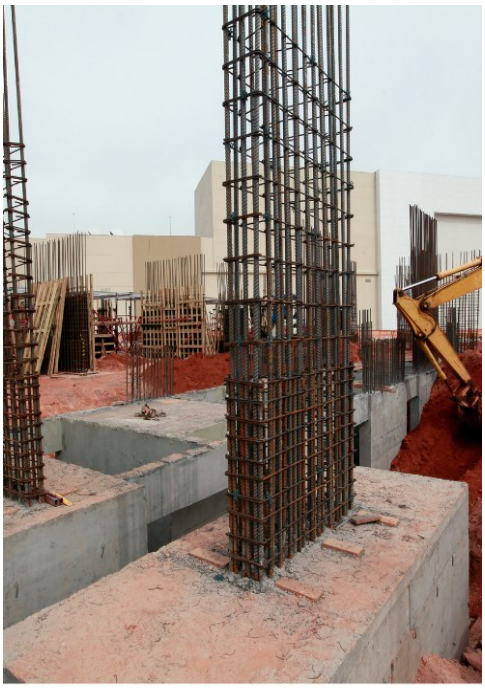
CONFERENCE SPECIAL ISSUE

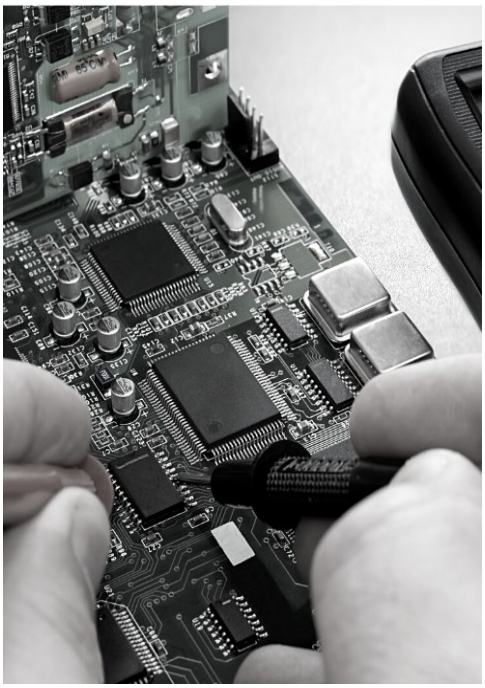
VOLUME 3, ISSUE 4

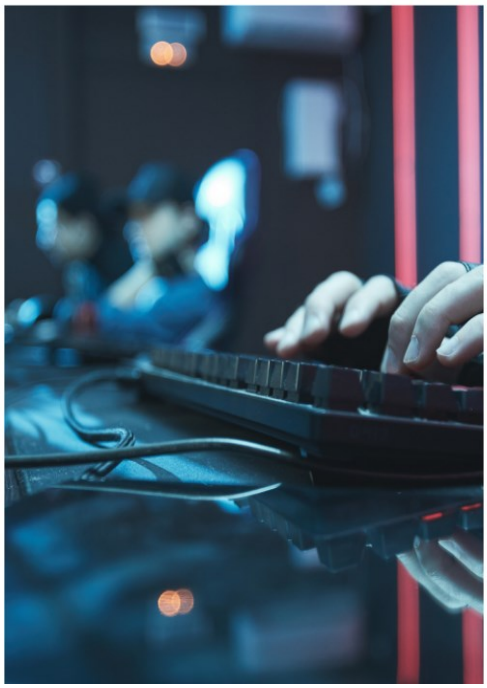
INTERNATIONAL RESEARCH JOURNAL IN GLOBAL ENGINEERING AND SCIENCES (IRJGES)

ISSN: 2456-172X
COSMOS IMPACT FACTOR (GERMANY)- : 5.195

INTERNATIONAL CONFERENCE ON RECENT ISSUES IN ENGINEERING, SCIENCES AND MANAGEMENT (ICRIESM 2018')







Blank page

International Research Journal in Global Engineering and Sciences (IRJGES)

ISSN : 2456-172X | Cosmos Impact Factor (Germany) : 5.195

Volume 3, Issue 4 (Special Issue)

Journal URL : http://www.irjges.com

Published By:

PRANAVAM PUBLICATIONS

An ISO 9001:2015 Certified Trust

Reg. Office : J-1963, 3rd Street, 15th Main Road, Anna Nagar

Chennai - 600 040. Tamil Nadu, India.(Germany) : 5.195

Imprint:

PRANAVAM PUBLICATIONS

Editorial Board

EDITORIAL & REVIEW BOARD MEMBERS - ENGINEERING AND TECHNOLOGY

Architecture

Civil Engineering

Computer Science and Engineering

Chemical Engineering

Dr. Shailendra Bajpai, Associate Professor, Department of Chemical Engineering, & Associate Dean (Faculty Welfare), National Institute of Technology, Jalandhar, Jalandhar-144011,Punjab, India. Email:bajpais[at]nitj.ac.in
Editor & Reviewer - Chemical Engineering

Dr Jatinder K Ratan, Assistant Professor, Department of Chemical Engineering, Dr B R Ambedkar National Institute of Technology, Jalandhar-144011, Punjab, India
Editor & Reviewer - Chemical Engineering

Electronics and Communication Engineering

Prof. Dr. E.D. Kanmani Ruby, Professor, Department of Electronics and Communication Engineering, Kongu Engineering College. E-Mail: kanmaniruby[at]kongu.ac.in
Editor - Electronics & Communication Engg.

Prof. Dr. R. Latha, Principal & Professor, Electronics and Communications Engineering, KSK College of Engineering and Technology, Kumbakonam, Thanjavur District, TamilNadu, India. E-Mail: kskenggprincipal[at]gmail.com
Editor - Electronics & Communication Engg.

Dr.(Mrs.) C.Kezi Selva Vijila, Principal, Professor (ECE), Christian College of Engineering and Technology, Oddanchatram, Dindigul Dist. India. E-Mail: vijila_2000[at]yahoo.com
Editor - Electronics & Communication Engg.

Mechanical, Mechatronics and Automobile Engineering

Prof. Dr. S. Nallusamy, Professor & Dean-Mechanical Engineering, Additional Dean (Engineering & Technology), Dr. M G R Educational and Research Institute, (Deemed-to-be University U/s. 3 UGC Act. 1956), Maduravoyal, Chennai - 600 095, Tamilnadu, India. E-Mail: ksnallu[at]gmail.com

Dr. J. Venkatesan, Professor & Head, Department of Automobile Engineering, Sri Venkateshwara College of Engineering, Chennai, India. E-Mail: venkat[at]svce.ac.in, jvenkat1965[at]gmail.com
Editor & Reviewer - Automobile Engg.

Prof. Dr. S. Selvi, Associate Professor, Department of Mechanical Engineering, Institute of Road and Transport Technology, Erode. India. E-Mail: selvimech[at]yahoo.com
Editor & Reviewer - Mechanical, Mechatronics & Auto.

Dr. S. M. Khot, Principal, Fr. C. Rodrigues Institute of Technology, Vashi, Navi Mumbai, India. E-Mail: principal[at]fcrit.ac.in
Editor & Reviewer - Engg & Tech, Sciences

Prof. Dr. Chandrashekhar Bhat, Professor and Head, Dept. of Mechatronics, MIT Manipal, India
Editor & Reviewer - Mechatronics

Electrical and Electronics Engineering

Dr. S. Ravi, Senior Lecturer, Department of Electrical Engineering, Botswana International

University of Science and Technology, Palapye, Botswana.
Email:ravis@biust.ac.bw
Editor & Reviewer - Electrical Engineering

Prof. M. S. Sivagama Sundari, Department of Electrical & Electronics Engineering, V. V. College of Engineering, Thisayanvilai
Tirunelveli District, Tamil Nadu. E-Mail: mssivagamasundari[at]gmail.com
Editor & Reviewer - Electrical and Electronics Engineering

EDITORIAL AND REVIEW BOARD MEMBERS - SOCIAL SCIENCES

Social Sciences

Dr. Aqila Rafi, Associate Professor, American College of Dubai, Dubai, United Arab Emirates. E-Mail: aqila.rafi[at]acd.ae
Editor & Reviewer - Social Sciences

Prof. Dr. Gurudas Das, Department of Humanities and Social Sciences, National Institute of Technology Silchar, Silchar-788010, Assam, India. E-mail: gurudas_das[at]yahoo[dot]co[dot]in
Editor & Reviewer - Humanities and Social Sciences

Management

Dr.Kabaly P Subramanian, Faculty of Business Studies, Arab Open University, Sultanate of Oman. Email : kabaly[at]aou.edu.om

Dr. S. Vijayalakshmi, Assistant Professor, Department of Commerce, Dr. M. G. R Educational and Research Institute, Chennai, India. E-Mail : vijayambaphd[at]gmail.com
Editor - Commerce & Management

EDITORIAL AND REVIEW BOARD MEMBERS - APPLIED SCIENCES

Dr. Aboobacker Jahufer, Faculty of Applied Sciences, South Eastern University of Sammanthurai, Sri Lanka. E-Mail: jahufer[at]seu.ac.lk jahufer[at]yahoo.com
Editor & Reviewer - Applied Sciences

Dr. B. Lavanya, Department of Computer Science, University of Madras (Chepauk Campus), Chennai, Tamil Nadu, India. E-Mail:lavanmu[at]gmail.com .
Editor & Reviewer - Computer Science

EDITORIAL AND REVIEW BOARD MEMBERS - LIFE SCIENCES

Prof. Dr. D. Bharathi, Head, Dept. of Sericulture & Dean of Examinations, S.P. Mahila Visvavidyalayam, Tirupati.India. E-Mail: depurubharathi1960[at]gmail.com
Editor & Reviewer - Biology

Dr. V. Sailaja, Head Incharge, Bos, Assistant Professor of Zoology, Vikrama Simhapuri University P.G. Centre, Kavali-524201. Nellore Dist.A.P, India.E-Mail:

EDITORIAL AND REVIEW BOARD MEMBERS - FORMAL SCIENCES

Advisory Board

Table of Contents

Blank page

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

ESTIMATING THE RUNNING COSTS OF COMMERCIAL BUILDINGS: ARTIFICIAL NEURAL NETWORK MODELING

[1] Mr Wajahat Ali [2] Mr Faqrudin ,[3]Mr Veerabadra Rao
[1] Assistant Professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[2]Assistant Professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[3]Assistant Professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA,.

Abstract: Running costs of a building is a substantial share of its total life-cycle cost (LCC) and it ranges between 70-80% in commercial buildings. Despite its significant contribution to LCC, investors and construction industry practitioners tend to mostly rely on construction cost exclusively. Though the early stage estimation of running costs is limited due to the unavailability of historical cost data, several efforts have been taken to estimate the running costs of buildings using different cost estimation techniques. However, the prediction accuracy of those models is still challenged due to less quality and amount of data employed. This study, therefore, developed an artificial neural network (ANN) model for running costs estimation of commercial buildings with the use of building design variables. The study was quantitively approached and running costs data together with 13 building design variables were collected from 35 commercial buildings. The ANN model developed resulted in a 96.6% perfect correlation between the running cost and building design variables. The testing and validation of the model developed indicate that there is greater prediction accuracy. These findings will enable industry practitioners to make informed cost decisions on implications of running costs in commercial buildings at its early stages, eliminating excessive costs to be incurred during the operational phase.
Keywords: Cost modeling, Operations cost, Maintenance cost, Building design variables, Decision-making, LCC.

1. INTRODUCTION AND LITERATURE REVIEW

Usually, costs incurred during the operational phase of a building responsible for a substantial share of its Life Cycle Cost (LCC). Some buildings have inherently higher running cost than others, such as commercial buildings. For example, the running costs of commercial buildings account for over 69% of the total LCC (Wang et al. 2014). Similarly, Wong et al. (2010)revealed that the running cost of an office building varies between 72 to 81% of its total LCC. Despite its contribution to the LCC structure, often running cost is given less focus in investment decision making and investors tend to mostly rely on initial cost alone.

A recent study on the review of existing models for LCC estimation revealed that there is no simple model for estimating the running cost of buildings to date (Krstić and Marenjak 2017). The application of available methods and models for the running cost estimation of buildings are also limited to the later stage of building life cycle as these models require an extensive set of operational cost data (Krstić and Marenjak 2017). For example, Al-Hajj and Horner (1998) have presented a running costs model for institutional buildings, with eleven cost elements and to an accuracy of 1.13%. Similarly, Kirkham et al. (2002) and El-Haram et al. (2002) have developed WLCC models for hospital buildings where cost components such as facilities management costs, energy costs, maintenance costs, residual costs, and discount rate were determinants of WLCC. Early-stage supportive running cost estimation models are therefore essential as it provides implications of costs to be incurred during the operating phase of buildings at early design stages of building constructions.

Estimation of cost of a product, system, or service based on its determinants is a well-known and approved method for cost estimation over the years. For example, Kirkham et al. (1999)have developed an energy cost model for sports centres based on building design variables such as the number of users and floor area. However, Krstić and Marenjak (2017) stressed that these models are not based on adequate historical cost records and not based on the available cost structure, rather than standard cost structure. Authors further indicate that the models developed so far ignore some important factors such as the age, location, level of occupancy, and standards of operation.

Deciding through which type of building to include in a forecasting model is not the only problem. The choice of modelling technique is also important (Boussabaine et al. 1999). Among the statistical approaches, regression techniques deserve attention due to relative ease of implementing and requirement of less computational power than other statistical

approaches (i.e. genetic algorithms, neural networks, support vectors machine) (Fumo and Biswas 2015). However, the application of purely parametric cost estimation methods is limited due to the lack of reliable historical cost data and building design variables, which have a direct influence on its LCC. In contrary, Boussabaine et al. (1999) opined that statistical models have been used for some time but in present, artificial intelligence is proposed as a more reliable and accurate modelling technique. Providing professionals with accurate forecasting techniques will enable them to make informed and reliable estimates of likely running cost in commercial buildings, as well as other forms of buildings. Therefore, this study introduces an early-stage supportive running cost estimation model for commercial buildings with use of the artificial neural network (ANN) modelling.

2 RESEARCH METHODS

The research was primarily approached quantitatively to develop early-stage supportive running cost estimation models for commercial buildings with the use of ANN modelling.Thedocuments including architectural drawings, bills of quantities, historical cost records, and monthly utility bills were reviewed to collect the required data. The case buildings selected for the study was limited to 35 out of the population of 117 commercial buildings, which were recorded in Sri Lanka due to the time constraints and limited access to cost data. Generally, a sample size of more than 30 at 5% confidence level is sufficient for many types of research. Though it is said that a big sample of data is required to run an ANN, an ANN tool including a particular training-validation-test procedure for small datasets has been developed some years ago and recently refined in order to obtain not only realistic regression laws, but also reliable ones (One can refer to Pasini and Potestà (1995) and Pasini et al. (2001) for the fundamentals of this tool) (Pasini 2015). Accordingly, the commercial buildings selected for the study consists of 49% of office buildings and 37% of banks while remaining include educational institutes, retails, and multi-purpose (i.e. hotel + apartment) buildings. Further, a majority of the selected buildings (63%) consists of three to 12 while remaining 26% and 11% are 13 to 25 and above 25 storied buildings respectively.

Based upon statistical pre-analysis, 13 variables (i.e. building design variables), which are quantitative in nature and convertible (nominal data) were selected for predicting the running cost of commercial buildings. The influence of variables on the running cost and ease of availabilityof data were the primary factors in the selection of the variables. Further, the running cost data were collected in accordance with the standards of BCIS, BS ISO 15686-5:2008 standard, and NRM3, for three consecutive financial years: 2014, 2015, and 2016.

Initially, the collected dataset was subjected to the ‘Multiple imputation" technique to impute the missing values within the data set. Next, the target variable was normalized using the gross internal floor area and obtain the normalized target variable called running cost/sq. ft. The ANN model was developed with the aid of Neural Designer machine learning software and the Feedforward neural network with backpropagation training was administered as it is commonly used with linear activation function. Finally, the prediction accuracy of the developed model was evaluated with use of the mean absolute percentage error (MAPE) and Theil’s U value.

3 DATA ANALYSIS AND FINDINGS

In order to proceed with the neural network analysis, there are three basic assumptions to be satisfied. Firstly, both dependent and independent variable s should be the continuous form of data. In this study, the dependent variable, which is running costs/sq. ft andindependent variables including working days/week, working hours/day, building age, GIFA, net floor area, circulation area, height, number of floors, window area, Window-to-Floor-Ratio, and number of occupants are scale data. In addition, two dummy variables namely, the grouping of buildings (1=Detached, 2=Attached), and type of structure (1=Concrete, 2=Steel, 3=Pre-fabricated) were added to the analysis to represent the nominal data collected. Therefore, satisfied the first assumption. Next, the Shapiro-Wilk normality test was conducted to explore the normal distribution of residual values. As observed from Table 1, the significance of the standardized residual (ZRESI) is greater than 0.5 indicates that the ZRESI is normally distributed.

Table 1.Test of normality: Shapiro-Wilk.

	Statistic	df	Sig.
Standardized Residual	0.954	30	0.211

Next, the relationship between the dependent variable and the independent variables are needed to be linear, both for each independent variable and globally. Accordingly, a scatterplot analysis was conducted between each independent variable and the dependent variable and the charts derived are presented in Figure 1. As shown in the scatterplot matrix, five continuous independent variables namely GIFA, NFA, CA, building height, and the number of floors out of 11 have strong linear relationships with the dependent

variable: running cost. Although other six independent variables don't represent strong linear relationships with the dependent variable as the points are more scattered and it is observed that the points are trying to gather along the diagonal. Therefore, it is concluded that all the independent variables have linear relationships with the dependent variable, thus satisfied the third assumption. As shown in the scatterplot matrix, five continuous independent variables namely GIFA, NFA, CA, building height, and the number of floors out of 11 have strong linear relationships with the dependent variable: running cost. Although other six independent variables don't represent strong linear relationships with the dependent variable as the points are more scattered and it is observed that the points are trying to gather along the diagonal.Therefore, it is concluded that all the independent variables havelinear relationships with the dependent variable, thus satisfied the third assumption.

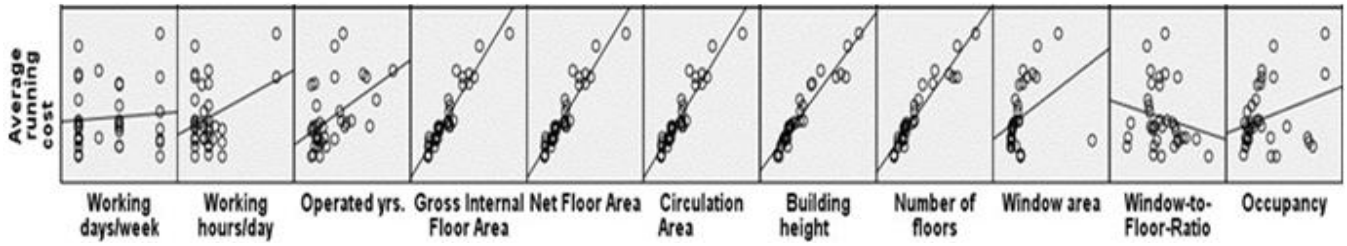


Figure 1. The relationship between the running cost and building design variables.

The Artificial Neural Network Model for Running Cost Estimation of Buildings

Initially, the pretreated data (with multiple imputation and normalization) was input to the "Neural Designer" software and the data set consists of 35 instances was itself divided into three types of instances such as 60% of training instances, 20% of selection instances, and 20% of testing instances. Next, the data set was further pretreated by setting all instances, which includes constant variables, repeated variables and univariate outliers and multivariate outliers as unused instances. Fortunately, the results derived indicate that there are no any constant or repeated variables in the data set and only 2 instances were set as unused due to outliers. Then, the neural network was developed and it represents the predictive model. Accordingly, the size of the scaling layer is 13, the number of inputs. The scaling method for this layer is the "MinimumMaximum". Further, the neural network was designed with three layers. Table 2 depicts the size of each layer and its corresponding activation function. The architecture of this neural network can be written as 13:10:7:1.

Table 2. The summary of the neural network.

	Input number	Neurons number	Activation function
1	13	10	Linear
2	10	7	Linear
3	7	1	Linear

The statistics of the parameters shown in Table 3 depict information about the complexity of the model. In general, it is desirable that all minimum, maximum, mean and standard deviation values are not very big as shown for the developed model.

Table 3. Parameters statistics of the natural network model.

	Minimum	Maximum	Mean	Deviation
Parameters	-0.990295	0.990173	-0.0601779	0.57255

The loss index plays an important role in the use of a neural network. It defines the task the neural network is required to do and provides a measure of the quality of the representation that it is required to learn. The normalized squared error (NSE) is used here as the error method. If the NSE has a value of unity then the neural network is predicting the data 'in the mean', while a value of zero means a perfect prediction of the data. In this network, the NSE is 3.28.

The procedure used to carry out the learning process is called training (or learning) strategy. The quasi-Newton method was applied as the training strategy of the neural network in this study in order to obtain the best possible loss. It is based on Newton's method but does not require calculation of second derivatives. Instead, the quasi-Newton method computes an approximation of the inverse Hessian at each iteration of the algorithm, by only using gradient information. Accordingly, the initial value of the training loss is 3.18746, and the final value after 230 iterations is 0.00238913 whereas the initial value of the selection loss is 5.59346, and the final value after 230 iterations is 0.208116.

A standard method to test the loss of a model is to perform a linear regression analysis between the scaled neural network outputs and the corresponding targets for an independent testing subset. This analysis leads to three parameters for each output variable. The first two parameters, a and b, corresponding to the y-intercept and the slope of the best linear regression relating scaled outputs and targets. The third parameter, R2, is the correlation coefficient between

the scaled outputs and the targets. If we had a perfect fit (outputs exactly equal to targets), the slope would be 1, and the y-intercept would be 0. If the correlation coefficient is equal to 1, then there is a perfect correlation between the outputs from the neural network and the targets in the testing subset. Accordingly, Table 4 lists the linear regression parameters for the scaled output running cost/sq. ft.

Table 4. The linear regression parameters for the scaled output running cost/sq. ft.

Regression parameters	Value
Intercept	-0.0355
Slope	1.14
Correlation	0.966

The mathematical expression represented by the neural network inputs working days/week, working hours/day, attached/detached, age, gross internal floor area, net floor area, circulation area, height, no. of floors, type of structure, window area, window to floor ratio and occupancy to produce the output Running cost/sq. ft. For function regression problems, the information is propagated in a feed-forward fashion through the scaling layer, the perceptron layers and the unscaling layer.

Model Testing

The purpose of model testing is to evaluate the performance of the developed ANN model in estimating a functional form that relates the design variables of commercial buildings to the running cost. Table 5 presents the prediction accuracy of the developed ANN model with use of the MAPE and Theil's U statistic, which commonly used to measure the performance.

Table 5. Results of test statistics for model accuracy.

Test	ANN
MAPE	-4.9%
Theil's U value	0.049

As shown in Table 5, the average MAPE of the ANN model is -4.9%, indicates that the ANN model has been achieved a high accuracy. The Theil's U value for the ANN model is 0.049 (where the U value indicates greater accuracy as U→0). Further, the neural network model recorded a correlation of 0.966, this accuracy is better than that recorded by the so far developed parametric regression models for LCC estimation.

4 CONCLUSIONS

The paper has highlighted the importance of different modelling techniques for predicting cost to be incurred during the operation phase of buildings particularly, commercial. The level of MAPE for the ANN model can be considered acceptable in most real applications, depending on the phase of application of the model. It is clear from this limited experiment that ANN was able to extract a functional form (i.e., a function) that represents the problem under investigation. The study has also shown that ANN models may prove as a good alternative to parametric cost modelling. Within the limits of this study, ANN models have been shown to be able to model data that strongly exhibit noise and achieve reasonable accuracy.

References

1. Al-Hajj, A., and Horner, M. W., Modelling the Running Costs of Buildings, Construction Management and Economics, Taylor and Francis, 16(4), 459-470, 1998.
2. Boussabaine, A. H., Kirkham, R. J., and Grew, R. G., Estimating the Cost of Energy Usage in Sport Centres: A Comparative Modelling Approach, 15th Annual ARCOM Conference, Hughes, W. (ed.), 481-488, Liverpool, UK, 1999.
3. El-Haram, M. A., Marenjak, S., and Horner, M. W., Development of A Generic Framework for Collecting Whole Life Cost Data for The Building Industry, Quality in Maintenance Engineering, Emerald, 8(2), 144-151, 2002.
4. Fumo, N., and Biswas, R. M. A., Regression Analysis for Prediction of Residential Energy Consumption,
5. Renewable and Sustainable Energy Reviews, Elsevier, 47(C), 332-343, 2015.
6. Kirkham, R. J., Boussabaine, A. H., and Awwad, B. H., Probability Distributions of Facilities Management Costs for Whole Life Cycle Costing in Acute Care NHS Hospital Buildings, Construction Management and Economics, Taylor and Francis, 20(3), 251-261, 2002.
7. Kirkham, R. J., Boussabaine, A. H., Grew, R. G., and Sinclair, S. P., Forecasting the Running Costs of Sport and Leisure Centres, 08th International Conference on Durability of Building Materials and Components, Lacasse, M. A., and Vanier, D. J. (eds.), 1728-1738. Institute for Research in Construction, 1999.
8. Krstić, H., and Marenjak, S., Maintenance and Operation Costs Model for University Buildings, Technical Gazette, 24(1), 193-200, 2017.
9. Pasini, A., Artificial Neural Networks for Small Dataset Analysis, Journal of Thoracic Disease, AME Publication Company, 7(5), 953, 2015.
10. Pasini. A., Pelino, V., and Potestà, S., A Neural Network Model for Visibility Nowcasting from Surface Observations: Results and Sensitivity to Physical Input Variables, Journal of Geophysical Research, American Geophysical Union, 106(D14), 14951-14959, July, 2001.
11. Pasini, A., and Potestà, S., Short-Range Visibility Forecast by Means of Neural-Network Modelling: A Case-Study, II Nuovo Cimento C, Springer, 18(5), 505-516 September, 1995.

12. Wang, N., Wei, K., and Sun, H., Whole Life Project Management Approach to Sustainability, Management in Engineering, American Society of Civil Engineers, 30(2), 246-255, March, 2014.
13. Wong, I. L, Perera, S., and Eames, P. C., Goal Directed Life Cycle Costing as A Method to Evaluate the Economic Feasibility of Office Buildings with Conventional and TI-Façades, Construction Management and Economics, Taylor and Francis, 28(7), 715-735, 2010.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

MIX DESIGN OF CONCRETE BY BIS METHOD

[1] Ma Qadeer [2]Md Arif,[3] Md Abdul Raheem Wasay

[1]Professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[2]Assistant professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[3]Assistant professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA

Abstract—The quality of concrete in a structure is determined not only by the proper selection of its constituents and their proportions, but also by appropriate techniquesin the production, transportation, placing, compacting, finishing, and curing of the concrete of the actual structure, often at a job site..Although these processes have an impact on the actual quality of concrete
In order to obtain a strong, durable and economical concrete mix, it is necessary to understand the characteristics and behavior of the ingredients

1. INTRODUCTION

Concrete is the most widely used man-made construction material. It is obtained by mixing cement, water and aggregates (and sometimes admixtures) in required proportions. The mixture when placed in forms and allowed to cure becomes hard like stone. The hardening is caused by chemical action between water and the cement and it continues for a long time, and consequently the concrete grows stronger with age. The hardened concrete may also be considered as an artificial stone in which the voids of larger particles (coarse aggregate) are filled by the smaller particles (fine aggregate) and the voids of fine aggregates are filled with cement. In a concrete mix the cement and water form a paste called cement water paste which in addition to filling the voids of fine aggregate acts as binder on hardening, thereby cementing the particles of the aggregates together in a compact mass.
The strength, durability and other characteristics of concrete depend upon the properties of its ingredients, on the proportions of mix, the method of compaction and other controls during placing, compaction and curing. The popularity of the concrete is due to the fact that from the common ingredients, it is possible to tailor the properties of concrete to meet the demands of any particular situation. The advances in concrete technology have paved the way to make the best use of locally available materials by judicious mix proportioning and proper workmanship, so as to produce concrete satisfying performance requirements.

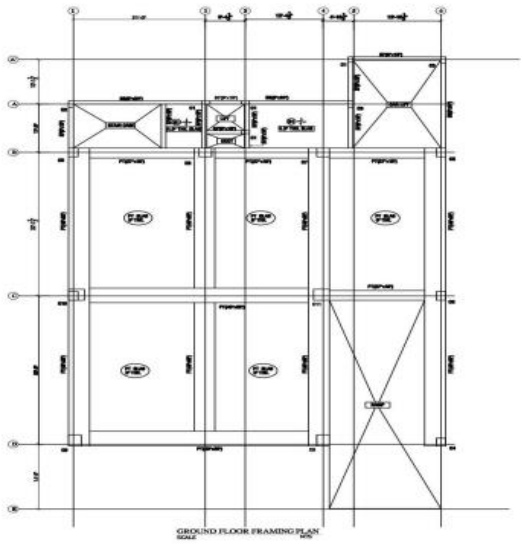
2. CONSTITUENTS OF CONCRETE

The constituents of modern concrete have increased from the basic four (Portland cement, water, stone, and sand) to include both chemical and mineral admixtures. These admixtures have been in use for decades, first in special circumstances, but have now been incorporated in more and more general applications for their technical, and at times economic benefits in either or both fresh and hardened properties of concrete.
The main constituents of concrete are:

(i) Cement
(ii) Aggregates
(iii) Water
(iv) Admixtures

3. CEMENT

Cement is a well-known building material and has occupied an indispensable place in construction works. There is a variety of cements available in the market and each type is used under certain conditions due to its special properties. The cement commonly used is portland cement, and the fine and coarse aggregates used are those that are usually obtainable, from nearby sand, gravel or rock deposits. In order to obtain a strong, durable and economical concrete mix, it is necessary to understand the characteristics and behaviour of the ingredients



4. AGGREGATES

Aggregate was originally viewed as an inert, inexpensive material dispersed throughout the cement paste so as to produce a large volume of concrete. In fact, aggregate is not truly inert because it's physical, thermal and, sometimes, chemical properties influence the performance of concrete, for example, by improving its volume stability and durability over that of the cement paste. From the economic viewpoint, it is advantageous to use a mix with as much aggregate and as little cement as possible, but the cost benefit has to be balanced against the desired properties of concrete in its fresh and hardened state.

5. WATER

Water is needed for the hydration of cement but not all is used up for this purpose. Part of this added water is to provide workability during mixing and for placing.

Generally, cement requires about 3/10 of its weight of water for hydration. Hence the minimum water-cement ratio required is 0.35. But the concrete containing water in this proportion will be very harsh and difficult to place. Additional water is required to lubricate the mix, which makes the concrete workable. This additional water must be kept to the minimum, since too much water reduces the strength of concrete. The water-cement ratio is influenced by the grade of concrete, nature and type of aggregates, the workability and durability.

6. ADMIXTURES

BS 2787: 1956 'Glossary of term for concrete and reinforced concrete' gives the following definition for the term 'admixture', with 'additive' given as an alternative term with the same definition:

'A material other than coarse or fine aggregate, cement of water added in small quantities during the mixing of concrete to produce some desired modification in one or more of its properties'.

7. FACTORS AFFECTING THE CHOICE OF MIX PROPORTIONS

The various factors affecting the mix design are:

1. Compressive strength

It is one of the most important properties of concrete and influences many other describable properties of the hardened concrete. The mean compressive strength required at a specific age, usually 28 days, determines the nominal water-cement ratio of the mix. The other factor affecting the strength of concrete at a given age and cured at a prescribed temperature is the degree of compaction. According to Abraham's law the strength of fully compacted concrete is inversely proportional to the water-cement ratio.

2. Workability

The degree of workability required depends on three factors. These are the size of the section to be concreted, the amount of reinforcement, and the method of compaction to be used. For the narrow and complicated section with numerous corners or inaccessible parts, the concrete must have a high workability so that full compaction can be achieved with a reasonable amount of effort. This also applies to the embedded steel sections. The desired workability depends on the compacting equipment available at the site.

3. Durability

The durability of concrete is its resistance to the aggressive environmental conditions. High strength concrete is generally more durable than low strength concrete. In the situations when the high strength is not necessary but the conditions of exposure are such that high durability is vital, the durability requirement will determine the water-cement ratio to be used.

4. Maximum nominal size of aggregate

In general, larger the maximum size of aggregate, smaller is the cement requirement for a particular water-cement ratio, because the workability of concrete increases with increase in maximum size of the aggregate. However, the compressive strength tends to increase with the decrease in size of aggregate.

IS 456:2000 and IS 1343:1980 recommend that the nominal size of the aggregate should be as large as possible.

8. RESULTS AND CONCLUSION

DESIGN EXAMPLE

Design concrete mix of characteristic strength (f_{ck}) M-30, type of cement is ordinary portland cement, fine aggregate natural river sand confirming to grading zone II of table 4 of IS 383-1970.

Coarse aggregate-crushed (angular) of 20mm maximum size confirming to IS 383 code requirements. Specific gravities of cement, sand and coarse aggregate are 3.14, 2.63 and 2.61 respectively.

Type of exposure – mild

Degree of quality control – very good

Degree of workability – 0.80.

Design procedure:

1. Target mean strength

The target mean strength ft is calculated assuming the degree of control as very good and the value of standard deviation for grade M-30 is 5.0

$$f_t = f_{ck} + ks$$

Assuming 5% of results to be below the characteristic strength, the value of k from table is 1.65 as per IS 10262 code

$f_t = 30 + (1.65 \times 5.0)$ = 38.25 Mpa

2. Selection of water/cement ration

The preliminary free water/cement ratio by weight

corresponding to the target mean strength at 28 days for different mixes is selected for strength from the table of code

For strength w/c = 0.39

For durability requirements the maximum water/cement ratio for moderate exposure for plain concrete = 0.70

Hence lower value of w/c ratio is selected.

3. Air content

From table of IS code for a nominal maximum size of 20mm aggregate, the entrapped air is 2 % of volume of concrete.

4. Water content and fine to total aggregate ratio.

For a nominal maximum size of 20mm aggregate from table of IS code for concrete of grade upto M-35, the water content for mix M-30 is 186.kg/m^3 of concrete and the sand as percentage of total aggregate by absolute volume is 35.

Adjustment of values in water content and sand percentage

From table of IS code of adjustment of values in water content and sand percentage for other conditions adjustments are made for water content percent and percent sand in total aggregate.

Change in condition	Adjustments required in	
	Water content percent	Percentage sand in total aggregate
For decrease in water/cement ratio (0.60-4.39) = 0.21 No correction since compacting factor.	0	-4.2%

1. Final water content after adjustments

` Water content required is = (180+0) = 186 kg/m^3.

2. Determination of cement concrete

w/c = 0.39

water content = 186 kg/m^3.

Cement content (C) = water content/0.39 = 186/0.39 = 476.92 kg/m^3.

3. Check for minimum cement content

From IS 456 : 2000 the minimum cement content required for durability for plain concrete under mild exposure conditions is 220 kg/m^3. The values of cement content for all the three grades is greater than this minimum value.

4. Determination of coarse and fine aggregate content

f entrapped air for 20mm maximum size aggregate from IS code is 2%. For this fine aggregate is calculated as

$$V = \left[W + \frac{C}{S_C} + \frac{1}{P}\frac{f_a}{S_{fa}}\right] \times \frac{1}{1000}$$

$$0.98m^3 = \left[186 + \frac{476.92}{3.14} + \frac{1}{0.308}\frac{f_a}{2.63}\right] \times \frac{1}{1000}$$

$f_a = 520.14\ kg/m^3$.

Coarse aggregate required is calculated as

$$V = \left[W + \frac{C}{S_C} + \frac{1}{1-P}\frac{C_a}{S_{ca}}\right] \times \frac{1}{1000}$$

$$0.98m^3 = \left[186 + \frac{476.92}{3.14} + \frac{1}{1-0.308}\frac{c_a}{2.61}\right] \times \frac{1}{1000}$$

$c_a = 1156.38\frac{kg}{m^3}$.

5. Total quantities of ingredients and mix proportions are:

Mix	Cement	Fine aggregate(kg)	Coarse aggregate (kg)	Water (kg)
M-30	476.92	520.14	1156.38	186.0

Mix proportions

Mix	Cement	F.A	C.A	Water
M-30	1	1.09	2.42	0.39

9. CONCLUSIONS

✓ This study provides design of concretemix i.e., proportioning concrete mixes as per the requirements using the concrete making materials including other supplementary materials identified for this design of concrete mix. The proportioning is carried out to achieve specified characteristics at specified age, workability of fresh concrete and durability requirements.

✓ The concrete mix design by BIS method is applicable for ordinary and standard aconcrete grades only.

All requirements of IS 456 are so far satisfied for the concrete mix design and designed concrete mix.

Reference

1. Nataraja, M. C., and Lelin Das. "Concrete mix proportioning as per IS 10262: 2009–Comparison with IS 10262: 1982 and ACI 211.1-91." *The Indian Concrete Journal* (2010): 64-70.

2. Nataraja, M. C., & Das, L. (2010). Concrete mix proportioning as per IS 10262: 2009–Comparison with IS 10262: 1982 and ACI 211.1-91. *The Indian Concrete Journal*, 64-70.

3. Raj, R. Rathan, EB Perumal Pillai, and A. R. Santhakumar. "Evaluation and mix design for ternary blended high strength concrete." *Procedia Engineering* 51 (2013): 65-74.

4. Raj, R. Rathan, EB Perumal Pillai, and A. R. Santhakumar. "Evaluation and mix design for ternary blended high strength concrete." *Procedia Engineering* 51 (2013): 65-74.

5. Kumbhar, P. D., & Murnael, P. B. (2012). Assessment of suitability of existing mix design methods of normal concrete for designing high performance concrete mixes. *International Journal of Civil & Structural Engineering*, *3*(1), 158-167.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

ESTIMATION OF RESIDENTIAL BUILDING USING LOW COST MATERIALS

[1]Tanveer Ali Khan,[2] Md akram khan, [3]Mohd abdul malik
[1]Assistant professor,Dept of Civil,Shadan College of Engineering and Technology HYD,T.S,INDIA
[2]Assistant professor,Dept of Civil,Shadan College of Engineering and Technology HYD,T.S,INDIA
[3]Assistant professor,Dept of Civil,Shadan College of Engineering and Technology HYD,T.S,INDIA

Abstract: Affordable housing mainly deals with effective costing and following of sustainable building techniques which helps in reducing the cost of construction without sacrificing the strength, durability and performance. The plan of 2BHK have been considered for Residential building. The total residential building is divided into two parts i.e., Structural and non Structural. As the cost of cement takes major part of total building cost, so we adopted fly ash by replacing cement with percentages of 30%, 40%, 50% for structural elements. The strength tests such as compressive, split test, flexural test have been calculated. From the test results, 40% replacement of fly ash gave required strength for single storey building. For Non- structural elements, the low cost materials such as concrete frames, hollow concrete blocks etc were adopted .This project recommends plan and sustainable materials adopted for a single storied building. After assigning low cost materials for structural and Non- structural elements of building, the quantity and cost is estimated. The overall cost is reduced up to 30% compared to conventional building cost.

Keywords : Sustainable building techniques, Building materials , Estimation

1. INTRODUCTION

Housing is a basic need of human being. But this is out of the means of low income house holder who constitute majority of population in our country. In India maximum affordability of household was defined to be 5.1 times the household's total gross income as compared to the developed countries. Low cost housing is a different concept which deals with effective costing and following of sustainable building techniques. There is a huge misconception that low cost housing is suitable for only sub normal works and they are built by using cheap building materials of low quality. The fact is that Low cost housing is done by proper management of resources.

The production of Portland cement is not only costly and energy intensive, but it also produces large amounts of carbon emissions. The production of one ton of Portland cement produces approximately one ton of co2 in the atmosphere. Fly ash is a byproduct of the combustion of pulverized

coal and is collected by mechanical and electrostatic separators from the fuel gases of thermal power plants where coal is used as a fuel. Fly ash is commonly used in concrete in replacement ranging from 0%-30% by weight of the total cementitious material. Large quantities of fly ash are available around the world at low cost and the use of HVFA seems to offer the best solution to rising cement demands. The use of HVFA in concrete has recently gained popularity as a resource efficient, durable, cost effective, sustainable option for OPC concrete application.

The low cost materials such as Hollow concrete blocks , spiral stair case, concrete flooring , pre cast doors and window frames are recommended for cost reduction of Residential building.

2. CONSTRUCTION OF 2 BHK :

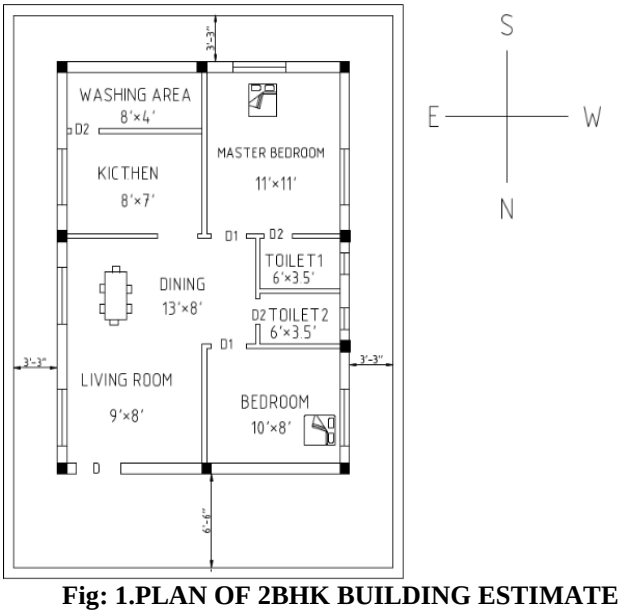


Fig: 1.PLAN OF 2BHK BUILDING ESTIMATE

3. DETAILS OF PLAN:

1.Plot size : 30'*40'=1200 sq ft 2.Type : detached building 3.Rules:Building bye laws, IS888

4. No of stories : 1
5. Road direction : North
6. From fig :

D = 1.0*2.0m D1= 0.8*2.0m
D2=0.7*
2.0m, W=1.2*1.2m

➢ **TOTAL BUILDING ELEMENTS ARE DIVIDED INTO 2 PARTS:**

- STRUCTURAL ELEMENTS
- NON STRUCTURAL ELEMENTS

➢ **STRUCTURAL ELEMENTS**

The structural elements such as beams ,columns, footings , plinth beam, lintels, sunshades etc are estimated by replacing cement with fly ash with percentages of 30, 40, 50. The different strength test such as compressive strength, flexure , split tests are conducted to know the 28 day strength for those percentages. Finally the particular percentage is recommended to use for structural elements which reduces cement cost by the usage of fly ash.

