding of an entrepreneurial mindset.

*Entrepreneurship shows that the word, entrepreneur, is derived from the French word *entreprendre*, which means 'to do something'. It is the process of creating something new with value by devoting the required time and effort to gain economic independence and rewards (monetary/non-monetary), and achieve satisfaction.*

The thrust of this paper is to evolve action—choices that can activate entrepreneurial behavior—using available research data from the social sciences and relevant experience. In this sense, entrepreneurship and intrapreneurship are processes that contribute to economic and societal growth. All schools of thought agree that entrepreneurship at the small or corporate level is the backbone of a sound economy and must be encouraged and promoted.

Thus, the research paper proposes that entrepreneurship development requires the attention of policy makers in changing the mindset of people and developing entrepreneurial organizations and intrapreneurship within organizations and entrepreneurship in a society are the foundations of growth and development of the economy in future.

Keywords: Economic Development, Intrapreneurship, Entrepreneurial Society

INTRODUCTION

Entrepreneurship serves as a catalyst of economic development. Entrepreneurship promotes capital formation by mobilizing the idle saving of the public. It promotes immediate large scale employment. Thus it helps to reduce the unemployment problem in the country, i.e the root of socio-economic problem. It promotes balanced regional development. According to Schumpeter, economic development consists of “employing resources in a different way”, bringing in a new combination of means of production. The entrepreneurs look for idea and put them into effect for economic development. It stimulates the equitable redistribution of wealth, income and even political power in the interest of the country. And it also encourages effective resource mobilization of capital and skill. Entrepreneurs are the agents of change in society. Therefore it also promotes country's export trade i.e., an important ingredient to economic development. Therefore we need to work towards developing entrepreneurship and building an entrepreneurial society.

NEED FOR UNDERSTANDING ENTREPRENEURSHIP

An entrepreneur was visualized as the organizer of the factors of production and supplier of managerial skills. One could say that entrepreneurship is an innovative way of managing opportunities. It is the process of creating something new with value by devoting the required time and effort to gain economic independence and rewards (monetary/non-monetary), and achieve satisfaction. In other words, entrepreneurship is the process of establishing a business

enterprise and entrepreneurs possess the capacity to generate employment for themselves as well as others. In other words, the entrepreneur is one who always searches for change, responds to it and puts persuasive efforts to exploit it as an opportunity for growth and development. Entrepreneurs create new jobs for people, improve their quality of life, contribute to/create economic growth, create wealth for reinvestment and improve their position in the global economic competition.

Data reveals that India is one of the largest upcoming economies in the world and has the third largest Gross Domestic Product (GDP) in all of Asia. The liberalization of the economy, which started in the 1990s, has paved the way for a huge number of people to become entrepreneurs. Opportunities for entrepreneurial activities are now increasingly available in traditional as well as non-traditional areas. However, the supply of entrepreneurs has not been increasing at the same pace.

Research on factors affecting entrepreneurial manifestation has a long history, extending to the field of Economics (Schumpeter), Sociology (Weber) and Psychology (McClelland). A largely shared view, is that entrepreneurial activation is the continued result of entrepreneurial opportunities which have an economic, social and organizational origin, and of human behavior that is related to entrepreneurial motives. In this sense, entrepreneurship and intrapreneurship are processes that contribute to economic and societal growth.

OBJECTIVE

The objective of this paper is to find out the step towards entrepreneurial activation, which is divided into four parts:

- Entrepreneurial behavior as an attribute of a person
- Conditions that facilitate entrepreneurship
- Cultural orientation that supports or discourages entrepreneurial activation
- Organizational framework for enhanced entrepreneurial effort

ENTREPRENEURIAL BEHAVIOR

Factors such as family environment, society, educational institutions and support systems play a very important role in forming and changing mindsets, which probably are not conducive to encourage the Indian youth to consider self-employment and an entrepreneurial career rather than salaried employment. It is, therefore, necessary to take steps for converting job seekers into job creators, where management scholars have a role to play for encouraging the youth to take up entrepreneurship as a career.

Content analysis of the studies focusing on entrepreneurial behaviour shows that a set of common characteristics could be identified, such as an intense drive, willingness to undertake a high degree of risk, enjoying performing difficult tasks, creativity and innovation, ability to get things done and focus on creating value. All these fall in line with what McClelland (1961) suggested four decades back, which can be considered as the determinants of entrepreneurial/organizational success even today.

Many studies have associated several characteristics of entrepreneurial behaviour such as strong predilection to (i) recognize opportunity; (ii) evaluate and judge a situation and (iii) make decisions after evaluating risk.

CONDITION THAT FACILITATE ENTREPRENEURSHIP

Entrepreneurial activity needs, as almost everything else, a supportive environment. Zahara (1996) emphasizes that corporate entrepreneurship is essential for ensuring survival by periodic

renewal of a firm's operations, redefining its business strategies and the product range, and enhancing its innovation capabilities. Such exercises are needed in a dynamic environment. Some institutions or business organizations have developed a culture of thinking beyond the proverbial box and adopted processes that encourage individuals to take initiatives in work situations.

Institution must encourage employee for initiating and encouraging interactions among people to develop shared institutional norms and values. The employee must feel free to raise new ideas without fear of being ridiculed. The community was not afraid of adopting new ways of thinking so long as they served institutional goals. Conformity and uniformity were not seen to be institutional virtues. Such supportive environment activates entrepreneurship.

The organizational support for entrepreneurial behavior conveys (i) respect for the individual; (ii) acceptance of an individual as a person by the community and not only as a role-performer; (iii) interactions among people that generate new ideas and encourage experiment even if they fail in their effort; (iv) recognition by the community for innovation and tolerance for deviance in thinking and (v) reward for high standards of performance and quality. The supportive environment demands performance and quality but it also encourages processes that create a sense of belonging and acceptance among employees, and practices that encourage self-direction and control.

CMC developed many such systems, and achieved impressive growth and became known for innovation (Sehgal 1996). National Thermal Power Corporation (NTPC) has schemes such as a 'best practices' reward and teamwork, leadership, training, etc. Bharat Heavy Electricals Limited (BHEL), Bharat Electronics Limited (BEL), Gas Authority of India Limited (GAIL) and several oil companies have injected different types of schemes. Tata Motors have brought in and encouraged innovations. Tata Iron and Steel Co. Limited (TISCO) has a very successful works committee organization and a suggestion scheme. Barclays Bank Plc has joined hands with Pratham, a non-government organisation working in the education space, to launch an entrepreneurship programme for economically disadvantaged youth in Maharashtra. This project will initially be launched in the Satara, Sangli and Lonavla regions, where, according to the latest Indian census, over 20 per cent of the 10 million inhabitants live below the poverty line. These areas also have over one million unemployed youth.

There are a growing number of companies, initiated by technically qualified individuals that have a somewhat flexible managerial orientation and provide elbow room for employees. Another useful trend is that individuals with professional or managerial qualifications branch off to set up enterprises after some work experience or on completion of their studies. With rare exceptions, organizations provide conditions that activate entrepreneurial behaviour among employees.

In 1976 Norman Macras wrote in London Economist that successful big corporation should become 'conferederation of entrepreneurs'. Gifford Pinchot III suggested that well established companies should learn to make use of entrepreneurial talents within to avoid stagnation and decline.

CULTURAL ORIENTATION THAT SUPPORTS OR DISCOURAGES ENTREPRENEURIAL ACTIVATION

Literature of the psychological sciences clearly shows that innovativeness develops from early childhood, where parents, senior members of the joint family, teachers, role models and ideals, peers of the similar value framework and overall environment play an important role in the moulding of an entrepreneurial mindset.

Cultural orientation has both positive and negative implications. The positive aspect is that individuals have the support of their families in whatever they undertake. Any failure of a project is condoned and accepted without the assigning of blame.

Some of the best recognized institutions of higher learning are consciously initiating systems and practices that help students to assess their own capabilities.

The most important sources of entrepreneurial development may be identified as:

- Family, which provides security against failure, thus enhancing the risk-taking propensity for individuals concerned.
- Organizations that empower and mould people to seek out entrepreneurial avenues, either within the organization or outside it.
- Institutions of higher learning, which encourage an atmosphere of questioning and development.

Organizational framework for enhanced entrepreneurial effort

Entrepreneurship is the core of economic development, especially in an open economy. Entrepreneurs are considered to be the change agents in the socio- economic development of any country. A couple of decades ago, it was believed that entrepreneurship was hereditary. Certain communities in India were identified as the entrepreneurial communities. But it is evident today that entrepreneurship does not belong to a particular region, community, sex, education level, age or income level. The free market model emphasizes minimal government intervention in the economy as the best way to maintain incentives for entrepreneurial behaviour. The Indian economy is poised for growth and with the government's commitment to liberalization, privatization and globalization, doors are opening for entrepreneurial ventures by all. Even micro-level (small area) development of entrepreneurial society will become a chain reaction in the future among the coming generation of Indian villagers, leading to the creation of an entrepreneurial revolution of the East! Minimizing bureaucratic controls and visible obstacles on the one hand and adopting a more scientific approach towards the appraisal of credit worthiness, delivery of credit, market assessment and marketing strategy, on the other, are urgently required to be executed.

In fact it is a common belief that innovation is difficult to predict, but with consistent efforts, people, particularly managers, could be converted into successful innovators through strategies and self- confidence. This requires analyses of the suitability of entrepreneurial ventures as well as the ability to change products, customers and stakeholders. Today's managers, who have to play the role of entrepreneurial leaders, must balance between internal resources and need to focus on continuous improvement of their people by creating a hassle-free environment for achieving growth and innovation. Their positive expectations of the performance of colleagues exert a powerful influence on an individual colleague's performance, though interpersonal relationships are not only simpler but also stronger between people of East as compared to people in the West.

CONCLUSION

Primary institutions such as family, societal structures and relationships, and perhaps educational systems are instrumental in generating among individuals an urge to achieve, to compete, and to appraise one's own capability. Factors such as family environment, society, educational institutions and support systems should motivate individuals to become job creators in place of job seekers.

At the micro-level, an organization may also promote intrapreneurship amongst its employees

(managers/non-managers) through strategic decisions. Intrapreneural culture builds a relationship of trust among the people in an organization and this forces them to create and undertake many entrepreneurial activities. Intrapreneurship within organizations and entrepreneurship in a society are the foundations of growth and development of the economy in future.

The intrapreneural experience in large organizations would encourage individuals to set up a variety of business ventures and such developments would provide an accelerated growth impetus to the economy. However, large organizations which develop intrapreneurship behaviour would have an important but indirect contribution to entrepreneurial activities in the evolving economic environment.

Thus, the important consideration is that societal structures that function on freedom of choice of individuals and consent are needed to contribute towards entrepreneurial activation. Behavioural training based on the McClelland model of achievement motivation has been successful in developing entrepreneurial behaviour among participants (Gupta 1989). Therefore the most significant contribution to entrepreneurial development will be when corporate management promotes an intrapreneural structure in their business practices.

