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TWO DAYS

INTERNATIONAL CONFERENCE

ON

FUTURE TRENDS IN ENGINEERING, MANAGEMENT, SCIENCE AND TECHNOLOGY

"ICFTEMST-19"

DATE: *5th & 6th January, 2019*

Organized by

DEPARTMENT OF ELECTRONICS ENGINEERING (ECE & EIE)

GIET MAIN CAMPUS AUTONOMOUS, GUNUPUR - 765022

Gandhi Institute of Engineering and Technology (Autonomous)

Approved by AICTE, New Delhi, Govt. of Odisha and Affiliated to BPUT, Rourkela
Accredited by NAAC with a CGPA of 3.28/4 at *A Grade* and Accredited by NBA
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Prof. (Dr.) Satya Prakash Panda
M.A., L.L.B., Ph.D.
Chairman, GGI,Gunupur

MESSAGE

It gives me immense pleasure to know that the Department of Electronics Engineering (ECE & EIE), GIET Main Campus Autonomous, Gunupur is organizing a two days ***"International Conference on Future Trends in Engineering, Management, Science and Technology" (ICFTEMST-19)*** *during 5th & 6th January, 2019 in GIET Main Campus. A large number of national & international experts, delegates, academicians and research scholars are participating in the international conference and will deliberate on the topic "Future Trends in Engineering, Management, Science and Technology", which plays a major role in meeting the demands of modern world that seeks continuous improvement in academic performance. The international conference is being organized to facilitate meaningful interaction among the Academician and R&D Institutions.*

It is an exceptional platform for all concerned to update their knowledge and share their expertise during the conference and I do hope that the delegates and participants will be highly benefited out of the international conference.

I wish the ICFTEMST-19 a grand success.

Dr. Satya Prakash Panda

Chairman, GGI, Gunupur

Prof. (Dr.) Chandra Dhwaj Panda
M.A., M.Phil., Ph.D.
Secretary, GGI, Gunupur

MESSAGE

I am extremely delighted to know that the Department of Electronics Engineering (ECE & EIE), GIET Main Campus Autonomous, Gunupur is organizing a two days ***"International Conference on Future Trends in Engineering, Management, Science and Technology" (ICFTEMST-19)*** *during 5th & 6th January, 2019 in GIET Main Campus.*

Trends in Engineering, Management, Science and Technology have undergone a drastic change in the last decade and continue to do so. The new technologies in Engineering, Management and Science have changed the old world to a new and upgraded dimension. In this competitive era, these new age techniques are bound to keep us ahead.

Large number of experts from reputed national & international institutes have agreed to deliver the keynote address, invited talks and chair the technical sessions during the conference along with many research papers from different institutes to be presented by the research scholars and academicians across the country. I am confident that the delegates, research scholars, faculty members and participants will certainly be benefited from the deliberation of the international conference.

I wish the international conference a grand success.

Dr. Chandra Dhwaj Panda

Secretary, GGI, Gunupur

Prof. (Dr.) Jagdish Panda
B.E., M.Tech., Ph.D.
Vice-Chairman & Director, GGI, Gunupur

MESSAGE

I am glad to know that the Department of Electronics Engineering (ECE & EIE), GIET Main Campus Autonomous, Gunupur is organizing a two days ***"International Conference on Future Trends in Engineering, Management, Science and Technology" (ICFTEMST-19)*** *during 5th & 6th January, 2019 in GIET Main Campus.*

In today's technical scenario the importance of Engineering, Management, Science and Technology & their advances need to be over emphasized. In such conferences the students and faculty members get a wonderful opportunity to come across the latest technologies through deliberation of experts from reputed institutions.

I wish the international conference a roaring success.

Dr. Jagadish Panda

Vice-Chairman Director, GGI, Gunupur

Prof. (Dr.) Senthil Kumar K.
B.E., M.E., Ph.D., MIST, MIE, MISHRAE
Principal, GIET (Autonomous), Gunupur

MESSAGE

I am extremely happy and also it gives me immense pleasure that the Department of Electronics Engineering (ECE & EIE), GIET Main Campus Autonomous, Gunupur is organizing a two days ***"International Conference on Future Trends in Engineering, Management, Science and Technology" (ICFTEMST-19)*** *during 5th & 6th January, 2019.*

I hope and wish that this international conference will be a platform for knowledge transfer from a number of quality papers from student's community, research scholars, industry and academia from various regions of the state and across the country. GIET Main Campus Autonomous, with the mission of producing quality engineers, is making every effort to impart state-of-the-art engineering education to its students. The output of the international conference will definitely throw light on the latest technologies.

I congratulate and convey my good wishes to Prof. Subhrajit Pradhan, the Convener and the team members of the international conference for the success of this great event.

Prof. (Dr.) Senthil Kumar K.

Principal, GIET (Autonomous), Gunupur

Dr. N. V. Jagannadha Rao
M.Com., MBA, Ph.D.
Dean, GGI, Gunupur

MESSAGE

I am delighted to know that the Department of Electronics Engineering (ECE & EIE), GIET Main Campus Autonomous, Gunupur is organizing a two days ***"International Conference on Future Trends in Engineering, Management, Science and Technology" (ICFTEMST-19)*** *during 5th & 6th January, 2019 in GIET Main Campus.*

The international conference will provide a forum for pooling the knowledge and experience of participants from the nationally reputed scientific and research institutions in the area of Engineering, Management, Science and Technology.

I congratulate all the organizers on this novel endeavor & wish it a grand success!

Dr. N.V. Jagannath Rao

Dean, GGI, Gunupur

Prof. Subhrajit Pradhan
B.E., M.Tech.,(Ph.D.)
Head, Dept. of Electronics Engineering,
GIET Main Campus Autonomous, Gunupur

MESSAGE

A warm greeting to all! I am immensely happy that we the Department of Electronics Engineering (ECE & EIE), GIET Main Campus Autonomous, Gunupur are organizing a two days ***"International Conference on Future Trends in Engineering, Management, Science and Technology" (ICFTEMST-19)*** *during 5th & 6th January, 2019.*

Under the noble guidance of our management we continue to march on the way of success with confidence. The sharp, clear sighted vision and precise decision making powers of our management has benefited our college to stay competitive in the present techno world with a remarkable position in India.

The dedicated staff members and disciplined students are the real value addition to our college. The role of students in building the nation cannot be overlooked and they are trained in all aspects to become successful engineers and good citizens, This type of conference becomes a large window through which our students can peep into the modern technological world.

I take the opportunity to congratulate the staff members and students of our department, participants from our colleges and other colleges for their untiring efforts in organizing and participating in this Conference and wish the conference all the success in the way of providing better observation, result and its future implementation for the benefit of academicians, researchers & students community.

Output of this conference will be definitely a contribution to the process of national growth in terms of building a strong engineering & technology platform.

Mr. Subhrajit Pradhan

Convener, ICFTEMST-19

THE INSTITUTION:

Gandhi Institute of Engineering and Technology, Gunupur was established in the year 1997, with a motto to provide quality engineering education in a high disciplined environment with international standard, along with character building of students who will able to stand up to the challenges of the present employment market.

It has produced the state of the art equipment for various laboratories, consequently drawing appreciation from the university, AICTE as well as the state Governments. It boasts of a highly educated, experienced and dedicated team of professors and lectures.

It endeavor to impart quality education, has earned it ISO 9001:2000 certification. It has added another feather in it's cap obtaining the accreditation from NBA committee of AICTE, New Delhi. In a step further ahead, it becomes the only college in Easter India and Second to India to acquire 3.28 CGPA out of 4 point grade system by NAAC (UGC) for its internationals standard education.

It was started with an intake of 200 students in 4 branches with a motto of providing quality engineering education in a highly disciplined environment. In less than a decade it become a citadel of engineering education in Eastern India having 1050 intake with 10 B. Tech. and 6 M. Tech. courses. It has been regarded as Modern Gurukul by the students, alumni's, faculties and all distinguished visitors for its learning environment, faculties, infrastructure and the facilities. It has the approval for admission of Foreign Nationals and Persons of Indian Origin (PIO's) also.

All the programs of engineering are approved by AICTE, New Delhi & State Govt. of Odisha. It is affiliated to Biju Patnaik University of Technology, Odisha. The institute has got **Autonomous** status in the year 2017. The institute has consistently excelled in academics, placements & extracurricular activities.

THE DEPARTMENT:

The department of EIE was established in the year 1997 and ECE was established in the year 2000. The department consists of highly qualified and experienced faculty members with well equipped laboratories to provide high quality technical education to the students. The department comprises of Analog & Digital Electronics Circuits, Electrical & Electronics Measurement, Microprocessor & Microcontroller, Instrumentation Device System, Analog & Digital Communication Technique, Digital Signal Processing, Control System Engineering, VLSI Design, Microwave Engineering and Process Control & Instrumentation laboratories. All the laboratories are equipped with modern and sophisticated instrument and simulating software's like PROTEOUS, EXPRESS PCB, XILINX, TANNER TOOL, LABVIEW, MATLAB, and FEKO. Most of these are custom design to facilitate better demonstration hands on practice and easier understanding for the students. Some of these laboratories cater the basic needs of other branch students also.

In addition to above, Program Logic Control (PLC) & Distributed Control System (DCS) provide better exposure among the students to reach the expectation of industry. Antenna and Radar System are useful to carry out the research work for both students and faculty members. Digital Signal Processing and Fiber Optics are useful for creative and innovative project work.

The department provides various value added course like Certified Automation Courses (PLC, DCS, SCADA, HMI, & DRIVES), Embedded System, VHDL Programming, MATLAB & LABVIEW training, PC Interface Robotics Programming, PCB design.

Department is regularly conducting National and International Conference, Seminars, Workshops and Faculty Development Programs in associate with AICTE to enhance the technical ability of faculty members. Department is also inviting reputed persons from IISc, IITs, NITs, various reputed Universities and Industries to give an exposure to the grey areas and current technologies.

We are members of various National and International Organization like IE(I), ISTE, ISOI, IETE for knowledge sharing of students and faculties. In order to conduct different performances such as

Seminars, Workshops, Tech-Fests & Social Welfare activities, department has their own students association named as ENIAC for EIE branch and EONYX for ECE branch.

THEME OF THE CONFERENCE:

The ICFTEMST-2019 aims to offer a golden opportunity to bring together professors, researchers and scholars around the globe to deliver the latest innovative research results and the most recent developments. The ICFTEMST-2019 is a forum to exhibit, discuss and exchange the latest technological trends and ideas in different areas of science and technology among the academia, research and industrial professionals. The main aim is to pro-vide the platform for discussing the recent development in communication, management and information technology that will be beneficial for society.

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- **Dr. Deben Das**
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A quantitative study for the removal of boron from wastewater using a novel adsorbent

Radha Krushna Padhi, & P. Sibakrishna
Department of Chemical Engineering, GIET, Gunupur-765 022, Rayagada, Orissa, India

ABSTRACT: *Boron is useful for various industrial activities. It is widely used in glass industry and detergent industry. It is also an important micro nutrient for the plants to vegetate but if its concentrations is high, then it has toxic effects. The objective of this study is to investigate by using cashew nut shell waste as an alternative adsorbent for the removal of boron ions from aqueous solutions. The effect operating variables such as pH, solution temperature, initial metal ion concentration and adsorbent dose on the adsorption of boron by using cashew nut shell waste as an adsorbent has been investigated in a batch method. The single and combined effects of operating parameters have been analyzed using response surface methodology (RSM). A 2^4 full factorial central composite experimental design has been employed. Analysis of variance (ANOVA) showed a high coefficient of determination value (R^2 = 0.8879) and satisfactory prediction second-order regression model has been derived. The optimum operating conditions have been determined as temperature, 32.66 °C; initial feed concentrations, 23.44 mg/l; adsorbent dose, 3.96 g/l and pH, 5.29. At optimum adsorption conditions, the percentage removal of adsorption of boron from waste water has been found to be 86.7759%.*

Keywords: *Adsorption; Removal of Boron; RSM; Optimization*

Introduction

Development of suitable technology to remove the toxic compounds of boron from different waters is a pressing goal over the entire world because of wide spreading of this element in both natural waters and waste waters [1]-[6]. Boron exist in a number of minerals form, in nature mostly calcium and/or sodium borates, such as colemanite ($2CaO.3B_2O_3.5H_2O$), ulexite ($Na_2O.2CaO.5B_2O_3.16H_2O$), tinkal ($Na_2O.B_2O_3.10H_2O$), etc. [7].

There is a wide variety of application by using Boron like fertilizers, insecticides, corrosion inhibitors in anti-freeze formulations for motor vehicle and other cooling system, buffers in pharmaceutical and dyestuff production, and the use of boron compounds for moderator in nuclear reactor, where anthropogenic water-soluble boron compounds are discharged to aqueous environment. Boron is normally in very low amounts in soil and irrigation waters, but it accumulates very fast in soils irrigated with boron-containing wastewaters because of difficulty of washing it. Boron compounds passing to soil, surface waters and ground waters form many complexes with heavy metals, such as Pb, Cd, Cu, Ni, etc. and these complexes are more toxic than heavy metals forming them. As per the WHO standard the permissible limit is below 0.3 mg/l boron for the quality of drinking water [8].

In plant there exist a little boron deficiency and boron toxicity in plants [9]. Boron has been shown to play a role in carbohydrate metabolism, sugar translocation, pollen germination, hormone action, and membrane structure and function [10].

In aqueous environments, boron is mainly present as boric acid and partially as borate ions according to the dissociation reaction ($Ka = 6\times10^{-10}$, pKa 9.1) as shown in the following equation [8]:

$$B(OH)_{3(aq)} + H_2O \Leftrightarrow B(OH)^-_{4(aq)} + H^+_{(aq)} \quad (1)$$

The use of boron-selective resins seems to have still the highest importance among several methods of boron removal from aqueous solutions. Some studies on application of flying ashes or natural sorbents, inorganic adsorbents show boron selective resins based on macroporous polystyrene matrices with N-methyl glucamine ligand as the best sorbent. Simonnot et al. have reviewed the methods of boron removal from drinking water. Among them, they have pointed that the use of boron-selective resins is the most efficient one [11]-[19]. Numerous researchers studied boron removal and/or recovery from wastewaters. Amberlite IRA 743, a boron specific resin, was used in boron removal from geothermal waters containing 19 mg/l boron and it was found that 99% of boron from geothermal water could be removed [20].

In this study focuses given on boron removal by means of adsorption process. Effects of several parameters such as, initial solution concentration, pH, and amount of adsorbent on boron removal from wastewater have conducted by batch process.

Materials and methods

Preparation of adsorbent

The cashew nut shell waste has been collected from the nearby area of where waste is generated and a big problem for disposal. The adsorbent was prepared by crushing air dried cashew nut by manually to reduce into smaller particles. To reduce the moisture content the crushed cashew nut particles were then sun dried for 15 days. The material was then grinded into finer particles with different particle diameters. The course powder was separated by using screening and then it is regrinded. The most common particle fractions were A(50-150 μm), B(150-300 μm) and C(300-500 μm) diameters. In this study, fraction A was used throughout the experiments. Fourier transform infrared (FTIR) and energy dispersive x-ray (EDX) spectra of the adsorbent were recorded on Perkin- A Perkin-Elmer GX2000 FTIR spectrometer adapted with Perkin-Elmer auto image microscope system and JSM 5800LV, Vantage 6, analytical systems with 130 eV detector (JEOL, Tokyo, Japan), respectively. Samples for FTIR were prepared by diluting the adsorbent to 5 % KBr solution and cast in disks for analysis. Analysis of standards and simulated samples was done using an AA140 atomic absorption spectrometer, linked to a HP Compaq with an HP L1906 monitor.

Method of experiment

Boron stock solution (1000 mg/l) was prepared and then dissolved in an appropriate quantity of boric acid (H_3BO_3) in distilled water, and then by diluting this solution the working solutions were prepared. Batch experiments were carried out taking adsorbent (1g) with 50 ml of boron solution (5.0 mg/l) taken in a stoppered glass bottle at pH 4-10. The pH was adjusted to the desired level with NaOH and HCl solutions. The samples were agitated at constant speed and a temperature controlled agitator for fixed time until equilibrium is achieved. Thereafter, samples are centrifuged by a mechanical centrifuge and supernatant liquid was analyzed for boron ion spectrophotometrically using iodine monochloride method. The experiments were carried out at different initial concentration of boron and adsorbent dosages.

Batch adsorption experiments were performed by contacting different doses of adsorbent with different initial concentration of aqueous solution in normal pH . During experimentation continuous agitation was provided with a constant speed for better mass transfer with high interfacial area of contact. The remaining concentration boron in each sample after adsorption at different time intervals was determined by atomic absorption spectroscopy. The boron concentration retained in the adsorbent phase was calculated according to

$$q_e = \frac{(C_o - C_e)V}{W} \qquad (2)$$

where C_0 and Ce are the initial and equilibrium concentrations (mg/l) of boron solution respectively; V is the volume (l); and W is the weight (g) of the adsorbent. Two replicates per sample were done and the average results are presented.

Response surface methodology (RSM) based central composite design

Response Surface Methodology (RSM) is a statistical method that uses quantitative data from appropriate experiments to determine regression model equations and operating conditions [21]. RSM is a collection of mathematical and statistical techniques for modeling and analysis of problems in which a response of interest is influenced by several variables [22].

The CCD is widely used for fitting a second-order model. By using this method, modeling is possible and it requires only a minimum number of experiments. It is not necessary in the modeling procedure to know the detailed information since the mathematical model is empirical. Generally, the CCD consists of a 2^n factorial runs with $2n$ axial runs and n_c center runs (six replicates). These designs consist of a 2^n factorial or fraction (coded to the usual ±1 notation) augmented by $2n$ axial points $(\pm\alpha, 0, 0, \ldots, 0)$, $(0, \pm\alpha, 0, \ldots, 0), \ldots, (0, 0, \ldots, \pm\alpha)$ and n_c center points $(0, 0, 0, \ldots, 0)$ [23]. Each variable is investigated at two levels. Meanwhile, as the number of factors, n increases, the number of runs for a complete replicate of the design increases rapidly. In this case, main effects and interactions may be estimated by fractional factorial designs running only a minimum number of experiments. Individual second-order effects cannot be estimated separately by 2^n factorial designs. Therefore, CCD has been used in this study. The responses and the corresponding parameters were modeled and optimized using analysis of variance (ANOVA), which was used to estimate the statistical parameters by means of response surface methods.

Basically, this optimization process involves three major steps, which are performing the statistically designed experiments, estimating the coefficients in a mathematical model and predicting the response and checking the adequacy of the model.

$$Y = f(X_1, X_2, X_3, \ldots\ldots\ldots, X_n) \quad (3)$$

where Y is the response of the system and X_i is the variables of action called factors. The goal is to optimize the response variable (Y). It is assumed that the independent variables are continuous and controllable by experiments with negligible errors. It is required to find a suitable approximation for the true functional relationship between independent variables and the response surface [24].

Since the experimental sequence has been randomized in to minimize the effects of the uncontrolled factors. The response has been used to develop an empirical model that correlates the response to adsorption of boron from aqueous using prepared adsorbent in a batch process variable using a second-degree polynomial equation as given by Eqn (4).

$$Y = b_0' + \sum_{i=1}^{n} b_i X_i + \sum_{i=1}^{n} b_{ii} X_i^2 + \sum_{i=1}^{n} \sum_{j>1}^{n} b_{ij} X_i X_j \quad (4)$$

Where Y is the predicted response, $b0'$, the constant coefficient, bi, the linear coefficients, bij, the interaction coefficients, bii, the quadratic coefficients and Xi, Xj are the coded values of process variables. The number of tests required for the CCD includes the standard 2^n factorial with its origin at the center, $2n$ points fixed axially at a distance, say α, from the center to generate the quadratic terms, and replicate tests at the center; where n is the number of variables. The axial points are chosen such that they allow rotatability [25], which ensures that the variance of the model prediction is constant at all points equidistant from the design center. Replicates of the test at the center are very important as they provide an independent estimate of the experimental error. For "n" number of independent variables, the recommended number of tests (N) at the center is six [26]. Hence, the total number of tests (N) required for the three independent variables is given by Eqn 5:

$$N = 2^n + 2n + n_c = 2^4 + 2\times 4) + 6 = 30 \quad (5)$$

Once the desired ranges of values of the variables are defined, they are coded to lie at ±1 for the factorial points, 0 for the center points and $\pm\alpha$ for the axial points. The codes are calculated as functions of the range of interest of each factor (Table 1) [27].

Statistical analysis

The statistical software package Design-Expert, Stat-Ease, Inc., Minneapolis, USA, has been used for regression analysis of the removal of boron and to plot response surface and ANOVA to estimate the statistical parameters.

Results and discussion

FTIR and EDX analysis of adsorbent

First in order to identify functional groups present on the waste that could be responsible for the removal of heavy metal species ,the FT-IR spectrum (Figure 1) of cashew nut shell waste was undertaken. The spectrum of the adsorbent was measured within the range of 4000-600/cm. The absorption peak around 3466/cm which indicates the existence of O-H groups. The peaks observed at 2921/ cm can be assigned to stretching vibration of the C-H group. The absorption peaks at 1734, 1643 and 1036/cm are associated with the presence of C=O, C=C and C-O, respectively. The EDX spectrum obtained for cashew nut shell is shown in Figure 2. The elemental distribution of cashew nut shell waste shows high percentage levels of Al, Mg and Si elements with potential to form organometallic compounds which might be responsible for the tough elastic properties exhibited by the cashew nut shell powder.

Development of regression model equation

To develop a correlation between four operating variables of adsorption of boron from aqueous solution CCD has been used. In Table 2,the complete experimental range and levels of independent variables are given. Experimental error have been identified in the Runs 25-30 which is at the center point. According to the sequential model sum of squares, the models have been selected on the basis of the highest order polynomials where the additional terms are significant and the models are not aliased. The quadratic model has been selected as suggested by the software. Experiments were planned to obtain a quadratic model consisting of 2^4 trials plus a star configuration ($\alpha = \pm 2$) and their replicates at the center point. The design of this experiment is given in Table 3 together with the experimental results. The maximum adsorption of

boron was found to be 89%. Regression analysis has been performed to fit the response function of adsorption of boron. The model expressed in Eqn (2), where the variables take their coded values, represents percentage adsorption (Y) as a function of temperature (X_1), pH (X_2), Initial feed concentrations of boron (X_3) and adsorbent dose (X_4). The final empirical model in terms of coded factors for adsorption of boron (Y) is shown in Eqn (6) .

$$Y = 79.20 + 6.74X_1 - 1.57X_2 - 2.63X_3 + 6.25X_4 - 2.4X_1X_2 + 0.025X_1X_3 - 2.35X_1X_4 + 4.19X_2X_3 + 6.21X_2X_4 - 6.43X_3X_4 - 5.63X_1^2 - 0.56X_2^2 - 4.81_3^2 - 2.11X_4^2 \quad (6)$$

The positive and negative sign indicates the synergistic and antagonistic effect.

Statistical analysis

Equation (2) has been used to visualize the effects of experimental factors on adsorption of boron and their response surface plots have been presented in (Figures 6–11). Checking the adequacy of the developed model is an important part of the data analysis procedure as the approximating model would give poor or misleading results if it were an inadequate fit. This is done by looking at the residual plots which are examined for the approximating model. The normal probability and studentized residuals plot is shown in (Figure 3) for adsorption of boron. In (Figure 4), residuals show how well the model satisfies the assumptions of the ANOVA, whereas the studentized residuals measure the number of standard deviations separating the actual and predicted values. Figure 3. shows that neither response transformation was needed nor there was any apparent problem with normality. Figure 4 shows the studentized residuals *vs.* predicted adsorption of boron. Actual values are the measured response data for a particular run, and the predicted values are evaluated from the model and are generally by using the approximating functions. The general impression is that the plot should be a random scatter suggesting the variance of original observations is constant for all values of the response. If the variance of the response depends on the mean level of *Y,* then this plot often exhibits a funnel-shaped pattern. This is also an indication that there was no need for transformation of the response variable.

The actual and the predicted values of adsorption (in percentages) are shown in Figure 5. Actual values are the measured response data for a particular run and the predicted values are evaluated from the model and are generated by using the approximating functions. From Figure 5, the values of R^2 and R^2_{adj} have been found to be 0.8879 and 0.7834 respectively. The predicted R^2 of 0.8879 is in reasonable agreement with the R^2_{adj} of 0.7834. Adequate precision measures the signal to noise ratio. The ratio of 9.497 obtained in the present study indicates an adequate signal as the ratio greater than 4 is desirable.. Thus, the developed model can be used to navigate the design space. The fair correlation coefficients might have resulted by the insignificant terms in Table 4 and is most likely due to four different variables selected in wide ranges with a limited number of experiments as well as the nonlinear influence of the investigated parameters on process response. The F-value for the model is found to be 8.49, which implies that the model is significant. There is only 0.01% chance that a "Model F-Value" this large could occur due to noise. Value of "Prob > F" less than 0.0500 indicate model terms are significant. In this case X_2X_4, X_3X_4, X_1^2, X_2^2, X_3^2 are significant model terms.

Combined effect of pH, adsorbent doses, temperature and initial concentration on percentage removal of boron

To investigate the effects of the four factors on the adsorption of boron, the RSM has been used and three-dimensional plots were drawn. On the basis of the ANOVA results obtained, pH and adsorbent dose have been found to have significant effects on the rate of adsorption with adsorbent dose imposing greatest on rate of adsorption. pH, on the other hand, imposes the least effect on the response. The quadratic effects of temperature, initial concentration, pH are significant terms and the effects are considered moderate. The interaction effects between X_2X_4, X_3X_4 are significant terms and also have been considered moderate. The adsorption response surface graphs are shown in (Figure 6–11).

Figure 6 shows the three-dimensional response surfaces which were constructed to show the two variables (temperature and pH) on the adsorption of boron at initial concentration of boron 40 mg/l and adsorbent dose 4g/l. It can be seen from the Figure 6 that the adsorption is the function of temperature. It increases exponentially with increase in temperature up to 35°C and then decreases exponentially when temperature is more than 35°C. The increase in metal uptake with increasing temperature may be due to either higher affinity of sites of metal or an increase in number of binding sites on carbon. The percentage adsorption is slightly affected by the pH. The adsorption of boron increases exponentially up to pH 6 and

then starts decreasing. A maximum adsorption of 64% was determined at an initial concentration of 40 mg/l and adsorbent dose of 4 g/l.

The combined effect of initial concentration and temperature on adsorption of boron at pH 6 and adsorbent dose 4g/l is shown in Figure 7, the three-dimensional response surfaces. It is observed from Figure 7 that the adsorption increases with initial concentration. A maximum adsorption of 83% was determined at pH 6 and adsorbent dose 4g/l. Figure 8 shows the three-dimensional response surfaces, the combined effect of adsorbent dose and temperature on adsorption at initial concentration of 40 mg/l and pH of 6. It can be seen from Figure 8 that with increase in adsorbent dose, the adsorption of boron increases linearly. A maximum adsorption of 72% was determined at initial concentration of 40 mg/l and of pH 6.

The three-dimensional response surfaces of the combined effect of initial concentration of boron and pH on adsorption of boron at temperature 30°C and adsorbent dose of 4g/l are shown in Figure 9. A maximum adsorption of 80% was determined at temperature 30°C and adsorbent dose of 4g/l. Figure 10 shows the combined effect of pH and adsorbent dose on adsorption of boron at a constant temperature of 30°C and initial concentration of 40 mg/l. It is observed that percentage removal of boron increases sharply with increase in adsorbent dose because as the adsorbent dose increases, the number of adsorbent particles increases and thus more boron is attached to their surfaces. A maximum adsorption of 72% was determined at temperature of 30°C and initial concentration of 40 mg/l.

Figure 11 shows the combined effect of adsorbent dose and initial concentration of boron on adsorption of boron at a temperature of 30°C and pH of 6. It can be seen that the maximum adsorption of 87% was determined at temperature 30°C and pH of 6.

Optimization by response surface modeling

The optimum process parameters to maximize the adsorption of boron from the mathematical model equations have been developed. The quadratic model equations were optimized using quadratic programming (QP) to maximize adsorption of boron within the experimental range studied. The optimum region on the pH and temperature for adsorption of boron are shown in (Figure 12). The optimum production conditions (Table 5) for adsorption of boron by using the novel adsorbent were determined as temperature 32.66°C, initial feed concentration of boron 23.44 mg/l, adsorbent dose 3.96 g/l and pH 5.29 to achieve the maximum adsorption of boron 86.7759%, compared to 80.926% which was maximum adsorption in the tests conducted.

Conclusion

RSM based CCD and QP were used to develop the model by experimental data and influence of process parameters on adsorption of boron from waste water optimized respectively. Temperature, initial feed concentrations, adsorbent dose and pH are the four process parameters used for this consideration. Mathematical model equations are derived for adsorption of boron from waste water by using sets of experimental data. Three-dimensional response surface plots, which are the result of simulations from the models, are presented to describe the effect of the process variables on the adsorption of boron. Predicted values obtained using the model equations were in very good agreement with the observed values. Taking advantage of the QP, temperature of 30.98°C, initial feed concentration of boron 23.45 mg/l, adsorbent dose of 3.69 g/l and pH of 6.01 have been determined as optimum levels of the process parameters to achieve the maximum adsorption of boron of 84.4%, compared to 80.926% which is maximum adsorption in the tests conducted. The results in this paper indicate that optimization by using RSM; CCD and QP can be useful in improving the adsorption capacity of boron from waste water.

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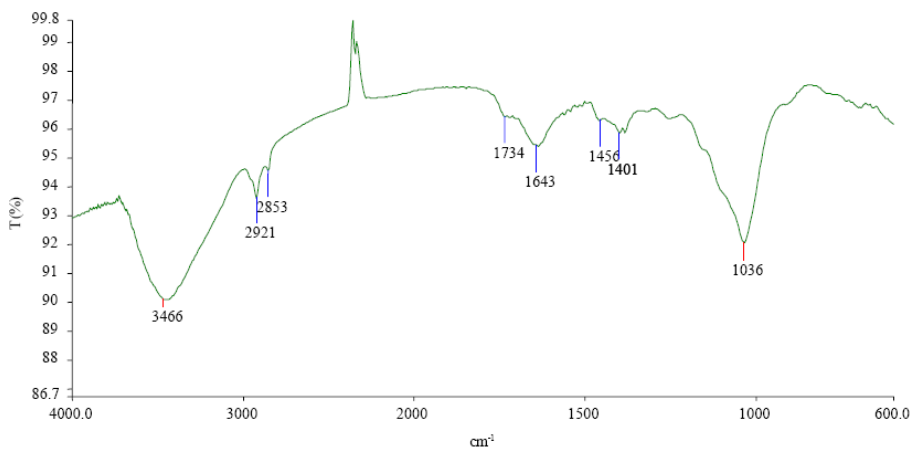

Figure 1: FT-IR spectrum of cashew nut shale waste

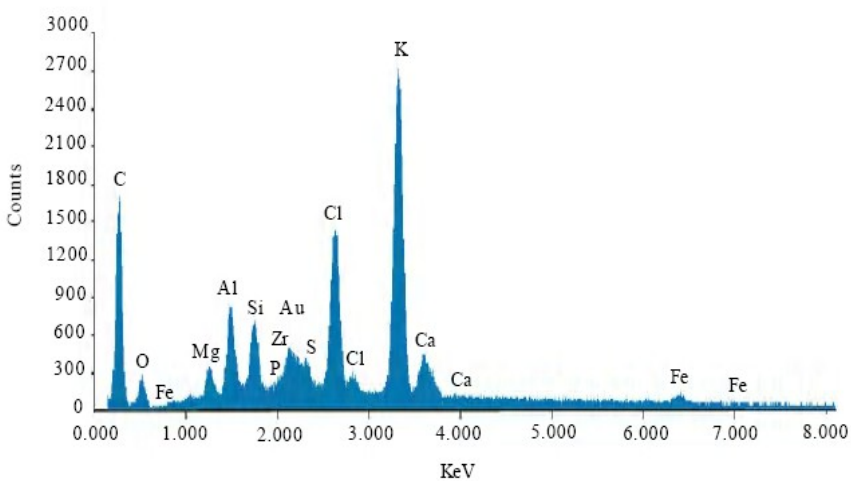

Figure 2: EDAX spectrum of cashew nut shale waste before use

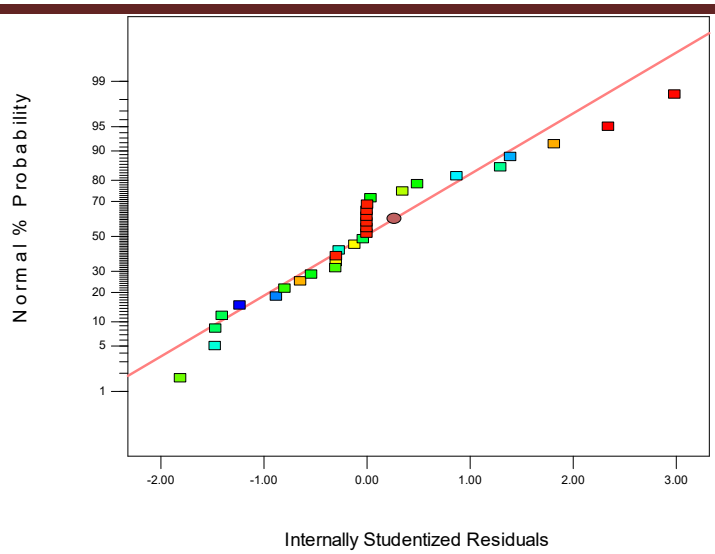

Figure 3: The studentized residuals and normal percentage probability plot of adsorption of boron from waste water.

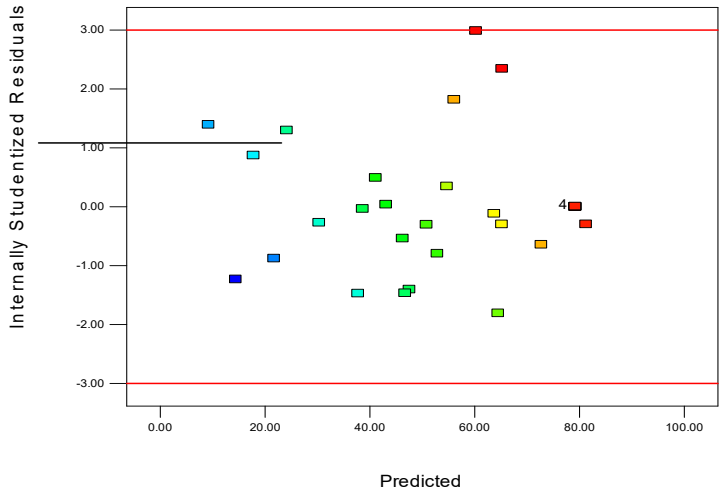

Figure 4: The predicted adsorption of boron from waste water and studentized residuals plot.

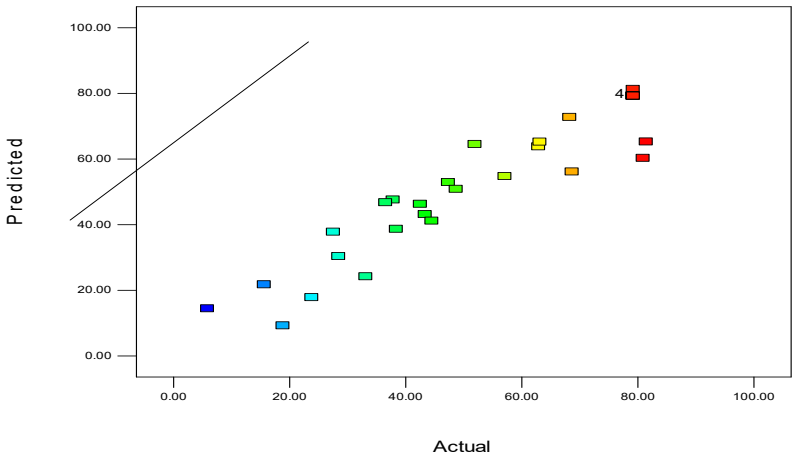

Figure 5: The actual and predicted plot for adsorption of boron from waste water.

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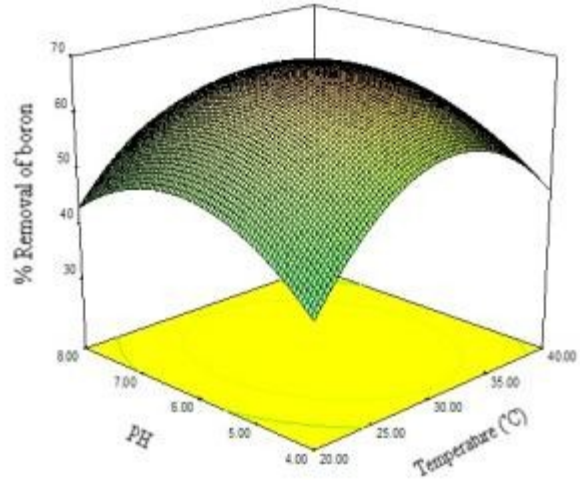

Figure 6: The combined effect of PH and temperature on adsorption of boron at constant initial concentration of 40 mg/l and adsorbent dose of 4 g/l .

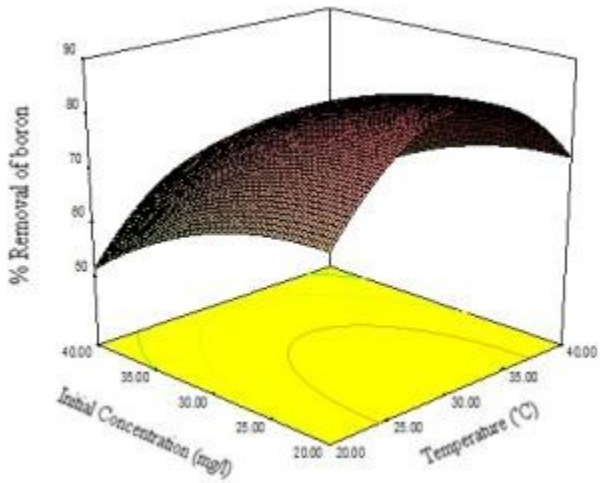

Figure 7: The combined effect of temperature and initial concentration on adsorption of boron at constant PH 6 and adsorbent dose of 4 g/l .

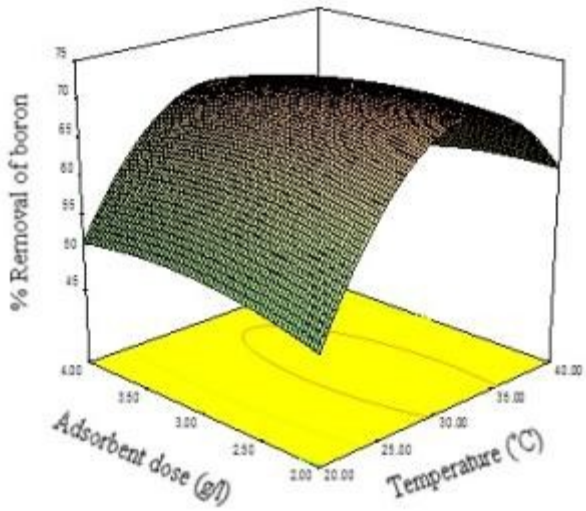

Figure 8: The combined effect of temperature and adsorbent dose on adsorption of boron at constant PH 6 and initial concentration of 40 mg/l .

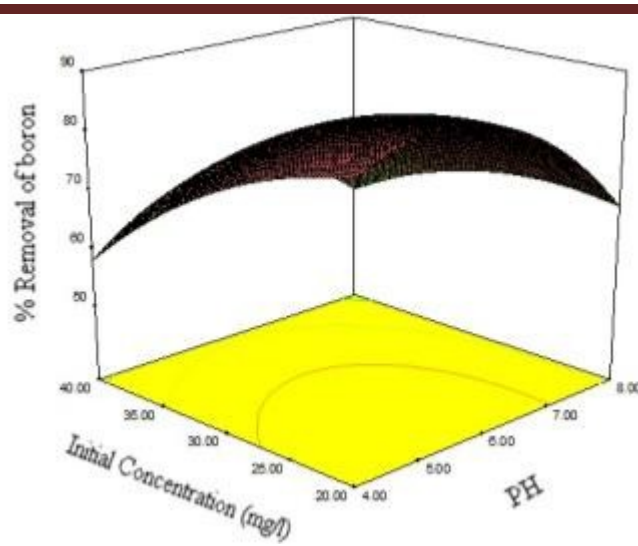

Figure 9: The combined effect of initial concentration and PH on adsorption of boron at constant temperature of 30°C and adsorbent dose of 4g/l .

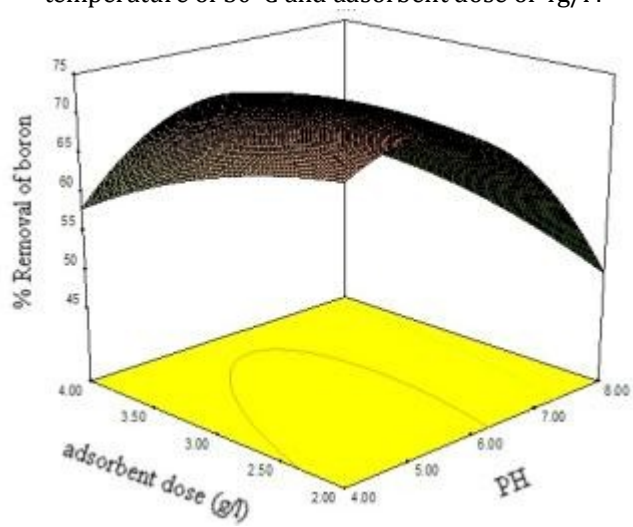

Figure 10: The combined effect of adsorbent dose and PH on adsorption of boron at constant temperature of 30°C and initial concentration of 40mg/l .

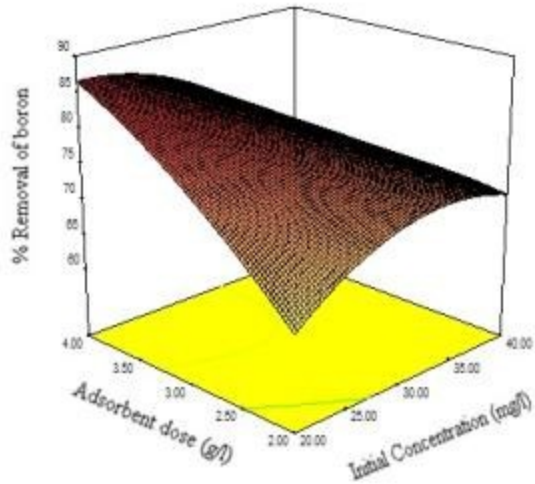

Figure 11: The combined effect of adsorbent dose and initial concentration on adsorption of boron at constant temperature of 30°C and P^H of 4g/l .

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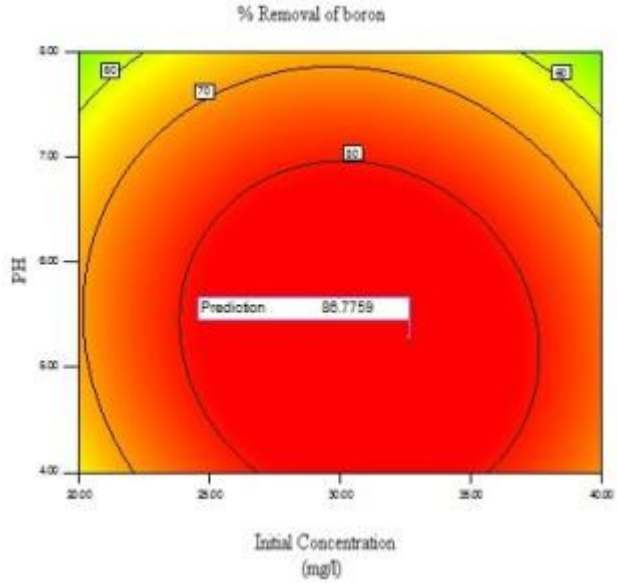

Figure 12: The optimum region on the PH and initial feed concentration for adsorption of boron.

Table 1.
Actual value and corresponding coded value of the variables

Code	Actual level of variable
$-\alpha$	A_{min}
-1	$[(A_{max} + A_{min})/2]-[(A_{max} - A_{min})/2\beta]$
0	$(A_{max} + A_{min})/2$
+1	$[(A_{max} + A_{min})/2]+[(A_{max} - A_{min})/2\beta]$
$+\alpha$	A_{max}

Table 2
Level of indepndent variables

Variables	Symbol	-α	-1	0	+1	+ α
Temperature (°C)	X_1	10	20	30	40	50
PH	X_2	2	4	6	8	10
Initial feed concentration (mg/l)	X_3	10	20	30	40	50
Adsorbent dose (g/l)	X_4	1	2	3	4	5

Table 3
Experimantal design matrix and response

	Coded level variable				Actual level variable				OEE
Run	X_1	X_2	X_3	X_4	X_1	X_2	X_3	X_4	Y
1	-1	-1	-1	-1	20	4	20	2	37.826
2	+1	-1	-1	-1	40	4	20	2	51.95
3	-1	+1	-1	-1	20	8	20	2	5.86
4	+1	+1	-1	-1	40	8	20	2	15.631
5	-1	-1	+1	-1	20	4	40	2	36.549
6	+1	-1	+1	-1	40	4	40	2	62.9164
7	-1	+1	+1	-1	20	8	40	2	28.461

8	+1	+1	+1	-1	40	8	40	2	27.5478
9	-1	-1	-1	+1	20	4	20	4	63.127
10	+1	-1	-1	+1	40	4	20	4	68.254
11	-1	+1	-1	+1	20	8	20	4	47.3652
12	+1	+1	-1	+1	40	8	20	4	48.698
13	-1	-1	+1	+1	20	4	40	4	38.386
14	+1	-1	+1	+1	40	4	40	4	42.5265
15	-1	+1	+1	+1	20	8	40	4	43.357
16	+1	+1	+1	+1	40	8	40	4	44.514
17	-α	0	0	0	10	6	30	3	18.8523
18	+α	0	0	0	50	6	30	3	33.13
19	0	-α	0	0	30	2	30	3	68.672
20	0	+α	0	0	30	10	30	3	23.824
21	0	0	-α	0	30	6	10	3	81.456
22	0	0	+α	0	30	6	50	3	57.102
23	0	0	0	-α	30	6	30	1	80.926
24	0	0	0	+α	30	6	30	5	79.2
25	0	0	0	0	30	6	30	3	79.19
26	0	0	0	0	30	6	30	3	79.19
27	0	0	0	0	30	6	30	3	79.19
28	0	0	0	0	30	6	30	3	79.19
29	0	0	0	0	30	6	30	3	79.2
30	0	0	0	0	30	6	30	3	79.243

Table 4
Analysis of variance (ANOVA) for response surface quadratic model for removal of boron from aqueous solution.

Source	Sum of Squares	Degrees Of freedom	Mean Square	F Value	p-value Prob > F	Remarks Remarks
Model	13682.92	14	977.3517	8.490535	< 0.0001	significant
X_1-Temperature (°C)	334.969	1	334.969	2.909972	0.1086	
X_2-P^H	2200.276	1	2200.276	19.11443	0.0005	significant
X_3-Initial Concentration of As (III) (mg/l)	166.224	1	166.224	1.444035	0.2481	
X_4-Adsorbent dose (g/l)	661.8623	1	661.8623	5.749788	0.0299	significant
X_1 X_2	92.21425	1	92.21425	0.801092	0.3849	

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$X_1 X_3$	0.009846	1	0.009846	8.55E-05	0.9927	
$X_1 X_4$	88.32193	1	88.32193	0.767278	0.3949	
$X_2 X_3$	281.44	1	281.44	2.444951	0.1388	
$X_2 X_4$	434.538	1	434.538	3.774957	0.0710	
$X_3 X_4$	661.3628	1	661.3628	5.745449	0.0300	significant
X_1^2	6699.823	1	6699.823	58.20329	< 0.0001	significant
X_2^2	3061.409	1	3061.409	26.59534	0.0001	significant
X_3^2	633.798	1	633.798	5.505986	0.0331	significant
X_4^2	122.2302	1	122.2302	1.061849	0.3191	
Residual	1726.661	15	115.1107			
Lack of Fit	1726.659	10	172.6659	384128.7		
Pure Error	0.002248	5	0.00045			
Cor Total	15409.58	29				

Table 5
Model Validation

Temperature (°C)(X_1)	P^H (X_2)	Initial Concentration (mg/l) (X_3)	Adsorbent dose (g/l) (X_4)	Adsorption of boron (%) (Y) Predicted	Observed
32.66	5.29	23.44	3.96	86.7759	80.926

An analysis on task Load Balancing in Linux operating System on multi-core architecture

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ABSTRACT: *As the computing moves toward large-scale multi-core processors (also called Chip Multi-Processor, CMP), the quantity of cores on a chip increases dramatically. With the advent of multi-core processors, parallel execution of multiple tasks has become a common practice. In order to fully utilize these processing cores, load balancing has become one of the most important factors that shows performance measures of multi-cores. Various scheduling algorithms have addressed this issue considering multi-core systems. This paper is an attempt to analyze load balancing in multi-core platform, rather than focusing on naive load-balancing scheme for equally balanced CPU usage, it tries to minimize the cost of task migration. We have focused Linux kernel as open source O.S. because of its popularity and large scale use. We have proposed some improvement areas in Linux load balancing for multi-core platform.*

Keywords:

Introduction

Performance improvement achieved by clock speed of a single CPU results power consumption problems [2,3]. Increasing the core architecture has been widely used to resolve the power consumption problem as well as to improve performance [4]. In embedded systems, the multi-core architecture is having advantage over single core architecture [5].As the number of core grows, the need to ensure effectiveness of utilization of the processing cores becomes essential. This is the need for the research and development for a well engineered operating systems load balancer for these multi-core processors.

Modern operating systems utilize SMP scheduler, synchronization [6], interrupt load-balancer, affinity facilities [7, 8], CPUSETS [9], and CPU isolation [10, 11]. These functions help running tasks adapt to system characteristics very well by considering utilization of CPU.Some people have tested and improvements in traditional O.S. like Linux on high core platform and concluded there is no reason to shun the adaptability issues of traditional O.S. even on multi core platform in near future. Due to the easy availability as open source and large scale use of LINUX OS we have adapted this for the research.

Multi-core Architecture

A multi-core processor is a single computing component with two or more independent processing cores which reads and executes program instructions. Multi-cores can run multiple instructions simultaneously, increasing overall speed for programs like parallel computing.

Most processor vendors have multi-core products, e.g. Intel Quad- and Dual-Core Xeon, core 2 duo, i3,i5,i7, AMD Quad- and Dual-Core Opteron, Sun Microsystems UltraSPARC T1 (8 cores), IBM Cell, Intel Xeon E7-2820 (8 cores), AMD FX-8150 (8 cores) etc.

Below Figure 1 shows a multi-core architecture with two nodes. One node is based on Non Uniform Memory Access (NUMA) based design and other is based on Symmetric Multi Processing (SMP) based design. In NUMA memory access times of cores can be different where as in SMP memory access times of cores are similar. Each core has similar structure in both nodes and has it's private L1 cache. Two nodes can be connected through interconnection network like mesh, bus, and ring network.

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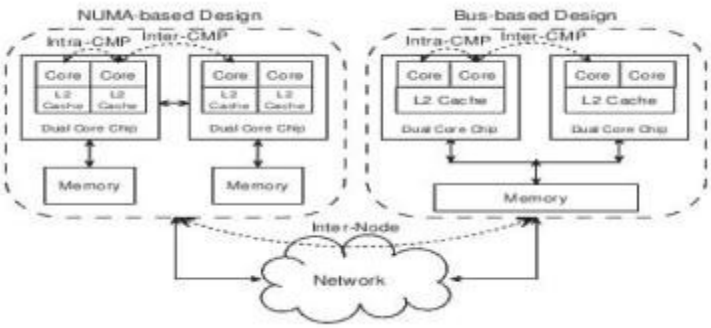


Figure 1: This Figure shows multi-core architecture with two nodes

Linux OS Scheduling in Multicore Architecture:

The Linux scheduler is a preemptive priority-based algorithm with two priority ranges - *Real time* from 0 to 99 and a *nice* range from 100 to 140.

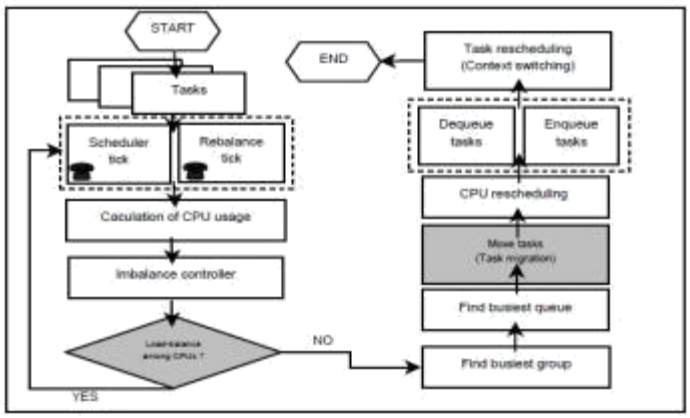
When a multithreaded application is run with four threads (or even four serial applications), Linux will *schedule* those threads for execution by assigning each one to a CPU core. Without being explicitly told how to do this scheduling, Linux may decide to:

1. run thread0 to thread3 on core0 to core3 on socket0
2. run thread0 and thread1 on core0 and core1 on socket0, and run thread2 and thread3 on socket1
3. run thread0 and thread1 on core0 only, run thread2 on core1, run thread3 on core2, and leave core3 completely unutilized
4. any number of other nonsensical allocations involving assigning multiple threads to a single core while other cores sit idle

It should be obvious that option #3 and #4 are very bad for performance, but the fact is that Linux will schedule the multithreaded job (or multiple single-thread jobs) this way if threads behave in a way that is confusing to the operating system.

Linux Load Balancing

In multi-core systems efficient load balancing is very important for achieving high performance and reducing scheduling latency when many tasks are running concurrently. It can offer competitive advantage. Here we have will discuss about Linux load balancing policy and it's limitations and an improved version of load-balancing by name operation zone based load-balancer developed by researchers. The current SMP scheduler in Linux kernel periodically executes the load-balancing operation to equally utilize each CPU core whenever load imbalance among CPU cores is detected. Such aggressive load-balancing operations incur unnecessary task migrations even when the CPU cores are not fully utilized, and thus, they incur additional cache invalidation, scheduling latency, and power consumption. If the load sharing of CPUs is not fair, the multicore scheduler [26/12] makes an effort to solve the system's load imbalance by entering the procedure for load-balancing [27]. Figure 1 shows the overall operational flow when the SMP scheduler [28] performs the load-balancing.



Load-balancing operation on Linux.

At every timer tick, the SMP scheduler determines whether it needs to start load-balancing or not, based on the number of tasks in the per-CPU run-queue. At first, it calculates the average load of each CPU [30].If the load imbalance between CPUs is not fair, the loadbalancer selects the task with the highest CPU load [31], and then lets the migration thread move the task to the target CPU whose load is relatively low. Before migrating the task, the load-balancer checks whether the task can be instantly moved. If so, it acquires two locks, busiest->lock and this_rq->lock, for synchronization before moving the task. After the successful task migration, it releases the previously held double-locks [32]. The definitions of the terms in Figure are as follows [33] [34]:

- Rebalance_tick: update the average load of the runqueue.
- Load_balance: inspect the degree of load imbalance of the scheduling domain [35].
- Find_busiest_group: analyze the load of groups within the scheduling domain.
- Find_busiest_queue: search for the busiest CPU within the found group.
- Move_tasks: migrate tasks from the source runqueue to the target run-queue in other CPU.
- Dequeue_tasks: remove tasks from the external run-queue.
- Enqueue_tasks: add tasks into a particular CPU.
- Resched_task: if the priority of moved tasks is higher than that of current running tasks, pre-empt the current task of a particular CPU.