4. OBSERVATIONS:

- Grade of cement: M25
- Type of cement and brand: OPC & Chettinad cement
- Specific gravity of cement: 3.15
- Specific gravity of coarse aggregates: 2.7
- Specific gravity of fine aggregates: 2.7
- Fly ash percentages: 30%,40%,50%

➢ **NON STRUCTURAL ELEMENTS**

For Non-structural elements the low cost materials such as pre cast concrete frames, Hollow concrete blocks, concrete flooring, spiral staircase are provided and cost is calculated.

5. TEST RESULTS AND DISCUSSIONS:

From table1, the replacement of 40% fly ash gave appropriate strength compared to 30% and 50%.

Table 1 Test results of fly ash replacement

SNO	CONTENTS	CONVENTIONAL CONCRETE	(N/mm2)	30%	(N/mm2)	40%	(N/mm2)	50%	(N/mm2)
1	DAYS	7	28	7	28	7	28	7	28
2	CUBES(150*150*150)	30.22	53.77	16.885	33.55	22.44	37.11	15.995	19.33
		41.33	50.66	17.11	21.33	21.995	36	16.66	13.33
	AVERAGE	35.775	52.215	16.9975	27.44	22.2175	36.555	16.3275	16.33
3	BEAMS(500*100*100)	4.5	7.5	4.5	8.5	4.125	8.5	4	7.5
		4.75	5.5	4.75	8	4.25	9	4.5	7
	AVERAGE	4.625	6.5	4.625	8.25	4.1875	8.75	4.25	7.25
4	CYLINDERS(150*300)	2.87	2.97	2.045	2.325	1.552	2.334	1.342	2.19
		3.05	3.11	1.905	2.4015	1.482	2.4015	1.414	2.05
	AVERAGE	2.96	3.04	1.975	2.36325	1.517	2.36	1.378	2.12

6. TOTAL COST OF BUILDING:

The quantities of structural elements such as beams ,footings, columns are calculated by assuming dimensions for the given plan and the materials for those elements such as cement ,fly ash, coarse and fine aggregates were taken and individual quantities are estimated. The cost of different materials had been taken as per Standard schedule rates and the cost is calculated for some elements for Affordable housing according to their quantities and finally the values are compared with conventional residential building.

S.NO	ELEMENTS	AFFORDABLE HOUSING COST	CONVENTIONAL HOUSING COST
1	Slabs	86400	108000
2	Beams	18945	20940
3	Columns	24705	28000
4	Footings	42030	47300

5	Staircase	15000	40000
6	Plastering	14000	28000
7	Bricks	1,20,000	1,27,710
8	Door frames	6420	10400
9	Window frames	11510	18720
10	Flooring	32400	108000
Total cost		**3,71,410**	**5,37,070**

NOTE:

- As steel is not replaced with any other low cost material, the quantity and cost of steel have not been included in this report.
- The electrical fixtures and plumbing etc can be taken as contingencies.

7. DISCUSSIONS

- There is an increase of strength with 40% replacement of cement compared to 30% and 50%. It has good workability.
- As fly ash does not give early strengths ,we have to wait for 56 days and more for goodstrengths.

8. CONCLUSION

- After calculating strength of cubes ,beams and cylinders with 30%,40%,50% of fly ash ,the test results for 40% gave appropriate strength compared to conventional concrete. So that 40% flyash can be recommended.
- Quantity and cost is estimated for structural and non structural elements. Using low cost materials in non structural elements cost can be reduced. So we can adopt them.
- The overall total cost of the Residential building can be saved up to 30%.

REFERENCES

1. Dhiraj B Tapkir , Nikhil R Mohire , Pratik N Zurunge , Siddharth R Sonsale4, A.W Dhawale(2016), “Study And Analysis Of Low Cost Housing Based On Construction Techniques”, International Journal Of Research In Engineering And Technology , Volume: 05 Issue: 05, Pg-146-148.
2. P. Vipul Naidu And Pawan Kumar Pandey(2014), “Replacement Of Cement In Concrete”, International Journal Of Environmental Research And Development, Volume-04, Pg-91-98.
3. Swapthik Chowdhary, Sangeetaroy,(2013)“Prospects Of Low Cost Housing In India”,Geomaterials, Pg-60-65
4. Shaik Ajim, Badhe Ajinkya, Rashinkar Sandip, Sarode Lalu Prasad(2017), “Low Cost Housing”, International Research Journal Of Engineering And Technology, Volume-04, P-Issn: 2395-0072.
5. Vivian W.Y.Tam , (2011), “Cost Effectiveness Of Using Low Cost Housing Technologies In Construction”, Procedia Engg, 14, Pg-156-160.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

CONSTRUCTION PLANNING AND MANAGEMENT OF RESIDENTIAL BUILDING USING PRIMAVERA

[1]ShaikAmeerHussain,[2]MohdRiyazUddin,[3]MohdIshtiyaq Ahmed
[1] Assistant Professor ,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[2] Assistant Professor ,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[3] Assistant Professor ,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA

Abstract Indian Construction industry now days are facing with a lot of problem which is produce the lost of a billion ringgit. The main factor which gives the instability to the construction industry is a cost and time planning. By referring to the news in mass media the cost and the time of the project will be the first factors that lead in the uncompleted of the project or the delayed of the project. This phenomenon will cause a lot of problem to the client which is the client must do the payment back to the bank form the loan that the bank provided although the project did not complete. Cost of the project is the factor that usually may lead of the project delayed or uncompleted The time scheduling also is the major factor that lead to the delayed or the uncompleted of the project. The construction company is facing a tough challenge in the time planning of the project because without the proper planning the time factor will cause the lost of the profit to the company. All of the construction company have planning and scheduling the time first before starting the project and some of the company did not follow well the time constraint of the project and this situation will lead the delayed of the project. Sometimes the construction companies which are planning their time for the project did not concern about the environment factor when doing the planning. The environment factor must be consider when doing the planning because the bad impact of the environment factor to the scheduling of the project will cause the delayed of the project and at the same time will make the loss of profit to the company. Thus it is important to carry a study on schedule developing for a project

I. INTRODUCTION

India is the one of the developing countries which is concentrating in the development of the new buildings and at the same time maintaining all existing building. The government is spending a lot of money for the new infrastructure works especially schools, hospitals, universities and low cost housing projects. With this investment, many contracting companies are being set up. At the same time multinational companies are looking forward in exploring the construction industry in India. By looking for the expenditure of the construction industry, the project management profession is being very valuable for the construction companies in order to make sure the projects can be completed successfully. The project management knowledge becomes the critical part in the project because it contains the knowledge in controlling the cost, scheduling, and resources. In this Project Management field, project manager plays very important role in the construction project. Project management professionals are responsible for ensuring the project completes successfully, thus it is important for them to have experience and knowledge in Project Management techniques.

II. LITERATUREREVIEW

The life cycle is the only thing that uniquely distinguishes projects from non-projects". If that is true, then it would be valuable to examine just what role the so-called Project life cycle plays in the conduct of project management. The basic life cycle follows a common generic sequence: Opportunity, Design & Development, Production, Hand-over, and Post-Project Evaluation. A project can be defined as the work required Taking an opportunity and converting it into an asset." In this sense, both the opportunity And asset are singular, with the implied use being for generating benefit rather than Consumed as a resource in normal operational activity over a prolonged period. (Kerzner, 1995).

III. METHODOLOGY

The Project Management Module is comprehensive, multi-project planning and control software built on Oracle and Microsoft SQL server relational database for enterprise-wide project management scalability. The Project Management module can stand alone for Project and resource management, or it can be used in conjunction with other products, including the Time sheets module, Methodology Management module and PRIMAVERA‟s Web application The project Management module enables organization to store and manage its projects in a central location. The module

supports work breakdown structures (WBS), organizational breakdown structures (OBS), user-defined fields and codes, critical-path-method (CPM) scheduling and resource leveling.

1. Monthly Project Cash Flow

25-Mar-1

TC-02 Monthly Project Cash Flow by WBS

WBS		Cost 01-Feb-13 - 28-Feb-14	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013	Sep 2013	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Period Total
RO01	Period		INR382,624	INR125,756	INR418,743	INR231,551	INR191,743	INR286,506	INR372,496	INR357,134	INR344,024	INR51,603	INR4,853	INR23,995		INR2,791,032
	Cumulative		INR382,624	INR508,381	INR927,124	INR1,158,675	INR1,350,418	INR1,636,924	INR2,009,423	INR2,366,556	INR2,710,580	INR2,762,183	INR2,767,037	INR2,791,032	INR2,791,032	INR2,791,032
RO01.1	Period		INR226,921	INR12,511	INR4,662	INR222		INR193	INR386	INR598	INR386	INR925	INR366	INR405		INR247,575
	Cumulative		INR226,921	INR239,432	INR244,094	INR244,317	INR244,317	INR244,509	INR244,895	INR245,493	INR245,878	INR246,803	INR247,170	INR247,575	INR247,575	INR247,575
RO01.1.8	Period		INR222,224													INR222,224
	Cumulative		INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224
RO01.1.8.1	Period		INR222,224													INR222,224
	Cumulative		INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224	INR222,224
RO01.1.8.7	Period															INR0
	Cumulative															INR0
RO01.1.2	Period		INR2,165	INR2,146	INR260											INR4,571
	Cumulative		INR2,165	INR4,312	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571	INR4,571
RO01.1.2.1	Period		INR551	INR118	INR118											INR787
	Cumulative		INR551	INR669	INR787	INR787	INR787	INR787	INR787	INR787	INR787	INR787	INR787	INR787	INR787	INR787
RO01.1.2.2	Period		INR939	INR651												INR1,589
	Cumulative		INR939	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589	INR1,589
RO01.1.2.3	Period		INR392	INR103												INR496
	Cumulative		INR392	INR496	INR496	INR496	INR496	INR496	INR496	INR496	INR496	INR496	INR496	INR496	INR496	INR496
RO01.1.2.4	Period		INR283	INR1,275	INR142											INR1,700
	Cumulative		INR283	INR1,558	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700	INR1,700
RO01.1.4	Period		INR189	INR4,160	INR2,427	INR30										INR6,806
	Cumulative		INR189	INR4,349	INR6,776	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806	INR6,806
RO01.1.4.1	Period			INR330	INR378											INR708
	Cumulative			INR330	INR708	INR708	INR708	INR708	INR708	INR708	INR708	INR708	INR708	INR708	INR708	INR708
RO01.1.4.2	Period		INR189	INR2,431	INR1,275											INR3,895
	Cumulative		INR189	INR2,620	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895	INR3,895
RO01.1.4.3	Period			INR702	INR124											INR826
	Cumulative			INR702	INR826	INR826	INR826	INR826	INR826	INR826	INR826	INR826	INR826	INR826	INR826	INR826
RO01.1.4.4	Period			INR696	INR651	INR30										INR1,377
	Cumulative			INR696	INR1,347	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377	INR1,377
RO01.1.3	Period		INR1,137	INR1,369												INR2,506
	Cumulative		INR1,137	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506	INR2,506
RO01.1.3.1	Period		INR520	INR58												INR578
	Cumulative		INR520	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578
RO01.1.3.2	Period		INR559	INR598												INR1,157
	Cumulative		INR559	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157	INR1,157
RO01.1.3.3	Period		INR19	INR173												INR193
	Cumulative		INR19	INR193	INR193	INR193	INR193	INR193	INR193	INR193	INR193	INR193	INR193	INR193	INR193	INR193
RO01.1.3.4	Period		INR39	INR540												INR578
	Cumulative		INR39	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578	INR578
RO01.1.5	Period		INR470	INR3,740	INR1,937											INR6,147
	Cumulative		INR470	INR4,210	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147	INR6,147
RO01.1.5.1	Period		INR328	INR173												INR501
	Cumulative		INR328	INR501	INR501	INR501	INR501	INR501	INR501	INR501	INR501	INR501	INR501	INR501	INR501	INR501
RO01.1.5.3	Period		INR142	INR1,279	INR80											INR1,501
	Cumulative		INR142	INR1,421	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501	INR1,501
RO01.1.5.2	Period			INR598	INR366											INR964
	Cumulative			INR598	INR964	INR964	INR964	INR964	INR964	INR964	INR964	INR964	INR964	INR964	INR964	INR964
RO01.1.5.4	Period			INR1,690	INR1,491											INR3,181
	Cumulative			INR1,690	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181	INR3,181

© Primavera Systems, Inc.

Page 1 of 2

2. RESOURCES

ROYAL PALACE VILLA — Current Project's Resources — 25-Mar-13 13:17

Resource ID	Resource Name	Resource Type	Unit of Measure	Primary Role	Default Units / Time
VIL 21	STRUCTURAL ENGINEER	Labor		STRUCTURICAL ENGINEER	12/d
VIL 25	CIVIL ENGINEER	Labor		CIVIL ENGINEER	14/d
CR2-2	CRANE(15T CAPACITY)	Nonlabor			8/d
VIL 22	ARCHITECT	Labor		ARCHITECH ENGINEER	12/d
VIL 26	FINISHING ENGINEER	Labor		ARCHITECH ENGINEER	14/d
2	M20 CONCRETE	Material	CUBIC METER		1/d
VIL 23	ELECTRICAL DESIGN ENGINEER	Labor		ELECTRICAL ENGINEER	12/d
VIL 27	ELECTRICAL ENGINEER	Labor		ELECTRICAL ENGINEER	14/d
VIL 24	MECHANICAL DESIGN ENGINEER	Labor		MECHANICAL ENGINEER	12/d
VIL 28	MECHANICAL ENGINEER	Labor		MECHANICAL ENGINEER	14/d
VIL 29	COMMISSIONING ENGINEER	Labor		COMMISSIONING ENGINEER	14/d
SEng	Site Engineer	Labor			8/d
EXC	EXCAVATOR	Nonlabor			8/d
VIL 30	PROCUREMENT ENGINEER	Labor		PROCURMENT ENGINEER	14/d
3	M30 CONCRETE	Material	CUBIC METER		1/d
Helper 1	Male Helper	Labor			8/d
LOD	LOADER	Nonlabor			8/d
S4	STEEL	Material	MT		8/d
VIL 31	PURCHASING ENGINEER	Labor		PURCHASING ENGINEER	14/d
Helper 2	Female Helper	Labor			8/d
DUM	DUMP TRUCK	Nonlabor			8/d
FITT-2	FITTINGS SUPPLY	Material	Nos		1/d
D1	Door Frames 2 3/4	Material	Numbers		8/d
VALVE-2	VALVE SUPPLY	Material	Nos		1/d
D2	Door Frames 3	Material	Numbers		8/d
P1	Painter	Labor			8/d

© Oracle Corporation — Page 1 of 1

3. CLASSIC SCHEDULE REPORT

ROYAL PALACE VILLA

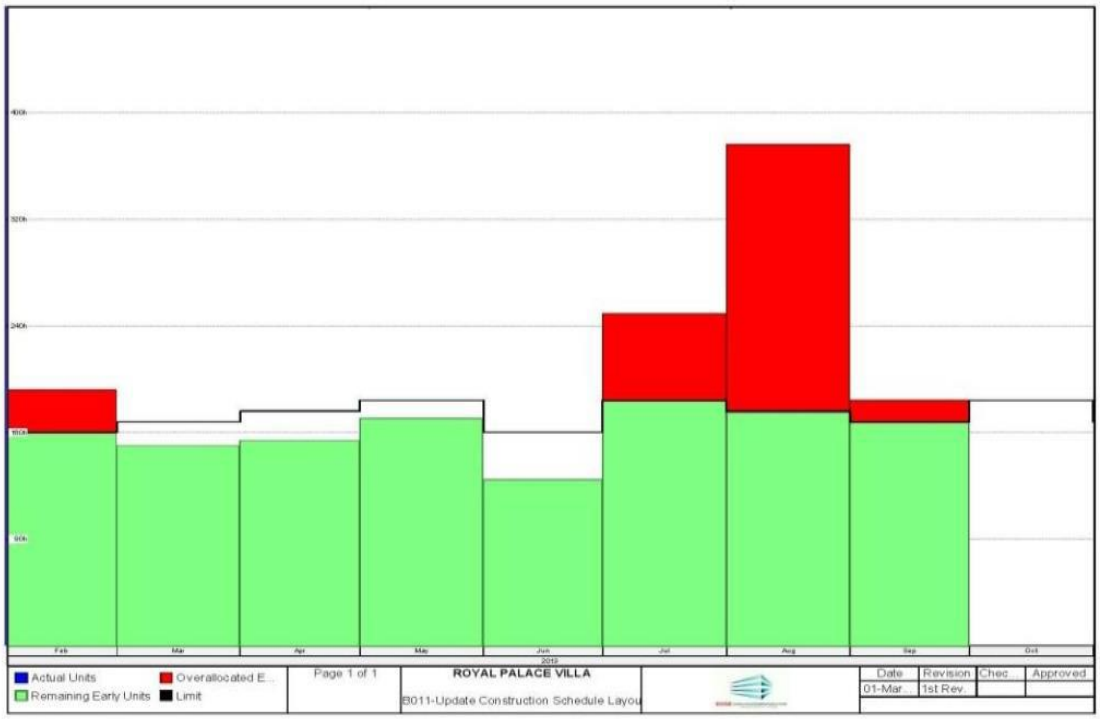
Project Start 01-Feb-13
Project Finish 01-Feb-14
Data Date 01-Feb-13

Report Date 28-Mar-13 21:51

SR-01 Classic Schedule Report - Sort by ES, TF

Activity ID	Orig Dur	Rem Dur	Calendar	%	Department	Activity Name	Early Start	Early Finish	Late Start	Late Finish	Total Float
MTARAP1(	15	15	7-Day Workweek	0		BALUSTRADES	27-Feb-13	13-Mar-13	17-Jul-13	31-Jul-13	140
MTARAP1(	15	15	7-Day Workweek	0		HOLLOW BLOCKS	27-Feb-13	13-Mar-13	14-Sep-13	28-Sep-13	199
SDARSB1(	18	18	7-Day Workweek	0		FURNITURE LAYOUTS	27-Feb-13	16-Mar-13	20-Nov-13	07-Dec-13	266
MTCLAP1(	5	5	7-Day Workweek	0		CONCRETE 30MPA	28-Feb-13	04-Mar-13	21-Jun-13	25-Jun-13	113
MTCLDY1(	7	7	7-Day Workweek	0		PLASTER	28-Feb-13	06-Mar-13	18-Sep-13	24-Sep-13	202
MTARAP1(	15	15	7-Day Workweek	0		HANDRAILS	01-Mar-13	15-Mar-13	17-May-13	31-May-13	77
SDCLAP1(	10	10	7-Day Workweek	0		FRAMING PLAN	03-Mar-13	12-Mar-13	25-Aug-13	03-Sep-13	175
SDMLAP1(	10	10	7-Day Workweek	0		PLUMBING PLAN	03-Mar-13	12-Mar-13	29-Sep-13	08-Oct-13	210
SDARAP1(	20	20	7-Day Workweek	0		ROOF PLAN	03-Mar-13	22-Mar-13	29-Oct-13	17-Nov-13	240
SDELAP1(	15	15	7-Day Workweek	0		GROUND FLOOR COMM. & GROUNDING PLANS	03-Mar-13	17-Mar-13	03-Nov-13	17-Nov-13	245
MTARSB1(	10	10	7-Day Workweek	0		TOILET AND BATH ACCESSORIES	04-Mar-13	13-Mar-13	20-Apr-13	29-Apr-13	47
MTARAP1(	30	30	7-Day Workweek	0		WINDOW GUARD	04-Mar-13	02-Apr-13	24-Apr-13	23-May-13	51
MTELSB1(	5	5	7-Day Workweek	0		SOCKETS	04-Mar-13	08-Mar-13	07-May-13	11-May-13	64
MTARSB1(	10	10	7-Day Workweek	0		DOORS & WINDOWS	04-Mar-13	13-Mar-13	24-May-13	02-Jun-13	81
MTARSB1(	5	5	7-Day Workweek	0		HOLLOW CORE WOOD	04-Mar-13	08-Mar-13	29-May-13	02-Jun-13	86
MTARAP1(	15	15	7-Day Workweek	0		LADDER	04-Mar-13	18-Mar-13	04-Jun-13	18-Jun-13	92
MTMLAP1(	30	30	7-Day Workweek	0		CONDUITS	04-Mar-13	02-Apr-13	16-Jun-13	15-Jul-13	104
MTCLAP1(	5	5	7-Day Workweek	0		PRECAST CONCRETE	04-Mar-13	08-Mar-13	24-Jun-13	28-Jun-13	112
SDELSB1(	12	12	7-Day Workweek	0		GROUND FLOOR LIGHTING PLANS	04-Mar-13	15-Mar-13	11-Aug-13	22-Aug-13	160
SDARSB1(	8	8	7-Day Workweek	0		FINISHES DETAILS	04-Mar-13	12-Mar-13	06-Nov-13	14-Nov-13	247
MTCLDY1(	5	5	7-Day Workweek	0		CONCRETE 30MPA	05-Mar-13	09-Mar-13	26-Jun-13	30-Jun-13	113
SDARAP1(	30	30	7-Day Workweek	0		SECTIONS	08-Mar-13	06-Apr-13	05-Aug-13	03-Sep-13	150
SDMLAP1(	30	30	7-Day Workweek	0		GENERAL DETAILS	08-Mar-13	06-Apr-13	09-Sep-13	08-Oct-13	185
SDARAP1(	25	25	7-Day Workweek	0		ELEVATIONS	08-Mar-13	01-Apr-13	23-Nov-13	17-Dec-13	260
MTMLAP1(	30	30	7-Day Workweek	0		PLUMBING FIXTURES	09-Mar-13	07-Apr-13	09-Mar-13	07-Apr-13	0
MTELSB1(	5	5	7-Day Workweek	0		GANG SWITCHES	09-Mar-13	13-Mar-13	28-Mar-13	01-Apr-13	19
MTELAP1(	15	15	7-Day Workweek	0		SOCKETS	09-Mar-13	23-Mar-13	12-May-13	26-May-13	64
MTARAP1(	30	30	7-Day Workweek	0		HOLLOW CORE WOOD	09-Mar-13	07-Apr-13	03-Jun-13	02-Jul-13	86
COCWSB'	10	10	7-Day Workweek	0		RETAINING WALL	11-Mar-13	20-Mar-13	29-Sep-13	08-Oct-13	202
SDARAP1(	40	40	7-Day Workweek	0		FURNITURE LAYOUTS	13-Mar-13	21-Apr-13	04-Dec-13	12-Jan-14	266
MTMLSB1(	10	10	7-Day Workweek	0		FITTING & VALVE SUPPLIES	14-Mar-13	23-Mar-13	23-Mar-13	01-Apr-13	9
SDELSB1(	24	24	7-Day Workweek	0		TELEPHONE AND MATV SINGLE LINE DRAWINGS	14-Mar-13	06-Apr-13	29-Mar-13	21-Apr-13	15
MTELAP1(	20	20	7-Day Workweek	0		GANG SWITCH	14-Mar-13	02-Apr-13	02-Apr-13	21-Apr-13	19
SDELSB1(	12	12	7-Day Workweek	0		POWER AND INTERCOM SCHEDULE DRAWINGS	14-Mar-13	25-Mar-13	28-Apr-13	09-May-13	45
MTARAP1(	20	20	7-Day Workweek	0		TOILET AND BATH ACCESSORIES	14-Mar-13	02-Apr-13	30-Apr-13	19-May-13	47
SDELSB1(	12	12	7-Day Workweek	0		ROOF ELECTRICAL PLANS	14-Mar-13	25-Mar-13	13-May-13	24-May-13	60
MTARAP1(	15	15	7-Day Workweek	0		DOORS & WINDOWS	14-Mar-13	28-Mar-13	03-Jun-13	17-Jun-13	81

4. HISTOGRAMS for MALE HELPER



IV. CONCLUSIONS

1. The Critical Path Network of the ROYAL PALCE VILLA being built at ATTAPUR is obtained using the planning and scheduling software PRIMAVERA P6.
2. The activities required to complete the building was identified and were fed as an input into the PRIMAVERA.
3. The durations of the activities were determined depending upon the quantity and type of work to be done and the available resources.
4. The predecessors and successors of the activities were also defined. After s c h e d u l i n g the critical path and project duration are obtained.
5. The scheduled network was then analyzed and a classic schedule report was generated using PRIMAVERA.

REFERENCES

1. A Guide to the Project Management Body of Knowledge. 2000. Pennsylvania, Project Management Institute, Inc: 211 p.
2. Marchman, D., L. Anderson, T. 2003. Construction Scheduling with Primavera Enterprise, Second Edition. New York: Delmar Learning, Inc: 367 p.
3. Cook B., Williams, and P. 2004. Construction Planning, Programming and Control. Oxford, Blackwell Publishing Ltd: 442 p.
4. Ahuha, H.N. Dozzi, S. Abourizk, M. Project Management, Techniques in Planning and Controlling Construction Projects. New York: Wiley & Sons Inc, 1994.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

CONSTRUCTION PLANNING & MANAGEMENT OF COMMERCIAL BUILDING USING PRIMAVERA_

[1,]M.AQadeer,[2]NAFEES AHMED,[3]MasrathFathima,
[1]Professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[2]Professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA
[3]Assistant professor,Dept of CIVIL,Shadan College of Engineering and Technology HYD,T.S,INDIA

ABSTRACT—The main objective of this project is to analyze and design a RCC framed structure with and without diaphragm for seismic forces.For this analysis we considered a college building [G + 3] (3 dimensional frame).In order to compete in the ever growing competent market it is very important for a structural engineer to save time, as a sequel to this First architectural plan and layout of a college building has been prepared in AUTOCAD and the analysis and design is done by using the software package STAADPRO. In this first the analysis and design is done by applying dead load, live load and floor loads and the results are tabulated. Then again the analysis and design is repeated by applying the panel properties with pressure intensity on the panel and the results are tabulated.The results obtained from the above two steps are compared and are represented graphically

1. INTRODUCTION

The construction industry mainly caters to the need of providing shelter, harnessing energy and creates public access. The basic human needs have not changed over time even though the process and environment in which designer or constructor operate have become increasingly more complicated. Rapidly escalating technology has made challenging construction possible which were impossible to imagine in the previous generations. India is the one of the developing countries which is concentrating in the development of the new buildings and at the same time maintaining all existing building. The government is spending a lot of money for the new infrastructure works especially schools, hospitals, universities and low cost housing projects. With this investment, many contracting companies are being set up. At the same time multinational companies are looking forward in exploring the construction industry in India

By looking for the expenditure of the construction industry, the project management profession is being very valuable for the construction companies in order to make sure the projects can be completed successfully. The project management knowledge becomes the critical part in the project because it contains the knowledge in controlling the cost, scheduling, and resources. In this Project Management field, project manager plays very important role in the construction project. Project management professionals are responsible for ensuring the project completes successfully, thus it is important for them to have experience and knowledge in Project Management techniques. The construction management it may refer to the contractual arrangement under which is a firm supplies construction management service to an owner. However, in its more common 7 use it refers to the act of managing the construction process which is the way to manage the basic resource of construction. The resource included workers and subcontractor, equipment and construction plant, material, money and time. Skillful construction management results in the project completion on time and within budget. Time management is on keys of effective project management. They are a few problems effect the time management such as a rework activity, the change of job specification without direct notification, work overload, unreasonable time constraint and etc. The impact that from poor time management will cause delay or event worst effect mostly on cost as it is correlates to each other. As a solution of this situation the planning and scheduling will be the best method that can be used to overcome with this problem. With the proper planning and scheduling it will assist the project manager in completing the project within the time and meet the aim and objective of the project.

2. OBJECTIVE OF STUDY

For conducting this study the following objectives are proposed and these objectives will be the guideline for the production of the final thesis.

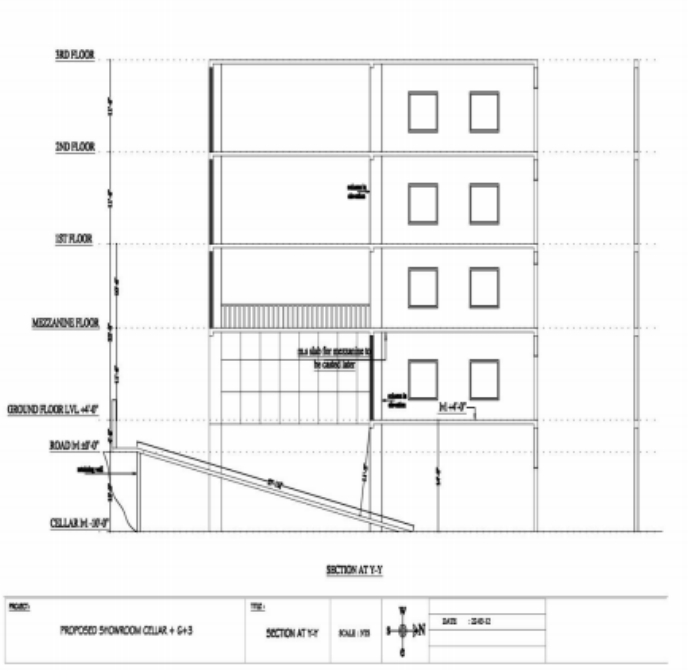
To learn the various interdependencies between activities of a construction project.

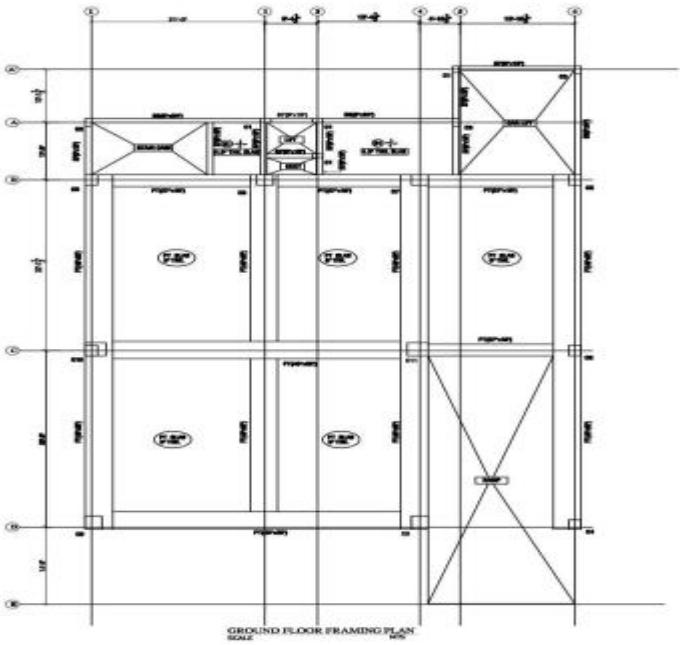
To sequence the activities in the most appropriate way.

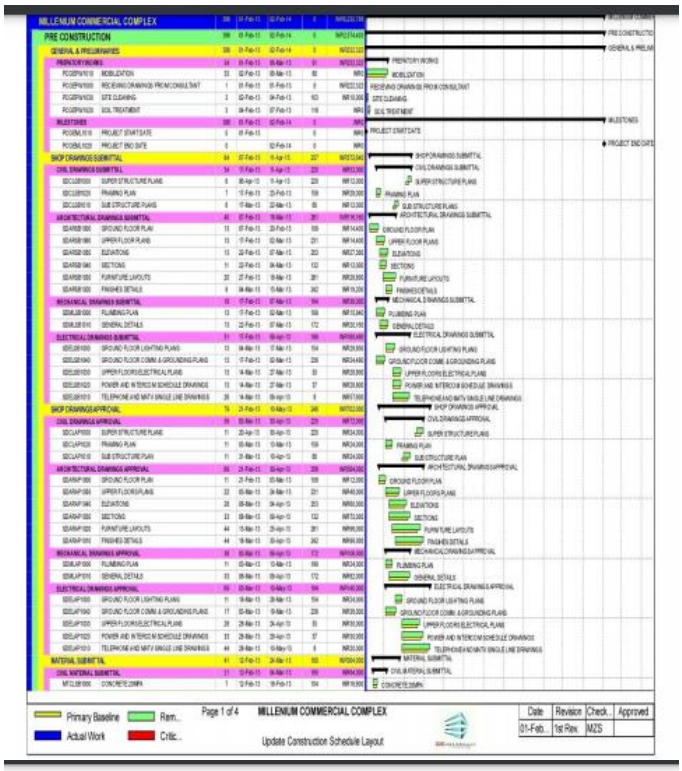
To make a realistic and achievable EPC schedule using PRIMAVERA.
To estimate the amount of resources and its cost in a project in the planning stage.
To implement time, cost controlling& monitoring

3. PROJECT DETAILS NAME OF THE PROJECT :

MILLENIUM COMMERCIAL COMPLEX
Total Site area : 700 sq meters'
Built up area : 420 sq meters
Number of Floors : Ground +
Three Total Project Duration : 12 Months
Civil works Duration : 10 Months
Cost of the Project : 62 Lakhs INR







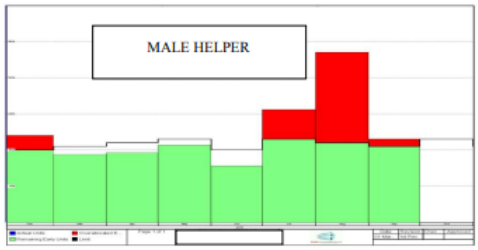
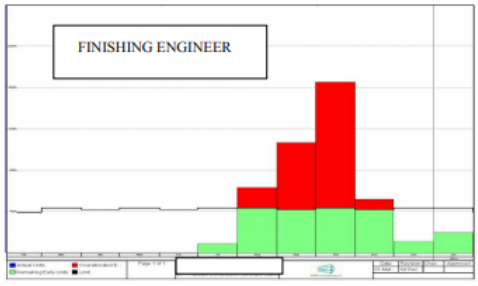


Figure 5.5 RESOURCE HISTOGRAMS for MALE HELPER



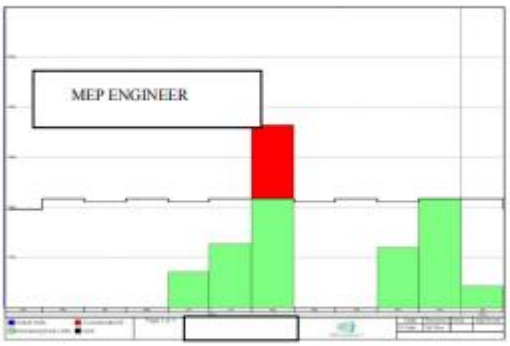


Figure 5.7 RESOURCE HISTOGRAMS for MEP ENGINEER

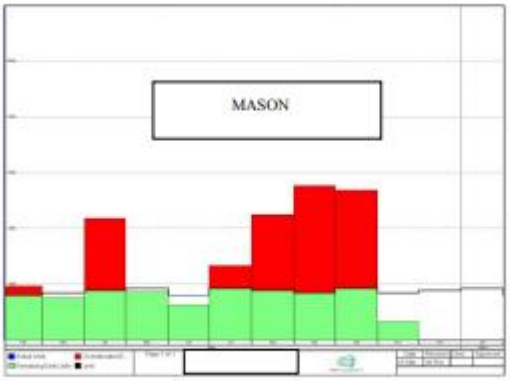


Figure 5.8 RESOURCE HISTOGRAMS for MASON

4. CONCLUSION

The Critical Path Network of the MILLENIUM COMMERCIAL COMPLEX being built at Abids is obtained using the planning and scheduling software PRIMAVERA P6. The activities required to complete the building was identified and were fed as an input into the PRIMAVERA. The durations of the activities were determined depending upon the quantity and type of work to be done and the available resources. The predecessors and successors of the activities were also defined. After s c h e d u l i n g the critical path and project duration are obtained. The scheduled network was then analyzed and a classic schedule report was generated using PRIMAVERA.

Therefore an attempt is made in arriving at an optimum network diagram that will go at least a step towards minimizing the time and cost overruns which will play a crucial role in this present competitive and globalised environment. This project intends to make an attempt in this direction. This project has helped us to have a comprehensive study in the areas relating to planning, scheduling and controlling of projects. It has also helped

us to gain knowledge about other fundamental principles and techniques of construction project management. As an important milestone in our learning process is the acquisition of k n o w l e d g e about the software tool PRIMAVERA P6, which is being most widely and globally used. Facing the challenges of real life construction management will no longer be a difficult one

REFERENCE

1. Reddy, B. S. K., S. K. Nagaraju, and M. D. Salman. "A study on optimisation of resources for multiple projects by using primavera." *Journal of Engineering Science and Technology* 10.2 (2015): 235-248.
2. Reddy, B. S. K., Nagaraju, S. K., & Salman, M. D. (2015). A study on optimisation of resources for multiple projects by using primavera. *Journal of Engineering Science and Technology*, *10*(2), 235-248
3. Reddy, B. S. K., S. K. Nagaraju, and M. D. Salman. "A study on optimisation of resources for multiple projects by using primavera." *Journal of Engineering Science and Technology* 10, no. 2 (2015): 235-248.
4. Reddy, B.S.K., Nagaraju, S.K. and Salman, M.D., 2015. A study on optimisation of resources for multiple projects by using primavera. *Journal of Engineering Science and Technology*, *10*(2), pp.235-248.
5. Heesom, David, and Lamine Mahdjoubi. "Trends of 4D CAD applications for construction planning." *Construction management and economics* 22, no. 2 (2004): 171-182.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

SHEET PILE TECHNOLOGY

[1]Azeemulhussain,[2]Heenasadiq,[3]Mohdfaqharuddin
[1]Assistant professor,Dept of Civil,Shadan College of Engineering and Technology HYD,T.S,INDIA
[2]Assistant professor,Dept of Civil,Shadan College of Engineering and Technology HYD,T.S,INDIA
[3]Assistant professor,Dept of Civil,Shadan College of Engineering and Technology HYD,T.S,INDIA

ABSTRACT—Piling is a type of ground treatment constructed to resist the lateral pressure of soil when there is desired change in ground elevation. Sheet pile retaining walls are usually used in soft soils and when there is excess water in the surrounding subsoil, which interferes with the foundation of structures. In case of soft soils sheet piles act as retaining walls for sliding soil and in the later case they are used as water barrier for stopping the surrounding water penetrating the foundation leading failure of structure. In this particular work sheet piles are used for retaining the non-cohesive soil sliding frequently interrupting the earth-work in excavation as well as for stopping the excessive water penetrating through the soil from surroundings. Scope of this work is to study the Topography of the soil, Engineering Properties to reflect the type and selection of sheet pile suitable and methods of driving.

1. INTRODUCTION

I. A deep foundation is distinguished from shallow foundation by the depth they are embedded into the ground. Poor soil and large design loads at shallow depths are some of the reasons to recommend deep foundation. There are different terms used to describe deep foundation including the piles which are generally driven into ground in-situ. Sheet piles can be made up of timber, steel, reinforced concrete, etc.

II. Sheet piling is a form of driven piling using thin interlocking sheet of steel to obtain a continuous barrier in the ground. They are used for the stabilization of the soil. The main application of sheet piles is in retaining walls and cofferdams erected to enable permanent works to proceed. Normally, vibrating hammer, t-crane and crawle drilling are used to establish sheet piles. Material used can be estimated by driving them 1/3 above ground and 2/3 below ground, but this can be altered depending on the environment.

III. Generally tests are performed on soils to obtain physical properties of soil around a site to design earthworks and foundations for proposed structures. They can be performed either in laboratory or on site. Some of the laboratory tests performed is particle size analysis, direct shear test, soil compaction test, etc,.

IV. Particle size analysis is done to determine the soil gradation. The distinction between coarse and fine particles is usually made at 75μm. The rate of sedimentation is used to determine the particle gradation

V. Direct shear test determines the consolidated, drained strength properties of a sample. A constant strain rate is applied to a single shear plane under a normal load, and the load response is measured. If this test is performed with different normal load, the common shear strength parameters can be determined.

VI. Recently, development of construction methods for densely populated urban area is emphasized. For example, in order to ease traffic congestion, railroads are re-laid on viaducts. For this project, structures are usually constructed very close to existing structures, and the space allowed for construction work is limited. In addition, it is required to reduce costs, as well as minimizing the impact to the environment, such as noise, vibration and disposals from construction work. Sheet-pile Foundation, which combines the footing and sheet-piles, proposed as a new foundation form (Koda et al. 2003, Nishioka et al. 2004) is one solution. Because of the confinement of the ground is increased by the sheet-piles, both bearing capacity and horizontal resistance of the SPF are improved compared to those of the shallow foundation. Therefore, the applicability became wider than that of the shallow foundations. For example, SPF can be adopted on the loose sandy ground to which the pile foundation has been usually applied. The construction cost of SPF is almost the same as that of the shallow foundation and more competitive than that of the pile foundation. On the other hand, since the pile work is not necessary, it can avoid various disadvantages of pile foundation, such as noise, vibration and the disposal of surplus soil.

On the basis of the materials from which they are made, the different types of sheet piles are:

a) Timber/wood sheet piles
b) Reinforced concrete sheet piles
c) Steel sheet piles
d) Composite

2. EVALUATION OF THE SHEAR STRENGTH OF SOIL:

Shear box dimensions = 60 * 60 mm2
Weight of soil sample =158.5 gms.
Proving ring constant =0.6lbs =0.272 kg.
Horizontal dial gauge constant = 0.01 mm.
The following tables give the Shear Stress of the soil at different normal load conditions:
6.2.1Normal load applied = 50KN/m2.