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ROLE OF CHRISTIAN CHURCHES TOWARDS VALUE-BASED EDUCATION

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ABSTRACT

In Ancient Times it was said, "Vidya which change the attitudes of our children making them complete human beings. And, in return they will change the entire human society". But, now in our modern society our lives have become miserable, the quantity of education has considerably increased, but the quality has decreased. The number of educated people has reached at a high level, but murder, hatred, and selfishness have spread out like wildfire everywhere. Trained people are produced from many institutions, but sincere people are very few. Education that does not help promote human virtues will not do any good to the society; it will rather mislead the entirety of humanity. The societal values have been diminishing over the past few decades. Therefore, it is necessary develop the holistic citizenship education.

*The Value Based Education is organized to secure the fullest possible development of body, mind and heart and a fruitful channelization of the life-energy in pursuits that contribute to the growth of both internal and external personality. Value Based Education create the realization among the all citizen that Almighty God loved us and gave this life as a gift so we must bear the fruits of spirit - love, joy, peace, patience, gentleness, goodness, faith, kindness and self control to others as mentioned in Bible (Galatians 5:22-23). **The objective of the paper is to highlight how Christian churches are contributing towards providing value based education through conducting various programs for age group from 4 years till the end.***

Keywords: Christian Churches, Fruits of Spirit, Vidya, Good Citizen, Human Development.

INTRODUCTION

Education is the vehicle of knowledge, self-preservation and success. Education not only gives us a platform to succeed, but also the knowledge of social conduct, strength, character and self respect. The greatest gift education gives us is the knowledge of unconditional love and a set of values.

These values include the simple difference between right and wrong, a belief in God, the importance of hard work and self respect. Education is a continuous learning experience, learning from people, learning from success and failures, learning from leaders and followers and then growing up to be the person we are meant to be.

Value based education is a threefold development of any individual of any gender and age, but most importantly of a child. Education tries to develop three aspects: physique, mentality and character. Value based education is a tool which not only provides us a profession which we can pursue but also a purpose in life. The purpose of our life is undoubtedly to know oneself and be ourselves. We cannot do it unless we learn to identify ourselves with all that lives. It is very aptly said that: "Know thyself" was written over the portals of the antique world. Over the portal of the new world, "Be thyself" shall be written".

Contribution of Church towards value based education is very vital and divine subject of the church. Education is one of the primary focus of the church to impart values, principles and corruption free civilized lifestyle along with education for the present and coming generations. The mission of India Christian Church is to give this education through reaching the lost with

the Good News of Jesus Christ and Ministering to the needs of people regardless of cast, creed or religious affiliation.

OBJECTIVES OF THE STUDY

The objectives of the study is to highlight how Christian churches are contributing towards providing value based education through conducting various programs for age group from 4 years till the end.

OBJECTIVES OF CHURCH

Church is the representation of Jesus Christ and functions to fulfill the ministry what Jesus started during his life on this earth. The ministry of the church to preach the Good News to the poor, to proclaim liberty to the captives, to give sight to the blind , to set free the oppressed and to proclaim the years of lords favour. [Luke 4 verse 18:19]. Evil is found both in individuals and in the structures of society.

With this above mission, church has extended aim and organization to present the power of God which saves individuals and changes social structures. The world is divided on various lines. The Christian church should work for peace, justice and reconciliation. The church not only aims to liberate but also aims to binds people together in love and universal brother/sisterhood.

ORGANISATION UNDER CHURCH

Church believes in building good citizens abiding by the law and living in harmony without diluting pupil's integrity and faith. There are various organization of the church working towards building character of the students among other institutions through structured programmes, street plays, group activities and self help support groups.

The various organizations under the church actively participating to achieve these objectives.

1) Sunday School

Sunday school offers a gentle introduction to the complexity of most of life's moral issues. Which in turn are explored over a period of weeks, and are not presented as isolated matters, it allows to delight in the extraordinary nature of things. The purpose of Sunday school is to help the school children think about and reflect upon positive universal values and the practical implications of expressing them in relation to themselves, others, the community and the world and to inspire individuals to choose their own positive personal, social, moral and spiritual values and be aware of ways for developing and deepening them as world citizens.

The Sunday school believes that “Train up a child in the way he should go: and when he is old, he will not depart from it.” – Proverbs 22:6.

Teaching and learning in Sunday school takes places in the following steps:

1. By teachers explaining the meaning of a value;
2. Children reflecting on the value and relating to their own behaviour;
3. By child using the value to guide their own actions;

2) Women Welfare

The motto of the Women welfare is 'Service and Evangelism in the life '. Every women of the Church above the age of 18 years is a member of this group. They focus on Self development and empowerment of women through modern, scientific and value based education to enable them to lead a purposeful life filled with moral and spiritual values. The poor rural women need to be assisted with literacy programs, provision of Bibles and Bible literature apart from traditional training.

The women welfare believes that “These all continued with one accord in prayer and supplication, with the women, and Mary the mother of Jesus, and with His brethren” – Acts 1:14

Value-based education was need of the hour, to control the atrocities against women, according to Income Tax Commissioner K. Ajay Kumar. Therefore women need to be awakened to prevent atrocities on them. The awakening program was taken up at village level. The purpose mainly to create awareness about where women stand in society.

The Income for the Women welfare is through voluntary contributions from its members by way of collections, which is used for Children’s Work and Evangelistic Work

3) Youth Forum

India is a country in which has the largest population of young people in the world. According to census there are 64 crores of youth between the age of 13-35. The projected figure is 70 crores. According to the national youth policy it is the **40% of total population of India**. Therefore Youth forum was formed with the view that youth of the Church should accept Jesus Christ as their savior and Lord, and bear witness to His powers. It was set up in the churches with a four-fold programme of worship, study, witness and service. It is taught that journey with Christ through the ‘Way of Cross’ is indeed a journey towards self-emptying experience. (Philip 2,5-11). Limiting their life to extremely necessary provisions with regards to food, consumer goods and service and by emptying their pride, ego selfish ambition is a mean towards self-emptying. Bible says **“If I give all I possess to the poor and surrender my body to the flames but have no love, I gain nothing”**. (1 Cor 13:3)

4) Parish Mission

Parish Mission is a group of individual who voluntarily work towards social causes outside the church through helping the needy, supporting the under privileged, reaching the unreached and financial help to the poor .

The parish mission goes out to identify the needy especially children in need of education. They facilitates and connects them with respective institutions and generate funds for their educational needs. Various rural development programs were conducted under their leadership by like tailoring class for ladies, training to do proper agriculture, opening old age homes and orphanages etc.

CONCLUSION

All of creation is linked with one another for the sustenance of life. The existence and presence of the other is essential and necessary. All created beings irrespective of whether we may think of them as lowly in strength or status are vital in God’s handiwork. All of us bear the fingerprint of God our Creator. Hence we are all related as well as unique before God. We need to imbibe this within our hearts so as to strive to acknowledge the divine purpose for which we have been placed upon the earth and to realize that we are part of a community, a bigger whole, created by and for God. So as we must look upon the meaning and purpose of our lives. Among the extremities, it is a challenge to keep one’s sense of equilibrium, as the extremities could easily take control of us to sway either way. **As the Bible reminds us in 2 Peter 3:17,” You therefore beloved, knowing this beforehand, take care that you are not carried away and lose your own stability.”** Therefore value based education ultimately provides the requisite help, through a powerful spiritual atmosphere, for the soul to come forward and gradually begin to govern a balanced, peaceful and spiritually awakened life. Value based-education is instrumental to unfold and nurture the ideals of life.

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SOCIAL SECURITY SCHEMES: A STUDY ON MODI'S PMJJBY, PMSBY AND APY**Dr. Sheena Abraham¹ and Dr. Zarina Shaikh²**¹Assistant Professor and Associate Professor², Y. & M. AKI's Poona Institute of Management Sciences and Entrepreneurship, Pune**ABSTRACT**

“A large proportion of India’s population was without insurance of any kind, health, accidental or life. Worryingly, as our young population ages, it is also going to be pension-less. Encouraged by the success of the Pradhan Mantri Jan Dhan Yojana (PMJDY), the Government of India proposed to work towards creating a universal social security system for all Indians that will ensure that no Indian citizen will have to worry about illness, accidents or penury in old age.” Government announced insurance schemes Pradhan Mantri Suraksha Bima Yojana (for Accidental Death and Disability), Pradhan Mantri Jeevan Jyoti Bima Yojana (for life insurance) and Atal Pension Yojna (for pension). These schemes were launched by Prime minister on 9 May 2015. The government plans to use technology to the extent possible to reach out to the beneficiaries, thereby plugging leakages in the system. This article gives the highlights of these schemes and also focuses on how best these schemes have reached to the Indians.

Keywords: Pradhan Mantri Suraksha Bima Yojana, Pradhan Mantri Jeevan Jyoti Bima Yojana, and Atal Pension Yojna, Government, Indians.

Social Security Schemes: A study on Modi’s PMJJBY, PMSBY and APY**INTRODUCTION**

Pradhan Mantri Jeevan Jyoti Bima Yojana and Pradhan Mantri Suraksha Bima Yojana are government-backed Life insurance schemes in India. It was originally mentioned in the 2015 Budget speech by Finance Minister Arun Jaitley in February 2015. It was formally launched by Prime Minister Narendra Modi on 9 May at Kolkata. As of May 2015, only 20% of India's population has any kind of insurance, these schemes aims to increase the number.

Atal Pension Yojana is a government-backed pension scheme in India targeted at the unorganized sector. It was originally mentioned in the 2015 Budget speech by Finance Minister Arun Jaitley in February 2015. It was formally launched by Prime Minister Narendra Modi on 9 May in Kolkata. As of May 2015, only 11% of India's population has any kind of pension scheme, this scheme aims to increase the number.

OBJECTIVES OF THE STUDY

- To understand the benefits of three schemes.
- To study how best the banks and Government of India have succeeded in reaching these schemes to the whole Indian population
- To know how much expenditure the Government of India has to bear for uplifting these schemes.
- To understand which scheme is more obtained by the people.

RESEARCH METHODOLOGY

This research paper is based on descriptive study. Secondary data was used to collect the data's. Secondary Data was collected from concern websites, magazines, newspapers, journals and past research papers.