At every tick, the scheduler_tick() function calls rebalance_tick() function to adjust the load of the run-queue that is assigned to each CPU. At this time, load-balancer uses this_cpu index of local CPU, this_rq, flag, and idle (SCHED_IDLE,NOT_IDLE) to make a decision. The rebalance_ tick() function determines the number of tasks that exist in the run-queue. It updates the average load of the run-queue by accessing nr_running of the run-queue descriptor and cpu_load field for all domains from the default domain to the domain of the upper layer. If the load imbalance is found, the SMP scheduler starts the procedure to balance the load of the scheduling domain by calling load_balance() function. It is determined by idle value in the sched_domain descriptor and other parameters how frequently loadbalancing happens. If idle value is SCHED_IDLE, meaning that the run-queue is empty, rebalance_tick() function frequently calls load_balance() function. On the contrary, if idle value is NOT_IDLE,the run-queue is not empty, and rebalance_tick() function delays calling load_balance() function. For example, if the number of running tasks in the run-queue increases, the SMP scheduler inspects whether the loadbalancing time [36] of the scheduling domain belonging to physical CPU needs to be changed from 10 milliseconds to 100 milliseconds. When load_balance() function moves tasks from the busiest group to the run-queue of other CPU, it calculates whether Linux can reduce the load imbalance of the scheduling domain. If load_balance() function can reduce the load imbalance of the scheduling domain as a result of the calculation, this function gets parameter information like this_cpu, this_rq, sd, and idle, and acquires spin-lock called this_rq->lock for synchronization. Then, load_balance() function returns sched_group descriptor address of the busiest group to the caller after analyzing the load of the group in the scheduling domain by calling find_busiest_group() function. At this time, load_balance() function returns the information of tasks to the caller to move the tasks into the run-queue of local CPU for the load-balancing of scheduling domain. The kernel moves the selected tasks from the busiest run-queue to this_rq of another CPU. After turning on the flag, it wakes up migration/* kernel thread. The migration thread scans the hierarchical scheduling domain from the base domain of the busiest run-queue to the top in order to find the most idle CPU. If it finds relatively idle CPU, it moves one of the tasks in the busiest run-queue to the run-queue of relatively idle CPU (calling move_tasks() function). If a task migration is completed, kernel releases two previously held spinlocks, busiest->lock and this_rq->lock, and finally it finishes the task migration.dequeue_task() function removes a particular task in the run-queue of other CPU. Then, enqueue_task() function adds a particular task into the run-queue of local CPU. At this time, if the priority of the moved task is higher than the current task, the moved task will pre-empt the current task by calling resched_task() function to gain the ownership of CPU scheduling.As we described above, the goal of the load-balancing is to equally utilize each CPU [37], and the load-balancing is performed after periodically checking whether the load of CPUs is fair. The load-balancing overhead is controlled by adjusting frequency of load-balancing operation,load_balance() function, according to the number of running tasks in the run-queue of CPU. However, since it always performs load-balancing whenever a load imbalance is found, there is unnecessary load balancing which does not help to improve overall system performance for the following reasons.

1. Direct cost: the load-balancing cost by checking the load imbalance of CPUs for utilization and scalability in the multicore system
2. Indirect cost: cache invalidation and power consumption

(a) cache invalidation cost by task migration among the CPUs
(b) power consumption by executing more instructions according to aggressive loadbalancing

3. Latency cost: scheduling latency and longer non-pre-emptible period

a) scheduling latency of the low priority task because the migration thread moves a number of tasks to another CPU [38]
b) longer non-preemptible period by holding the double-locking for task migration

Adaptive Task-Core Ratio Load Balancing Strategy

Current operating systems are designed in such a manner where each processing core is assigned a task queue (runqueue) and where a static variance load balancer is implemented; the variance between the numbers of tasks on the processing cores' runqueues is predetermined during system startup. When this preset variance is detected, the load balancer will trigger tasks migrations. Using the Linux operating system as a reference, it is generally set to 25% variance (denoted by the imbalance value of 125). Effectively, the load balancer will trigger tasks migrations when the ratio between two runqueues is greater than 5:4. In such a setting, when there are a low number of tasks, as typically will be on a dedicated system, it will unnecessarily trigger tasks running concurrently and 1 task completes its allocated epoch (time slice in a multi-tasking system), the ratio between that runqueue and any others will be 3:2, or a 50% variance. when the tasks are evenly distributed among the four cores, minimal or no migration occurs but when there is just an imbalance of 1 task in the system, it triggers numerous tasks migrations. Beyond 16 tasks, the ratio of any additional tasks will not trigger migration as the ratio will be greater than 5:4. The migrations that are recorded are for the initial migration of the tasks by the load balancer to a less busy processor. Tasks in the Linux operating system are created initially on the first processor. It should also be noted that the number of cross cache migration consistently amounts to approximately 67% of the migration which indicates that the default Linux operating system load balancer gives no preference for same cache processing core migration [41].

It is observed that the time variance between the Adaptive Load Balancer and the Linux native implementation ranges between -2% to 1.5% which is considered as not significant and the overhead is less. For more refer [48].

Future Work

In this section we have discussed approaches to improve Linux load balancing for scalable multi-core architecture.

- Test Linux's different parts like network handling, memory management, file descriptor management, scheduling, protection & security etc. with different benchmarks.
- Test Load balancing Algorithm with benchmark with and without static option to check whether statically linking shared libraries can result in any benefit of total throughput.
- Test the effects of Cache access like Cache miss and coherency using Cache Profiling tools. Cache profiling tools (Oprofile, perf) can be used to understand cache behavior (like cache misses) while running benchmarks and hence can be used to reduce number of misses by improving code or providing a better cache design. Also if Linux memory management has any role on Cache misses and coherency then that can be analyzed to check whether it is optimized or not. If it not optimized then it can be improved. One may work on this topic in coming days. For details refer to [49].
- Test Linux with serial benchmarks (major portion of benchmarks is inherently serialized like one instruction depends on previous instruction) to predict how Scheduler will perform in real life serialized applications.

Conclusion

Load balancing is important to achieve full utilization of the cores in multi-core architecture. We have found some area of opportunities to make load balancing scheduling of Linux for multi-core architecture. While a lot of work has been done in this area, and Linux works reasonable well for a variety of workloads today, improving scheduling further is a ongoing process that needs constant effort.

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EDGE CRACK AND ITS PREVENTIVE ON THE SHEET METAL USED IN MANUFACTURING OF AUTOMOBILE COMPONENTS

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ABSTRACT: *In automobile industry the sheet metal plays a vital role to manufacture various components. More or less defects are associated in several processes with different components during its manufacturing from the sheet metal. Crack edge defect is a common and distinguished defect among them. Therefore dominant this defect is that the issue of quality further and a study of relevant factors is completed during this paper.*

Keywords: *Edge cracking ; flanging ; edge crack preventive*

1. INTRODUCTION

Sheet metal forming is used in various industrial production sectors like: Automobile (e.g. doors, hoods, fenders) , Craft trade (e.g. wings, fuselage) , Household product manufacturing industry (e.g. sinks, cookware hoods, freezers), etc.. Another components are factory made from sheet like: levers, brackets, hooks, patch, throttle bracket, etc.. Sheet parts and tools area unit bit by bit finding their in depth usage within the automobile industries because of their convenience in varied shapes yet as sizes. The producing method (Figure-1) of those parts area unit very tough and sophisticated because of the precise demands of precise dimension specification.

More dductility of materials are produced by using standard sheet metals through forming technique and normally it begins failure by the localized necking area at the edge of the flange [1] . The metal at the neck zone shows an unstable deformation by following a plane strain state till ductile fracture takes place [2]. In hole-flanging by SPIF, a sheet with pre-cut hole generated through forming tool followed by a pre-established mechanical phenomenon and slowly produces a swish spherical rim as known as round flange. The metal of the sheet material is deformed and accomplished with the combination of stretching as well as bending [3] .

Press tools are devices to provide sheet parts in mass quantities by punching, notching, lancing, bending, shaving, drawing, embossing, coining and trimming. Fundamentally, punching operation comprises of the sheet cutting by mechanical induction of shearing tensions employing a rigid punch and die [4]. One in every of the foremost vital needs of the cutting method is that the quality of the sheared edge , that is affected not solely by the material characteristics, however conjointly by the method parameters like: die clearance and sharpness of the cutting edges [5]. A versatile flanging methodology supported the single-point progressive sheet forming (ISF) technology was represented [6] by utilizing simple toolbars with tapered shoulders in an exceedingly two-stage procedure.

Round hole-flanging was considered as a stretch flanging with concave bending line. Till date, so many researchers presented their works on various flanging processes. A work published on stretch/shrink flanging [7] on open edges of two dimensional plates and a systematic study on hole-flanging was presentd [8]. Wherever [9] worked out on the fine hole flanging with wall reduction throughout forming, while the deformation features, formability, forming load, etc [10] were examined to check the arched flanging on non-planar sheets . The stretch flanging method is considerably suffering from varied geometrical, material and process parameters [11-14].

Not only the punch-die clearance but also primary flange length are key parameters that effects on the boundary crack and strain circulation on the radius of die profile in the flange.

Commonly three distinct steps are concerned in the manufacturing as: (a) cut the sheet metal into a precise sizes and shapes (b) pattern of cutting metal to the required shape through various operations such as bending, stamping, rolling, welding and punching (c) the last step endow with the finished product and make it ready for use.

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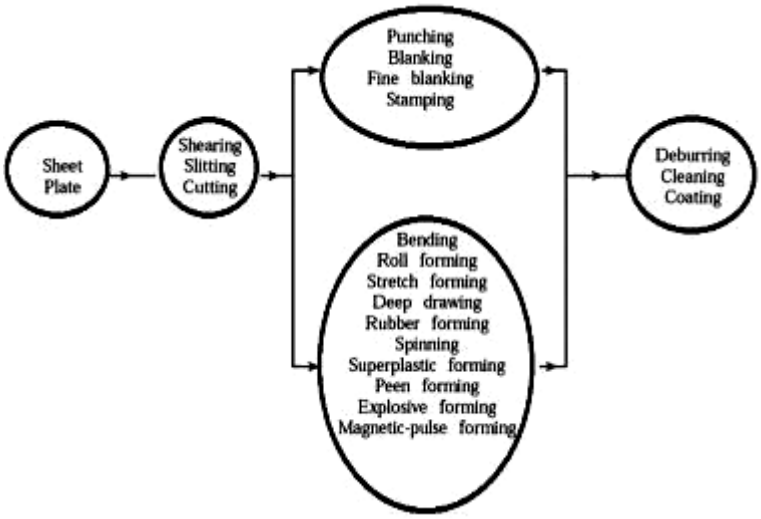

Figure-1: Various manufacturing steps usage in sheet metal

2. BENDING, FLANGING AND HEMMING IN INDUSTRIAL APPLICATION

The Bending is because of plastic deformation of a sheet metal about a linear axis. Plane strain as well as the localized deformation area unit obtained on the axis. Bending could also be the foremost operation in the sheet metal forming, however it's quite complex; neutral surface ' shifting, springback when unloading, strain hardening, and cutting at the deformation regions are briefly studied. Varied varieties of common bending processes, that area unit air bending, V-die bending, U-die bending, wiping die bending, double die bending, and rotary die bending.

Flanging is a type of forming operation and a slim strip at the edge of a sheet is bent on a straight or curved line. If the contour radius (radius = one / curvature) of the deformation corner is infinite, then this operation is one quite plane strain bending, or a lot of usually, wiping die bending. Compared to plane strain bending, flanging is applied on the perimeters of elements , and therefore the projection length is comparatively little. Typical bend angle in flanging is 90° and one to four degrees recovery may be found when unloading because of springback development.

In hemming the edge of the sheet is folded to 180° or more and additionally increasing the stiffness of the part, hemming method conjointly eliminates acute edges, improves look and joins components.

A number of automotive interior and exterior panels (Figure-2) are shaped through press brake bending or flanging, then joined by hemming.

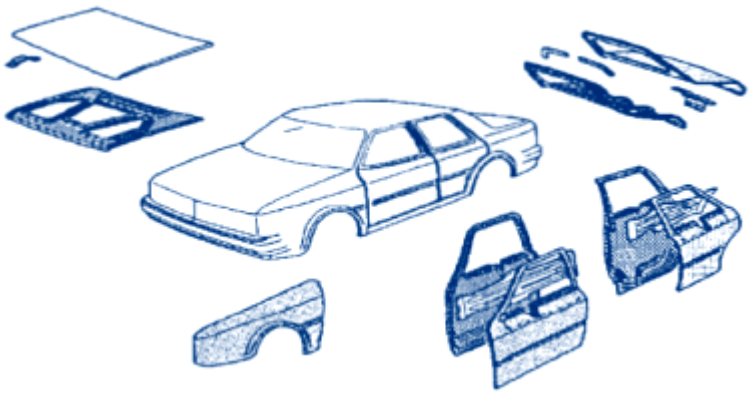

Figure-2 : Bent, flanged and hemmed parts on a car

Sorted by area shapes : a flat or a arc apparent and edges , a straight line or a curve, flanges may be generated from altered surfaces as shown in figure-3. Flanging is the aboriginal footfall in hemming process, hems may be analysed with the aforementioned classification. It is noticed from figure-(B) and (C), that a flat sheet is angled over a ambit and a non-straight border is obtained. Figure- (D) and (E) shows a arced area is angled to a plane; therefore, stretching or shrinking in ambit occurs because of the initial sheet curvature. These flanging cases begin in the automotive door panel as in Figure-2.

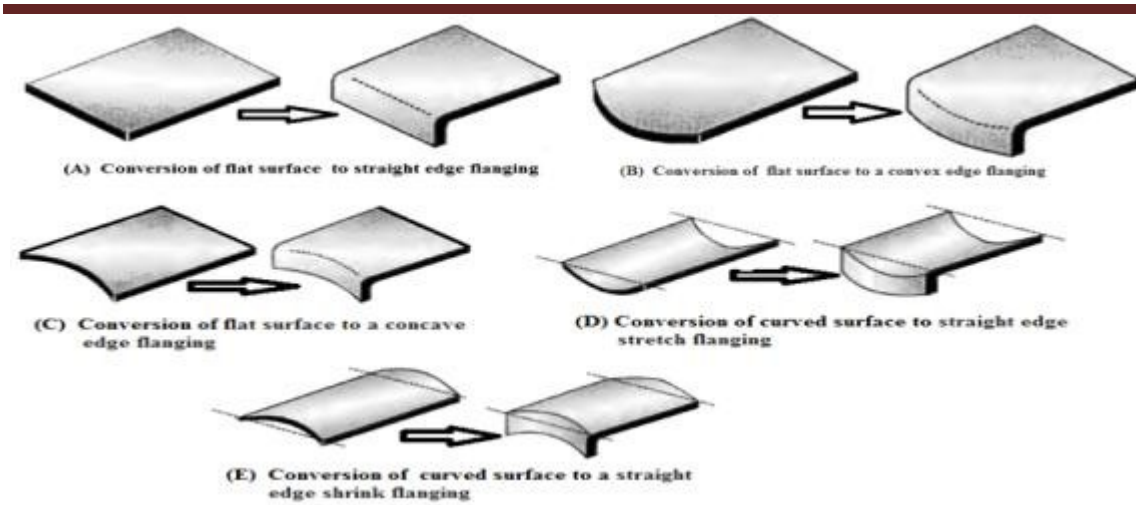

Figure-3 : Geometric shape conversion model of surface to flanging

In stretch flanging tension is major along the top portion of the flange and lesser close to die profile radius in circumferential direction(Figure-4). Initial flange length is one among the key parameter of stretch stretch flanging process. Prediction of strain and trimline are often analysed by using two different models for axisymmetric and non-axisymmetric stretch flanging process.

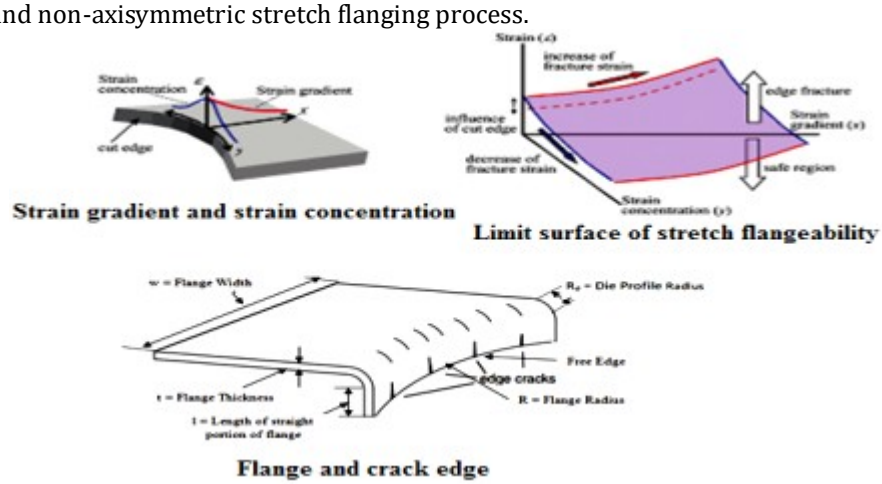

Figure - 4: Flangeability and crack edge

3. BASIC PARAMETERS FOR PROCESSING

3.1. Parameter affect on the edge

The essential parameters (Figure-5) that affect the blanked edge quality and hole expansion ratio, flangeability are (i) punch-die clearance (ii) blank holder pressure (iii) punch tip geometry (iv) punch velocity (v) hardness of blanked/pierced edge (vi) surface quality of the blanked/pierced edge (vii) tool wear/radius (viii) sheet material/thickness.

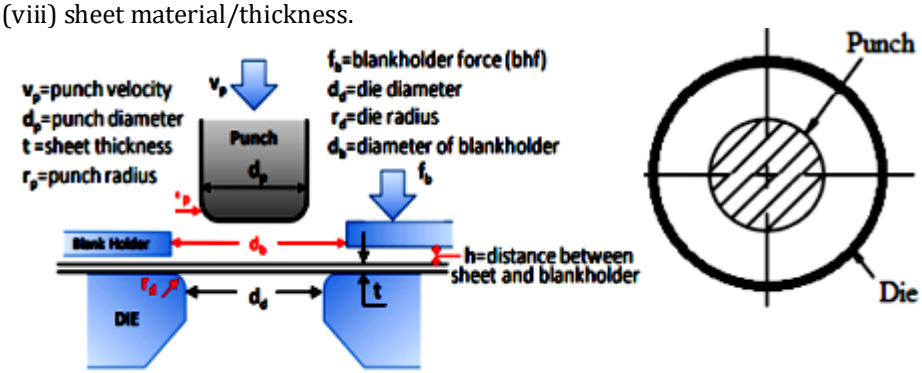

Figure-5: Parameters in the blanked edge

The average circumferential strain $(\mathbf{e}) = \frac{(d_f - d_i)}{d_i}$

Where, **e** = Strain ;

d_i = Diameter of the hole extrusion ;

d_f = Diameter of the edge after hole extrusion

Some distinct characteristics were shown by the sheared edge. Fractures, burnishing, rollover, burrs, and work hardening with in the flanking area were gripped. Work hardening gives edge crack or brittle fracture. This will tear instantaneously from the stress concentration around the cracks during the product functioning.

3.2. Effect of punch-die clearance

Proper clearance between the punch and die is crucial due to :

a) Large abundant punch and die clearance leads to additional change deformation wherever punch enters the fabric and an outsized burr on the die aspect.
b) There will be a bottom change deformation round the hole wherever the punch enters the fabric due to proper clearance between the punch and die. There may be a nominal burr.
c) There may be a requirement of secondary shear of the material to form the hole because of insufficient die clearance. This secondary shear is at the outlay of tonnage .So additional tonnage is required to make the hole and a supplementary strip force is necessary to remove the punch may result in premature punch failure or breaking of the punch.

The punch is same as of the die opening with some clearance. Punch pushes the material into the die opening when it moves downwardly. The sheet metal is affected by tensile as well as compressive stresses. As a result of this a larger value of stresses are generated at the edges of punch and die . So, the material will start cracking there. Various zones of fracture on the material are shown in figure-6(a) and 6(b). If the clearance between the punch and the die is fruitful then the cracks are starting from edges and the rupture will takes place.

If the clearance is larger or smaller then cracks will not meet. Instead of that material will be dragged and torn through the die to. Hence burr is developed. Punch is the master piece in punching operation where as clearance should be added in die. The normal clearances per side of the die are given below for different kinds of material in terms of thickness, t:

Table-1 : Normal clearances per side of the die

Sl. No.	Material type	Normal clearances (c)
1	Brass and soft steels	5% of t
2	Medium steel	6% of t
3	Hard steel	7% of t
4	Aluminum	10% of t

Therefore die and punch alignment is based on manufacturing process as well as final assembly of the tool. Right alignment of die & punch decides the part quality.

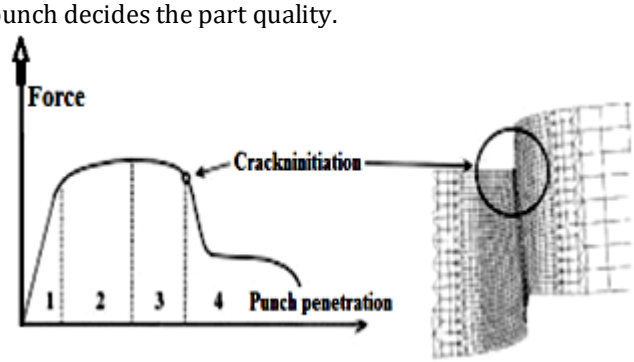

Figure- 6(a) Crack initiation stage

Zone- 1: Elastic stage
Zone-2 : Elastoplastic stage
Zone-3: Elasto plastic stage with damage of matterial occurs
Zone-4 : Propagation of cracks lead to final rupture.

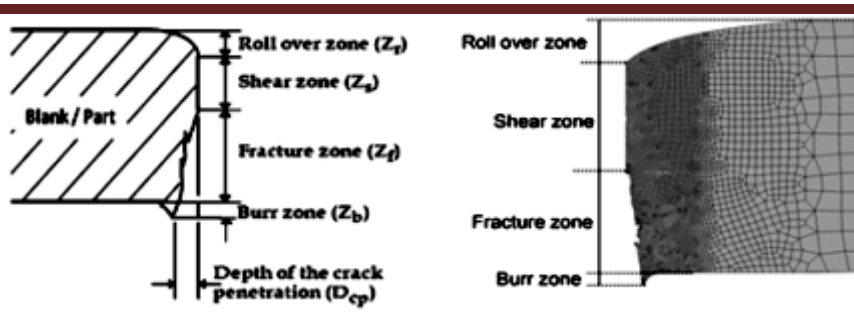

Figure- 6(b): Various zones

The amount of the minimum die clearance is bent on the basis of the amount advantage of the allotment to be blanked using the press tool. If the element to be blanked as an example, a washer, the burr unseen close to the sheared edge and also the secondary shear fashioned on the opposite aspect would not have an effect on the essential operator of the washer. Therefore, the minimum die clearance assigned for the press tool that produces the washer will be less. On the other hand , the minimum die clearance ought to be larger for a essential product.

3.3. Influence of flange length on edge crack

Edge cracking would-be in real components are vary significantly with the edge condition of the part as well as the amount of deformation that the flange instills into the edge itself. However, there are some useful indicators to the potential for part geometry to origin an edge crack.

Edge cracking (Figure-7) is just a failure in the sheet metal created by the pattern of a stretch flange. Stretch flange is defined as a flange from initial shape to finished shape cause the free edge of the metal to stretch. It is recognized that stretch flanges are due to the situation: extruded holes, flanges in wheel arch of car, cowl hems in the hood and deck-lid of car, or any flange where the plan view radius of the flange has its center outside the bend. The sheet metal will be trimmed to a curved edge prior to the flanging operation on these types of flanges. So, the material on the free edge of the flange has to stretch from the original length because of the trimmed metal is flanged downward and it has during the trimming operation to take on the new edge length as identified by the plan of the finished flange.

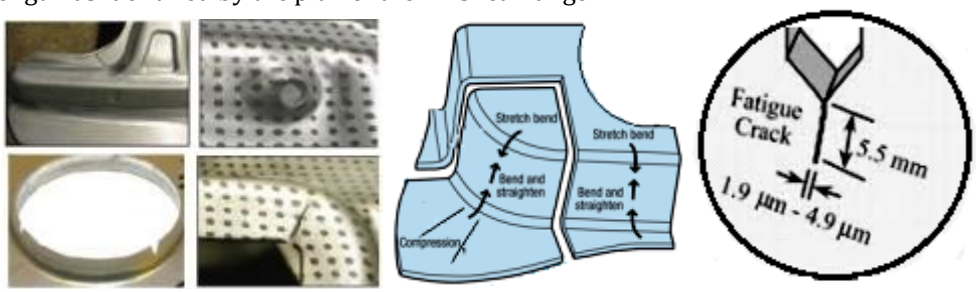

Figure-7: Edge crack and stretching

The quantity of stretching in the flange termed as engineering strain(**e**) can be calculated by estimating the difference in the edge length before and after the flanging, and then dividing it by the original edge length. The difference in arc length of the trim edge initial and the trim edge final can be estimated by using the plan view radii of the initial trim line and the plan view of the flange. The calculation in the given figure-8 as shown below, it is assumed that the plan view radius of the initial trim is corresponding to the final plan view radius minus the intended length of the flange.

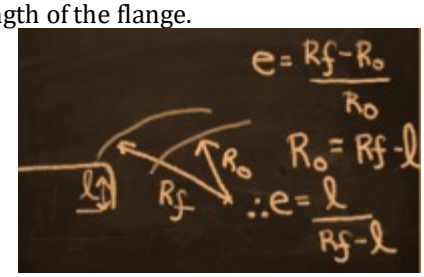

Figure-8 : plan view radius of the initial trim, final plan view radius and intended length of the flange

Once the strain/stretching in the edge of the flange is predicted then only the issue on the amount of stretching is likely to be calculate as a result in failure. If the strain calculated (e) is more than the total elongation then the flange will experience edge cracks, otherwise process modifications is required.

3.4. Bending of sheet metal

In bending the ductility of the sheet metal is an important mechanical property. For low ductility, the minimum angle ambit is larger. Similarly, accompaniment of biaxial accent in angle arena may as well abate ductility on alien fibers. Accompaniment of biaxiality reaches only when width to thickness (w/t) ratio value reaches to 8. The analytical ache appropriate for fracture only beyondwhen w/t ratios decline. Slim sheets suffer crack at the edge due to more stress than at center.

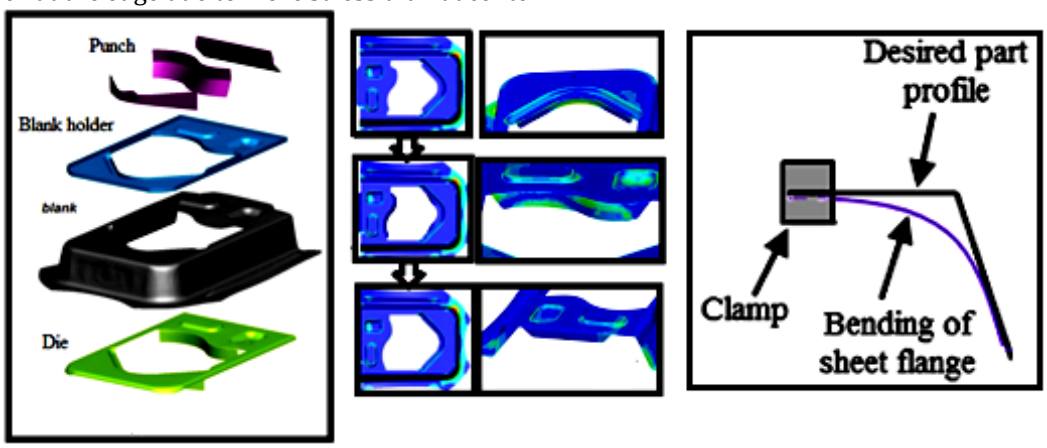

Figure-9 : Sheet metal parts and Bending of flange geometry

4. EDGE CRACK PREVENTIVE

A blanked edge industrial accident will be added by adjusting the tolerance, designing an acceptable contour of the apparatus and compassionate the automated backdrop of the sheet metal area.

The approval among the shearing bite and the die definitely affects the bend condition. It determines the bend characteristics and the burning ring will boss the profile. It says that apparatus activity is proportional to the clearance.

The bend could crop a contour that is absolutely burnished if a bound approval is maintained during blanking and that would decline its need to fracture. A bound approval is acclimated if a beeline bend is required. Here, the apparatus activity will be abbreviated due to the sharp contact among the apparatus with the blank.

If the bend is accountable to consecutive basic operations, plan hardening is bigger to micro-cracking. Conversely, if approval is loose, the bend will accept a openhanded rollover field and a micro-cracks that actualize a aciculate edge. The apparatus activity can be maximized here.

Shaving method can be used to remove the defective section of blanked edge and exhibit burrs as well as micro-cracks produced throughout blanking. It can be done at a station prior to forming. A skinny slice is cut out from the sheared edge. On the other hand, shaving will lead to problems like: scratches, and die damage.

Excessive clearance dishes the blank and produces long, stringy burrs all round the edge. The appliance of correct clearances can lead to a blank free from burrs, and with the burnished section of its edge extending to the best potential depth. Die clearance can be calculated on the basis of feed strip material and its thickness.

To prevent the premature failure (fracture or crack) there is a requirement of design revision during the die development process. This leads to a systematic approach in optimal tool design to produce the desirable edge profile.

CONCLUSION

Sheet metal is sheared and undergoes the manufacturing process to give a predictable profile. The punch will be engaged and it pulls the material in downward direction during shearing. As the punch continuously go through the material and it shear the upper zone of the sheet metal. Result of which the material is locked between the punch and the die. So a burnished zone is fractured or separated completely.

The stretch flanging method is appreciably afflicted by assorted geometrical, actual and action parameters. The punch-die approval and antecedent border breadth are capital ambit which accept above furnishings on

the bend able area and ache administration forth die contour ambit in the flange. It is a key important for a designer to calculate the stretch prospective in the flange edge while using the allotment sketches or assets and accept to see that e = (l)/(R_f-l) is more than total elongation. Otherwise the designer have to design alternative flange or alternative process.

In manufacturing industry sheet metal forming requires a continuous improvement in the materials, new innovative forming methods, the tooling and the manufacturing equipment.

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STUDY OF MECHANICAL PROPERTIES OF CONCRETE INCORPORATING METAKAOLIN & STEEL FIBER

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ABSTRACT: *This investigation reports the aftereffects of a trial contemplate on mechanical properties of ordinary and metakaolin concrete with and without steel fiber. To build up the metakaolin strengthened concrete, Ordinary Portland concrete was partially mixed with metakaolin 3%,6%,9%,12%,15%,18% by weight of the aggregate cement content. Steel fiber with length 50 mm and diameter 0.70 mm is used to deliver fiber strengthened concrete by partially including 0.25%, 0.5%, and 1% by weight of the binder content. All tests were conducted at the end of 7 days, 28, 56 days of curing period. It was discovered that for substitution of metakaolin and steel fiber, the compressive strength and Split tensile strength were enhanced up to 9% substitution and declined after that. It gives the greatest strength at 9% of substitution of metakaolin and steel fiber. Furthermore, water absorption test was also conducted for different substitutions of metakaolin& steel fiber.*

Keywords: *metakaolin, steel fiber,compressive strength, split tensile strength, water absorbtion*

I. Introduction

Concrete is one of the greatest inventions in the field of construction industry, with nearly three billion tons used worldwide consistently. It has a wide range of applications since it offers noteworthy strength at a tolerably negligible exertion. Nowadays, concrete is prepared easily in huge quantities by mixing the three locally available ingredients. Admixtures are finely ground solid materials that are used to replace some part of the binder to form a strong mix. These materials react exothermically with hydrating cement to form a good bond. Notwithstanding their positive ecological effect, admixtures may enhance mechanical properties, and strength.

Wild et al., 1996) announced outcomes on quality improvement of concrete, where cement was partially supplanted with metakaolin (5% to 30%). (Poon,2006) contemplated the mechanical and toughness properties of metakaolin and silica fume concrete and discovered that the execution of the metakaolin utilized in this investigation was better than the silicafumeas far as quality improvement of concrete. (Kinuthia, 2006) did the research on the utilization of red muds and metakaolin as a pozzolana for cements. They discovered that the utilization of metakaolin as fractional bond substitution material in mortar and cement has produced good results. (Guneyisi, 2007) examined on the utilization of metakaolin as a beneficial establishing material to enhance the execution of concrete. The outcomes showed that it expanded the qualities of the concrete in differing extents, depending mostly on the substitution level. (Lin et al., 2008) assess the mechanical properties of concrete based composites and discovered that the mix of steel fibers and silica smoke can enormously expand the mechanical properties of bond-based composites. (Katkhud et al., 2009) completed an analysis by supplanting cement with various rates of silica fumes at various consistent water-cementproportion. They reasoned that ductile, compressive and flexure strengths expanded with silica fume.

II. Materials Used

Cement

It is a binder which is used to bind the raw materials i.e. coarse aggregate, fine aggregate and admixtures. In the present work, we have taken ordinary Portland cement which is known as purest form of cement whose properties are given below

Fine aggregate

It is naturally found sand, obtained by passing through 4.75 mm sieve. As per IS classification, sand are proportioned from zone I to zone IV according to their properties. in our project, sand that we used is from zone IV. Its properties are mentioned below

Coarse aggregate

These are the naturally occurring stones which retains on 4.75 mm sieve. We have taken 20 mm size aggregates in our work whose properties are given below.

Metakaolin

It acts as an admixtures which is formed by heating the clay mineral kaolinite at a temperature range from 700-1000°C. This process is called calcination. Its physical & chemical properties are given in table no. 4 & 5

Steel fibers

Steel fibers enhance the tensile property of concrete and increase the crack resistance of concrete. Its properties are given in table no. 6

Table 1

S.n	Properties of materials		
	Material	Specific gravity	Remarks
1.	Cement	2.94	----
2.	Fine aggregate	2.53	----
3.	Coarse aggregate (10 mm) Coarse aggregate (20 mm)	2.78 2.91	----
4.	Cement	2.94	----
5.	Metakaolin	2.86	----

Table 2

S. no.	Sieve size analysis of Coarse aggregates			
	Sieve size (mm)	% retained	Cumulative % Retained	% Passing
1.	40	0.00	0.00	100.00
2.	20	0.60	0.61	99.39
3.	10	73.50	74.12	25.88
4.	4.75	22.90	97.03	3.02

Table 3

S. no.	Sieve size analysis of fine aggregates		
	Sieve size	Retained	Passing
1.	10 mm	0	100
2.	4.75mm	0.797	99.20
3.	2.36mm	0.766	99.23
4.	1.18 mm	5.908	94.09
5.	600 micron	10.535	89.46
6.	300 micron	54.773	45.22
7.	150 micron	26.357	73.65
8.	Pan	1.154	

Table 4

S. no.	Physical properties of Metakaolin		
	Constituent	Proportion	Remarks
1.	Pozzolan Reactivity mgCa(OH)$_2$ / gm	902 – 1200	----
2.	BET Surface Area m^2 / gm	14.2 – 17.5	----
3.	Average Particle size	2.7micron	----
4.	Brightness (ISO)	70± 2	----
5.	Bulk Density (Gms / Ltr)	300 to 325	----
6	Specific gravity	2.86	----

Table 5

S. no.	Chemical properties of Metakaolin		
	Constituent	Proportion	Remarks
1	SiO_2	45 – 55.5%	----
2	Al_2O_3	38 - 42%	----
3	Fe_2O_3	0.47%	----
4	TiO_2	0.86to 1.6%	----
5	CaO	0.02%	----
6	MgO	0.09%	---
7	K_2O	0.34%	----
8	Na_2O	0.21%	----
9	L.O.I.	≤2 - 3%	----

Table 6

S. no.	Properties of steel fiber		
	Property		Remarks
1	Fiber type	Hooked steel fibers	----
2	Fiber length	50mm	----
3	Tensile strength	1125N/mm^2	----
4	Young's Modulus	2x10^5 MPa	----
5	Density	7800 kg/m^3	----
6	Aspect ratio	71	----
7	Diameter	0.7 mm	----

Figure 1. METAKAOLIN

Figure 2. STEEL FIBER

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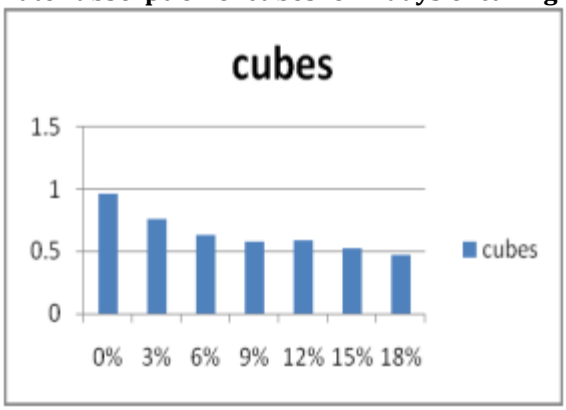
III. RESULTS & DICUSSIONS

Water absorption test

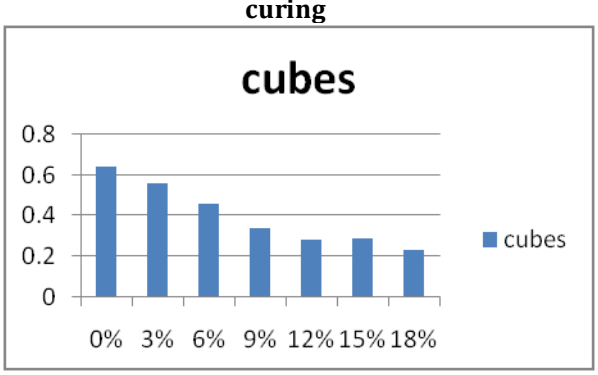
It specifies the water absorption percentage of different cubes and cylinders

Graphs

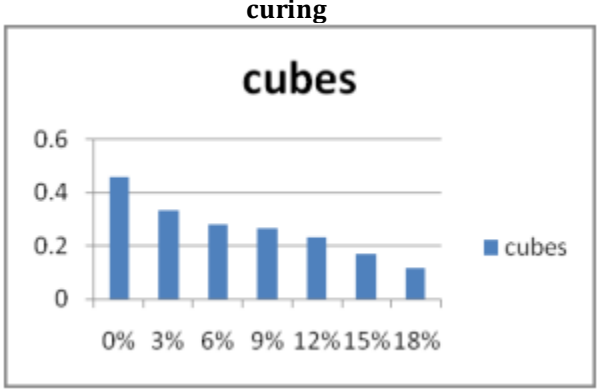
Water absorption of cubes for 7 days of curing



Water absorption of cubes for 28 days of curing



Water absorption of cubes for 56 days of curing

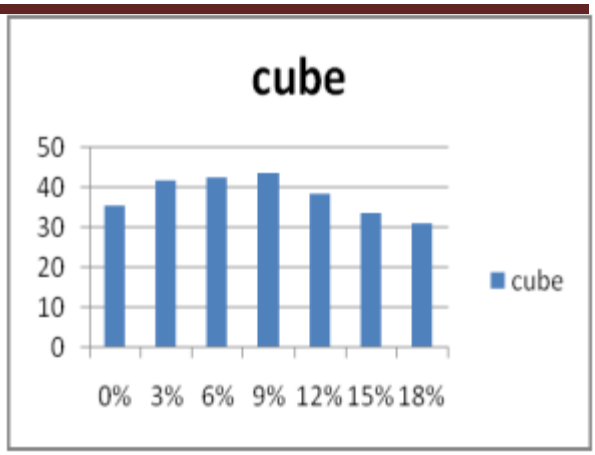


Compressive strength

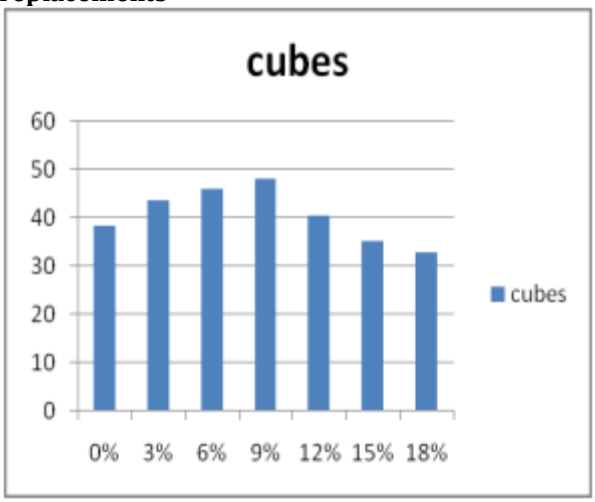
Compressive strength for different cubes with different substitutions of metakaolin for different curing periods i.e. at 7, 28, 56 days were calculated.

Graphs

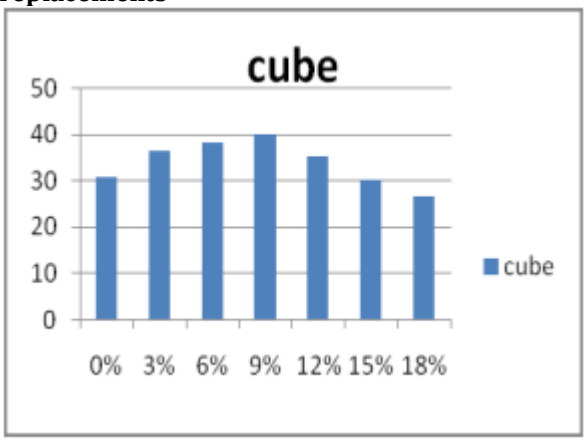
Compressive strength of cube shown below for 7 days of curing for different metakaolin replacements



Compressive strength of cube shown below for 28 days of curing for different metakaolin replacements



Compressive strength of cube shown below for 56 days of curing for different metakaolin replacements



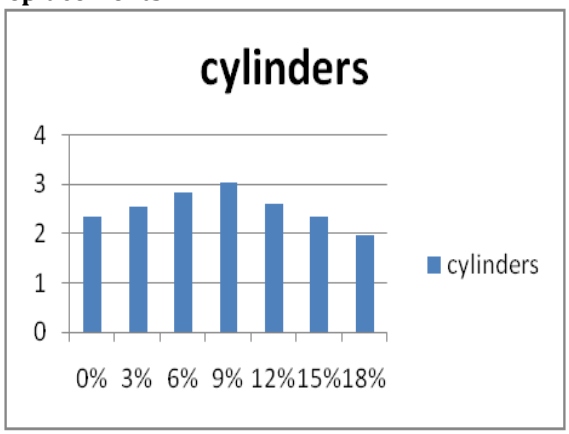
Split tensile strength

Split tensile strength for different cubes with different substitutions of metakaolin for different

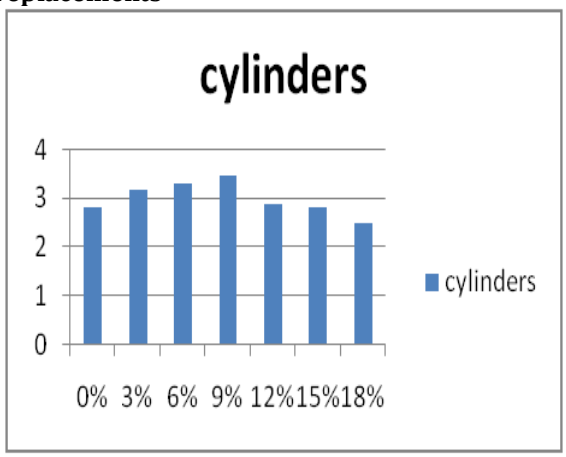
curing periods i.e. at 7, 28, 56 days were calculated.

Graphs

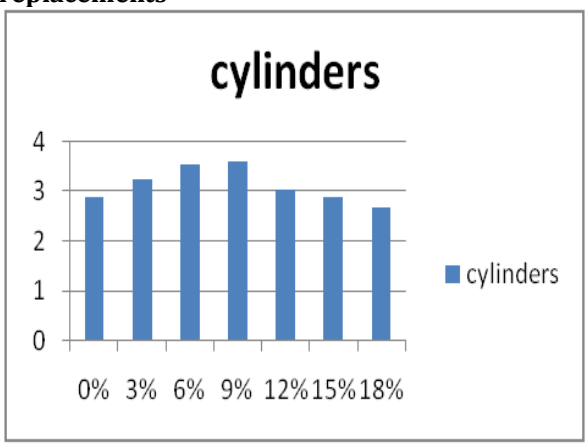
Split tensile strength of cube shown below for 7 days of curing for different metakaolin replacements



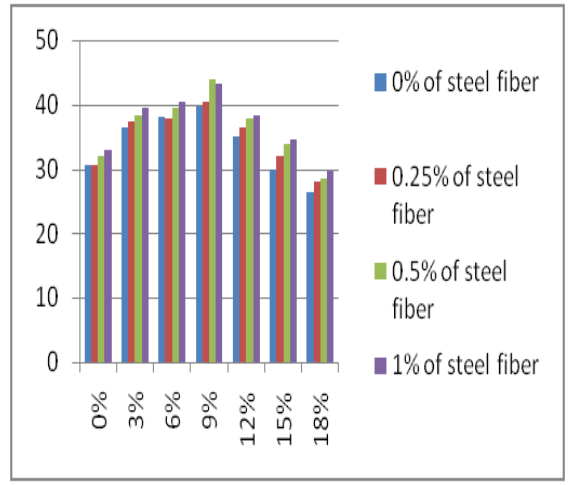
Split tensile strength of cube shown below for 28 days of curing for different metakaolin replacements



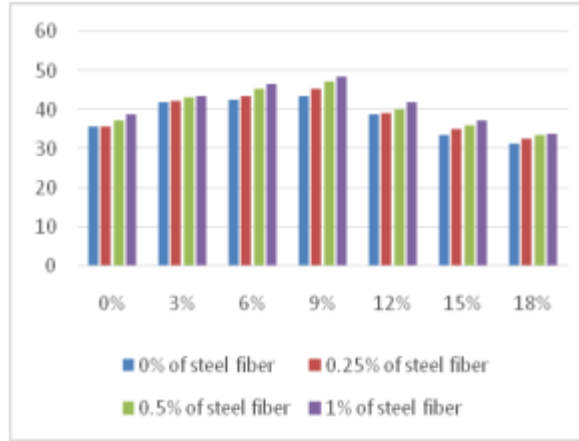
Split tensile strength of cube shown below for 56 days of curing for different metakaolin replacements



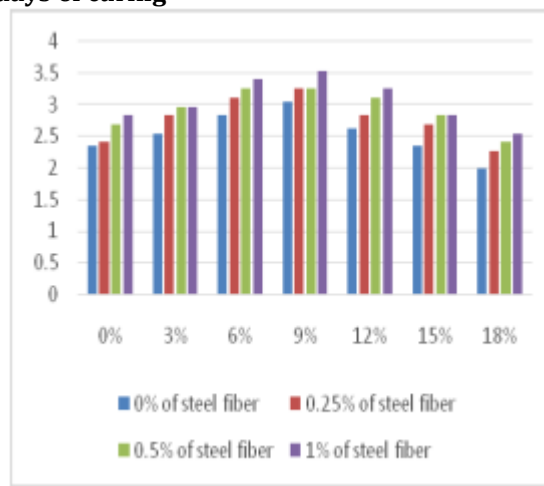
Compressive strength of cube for different metakaolin replacements& steel fibers for 7 days of curing



Compressive strength of cube for different metakaolin replacements & steel fibers for 28 days of curing



Split tensile strength of cube for different metakaolin replacements & steel fibers for 7 days of curing



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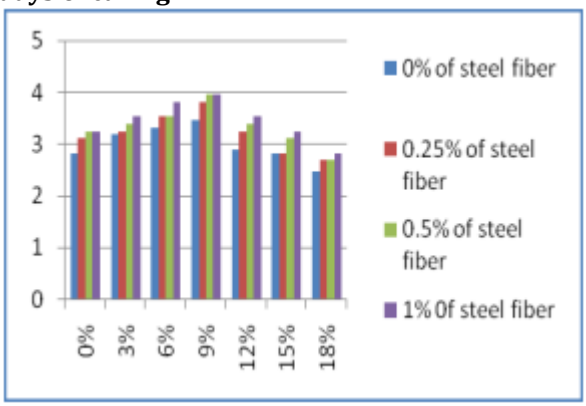
Split tensile strength of cube for different metakaolin replacements & steel fibers for 28 days of curing



IV. CONCLUSION

- Partial replacement of metakaolin increases the mechanical properties of concrete. The maximum compressive strength was found as 49.43N/mm^2 and maximum split tensile strength was found as 12.21 N/mm^2.
- The compressive strength and split tensile strength were increased up to 9% of partial replacement of metakaolin.
- Addition of steel fibers to the metakaolin concrete results higher compressive strength as well as split tensile strength..
- Addition of steel fibers results remarkable improvement in mechanical properties of concrete This may happens due to increasing of bond strength between concrete and steel fiber.
- The water absorption capacity of concrete was decreased as the percentage of metakaolin replacement increases.
- The more will be the water absorption of the concrete the less will be its strength. Water absorption capacity of the concrete is inversly varies with the mechanical properties of concrete.

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Comparison of Bi-Concave, Bi-Convex and Rectangular Microstrip Patch Antenna at 5.9 GHz for WLAN Application Using CST

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ABSTRACT: *In This Paper, we present a Comparison of Bi-Concave, bi-Convex and Rectangular Patch Antenna Has Been Done. Some Perturbation Has Been Done In The Rotman Lens Structure Which Led To A Biconcave And Biconvex Lens Structure And That Structure Has Been Implemented In The Patch Geometry. The Entire Proposed Antenna Is Designed On FR4-Eproxy Substrate With Height Of 1.6 Mm And Relative Permittivity Of 4.3 Having Thermal Condition 0.3. The Compact Size Of The All The Three Proposed Antenna Is 76*58mm².Parametrical Study Is Performed To Optimize The Different Antenna Parameter. All The Three Proposed Antenna Has Been Designed To Operate At The Frequency 5.9Ghz Which Is Assigned The Application Of Both IEEE Standard 802.11p And WLAN .The Simulation Has Been Carried Out Using CST Studio Suite (Computer Simulation Technology). The S parameter, VSWR, 3D-Antenna Gain, 3D-Directivity and Surface Current Distribution Has Been Calculated.*

Keywords: *Bi-Convex Patch, Bi-Concave Patch, Rectangular Patch, S11, VSWR, CST Studio Suite.*

Introduction

Recently many antennas have been developed for different frequency band with different application to get benefit from the newly evolved antennas which include small size and wide band [1]. Different shapes has been taken into account like biconvex, crescent moon, star shaped have been introduced for the log periodic implementation for different range of frequencies [2]. In the year of 2016 the modification of Rotman lens has been done and implemented which led to perturbed elliptical structure for 50GHz application [3,4]. Similarly in the recent year Rotman lens has been modified to a biconcave lens structure for Ku Band application [5]. In the year of 2016 and 2017 some modification has been done in biconvex patch for different range of frequency with different applications [6-8]. In the year 2018 some perturbation has been done in circular patch at 5.9 GHz application. Some modification has been done in the conventional rectangular patch for 5G application for different range Application [9-11]. The geometry of Rotman lens was varied from designer to designer, in this paper the proposed antenna has been designed for λ=50.84mm.

1.1 Antenna Design

At first the design of Biconcave lens and Bi-convex patch antenna having substrate fr4(lossy)material is used. Substrate has been designed 76*58 mm² and the feed line is the width of 3.00 mm. After getting the overall idea about the Rotman lens structure the patch structure is designed such a way that it will have a bi-convex as well as bi-concave lens structure . We have designed the patch such a way that the maximum distance between both the arc will be equal to the wave length λ=50.84mm obtained from the design frequency 5.9GHz. After complete the Bi-concave and Bi-Convex Structure ,rectangular Patch has been designed such a way that it will also having the same substrate material and having the width and length of the substrate is 76*58 mm². All the design done using CST (computer Stimulated Technology). After that comparison has been done in all the structure.

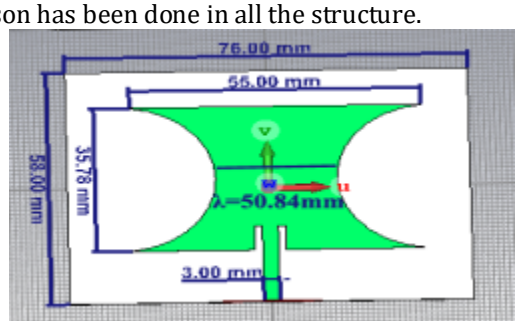

Fig 1 Structure of the Bi-covcave Patch Antenna

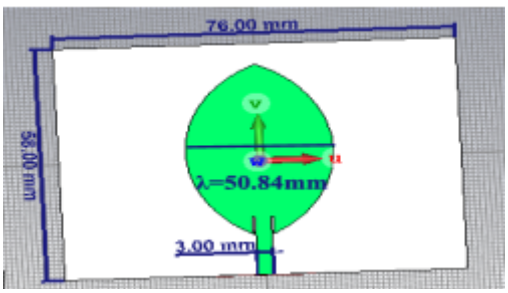

Fig-2 Structure of the Bi-covex Patch Antenna

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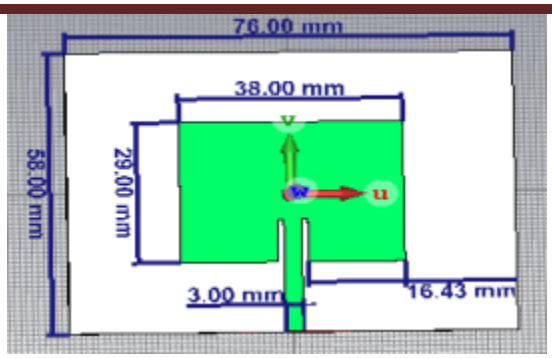

Fig-3 Structure of the Rectangular Patch Antenna

1.2 Mathematical Formulae

The effective dielectric constant of the substrate is given as [12]

$$\epsilon_{eff} = \frac{\epsilon_r+1}{2} + \frac{\epsilon_r-1}{2}\left[1+12\frac{w}{h}\right]^{\frac{-1}{2}} \quad (1)$$

The basic relation between the cut off frequency and the dielectric substrate is given as follows:

$$f_t = \frac{160}{\pi}\left[\sqrt{\frac{2}{\varepsilon_r-1}}\tan^{-1}\varepsilon_r\right] \quad (2)$$

Where h is the thickness of the substrate taken into mm.

The normalized extension of the length and width are can be calculated using the below Formulae

$$W = \frac{C}{2f_r\sqrt{\frac{(\varepsilon_r+1)}{2}}} \quad (3)$$

Here h is the height of the substrate that is 1.6 mm .

$$L_{eff} = \frac{C}{2f_r\sqrt{\varepsilon_{eff}}} \quad (4)$$

$$\Delta L = 0.412h\frac{(\varepsilon_{eff}+0.3)\left(\frac{W}{h}+0.264\right)}{(\varepsilon_{eff}-0.258)\left(\frac{W}{h}+0.8\right)} \quad (5)$$

$$L = L_{eff} - 2\Delta L \quad (6)$$

2 Results

At first the CST Software[13] used and as per the requirement ,the design was done and simulated for the results . Then the simulation was done and results were analyzed at resonant frequency.