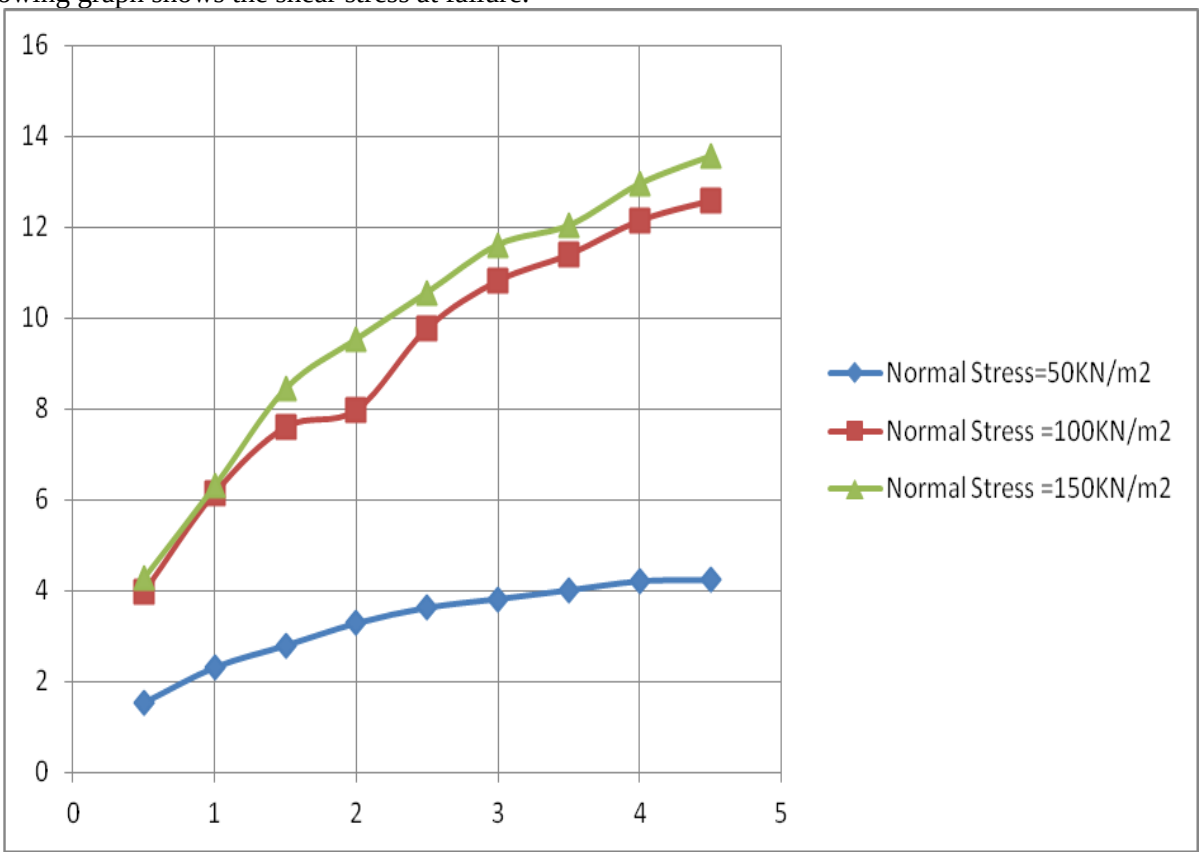
Sr. No.	Shear displacement division	Proving Ring Reading	Shear force (kg)	Area correction for shear displacement(mm^2)	Shear stress (kg/m^2)
1.	50	2.0	0.544	3570	1.524
2.	100	3.0	0.186	3540	2.305
3.	150	3.6	0.979	3510	2.789
4.	200	4.2	1.142	3480	3.282
5.	250	4.6	1.252	3450	3.628
6.	300	4.8	1.305	3420	3.817
7.	350	5.0	1.360	3390	4.011
8.	400	5.2	1.414	3360	4.209
9.	450	5.2	1.414	3330	4.240

Normal load applied = 100 kN/m2

Sr. No.	Shear displacement division	Proving Ring Reading	Shear force (kg)	Area correction for shear displacement(mm^2)	Shear stress (kg/m^2)
1.	50	5.2	1.414	3570	3.961
2.	100	8.0	2.176	3540	6.146
3.	150	9.8	2.665	3510	7.594
4.	200	10.2	2.774	3480	7.972
5.	250	12.4	3.372	3450	9.776
6.	300	13.6	3.699	3420	10.816

7.	350	14.2	3.862	3390	11.393
8.	400	15.0	4.080	3360	12.142
9.	450	15.4	4.188	3330	12.578

The following graph shows the shear stress at failure.



Shear Stress Vs Shear Displacement
Graph - 6.2.0

Variation of Shear Strength of Sand with Normal Shear Stress can be obtained as follows:

Normal Stress, σ KN/m²	Shear stress at failure, τ KN/m²
50	4.240
100	12.578
150	13.558

3. RECOMMENDATIONS TO REDUCE THE EFFECT OF VIBRATIONS

The worries of householders and the probable number of complaints can be reduced, if neighbors to a piling site are visited, and are given a clear description of the extent and duration of the activity, and of the relatively low probability of structural damage despite their human perception of vibrations. On site, the major variable is the choice of hammer, and its mode of operation so as to control energy input.

Impact hammers may be controlled by the operator in terms of drop height or energy input and ground vibrations can be reduced if site measurements or observations dictate this, particularly at shallow toe penetrations.

Vibrators are very effective pile drivers essentially in granular soils and usually generate only modest vibrations; however, the vibrations are continuous and periodic and may cause problems if a nearby building element has a resonance at a similar frequency. Also these vibrations attenuate rapidly, which may be useful if a sensitive building is at a critical distance from the source. Pile jacking systems may be appropriate when soil condition allow.

It may also be of benefit to using jetting or pre-drilling in conjunction with any of the above driving systems.

Whatever hammer type is used, good driving practice leading to axial impact on the pile, with suitable guidance to the pile to limit whip, will allow driving to continue with the minimum of disturbance or risk of damage to neighbours and their property.

The final recommendations are that when it seems a building may be at risk, or occupants worried then before and after surveys be undertaken so that any induced damage can be evaluated, and repaired, whether it be caused solely by vibration as a trigger when superimposed upon other strains, or a result of piling induced differential settlement.

4. CONCLUSION:

Ease and speed of construction and repeat users are two of the most important reasons why sheet piles are preferred over other alternative. A systematic and designed-based approach to select sheet piles lead to an optimized solution, thus making it better than sconventionally used materials.

Execution of sheet piles can be faster, with less resources and manpower. In the majority of cases, just a vibrohammer would be sufficient for installation. Many of the contractors have their own vibrohammers.

For temporary works, a contractor can be assured of repeat uses and high resale value of the materials.

Importantly, sheet piles are available with buyback and rental option too. Delivery with exact specification is possible from mill rolling and local stocks.

Sections with low to high elastic section modulus are available in the forms of trench sheets, sheet piles and combined walls such as sheet piles with tubes, box sheet piles and HZ system.

For large retaining heights where cantilever wall is not possible, sheet pile walls can be supported with struts, or an anchorage system can be easily designed and implemented.

Unlike other solutions, sheet piles don't occupy much space. It is easy to extract for reuse. For strict plot limits in construction projects such as buildings, roads and utilities, sheet piles have been extremely useful.

Sheet piles can be designed to prevent corrosion. When the development of new grades, steel sheet piles have better corrosion resistance. Solutions like protective coating and cathodic protection are available to prevent corrosion.

Sheet pile walls can also be made fully water tight. The increasing trend of having more under ground car parking structures is one example of the benefits from water tightness of the sheet pile wall. Steel sheet piles are completely impervious.

The only possibility of water infiltration through a sheet pile wall is by flowing through the interlocks. For sheet piles with good interlocks, sealing systems are not necessary for temporary retaining structures, where moderate rates of seepage are acceptable.

With application of proper sealing system or welding of joints, the wall can be made completely water tight.

The seismic performances of the sheet-pile foundation are greatly improved compared with those of the shallow foundation. Performance of the sheet-pile foundation is influenced by both sheet-pile length and ground condition. Sheet-pile is not a critical member on the seismic design of the SPF. Bearing capacity of the SPF is calculated by assuming the force equilibrium around the footing. Most resistant moment of the SPF is shared by the axal resistance of the front/back sheet-piles.

Based on the above test results, a guideline of design and construction of the sheet-pile foundation was published by the Railway Technical Research Institute, Japan, and several actual projects were realized so far. Because of its excellent performance and cost competitiveness, application of the sheet-pile foundation may increase in future.

REFERENCES:

1. Lemin W.G.K. et al, 1985, piling engineering, surrey university press.
2. Hunt, R.E geotechnical engineering analysis and evaluation, 1986, McGraw-hill.
3. Conduto, Donald P.foundation design: principles and practices 2nded, prentice-hall Inc.
4. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain and Arjun Kumar Jain, Laxmi, Publications Pvt. Ltd., New Delhi.
5. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
6. Terzaghi, 1934, Last Retaining Wall Test, Engg news record - Feb 1st, April 19th, March 8th.
7. Tomlinson, Pile Design and Construction Practice.
8. Rajapaksc, rowan, Pile Design and Construction Guide.
9. Mechanics and Foundations Divisions, American Society of Civil Engineers, Vol 82, No. SM1, pp 1-19.
10. National Forest Products Association. 1986. "National Design Specifications for Wood Construction, "Washington, DC.
11. Newmark, N. M. 1942. "Influence Charts for Computation of Stresses in Elastic Foundations," University of Illinois Engineering Experiment Station Bulletin, Series No. 338, Vol 61, No. 92, Urbana, IL, reprinted 1964.

Peck, R. B., and Bazaraa, A. S. 1969."Discussion on Settlement of Spread Footings on Sand," Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 95, No. SM3

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

EXPERIMENTAL STUDY AND THE EFFECT OF ALKALI TREATMENT WITH TIME ON JUTE POLYESTER COMPOSITES

[1]Mr.T.Nagaruna Rao, [2]Mr. Nayeemuddin, [3]Mr. Mohd. Mohiuddin
[1]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008
[2]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008
[3]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008

ABSTRACT—The main aim of the work is the treatment that is to be given to enhance the surface properties of the fibers in view of obtaining better interfacial reaction between the matrix and the fiber of the composite, which in turn enhances the mechanical properties of the laminate on the whole. The work also focuses on the effect of alkaline solution treatment on the fibers. Numbers of laminates are prepared with different soaking time to be able to subject them to various test methods.
Key words: Alkali treatment, Natural fiber, laminate

1. INTRODUCTION

Currently, many research projects are devoted to the utilization of cellulose-based fibers as reinforcement for plastics. However, these fibers are mainly composed of cellulose, hemi- cellulose, and lignin. In order to expand the use of cellulose-based fibers for composites, it is useful to have the information on fiber characteristics and factors which affect performance of thefibers

P. J. Roe, M. P. Ansell in (1985),

[1] studied the behavior of the jute fiber. Raw jute fiber has been incorporated in a polyester resin matrix to form uni- axially reinforced composites containing up to 60 vol % fiber. The tensile strength and Young's modulus, work of fracture determined by Charpy impact and inter-laminar shear strength have been measured as a function of fiber volume fraction. Derived fiber strength and Young's modulus were calculated. Polyester resin forms an intimate bond with jute fibers up to a volume fraction of 0.6, above which the quantity of resin is insufficient to wet fibers completely. He compared properties of jute and glass fibers, and on a weight and cost basis jute fibers are seen in many respects to be superior to glass fibers as a composite reinforcement. Jute fiber forms an intimate bond with polyester resin, and can fully or partially replace glass fiber without entailing the introduction of new techniques of compositefabrication.

A.K. Mohanty, Mubarak A. Khan,

G. Hinrichsen in (1998),[2] investigated on surface modifications of two varieties of jute fabrics, i.e. hessian cloth (HC) and carpet backing cloth (CBC), involving de waxing, alkali treatment, cyanoethylation and grafting, were made with a view to their use as reinforcing agents in composites based on a biodegradable polymericmatrix,Dipa Ray, B.K.Sarkar, A.K.Rana and N.R .Bose in (2001),[3] investigated the effect of alkali treatment of 5% alkali (Noah) solution for 0, 2, 4, 6 and 8 h at 30°C.

Joung-Man Park, Son Tran Quang, Byung-Sun Hwang, K. Lawrence De Vries in (2005),[4] investigated on interfacial evaluation of the untreated and treated Jute and Hemp fibers reinforced different matrix polypropylene-maleic anhydride polypropylene copolymer (PP-MAPP) composites by micromechanical technique combined with acoustic emission (AE) and dynamic contact angle measurement.

Thi-Thu-Loan Doan, Hanna Brodowsky Edith Mader in (2006),[5] studied the thermal, dynamic mechanical and aging behavior are critical issues for the application of jute/polypropylene composites.

H.M.M.A. Rushed, M. A. Islam and F. B. Rizvi in (2006),[6] experimented on natural fibers such as flax, hemp, jute, kenaf. In the research work, jute fiber reinforced polypropylene matrix composites were developed by hot compression molding technique with varying process parameters, such as fiber condition (untreated and alkali treated), fiber sizes (1, 2 and 4 mm) and percentages (5%, 10% and 15% by weight). An attempt was made by U. S. Ishiakul, X. Y. Yang, Y.W. Leong, H. Hamada, T. Semba, and K. Kitagawa in (2007),[7] at increasing both toughness and rigidity by simultaneous toughening andreinforcement.

E. Sinha1,S.K. Rout P.K. Barhai in (2007),[9] all together treated the jute fibers with argon cold plasma for 5,

10 and 15 min. Structural macromolecular parameters of untreated and plasma treated fibers were investigated using small angle X-ray scattering (SAXS), and the

crystallinity parameters of the same fibers were determined by using X-ray diffraction (XRD). K. Sabeel Ahmed, S. Vijayaranga in (2008),[10] investigated on the effect of stacking sequence on tensile, flexural and inter laminar shear properties of untreated woven jute and glass fabric reinforced polyester hybrid composites experimentally.

METHODOLOGY

A.Materials andMethods

The materials used in this work are: Jute Fibers, Sodium Hydroxide (Noah), Polyester Resin, Methyl ethyl ketone peroxide (MEKP)(used as catalyst) commonly called Hardener (K6).

A. PreTreatment

A bunch of the clean fibers was taken to investigate the effect of time of alkali treatment on the weight of the fiber for each treatment time. After soaking the fibers for 8, 16 and 24 hours in alkali solution the weight of the fibers were recorded using the electronic balance.

Fig.1. Pretreatment (Alkali Noah) of the fibers

Fig.2. Weight of the fiber

The Jute fibers bags were washed with water to remove the contaminants and adhering dirt and were soaked in water for 48h. Thereafter, they were air dried at room temperature. After the jute fibers were completely dried the fibers were soaked in 10% Noah solution at ambient temperature and were air dried thoroughly at room temperature without destroying the fibrils. The jute bags after the treatment were cut into layers of 300mm x 300mm to make thelaminates.

Fig.3. Pretreatment (Alkali Noah) of the fibers and the jute material

B. Testing of Specimens Tensiletest:

The tensile test is generally performed on flat specimens. During the test a uni-axial load is applied through both the ends of the specimen. The ASTM standard test method for tensile properties of fiber resin composites has the designation D 3039-76. The length of the test section is 120 mm approximately. The tensile test is performed in the universal testing machine (UTM) 1195 and results are analyzed to calculate the tensile strength of composite samples.

Fig.4. Specimen under tensile test

Flexural Test:

The short beam shear (SBS) tests are performed on the composite samples at room temperature to evaluate the value of flexural strength (FS). It is a 3-point bend test, which generally promotes failure by inter-laminar shear. The SBS test is conducted as per ASTM standard (D2344- 84) using the same UTM. Span length of 21 mm was maintained. The flexural strength (F.S.) of any composite specimen is determined using the following equation.

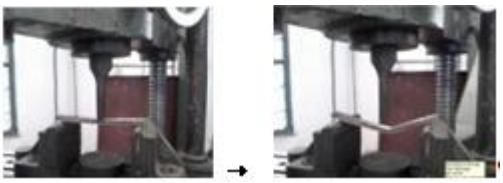


Fig.5.Specimen under the 3 point bending test

The equation to calculate flexural strength is,

$$F.S = \frac{3PL}{2bt^2}$$

Where P is the load applied, L is the span length, b is the width and t is the thickness of thespecimen.

Impact Test:

Un-notched Izod impact test was carried on the specimens with the required dimensions of the different fiber treatments and the fracture toughness values wererecorded.

The test is a low velocity impact test.

I = K/A , where K is the energy absorbed and A is the areaand values were recorded in J/cm2

C. Equations for the evaluation of theexperimental results:

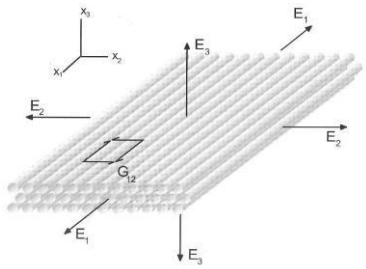


Fig.6. Representation of the Elastic properties of the composite laminate

According to Rule of mixtures assuming no voids in the composite laminate $V_f + V_m = 1$

Where isvolumefractionofthefiber,is thevolume $V_f = \frac{\rho_m w_f}{\rho_f w_m + \rho_m w_f}$

Where $V_f$is the volume fraction ofthefiber, ρ_m is the density of thematrix, ρ_f isthedensityof the fiber, ofthe

fiber, w_m is the weight of thematrix. $\sigma_c = \sigma_f V_f + \sigma_m V_m$

The tensilestrength of thecomposite, is the tensilestrengthofthefiber, isthetensilestrengthofthe matrix. $E_c = E_m V_m + E_f V_f$

WhereE$_c$ is the Young's modulus of the composite,E$_m$is the Young's modulusofthe matrix,E$_f$is the Young's modulusofthe fiber, V$_m$ is the volume fraction of the matrix, V$_f$is volume fraction of thefiber.

Elastic properties of Orthotropic Lamina:

The number of independent elastic constraints required to characterize anisotropic and orthotropic materials are 21 and 9 respectively.Foran orthotropicmaterial,the9independent elasticconstantsare

$E_{11}, E_{22}, E_{33}, G_{12}, G_{13}, G_{23}, \vartheta_{12}, \vartheta_{13},$ andϑ_{23}

Elastic properties of the continuous fiber lamina are calculated from the following equations:

Longitudinal Modulus:, $E_{11} = E_f V_f + E_m V_m$

And Major Poisson's ratio by the formula, The Transversemodulusis calculated by theformula, $\vartheta_{12} = E_f \vartheta_f + V_m \vartheta_m$

MinorPoisson'sratiois calculatedby theformula,

$E_{22} = \frac{E_f (E_f V_m + E_m V_f)}{E_m}$

Shearmodulusiscalculatedbytheformula,

$G_{12} = G_f V_m + G_m V_f$

The following properties are to be noted from the above equations

- The longitudinal modulus E$_{11}$ is always greater than the transversemodulus E$_{22}$
- Thefibercontributestothedevelopmentofthe longitudinal modulus, and the matrix contributes to the development of transverse modulus.
- The major Poisson's ratio $\vartheta_{12}$is always greaterthan theminorPoisson'sratioϑ_{21} .Since thePoisson's ratio is related by the equation only, can be considered independently.
- As in the case ofE_{22}, the matrix contributes more to the development of G_{12} than thefibers
- Four independent elasticconstants namely, E_{11}, E_{22}, ϑ_{12} and ϑ_{12} , and arerequiredtodescribethein plane elastic behavior of a lamina. The ratio / is often considered a measure oforthotropic.

The above equations are derived using the simple mechanics of the material approach along with the following assumptions.

- Both fibers and matrix are linearly elastic isotropic materials.
- Fibers are uniformly distributed in thematrix.
- Fibers are perfectlyaligned
- There is perfect bonding between fibers andmatrix
- The composite lamina is free ofvoids

Elastic isotropic lamina:

From the mechanics of materials the Cartesian strains resulting from a state of plane stress is represented by the followingequations:

$\sigma_z = \tau_{xz} = \tau_{yz} = 0$, $\varepsilon_x = \frac{1}{E(\sigma_x - \vartheta\sigma_y)}$,

$\varepsilon_y = \frac{1}{E(\sigma_y - \vartheta\sigma_x)}$; $\gamma_{xy} = \frac{1}{G\tau_{xy}}$ In an isotropic material, considering plane stress, there is a strainalsoinz direction due to Poisson's effect, $\varepsilon_z = -\vartheta(\sigma_x + \sigma_y)$

This strain component will be ignored. In this relation there are three elastic components. These are Young's E, Poisson's ratioand shear modulusG $(\sigma_x = \tau_{xz} = \tau_{yz} = 0)$

$$\begin{Bmatrix} \varepsilon_x \\ \varepsilon_y \\ \gamma_{xy} \end{Bmatrix} = \begin{bmatrix} \frac{1}{E} & \frac{\vartheta}{E} & 0 \\ \frac{-\vartheta}{E} & \frac{1}{E} & 0 \\ 0 & 0 & \frac{1}{G} \end{bmatrix} \begin{Bmatrix} \sigma_x \\ \sigma_y \\ \tau_{xy} \end{Bmatrix}$$

The stiffnessmatrix$[Q]$ can be formulated as follows$[S]$ represents the compliance matrix relating strains to known stresses. The inverse of the compliance matrix is

called stiffness matrix, which is used in relating stresses and strains. Thus,thestiffness matrix $[Q]$foranisotropiclaminais:

$$[Q] = [S^{-1}] = \begin{bmatrix} \frac{E}{1-\vartheta^2} & \frac{\vartheta E}{1-\vartheta^2} & 0 \\ \frac{\vartheta E}{1-\vartheta^2} & \frac{E}{1-\vartheta^2} & 0 \\ 0 & 0 & G \end{bmatrix}$$

Stiffness Matrix for orthotropic lamina:

In the$[S]$ same as above, by arranging equations in matrix form, the stress strain relation can be written as given below

$$\begin{Bmatrix} \varepsilon_{xx} \\ \varepsilon_{yy} \\ \gamma_{xy} \end{Bmatrix} = \begin{bmatrix} S_{11} & S_{12} & 0 \\ S_{21} & S_{22} & 0 \\ 0 & 0 & S_{66} \end{bmatrix} \begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \tau_{xy} \end{Bmatrix} = [S] \begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \tau_{xy} \end{Bmatrix}$$

Where $S_{11} = \frac{1}{E_{11}}$

$$S_{12} = S_{21} = \frac{\vartheta_{12}}{E_{11}} = \frac{\vartheta_{21}}{E_{22}}, \quad S_{22} = \frac{1}{E_{22}}, \quad S_{66} = \frac{1}{G_{12}}$$

The$[S]$ matrix is called the compliance matrix for aspecial orthotropic lamina. Inverting the above equation we can write the stress strain relation for a special orthotropic lamina as:

$$\begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \tau_{xy} \end{Bmatrix} = \begin{bmatrix} Q_{11} & Q_{12} & 0 \\ Q_{21} & Q_{22} & 0 \\ 0 & 0 & Q_{66} \end{bmatrix} \begin{Bmatrix} \varepsilon_{xx} \\ \varepsilon_{yy} \\ \gamma_{xy} \end{Bmatrix} = [Q] \begin{Bmatrix} \varepsilon_{xx} \\ \varepsilon_{yy} \\ \gamma_{xy} \end{Bmatrix}$$

Where$[Q]$represent he stiffness matrix for especially orthotropic lamina. Various elements in the$[Q]$matrixare

$$[Q_{11}] = \frac{E_{11}}{(1 - \vartheta_{12} * \vartheta_{21})}, \quad [Q_{22}] = \frac{E_{22}}{(1 - \vartheta_{12} * \vartheta_{21})},$$

$$[Q_{12}] = [Q_{21}] = \frac{\vartheta_{12} E_{22}}{(1 - \vartheta_{12} * \vartheta_{21})} = \frac{\vartheta_{21} E_{11}}{(1 - \vartheta_{12} * \vartheta_{21})},$$

$$[Q_{66}] = G_{12}$$

General Stiffness Matrix for Orthotropic Lamina (θ≠0°or 90°):

The Stress-Strain relation for a general orthotropic lamina can be expressed in the matrix notation as

$$\begin{Bmatrix} \varepsilon_{xx} \\ \varepsilon_{yy} \\ \gamma_{xy} \end{Bmatrix} = \begin{bmatrix} S'_{11} & S'_{12} & S'_{16} \\ S'_{21} & S'_{22} & S'_{26} \\ S'_{16} & S'_{26} & S'_{66} \end{bmatrix} \begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \tau_{xy} \end{Bmatrix} = [S'] \begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \tau_{xy} \end{Bmatrix}$$

$$S'_{11} = \frac{1}{E_{xx}} = S_{11}\cos^4\theta + (2S_{11} + S_{66})\sin^2\theta\cos^2\theta + S_{22}\sin^4\theta,$$

$$S'_{22} = \frac{1}{E_{yy}} = S_{11}\sin^4\theta + (2S_{12} + S_{66})\sin^2\theta\cos^2\theta + S_{22}\cos^4\theta$$

$$S'_{16} = -m_x = (2S_{11} - 2S_{12} - 2S_{66})\sin\theta\cos^3\theta - (2S_{22} - S_{66})\sin\theta\cos^3\theta$$

$$S'_{26} = -m_y = (2S_{11} - 2S_{12} - S_{66})\sin^3\theta\cos^1\theta - (2S_{22} - 2S_{12} - S_{66})\sin^3\theta\cos\theta$$

$$S'_{66} = \frac{1}{G_{xy}} = 2(2S_{11} + 2S_{22} - 4S_{12} - S_{66})\sin^2\theta\cos^2\theta + S_{66}\sin^4\theta + \cos^4\theta$$

On inverting the stress-strain relations for the general orthotropic lamina can be written as

$$\begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \tau_{xy} \end{Bmatrix} = \begin{bmatrix} Q'_{11} & Q'_{12} & Q'_{16} \\ Q'_{21} & Q'_{22} & Q'_{26} \\ Q'_{16} & Q'_{26} & Q'_{66} \end{bmatrix} \begin{Bmatrix} \varepsilon_{xx} \\ \varepsilon_{yy} \\ \gamma_{xy} \end{Bmatrix} = [Q'] \begin{Bmatrix} \varepsilon_{xx} \\ \varepsilon_{yy} \\ \gamma_{xy} \end{Bmatrix}$$

Where $[Q']$ represents the stiffness matrix for the lamina, variouselementsin$[Q']$are expressed in terms of the elements in the $[Q']$ matrixas

$$\bar{Q}_{11} = Q_{11}\cos^4\theta + Q_{22}\sin^4\theta + (2Q_{12} + 4Q_{66})\cos^2\theta\sin^2\theta,$$

$$\bar{Q}_{12} = (Q_{11} + Q_{22} - 4Q_{66})\cos^2\theta\sin^2\theta + Q_{12}(\cos^4\theta + \sin^4\theta)$$

$$\bar{Q}_{22} = Q_{11}\sin^4\theta + Q_{22}\cos^4\theta + (2Q_{12} + 4Q_{66})\cos^2\theta\sin^2\theta,$$

$$\bar{Q}_{66} = (Q_{11} + Q_{22} - 2Q_{12} - 2Q_{66})\cos^2\theta\sin^2\theta + Q_{66}(\cos^4\theta + \sin^4\theta)$$

$$\bar{Q}_{16} = (Q_{11} - 2Q_{66} - Q_{12})\cos^3\theta\sin\theta - (Q_{22} - Q_{12} - 2Q_{66})\cos\theta\sin^3\theta$$

$$\bar{Q}_{26} = (Q_{11} - 2Q_{66} - Q_{12})\cos\theta\sin^3\theta - (Q_{22} - Q_{12} - 2Q_{66})\cos^3\theta\sin\theta$$

From the above system of equations the following properties of the materials could be inferred.

ElementsS_{16}andS_{26}in the$[S]$matrix or Q_{16}andQ_{26}in the $[Q]$matrix represent extension shearcoupling

- Fromtheaboveequationsitappears that

there are6 elastic constants that govern the stress- strain andthereforearenotindependent.Elementsinboththe $[S']$ and $[Q]$matrices are expressed in terms of the properties in the principalmaterial directions, namely, $E_{11}, E_{22}, G_{12}\ \vartheta_{12}$ which can either experimentally determined or predicted approximately from the constituent properties using the equations.

2. RESULTS ANDDISCUSSION

Composite laminates have been prepared with the same volume fraction of the fiber for all the laminates and have been tested by cutting them into required dimensions to perform tests. All the tests have been performed on the specimens and results obtained from the experiments have been tabulated and graphed.

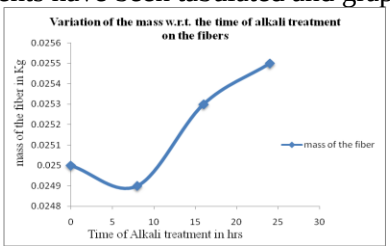


Fig.7. Time of Alkali treatment Vs Mass of the Fiber

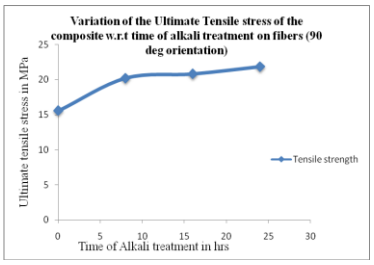


Fig.8. Ultimate stress of the composite (90 deg) Vs Time of alkali treatment

The fig 7 shows the change in the mass of the fiber with the change in the hours of treatment .In this graph we see that the there is a decrease in the fiber mass after 8 hours

of alkali treatment and it increases after 24 hours of alkali treatment.

Tensile test:

The fig 8 gives the information that there is a very little change between 8 and 16 hours of treatment of the fiber; however there is a considerable change in the ultimate stress between 0 and 8 hours of alkalitreatment.

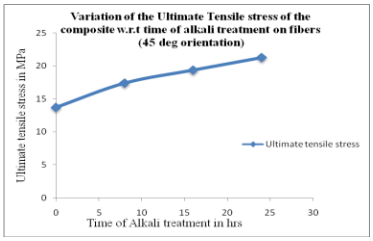


Fig.9.Stress of the composite (45 deg) Vs Time of alkali Treatment

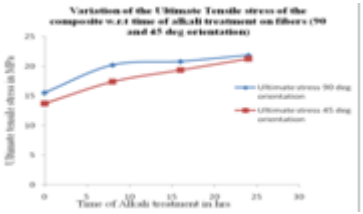


Fig.10.Ultimate stress of the composite (90 deg and 45 deg) Vs Time of alkali treatment

From the Fig.9 we can conclude that the there is a gradual change in the value of ultimate stress of the composite between 0 to 8, 8 to 16 and 16 to 24 hours of treatment which is unlike the change in 90 deg orientation of the composite. From the Fig.10.we can conclude that for all the time intervals of the treatments given to the fiber, the value of ultimate stress of the composite for 90 deg(blue curve) orientation of the fiber is higher when compared to 45 deg (red curve) orientation. And we can also see that both the curves converge at 24 hours of treatment of the fiber.

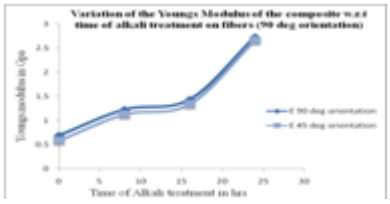


Fig.11. Young's Modulus Vs Time of alkali treatment

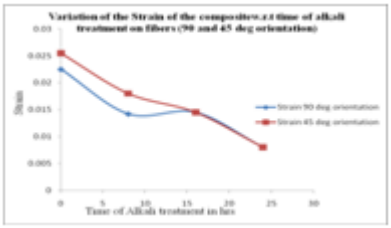


Fig.12. Strain of the composite Vs Time of alkali treatment

The Fig.11 shows the value of Young's modulus of the composite in the both orientations (90 deg and 45 deg).

From the graph we can say that the Young's modulus for the both the orientations of the fiber in the composite at are almost equal.

From the Fig.12 it's clear that in composites of both the orientation of the fiber the strain increases as the time of alkali treatment increases. It is drastic in the 45 deg fiber oriented composite where as we do not see that in 90 deg fiber oriented composite and it does not follow a regular pattern

The flexural test and Impact test:

The fig 13 shows that the flexural strength of the composite

w.r.t time of alkali treatment from 0 to 24 hours is increasing in 90 deg orientation of the fiber. Flexural strength value remains close between 8 hours and 16 hours of treatment of the fiber and then increase between 16 to 24hours.

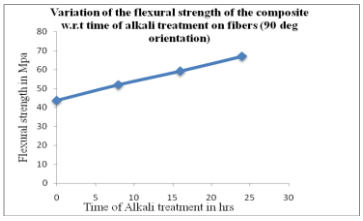


Fig.13. Flexural Strength Vs time of alkali treatment (90 deg Orientation)

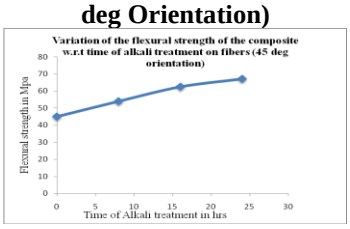


Fig.14. Flexural Strength Vs time of alkali treatment (45 deg Orientation)

The fig 14 shows the Flexural strength value remains close between 8 hours and 16 hours of treatment of the fiber and then increase between 16 to 24 hours of treatment of the fiber and there is also an increase seen between untreated and 8 hours of alkali treatedfiber.

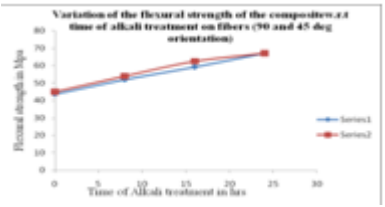


Fig.15. Flexural Strength Vs time of Alkali treatment (90and 45 deg)

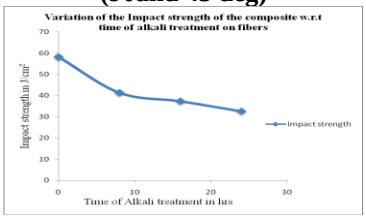


Fig.16. Impact Strength Vs time of Alkali treatment

From the fig 16 we see that the red curve by passes that blue one which means that the flexural strength at the 16 hours of treatment of the fiber in both orientations is same and the flexural strength is higher for the 45 deg orientation of the fiber at 24 hours of fiber treatment than that in 90 deg orientation of the fiber.The above Figure Gives the information about the impact strength of the jute fiber composite between 0 to 24 hours of treatment .We see that the impact strength gradually decreases between untreated to the 24 hours treated jute fiber composite.

3. CONCLUSIONS

- The alkali treatment given to the fibers with the different time intervals first resulted in decrease in the weight of the fiber and then the weight increased between 16 hours of treatment and 24 hours oftreatment.
- The initial decrease in the weight of the fiber could be attributed to the decrease in the hemicelluloses and lignin. The increase in weight after 16 hours of treatment could be because of the regain of the same contents as the fibers are treated for longerduration.
- Rougher surface area and increased surface area of the chemically treated fibers facilitated better interaction between the fiber and the matrix. Thus composite laminate prepared with the chemically modified fibers showed better tensile and flexural properties.
- The composite laminate prepared with the 16 hours alkali treated fibers can be used where weight of the of the material is ofconcern.
- There was a drop in the strain value between the laminates prepared with the untreated and the treated jute fiber which gives an indication that exposing the fibers to the alkali solution for longer duration could result in making the fibers brittle.
- It is observed that the impact strength of the laminates decreased with the increasing hours of alkali treatment of the fibers, which could be because of the strong fiber/matrix adhesion that hinders the energy absorption mechanisms, such as de-bonding and fiber pullout.
- Composites fabricated from the natural fiber can be used where they are subjected to lower values of loads as in house holdappliances.

REFERENCES

1. .P. J. Roe, M. P. Ansell. The study of jute reinforced polyester composites .School of Material Science, University of Bath. Claverton Down. Bath. U.K (1985).
2. A.K. Mohanty, Mubarak A. Khan, G. Hinrichsen. Surface modificationof jute and its influence on performance of biodegradable jute- fabric/Biopol composites. Technical University of Berlin, Institute of Nonmetallic Materials, Polymer Physics, Englische Str. 20, D-10587 Berlin,Germany.(1998)
3. Dipa Ray, B.K.Sarkar, A.K.Rana and N.R .Bose. Effect of alkali treated jute fibers on composite properties. Department of Materials Science, Indian Association for the Cultivation of Science, Kolkata 700 032, India (2001).
4. Joung-Man Park, Son Tran Quang, Byung-Sun Hwang, K. Lawrence De Vries. Interfacial evaluation of modified Jute andHemp fibers/polypropylene (PP)-maleic anhydride polypropylene copolymers (PP-MAPP) composites using micromechanical technique and nondestructive acoustic emission. Composites Science and Technology 66(2005)
5. Thi-Thu-Loan Doan, Hanna Brodowsky Edith Mader. The investigation of Jute fiber/polypropylene composites II. Thermal, hydrothermal and dynamic mechanical behavior. Leibniz Institute of Polymer Research Dresden, Hohe Strasse 6, D-01069 Dresden, Germany(2007).
6. .H.M.M.A. Rushed, M. A. Islam and F. B. Rizvi. Effects of process parameters on tensile strength of jute fiber reinforced thermoplastic composites. Journal of naval architecture and marine engineering (2007).
7. U. S. Ishiakul, X. Y. Yang, Y.W. Leong, H. Hamada, T. Semba, and K. Kitagawa Effects of Fiber Content and Alkali Treatment on the Mechanical and Morphological Properties of Poly(lactic acid)/Poly(caprolactone) Blend Jute Fiber-Filled Biodegradable Composites Journal of Bio based Materials and Bio energy (2007).
8. X. Y. Liu, G. C. Dai. Study of Surface modification and micromechanical properties of jute fiber mat reinforced polypropylene composites State- Key Laboratory of Chemical Engineering, East China University of Science and Technology .China.(2007)
9. E.Sinhal, S.K.Rout, P.K.Barhai. Study of the structural and thermal properties of plasma treated jute fiber. Materials Science & Processing (2008).
10. K. Sabeel Ahmed, S. Vijayaranga. Study of Tensile, flexural and inter laminar shear properties of woven jute and jute-glass fabric reinforced polyester composites journal of materials processing technology (2008).
11. Hazizan Md Akil *, Leong Wei Cheng,Z.A. Mohd Ishak, A. Abu Bakar, M.A. Abdul Rahman. Water absorption study on pultruded jute fiber reinforced unsaturated polyester composites School of Materials and Mineral Resources Engineering, Engineering Campus, University Sains Malaysia (2008).2009
12. Hoi-yen Cheung, Mei-po Ho, Kin-tak Lau, Francisco Cardona , David Hoi Natural fiber-reinforced composites for bioengineering and environmental engineering applications Department of Mechanical Engineering, The Hong Kong Polytechnic University, Kowloon, Hong Kong, SAR, China.(2008)
13. .S.Rassmann, R.Paskaramoorthy, R.G. Reid. Effect of resin system on the mechanical properties and water absorption of kenaf fiber reinforced laminates. School of Mechanical, Industrial and Aeronautical Engineering, University of the

Witwatersrand, Johannesburg, Wits 2050, South Africa (2010).
14. .A.A. Sheikh and S.A. Channiwala. Study the Characteristics of Jute Polyester Composite for Randomly Distributed Fiber Reinforcement. Proceedings of the World Congress on Engineering (2010) .
15. .Mohammad K. Hossain, Mohammad W. Dewan, Mahesh Hosur, Sheik Jeelani. Mechanical performances of surface modified jute fiber reinforced biopolnanophased green composites. Tuskegee University Center for Advanced Materials (T-CAM), Tuskegee University, USA (2011)

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

DESIGN AND 3D PRINTING OF FOOT AND ANKLE-FOOT ORTHOSES

[1]Dr. T.Shrihari , [2]Mr. Naseeb Khan, [3] Mr. Rahamthulla Khan , [4]Mr,Makdoom
[1]Professor & HOD, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[2]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[3]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[4]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.

ABSTRACT- Many people with disabilities require positioning of the feet and stability at the ankles, which is achieved through the use of an ankle-foot orthotics (AFO). Models currently in use are bulky, uncomfortable, and hard to put on, especially for pediatric patients. These patients visibly have trouble walking as their oversized shoes, necessary for the insertion of the AFO, get in the way. The goal of this research is to design a AFO to solve the current issues. The design is constructed with many considerations taken into account. Finally, structure is modeled in Creo (Pro-E) software and saved in IGES format, Then the model is imported in Ansys software for analyzing various stresses, at last manufacturing process takes place with the help of 3D printing.

1. INTRODUCTION

The Ankle-foot-orthotics (AFOs) is externally applied assistive devices that are prescribed to the patients with neuromuscular dysfunctions in order to improve abnormal lower limb motor functions. AFO's are mainly used to control the range of motion of the ankle joint, to compensate for the muscle weakness caused by different motor neuron diseases, to improve the gait functions during post-operative stages and to optimize the efficiency of walking.

Different types of AFO's are used to treat different dysfunctions. Each type of AFO's has its characteristic function. However, AFO's with same function can have different designs that differ in material, geometry, additional mechanism and components which affect the comfort, cost of AFO and oxygen consumption of patients. Additionally, recent advances in different technology areas, such as 3D manufacturing, three dimensional (3D) scanning and CAD-CAM (computer aided design-computer aided manufacturing) have led to new designs and manufacturing methods for AFO's. The objective of this project is to provide a design, analyze, and manufacture of AFO's.

2. LITERATURE SURVEY

First of all, it would be beneficial to describe orthoses and prosthesis concepts that are mostly confused with each other. Briefly, orthoses are braces to support dysfunction of a body part, while prostheses are artificial parts to replace a missing body part. Prostheses are devices for external and internal use. External prostheses, such as prosthetic legs or prosthetic breast form used after mastectomy (Lake, Ahmad, & Dobrashian, 2013), can be employed for cosmetic and also functional aims with the developments in prosthetic technology. On the other hand, internal prostheses, such as artificial knee joints (Guo, Hao, & Wan, 2016) and cataract lenses (Heys & Truscott, 2008) are devices which are surgically implanted within a body.

Orthoses are assistive devices that are used to align, protect and assist limbs or body parts besides supporting to treat deformities. Orthoses can be used for neurological conditions, injuries and congenital deformities. Orthoses are designed as standard or custom made forms from an individual mold in the shape of patient's foot. Orthoses can be divided into two classes, i.e. i) standard orthoses for general use and ii) custom made orthoses that are prescribed for more complex conditions. Orthoses are used for lower extremity (Moisan & Cantin, 2016), upper extremity (Belda-Lois et al., 2006), and spine (Hofmann et al., 2016). Lower extremity orthoses have a wide range of use that are designed for hip, knee and ankle joints' immobilizations. They reduce energy consumption and pain as assisting the gait and improving the posture. Development of lower extremity orthotic technologies and new materials lead to new designs and manufacturing methods, and also affect selection criteria of orthoses.