Analysis and Interpretations

People Enrollment Details

Chart 1:

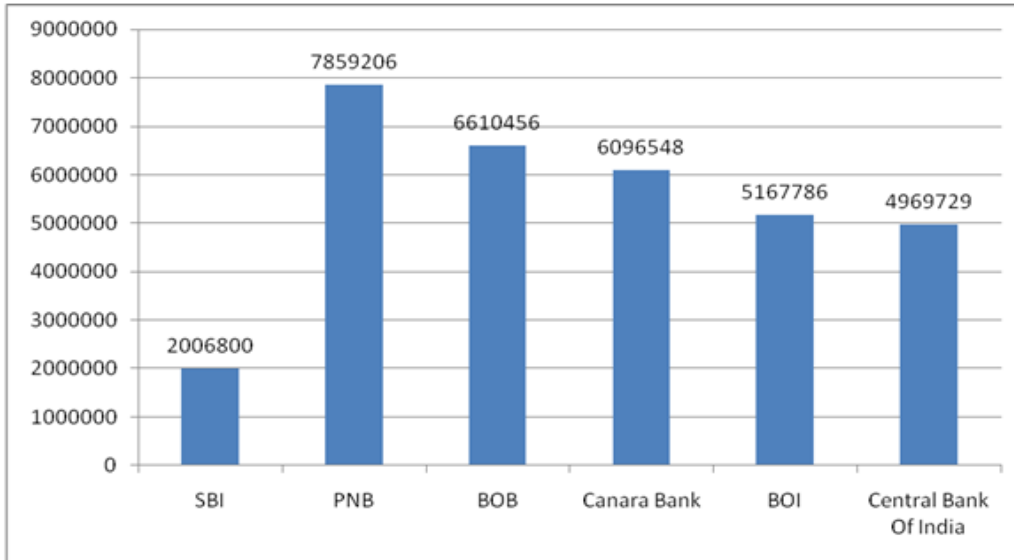
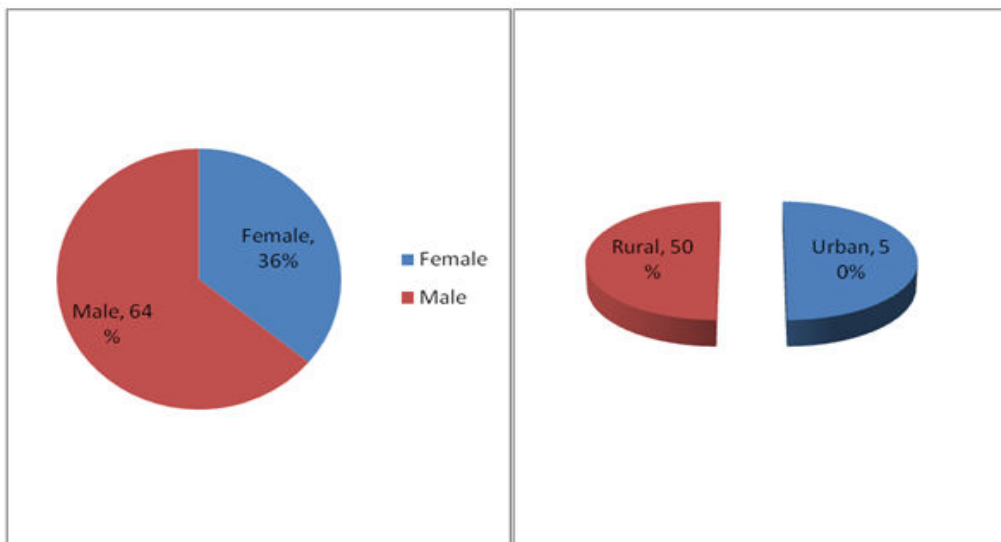


Chart 2: showing the total number of people enrolled for all the three schemes in top six banks until 22.06.2015

Summary of APY/PMJJBY/PMSBY as on 22.06.15					
Scheme Name	Rural Male	Rural Female	Urban Male	Urban Female	Grand Total
APY	68340	41572	113518	71768	295198
PMJJBY	8661286	4879799	7979647	4578238	26098970
PMSBY	24453356	13836461	25152856	13785704	77228377
GRAND TOTAL	33182982	18757832	33246021	18435710	103622545



Pradhan Mantri Suraksha Bima Yojana

PMSBY –Accidental insurance cover - This scheme will be a one year cover, renewable from year to year, Insurance Scheme offering life insurance cover for death due to any reason. The scheme would be offered / administered through LIC and other Life Insurance companies

Eligibility: Available to people in age group 18 to 70 years with bank account.

Premium: Rs 12 per annum.

Payment Mode: The premium will be directly autodebited by the bank from the subscribers account. This is the only mode available.

Risk Coverage: For accidental death and full disability– Rs 2 Lakh and for partial disability – Rs 1 Lakh.

Eligibility: Any person having a bank account and Aadhaar number linked to the bank account can give a simple form to the bank every year before 1st of June in order to join the scheme. Name of nominee to be given in the form.

Terms of Risk Coverage: A person has to opt for the scheme every year. He can also prefer to give a longterm option of continuing in which case his account will be auto-debited every year by the bank.

Who will implement this Scheme? : The scheme will be offered by all Public Sector General Insurance Companies and all other insurers who are willing to join the scheme and tie-up with banks for this purpose.

Tax benefit: The premium paid will be tax-free under section 80C and also the proceeds amount will get tax exemption u/s 10(10D). But if the proceeds from insurance policy exceed Rs.1 lakh, TDS at the rate of 2% from the total proceeds if no Form 15G or Form 15H is submitted to the insurer.

Pradhan Mantri Jeevan Jyoti Bima Yojana

PMJJBY- FOR LIFE INSURANCE COVER scheme will also be a one year cover, renewable from year to year, Insurance Scheme offering life insurance cover for death due to any reason. The scheme would be offered / administered through LIC and other Life Insurance companies and tie ups with Banks for this purpose.

Eligibility: Available to people in the age group of 18 to 50 and having a bank account. People who join the scheme before completing 50 years can, however, continue to have the risk of life cover up to the age of 55 years subject to payment of premium.

Premium: Rs 330 per annum. It will be auto-debited in one instalment.

Payment Mode: The payment of premium will be directly auto-debited by the bank from the subscribers account.

Risk Coverage: Rs. 2 Lakh in case of death for any reason.

Terms of Risk Coverage: A person has to opt for the scheme every year. He can also prefer to give a longterm option of continuing, in which case his account will be auto-debited every year by the bank.

Who will implement this Scheme?: The scheme will be offered by Life Insurance Corporation and all other life insurers who are willing to join the scheme and tieup with banks for this purpose.

Atal Pension Yojna (APY)

The scheme will be launched on June 1 2015 and focus is on the unorganised sector. A pension provides people with a monthly income when they are no longer earning. A Subscriber receives pension based on accumulated contribution out of his current income. Under the Atal Pension Yojna Scheme (APY), the subscribers, under the age of 40, would receive the fixed monthly pension of Rs. 1000 to Rs 5000 at the age of 60 years, depending on their contributions. To make the pension scheme more attractive, government would co-contribute 50 per cent of a subscriber's contribution or Rs 1,000 per annum, whichever is lower to each eligible subscriber account for a period of 5 years from 2015-16 to 2019-20. The benefit of government's cocontribution can be availed by those who subscribe to the scheme before December 31, 2015.

Eligibility for APY: Atal Pension Yojana (APY) is open to all bank account holders who are not members of any statutory social security scheme.

Age of joining and contribution period: The minimum age of joining APY is 18 years and maximum age is 40 years. One needs to contribute till one attains 60 years of age.

Government's Expenditure Government expenditure is expected to range between Rs. 2,520 crore and Rs. 10,000 crore on account of Government co-contribution to subscribers of the APY over a period of five years. Further, an expenditure of Rs. 2,000 crore for promotional and developmental activities for enrolment and contribution collection under APY and Rs. 250 crore for publicity, awareness building for PMJJBY and PMSBY is envisaged by the Government, over a period of five years.

FINDINGS

- The schemes have more benefits for the people especially for poor people and youngsters.
- The Government and banks have played a major role for the success of these schemes.
- Both urban and rural people are equally obtaining these schemes.
- Comparatively, than male female enrollment into these schemes are almost 50% less than males.
- 5. Government is spending approximately 12,520 crores for five years towards PMJJBY, PMSBY and APY.

SUGGESTIONS

- The Government and banks has to take still more steps in reaching these schemes for all the women.
- The Government and banks has to maintain still more transparency in informing how the money collected from these schemes will be utilized by the Government/ bank.
- People from all the sectors has to come up voluntarily to uplift these schemes.

CONCLUSION

From the above study it can be said that the beginning to provide social security benefit to large number of unorganized people is really good. The subscribers for these schemes are at increasing pace, however if implemented still more properly and the benefit is passed on to the real subscriber it will go a long way in establishing a social security system to the large section of society which has remained uncovered.

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STUDY OF BUSINESS SERVICE MANAGEMENT

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ABSTRACT

Business service management (BSM) is a methodology for monitoring and measuring information technology (IT) services from a business perspective. BSM consists of both structured process and enabling software. The objective of this paper is to introduce the concept and approach of BSM and to analyze the effectiveness and advantages of BSM in today's business world for external as well as internal customer.

It is found that BSM is team-focused and can be used by any team in an organisation to improve their performance. It is the foundation of IT Service Management (ITSM) where IT functions adopting ITSM have become service-centric getting IT teams to think of what they do as services, be they automated services provided by the technology, or manual operational and support services provided by the IT people.

Key Word: Business Management Methodology, Information Technology Infrastructure Library (ITIL), IT Service Management (ITSM), IT optimization

INTRODUCTION

Business Service Management (BSM) is a comprehensive and unified platform that simultaneously reduces IT costs, increases business impact, improves quality of service, manages risk, and provides transparency. The BSM approach helps link the key IT components of a company to the goals of the business and helps predict the impact of technology on business and vice versa. BSM is the level above IT Service Management (ITSM) software which many organizations use to monitor infrastructure and services from an IT perspective.

With BSM, IT moves into the role of business value creator. BSM transforms the corporate environment, enabling business and IT leaders speak a common language. They can approach challenges from a united front and understand the shared impact of new initiatives. Thus, an organization can focus its energy on where it counts most for the business. More efficient incident management frees IT staff time for proactive IT projects.

The study was conducted with the literature survey via various journals, magazines that helped to comprehend basics of Business Service Management. Also Internet survey was conducted to identify the latest up gradation in it.

STATEMENT OF PROBLEM

The need for an IT management platform is important for two reasons:

First, a platform-based approach provides a consistent way of sharing information. Just as businesses needed to standardize on the definitions of "customer" and "products," IT organizations need to standardize around consistent terms, such as "services" and "resources."

Second, a platform-based approach also standardizes the communications and workflow between functions through APIs and a shared data model. With a platform-based approach, the output of one function becomes the input to another (for example, the output of request management is an input to change management).

OBJECTIVE:

- To introduce the concept and approach of BSM.
- To analyze the effectiveness and advantages of BSM in today's business world for external as well as internal customer.

Key Term used

Business service management (BSM) is a methodology for monitoring and measuring information technology (IT) services from a business perspective. BSM consists of both structured process and enabling software. The **Information Technology Infrastructure Library (ITIL)**, a set of IT management frameworks and concepts, has recently identified BSM as a best practice for IT infrastructure management and operations.

The BSM approach helps link the key IT components of a company to the goals of the business and helps predict the impact of technology on business and vice versa. BSM is the level above **IT Service Management (ITSM)** software which many organizations use to monitor infrastructure and services from an IT perspective.

BSM is not something that can be achieved all at once, but rather, by reaching consecutive goals of **IT optimization**, beginning with monitoring tools, moving on to dashboards, CMDB implementation, and, finally, true BSM via multiple, federated CMDBs.