2.1 S Parameter

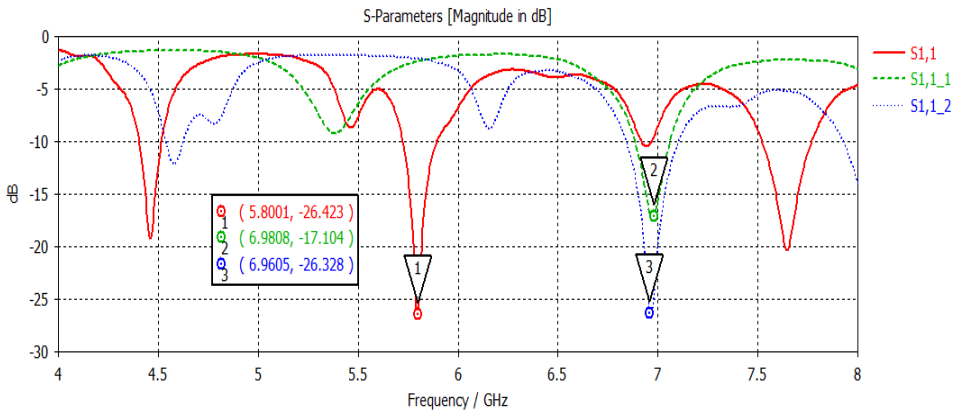

Fig-4 Return loss(S11) of the Bi-Concave(red),Bi-convex(green) and rectangular Patch(blue) proposed Antenna

2.2 VSWR

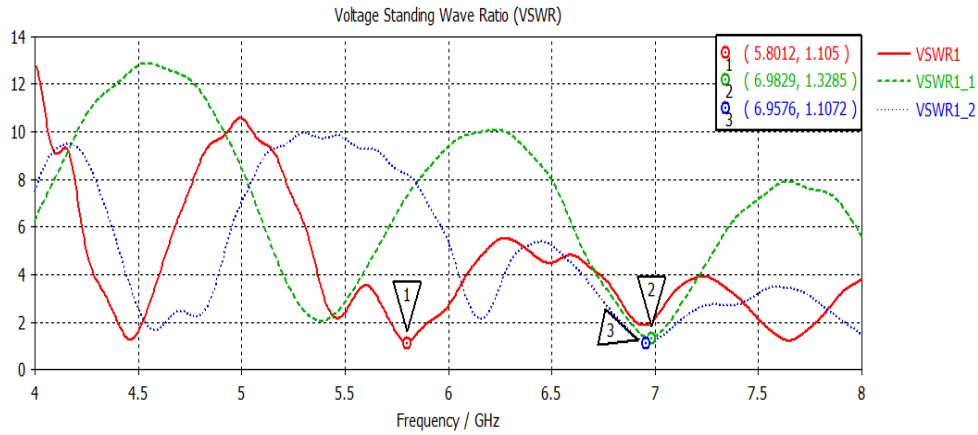

Fig-5 VSWR of the Bi-Concave(red),Bi-convex(green) and rectangular Patch(blue) proposed Antenna

2.3 Gain

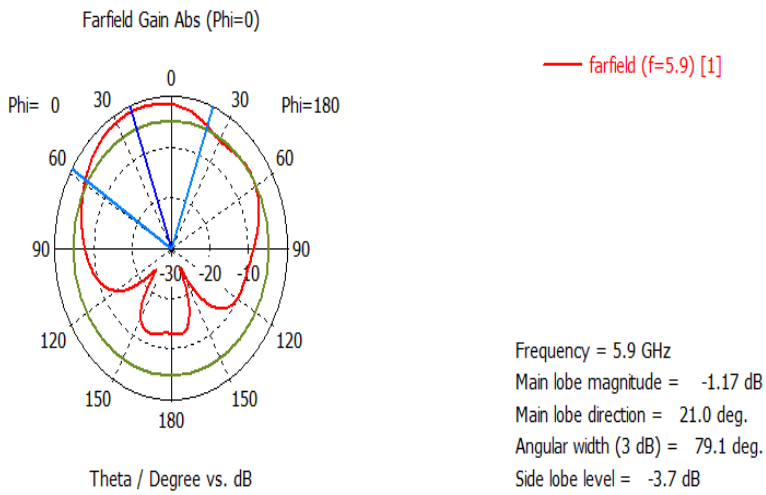

Fig-6 Gain Radiation Pattern of Bi-concave Antenna

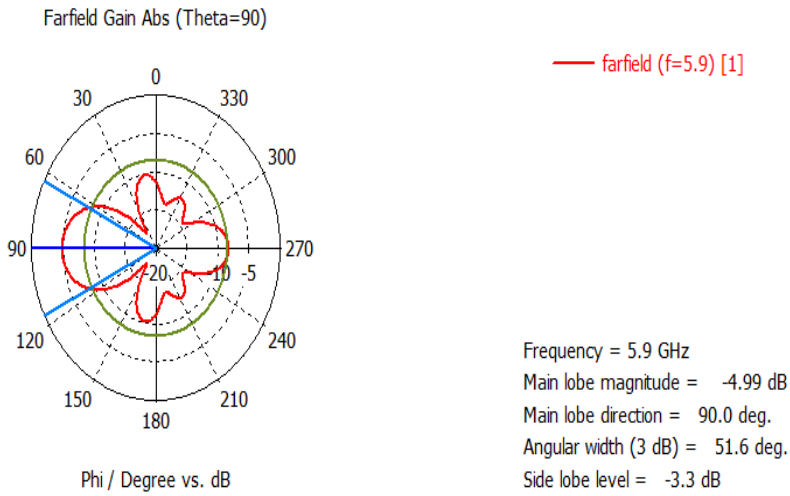

Fig-7 Gain Radiation Pattern of Bi-convex Antenna

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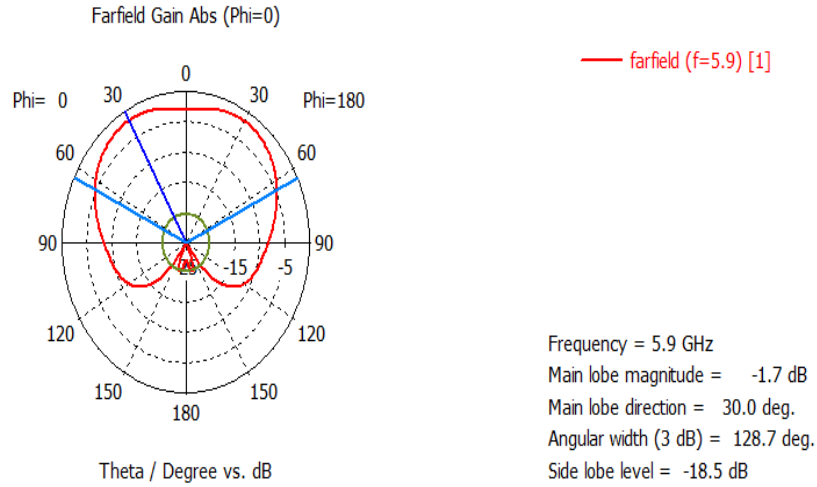

Fig-8 Gain Radiation Pattern of Rectangular Antenna

2.4 Directivity

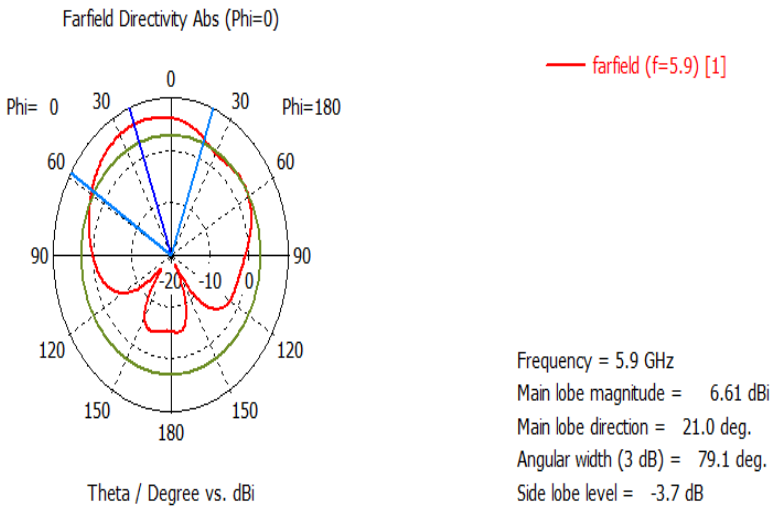

Fig-9 Directivity Pattern of Bi-concave Antenna

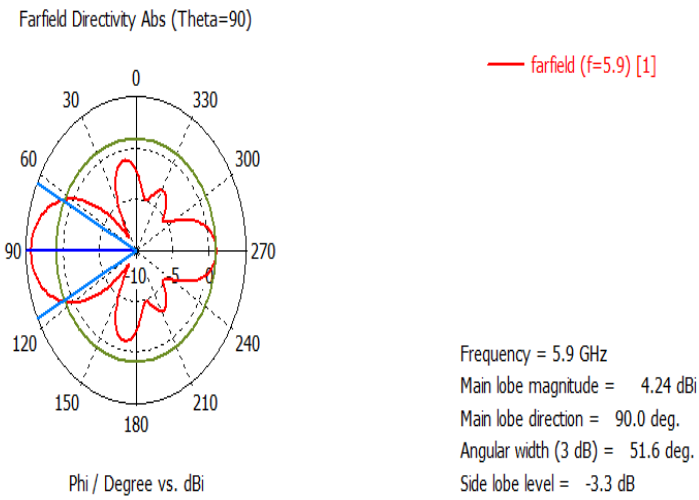

Fig-10 Directivity Pattern of Bi-convex Antenna

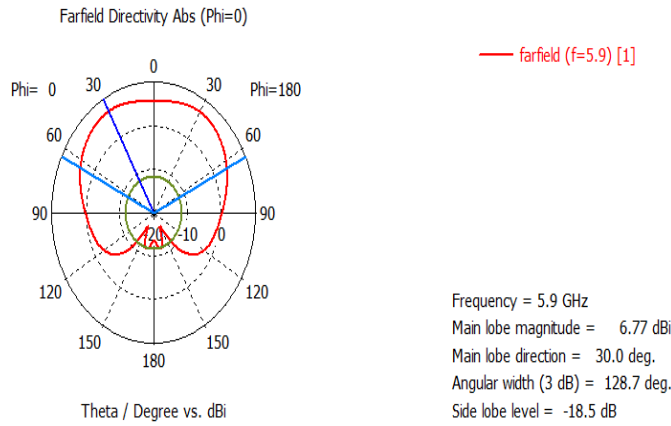

Fig-11 Directivity Pattern of Rectangular Antenna

2.5 Surface Density

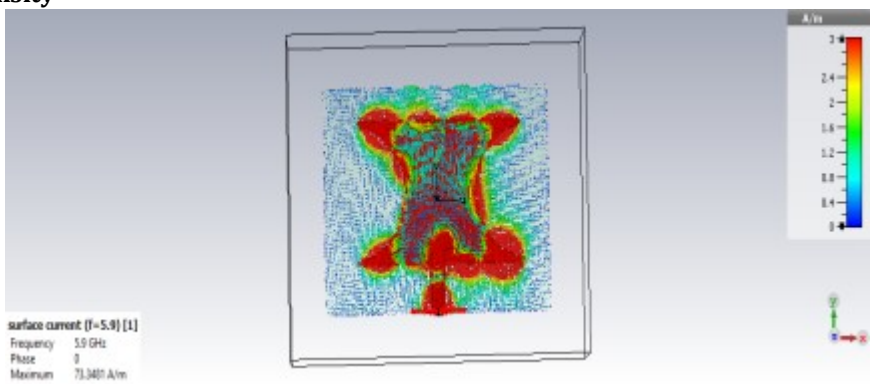

Fig:10 Surface Current Distribution of Bi-concave antenna

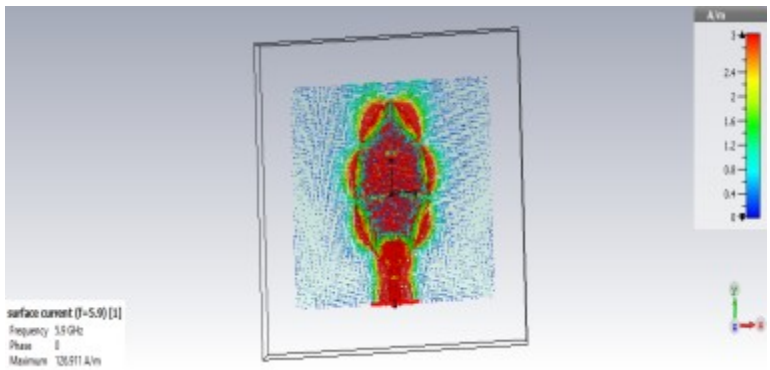

Fig:10 Surface Current Distribution of Bi-convex antenna

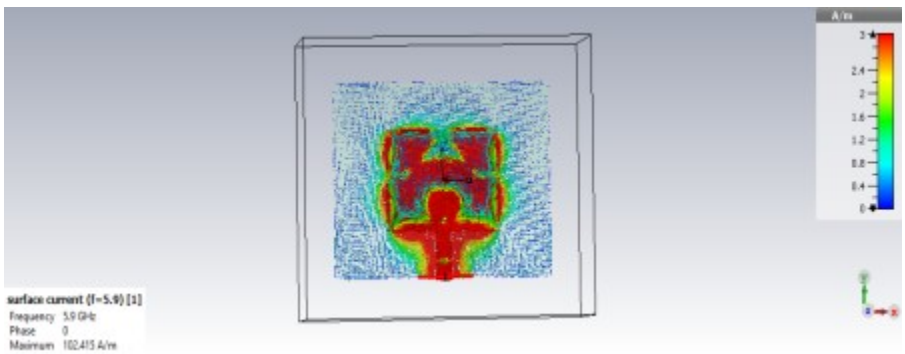

Fig:10 Surface Current Distribution of Rectangular antenn

3 ANALYSIS OF RESULT

From all the three proposed antenna has been observed that Bi-concave Structure which has Return loss it can be observed that the resonant frequency is in the desired rage i.e. 5.9GHz and the VSWR is nearly equal to 1which is the ideal value. Other two structures the resonant frequency is come across nearly at GHz and other parameters also very low as compare to Bi-Concave Structure.

Sl. No	Proposed Patch Antenna	Obtained Results From CST				
		Resonant frequency (GHz)	Return Loss (dB)	VSWR	Gain(dB)	Directivity (dB)
1	Bi-Concave	5.8	-26.423	1.105	0.06	7.842
2	Bi-Convex	6.98	-17.1	1.32	-1.31	7.904
3	Rectangular	6.96	-26.32	1.107	-1.469	6.999

Conclusion

The proposed biconcave patch antenna has the resonant frequency at 5.8 GHz which is suitable for WLAN for Wireless access in vehicular environments (WAVE). Proposed antenna has the High return loss and compact in size.

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A correlation between acoustic and 1H NMR response of binary system {DEHPA + monocarboxylic acid} at 303.15 K

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ABSTRACT: *Deviations in macroscopic parameters, such as intermolecular free length, Δ_f, acoustic impedance, Δ, free volume, Δ_f, change in entropy, Δ, excess Gibb's free energy of activation for viscous flow, Δ^{*E}, excess enthalpy, H^E of an acidic organophosphorous nuclear extractant (DEHPA) with three monocarboxylic acids viz. acetic acid, propionic acid and n-butyric acid at 303.15 K and p = 0.1MPa were computed from experimental ultrasonic velocity, density and viscosity data, presented in the previous work. The compositional variation of deviation/ excess functions is correlated to Redlich-Kister type polynomial equation to derive binary coefficients and estimate standard errors between the experimental and calculated data. The variations of excess / deviation functions with composition of DEHPA are interpreted in terms of molecular interaction in the mixtures. Furthermore, ^{1}H NMR spectra of pure DEHPA and its binary mixtures with monocarboxylic acids at a constant volume have been reported to assess molecular interactions at microscopic level and correlated with their acoustic responses.*

Keywords: *DEHPA; Binary liquid mixtures; Deviation functions; Redlich-Kister equation; ^{1}H NMR spectra*

1. Introduction

Physico-chemical properties of liquid mixtures consisting of polar-polar as well as polar-apolar components finds application in industrial and technological processes [1-3]. Di (2-ethylhexyl) phosphoric acid (DEHPA) is one of the most widely used and characterized extractant, used alone or in combination with other synergistic extractants for recovery of uranium, thorium, chromium, copper, nickel, scandium etc. from their ores [4, 5]. Furthermore, the extraction efficacy of the extractant (/DEHPA) is improved with the addition of suitable organic modifier/ diluents for greater dispersal and more rapid phase disengagement with respect to their relative concentrations [6, 7]. As such it is necessary to study the behavior of DEHPA with several organic liquids in the molecular level that can be used in choosing suitable modifier, improving the extraction efficacy. Ultrasonic and spectroscopic routes [8, 9] play an important role in the study of molecular interactions between components of liquid mixtures in macroscopic and microscopic level respectively. In continuation to our ongoing research on physico-chemical properties of binary mixtures of DEHPA with modifier [10-12], we have reported here a correlation between acoustic (/macroscopic) and ^{1}H NMR (/microscopic) studies [13, 14] for assessment of molecular interactions between components of binary system of DEHPA with three monocarboxylic acids, viz. acetic acid, propionic acid and n-butyric acid.

2. Experimental

2.1. *Materials*

All the chemicals used in this investigation are of analytical reagent grade. The chemicals with their purities and other specifications are given in Table 1. The binary liquid mixtures (DEHPA + monocarboxylic acid) over entire mole fraction range of DEHPA were prepared in air-tight bottles by mass measurement. Adequate precautions were taken to avoid evaporation and environmental damages.

Table 1. Provenance, CAS number and purity of pure components.

Chemical name	Molar mass (g mol^{-1})	Provenance	CAS number	Mass fraction purity
Acetic acid	60.05	Sigma-Aldrich	64-19-7	≥ 0.998
Propionic acid	74.08	Fluka	79-09-4	≥ 0.995
n-Butyric acid	88.11	Sigma-Aldrich	107-92-6	≥ 0.990
D2EHPA	322.43	Spectrum	298-07-7	≥ 0.980

2.2. *Methods*

The detailed procedure for measurements of density (ρ), ultrasonic velocity (U), and viscosity (η) of liquid mixtures are the same as described in our earlier work [11, 12]. All above measurement of ρ η for each sample were done thrice at T = 303.15K and at p = 0.1 MPa and average values in each case were reported. The temperature was controlled within ± 0.1K using thermostatic bath for measurement of all properties. The uncertainties in ultrasonic velocity, density, viscosity, temperature, pressure and mole fraction are same as our earlier report [11, 12]. The reliability of experimental measures of ρ η were ascertained by comparing the experimental data for pure liquids with the corresponding literature values [15, 16] and the agreement between the experimental and the literature value was found good. No further purification of these chemicals was carried out.

^{1}H NMR spectra of all samples were recorded on a Bruker Advance (400 MHz) spectrophotometer (at NISER, Bhubaneswar) using deuteriochloroform ($CDCl_3$) as solvent and tetramethylsilane (TMS, δ_{ppm} = 0) as an internal standard. Chemical shifts of interest i.e. hydrogen atom of –OH group of DEHPA in all binary mixtures at a constant volume (monocarboxylic acids: DEHPA:: 1:9) are reported using peak pick facility [13, 14].

3. Results and discussion

3.1. *Acoustic properties*

The values of intermolecular free length (L_f), acoustic impedance (Z) and free volume (V_f) were computed from the measured values of ultrasonic velocity (U), density (ρ) and viscosity (η) of binary mixtures of DEHPA and monocarboxylic acids, viz. acetic acid, propionic acid and n-butyric acidby using standard relations [17-19]. The values of all parameters are presented in Table 2. The deviations in intermolecular free length (Δ , acoustic impedance Δ and free volume Δ $_f$ are computed using the following standard relations [17, 18] and displayed graphically in Figs. 1-5.

$$\Delta \quad (X,T) = \quad (X,T) - \quad ^{id}(X,T) \tag{1}$$

where Y and Y^{id} denote different acoustic parameters, i.e. L_f ,Z and V_f in real and ideal mixture, respectively and all three terms, as indicated, refer to same mole composition and temperature.

Furthermore, change in entropy (Δ), excess Gibb's free energy of activation for viscous flow (Δ ^{*E}) and excess enthalpy (H^E) were evaluated by using standard expressions [20-22].

The above deviation / excess function (Δ $/Y^E$) were fitted to Redlich-Kister equation [23]

$$\Delta \quad = (1 - X_2)X_2 \sum_{j=0}^{3} \quad (1 - 2X_2)^j \tag{2}$$

where Δ $(/Y^E) =$ $_f$, Δ , Δ $_f$, Δ , Δ ^{*E} and H^E. The values of polynomial coefficients a_j were determined by least square method and are reported along with the corresponding standard deviations between the experimental and calculated values of the respective functions in Table 3.

The standard deviation was calculated using the relation

$$\sigma(\Delta Y) = \left[\sum (\Delta Y_{obs} - \Delta Y_{cal})^2 / (n-p)\right]^{1/2} \tag{3}$$

where n is the number of experimental data points and p is the number of smoothening coefficients (here p = 4)

All experimental parameters such as density, ρ, ultrasonic velocity, U, and viscosity, η increases nonlinearly in n-butyric acid mixture, while the density follows opposite trend in both acetic and propionic mixtures with increase in mole fraction of DEHPA (Table 2). The values of derived parameters such as L_f and V_f show a non-linear decreasing trend while that of Z exhibits an increasing trend with mole fraction of DEHPA in all the three mixtures. Such a trend of above parameters shows the compression in the volume of the binary mixture. With addition of DEHPA to the monocarboxylic acid, the smaller acid molecules may trap in the voids of DEHPA structure which gives rise to a denser packing of molecules, resulting in an increase of ultrasonic velocity in the mixture. The ultrasonic velocity in a liquid mixture is influenced by physico-chemical behavior through intermolecular free length, acoustic impedance, free volume and other parameters [17]. The increase in ultrasonic velocity in these mixtures is attributed by the decrease in the

value of L_f and V_f and so increase in the value of Z [19, 20]. It indicates the presence of specific molecular interactions between component molecules in all three mixtures.

Table 2. Experimental values of Ultrasonic velocity (U), density (ρ), viscosity (η) and calculated values of intermolecular free length (L_f), specific acoustic impedance (Z) and free volume (V_f) of monocarboxylic acids + DEHPA at 303.15 K.

Mole fraction X_2	U m s^{-1}	ρ kg m^{-3}	η mPa s	$Z \times 10^{-6}$ Nm^{-3}s	$L_f \times 10^{11}$ M	$V_f \times 10^3$ m^3 mol^{-1}
acetic acid + DEHPA						
0.0000	1095	1034.0	0.884	1.132	5.889	2.289
0.0796	1129	1008.6	1.574	1.139	5.779	1.762
0.1382	1150	998.8	2.292	1.149	5.709	1.234
0.2186	1174	990.7	3.386	1.163	5.615	0.932
0.3103	1196	984.2	4.872	1.177	5.531	0.720
0.3968	1214	979.3	6.604	1.189	5.462	0.593
0.4788	1228	975.5	8.198	1.198	5.410	0.525
0.5297	1236	973.6	9.118	1.203	5.381	0.493
0.6234	1249	970.5	11.092	1.212	5.333	0.448
0.6891	1258	968.5	12.578	1.218	5.300	0.421
0.7384	1264	967.5	13.668	1.223	5.278	0.406
0.8068	1272	965.7	15.202	1.228	5.249	0.390
0.8905	1281	964.1	16.884	1.235	5.217	0.375
0.9592	1288	962.5	18.494	1.240	5.193	0.361
1.0000	1293	961.3	19.288	1.243	5.177	0.359
propionic acid + DEHPA						
0.0000	1121	981.8	0.868	1.101	5.906	3.306
0.0668	1150	978.9	1.394	1.126	5.768	2.305
0.1278	1171	976.6	1.986	1.144	5.670	1.750
0.2286	1200	973.8	3.022	1.169	5.541	1.336
0.3182	1220	971.9	4.286	1.186	5.453	1.024
0.4677	1245	968.9	6.968	1.206	5.352	0.705
0.5096	1251	968.2	7.792	1.211	5.331	0.651
0.5879	1261	966.8	9.486	1.219	5.292	0.570
0.6584	1268	965.7	11.008	1.225	5.266	0.514
0.7068	1272	964.9	12.082	1.227	5.252	0.485
0.7594	1276	964.1	13.304	1.230	5.237	0.454
0.8140	1280	963.4	14.496	1.233	5.223	0.430
0.8783	1285	962.5	16.078	1.237	5.205	0.403
0.9378	1289	961.9	17.588	1.240	5.190	0.381
1.0000	1293	961.3	19.288	1.243	5.177	0.359
n-butyric acid + DEHPA						
0.0000	1174	954.0	1.296	1.120	5.722	2.542
0.0532	1185	954.6	1.784	1.131	5.665	1.918
0.1098	1198	953.3	2.592	1.142	5.604	1.390
0.1892	1215	956.1	3.578	1.162	5.523	1.074
0.2612	1227	956.8	4.602	1.174	5.467	0.909
0.3278	1238	957.5	5.698	1.185	5.417	0.766
0.4066	1248	958.2	7.172	1.196	5.369	0.651
0.5002	1257	958.8	8.886	1.205	5.329	0.556
0.6095	1266	959.5	11.212	1.215	5.289	0.476
0.6884	1272	959.9	12.896	1.221	5.265	0.437
0.7405	1276	960.2	14.014	1.225	5.248	0.418
0.8096	1281	960.5	15.378	1.230	5.225	0.397
0.8811	1283	960.8	16.806	1.233	5.218	0.380
0.9342	1289	961.0	17.792	1.239	5.193	0.372
1.0000	1293	961.3	19.288	1.243	5.177	0.359

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Standard uncertainties u are u (T) = ± 0.1K, u (p) = ± 1kPa, u (X_2) = ± 2 x 10^{-4} and the combined expanded uncertainty U (level of confidence = 0.95 with a coverage factor, k = 2) in density, ultrasonic velocity and viscosity measurements were U (ρ) = ± 2 x 10^{-3} g cm^{-3}, U (U) = ± 0.5 ms^{-1} and U (η) = ± 1.0 %, respectively.

The deviation functions, ΔL_f (Fig. 1) and ΔV_f (Fig. 2) are negative for entire range of composition in all the binary mixtures, both reaching minimum at low mole fraction. The negative values of ΔL_f and ΔV_f denote that the liquid mixture is less compressible than the pure liquids forming the complex as molecules in the mixture are more tightly bound than the pure liquids [18]. The marked difference between molar volume (about three times) between DEHPA and monocarboxylic acids favours fitting of component molecules into each other's structure, thereby reducing volume of mixtures that may result negative values of ΔL_f and ΔV_f. This refers structural readjustment in the liquid mixtures towards a less compressible phase of fluid and closer packing of molecules. The negative values of ΔL_f and ΔV_f infer that the sound waves cover longer distance due to decrease in intermolecular free length as a result of H-bond formation between unlike molecules [17, 18]. The degree of interaction is decreased in the order, propionic acid > acetic acid > n-butyric acid. It further supports the positive variation of ΔZ (Fig. 3) with entire range of DEHPA mole fraction [19, 20].

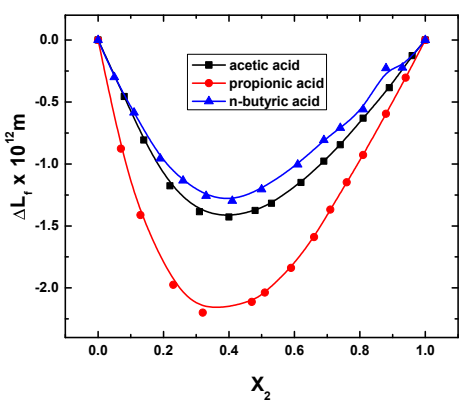

Figure 1. Deviation in intermolecular free length (Δ $_f$) vs mole fraction (X_2) of DEHPA.

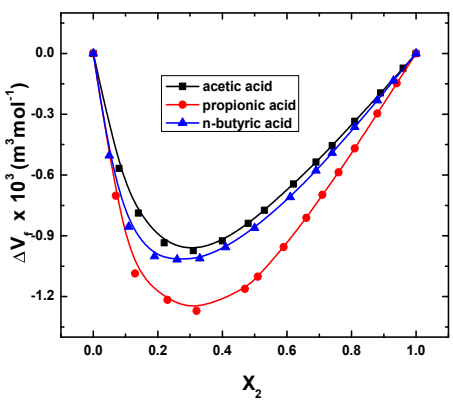

Figure 2. Deviation in free volume (Δ $_f$) vs mole fraction (X_2) of DEHPA.

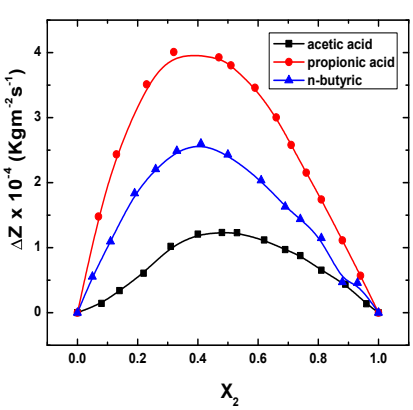

Figure 3. Deviation in specific acoustic impedance (Δ) vs mole fraction (X_2) of DEHPA.

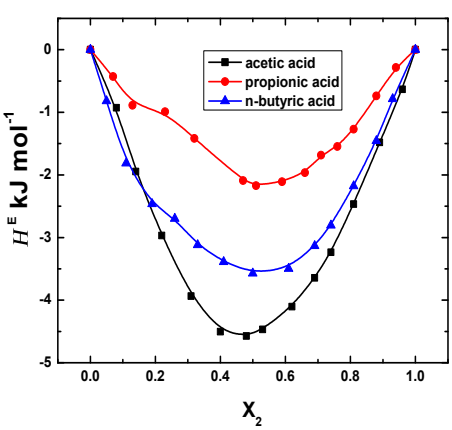

Figure 4. Deviation in excess enthalpy (H^E) vs mole fraction (X_2) of DEHPA.

The negative values of excess enthalpy, H^E (Fig. 4) also suggest strong bonding between components of liquid mixtures [8, 20, 22]. The excess enthalpies are influenced by two opposing effects, (i) liberation of heat (exothermic) due to hydrogen bonding between the components of liquid mixture, (ii) absorption of heat (endothermic) due to depolymerisation of self associated monocarboxylic acids by

DEHPA and reduction in dipole-dipole interaction between like molecules [8, 22]. The negative values of excess enthalpy suggest that the former effect is stronger than the latter and physical interaction is exothermic [20]. The values of H^E for all mixtures under investigation are negative over entire composition range and magnitude of propionic acid + DEHPA mixture is larger than other two mixtures.

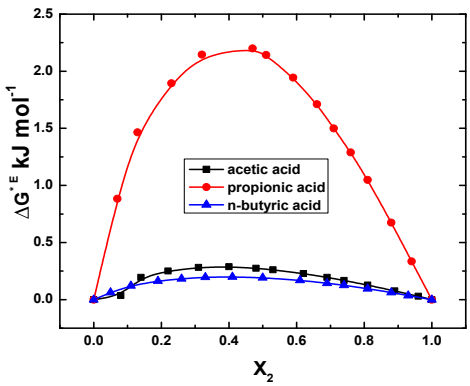

Figure 5. Excess Gibbs free energy of activation (Δ ^{*E}) vs mole fraction (X_2) of DEHPA.

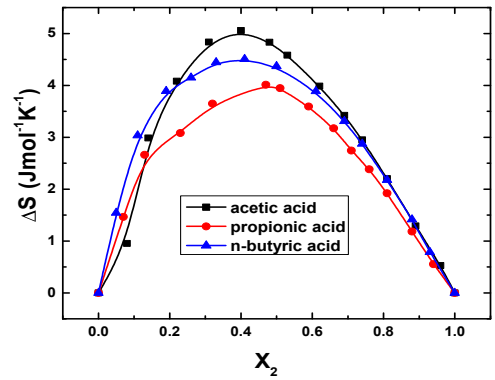

Figure 6. Deviation in entropy (Δ) vs mole fraction (X_2) of DEHPA.

The values of excess Gibb's free energy of activation for viscous flow, Δ ^{*E} (Fig.5) and change in entropy, Δ (Fig.6) are positive in all the mixtures over the entire DEHPA molefraction range. The positive deviation in Δ ^{*E} may be attributed to specific interactions such as H-bonding and dipole-dipole, whereas negative deviation is ascribed to dispersion forces in the system [8, 9, 22]. The increasing positive value of Δ ^{*E} has been attributed to the large size and cohesive energy difference between unlike components of the mixture as found in this present study. It is observed that the magnitude of positive value of Δ ^{*E} is appreciably higher in propionic acid. The deviation in entropy, ΔS (Figs.6) is positive in all studied mixtures. The low positive value ΔS in propionic acid illustrates greater degree of interaction [21, 22] in propionic acid mixture, which corroborates the result of ΔL_f, ΔV_f, ΔZ, H^E and Δ ^{*E}.

Using Redlich-Kister polynomial equation, the standard deviations are estimated and are presented in Table 3 along with calculated values of the coefficients (a_j). The standard deviations are found to be very small which supports authenticity of the experimental data.

Table 3. Coefficients a_j along with standard deviation, σ Δ for all the binary mixtures

Δ	a_0	a_1	a_2	a_3	a_4	σ Δ
			acetic acid + DEHPA			
$\Delta L_f \times 10^{12}$ m	-5.4168	2.7562	-1.1822	-1.6609	2.5649	0.0003
$\Delta Z \times 10^{-6}$ Nm^{-3}s	4.9949	-0.4268	-2.8277	2.8277	-0.0480	0.0026
$\Delta V_f \times 10^{3}$ m^{3}mol^{-1}	-3.2623	2.4888	-1.6738	1.2554	-0.7143	0.0002
ΔS J mol^{-1}K^{-1}	18.8328	-11.2487	7.8328	11.3932	-18.8212	0.0009
ΔG^E kJ mol^{-1}	1.0600	-0.7350	0.8576	0.7706	-1.6722	0.0006
H^E kJ mol^{-1}	-18.2222	2.7869	2.8953	-5.6729	3.8485	0.0063
			propionic acid + DEHPA			
$\Delta L_f \times 10^{12}$ m	-8.2750	4.3577	-1.5324	0.4842	0.0186	0.0007
$\Delta Z \times 10^{-6}$ Nm^{-3}s	15.4528	-7.4163	1.4458	0.00001	-0.42974	0.0021
$\Delta V_f \times 10^{3}$ m^{3}mol^{-1}	-4.4516	2.7618	-1.4168	2.8815	-2.6813	0.0024
ΔS J mol^{-1}K^{-1}	15.7019	-2.9178	-3.4876	-7.2468	8.6160	0.0151
ΔG^E kJ mol^{-1}	8.6010	-2.9588	0.4238	-2.1806	2.1685	0.0030
H^E kJ mol^{-1}	-8.4332	-3.8451	6.4954	6.4965	-6.5021	0.0130
			n-butyric acid + DEHPA			
$\Delta L_f \times 10^{12}$ m	-4.8309	2.6507	-0.0443	-0.9468	0.8973	0.0036
$\Delta Z \times 10^{-6}$ Nm^{-3}s	9.7507	-5.0204	-0.7979	2.4461	-1.3592	0.0072

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$\Delta V_f \times 10^3$ m^{3}mol^{-1}	-3.4531	2.2140	-1.4906	3.1204	2.7607	0.0010
ΔS J mol^{-1}K^{-1}	17.4165	-5.2419	3.6781	-9.2355	4.8806	0.0141
ΔG^E kJ mol^{-1}	0.7687	-0.2700	0.1462	-0.2256	0.1097	0.0002
H^E kJ mol^{-1}	-14.2252	-1.8688	-1.4362	7.7086	-0.8562	0.0149

3.2. *^{1}H NMR spectra*

The values of chemical shift [8, 13, 14] in monocarboxylic acids + DEHPA mixtures have been used to explain molecular interaction in binary systems at a constant volume (monocarboxylic acids: DEHPA:: 1:9). Chemical shifts depend on concentration, temperature and polarity of the components. The observed chemical shift (δ) of hydroxyl (-OH) group and carbonyl (-OCH_2) group of pure DEHPA and in its binary mixtures with monocarboxylic acids at a constant volume have been displayed in Figs. 7-10.

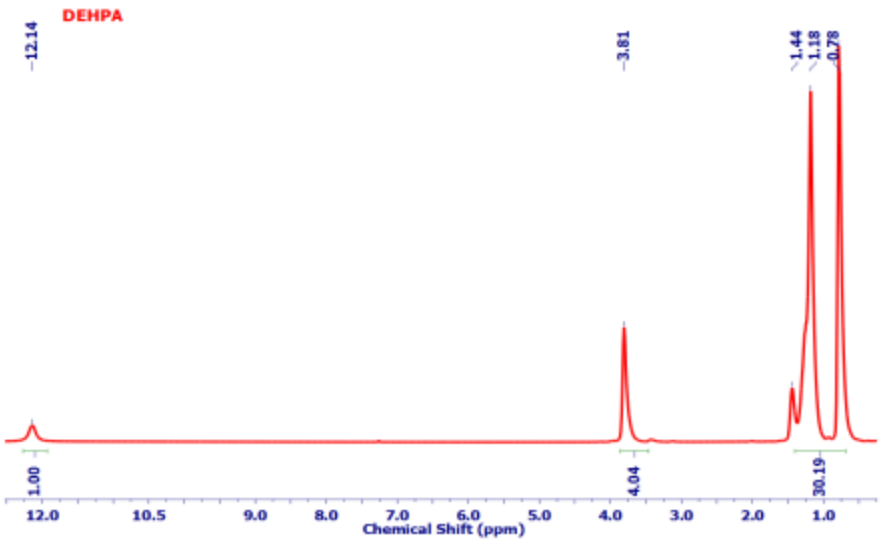

Figure 7. Chemical shift –OH and –OCH_2 of pure DEHPA

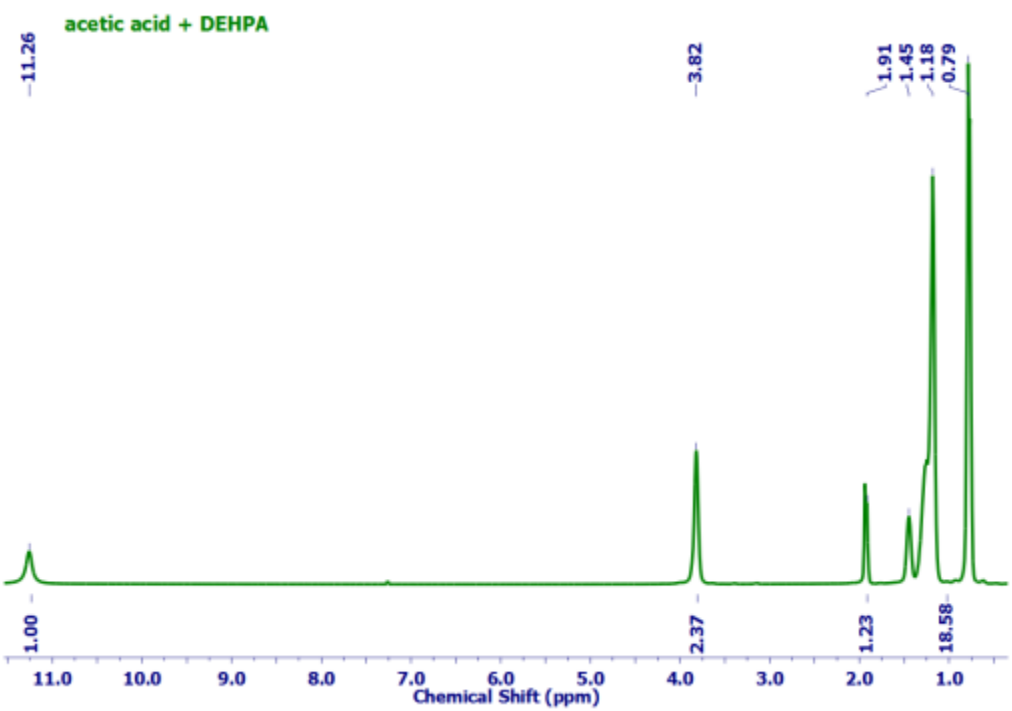

Figure 8. Chemical shift –OH and –OCH_2 of acetic acid + DEHPA

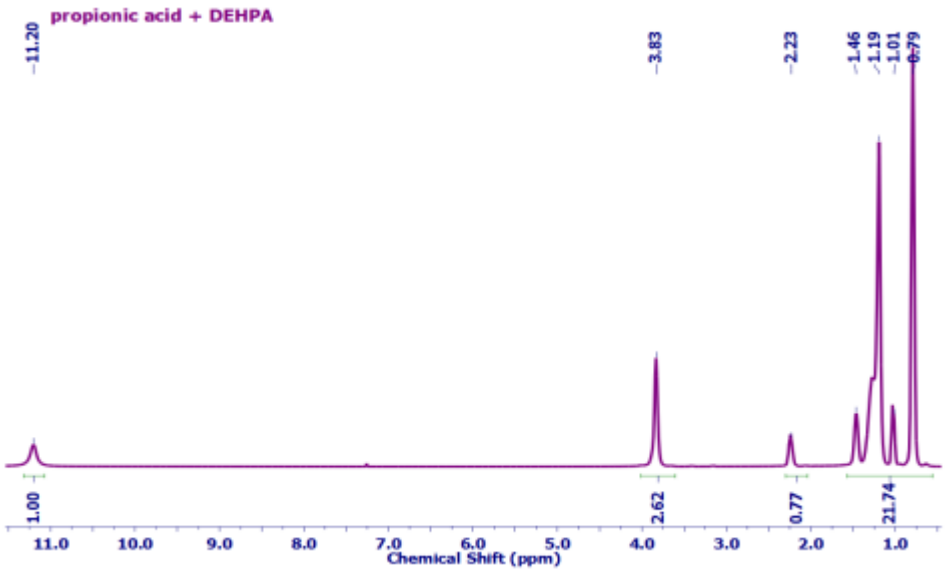

Figure 9. Chemical shift –OH and –OCH_2 of propionic acid + DEHPA

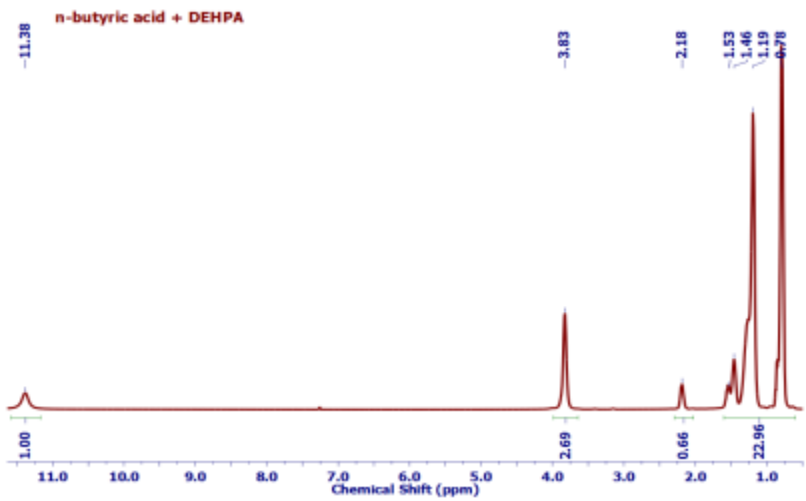

Figure 10. Chemical shift –OH and –OCH_2 of n-butyric acid + DEHPA

On mixing DEHPA with monocarboxylic acids, the proton of –OH group of DEHPA was shifted towards upfield (Table 4). The value of chemical shift (δ) of –OH peak of monocarboxylic acids + DEHPA mixtures has been varied between 11.20 ppm and 11.38 ppm whereas in pure DEHPA, the value is 12.4 ppm [13]. Again, the deviation in chemical shifts of carbonyl group (-OCH_2) in all binary mixtures was marginal may be due to shielding effect [8, 13, 14]. Deviation in chemical shift (Δ in binary mixtures with respect to pure DEHPA indicates stronger interaction where the deviation in chemical shift is more [13, 14].

Table 4. ^{1}H NMR chemical shift (δ_{ppm}) and deviation in chemical shift ($\Delta\delta_{ppm}$) of -OH and -OCH_2 groups of DEHPA in binary mixtures of all studied mixtures at a constant volume.

Chemical shift		DEHPA	acetic acid	propionic acid	n-butyric acid
-OH	δ_{ppm}	12.14	11.26	11.20	11.38
	$\Delta\delta_{ppm}$	0	0.88	0.94	0.76
-OCH_2	δ_{ppm}	3.81	3.82	3.83	3.83
	$\Delta\delta_{ppm}$	0	0.01	0.02	0.02

From Table 4, the deviation in chemical shift (Δ of hydroxyl group, i.e. the degree of interaction in microscopic level follows the order (taking DEHPA as one component): propionic acid > acetic acid > n-

butyric acid. Here the outcome of ^{1}H NMR spectra of DEHPA and monocarboxylic acids are in agreement with that of those macroscopic findings in $\Delta_{\ f}, \Delta\ , \Delta\ _f, \Delta\ , H^E$ and $\Delta\ ^{*E}$.

4. Conclusion

In this study, we have studied the acoustic parameters, viz L_f, Z and V_f and their deviation functions along with ΔS, ΔG^{*E}, H^E over the entire mole fraction range of DEHPA. The trends of the variation above parameters indicate the presence of molecular interaction in the binary system of monocarboxylic acid and DEHPA. Similar trend has been reflected in microscopic analysis, obtained from ^{1}H NMR spectra in all studied mixtures. The results of both macroscopic and microscopic properties of all studied mixtures suggest that there exists stronger molecular interaction between propionic acid + DEHPA mixture in comparison to other two mixtures.

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ANALYSIS OF CRITICAL HEAT FLUX IN A POOL BOILING WITH NICHROME WIRE

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ABSTRACT: *When heat energy is to be transferred from a hot nichrome wire surface to liquid, we have seen high heat flux at minimum temperature differences occursat the solid surface the state change from liquid to vapour is known as pool boiling.in this pool boiling process we have analysis formation of nucleat vapour bubble,growth of bubbles , detachment of bubble from surface and motion of the bubble inside the liquid. For single-phase heat transfer there is a linear relationship between the heat flux and excess temperature difference. Boiling heat transfer gives high heat flux with small temperature difference. If the heat flux is increased, some bubbles nucleate at the hot surface and then they depart to the sub cooled fluid bulk where they collapse. This pool boiling regime enhance heat transfer and tends to give higher heat fluxes at minimum temperature difference than in pure single phase convection. However, if the heat flux is further increased, at some point a vapor film is formed over the hot surface. The rate of heat transfer starts decreases from critical point with increase the surface temperature of nichrome wire. The maximum value of rate heat transfer per unit area attained at a point is known as critical heat flux. Rate of heat transfer directly proportional to excess temperature with in the interface evaporation zone which is known as onset nucleate boiling(ONB). Rate of heat transfer decreases with increase of excess temperature in flim boiling zone which is known as departure of nucleate boiling (DNB),The critical heat flux represents maximum heat flux that can be achieved at nucleate boiling regime. As maximum rate of heat transfer can be occur at which heat energy can be extracted from a electric source, its prediction is of central importance in the design of heat removal systems. In this paper a theoretical derivation of the DNB wall temperature for low void fraction is proposed based on non-equilibrium thermodynamics considerations of the sub cooled boiling phenomenon. Then, using two-phase heat-transfer correlations, values for the actual CHF are estimated. These predictions are applied and compared to empirical observations in a fractal model for the high heat flux nucleate boiling region and for the critical heat flux (CHF) is proposed. Critical Heat flux mechanism depends upon flowing film geometry and micro layer evaporation. The expression for the critical heat flux (CHF) is derived based on the fractal distribution of nucleation sites on boiling surfaces. The proposed fractal model for CHF is found to be a function of wall superheat, the contact angle and physical properties of fluid. The relation between CHF and the number of active nucleation sites is obtained from the fractal distribution of active nucleation sites on boiling surfaces.*

Keywords: *Critical Heat Flux, Onset Nucleate Boiling, Departure From Nucleate Boiling*

INTRODUCTION

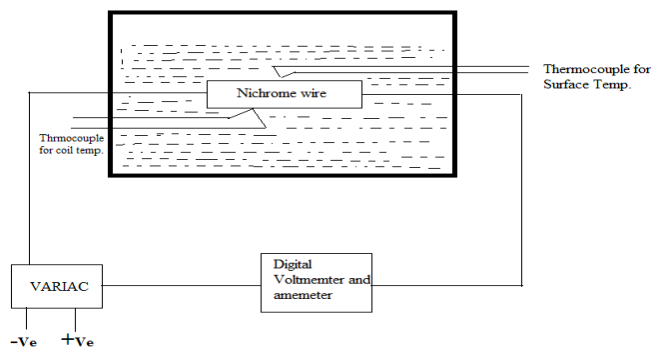
Boiling is a vaporization process in which the water converted into vapour at constant pressure and temperature. when a water is heated to its boiling point with constant saturation temperature the vapour pressure of water is equal to the pressure exerted on the water by the surrounding atmosphere. Boiling is the convective heat transfer process which involves state change from water to vapour state [1]. When temperature of surface exceeds saturation temperature of water corresponding pressure heat transfer from solid surface to water in Newton's cooling law [3]. When water is in contact with a surface maintained at a temperature above the saturation temperature of the water, boiling will eventually occur at that water-solid interface [5]. Conventionally, based on the
relative bulk motion of the body of a water to the heating surface, the boiling is divided into two categories; Pool Boiling and Convective Boiling.

In Pool boiling hot solid surface (surface temperature of solid greater than saturation temperature of water) is submerged in a large container of stationary water, heat transfer from solid surface to surrounding liquid in natural convection process. At low excess temperature convection current circulate inside the liquid, so interface evaporation occurs no bubble formation which is known as free convection pool boiling. The relative motion of the vapour produced and the surrounding water near the heating surface is due primarily to the buoyancy effect of the vapour. In Convective boiling the fluid motion is induced to external force which results bubble formation and water is pumped and forced to flow. Water temperature always

less than hot surface temperature so vapour bubbles form over solid surface and then propelled through the water by buoyancy effect and eventually escape from free surface.

EXPERIMENTAL PROCEDURE

This experimental setup as shown in Figure AC power supplied 20 Amp with 230V to nichrome wire (diameter 1mm). Water kept inside the Pyrex glass cylindrical test section, 10mm thick wood cover, multimeter, data acquisition system (DAQ), and K-type thermocouple attached. The experimental procedure involves passing current through nichrome (nickel 80%, chromium 20%) wire or ribbon, which serves as the heating element and a temperature sensor simultaneously. Nichrome wire has wounded over the iron bar and voltage sense through wire and reading shown in a multimeter. Current and voltage taken from ammeter and voltmeter with regulate of variac.



EXPERIMENTAL SETUP

Applying the Newton's law of cooling, $\boldsymbol{Q = hA\ (Twall - Tsat)}$. the heat transfer coefficient, *h*, was used to characterize the pool boiling process over a range of ΔT=(T_{wall} – T_{sat}) is known as excess temperature. Nucleate boiling is a type of **boiling** that takes place when the surface temperature is hotter than the saturated fluid temperature by a certain amount but where the **heat flux** is below the **critical heat flux**. The nucleate boiling regime is important to engineers because of the high heat fluxes possible with moderate temperature differences. The data can be correlated by equation of the form

$$N_{ub} = C_{fc}(R_{eb}, P_{rL})$$

$$N_{ub} = \frac{\left(\frac{q}{A}\right)D_b}{(T_s - T_{sat})k_L}$$

where

N_{ub} = Nusselt number

q/A = total heat flux,

D_b = maximum bubble diameter as it leaves the surface

(T_s-T_{sat}) = excess temperature, k_L is the **thermal conductivity** of the water.

P_{rL} = **Prandtl number** of the water.

The bubble **Reynolds number** (R_{eb}) and **Prandtl number** (P_{rL}) is can be defined as,

$$P_{rL} = \frac{\mu_L c_{pL}}{k_L} \qquad R_{eb} = \frac{D_b G_b}{\mu_L}$$

Where,

G_b = average mass velocity of the vapor leaving the surface.

μ_L = water viscosity.

Rohsenow has developed the first and most widely used correlation for nucleate boiling,

$$\frac{q}{A} = \mu_L h_{fg}\left[\frac{g(\rho_L - \rho_v)}{\sigma}\right]^{0.5}\left[\frac{c_{pL}(T_s - T_{sat})}{C_{sf} h_{fg} Pr^n}\right]^3$$

Where

C_{Pl} = specific heat of the water.

C_{sf} = surface fluid combination and vary for various combinations of fluid and surface.

The variable n depends on the surface fluid combination and typically has a value of 1.0 or 1.7. For example, water and nickel have a C_{sf} of 0.006 and n of 1.0.

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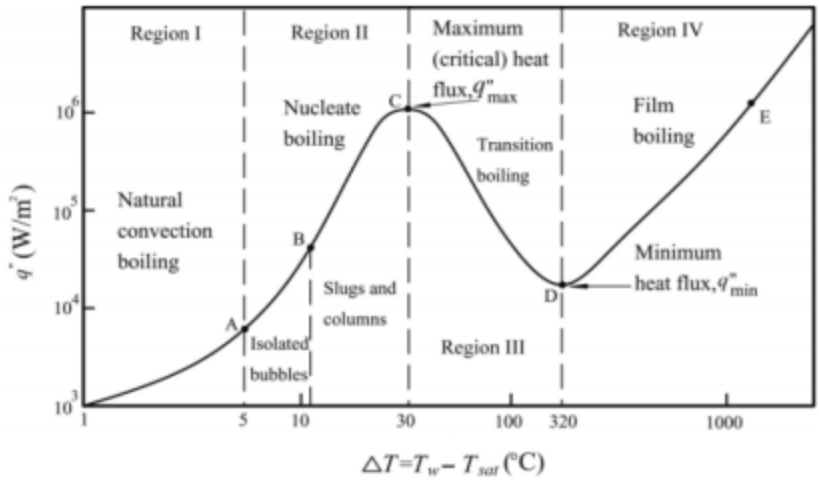


POOL BOILING CURVE

Stage:-I (INTERFACE EVAPORATION)

The conversion of a water into a vapour is one of the important and obvious phenomena. It has been found that if water (say) is totally distilled and degassed so that it does not have any impurity or dissolved gases, it will undergo water to vapour phase change without the appearance of bubbles, when it is heated in a clean and smooth container. However, in normal situation, as can be understood, the presence of impurities, dissolved gases, and surface irregularities causes the appearance of vapour bubble on the heating surface, when the rate of heat input is significantly high.The boiling may be in general of two types. The one in which the heating surface is submerged in a quiescent part of water, and the heat transfer occur by free convection and bubble agitation. The process is known as pool boiling. The pool boiling may further be divided into sub-cooled or local boiling and saturated or bulk boiling. If

the temperature of the water is below the saturation temperature, the process is known as sub-cooled, or local, boiling. If the water is maintained at saturation temperature, the process is known as saturated or bulk boiling.The other form of the boiling is known as forced convective boiling in which the boiling occurs simultaneously with fluid motion induced by externally imposed pressure difference. In this chapter, we will mostly consider the pool boiling. As generally the bubbles are formed during boiling, we will first refresh the following basic information.. The pressure of vaporisation inside the bubble, P_{vap}, must exceed that in the surrounding water, P_{liq}, because of the surface tension (σ) acting on the water-vapour interface.

The force balance on the equatorial plane

$$\pi r^2(P_{vap} - P_{liq}) = 2\pi r\sigma$$

$$Pvap - Pliq = \frac{2\sigma}{r}$$

The eq. shows that to create a bubble of small radius, it would be necessary to develop very large pressure in the vapour. In other word, a high degree super heat is necessary for the generation of a tiny bubble (or nucleus) in the bulk water. This is the reason, the bubble are usually formed at bits existing in the surface irregularities, where a bubble of finite initial radius may form, or where gasses dissolved in the system of the water come out of the solution.

Stage:-II (BUBBLES CONDENSE)

The first bubbles start forming after the stage -I of the boiling curve at various preferential sites on the heating surface. The bubbles form at an increasing rate at an increasing number of nucleation sites as we move along the boiling curve toward stage-III. The nucleate boiling regime can be separated into two distinct regions. In stage-II, isolated bubbles are formed at various preferential nucleation sites on the heated surface. But these bubbles are dissipated in the water shortly after they separate from the surface. The space vacated by the rising bubbles is filled by the water in the vicinity of the heater surface, and the process is repeated. The stirring and agitation caused by the entrainment of the water to the heater surface is primarily responsible for the increased heat transfer coefficient and heat flux in this region of nucleate boiling.

The condensation rate and the heat dissipation from the bubble are directly affected by three major parameters . The temperature difference of the condensing vapor and the surrounding water temperature, which is the driving force for the condensation heat transfer resulting from two thermal resistances, the external thermal resistance due to the flow and heat transfer phenomenon in the condensing water near the bubble surface; and the internal thermal resistance of the condensate that remains within the bubble (obviously for condensing in immiscible waters). When the condensation rate is higher than the mixing rate of the non condensible gases in the vapour, a third thermal resistance is added.

The condensate shape of bubbles condensing in immiscible waters is of great importance for defining internal thermal resistance. The condensate shape was visualized in two ways: by casting a shadow of the vapor bubble and by coloring the water condensate.shows four Hexane bubbles condensing in water at different stages of collapse. In these photographs the vapor appears black, and the external interface between the condensate and the water is distinctly outlined. The images show the two-phase bubble shape at different stages of collapse. Bottom image presents a bubble at the early stages of collapse when the condensate is a thin layer appearing mainly at the bottom of the bubble. Then the condensate volume increases and a two-phase bubble, which contains a vapor bubble adhering to the two-phase bubble at the top, is established. The condensate film cannot be seen at the top of the bubbles, perhaps because the black vapor bubble has concealed the thin condensate film that could have been maintained at the upper part of the bubbles.

Nucleate Boiling

Yamagata relation(q)

$$q_w = C\Delta T^a n^b$$

Where,

n = site density = 1, a = 1.2, b = 0.33

Collier Correlation:

$$q_w = 0.000481\Delta T^{3.33} {P_{Cr}}^{2.3}\left[1.8(\frac{P}{P_{Cr}})^{0.17} + 4(\frac{P}{P_{Cr}})^{1.2} + 10(\frac{P}{P_{Cr}})^{10}\right]^{3.33}$$

Where,

P = Atmospheric pressure

P_{Cr} = Critical Pressure

Stage:-III (BUBBLES RISE)

In Stage-III, the heater temperature is further increased, and bubbles form at such great rates at such a large number of nucleation sites that they form numerous continuous columns of vapor in the water. These bubbles move all the way up to the free surface, where they break up and release their vapor content. The large heat fluxes obtainable in this region are caused by the combined effect of water entrainment and evaporation. The growth of a vapor bubble in a superheated water is controlled by three factors, the inertia of the water, the surface tension, and the vapour pressure. As the bubble grows, evaporation takes place at the bubble boundary, and the temperature and vapor pressure in the bubble are thereby decreased. The heat inflow requirement of evaporation, however, depends on the rate of bubble growth.

A bubble ring, or toroidal bubble, is an underwater vortex ring where an air bubble occupies the core of the vortex, forming a ring shape. The ring of air as well as the nearby water spins poloidally as it travels through the water, much like a flexible bracelet might spin when it is rolled on to a person's arm. The faster the bubble ring spins, the more stable it becomes.[1] Bubble rings and smoke

rings are both examples of vortex rings the physics of which is still under active study in fluid dynamics. Devices have been invented which generate bubble vortex rings. .