AFO's are braces encompassing the lower leg, ankle joint and foot of the patients. AFO's provide stability in the ankle joint and biomechanical control above and below of ankle. For example, a patient with crouch gait pathology (walking with flexed knees) can reduce knee flexion during stance phase by using an AFO. Because, AFO produces a moment around the ankle joint that prevents ankle dorsiflexion in stance phase, which prevents excessive knee flexion by directing the ground reaction force in front of the knee joint center. They are manufactured using metal and plastic materials. However, plastic AFOs are more preferred than metal ones, because they are lighter and more cosmetic (Franceschini et al., 2001). Also it was reported that custom plastic AFOs decrease oxygen consumption in the patients. However, the patients, who want to use AFO, should have sufficient active hip flexion to propel their legs. And their quadriceps muscle strength should be greater than four or five grade according to manual muscle test (Hsu, Michael, & Fisk, 2008).

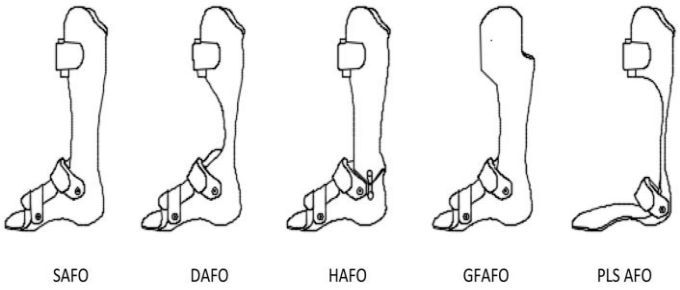


Fig- 2.1.1: Typical examples of ankle foot orthoses

There are several different types of AFOs for different biomechanical aims. Solid ankle foot orthosis (SAFO) (Ridgewell, Rodda, Graham, & Sangeux, 2015) rigidly supports ankle and prevent any movement at the ankle. Dynamic ankle foot orthosis (DAFO) provides subtalar stabilization. Unlike solid AFO models, this device allows ankle to dorsiflex and partially limits the plantarflexion (Sherief, Gazya, & El Gafaar, 2015). Hinged ankle foot orthosis (HAFO) is also a type of dynamic AFO which let the dorsiflexion exists during gait. On the other hand, HAFO is commonly used to restrict three-dimensional ankle mobility and limit the motion of ankle joint within the sagittal plane (Leardini, Aquila, Caravaggi, Ferraresi, & Giannini, 2014). Ground reaction ankle foot orthosis (GRAFO) is used to reduce excessive knee flexion (Ries & Schwartz, 2015). This type of orthoses has a solid part below the knee (pre-tibial support) which doesn't allow the knee joint moving forward. Posterior leaf spring ankle foot orthosis (PLS AFO) is used to primarily for foot drop in order to control plantarflexion during heel strike and swing phases to improve the functional quality of locomotion (Leone, 1987). All these AFOs have different characteristics, since they are designed for specific goals. Different characteristics of AFOs meet specific needs which result from injuries and diseases, such as foot drop (Everaert et al., 2013), cerebral palsy (van Beeten, Hartman, & Houdijk, 2015), spina bifida (Duffy, 1997) and hemiplegia (Nolan, Savalia, Lequerica, & Elovic, 2009).

AFO, with physical therapy combination, is widely used to provide adequate proper heel contact at initial-contact, to prevent premature heel-rise and to increase stance phase stability during walking (Rethlefsen, Kay, Dennis, Forstein, & Tolo, 1999). Solid, articulated and leaf spring AFOs are widely used in clinics which, in literature, were reported improving gait velocity and gait dynamics (White, Jenkins, Neace, Tylkowski, & Walker, 2002), preventing excessive plantar flexion instance, providing adequate dorsiflexion in initial-contact and swing phases (Lam, Leong, Li, Hu, & Lu, 2005; Romkes, Hell, & Brunner, 2006), and improving natural position of the foot in late swing for hemiplegic children (Van Gestel, Molenaers, Huenaerts, Seyler, & Desloovere, 2008). Solid AFOs are used to prevent excessive plantar and dorsiflexion of the ankle during walking to enhance the stability in stance, reduce the abnormal motion at ankle and foot. The simplest way of creating a hinge motion in AFO is to trim material away around the ankle, which makes the material more flexible at this point. This is so called posterior leaf spring AFO, which capable of limiting plantar flexion and allowing dorsiflexion as required. The amount of dorsiflexion is directly related with the amount of trimming from the back of the ankle (Morris, 2007). On the other hand, hinged AFO is only prescribed to prevent either plantar flexion or dorsiflexion of the ankle (Morris, 2007). It was revealed in literature that dynamic parameters of walking are significantly improved by using solid and articulated AFO, although, in terms of these gait parameters, there was no significant superiority of any of these AFOs on another (Radtka, Skinner, & Johanson, 2005; Radtka, Skinner, Dixon, & Johanson, 1997; Eddison & Chockalingam, 2013).

Sophisticated analysis tools (computerized gait analysis, force platform, electromyography etc.), video based gait analysis methods (Edinburg Visual Gait Scale) or functional assessment scales (Gross Motor Functional Measure, PEDI etc.) are utilized to evaluate the gait parameters (Bella, Rodrigues, Valenciano, Silva, & Souza, 2012; Dalvand, Dehghan, Feizi, Hosseini, & Amirsalari, 2013). These tools are valuable to compare the effects of the AFO for the patient and to tune the

AFO in order to increase the influence on related gait parameters (gait velocity, step length, kinetics and kinematics).

3. DESIGNING PROCEDURE OF AFO IN CREO SOFTWARE

3.1 Introduction to Creo Software:

The feature-based parametric modeling technique enables the designer to incorporate the original design intent into the construction of the model. The word parametric means the geometric definitions of the design, such as dimensions, can be varied at any time in the design process. Parametric modeling is accomplished by identifying and creating the key features of the design with the aid of computer software. The design variables, described in the sketches and features, can be used to quickly modify/update the design.

In Creo Parametric, the parametric part modeling process involves the following steps:

1. Set up Units and Basic Datum Geometry.
2. Determine the type of the base feature, the first solid feature, of the design.

Note that Extrude, Revolve, or Sweep operations are the most common types of base features.

3. Create a rough two-dimensional sketch of the basic shape of the base feature of the design.
4. Apply/modify constraints and dimensions to the two-dimensional sketch.
5. Transform the two-dimensional parametric sketch into a 3D feature.
6. Add additional parametric features by identifying feature relations and complete the design.
7. Perform analyses/simulations, such as finite element analysis (FEA) or cutter path generation (CNC), on the computer model and refine the design as needed.
8. Document the design by creating the desired 2D/3D drawings.

3.2 Starting Creo Parametric:

1. Select the Creo Parametric option on the Start menu or select the Creo Parametric icon on the desktop to start Creo Parametric. The Creo Parametric main window will appear on the screen.
2. Click on the New icon, located in the Ribbon toolbar as shown.

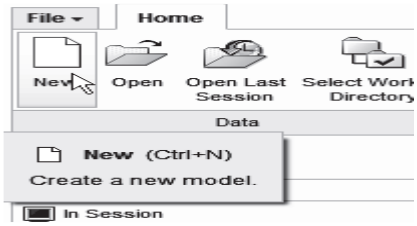


Fig-3.2.1: Selection of NEW

3. In the New dialog box, confirm the model's Type is set to Part (Solid Subtype).
4. Enter Adjuster as the part Name as shown in the figure.
5. Turn off the Use default template option.
6. Click on the OK button to accept the settings.
7. In the New File Options dialog box, select EMPTY in the option list to not use any template file.
8. Click on the OK button to accept the settings and enter the Creo Parametric Part Modeling mode.

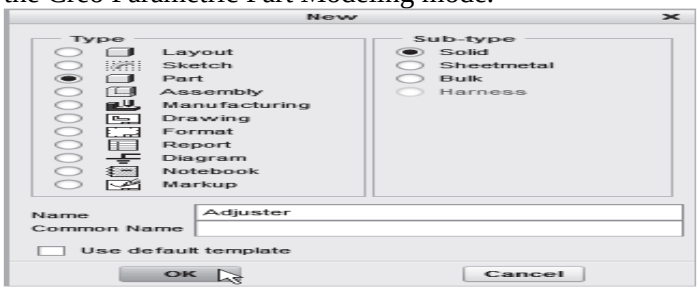


Fig-3.2.2: Selection of PART

3.3 Design procedure of AFO:

For designing the AFO the following procedure has to be followed

- To draw a model, first open the creo software.
- Then select the NEW option & select the SOLID GEOMETRY.
- Then select a sketch & then select the plane.

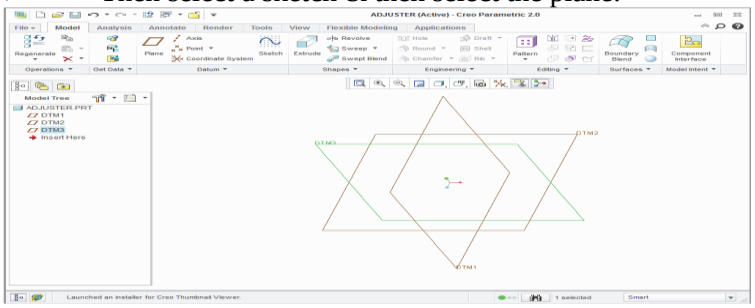


Fig-3.3.1: Selection of PLANE

- Then draw a model by using various types of tools provided init (i.e., lines, spline, circles, etc)
- Then click on the OK.
- Then go for extrude & give extrude up to 10mm, Then click OK.

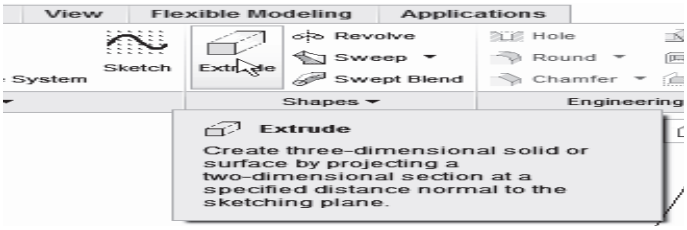


Fig-3.3.2: Selection of EXTRUDE

- Then select the plain & again draw a sketch to provide hinges & extrude the hinges.

➢ Then go to the sketch & select plane then provide a hole upon the hinges.
➢ Finally the model is ready & can be saved in IGES format.

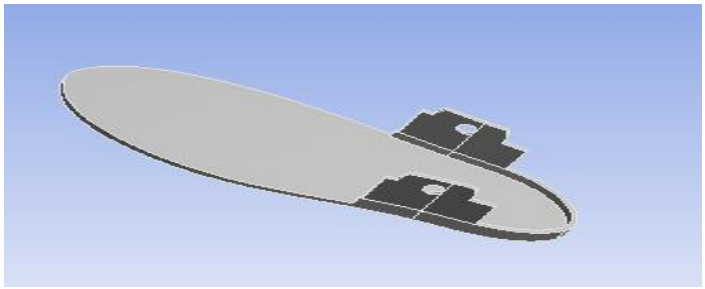


Fig-3.3.3: DESIGNED PART OF ANKLE FOOT ORTHOTICS IN CREO SOFTWARE

4. ANALYSIS DEFINATION & STEPS

Analysis is defined as a systematic examination and evaluation of data or information, by breaking it into its component parts to uncover their interrelationships.
The steps needed to perform an analysis depend on the study type. You complete a study by performing the following steps:
➢ Create a study defining its analysis type and options.
➢ If needed, define parameters of your study. A parameter can be a model dimension, material property, force value, or any other input.
➢ Define material properties.
➢ Specify restraints and loads.
➢ The program automatically creates a mixed mesh when different geometries (solid, shell, structural members etc.) exist in the model.
➢ Define component contact and contact sets.
➢ Mesh the model to divide the model into many small pieces called elements.
➢ Fatigue and optimization studies use the meshes in referenced studies.
➢ Run the study.
➢ View results.

4.1 Analysis on AFO by using ansys 14.0 work bench software:

The analysis of AFO model is carried out using ANSYS software using Static Structural Method.
➢ Firstly the model files prepare in the CREO SOFTWARE.
➢ The file should be saved as IGES format.
➢ Then are exported to ANSYS software as an IGES files as shown in figure.

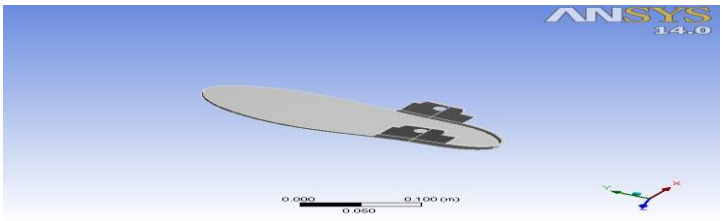


Fig-4.1.1: Static Structural Analysis

4.2 Materials and their properties:

➢ CARBON FIBER:

Density (g cm^-3)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
0.0018	3E+11	0.3	2.5E+11	1.1538E+11

➢ GLASS FILLED NYLON:

Density (g cm^-3)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
1.6	1.45E+10	0.35	1.6111E+10	5.3704E+09

➢ ABS:

Density (g cm^-3)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
1.05	2.5E+09	0.35	2.7778E+09	9.2593E+08

➢ NYLON:

Density (g cm^-3)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
0.00115	2.5E+09	0.4	4.1667E+09	8.9286E+08

➢ POLYPROPLENE:

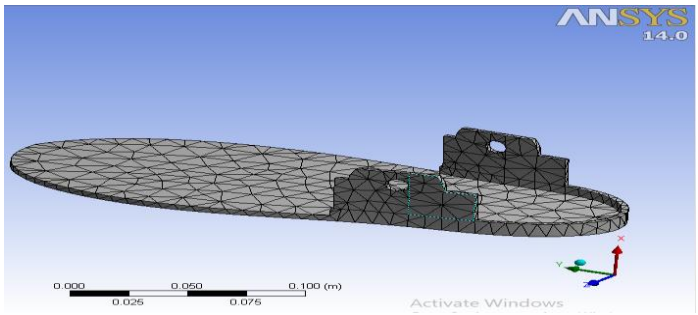
Density (g cm^-3)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear
0.9	1.4E+09	0.42	2.9167E+09	4.929

➢ PVC:

Density (g cm^-3)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)	Shear Modulus (Pa)
0.00135	3.3E+09	0.4	5.5E+09	1.1786E+09

4.3 Meshing:

Meshing is probably the most important part in any of the computer simulations, because it can show drastic changes in results you get. Meshing means you create a mesh of some grid-points called 'nodes'. It's done with a variety of tools & options available in the software. The results are calculated by solving the relevant governing equations numerically at each of the nodes of the mesh. The governing equations are almost always partial differential equations, and static structural method is used to find solutions to such equations. The pattern and relative positioning of the nodes also affect the solution, the computational efficiency & time.



Mesh Type: Tetrahedral
No. of nodes: 3325
No. of elements: 1727

Fig-4.3.1: MESHING

4.4 Load & fixed support:

➢ Fixed support :

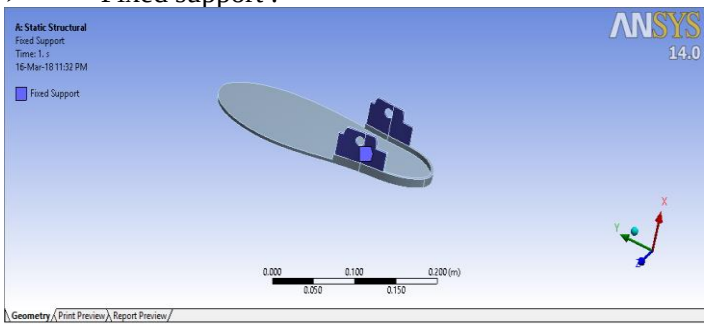


Fig-4.4.1: FIXED SUPPROT

➢ Pressure :-785pa :

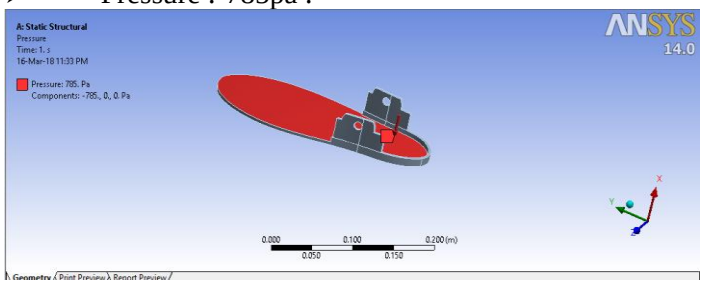


Fig-4.4.2: PRESSURE

5. STRUCTRUAL ANALYSIS RESULTS:

5.1 Material: Carbon Fiber :

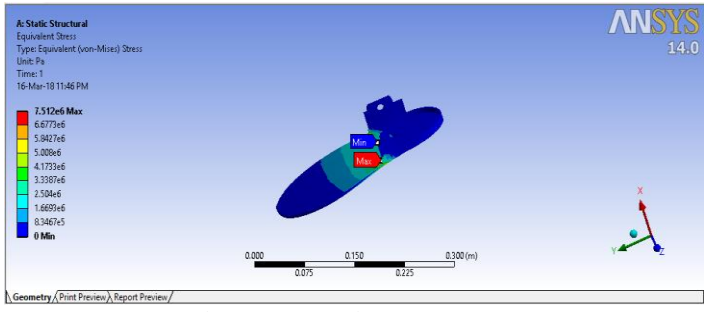


Fig-5.1.1: Maximum Stress

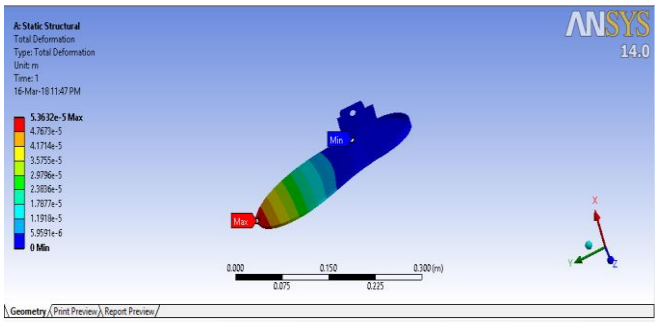


Fig-5.1.2: Total Deformation

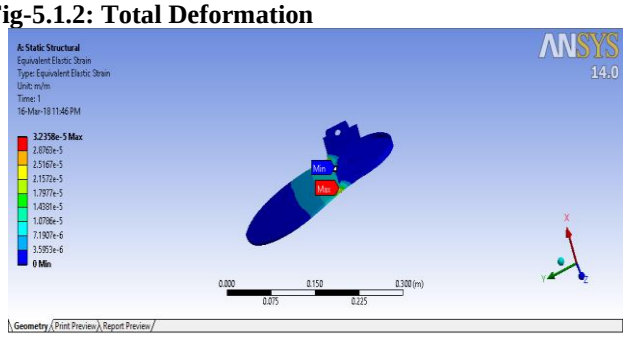


Fig-5.1.3: Maximum Strain

5.2 Material: Glass filled nylon:

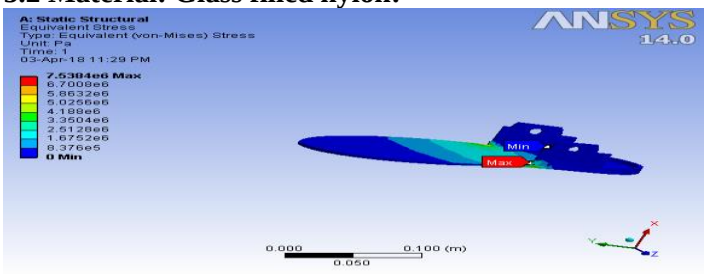


Fig-5.2.1: Maximum Stress

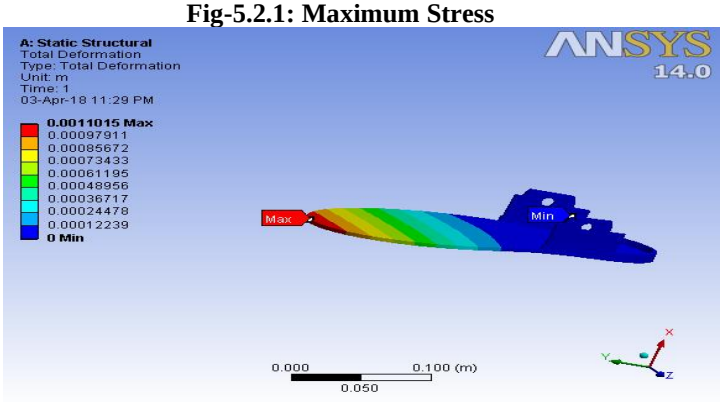


Fig-5.2.2: Total Deformation

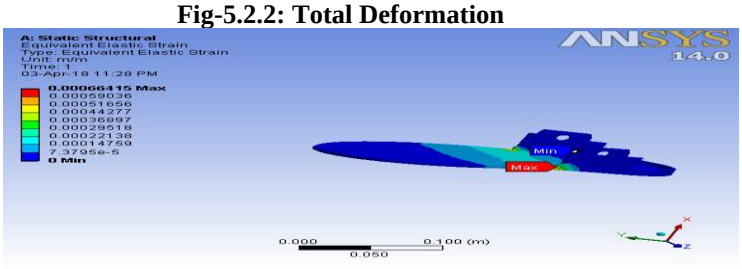


Fig-5.2.3: Maximum Strain

5.3 Material: PVC :

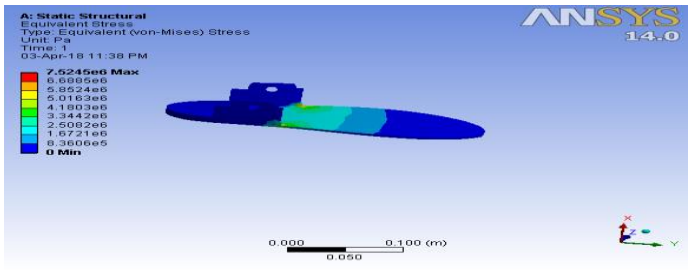


Fig-5.3.1: Maximum Stress

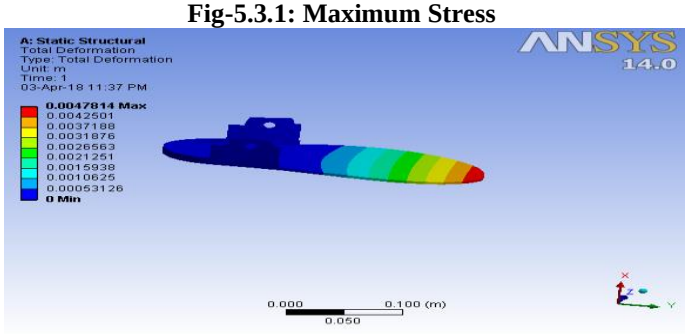


Fig-5.3.2: Total Deformation

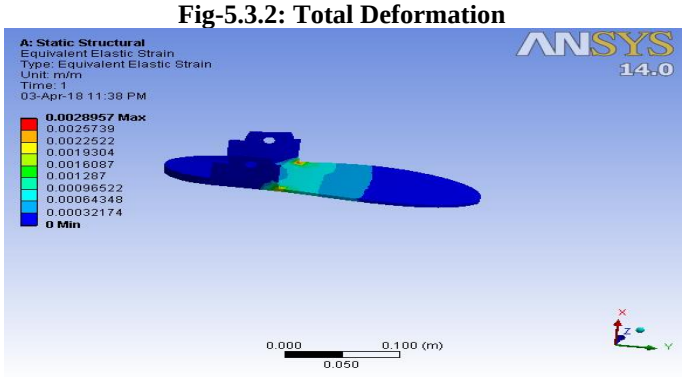


Fig-5.3.3: Maximum Strain

5.4 Material: Polypropylene:

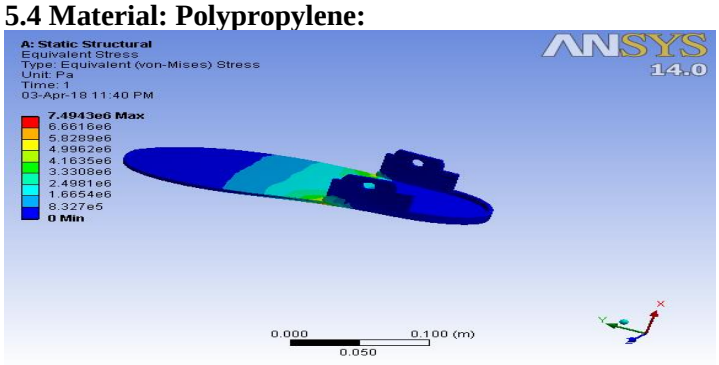


Fig-5.4.1: Maximum Stress

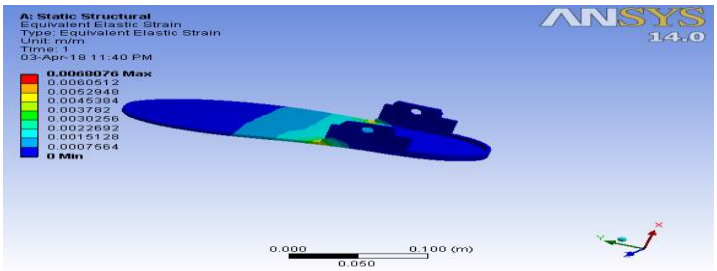


Fig-5.4.2: Maximum Strain

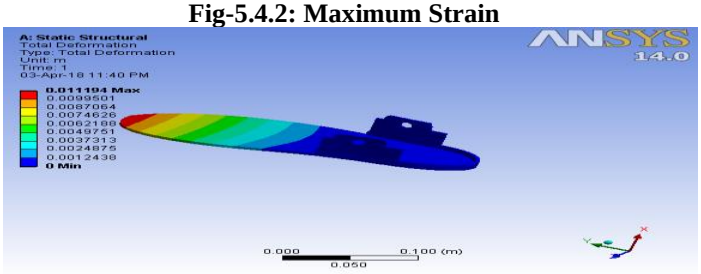


Fig-5.4.3: Total Deformation

5.5 Material: ABS:

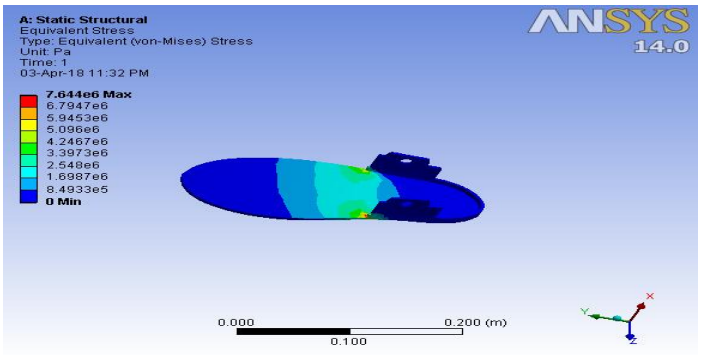


Fig-5.5.1: Maximum Stress

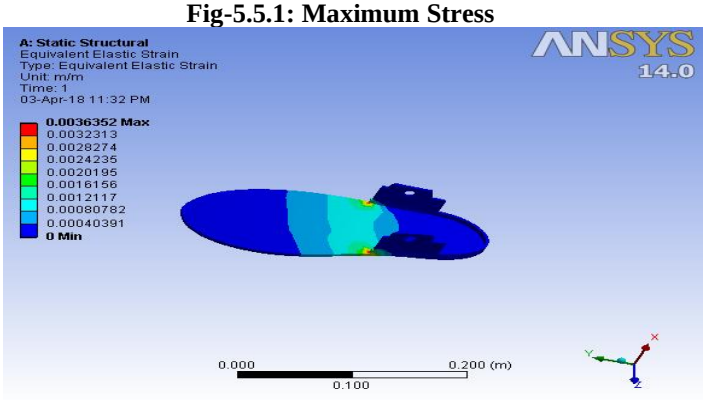


Fig-5.5.2: Maximum Strain

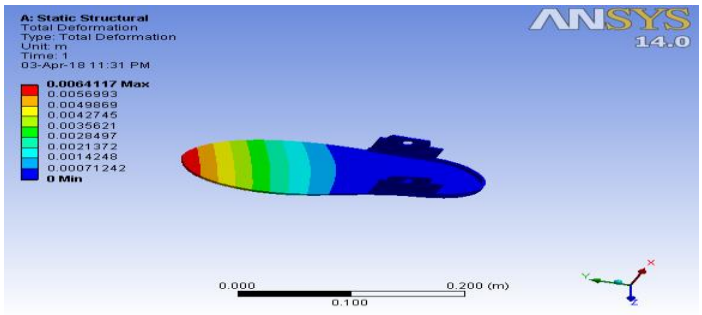


Fig-5.5.3: Total Deformation

5.6 Material: Nylon:

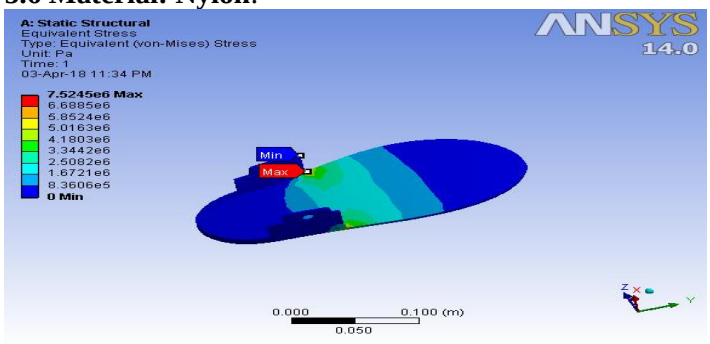


Fig-5.6.1: Maximum Stress

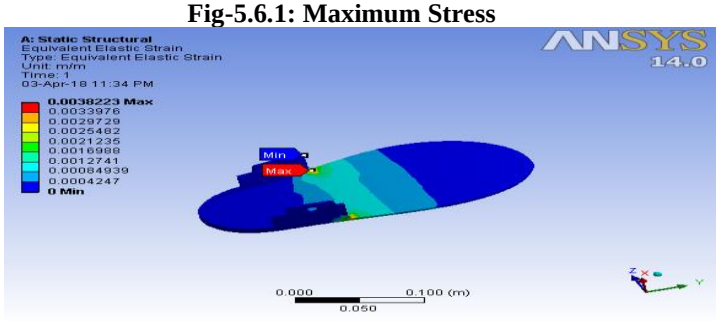


Fig-5.6.2: Maximum Strain

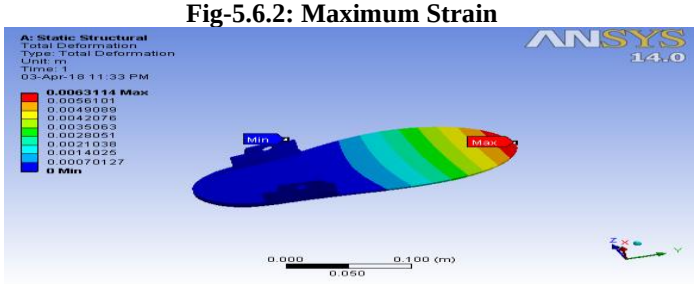


Fig-5.6.3: Total Deformation

6. MANUFACTURING OF AFO BY USING 3D PRINTING

6.1 Material used in Manufacturing of AFO:

As we have done Analysis upon various types of materials, among all the materials the CARBON FIBER was the best suitable material which can resist load.

So, finally we have decided to select CARBON FIBER as a part of best material for manufacturing of AFO.

6.2 Procedure for Manufacturing of AFO:

The following steps are to be followed for manufacturing of AFO by using 3D Printing,

- Produce a 3-D model using CREO software (CAD). The software may provide some hint as to the structural integrity you can expect in the finished product, too, using scientific data about certain materials to create virtual simulations of how the object will behave under certain conditions.
- Convert the CAD drawing to the STL format. STL, which is an acronym for STANDARD TESSELLATION LANGUAGE, is a file format developed for 3D Systems.
- A user copies the STL file to the computer that controls the 3-D printer. There, the user can designate the size and orientation for printing. This is similar to the way you would set up a 2-D printout.
- Each machine has its own requirements for how to prepare for a new print job. This includes refilling the polymers, binders and other consumables the printer will use. It also covers adding a tray to serve as a foundation or adding the material to build temporary water-soluble supports.
- Let the machine do its thing; the build process is mostly automatic. Each layer is usually about 0.1 mm thick, though it can be much thinner or thicker. Depending on the object's size, the machine and the materials used, this process could take hours or even days to complete. Be sure to check on the machine periodically to make sure there are no errors.
- Remove the printed object from the machine. Be sure to take any safety precautions to avoid injury such as wearing gloves to protect yourself from hot surfaces or toxic chemicals.
- Many 3-D printers will require some amount of post-processing for the printed object. This could include brushing off any remaining powder or bathing the printed object to remove water-soluble supports. The new print may be weak during this step since some materials require time to cure, so caution might be necessary to ensure that it doesn't break or fall apart.
- At last, make use of the newly printed object.

Fig-6.2.1: Formation of First Layer in 3D Printing

Fig-6.2.2: Formation of Second Layer

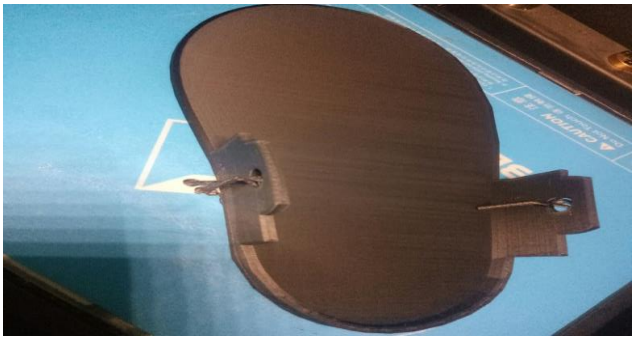


Fig-6.2.3: Final 3D Printed AFO

7. FUTURE SCOPE:

Orthotic designs focus on the improvement of the function and stability of patients during ADL. Therefore, different movement types require different supports or facilitations. Orthoses need to be lighter, more durable, more skin friendly and smarter. If smart designs and smart materials gather with better understanding of the patients' need, the orthotics may find an important role in their life. Also it is expected that with the improvement of the 3D Printing manufacturing techniques, more subject-specific AFOs would be fabricated, thereby leading to eliminate the most of the problems stemmed from the standard and common approaches on patients with different demands and diseases.

8. CONCLUSION:

This project is intended to be useful for the orthotics, physiotherapists and engineers as well as the other health specialists who are eager to know about the usage of AFOs, their different designs, and different ways of their manufacture.

Finally, we to conclude that:

- Brief study about AFO is done in this project.
- Designing, Analysis, and Manufacturing of AFO is done.
- A reasonable factor of safety for the studied AFO design was obtained for axial force.
- The static structural analysis has carried out in the ansys 14.0 software and the materials used here is Carbon Fiber, Glass Filled Nylon, Nylon, Polypropylene, PVC, ABS.
- The utmost stress, strain and deformation values of static analysis are tabulated on load condition of 785Pa.
- The material used for manufacturing of AFO is Carbon Fiber.
- Finally, Manufacturing of AFO is carried out in 3D printed machine.
- Strength to weight ratio for the AFO can be improved by material optimization at the calf and foot elements of the AFO.
- However, the design needs to be revised for sustaining axial loads.
- One way of increasing the strength is to add more material by increasing thickness in regions of excessive stresses.

REFERENCES

1. K. A. Shorter, J. Xia, E. T. Hsiao-Wecksler, W. K. Durfee, and G. F. Kogler, "Technologies for Powered Ankle-Foot Orthotic Systems: Possibilities and Challenges," IEEE/ASME Trans. Mechatronics, vol. 18, no. 1, pp. 337–347, Feb. 2013.
2. H. K. Banga, P. Kalra, R. M. Belokar, and R. Kumar, "Development of Ankle Foot Orthoses (AFO) to enhance walking and balance on Foot Drop Patients in India," in Proceedings 19th Triennial Congress of the IEA, 2015, no. August, pp. 1–7.
3. J. H. P. Pallari, K. W. Dalgarno, J. Munguia, L. Muraru, L. Peeraer, S. Telfer, and J. Woodburn, "DESIGN AND 3D PRINTING OF FOOT AND ANKLE-FOOT ORTHOSES," in 6th International Conference on Additive Manufacturing, 2011, pp. 834–845.
4. N. Jamshidi, M. Rostami, S. Najarian, M. B. Menhaj, M. Saadatnia, and S. Firooz, "Modelling of human walking to optimise the function of ankle-foot orthosis in Guillan-Barré patients with drop foot.," Singapore Med. J., vol. 50, no. 4, pp. 412–7, Apr. 2009.
5. A. I. Kottink, H. J. Hermens, A. V. Nene, M. J. Tenniglo, H. E. van der Aa, H. P. Buschman, and M. J. IJzerman, "A Randomized Controlled Trial of an Implantable 2-Channel Peroneal Nerve Stimulator on Walking Speed and Activity in Poststroke Hemiplegia," Arch. Phys. Med. Rehabil., vol. 88, no. 8, pp. 971–978, Aug. 2007.
6. Douglas Hale, et al,"Treating Drop foot With Ankle-Foot Orthosis", Foot and Ankle Center of Washington, Seattle, USA, 2009.
7. C. E. Dombroski, M. E. Balsdon, and A. Froats, "The use of a low cost 3D scanning and printing tool in the manufacture of custom-made foot orthoses: a preliminary study," BMC Research Notes, vol. 10, no. 7, p. 443, 2014.
8. E. Suaste-Gomez, G. Rodriguez-Roldan, H. Reyes-Cruz, and O. Teran-Jimenez, "Developing an ear prosthesis fabricated in polyvinylidene fluoride by a 3D printer with

sensory intrinsic properties of pressure and temperature," Sensors, vol. 16, no. 3, 2016.
9. J. Li, M. Chen, X. Fan, and H. Zhou, "Recent advances in bioprinting techniques: approaches, applications and future prospects," Journal of Translational Medicine, vol. 14, p. 271, 2016.
10. J. Zuniga, D. Katsavelis, J. Peck et al., "Cyborg beast: a low-cost 3d-printed prosthetic hand for children with upper-limb differences," BMC Research Notes, vol. 8, no. 10, p. 10, 2015.
11. K. H. Lee, S. J. Kim, Y. H. Cha, J. L. Kim, D. K. Kim, and S. J. Kim, "Three-dimensional printed prosthesis demonstrates functional improvement in a patient with an amputated thumb: a technical note," Prosthetics and Orthotics International, 2016.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

AN OVERVIEW OF JOINING OF AL AND ITS ALLOYS BY FUSION AND SOLID-STATE WELDING PROCESSES

[1]Mr. Ravi Prakash, [2]Mr. Mudassir, [3]Mr. N. Raja Srikanth,
[1]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[2]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[3]Professor, Department of Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008

ABSTRACT- Among all the non-ferrous materials, aluminium is widely employed in various aerospace, defence and industrial applications. The natural qualities, of aluminium and its alloys, like lightness, electrical and thermal conductivity, corrosion resistance, suitability for surface treatments, the diversity of the alloys and intermediates, ease of use, recycling make them usable in many applications. The applications demand the manufacturing of components by a superior manufacturing process, so that the products will be without any defects. Welding is one such process which is widely used in fabrication of aluminium components. Both fusion and solid- state welding processes are employed in the manufacturing of aluminium components. An attempt is made in this paper to take an overview of some fusion welding and some solid-state welding processes to weld Al and its alloys with a focus on the process parameters of these processes, tools used, micro structure of the welded specimens, thermal profiles, strength of joints and heat treatment. This is an attempt understand and summarize the issues related to welding of aluminium and its alloy

Keywords— Process parameters, microstructure, Aluminium.

1. INTRODUCTION

Pure aluminium is relatively soft. Generally, it cannot meet the demands made on advanced materials for high yield stress and high temperature performance as strength should not be lost at increased working temperatures and processing temperatures [1]. It is possible to some extent to meet these demands by means of alloying and heat treatment. The typical alloying elements in aluminium are copper, magnesium, manganese, silicon, tin and zinc. Alloying elements are selected based on their effects and suitability [2]. Based on the type of alloying element, the aluminium alloys are divided into 8 groups. They are 1xxx, 2xxx, 3xxx, 4xxx, 5xxx, 6xxx, 7xxx, 8xxx. Each alloy system is metallurgically distinct. Furthermore, different alloys within the given class may have different properties and characteristics. As a result processing for each alloy may vary. Aluminium and aluminium alloy are gaining huge industrial significance because of their excellent combination of mechanical, physical and tribological properties. One of the major routes of fabrication of theses alloys for various application in welding. Joining of aluminium and its alloys was never an easy task due to the various problems. This paper is an attempt to take an overview of problems associated with welding of aluminium and its alloys employing various conventional fusion welding techniques and solid state weldingtechniques.

2. WELDING PROCESSES

Gas Tungsten Arc Welding (GTAW)

GTAW is also known as Tungsten Inert Gas (TIG) welding. It is the welding process, in which heat is generated by an electric arc struck between a tungsten non-consumable electrode and the work piece as shown in “Fig.1”. The weld pool is shielded by an inert gas (Argon, helium, Nitrogen) protecting the molten metal from atmospheric contamination.The heat produced by the arc melts the work pieces edges and joins them. Filler rod may be used, if required. Automation or mechanization of the TIG process can have a number of benefits. These include the ability to use faster travel speeds, resulting in less distortion and narrower heat affected zones[3].