Review about BSM

Chip Salyards, VP, Asia Pacific, BMC Software, said, "BMC has been delivering BSM solutions to thousands of customers, in every industry and geography, to address their most critical IT needs. We pioneered the concept of BSM as a way to better align IT operations with business needs. Our BSM leadership comes from several years of internal development and complementary acquisitions around the core platform of Remedy and Atrium and is further strengthened by our mainframe expertise." [1]

Rahul Singh, Country Marketing Manager, HP Software & Solutions, HP India, explained with an example, "The functioning of BSM can be explained with the help of a simple business case—a Web-based travel service provider. BSM in these scenarios would automate and check the health of the business service in a continuous manner and proactively raise an alert if there is a potential failure coming up in any of the components. In the event of a failure, BSM can pinpoint the exact component that caused the failure. Importantly, in the event of more than one failure it can help prioritize corrective action by determining which failure is more critical to the business service." [2]

"In the event of more than one failure, BSM can help prioritize corrective action by determining which failure is more critical to the business service"-- Rahul Singh, Country Marketing Manager, HP Software & Solutions, HP India

Dr. P. K. Mishra, Novell India highlighted the company's products and solutions that help create an effective e-governance infrastructure

"We also have Business Service Management (BSM), which is a methodology for monitoring and measuring IT services from a business or CIO perspective. BSM brings together disparate processes and tools, and creates quantifiable improvements in efficiency," added Mishra. [3]

Reliance Internet Data Centre (IDC), a part of Reliance Communications, entered into a tie-up with Compuware for providing application service management solutions to its data centre customers. This alliance will provide BSM and EUE services to Reliance

customers in a managed services environment. The service promises multifold benefits to CIOs including aligning IT to business objectives, improved communication and making IT more efficient and cost effective.

The BSM solutions will try to find out where the problem is. For solving the problem, Compuware's Vantage BSM provides real-time views of IT service delivery so that CIOs, IT managers and line-of-business counterparts can understand the impact that IT services have on business operations. As a result, Vantage BSM helps one to communicate IT service delivery more effectively, meet SLAs, improve operational efficiency, reduce costs and increase satisfaction with IT[4].

Robert E Beauchamp, President & CEO, BMC Software Inc says "BSM transforms the corporate environment"

With BSM, customers from around the world, and in every industry, have been able to [5]:

- » Deliver services up to 30 percent more efficiently
- » Deliver new services up to 50 percent faster
- » Reduce downtime by 75 percent
- » Reduce the cost of compliance by 30 percent
- » Gain 95-plus percent visibility into IT spend and effectively centralize planning and budget efforts

Advantages of BSM

1. Reduce I.T. Costs

With BSM, you can maximize the efficiency with which you plan, deliver, and manage services, so you services to delivering new ones.

- » A global telecommunications company estimates cost savings and productivity gains of \$20 million as a result of standardizing its service desk capability, and another \$12 million in savings associated with the elimination of 81 percent of help desk incidents associated with changes.

2. Increase Business Impact

With BSM, you can design your service portfolio so that you can quickly respond to recurring business requirements; add or modify services to address new and changing business requirements; and drive IT-enabled business changes.

- » With BSM, a large European and Latin American bank has reduced the time to deploy new services by more than 50 percent. The bank now manages its infrastructure from a business perspective and has improved both quality of service and IT responsiveness.

3. Improve Quality of Service

BSM offers an alternative. With BSM, you can improve service quality, reliability, and availability by prioritizing business services, anticipating service issues, and quickly restoring service.

- » An institutional securities group achieved 99.9 percent availability, a key performance indicator for critical business objectives. The customer estimates savings of 50 percent in administration time, and also estimates a savings of up to 30 percent in storage cost avoidance.

4. Manage Risk

With BSM, you can automate and enforce controls and processes that relate to

compliance, business interruption, personnel, and vendors.

» A leading telecommunications manufacturer consolidated multiple processes into a single companywide change process, providing 30 percent reduction in mean time to repair, 60 percent reduction in unplanned outage time, and an \$11 million savings in change management alone.

» A global financial services company reduced outage time for mainframe database changes by 97 percent.

5. Provide Transparency

BSM helps you demonstrate where IT is spending its time and money so that business stakeholders have a clear understanding of what IT is doing to meet business expectations and goals.

» A global securities trading firm eliminated 20 full-time employees, creating first-year savings of 3 million euro by centralizing its planning and budgeting efforts with BSM. The firm reduced the number of its cost centers from 1,500+ to 150, increased transparency and governance, and can now make strategically aligned IT investment decisions with increased credibility[6].

CONCLUSION

The purpose of Business Service Management; Business Management Methodology (BSM - BMM) is to help organisations and their teams understand what they do is to provide Services, many internally to other teams, with the end result of some teams providing services to the external customers of the organisation and so achieve the organisation's customer service mission[7]. The vast majority of an organization's teams are internal working teams providing internal services. These teams do not directly serve or get involved in serving the organization's external customers. BSM provides the critical framework for organizations to make sure that the work of customer facing and internal working Teams is defined and so transparent to the customers who can then influence to functionality and quality of the services they receive[8]. BSM supports Business Process Management by helping all the teams involved in performing a business Process to think of their part of the process as Team Service Activities.

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**A CRITICAL STUDY ON STRATEGIES TO MANAGE WORK STRESS IN
MANUFACTURING AND IT INDUSTRIES – NEED OF THE HOUR IN THE
PRESENT INDIAN CONTEXT**

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ABSTRACT

Job or occupational stress is something we all face as employees or employers and we all handle it differently. It is a mismatch between the individual capabilities and organizational demands. Also it is a mismatch between the expectations of both individual and organisation. Stress not only affects the physical, psychological and financial balances of an employee but also the employers as well. Desired results cannot be expected from employees who are burnt out, exhausted or stressed, as they lose their energy, accuracy and innovative thinking. By this, employers may lose more working days there by a decrease in productivity and increase in cost to company. By virtue, some jobs are highly stressful like Army, Police, and Fire Service etc. Some are relatively moderate viz service sector and health care industry etc. In the present day scenario, IT and BPO companies' jobs are termed as more competitive and stressful. The National Institute for Occupational Safety and Health (NIOSH), part of the U.S. Department of Health and Human Services, states that job stress, now more than ever, poses a threat to the health of workers – and the health of organizations. The present paper shall bring out the general broad outline of causes of occupational stress at individual employees level and at the corporate level. It shall suggest some urgent strategic planning needed to combat the alarming rise of disorder in the health of the employee and the organization as a whole, in the present Indian context and scenario.

Key Words: Attitude, Burnout, Career Development, Channel of Communication, Combat, Corporate Planning, Diet, Downsizing, Energy, Growing Population, Health Disorders, High Competition, Individual Planning, Job, Job Performance, Job Satisfaction, Job Stress, Meditation, Mismatch, Physical/Mental Exercise, Physical/Psychological/ Financial Imbalances, Productivity, Recognition, Relax, Strategic Remedy, Stress Syndrome. Work-Family Balance, Workloads, NIOH – National Institute of Occupational health.

OBJECTIVES OF THE STUDY:

- To understand what are the aspects and causes of stress in Manufacturing and IT units
- To know what are the effects of occupational stress
- To understand what is Human occupational stress syndrome.
- To be able to understand how can some strategic remedies that can be helpful to avoid stress in occupation and individually.
- How to change the organisation to avoid job stress.
- Tips for relaxation in office and to suggest suggestions and conclusions on the study.

RESEARCH METHODOLOGY:

The research has been done on secondary data with the help of journals, internet and books.

INTRODUCTION – STRESS AND BURNOUTS AT WORK

20 years back - Have you ever heard of a cardiac arrest, blockage in angina, high cholesterol and high diabetic to an employee in the age group of 30 to 40? Similarly have you heard of early retirement, mental strain, absenteeism and burnout? Obviously no, which you have not come across such a scenario. Occupational stress is the interaction of the worker and the conditions of work. Downsizing, increased workloads, high competition, growing population etc. are taking their toll. "Stress, in essence, is a feeling of doubt about being able to cope, a perception that the resources available do not match the demands made. When it persists, stress can cause physical and psychological ill-health and adversely affect social functioning."

Occupational stress has become a common and costly problem, leaving few workers untouched. Not all stress is bad. Learning how to deal with and manage stress is critical to maximizing job performance, staying safe on the job, and maintaining physical and mental health.

Survey of the literature on occupational stress reveals that there are a number of factors related to job, which affect the behaviour of the employees and as a result of it, normal life is disturbed (McLean, 1974; Brief, Schular and Vansell, 1981).

Aspects and causes of work stress in manufacturing and IT units:

- a. Low level of job satisfaction.
- b. Clear goals and targets set for each employee in the organization are not set
- c. Clear chain of command or absence of it as multiplicity of command leads to confusion and stress.
- d. Harassment at work place in the form of unkind words, behaviour or bullying or sexual advances.
- e. Unrealistic deadlines for achieving the targets assigned to the employee leads to burnouts in the firm.
- f. Lack of clarity about duties and responsibilities leads to demotivation in employees
- g. Discrimination at work.
- h. Regular or temporary or work charged or contract status.
- i. Job security.

Human Occupational Stress Syndrome

For weeks, with plagued aching muscles, headache, loss of appetite, restless sleep, a complete sense of exhaustion, difficulty in concentrating, job dissatisfaction, low morale, alienation, short-temper and irritation are the symptoms of stress.

During stress, as a pre-programmed biological system, brain activates hormone release, pulse, respiration, muscles (which is called as flight response) to defend the alarming situation. Every person faces this situation, but repetition of the same in frequent intervals is a cause of concern. Continuing the body in such constant state of activation damages the biological systems. Such recurrent dis balance causes fatigue and curtails the bodily ability to defend.

STRATEGIC REMEDY**Individual Level Strategy**

What is the remedy to Stress? Leaving the job – No.

Corporate change occurs, only when the staff changes individually. As an individual, an employee must change his life style with intake of healthy drinks and diet, regular physical and mental exercises.

NIOSH research suggested examples of individual and situational factors that can help to reduce the effects of stressful working conditions include the following:

- Balance between work and family or personal life
- Create support network of friends and co-workers and talk out openly
- Maintain relaxed and positive outlook/attitude
- Change the motto - No one is perfect – perform the best
- Have realistic expectations
- Have a balanced diet
- Practice relaxation and meditation
- Have thorough medical check-up at frequent intervals

Corporate Level Strategy

The corporate body has also a moral responsibility to practice healthy work culture and environment. The employee during most of the productive period of the day ie eight hours of his awoken period of the day, is available in the work place of the company. Each corporate policy makers must analyse their environment (general as well as organizational), evaluate alternative contingency strategies for likely future scenario like one that is being discussed now “The Occupational Stress”, choose the right option and implement it to equip their middle and operating level employees to cope the situation.

Experts feel that change in the attitude of the management is essential and needed. Simple measures could improve greatly the contentment and morale. Common sense recommendations include redesigning the job to increase variety, prevent excessive hours, and provide better support. Rewards should also be improved-both praise and interest from more senior staff and, more tangibly, working conditions, holidays, and opportunities for study leave. Participatory decision-making, skill building, social security, support etc. are some of the other attentions management must throw upon its employees. Management has to recognize its responsibility for minimizing stress, thereby reducing ill health among employees, including potentially fatal coronary heart disease. Volvo Car Company in Sweden is an example to this method of stress release. It introduced innovations such as job rotation to widen workers’ skills, and less authoritarian management style that improved productivity and decreased depression and tiredness.