As the bubble ring rises, a lift force pointing downward that is generated by the vorticity, acts on the bubble in order to counteract the buoyancy force. This reduces the bubble's velocity and increases its diameter. The ring becomes thinner, despite the total volume inside the bubble increasing as the external water pressure decreases. Bubble rings fragment into rings of spherical bubbles when the ring becomes thinner than a few millimetres. This is due to Plateau-Rayleigh instability. When the bubble reaches a certain thickness, surface tension effects distort the bubble's surface pulling it apart into separate bubbles. Circulation of the fluid around the bubble helps to stabilize the bubble for a longer duration, counteracting the effects of Plateau-Rayleigh instability.

Bubble growth and collapse

$$(P_v - P_l)\pi r^2 = 2\pi r\sigma$$

$$(P_v - P_l) = \frac{2\sigma}{r}$$

Where,

$P_v = Vapour\ Pressure$

$P_l = Liquid\ Pressure$

$\sigma =$ Surface tension between water & vapour interface.

4.3.2 Clausius- clayperon Equation

$$\frac{dp}{p} = \frac{h_{fg}}{RT^2}dT$$

$$\frac{P}{RT} = \rho_v$$

$$\frac{dp}{dT} = \frac{h_{fg}P}{RT^2}$$

$$\frac{dp}{dT} = \frac{h_{fg}\ \rho_v}{T}$$

$$\frac{(P_v - P_{tl})}{(T_v - T_{sat})} = \frac{h_{fg}\ \rho_v}{T_{sat}} = \frac{P h_{fg}}{RT_{sat}{}^2}$$

$T_v = vapour\ temp. inside\ the\ bubble.$

$T_{sat} = Saturation\ temp.$

$$T_v - T_{sat} = \frac{2\sigma}{r}\left[\frac{RT_{sat}{}^2}{P h_{fg}}\right]$$

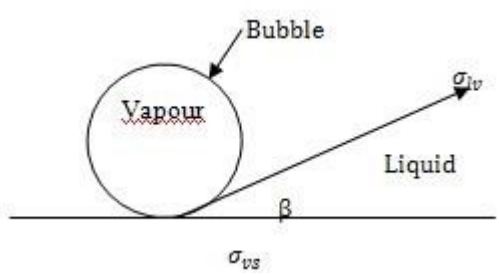
If $(T_l - T_{sat}) > (T_v - T_{sat})$ the bubble of radius "r" will grow otherwise it will collapse.

$T_l =$ Temperature of water surrounding of the bubble.

Critical diameter of bubbles

$D_c = f\,[\beta\ , \sigma_{lv}\ , g(\rho_L - \rho_v)\ , (\rho_{Lv}/\rho_{vs})\ ]$

$$D_c = C\beta\left[\frac{\sigma_{lv}}{\sigma_{ls}}\right]\sqrt{\frac{\sigma_{lv}}{g(\rho_L - \rho_v)}}$$



Bubble Angle

Where,

$\sigma_{lv} =$ Surface tension between water & vapour .

$\sigma_{ls} =$ Surface tension between water & solid surface .

$\sigma_{vs} =$ Surface tension between solid surface & vapour .

$\beta =$ angle formed by bubble

D_c = maximum or critical diameter of bubbles
$g(\rho_L - \rho_v)$ = buoyancy force
C = constant= 0.0148(water)
Critical heat flux for nucleate pool boiling (q)

$$q = 0.18\rho_v^{0.5} h_{fg}[g\sigma(\rho_L - \rho_v)]^{0.25}$$

Critical heat flux for nucleate pool boiling (zuber) for maximum

$$q_{max} = C h_{fg}\rho_v\left[\frac{g\sigma(\rho_L - \rho_v)}{\rho_v^2}\right]^{0.25}$$

C= constant =0.131 to 0.149

Stage:-IV (UNSTABLE FLIM)

As the heater temperature and thus the ΔT excess is increased past stage-III, the heat flux decreases. This is because a large fraction of the heater surface is covered by a vapor film, which acts as an insulation due to the low thermal conductivity of the vapor relative to that of the water. In the transition boiling regime, both nucleate and film boiling partially occur. Nucleate boiling at stage-III is completely replaced by film boiling at stage-IV. Operation in the transition boiling regime, which is also called the unstable film boiling regime, is avoided in practice. For water, transition boiling occurs over the excess temperature range from about 30°C to about 120°C.

Convection heat transfer co-efficient (h)

$$\mathbf{Nu = 0.16\,(Gr\,Pr)^{0.33}}$$

$$\mathbf{Gr = \frac{g\beta\,\Delta T\,D^3}{\vartheta_v^2}}$$

Where,

$$\beta = \frac{1}{T_{mf} + 273}$$

$$T_{mf} = Mean\ temp = \frac{T_{sur} + T_{sat}}{2}$$

$$\Delta \boldsymbol{T} = T_{sur} - T_{sat}$$

ϑ_v = kiematic viscocity in m^2/s

Stage:-V (STABLE FLIM)

The water vapour interface is substantially smooth except at very high heat fluxes. It is of course always uneven at its top surface due to bubble formation.

The effect of any variable such as pressure may be calculated from the effect on the physical properties of water and its vapour. A decrease in vapour-water interfacial surface tension produces no change in the calculated coefficients but such a decrease in interfacial tension does reduce the minimum critical heat flux and the temperature corresponding to it.

If the water is below the boiling point it is possible to still have a complete vapour blanket around the hot object but the coefficient of the heat transfer are higher than those to a water at the boiling point. This phenomena occurs in the quenching of steel etc.

Critical heat flux for nucleate pool boiling (zuber) for minimum

$$q_{min} = 0.009 h_{fg}\rho_v\left[\frac{g\sigma(\rho_L - \rho_v)}{(\rho_L + \rho_v)^2}\right]^{0.25}$$

Stage:-VI (LEIDENFROST)

In this zone the heater surface is completely covered by a continuous stable vapor film. Stage -V, where the heat flux reaches a minimum, is called the Leidenfrost point, in honor of J. C. Leidenfrost, who observed in 1756 that water droplets on a very hot surface jump around and slowly boil away. The presence of a vapor film between the heater surface and the water is responsible for the low heat transfer rates in the film boiling region. The heat transfer rate increases with increasing excess temperature as a result of heat transfer from the heated surface to the water through the vapor film by radiation, which becomes significant at high temperatures

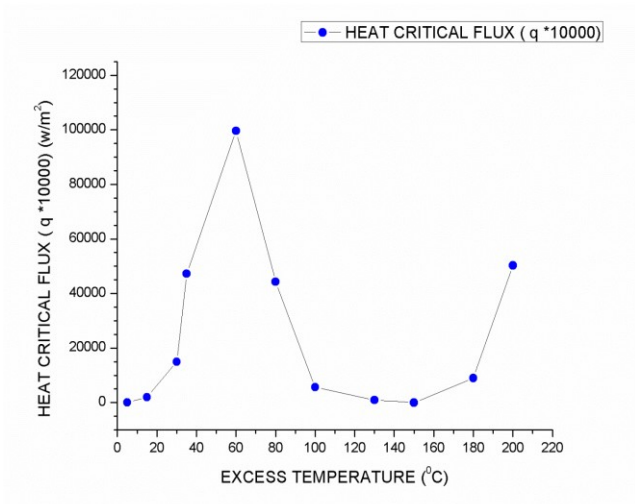
$$\mathbf{h = 0.62\left[\frac{k_v^3\rho_v g(\rho_L - \rho_v)(h_{fg} + 0.68c_{pv}(T_s - T_{sat}))}{D_o\mu_v(T_s - T_{sat})}\right]^{0.25}}$$

$$\mathbf{h_{total} = h_c + 0.75h_r}$$

$h_{rad} = \frac{0.82\sigma\,(T_s^4 - T_{sat}^4)}{(T_s - T_{sat})}$ **RESULT ANALYSIS**

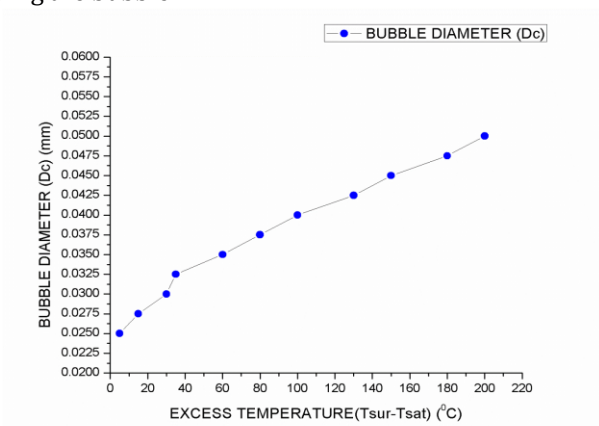
VARIATION OF SURFACE TEMPERATURE VS TIME

In this above graph X-axis indicates time in minutes and Y-axis indicate surface temperature in 20 ^{0}C of the coil. it indicates rise of the temperature with respect to change in time. Because nichrome material is a good thermal conductor of heat and electricity. When current increases according to the law H= I^2RT heat dissipation rate also increases. we have seen when time increases surface temperature of nichrome wire also increases.



VARIATION OF DIAMETER VS EXCESS TEMPERATURE

If $(T_l - T_{sat}) > (T_v - T_{sat})$ the bubble of radius "r" will grow otherwise it will collapse.
T= Temp of Water Surrounding the bubble.



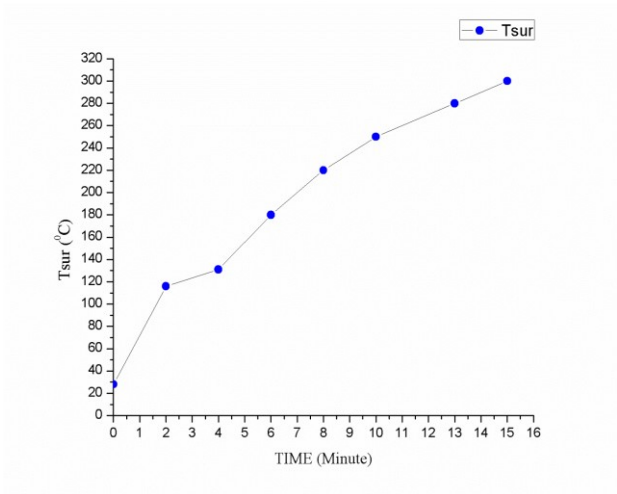
Critical diameter of bubbles

$D_c = f\,[\beta\,, \sigma_{lv}\,, g(\rho_L - \rho_v)\,, (\rho_{Lv}/\rho_{vs})\,]$
$T_{sur} = 105^0$c
$\rho_v = 0.598$ kg/m³

$$D_c = C\beta\left[\frac{\sigma_{lv}}{\sigma_{ls}}\right]\sqrt{\frac{\sigma_{lv}}{g(\rho_L - \rho_v)}}$$

In this graph X-axis indicates Excess temperature in ^{0}C and Y-axis indicate Bubble Diameter (D_C) in mm. it indicates rise of the bubble diameter with respect to rise of excess temperature. The excess temperature is directly proportional to bubble diameter so both are dependent each other because when the excess temperature is increases then the heat transfer rate is increases. After increase the heat transfer the water particles are absorb the heat and create bubbles .these bubbles diameter is very small after rise

the excess temperature the bubble diameters are rises. we have seen when excess temperature increases bubble diameter also increases.

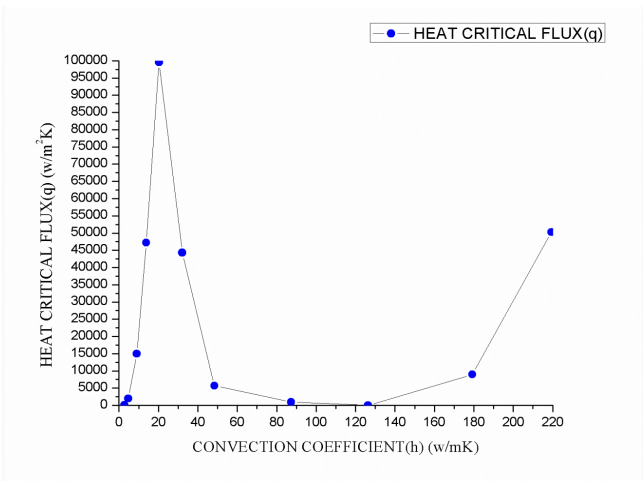


CONVECTION HEAT TRANSFER CO-EFFICIENT (H) VS EXCESS TEMPERATURE

In this above graph X-axis indicates Excess temperature in ^{0}C and Y-axis indicate convection coefficient(h) in w/mK. it indicates rise of the convection coefficient with respect to excess temperature because when excess temperature is increases then the water particles are convert from water to steam . the heat flux is increases in excess temperature when we consider the atmospheric pressure. we have seen when excess temperature increases convection coefficient also increases.

CRITICAL HEAT FLUX VS EXCESS TEMPERATURE

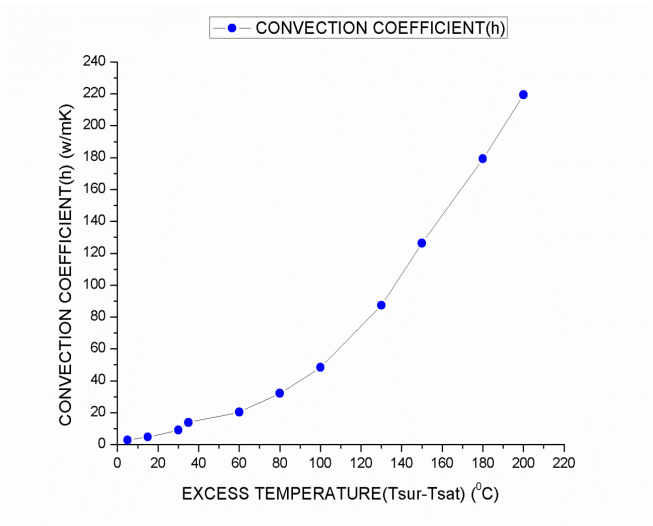
In this above graph X-axis indicates Excess temperature in ^{0}C and Y-axis indicate in Critical Heat Flux (q) in w/mK. illustrates the measured heat transfer coefficient in the present investigation as a function of heat flux at 1 atm (101.3 KPa) pressure. The results illustrate that the excess temperature increases as heat flux increases. In this region, heat is transferred mostly by natural convection and is not related to the current investigation. At higher excess temperature, the increasing wall temperature leads to the formation of bubbles at the surface. In the nucleate boiling regime, the influence of heat flux is stronger and a straight line could be fitted through the data points in the double logarithmic plot. The experimental data are compared with the prediction from correlation. Both are increases upto critical heat flux after heat flux decreases due to adjacent layer create by water after the excess temperature 150^{0}C the heat flux again increases.



CRITICAL HEAT FLUX VS HEAT TRANSFER CO-EFFICIENT

In this graph X-axis indicates convection coefficient(h) and Y-axis indicate in Critical Heat Flux (q) in w/mK. illustrates the measured heat transfer coefficient in the present investigation as a function of heat

flux at 1 atm (101.3 KPa) pressure. The results illustrate that the heat transfer coefficient increases as heat flux increases. Two distinctive regimes can be distinguished. At low heat fluxes - although not shown here - the heat transfer coefficient depends moderately on heat flux. In this region, heat is transferred mostly by natural convection and is not related to the current investigation. At higher heat fluxes, the increasing wall temperature leads to the formation of bubbles at the surface. In the nucleate boiling regime, the influence of heat flux is stronger and a straight line could be fitted through the data points in the double logarithmic plot. The experimental data are compared with the prediction from correlation.both are increases upto critical heat flux after tha heat flux decreases due to adjusent layer create by water after the excess temperature 150^{0}C the heat flux again increases.



CONCLUSION

From this experiment, we have plotted different graphs these are Surface Temperature Vs Time, Critical Bubble Diameter Vs Excess Temperature, Convection heat transfer co-efficient Vs Excess Temperature, Critical Heat Flux Vs Excess Temperature and Critical Heat Flux Vs Convection Heat Transfer coefficient.

From this graph it is clear that with increase in the temperature of nichrome wire,

- Critical Bubble Diameter
- Critical Heat Flux increases.
- Heat Transfer co efficient increases
- Critical heat flux increases

The heat flux is increased, some bubbles nucleate at the hot surface and then they depart to the sub cooled fluid bulk where they collapse. This sub cooled boiling regime enhances transference and tends to give higher heat fluxes for the same temperature difference than in pure single phase convection. Heat Critical Heat Flux is reduces with increase in excess temperature & Heat transfer Co-efficent. Again excess temperature rise (i.e., after 150^{0}C) then the heat critical flux is increases.

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Energy Management in Wireless Sensor Network Through EB-LEACH

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ABSTRACT: *Wireless sensor network (WSN) is a trending research topic because of its remote and hostile deployment. Unlike traditional networking the WSN limited with power supply, sensing and processing capacity. A core WSN consists of a set of sensor nodes which are small in size with cost variant [1]. The hostile and remote deployment of sensor nodes demands distributed fashion of node plantation [2]. Typically, communication in WSN is an energy consuming process according to the constraints of network. The tiny size of sensor nodes constraints with memory, power and lifetime. In this paper, we have proposed an improvised and simplified cluster formation EB-LEACH algorithm which is competent with LEACH and SEP. Here we assumed the sensor nodes are static in nature and the network is hybrid type in terms of energy level of sensor nodes (SN). In the proposed algorithm we have used sorting process as a sub-operation. The outcome of our simulation proves the optimized performance of EB-LEACH then LEACH and SEP.*

Keywords: *Wireless Sensor Network; Homogeneous; Heterogeneous; Energy Management.*

Introduction

The WSN may be centralized or distributed according to the applications [1]. The developed nature inspired meta-heuristic approach is the cause for optimized performance. The traditional WSN limited with power resource and computational capacity. Hence, energy management for long durability is indeed. The sensor nodes are may be deployed both in smooth and harsh environment. Mostly, the harsh deployment is human unreachable. This is the main cause why so far extensive research has been done in the energy management domain of WSN. During hostile deployment manual recharging of battery is almost impossible [5]. The WSN already implemented in various fields such as defense, agriculture, habitat monitoring, industry automization, health care monitoring, volcanic monitoring, seismic effect and health care etc. [6]. The applications like volcanic monitoring, seismic effect monitoring need to attend by remote sensors where the battery replacement is a difficult task. But the WSN need to work smoothly provided with all constraints. So far the existing methodologies are clustering and extending lifetime. Clustering of sensor nodes in both centralized and distributed environment is a common approach of energy saving.

Literature Review

In past literature sufficient work has been done on cluster-based technique both in centralized and distributed environment. LEACH (Low Energy Adoptive Clustering Hierarchy) is one of famous approach towards clustering. The principle of LEACH protocol is to distribute the energy evenly among the motes in WSN and for this it adopts random rotation of cluster head selection [2]. As LEACH is performed in homogeneous type of WSNs, Stable Election Protocol (SEP) is the improvement of LEACH by populating a ratio of SNs with more energy than remaining nodes in the same network [3]. Due to these advanced nodes, the network is heterogeneity in term of node energy. In SEP, the probabilities for elections are weighted by the initial energy of a node to that of other nodes in the network. This extends the lifetime before the death of the first node, which is important for some applications where the input from the sensor network must be reliable [4]. According to the energy constraint environment sending of collected data is costlier in terms of energy resource. This process reduce the lifetime of WSN. In this paper, the researcher proposed PEGASIS (Power-Efficient Gathering in Sensor Information Systems), which is optimal then LEACH [7]. In PEGASIS, only close communication among neighbor node taken place which overcomes the overhead problem of LEACH. For the transmission to the base station it takes turns. In [8], combination of chaotic, based genetic algorithm and fuzzy logic has been used to increase the lifetime of sensor nodes. Basically fuzzy logic was proposed on the basis of three variable i.e. density, energy and centrality. The combination of these three attributes helps to find out the best nodes as a cluster head candidate and later on genetic algorithm proposed for determining the cluster head position. The limitation of proposed algorithm is lack of knowledge regarding cluster formation and energy consumption. In [9] the researcher proposed an

algorithm called Hybrid Energy-Efficient Distributed (HEED) clustering which focused on increasing the lifetime of network and in same time allowed for dynamic scalability. In this protocol the CH selected periodically according to the combination of RE and the node degree. [10] has proposed a Distributed Energy Efficient Hierarchical Clustering (DWEHC) where weight is distributed based on energy efficient hierarchical clustering protocol whose objective is to increase the energy efficiency by creating a balanced cluster and enhancing the intra-cluster communication. The role of each SN is to find neighboring nodes in its surrounding then it calculates its weight. Basically weight is nothing but a function of remaining energy i.e. residual energy and the closeness to its neighbor node. In a community node having highest weight is selected as CH and the left out nodes became its member. At this position the nodes are the primary level members due to its direct link with CH. Mostly, a node compares the minimal cost to reach a CH with its non-cluster head neighbor. In case of stability this protocol is not performing well because huge amount of energy is dissipated in finding its neighbor node. This protocol [11] is the improved version of LEACH, to reduce the energy consumed in redundant nodes and to balance the energy dissipated among SNs by piercing bulky clusters in smaller clusters. According to the researcher a mechanism called sub cluster head is induced for splitting larger clusters into smaller ones. As a result the data frame becomes smaller and at the same time the amount frame recovered at the base station is increased. The redundant nodes are also kept in sleep mode for most of the time which is an improvement in this protocol. Here only one node is required while remaining nodes are kept in sleep mode until the energy of first node is exhausted. This helps in extending the network lifetime but this leads to unequal cluster size due to flexible cluster count.

To enhance the network lifetime this protocol [12] developed a method based on data aggregation. In ECBDA (Energy efficient cluster based data aggregation) during the formation of cluster the network is split into a group of clusters. Here, in each layer K amount of cluster is formed which if further subdivided into set of clusters. Basically there will be cluster head from each cluster, so here the election of cluster head for each cluster is calculated by considering the residual energy and communication cost factor. Once a cluster head is elected, its main aim is to broadcast its message to every nodes, cluster heads and base station. There is a third phase called as data aggregation phase in which the cluster member forward their sensed data to their respective cluster head. There may be large amount of duplicated data or redundant data, these data is removed by using data aggregation and finally transmit it to sink node via wireless communication. The maintenance phase keep tracks on residual energy of each cluster head in every round. Whenever, the residual energy gets below the threshold energy, from the same cluster a new CH is selected. These protocols result in scattering of small size clusters which increase the amount of energy required to transmit data to base station from cluster head which consumed large energy. It is one of the hierarchical clustering algorithms where hierarchy of sensor nodes were present. Here information's are accumulated from various sensor nodes and propagated from first level of cluster head to next level cluster head, it will continue till it reaches to base station. This TEEN [13] algorithm relies on the basis of threshold value. This algorithm was considered to be best, as it decides when the sensor should sends the data which results in reducing the number of transmissions.

System Model

Network Model

In this paper, we consider a WSN which contains N sensor nodes and a sink node. Sensor nodes are deployed in a 2D monitoring area of interest. All sensor nodes are homogeneous, static and self-organizing. Sink node is a resource rich device and has a long transmission power that enable it to send its message to any sensor nodes in the network. It is assumed that all sensor nodes know its location coordinate and its value is stable. In the clustered based WSN architecture, it is assumed that each CH aggregate the sensed data received from its CMs and transmit the aggregated data of the cluster to the sink node by using inter-cluster multi-hop routing as done in this report.

This report adopted the energy model as used in [14] and [15]. In this energy model, energy consumption at each node depends on the size of the data packet and distance to be sent from the source node. For transmitting the l- bits of data packet from a sensor node to its d distance far away receiver node, total energy consumption of a sensor node is calculated by the following equation:

$$E_{Tx}(l,d) = l \times E_{elec} + l \times \varepsilon_{fs} \times d^2, if d < d_0 \quad (1)$$

$$E_{Tx}(l,d) = l \times E_{elec} + l \times \varepsilon_{mp} \times d^4, if d \geq d_0 \quad (2)$$

Radio Energy Model

However, for receiving the l-bits of data packet at a sensor node, energy consumed by the receiver nodes is calculated by the following equation:

$$E_{Rx} = l \times E_{elec} \quad (3)$$

Where, value of the E_{elec} is the energy dissipated per bit during execution of the transmitter or receiver circuit. ε_{fs} and ε_{mp} is the amplification coefficient of the transmission amplifier for free space and multi-path model respectively. Here d_0 Represents threshold transmission distance and its value is generally [14] and [15].

$$\sqrt{\varepsilon_{fs}/\varepsilon_{mp}} (4)$$

Proposed Model

With a specific end goal to save the total energy cost of the sensor networks and to increase its lifetime, we propose a residual energy-based clustering algorithm, Energy Bank-LEACH (EB-LEACH). The basic idea of the protocol is as follows: Initially a few presumptions are addressed in this paper:

- All nodes are static in nature.
- The BS knows the location of each node. It assumed that the CHs and nodes have the knowledge of each other location.
- CH is responsible for data aggregation or compression.
- All nodes are of same design.
- Initially all the SNs in the network are having same energy.
- The dissipated energy during transmission depends on the distance and data size.

In WSN generally there are two types of communication happening i.e. inter cluster communication and intra cluster communication [19]. By the concept of clustering the intra cluster communication increases. The transmission of data from CH will be via single hop or multi hop through another CH to the BS [20]. In a clustering environment, after gathering all the information from cluster member, the CH will aggregate all the data in order to remove the redundancy which is further forwarded to the BS. Thus, the amount of energy consumption by the SNs will be decreased tremendously. An issue needs to be noted here, that if only one CH will behave always as a head node, then after certain time its amount of energy level reduces. Hence, a new CH is required for this situation. The choice of picking a new CH will be completed by the EB-LEACH algorithm. Amount of residual energy is the criteria in defining and nominating a new CH. Normally, clustering based protocols comprise of four notable stages and two phases [21]. The major stages are: i) CH selection ii) formation of cluster iii) Data aggregation iv) Data communication. Whereas, the phase are setup and steady state phase [24]. Initially in each setup phase, SNs forwards their current energy level and location to BS. Based on the information acknowledge by the BS, it calculates average energy level of all the SNs in the network. As the CH is responsible for additional work such as cluster management, data aggregation and segregation. So, we have to choose CH in such a way that it must have highest energy level as compared to the other nodes. Thus, in every round SNs with higher energy level is elected as CH candidate. The above process makes sure that SNs with adequate energy are selected as CHs.

The proposed algorithm, EB-LEACH has been executed through following phases: In the initial phase the sensor network will be deployed as per traditional concept of WSN. In, normal clustering application the process of CH selection is based on Re level. In LEACH and SEP, the continuous pressure of to being CH leads to rapid energy depletion. Hence, in our algorithm we have proposed ho to reduce this CH work pressure from selective nodes by adding an energy bank to the sensor network. The normal position of sink node is at center of sensor network. As per, or algorithm we are adding an energy bank at sink position which is assumes as full of all resources. When, the Re of CH approaches close towards THen , then CH will generate at REQ message to BS. BS will cross check the trueness of REQ message and send RESP msg as acknowledgement. The RESP signal carry an ACK packet where it has two slots of data. The first slot contains the CH-id to identify who generate REQ and second slot have the energy for recharging the CH. This will lead to saving of energy consumption by reducing unnecessary selection rounds. Because selection of CH round itself an energy consumption process. Likewise, all CH can participate and recharge their battery.

Algorithm: EB-LEACH

Step 1: Start
Step 2: Form Cluster and Select Cluster Head (CH) according to LEACH

Step 3: Compare (Cenergy with Thenergy)
If (Cenergy < Thenergy)
If (True)
CH (Energy) $\xrightarrow{\text{REQ}}$ Energy Bank Node
Energy Bank Node $\xrightarrow{\text{RESP}}$ CH
Else
End IF
The CH remains same. (Till the condition true)
Step 4: Cluster recharged
Step 5: End

Simulation Parameters:

The proposed algorithm is simulated in PARAM SHAVAK supercomputer with Matlab R2016a. We executed the algorithm with 100 nodes in a hybrid network area of 100m x 100m. We assumed the initial energy status of all SNs are equal i.e. 0.5Joule. In order to maintain an approximate equal distance between CHs and BS, we have deployed BS at center of sensor network i.e. with coordinates (50, 50). The other parameter what we have considered are:

PARAMETERS	VALUE
Network size	**100 × 100**
Base Station Position	**(50 ,50)**
Number of nodes	**100**
E_{elec}	**50nJ/bit**
E_{mp}	**0.0013pJ/bit/m4**
E_{fs}	**100pJ/bit/m2**
$E_{aggregate}$	**5nJ/bit/signal**
Percentage of CHs	**10% of total nodes**
Packet size	**4000bits**
Initial Energy	**0.5J/node**

Results

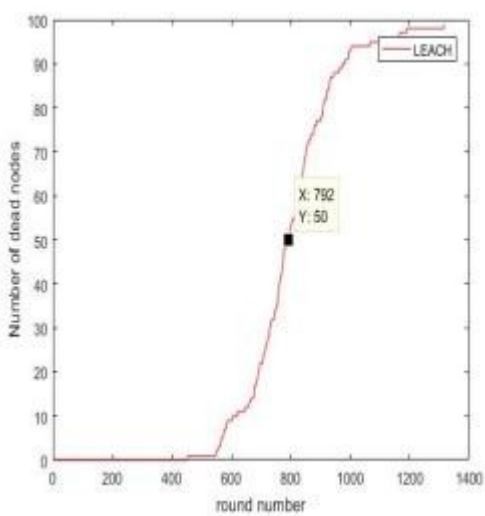

Fig.1 Dead Node Ratio LEACH

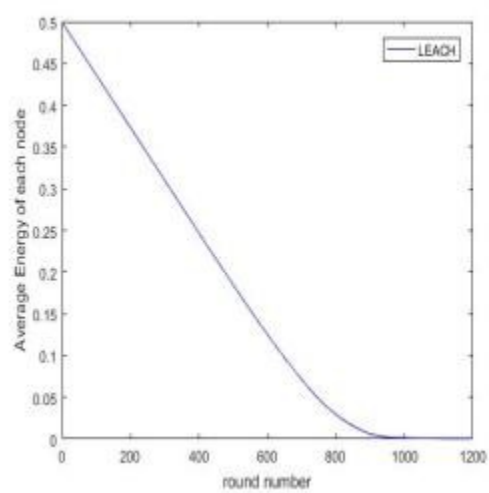

Fig.2 Performance Ratio LEACH

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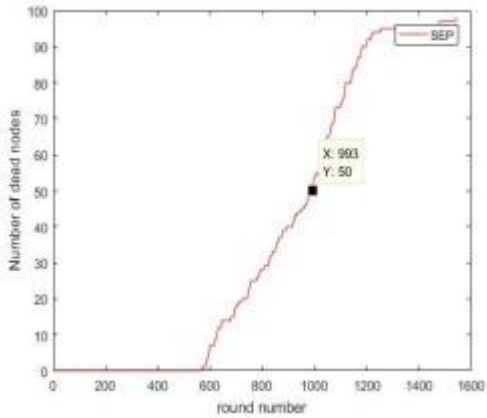

Fig.3 Dead Node Ratio SEP

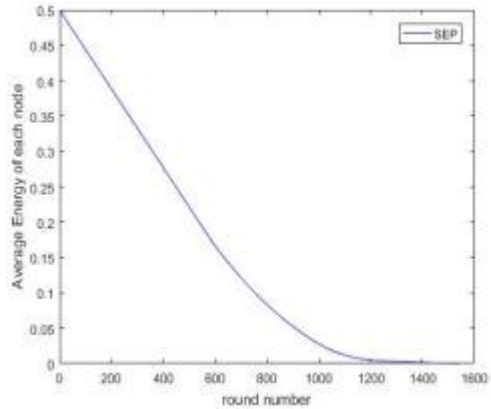

Fig.4 Performance Ratio SEP

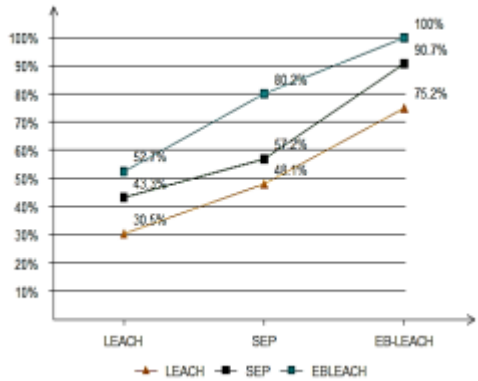

Fig.5. Dead Node Ratio EB-LEACH *Fig.6. Performance Ratio EB-LEACH*

Conclusion

In this paper, a bio-inspired meta-heuristic hierarchical clustering algorithm has been presented for WSN named as EB-LEACH. The simulation results validate the superior performance of the proposed algorithm which has improved cluster formation by uniformly distributing the CHs throughout the area and thus maximizing the lifespan of the network than other popular algorithms like LEACH and SEP. Performance of the proposed algorithm has been evaluated in different scenarios and the experimental results are compared with some well know clustering-based algorithms. The overall performance of our proposed EB-LEACH protocol is optimized then LEACH and SEP respectively. This work can be extended by balancing energy between multiple clusters to enhance life span of sensor network.

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The importance of English for engineering Students…

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ABSTRACT: *English has become the international language. English is the official language of 53 countries and spoken by around 400 million people across the globe. Being able to speak English is not just about being able to communicate with native speakers, it is the most common second language in the world. If you want to speak to someone from another country, then the chances are that you will both be speaking English to do this.*
In students social, spiritual and everyday life English plays an important role. There are strong reasons for Indian students to improve their skills in spoken and written English. English has become one of the most widely spoken languages around the world and for Engineering student's fluency in English is vital for success in both study and future careers. For students, improved skills in the English language is also important for their social and spiritual development to help create stronger relationships and understanding with other students and leaders in the Engineering sector in India and abroad. One has to really understand what is expected from those with whom you are competing so unless you update your language skills in English you will face many difficult challenges ahead.
Improving skills practically means improving one's language skills in four areas: listening, speaking, reading and writing. As all four skills are equally important, developing these skills requires extra stress on each one.

Keywords:

INTRODUCTION:

World is your opportunity. Every sixth person in the world is Indian. We have that much potential. Especially in the globalized world, one is not limited to the region or even country. The whole world is open for us. Indians are doing extremely well in numbers of fields in the international realm. So, our scope to get jobs with good packages is really high. We need to grasp that advantage. But without English language one cannot but be a handicap. Therefore, for engineering students it is more important to develop their communication skill.

Being able to communicate in the world of business is the most important skill you can bring to the corporate world. Because English is now the most widely used language in the world an Engineer, graduate or under-graduate needs to be able to communicate in English some way or the other without exception. Communication plays a very significant role in the modem era. It is a tool that gives access to express one's ideas views and opinions lays deep within. Of all the languages, the language of English has been a popular, effective and significant medium of communication across the globe and thus has been a global language. Fluency in English will give you greater advantages to work with people from other countries and even with other states in India. It is a "ling a franca", which means a "universal language." No other language is likely to become as universal as English and thus knowing English will help make a person dominant in the corporate world.

It has been used now as a yard stick in most of the jobs. With the advancement of technology, English serves as a facilitator. For the advancement of the modern communication the language English, is really an indispensable factor. So, to speak each and everything is associated with English today. Because India is a vast country with various languages it can even be difficult to communicate with people of our nation in different states and regions because of the numerous regional dialects. Because all of us know that English is a global language it is also considered an official language in almost every nook and corner of the globe. It is the primary language of trade and commerce and is used in international affairs. We live in a world that is connected digitally and online which we experience in every walk of our life. We can hardly ever think of the so-called digital age without the medium of the English language. English is used widely across the globe and is the language of the most applications and programs, social media networks and websites, software instruction booklets, installation guides and entertainment devices, all of which are usually available only in English. More over it is the language of science, aviation, computers, diplomacy and tourism. Knowing English increase your chances of getting a good job in a multinational company within your home country or for finding work abroad. It is also the language of international communication, the

media and the internet, so learning English is also important for socializing and entertainment as well as work. An estimated 565 million people use the internet every day, and an estimated 52 percent of the world's most visited websites are displayed in the language English. It is the most frequently used language for the development of technology. Further, the English language has played an essential role in the spread of formal education as most textbooks and technical manuals are written in English.

English is also the language used for higher education. People who go abroad for higher education, such as medical or business schools, and innovative studies will find that it is English that is used for instruction in universities and colleges. Students will thrive in these international forums if they have a good knowledge of English.

English opens the wider world and opens door to greater opportunities. Knowing English expands the mind to new ideas. Due to the advancement of science and technology its implication and popularity has made the entire world a small global village.

In what waysignificant is English language, and its articulacy for Engineers?

Because English is one of the most widely spoken languages around the world and fluency in English is important both in studies and careers for an engineer and an engineering student.

Engineering is one of the fastest growing sectors in the world and most works of research and academics are written in English. Without knowledge in English, engineering students may find it difficult to understand concepts put forward by researchers and academics. Because, many components in engineering require writing academic reports fluency in English language is obligatory.

Due to the use of English as a common language, it is easy to do business on the worldwide scale. For instance, the healthcare sector, stock markets, advertisement, software, banking, petroleum products, biotechnology have a wide presence due to English as common means of communication. Thus, the importance of English language is immense in development of the world.

Knowing English is vital for the economic growth of India and India's relations with the rest of the world. Globalization may be defined as the integration of the world's people, firms and government. Globalization is the process arising from the interchange of world views, products, ideas and other aspects of culture. Advances in transportation and telecommunications infrastructure, including the rise of the telegraph and its posterity the internet, are major factors in globalization, generating further independence of economic and cultural activities. From the business prospective, one effect of globalization is that of expanded markets. This means that a business that had previously only sold its goods domestically and now can start selling products to other countries. Engineers will contribute to India's global prosperityby working with engineers around the world and by communicating with them in English. Working in English will allow Indian engineers to share their ideas and Indian technology with the rest of the world.

Elementarymotives why an engineer should be confident and fluent:

In a student's social, spiritual, and everyday life, English helps shape strong relationships and better understanding among fellow students and leaders in the Engineering sector in India and abroad.

For success in any endeavour a person must know, understand and communicate effectively. In this era of globalisation, communication skills are the key to success.

English is now the language of international business, technology and research. About 1 billion people speak in English and the number is still rising.

- All BPO jobs are given to India from Spain, Latin America or England. And from America jobs are coming to India. Because India is an English-speaking country, especially cheap labour is here in India and there is so much unemployability so, people are willing to work and hence, we are getting lots of outsourcing from other countries.
- Earlier the foremost English was only the British English which was considered to be the standard English. But now in a globalized world the standard is being broken that is melting in the sense that, if English is English then why must there be American English and British English? So, in the same way now Indian English is being standardized. Today we have just two percent of the population speaking English in India, that two percent of population is also larger than the entire British population. Therefore, even two percent is not small and therefore, Indian English is also emerging as another variety. Thus, in time to come Indian English also will become just like British English, American English and Indian English will emerge. Hence, we do not need to imitate the American or even the British. Henceforth, time to come you may talk about the importance of English in India and talk about how Indian English can also grow to the stage or status of Indian English as another

bigger variety. Because the percent of population speaking English in India is not small, although it is only two percent, it is growing and therefore when it grows, it will also become another variety.

- Why it is important for the students to study, learn and speak English, is simply because wherever they would be entering the public life and whichever office, or any job they would be joining need to acquire the standard and fluency of English language. All these things would be highly required because English is becoming all the more important, therefore, English would be the only communication or correspondence.
- For example, if any entrepreneurship enters in and now it is a globalized world so the entire market world or corporate world has completely shifted to English language so the only correspondence left to them is in English.
- At least in the institution English speaking should become a common and compulsory language otherwise we will not learn, and we will not come up to that level of expectation. And you should know with whom you are competing and your area is not where you are studying and even though, you are studying in a village set up but your marketability or your job scope is not here. If you are limited to a township or small level of area then it's very restricted. It must become major cities, companies and even abroad. Consequently, one has to really understand what is expected from them with whom your competing, unless you update your language skill, it will be a very difficult task to face the challenge. It is not just studying, you may have knowledge and you may have good grades or marks on your paper, that is hardly the criteria to be selected. But if you are not able to communicate effectively then it is a matter of great concern. So, if you don't have the communication skill no one will hire you. Today in India government jobs are hardly two percent so certainly we are not preparing ourselves for government jobs. Therefore, ninety-eight percent of jobs are in the private sector. Thus, we have to prepare for that and in those jobs an English language is so crucial and significant. So there lies the challenge. Consequently, we need to have a global vision and global ideas. Because, what we are facing is not a township once we passed out from the institution, we are just before the market with the students who are passed out from all other big institutions. Therefore, we may have good grades or better grades than even students studying in other very good institution or major cities, but you're not able to prove that because of lack of communication skills so English should be spoken language in the institution.
- There are numerous people in rural as well as urban parts of India who are literate in their regional dialects and are highly successful. But with the changes brought about by globalisation and the free movement of people, more and more multinational companies are coming to India. English has become one of the basic obligations and prerequisites for employment in the corporate sectors. Companies without a workforce which is fluent in English, remain restricted to small regions. They lose contact with the rest of the world. With no common language the workforce reaches and communication and teamwork become difficult.
- And moreover, we are living in an impressionistic world one must create an impression about yourself, so if you have good grades on your marksheet but you do not give an impression to me then you are a failure. So how do you create an impression about yourself that you are capable? Language skill is one major way through your communicating skill that you are giving an impression about yourself that you are capable.
- If I challenge you saying that, you may have bought the certificate how do you prove that you have merited it and you have worked hard for it, prove it through your communication if they ask some questions and you do not know how to answer, you may know the answer but don't know how to communicate it then you are a failure. So many people do not get jobs and many people are not successful not because they do not have talent but because they lack communication skills. And thus, communication skill is so important. For example, one average student with good communication skill will prove better than a very intelligent student with no communication skill. That is what the trend is now.

For improved communication skills an engineer must accept the following observations:

1. Most theories are taught in English and thus, a high level of expertise in English language is indispensable.
2. For further education overseas in some of the finest universities in the world, students are required to take standardised assessments to demonstrate proficiency in English. These tests also play a major role for admission to most of the universities overseas and are carried out to ensure that the students from non-English speaking countries can write, listen, and converse in English fluently and smoothly.

3. Engineers today and in the future will need to be able to communicate with their corresponding peers across the globe. For most professionals like scientists, technologists and business experts who belong to different educational, cultural and linguistic backgrounds, English is considered to be the principle language of communication.

Conclusion.

Knowing English will improve the lives of people and their working endeavours no matter where they are. As a global language English connects societies all around the world. It is all the more important for the engineering students to cope with the demanding challenges. If they are not outspoken and develop their personality will be least concerned. And English is the only language which will help and boost their level of confidence. Henceforth, it will be a bright future ahead for those who learn English language.

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IDENTIFICATION OF FAULTY NODE IN MULTI-HOP CLUSTER WITH ON-DEMAND DATA TRANSMISSION IN WIRELESS SENSOR NETWORK

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ABSTRACT: *Fault Free data transmission is an important factor in wireless sensor network for performance measurement. To achieve this, the culprit node must be identified. In this paper, we propose a new framework for identification of faulty node in a cluster. It is based on on-demand concept of data transmission. Clustering is done by considering the pre-computed signal – to – noise ratio (SNR) of the node with respect to the deployed, pre- assumed base station. Depending upon the status of the node its data will be accepted or rejected by the respective receiver node. Simulation results of various approaches are considered to prove the supremacy of this framework.*

Keywords: *Cluster Head, Non Cluster Head, Faulty node,*

INTRODUCTION:

WSN (Wireless Sensor Network)[1]is the most standard services employed in commercial and industrial applications, because of its technical development in a processor, communication, and low-power usage of embedded computing devices.

The WSN is built with nodes that are used to observe the surroundings like temperature, humidity, pressure, position, vibration, sound etc. These nodes can be used in various real-time applications to perform various tasks like smart detecting, a discovery of neighbor node, data processing and storage, data collection, target tracking, monitor and controlling, synchronization, node localization, and effective routing between the base station [2] and nodes. To build a wireless sensor network these nodes communicate with each other through a wireless media [3].

Data transmission action occurs between the NCH and CH pair [4]], CH and Gateway node pair and Gateway node and BS pair. The energy left after completion of the entire routing process of the networks is called residual energy [3].On each and every transmission the residual energy of the nodes are decreased by certain amount. Gradual decrement in the energy [5] makes the network to be dead or failed. Similarly, processing power includes the energy consumption due to data aggregation [6] or data averaging or data processing. The data aggregation may be the intra cluster or inter cluster.

Depending on the storage capacity of the sensor, a queue is maintained where the sensed data are stored. After observing the data selected transmission carried out on demand by the respective cluster head. There are various methods to minimize the energy consumptions of the sensor nodes. Like data aggregation, Routing MAC layer power management and topology based transmission power control. The basic idea behind this topology is clustering.

Clustering [5] involves the grouping of similar objects into a set known as cluster. Some of the popular clustering methods that are used include hierarchical, partitioning, density-based and model-based. Clustering is also known as clustering analysis. Clustering technique is of two types. They are static clustering and dynamic clustering [5]. If the chs are selected before transmission starts, then the clustering technique is called as static. Whereas, in dynamic clustering, through out the process the chs are selected.

The task of clustering is to maximize the intra-clust similarity and minimize the inter-cluster similarity. These cluster Heads are responsible for intra cluster coordination and inter cluster communication. Intra-cluster coordination meant for coordination among the nodes in the respective cluster and data aggregation [6]. And the inter cluster communication meant for communication among the CHs.

In this paper, a new technique called as On-demand data transmission is proposed. Here the rate of transmission is reduced, time slice is introduced, and fault tolerance is implemented. Using the proposed protocol, data transmission from the sensor nodes purely depends on the CH. Transmission process is initiated only after getting the instruction from the CH. It reduces the number of data transmission. It leads to less energy consumption and improved network lifetime

RELATED WORK

Leach [7] is used in order to increase the life time of the network. This protocol includes two phases. In the first phase, CH is selected based upon maximum energy value. This phase is called set up phase. Steady phase, is the second phase that transmits aggregated data. Cluster head failure is the main issue with this protocol. Another issue is the information about the total number of CH present in the UWSN. LEACH does not define the position of the cluster [8] that is assumed to be unknown. CHs are found either at the centre or at the boundary of cluster. Thereby, it requires more amount of transmission energy.

Ganesha and Amutha [9] proposed a new concept to resolve the issues of leach. In this paper they create a new cluster by taking the nodes in the boundary region. Those nodes are unable to transmit the data to the respective CH. SNR is used to select a new CH among those unreachable nodes.hor have not considered the frequency of transmission.

In selective data transmission [10] , the sensor nodes sense data and stored in its input queue. It stores only the data which is different from the values stored in the queue. If it reads the same data then it will be simply dropped. It also sends the processed data. But even if the CH requires the data or not, it sends the data when its queue is full. This protocol is concerned about the storage space rather than the number of data transmission [11].

Energy efficient data transmission [12] is an approach, where clustering process has the supremacy over all other operation. It only concentrates on efficient utilization [13] of energy rather than data transmission. It reduces the energy consumption by properly selecting the CH.

On-demand data transmission protocol [14] is an extension has of selective data transmission protocol. It will check the space in the input queue and if not available then create the space for new data. Data transmission is initiated only after the demand generated by CH. It sends the processed data to the CH there by reducing the CH overhead [15]. Using this protocol, number of data transmission also reduced.

SYSTEM MODEL:

We need two steps to explain the proposed approach. It includes

i) Designing of the Cluster Model

ii) Designing of the Energy model

In the first step, the design methodology of forming cluster is described. However, the second step shows how data transmission affects the residual energy of the nodes. The system model is shown in figure 1.

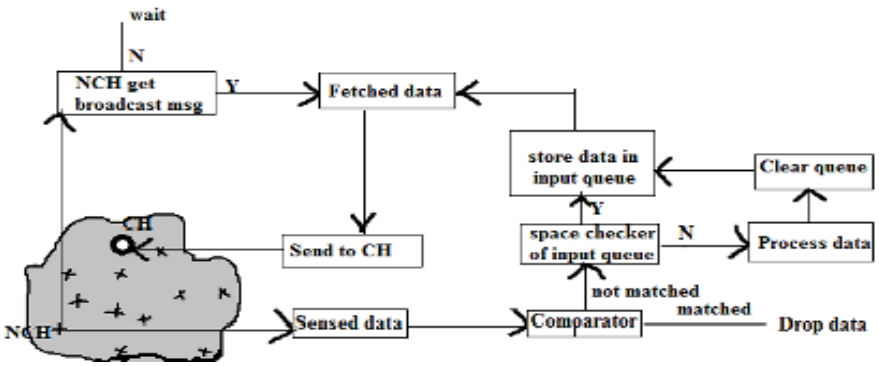

Figure 1: Selective data transmission[]

i) Cluster model design: In this step, Clusters are formed Based upon the SNR[9] values and range. Cluster Heads (CH) are chosen depending upon the SNR values computed with respect to BS. All the sensor nodes coming within the range of that CH belong to that cluster. These belonging nodes are called as the non cluster head (NCH) or the follower nodes.

ii) Energy model design: In this step, the data transmission is categorized into four types. These are,

1. Direct data transmission
2. Selective data transmission
3. On-demand data transmission
4. Fault free demand based data transmission

In sensor network, for each data transmission process the residual energy of the nodes is decreased by some amount. This decremented amount is assumed to be sum of the transmission energy and the processing energy.

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Same amount of energy will be reduced for each data transmission without depending upon the data transmission process chosen. However, the total amount of reduction depends on the number of transmission. As compared to direct and selective, On-demand method restrict the frequency of data transmission thereby, less reduction in the residual energy takes place here. At the initial step, the residual energy is assumed to be the initial energy of each node.

PROPOSED MODEL

In this proposed algorithm, the under water sensor network is deployed with number of sensor node randomly. All the sensor nodes are assumed to be deployed with same transmission power, Initial energy, and frequency. However, there is a variation in the no of nodes that are deployed.

```
Algorithm 1: Identification of faulty node

Step1:  For each cluster 1 to k

        Compute no of NCH

        no_nch = n ;

        for j=1 to n

       ch[i][k]= grt(node)  //get address of each node

Step2:  For i = 1 to n

        Set-timer (NCH[i]) = 180

        initiate data transmission(NCH[i])

Step3:  for each j =1 to n

        if (receive(ch[i][j]) && timer != 0)

         status (ch[i][j]) ="W"

        else

status (ch[i][j]) = "F"
```

```
Algorithm 2:Removal of Faulty Node

step 1:  check the status of each node

        if (status==F)

            delete[i][j] from  node list

else

 {  if ( (msg=receive ch[i][j]) !=0 && timer !=0)

        {

            if (msg > th)

            delete from  queue // delete the data from

        corresponding cluster }    }
```

Algorithm 1 describes the method of identifying the faulty node in the deployed network. This task is accomplished by the help of a timer. Status of each node is recorded. In algorithm2, if on data receiving the status of the node is checked. If it is F, then the data are simply dropped. Whereas, for status W, the received data is compared with the previously stored threshold value. If it is more than that again the data will, the received data is compared with the previously stored threshold value. If it is more than that again the data will be dropped. Otherwise, the data is accepted.

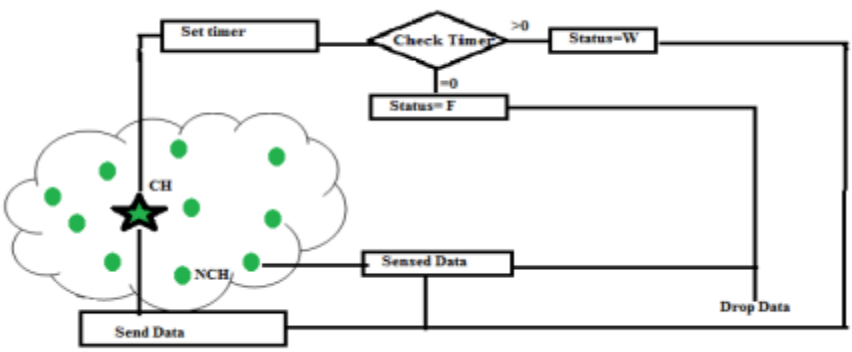

Figure 2: Proposed model

SIMULATION AND RESULT

As shown in figure 3, in a 100 X 100 grid nodes are deployed using random topology and addresses are accessed.

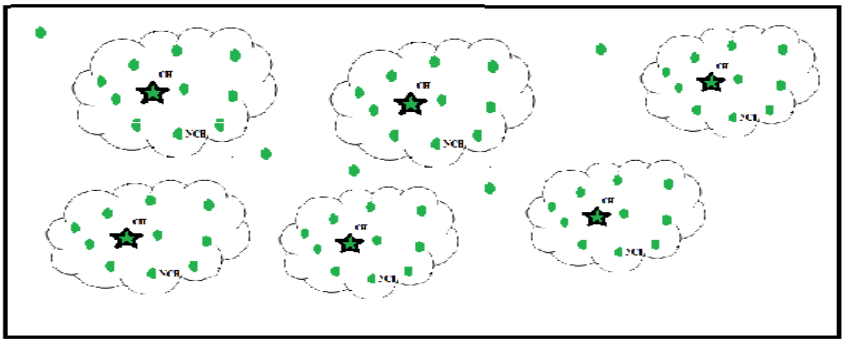

Figure 3: Random node deployment in a 100 X 100 grid

Table 1: Assumption Parameter

Parameter	Value
Sensing range	2m
Communication Range	10m
Number of cluster	5
Depth	4m

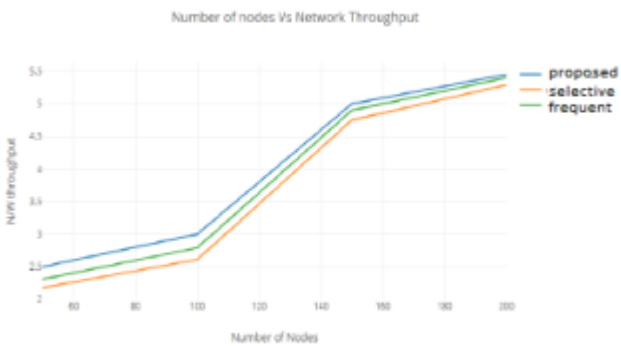

Figure 4: Network throughput

If the number of nodes increases in the deployed area, the chance of fault is more. However, due to distributed load of each CH, the throughput of the network increases. As shown in figure 4, more the nodes more will be the reliability and hence better throughput. Figure 5 describes the deviation of sensed data from the mean of the sensed data set. This is an assumed value. The fault accuracy rte is computed from the sensed data

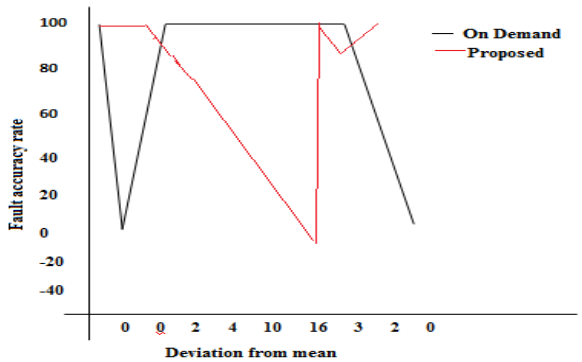

Figure 5: Deviation from mean value

CONCLUSION

In this paper, We have studied various approaches on clustering and data transmission. When a node becomes faulty It may stop sending data, or send erroneous data. Such nodes are identified In this proposed method. As it is based on on-demand approach, number of transmission is also reduced. Thereby, increasing the network lifetime. In future We will include the encryption mechanism on transmitted data.