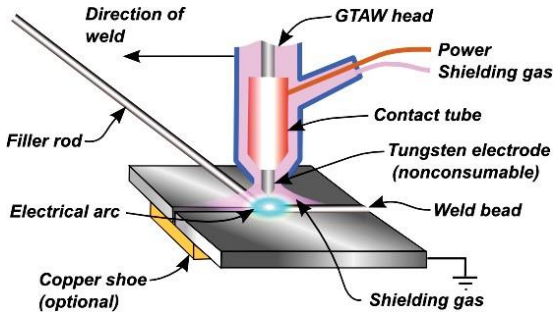


Fig. 1: Schematic of TIG Welding

Gas Metal Arc Welding (GMAW)

GMAW is also known as Metal Inert Gas (MIG) welding. The GMAW process was developed in the 1950s.In this process an electric arc forms between a

consumable wire electrode and the work piece metal(s), which heats the work piece metal(s), causing them to melt and join as shown in "Fig.2". The weld area is shielded by an external source, such as argon, helium, carbon dioxide, or various other gas mixtures. The consumable bare wire is fed automatically through a nozzle into the weld arc. This process is used as a highly efficient process for welding various types of metals [4]. The basic GMAW process includes three distinctive process techniques they are Short Circuit (Short Arc), Globular Transfer and Spray Arc Transfer. The GMAW process is flexible in its ability to provide sound welds for a very wide base material type and thickness range. And this process is dominant today as a joining process among the world's welding fabricators. Despite its sixty years of history, research and development continue to provide improvements to this process.

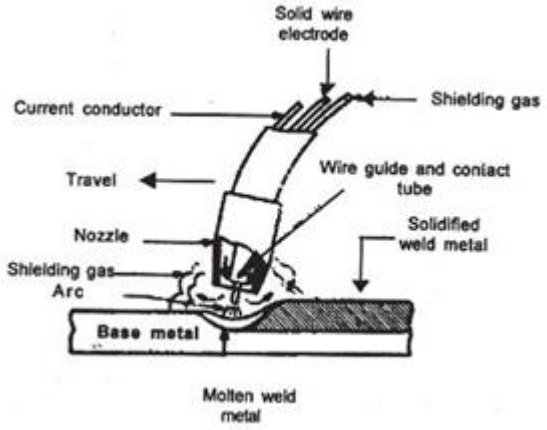


Fig. 2: Schematic of GMAW Process

Friction Welding

Friction welding is widely used solid state welding method for joining of similar or dissimilar metals. Friction welding requires rapid rotation of one component at high rpm and other component is brought into contact at high forging pressure to get upset as shown in "Fig.3". Two pieces rotate in contact and heat necessaryfor

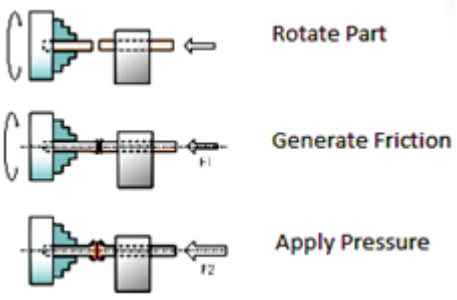


Fig. 3: Schematic of Friction Welding

welding is generated on friction plane. One important characteristic of friction welding is its ability to weld alloys and combination of alloys previously regarded as unweldable [5]

Friction Stir Welding

Friction-stir welding (FSW) is a solid-state joining process is used when the original metal characteristics must remain unchanged as much as possible and also the metal is not melted. It is primarily used on aluminum and most often on large pieces that cannot be easily heat-treated after welding to recover temper characteristics. A constantly rotated non consumable cylindrical-shouldered tool with a profiled pin is transversely fed at a constant rate into a butt joint between two clamped pieces ofbutted material shown in "Fig.4". The pin is slightly shorter than the weld depth required, with the tool shoulder riding atop the work surface. Frictional heat is generated between the wear-resistant welding components and the work pieces. This heat, along with the heat generated by the mechanical mixing process and the adiabatic heat within the material, cause the stirred materials to soften without melting. It isdemonstrated that FSW of aluminum is becoming an increasingly mature technology with numerous commercial applications[6].

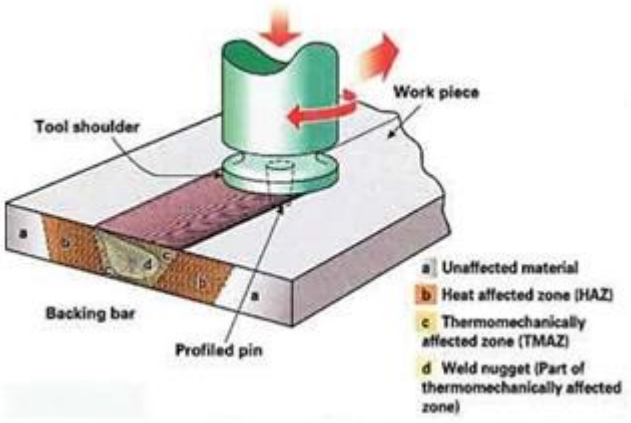


Fig. 4: Schematic Of Friction Stir Welding

3. STUDIES ON SIMILAR METAL TIG ALUMINIUM WELDS

In TIG welding process, a non-consumable tungsten electrode is used to produce the weld. The weld zone is protected from the atmospheric oxidation by means of a shielding gas. This shielding gas may be argon or helium and a filler material is used to fill the gap between the work pieces. A constant-current welding power supply produces an electric arc between the tungsten electrode and the work piece. The primary functions of the arc are to supply heat to melt the work piece and any filler metal which may be necessary [7]. Rectifier supplies the power through a welding torch and is delivered to the tungsten electrode through it. An electric arc is then created between the tungsten electrode and the work piece

usinga constant-current welding power supply that produces energy and conducted across the arc through a column of highly ionized gas and metal vapours. Power source, type of current, gas flow rate, electrodes, filer wire, TIG Machines settings, and shielding gases are most important in determining arc stability, arc penetration and defect freewelds.

Following is the brief overview of the findings of TIG welding of Al alloys:

Lakshman Singh et al [8] considered welding current, gas flow rate and welding speed into account as input parameters. They studied that keeping the gas flow rate constant and for different values of welding current, the front width and back width of weld bead increases linearly. And at constant current and increase in welding speed, the front and back widths decreased linearly.

Lakshman Singh et al [9] welded 5083 Al – alloy and they found that at constant current and voltage and with the increase in welding speed, the depth of penetration will increase until an optimum value which shows maximum penetration. Beyond an optimum value, there is a decrease in depth ofpenetration.

K. M Eazhil et al [10] used Taguchi experimental design for determining the successful welding parameters. Pulse current, base current, Pulse Frequency are considered as working range process parameters and Shielding gas, Shielding gas flow rate, Electrode diameter, pulse ratio, pulse on time are constant process parameters. Based on ANOVA the contribution of each parameters are calculated. They found that pulse current is the most dominant factor followed by pulse frequency and base current are influenced in the ultimate tensile strength.

Pankaj C. Patil [11] concluded that using TIG welding uniform welding of aluminium alloy possible. By optimizing and controlling welding parameters (like welding current, gas flow rate, welding speed) welding defects get totally avoided.

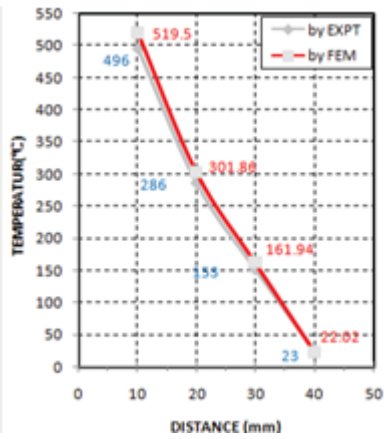


Fig. 5: Comparison of simulation and experimental thermal profiles [12]

Swapnil S. Ingle [12] welded Aluminium Alloy 6082 by TIG welding and analyzed that there is a agreement between the simulation and experimental thermal profile as shown in "Fig.5" it can be predicted that that stress profiles and deformation got by simulation must match with experimental profile.

As the experimental methods for measuring residual stresses are costly and time consuming, FEM is enough for getting better results with negligible variation to that of experimental results so Simulation process can be carried out where welding applications deals with complexproducts.

4. STUDIES ON SIMILAR METAL MIG ALUMINIŪM WELDS

MIG welding has four modes or MIG welding transfer types for the wire to hit the joint.

They are Short circuit, Globular, Spray, Pulsed spray. Aluminium is much softer metal so the feed wire must be larger and also feeding aluminum welding wire during gas-metal-arc-welding (GMAW) presents a challenge because the wire is softer than steel, has a lower column strength, and tends to tangle at the drive roll.

Aluminum is also a better conductor of heat, so welding aluminum requires more control over the power supply and the feed rate of the electrode.

Jyoti Prakash et al[13] welded aluminium alloys using different shielding gases and concluded that the high helium content gases are used for GMAW welding on thicker materials and GTAW welding with DCEN. Pure argon can be used for both GMAW and GTAW welding and is the most popular of the shielding gases used for aluminum. The helium content gases are usually more expensive. welding speeds can be increased by using helium and/or helium/argon mixtures.

E. Mahdi et al[14] attempted an investigation on effects of MIG welding on the corrosion and mechanical properties of AA 6061 T6.

Fig. 6: Extent of corrosion on BM and HAZ [14]

They found that Pitting corrosion is dominant on both BM and HAZ and the HAZ was more susceptible to corrosion showing severe pitting corrosion comparing to the BM as shown in "Fig.6".

The hardness of the welded specimens was increased as we moved away from the weld centre and the welded specimens were shown to have lower torsion properties.
Chandan Kaushal et al[15] concluded that, different parameters are to be considered to know the behavior of weldments and their effects on mechanical properties as aluminium alloys are susceptible to large change in microstructure after the welding. Welding heat input was increased by increase in arc voltage and welding current.
In this study, metal inert gas (MIG) welding was used to join heat treatable extruded 6063 T6 aluminum alloys.
I.O. Oladele Msc et al[16] worked on Wrought (6063) aluminum alloy for investigation using MIG welding. The current and voltage is used as parameters current and voltage on microstructure, tensile strength, toughness and impact strength. Since in arc welding is directly related voltage and current, the two conditions are applied i.e. at constant voltage the current was I1=75A & I2=100A and at constant current the welding voltage was varied as V1=25V & V2=30V. Tensile strength is more when current is at 100A.Toughness property is found to be good at V1=25V and other are nearer to it. Hardness is more at I1=75A & at V2=30V.The micro structure of I1= 75A shows that the constant MG2Si precipitation surrounding aluminum matrix leaded to fine particles are more responsible for high ultimate tensile strength & Hardness. From this it can be concluded that as current get increased heat input get increases & leads to better fusion of grains which give best possible mechanical properties (Ultimate tensile strength & hardness) and Change in current or voltage doesn't affect more on impact strength.

5. STUDIES ON SIMILAR METAL FRICTION ALUMINIŪM WELDS

Friction welding is used extensively in various industries. Heat in friction welding is generated by conversion of mechanical energy into thermal energy at the interface of work pieces during rotation under pressure.. This process can be used to join different types of ferrous metals and non-ferrous metals that cannot be welded by traditional fusion welding processes. The process parameters such as friction pressure, forging force, friction time and forging time play the major roles in determining the strength of the joints. FSW of aluminium is becoming an increasingly mature technology with numerous commercial applications[17].
K. Boonseng et al [18] observed fine and homogeneous structures in the weld zone (WZ) this is due to thermal effect and in the thermo mechanicall affected zone (TMAZ), change is from globular structures to fine structures and after welding Mg2Si phase particles were broken and the hardness is close to the hardness of base metal due to heating.
N. Bhanodaya Kiran Babu et al [19] observed the results of many researchers in which rotational speed, welding speed and axial force are considered as process parameters for welding AA 6061 Aluminium alloys in determining tensile properties by friction welding. They observed fine equiaxed grains and uniformly distributed very fine strengthening precipitates in the weld region. They also suggested that the higher tensile strength of these alloys, allows the manufacturer to use in the area of aerospace and automobile industries, where the high strength to weight ratio isimportant.
Al Faizal at al[20] carried out a study on friction welding process for Al 6063-T6 and 3D model of the rotary friction welding was made. They performed the tensile tests as shown in "Fig.7" which shows that the weld zone is stronger than the base metals, since the ruptureoccurred outside of the welding area and the quality of rotary friction welding is depend on rotating velocity of members.

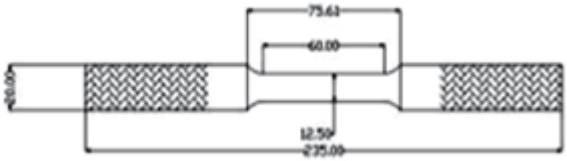


Fig. 7: ASTM Standard Tensile Specimen [20]

The length of work piece is reduced after welding due to high material penetration. The weld zone was divided into three regions based on the microstructure (center of weld and two HAZ). The center of weld had fine grains due to dynamic recrystallization with higher tensile strength and hardness. They concluded that the speed of rotating member affect the quality of weld and the study reveals for Al 6063-T6 after friction welding at 1200, 775 and 500 rpm the mechanical properties are remains almost same as that of parentmaterial.
R.Sathish et al [21] investigated effects of friction welded corrosion behavior of dissimilar aluminum alloys of AA7075-T6 and AA6061 –T6. The welded samples are initially subjected to tensile test. Based on tensile strength the samples are subjected to potentiodynamic polarization resistance measurements in NaCl solution. It is observed that the parent metal wrought aluminum alloy found to corrode higher than the corresponding friction welded region of joints. Also the corrosion current and the corrosion rate are higher for the AA7075-T6 side compared to the AA6061-T6 side. The minimum and maximum corrosion rate was varied from 1.91 and 5.74 mm/year in different region. Micro structure study

was conducted by optical microscopy to validate the results of the weld joints.

M.Y. Xie et al [22] stated that linear Friction Welding has tremendous potential for joining components from similar and dissimilar materials, avoiding material melting and introducing minimal distortion and only moderate levels of residual stress. They welded aluminium alloy specimens and found that the thermal mechanical process that occur during the LFW process lead to significant modification of the orientation distribution, but cause only moderate changes in the textureindex.

6. STUDIES ON SIMILAR METAL FRICTIONSTIR ALUMINIŪMWELDS

With recent developments in technology of friction stir welding, it is now possible to carry out dissimilar welding of various types of steels with alloys of aluminium, magnesium, copper, titanium and also other alloy combinations. Moreover, work pieces in the form of plates, sheets and hollow pipes can be welded by this method. Over a period of time developments in friction stir welding have led to different variants like friction stir processing, friction stir spot welding, friction stir channeling etc. Thus, it can be said that friction stir welding and its variants have brought a revolution in the field of solid state joining technology. In addition, friction stir welds can be accomplished in material is firmly held in place in a fixture[23].

P. Vijaya Kumar et al [24] Welded AA7075 Alloy Plates using FSW, they concluded that while joining these higher strength alloys, post weld heat treatment is necessary in order to stabilize the microstructure in the friction stir welded regions and this in turn has a potential to restore the corrosion resistance in sensitized weldzones to that of the parent metal. Than the other post weld treatments, the peak aged condition (T6) shown better mechanical properties.. In RRA the SCC resistance was good and also the strength was recovered nearer to the base metalstrength.

M. Koilraj [25] joined dissimilar AA2219-T87 and Al–Mg alloy AA5083-H321 using Friction Stir Welding (FSW) technique and they optimized the process parameters using Taguchi L16 orthogonal design of experiments.

They considered rotational speed, transverse speed, tool geometry and ratio between tool shoulder diameter and pin diameter as process parameters. By using the optimum process parameters, they predicted the optimal value of tensile strength. Micro structural studies revealed that the material placed on the advancing side dominates the nugget region. According to the analysis of variance, the ratio between tool shoulder diameter and pin diameter is the most dominant factor in deciding the joint soundness while pin geometry and welding speed also played significant roles.

A.k.lakshminarayanan et al [26] RDE 40 aluminium alloy using FSW and evaluated tool rotational speed, traverse speed and axial force on tensile strength. Taguchi approachwasappliedtodeterminethemostinfluential control factors which will yield better tensile strength of the joints of friction stir welded RDE-40 aluminium alloy. Through the Taguchi parametric design approach, the optimum levels of process parameters were determined. The results indicate that the rotational speed, welding speed and axial force are the significant parameters in deciding the tensile strength of the joint.

Prashant Prakash et al [27] welded AA 6061 Aluminium Alloy plates (150mm X 50mm X 6mm) using FSW as shown in"Fig.8". In this experiment it is observed that the process parameters like tool design, tool rotational speed, welding speed and axial force are the main parameters to produce the butt joint.

Fig. 8: Aluminium Alloy Plates [27]

Other parameters are important but sub sets of the main parameters like indentation time of tool cannot be too long or too short, materials of the tool and backing bars should have low thermal conductivity and tilt angle used should be between 00 to 30. It is also observed that more than 6mm thickness of work piece is possible to weld by friction stir welding butt. The condition is to design a different tool for different thickness. While designing tool, the tool tip length should be less than the thickness of the base material i.e. less than 0.25 to 0.8 times of the base the materialthickness.

Saumil K.Joshi et al [28] stated that from last some years, there is some significant improvement in FSW process. According to them, the main requirement of FSW is good material flow and less flash formation during welding process where as various types of tool shoulder and pin geometry with different diameters have been designed as shown in "Fig.9" and for that effective shoulder geometry with optimum shoulder diameter are required. So, further work should be focused on deigning

effective shoulder geometry with optimum shoulder diameter.

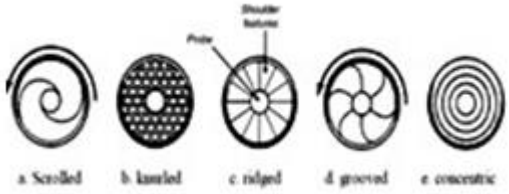


Fig. 9: Tool Shoulder Geometries [28]

K. Ramanjaneyulu et al [29] experimented on FSW with different pin profiles and observed that adiabatic temperature rise due to plastic deformation is significant in ensuring adequate plasticity of the material and also concluded that the rate of heat generation as well as peak temperature are relatively higher in casse of non- circular pin profiles, increasing with number of flats(i.e., square to hexagonal).The various tool pin profiles are presented in "Fig.10".

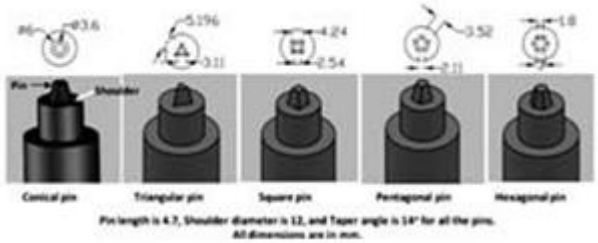


Fig. 10: Geometry of various tool pin profiles [29]

7. CONCLUSIONS

From the literature survey, it can be concluded that welding of Al and its alloys can be performed by means of conventional fusion welding as well as solid state welding processes. But the nature of the joint will not be thesame.

- While welding various alloys of Al using TIG welding, different process parameters like welding current, gas flow rate, welding speed, Pulse current, base current, Pulse Frequency are taken in to account in order to get a soundjoint.
- Welding of aluminium alloys can be done using different shielding gases and concluded that the high helium content gases are used for GMAW welding on thicker materials and GTAW welding with DCEN. Pure argon can be used for both GMAW andGTAW.
- A study on friction welding process for Al alloyshows that the weld zone is stronger than the base metals.
- In FSW of Al alloys, rotational speed, transverse speed, tool geometry and ratio between tool shoulder diameter and pin diameter, axial force play an important role in obtaining the soundwelds.

REFERENCES

1. Jyoti Prakash, S.P.Tewari, Bipin Kumar Srivastava, "Shielding Gas for Welding of Aluminium Alloys by TIG/MIG Welding-A Review" International Journal of Modern Engineering Research (IJMER) Vol.1, Issue.2, ISSN: 2249-6645,pp.690-699.
2. R. S. Rana, Rajesh Purohit, and S Das, "Reviews on the Influences of Alloying elements on the Microstructure and Mechanical Properties of Aluminum Alloys and Aluminum Alloy Composites" International Journal of Scientific and Research Publications, Volume 2, Issue 6, June2012.
3. N.Jeyaprakash, Adisu Haile, M.Arunprasath, "The Parameters and Equipments Used in TIG Welding: A Review", The International Journal Of EngineeringAnd Science (IJES), Volume 4 Issue 2, Pages PP.11-20, 2015, ISSN (e): 2319 – 1813 ISSN (p): 2319 –1805.
4. K.Yasuda, "MIG welding of Al alloys", Journal of light Metal welding and Construction, 1990 28(8),pp.18-21.
5. Mr. Sachin Kumar, Mr. Deepak Bhardwaj, Mr. Jagdeep Sangwan, "A Research Paper on Temperature Modelling of Friction Welding of Aluminium and Stainless Steel- 304" International Journal of Enhanced Research in Science Technology & Engineering, ISSN: 2319-7463 Vol. 3 Issue 6, June-2014, pp:319-327.
6. Sivakumar, Vignesh Bose, D.Raguraman, D. Muruganandam, "Review Paper on Friction Stir Welding of various Aluminium Alloys", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e- ISSN: 2278-1684, p-ISSN : 2320–334X, pp.46-52.
7. Sunil M. Pawar, Prof. Vivek V. Kulkarni, "Mechanical Characterization of Aluminium Alloys for TIG Welding Experimental and Modeling Studies" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 02 Issue: 02 May- 2015, ISSN:2395-0072
8. Lakshman Singh, Vinay Shah and Naveen K.Singh, "Study The Influence of TIG Welding Parameters On Weld Characteristics Of 5083 Aluminum Alloy", International Journal of Engineering Science and InnovativeTechnology(IJESIT)Volume2,Issue5, September 2013
9. Lakshman Singh, Rohit Kumar, Nidhi Gupta and Mayur Goya, "To investigate the effect of tig welding parameters on 5083 aluminium alloy weldability" Mechanica Confab ISSN: 2320-2491, Vol. 2, No. 4, June-July2013.
10. K. M Eazhil, S.Mahendran, S.Ganesh Kumar "Optimization of Tungsten Inert Gas Welding on 6063 Aluminum Alloy on Taguchi Method ", Volume I, Issue III, August 2014 IJRSI ISSN 2321 -2705.
11. Pankaj C. Patil, Prof. R. D. Shelke "Review on welding parameter effects on TIG welding of aluminium alloy" International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June, 2015 ISSN2091-2730
12. Swapnil S. Ingle, Dr. Rajendra S. Dalu, " Thermo-Mechanical Analysis in TIG Welding of Aluminium Alloy 6082" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Volume 4 Issue 4, April2015
13. Jyoti Prakash, S.P.Tewari, Bipin Kumar Srivastava, "Shielding Gas for Welding of Aluminium Alloys by

TIG/MIG Welding-A Review", International Journal of Modern Engineering Research (IJMER) www.ijmer.com Vol.1, Issue.2, pp-690-699 ISSN:2249-6645
14. E. Mahdi, E. O. Eltai, A. Rauf, "The Impact of Metal Inert Gas Welding on the Corrosion and Mechanical behavior of AA 6061 T6" Int. J. Electrochem. Sci., 9 (2014) 1087 -1101
15. Chandan Kaushal, Lochan Sharma, "To find effects of GMAW parameters on Mechanical Properties of Aluminum Alloys", l Int. Journal of Engineering ResearchandApplications,ISSN:2248-9622,Vol.4, Issue 11 (Version - 6), November 2014, pp.88-92
16. I.O. Oladele Msc, J.A OmotoyimboPhd, B.O. Adewuyi Phd "Study of the effect of welded joints on the mechanical properties of Wrought (6063)aluminum alloy", The Pacific journal of science and Technology, Vol 10, Nov 2009, pp 120-125
17. P L Threadgill, A J Leonard, H R Shercliff and P J Withers, "Friction stir welding of aluminium alloys", TWI
18. K. Boonseng, S. Chainarong, C. Meengam " Microstructure and Mechanical Properties of Friction Welding in SSM356 Aluminium Alloys", International Journal of Emerging Trends in Engineering Research Volume 2, No.4, April 2014, ISSN 2347 -3983
19. N. Bhanodaya Kiran Babu, A. Prabhu Kumar and M. Joseph Davidson, "A Review Of Friction Stir Welding Of AA6061 Aluminium Alloy", ARPN Journal of Engineering and Applied Sciences, VOL. 6, NO. 4, April 2011 ISSN1819-6608
20. Al Faizal, Amarnath T, Roshan T Ninan, " An Investigation of Mechanical Properties of Aluminium 6063-T6 after Friction Welding Process", International Journal of Engineering Trends andTechnology (IJETT) Volume 17 Number 5 – Nov 2014
21. R.Sathish, V.Seshagiri Rao, "Corrosion Studies on Friction Welded Dissimilar Aluminum Alloys of AA7075-T6 and AA6061 –T6", Int. J. Electrochem. Sci., 9 (2014) 4104 -4113.
22. M.Y. Xie, T.S. Jun A.M, Korsunsky and M. Drakopoulos, "Analysis of Preferred Orientations in Linear Friction Welded (LFW) Aluminium Alloy Specimens using 'One-shot' Multi-element Energy Dispersive Synchrotron X-rayDiffraction"
23. R. Hariharan and R.J. Golden Renjith using Nimal, "Friction Stir Welding Of Dissimilar Aluminium Alloys (6061&7075) By Using ComputerizedNumerical Control Machine", Middle-East Journal of Scientific Research 20 (5): 601-605, 2014 ISSN 1990-9233.
24. P. Vijaya Kumar, G. Madhusudan Reddy and K. Srinivasa Rao, "Effect of Post Weld Heat Treatments on Mechanical and Stress Corrosion Cracking Behavior of Aa7075 Friction Stir Welds" International Journal of u- and e-Service, Science and Technology Vol.7, No.4 (2014),pp.251-262
25. M. Koilraj, V. Sundareswaran, S. Vijayan, S.R. Koteswara Rao, "Friction stir welding of dissimilar aluminum alloys AA2219 to AA5083 – Optimization of process parameters Taguchi technique",Design, Volume, December 2012, pp.1–7
26. A.K. Lakshminarayanan, V.Balasubramanian, "Process parameters optimization for friction stir welding of RDE-40 aluminium alloy using Taguchi technique", Transactions of Nonferrous Metals Society ofChina, Volume 18, Issue 3, June 2008, pp.548–554
27. Prashant Prakash, Sanjay Kumar Jah, Shree Prakash Lal, "A Study Of Process Parameters Of Friction Stir Welded AA6061 Aluminium Alloy", International Journal Of Innovative Research In Science, Engineering and Technology, Vol 2, Issue 6, June2013.
28. Saumil K.Joshi, Jaivesh D. Gandhi, "Influence of Tool Shoulder Geometry on Friction Stir Welding: A Literature Review", 2nd International Conference on Multidisciplinary Research & Practice Page261.
29. K. Ramanjaneyulu, G. Madhusudhan Reddy, A. Venugopal Rao & R. Markandeya," Structure-Property Correlation of AA2014 Friction Stir Welds: Role of Tool Pin Profile", J Mater Engg Perform, Vol. 22 Issue 8, Aug2013,pp.22

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

CALCULATION OF SPECIFIC ENERGY IN BARE AND TBC COATED SUPER ALLOYS

[1]N. Ravinder ,M.E, [2]Mr. D.Mallesh, [3]Mr.D.Karthik, [4]Mr.A.Abdullah Aafaq
[1]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[2]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[3]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[4]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.

ABSTRACTAerospace engines and land based Gas turbines operates at very high temperatures which are made with materials which can withstand high temperatures such as Ni- based or Co-based superalloys. To increase the efficiency of engine by increasing working temperature, however superalloys are used for engine components needs to protect from high temperatures. The thermal barrier coatings (TBCs) gives good protection to high temperatures and also it is easy to apply on blades and engine components. A TBCs of 150 □m thick on a gas turbine blade will lead to an increase of 150 – 200o C in the operating temperature of the gas turbine.However, further cooling is necessary to protect the TBC and underlying superalloys from high temperatures air film cooling is one of the best way cool the turbine blades easily. For this purpose, fine holes drilling on the surface of turbine blades is required. Laser drilling of these TBC/superalloys multi layer system is best method than other existing techniques.

Conventional drilling methods are not possible or difficult to use for drilling of very small and fine holes. Laser drilling does not involve tool wear and it is easy to drill the bare and ceramics coated superalloys. Plasma sprayed thermal barrier coatings (TBCs) consist of partially stabilized zirconia as a top coat and NiCrAlY as bond coat, deposited on a nickel based superalloy (Inconel/IN718) substrate used for laser drilling experiments.Different thickness of TBCs, (600 & 1600 □m) on 2mm thick IN718 superalloy and 4mm thick IN718 superalloy used for this study. A pulsed Nd: YAG Laser (□ = 1.06 □m) with a focal length of 120mm and using different pulse widths and pulse energy were used for drilling.

During laser drilling, material removal in general occurs by vaporization and expulsion of molten material.The energy required to remove material via melt ejection or expulsion of molten material is about one twelfth for IN718 and one third for ZrO2of that required to vaporize the same volume.In this project we investigated the amount of specific energy required to remove the material from melt ejection and vaporization mechanisms. And compared with theoretical values.In addition, all metallurgical characteristics of interest, viz. extent and nature of spatter, recast and heat-affected zone have been evaluated

1. INTRODUCTION OF THE LASERS

The increasing demand for processing of advance materials like superalloys and other materials which are difficult-to-process by conventionally and the availability of high power lasers have stimulated interest in research and development related to laser manufacturing. The already existing laser-based operations such as laser cutting, laser welding, laser heat treatment and rapid prototyping have already found their way into actual manufacturing shop floors. In addition, the applications of lasers in surface alloying, cladding and glazing now offer the exciting possibility of producing new materials with novel properties. The increasing interest in the use of lasers for manufacturing can be attributed to the several unique advantages listed below, which are generically applicable to the entire range of materials processing applications. The materials that can be processed using laser ranges from metals and alloys to inorganic as well as organic non metals and composites. The prominent laser based materials processing applications are briefly discussed below.

1. Laser Cutting
2. Laser Drilling
3. Laser Welding
4. Laser Cladding
5. Laser Alloying
6. Rapid Prototyping
7. Laser Marking
8. Laser Hardening
9. Laser Glazing

2. LITERATURE REVIEW

Gas Turbine

Gas turbine has become, in the recent years, the basic item of the modern energy plants; their reputation is due (compared to the traditional steam turbines) to:

Very high plant efficiency (up to almost 60% in combined cycle)

Flexibility of operation (fast start-ups and load changes)

Lower initial capital expenditure (shorter "pay back periods")

Compact layout and "environmental friendliness" (" power intensive" plants with low emissions: therefore easy to be located)

The "heart" of these new machines is made by the blades and vanes, which are subjected during operation to very high thermal and mechanical stresses (combined effects of centrifugal force and thermal gradient), in aggressive environment. The blades suffer during operation of several damages, which limit the component overall life: creep (the gas temperature has already reached up to 1500^0 C), life cycle fatigue, hot corrosion, etc. Therefore, in terms of maintenance requirements, manufacturing difficulties and costs, the blades are the most critical item of the today gas turbines.

Thermal Barrier Coatings

The efficiency of gas turbine engines is dictated by the maximum temperature that the turbine rotors can sustain during continuous operation.Such a limitation is usually imposed by the mechanical properties, particularly the creep resistance of the turbine blade material.Improvements to the composition of the superalloy series, internal air cooling, and in the extreme case, directionally solidified blades and single crystal blades have all been employed to extend the technology of the metal turbine blade to its limit However, if a thin coating of ceramic can be applied to a metal blade, 50-200°C without the metal temperature increasing may increase the engine temperature; the ceramic acting as a thermal insulating barrier.In this manner the efficiency of an engine may be increased by ~ 6-12% thereby saving $250,000 per year in fuel costs on a large aircraft engine. The economic inducement to find a successful coating is therefore high.

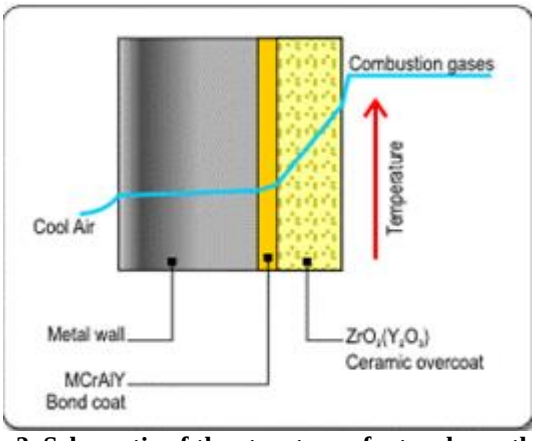


Figure 3. Schematic of the structure of a two layer thermal barrier coating on a turbine blade surface together with a temperature profile

Cooling of Turbine

In order to employ high gas temperatures in gas turbine stages, it is necessary to cool the casing, nozzles, rotor blades and discs. On account of high rotational speeds and the associated stresses, cooling of the rotor blades is more critical.

Cooling of these components can be achieved either by air or liquid cooling. Liquid or water cooling, if possible, appears to be more attractive on account of the higher specific heat and possibility of evaporative cooling. However, the problems of leakage, corrosion, scale formation and choking militate against this method.

Cooling by air, besides other advantages, allows it to be discharged into the main flow without many problems. It can be tapped out from the air compressor at a suitable point. The quantity of air required for this purpose is from 1 to 3% of the main flow entering the turbine stage. Blade metal temperatures can be reduced by about $200\text{-}300^0$ C.

Air film cooling

One of the major problems in enhancing the specific work out put and efficiency in gas turbines is the maximum possible value of the turbine inlet temperature due to blade material properties up to about 1300K uncooled blades can be used. To increase this maximum turbine blades need to be cooled (external or internal) which is usually done by compressor air. Based on its high cooling efficiency, film cooling is one of the major cooling techniques used, especially for hotter blades. In film cooling compressed air is injected along blade surface, forming a cold boundary layer, thus separating the hot gas from the blades. The use of cooling is limited, while it leads to an increased use of the compressed air, which in its turn decreases the efficiency of the system.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

3. EXPERIMENTAL PROCEDURE

Laser Drilling Experiments

Laser drilling experiments were performed with a 400 W Nd:YAG laser (Model JK704) from GSI Lumonics, U.K, emitting 1.06 μm wavelength with fixed beam delivery. The laser was operated in the low divergence (LD1) tuned resonator configuration suitable for drilling. The laser beam was focused with a 120 mm focal length lens, giving a spot size of approximately 0.24 mm diameter. A co-axial gas nozzle assembly equipped with the lens was used to provide an assist gas for drilling through a conical Teflon nozzle with a 1.5 mm diameter orifice. Nitrogen is employed as assist gases during processing of both bare IN718 and TBC/IN718. All drilling experiments were carried out in the percussion-drilling mode and holes were drilled normal to the surface.

The values of different parameters that are used during experimentation for both IN718 and TBC/IN718 are shown in Table given below

Parameters employed for laser drilling experiments

.

Parameter	Pulse width (ms)	Pulse energy (J)	Pulse frequency (Hz)	Sector height (%)	Assist gas, (bar)	Stand off distance (mm)	Lamp power (kW) L1, L2	Total power (W)
1	0.5	3	45	34	N_2,6	3	2.4, 2.5	135
2	1	4.5	30	30.4	N_2,6	3	2.4, 2.5	135
3	2	6.8	20	29.7	N_2,6	3	2.7, 2.7	135
4	3	16.8	8	36	N_2,6	3	2.1, 2.1	135
5	0.5	9	15	66.5	N_2,6	3	2.1, 2.2	135

4. CHARACTERIZATION

All laser-drilled holes were extensively characterized to determine the geometrical and metallurgical characteristics. The spatter pictures were taken by using the stereo microscope at 25X magnification. The spatter was subsequently removed by light polishing using a coarse emery paper and the inside of the hole was cleaned of any debris by an ultrasonic cleaning system to facilitate accurate measurement of the entry-side and exit-side hole diameters. The hole diameter measurements both entry and exit were made again after taking the pictures afresh, by using the same stereo microscope at 25X magnification only.Based on entry-side hole diameter (d_{entry}) and exit-side hole diameter (d_{exit}) measurements, the non-cylindricity or taper was calculated using the expression (i)

Taper (θ) = $\tan^{-1} [(d_{entry} - d_{exit})/2 \times t]$ - (i)

Where θ is the taper angle and t is the material thickness.

After completion of geometrical measurements, the laser-drilled samples were sectioned using a slow speed saw (ISOMET), mounted on a hot mounting machine using Bakelite as the material for mounting and then sequentially ground to the hole center by using different emery papers of grades ranging from 220 – 1000.

For the same samples, hole diameter measurements were carried out on mounted cross-sections at 100 μm depth intervals from the drilled hole surface to investigate the evolution of taper and its variation with depth. To reveal the metallurgical characteristics of the drilled hole, all samples were polished finely with 10 μm - 0.5 μm diamond paste on disc polishing machine. The samples were then etched to reveal the HAZ and recast layer microstructures. Both IN718 and TBC/IN718 samples were electrolytically etched with a 2:3:6 H_3PO_4-H_2SO_4-H_2O (Isophosphoric acid, Sulphuric acid and water) mixture solution for a time period of 10 – 15 seconds.Optical microscope at 100X was used for investigation of recast layer and HAZ microstructure.

5. THEORETICAL AND EXPERIMENTAL CALCULATIONS

To calculate the specific energy utilized for material to drill through study has been conducted on 4 mm thick IN718 and TBC/IN718 with different thickness of TBC which had taken different values of no of pulses to drill through. The variation in drilled hole depth with number of pulses or penetration/depth with no of pulses for both materials drilled under identical conditions is shown in Fig. 2. The results suggest that if pulse energy is more then the depth of penetration is more and viceversa. In order to explain the above observation, it was deemed appropriate to ascertain theoretically the specific energy requirement for melting as well as vaporization of unit volume of IN718 and YSZ materials and compare these values with the experimentally calculated specific energy. The theoretical calculations of specific energy η ($J\ m^{-3}$) were made using the following expressions:

$\eta_{theoretical\ for\ melting} = \rho_s[C_{ps}\ (T_m - T_i) + L_m]$ -(ii)

$\eta_{theoretical\ for\ vaporization} = [\rho_s\{C_{ps}\ (T_m - T_i) + L_m\} + \rho_l\{C_{pl}\ (T_v - T_m) + L_v\}]$ - - - - - - -- - - - (iii)

Where ρ_s = density of the solid ($kg\ m^{-3}$),

ρ_l = density of the liquid metal ($kg\ m^{-3}$),

C_{ps} = specific heat capacity of the solid material ($J\ kg^{-1}\ K^{-1}$),

C_{pl} = specific heat capacity of the liquid material ($J\ kg^{-1}\ K^{-1}$),

T_m = melting temperature (K),

T_v = vaporization temperature (K),

T_i = initial temperature (K),

L_m = latent heat of melting (J kg^{-1}) and
L_v = latent heat of vaporization (J kg^{-1}).
Using the thermo-physical properties of IN718 and YSZ materials as indicated in Table 2 , the above theoretically required specific energies were calculated for each material and these are also shown in Table 2.

Table 2. Thermophysical properties of IN718 and YSZ, and theoretical specific energy requirements for their drilling.

	IN718	YSZ
ρ_z (kg/m^3)	8.90×10^3	5.40×10^3
ρ_l (kg/m^3)	7.90×10^3	4.80×10^3
T_m (K)	1728	2950
T_v (K)	3558	4548
T_i (K)	300	300
C_{pz} (J/kgK)	452	604
C_{pl} (J/kgK)	620	820
L_m (J/kg)	2.92×10^5	7.1×10^5
L_v (J/kg)	6.40×10^6	5.06×10^6
Theoretical Specific Energy for Melting (J/m^3)	0.83×10^{10}	1.25×10^{10}
Theoretical Specific Energy for Vaporization (J/m^3)	6.23×10^{10}	4.30×10^{10}

The specific energy consumption was also experimentally determined as follows:

$\eta_{experimental}$= No. of pulses × Energy per pulse (J) / Volume of hole (m^3)- - - - - - - - - (iv)

Volume of holes which is not drill through is calculated at 100 μm depth intervals, considering the volume of hole as a frustum of cone at first few depths and the remaining is assumed as a cone. Total volume of the hole is calculated by summing up of all the volumes. This is done for the holes that are not drill through. The hole that is drill
through, the volume is calculated at 100 μm interval assuming it as frustum of a cone.
Then the total volume is calculated by

V = v1 + v2 + v3 + ……(v)

Figure __. Laser drilled hole with a single pulse

Where individual small volume of frustum of cones is calculated by using the formula,

$V1 = \Pi/12 * [D1^2 + D2^2 + D1 * D2] * H$

similarly V2 and V3 .
Where,D1, D2, D3, …….. are the diameters measured at different intervals
Where, H1, H2 , H3 ,…….height or interval between two readings of diameters
Taper

$\text{Tan } \theta_1 = (D1-D2)/(2*H1)$

After the completion of theoretical and experimental calculations the following graphs have been drawn.

1. Diameter as a function of laser parameter/no of pulses
2. Depth of penetration Vs no of pulses.
3. Taper Vs no of pulses
4. Diameter Vs Depth of hole.
5. Volume of material removed Vs no of pulses
6. Specific energy Vs no of pulses
7. Specific energy/pulse Vs no of pulses

Results related to each graph have been discussed in **results and discussions** chapter.

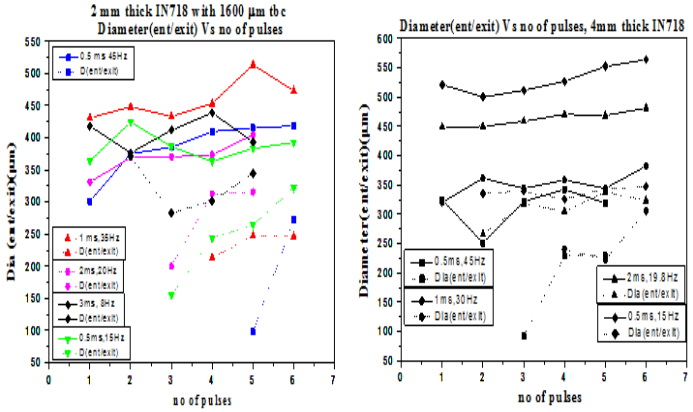
6. RESULTS AND DISCUSSIONS

The influence of laser drilling parameters identified as being critical, namely pulse width and pulse energy, on the geometrical and metallurgical features observed in the drilled holes.

Geometrical Characteristics

The geometrical features of every laser-drilled hole generated during the present study were carefully investigated. This included measurement of entry and exit side hole diameters for each hole and calculation of taper angle based on the above measurements. The prominent results are briefly discussed below.