NIOH also has identified organizational characteristics associated with both healthy, low-stress work and high levels of productivity. Examples of these characteristics include the following:

- Recognition of employees for good work performance
- Opportunities for career development

- An organizational culture that values the individual worker
- Management actions that are consistent with organizational values
- Exposure to stressful working conditions (called job stressors)

Corporate Stress Prevention Strategy

- Talk to individual employees, if possible or else to their first supervisors
- Hold group discussions with employees
- Measure employee perceptions of job, working conditions, stress, satisfaction etc
- Design a survey method
- Collect objective data
- Analyze the data and identify the problem
- Find out remedial measures

How to Change the Organization to Prevent Job Stress

- The workload should be in line with workers’ capabilities and resources
- Job design should stimulate and provide ample opportunities for workers to use their skills
- Clarity in workers’ roles and responsibilities
- Worker’s participation in making decisions for those actions affecting their interests
- Improved channels of communication
- Drawl of clear career development chart
- Ensuring social interaction opportunities among workers

Fig: Present stressful organizational practices

Fig: Present stressful organizational practices				
Background	Work Organisation			Mechanisms
Forces				
Worker	Organisational	Job		Biological
Demographic	Practices	Design		
Labour Supply				Behavioural
Technology	Physical and Chemical			Cognitive
Economy	Exposure			etc.

To go ahead risk can result to illness, injury, dysfunction and diseases

Source: NIOH Approach to Job Stress – Stressat work: Published in 2014

TABLE: Occupational Stress Evaluation Grid (OSEG)

Levels	Stressors	Interventions	
		Formal	Informal
Socio cultural	Racism; Sexism Ecological shifts Economic downturns Political changes Military crises	Elections Lobbying/political action Public education Trade associations	Grass roots organizing Petitions Demonstration Migration Spouse employment
Organisational	Hiring policies Plant closings Layoffs, Relocation, Automation, Market shifts, Retraining Organisational priorities	Corporate decision Reorganisation New Management Model Management consultant inservice/retraining	Social activities Contests; Incentives Manager involvement & ties with workers Continuing education Moonlighting
Work Setting	Task (time, speed, autonomy, creativity) Supervision Co-workers Ergonomics Participation in decision Making	Supervisor meetings Health/safety meetings Union grievance Employee involvement Quality circles Job redesign Inservice training	Slow down/speed up Redefine tasks Support of other workers Sabotage, theft, Quit, change jobs
Interpersonal	Divorce, Separation Marital discord, Conflict, family/friend, Death, illness in family Intergenerational conflict Legal/financial difficulties Early Parenthood	Legal/financial services Leave of absence Counseling, Psychotherapy Insurance Plans Family therapy Loans/credit unions Day care	Seek social support/advice Seek legal/financial assistance Self-help groups Vacation/sick days Child care
Psychological	Neurosis, Mental illness, Disturbance of Affect, Cognition or Behavior Ineffective coping skills Poor self-image Poor communication Addictive behaviour	Employee assistance (referral /in house) Counseling, Psychotherapy Medication Supervisory training Stress Management Workshop	Seek support from friends, family, church Self-help groups/books Self-medication Recreation, leisure Sexual activity “Mental health” days
Biological	Disease, Disability Sleep, Appetite disturbance, Chemical Dependency Biochemical imbalance Pregnancy	Pre placement screening Counseling Medical treatment Health education Employee assistance Maternity leave	Change sleep/wake habits Bag lunch Self-medication Cosmetics Diets, exercise Consult physician
Physical/Environment	Poor air, climate	Protective clothing/	Own equipment,

al	Noise exposure Toxic substance Exposure Poor lighting Radiation exposure Poor equipment design Bad architecture	equipment Climate control Health/safety committee Interior decoration Muzak Union grievance	decoration Walkman, radio Consult personal physician Letters of complaint
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Source: The Nuts and Bolts of Assessing Occupational Stress: A Collaborative Effort with Labour – Jefferson A Singer et al. published by NIOH in May 2011

Tips for relaxation at Office

Right Posture

Failure to adopt proper posture while in neutral standing or sitting end up in problem. Sit straight and tall at the edge of your chair.

Lunch Break De Stress Exercises

Yawning during working hours is the symptom to identify your stress level. You may fall asleep with the increasing level of stress.

Do few exercises before taking your lunch like:

Eye Exercise

You need rest to eyes for few seconds at least twice during the course of your days work. Continuous concentration on one particular point or object, improper of over lighting and stress may harm the eyes.

1. Sit or stand straight
2. Without moving your body and neck, inhale and look up the ceiling. Hold it for few seconds
3. Exhale and gradually drop the sight down to look the floor
4. Similarly do it on side ways
5. Rotate your eyes slowly and steadily both clock wise and anti-clock wise
6. Blink the eyes several times and close it to relax

Neck Relaxation

Improper standing/sitting or continuous standing/sitting in one particular posture may lead to terrible aching, stress and end up in spondylitis. Relieve such things with Neck Relaxation techniques.

1. Keep the body straight, put your hands on waist and lower the neck ie touch your cheek on the upper part of chest
2. Hold for few seconds and take few breath at this position
3. Lift back the neck
4. Similarly do it on the reverse side
5. Then, touch your right shoulder with right ear, hold for few seconds and take few breath
6. Do the same on left side
7. Then, rotate your neck slowly and steadily clock wise few times and come back to neutral

position and take few breath

Shoulder Exercise

1. Keep your hands on the waist and rotate your hands at shoulder level slowly clockwise and anti-clockwise for few times
2. While inhaling stretch your hands so that it touch your ears. While exhaling bring back your hands to the side

Breathing Exercise

Pranayama, the breathing exercise, may rejuvenate you, to carry on your work with extra energy.

1. Put your right thumb on your right nostril
2. Deeply inhale air using your left nostril
3. Close your left nostril with your right index finger and hold breath for few seconds
4. Exhale through left nostril
5. Do it similarly with left nostril closing right nostril
6. Now inhale through left nostril, hold breath and exhale through right nostril and

Ergonomics, evolved out of two Greek words “Ergon = Work and Nomos = Principles/Laws, is a science (Manav Karya Vigyan) that deals with the interactions between the human, the artifacts and the working environment. It is culmination of specializations in Occupational Health, Industrial Safety, Job Analysis & Design, and Information & Cognitive Design etc. For this reason, every organisation must formulate a strategy to conduct Annual Stress Audit with a combination of Organizational Change, Stress Management and Ergonomics, which will be the most useful approach for preventing stress at work and plan suitable remedial actions for Organizational and Individual growth.

CONCLUSION AND SUGGESTIONS

Every person has a working life-time/period of about 35 years, normally between 25 to 60 years of age. Given the Indian scenario of competitive market, over population and scarcity of good jobs, runs on the theory of “Survival of the Fittest”, no profession is stress free. The degree and depth may vary from one another. Both employer and employee must understand that work should be valued and not excessive. Work should not compromise on health and family life; rather offer happiness, peace of mind, certainty, variety and flexibility. As a general rule, actions to reduce job stress should be given top priority in the process of organizational change to improve working conditions and to avert the situation of brain drain. But even the most conscientious efforts to improve working conditions are unlikely to eliminate stress completely for all workers.

The following results and conclusions have been arrived at on the basis of this study. It has been clearly brought out more than 50% of the respondents are affected by work stress. The main causes for work stress are:

- i. Job satisfaction is related to work stress and lack of job satisfaction leads to work stress.
- ii. Lack of clear goals and unrealistic targets set by employers.
- iii. Harassment at work place including rude behaviour, bullying or sexual advances.
- iv. Friction between employees at different levels.

- v. Family issues like children's education; illness in the family or other domestic issues.
- vi. Long working hours beyond the fixed schedule that too, many times in a month at short notice.
- vii. Knowledge, skills and abilities not suited to the work assigned in the organization.

The suggestions of this study are listed below:

- Conduct regular walk around inspections,
- Investigate incidents that might be related to stress,
- Review health, absenteeism, and other available records
- Assist other committees on problems related to stress
- Train other committee members and stewards how to recognize stressful situations and workers suffering from stress
- Collect resource material for the union's library related to stress and how to cope with it
- Review changes in work-practices and procedures for potential as stressors, Recommend changes that might reduce stress
- Participate in training programs on job stress and job design
- Document activities and events related to potential stressful situations
- Hold educational sessions on job stress for the membership
- Form Local Union discussion groups
- Include the issue of occupational stress in member assistance groups, Publish news articles on job stress in union publications
- Develop stress-related materials for dissemination to members and new hires during orientation sessions
- Conduct on and off-the-job relaxation and physical conditioning programs
- Become actively involved with personnel at research and academic institutions developing and carrying out scientific studies on occupational stress
- Initiate and develop cooperative relations and activities with other unions

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**PROSPERING BUSINESS IN ISLAMIC WAY: STRATEGIC INNOVATIONS FROM
THE PAST FOR FUTURE**

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ABSTRACT

A business is a process of being involved in trade of goods or services or both in the exchange of monetary values. Business has grown in last few decades from myopia to hyperopia. It has also evolved the concepts of Holistic Marketing Approach, Customization and Corporate Social Responsibilities. The following study will also pay concentration to Business management and how the recent business management strategies are related to conventional Islamic practices.

Whenever we talk about marketing and business, 4Ps of marketing i.e. Product, Price, Place & Promotion, always come to our minds. This study will also help us to understand what Islam says about these 4 Ps. We have always followed the concept of auto-suggestion in the business. The present study will also put the light on the concept of Islamic auto-suggestion to prosper the business.

The research methodology used in the study is purely literature review. The important information & data collected is qualitative in nature and collected from internet & books of Islamic scholars.

Keywords/ Key concepts: *Business management, Holistic Marketing approach, Customer Oriented Business, Corporate Social Responsibilities, 4 Ps of Marketing & Islamic Auto-Suggestion Process.*

INTRODUCTION

The entire concept of business management revolves around earning wealth. Therefore to understand business management, one should understand the concept of wealth.

Wealth is the abundance of valuable resources or material possessions. The word wealth is derived from the old English weal, which is from an Indo-European word stem. An individual, community, region or country that possesses an abundance of such possessions or resources is known as wealthy.

Wealth in monetary term is anything that can be bought and sold, for which there is market and hence a price. The market price, however, reflects only the commodity price and not necessarily its value. On the other, in hand non-monetary terms the wealth is the thing which depends on scarce resources, and for which there is demand, but are not bought and sold in a market and hence have no price like education, health, and defence.

In Islam, Wealth is not just the property & your bank balance, but it has several faces like,

Wealth as Blessings of God: Wealth has been referred as **KHAIR** in Holy Quran which means noble deed, attaining, excellence, honor and greatness etc.

Wealth is a Reward of Good Deeds: “If they would have followed Bible, Tohra and other divine scriptures, prosperity would have rained on them from sky and would have erupted from below their feet” (*Holy Quran 5:66*)

Wealth has been also mentioned as an instrument of divine examination to the path of eternal success. It has been also mentioned in the Holy Quran that wealth is meant for astonish the human being and it is a divine punishment too.

Business Management can be defined as the activities associated with running a company, such as controlling, leading, monitoring, organizing & planning. In the era of cut throat competition, business can be defined as the best alternative to earn money. One can get high income in service also, but there is always a limitation. While in business, there is no limit of progress and it does not end with retirement or death.