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Braille pad system using voice control

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ABSTRACT: *In day to day life the telecommunication technology plays an important role. It has completely revolutionaries the way allcommunicate, especially long distance communication. Despite of all these advancement in the telecommunication field, the physically impaired people have no access for these technologies. So as a step to bridge the gap between the blind people and the technological advancement in the telecommunication field, decided to design a SMS system for them by interfacing loud speaker is also used for making the voice announcement.Voice Actions are a series of spoken commands that let you control your phone using your voice. Voice Recognition is a fascinating field spanning several areas of computer science and mathematics.Speech recognition is technology that uses desired equipment and a service which can be controlled through voice without touching the screen of the android smart phone.*

Keywords: *Braille text, Solenoid, Servo motors, Blind persons.*

I.INTRODUCTION

The system is specially designed for the visually impaired community to connect, communicate and socialize without vision. Enabling those who are blind to accomplish important tasks with just their sound and touch via a comprehensive eye free. Now a day physically impaired people have no access of advanced communication technologies. To aware the blind peoples with the advance telecommunication system, our approach focused on design a pc system for them, it interface Braille pad with pc. Now a day's smart phones are not use for making calls but they have innumerable uses and can be used as a Camera , Music player, Tablet PC, T.V. , Web browser etc. New application and operating systems are required with the new technologies. In recent years, smart phones have placed an increasing emphasis on bringing speech technologies into limelight usage. This focus has led to products such as Speech server. Many of them needs their cell phones when they can't do so example at the time of driving, cooking accidents may occur because of this activity ,a voice recognition application for mobile device is being develop to avoid harmful incidents. Android is the one of the best suitable operating system for this kind of system. It is the open source operating system that is use to develop application for mobile users

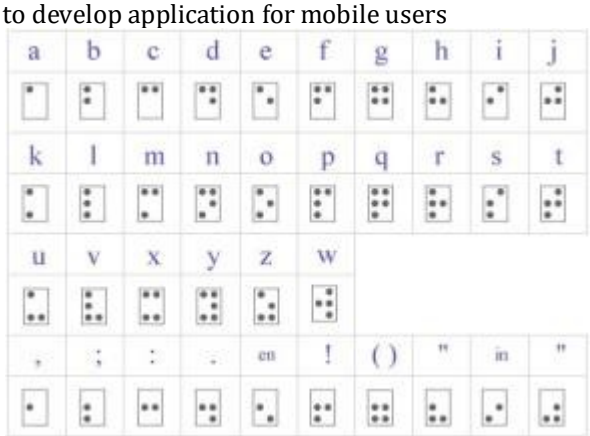
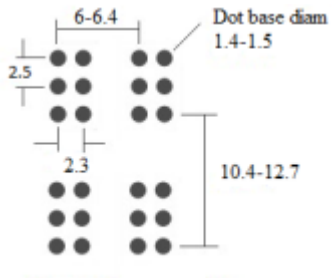


Fig:1 Character Symbol for Brallie pad

PROBLEM IDENTIFICATION DESCRIPTION

Braille technology is assistive technology which allows blind or visually impaired people to do common tasks such as writing, browsing the Internet, typing in Braille and printing in text, engaging in chat, downloading files, music, using electronic mail, burning music, and reading documents. It also allows blind or visually impaired students to complete all assignments in school as the rest of sighted classmates and

allows them take courses online. In recent years, information technology has made it possible to read and write Braille easily, meaning there is ample research and development. However, these works focus on supporting to distinguish Braille characters on the monitor using vibration or audio feedback, and do not give much thought to experience of touching Braille physically. Especially, in the early stage of Braille education, it is important to touch Braille physically. Through this physical experience, visually-impaired children, who have underdeveloped tactile sense, can become familiar with Braille, improve their awareness of tactile sense, and practice how to touch Braille to read it in an efficient way. For such occasions, we consider teaching materials necessary to make visually-impaired children actively and physically touch Braille.



STATEMENTS OF PROBLEMS

Existing Braille systems provide the BVI with technologies and tools to access and process information using devices such as: note takers, GPS systems, calculators, mobile phones, and print-reading devices. Most of the existing portable systems are heavy and/or costly. A technology resource list is provided by the National Federation of the Blind (National Federation of the Blind, 2012). Many of these Braille devices are portable. However these devices function as storage/playback devices. In 3 addition, they use between 20 and 88 Braille displays, making them bigger in size, also they are relatively expensive. The lateral force generated on the finger pad due to the physical contact with the Braille dots, and the sustained yet tedious pressure due to the repetitive Braille reading pattern may cause finger pad numbness and tingling.

As a result, there is an increasing need to overcome these limitations to attain the sought welfare for the blind. It is suggested that a convenient, portable, wearable, light and small, yet budget-friendly device be developed. The objective of this research is to design an affordable Braille tactile display that is wearable, refreshable, and portable. The device is intended to be used as an output device that can playback stored media. It can be also incorporated with current Braille reading technologies. The device will control both the electrical and mechanical stimulations to optimize the sensation and ensure extended use of the device. This work is concerned mainly with the mechanical aspects of the design. Other related issues of the electrical components design and control were presented.

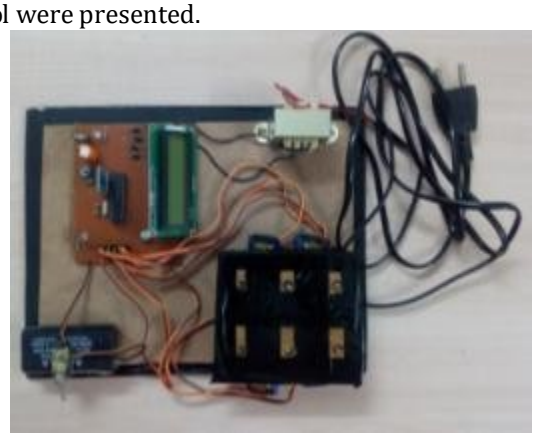


Fig:2 Brallie pad

WORKING

Visually impaired person faces lots of difficulties when it comes to reading of particular text, whether it's a child or a middle aged or an aged person. Thus for the communication purpose a medium has to be build and that is braille pad. The system was designed for visually handicapped person for their better

understanding of text, thus the formal braille was designed. For continuous supply A.C. supply is used. A step down transformer is used to convert 230 v A.C. to 12 v A.C. Which should be converted into a D.C. , for that a bridge rectifier is used. It will convert A.C to pulsating D.C. Again one capacitor is used to get the pure D.C from the pulsating D.C. The input voltage to the kit should be 5 v, so for that a voltage regulator of 5 v is used which converts 12 v to 5 v D.C. Then the Bluetooth module is there for making a proper connection. A microcontroller is used which convert the voice clip to the respective braille code. A display is used to deliver the message and a crystal oscillator is there to provide motion. There is a set of 6 screw which are connected to 6 different servomotors. The moment of servomotors are 30 degree after converting the voice to braille code, the respective servomotors will response as per the respective braille code and the screws will pop out letter by letter. So that a disable person can feel the letters by putting his hand on that.

PROBLEM IDENTIFICATION DURING EXECUTION OF PROJECT

Initially it had been decided to make actuators using the concept of EMF and solenoid has been designed. But during execution it was examined that making was easy but the amount of heat produced had effect on outer plastic covering. Due to large amount of heat production the outer cover were melting. To solve this problem servo motors are used.Servo motors are the motors that moves in specific inclination. As moment of 6 cells are required so 6 servo motor is used.

CONCLUSION

In this way this project explains the idea of messaging system for visually impaired peoples. This vital technology tool and its application in the area of telecommunication have significant and widespread. It allows environmental barriers to be removed for people with a wide range of disabilities. Thus with some modifications in previous conventional communicating device, we can accommodate large no. of visually impaired people in communication system. In this way system is modified to read the SMS in a string, also blind person able to read the e-mail also. In recent years, SMS messaging system for disability and handicapped communication aids has become widely deployed in large amount. Text to Speech is also finding new applications outside the disability market in future. Students with limited vision need a multisensory approach to learning. In addition to using their vision when it is effective and efficient, they should be encouraged to develop both listening skills and tactile skills.

To develop full literacy skills that will last throughout life, students with low vision should be taught to read and write both print and Braille. They must also develop the ability to determine which medium would be most appropriate for the task at hand. Instruction in Braille must be thorough. Only if the student gains sufficient speed and fluency can Braille be a realistic and efficient choice for a given task. Braille instruction must begin as early as possible in the student's education. Students who receive Braille instruction infrequently, such as two or three times a week, will not achieve fluency. Braille should not be treated as an isolated, irrelevant subject, but must be incorporated into the student's curriculum and school day. The student should be expected to use Braille for the various subjects that he is studying. As the student matures, he should be able to choose whether to do a given task in print or in Braille based on efficiency.

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Critical thinking and innovative approach in engineering education: An Overview

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ABSTRACT: *Innovation is most important aspect in engineering education. It happens when an individual think critically and critically thinking arises when any problem exists. It is an assessment that lies in the capability to cater unique and effective way of solving the problems from a lateral thinking perspective. However, there is a difference between creativity, innovation and engineering. Programs related to engineering education depends heavily on micro and intense technical explanation, in which there is little or no room in the course to develop creative and working ability.If this difference is not implemented in the overall curriculum of engineering education, then we will confine the engineers to deal with various problems in the traditional way rather that applying critical thinking to solve numerous problems.. In this article, the author tries to provide a glimpse of the roles and advantages of critical thinking and innovative service in engineering education. Further provide strategic framework to make an innovative curriculum for the technocrats.*

Keywords: *Critical thinking, Process of Critical thinking, Strategies for innovative Engineering education.*

I. Introduction:

Transformational innovation is the imperative notion of present education system, particularly in engineering education. Innovation comes just when individual think critically and comprehend the issue emerges. The curricula of the engineering education should be shifted from the Lecturer-centric to User-centric. The academia requires leveraging its strengths and innovating to make receptive and expedient services in order to retain its character in this digital environment (Li, 2006). Further the rapid advances of technology and the impact of globalization, engineering industry has been changed imperatively. The basic need of human being i.e. food, shelter, security, transport, energy etc., has meet due to the application of science and engineering. Other technological and scientific advances like, physics, botany and advance computing facilitate to the world of new innovation and provide opportunity to boost country's economy. Indeed it is highly essential for engineering education to keep its endeavor to cope up with the challenges and advances. Further the role of the higher education is to expertise engineers to manage the complexity and undetermined changes. It is very important to customize engineering explication in to the content of social, cultural, political and environment and to recognize the effect of local action of whole over the globe.An important issue of the future success of Indian industry is the growth of engineering education in India. Because the industry is challenging in the field of automobile, petro chemical, software and other engineering apparatus globally.

II. What is Critical Thinking?

Critical thinking is an innovative approach and a series of procedure, helps to design a consequential solution of a problem arises. These solutions lie on the collaboration of three factors includes, desirability, feasibility, and viability. Whenever, these factors get overlap than the innovation come to an existence.Further, it is a process of deep sympathetic and perceptive that naturally falls in to all abilities but often overlooks. In other sense, it is not required to use any creative tools to overcome the problem; rather, it depends upon the inherent ability to recognize the prototype and to built ideas rationally through expressive action. The process critical thinking begins with systematic assessment of individual needs; hence it is called as User Centric Approach".

III. Process of Critical Thinking:

The critical thinking process is overleaping steps of a system's deep thought, rather than a sequence of systematic steps. If an individual can transform an idea into sustainable offering, it is known as "Reaching to Scale", which means the idea has a broader impact and the ability to effect a systematic change of whole organization. Three steps are included in this process i. e inspiration, ideation, and iteration. Inspiration:

The first step in getting inspiration is to reflect the challenges that are appropriate for thinking in libraries: programs, locations, services or systems. There may also be operational challenges with which you are facing: the issues of employees, a disabled shelving system, or the process of buying technology. Do not let you be disappointed. Change is a procedure that can be incremental, developmental or progressive, relying upon what you make (offer) and for whom (client). When starts think critically, it is recommended intending to create transformative arrangements, which implies either generating new thought for present stakeholder or remain with the existing thought for new users. Ideation: In this stage transforming the thought into actionable insights, which will be the base of a substantial framework. Develop imagery the perceived thought of the inspiration stage,that will provide an opportunity to describe the framework. Ideas are generating with brainstorming. At the end, pick up the right idea and transform them into something considerable that can be tested in reality. Iteration: In this process, ideas are to be considered as per the assessment based on the user feedback. The primary thought should not be the greatest one, there is a need to Iterate or think about that idea to improve it. Further, in this process, assessment is being conducted with the use of prototype, collecting feedback and evolves the concept. The approach of critical thinking is not always linear contrary to previous phases, before preparing to fully implement an idea, it is required to go through multiple rounds of iteration on the concept. The main aim of this process is to generate a sequence of test or a pilot framework to build on the previous prototype.

IV. Critical thinking: it's Importance

As we live in a knowledge-based society, it is very important for the academia to think critically and be inventive in order to provide user-centric service. Critical thinking develops one's capacity to analyze and assess information so it can utilize the information preeminently for its own benefit. Further, it helps to deal with information that is exceptionally significant and particularly expected of a student. It empowers the students:-

to access huge amount of information

- to sum up information
- to be able to customize theories and arguments
- to be able to communicate effectively and justify the point of view that you have taken.

V. Why does the academia need Critical thinking?

Critical thinking helps academic institutions to introduce an innovative service, which will overcome the problem encountered by the institutions in daily basis. Initially, it begins to engage the user and then it spreads out all the institutions and provides various advantages as follows:-

Provide more confidence to initiate new innovation

- Provides better skill in project management process.
- Provides better collaborative culture
- Helps in strategic decision-making
- Responsiveness of users need to be augmented
- Prioritizing and evolving effective services
- Develop and prioritize innovative services
- Collaboratively engage the patron
- Helps to augment user satisfaction
- Provides innovative methods to connect with user community
- Make the curricula more advocate and loyalists

VI. Innovative services

Innovation isn't demonstrated just by starting or executing new thoughts or strategies. The meaning of innovation can be characterized as a procedure in which many activities are involved with featuring better approaches for getting things done. It ought not to be mistaken for creation because it may be characterized as the task of creating, developing, or delivering something. Though, the new innovations can be acknowledged with imagination. Individuals need to realize totally new possibilities to make incremental improvements. As we live in a digital age, each day something new, energizing and completely new innovation has propelled. The education sector are rapidly changing with the changing environment as the ways to consume and disseminate information are moving forward and the way people think and communicate. As indicated by the Merriam Webster Dictionary (2014) "Innovation is the demonstration or

process of presenting new thoughts, devices, and strategies". It seems to a pretty simple concept, but in reality, it feels like moving mountains.

VII. Strategy for innovative in engineering education

Sternberg (2007) defined three stuffs to promote the habit of creativity 1. Students are required to be involve in creativity, 2. Students should get positive encouragement because they engage in tasks requiring creativity, and 3 Students should be rewarded for demonstrating the desired creativity. Further, he advocate 12 strategies which directs the development of creativity habit and informs the development of the course for creativity. It is not suggestion that every aspect of engineering learning has to be changed. There will be several areas of the curriculum that are best served by the convergent approach

Redefine problems:-Students need to practice to make good choices. When their options do not work, students need an opportunity to try again. In order to meet the engineering students need, it is required to engage them in a project which will meet their requirement.

Analyze question and assumptions: - Students should be encouraged to ask questions, not just to accept the problem because it is given to them. This can be partially achieved in a manner in which faculty answers the question, as well as the faculty establishes a press in which the mindset of a question is valuable and demonstrated.

Sell your creative ideas:- students need to learn how to persuade others of the value of their ideas, i.e. to justify their ideas. Team-based activities, as well as competitive elements to student projects, engender an environment in which the students must become adept at selling their ideas, both to each other, and to faculty;

Selling of innovative ideas:- Students must know how to influence others to give

Importance to their ideas, that is, to justify their thoughts. Team-based activities, as well as competitive elements for student projects will enhance an environment in which students should be experts in marketing their ideas for each other and faculty.

Cohort of inspiration Idea:- Students need to practice in constructing ideas, with creative criticisms. In particular, students should be encouraged internally for peer teaching to engage in the thinking of deviation, as an essential component of the activities undertaken by students. In other words, students should be taught how they should think differently, and they should be given an ample opportunity to utilize this skill.

The role of Value based knowledge:- Creative Engineers at first need to be Technically competent. Comprehensive preparing is import, and we should be careful about over-spying. Students should be facilitate and encourage to understand wroth in emerging other knowledge and skills.

Recognize and surpass hindrances:- Students should do challenging work to create flexibility. They must be provided the opportunity to try and retry, if they fail. Of course, in project work, but in other courses too, students must understand that engineering is all about trying and learning.

Encourage functional risk-taking:- Students must be provided opportunity to try ideas, even if these ideas do not work. They need to know how to measure risks and understand that the risk is acceptable. It can only be encouraged to clarify to the students that they will not be penalized for the mistakes, both in their grade and in actual form.

Encourage tolerance of ambiguity:-by presenting students with non-defined problems. Creative people believe that ambiguity gives them more space to be creative. This may be as modest as being different from a familiar lab pattern - "Today's laboratory is handout for classroom. Follow the instructions". Instead of providing students a fully structured menu for a laboratory class, give them more open-ended problem statements which requires them to deal with ambiguity and think more independently.

Building innovative self-efficacy:- Students must be allowed to be innovative in order to avoid fallacy showing to be non-innovative. Innovative is a measureable portion of a project work, permits student to find out that they can be innovative and that innovation is the strength. For this, the faculty needs to understand Innovative, and how it appears in engineering products, and enthusiasm students to encourage it for the work they do.

Holding up gratification:-Promote the feeling that many-a -times you should work hard to get reward. Students are required to push their potential to the fullest extent. In both regular courses, and in the work of the project, we should ensure that students get an opportunity to pursue borders.For this, more flexibility may be required in the evaluation, so that each student can be pushed into the boundaries without always assessing in an ideal fashion. In every case, however, as a faculty we should have the option of pushing students beyond their comfort zone. However, this does not mean that instead of ten, twenty convergence do homework problems, but let students pursue all aspects of their program

Provide a favorable environment – Engineering educators need to be creative role model. We need to demonstrate our own flexibility, openness, tolerance for ambiguity and resilience –all twelve of the items mentioned.

Engineering teachers require acting as a role model of innovativeness. We need to demonstrate our own flexibility, openness, tolerance for ambiguity and twelve out of the mentioned things. More easily, we need to validate that we comprehend what is innovative, why it is worth, and why it is in the curricula. If, as soon as the programs are updated and re-accredited, the faculty certifies that students should be given the chance to progress a habit of building innovativeness by inserting these twelve strategies during the program, which will take a long way to reconstruct the innovativeness in engineering.

VIII. Conclusion

In this modern digital environment, an innovative effort is the most key to the success of overall higher education system. Most of the student increases expertise on their education through pragmatic knowledge, particularly in the event that it is shrewdly repackaged as fun. They are contented with those services which are more familiar to them. Engineering education may initiate familiarity that forms the awareness and increase the enthusiasm of their students to design the academic curriculum more attractive. This will restore their brand Instead of competing with technological progress in an adverse way.

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Optical Hybrid Communication System Using DP-QPSK Modulation Technique

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ABSTRACT: *In this paper, a 100 Gbps 4-channels WDM optical hybrid communication system is proposed using two mediums: FSO link covers 750m and optical fiber link covers 240km. The transmission performance is achieved using DP-QPSK modulation technique, and the optical coherent DP-QPSK receiver used to demodulate the received signals. The system is successfully demonstrated, designed, simulated using Opti system software and its performance is also analyzed in BER, Q-factor.*

Keywords: *FSO; fiber optics; DP-QPSK modulation; optical coherent demodulation; hybrid WDM*

I. INTRODUCTION

The increase in high speed internet demand, today's communication system requires a large bandwidth and high data rate (up to Tb/s) with efficient performance. The optical communication systems are designed to handle high speed operations, multi-channels, long-haul data transmissions, broadband services and so on. So optical hybrid systems based on FSOs (wireless link) and fiber optics have emerged as a better solution for these services. FSO links are wireless optical communication technology considered as best for short haul communication in both indoor and outdoor area [1].It uses free space as transmission medium and operates on line-of-sight technique. Many advantages of FSO are like an unregulated spectrum, easily deployable, low infrastructure cost, high BW, security, allowing higher data rate etc. They have wide range of applications such as MAN extension, LAN connectivity, fiber back-up, backhaul for wireless cellular network, disaster recovery, HD TV and medical image/video transmission, video surveillances etc[1]-[3].Whereas, an Optical fiber links are wired communications medium having advantage of transmitting data over long distances with less attenuation, less EMI (electromagnetic interference), transparent to wireless signal, greater information carrying capacity and multiple channel can be multiplexed on it. Signal propagation through an optical fiber experience a loss in quality and power due to the attenuating properties of fiber materials and dispersion [4]-[5]. Due to huge demand on communications, installation of optical fiber at large scale can be bulky and cost effective. Depending on their specific advantages and disadvantages, the optical hybrid system were improved.FSO links are affected by atmospheric turbulences which induce fading and path loss causing limitations of link distances. To overcome these problems some advanced modulation technique (BPSK, DPSK, QPSK, QAM etc) are implemented at a transmitter and receiver section [6].These modulations allow the transmission system to carry data at a channel bit rate higher than 100 GB/s e.g. 400 GB/s to 1 TB/s or beyond. For bit rate of 10 GB/s data transmission in fiber optics communication, different modulation techniques (RZ, NRZ, MDRZ, CSRZ) used and performance of these systems were improved by varying the dispersion parameters[7].It was observed that the modified duo binary modulation format provides maximum tolerance to dispersion but limited by low OSNR. Inter satellite systems performance were also analysed using DPSK and QPSK modulations on FSO communication link [8].

The WDM technology in optical communication system enhances system design and flexibility. WDM transmits data on many parallel carriers of different wavelengths on a single fiber core. 10 GB/s 4-channel WDM optical transmission over a 40 km fiber is achieved using two semiconductor optical amplifiers with wavelength BW of 40nm [9]. Later, a 64×10GbpsNRZ WDM with 100 GHz channel spaced is demonstrated using FRA. The WDM signals are propagated through SMF of 96 km, DCF of 16 km and RF of 10 km distance [10]. Hafiz etal. proposed a 100×40 Gbps, 0.2nm spaced DWDM system for long haul applications. This system combined with two hybrid amplifier (Er-Yb codoped waveguide amplifier and fiber optical parametric amplifier)which can achieve flat gain of 30.6 dB, ripple gain of 6.18 with low noise figure [11].An optimized hybrid optical system was designed using modified duo binary RZ(MDRZ) modulation in fiberbased DWDM system and QPSK modulation in FSO for bit rates of 160 Gb/channels,100

Gb/channels,40 Gb/channels [12]. This proposed system uses fiber optics for long haul, point to point communication and wireless optical diffused link for short haul, multicasting applications.It was also mentioned at strong atmospheric turbulences effect with 160 Gbps bit rate the optimized coverage distance obtained 419.53 km in fiber link and 129.34 m in wireless diffused link [12][13]. To obtain higher spectral efficiency and high bit rate transmission, DP-QPSK modulation is preferred which uses two orthogonal polarization (horizontal polarization and vertical polarization) of laser beam with same QPSK modulation signal on each polarization. For any given baud rate, it doubles the channel capacity. Kim et al. described with a practical implementation that DP-QPSK shows the best performance on optical noise tolerance and implementation complexity with the presence of AWGN in amplified spontaneous emission [14]. Their measurement result showed that DP-QPSK with one or two subcarrier transmits 46 Gbps or 112 Gbps using symbol rate of 11.5,14,28 Gbaud and DP-16QAM can transmit 224 Gbps. This article also mentioned the tolerance of coherent detection to transients and propagation conditions due to which it can enable transmission of 200,400,1000 Gbps per wavelength. Li etal. described for above 100 Gb/s data transmission through FSO,dual-polarization QPSK modulation techniques with coherent detection using DSP techniquesgivesthe best result as in improving line efficiency and maximizing spectral efficiency in DWDM system[15]. The coherent receivers integrated with complicated DSP circuits to supress and compensate the phase and polarization fluctuations occurred between reference light and signal light.In this paper a 4-channels WDM technique based optical hybrid FSO/FIBER is designed, simulated and performance is analyzed. The data transmission of 400 Gbps (100 Gbps/channel) is possible using DP-QPSK modulation. The 100 Gbps data rate can be transmitted 240km on fiber and 750m onFSO.

II. DP-QPSK MODULATION

The dual polarization quadrature phase shift keying (DP-QPSK) is one of the most useful modulation techniques for the 100 GB/s or higher bit rate transmission among all the multilevel modulation techniques as explained in the article [15]. It uses two orthogonal state of polarization (horizontal and vertical) of laser beam with IQ modulator (QPSK) signal for digital modulation and encodes 4 bits/symbol rate. DP-QPSK is widely used in optical communication to represent laser output into symbols for reducing the BW of the transmission of information. The system information is encoded in both polarizations and phase. Ex: for transmission of 100 Gb/s is achieved using 25 Gsymbol/s as it contains 4bits/symbols in its constellation. The Block diagram of DP-QPSK modulator is shown in figure 1. Pseudo random bit sequence (PRBS) generates 100Gb/s bit sequences. These sequences passed into serial to parallel converter (SPC) to equally for each input of PSK sequence generator. The output of PSK is given to M-ary pulse generators. The laser source contains one polarization which is linearly polarized. This laser source power or optical signals are splitted using a polarization beam splitter (PBS). Beam splitter produces two signals having same polarizations with each containing equal power. One of the splitted signal is given to upper IQ modulator (QPSK) while the other is given to lower IQ modulator (QPSK). Again, in upper part, QPSK signal polarizati on is rotated using polarization rotator to make vertical polarized signal(Y-pol^n).In lower part, it makes horizontal polarized signal (X -Pol^n). Both these polarized signals are combined using polarization beam combiner to obtain dual polarization QPSK (DP-QPSK) modulated signal.

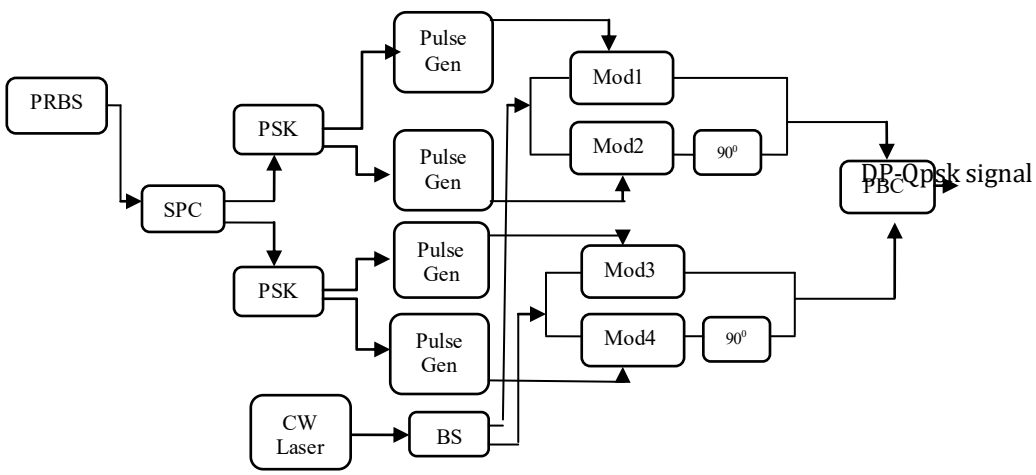

Figure 1: DP-QPSK modulator

III. OPTICAL COHERENT DP-QPSK DEMODULATION

The optical coherent receiver is required to recover the DP-QPSK signal as explained in [15]. The receiver section involves polarization beam splitter, a local oscillator or CW laser, 90-degree hybrid, balanced photo detectors, electrical subtractors, electrical amplifiers, threshold detector, PSK decoder, serial to parallel converter. All these combinedly recover the amplitude and phase of the transmitted signal. The coherent receiver requires two polarization beam splitter(PBS) and two 90-degree hybrid (IQ demodulator) to demodulate the received signal. One PBS is used for received signal and another PBS is used in the local oscillator (CW laser) to split. The PBS that splits the DP-QPSK signal into an X-polarization QPSK signal and a Y-polarization QPSK signal. They combinedly passed into two 90-degree hybrid circuits that mix the X-polarization QPSK signal with local oscillator laser light and Y-polarization QPSK signal with local oscillator laser light respectively. The two 90-degree hybrid produce 8 outputs which are proportional to sum of CW signal delayed by one (0,90,180,270) and input signal field to generate 8 light states in complex space and fed to balanced photo detectors. These 8 light states couples into 4 pairs (I_X, I_Y, Q_X, Q_Y) of orthogonal components I, Q at balanced detector output. The photo detected outputs are again fed to electrical amplifiers for low noise amplification. It minimizes dark current and maximizes sensitivity of the device. Then amplified signal passed to DSP which equalizes the linear transmission impairments such as GVD and PMD of optical fiber. DSP performs the impairment compensations to recover the incoming transmission signals after coherent detection. The threshold detector/decision components process the I and Q electrical signal channels received from DSP stage, normalizes the electrical amplitudes of each I and Q channels to respective M-ARY grids to perform decision for each received symbols into threshold levels. Then it is passed to PSK sequence decoder to decode into binary signals. The resultant is given to parallel to serial converter to produce DP-QPSK signal at output for further transmission.

Mathematically it is expressed as

$$I_x = E_x \cos[\theta_s(t) - \theta_{CW}(t) + \emptyset] \quad \text{----------(1)}$$

$$Q_x = E_x \sin[\theta_s(t) - \theta_{CW}(t) + \emptyset] \quad \text{----------(2)}$$

$$I_y = E_y \cos[\theta_s(t) - \theta_{CW}(t)] \quad \text{----------(3)}$$

$$Q_y = E_y \sin[\theta_s(t) - \theta_{CW}(t)] \quad \text{----------(4)}$$

Where E_x, E_y= amplitude of the received signal at X-polarization and Y-polarization,

$\theta_s(t)$= phase of the received signal,

$\theta_{CW}(t)$ = phase of the CW laser signal,

$\emptyset$ = phase difference between two polarization components.

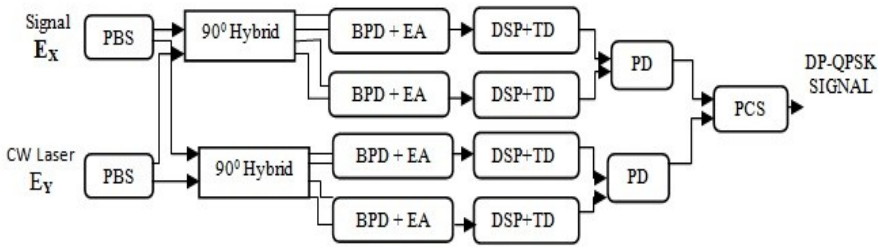

Figure 2: Optical Coherent DP-QPSK Demodulator

IV. PROPOSED HYBRID OPTICAL WDM SYSTEM

The schematic block diagram of4-channelsWDM fiber/FSO optical hybrid system is given in figure below. It consists of 4-channels FSO subsystems at transmission and receiver section, and a single mode optical fiber in between them for transmission. Each channel carries 100 Gb/s data e.g. total of 4×100 Gb/s data rates.

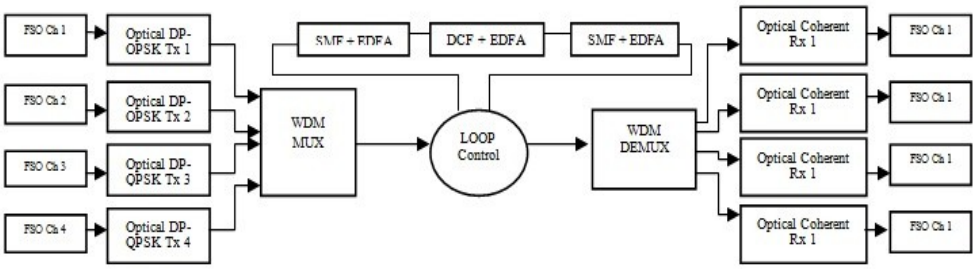

Figure 3: Schematic Block diagram of hybrid optical WDM system

In the above system, each FSO subsystems of transmitter section transmits data rate of 100 Gb/s. The wavelength of transmitter subsystems (T_{ch1}, T_{ch2}, T_{ch3}, T_{ch4}) were set to 1560.60nm, 1552.52nm, 1544.52nm, 1536.60nm respectively. Channel spacing is set to 1 THz. The generated 100 Gb/s DP-QPSK modulated signals are transmitted over 750m by FSO subsystems. Then the optical information signals are received and demodulated by using optical coherent DP-QPSK receivers with equal wavelengths. The demodulated signal is further processed and passed to DP-QPSK transmitters which has power penalty of 3dbm. A 4:1 WDM MUX carry all these wavelengths, multiplexed and the single output is fed to optical fibers. Two optical fibers used e.g. SMF (single mode fiber) and DCF (dispersion compensating fiber). The 4-channel multiplexed wavelengths were carried by two 25km SMF and one 10km DCF using 4 loop controls e.g. data transmission achieved over total distance of 240km via optical fiber. The transmitted optical signals were amplified by using erbium doped fiber amplifier (EDFA) with gain of 5db. To compensate fiber losses an EDFA is used to boost the WDM signals. A 1:4 WDM DEMUX is used to demultiplex the 4 channel wavelengths with BW of 75 Ghz. Again, 4 subsystems used which recovered the received signals. An optical coherent receiver using DP-QPSK demodulation techniques demodulate the information signals for further receiving at receiver section. The power of 5dbm is set to each channel receiver. The receiver section performs similar operations as per transmitter section. 4 FSO subsystems with matched wavelengths transmits data rate of 100Gb/s per channel over 750m. All turbulences effect such as scintillation absorption, scattering, rain, fog by which FSO system may be affected is set around 25db/km. The DSP of coherent receiver compensated the losses occurred during reception. The complex amplitudes of both horizontal and vertical polarizations are simultaneously measured and processed via DSP at receiver section. It was observed 400Gb/s data is transmitted successfully using 4-channel WDM fiber/FSO hybrid optical systems.

V. SIMULATION

The proposed 4-channel WDM based hybrid FSO/Fiber optical communication system is designed and simulated using Opti system software. From the literature survey, DP-QPSK performs better for 100 Gbps data transmission than other modulations. DP-QPSK modulation reduces circuit complexity and enhances channel capacity. So, it is possible to cover link distance of 750m on FSO channel with 240 km on fiber.The results are analysed and tested using BER test set and BER analyser. The bit error rate calculation obtained 0.00134. The details simulation parameters are given in tables. The bit rate of 100Gb/s considered for each 4-channels to transmit total of 400GB/s. The simulation parameters are

Table 1: WDM Parameters

PARAMETERS	VALUES
Bit rate per channel	100 Gb/s
Sequence Length	65536
Samples per bit	1
Number of Channels	4
Frequency Spacing Between Channels	1 THz
Reference Wavelength	1550nm
Symbol rate	25 Gb/s
Sensitivity	-100dbm
Resolution	0.1nm
WDM BW	75 Ghz

Table 2: Optical Fiber and FSO Parameters

PARAMETERS	SMF	DCF	FSO
Length	25km	10km	
Attenuations	0.2db/km	0.5db/km	25 dB/km
Dispersion	17ps/nm/km	-85ps/nm/km	
Dispersion slope	0.075	-0.3	
Differential group delay	0.2ps/km	0.2ps/km	
Effective area	70 um^2	22um^2	
EDFA gain	5db	5db	
EDFA noise figure	6db	6db	
Distance	60km × 4 span		750 meter

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VI. RESULTS & DISCUSSION

The output of above system is analysed using BER analyser and tested by BER test set. The BER obtained 0.00134, log of BER is -2.871 and sequence length for BER/iteration is 0.065536×10^{6}. Maximum power obtained at FSO output section is -52.311dbm for power-X and -52.43dbm for power Y, total of -50.319dbm.The constellation diagram and output spectrum observed at each section is shown in figure below. The input and output bit sequences are shown at binary sequence visualizer.

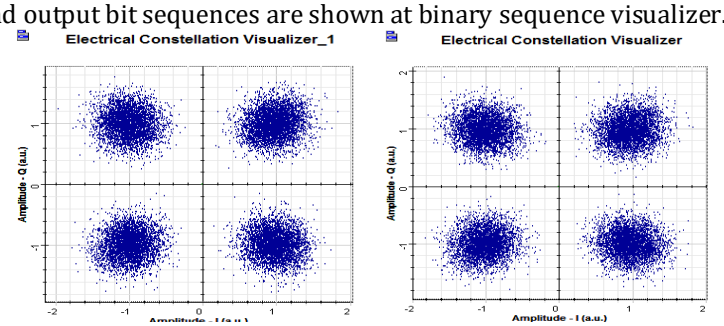

Figure 4: Constellation diagram of FSO subsystems at a distance of 750m for X-pol^{n} and Y-pol^{n} for transmitter section

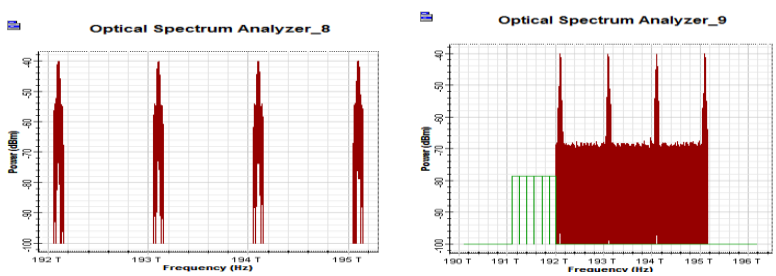

Figure 5: Optical spectrum view at 4-channel WDM MUX output and WDM DEMUX input

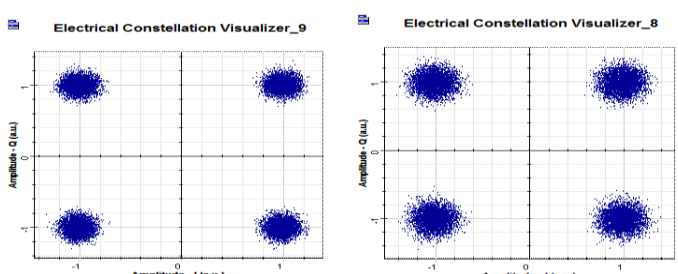

Figure 6: Signal constellation diagram of optical fiber at a distance of 240 km for X-pol^{n} and Y-pol^{n}

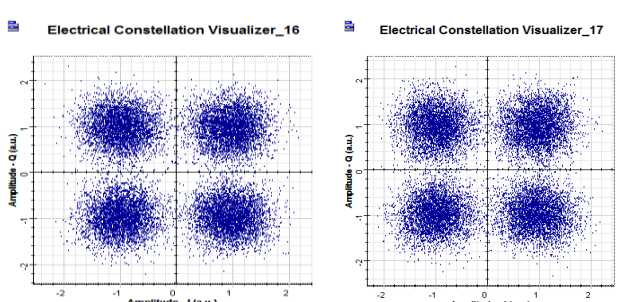

Figure 7: constellation diagram of FSO subsystems receiver section at a distance of 750m for X-pol^{n} and Y-pol^{n}

VII. CONCLUSION

The presented 4-channel WDM based optical hybrid system, which consists of two FSO link and Fiber link set up. The system is designed, simulated and performance is analysed for bit rate of 400Gb/s (4×100 Gb/s) using DP-QPSK modulation technique. The BER rate for different FSO and fiber distances obtained and compared. The constellation results showed both polarizations (X and Y) at receiver section. It

is observed that DP-QPSK modulation performs better for data rate of 100Gb/s or more transmission per channels. The total coverage distance obtained is 750m on FSO link and 240km on optical fiber link. The above system is useful in high speed and higher data rate communication systems.

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Analysis of Decision Tree Construction: A Data Mining Approach

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ABSTRACT: *Data mining is considered as one of the evolving field in the area of data science. Data mining consists of several methods and approaches to solve real world problems related to banking, finance, society etc. In this paper we have presented a detailed analysis of classification rule mining using decision tree induction. The method presented in this paper can be further used to solve various real world classification problems.*

Keywords: *Data mining, rule mining, classification, decision tree*

Introduction

There have been explosive growths in the volume of data, because of ease of storage, data collection, more computerization of various companies, and in daily life use of computer and mobile applications. Some of the major source of abundant data includes:

- Business: Online shopping, online banking transactions, stock market etc.
- Science: Organization bio-informatics, scientific simulations etc.
- Society: Digital media

So there is a huge volume of data but, it is not giving us enough meaningful knowledge. So with the help of data mining automated analysis can be done, and such massive data put to gather gives a meaning full knowledge. There is an alternate name to data mining called knowledge discovery from data base. Data mining is the process of extraction of useful hidden information from the historical data bases. The process is called as KDD. An outline of the steps of the KDD process are as follows [1]:

- Data Integration: From different source the data need to be collect.
- Data Selection: from the collected data we need to select some data which are useful for data mining.
- Data Cleaning: the data which are collected they may not be clean or they may contain errors, missing values, noisy or inconsistent data. For those data we may apply different approaches for avoiding or eliminating such anomalies.
- Data Transformation: Even after the data are cleaned even they are not ready for data mining. We need to transform them into different forms of mining. We can use various techniques like smoothing, aggregation, normalization.
- Data Mining: In this step we apply data mining techniques on the data. Basically this process is used to discover the interesting patterns. So clustering and association analysis like many different techniques are available.
- Pattern Evaluation and Knowledge Presentation: In this phase we use visualization, removing duplicate patterns and transformation
- Decisions / Use of Discovered Knowledge

The first four stages of KDD is called as data preprocessing. The real world data are consisting errors, missing values, noisy or inconsistent data. To removes these anomalies from the data set, the data has to go through data cleaning step of KDD. After data cleaning all the data from various sources has to be integrated. During data integration some of the issues have to resolve using entity identification problem and redundancy detection. Then data selection can be performed to analysis a selected part of the entire data source. Data transformation is highly essential, because all the real world data needs to be converted from the original format to the data warehouse specified format. Once the data preprocessing is over then we can perform data mining on them [1, 2] Data mining is one of the steps among KDD steps. It consists of several approaches to deal with different real time problems. Some of the approaches of data mining includes[1, 3]:

- Association rule mining.
- Classification analysis.
- Clustering and anomaly detection.

• Sequence analysis etc.

In this paper we have analyzed classification rule mining in details using an example. There are two types of forms for data analysis, which are used for to predict future data trends or extracting models describing important classes. The two forms are i. Classification ii. Prediction. These two forms really help for better understanding of large volume of data. Classification models predict categorical class labels; and prediction models predict continuous valued functions. For example, we can build a classification model to categorize bank loan applications as either safe or risky, a customer who will buy a new computer between a set of new profile customer. Where as a prediction model to predict the expenditures in dollars of potential customers on computer equipment given their income and occupation. In this paper we will learn the basic technique for constructing decision tree classification

CLASSIFICATION MODEL

Classification is the process of assigning one object in to several predefined categories. It is common problems that can be enclose in to many diversify applications. For example finding spam email message based on the message header and body content, categorizing cells as malignant or being based up on the results of MRI scans, classifying galaxies based on their shapes etc. in data mining functions classification model is commonly used for assigning items in a collection to the classes or target categories .the classification plays an important role to predict the target class for each case in data. For example to find low, medium or high credit risk for an applicants. When a classification task starts with data set in which the class assignments are all ready known. For example over a period of time for many loan applicants the classification model predicts credit risk could be developed based on observed data. The categories can be identified by discrete values, there is no impact factor on the ordering among values. Let assume a set of values 1,2,3 can be used to represent x,y,z , when there is no ordering applied among the group of treatment dominion. Suppose a marketing manager of a shopping mall would predict how many customer will spend during a sale. In this predict we found a numeric value. There for the prediction can be a number prediction. For the given case a predictor or model can be illustrated which can predict a continues-valued-friction or an ordered value. This kind of model called as predictor model. For numeric prediction we use regression analysis as statistical methodology. Hence both the terms are used. Expect these two methods there are several other methods are used for numeric prediction. An attribute selection measure is a heuristic for selecting the splitting criterion that "best" separates a given data partition, D, of class labeled training tuples into individual classes. This method is used to determine the splitting criterion, the splitting criterion approach identifies on which attribute to test at node N by determining the best way to separate the tupples in D into individual classes [4].

CONSTRUCTION OF DECISION TREE

A decision tree a kind of data structure which includes leaf nodes, intermediate node, branches with a root node. Each internal node represents a test on an attribute, each leaf node has a class label and each branch identifies the outcome of a test. The root node the topmost node of the tree. Decision tree is the selection process for learning of decision trees from set of class based training tuples [4, 5].

In this paper we have used ID3 as a standard approach for tackling a classification problem [4]. There are 3 popular attribute selection measures they are : information gain, gain ratio, gini index. The tree node constructed for the partition labeled as D with the splitting criterion, and each outcome of the criterion are grown with branches and accordingly the tuples also portioned.

The tree node created for partition D is labeled with the splitting criterion, branches are grown for each outcome of the criterion, the tuples are partitioned accordingly, this section describes three popular attribute selection measures information gain, gain ratios, and gini index.

The algorithm uses three parameters:

• D: it called as data partition, it the complete set of training tuples in initial stage with their class levels.

• Attribute list: it describes the tuples with a list of attribute

• Attribute Section Method : it defines a heuristic approach for selecting the attributes which can discriminates the given tuples as per the given class.

An attribute selection measure is a heuristic for selecting the splitting criterion that "best" separates a given data partition, D, of class labeled training tuples into individual classes. This method is used to determine the splitting criterion, the splitting criterion approach identifies on which attribute to test at node N by determining the best way to separate the tupples in D into individual classes.

ID3 uses information gain as its attribute selection measure. Where gain of an attribute is measured using the following expression.

Gain (A) = Info (D) – Info$_A$ (D) (1)

Where *Info* (D) can be obtained using the following expression.

$$\text{Info (D)} = -\sum_{i=1}^{m} p_i \log_2(p_i) \qquad (2)$$

Where,

D is the training data set.

p_i is the probability that an arbitrary tuple in D belongs to class C_i and is estimated by $|C_{i,D}| / |D|$.

m is the number of classes. Now, *Info$_A$(D)* can be calculated using the following expression.

$$\text{Info}_A(D) = \sum_{j=1} \frac{|D_j|}{|D|} \times info(D_j) \qquad (3)$$

Let's consider a well known training data set for weather forecasting as presented in Table I. From the given training

TABLE I
TRAINING DATA SET

T	Y	Z	W	V	N
T1	Y1	Z1	W1	V1	N
T2	Y1	Z1	W1	V2	N
T3	Y2	Z1	W1	V1	Y
T4	Y3	Z2	W1	V1	Y
T5	Y3	Z3	W2	V1	Y
T6	Y3	Z3	W2	V2	N
T7	Y2	Z3	W2	V2	Y
T8	Y1	Z2	W1	V1	N
T9	Y1	Z3	W2	V1	Y
T10	Y3	Z2	W2	V1	Y
T11	Y1	Z2	W2	V2	Y
T12	Y2	Z2	W1	V2	Y
T13	Y2	Z1	W2	V1	Y
T14	Y3	Z2	W1	V2	N

data set we can find out the splitting attribute by using the Information gain of each attribute. The gain of attributes can be obtained using Eq. 2.

Info (*D*) = -9/14 log $_2$ (9/14) - 5/14 log $_2$ (5/14) = 0. 940

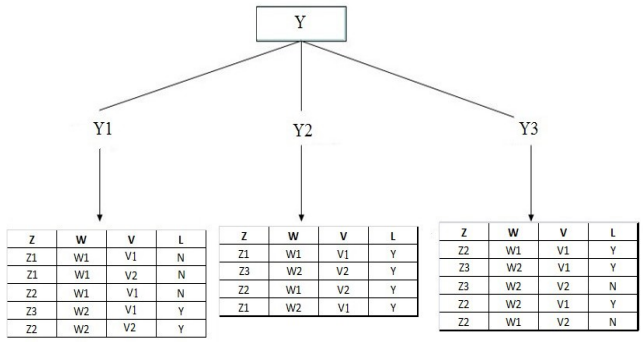

Fig. 1. Outlook as a splitting attribute.

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Here,
Info $_Y(D)$ = 0.694
Gain (Y) = Info (D) – Info $_Y(D)$= 0.246
Info $_Z(D)$ =0.911
Gain(Z)= Info(D) – Info $_Z$(D)=0.029
Info$_W(D)$ = 0.789
Gain(W) = Info (D) – Info $_W$(D)= 0.151
Info(V) = 0.892
Gain(V) = Info (D) – Info$_V$(D)= 0.048

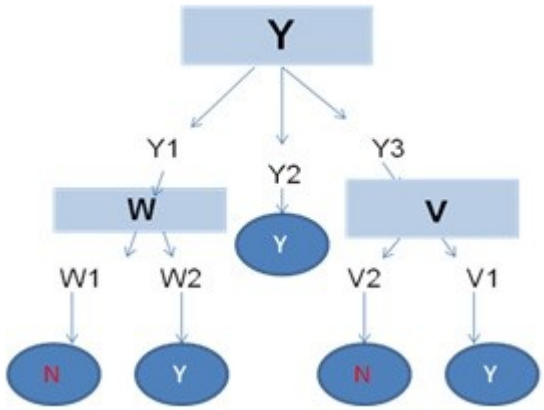

Fig. 2. Decision Tree

Since Outlook is having highest Information gain thus this attribute is selected as a splitting attribute. After splitting the attribute the intermediate tree is presented in Figure 1. The same process will be repeated for all the node to reach the leaf. After completion of the entire process the finale tree that is generated is represented in Figure 2.

RESULTS AND DISCUSSION

The rules that are derived from the decision tree for the concept play are outlined in the followings.
IF y= y1 AND y2= w1 THEN l= N
IF y= y1 AND y2= w2 THEN l= Y
IF y= y2 THEN l= Y
IF y= y3 AND v = v2THEN l= N
IF y= y3 AND v= v1 THEN l= Y

CONCLUSION

In this paper, we have presented the overview of some concepts and techniques of data mining. Further we have analyzed the classification rule mining process using a well known Weather forecasting data set for simplicity. The results obtained are the rules that can be used for future forecasting, again this approach can be used for other classification problems.

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A Novel Approach in Opinion Mining and Sentiment Analysis

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ABSTRACT: *The web consists of highly valuable, vast and unstructured information about public opinions on so many entities like product reviews, industry feedbacks, political issues etc. Here the history, current use and future of opinion mining and sentiment analysis along with are discussed along with relevant techniques and tools with their classifications and implementation.*

Keywords: *Opinion mining, Sentiment analysis, Natural Language, polarity.*

Introduction

Making a decision is always a difficult task, whenever there are multiple choices available to choose from. The choices may include certain valuable resources like investing some fund and time involved to buy some products or services. Public generally rely on the peer's past experience on the same ground. Until now we are gathering information from the sources like friends, websites or magazines. Now we got many platforms like social media, blogs or different forums. The challenging factors of the information collected from the above platforms are highly unstructured as they are produced for human consumption but can't be processed by the machines. Confining public opinion about social actions, political movements, organization policies, marketing strategies and product reviews are gaining interest towards the scientific community due to its challenging factors and business world for possible financial market prediction etc. the resulting fields gaining popularity are opinion mining and sentiment analysis. These fields are actually using the data mining and natural language processing (NLP) techniques to extract and filter the information from the World Wide Web's textual information. Mining sentiments and opinion from natural language is very difficult as it requires deep knowledge of syntactic and semantic rules of the language. Opinion mining is a very restricted NLP problem as there are a lot of ambiguity at the time of handling the negation, positive, negative, happy, sad etc. statements. The text may also contain different named entity, references etc, recognizing which is a very complex problem.

Transforming Knowledge Based Methods to Concept Level Sentiment Analysis: The field of opinion mining is a very narrow area of NLP as it only requires understanding the positive and negative sentiments of any sentence of any particular statement, hence it's an emerging area to make research on the field and do progress on getting an optimal result. Many organizations are now currently doing research on opinion mining and sentiment analysis, such as companies are using opinion mining tools to keep an eye on the public reviews to create and maintain opinion aggregation websites. The organizations generally gather a wide range of information from the web such as public reviews of different products, brand feedbacks, issues on political decisions etc. some also use this technology to build customer relationship by continuous study of positive and negative feedbacks of customer by analyzing them. The research and development of such organizations focuses on development of some automated tools that can extract the desired information from the reviews automatically. Several tools are already exist in the market to extract and analyze information from blogs which includes SenticNet, Luminoso, Factiva, Attensity, Converse etc. Most of the tools already developed are very much limited towards their functionality to find out the polarity evaluation and mood classifications according to a limited set of emotions; hence these tools cannot capture the opinions or sentiment which has been expressed implicitly.[1][3]

Common Approaches for Sentiment Analysis: The major role of opinion mining is polarity classification. It occurs whenever a text is giving multiple statements on a single issue. Reviews like 'Thumbs up' or 'Thumbs down' or 'like' or 'dislike' etc are examples of polarity classification. Classifications of polarity also define the positive and negative expressions in web reviews and helps making the product evaluation more clear. Detection of agreements is another form of binary sentiment classification which determines whether a set of text should get the same or different sentiment related labels. After identification of polarity classification it may assign degrees of positive or negative. If any text doesn't contain strong opinions or

contain more than one opinion than subjective detection may be a great challenge. The subjective and objective of a text helps in the classification of sentiments, as a piece of text might have a polarity without necessarily containing an opinion. Sometimes a text document may contain information on several topics which excites the users, in such cases identifying the topic and separating the opinion from the topic is more important.

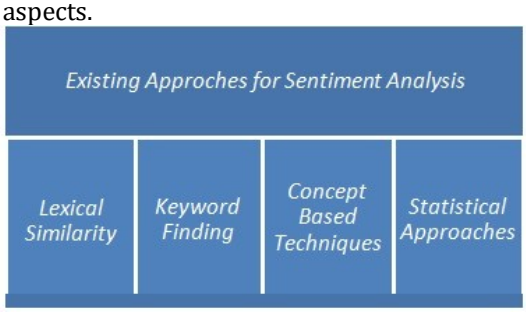
Evolution of Opinion Mining: Currently vector extraction plays an important role in the field of opinion mining and sentiment analysis to produce most important features from text; hence we can use this to get the most relevant features in sentiment classification. The firm frequency and presence are two common feature used currently for the same purpose. The binary valued features vector "presence" in which the "value 1" and "value 0" gives indication of the entries. For review of polarity classification presence can be a more effective basis, but repeated terms may not reflect the overall sentiment.

More often the position of a token in a text unit may affect the overall sentiment of a text. Here we might consider presence n-grams typically bigrams and trigrams to be more useful features. General analysis of text uses part of speech (POS) information (nouns, adjectives and verbs) as a basic form of word sense disambiguation. Adjectives are good source in finding sentiments and features. Most of the researches on sentiment analysis was focused on English language and some applications were developed like sentiment lexicons, corpora etc., But apply these researches to other languages may result in domain adaptation challenges [5]. A sentiment lexicon is being used in some unsupervised learning approaches to find out the degree of positivity. It generally finds the prior polarity of identifying the contextual polarity as subjectivity [1].

Documents with full of opinions such as public reviews on products generally uses the regression technique to predict the degree of positivity or negativity of opinions for a similar kind of product regression method implicitly develops similar relationships among classes that correspond to point on a scale, such as the no. of stars that generated by the reviewer, modeling discourse structure, such as twists and turns in a document. In earlier research some researchers tries to incorporate location information into the feature to get better result in getting accurate polarity.

Opinion mining and sentiment analysis research are involved in so many complexities as many researchers contributed many things toward the field, as Bo Pang and her association classified the documents by overall positive or negative polarity and gathered scores from the review ratings [7], but these documents are mainly supervised in nature. The real challenge lies as sentiments do not occur only at document level. Sometime one document may have both positive and negative opinions, hence later works focused on segment level, which use graph based techniques to identity sentiments.

Later on researchers reduced text analysis, phenomenon by introducing sentence level analysis by using the presence of opinion bearing lexical items to detect the subjective [9]. More often the sentence level approaches may also fail to find out the sentiments about an object or its aspects. To overcome the problems some researches adopted an aspect level approach where an opinion consists of targets and the sentiments associated with it [15-17]. For e.g. "the Samsung S5 phone has a great look with a huge screen but its battery life is too short, "gives two aspects of opinion targets". The sentiment about the look and screen is positive but built a strutted summary about any product or entity which will give more accurate statistics about those aspects. By analyzing the evolution opinion mining in sentiment analysis we can broadly categories the existing approaches in four aspects.



Key word finding: The most popular approach due to its economy and accessibility is keyword spotting as it classifies text with the help of some unambiguous words like happy, sad, afraid, bored, cheerful etc. key word finding is work in two aspects, it can't reliably identify affect negated words and it replies an surface features too[19]. Though it can classify sentences with affectivity positive words such as 'you look happy today' or "you are not looking happy today" but sometimes it fails in some sentences such as" my brother

just filed a case on civil court and he wants to take all property away from me." This statement evokes strong emotions, but uses no affect keyboard and hence is ineffective. Lexical affinity is little more sophisticated than keyword finding.

Lexical similarity: This method not only finds the affects words but also gives a set of uninformed similar words towards a particular emotion. E.g. Lexical similarity method may assign a 75% probability of identification as a negative effect as in "train accident", "met with an accident" etc. this method generally trains probability through linguistic corpora [21-23]. Though it performs well than keyword spotting there may be two problems with this method. i) Negated sentences like "I just pass up from an accident "and with other meanings like "I met my old friend by accident "may raise complexities to find the appropriate polarity ii) Probability based on lexical similarity and often biased toward text of a particular variety.

Statistical Approaches: This method is very popular for affected text classification which involves Bayesian inference and support vector machine to implement it [9][10][15][24]. Researchers use statistical approaches by applying machine learning algorithms (large training corpus of affectivity well interpreted texts). Hence the system learns the affective group of affect keywords as well as takes a group of other similar keywords and word co-occurrence frequencies.

Unfortunately the statistical approaches are weak in semantics i.e., the statistical model's other lexical or co-occurrence factor have little predictive value. As a result it works well when a large set of text must be given as input. These approaches don't work well on smaller text units like sentences or classes.

Concept based techniques: These approaches help the system in collecting conceptual and affective information associated with natural language opinions. These approaches rely on the implicit meaning or features attached with natural language concepts rather than blindly following the keywords and word co-occurrence count [25-27]. Concept based approaches can find and detect ingeniously expressed sentiments. The concept based approach relies strongly on the knowledge bases it uses. The distinctiveness of the fact that they include only typical information association with the concept restricts their capability to handle semantic gradations.

Eventually research on sentiment analysis is representing a distinguished field for itself which may falls somewhere between NLP and natural language understanding. Opinion mining mainly focuses on semantic implications and touching information associated with natural language which may not necessarily requires a deep understanding of text. We visualize content-/concept-/context based analysis of natural language text as sentiment analysis supported by most efficient parsing techniques feasible for big social data analysis [32].