1. Diameter as a function of laser parameter/no of pulses



The variation in entry and exit side hole diameter with the increasing no of pulses for various different laser parameters is indicated in fig.1. It can be seen that what ever may be the parameter both entry and exit diameters are increasing, at the entry side it is removing the more material as the no of pulses are increasing and at the same time the effect of increasing no of pulses at the exit diameter is to reduce the taper. The increasing no of shots after drill through can be called as leveling or cleaning shots.

The range of entry diameter with increasing no of pulses in 0.5ms(pulse width), 3J(pulse energy) is 300 μm – 420 μm. At the exit side also the diameter is increasing because the 6th pulse is act as a cleaning shot and removes the more metal. In case of 1ms, 3.84J the range is 430 μm – 475 μm at the entry side and at exit side the

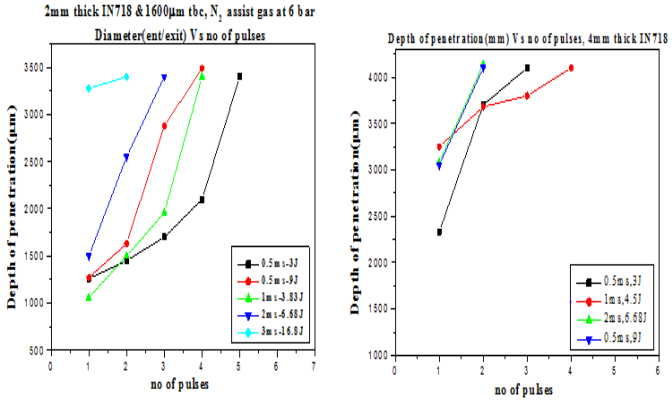
range is 210 µm – 250 µm. The diameter range in the case of 2ms, 6.68J at entry side is 330 µm – 410 µm and 200 µm – 315 µm at exit side. In 3ms, 16.8J case the range of diameter at entry side is 418 µm – 440 µm. In the last case of 0.5ms, 9J the range at exit side is 360 µm – 390 µm and that at exit side is 150 µm - 325 µm.

When comparing with 4mm thick bare IN718 material, in that also the diameter is increasing with no of pulses both at the entry and exit side.

Explain the inconsistency of entry diameter at 5th & 6th pulses of 1ms, 35Hz, 3.84J parameter in the above graph?

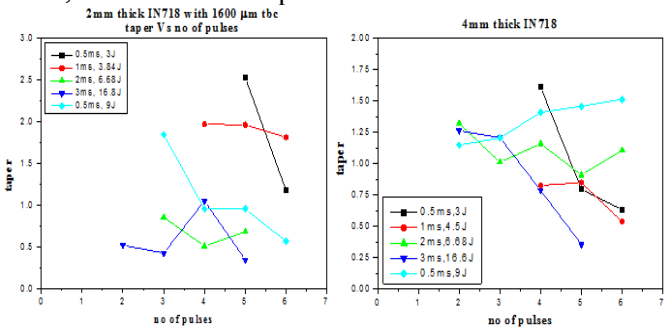
The entry diameter at 5th pulse is more than 6th pulse because the value of diameter it is showing in the graph is the maximum diameter value at that pulse only. The diameter at 5th pulse is increasing because the maximum diameter is coming at the center after grinding where as in all other pulses the average diameters are coming to the center. In this project, grinding is done manually using emery papers; hence it is very difficult to come to the exact center of the hole. The measurements along the depth of hole are taken after checking that all the entry and exit diameters are coming in the range, near to the average diameter and maximum diameter.

2.Depth of penetration Vs no of pulses



The typical variation in depth of penetration with the no of pulses for various laser parameters is indicated in fig.2.It can be seen that as pulse width/ pulse energy is increasing the depth of penetration is also increasing. In both cases of bare and tbc (1600 µm and 600 µm) coated IN718 samples we have found the same trend, that penetration is purely dependent on pulse energy, if pulse energy and pulse width is more and hence the penetration will be more.

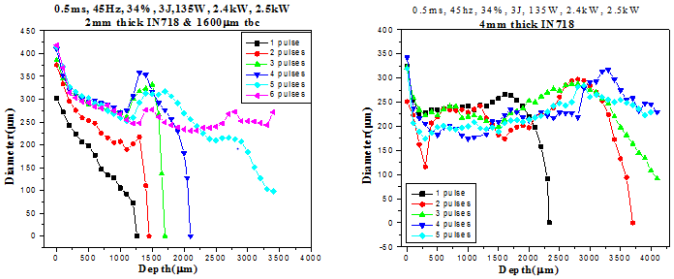
The penetration/depth rate is less for low pulse energy and low pulse widths and more for higher pulse energy and higher pulse widths. In case of bare IN718 also, the penetration is dependent on both the pulse width and pulse energy, higher the energy per pulse and pulse width, more will be the penetration and viceversa.



3. Taper Vs no of pulses

The variation in taper with the no of pulses for the different laser parameters has been plotted in fig.3.After calculating the taper with the entry and exit diameter of drill through holes, it has found that as no of pulses, after drill through are increasing the taper is reducing, which it is purely dependent on the no of pulses. The increase in no of pulses, than what actually require to drill through the given material, then that increasing no of pulses will act as a sort of some cleaning shots. And because of cleaning shots the exit diameter will try to reach the entry diameter by reducing total taper to some minimum.

If the pulse energy and pulse width is more then the no of pulses required to drill through is less and hence if more no of pulses of higher pulse energy and pulse widths are given then the taper will be reducing to some minimum. And in case of lower pulse energy and pulse widths the taper will be more because that lower pulse energy and pulse widths will not remove that much of material, and hence more no of pulses are required.

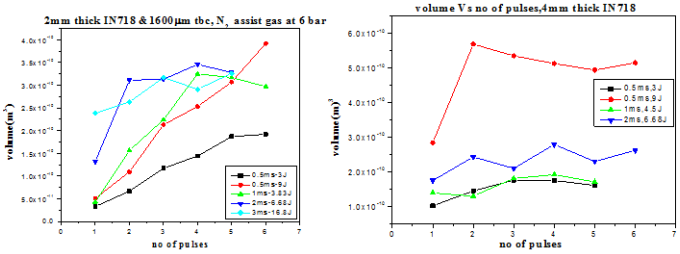


4.Diameter Vs Depth of hole

The typical variation of diameter along the depth of the hole is shown in the figure.4, which is given below. The depth of penetration per pulse can also be checked from this figure and it is also revealing that there is barreling at the interface between the substrate and TBC layer. After examining the plots for all different cases it has found that the barreling is there at interface of coated material and diameters are varying in the same way after drill through. In some cases, it is showing that there is

some barreling along the length of the hole in the substrate material.

5. Volume of material removed Vs no of pulses

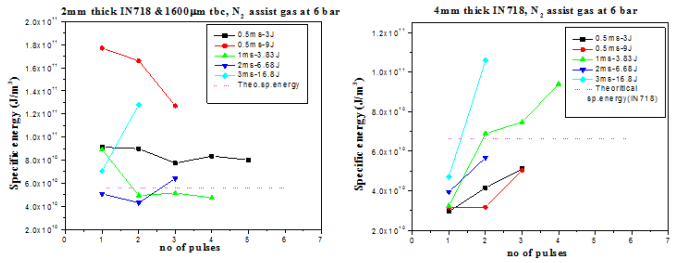


The variation in volume of material removed with the no of pulses is plotted in the next figure5. After observing all the cases it can be noted that, volume of material removed is increasing with increasing no of pulses. Further more, it can be seen that when comparing to other parameters with in the figure that the volume of material removed also has relation with pulse energy, more the pulse energy the volume of material removed will be more and viceversa.

The volume of material removed is increasing in case of TBC coated material, because the first pulse is removing the material upto the coating layer only. That is due to the high temperature of YSZ compared to base metal. After the removal of material upto the coating thickness the material removed per pulse is more than that of material removed by single pulse.The volume of material removed is increasing as the no of pulses are increasing, upto drill through. Even after the drill through, the volume is increasing that is because the increasing no of pulses will going to remove the more material from the bottom side of the workpiece by means of cleaning and barreling in between the hole.

In case of bare IN18 the volume is increasing in almost all cases. In some cases volume is increasing upto drill through again decreasing. This is because the energy is not fully utilized in removing the material, it will drill the material upto the drill through but the diameter along the length of hole will be less leaving a larger amount of Heat Affected Zone.

6.Specific energy Vs no of pulses



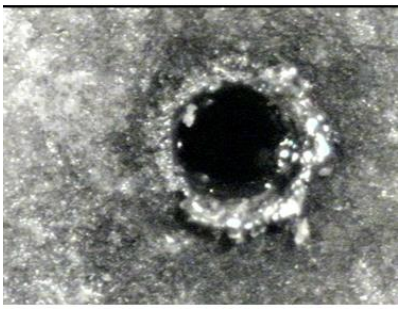
The variation in specific energy with the increasing no of pulses is shown in the following figure.6.The specific energy is the energy that is required to remove a unit volume of material. Since specific energy has relation with the volume of material removed then less the volume of material removed, the specific energy will be higher and vice versa. It has found that specific energy is decreasing in some cases and it is due to volume of material removed, which is more in those cases. However specific energy is the energy required to remove a unit volume of material it should have to increase with increasing no of pulses, the increasing trend has observed in some cases.

In case of bare IN718 the specific energy is increasing as no of pulses are increasing.

But when comparing with the theoretical specific energy value the experimental values are very less. Specific energy as said above is dependent on volume of material removed.It means that if the pulse energy is higher then more amount of material is removed by the process of barreling in case of TBC/IN718 and if more amount of material is removed then the specific energy consumption decreases.

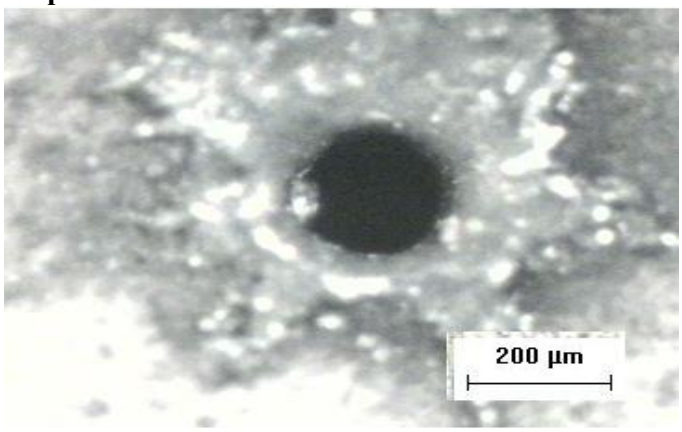
Based on the theoretically calculated and experimentally determined specific energy values, some interesting observations can be made. Foremost, it can be noted that the actual specific energy consumption is significantly higher than the theoretically predicted values. This can be attributed to the low absorptivity of the materials, in solid as well as in liquid phase, to the Nd: YAG laser beam. Although the precise absorptivity values of IN718 and ZrO_2 are not known, the typical values for Nickel and Zirconium metals are reported to lie in the range 15-33 % and 10-20 %, respectively. It is also pertinent to note that the specific energy consumed experimentally is less in case of IN718 and more in case of TBC/IN718 than theoretical determined values. It should be borne in mind that the specific energy consumption calculated from Eq. (iv) is based exclusively on the amount of energy provided by the laser beam.

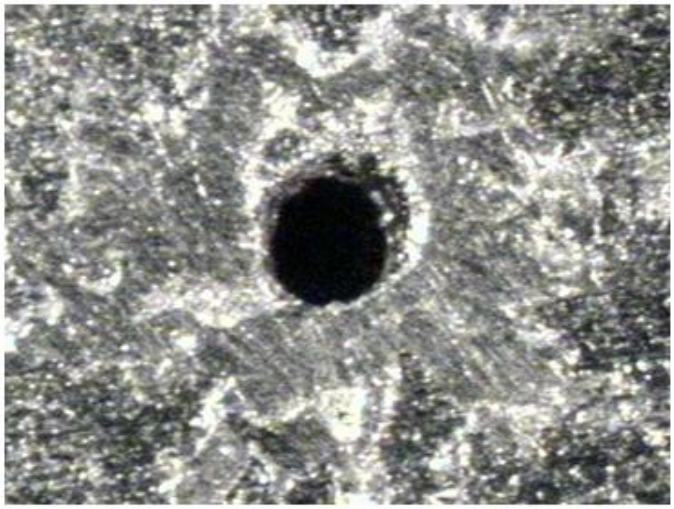
7. METALLURGICAL CHARACTERISTICS:



2mm thick IN718 with 600 µm tbc,0.5ms,50hz,2.7J, 6th pulse

2mm thick IN718 with 1600 µm tbc, 1ms,35hz,3.83J, 2nd pulse





4mm thick IN718,0.5ms,45hz,3J, 4th pulse entry dia

Formation of spatter:

Spatter formation is one of the inherent defects in laser drilling which results when the ejected material is not completely expelled but when re-solidifies and adheres around the periphery of the hole. In this project, the extent of spatter formation, mainly observed at the entrance side of the hole, was found to be consistently more in case of 4mm thick bare IN718.This is because of more amount of material is removed during drilling of thick sections as compared to thin ones. In case of TBC/IN718 spatter was less when compared to bare IN718. The two features are immediately evident from the figure. First, it is abundantly clear that the extent of spatter formation is significantly greater in case of IN718 as compared to TBC/IN718.

The spatter is less in low energy and low pulse width as compared to the high pulse energy and pulse width parameter.The spatter is increasing as the no of pulses is increasing in all the cases of all parameters.

Recast layer & Heat Affected Zone (HAZ):

Microstructure of Recast Layer and HAZ

Apart from spatter formation, the recast layer and the heat-affected zone (HAZ) are two other metallurgical characteristics of interest in laser drilling and these two were also comprehensively investigated during this project. Figure 11 shows a typical low magnification microstructure of the recast layer and HAZ in laser drilled TBC/IN718 and also highlights the variation in recast layer and HAZ thickness with depth.On the other hand, the recast layer formed in the case of IN718 was found to be brittle and poorly adhered, and readily spalled during sample preparation precluding proper microstructural examination at low magnifications.As in Fig. 11, the recast layer thickness is seen to vary substantially with location. However, the recast layer in case of 4mm thick IN718 is observed to be very non-uniform presumably because of spallation, and localized regions of recast layer detachment are also visible.

8. CONCLUSIONS:

On the basis of the results ensuing from the present study dealing with pulsed Nd:YAG laser drilling of 4mm thick IN718 and 2mm thick TBC/IN718 the following conclusions can be drawn.

1. The hole quality, both in terms of geometrical features and metallurgical characteristics, is significantly influenced by the type of material and its thickness, as well as by laser variables like pulse energy and pulse width. The laser-drilled holes are not perfectly conical and taper varies along the depth of the hole.
2. The hole characteristics observed during drilling of IN718 are different from TBC/IN718. Results suggests that depth of penetration is depend on surface materials such as superalloy or TBC.Also the depth of penetration depend on laser pulse energy and corresponding pulse width.However, the penetration depth is not linear as the no of pulses increases for same parameter.

3. The volume of material removed during drilling of IN718 are different from TBC/IN718. After viewing the results it can be suggested that volume of material removed is less in the TBC/IN718 compared with the bare IN718 for same processing parameter. This is due to IN718 has good thermal diffusivity and low melting point than the TBC material.

4. Specific energy is the energy that is required to remove the material per unit volume. From specific energy information, one can get the idea about energy requirement to drill through given material. The calculated specific energy for melting is coming about one eighth of the specific energy for vaporization for IN718 and one fourth for TBC. In case of IN718, experimental specific energy is less than the theoretical value and it increases as the no of pulses increases upto drill through the hole. However, in case of TBC/IN718 multilayer the experimental values are higher than the theoretical value. Interestingly, as the no of pulses increases the specific energy value decreases. This is due to the material removal rate of TBC is less than the IN718.The first pulse removes the very less material in case of the laser radiation incident on the TBC surface.

REFERENCES

1. Qihong Wu. R ongchuan l·ang, X 1angli Chen. Kelvin Wang, "Hole drilling of rNCON J :L 7 18 by high intensity Pulsed UV laser • Presented at the lntcntalJCJnal Confo1c11cc on Application of Lasers and Electro-Optics, Jacksonville, FL, Oct l S-18.200 l, CRD

2. John Kamal u and Dea n Jones, Statistical anal ysis and control of the Nd YAG laser percussion drilling process."JCALEO C, 1996, pp 123-\30

3. Martei n 11 11 van Dijk,Eric P.A J leeran,Jan-EricRubingh,PeterHL J lafka mp Eldim b v, "Percussion Drilling with Hjgh Power Lasers. IC\LEOE, 1997. ppI 13-122

4. P W.French, D P I-land, C Peters, G J Shannon, P Byrd, W 1 Steen, "In vestigation of the Nd:YAG laser percussion drilling process using high speed photography " CLF Annual report. 1998/99, PP· 62-166

5. B S Yilbas,"Parametric studytoimprovelaserholednlhnsprni.:1111 Materials Processing TechnolOBY 70, 1997, 267-273

6. K T. Voisey, J.A. Thompson, T.W. Clyne, D1l1n11gcc1111Hl'd1h1111111.111• drilling of thennal spray TBCs on superalloy substrntcs I J11p11hl1Hlwil

7. John Kamalu and Colin Mcintyre, "High-speed du1111dt.>11/11l 1111111111111 percussion drilled holes."ICALEO E 1997, pp IOJ-I 12

8 . Todd J.Rockstroh, Xiangli Chen and William T L.01shuw "I11llt11 111 1· 111 l.1 , 1 pulse duration on laser drilled hole quality in nickd hasl·ll s111w1 11l11y 1 ICALEO C, 1996, pp. J 13-I22.

9.J.Murthy, RE. Mueller, V V Semak, M.H McC11y, "l11v1.•stialll111 111 1lw drilling dynamicsin Ti-6AJ-4V using high speed Pl11H ug1aphyI<'A l I \ > 1994,pp 820-829.

10. C Lehane, H S Kwok, S .J.Hamlin, G.M Bishop, 1111d .I D l\lyl·1 s, • 1..1 1·1 drilling at large standoff distances usi ng dual pulse Nd YJ\(i IHSl'1 ' H'A III> 1994 PP 230-239.

11. WilliamMSteen, *fa:ser/\ fate11a/1>roc1'u111g*, (Jntl hlt1H111 I 1> 1>H) Pub Springer,4. ISBN 3 540-76174-8*1-rrnaterial\proce.\i11g*, l.con111d Miglilll1(1·dilo1), f\l,11 dl kkk r I m.;

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

DESIGN & DEVELOPMENT OF FRP SANDWICH CRASH BUMPER FOR ENHANCED SAFETY

[1] Mr.SYED SALMAN QUADRI, [2]Mr. Naseeb Khan, [3]Mr. Uday Bhaskar ,[4] Mr. Raghu
[1]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[2]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[3]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[4] Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008

ABSTRACT:A bumper is a shield made of steel, aluminum, rubber, or plastic that is mounted on the front and rear of a passenger car. When a low speed collision occurs, the bumper system absorbs the shock to prevent or reduce damage to the car.. The crash bumper is a component associated with the safety of passenger and automotive engine and related components.
Better and Improved design is a continuous process to create better components with improved performance than the existing ones. A new or better component is one which is more economical in all respects such as cost, performance, and aesthetics and so on..
In the present work the PVC made automotive bumper is studied thoroughly and the section properties are evaluated. Various fiber reinforced plastic designs considered for theanalysis on the basis of providing betterflexuralrigidity at very moderate change in the weight of bumperwere proposed. The cross sectional area and mechanical properties are calculated along with the flexural rigidity of designs. Finite element analysis is carried out on these designs to select a better and commercially feasible design. The proposed design model has been fabricated and tested.

1. INTRODUCTION

The bumper is one of the most important parts of a car, which can be found at the rear-most and front-most parts. The car bumper is designed to prevent or reduce physical damage to the front and rear ends of passenger motor vehicles in low-speed collisions. Automobile bumpers are not typically designed to be structural components that would significantly contribute to vehicle crash worthiness or occupant protection during front or rear collisions. It is not a safety feature intended to prevent or mitigate injury severity to occupants in the passenger cars. Bumpers are designed to protect the hood, trunk, grille, fuel, exhaust and cooling system as well as safety related equipment such as parking lights, headlamps and taillights and rest of the vehicle in low speed collisions. When bumpers are poorly designed, these car body parts sustain most of the damage in parking-lot collisions and other low-speed impacts.

Basic function of bumper :

The function of the bumper is to absorb crash energy without significant damage to the bumper itself and no damage to the vehicle's front or rear end. The bumper of vehicle is a first element, which perceives the front impact in the most common cases of automobile accidents Generallytoday's bumpers are made with a reinforcement bar of steel, aluminum, or plastic with a plastic cover. The system includes crash absorbing mechanisms that compress on impact, such as polypropylene foam or plastic honeycomb. The most effective bumpers are positioned with distance between the reinforcement bar and the vehicle's sheet metal. It helps the vehicle sustain tremendous impact while preventing the safety systems from being damaged. However, it can reduce the injury of passengers especially during high speed impacts. Car bumpers can be damaged in accidents, For low speed collisions of 16km/h or lower bumpers are intended to protect body parts such as, hoods trunk lids, and lamps from losing their functions. Bumpers are designed to plastically deform at the time of collision under the speeds. So as to absorb the crash energy and protect automotive body and the rest of the vehicle.

2. LITERATURE REVIEW

Stephen H.Hamid Razi and M. Dudley 1999. [1], Have carried out study of composite material. In a composite material under tension or compression loading, a damage zone (DZ) is developed in front of a notch prior to failure. Recent research indicates that the DZ manifests itself in the form of strain-softening material behavior. This describes a generalized analysis method based on a bilinear strain-softening material law combined with a damage zone model (DZM) to predict residual strength of thin-skin honeycomb sandwich structures with damage such as holes and slots. This method was

developed as an engineering tool for evaluating the strength of damaged composite aircraft structures. The method can be extended to determine the strength of impact-damaged composite structures.

Dragan D. Kreculj, 2008. [2] Carried out investigations on damages in constructions from composite materials. Such damages may have negligible influence, but they may be critical for the integrity and service life of constructions from composites. Therefore, it is extremely important to assess the state of constructions due to damages. It is necessary to predict accurately where damages will appear, how they will spread and when they will eventually produce a fracture and failure of constructions. The development of modern military and civilian aircraft in the world and in India also requires a great amount of finance. As a result, there is a tendency to develop software packages, which could predict conditions on the aircraft constructions. These programs for structural analysis are mainly based on the finite element method (FEM). With these packages realistic conditions pertaining to the construction during service life can be simulated. The results of simulations offer the possibility of tracking and analysis of critical positions in construction. In order to determine stresses in the composite materials, software packages MSC Patran and MSC Nastran are used. By using appropriate program, stress distributions on the model were achieved. For all three tests (tension, shear and compression) deviations from the obtained values and supposed values are insignificant. On the basis of the results from the tests of these programs, potentially critical locations in model structures are determined, due to the existence of maximum stress, and accordingly possible occurrence of damage and fracture. The data obtained can be used for further testing and analysis of the damage present in these locations on the real constructions. With a particular probability, the model behaves almost the same as the actual construction. However, these facts have to be proved and confirmed by experiments.

Rocca and Nanni, 2005. [3], reported about the feasibility of Glass fibre Reinforced Polymer (GFRP) systems for low-profile bypass roadways, in particular, sandwich panels comprised of GFRP facings and a fibre Reinforced Foam (FRF) core. With the purpose of investigating the performance of the sandwich construction, an experimental program, including static and dynamic fatigue tests, was performed. The same type of specimens tested under static loading, were cyclically conditioned in order to determine its residual strength. The investigation focused on the ultimate capacity and stiffness (compressive and flexural) of the sandwich structure, as well as its residual strength and rigidity after fatigue conditioning. The mechanical properties resulting from the experiments on virgin and fatigue-conditioned samples constitute the basis for the assessment and validation of the material system for the intended application.

Denis Welch Whilst,1996 [4] it was introduced to the marine and civil industriesthe Sandwich Plate System (SPS) technology has evolved through 11 years of research and development since its genesis as a new material for drilling activities in the heavy ice conditions of the Canadian Beaufort Sea. SPS offers unique benefits to structural designs including reduced complexity and production costs, enhanced safety and environmental protection, improved space utilization and passenger/crew comfort. SPS technology represents a step-change in ship construction and repair; and so extensive testing and analysis to prove the effectiveness of the new techniques have accompanied the progressive development of new applications always in close dialogue with Classification Societies and other regulatory bodies.

Santulli, etal. 2005. [5], reported about the limitations of manufacturing procedure employed, to the flake fiber reinforced core in the hybrid laminates have shown an appreciable action of impact damage dissipation. This may suggest that limited substitution of flake fibers to glass fibers is a strategy practicable in structural components, after addressing material processing and fiber extraction issues. Flake-epoxy laminates and hybrid E-glass/epoxy-flax/epoxy laminates provide a sufficient impact performance with a considerable weight reduction with respect to fiberglass. Areas of concern for these laminates are the need for control over void content and defects and the requirement of further studies on the effect of damage on performance, especially when the material undergoes repeated impact effects

3. Fabrication and Experimentation

3.1 Introduction:

As from the above results [$\pm 45^0$] oriented fibers have been showing better results. And hence the fabrication of the bumper with [$\pm 45^0$] orientation has been carried out.In the present work hand lay up process is used to fabricate the bumper.

Types of manufacturing process:

Open Mold Process

Spray lay-up - Chopped roving and resin sprayed simultaneously, rolled

Hand lay-up - Lay-up of fibers or woven cloth, impregnate, no heat or pressure

Filament winding.

Sheet molding compound.
Expansion tool molding.
Contact molding

Closed Mold Process

Compression molding – Load with raw material, press into shape.
Vacuum bag, pressure bag, autoclave - Prepreg laid up, bagged, cured.
Injection molding – Mold injected under pressure.
Resin Transfer – Fibers in place, resin injected at low temperature.

Continuous Process

Pultrusion.
Braiding.

3.1.1 Hand lay-up:

This method is commonly used production processes. Generally wooden are FRP moulds are used to produce components. This method is flexible and size of the component has no constraint but repeatability of quality depends on the skill of the worker. Hand lay-up composites are a case of continuous fiber reinforced composites. Layers of unidirectional or woven composites are combined to result in a material exhibiting desirable properties in one or more directions. Each layer is oriented to achieve the maximum utilization of its properties. Layers of different materials (different fibers in different directions) can be combined to further enhance the overall performance of the laminated composite material. Resins are impregnated by hand into fibers, which are in the form of woven, knitted, stitched or bonded fabrics. This is usually accomplished by rollers or brushes, with an increasing use of nip-roller type impregnators for forcing resin into the fabrics by means of rotating rollers and a bath of resin.FRP Component can be produced in the following steps. The production process is furnished in the Fig no 4.1

(1) Mold is treated with mold release agent;
(2) Thin gel coat (resin, colored) is applied, to be the outside surface of molding;
(3) When gel coat has partially set layers of resin and fiber is applied, the fiber is in the form of mat or cloth; each layer is rolled to impregnate the fiber with resin and remove air;
(4) Part is cured.
(5) Fully hardened part is removed from mold.

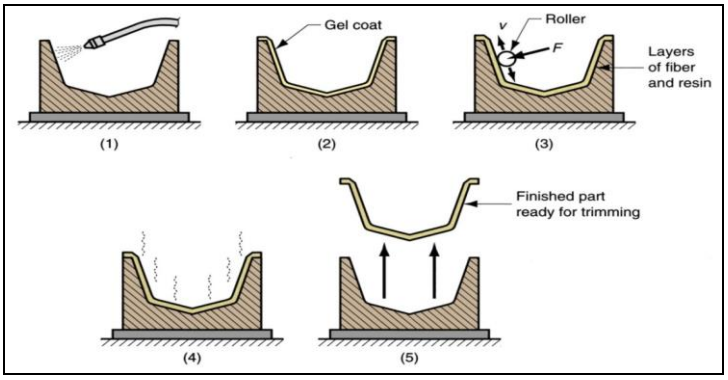


Fig .3.1 Hand lay-up method

Advantages

Design flexibility.
Large and complex items can be produced
Tooling cost is low.
Design changes are easily effected
Sandwich constructions are possible.
Semi-skilled workers are needed.
Higher fiber content and longer fibers than with spray lay-up.

Disadvantages

Only one molded surface is obtained.
Quality is related to the skill of the operator.
Low volume process.
Longer cure times required.
Resins need to be low in viscosity to be workable by hand. This generally compromises their mechanical/thermal properties

Applications

Standard wind-turbine blades, production boats, architectural moldings.

3.1.2Polyurethane Foam:

From the variety of foams, Polyurethane the Foams are one of the most common forms of core material and very low cost. They can be manufactured from a variety of synthetic polymers including polyvinyl chloride (PVC), polystyrene (PS), polyurethane (PU), polymethyl methacrylamide (acrylic), polyetherimide (PEI) and styreneacrylonitrile (SAN).

They densities ranging from less than 30kg/m^3 to more than 300kg/m^3 , although the most used densities for composite structures range from 40 to 200 kg/m^3 . They are also available in a variety of thicknesses, typically from 5mm to 50mm.

Advantages

Higher load bearing capacity up to 30%
Higher hardness and hardness to density ratio is higher
Lower raw material cost per kg of foam.
Higher moisture resistance
Lower ignitability.

Application of Polyurethane Foam

Measure interest of flexible PU foam is cushioning and other upholstery materials.

In addition to upholstery applications polyester foams are useful as foam backs, i.e. foam backing in order to stiffen or shape some softer fabrics, examples include car –door, roof-trim, quilting, shoulder pads and coat interlinings.

Paint rollers, sponges and packaging for delicate equipments.

In an automobile Industry Widely used for making chair backs, chair seats, head restraints etc.

Thermal Insulation : Rigid foam offer advantages in thermal insulation of building, refrigerators and domestic appliances and for heat exchanger- insulation, condenser insulation

Epoxy resin with k-6 hardener		
Mechanical properties	values	units
Young's modulus	3500	MPa
Tensile strength	60	MPa
Elongation	------	%

Table 3.1: properties of k-6 hardener

Properties of Polyurethane foam:

Mechanical properties	values	units
Density	42 – 64	Kg/m3
Tensile strength	48 – 76	Kpa
Elongation at break	80 – 110	(%)
Abrasion Resistance	158 – 228	**N/m**
Resilience	55 – 60	**(%)**
Compression strength	**105**	**Nm-2**

Table 3.2: properties of foam

3.2. Manufacturing and Testing of FRP Sandwich Bumper:

The bumper is made of woven fabric cloth reinforcement, and the Polyurethane foam and the general purpose polyester resign. The evaluations of mechanical properties, specifications of sandwich bumper are shown in section 3.2.3.1 E. The manufacturing processes consist of mould making and followed by hand lay-up manufacturing processes. The flow chart of the manufacturing processes is given below. **The manufacturing process:**

he first step for manufacturing the bumper to prepare a wooden mould of considerable length taken on to which the fiber and foam outline is paste and cut according to the required shape. Various moulds and moulding processes used in the manufacturing of the crash bumper. A Wooden mould for sandwich FRP corrugated Bumper as shown in fig. 4.2

Fig 3.2 Wooden mould for sandwich FRP corrugated Bumper

After the wooden mould is prepared and for obtaining a good surface finishing, the small gap between the wooden moulds is filled with a Ajanta paint (green color) as shown in figure below.

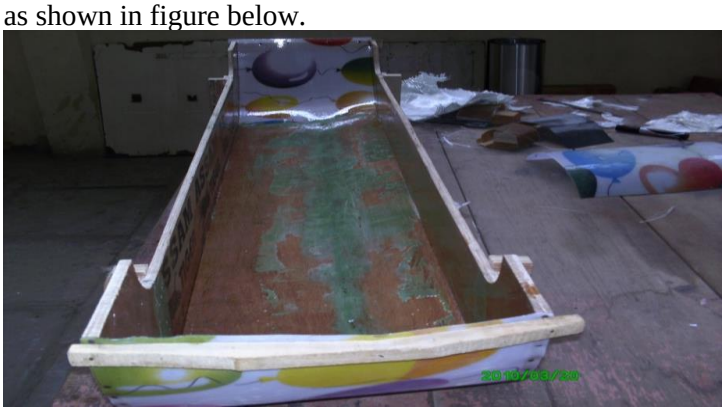


Fig 3.3: Surface preparation of wooden mould and apply of removing agent

The releasing agent and then another layer of gel coat is applied on the wooden mould for better surface finish of

the extracted mould. After that it is left for curing for few hours.

Fig 3.4: cutting the foam in required shapes

Molding of foam in to a required shape : After the mould is prepared,for the placingthe foam,on to the fiber, it cut in to the required shape The dry part is ground using a sand paper to the required shape.

Fig 3.5: material requirements for bumper

The various requirement of material is Poly urethane slabs, woven fabric. and Polyester resign, ,PVA ,gel coat, removing agent ,brushes,. Rollers, glass tube etc..as shown in fig.

Fig 3.6: The woven fabric cloth is cut into the required shape of the mould and laid inside the mould

The woven fabric cloth is kept at orientation of ±45˚for better stiffness. Before stacking foam on woven fiber has to be placed in a proper sequence with proper orientation. For this a Sharpe knife is used in cutting fibers in required orientation sequence. The angle of ply is maintained to 45-degrees and to measure the angle a **bevel protractor** is used. The placing of foam onto the fiber as per required shape is done using the hand lay up method. In this method a miler film is placed onto which the fibers oriented in a particular angle ply i.e., [±45] are placed.

Fig 3.7: Applying a resign lay up

The epoxy resin and the catalyst are mixed proportionately in a bucket and apply on to stacked fibers. A roller is used to impregnate resin through out the fabr**ic.** As shown in above fig Resign is applied with

a mixture of 2% of Accelerator MEKP (methyl ethyl ketone peroxide) and catalyst as hardener on the woven fabric cloth.

Fig 3.8: placing of foam on mould

As soon as the resin is applied on the woven fabric, polyurethane foam slabs are fixed inside the wooden mould

The polyurethane foam is grounded according to the shape of corrugated bumper design. And for fill the gap between the foam the extra amount of resign is applied. After this finally another layer of woven fabric cloth is laid on the upper layer of the mould.-image. The final coat of the resin with accelerator and catalyst is applied on the upper layer of the mould.-image. The fabricated mould is allowed for curing for 18 hours.

Fig 3.9: After the removing the wooden mould

After the wooden mould has been removed. The excess material has been removed from the extracted mould by hacksaw. After that the bumper is taken for Surface finishing and painting.

Deflection Test on the Moulded Crash Bumper:

A simple static deflection test rig setup is made for the deflection test. The U channels are welded together as shown in fig(4.8).the span between the two supports is maintained approximately 1 meter. To give the fixed end conditions at the end recessions are made which fixed exactly onto the test rig. The bumper is fixed into a space provided and applies the uniformly distributed load. To make a static results for the different loading conditions. A dial indicator has been used to measure the deflections of a various loading conditions.

Deflection test is carried out on the sandwich corrugated bumper on the rigid frame fabricated shown in the figure 4.10 to 4.13.

Fig 3.10: Rigid Metallic frame to conduct the deflection test

Fig 3.11:FRP Sandwich bumper fixed to Rigid Metallic frame to conduct the deflection test

The deflection test is carried out considering the beam at both ends fixed and uniformly loaded. In order to distribute the applied load uniformly on the beam 12.5mm plywood sheet is laid on the bumper

Fig 3.12: FRP Sandwich bumper deflection test inprogress 100Kg Load

Fig 3.13: FRP Sandwich bumper deflection test inprogress 150Kg

Sandwich Bumper under Loading and Maximum Deflection Measurement at Mid Point.

The deflection is measured at the center of the beam by deflection meter of least count .01mm. The experimental results are shown in the table 4.3and plotted in figure 3.14..

Serial No.	Load =Total load wl Newtons	Deflection In mm
1	500	0.085
2	1000	0.110
3	1500	0.145
4	1600	0.180
5	1800	0.220
6	2000	0.346

Table 3.3: Load Vs Deflection of Sandwich Bumper

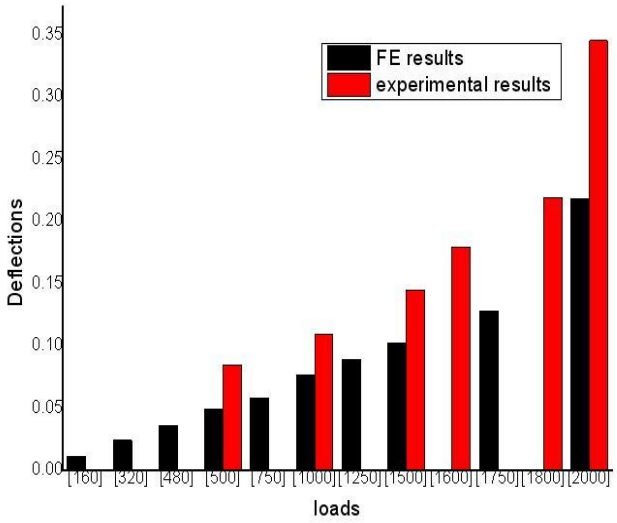


Figure 3.14: Load versus deflection of FE Analysis and experimental results of FRP Sandwich corrugated bumper

Deflection test results generated by FE analysis and experimental values are compared as given in figure 3.14. It is observed that the trends of FE analysis are matching with experimental findings.

3.6 - Break Even Analysis:

a. Introduction to Break Even Analysis:

Profit maximization is one of the major goals of any business. The other goals whichinclude enlarging the customer base, entering new markets, innovation through major investments in research and development, and so on. The volume of profit is determining a number of internal and external factors. As a part of monitoring the profitability of the operations of the business, it is necessary for the managerial economist to study the impact of changes in the internal factors such as cost, price and volume on profitability. Break even analysis comes very handy for this purpose.

b. Definition:

Break even analysis is defined as analysis of costs and their possible impact on revenues and volume

of the firms. Hence, it is also called the cost-volume-profit analysis. A firm is said to attain the Break Even Point when its total revenue is equal to total cost.

Break Even Point (BEP): is defined as a "no profit or no loss point."

c. Applications:

Make or buy decision
Choosing a product mix when there is a limiting factor
Drop or Add decisions

d. Significance of Break Even Analysis:

To ascertain the profit on a particular level of sales volume or a given capacity of production.
To calculate the sales required to earn a particular desired level of profit.
To compare the efficiency of the different firms.
To decide to make or buy a given component or spare part.
To assess the impact of changes in a fixed cost, variable cost or selling price on BEP and profits during a given period.

4. Results and discussion

The technologies of FRP manufacturing techniques are inexpensive when compared to PVC based components.
In this work various designs of FRP crash bumpers which are geometrically looking similar to the existing PVC bumpers are considered. CATIA V5 R16 is used for geometrical modeling and Analysis is carried out with ANSYS 10. The results obtained are very encouraging. From these test results it is clearly evident that the FRP structures of proposed design are stiffer when compared to existing PVC designs. The following comparative statement of stiffness clearly indicates that the sandwich design is stiffer with good structural rigidity and recommended for the fabrication..

Bumper Material	Stiffness (N/mm)
PVC Bumper	4.116(obtained by FE analysis)
Sandwich Bumper	880.86(obtained by experiment)

Table 5.1: stiffness of PVC bumper and FRP bumper

When cost comparison is considered the cost of FRP bumper is slightly higher than PVC bumper. This is because the raw material cost in India is slightly higher side when compared to western countries. Even then the advantages gained by the usage of FRP polymers are very high such as the stiffness is 216 times more. Crash energy absorbing capabilities of FRP is extensively high. The corrosion related problems are nil. The built-in coloring enables it maintenance free. The design flexibilities and simple manufacturing techniques make this product commercially viable and also provide a scope to gain customer satisfaction by adopting customized manufacturing processes.

Even though the cost of the component is slightly higher than the PVC bumper, the break even number of components to be produced is very low, which is the important concern in this work and apart from that, the paramount objective is the passenger safety.

In the sandwich based construction the usage of foam core considerably improved flexural rigidity when compared to the hollow bumper design by incorporating poly urethane foam weighing 125 grams in the construction.

5. Conclusion:

The simulation results is that [±45º] orientation of the fiber is the best orientation for the fabrication of the bumper.
The fabrication of the bumper has been done with sandwich construction.
The static deflection test was conducted on the model and deflection is found to bemax 0.346
The theoretical calculation and the simulation results differ i.e., due to localized buckling effect in the sandwich construction

REFERENCE:

1. Donga, Amarnath. Application of sandwich beam in Automobile front bumper for frontal crash analysis. Diss. Wichita State University, 2011.
2. Donga, A. (2011). Application of sandwich beam in Automobile front bumper for frontal crash analysis (Doctoral dissertation, Wichita State University).
3. Zhu, Lu, et al. "Design and simulation of innovative foam-filled Lattice Composite Bumper System for bridge protection in ship collisions." Composites Part B: Engineering 157 (2019): 24-35.
4. Zhu, L., Liu, W., Fang, H., Chen, J., Zhuang, Y., & Han, J. (2019). Design and simulation of innovative foam-filled Lattice Composite Bumper System for bridge protection in ship collisions. Composites Part B: Engineering, 157, 24-35.
5. Zhu, Lu, Weiqing Liu, Hai Fang, Jiye Chen, Yong Zhuang, and Juan Han. "Design and simulation of innovative foam-filled Lattice Composite Bumper System for bridge protection in ship collisions." Composites Part B: Engineering 157 (2019): 24-35.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

INVESTIGATION ON PERFORMANCE OF BURNISHING PROCESS ON DIFFERENT MATERIALS

[1]Mirza Shoeb Ahmed Baig, [2]Mr.N.Ravinder, [2]Mr,Gona Yarraiah, [4]Mr. T. Ramesh
[1]Assistant Professor in Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500008.
[2]Assistant Professor,Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[3]Assistant Professor,Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[4]Assistant Professor, Mechanical Engineering, Shadan College of Engineering & Technology, Hyderabad, India, 500 008

Abstract
The main aim of this paper is to analyze the impact of roller burnishing operations on the work material, which is a cold- working, non-metal removal and plastic deformation process. Surface finish has a positive and prolonged effect on the functioning of the machined parts. In this work roller burnishing is used to get a high-quality surface finish on different materials like aluminium, copper and brass.
A test rig was set up on a center lathe to conduct experiments. The surface finish of the roller burnished cylindrical surfaces was examined for the soft materials like aluminium, Copper and also for hard materials like Brass. The optimum values of feed, speed, and depth of penetration were suggested by conducting a number of experiments varying one-factor-at-a-time holding the other parameters constant. Number of passes of the tool was also the factors under study for the optimization.
Since all the factors are independent, varying one-factor-at-a-time and keeping the rest constant method of experimental optimization technique will not give accurate results either for the main effects or any interactions present. At same time it is not possible to vary more than one factor at a time experimentally.