Islam has also given a great importance to business. Prophet Mohammad (s.a.w.) said that Allah has divided the blessing (progress & prosperity) into twenty parts. Out of twenty, nineteen parts are for (business) traders, and one part for shepherds (may be for those who are employed). (Kanzul Ummal 4/16, Hadees no. 9354)

Even the above hadees points out that Islam prefer Business than being employed. The ratio of 19:1 clearly indicates that. The concept of business and marketing has grown from myopia to hyperopia. To understand the business management acutely, one should concentrate on these concepts as well.

Marketing Myopia is defined as a short-sighted and inward looking approach to marketing that focuses on the needs of the company instead of defining the company and its products in terms of the customers' needs and wants. It results in the failure to see and adjust to the rapid changes in their markets.

The concept of marketing myopia was discussed in an article (titled "Marketing Myopia," in July-August 1960 issue of the Harvard Business Review) by Harvard Business School emeritus professor of marketing, Theodore C. Levitt (1925-2006), who suggests that companies get trapped in this situation because they omit to ask the vital question, "What business are we in?"

Marketing Hyperopia concentrates on a better vision of distant issues than of near ones. Hyperopia is broader concept than Myopia. It deals with the long term goals than a short vision of earning profit. In Hyperopia, initial losses may be overlooked so that the entrepreneur can concentrate on earning high market share in future.

Islam has always concentrated on clean and pure business. Islam has always congested the entrepreneur from false way of business, cheating customers, and being selfish. Islam has always focused on hyperopia. Following rules of business in Islam will put further light on the issue.

Rules for Business: What Islam Says?

No Cheating

Prophet Mohammad (S.A.W) firmly said "You should have exhibited the true status of you goods. By hiding it below dry food grain you are cheating and a cheater cannot be a Muslim" (Ibne Majah 2303)

This hadees indicates that cheating is not a way of a life or business style of Muslim.

Don't get cheated

Prophet Mohammad (S.A.W) said, "A Momin (true believer) is never bitten twice from the same hole (of snake)". (Bukhari)

Hence once we realize that a person or organization is dishonest, we should never do a business with them again.

No Lying

It is narrated by Hazrat Abu Hurairah (R.A.) that Prophet Mohammad (S.A.W) said, " there are four signs of hypocrites

1. He always speaks lies.
2. He never fulfils his commitments
3. Whenever he is trusted and made responsible for something, he cheats.
4. Whenever he argues, he abuses.”

We should avoid the above mentioned four characteristics in business transactions, as hypocrites are worse than non believers.

Firm Commitment

Allah says in Holy Quran, “Fulfill your commitments; you will be surely accounted for commitment (on Judgment Day).” (Holy Quran 17:34)

One has to be firm at business commitment as it not only helps in earning more business but also in retaining more customers.

Charge fair Prices

It is always advised in Islam to earn moderate profit in business activities. And it is prohibited to earn extra profit, which causes customers to lose extra money.

Satisfy your customer more than his expectation

This is a basic common rule. It means that while selling your products or services you specify quality and quantity of your product or services against a particular amount. Delighting a customer is a rule of business in Islam.

No Exploitation

According to Hazrat Abdullah Ibne Umar (R.A.) Prophet Mohammad (S.A.W) said, “Pay wages labours, before their sweat dries” (Ibne Majah)

Labours work on the daily basis to fulfill their daily needs. They not only have to run their family but also have to secure the career of their children. It is quite difficult to manage both in a small pay they are earning. That’s why it is always suggested in Islam to not to exploit the labours and pay them adequate wages/ salary.

These are few of the basic rules of business in Islam.

Recent Strategies & Islam

There are so many strategies entrepreneurs and managers are using in the recent time. Let’s compress our study to the most used strategies in business.

Holistic Marketing Approach

A holistic marketing concept is based on the development, design and implementation of marketing programs, processes and activities that recognize the breadth and interdependencies. Holistic marketing recognizes that ‘everything matters’ with marketing and that a broad, integrated perspective is necessary to attain the best solution.

According to Hazrat Saddad bin Aus (R.A.), Prophet Mohammad (S.A.W.) said, “Allah has made compulsory for human beings to do every work perfectly.” (Zade Raah 340)

Like above hadees, there are so many references which say that Islam has always supported being modernized. While performing a business one must understand that everything matters, that is Holistic Marketing Approach. Islam is following the same concept since centuries.

Customization

The concept of customization says that “*Customer is the King*”. In today’s world, customers have numerous options available in the market. The competition has increased tremendously.

Now, to survive in the market competitors have to gain advantage. This advantage they may gain by being customized. Customization deals with providing the products and services as per the needs, wants and requisites of the customers, at the price, which customers want to pay, at the place, which is convenient or customer feels comfortable to purchase, is known as Customization.

Islam has explained the concept of customization 1500 years before. *Islam* has always given a preference to provide better quality and quantity product and services to customers. *Islam* has also advised to earn moderate profit in business activities. *Islam* has also preferred the concept of Globalisation. The reason behind expansion of business may be providing products to customers in the most convenient market to them. We must not lie to the customers about the product or services we are selling. False promotion strategies are prohibited in *Islam*.

Corporate Social Responsibilities

Corporate Social Responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large.

It is mentioned in *Islam* that one should earn money to satisfy his basic needs. If someone is earning more than his needs, he should spend that money in the welfare of the community. Organizations are following this concept recently; *Islam* is following it since centuries.

4Ps of Marketing & an Islamic View

Product is anything that can be offered to a market for attention, acquisition, use or consumption that might satisfy a want or need. This area covers everything to do with the creation, development and management of products. This group also covers the non tangible aspect of the product like after sales service, guarantees etc.

In Islam it is always preferred to provide better quality and quantity product and services to customers.

Price is the amount of money charged for a product or service, or the sum of the values that consumers exchange for the benefits of having or using the product or service. Pricing is very important and essential part of marketing mix. The price of the product or service may portray it being a quality item or a desirable one. Pricing of the product is used to get competitive advantage in the competitive market.

It is always advised in *Islam* to earn moderate profit in business activities. And it is prohibited to earn extra profit, which causes customers to lose extra money.

Place includes company activities that make the product available to target consumers. Place in the marketing mix is concerned with distribution channels, market intermediaries and consumer service levels. It gives the insight to the approach and availability of product and service to the consumers.

It is always preferred to travel in *Islam* for the purpose of trade. We can expand our business globally. One of the reasons behind expansion of business is providing products to customers in the most convenient market to them.

Promotion means activities that communicate the merits of the product and persuade target customers to buy it. While promoting the product we must not lie to the customers about the product or services we are selling. False promotion strategies are prohibited in *Islam*.

Auto-Suggestion Concept in Islam

Auto suggestion is a process of suggestion in which the person unconsciously supplies or consciously attempts to supply the means of influencing his own behavior or beliefs. The concept is developed by apothecary Émile Coué at the beginning of the 20th century. But Islam has also recommended the concept of Auto-suggestion so that the organization can prosper the business.

Following are the steps of auto-suggestion by Islam

Step 1: Define your goal or aim clearly & specifically.

Step 2: Specify your efforts.

Step 3: Record your clear aim & efforts.

Step 4: Repeat your written documents after getting-up in the morning and before going to bed.

Step 5: Visualize or imagine that you have already started achieving your goals.

Step 6: Put your plan in action.

Step 7: If required, modify plan, but continue it in anyway.

These steps will help the individual or an organization to specify the vision & mission. And also to improve the organization's working at any point of time to achieve success.

Prospering the Business in Islamic way

Most of the people have the myth that Islam follows the orthodox methodologies and doesn't support recent trends. But if we study Islamic rules and regulations properly, we will come to know that Islam is a religion with future orientation. It doesn't stop individuals to perform anything. But it provides the guideline so that one should perform a task safely.

Islam has suggested so many business manners 1500 years back, which we all are following today. Marketing Hyperopia, Holistic Marketing approach, Customization approach, Corporate Social Responsibilities, auto-suggestion concept and customer retention strategies to gain competitive advantage are few of the gifts of Islam to achieve a successful and long-running business. Though Islam has prohibited certain thing, but it is with the intention to avoid neglecting the long term profit for short term gains.

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BARRIERS TO ENTRY AS GROWTH STRATEGY

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ABSTRACT

We will attempt to review how barriers to entry influence the size and growth of firms. The concept of entry barrier and how it presents the entry of new firms will be discussed. The sources, types of entry barriers and the factors that place new entrants at a cost disadvantage in relation to established firms and the relation of entry barrier to our study is also attempted.

1. Barrier to Entry

Entry barriers refer to obstacles preventing potential entrants from engaging in the production of a particular commodity. In such a case, new firms have to face problems if they wish to enter an industry. Thus, entry conditions determine the extent to which existing firms can pursue monopoly behaviour without inducing a response from potential competitors. The policy of entry barriers adopted by established and reputed firms is to discourage the entry of new firms. Such policies may be in the form of advertising, product differentiation, and creation of excess capacity, possession of trademarks which will, of course, help the well-established firms to grow both in terms of size, sales and assets.

Entry of new firms in an industry will encourage competition among the potential competitors and established firms some economists have argued that a threat of potential entry may affect the price charged by firms already established: in an industry. Douglas Needham (1969) observes: "If this fact is held valid, this line of reasoning elevates entry barriers, and in particular, their height, to a position of great significance in determining price and output patterns in the economy as a whole". 'New firms may find their entry possible if they a, start selling their products at prices cheaper than those of the established firms. This may be possible only when new firms develop confidence among their valuable customers and follow proper advertising policy with better services (such as hire-purchase scheme, warranty period longer than that of the established firms, etc.) which have not been extended by the established firms. But the established firms may deter the entry of new firms by reducing their prices and extending other facilities such as free service after sales.

1.1. Economic of Scale as a Source of Entry Barrier

Economies of scale is a major source of entry barrier. It may occur when a firm's productive capacity causes total production costs to increase less than proportionately with output. As a result, long-run average costs of production fall. Economies of scale are generally classified as:

- (a) Internal economies and
- (b) External economies.

Internal economies take place as a result of the expansion of individual firm, independently of changes in size of the other firms in the industry, while external economies exist if the expansions in scale of the whole industry or group of firms result in a fall in costs of each individual firm. Economies of scale, however, will create a barrier to entry for potential entrants. It means the existing firms can use their established capacities to increase output which will create hindrance for potential entrants. The size and growth of such firms will ultimately change. How does a new firm make its entry? The potential entrant would expect a lower price in the post-entry situation. The established firms, therefore, may charge a limit price (which is higher than minimum attainable average cost) and prevent entry. This tendency shows that the

established firms can achieve growth through preventing entry of new firms.

Dixit (1979) presented a model in which established firms can select capacity to discourage entry. Bain (1956), in his seminal work on conditions of entry" argued that the necessity for a firm to be large relative to the market in order to attain productive efficiency creates a barrier to entry. In assessing the importance of the large-scale economies as entry barrier, introduced the limit pricing model of entry deterrence in which established firms act as a profit cartel and potential entrants expect the former firms to maintain their pre entry levels of out put even after entry. This model has been a subject of "criticism, because Dixit (1979) pointed out that it may not be rational for the established firms to keep out put constant after large scale entry has occurred. Moreover, Stigler (1968) and others have challenged the basic idea that scale economies can create a meaningful entry barrier. These critics have stressed the fact that once an entrant has invested in an efficient plant, there is no difference (under the usual assumptions) between it s position and that of the established firms. Without a post-entry difference, Richard (1961) argued there can be real barrier to entry.