The involvement of machine learning techniques in the field of research by the computer science researchers for automatic affect classification from video, voice or text which adds a ideology to its models and methods, which is leading towards understanding the human emotions by the machine in a more effective way. Future research must have more complete knowledge with reasoning methods that must deeply inspired by human thoughts and psychology. Better understanding of NLP may efficiently bridge the gap between multimodal information and machine processable data will add more perfection to the field. [23]

Conclusions: In this paper we focused on the existing techniques and tools that can be used for sentiment analysis or opinion mining. We have tried to give different examples which can ease to understand the concept. In this paper we also discussed how the existing approaches can be implemented to mine different sentiments from the web and how they can be in future by discussing various pros and cons. of the futuristic approaches.

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ENHANCED TIME STAMP ALGORITHM TO MINIMIZE STARVATION

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ABSTRACT: *This paper reviews the transaction synchronization using timestamp base protocol with its problems. Also analyzed the transaction confliction using timestamp which is maintained by the system. Starvation is the biggest issue in time stamping by which many problems may occur further like deadlock. Two new methods are introduced to minimize the starvation. Which may be implemented in many other systems like distributed system, real time system etc.*

Keywords: *transaction, synchronization, concurrency controller, locking, timestamp, deadlock, starvation, serializability.*

Introduction

Concurrency operation is extremely requisite in the field where the operations or the transactions are implementing concurrently or simultaneously. If synchronization is not being done by the system then the transactions may be conflicting with each other. Which gives many non desirable results like deadlock, non -serializability, starvation and inconsistency? To resolute these tribulations numerous techniques are existing. These are as follows:

A. Locking:

Lock is a variable which controls concurrent admittance in the direction of a data item. It reassures that one process should not retrieve or bring up to date a record which another process is updating. This is not making certain serializability. Therefore individual deviation of locking is two-phase mode is used to make certain serializability.

B.Timestamp based protocol:

It is an exceptional identifier. Apiece transaction is issued a timestamp at what time it enters into the system. It settles on the serializability order.

C. Optimistic method

To Move toward surrounded by reach of "hopes" that incongruity does not happen and transactions are permissible to advancement as although there were no prospect of divergence. Rationale is to rein in the time over which a specified resource would be out of stock for utilized by supplementary transactions.

System Model

A Transaction consists of three phases:

- Read Phase: All writes take place on local copies of the object to be modified
- Validations Phase: The step in which it is determined that the transaction will not cause a loss of integrity
- Write Phase: Copies are made global

Multiversion technique

A number of versions of an item are kept back by a system. A number of read operations that would be discarded in additional techniques can be established by assessment an older version of the item. It maintains serializability. Multiversion currency control scheme types

- Based on timestamp ordering
- Based on two-phase locking

On the other hand numerous concurrency control techniques are there but they are categorized into three types.

- Pessimistic (conservative) concurrency control: The pessimistic concurrency control impediment the transactions if they disagreement with other transactions at some time in the future by locking or a time-stamping technique.

- Optimistic concurrency control: the optimistic concurrency control, that presuppose that the disagreement is rare, permit concurrent transactions to ensue without imposing delays to ensure serializability then check conflict only at the end, when a transaction commits.
- Semi-optimistic -: Block operations in some circumstances, if they may cause infringement of some rules, and do not obstruct in additional state of affairs while impediment rules checking (if needed) to transaction's end, as done with optimistic.

Algorithm for time stamping

Here, each transaction is assigned with a unique timestamp by the scheduler or concurrency controller. The scheduler at each Data Manager (DM), keeps track of the largest timestamp of any read and write operation processed thus far for each data object. These timestamps may be denoted by R-ts(object) and W-ts(object), respectively.

Let us also make the following notations:

read(x,TS) --> Read request with timestamp TS on a data object x.

write(x,v,TS) --> Write request with timestamp TS on a data object x. v is the value to be assigned to x.

A read request is handled in the following manner:

If TS < W-ts(x) then

Reject read request and abort corresponding transaction

else

Execute transaction

Set R-ts(x) to max{R-ts(x), TS}

A write request is handled in the following manner:

If TS < R-ts(x) or TS < W-ts(x) then

Reject write request

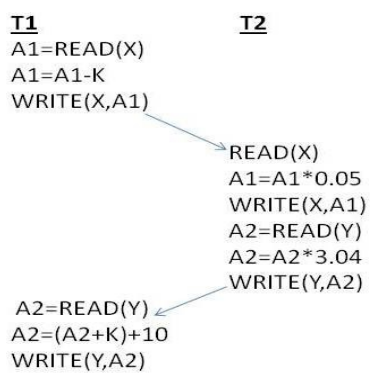
else

Execute transaction

Set W-ts(x) to TS.

Conditions for the execution of transactions

If timestamp is greater hen the requested transaction is allowed for execution otherwise not. If the timestamp is equal also be allowed for execution. In these two conditions again we have to see whether the transaction's operation is conflicting with the requested transaction's operation or not. if conflicting then the request must be rejected.



TS (T1)=5

TS (T2)=10 WHERE TS IS THE TIMESTAMP

Here T1 is not allowed to execute READ(Y) operation because this operation is conflicting with T2 transaction's WRITE(Y) operation and TS (T1) <TS (T2). So T1 is aborted.

Problems with the time stamping

- However, there is a possibility of starvation of long transactions if a sequence of conflicting short transactions causes repeated restarting of the long transaction.
- This protocol can generate schedules that are not recoverable.

The key problem by means of time stamping is Starvation. Condition a transaction is preferred as a casualty repeatedly and in receipt of aborted and restarted. Then that transaction by no means absolute its implementation.

Proposed solution

A. If the transaction is aborted and restarted to get a new timestamp. If that timestamp is less than the current transaction then the requested transaction is aborted. So the system must specify a limit .Limit means how many times a transaction is aborted. So that automatically the system based on that limit the timestamp will be increased. So that the transaction is getting chance to execute its operations.

Set Limit=n
If TS (T1)<TS(T2) then
T1 is aborted and restarted.
Else
Execute T1
Check if Limit (T1)=n then
Increment TS (T1)
Execute T1

B. Second solution is if priority is assigned to the transaction. up to some limit the transaction's abortion the system will assign priority. If priority is higher than the current transaction then the transaction is allowed for execution. If not then the system will increment the priority.

Set Limit=n
If TS (T1)<TS(T2) then
T1 is aborted and restarted.
Else
Execute T1
Check if Limit (T1)=n then
Assign priority to T1 and T2
If priority (T2)>priority (T1) then
Execute T2
Else
Increment the priority (T2)

This technique can be implemented in distributed system also. There are many methods to implement is. They are

Clock Synchronization by message passing (CSM Method):

If a message is coming from remote node to the local node with higher timestamp then the local nodes timestamp is assumed as less. If that message is not processed immediately then deadlock may occur. So the timestamp of the local node is incremented in advance to synchronize the concurrent transactions. Also same timestamp should not be assigned to two transactions. Clock synchronization algorithms may be broadly classified as Centralized and Distributed.

Conclusion

This paper first outlined different concurrency control approaches to synchronize the concurrent transactions. Also analyzed the role of time stamp and it helps in conflictions among concurrent transactions. After analysis identified some of the drawbacks of time stamping. Out of them starvation is the most serious problem. Two methods are proposed to minimize or remove the starvation. These two methods are also be implanted in many domains also. Here instead of repeatedly roll backing the transactions which are coming for execution we increased the timestamp so that we can minimize the starvation and also deadlock problem. In future we can use the locking concept with time stamping together to avoid starvation situation.

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A study on Query Processing and Optimization to reduce the usage of system resources in mobile environment

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ABSTRACT: *To process a query in a timely manner is an important factor of a DBMS. The database contains millions and trillions of records particularly in the application areas such as weather forecasting, aeronautical applications, banking system. Time limitation in these areas for the query execution is very important.The mobile devices became very important means for information, which are available to the world through various platforms like social networking, cloud computing, peer-to-peer communications and so on. Such information has been changed in form of databases and further use tosupport the queries from other users.*
So, the primary focus for a researchis on the resources spent on creating smart and efficient query optimization engine.
In a mobile computing area, a mobile user has a limited power to access various data via wireless communication. So, for mobile environment needs the best architecture and queries for implementation. We know now-a-days the applications such as stock activities, traffic reports, and weather forecasts, Google maps have become increasingly popular in mobile in recent years.
Here we have focussed on query optimization for reducing the usage of system resources and to provide correct result to the user within a minimum span of time. The optimization provides fast results and it increases the speed of execution of an application. It also allows the system to execute more queries in a very short time.

Keywords: *Mobile Database, Push Mechanism, Pull Mechanism, Location Management, Location Dependent Data, Database systems, Agent Based Query, Mobile application, data broadcast, multiple query optimizations.*

INTRODUCTION:

A database must give a prompt response to the query entered by a user for getting the desired information in a predictable and reliable manner.With the technique of Query Optimization the results can be extracted on time and the data must not be scattered for effectivequery processing.

In this paper we focussed on the poor performance of query when the date fragmentation percentage is more and we have analysed how the fragmentation can be reduced using rebuild and re-organize techniques. In the last section, we have taken a sample data for query processing before rebuild and after that to have a comparative analysis. [1][12]

In the mobile environment a query which is processed may relate to the different environment of different architecture.

So, the optimization of query will allow reducing the execution time. Also as in mobile the memory is limited so it is important to consider the location management for query processing. [2]

BACKGROUND AND SIGNIFICANCE:

We know that the mobile computers use small batteries for their operations. The mobiles are not connecting directly to any power source and also there is a limited bandwidth for wireless communication. So during designing a mobile it is very important to save the communication band width and energy of a mobile. At the same time we need to allow the users to access information.

DIFFERENT QUERY TYPES

The classification of queries in mobile database can be entirely new and specificallyapplied in the wireless environment.

The other queries can be of common type present in traditional databases. In a mobile environment there are three types of entities:

(i) Submitting query by a mobile client
(ii) A query or a portion of it is processed by mobile server
(iii) The targeted data by the query is represented by the moving object.

The entities of query are divided in to five categories, such as:

1) The Queries of Non Location (QNL): In a query when the predicates and attributes used are of Non location related are QNL. Ex: "select all Hotels with south Indian Recipes"[2][13]

2) The Queries of Location (QL):When the results of a query are belongs to the location of a query

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issuer then it is related to QL. For example: "Search for the closest cab within 2 kilo meter of mycurrent location".[2][14]

3) Query for a Location(QFL): When the query contains an attribute as one Location for finding then it is QFL. For example: "What is the weather condition in New Delhi?".[15]

4) Query of Continuity (QC): Here the queries contain all queries generated by a mobile device and the querying objects are moving. For Example: "Find the vehicles which are in the radius of 500 meters of my vehicle". The result could be a set of vehicle positions what also varies continuously with the movement of the vehicles.[2][16]

5) Ad Hoc Query(AQ): In these queries, the query statementrepresents the required information and does notinvolve in any context awareness information. Thus, the queryresult is only based on the actual query itself. For example: "In a College the studentsneed to get their academic information.[2]

QUERY PROCESSING: The query processing in a mobile environment is toform a high level query on a distributed database. Which means by using a single query in different environments with an efficientexecution strategy is important. Here the important point of query processing is queryoptimization. Because many query execution strategies are to help in reducing the time required fora query to be processed. In query processing the location management is an importantissue in the mobile environment. As because thenumber of users carrying mobile phones is increasinglinearly with the service demand of it, so the communication traffic forlocating the users is also increasing accordingly. Now it requires an efficient searching strategy for location tracking andmanagement. Location management is an important factorfor query optimization and processing in mobile based environment. The more number of data send by the devices, that movesas requests will be given by the centralized server and thiswill increase the chancesfor mobile clients to send the request. Anyway, at a certain point the advantage of thebroadcast data will be weakened if there is more data inthe broadcast cycle. Therefore, it will strictlydisturb thequery response time since mobile users have to wait fornoticeably long delay before they get the desired data.So, it is important to decide what data to be broadcastthat serves most of the requests as because the query access pattern is changed dynamically.The query can be optimized at different times relative to theactual time of query execution. Optimization can be done statically before executing the query.

The main advantage of the later method is that the actual sizes of the intermediate relations are availableto the query processor. The disadvantage of the dynamic method is thatthe query optimization is an expensive one and must berepeated for each and every query. So, the hybrid optimization is used as a better choice in some situation. [5][29][27]

The query processing is divided into two types: i) push operation and ii) pull operation.

The push operation is having many advantages in mobile environment. In push operation the clients sends query to the server using a dedicated channel and the client monitors to the broadcast channel continuously to get the query result. Here the broad cast channel is used to send the query result to the clients. In the mobile environment the no. of requests given by a client may be very large, so it is necessary for the server to find some technique to optimize the query requests. So, we are giving our focus on the different methods to optimize the queries.

PULL MECHANISM: The pull operation is similar to client-server interaction. Generally a client gives a request to the server, and then it is placed in a queue. Once the server processes the request from queue it gives back the result using a dedicated queue.

This mechanism provides a straight query processing methodology. In this, the client starts a query and that is subsequently sent to the server for processing using a dedicated channel. Then the server sends the result of the query back to the client side. The inefficiency of this technique is an extensive response time especially when the wireless traffic is high and a waste of power consumption since a client has to keep tuned in while waiting for the query result. Sothe mobile client has to resend the query if it misses the result from the server due to some problem such astransmission failure. We cane over come from this problem by caching the most frequently accessed data. This technique is used to improve the query response time, reduces the power consumption and the query traffic.[3][20]

PUSH MECHANISM: Whenthe data items broadcast frequently the mobile client storesthat data page. In this page the local probability of access is meaningfully greater than its frequency of broadcast. [3][18]So, the main reason for accessing data in this method is because of the poor performance that a mobile client experiences.

The main issues in characterize caching mechanism are:
(i) caching granularity,
(ii) cachingcoherence strategy,
(iii) caching replacement policy.

Caching granularity: It explains about the physical form of cached data items. The cached data item comes by the database in which the data is stored. This database type can be either a relational database or an object-oriented database. The cached data itemsin a relational database can be of tuple-caching or page-caching. So, it is a contradictoryargument between tuple-caching and page-caching design. In page caching, the overhead for transmitting one page is similar to a conventional client server environment. When a database item is retrieved from the server, the extra overhead for transmitting the remaining database item of the same page will be very small.[3][20][21]

Caching coherence strategy: This strategy contains cache invalidation and update schemes to invalidate and update an old and out-dated cached item. After a certain period of time the cached data will no longer be valid, that is why a mobile client must get a new version of the cache before the data is retrieved. There are many strategies have been proposed to overcome this problem. [22][19]

Caching replacement policy: It is required in order to maintain the frequently accessed database items in a client's local memory. For more effective a caching replacement policy is used for keeping the frequently accessed items. Here the caching replacement policies follow access utilize probability as the primary factor to get the data items to be replaced.[20][21][3]

THE QUERY PROCESSING IN MOBILE DATABASES:

We can divide query-processing system for mobile databases intothree parts, namely:

(i) Query with mobile client system(MCS),
(ii) Query with wirelessnetwork system(WNS),
(iii) Query with server system.

1)Query with mobile clients system: Itelaborates about the client manipulation and maintenance the data of its cache efficiently. Here the WNS communicates the data usingbroadcasting systems. The number ofmobile users does not affect the performance of a query in this system. The serversystem here associated with the designing techniques for the server so that it can accommodate multiple requests and the request can beprocessed efficiently. We can say that queryprocessing for a mobile databases is very much related to the issues of caching, broadcasting, and scheduling.[2]

In MCS each mobile client is divided into three parts.

Here the Resource Manager which manages the client CPUfor handling the results of query and the Client Manager processes the query requests and sends them to the server. Then the models for disconnecting operation, receives andprocesses the tuples transmitted from the server. Then a QueryGenerator generates the query requests. After that the clientqueries are submitted from an MH to the server for processing and after a message attached to the tuples that represents the answer to the query is transmitted back to theMH. The messages containing the tuples are processed by theMH.Then the tuples are shown on the screen of the MH.[2]

The mobile client system defines many strategies to handle the cached data items in the client's local memory. Actually in wireless communication channel it suffers with a narrowbandwidth where as it is also inherently an asymmetric communication. Here the downstream communicationbandwidth from a server to the mobile client is much greater than the upstream communication bandwidth from clients. Due to this reason, the caching of frequentlyaccessed data items in a client's memory storage becomesimportant for improving the performance and available data access queries. There is also other advantage of caching is theability to handle fault tolerance. [2][3]

2) Wireless network System: In this system allmessages are of equal priority and they will be served on a First-Come First-Served (FCFS) basis having a service rate ofNetwork Bandwidth. When a Manager of Wireless Network finds out that an MHis disconnected, then it is informedto the Server Manager about thedisconnection so that the transmission of the tuples to the MHcan be stopped temporarily until the MH reconnects to the network. In thisscheme, the server time to time broadcasts the frequentlyaccessed data items to clients through many broadcastchannels, but here the clients may not able to cache the data item of their interest. This situation may be when the client is not having enough memory space to hold the required data.[13]

3) Server System: This system handles the pull-based broadcastscheduling problems where the mobile clients sends queries to the server using a wireless network system, the server processes the query,and then sendsback the result to the client.

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The server system hasthree subsystems. There is a resource managerwhich manages the server CPU time for query and updates the processing. There is an update Generator that generates updaterequests, and the server manager coordinates the queryrequests of MHs and then updates requests from the UpdateGenerator.

When a client query is issued by an MH, it is processed by theServer Manager, and thenthe set of tuples satisfying the query aredetermined. The number of tuples in the answer set of a client query isdetermined randomly using a maximum value in MaximumNumber of tuples. Here the server manager also decides about when andwhich tuples should be transmitted. This strategy concernswith broadcast and disk scheduling. The broadcast scheduling is to find how queries to be served efficiently in the server based on a number of factors such as: the length of thequery, the wait time and the popularity of the items.A database server will improve the data retrievalperformance by using its own main memory and cacheto store those database items frequently accessed by most of the mobile clients. [14][15]

QUERY OPTIMIZATION PROCESS:

Query Plans: It is an ordered group of statements for accessing data in RDBMS.

Query optimization: There are different algorithms written in different forms and structures where a query can be executed.

The optimization is for effective use of time and memory space in the mobile.

Importance of Query Optimization: The main aim of query optimization is to decrease the usage of system resources and to give the user with the appropriate result set within minimum period of time.

i) Optimization gives results promptly and also makes the application quicker to the user.

ii) Optimization provides the system to run more queries in less period of time. It is because each optimized query request takes less time compare to the un-optimized queries.

The query optimization decreases the use of amount memory and allows the server to execute the query more efficiently and with a less power consumption.

The Query Optimization can be in Two Ways:

i) We can try to reduce the counts of column and tuples in the intermediate query processing and in final query processes.

ii) We can implement some appropriate algorithms on each process to find how tuples are accessed from the data structures.

The Query Optimization in Relational System: We can minimize the multi block query into a single block using the Merging Views: Consider a query of conjunctive type, if one or more relations in the query are views then the view definitions are to be unfolded to obtain a single block SQL query. But if the views are complex then the unfolding may not work. For evaluating the query the best process is to select an optimization engine and execute. Sometime the queries can be processed in parallel as independent processes or threads.

AGENT-BASED QUERY:

Mobile Database Query System submits the query task to the mobile agent directly. Then the mobileagent sends the query task to the server. Then it executes the query and stores the result and returns the query result to the user. In order to know the mobile query in the mobile database, we can design two different agent-based structures: single agent and mobile multi-cooperative agent.[1][9]

Single agent technology:

We can only design one dedicated mobile query agent in the mobile database query system. It can move to every server or nodes by the movement of the network and then uses the query task that is submitted by the user and collect the information of the results. When the Agent does the query task, it will take the query results and return to the client.[1][10]

Collaborative agent technology:

We will divide a query task into multiple sub-queries, and create multiple agents at thesame time. Here every mobile agent can implement each sub-query independently. When all the query tasks are completed, the multiple agents return the query results. Finally, it combines all these query results into a final query required for the users.[1][11][12]

Multiple Query Optimization Technique: The Multiple query processing optimizations is to find a common Sub expression for a set of query statements. Here the common sub expression is executed only once and then we get an intermediate result.So, all the queries that contain the common sub expression uses these intermediate results, which makes the query cost reduce drastically. So, the common sub expression algorithm can directly reflect on the performance of multiple query optimizations.

DISTRIBUTED DATABASE:

The collection of databases which are distributed over a computer network to provide the easy use by the users is distributed database. Here the

Computer network can be a large area or small area. The distributed database the user does not require knowing the actual location of the data. The user at different locations should be able to access the databases distributed over the computer network.[6][24][31]

Distributed Databases divided into 2 types:

1. Homogeneous Distributed Databases.
2. Heterogeneous Distributed Databases.

In this system the process of executing a query effectively should be such that it should minimize the network communication cost. Client/Server Distributed database architecture includes a Server that contains the main database and the N number of clients that contains distributed databases which are connected with the Server using LAN and WAN.[6]

QUERY PROCESSING ARCHITECTURE:

Thequery processing architecture shows an important role and it presents on the performance of the system in mobile environment. The important parameters for measuring the performance are query optimization, query response time, database size, location tracking and management. The Query processing in a mobile environment is used to make a high level query in various architectures. The query processing providesanswers for different types of queries by swapping less number of messages among the components of the network.

MODEL FOR MULTIPLE QUERIES IN MOBILE:

The multiple query processing optimization is to find a common Sub-expression for a set of query statements. During the query process, the common sub-expression is executed once and then an intermediate result is generated. Then all the queries that contain the common sub-expression use this intermediate result, which makes the query cost decrease drastically. The common sub-expression algorithm can directly affect the performance of multiple query optimizations. For finding a common sub-expression two algorithms used are: AND/OR graph and MULTIPLE graph.

In the AND/OR graph, the AND node can be used to represent the relationship and the OR node can be used represent the operations on the relationship. The heuristic algorithms compare the OR node of different AND/OR graph and detect their relationship of inclusion. A set of query statements can represent multiple AND/OR graph, so there is a problem existed of the processing order. The Multiple graph is a non-procedural expression of multiple queries. In Multiple Graph we can get the common sub-expression by searching the common edge. The Multiple graph has larger time and space complexity than the AND/OR graph.

APPLICATIONS:

We explore in several areas in mobile computing environment where the mobile devices are handy computing tools and they are used for effective analysis. Hence, we focus on mobile applications related to data dissemination, medical and healthcare applications, e-commerce, public services and geographical systems etc.[7]

Data Dissemination:

It is a passive mode of communication in which the rate of usage of information is much larger than the rate of information production. It is an asymmetric communication, where the downloading rate is much higher than uploading rate. The data dissemination related applications became very critical because of the rapid growth of information generation and their distribution over various communities. The recent social networking-based applications became a vital platform for the datadissemination. For handling different types of information and retrieving in real time in mobile environment, we need to have some rules tobe attached with the every piece of information.

Medical Healthcare:

In the field of healthcare environment it comes with major criteria's and requirements such as maintaining the confidentiality of the medical information, privacy of the doctor-patient relationships, and the genuineness of information which is to be diagnosed. Such important issues must be satisfiedby the mobile environment in order to deliver themobile applications for medical healthcare systems.

The recent mobile applications related to biomedical information became more popular for the medical usersas the small screen devices such as PDAs and smartphones provides the healthcare practitioners to accessonline biomedical resources.

Mobile e-commerce:

The E-commerce is the field where the sales, procurements of supplies and services using information systems aremuch more. The E-Commerce having three-step execution in the real-world application environment such as: (i) By advertisement the marketing information on the web (ii) By Selling the products by taking the online orders (ii) By making payments through construction of electronic exchanges. Some E-

commerce examples are :online shopping/retailing, electronic transactions through e-cheque and e-wallet, online reservation system.

Public Services:

As per the recent survey of mobile subscriptions, the social interaction becomes easy in the mobile environment. This enables many publicservices such as transportation, weather, m-commerce andhealthcare to represent on mobile environment.[7][23]

CONCLUSION:

We can plan to investigate more query optimization method in mobile database, such as semantic-based optimization, materialized views technique, embedded mobile database technique, etc. Also, we can plan to research on how to combine different optimization approaches together. Besides that, we are going to perform simulated experiments to indicate the efficiency of these optimization methods.

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Impact of Small-buffer networks supporting TCP flows

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ABSTRACT: *Backbone router at Internet holds large packet buffers due to dynamic nature of TCP, which significantly may increase the time of design and consumption of more power. Few model designed recently stated that much smaller buffer cannot replace the large buffer networks. It is also stated that small-buffer network cannot be predicted how they will behave.*
In this paper, we extensively studied the impact of small-buffer Internet networks using different active queue management (AQM) techniques such as random early detection (RED), random exponential marking (REM), adaptive virtual queue (AVQ) and proportional integral (PI). The simulation experiment results using NS2 shows how this small buffers in backbone router designs achieves higher throughput than large buffer network (old rule).

Keywords: *Buffer size, Thumb-rule, Active Queue Management and NS2.*

1. Introduction

Buffer sizing in Internet router is an important issue in wireless communication network. Over-buffering in network causes large packet loss and under buffering networks increases the queuing delays. In Internet network it is natural to have the need of buffering. In such network bursts of packets occurs naturally and hence in the routers, buffers used for queuing. The objective is to normalize them. In TCP traffic packet drop also occurs. The same buffers can be used to minimize the packet drop frequency. Sometimes TCP connections back-off caused due to loss of packets. The buffers also work towards avoiding under-utilization in this scenario. In spite of the above advantages buffers also causes some overheads like delay, jitter. The cost of the router also increases based on the buffers. Also they consume more power.[1]. Even today after more research on buffer-sizing still it remains unclear. We still need to decide the amount of buffering needed at the interface of a router. Large buffer network follows Thumb rule(old rule) which is equal to the product of the round trip time(RTT) and router capacity[2]. All internet routers contain buffers which are mainly intends for holding the packets during the time of congestion. The buffer in the router accommodates bursts in the traffic without having drop packet. It keeps a reserve of packets so that the link does not go idle. It also introduces query delay as jitter. One of the main reasons for uncertainty in internet is router buffer. Buffer, when they overflow causes packet loss and underflow causes degradation in the throughput.

Congestion is an accumulation of enormous amounts of data in the networks, leading to in a delay in the delivery ratio of packets and even large data loss. A technique known as queuing management is used to perform the successful transfer of data from source to destination by reducing congestion. Due to the drop of the packet, congestion in the router buffer leads to long delays in data delivery and waste of resources. To avoid this, there are a lot of AQM techniques have been developed in recent literature such as Random Early Detection (RED) [3] Proportional Integral (PI) [4], Random Exponential Marking (REM) [5], Proportional Derivative (PD) [6], Proportional Integral Derivative (PID) [7] and adaptive virtual queue (AVQ)[8]. The above controllers are static by nature. Use of them can result in transient response of a satisfactory level, minimized steady state error, well reduced queuing delay and average delay and small round trip time. However, they cannot fulfil the performance required under different network conditions and scenarios which are complex. To overcome the drawbacks many new AQM techniques have been introduced. In Internet traffic, routers play a crucial role. During the transmission buffers in the routers are used to store the packets which are incoming. Also these buffers are used for the same purpose during congestion. Congestion occurs when the buffer is full of packets. A proper buffer size is therefore required to reduce the loss of the packet and keep the congestion link free. If the buffer is not appropriately configured, it affects transmission as the throughput is reduced. The packets are also rearranged by the routers with the sequence numbers of the packets. A number of routers can be arranged between senders and receiver. The

size of router buffer solves the problem of congestion, transmission and loss of packets during transmission. In [2] proposed a rule namely as "Rule-of-Thumb" as shown in figure 1 to control the congestion over the buffer. This rule is popularly known as "Giga-Byte Buffers" rule. TCP's congestion algorithm is responsible for determining the size of the algorithm.

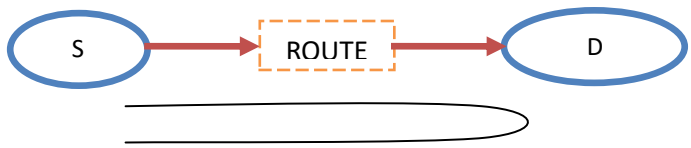


Figure 1. Rule of Thumb

Buffer size (B) can be stated from "Rule-of-Thumb". The rule states that each link needs a buffer size. The buffer size can be calculated by the following formula B=C*RTT. C denoted as data rate of the given link and RTT denoted as round trip time of the flows which are passing across the link. This buffer size is meant for long lived TCP flows. This buffer allows less congestion. But hence the consequences of over buffering are there. First it will make the design of high speed router, compliant by high power consumption and lower density. The rule having some lacuna regarding the high manufacturing cost due to large buffer length. The router manufacturer found the difficulties to manufacturer the router. This process compels the manufacturer to manufacture small size buffers. Also rule of thumb is applicable to TCP traffic. Now a day this rule is not suitable for TCP as UDP traffic.

A. Small Buffer Rule

In [9], Stanford Research Group proposed a novel and upgraded rule. Applenizer and his group presented a new rule known as "Small Buffer Rule" fixing of buffer size. They suggested that

$B = \sqrt{N}\ (C*RTT)$, here long lived TCP flows denoted as $\sqrt{N}$.

They also provide a theoretical solution which can prevent congestion and link utilization. At the point when an extensive number N of long lived TCP flows share a bottle neck link in the Internet core, they are asynchronous and independent. Long lived TCP flows handle the buffer size.

B. Tiny Buffer Model

Recently, using different techniques like control theory, differential equation as extensive simulation argued that the buffer size should be reduced and recommended as few as 20 - 50 buffer packets are sufficient for TCP traffic core routers to release accepters. The above replica treated as "Tiny Model". This model reducing buffer to any few dozen KS can lead to 10-20% drop in link utilization in this replica.

C. Stanford Model

The aim of the Stanford model is to make full use of the link with the minimum buffer space and therefore with a minimum queuing time. The Stanford model concentrates on a connection which mainly carries TCP packets. The aim of the Stanford model is to obtain the minimum buffer size B necessary for full use. This rule does not apply to the small buffer rule because it does not account for the input links of traffic variability.

The remainder of the paper is as follows. Related work is represented in Segment 2, way to set up the simulation is explained in Segment 3 and results and analysis are presented in Segment 4. Finally, in segment5 the conclusion of the paper is presented.

2. Related Work

In [2] presents a paper on size on internet router buffer. He proposed a rule namely "Rule-of-thumb". This rule derives the buffer size B=RTT*C. Following the above rule, the router manufactures cost is high, utilization of link is not satisfaction when the buffer is full, the packet are dropped and it is under buffered, then it degrades the throughput. So generally this rule is not correct. For example:- a router line card of 10 GB / s needs about 250msx 10GB / s= 2.5 G bits of buffer and the amount of buffering increases linearly with the line rate. Such large buffer are challenging so router manufacturer.

In (2005, guide Appezeller) presented his thesis over sizing of router buffer and awarded Doctoral degree for his research work. In his paper, he presented that the small buffer size gives good result than large buffer size. He rejected the Thumb's rule and expressed his view that the size of buffer B is equal to the RTT with the multiplication of link capacity divided by Square root of N. i.e. $B = (RTT \times C)\sqrt{N}$, here N denotes number of flows. Hence the size is reduced accordingly. The above explanations are for short-lived

and long lived TCP flows. A 2.5 GB / s link carrying flows reduces its buffer by 99 percent with a negligible throughput difference and a 10 GB / s link carrying 50,000 flows requiring 10 MB of buffering that can be easily executed.

In this simulation and experimental study, he found that small buffer size, with high link utilization with low cost router has better advantages than "Rule-of-thumb". This rule has therefore been accepted. In [10] the author introduced a novel model that gives a comprehensive statistical interpretation of the Internet's small buffers. They present novel models for the distribution of several network components, such as the line occupancy of each flow, the instantaneous rate of arrival at the bottleneck queues and the tail size of the bottleneck. Afterwards, all these models were consolidated in a single fixed point algorithm, which is the key to a global statistical small-buffer model. Specifically, given some QoS prerequisites, the outcome depicts how this novel model can be utilized to exactly measure small buffers in router designs. Ongoing studies show that this rule of thumb over-provisions buffers by multiple orders of magnitude [11-17].

3. Simulation Setup

In this segment, we investigated the effect of small buffer networks under different router based AQM techniques like REM, RED, AVQ and PI using NS2 network simulator [18]. We used two different buffer sized model for the analysis. One is Rule of Thumb as Model-1 where the queue size is 625 and small buffer network as Model-2 where the queue size is fixed to 10. The proposed network model is shown in figure 2 having 100 sources (S1 to Sn) and corresponding destinations (D1 to Dn) connected through common symmetric link (Router 1 - Router 2). The bandwidth of all the links are 50Mbps. The round trip times (RTT) of each TCP connection is 100ms. The propagation delay of bottleneck link is 50ms and side link is 10ms. We used RED, REM, AVQ and PI as queue management techniques at Router 1. The length of sender's data packet is 1000 bytes. It requires 100 sec of simulation time.

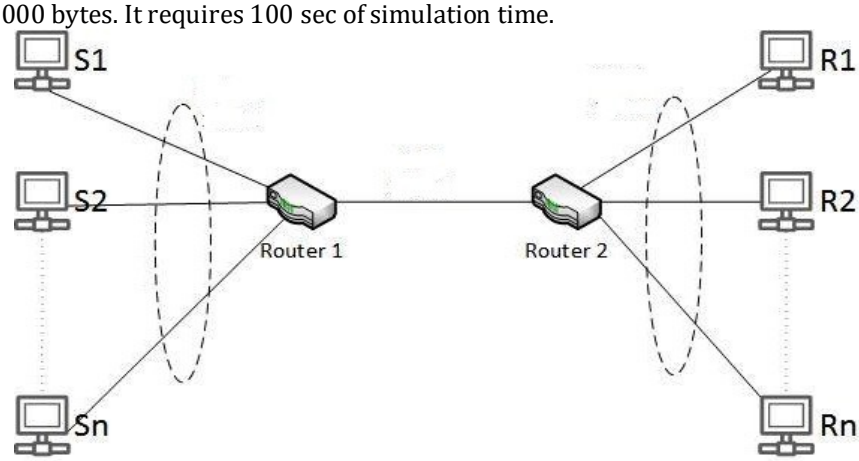


Figure 2. Proposed network model

4. Result and Analysis

In this segment, the simulation experiment results are presented using above proposed network model shown in figure 2. The impact of small buffer network model is analyzed under TCP flows by finding throughput and packet drop. We have considered two different buffer sized model for the analysis. The first one is old Thumb rule and second one is small buffer sized model. In Model-1, we set queue size to BDP, i.e. 625(100ms x 50Mbps/1000Bytes) and set queue size to 10 in Model-2. The performance of small buffer sized network model is analyzed considering queue size to different percentage of BDP. Initially we estimated the throughput of network for different proportion of BDP for Model-1 shown in figure 3 and Model-2 shown in figure 4. When we compare the figures 3 and 4, we conclude that throughput of Model-2 network is higher than Model-1. Moreover, throughput of network increases with the increase of queue size through the percentage of BDP. It also demonstrates that use PI technique achieves higher throughput than others.

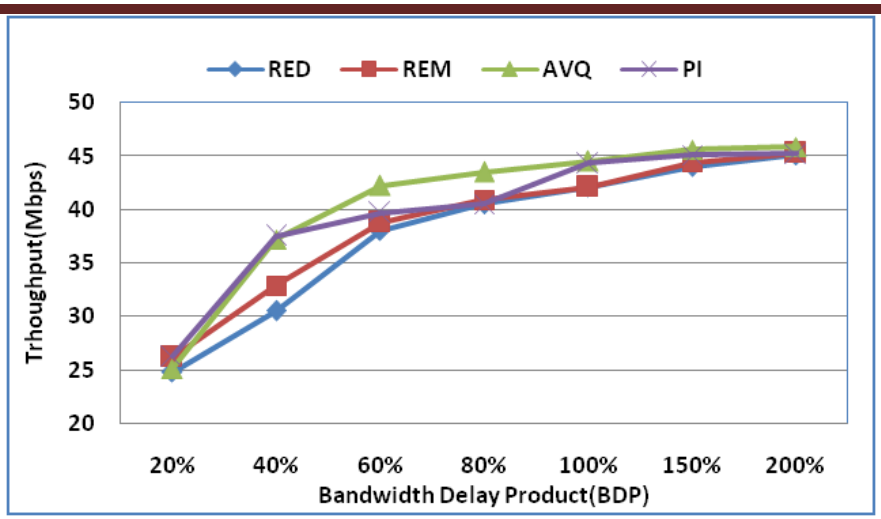


Figure 3. Throughput of a network using Model-1

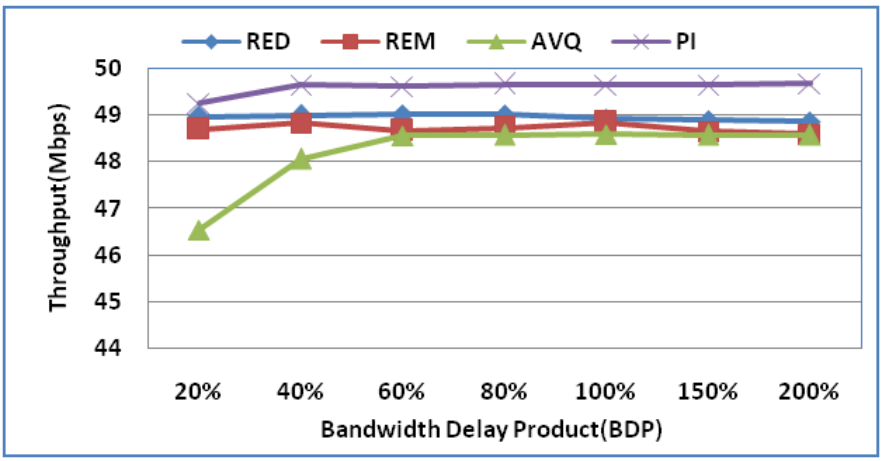
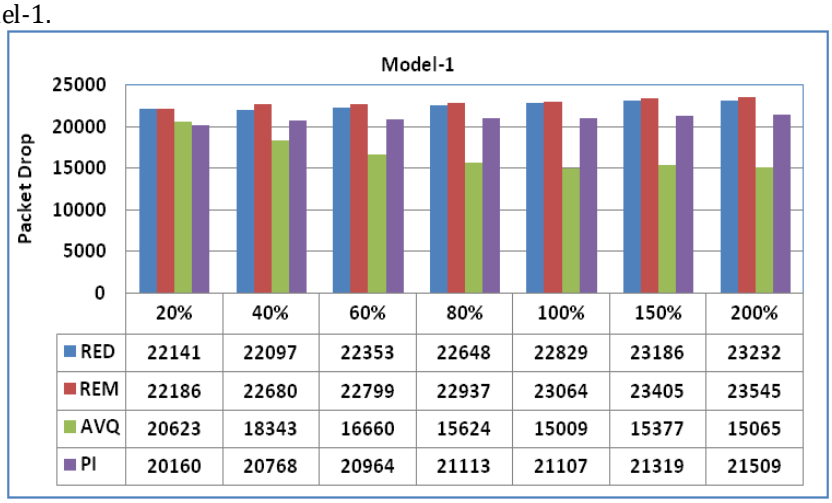


Figure 4. Throughput of a network using Model-2

Then we analyzed the performance of network by measuring the total packet drop for different proportion of BDP and shown in figure 5 and figure 6 for Model-1 and Model-2 respectively. Figure 5, shows that the packet drops of each AQM technique is more than 20000. However, the packet drop is lower at Model-2 as compared to Model-1.



	20%	40%	60%	80%	100%	150%	200%
RED	22141	22097	22353	22648	22829	23186	23232
REM	22186	22680	22799	22937	23064	23405	23545
AVQ	20623	18343	16660	15624	15009	15377	15065
PI	20160	20768	20964	21113	21107	21319	21509

Figure 5. Packet drop of a network using Model-1

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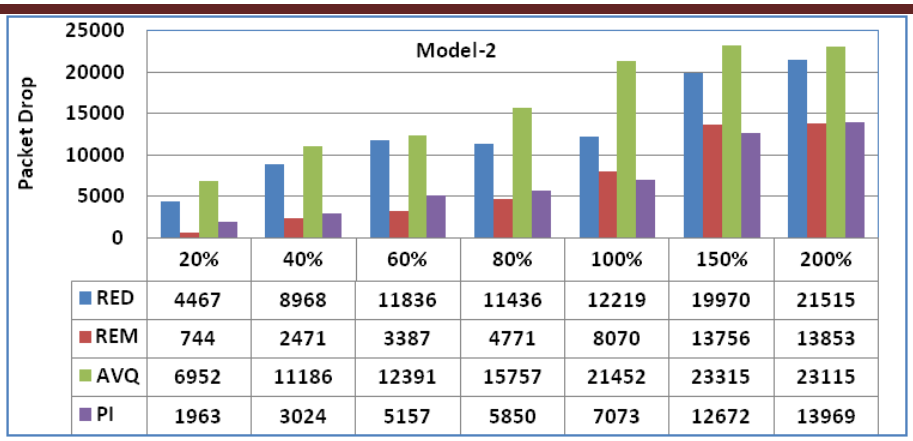

Figure 6. Packet drop of a network using Model-1

5. Conclusions

In this paper, impact of small buffer networks is analyzed under different AQM techniques using NS2 simulator. The network performance for the proposed symmetrical network model is measured in terms of throughput and packet drop. We used two buffer sized network model for the analysis. The first model follows old rule of thumb where the buffer size large. In second model we fix the buffer size to very small as compared Model-1. The results using NS2 network simulator shows that use of PI technique improves the performance of network and higher at Model-2. It shows that use of small buffer size increases the performance than large buffer size.

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PLC BASED SORTING SYSTEM USING METAL DETECTION

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ABSTRACT: *In today's world there is a huge demand for sorting products based on their material characteristics in industries.So our project gives an efficient way to sort products based on their metallic properties.Our project uses Programming Logic Controller for programming and SCADA for visualization. This work will provide high accuracy and flexibility during its operation. As well as it also consumes less time. The ladder logic used in this process for controlling the whole operation and segregating the metals and non-metals. Here we have used the PLC of Bosch Rexroth and simulated by the software of INDRA LOGIC ENGINEERING.*

Keywords: *PLC, SCADA, Metal Sensor, Pneumatic Valves and cylinders.*

I. INTRODUCTION

The basic aim of automation is to provide maximum productivity in short period of time with higher accuracy.Automation is the combination of two words;i.e., auto meaning automatic and motion meaning something in motion or movement. Automation is the backbone building structure of control engineering which includes PLC, DCS and SCADA.It supports different input and output terminals that run over a process to get the desired control. In this project differentsensors, motors and pistons are used to sort different material on the basis of their metallic characteristics.There is a continuous conveyor belt running where objects are placed and further it is decided by the sensors whether the material is metal or non-metal.

II. BASICS OF PLC AND SCADA

PLC is Programmable Logic Controller where it has different input modules and different output modules where the input is processed to get desired output. Processing of input takes place with the help of programming language that the particular PLC supports. It has memory unit where the data are stored.PLC has one CPU (Central Processing Unit) that scans the input and output, executes user written ladder program, supports device communication and different functions like data handling and diagnosis. In this project we have used Indralogic PLC for programming and simulation.

PLC processor stores the program and required data in its memory. It reads the status of input devices and after executing the control program, it will generate commands, which will be given to the output devices. Input modules are used to convert electrical signals coming from input devices to electrical signals that the PLC can able to understand. Output modules take information given from the PLC and convert it to electrical signals. The function of the power supply is to provide the appropriate DC power required for the operation of the the PLC system.

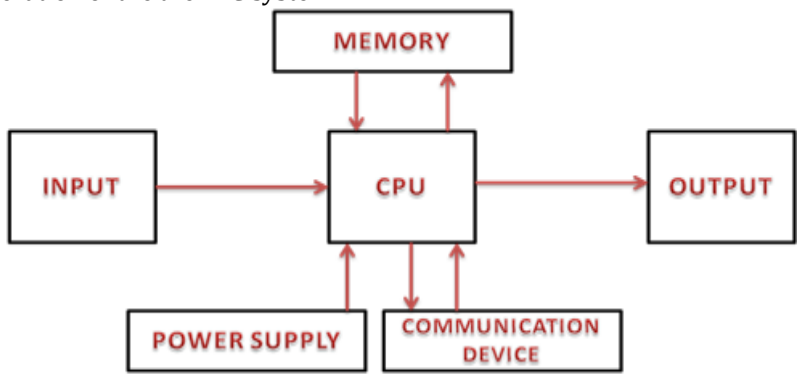

FIG1: Block diagram of PLC

SCADA is Supervisory Control and Data Acquisition which completely visualize the process going on with the hardware setup. It is easy for the user for troubleshooting if there in the process. It is the virtual screen where we draw different inputs and outputs and then connects the SCADA in accordance with the processing PLC.Effective SCADA system saves time and money. Here we have used the Indralogic PLC visualization software for performing SCADA.

III. COMPONENTS USED

Here we have used two switches; i.e., one START button and one STOP button.There is one conveyor belt which is driven by a DC motor.For sensing purpose we have used two sensors;i.e,One for sensing the presence of objects and other for sensing whether the object is metal or non-metal.These two sensors acts as an input to the PLC.We have also used 2 pistons that are pneumatically actuated at the output side of PLC.We have used minimum number of components to reduce the cost of automation.

Photo-electric sensor:

The system consists of proximity optical sensors or photo-electric sensors, used to detect the presence of object. IRD 183 diffuse type photo electric sensor is used in our project.

Inductive Proximity Sensor(Metal Sensor):

A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusion hidden within objects. Proximity sensors are generally constructed with four main elements.

- A coil and ferrite core assembly
- An oscillator
- A converter/trigger circuit(detector)
- An output device

Pneumatic Piston:

Pneumatic cylinder (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction.

Servo Motor:

The servo motor is most commonly used for high technology devices in the industrial application like automation technology. It may be a rotary actuator or linear actuator. Shaft of this motor can rotate up to a particular angle.

IV. METHODOLOGY

Initially, the objects or blocks are firstly kept on the conveyor belt for movement. When the starting switch is turned ON then the motor rotates which results in conveyor belt movement in forward direction. An IR sensor, which acts as a switch, detects the presence of blocks or objects in the conveyor belt.If the IR sensor gives positive output then the gate present in the conveyor belt opens and allows the blocks to go forward. The blocks will move forward if and only if the conveyer motor is in running condition and an IR sensor is sensed.Another metal sensor (Inductive sensor) is present which detects whether the object is metal or non-metal. The output of inductive sensor will high if it senses only the metal. Because of its inductive property it will only able to sense the metals. If the object is metal, then the pneumatically actuated piston moves after five seconds in the forward direction and push the object in the metal block and will retract after 2sec. If the object is non- metal, then the pneumatically actuated piston moves after seven seconds in the forward direction and push the object in the non-metal block.This method repeats continuously to check the properties of different available objects or blocks present in the conveyor belt.There is also one emergency stop button present.When once it turned ON then it stops the whole process in case of any emergency. This process is again explained by the flow chart mentioned below.

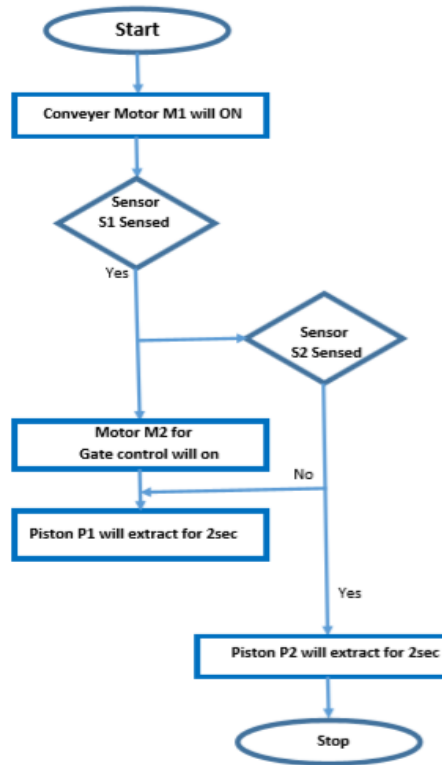

FIG 2: Flow chart

V. SIMULATION RESULT

The basic process of simulation has been done as per the above process to get good results. Here we have used the software of Indra logic engineering for the simulation of our paper. Program has been designed by using ladder logic and after simulation it is visualized by using the SCADA.

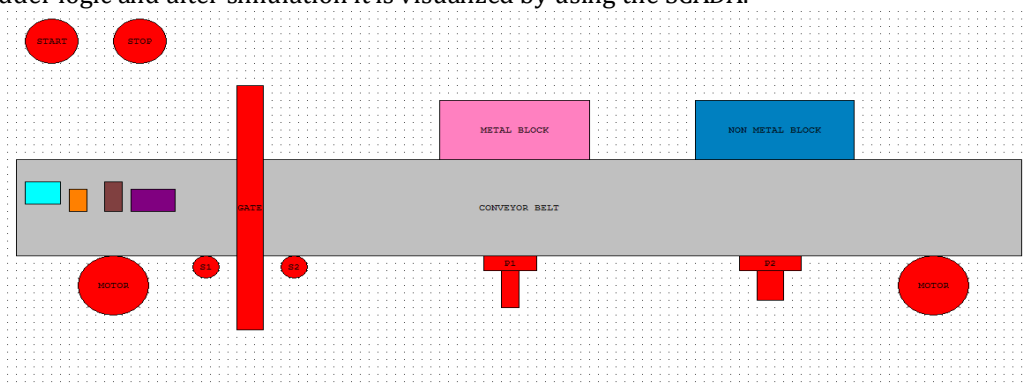

FIG 3: When the process is OFF or inactive

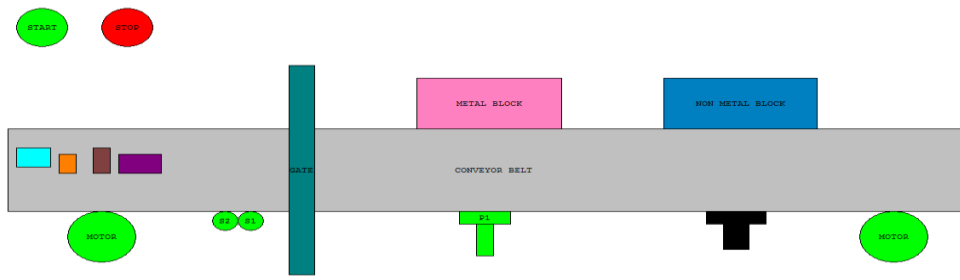

FIG 4: When the process is ON or active, the setup looks like as follows:

VI. CONCLUSION

Different materials are sorted on the basis of their metallic property with high accuracy and with less human error. Sorted materials are put into its desired blocks whether metal or non-metal. Here INDRALOGIC PLC provides a great platform for the user to execute and run the program and perform the visualization activity.In this project troubleshooting is easy. It is easy for the system to modify the program as per the requirement.Thus low cost automation is achieved where speed of production is high and less cycle time.

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An Eclectic Study on Bit Error Rate For Wide Range Communication

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ABSTRACT: *This paper investigates the use of neural network based minimization of BER for the upcoming generation of communication. Bit Error Rate, BER is used as an important parameter in characterizing the performance of data channels. When transmitting data from one point to another, either over a radio/ wireless link or a wired telecommunications link, the key parameter is how many errors will appear in the data that appears at the remote end. As such Bit Error Rate, BER is applicable to everything from fibre optic links, to ADSL, Wi-Fi, cellular communications, IoT links and many more. Even though the data links may utilize very different types of technology, the basics of the assessment of the bit error rate are exactly the same.*

Keywords: *Bit Error Rate (BER), Signal to Noise Ratio (SNR), Modulation, Error function (erf)*

Introduction:

The communications industry is growing at a rapid pace. Transmission quality of communication systems can be accessed directly by measuring how well the output signal reproduces the input .The communications corporations are searching for a way to increase the system capacity, while ensuring the bit error rate (BER) remains low. Bit Error Rate is the signal quality concept used for digital communication systems .Bit error rate, BER is a key parameter that is used in assessing systems that transmit digital data from one location to another.

Systems for which bit error rate, BER is applicable include radio data links as well as fiber optic data systems, Ethernet, or any system that transmits data over a network of some form where noise, interference, and phase jitter may cause degradation of the digital signal.

Although there are some differences in the way these systems work and the way in which bit error rate is affected, the basics of bit error rate itself are still the same.

When data is transmitted over a data link, there is a possibility of errors being introduced into the system. If errors are introduced into the data, then the integrity of the system may be compromised. As a result, it is necessary to assess the performance of the system, and bit error rate, BER, provides an ideal way in which this can be achieved.

What is Bit Error Rate (BER):

As the name implies, a bit error rate is defined as the rate at which errors occur in a transmission system. This can be directly translated into the number of errors that occur in a string of a stated number of bits. The definition of bit error rate can be translated into a simple formula

$$\text{Bit Error Rate, BER} = \frac{\text{Number of errors}}{\text{Total number of bits sent}}$$

BER measurements compare digital input and output signals to assess what fraction of the bits is received incorrectly.

$$BER = \frac{E(t)}{N(t)}$$

Where $E(t)$ the number of bits is received in error over time t, and $N(t)$ is the total number of bits transmitted in time t.

The BER essentially specifies the average probability of incorrect bit identification Thus, a BER of 10^{-9} means that 1 bit out of every 10^9 bit is, on average, read incorrectly. If the system is operating at 100 Mb/s – that is, 10^8 pulses per second – then to receive 10^9 pulses, the time taken would be

$$\frac{10^9}{10^8} \approx 10s$$

It is the average time for an error to occur. On the other hand, if the BER is 10^{-6}, then, on average, an error would occur every 0.01s and it is unacceptable.

BER and E_b/N_o:

Signal to noise ratios and Eb/No figures are parameters that are more associated with radio links and radio communications systems. In terms of this, the bit error rate, BER, can also be defined in terms of the probability of error or POE. The determine this, three other variables are used. They are the error function, erf, the energy in one bit, Eb, and the noise power spectral density (which is the noise power in a 1 Hz bandwidth), No.

It is possible to define the bit error rate in terms of a probability of error.

$$\mathrm{POE} = \frac{1}{2}\ (1 - \mathrm{erf})\sqrt{\frac{E_b}{N_o}}$$

It should be noted that each different type of modulation has its own value for the error function. This is because each type of modulation performs differently in the presence of noise. In particular, higher order modulation schemes (e.g. 64QAM, etc) that are able to carry higher data rates are not as robust in the presence of noise. Lower order modulation formats (e.g. BPSK, QPSK, etc.) offer lower data rates but are more robust.

The energy per bit, Eb, can be determined by dividing the carrier power by the bit rate and is a measure of energy with the dimensions of Joules. No is a power per Hertz and therefore this has the dimensions of power (joules per second) divided by seconds). Looking at the dimensions of the ratio Eb/No all the dimensions cancel out to give a dimensionless ratio. It is important to note that POE is proportional to Eb/No and is a form of signal to noise ratio.

Factors affecting Bit Error Rate(BER)

It can be seen from using Eb/No, that the bit error rate, BER can be affected by a number of factors. By manipulating the variables that can be controlled it is possible to optimise a system to provide the performance levels that are required. This is normally undertaken in the design stages of a data transmission system so that the performance parameters can be adjusted at the initial design concept stages.

- ***Interference:*** The interference levels present in a system are generally set by external factors and cannot be changed by the system design. However it is possible to set the bandwidth of the system. By reducing the bandwidth the level of interference can be reduced. However reducing the bandwidth limits the data throughput that can be achieved.
- ***Increase transmitter power:*** It is also possible to increase the power level of the system so that the power per bit is increased. This has to be balanced against factors including the interference levels to other users and the impact of increasing the power output on the size of the power amplifier and overall power consumption and battery life, etc.
- ***Lower order modulation:*** Lower order modulation schemes can be used, but this is at the expense of data throughput.
- ***Reduce bandwidth:*** Another approach that can be adopted to reduce the bit error rate is to reduce the bandwidth. Lower levels of noise will be received and therefore the signal to noise ratio will improve. Again this results in a reduction of the data throughput attainable.

Bit Error Rate testing:

The basic concept behind bit error rate testing is quite straightforward. A data stream is sent through the communications channel, whether a radio link, a fibre optic link or whatever, and the resulting data stream is compared with the original. Any changes are noted as data errors and logged. Using this information a bit error rate can be determined.

The basic concept of a bit error rate test is straightforward, but the actual implementation requires a little more thought, and is not as simple. There are a number of issues that need to be addressed.

As data errors occur in a random fashion it can take some while before an accurate reading can be gained using normal data. In order to shorten the time required for measurements, a pseudorandom data sequence can be used.

To expand the reason for using a pseudo random sequence take the example of a typical data link. To make a simple measurement of the number of errors that take place it is possible to use an error detector that compares the transmitted and received data and then counts the number of errors. If one error were detected while sending 10^12 bits, then a first approximation may be that the error rate is 1 in 10^12, but this is not the case in view of the random nature of any errors that may occur. In theory an infinite number of bits should be sent to prove the actual error rate, but this is obviously not feasible.