1. INTRODUCTION

Surface Roughness:
The surfaces of engineering components will provide link between manufacturing and their function in use. Provision and long-term keeping of specified characteristics of machine parts greatly depends on their surface quality. The main cause of machine failures (80%) are wear of contact surfaces in mating parts. Wear resistance of rubbing parts can be improved by reducing the initial wear of components. In this line, it is better practice to make the sliding Surfaces with a roughness equal to that of worn-in parts.
In today's production of machines and instrument components, finishing processes are becoming more and more important. Increasing attention is being paid to the quality of the surface finish obtained. Surface finish is important not only as an appearance it also has a positive prolonged effect on the functioning of machine parts. Surface finish is a characteristic of any machined surface. It is sometimes called as surface texture or roughness. The advantages of good surface finish are:

- Good surface finishes increase the wear resistance of the two work pieces in an assembly.
- Good surface finishes have cosmetic affect and make the parts look good.
- Good surface finish permits the proper function of static and dynamic O-ring in hydraulic and Pneumatic equipment
- Good surface finishes increase the load carrying capacity, tool life.
- Good surface finishes increase the corrosion and fatigue life of the components

Surface roughness is generally defined as the irregularities, which are inherent in the production process left by the manufacturing tool.
Some factors are

- The marks left by the tool
- The finer structure due to the tearing of material during machining.
- The debris of built-up edge.
- Small irregularities in the shape of the tool tip.

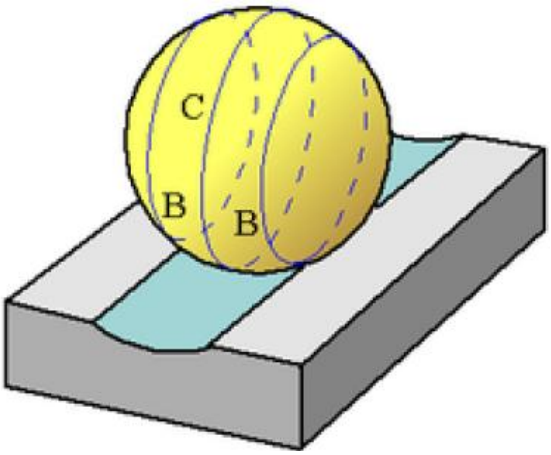
Poor surface finish may neutralize the effect of tolerances and require more power to operate the machines. Hence surface finish has vital role in machining process. The components manufactured without good surface finish may result in numerous problems. Increased wear on moving stressed parts, Excessive stress concentration etc. Thus,with a view to eliminate the above problems, a good surface finishing process is required.

2. LITERATURE

Burnishing
Burnishing is also called as chip less finishing process. It cold works the metal surfaces by applying the forces that exceed the yield strength of the material through

hardened roller or ball. This allows the peaks flow into the valleys. It is a new concept in finishing components. This process eliminates Grinding and honing which are costlier processes while improving the surface finish, surface hardness, wear-resistance, fatigue resistance and corrosion resistance of a part. This can also be termed as unconventional finishing operation.

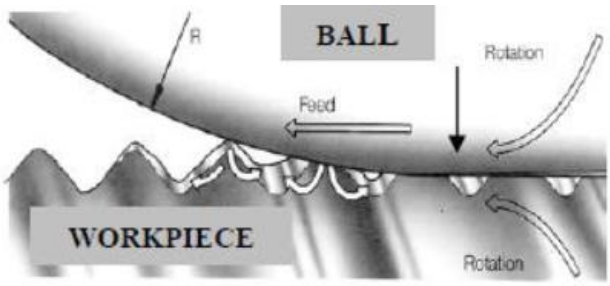
To understand burnishing, first look at the simple case of a hardened ball on a flat plate. If the ball is pressed directly into the plate, stresses develop in both objects around the area where they contact. As this normal force increases, both the ball and the plate's surface deforms. The deformation caused by the hardened ball is different depending on the magnitude of the force pressing against it. If the force on it is small, when the force is released both the ball and plate's surface will return to their original, un deformed shape. In this case, the stresses in the plate are always less than the yield strength of the material, so the deformation is purely elastic. Since it was given that the flat plate is softer than the ball, the plate's surface will always deform more. (Note 1: this is not necessarily true. For instance: if both items are steel, hardened steel has the same Young's Modulus as soft steel.)



Principle of Roller Burnishing

Roller Burnishing is a cold working process which produces a fine surface finish by the planetary rotation of hardened rolls over a bored or tuned metal surface. Roller Burnishing involves cold working the surface of the work piece to improve surface structure.

In the burnishing process, the pressure generated by the rolls exceeds the yield point of the softer piece part surface at the point of contact, resulting a small plastic deformation of the surface structure of the piece part.



Burnishing Operation

Since all machined surfaces consist of a series of peaks and valleys of irregular height and spacing, the plastic deformation created by roller burnishing is a displacement of the material in the peaks which cold flows under pressure into the valleys. The result is a mirror-like finish with a tough, work hardened and corrosion resistant surface.

The roller burnishing pressure required depends on number of factors like ductility and tensile strength of the material, surface roughness before and after roll.

Types of Burnishing Process:

The important types of Burnishing process can be enumerated as:

1. Roller burnishing
2. Ball burnishing
3. Multi roller burnishing
4. Impact burnishing
5. Oscillatory burnishing

Advantages of burnishing Process

a. Fine Finish

Roller Burnishing imparts a high finish to any machinable metal. Surfaces that are bored, reamed or turned up to 3-micron Ra or more can be finished to 0.05-to-0.2-micron Ra.

b. Accurate sizing

Roller burnishing tool feature is a built-in calibrated micrometer for adjustable size control in extremely small increments to cover the tolerance range of any part, Part size can be changed as little as 0.002 mm in one pass in a matter of seconds.

c. Improved metallurgical properties:

Burnishing 'cold – works' the metal of a machined part. Tool marks are rolled out. Grain structure is condensed and refined, and compacted surface is smoother, harder and longer wearing than ground or honed surfaces.

Rolling action greatly reduces surface porosity, pits and scratches which could hold reactive surfaces or contaminates. As a result the corrosion resistance of burnished surface is higher than the open surfaces produced by grinding or honing. Depending on the type of material being burnished surface hardness can be

increased by as much as 10-Rc. This increase often eliminates the need for heat treatment.

Due to plastic deformation in the roller burnishing operation, residual compressive stresses are inducted in the surface of the part. These compressive stresses greatly increase the strength properties and fatigue life of part, because any forces on the part must overcome these residual stresses, well as the tensile strength of the material, before fatigue conditions occur.

d. No Additional Machine Investment:

Roller burnishing tool can be used on most of the machine tools already installed in the shop, like screw machines, turret lathes, engine lathes, drill presses or the most sophisticated N/C machines. In most cases roller burnishing operation can be integrated with the automatic cycle or indexing sequence, eliminating time-consuming, costly secondary operations. Burnishing tools operate at standard speeds and feeds found in the most conventional shop machines.

e. Long tool life:

Thousands of parts can be finished with little or no burnishing tool wear. In many cases rolls and mandrels will hold size through 15 to 20 thousand operations. Even with a very small size tool, several thousand parts can normally be run before replacement parts are required.

f. Minimum Operator Skill required:

Set-up of roller burnishing tool takes less than a minute, using the built-in micrometer adjustment. Unskilled operators can produce close tolerance work with consistent part-to-part uniformity through an entire production run.

g. Low Torque and Power Requirements:

Power requirements for burnishing is a very low due to the small amount of torque generated. Work holding problems are therefore considerably simplified when designing fixtures and machine setups to be employed in surface finishing with this Type tool.

h. Maximum Parts Interchangeability:

Interchangeable parts of roller burnishing tools keep inventory low. Tools are grouped in standard series, each covering a specified size range. Since most parts in a series are standard, each tool is easily converted to other sizes within a range. Only the cage, mandrel and rolls are changed. This convertibility features can save up to 50% of the cost ofa new tool each new size needed for burnishing.

Disadvantages:

1. The initial cost of the burnishing tool is high.
2. Burnishing cannot be applied on miniature work pieces.
3. Components with thinner walls, which do not have enough strength, cannot be burnished, because the forces applied during burnishing are generally high.
4. Burnishing of intricate shapes and contours require dedicated tools and high skilled workmen. If the design or shapes of the contours change, new set of tools have to be designed and manufactured. This increases the cost and time.

Applications of Burnishing Process

1. Pneumatic Cylinders
2. Hydraulic Cylinders
3. Hydraulic Cylinders
4. Brake Cylinders
5. Piston G.P Holes
6. Valve Rod
7. Valve Guide
8. Mixie Shaft
9. Fan Rotor Shaft
10. GM / Bronze Bushes
11. Connecting Rod Small / Big End
12. Rocker Arm
13. Bearing Housing
14. Rotor Stamping I.D
15. Motor End Cover
16. Pipes
17. Drilled Holes etc.

3. EXPERIMENTAL DESIGNSTRATEGY:

Taguchi recommends orthogonal array (OA) for laying out of experiments. These OAs are generalized Graeco-Latin squares. To design an experiment is to select the most suitable OA and to assign the parameters and interactions of interest to the appropriate columns. The use of linear graphs and triangular tables suggested by Taguchi makes the assignment of parameters simple. The array forces all experimenters to design almost identical experiments.

In the Taguchi method the results of the experiments are analysed to achieve one or more of the following objectives.

1) To establish the best or the optimum condition for a product or process.

2) To estimate the contribution of individual parameters and interactions.

3) To estimate the response under the optimum condition

In this step, the original response values are transformed into S/N ratio values. Further analysis is carried out based on these S/N ratio values. The surface roughness is a lower-the-better performance characteristic, since the maximization of the quality characteristic of interest is sought and can be expressed as

$$\frac{S}{N}\ Ratio = -log_{10}\left[\frac{1}{n}\right]\sum_{i=1}^{n}\frac{1}{Y_{ij}^2}$$

Where,
n = number of replications and
Y_{ij} = observed response value

Where,
i=1, 2....n
j = 1, 2...k.

The surface roughness is the lower-the-better performance characteristic and the loss function for the same can be expressed as

$$\frac{S}{N}\ Ratio = -log_{10}\left[\frac{1}{n}\sum_{i=1}^{n}Y_{ij}^2\right]$$

Experimental set-up

The experimental set up consists the following for carrying out the roller burnishing process.

1. Lathe machine
2. Dynamometer
3. The burnishing tools
4. Work pieces and coolants
5. Surface finish measuring instrument

Lathe Machine Capacity:

Type of bed: Flame Hardened bed ways
Max swing over bed: 325 mm
Max swing over cross slide: 175 mm
Height of centers: 165 mm

Spindle speeds:

No of spindle speeds: 8
Spindle speed range: 40-1200 rpm

Feeds:

No of feeds: 40
Range of longitudinal feeds: 0.066 to 2 mm / Rev of spindle
Range of Transverse feeds: 0.0165 to 0.50 mm / Rev of spindle
Capacity of motor: 1 Hp

Dynamometer is used to determine the forces during the burnishing operation. The dynamometer used here is kistler three axes lathe tool dynamometer. This dynamometer is mounted on the cross slide of lathe machine,it is a four-component dynamometer and is for measuring the torque (M_Z) and the three orthogonal components of the forces (F_X, F_Y &F_Z). For satisfactory mounting of tools up to 12*12 mm shank cross section is used. The dynamometer has a great rigidity and consequently a high natural frequency. Its high resolution enables the smallest dynamic changes in large forces and torques to be measured. The dynamometer consists of a four-component sensor fitted under high preload between a base plate and top plate. The four components are measured practically without displacement. It must be taken in to account combined and eccentric loads may reduce the measuring ranges.

The sensor is mounted ground-isolated. Therefore ground loop problems are largely eliminated. The dynamometer is rustproof and protected against penetration of splash, water & cooling agents. Together with connecting cable type 1677A5/1679A5 it corresponds to protection class IP67.

Burnishing is a chip less removal process. Hence the force considered for burnishing operation is present case is only thrust force. This kistler dynamometer can be used for measuring the forces during Turning, Milling, drilling etc.

Burnishing tool

The burnishing tool mainly consists of two parts. They are tool holder and roller. Burnishing tool is mounted on the tool post in the lathe tool dynamometer so that the forces during burnishing process can be measured. The combination of the tool holder and the roller is called as burnishing tool.

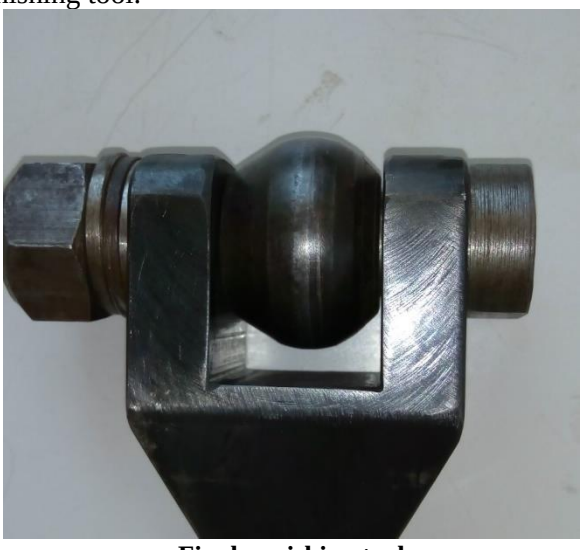


Fig: burnishing tool

Work piece

In this experiment we took nine work pieces with three different materialsAlluminium, Copper, Brass. Each workpiece has 25mm diameter and 4 inches long. Burnishing operation is carried out on the three materials. Totally we took nine work pieces to observe surface roughness after number of passes. For all work pieces first we did turning and facing operations to remove the waste material like corrosion, etc. For first three work pieces we did burnishing for 5 times. For next three we did burnishing for 10 times.For the last set we did burnishing for 15 times.

Dimensions

S.no	Material	Length (mm)	Diameter (mm)
1	Alluminium	100	25
2	Copper	100	25
3	Brass	100	25

Table : Dimensions of the work piecematerial

Properties

Material	Young's modules	Poison's ratio	Density
Alluminium	70	0.33	2700
Copper	120	0.35	8940
Brass	110	0.34	8750

Table : The properties of these materials

Coolants

During the burnishing process heat is produced. Because of these heat the tool will be damaged and the surface finish is also changes. To remove these heat these heat coolants are used. The coolants are also providing good lubrication between the tool and material. They are also used as remove the small particles of the metal that produced in the process. Kerosene is used as coolants for alluminium component. Some water soluble oils, SAE 40 oil is used for the other materials.

Profilometer:

Profilometer is a measuring instrument used to measure asurface's profile, in order to quantify its roughness. While the historical notion of a profilometer was a device similar to a phonograph that measures a surface as the surface is moved relative to the contact profilometer's stylus, this notion is changing with the emergence of numerous noncontact profilometry techniques.

The basic operations involved in the experimentation

1. Turning
2. Burnishing
3. Surface roughness measurement

4. RESULTS

In turning operation

The speed is 140 rpm
Depth of cut is 0.4 mm
Feed is constant that is 0.1 mm/rev

Surface roughness test before burnishing

Aluminium:

S.no	Ra	Rq	Rz
A1	1.884	2.345	11.61
A2	1.714	2.113	10.813
A3	1.847	2.238	10.875

Copper:

S.no	Ra	Rq	Rz
C1	2.466	3.029	12.973
C2	2.016	2.439	11.82
C3	2.685	3.244	14.668

Brass:

S.no	Ra	Rq	Rz
B1	2.391	2.919	13.354
B2	2.369	2.863	12.846
B3	2.322	2.859	12.898

The variation of surface hardness with burnishing force is shown in table for Aluminium, Brass, Copper by roller burnishing. It is observed that surface hardness increases with increase in the burnishing force. This is mainly due to the increased plastic deformation of micro irregularities with high burnishing forces. There is an optimum burnishing force, beyond which the surface hardness decreases.

Higher work hardening of surface layer will lead to flaking effect, which is the main cause for decrease in surface hardness with higher and higher burnishing forces. The burnishing force which gives maximum surface hardness for Aluminium by roller burnishing operation at a speed of 0.5m/s and feed of 0.1mm/rev and max force value is 0.45. The force values are changed for copper and brass as 0.9 and 0.3 but the speed and feed are constant.

BURNISHING PROCESS:

In this burnishing process materials **aluminum, brass, copper** is machined several times per sample.

Alluminium-A1 is done for 5 times, A2 for 10 times, A3 for 15 times similarly this process is done for brass and copper. By doing this process surface hardness of the particle increases time to time. Final sample is done for surface finishing.

In burnishing process

Depth of cut is 0.4 mm
Speed of spindle-140 rpm
Feed is constant that is 0.1 mm/rev

For Aluminium

S.no	Ra	Rq	Rz
A1	0.455	0.63	4.175
A2	0.154	0.221	1.79
A3	0.319	0.397	1.987

For Copper:

S.no	Ra	Rq	Rz
C1	0.721	0.905	4.304
C2	0.618	0.776	3.827
C3	0.802	1.038	4.393

For Brass:

S.no	Ra	Rq	Rz
B1	0.398	0.492	2.525
B2	0.461	0.601	2.969
B3	0.503	0.622	3.31

The variation of surface roughness with number of burnishing passes is studied keeping the other burnishing conditions (speed, feed and force) constant and the results are shown in table. It is observed from the graph that maximum reduction in surface roughness is observed in the first five passes. Beyond five passes, there is not much improvement in the surface finish in the present experiment. In each number of pass, the burnishing force is being applied on the deformed asperities of the previous operation. Then, there will be a further deformation in the asperities in each number of pass thereby the surface roughness will decrease with number of passes

After a certain number of passes, as the surface layer is highly work hardened due to repeated contact of the tool, further deformation of asperities at the same burnishing force is not so considerable.

Thereby, there is not much improvement in surface finish after a certain number of passes.

After burnishing the surface roughness value of alluminium 0.455

This is of 5 times, 0.154 for 10 times and 0.319 for 15 times.

Brass 0.398 for 5 time, 0.461 for 10 times and 0.503 for 15 times

Copper-0.721 for 5 times, 0.618 for 10 times and 0.802 for 15 times.

After surface finishing testing is done for materials such as hardness test and x-ray test.

Forces:

During the burnishing process forces obtained from dynamometer are:

For Alluminium

X	Y	Z	R
0.45	32.1	53.4	62.30
0.4	37.05	54.8	66.15
0.2	33.8	56.9	66.18
0.5	33.9	58.9	67.96
0.3	37.8	63.2	73.64
0.2	38.2	63.5	74.104
0.1	40.2	62.5	74.31

For Copper:

X	Y	Z	R
0.9	0.9	27.5	27.52
2.5	16.5	32.5	36.53
3.9	17.5	33.6	38.08
0.1	20.2	34.4	39.89
0.2	19.3	36.9	41.64
0.3	21.4	37.5	43.17
0.1	22.5	38.6	44.67
0.1	22.1	40.9	46.48

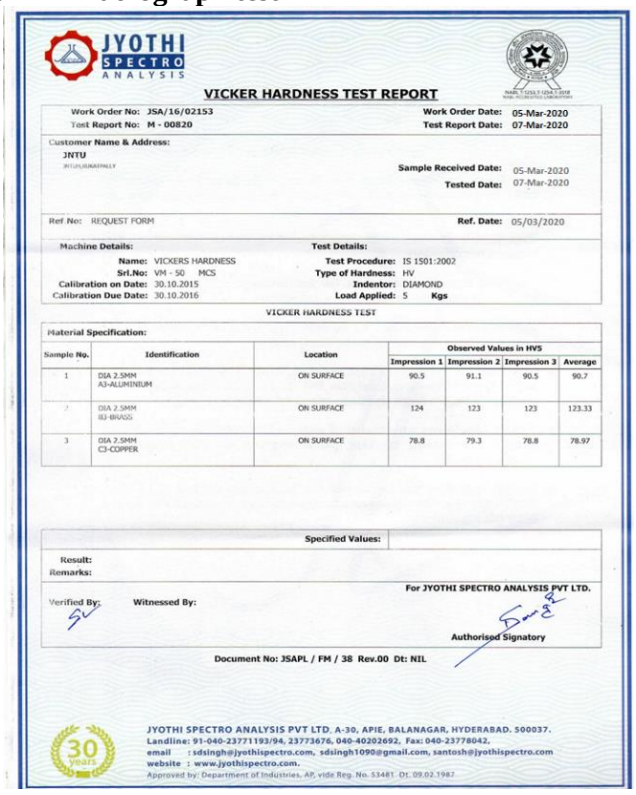
For Brass:

X	Y	Z	R
0.3	12.0	29.3	31.66
0.4	20.6	39.8	44.81
0.7	20.2	40.7	45.44
4.3	20.8	43.5	48.40
3.4	21.3	42.9	48.01
0.2	21.5	45.5	50.32
0.1	22.6	47.3	52.42
0.4	23.5	48.5	53.89

TESTING:

We have done the following tests on the work pieces to know the properties

1. **Hardness test**
2. **Radiograph test**



JYOTHI SPECTRO ANALYSIS

VICKER HARDNESS TEST REPORT

Work Order No: JSA/16/02153 — Work Order Date: 05-Mar-2020
Test Report No: M - 00820 — Test Report Date: 07-Mar-2020

Customer Name & Address: JNTU

Sample Received Date: 05-Mar-2020
Tested Date: 07-Mar-2020

Ref No: REQUEST FORM — Ref. Date: 05/03/2020

Machine Details: Name: VICKERS HARDNESS; Srl.No: VM - 50 MCS; Calibration on Date: 30.10.2015; Calibration Due Date: 30.10.2016

Test Details: Test Procedure: IS 1501:2002; Type of Hardness: HV; Indentor: DIAMOND; Load Applied: 5 Kgs

VICKER HARDNESS TEST

Material Specification:

Sample No.	Identification	Location	Observed Values in HV5			
			Impression 1	Impression 2	Impression 3	Average
1	DIA 2.5MM A3-ALUMINIUM	ON SURFACE	90.5	91.1	90.5	90.7
2	DIA 2.5MM B3-BRASS	ON SURFACE	124	123	123	123.33
3	DIA 2.5MM C3-COPPER	ON SURFACE	78.8	79.3	78.8	78.97

Specified Values:

Result:
Remarks:

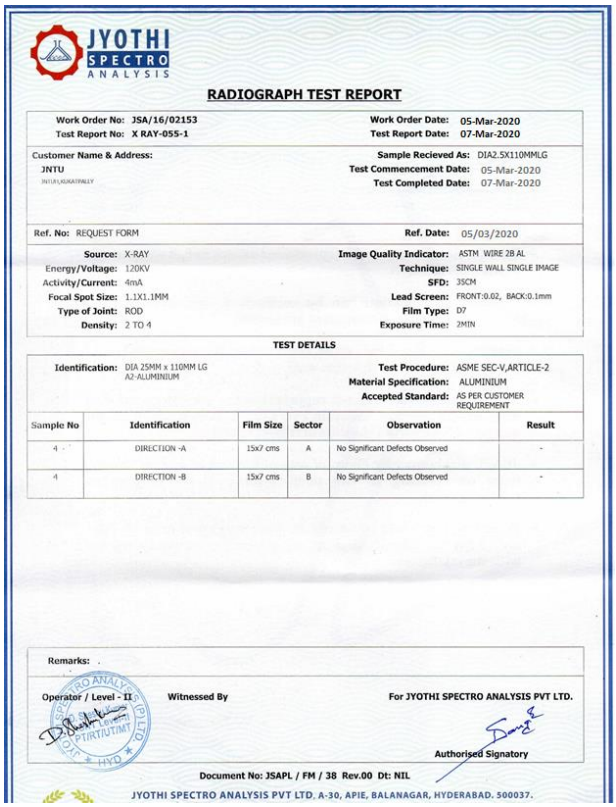
For JYOTHI SPECTRO ANALYSIS PVT LTD.

Verified By: Witnessed By:

Authorised Signatory

Document No: JSAPL / FM / 38 Rev.00 Dt: NIL

JYOTHI SPECTRO ANALYSIS PVT LTD, A-30, APIE, BALANAGAR, HYDERABAD. 500037.
Landline: 91-040-23771193/94, 23773676, 040-40202692, Fax: 040-23778042,
email : sdsingh@jyothispectro.com, sdsingh1090@gmail.com, santosh@jyothispectro.com
website : www.jyothispectro.com.
Approved by: Department of Industries, AP, vide Reg. No. 53481 Dt. 09.02.1987



JYOTHI SPECTRO ANALYSIS

RADIOGRAPH TEST REPORT

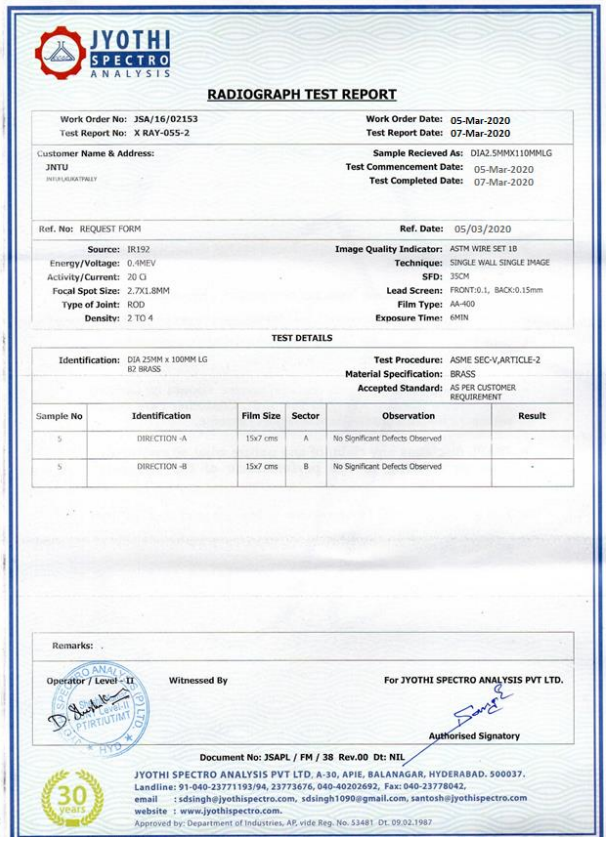
Work Order No: JSA/16/02153 — Work Order Date: 05-Mar-2020
Test Report No: X RAY-055-1 — Test Report Date: 07-Mar-2020
Customer Name & Address: JNTU — Sample Recieved As: DIA2.5X110MMLG
Test Commencement Date: 05-Mar-2020
Test Completed Date: 07-Mar-2020
Ref. No: REQUEST FORM — Ref. Date: 05/03/2020
Source: X-RAY — Image Quality Indicator: ASTM WIRE 2B AL
Energy/Voltage: 120KV — Technique: SINGLE WALL SINGLE IMAGE
Activity/Current: 4mA — SFD: 35CM
Focal Spot Size: 1.1X1.1MM — Lead Screen: FRONT:0.02, BACK:0.1mm
Type of Joint: ROD — Film Type: D7
Density: 2 TO 4 — Exposure Time: 2MIN

TEST DETAILS

Identification: DIA 25MM x 110MM LG A2-ALUMINIUM
Test Procedure: ASME SEC-V,ARTICLE-2
Material Specification: ALUMINIUM
Accepted Standard: AS PER CUSTOMER REQUIREMENT

Sample No	Identification	Film Size	Sector	Observation	Result
4	DIRECTION -A	15x7 cms	A	No Significant Defects Observed	-
4	DIRECTION -B	15x7 cms	B	No Significant Defects Observed	-

Remarks:
Operator / Level - II — Witnessed By — For JYOTHI SPECTRO ANALYSIS PVT LTD.
Authorised Signatory
Document No: JSAPL / FM / 38 Rev.00 Dt: NIL
JYOTHI SPECTRO ANALYSIS PVT LTD, A-30, APIE, BALANAGAR, HYDERABAD. 500037.



JYOTHI SPECTRO ANALYSIS

RADIOGRAPH TEST REPORT

Work Order No: JSA/16/02153 — Work Order Date: 05-Mar-2020
Test Report No: X RAY-055-2 — Test Report Date: 07-Mar-2020
Customer Name & Address: JNTU — Sample Recieved As: DIA2.5MMX110MMLG
Test Commencement Date: 05-Mar-2020
Test Completed Date: 07-Mar-2020
Ref. No: REQUEST FORM — Ref. Date: 05/03/2020
Source: IR192 — Image Quality Indicator: ASTM WIRE SET 1B
Energy/Voltage: 0.4MEV — Technique: SINGLE WALL SINGLE IMAGE
Activity/Current: 20 Ci — SFD: 35CM
Focal Spot Size: 2.7X1.8MM — Lead Screen: FRONT:0.1, BACK:0.15mm
Type of Joint: ROD — Film Type: AA-400
Density: 2 TO 4 — Exposure Time: 6MIN

TEST DETAILS

Identification: DIA 25MM x 100MM LG B2 BRASS
Test Procedure: ASME SEC-V,ARTICLE-2
Material Specification: BRASS
Accepted Standard: AS PER CUSTOMER REQUIREMENT

Sample No	Identification	Film Size	Sector	Observation	Result
5	DIRECTION -A	15x7 cms	A	No Significant Defects Observed	-
5	DIRECTION -B	15x7 cms	B	No Significant Defects Observed	-

Remarks:
Operator / Level - II — Witnessed By — For JYOTHI SPECTRO ANALYSIS PVT LTD.
Authorised Signatory
Document No: JSAPL / FM / 38 Rev.00 Dt: NIL
JYOTHI SPECTRO ANALYSIS PVT LTD, A-30, APIE, BALANAGAR, HYDERABAD. 500037.
Landline: 91-040-23771193/94, 23773676, 040-40202692, Fax: 040-23778042,
email : sdsingh@jyothispectro.com, sdsingh1090@gmail.com, santosh@jyothispectro.com
website : www.jyothispectro.com.
Approved by: Department of Industries, AP, vide Reg. No. 53481 Dt. 09.02.1987

5. CONCLUSION

The roller burnishing process is carried out on three different materials, they are Alluminium, brass & copper. The effect of burnishing parameters, and the proposed tool dimensions is studied, and the following points are concluded.

The surface roughness decreases with increase in feed, burnishing speed, force and number of passes to a certain limit.

Best surface roughness values for these materials at constant force, constant feed (0.1 mm/rev), and speed-140 rpm and after number of passes are

- For 10 times of burnishing for alluminium we got surface roughness Ra-0.154
- For 5 times of burnishing for brass we got surface roughness Ra-0.398
- For 10 times of burnishing for copper we got surface roughness Ra-0.618

REFERENCES

1. GRZESIK W., 2008, Advanced Machining Processes of Metallic Materials, Elsevier, Amsterdam.
2. GRZESIK W., RECH J., WANAT T., 2007, Surface finish on hardened bearing parts produced by superhard and abrasive tools, Int. J. Mach. Tools Manuf. 47, 255-262.
3. Labuda, W., Starosta, R., Dyl, T., Estimation of the influence of burnishing parameters on steel X5CrNi1810 surface layers strengthening and roughness changes, Journal of KONESPowertrain and Transport, Vol. 15, No. 3, pp. 259-267, Warszawa 2008.
4. Davies et al.,. ASM Handbook, ASM Machining. Vol. 16, 1999.
5. Dr. Mike S. Lou, Dr. Joseph C, "surface roughness prediction technique for CNC – milling", Journal of industrial technology vol. 15, No 1, 1998 – 1999
6. L. LUCA, S. NEAGU-VENTZEL, I. MARINESCU: Effects of working parameters on surface finish in ball-burnishing of hardened steels. Precision Engineering, **29**(2005), 253-256.
7. F. PUŠAVEC, E. GOVEKAR, J. KOPAČ: Jawahir IS The Influence of Cryogenic Cooling on Process Stability in Turning Operations. CIRP Annals-Manufacturing Technology, **60**(2011)1, 101-104.
8. Y. YILDIZ, M. NALBANT: A Review of cryogenic cooling in machining processes. Inter. Journal of Machine Tools and Manufacture, **48**(2008), 947-964.
9. D. UMBRELLO: Analysis of the white layer formed during machining of hardened AISI 52100 steel under dry and cryogenic cooling conditions. Inter. Journal ofAdvanced Manufacturing Technology, **64**(2013), 633-642.
10. W. GRZESIK, K. śAK: Producing high quality parts using sequential hard turning and ball burnishing operations. Precision Engineering, **37**(2013), 849-855

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

EXPERIMENTAL INVESTIGATION OF AIR FLOW CHARACTERISTICS IN RECTANGULAR CHANNEL USING PEDESTALS AS VORTEX GENERATOR

[1]Mr. A. Abdullah Aafaq , [2] Mr. Asfan Mohiuddin , [3]Mr. Mohd Habeeb Ali, [4] Mr. Md Siddique,
[1] AssistantProfessor, Mechanical engg., SCET,Hyderbad, India,
[2] AssistantProfessor, Mechanical engg., SCET,Hyderbad, India,
[3]AssistantProfessor, Mechanical engg., SCET,Hyderbad, India,
[4] AssistantProfessor, Mechanical engg., SCET,Hyderbad, India

Abstract- This experimental study is to investigate the effect or influence of pedestal vortex generator on one wall of rectangular duct on the flow performance. The effects of geometrical parameters of pedestal vortex generator and aspect ratio of duct on friction factor ratio have resulted in Reynolds number which is based on hydraulic diameter of the rectangular channel in the range 8000 to 24000. The factors which are varied for vortex generator were pitch to height ratio of vortex generator (p/h) and aspect ratios of vortex generators (Δ). Vortex generator numbers were also varied on wall at axial locations. Experimental results reported for aspect ratio 2.8, 5.5, 7.3 and 1.6 of pedestal vortex generator and pitch to height ratio (P/h) 4,8,12, 16. And 8000 to 24000 is the range of Reynolds number. Experimentally investigated that the friction factor ratio increases with increase in Reynolds number and friction factor ratio increases with decrease in pitch to height ratio. For pedestal vortex generator with aspect ratio 2.8 and height 8mm the results were, For pitch to height ratio (P/h)=16 friction factor ratio for 8000 Reynolds number is 27.12% less than the friction factor ratio for the Reynolds number 24000. So it is clear that friction factor ratio increases with increase in Reynolds number. And for Reynolds number 20000, pitch to height ratio (P/h) =4 friction factor ratio is 21.14% greater than pitch to height ratio (P/h)=16 so we can say that friction factor ratio increases withdecrease in pitch to height ratio.
Keywords: Pitch to height ratio, Aspect ratio, Pressure drop, Hydraulic diameter, Pedestals

1. INTRODUCTION

There are many uses in engineering processes in which we come across addition or removal of heat for this to happen we use heat exchange equipment's in wide applications of engineering. Flow in channels gains more attention because of their uses in heat exchangers. In channels we use vortex generators which obstruct the flow and produce vortices due to these vortices heat transfer rate is enhanced. There are many types of vortex generators which are used in channel flow and the most often used are ribs, wings and winglet pairs. And for these vortex generators there are many number of methods to raise the coefficient of heat transfer. Commonly used methods are active, passive and compound methods. But here we are using passive method in which no external power is used but we make use of geometry of surface which is main factor in passive method, where as in active method we use external power like mechanical equipment's, surface vibration ,electric or acoustic fields. The method which makes use of both active and passive method is named as compound method. In passive method the main factors which raises the heat transfer rate mainly depends on two important things one is disturbing thermal layer and mixing of bulk fluid. This disturbance in the presence of roughness elements will raise the heat transfer rate by producing a boundary layer which is thinner than undisturbed thermal boundary layer. Mixing of bulk fluid increases the heat transfer rate and because of vortices produced due to disturbance reduces thermal gradient in the center and it mainly on side wall region of the channel. This can be achieved by using vortex generators.

The method which uses vortex generators to raise the heat transfer rate is named as induced vortex enhancement technique. The vortex generators are mainly divided into four forms on the basis of their geometry. Ribs, winglet pairs, delta wings and delta winglet pairs.

Vortex generators which disturb the flow and produce vortices which further increase the heat transfer rate and these shapes of vortex generators are either be cut or punched. And these vortex generators are attached to the surface of the channel which is to be roughened. These

vortex generators stick to the surface which is to be roughened with the help of glue or anabond. And the channel which we are using is two way closed channel
And the material used for channel is transparent acrylic sheets. Mixing can also be effected using ribs, dimples and surface bumps.
Ribs are also most commonly used type of vortex generators and vortex generators used here are rectangular pedestals. And the most attractive heat transfer rise can be achieved by dimples. These produce multiple vortex pairs that supplement local nusselt number distributions. They actually do not peek into the flow because of low pressure drop is being produced by dimples. Other than dimples like ribs are attached to the surface with the help of glue or anabond and these are kept at angle with respect to open stream end. In ribs since they extend into the flow because of this ribs produces higher pressure drop than the dimples. And same case with pedestals which offer higher pressure drop. The material used for pedestals is transparent acrylic which is cut into shapes with base which resembles the base of the channel surface which is roughened. The duct we are using is rectangular duct with turbulent flows.

2. VORTEX GENERATORS

These are the members which obstruct the flow and produce vortices that raise heat transfer rate. There arevarious typesofvortexgeneratorsthat can be used to obstruct the flow and they are such ribs, winglet type generators, delta wing and theseareusedincoolingmethods in gas turbine blades. But the vortex generator which we are using here is PEDESTALS. Rectangular pedestals which are of acrylic material and they are cut according to the aspect ratio. Due to this, longitudinal vortices are produced and effects of these vortices on heat transfer rate and pressure drop from the wall duct are studied successfully.

Fig 1 Vortex generators with different heights and aspect ratios

Pedestals as vortex generators with different aspect ratio (Δ) are used
Δ= 2.8, 7.3, 1.6 and 5.5

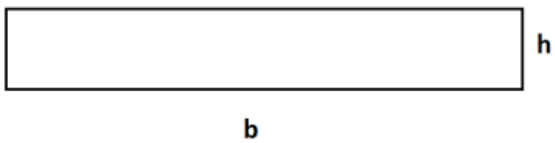


Fig 2 Geometry of the pedestal vortex generator

Aspect ratio for pedestals vortex generator = b/h
(P/h) = it is the ratio of pitch to height of the vortex generator
Where,
b= width or base of the vortex which resembles the hydraulic diameter of rectangular channel
h = height of the pedestal vortex generator
p = pitch

3. EXPERIMENTAL SET UP AND DATA REDUCTION

Experimental set up is constructed once all the operations of fabrication are done. To place the venturimeter, rectangular channel and gate valve what we have done is we designed a steel table like structure to place the equipment's required to measure the air flow rate. And equipment's heights are adjusted so that the entire set up is at equal height so that do not disturb the flow of air. The insides of venturimeter and transition pieces are smoothly finished to avoid back pressure due to disturbance to the flow. Air is entered from blower through a gate valve which can be closed and opened according to the requirement. First we take readings for smooth duct i.e. without placing the vortex generators in the channel which obstructs the flow.
And Reynolds number is varied from 8000 to 24000 based on the hydraulic diameter of the rectangular channel and due to this there will be variation in U- tube due to pressure drop across venturimeter. And to measure the pressure drop in rectangular channel it is connected to differential manometer which contains two fluids one is water and the other one is benzyl alcohol of specific gravity 1.04 and weight 1046kg/m3 and it is measured when the pressure is very small.
It is by operating blower, the air is taken inside duct section through gate valve. It is operated to vary for Reynolds number upon which it either closed or opened. Air is entered in the test section and it is measured by venturimeter connected to U-tube manometer showing small pressure drop and difference in pressure at the test section is calculated using differential manometer. After taking readings for pressure drop in differential manometers calculations are done according to the data required for it to find out frictional factor ratio for different configuration.
And the vortex generators pedestals which are of 4mm thickness are placed in the chaanel base using sealant Anabond to stick firmly according to the aspect ratio and pitch. And readings were taken for different pitch and different aspect ratio. And the maximum preesure rise in the differential manometer is 85cm. U tube manometer is used to measure large pressure drop. Two pressure taps

are drilled to the test section to measure the average pressure drop.

4. DATA REDUCTION

Reynolds number (R_e):

Reynolds number is calculated based on hydraulic number of the duct obtained from the equation

$R_e = \rho V D_h / \mu$

$R_e = V D_h / \nu$

Smooth duct frictional factor (f_s) or theoretical friction factor :

Blasius equation is used to calculate friction factor for fully developed turbulent flows in a smooth duct

$f_S = 0.046(R_e)^{-(0.2)}$

Mass flow rate through duct section:

$m = \rho Q kg/sec$

Experimental or actual friction factor ratio (f) :This is calculated from test section using average velocity of air in the channel and measured pressure drop. And this is done at atmospheric temperature i,eat room temperature without heating And friction factor is calculated using air density at atmospheric temperature.