The basic point that arises here is that established firms, assuming they can coordinate their actions, have the advantage of being able to make some irreversible decisions before new entrant appears. In particular, they can select the level of capacity facing any new entrant. Even if entry occurs and the established firms wish to have less capacity, their pre-entry commitments may make a rapid reduction in capacity possible. Recognizing this, entrants may be deterred. In his formal analysis, Spence (1979) assumes that the established firms build enough capacity to produce merely the competitive output. Before entry, they produce the monopoly output, but they threaten to use all their capacity this threat is believed, as Spence (1979) assumes it would be, entry can clearly be deterred. But Richard (1981) argues that the threat to increase output after entry is surely no more credible than the threat to maintain output that is the core of the limit price model. Dixit finds that the established firms may still be able to profitably deter entry if they can commit to a level of capacity before potential entrants appear.

Thus, an established firm may prevent the entry of potential entrants in order to get a desirable size of the firm. But it is also true that the threat of entry of new firms may enhance the possibility of competition in the market. Once competition takes place, the potential entrant will try to use all possible economies of scale to make entry into the market. Thus, established firms may not prevent entry of potential entrants. The new firms will be able to increase their sales and thus size of firms will increase.

Muller and Tilton (1969) and others see the maturity of the industry as important in defining the role of technological change as an entry barrier. It is essentially argued by them that in the early stages of the life of industry, small firms have most opportunities because scale economies are unimportant, market shares are volatile and loyalty is weak. However, as the technology matures, scale, efficiency and brand loyalty build up, making opportunities for small firms fewer and entry more difficult. The basic hypothesis is that entry is related to advance in product technology. As technology matures the rate of innovation declines and so does entry. The potential rate of product improvement declines, the impact of technological "change on entry is an hypothesis that states that a technological advance will enable a firm to oust rivals from the market and that will lead to monopoly over in the market. Thus technological change as entry terrier favours the growth of firms.

1.2. Product Differentiation as a Source of Entry Barrier

Product differentiation, being an important source of entry barrier, deters new firms to enter an industry. A firm which has ability to differentiate its product may increase opportunities for competition. With the introduction of product differentiation, manipulation of both price and

selling costs become part of a strategy that may be adopted by existing firms to restrict entry. What is most relevant here is the role of heavy sales-promotion expenditure in increasing the resources needed by potential entrants to affect a successful entry into a market. Thus, product differentiation too reflects the size and growth of firms.

Bain (1956) found that product differentiation was the most significant barrier to entry in the U.S. manufacturing industries. Product differentiation refers to the ability on the part of producers to differentiate products one from another. The goods are differentiated through packaging, branding, trade mark, offering auxiliary services to buyers. The buyers have advantage to express their preferences for different types of products. There are preferences of buyers for the products of established firms as compared to those of new entrants. Such preferences can, however, always be overcome if the new entrant invests sufficiently in sales promotion activities. The entrant would have to incur sales promotion costs per unit at output, which are higher than those of established firms. If preference barriers exist, they will emerge as difference in the unit costs of established firms and potential entrants respectively. An existing firm may have goodwill in the market as a result of which it may get credit on easy terms; it might have gained considerable expertise in the business through experience. The new firms eager to join the market may find it difficult to compete with such established firms.

Product differentiation presents two sets of factors: The basic characteristics of products within the market, and the present and past policies of established firms with respect to advertising, product design, servicing and distribution.

It is noteworthy that, Bain (1956) in his authoritative examination of product differentiation in 20 manufacturing industries in U.S.A. found that product differentiation as a barrier to entry was very important in six industries such as tractors, and large farm machinery, typewriter, cigarettes, liquor, fountain pens (high priced) and automobiles. They were also moderately important in seven industries and unimportant in the rest. It was found that high entry barriers were frequently attributable to product differentiation than to scale economies in production and distribution. He found advertising to be the most important source of product differentiation in the consumer goods industries in his sample. The differentiated products are advertised to attract the consumers. If a reputed firm, which has won the confidence of people, advertises the differentiated products. This will create demand among the consumers for their products. Thus, established firms will prevent the entry of new entrants. It is clear that the existing firms will grow at a faster rate than the potential entrants.

1.3. Excess Capacity as a Source of Entry Barrier

Excess capacity in a business firm refers to the ability to produce more than what is currently produced (accumulation of plant and equipment). Excess capacity plays a vital role in preventing the entry of new firms and also helps in the size and growth of a firm. The firms which want to prevent the entry of new firms may create excess capacity. Similarly, a firm which wants to made entry may create excess capacity deliberately.

Pashingian, B. D. (1968) briefly alludes to a situation in which excess capacity may be used by established firms to forestall entry, by threatening to lower price and use such excess capacity to increase output if an entrant should appear on the scene.

Firms, which want to grow by using excess capacity must have efficient equipment. Equipment which is idle because it is obsolete or inefficient does not contribute toward excess capacity. If the established firms are using capacity utilisation fully, the potential entrant, therefore, would be put at a disadvantage because it did not command large customers. To overcome this disadvantage what entrants have to do, the entrants may be forced to sell at a price lower than

that of established firms. Another alternative is that the entrants have to incur high selling costs per unit in order to secure a reasonable market share. Apart from this, the size and growth of firms also depend on the quality of products, availability of raw materials, price, behaviour of sellers, service after sales, etc.

2. Types of Entry Barrier

Considering the types of entry barriers in brief, barriers to entry caused by permits, licences or other legal or institutional rights also lead to the growth of firms. Now the question arises which types of entry barriers will result in greater growth of firms. Economies of scale being the major source of entry barrier may permit established firms to charge a limit price (which is higher than minimum attainable average cost) and prevent entry. The size of firms in terms of production, sales, profits, assets, etc., will ultimately increase. If it continues to grow, the entry of potential firms is further prevented.

Considering the different sources and types of entry barriers, it can be concluded that product differentiation may be most important entry barriers because the established firms have enough capital to keep on changing the design, colour of their products, etc. these messages are given to the loyal consumers through advertisement. Thus, the growth of firms will occur in all types of entry barriers.

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WIRELESS NETWORKING IN THE DEVELOPING INDIA**Mr. Zafar Ahmed Khan**

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ABSTRACT

Wireless network is a flexible data communications system, which uses wireless media such as radio frequency technology to transmit and receive data over the air, minimizing the need for wired connections. Wireless networks use electromagnetic waves to communicate information from one point to another without relying on any physical connection. Multiple radio carriers can exist in the same space at the same time without interfering with each other if the radio waves are transmitted on different radio frequencies. To extract data, a radio receiver tunes in one radio frequency while rejecting all other frequencies. The modulated signal thus received is then demodulated and the data is extracted from the signal.

The increased prominence of wireless devices like laptops, smartphones and tablets in the workplace means that small business owners are taking a new look at wireless local area networks (WLAN) and the positive impact wireless networks can have on the bottom line. Today's wireless networks are faster, and the technology is more affordable than ever. Wireless also improves employee satisfaction by increasing productivity, flexibility and accessibility. From the sales force and warehouse to manufacturing and inter-office communication, wireless computing lets employees work from anywhere at any time to review data, take notes, send and receive emails and do research on the spot.

*Wireless communication has brought changes to data networking and telecommunication. Broadband Wireless Networks, Wireless LAN's, mobile radio networks and cellular systems, are together combined to have mobile computing and communications anytime, anywhere. **Wireless Technology Future Scope** has the capability of reaching every location on the earth. Wireless telephony and messaging services are having domains of personal and business computing. WLANs are based on the IEEE 802.11 standard. Wireless technology encompasses notebook computers, laptops, cellular phones, PDA's (personal digital assistant), and wireless networking. A Fixed wireless system uses radio frequencies that require a line of sight for connection. A Portable wireless system is a device used outside the office, home, or vehicle. An IR wireless system uses infrared radiation to send signals of communication. Applications of wireless technologies are divided into Voice and messaging, Hand-held and other Internet-enabled devices, and Data Networking. Types of wireless networks are personal area networks (PANs), local area networks (LANs), and wide area networks (WANs).*

INTRODUCTION

Wireless networking began to penetrate the market in the 1990s, the technology has actually been around since the 1800s. A musician and astronomer, Sir William Herschel made a discovery that infrared light existed and was beyond the visibility of the human eye. The discovery of infrared light led the way to the electromagnetic wave theory, which was explored by James Maxwell (1831 to 1879). Much of his discoveries related to electromagnetism were based on research done by Michael Faraday (1791 to 1867) and Andre-Marie Ampere (1775 to 1836), who were researchers that came before him. Heinrich Hertz (1857 to 1894) built on the discoveries of Maxwell by proving that electromagnetic waves travel at the speed of light and that electricity can be carried on these waves. Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications

systems e.g. radio transmitters and receivers, remote controls etc. which use some form of energy (e.g. radio waves, microwaves, ultrasonic, electromagnetic induction, infrared data association, etc.) to transfer information without the use of wires. Information is transferred in this manner over both short and long distances.

OBJECTIVES:

1. Education

- > Increase opportunities in community schools by creating a live tele-teaching program.
- > Providing contents in local languages to the students and villagers.

2. Healthcare

- > Establish a tele-hospital in urban area and link it to the district level hospitals and rural health centers
- > Provide medical assistances to the villagers through telemedicine program.

3. Communication

- > Increase communication facilities in the isolated rural areas by providing .
 - ~ VoIP phone.
 - ~ Video conferencing facilities.
 - ~ Internet services.

Steps to Implement a Wireless Network:

The basic approach to wireless implementation (as with any basic networking) is to gradually configure and test incrementally, following these steps:

- **Step 1:** Before implementing any wireless, verify pre-existing network and Internet access for the wired hosts.
- **Step 2:** Implement wireless with only a single access point and a single client, without wireless security.
- **Step 3:** Verify that the wireless client has received a DHCP IP address and can ping the local wired default router and then browse to the external Internet.
- **Step 4:** Finally, configure wireless security with WPA/WPA2. Only use WEP if hardware equipment does not support WPA/WPA2.

SUMMARY OF IMPLEMENTING A WLAN:

The following summarizes the key points that were discussed in this lesson:

- Ad hoc mode: Clients connect directly without an intermediate access point.
- Infrastructure mode: Clients connect through an access point. There are two modes:
 - Basic Service Set (BSS)
 - Extended Services Set (ESS)
- BSS wireless topology:
 - Basic Service Area (BSA)
 - Extended Service Area (ESA)
- Wireless access points can be configured through a command-line interface or more commonly a browser GUI.

- The basic approach to wireless implementation is to gradually configure and test incrementally.
- Currently, many form factors exist to add wireless to existing laptops:
 - Windows Zero Configuration
 - Cisco Compatible Extensions
 - Cisco Secure Services Client
- Troubleshooting wireless by breaking the environment into wired network versus wireless network.

FINDINGS:

People now expect to be connected at any time at any place. However, the most tangible benefit of wireless is cost reduction. Both WLANs and LANS use CSMA. However, WLANs use CA, whereas LANs use CD.