As the error rates fall so it takes longer for measurements to be made if any degree of accuracy is to be achieved. For Gigabit Ethernet that specifies an error rate of less than 1 in 10^12, the time taken to transmit the 10^12 bits of data is 13.33 minutes. To gain a reasonable level of confidence of the bit error rate it would be wise to send around 100 times this amount of data. This would take 1333 minutes or about 22.2 hours!

It is clearly not convenient to have measurements taking this long. Accordingly to assist making measurements faster, mathematical techniques are applied and the data that is transmitted in the test is made as random as possible - a pseudorandom code is used that is generated within the bit error rate tester. This helps reduce the time required while still enabling reasonably accurate measurements to be made.

System simulation for BER testing:

In addition using a pseudo-random data source, it is often necessary to simulate the transmission path. In this way the BER testing can be undertaken in the laboratory with the transmitter and receiver close to each other. To simulate the transmission path it is necessary to set up a "medium" that is representative of the actual data transmission path to be used. In terms of a radio transmission, this includes noise and propagation fading.

- ***Noise:*** Noise in the radio path comes from a number of sources. It can be generated either externally to the electronics system itself and comes as received noise, or it may be generated internally, chiefly as noise in the front end of the receiver. The receiver noise will be present regardless of whether the system is in a simulated or real environment.
  The remaining noise can be simulated and introduced to the receiver using a noise diode generator.
- ***Fading characteristics for radio communications systems:*** It is very important to simulate the real life characteristics of the transmission path in as realistic a way as possible. With signals constantly varying as a result of many factors it is necessary to simulate a this. To achieve this for a radio link it is necessary to use a fading simulator that adds Rayleigh fading characteristics to the signal. A sophisticated fading simulator may also use multiple channels with variable time delays to simulate changing path conditions. Although fading simulators are complicated items of test equipment they are able to give a realistic medium for testing bit error rate, BER within the laboratory.

One of the main precautions when testing BER in the laboratory is to ensure that none of the transmitted signal leaks directly into the receiver and avoids passing through the fading simulator. If the transmitter power is relatively high, then it is difficult to give adequate levels of screening and some of the testing may not be valid. Great care must be taken to ensure that all the signal travels via the fading simulator. Considerable levels of screening may be required. In some occasions screened rooms have been used.

Conclusion:-

Bit error rate testing, BER testing is a powerful methodology for end to end testing of digital transmission systems. A BER test provides a measurable and useful indication of the performance of the performance of the system that can be directly related to its operational performance. If the BER rises too high then the system performance will noticeably degrade. If it is within limits then the system will operate satisfactorily.

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StaRe: Statistical Reasoning Tool for 5G Network Management

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ABSTRACT: *In operations of increasingly complex telecommunication networks, characterization of a system state and choosing optimal operation in it are chal-lenges. One possible approach is to utilize statistical and uncertain information in the network management. This paper gives an overview of our work in which a Markov Logic Network model (MLN) is used for mobile network analysis with an RDF-based faceted search interface to monitor and control the behavior of the MLN reasoner. Our experiments, based on aprototype implementation, indicate that the combination of MLN and semantic web technologies can be effectively utilized in network status characterization, optimization and visualization.*

Keywords:

1. Introduction

The growing complexity of telecommunication networks requires more automation from the network management layer. Currently researched and standardized technology in the telecommunication field is Self-Organizing Networks (SON) [1] which solves automatically some management tasks in a limited context using a fixed rule base. How-ever, advanced uncertainty management beyond simple static rule bases is required to combine high service quality with optimization of operational expenses [5]. For this goal, we present a prototype tool StaRe that provides the user with a possibility to understand the characterization of the autonomic network management system and its uncertainties. The novel idea is to apply MLN for mobile network analysis and man-agement under uncertainty. We have examined how an ontology-based MLN model can be effectively utilized by a human operator using a SPARQL endpoint and a faceted browser GUI. It is crucial that the operator monitors and controls the system behavior even when the autonomic system solves the majority of management tasks

2. Prototype Architecture and Data Sequence

StaRe is a runtime environment tool that integrates dynamically an MLN model, an ontology based on it, and a GUI for mobile network data analysis and management. A Long-Term Evolution (LTE) simulator is used for simulating an urban mobile network environment

Fig. 1 depicts our architecture and its data sequence for managing a mobile network. The data sequence starts from the right where the simulator data is retrieved tothe MLN model in every 15 minutesofsimulation time. This data contains key performanceindicators(KPI)formeasurementcases,suchaschannelqualityindicator(CQI) and radio link failures(RLF).Inreturn,theMLN modelreasonsconfigurationmanagement parameters for the mobile network (i.e., the LTE simulator) that contain needed changes in the transmission power (TXP) and angle (remote electrical tilt, RET) of a cell antenna. These parameters are critical for the quality of service of the network and operation optimization.

The simulator data is used as the evidence of the MLN model to infer posterior probabilities for action proposals. Network cells in the simulator are then configured based on the action proposal distributions. In order to make this process manageable to the operator, the ontology processor retrieves the evidence, rules, action proposals, and configurations, and constructs an ontology by parsing and mapping this data into a network- and MLN-related semantic graph. This ontology is then uploaded into a SPARQL server based on Fuseki1. The server dynamically generates facets from the ontology (with SPARQL update scripts) for the GUI and acts as a data storage both for the GUI and MLN model. The GUI interacts with the SPARQL endpoint to retrieve semantic data from the ontology and to update the semantic MLN rule base. Similarly, the MLN model queries the SPARQL endpoint in order to retrieve updated rule b

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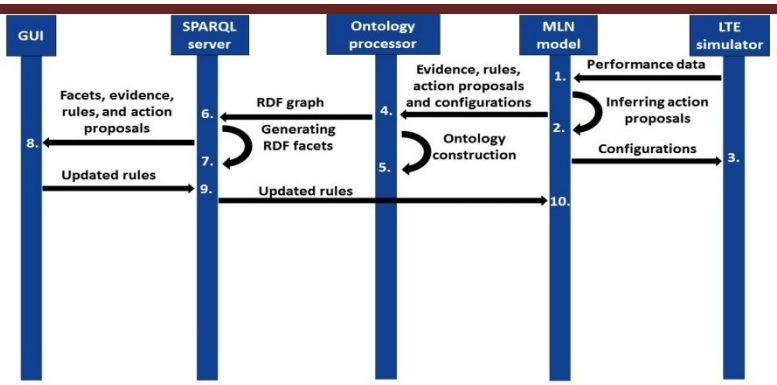

Fig.1.Data sequence diagram for managing a mobile network (simulator)

3. Faceted Browser Interface

The GUI is an HTML5 application which is built by using faceted browsing and interactive visualization methods in order to 1) determine needed network management actionsinasituationandto2) manage the MLN rules. Fig.2 showshowfacetselections can be used to search for recommended actions. Here cells with a high RLF value and low CQI value are selected on the facets on the left, and the tool suggests as an action proposal to increase the TXP of the cells on the right with a varying uncertainty.

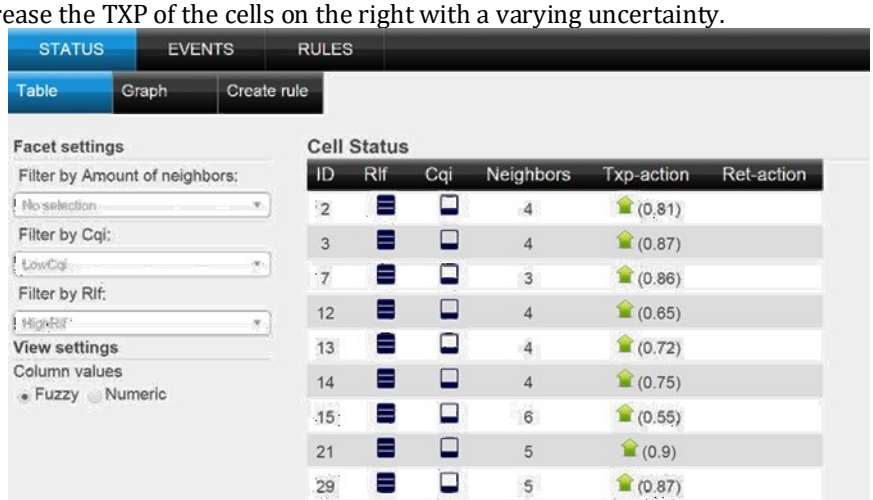

Fig. 2. Faceted browsing for the filtering reasoning outcome

Fig. 3 shows a view for managing the uncertain MLN rules by dividing each rule into a rule weight and to semantically defined rule classes: context (current network status), objective (desired change in the network status) and action (configurations for 1the network). The operator uses this view to investigate contents of the rules and to manipulate the rule base in order to change the behaviour of the MLN reasoned The facets are generated as a combination of rule classes (context, objectives and actions) and their objects (CQI, RLF, TXP, and RET). Here the operator has filtered out rules containing low CQI in the context part and increase CQI in the objective part. The result indicates that every single rule can be removed or its weight can be updated. The possibility to remove a set of rules that satisfies current facets elections can be seen above the result table.

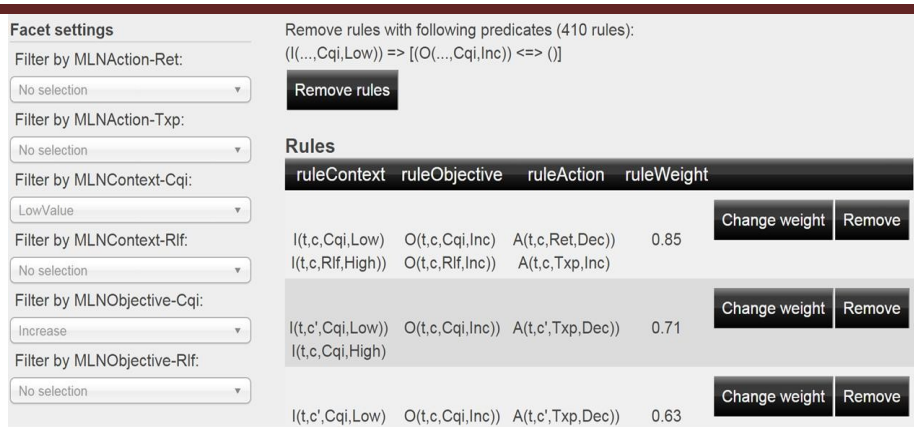

Fig. 3. Faceted search for uncertain rules

In StaRe, the operator can also create new rules with a rule creation form which enables a productive way to create MLN rules without writing the actual MLN syntax.

4. Related Work and Discussion

Various uncertain reasoning techniques have been applied to different network management tasks in the telecommunications field. For example, Bayesian networks (BN) are proposed for automatic network fault management [4][2] and MLN to diagnose anomalous cells [3]. Ontologies have also been used to model general concepts of the telecommunication field[6] as well as to model context in mobile network management. The Linked Open Data (LOD)2 paradigm has also been addressed in , which models cells and terminals, and combines them with other data sources, for example with event data. However, there exists no research of using ontologies and statistical reasoning together to analyze and configure the mobile network, as in this paper.

Altogether, StaRe has proven to be a useful tool in complex network management tasks as it contains a reasoner for processing uncertain information and a semantic faceted browser interface for information exploration. As this paper shows, the StaRe ontology can be used as a semantic data storage between the MLN reasoner and GUI.

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Modeling of Intersatellite Wireless Link between LEO and GEO Satellites

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ABSTRACT: *The investigation of this research work implies the satellite communication system with laser in which satellites can be coupled at signalling rates up to 10Gbps. This research work review the free space optic technology for intersatellite communication link for forthcoming improvement of large information transfer between satellites with high Quality of Service (QoS). The model performance were inspected in terms of bit rates, receiver sensitivity and separation between LEO and GEO intersatellite links.The intersatellite link was modeled and simulated by considering the wireless link range upto 350 km using optisystem (14.0) software by Optiwave.*

Keywords: *Free space optics, optical wireless communication, inter-satellite optical wireless link, Q-factor, optiwave 14.1*

I. INTRODUCTION

The evolution of light wave communication systems from long fibers to robust wireless network has led to the idea of connecting two satellites using an optical wireless link. The optical wireless communication (OWC) enables the interchange of statistics among satellites at greater rate and also a satellite can act as a medium between two satellites or between a satellite and ground base station.[1] Optical wireless communication OWC is one of the most important implementation of communication based on laser. Free space optics (FSO) is the only wireless technology having data rates in Gbps but vulnerable to weather conditions. Light wave communication using LASER is now capable to propagate original information at bit rates up to Gbps and at distance of thousands of kilometers. It has introduced new concept to acclimate optical wireless communication technology into space wave communication; therefore intersatellite optical wireless communication (IsOWC) is introduced [2] . The size of the antenna depends on the frequency of the carrier used. It is evident that the transmitting and receiving antenna for the RF system has to be meters wide. An optical communication system requires an antenna of a few centimeters in sizes. Laser beam width is narrow because of the smaller wavelength of the light signal used [3]. Therefore, signal power loss in case of OWC system is less compared to RF system. The benefits of using an inter satellite optical wireless communication system are its high bit rate, less transmission error and reliable transmission .

The suggested inter-satellite optical wireless communication (IsOWC) system utilizes laser beam as an optical source which radiates signal carrier .And free-space is used as the propagation medium for carrying information. As a result long-haul ultrahigh speed wireless optical data communication is realized. The broadcasting distance of the IsOWC system depends upon these parameters like used modulation type, applied input power, operational wavelength. It is required to select the correct modulation format in system design process.

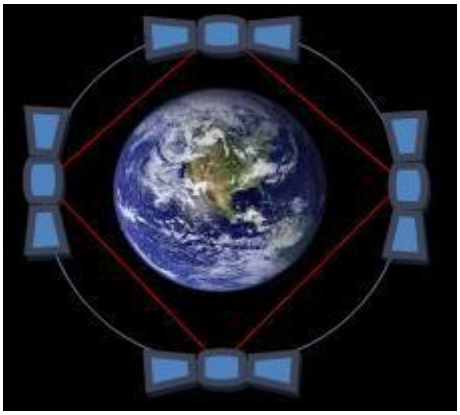

Figure 1: Overview of inter-satellite optical link

This paper contains the study about the effects of satellites separation , data rates, input power, used optical antenna and receiver sensitivity by taking the assumption both the satellites are in line-of-sight(LOS).

II. PROPOSED INTER-SATELLITE MODEL DESCRIPTION

The motivation behind the research is that the optical wireless link between LEO satellites can form a powerful satellite network of high data rates. To achieve the objective of this proposed model some guiding principles are considered. The guidelines are 1) The satellite maintain line-of-sight and designed for intersatellite link.2) the medium between the satellites must be free space [4].This work is a prototype of light wave communication system where system performance is analyzed without employing advanced modulation. By using Optisystem software optisystem software it is simulated depends on channel characteristics, the separation between transmitting and receiving antenna, bit rate and input power. The output performance is determined in terms of bit error rate, quality factor (Q-factor). Performance of an intersatellite system is greatly affected by the separation between the satellites and the signaling rate.

The simulated model consists of transmitter section, receiver section and optical wireless channel section. The transmitter section works as follows

a) **Transmitter Section :** The transmitter contains four subsystems. The first subsystem consists of pseudo-random bit sequence generator, NRZ pulse generator, optical source and optical modulator. Non-return to zero (NRZ) pulse generator encodes the binary information into the corresponding electrical signal. CW laser is the source of the light carrier produces a continuous unmodulated wave. The operating frequency is from 193.1 Thz to 193.4 Thz with input power 0 dB and 10dB. MZ-modulator is used to externally modulate the optical signal. The function of optical modulator depends on its electro-optic effect because of which phase-shifting occurs. The output of pulse generator which is electrical in nature will change the input voltage hence changing the refractive index. The output of the Mach-Zehnder modulator will be transmitted through a multiplexer to wireless link [5].

The system modeling is performed on the basis of following flow chart as shown in figure-2. .

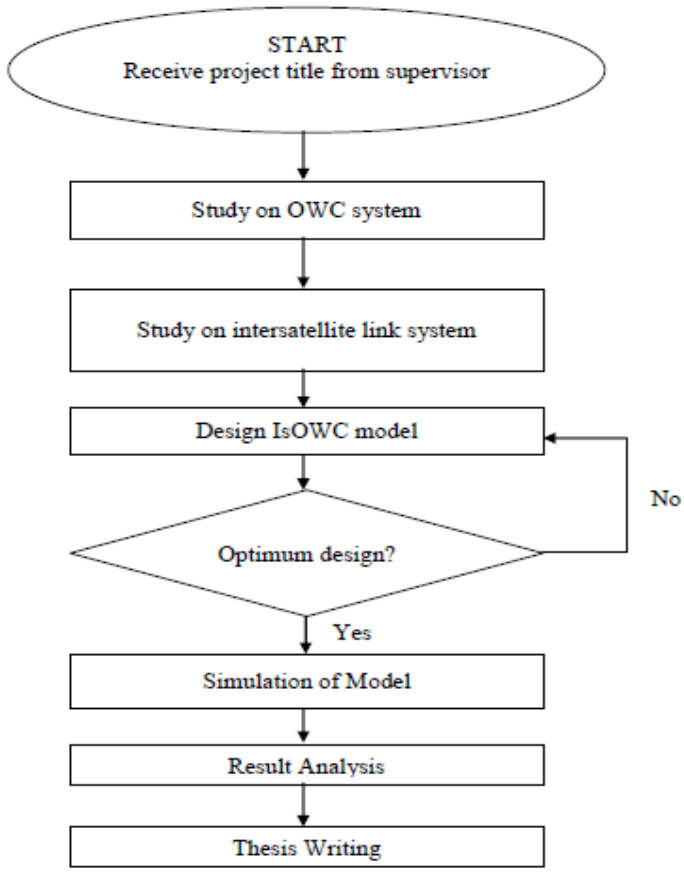

Figure-2 The project methodology

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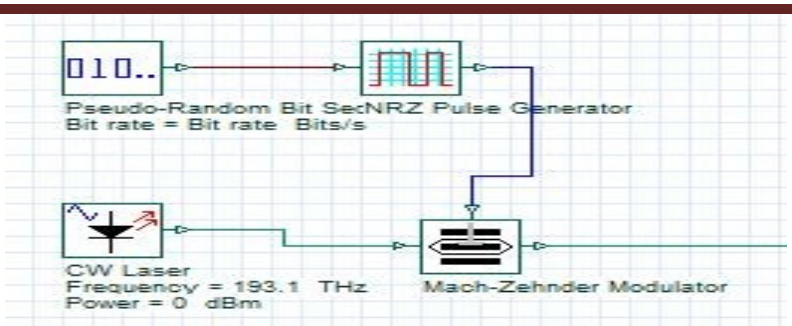

Figure 3: transmitter section

b) **Optical Wireless Channel :**

In intersatellite link, optical wireless channel is used as propagating medium for the transmitted light signal .In the OptiSystem software, the OWC channel is between an optical transmitter and optical receiver with 15cm optical antenna at each end. The transmitter and receiver gains are 0dB and 10dB.

c) Receiver section :

The receiver circuit consists of an APD photo-detector, low pass filter and 3R regenerator. The photo-detector receives the optical signal and converts it into electrical signal. The photodetector allows the reduction of noisy external amplifiers in optical detection systems. The used low pass filter has Bessel function is 4 and the maximum attenuation is 100 dB. The 3R regenerator is used to reconstruct electrical signal of the transmitted bit stream. Then the modulated electrical form is given to BER analyzer . The BER analyzer can be connected either through 3R generator after low pass filter or with output of pseudo-random generator and NRZ pulse generator in the transmitter to compare with output of filter in receiver side.[6]

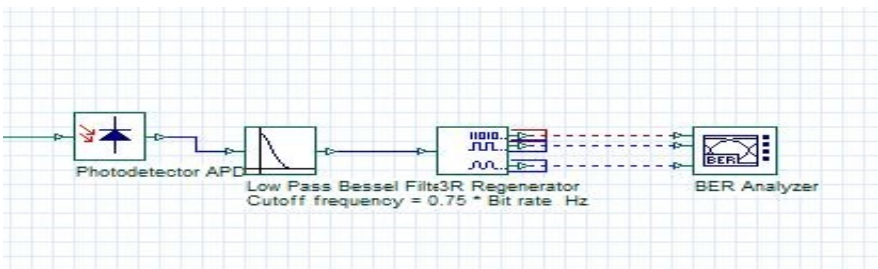

Figure 4 receiver section

d) Simulation Model:

In reference simulation, frequency of 193.1 Thz is used in CW laser with the input power of 0 dBm and 10 dbm . Line width of 10 MHz is used in Optical transmitter of reference simulation. The output of each modulator is connected to a WDM multiplexer which transmits parallel transmission to serial transmission. Then the signal is transmitted through OWC channel at operating frequency of 850 nm at different range[7]. The model is simulated at the range of 20 km,50km,80km,110km and 350km. At receiver side the signal is distributed by using demultiplexer followed by photodiode.

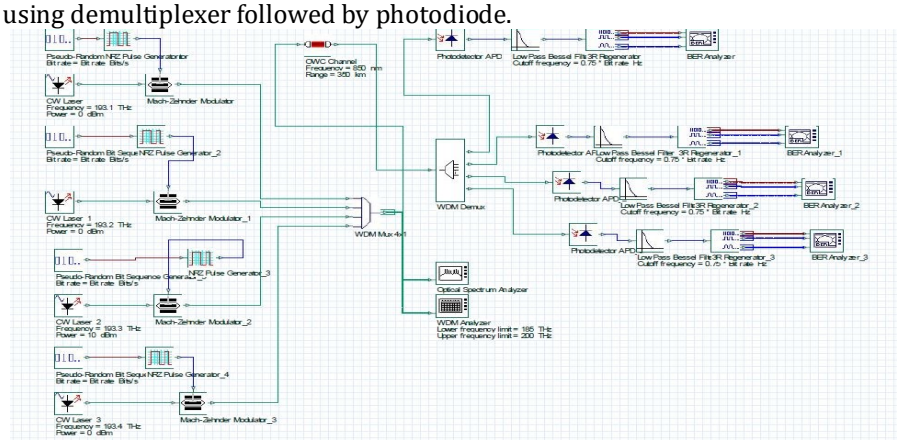

Figure 5: Proposed Simulation Model

III. RESULTS AND DISCUSSION

The designed inter-satellite model is simulated under various different parameters using optisystem. The important parameters considered in this paper are variation of system quality factor at different transmission distance and input power. From the simulation, the comparision of Q-factor is done at different range and at different power.

From figure-6 it can be visualized that the eye diagram is constructed at the distance of 20km and the power is 0db and 10 db for the channel-1. The Q-factor recorded is 4.86389 and 4.8616 for power at 0db and 10db respectively. When the power is increased from 0 dB to 20dB with the same distance i.e. 20 km, the eye diagram contains less jitter and the opening of the eye increases as compared to eye diagram at power 0db.

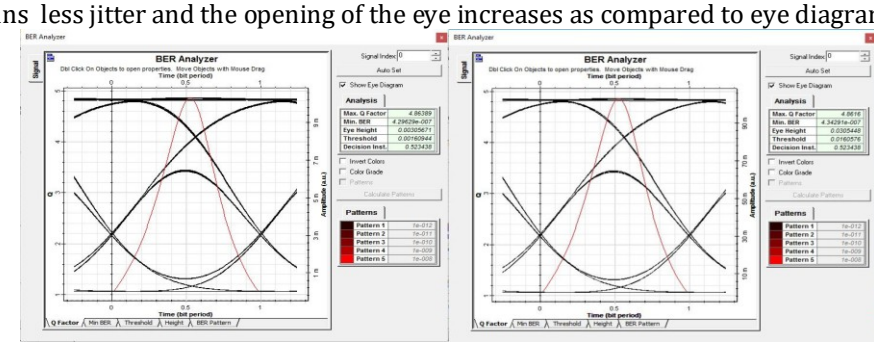

Figure 6: Comparison of Eye Diagrams at 20km for power at 0db and 10db for channel-1

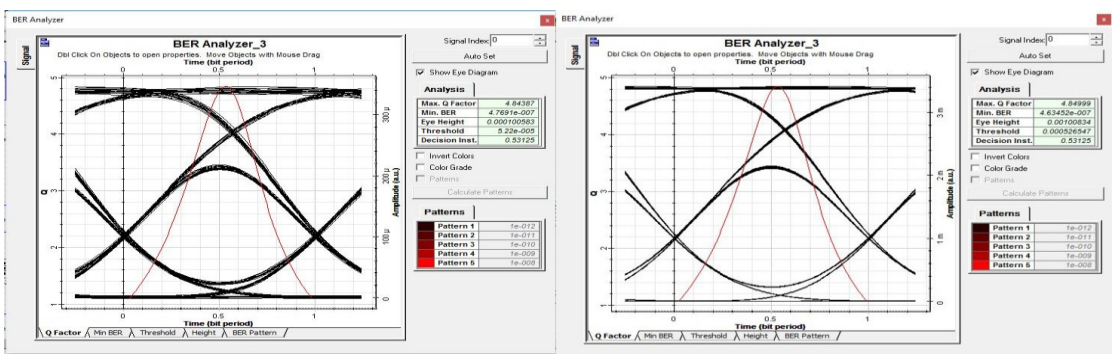

Figure 7: Comparison of Eye Diagram at 110km for power at 0db and 10db for channel-4

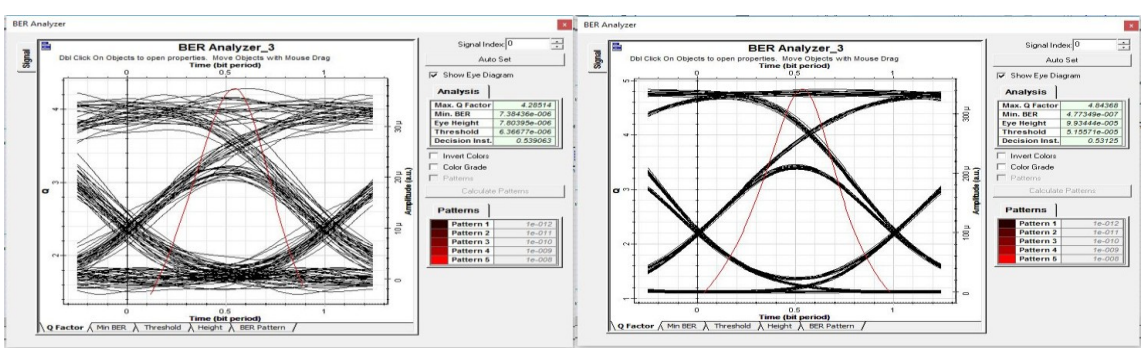

Figure 8: Comparison of Eye Diagram at 350km for power at 0db and 10db for channel-4

From table-1 it can analyze that the system performance is determined on the basis of Q-factor at different length.when input power increased the Q-factor increases as at distance of 350km at 0db it is 4.02 but when power increases to 10db the Q-factor is increased to 4.8.

Table 1 variation of Q-factor w.r.t to distance and power

SL NO	Power(dB)	Length(km)	Q- Factor	
			Channel 1	Channel 4
1	0	20	4.86389	4.84941
		50	4.8643	4.85026

		80	4.85689	4.84908
		110	4.83883	4.84387
		350	4.02791	4.28514
2	10	20	4.8616	4.84869
		50	4.86332	4.84921
		80	4.86444	4.84965
		110	4.86493	4.84999
		350	4.83827	4.84368

IV.CONCLUSION

It was also identified that signals with high Q-factor has better eye diagram with higher eye-heights. Fig.6,7,8 shows the eye diagrams of an intersatellite optical wireless communication network with distance of 350 km and bit rate of 10Mbps that generates very minimum errors with Q-factor of 4.83. The error in received signal increases as the distance between the satellites increases. With the increase in distance between satellites the error increases and by using different hybrid modulation techniques error can be minimized.

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An innovative approach of Electronic Gadgets Charging andHealth Care by acupuncture using Insoles

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ABSTRACT: *The electrical devices have become an important part of our lives as they make a lot of work easier for us, like us they also require an external source of energy to work. However the charging of these devices is not so flexible and always requires an external non-renewable source, restricting movement of the user. Therefore it is important to introduce a new flexible way of charging the electrical devices. The flexibility and adaptability should be such that it can draw immense attention and should bring revolution in field of charging an electronic gadget. What could be better than charging a system by merely walking? So, the idea is to develop a mechanism which could charge our small portable power banks or directly power-up the device battery just by walking. Now, charging a device with the help of an activity as simple as walking can be achieved by conversion of the body weight, acting downwards, into electricity with the help of a conversion medium. And it will become more user-friendly if the same energy is transferredwirelessly and can charge a specific device. It should also contain aqua points which may help a person with acupressure therapy to keep him/her healthy. Hence, the gist is to bring such a sole which can be fit in any shoe with some basic modifications and can generate electricity wirelessly and charge the targeted device as soon as person starts walking.*

Keywords: *Insole, acupuncture, TCM, acupoint*

I. INTRODUCTION

Electrical devices have proved to be a boon to the mankind and its usage is increasing day by day worldwide. Like us they even need a surplus source of energy to work continuously. However, the research gap that is established is yet there is no flexible way of charging these electrical devices without any restrictions. The restriction that is faced by people is wired system of charging. In today's era, people are indulged in the thoughts to get their work to be done at an instant but the wired of charging is limiting their efficiency. According to the recent statistics it is even found that 1 billion KW of energy is used up worldwide just for charging of these electrical devices and therefore our proposed idea is to diminish this huge amount of energy usage to such an extent that we can charge the electrical devices in very simpler and much more efficient way such as walking. It is found that an average human being takes a great number of steps a day. When a normal human being walks ,a force is exerted downwards which is equivalent to the body weight of a person .The mechanical stress created by body weight of a person can be converted into electrical energy. This conversion can be achieved by a conversion medium. This electrical energy can be used in charging the electrical devices wirelessly with very simple process of 'walking'. As walking is healthy habit as well it is done by majority of us in our daily life, therefore our proposal is to bring such a sole which can generate electricity and charge our devices wirelessly without any external energy consumption and by staying healthy as well .The necessity of this idea is the type of life-style that the human beings want i.e. Independent of any wired way of charging

II. MATERIALS & METHODS

The concept behind this idea came because of necessity of a life-style where human beings donot need to depend on wired way of charging and neither they have to get worried how their electronic equipment's may get charged even though there power source is not nearby. It actually meant of an environment where we may not have to worry regarding charging our electronic devices as they will get charged just by our walk. This uniqueness of innovation is possible by creating sole which can produce enough amount of energy just by the force we exert on our feet. On an average a common man takes around "5000" steps per day, which means he or she spends a significant amount of time in walking from one place to another. This expected number of footsteps in a day are enough to produce the required amount of

electricity. General people will use this product just like any other footwear they use for daily use. They can wear these "footwear embedded with the smart insoles" at work, while travelling, playing sports or any other activity that we can think of which includes walking. The foot wears are to be equipped with a transmission circuit and a receiver module that comes with the soles. When walking the conversion medium in the sole will convert the footsteps into electricity. Once transmission circuit is switched on the "receiver module" is to be plugged into the device to be charged and hence the device can be charge while walking that too through a wireless medium. Hence the main material building can be segregated as insole building material which generates potential difference when force is applied and a unique mechanism of wireless charging.

Unlike other charging techniques, our device eliminates i) External power ii) Supply external carrying charger iii) It saves around 1 billion KW of energy every year that is used up in charging worldwide. It will also be able to provide charging for external devices such as power banks. Though there are some other techniques of charging mobile phones while walking, but there still remains a restriction of wires. Our device is unique in a way that it eradicated the wired system of charging. Instead our device can charge the phone wirelessly while walking. A self-power generating unit is installed in our device.

Our device not only makes the charging easier but also helps in keeping the user healthy by making the use of Acupressure points in the sole of ones feet. As science has proved acupuncture to be very effective in keeping people healthy. There a number of acupressure points in a human body out of which around 25 in numbers are just in feet.Also when these acupoint gets activated,can help in keeping organs healthy as well as releasing and maintaining hormonal balance in the body. According to the Traditional Chinese Medicine (TCM) practitioners, acupoint are the specifically chosen points or sites in the human body used for acupuncture or acupressure manipulation. An acupoint may incur or release certain substance that could adjust the functioning of an organ.

What is acupressure?Acupressure is an ancient healing art using the fingers to gradually press key healing points, which stimulate the body's natural self-curative abilities.Like Acupuncture, Acupressure is a form of Traditional Chinese Medicine. Acupressure involves accessing or activating the meridian points also known as acupoint in the body. Doing this restores the flow of energy in the body and hence promotes healing.TCM practitioners believe that a person becomes ill because the energy flowing in the body called "qi" is weak or disrupted by a negative force. Acupressure and acupuncture both the healing techniques works on the premise that positive thoughts generate good "qi" whereas negative thoughts destroy it. There are scientific reviews that can conclude that "Acupuncture relieves many illness".

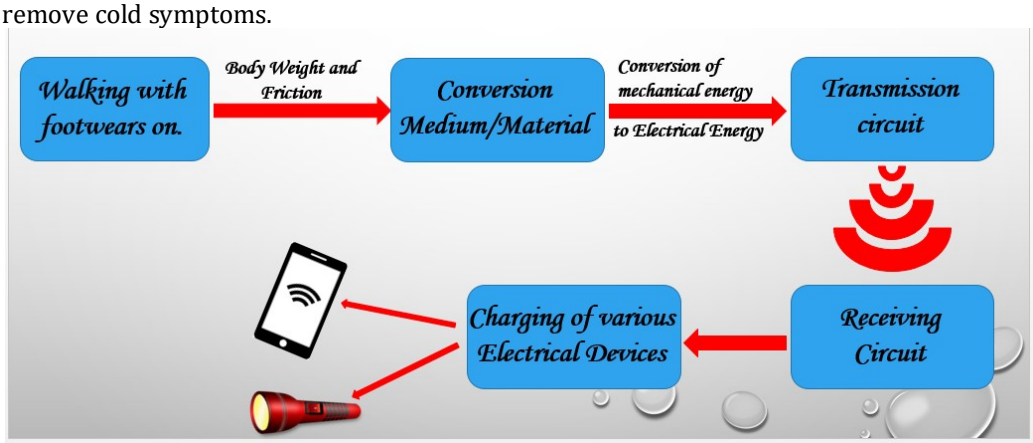
Acupressure points in foot soles.There are many acupoint located in one's feet almost over 25 acupoint are present just in our feet, out of which our product helps in re-energizing or activating the major 9 acupoint. The soles will have a raised pointed blunt surface that is supposed to touch the particular site on one's feet. According to the development of the soles we have planned to split these acupoint into 3 regions depending upon their location, where each group consists of 3 acupoint. Our soles majorly focus on stimulation of these three regions. Each of the raised blunt points will hit these specific acupoint and hence providing the benefits to the user by activating the following point.

The Upper Region: - This region lies under the foot near to the balls of the feet. The most acupoint lying in this region can be found near to the balls of feet. The region has 3 essential acupoint namely LUNG POINT, HEART POINT and SHOULDER POINT. This region basically helps in getting rid of diseases like bronchitis, asthma. Along with this it helps in functions in heart failure patients and get rid of sore shoulder muscles.LUNG POINT: -The right and left lung points are located on the balls of the two feet. The points are located near the edge of the toe. Stimulating this point on both feet with the help of mild pressure aids in improving energy flow through the lungs and enhances functions of the nervous system.HEART POINT:- These acupoint are present right beside of the LUNG point. This point is located a little far from the balls of feet. Stimulating these points on both feet will help in maintenance of blood pressure. It also helps in keeping your heart healthy. SHOULDER POINT:- These points are located to the other side of the LUNG POINT, Stimulation these acupoint helps in relaxation of the shoulder and arm muscles. It helps in restoring the "qi" of the parts.

THE MID REGION: - This region lies a little below the UPPER REGION, but to the side where the feet have more contact with the walking on surface. The 2 major acupressure points in this region are LIVER POINT and DIGESTION POINT. Stimulation of these points can help in detoxification of your liver and kidneys, improving blood circulation and keeping a proper digestive system.LIVER POINT: - This point is located right below the upper region, a little below from the balls of feet. The stimulation of this point helps in avoidance of liver cirrhosis and liver infections.DIGESTION POINT: - This acupoint is right below the

LIVER POINT and a little above the region where the heel of the feet begins. Activating this point helps in maintain good digestion and avoiding the situation ofgastric problems.

LOWER REGION: - This region lies below the mid region, near to the heel portion of your feet. This region also has 3 acupoint that immensely help in maintaining good mental as well as physical health. These Points are TAILBONE POINT, SCIATIC POINT and BRAIN POINT.TAILBONE POINT: - This point is present on both left and right foot near to heel portion at the raised side of the feet. Stimulation of these points help in reduction of tailbone pain, curing sore tailbone and avoidance of Coccydynia.SCIATIC POINT: - This point lies above the TAILBONE POINT, it is present in a strip like portion across the heel region. The region is responsible for maintaining the regular blood flow through nerves. Hence stimulation on this particular acupoint can help in treatment of sciatic nerve pain and maintaining a regular blood flow in nerves and hence maintaining right hormonal balance in the body. BRAIN POINT: - This point is located in the region between the TAILBONE POINT and SCIATIC POINT. This acupoint is majorly responsible for maintenance of mental health of an individual. The perfect stimulation of this point can help in many ways. It helps in getting relieved from stress. Applying pressure to this point will promote patience, reduce fear and anxiety and also remove cold symptoms.



A general method adopted to create such insole: - The general method to be adopted for creating the power generating insoles will follow the steps given below:

1. Generally the insoles of a footwear are made of cellulose paper board or a synthetic insole board. First of all, different sizes are traced on these boards and are to be cut out in the shape of a sole.
2. The 9 spots responsible for activating the acupoint are marked.
3. 9 units of conversion medium is placed on these 9 spots so that these 9 spots emerge to be raised which will help in triggering of the acupoint.
4. The conversion mediums are connected with each other with the help of conducting wires and at the end we'll be left with having 2 free ends.
5. A transmission circuit could be made by using a bar magnet tightly wrapped around with copper wires in the form of coils. So when the current is passed through this coil, a electromagnetic field is formed that can be used to transport the charge to some distance or create a potential difference. The 2 free ends in the previous steps are to be connected with this transmission circuit.
6. A receiving circuit is another circuit that is made using the same procedure is the above step and is to be plugged into the device that is to be charged.
7. The soles can be tested manually by applying a little low pressure or stress onto the spots where the conversion mediums are embedded and the potential difference can be measured between the two free ends in step 3.

Working of Insole:-

1. When a person walks, a force equivalent to his/her body weight acts downwards. This force will put the conversion mediums under some pressure.
2. The conversion medium placed on the insoles will convert the pressure applied on them into electrical energy and also trigger the 9 acupoint of the user which will help is maintenance of good "Qi" and help in keeping the user healthier than before.
3. The electrical energy produced by the conversion medium reaches the transmission medium through conducting wires.

4. The transmission medium is responsible to transport the charge to a receiving circuit which will be plugged into the electrical device.
5. A communication between the transmitter and receiver is established to ensure that only one particular device having the receiver plugged in, is only eligible for charging.
6. Once the device is charged the transmitter is notified and hence will stop transmission which results in a stop to charging of the device.

III. DISCUSSION

Potential areas of application is very diverse and has a very wide range. The idea has high scalability, and can be used by everyone as a daily use product.The main targeted areas for the market are the ones where "Walking is a major mode of transportation". Thus the main targeted areas would be:

Hilly areas: In these areas, the electricity is scarce and also a major population has to walk for most part of the day, which makes an activity like walking a widely used mode of transportation for the general population.People face a lot of problems due to lack of electricity. Hence, this innovation can play an important part is solving the issues faced by the people due to scarcity of electricity. The product can be used to charge the cell phones and other electrical devices. Also the fatigued faced at the end of the day can be reduced by making use of the innovation as it activates the acupoint, regulates a good flow of energy and this helps in increasing the efficiency in working of an individual. Develops a positive mindset.

Deserts: The desert areas experience a frequent rise and fall in temperatures, though the population in these areas may not be huge in numbers but they too face a lot of difficulties due to scarcity of electricity in the areas. The population requires a constant electricity source for lighting up their houses in the night time, also, people mostly prefer to walk from one place to another for short distances. Here, the innovation comes into play as it requires a few number of footsteps to generate a considerable amount of electricity. The general population can use the device to keep their cell phones charged as well as it can be used to charge the electrical devices such as torches, emergency lights etc.

Cities: In cities, though the walking is not a major mode of transportation, the population residing is huge in numbers and hence the number of footsteps falling in a unit time is more. Also the most part of the population residing in the cities tend to suffer from diseases like liver cirrhosis, infections, breathing problems. Also the most common are the mental health problems such as depression. Hence our device have the specific acupoint that can be helpful in making people get rid of these kind of diseases and keep a healthy and sound mind. Also because of the busy life in cities the current way of charging imposes a restriction on the movement of the user. This innovation helps in getting rid of all the restriction imposed by the wired way of charging.

In all these mentioned areas the electricity is scarce and major population can reduce electricity consumption by waking. The segregations can also be done on basis of professionals residing in these areas. Based on this following professionals can make use of this product:

Military: As the military soldiers have to carry huge batteries on their back to make a contact between the base and the soldiers on the field, alsothey carry external batteries with them when on the field as there are no source of electricity available to charge their phones. Our product can be of great assist in removing the weight off of their shoulders as the insoles in the military boots can be replaced with these new insoles which will help them to keep their cell phones and all other devices charged when on the field. It will also eliminate the need of carrying external batteries. Also the young soldiers spend most of their day doing drills and marching which involves a lot of walking and running these activities when performed using the proposed insoles will not only help the soldiers to feel less fatigued and more relaxed but also come in handy to charge their electrical gizmos.

Sportspersons: As the sportspersons and players spend a significant amount of time at the gymnasium on the treadmills and practicing with their shoes on to take themselves a step closer to fitness and perfection, The product can be very handy and of great use to them as the acupoint activation mechanism used in the insoles will not only help them in keeping a healthy body but also help them in being able to concentrate better and have improved focus on their practice. Plus in handy they can use their footwear to charge up their gadgets such as phones, fit bit, etc. by keeping them right in their pockets without any restriction in the movement.

Regular people: Walking is a very basic and common activity in everyone's life. The only requirement of our product is walking and hencethe regular people who are fitness and health concerned and go out for daily morning walk or jogging or play any sport can use the product. Hence, the product can be used by the regular people to stay fit, healthy as well as use a fancy, new and effective way of charging.

Camera Person shooting in dense forests and mountains:The cameramen who travel in dense forests and mountains for capturing the pictures and for photo and film shooting of wildlife do not have access to any mode of electricity to charge their electrical devices, A dead or uncharged cell phonein such remote areas can lead the person into grave danger as they may fail to make a contact with their base or office. Since they have to walk long distances in the forests they can make use of the product and keep their devices charged. This will also help in keeping themselves healthy and also keeping their lives saved.

IV. CONCLUSION

The idea has high scalability and a wide range of applications that will bring a change in the "Lifestyle" of the people, taking them a step closer towards modernization and help them live a stress free and healthy life. The idea has a potential to completely restructure the current methods of charging and charge transmission and introduce a whole new and easy way of charging of electrical devices. A significant raise in the numbers of mentally relived and stress free population will be observed. A huge amount of electricity spent on charging of the electrical devices can be saved and used for different useful purposes. The idea will make the population grow health conscious and hence promote a healthy lifestyle. The idea on being presented as a product will be immensely useful as well as beneficial for all of the world and can be used by everyone right from a common man to famous celebrities, army-personal etc.

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A REVIEW ON FAULT DETECTION IN FIBBER USING OPTICAL TIME DOMAIN REFLETOMETER

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ABSTRACT: *Optical fibers are used extensively for data transmission systems because of their dielectric nature and their large information-carrying capacity. The main advantages of optical fiber are: Small size and weigh, Electrical isolation, Signal security etc. Along with the advantages there are also some disadvantages like attenuation which hinders in the proper transmission of signals. This review paper is written to analyse various methods to overcome attenuation in optical transmission. In this paper we will discuss mainly about OTDR (Optical Time-Domain Reflectometry). OTDR is extensively used in telecommunications to check the integrity of fiber links and to locate possible defects.*
OTDR with one of its most unique and appreciated features: only accessible to a single fiber end can carry information for larger distances. This brings obvious advantages when monitoring tens-of-kilometers-long communication links.

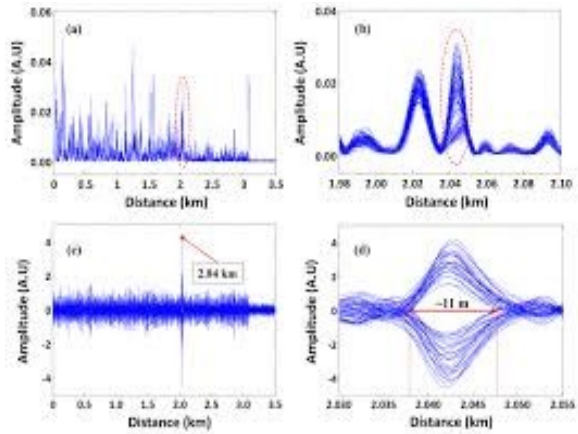
Keywords: *OTDR, VFL, EDFA, OCCS.*

Introduction: Fiber-optic communication is a method of transmitting information from one place to another by sending pulses of light through an optical fiber. The reduction in the strength of a signal is generally termed as attenuation. Attenuation may occur with any type of signal, it may be analog or digital. It is a natural consequence of signal transmission over long distances. Attenuation is measured in decibels.
As the rate of attenuation increases ,the transmission becomes more distorted. In optical communication, attenuation may be due to the following reasons

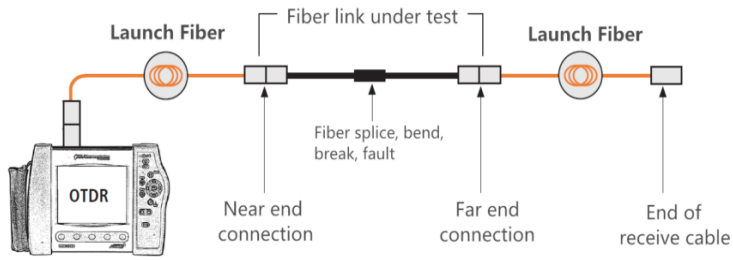
- Dispersion
- Scattering
- Bending (internal or external)
- Intrinsic or extrinsic absorption losses

There are many ways to minimise or control attenuation.
One of the ways to tackle attenuation in fiber-optic cabling is by using low-loss or ultra-low-loss cables. These cables are coaxial cables which have improved shilding in comparison to standard RG coaxial cables. Depending on their effectiveness, they are categorised into low-loss and ultra low loss cables. This improved shielding helps to achieve a lower attenuation loss at higher frequencies.
Another method for detecting optical signal degradation or loss within the optical domain of a fiber network is the Optical cross-connect switches (OCCS) which are provided at network nodes. Optical cross-connection may be accomplished by hybrid approach and all optical switching. OCSS are located at the network loads. Optical data traffic between the nodes are conducted through a fiber link. Specific signals for detecting faults are introduced and removed within the optical domain of the fiber. Rapid, accurate optical fault capability can be applied to communication networks without changing the existing light terminal elements and processing circuitry in the electrical domain.
The last but not the least method is the OTDR method. We will be going through this topic in details later in this review paper.
It is a distributed characterization technique for optical fiber communication. OTDR is extensively used in telecommunication to locate possible defects in fiber links. As the light propagates in a fiber, small material imperfections scatter the incoming light in all the directions. From the fault point, the incoming light propagates back and can be detected at the same point where it was launched.
OTDR exploits Rayleigh Scattering by taking place in the core of optical fibers.
This topic is vividly discussed in the papers of some prominent authors and personalities. Glimpses of few of them are as follows:

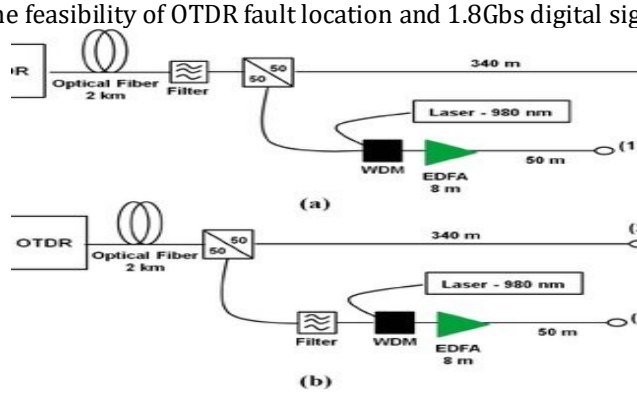
According to Vittorio M. N. Passaro, a phase-sensitive optical time domain reflectometer can be used for pipeline security. However the sensing distance of traditional phase-OTDR is too short for oil and gas pipeline monitoring applications. A simple structure phase-OTDR system utilizes long pulse, balanced amplifier and heterodyne detector. In his paper, he proposed to locate accurately at a few meters when a long pulse (5us) is used. The increase in pulse width decreases the time series of each sensing point. In order to reduce this decrement, a data processing technique in combination with wavelet and empirical mode is applied to this system.



MITSUHIRO TATEDA AND TSUNEO HORIGUCHI, MEMBER, IEEE introduced a technique that was first demonstrated by Barnoski and Jensen. This technique couples light from a pulsed GaAs injection laser into a glass fiber and the attenuation characteristics can be obtained by analyzing the time dependency of the detected Rayleigh backscattered light. This technique can also be used to analyze fiber parameters like fluctuation and splice loss and to locate faults in fiber cables.
This adds to an advantage which is that it can be achieved non-destructively at one end face. Hence this technique has become a practical and helpful tool in various works of optical fiber cables.



According to y sato and k.ayomaya NTT Transmission Syst. Lab., Kanagawa, Japan, OTDR cannot be used for an optical transmission line containing EDFAs (Eribium –Doped Fiber Amplifier), as they contain optical isolators. The authors introduced a scheme that uses an OTDR with new EDFAs containing optical circulators and return transmission lines. This new OTDR supports both OTDR and digital signal transmission. A 280.9Km transmission was constructed conataining three of the proposed EDFAs and tested. The results gave the feasibility of OTDR fault location and 1.8Gbs digital signal transmission.



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How Does an OTDR Work?

OTDR works indirectly in comparison to the sources and power meters which measure the loss of fiber optic cable directly. By using the phenomena of "backscattered light" measurements are made along with reflected light from connectors or cleaved fiber ends. This way it measures the loss indirectly.

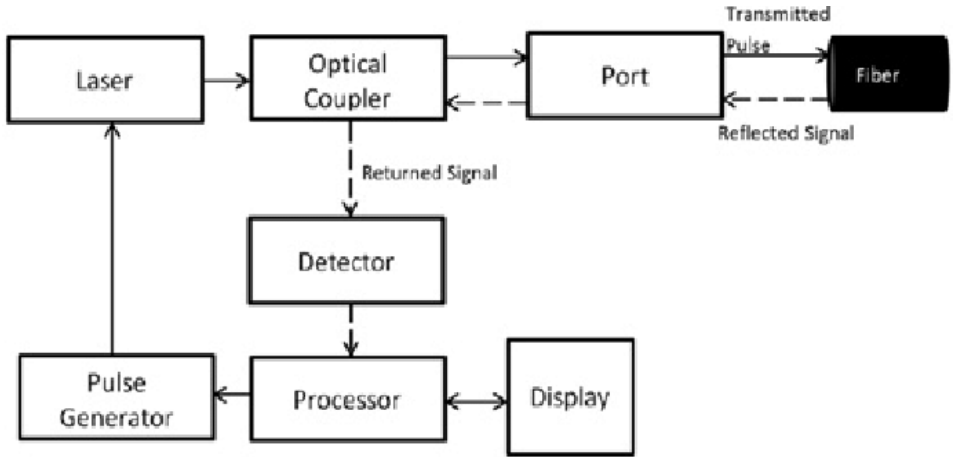
During the process of testing, the instrument injects a high power laser into a fiber, and the OTDR port receives the returning information. As the optical pulse is cable, a part of it is scattered and return to the OTDR. The OTDR detects only only the useful information. Distance can be calculated by recording the time for signals from transmission to returning and the speed of transmission in fibers.

The Working Characteristics of OTDR

OTDR uses two optical phenomena, Rayleigh Scattering and Fresnel reflection to measure fiber characterises.

In Rayleigh scattering, irregular scattering are generated as optical signals transmits through the fiber. OTDR measures only the backscattered light and it shows the degree of attenuation. Rayleigh scattering power is related to the wavelength of transmitted signal which means shorter the wavelength, the stronger the power. For example the backscatter lose generated by the trajectory of 1310nm signal will be higher than that of 1550nm signals.

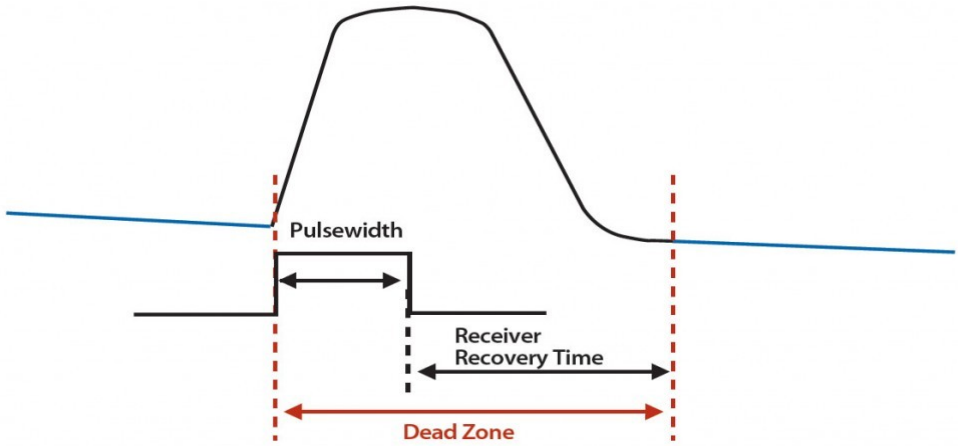
Fresnel reflection comes under the category of discrete reflection which is caused by the individual point of whole fibers. Therefore, Fresnel reflection is use to locate the connection point, fiber optic terminal and breakpoints.



The Solution for OTDR Dead Zone

There is another phenomenon which arises from Fresnel reflection is known as "dead zone"There are two types of dead zone: event and attenuation.

During the working phase of OTDR, time is converted into distance. More reflection leads to more time for the detector to recover, which results in a longer dead zone. Dead zone hinders in the operation of OTDR, making it unable to locate and resolve faults.



This drawback can be minimised by adapting visual faults locator (VFL). It works in compliment with the OTDR in cable troubleshooting .It can successfully cover the range where OTDRs fails to monitor because of the dead zone . The VFL is designed with a visible laser and universal adapter like FC,SC and ST etc, through which faults like breakpoint, bending or cracking of the fibre optic cables can be located easily .

Conclusion

So, in conclusion we can say that OTDRs are used in optical fiber installation and maintainance services of access networks like communication links between telephone exchanges.The drawbacks in the working of OTDR are largely minimised by using VHL. Fiberstore(FS.COM) offers a wide range of reliable and quality OTDRs.

Hence OTDR tester is an optical radar in essence.

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In vitro antibacterial activity and chemical composition of leaf extract of *Tinospora cordifolia* (Willd.) Hook. F. & Thomson

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ABSTRACT: *Tinospora cordifolia is a very popular medicinal plant. The plant is used for curing of many human diseases particularly for fever, dyspepsia and urinary diseases. The fresh leaves of a disease free plant were collected and the bioactive compounds present in the leaves were extracted by Soxhelt extractor using different solvents such as distilled water, ethanol, methanol, chloroform and petroleum ether. The efficacy of the bioactive compound as an antibacterial agent were studied in vitro against five human pathogens viz. Escherichia coli, Staphylococcus aureus, Bacillus subtilis, Salmonella typhimurium and Klebsiella pneumoniae. The ethanol leaves extract of T. cordifolia showed significant antibacterial activity against all types of tested bacterial strains. The ethanolic leaves extract was analyzed by GC-MS and major three bio compounds are identified as 4-methyl -3-heptanonl, D-Ribonse acid and 3 Hydroxy-12-Keto bisnorcholanic acids. The ethanol leaves extract showed minimum inhibitory concentration (MIC) for E. coli, B. subtilis and S. typhimurium was 50 mg.ml^{-1}. Similarly, minimum bactericidal concentration (MBC) of ethanol leaves extract was recorded as 100 mg.ml^{-1}. Therefore, from the present work it can be concluded that, the leaf of T. cordifolia contains bioactive compounds which have potential bactericidal properties and also reveals a scientific evidence for use as an alternate to antibiotic in modern medicine.*

Keywords: *Antibacterial activity, Tinospora cordifolia, pathogenic bacteria*

1. Introduction

The medicinal plants have been used as a source of remedies for many diseases dated back to prehistoric period and people of all continents have been practicing this tradition (Chopra *et al*., 1982). Medicinal plants possess curative properties due to presence of various bioactive compounds (Dev *et al*., 2011). The important bioactive compounds of the plant having bactericidal activity are alkaloides, tannins, flavonoids and phenolic compounds (Tarfa *et al*., 2004).

In recent years one of the most serious problems in clinical science is the emerging of antibiotic resistance microorganism, and many bacteria have been reported as resistance to antibiotic (Anas *et al*., 2008). Besides that certain antibiotics have serious side effects so that these are having very limited applications (Putman *et al*., 2000). In other hand herbal medicines are considered as safe and without any adverse effect on human (Makut *et al*., 2008). They are also available at low cost in the local doorstep. Thus, search for new drugs with better and cheaper cost, substitutes with plant resources have been drawn interest of many researchers in recent past (Owasis *et al*., 2005)

Tinospora cordifolia (Willd.) Hook. F. & Thomson (*T. cordifolia*) is a large, glabrous, deciduous climbing shrub belongs to family Menispermaceae, is distributed throughout the tropical Indian subcontinent, Sri Lanka, Bangladesh and China (Sharma *et al*., 2010). Gunupur is located on southern part of Odisha at the foot hill of Eastern Ghat. The plant is growing naturally in this region and is exploited by local tribal people for treatment of many diseases. It is used for preparation of different Indian ayurvedic medicines (Kala, 2005). The stem is used for fever, dyspepsia, urinary diseases and as well as skin infection (Raghunathan and Mittra., 1982). Dry bark has antispasmodic, antipyretic, antiallergic and antileprotic properties (Patel and Mishra, 2011). The root is reported as an antioxidant (Upadhyay *et al*, 2010). Therefore, the plant is considered as an important bio-prospecting because of its wide use for many diseases (Singh *et al*., 2006). A variety of constituents have been reported from different parts of *T. cordifolia* includes alkaloids, diterpenoid lactones, steroids, glycodides, aliphatic compounds and polysaccharides (Kapil and Sharma., 1997). In the present study, the selection of this plant has based on its traditional use by the local people. Since there is no report on the chemical constituents of the biotype of *T. cordifolia* available in this locality, we have studied the major chemical constituents present in leaves and its bactericidal effect on some pathogenic bacteria viz. *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, *Salmonella typhimurium* and *Klebsiella pneumonia*.

2. Materials and Methods

2.1. Plant Material

Health and fresh leaves of *Tinospora cordifolia* were collected from the forest located near college campus, Gunupur. The plant material was identified and authenticated at laboratory of Floristic and Ecology, Department of Botany, Berhampur University, Berhampur, Odisha and a voucher specimen for the authentication was deposited to the departmental herbarium.

2.2. Plant Extract Preparation

T. cordifolia leaves were dried in shade and then powered. Leaf power (5g) was packed in Whatman no.2 filter paper and soxhletted with 100 ml of solvents. The solvents used for extraction were aqueous, ethanol, methanol, chloroform and petroleum ether. The extraction was carried out for 12 h for each solvent. The extracts were dried in a rotary flash evaporator and then dissolved in dimethyl sulfoxide (DMSO, 99.00% pure, Merk, USA) and the solution was regarded as stock solution. The stock solution was preserved at 4^0C until further use.

2.3. Analysis of Extract

The ethanol leaves extract of *T. cordifolia* was analyzed by GC-MS instrument (model MSGC- 11) having capillary column of HP-3 (50 mm × 0.521mm, film thickness 0.25μm). 1μL of extract was carefully injected into GC-MS for analysis. The chemical compositions of the solution were identified by taking into consideration of their retention indices (RI) and mass fragmentation pattern.

2.4. Test microorganisms used

The test bacterial strains used for the study were *Escherichia coli* MTCC 739 (*E. coli*), *Staphylococcus aureus* MTCC 2940 (*S. aureus*), *Bacillus subtilis* MTCC 441 (*B. subtilis*), *Salmonella typhimurium* MTCC 1254 (*S. typhimurium*), and *Klebsiella pneumoniae* MTCC 162 (*K. pneumoniae*), obtained from Institute of Microbial Technology (IMTECH), Chandigarh, India. All the microbia strains were maintained on the nutrient agar medium as per the instructions provided by IMTECH and were sub cultured at the Laboratory in an interval of one week.

2.5. Antibacterial activity assay

Antibacterial activity of *T. cordifolia* leaves extracts viz. aqueous, ethanol, methanol, chloroform and petroleum ether determined by following agar well diffusion assay method (Bodroth and Das, 2012). The Muller-Hinton agar (MHA) plates were prepared with 20ml of the medium and were left overnight at room temperature to check for any contamination to the plates. The test bacteria were grown in a nutrient broth and diluted (OD 620nm = 0.1) to obtain a microbial suspension of 1×10^8 CFU/ml before apply onto the agar plate. Agar wells of 5mm diameter were prepared with a sterilized steel gel puncher and each well received 10μL of the extracts. The control well received dimethyl sulfoxide (Hi media, India). For reference, commercial antibiotic gentamycin (10μg/10μL, w/v) was added to one well. The agar plates were containing organisms and extracts were incubated in a BOD chamber at 37^0C for 24 h. The antibiotic activity against each test organisms was quantified by determining the zone of inhibition appeared around the well, were measured using a meter ruler. The average diameter of three replicates for each organism was determined and expressed in millimeter (mm).

2.6. Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC)

The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the leaves extract were determined by micro broth dilution assay method (Pavithra *et a*l., 2009). The minimum inhibitory concentration was defined as the minimal concentration of the plant extracts which completely inhibited the visible growth (turbidity) of the bacteria in tubes and the minimal bacterial concentration of the extract which completely inhibited the visible growth of the test bacteria on solid media in petridishes were incubated at 37^0C for 72 h (Beverly and Sudarsanam, 2013).

The leaves extract was 10 fold serially diluted in DMSO to obtain concentrations 0.01 mg/ml. 10μL of the diluted extract was added to each tube contains nutrient broth. 10μL of 1×10^6 bacterial suspensions were added to the tubes. The tubes were incubated at 37^0C for 24 h. The lowest concentrations of extract which inhibited the bacterial growth after 24 h were considered as MIC. The minimum bactericidal concentration (MBC) was determined by sub culturing 10μL of the MIC test solutions on Muller – Hinton agar (MHA) plates at 37^0C for 24 h. The heights dilution that yielded no bacterial growth was regarded as MBC.

3. Results

3.1. *Chemical composition*

The chromatogram of GC-MS analysis of leaves extract of *T. cordifolia* shows three major peaks having retention time of 10.478, 11.569 and 14.617 and the % of area occupied are 69.27%, 28.22% and 2.51% respectively. These three compounds are identified as 4-methyl -3-heptanonl, D-Ribonse acid and 3 Hydroxy-12-Keto bisnorcholanic acids. The other components are identified as sitosterol, heptocosanol, octocosanol and tinosponone (Fig.1).

3.2. *Antibacterial activity*

The results of bactericidal activity of leaf extract viz. aqueous, ethanol, methanol, and chloroform and petroleum ether against different bacterial strains are represented in Table 1. The ethanol leaves extract of *T. cordifolia* showed significant antibacterial activity against all types of tested bacterial strains. The extract had maximum bactericidal activity on *E. coli* (9 mm) and minimum to *K. pneumoniae* (4 mm*)*. Among the all solvent extracts, petroleum ether leaves extract was found to be less effective against all test bacteria. Both aqueous and petroleum ether leaf extracts of *T. cordifolia* had no inhibitory effect on *K. pneumoniae*. It was also observed that all the experimental extracts had least effect on *K. pneumoniae*. The inhibitory activity of all the five extracts of *T. cordifolia* leaves described here in the present work was compared with standard pure antibiotic gentamycin. The antibiotic showed higher values of zone of inhibition in all the tested bacterial strains used for the study.

The result on MIC of *T. cordifolia* leaves extract against five types of pathogenic bacterial strains is tabulated (Table 2). The ethanol leaves extract observed as lowest MIC value (50mg/mL) for *E. coli, B. subtilis* and *S. typhimurium*. The extract had MIC value 75mg/mL and 100mg/mL for *S. aureus* and *K. pneumoniae* respectively. The aqueous extract showed MIC of 75mg/mL for *E. coli, B. subtilis*, *S. typhimurium K. pneumoniae* but 100mg/mL for *S. aureus*. The methanol extract had MIC of 75mg/mL for *S. aureus, S. typhimurium* and *K. pneumoniae* and 100mg/mL for both *E. coli* and *B. subtilis*. Both the chloroform extract and petroleum ether extracts had MIC value 75mg/mL for two tested bacteria viz. *E. coli* and *B. subtilis* and 100mg/mL for *S. aureus, S. typhimurium* and *K. pneumoniae* respectively. The ethanol leaves extract of *T. cordifolia* showed the least value of MBC compared to other used solvent extracts for all the bacterial strains. The minimum and maximum values of MBC were 50mg/mL and 100mg/mL respectively. The standard antibiotic had MBC 25.0 mg/mL for *S. aureus*, *B. subtilis* and *K. pneumoniae* and 12.5mg/mL for *E. coli* and *S. typhimurium* (Table 3).

4. Discussion

The medicinal plants contain various types of phytochemicals /bioactives which have therapeutic use. Each bioactive has a definite mode of action on pathogen (Behera *et al*., 2008)]. Tannins are potential antibacterial compounds which react with the proteins present in bacteria to form water soluble compounds (Elmarie and Johan, 2001). It has also reported that some tanning damage the bacterial cell membrane. Flavonoids are a major group of phenolic compounds reported for their antiviral (Chiang *et al*., 2003), antimicrobial (Maria, 2009) and spasmolytic properties (Amor *et al*, 2005). Alkaloids isolated from plants are commonly found to have antimicrobial properties (Ahmed *et al*., 2010). The bactericidal property of leaves extracts of *T. cordifolia* can be correlated in presence of 4-methyl-3-heptanone, D-Ribonic acid and tinosponone. Moreover, the antibacterial activity of the leaves extracts can also be considered due to synergistic effect of all the chemical constituents present in the extract (Dorman et al., 2006).

It is concluded from the present study that leaf of *T. cordifolia* has bactericidal activity, and attributes its significance ethno medicinal value for treatment of various ailments and puerperal diseases. It is also reported that leaf of *T. cordifolia* is a source of stable bioactive compounds which can be exploited for use in modern medicine.

Conflict of interest

The authors declare they have no conflict of interests.

Acknowledgements:

The authors are highly grateful to HOD, Department of Chemistry, Pune University, Pune for providing GC-MS facility and also to the management, GIET, Gunupur for encouragement.

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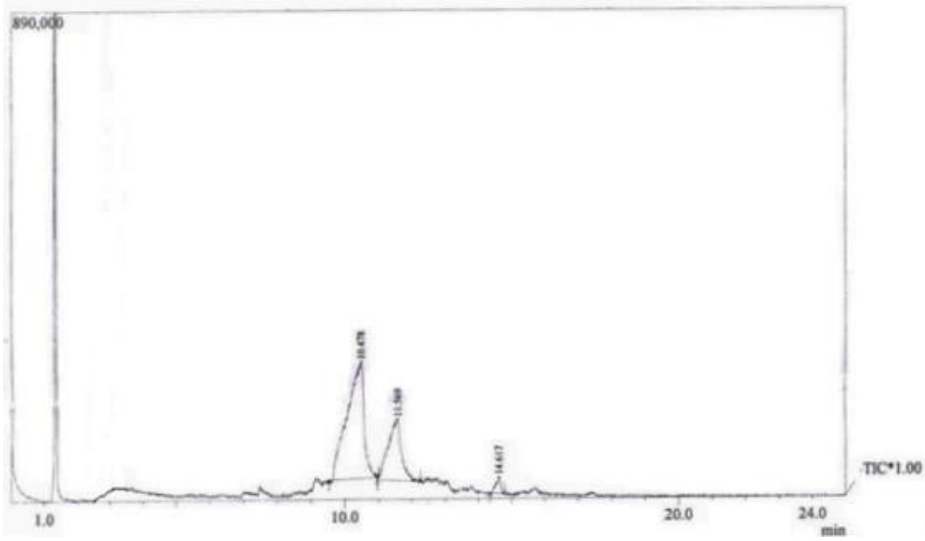

Fig. 1: Chromatogram of GC-MS analysis of *Tinospora cordifolia* Leaf extract

Table I: Antibacterial activity of different extracts of leaves of *T. cordifolia* against test bacterial strain.

Bacterial strains	Zone of inhibition (mm)[a]					
	AE	EE	ME	CE	PE	Reference drug
E. coli	8	9	7	7	5	17
S. aureus	5	7	8	5	3	15
B. subtilis	5	8	7	4	2	14
S. typhimurium	4	7	5	4	3	13
K. pneumoniae	-	4	3	4	-	12

a :Excluded the diameter of well
AE: aqueous extract, EE: Ethanol extract, ME: Methanol extract, CE: Chloroform extract, PE: Petroleum ether extract

Table II: Determination of minimum inhibitory concentration (MIC) for *T. cordifolia*

Bacterial strains	MIC (mg/mL)					
	AE	EE	ME	CE	PE	Reference drug
E. coli	75	50	>100	75	75	12.5
S. aureus	>100	75	75	>100	>100	25
B. subtilis	75	50	>100	75	75	25
S. typhimurium	75	50	75	>100	>100	12.5
K. pneumoniae	75	> 100	75	>100	>100	25

AE: Aqueous extract, EE: Ethanol extract, ME: Methanol extract, CE: Chloroform extract, PE: Petroleum ether extract

Table III: Determination of minimum bacterial concentration (MBC) for *T. cordifolia*

Bacterial strains	MBC (mg/mL)					
	AE	EE	ME	CE	PE	Reference drug
E. coli	75	50	>100	75	>100	12.5
S. aureus	>100	75	75	75	> 100	25.0
B. subtilis	75	50	75	75	75	12.5
S. typhimurium	75	50	>100	> 100	> 100	12.5
K. pneumoniae	75	75	75	> 100	75	25.0

AE: Aqueous extract, EE: Ethanol extract, ME: Methanol extract, CE: Chloroform extract, PE: Petroleum ether extract

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DUAL BAND STAIRCASE PATCH ANTENNA

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ABSTRACT: *With the accelerating advancement in the field of science and technology, antenna plays an important role in the field of communication and has experienced a dramatic growth from including all features to higher speed. This paper describes the design and simulation of dual band staircase patch antenna, using CST software. The simulation and results comes under the frequency range of 9.54 GHz and 12.508 GHz which includes the X-band and Ku-band. The result shows that the dual band function which includes weather monitoring, air traffic control and satellite communication. The patch is made of conducting material having specific dimensions. The designed antenna can be operated and it has wide range of application.*

Keywords: *CST, X-band, Ku-band, satellite communication.*

1. Introduction:

The wireless telecommunications industry has seen incredible advances in recent years, based on new inventions and practical implementation which brought a revolutionary change. Antennas play an essential role in the field of wireless communication. It includes slot antennas, patch antennas, folded dipole antennas having own properties and importance. Microstrip antenna developed rapidly in 1970's. The proposed design of dual band staircase patch antenna, the frequency is 9.54 GHz and 12.508 GHz it comes under the frequency band i.e. X-band and Ku-band respectively. In X-band the radars are used for fire control purpose, weather monitoring, air traffic control,defence tracking, vehicle speed detection. X band is often used in modern radars. Higher frequency bands give access to wider bandwidths. Ku band is mainly used for satellite communications and also for direct broadcast satellite services, such as Astra.This is designed and simulated using the CST Microwave Studio software. This software is a powerful tool for 3D electromagnetic simulation of high frequency components. This software enables the fast and accurate analysis of High frequency devices such as filters, antennas, couplers and multilayer structures.

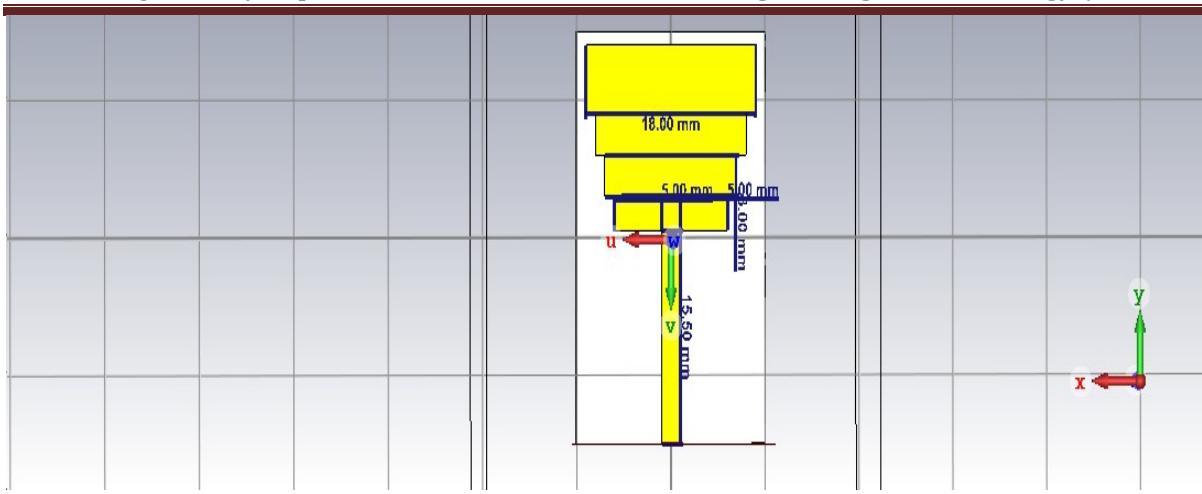
2. Antenna Design:

The designed antenna consists of a feed line, patch, substrate and ground plane.The patch itself is the combination of four rectangular shapes having different dimensions.

The patch is designed using a conducting material (copper in this design).The patches are then integrated using the Boolean addition to form a staircase shape. Substrate is made up of a dielectric material (FR4) having a dielectric constant of 4.4.

The height of the antenna is nearly equal to the height of the substrate. The ground plane is designed using the same material as the patch (copper).

The height of the antenna is mostly preferred to be 1.6mm. The PCB boards are made with the dimension (Height) of 1.6mm, so for simplification of the fabrication of designed antenna height of 1.6mm is preferred.



Dimension of the designed antenna.

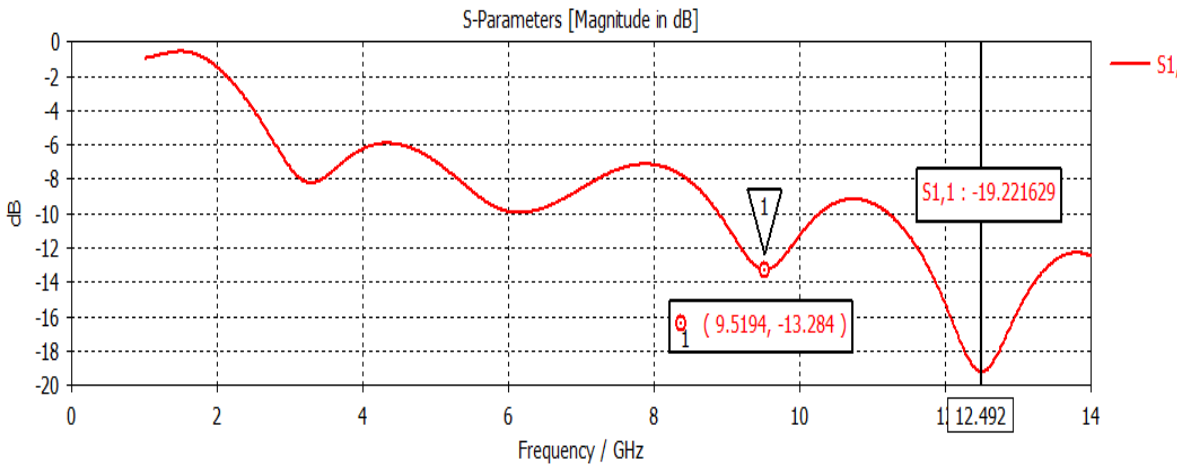
In this design we got dual band and the bandwidth is also more.

3. Simulation results:

The performance of the designed antenna is simulated, and the results are analyzed by CST software.

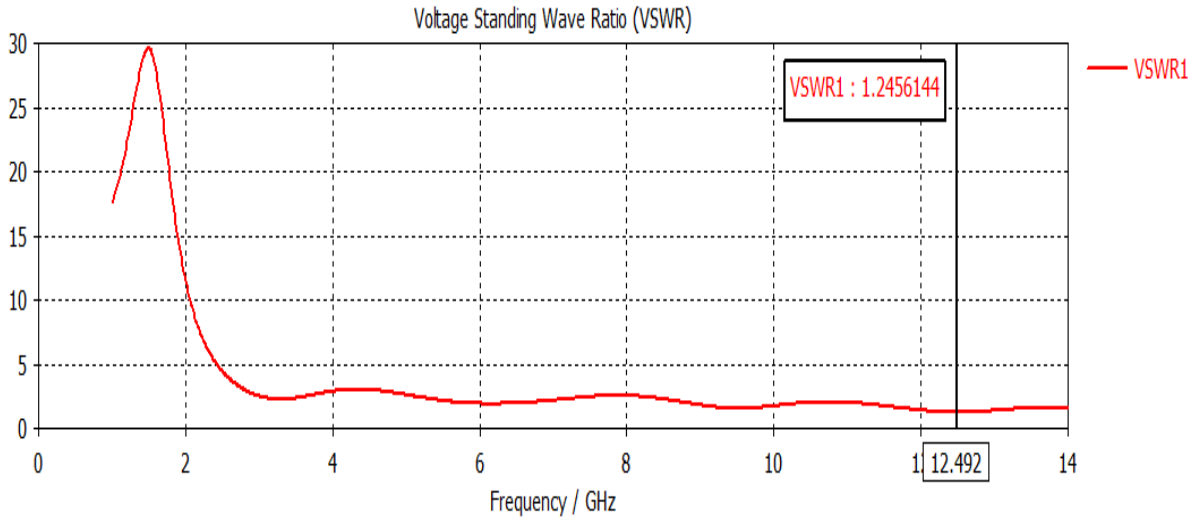
The result parameters are plotted, that is S-parameter, VSWR curve, Gain of the antenna, Directivity of the antenna.

The S-parameter shows that the designed antenna results in dual band i.e. (1st band 12.492GHz),(2nd band 9.519 GHz).



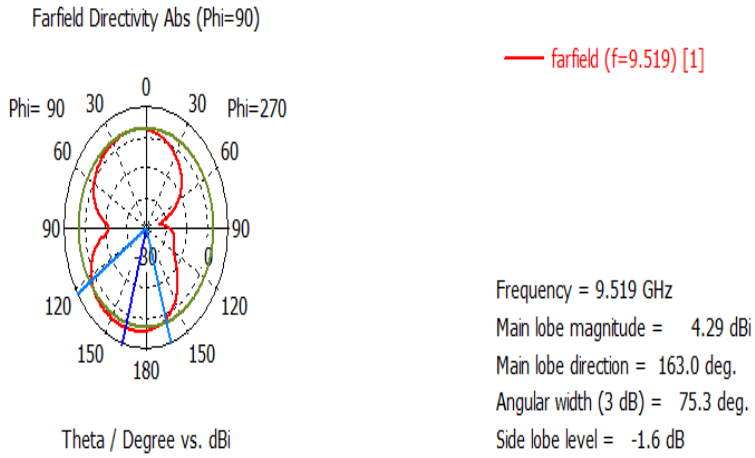
(S-parameter of the designed antenna)

Here we can observe the dual band nature of the designed antenna.

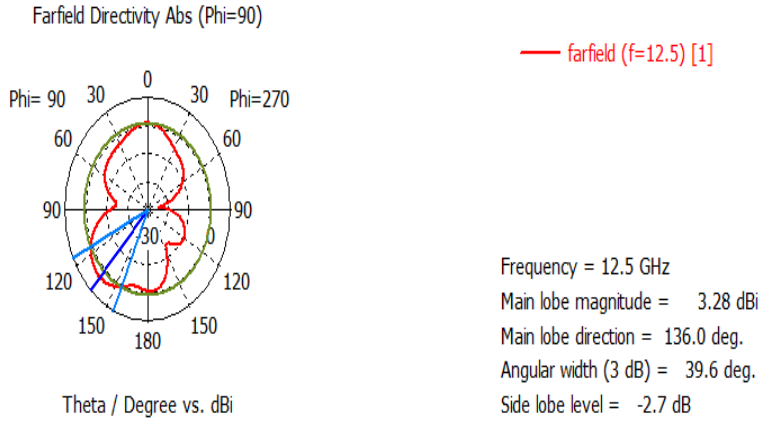


(This plot shows the VSWR curve of the designed antenna)

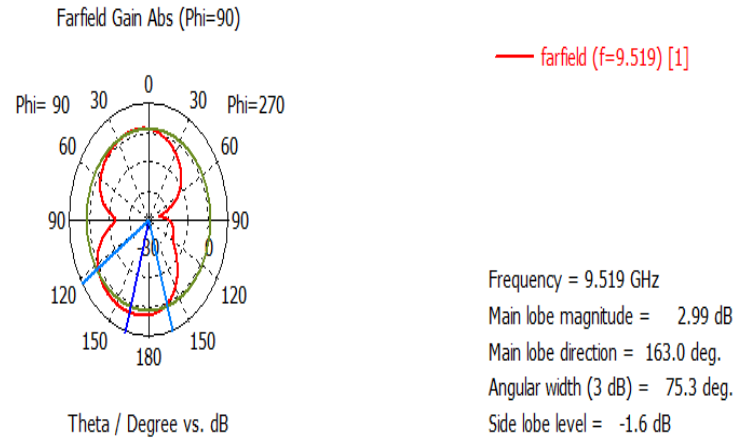
The VSWR is found to be 1.2456



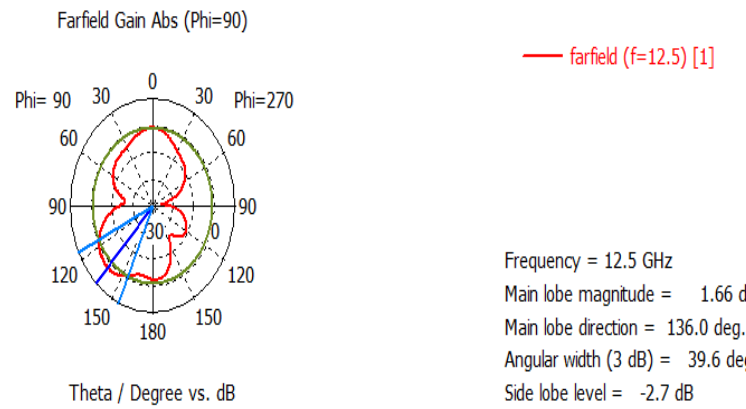
This plot shows the directivity of the designed antenna at (Freq. 9.519GHz)



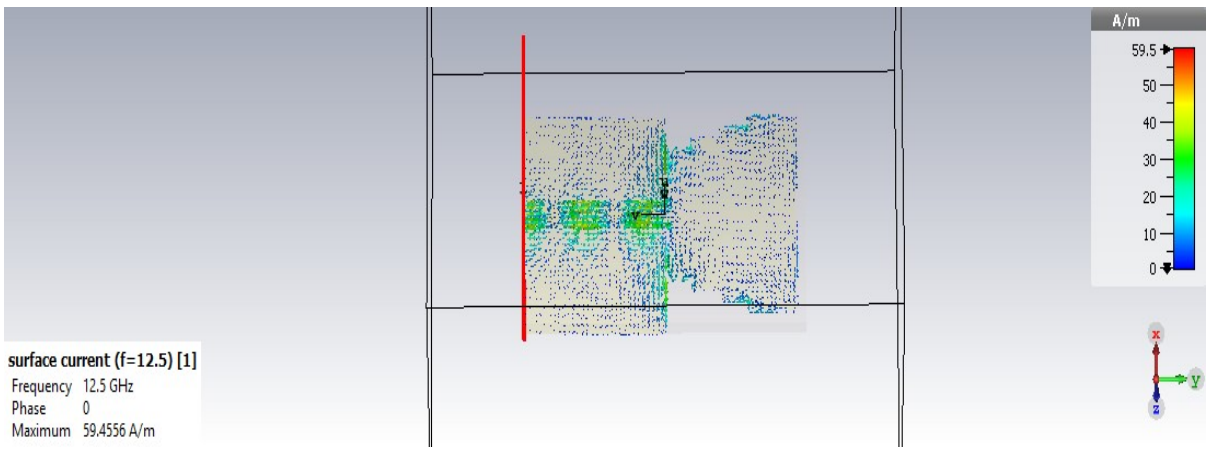
This plot shows the directivity of the designed antenna at (Freq. 12.5 GHz)



This plot shows the Gain of the designed antenna at Freq. 9.519GHz



This plot shows the Gain of the designed antenna at Freq. 12.5GHz .



This plot shows the surface current distribution of the designed antenna.

Tabulation:

Parameters	At Freq. 12.5GHz	At Freq. 9.519GHz
S-parameter	12.5	9.519
VSWR	1.245	1.245
Directivity	3.28 dBi	4.29 dBi
Gain	2.99 dB	1.66 dB

(Parameters of the antenna)

4. Conclusion:

This project was aimed to study the dual band staircase patch antenna with the wide range of applications and the various parameters related to it.

We have witnessed that the dual band patch antenna provides better bandwidth and wide range of frequency with applications which are useful in our day to day lives.

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IOT Based Switching Circuit

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ABSTRACT: *We have made a simple but reliable and effective IoT-based Switching System, such that a device can be switched ON or OFF from any place via Internet. In this project, we have used a Raspberry pi 3 Model b, a 4 Channel Relay (12V DC) and few passive elements. The operating devices are connected to the relay, which switches the devices according to input given by the Raspberry pi. Raspberry pi 3 is a single-board computer with wireless LAN and Bluetooth connectivity, which works according to the codes programmed in it. Whenever the user gives the data from a Mobile/PC/Laptop connected to the Internet from any location, raspberry pi receives the data and accordingly gives input to the relay. Thus it helps to prevent wastage of Electricity.The project is a prototype which can be remolded and used in large scale to replenish the wastage of Electricity as it is an energy efficient project. This project has many real-world applications like Smart home, Smart Cities,Smart Cars, IoT concept can be implemented in Agriculture, etc..*

Keywords: *IoT, Raspberry pi, Relay, LED, LAN, Smart City, Breadboard, NOT gate*

I. INTRODUCTION

Internet of things (IOT) plays a key role in our day to live from managing airports' passenger flow to heating building and taking care of the elder. The capability to network electronics in a standard means is set to modernize intelligent device control. It represents the world described by the so-called IoT where electronic machines transfer data into the cloud over the internet with TCP/IP. Nowadays, internet based home automation is possible with the invention of low-costs computing devices such as Raspberry Pi, RF network, and infrared to IP interfaces. Till now IoT has been a greater influence in our routine activities. For instance, if someone who is usually losing or misplacing valuable items such as keys, TV remote, smartphone or wallet. For such peoples, there's IOT that can help from inside the home to right across society, the IoT is a rebellion that guarantees to change people's lives. This will happen due to the boom in affordable computing. The technologies IoT support can sense the surroundings in many ways such as monitoring pressure, temperature, viscosity, and geo-positioning. Even in food preparation its systems are being used. While in past, sensors have to be connected to a local computer system and are controlled by an embedded module. IoT allows us to use affordable wireless technology and transmit the data into the cloud at a component level. It also provides a place to save data as well as management and security. IoT supports a way to build systems flexible and cost effective way, by an open set of components which are included and connected easily to your workplace.

II. PROJECT DESCRIPTION

The main objective of this project is to develop aIoT-Based Switching System such that a device can be switched from any location via Internet. To achieve this the following components have been used

A. Raspberry pi 3 Model-B:

Raspberry pi 3 is a single-board computer with wireless LAN and Bluetooth connectivity. Processor speed ranges from 700 MHz to 1.4 GHz, on-board memory ranges from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system. The board have one to four USB ports. For video output, HDMI and composite video are supported, with a standard 3.5 mm tip-ring-sleeve jack for audio output. Lower-level output is provided by a number of GPIO pins, which support common protocols like I^2C. Raspberry Pi 3 Model B was released in February 2016 with a 64 bit quad core processor, on-board WiFi, Bluetooth and USB boot capabilities.

B. Channel Relay Module

A relay is a special type of switch turned on and off by an electromagnet. When current flows through the coil an electro-magnetic field is set up. The field attracts an iron armature, whose other end pushes the

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contacts together, completing the circuit. 4 Channel Relay Module consist of four relays on a single board with four input pins , one Vcc pin and one GND pin

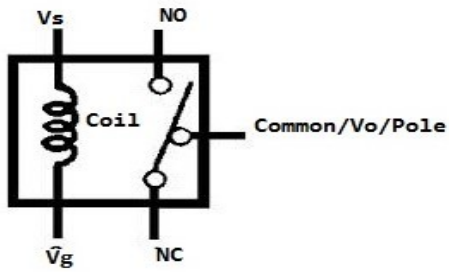

Figure 1: Relay Module

C. Breadboard

A breadboard is a construction base for prototyping of electronics. As a beginner we have used the breadboard for designing the circuit. It is easy to design the circuit as it doesn't require soldering.

D. IC 7404 NOT Gate

7404 is a N**OT gate IC**. It consists of six inverters which perform logical invert action. The output of an inverter is the complement of its input logic state, *i.e.*, when input is high its output is low and vice versa.

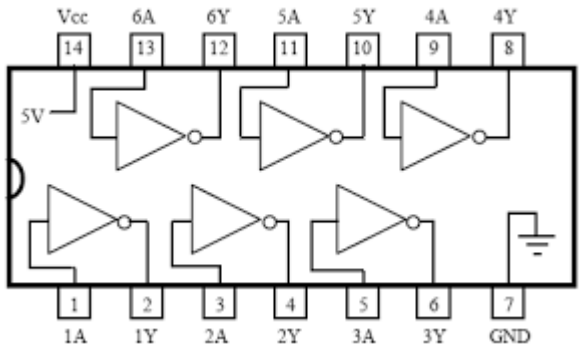

Figure 2: IC 7404

III. PROJECT OPERATION

The devices connect to the system are control through a Web page. There are four columns Device Name, ON, OFF, Status.Devices name gives the information of devices connected, ON and OFF are two switches and Status gives the information about the condition of device.

A. Switching ON a Device

By clicking on the ON button of a particular device listed in the Device Name column by a Smart phone/PC connected to Internet will send informationto the Server. Then it will be received by the Raspberry pi 3 which will give logic 1 to the NOT Gate as input. As the input of NOT Gate is connected to the LED which act as indicator will be turned ON and output of the NOT Gate is connected to the Relay as it is an Active-Low device i.e. when logic 0 is given to make the relay working, which turns the connected device ON.

B. Switching ON a Device

By clicking on the OFF button of a particular device listed in the Device Name column by a Smart phone/PC connected to Internet will send information to the Server. Then it will be received by the Raspberry pi 3 which will give logic 0 to the NOT Gate as input. As the input of NOT Gate is connected to the LED which act as indicator will be turned OFF and output of the NOT Gate is connected to the Relay as it is an Active-Low device i.e. when logic 0 is given to make the relay working, which turns the connected device OF.

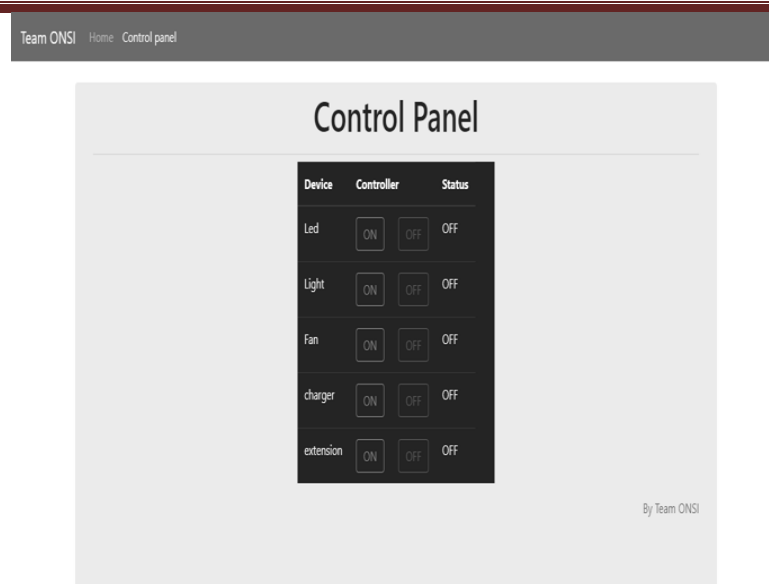

Figure 3: Control Panel

IV. Circuit Diagram

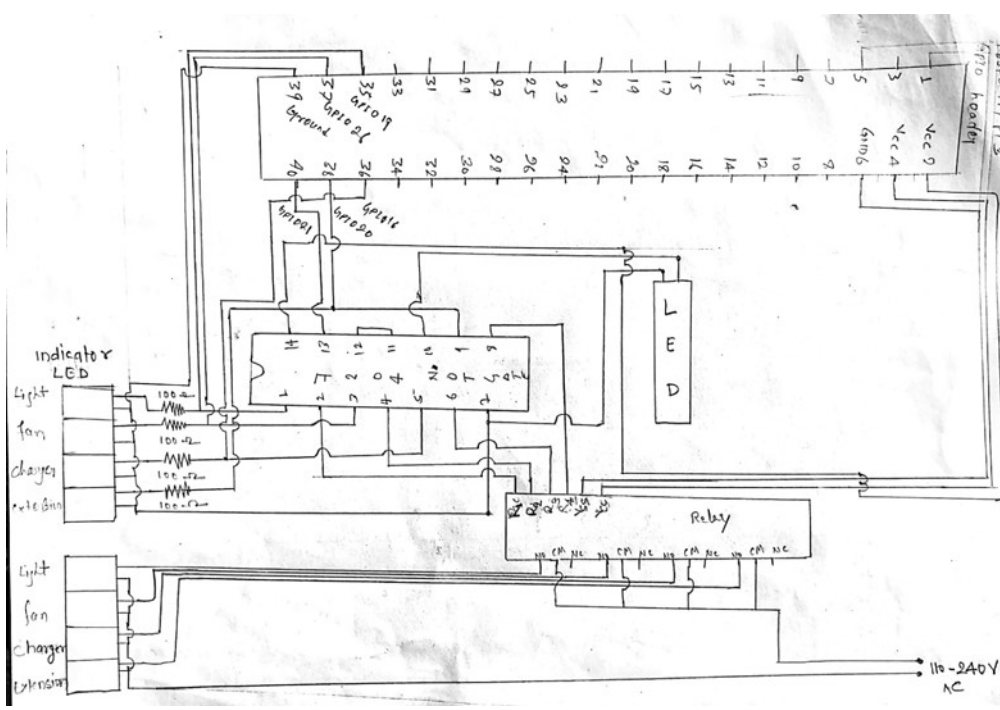

Figure 4: Project Architecture

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V. PROJECT PROTOTYPE & TESTING

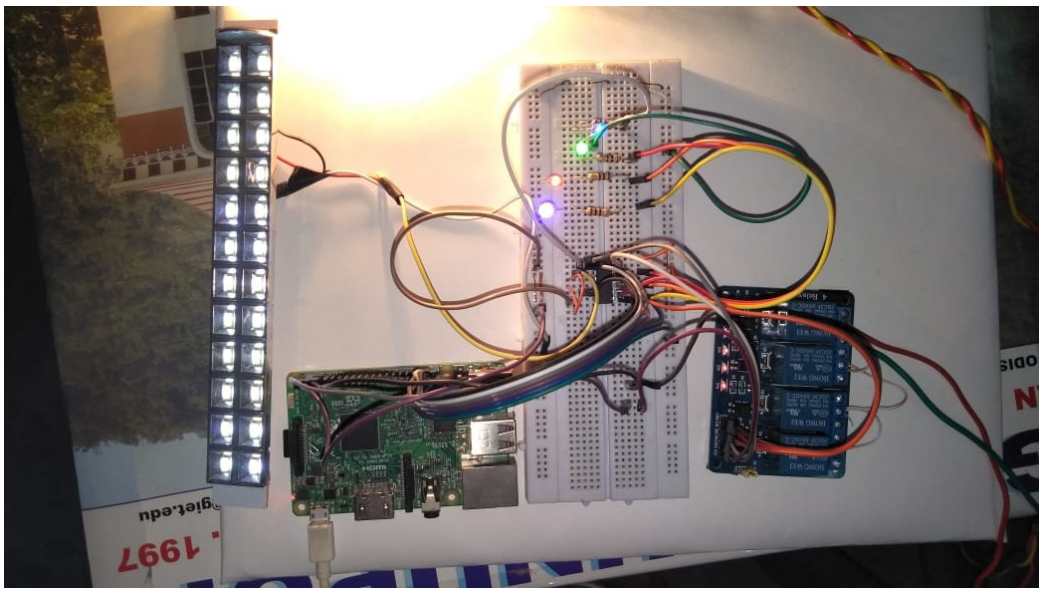

Figure 5: Project Prototype

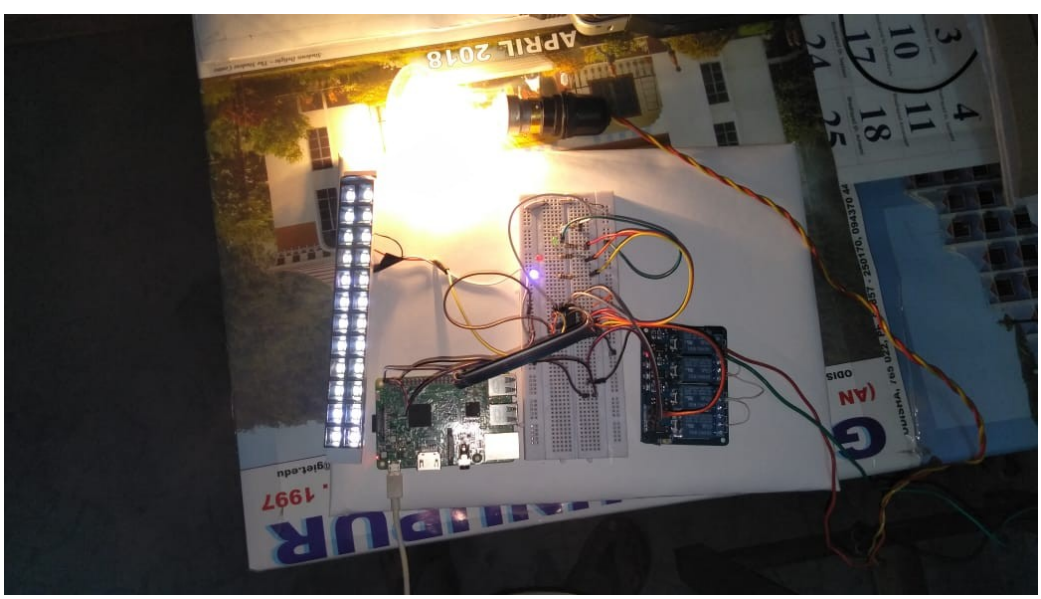

Figure 6: Prototype testing

VI. CONCLUSION

This project was intended to design a simple and low-cost IoT-based Switch to operate various devices. This device can be in various places like houses, shops, stores houses, etc. To design this device, we have used a Raspberry pi 3 Model B and a 4 Channel relay module. We have designed the device in such a way that the devices which are connected to the relay module can be switched ON and OFF from any location using a mobile phone, laptop or any other electronic devices connected to Internet. This device saves time, encourages machine to machine communication which results in greater efficiency. This device doesn't require any expertise for using it. We tried to overcome the problems in recent times and our main intension of this project was to establish a flexible, economical and easy configurable system which can relatively decrease the wastage of electricity. This device has much more scope for research and

development. Though it is a project, we hope some modification in this project will lead to a reasonable diversity of usage. In the near future as home automation web based level monitoring and controlling system can be designed, through which the system can be controlled from any place via mobile internet.

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AN EFFICENT OPTICAL HYBRID DISPERSION COMPENSATION MODEL TRANSMITTING AT 48 GBPS UPTO 460 KM.

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ABSTRACT: *optical communication is a method of transmitting information from source to destination by sending pulses of light through an optical fiber which has the properties like larger bandwidth, signal security, flexibility etc. As it has various advantage and less transmission loss it is often used for high speed data transmission. With various advantage fiber communication has also flaws as dispersion , scattering, attenuation which restricts the transmission distance. Dispersion degrades the performance of optical fiber due to intefrence as fiber brag grating gives good result with post DCF therefore, here we have used a hybrid model for compensating dispersion using DCF and FBG and successfully transmitted a data rate of 48gbps upto 460km*

Keywords: *FBG,DCF, EDFA, Q Factor , BER, Optisystem 14*

INTRODUCTION:

In the field of fiber optic communication dispersion is the major concern to consider data transmission it causes spreading out the light pulse in time as it propagates down the fiber. when a pulse of light travels through an optical fiber it gets broadened due to spreading of light. so if dispersion can be minimized further performance enhancement can be achieved from optical fiber communication. one of the method is fiber bragg grating to compensate dispersion. In fiber brag grating [1] we usually transmit our required wavelength by using different refractive index material which reflects the required wavelength and passes the rest. Another method of compensating dispersion in optical fiber is the method of using Dispersion [2] Compensating Fibers. In dispersion Compensating Fibers we use a fiber of a particular parameter according to the parameter of the SMF and calculate its length with the help of dispersion calculation formulae. It is also a very efficient method to compensate dispersion. After our analysis we found that symmetrical DCF and post FBG gives the best results therefore in our work here we have used a hybrid model which involves both of this techniques to compensate the dispersion.

2. TYPES OF DISPERSION IN OPTICAL FIBERS

Chromatic Dispersion: Chromatic or intermodal dispersion can occur in every types of fibers, as we know that the light sources of optical communication are LASER and LEDs, talking about lasers we know that the lasers emit light with different frequencies, as it emits light with different frequency components in this type of dispersion[3] time domain spreading of pulses occur. This causes the pulses to broaden n different transmitted modes, sometime or the other these type of broadening may occur due to the material used in the waveguide[4] which can also cause the light to spread while transmission, the formulae which may define this type of dispersion is given as $\sigma\tau = \Delta.L/(C_0/N_1).2$

Material Dispersion Material dispersion in optical fibers occurs due to the presence of signal with different group velocity of the different available spectral components . it also happens when the phase velocity of the light wave being transmitted in the medium has a non linear relation with the wavelength of light being transmitted within the optical fiber spectral width [5]$\sigma\lambda$ is defined as of length L is ,

$$\sigma\lambda = |D\lambda|\sigma\lambda L \quad \text{where,} \quad D\lambda = \frac{\lambda_0}{C_0}\frac{d^2n}{d^2\lambda_0^2}$$

This is known as Material dispersion.

Waveguide Dispersion the wave which guide the optical light through the fiber may also be a reason for the chromatic dispersion caused, here the dispersion is equal to the angle between the light ray and the axis of the fiber varying along with the wavelength of light For a fiber whose propagation constant is β, the fiber

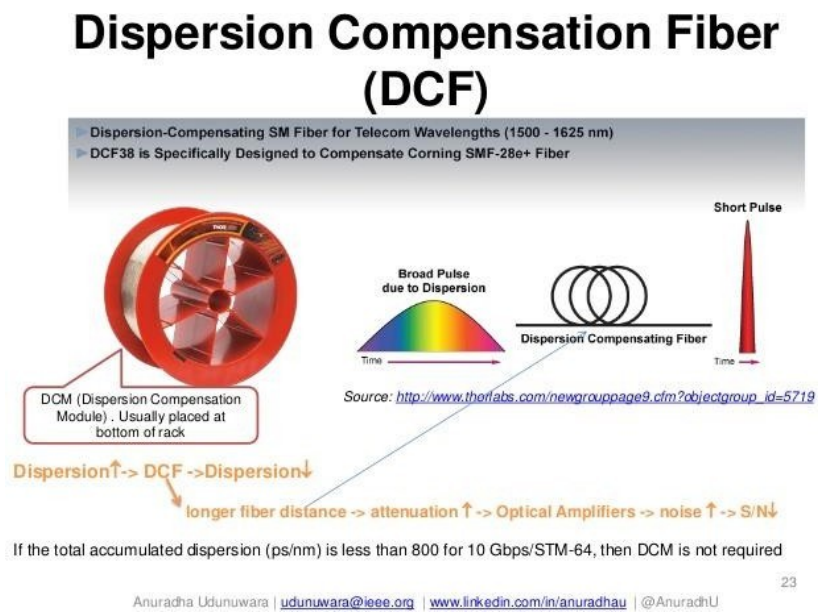
exhibits waveguide dispersion[6] when $d^2(\beta)/d^2(\lambda)\neq 0$.

$$D_W = -(1/2\pi c0)V^2(d^2\beta/dV^2)$$

Where, $V=2\pi(a/\lambda 0)NA$

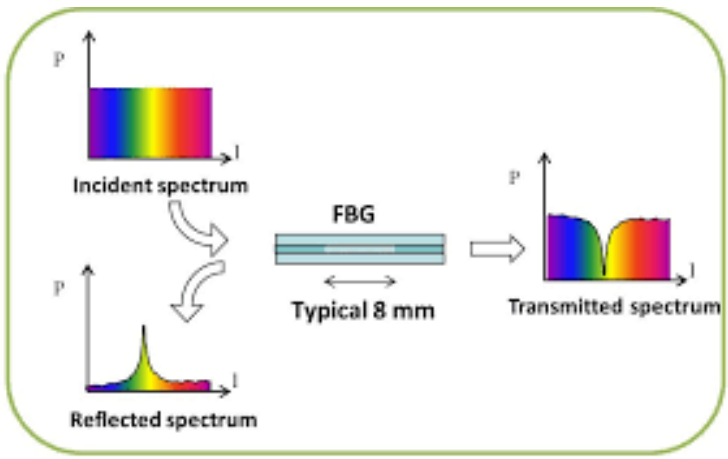
DISPERSION COMPENSATION :

1. DCF: Dispersion compensating fibers [7] is a method to reduce the dispersion in the optical fiber caused due to the time domain spreading ,in this method we basically introduce a fiber with calculated length according to the single mode fiber with has a inverse dispersion coefficient which cancels the dispersion caused by the SMF[8]. A schematic diagram of dispersion compensating fibers is shown in the figure below



2. FIBER BRAGG GRATING:

Fiber Bragg Grating : It is a reflector used in optical fiber which is used to transmit a wavelength of a particular specification and reflects the other wavelength ,it is a very useful method of reduction of dispersion[11] of optical fibers



SIMULATION SETUP:

Using the above mentioned formulas for dispersion compensation we have accordingly designed a hybrid model which can transmit data of 48gbps up to 460km successfully, in this model of hybrid data transmission we have used the a 8x1 Multiplexer[9] which is used to transmit the data with a data rate of 6gbps per channel the channel frequency successively are from 193.1thz separated by 100ghz.In the receiver section correspondingly we have used a demux[10] to divide the 8 channels and fiber bragg

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gratings. corresponding to all the channels in the receiver section we have used analyzers to observe the Q factor and the bit error rate ofeach channel for transmission. The transmission parameters are given in the below mentioned table.

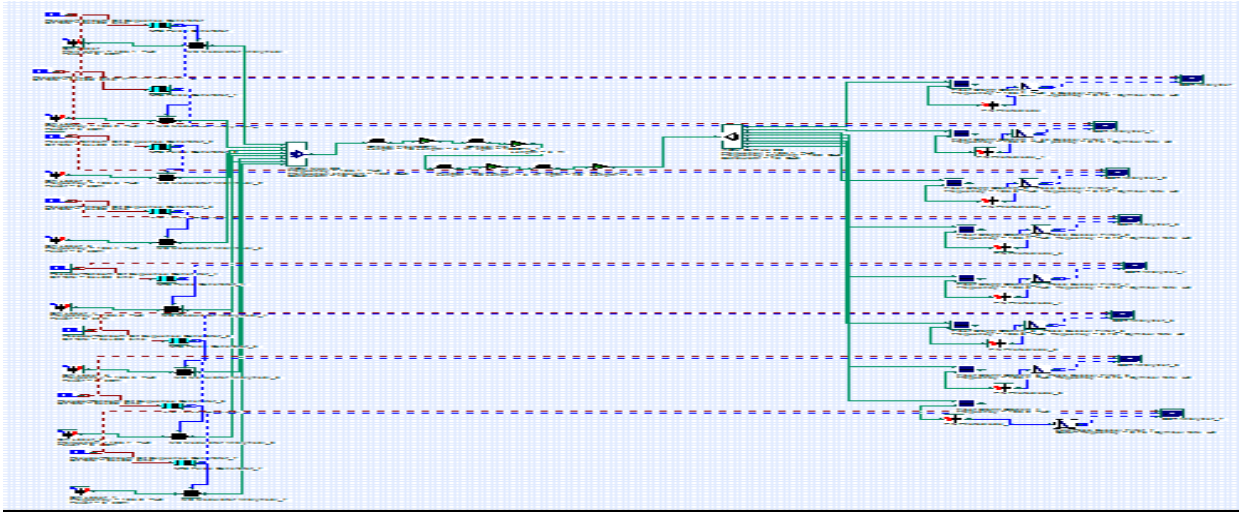


Fig – Project layout for simulation

DESIGN PARAMETERS

SMF parameter	value
Length	190km
Attenuation	0.2db/km
Dispersion	16.75ps/nm/km

DCF parameter	value
Length	40km
Dispersion	-80 ps/nm/km
Fibers used	2

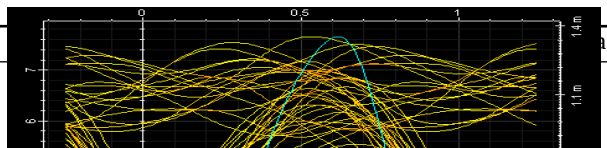
FBG parameter	value
Effective index	1.45
Chip function	linear
length	2
Linear parameter	0.0001μm

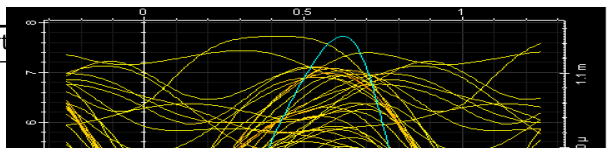
RESULT AND ANALYSIS:

The result obtained from the above simulation model can be observed in the given schematic eye diagrams shown below and their corresponding quality factor [12]values. From the values of quality factor we can observe that post FBG along with symmetric DCF is an efficient way of data transmission.

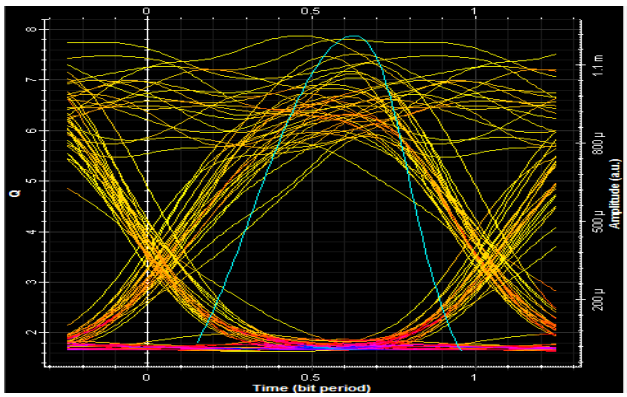
Q FACTOR AND BER FOR CORRESPONDING CHANNELS:

CHANNEL	Q FACTOR	BER
1	6.73876	$5.17377e^{-012}$
2	7.65491	$6.31405e^{-015}$
3	6.93738	$1.39646e^{-012}$
4	7.72934	$3.13177e^{-013}$
5	7.09677	$4.29455e^{-013}$
6	7.87455	$1.19777e^{-015}$
7	7.98616	$4.59507e^{-016}$
8	6.79889	$3.89137e^{-012}$

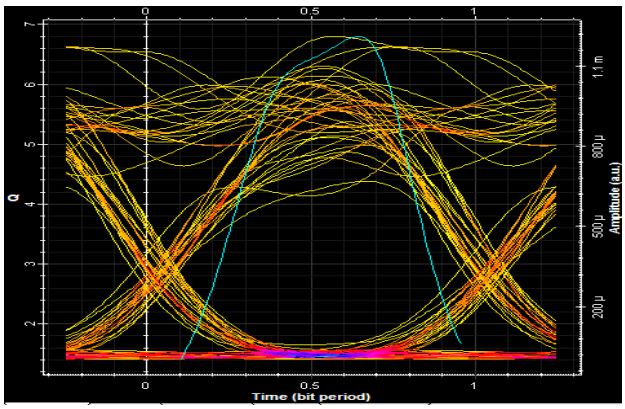




BER Analyzer 2



BER Analyzer 4



BER Analyzer 6

BER Analyzer 8

CONCLUSION:

It is shown in this paper that the recent advance technology in fiber bragg grating technique allow the realization of high speed optical fiber, high performance with good dispersion compensation technique. The dispersion is analyzed by sending NRZ pulse as an input. We have successfully transmitted 48gbps data upto 460 km using hybrid model. The performance of this model can be further enhanced by using electronic dispersion compensation technique alongside DCF and FBG.

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