Radio frequencies are radiated into the air by antennas where they are affected by:

- Reflection
- Scattering
- Absorption
- The IEEE defines the 802.11 standards. The 802.11 standards are a set of standards that define the frequencies and radio bands for WLANs.
- One of the primary benefits of the Wi-Fi Alliance is to ensure interoperability among 802.11 products.

METHODOLOGY

802.11 Standards Comparison

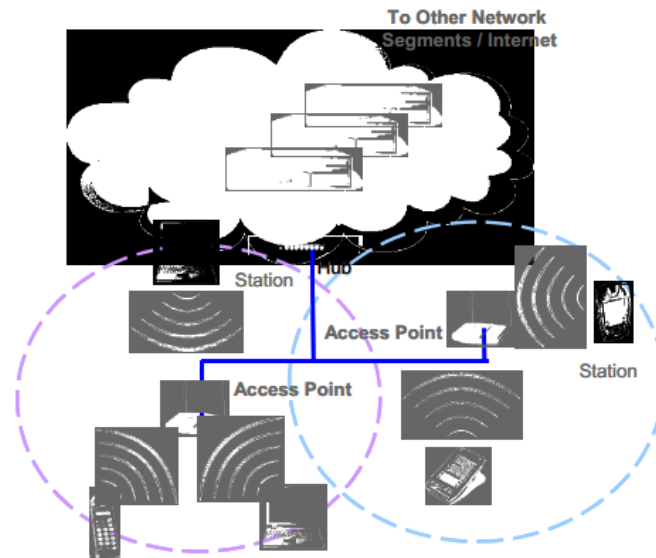
IEEE standards define the physical layer and the Media Access Control (MAC) sublayer of the data link layer of the OSI model. The original 802.11 wireless standard was completed in June, 1997. It was revised in 1999 to create IEEE 802.11a/b and then reaffirmed in 2003 as IEEE 802.11g.

By design, the standard does not address the upper layers of the OSI model. IEEE 802.11b was defined using Direct Sequence Spread Spectrum (DSSS). DSSS uses just one channel that spreads the data across all frequencies defined by that channel. Table 3-1 shows the different standards and how they compare.

Table. 802.11 Standards

Standard	802.11b	802.11a	802.11g	
Frequency band	2.4 GHz	5 GHz	2.4 GHz	
Number of channels	3	Up to 23	3	
Transmission	Direct Sequence Spread Spectrum (DSSS)	Orthogonal Frequency Division Multiplexing (OFDM)	Direct Sequence Spread Spectrum (DSSS)	Orthogonal Frequency Division Multiplexing (OFDM)

Standard	802.11b	802.11a	802.11g	
Data Rates in Mbps	1, 2, 5.5, 11	6, 9, 12, 18, 24, 36, 48, 54	1, 2, 5.5, 11	6, 9, 12, 18, 24, 36, 48, 54



Fundamental 802.11 Wireless LAN Topology

IEEE 802.11 divided the 2.4-GHz ISM band into 14 channels, but local regulatory agencies such as the FCC designate which channels are allowed, such as channels 1 through 11 in the United States. Each channel in the 2.4 GHz ISM band is 22 MHz wide with 5 MHz separation, resulting in overlap with channels before or after a defined channel. Therefore, a separation of 5 channels is needed to ensure unique nonoverlapping channels. Given the FCC example of 11 channels, the maximum of nonoverlapping frequencies are channels 1, 6, and 11.

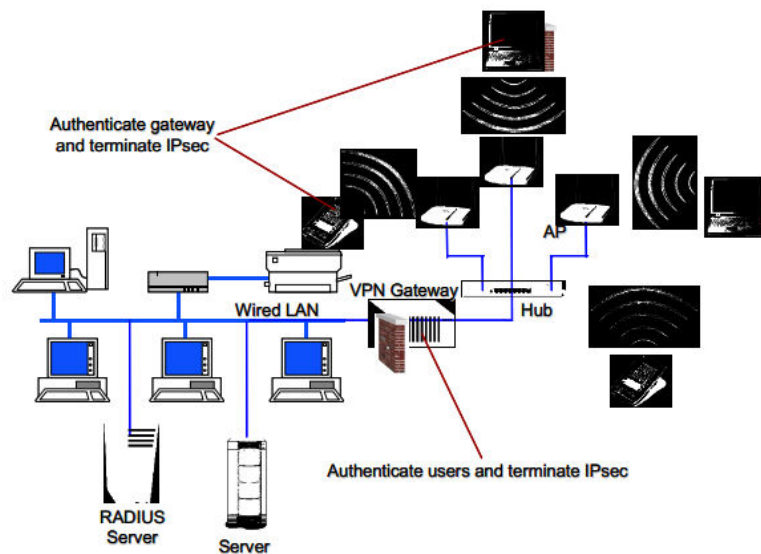
Recall that wireless uses half-duplex communication, so the basic throughput is only about half of the data rate. Because of this, the IEEE 802.11b main development goal is to achieve higher data rates within the 2.4-GHz ISM band to continue to increase the Wi-Fi consumer market and encourage consumer acceptance of Wi-Fi.

802.11b defined the usage of DSSS with newer encoding or modulation of Complementary Code Keying (CCK) for higher data rates of 5.5 and 11 Mbps (Barker Coding of 1 and 2 Mbps). 802.11b still uses the same 2.4-GHz ISM band and is backward compatible with prior 802.11 and its associated data rates of 1 and 2 Mbps.

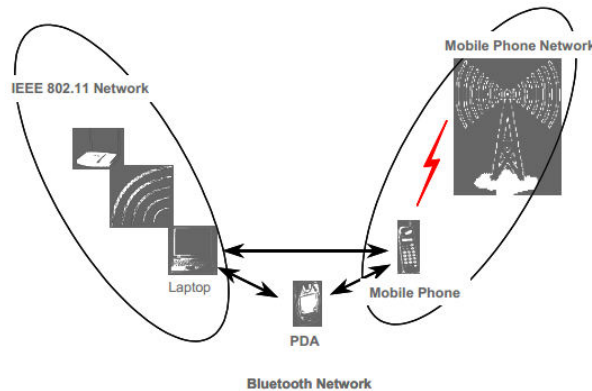
The year that the 802.11b standard was adopted, IEEE developed another standard known as 802.11a. This standard was motivated by the goal of increasing data rates by using a different OFDM spread spectrum and modulation technology and using the less crowded frequency of 5 GHz UNIL. The 2.4-GHz ISM band was widely used for all WLAN devices, such as Bluetooth, cordless phones, monitors, video, and home gaming consoles, and it also happens to be the same frequency used by microwave ovens. 802.11a was not as widely known because materials for chip manufacturing were less readily available and initially resulted in higher cost. Most applications satisfied the requirements following the cheaper and more accessible standards of 802.11b.

A more recent development by IEEE maintains usage of the 802.11 MAC and obtains higher data rates in the 2.4-GHz ISM band. The IEEE 802.11g amendment uses the newer OFDM from 802.11a for higher speeds, yet is backward compatible with 802.11b using DSSS, which was already using the same ISM frequency band. DSSS data rates of 1, 2, 5.5, and 11 Mbps are supported, as are OFDM data rates of 6, 9, 12, 18, 24, 48, and 54 Mbps. IEEE requires only mandatory data rates of OFDM using 6, 12, and 24 Mbps, regardless whether it is 802.11a or 802.11g OFDM.

Wireless Network Security:



The purpose of this document is to provide agencies with guidance for establishing secure wireless networks. Agencies are encouraged to tailor the recommended guidelines and solutions to meet their specific security or business requirements. The document addresses two wireless technologies that government agencies are most likely to employ: wireless local area networks (WLAN) and ad hoc or—more specifically—Bluetooth networks. The document also addresses the use of wireless handheld devices. The document does not address technologies such as wireless radio and other WLAN standards that are not designed to the Institute of Electrical and Electronics Engineers (IEEE) 802.11 standard. These technologies are out of the scope of this document. Wireless technologies are changing rapidly. New products and features are being introduced continuously. Many of these products now offer security features designed to resolve long-standing weaknesses or address newly discovered ones. Yet with each new capability, a new threat or vulnerability is likely to arise. Wireless technologies are evolving swiftly. Therefore, it is essential to remain abreast of the current and emerging trends in the technologies and in the security or insecurities of these technologies. Again, this guideline does not cover security of other types of wireless or emerging wireless technologies such as third-generation (3G) wireless telephony.



Policy scope and application:

For all members of the public, unlimited mobility and convenience are two of the primary advantages that are driving this change. For professionals such as lawyers and journalists, ready access to their business resources such as research databases, calendars, client files make wireless computing an important productivity tool. Finally, one of the biggest influences on the growth of wireless networking is the huge cost saving over any comparable wired environment.

In a hard-wired building, every user requires an outlet and wiring to connect to a hub and servers. For wireless connections, multiple users share access to the Servers through a single access point (which is in turn wired). For older buildings especially, wireless networking may be the only economical approach to internet access.

> When lawyers, journalists and members of the public enter any courthouse and courtroom in Canada, should they be able to use their laptops at all, and if so, should they be permitted (if not encouraged) to use wireless internet access? What is the court's role, if any, in supporting or managing such access?

> Despite the tremendous benefits of wireless internet access for all participants in the justice system there are several legitimate concerns relating to cost, security, privacy and courtroom decorum. Other potential concerns with wireless technology include range, reliability and performance.

> Although any wireless LAN obviates the need for renovations, retrofitting and wire pulling or installation, there are still costs associated with establishing and maintaining a wireless Local Area Network ("WLAN"), including hardware, software, internet connectivity and the human resources required to operate, manage and support the system. For large structures such as court buildings, multiple access points and repeaters may need to be installed. Proper security features need to be installed and maintained updated and audited. Proper staffing resources must also be applied.

CONCLUSION

According to the 802.11 standard, the frequency band from 2.400 to 2.483 GHz has been assigned for wireless LAN use worldwide. It is possible to operate more than one overlapping cell at different frequencies. However, if the frequencies are too close, interference will distort both signals and lead to much lower throughputs. Thus, the placement of the access point on the campus determines the network capacity in each area. For future applications in education multicast might prove to be very useful to reduce the necessary bandwidth. Therefore, it is important that the wireless LAN truly supports multicast.

Installing a wireless network in your home or small business can provide a simple, inexpensive networking solution, especially compared to retrofitting an existing building to a wired Ethernet network. Properly configured and secured, a wireless network does not expose network users to greater risks than they would face attached to a traditional wired network, and in fact, it will significantly increase security for computer users who have been directly attached to a Cable or DSL modem with a public IP address assigned to their computer. With the added benefit of not having to leave your computer tethered to wherever the Cable or DSL installer left the modem, a wireless network can provide increased flexibility in locating your computer where it makes sense for you. Wireless networks are a must if your home has more than one computer, or if you have a work-issued laptop you would like to use at home. Even small businesses can benefit from a wireless network; instead of running cable over the ceiling tiles, down the walls, or along the floors, everyone connects wirelessly. Rearranging workspaces becomes easier, without having to consider where the Ethernet jack is located. Even if you need to hire a computer professional to install one, a wireless network will cost less money to install than a similar wired network.

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