Pressure loss in the channel is

$h = 4fLV^2/2gD_h$

$\Delta p = 4fLV^2/2gD_h$

$f = \Delta p / \{(4L/D_h)(\rho_a V^2/2)\}$

Pressure Drop(ΔP) :

It can be calculated using pressure in the duct section pressure taps connected across differential manometer. Pressure drop in the duct was estimated from the differential pressure head as:

$\Delta p = gy\{\rho_m + \rho_w[(d/D)^2 - 1]\}$ **N/m²**

Friction factor ratio based on equal Reynolds number :

$ff = f/f_S$

5. RESULTS AND DISCUSSIONS

Smooth duct

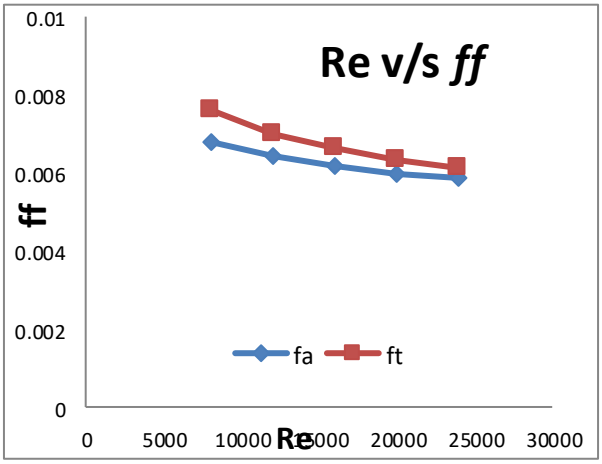


Fig 4 smooth duct curve

Fig 4 is as shown in above graph. It is obtained by plotting friction factor ratio against Reynolds number. The 'f_a" is the actual friction factor and f_t is theoretical friction factor which is obtained from Blasius equation and actual friction factor is obtained from the experimental readings. From the graph we come to the result that actual friction factorgoes good with theoretical within the range of±6% and ±4%. From the graph if the distance between the lines is more there will be more error in the experiment

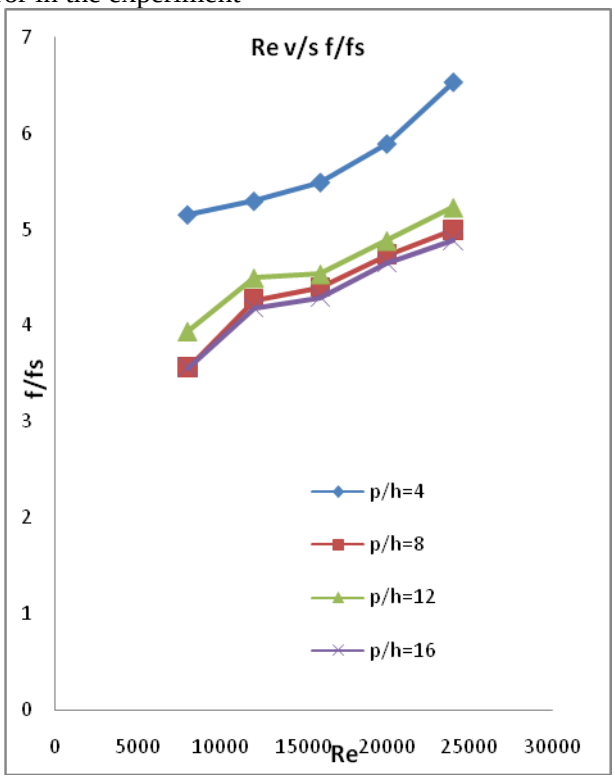


Fig 5 Re Vs f/fs AR= 2.8 and h=8mm

Fig 5 is as shown above it is obtained by plotting Reynolds number against friction factor ratio for vortex generator AR= 2.8 and for (P/h) = 4, 8, 12 and 16. From the graph we can say that as the Reynolds number increases friction factor ratio also increases. Because rate of vortex formed depends on flow velocity in the channel and flow velocity is directly proportional to Reynolds number. So increase in flow velocity leads to increase in pressure drop and consequently friction factor ratio. For (P/h)=16, friction factor ratio for Reynolds 8000 is 27.12% less than the friction factor ratio for Reynolds number 24000 so from the graph we can conclude that friction factor ratio increases with increase in Reynolds number

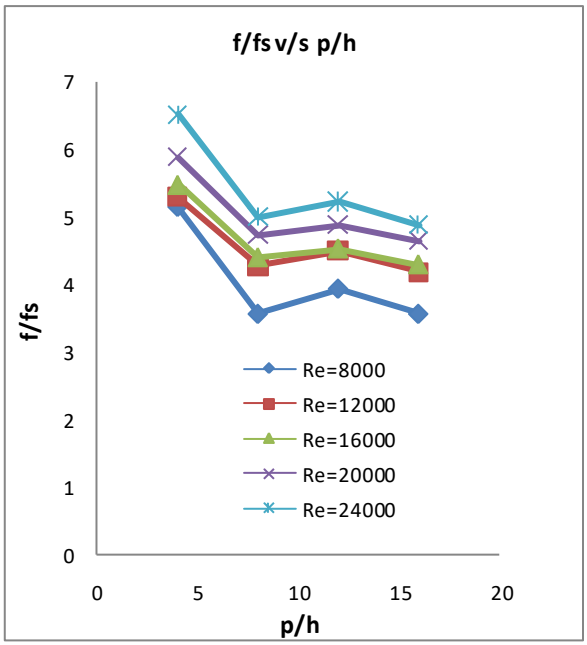


Fig 6 P/h Vs f/fs AR=2.8, h=8mm

Fig 6 is as shown in the above graph and the graph is plotted pitch to height ratio against friction factor ratio. Mixing of flow is important here, if axial pitch is smaller then the flow gets disturbed by next pedestal vortex generator which results in higher pressure drop. If the pitch between the vortex generators is high then pressure drop decreases which again results in decrease in friction factor ratio. For aspect ratio 2.8 and for Reynolds number 20000 (P/h)=4 is 21.14% is greater than the (P/h)=16, so from this we come to the result that pitch to height ratio increases with decrease in friction factor ratio.

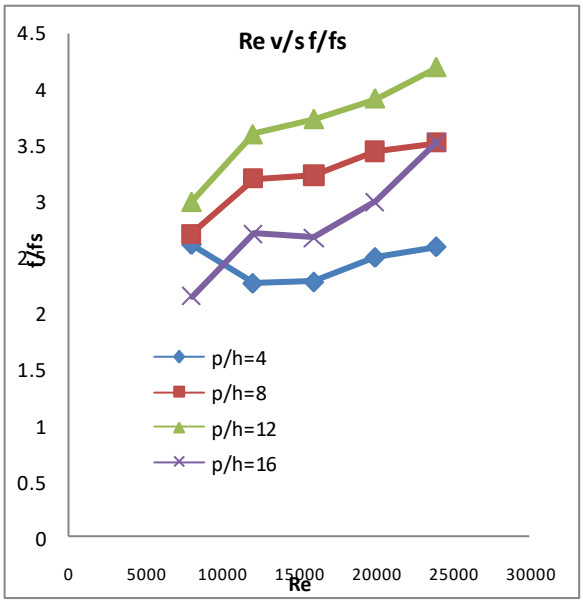


Fig 7 Re Vs f/fs AR=7.3, h=3.1mm

Fig 7 is as shown above it is plotted Reynolds number against friction factor ratio and it is seen that as the Reynolds number increases for different pitch to height ratio friction factor ratio also increases. It mainly depends on the velocity of flow inside the channel. If Velocity is high then pressure drop increases and automatically friction factor ratio also increases. For pitch to height ratio (P/h)=12, friction factor ratio for 24000 Reynolds number is 28.6% greater than friction factor ratio at Reynolds number 8000. So from this we can say that friction factor ratio increases with increase in Reynolds number

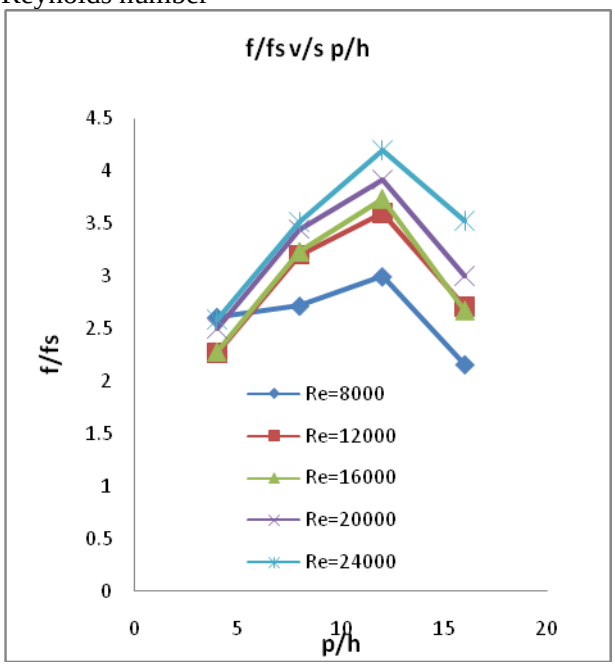


Fig 8 P/h Vs f/fs, AR=7.3, h=3.1mm

Fig 8 is as shown above it is obtained by plotting pitch to height ratio against friction factor ratio. Proper vortices are formed when the distance between pedestals vortex generators is more then there will be less chance of flow getting disturbed by next pedestal vortex generator if the axial distance is small then pressure drop increases which again results in increase of friction factor ratio.Reynolds number 20000 for (P/h=12) friction factor is 23.57% greater than the friction factor ratio at (P/h)=16 so from the graph it is clear that friction factor increases with decrease in pitch to height ratio.

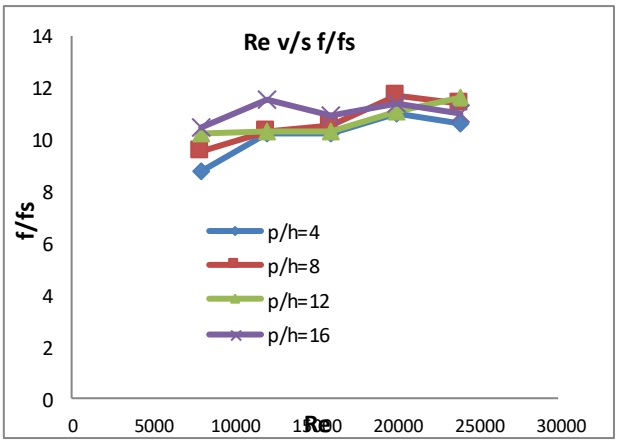


Fig 9 Re Vs f/fs, AR=1.6, h=14.1mm

Fig 9 is as shown above it is the graph resulted when the Reynolds number is plotted against fiction factor ratio for different pitch to height ratio of vortex generators. It is seen that velocity of flow is less for 8000 Reynolds number to that of 24000 Reynolds number. So from this we can say that higher the velocity of flow in the rectangular channel the higher the Reynolds number which again results in high pressure drop and friction factor ratio. Example for (P/h)=4 friction factor ratio for 8000 is 20.67% less than that of friction factor ratio at Reynolds number24000.

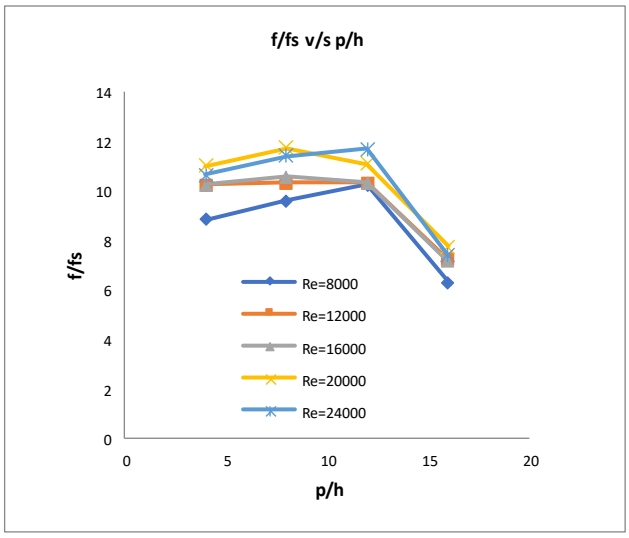


Fig 10 P/h Vs f/fs, AR=1.6, h=14.1mm

Fig 10 variation of pitch to height ratio to friction factor ratio for different Reynolds number is shown in the above figure. If the pedestals vortex generator are placed with less pitch in the channel then flow gets disturbed in the earlier stage due vortices being obstructed by next placed pedestal vortex generator. This results in higher pressure drop and friction factor ratio. For Reynolds number 20000 for (P/h) =4 friction factor is 29.27% is greater than friction factor ratio at (P/h)=16. So it is clear from the graph friction factor ratio decrease with increase in pitch to height ratio.

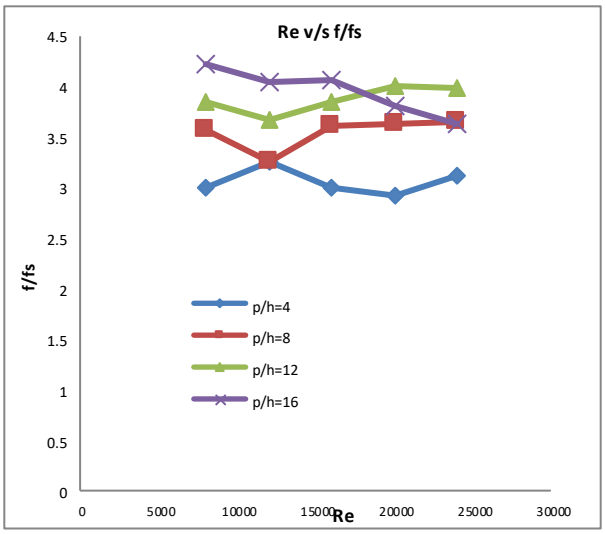


Fig 11 Re Vs f/f_s, AR=5.5, h=4.1mm

Fig 11 is as shown in the figure. The parameters which are presented in this graph are Reynolds number against friction factor ratio. And from fig.9, and fig.11 it is seen that as the aspect ratio increases with in Reynolds number and flow velocity increase leads increase in Reynolds number and pressure drop and friction factor ratio also increases for pitch to height ratio for (P/h)=12 the friction factor ratio for Reynolds 8000 is 3.5% lesser than friction factor ratio for Reynolds number 24000. So we came to result that friction factor increases with increase in Reynolds number and as the aspect ratio increases friction factor ratio also increases.

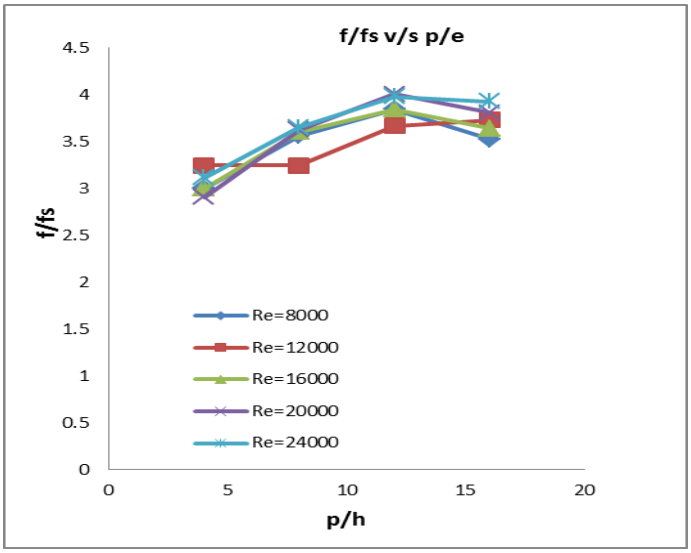


Fig 12 P/h Vs f/fs, AR=5.5, h=4.1mm

Fig 12 shows variation of pitch to height ratio to the friction factor ratio as shown in the above figure. From

fig.10 and fig.12 it is seen that aspect ratio decreases with increasing friction factor ratio and here from the graph it is seen that if the axial distance is less it results inhigher friction factor ratio. From the graph taken for Reynolds number 16000 and for (P/h)=12 friction factor is 5.2% greater than (P/h)=16. So we can conclude that friction factor increases with decrease in pitch to height ratio.

6. CONCLUSION:

From the experimental study and graphs obtained by experimental investigation the following conclusions can be drawn:

- As the height of the vortex generator increases friction factor ratio also rises due to more blockage to the flow.
- Friction factor ratio increases with increase in aspect ratio of the vortex generators.
- As the Reynolds number increases the friction factor ratio increases significantly.
- It is observed that with more circulation of vortices there is raise in the resistance to the flow and friction factor ratio of higher value is obtained.
- With reducing pitch to height ratio (p/h) friction factor ratio starts rising for Reynolds number ranging 8000 to 24000. Shorter pitch to height ratio results in shorter axial distance before the flow get disturbed by nextpedestals VG's which again increases the pressure drop.
-

REFERENCES

1. G.V.Phadtare, S.V.Channapattana, Dr.S.L.Bosedr. A.A.Pawar "Experimental Investigations Of Heat Transfer Enhancement In A Tip Of 180-Degree Bend Square Duct With Vortex Generators" Ijest – Issn 0975-5462, Volume 5, July 2013

2. I .Jaswal , F.E.Ames "Heat Transfer And Pressure Drop Meassurements In Constant And Converging Section Pin And Diamond Pedestal Arrays" Journal Of Thermal Science And Engineering Applications,Volume1, 21 July, 2009

3. Gongnan Xie, Li,Shain; Zhang,Weihong And Sunden ,Bengt " Computational Fluid Dynamics Modeling Flow Field And Side Wall Heat Transfer In Rectangular Rib-Roughed Passages" Journal Of Energy Resources Technology ,Volume 135,Isn 0195-0738,Doi 10.1115/1.4023332

4. Sean C. Jenkins, Frank Zehnder, Igorv.Shevchuk,Jns Vowolfersdrof, Bernard Weighgand And Martin Schineder " The Effects Of Ribs And Tip Wall Distance For A Varying Aspect Ratio Two Pass Ribbed Internal Cooling Channel" Journal Of Turbomachinery ,Volume 135, Issue 2,2013

5. Manvendra Tiwari, Sujoy Kumar Saha "Laminar Flow Through Circular Tube Having Transverse Ribs And Twisted Tapes" Journal Of Thermal Science And Engineering Applications, Volume 7, Issue 4,Dec 1 2015

6. S.V. Garimella, P.A.Eibeck " Enhancement Of Single Phase Convective Heat Transfer From Protruding Elements Using Vortex Generators" International Journal Of Heat And Mass Transfer, Volume 34,Pages 2431-2433,Doi 10.101

7. Jeen-Jiang Hwang "Heat Transfer-Friction Characterstic Comparission In A Rectangular Channel With Attached And Detached And Attached Detached Ribs On Two Wall Surface"International Gas Turbine And Aeroengine Congress And Exhibhition, June 5 1997

8. K. Arun And S.V.Prabhu "Effect Of Aspect Ratio,Channel Orientation,Rib Pitch To Height Ratio, And Ribbed Walls On Pressure Drop Characterstics In A Rotating Channel With Detached Ribs" International Journal Of Rotating Machinery, October 2006

9. Mohit Taneja, Sandeep Nandal, Arpan Manchandan, Ajay Kumar Agarwal "Experimental Study Of Convective Heat Transfer And Thermal Performance In The Heat-Sink Channel With Various Geometrical Configurations Fins" Ijett, Volume 4,June 2013,Issn 2231-5381

10. Amnart Boonloi, "Turbulent Forced Convection In A Heat Exchanger Square Channel With Wavy-Ribs Vortex Generator" Journal Of Chemical Engineering, April 2015, Pages.1765-1779

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

PIC MICROCONTROLLER BASED POWER FACTOR CORRECTION

[1]DargaShivadas, [2]D Sunil Kumar, [3]Arifa Fatima
[1]AssociateProfessor, Department of Electrical and Electronics Engineering,
[2,3]Assistant Professor, Department of Electrical and Electronics Engineering,
[1,2,3]Shadan college of Engineering and Technology. Peerancheru 500086 Telangana India

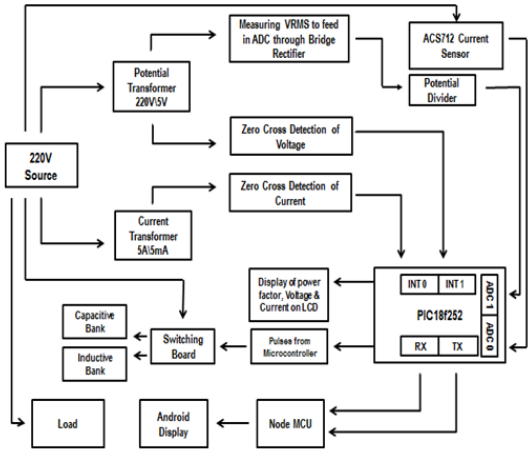
Abstract- This project includes a new implementation method to improve power factor for both leading and lagging loads using PIC Microcontroller after determining their zero crossing locations of voltage and current waveforms by zero cross detectors (ZCD). Capacitive and inductive banks are used for the compensation of power factor according to nature of load which is determined based on microcontroller algorithm.
To design this project microcontroller plays a major role. The interfaced devices to the microcontroller are node cu, Zero cross detector, Potentiometer, Current Transformer, Voltage Transformer, Capacitive Bank and Inductive Bank. The main purpose is to detect the zero crossing of the voltage and current and then switching of capacitive and inductive banks based on microcontroller algorithm.The voltage is first stepped down using potential transformers and the current is stepped down using current transformer whose rating is decided based on maximum rating of your load. These two waves of voltage and current are passed through zero cross detectors (ZCD). The waves that appear across the output of the ZCD are the square waves and their amplitude approaches almost to the biasing of the operational amplifier. These two waves are then fed to microcontroller so that it can measure the phase delay between the voltage and current waveforms and then show the power factor accordingly based on the proposed algorithm. The microcontroller then based on number of counts decides the power factor and displays it on LCD.
Keywords: PIC Microcontroller, zero cross detectors (ZCD).

1. INTRODUCTION

This project includes a new implementation method to improve power factor for both leading and lagging loads using PIC Microcontroller after determining their zero crossing locations of voltage and current waveforms by zero cross detectors (ZCD). Capacitive and inductive banks are used for the compensation of power factor according to nature of load which is determined based on microcontroller algorithm.
To design this project microcontroller plays a major role. The interfaced devices to the microcontroller are node cu, Zero cross detector, Potentiometer, Current Transformer, Voltage Transformer, Capacitive Bank and Inductive Bank. The main purpose is to detect the zero crossing of the voltage and current and then switching of capacitive and inductive banks based on microcontroller algorithm.
The voltage is first stepped down using potential transformers and the current is stepped down using current transformer whose rating is decided based on maximum rating of your load. These two waves of voltage and current are passed through zero cross detectors (ZCD).

1.1 Block Diagram

These two waves are then fed to microcontroller so that it can measure the phase delay between the voltage and current waveforms and then show the power factor accordingly based on the proposed algorithm. The microcontroller then based on number of counts decides the power factor and displays it onLCD.



BLOCK DIAGRAM PIC Microcontroller Based Power Factor Correction For Both Leading And Lagging Loads Using Compensation Metho

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

2. OVERVIEW OF PROJECT

Electric power is defined as the rate at which electrical energy is transferred by an electric circuit. The SI unit of power is the watt.

In alternating current circuits, energy storage elements such as inductance and capacitance may result in periodic reversals of the direction of energy flow. The portion of power flow that, averaged over a complete cycle of the AC waveform, results in net transfer of energy in one direction is known as real power (also referred to as active power). That portion of power flow due to stored energy, which returns to the source in each cycle, is known as reactive power.

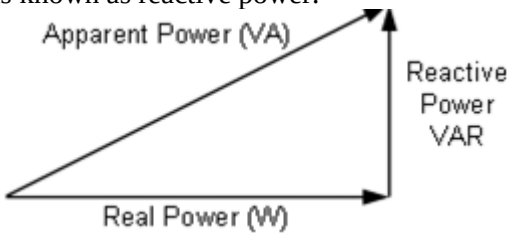


Fig 2 Power triangle the components of AC power

The relationship between real power, reactive power and apparent power can be expressed by representing the quantities as vectors. Real power is represented as a horizontal vector and reactive power is represented as a vertical vector. The apparent power vector is the hypotenuse of a right triangle formed by connecting the real and reactive power vectors. This representation is often called the power triangle. Using the Pythagorean Theorem, the relationship among real, reactive and apparent power is:

(apparent power)2 = (real power)2 + (reactive power)2

3. HARDWARE DESIGN

The "embedded", large application systems will have subcomponents at most points even if the system as a whole is "designed to perform one or a few dedicated functions", and is thus appropriate to call "embedded".

4. IMPLEMENTATION

Since olden times man has been cultivating and depending heavily on the plants and crops to arrange for the staple food. To do this he had to toil and severe with labor. As the technology advances people wish for more and more comfort, reliability and fast operations. India is a farmer's country and major part of the revenue is generated out of the agriculture industry.Keeping the above ideology in mind we propose to

The uses of embedded systems are virtually limitless, because every day new products are introduced to the market that utilizes embedded computers in novel ways. In recent years, hardware such as microprocessors, microcontrollers, and FPGA chips have become much cheaper. So when implementing a new form of control, it's wiser to just buy the generic chip and write your own custom software for it. Producing a custom-made chip to handle a particular task or set of tasks costs far more time and money. Many embedded computers even come with extensive libraries, so that "writing your own software" becomes a very trivial task indeed. From an implementation viewpoint, there is a major difference between a computer and an embedded system. Embedded systems are often required to provide Real-Time response. The main elements that make embedded systems unique are its reliability and ease in debugging.

design a unit with the following features:

1. Embedded Cprogramming.
2. Zero-crossing detector interfacing withMicrocontroller.
3. Current transformerinterfacing.
4. Potential transformerinterfacing.
5. Visible alerts using LCDdisplay.
6. Remotely monitoring usingNodeM

4.1 Applications

Among these Microcontroller is of low cost processor and one of the main advantage of microcontrollers is, the components such as memory, serial communication interfaces, analog to digital converters etc.., all these are built on a single chip. The numbers of external components that are connected to it are very less according to the application.

4.2 Advantages and Disadvantages

Advantages

- The kW capacity of the prime movers is better utilized.
- This increases the kilowatt capacity of the alternators.
- The kW capacity of transmission and the lines are increased.
- The efficiency of every plant is increased.
- The overall cost per unit decreased.
- The regulation of the lines is improved.

- Fast response.
- Efficient and low cost design.
- Low power consumption

Disadvantages

- The system cannot be used for heavy loads.
- The interfacing of all components with microcontroller is highly sensitive.
- The connections of the circuit are most sensitive

5. RESULT

The project ―PIC Microcontroller Based Power Factor Correctionfor both Leading and Lagging Loads using Compensation Method‖ was designed such that to provide continuous power factor correction without manual capacitive bank loading. The voltage is first stepped down using potential transformers and the current is stepped down using current transformer whose rating is decided based on maximum rating of your load. These two waves of voltage and current are passed through zero cross detectors (ZCD). The waves that appear across the output of the ZCD are the square waves and their amplitude approaches almost to the biasing of the operation a amplifier. These two waves are then fed to microcontroller so that it can measure the phase delay between the voltage and current waveforms and then show the power factor accordingly based on the proposed algorithm. The microcontroller then based on number of counts decides the power factor and displays it on LCD.

6. FUTURE SCOPE AND CONCLUSION

This project can be extended using Zigbee technology, which increases operating wireless distance. The system can also be extended using GSM technology which sends the alerting SMS messages about the power factor correction to the authorities

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC‘s with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested. So, by using the Automatic Power Factor Improvement module we can efficiently improve the power factor for variable inductive loads, improving the life span of equipment and reducing power bills.

REFERENCES:

1. BertholdFuld'; Siegfried Kern; RayRidley (1991) ―A Combined Buck andBoost PowerFactor-Controller for Three-Phase Input‖, IEEE European Conference on Power Electronics and Applications, Volume: 7, Pages: 144-148. 9.

2. Freitas, W.;Morelato, A.;WilsunXu; Sato, F.(2005)―Impactsof AC Generatorsand DSTATCOM Devices on the Dynamic Performance of Distribution Systems‖, I EEE Transactions on Power Delivery, Volume: 20, Issue: 2, Pages: 1493-1501.

3. Jones, L. D.; Blackwell, D. (1983) ―Energy Saver Power Factor Controller for Synchronous Motors‖, IEEE Transactions on Power Apparatus and Systems, Volume: 5, Issue: 5, Pages: 1391-1394.

4. Jiang, Y. et al, A Novel Single-phase Power Factor Correction Scheme, Applied Power Electronics Conference and Exposition, 1993, pp. 287-292.

5. Shwehdi, M. H. & Sultan, M.R., Power Factor Correction Capacitors; Essential and Cautions, IEEE Power Engineering Society Summer Meeting, 2000, pp. 1317-1322.

6. Choudhury, S. M., Design and Implementation of a Low Cost Power Factor Improvement Device, IEEE Region 10 Conference TENCON, 2008, pp.1-4.

7. Shahid, A. & Anwar, A., Microchip based Embedded System Design for Achievement of High Power Factor in Electrical Power Systems, Power and Energy Engineering Conference APPEEC, 2013.

8. Neil Rasmussen, Impact of Leading PowerFactoronDataCentreGeneratorSystems, Schneider Electric - White paper pp. 1-19

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

ACCIDENT DETECTION AND REGULATIONTHROUGH INTERNET OF VEHICLES BY USING VANET

[1]Amer Ali Khan, [2]Waseem tarique, [3]Amina Yasmeen
[1]Associate Professor, Shadan college of Engineering and Technology, Peerancheru, Telangana, India
[23]Assistant Professor, Shadan college of Engineering and Technology, Peerancheru, Telangana, India

Abstract: The dramatic increase of urban motorcycle road fatalities has led to significant issues in contemporary traffic management systems. The impact of synergetic paradigms of VANET envisages sustainable solutions for smart transportation. Furthermore, Internet of Vehicle (IoV) the fastest growing extension module of VANET builds highly compatible cloud-based collaboration among heterogeneous entities like vehicles, human and internet services.

The proliferation of such IoV enabled device configuration provides scalable, efficient and quality driven applications for smart city ecosystem. This project focusses on identifying and examining the adoption of wearable embedded smart helmet technology among the motorcyclist that reduces the potential injuries to the head and prevention of accidents due to drunken drive for safe riding.

In addition, this project critically evaluated the existing best practices of smart helmet management and issues in terms of software and hardware aspects.

Keywords – ARDUIN, ZIBGEE, InternetofVehicle(IoV)

1. PROBLEM DEFINITION

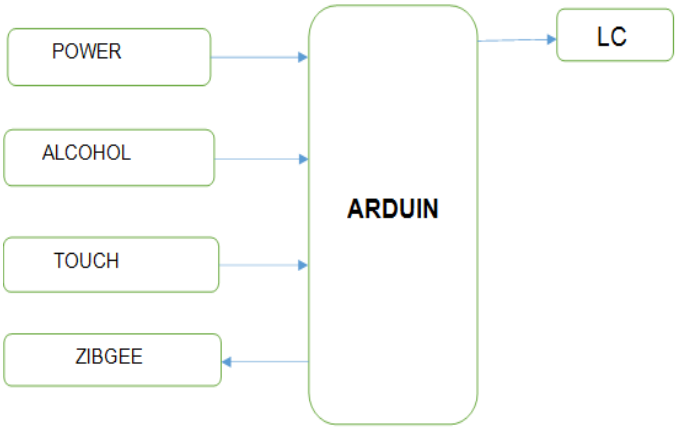
A traffic accident is defined as any vehicle accident occurring on a public highway (i.e. originating on, terminating on, or involving a vehicle partially on the highway). These accidents therefore include collisions between vehicles and animals, vehicles and pedestrians, or vehicles and fixed obstacles. In higher-income countries, road traffic [1] accidents are already among the top ten leading causes of disease burden in 1998 as measured in DALYs (disability-adjusted life years). In less developed countries, road traffic accidents were the most significant cause of injuries, ranking eleventh among the most important causes of lost years of healthy life. In Indian road system, widening of the road is not an alternative solution to avoid traffic in such a cities.

As per Section 129 of Motor Vehicles Act, 1988 makes it compulsory for every individual riding a two-wheeler to wear protective headgear conforming to standards of the Bureau of Indian Standards. Despite creating much awareness, people don't wear helmets. Traffic police monitoring for helmets is not permanent solution. As traffic police cannot be present at all places. Also they do not have adequate manpower to implement the rule as manning traffic is also a priority.

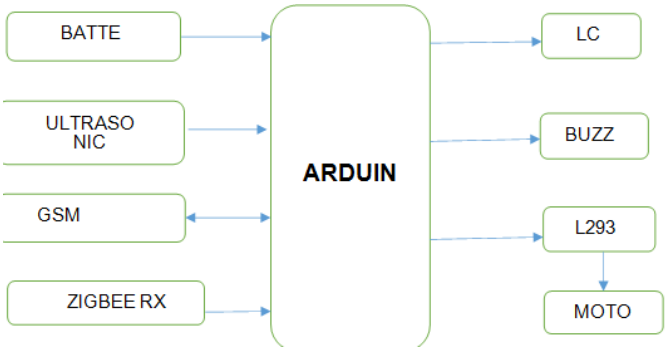
2. BLOCK DIAGRAM

Transmitter and Receiver sections are designed as below

3. TRANSMITTER



4. RECEIVER



5. HARDWARE IMPLEMENTATION

This chapter briefly explains about the Hardware implementation of authentication of design & implementation of a smart helmet based on iot. It discusses the circuit diagram of each module in detail.

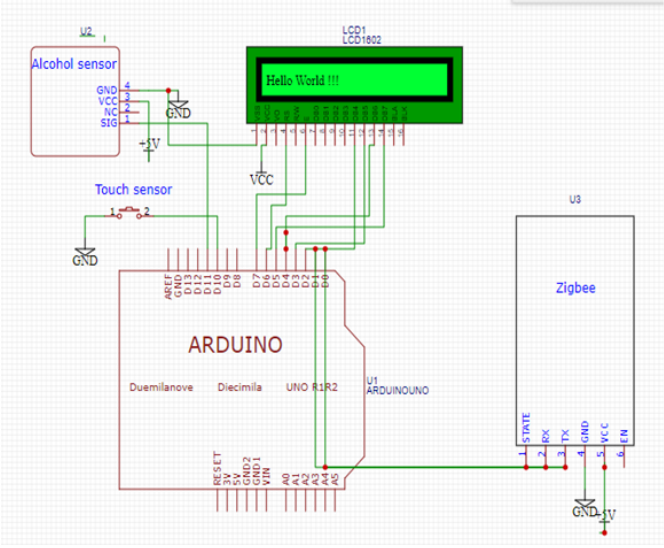


Fig (i) 3 Schematic Circuit Diagram Of Transmitter

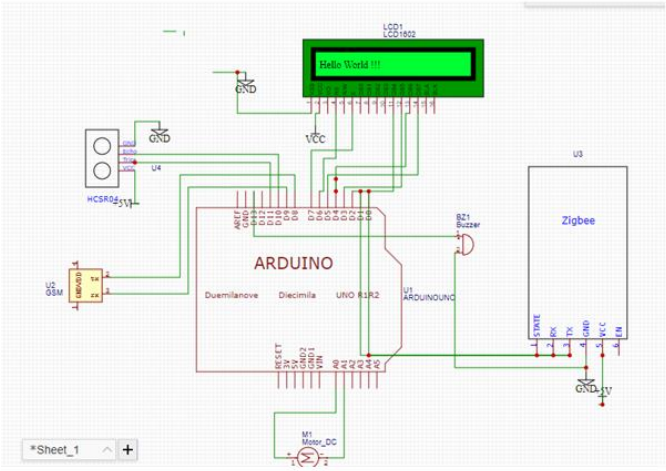


Fig (ii) 3 Schematic Circuit Diagram Of Receiver

6. ADVANTAGES AND DISADVANTAGES

Advantages

- The circuit of helmet is design in such a manner that the bike won't start unless the rider wears the helmet.
- An alcohol sensor will detect alcohol in the rider's breath, checking if the driver is drunk in order to prevent accident due to drunken driving which is the cause of large percentage of automobile accidents.
- It will send a message of location automatically when he/she met an accident with helmet on.
- Transmitter and receiver are used for starting the two-wheeler, if he/she not wearing the helmet the two-wheeler will not start.
- The alcohol sensor is used to sense the alcohol consumption and it will lock the ignition if drunk.

Disadvantages

- GSM is required.
- If helmet is stolen the bike cannot be started.
- The circuit is very sensitive

7. APPLICATIONS

1. It can be used in real time safety system, we can implement the whole circuit into small module.
2. The VANET based helmet is a less power consuming safety system.
3. This safety system technology can further be enhance into four wheeler also by replacing the helmet with seat belt.
4. It provide safety to the rider by ensuring that the rider is wearing helmet and not drunk, if any one of the condition is not satisfy then it stop the ignition of bike not allow the bike to start.
5. In case of accident, the GPS system installed in the helmet will locate the biker and an immediate message will be send to the family members or emergency contacts will locate authorities about the location of accident.

8. CONCLUSION

Aseriousproblemthathasariseninthiscenturyarecrashesand injurieswhichheavily include motorcycles. It is a major challenge on our part to project the motorcyclist which hit and drive with the larger amount of speed. Only checking license and speed barriers won't be effective for checking safetyconcern.

An AUTHENTICATION OF HELMET ALCOHOL SENSING FOR RIDERSSAFETYwouldceasealcoholdriving,helponcontrollingspeed,senseobstructionandincase ofunfortunatefallshallinformtheconcernedauthority.PreventionwithSmartHelmetisbetter than unfortunateincident.

9. RESULT AND DISCUSSION

The VANET based helmet system with advance alcohol sensing technology including GSM and GPS technology is used to authenticate with bike to unlock the ignition of the two wheeler. The life of the rider on the two wheeler can be saved from the road accident with standard protection with safety features.

By using this helmet we can prevent the accidents which are causing due to improper implementation of traffic rules on the road by the riders, this helmet provide safety to the rider and also ensure that the rider of the two wheeler is not drunk, if the rider not wearing helmet or drunk then it not allow the bike to start.

REFERENCES

1. "Wind energy generation by region". Our World in Data.Retrieved 5 March 2020.
2. "Electricity generation by source". International Energy Agency.
3. "bp Statistical Review of World Energy 2020"(PDF). BP p.l.c. pp. 55, 59.Retrieved 23 October 2020.
4. "Global Wind Report 2019". Global Wind Energy Council. 25 March 2020. Retrieved 23 October 2020.
5. "Global Wind Atlas". Technical University of Denmark (DTU).
6. "Harvesting the Wind: The Physics of Wind Turbines" (PDF). Archived from the original (PDF) on 24 August 2015. Retrieved 10 May 2017.
7. "Energy Sources: Solar". Department of Energy.Archived from the original on 14 April 2011.Retrieved 19 April 2011.
8. 8.Ranjan, Rakesh (27 December 2019). "World's Largest Solar Park at Karnataka's Pavagada is Now Fully Operational". Mercom India.Retrieved 13 February 2020.
9. "Technology Roadmap: Solar Photovoltaic Energy". (PDF) IEA. Archived (PDF) from the original on 7 October 2014. Retrieved 7 October 2014.
10. "BP Global: Solar energy".
11. "Levelized Cost of Energy and Levelized Cost of Storage 2020".
12. "Electricity generation by source". International Energy Agency.
13. 13.http://www.ren21.net/wp-content/uploads/2016/06/GSR 2016 Full Report REN21.pdf.
14. World watch Institute (January 2012). "Use and Capacity of Global Hydropower Increases".Archived from the original on 2014-09-24.Retrieved 2012-01-20.
15. Renewables 2011 Global Status Report, page 25, Hydropower, REN21, published 2011, accessed 2016-02-19.
16. One of the Oldest Hydroelectric Power Plants in Europa Built on Tesla's Principels, Explorations in the History of Machines and Mechanisms: Proceedings of HMM2012, TeunKoetsier and Marco Ceccarelli, 2012.
17. Holler, F. James; Skoog, Douglas A. & Crouch, Stanley R. (2007). Principles of Instrumental Analysis (6th ed.). Cengage Learning. p. 9.ISBN 978-0-495-01201-6.
18. Harper, Douglas. "piezoelectric". Online Etymology Dictionary.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

SEGWAY ROAD CLEANING AND WATER SPRINKLE SYSTEM

[1]D Shyamnath Rao, [2]Pandu Rangaiah, [3]HAIDER SHAREEF
[1]Associate Professor, Department of Electrical and Electronics Engineering,
[2,3]Assistant Professor, Department of Electrical and Electronics Engineering,
[1,2,3]Shadan college of Engineering and Technology. Peerancheru 500086 Telangana India

Abstract- The uses of alternative sources of energies are becoming widely spread in all over the world. Our sun is also a very good source of different energies; the light energy has a very remarkable value. The Solar panel converts the light energy into the electrical energy.
The efficiency of solar panel can be maximized by aligning the solar panel with the sun. The sun tracking system is designed in this project, offers a reliable and affordable method of aligning a solar panel with the sun on single axis. This project is based on microcontroller 8051 with a simple circuit and sun tracking software.
In the recent years, the energy sources like fossil fuel, gas, crude oil, coal, nuclear fuel etc. are becoming scared due to excessive use of it for domestic as well as commercial purpose. These are non-renewal sources of energy.
The situation was energy resources are scared, it is vital to use renewable source of energy for example solar energy, Wind power, Tides, Hydroelectricity, Geothermal power. This paper gives the design and construction of 8051 microcontroller for solar panel tracking system to produce solar energy. Solar tracking system produces more energy since the solar panel remains aligned to the sun.
"Solar Tracking System" is a power generating method from sunlight. This method of power generation is simple and is taken from natural resource. This needs only maximum sunlight to generate power. This paper helps for power generation by setting the equipment to get maximum sunlight automatically.
This system is tracking for maximum intensity of light. When there is decrease in intensity of light, this system automatically changes its direction to get maximum intensity of light.
Keywords: Solar Tracking System, Arduino, Intermittency

1. INTRODUCTION

The Segway PT (referred to at the time as the Segway HT) wasdevelopedfromtheself-balancing iBOT wheelchair which was initially developedat UniversityofPlymouth,inconjunctionwith BAE Systems and Sumitomo Precision Products. Segway's first patent was filed in 1994 and granted in 1997 followed by others including one submitted in June 1999 and granted in October2001.
The invention, development, and financing of the Segway was the subject of a book, and a leak of information prior to publication of the book and the launch of the product led to excited speculation about the device and its importance. JohnDoerr speculatedthatitwouldbemoreimportantthantheInternet.
South Park devoted an episode to making fun of the hype before the product was released. SteveJobs was quoted as saying that it was "as big a deal as the PC", (but later retracted that saying that it "sucked", presumably referring to "the design"butcommentingaboutthe boutiqueprice,asking,"You're sure your market is upscale consumers for transportation?") The device was unveiled on 3 December 2001, following months of public speculation, in Bryant Park, New York City,onthe ABCNews morning program Good Morning America with the first units delivered to customers in early2002.

1.1 Energy Resources

The world's energy resources can be divided into fossil fuel, nuclear fuel and renewable resources.Renewable energy resources and significant opportunities for energy efficiency exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency, and technological diversification of energy sources, would result in significant energy security and economic benefits. Solar energy and wind energy are chosen here for hybrid power generation

2. HARDWARE IMPLEMENTATION

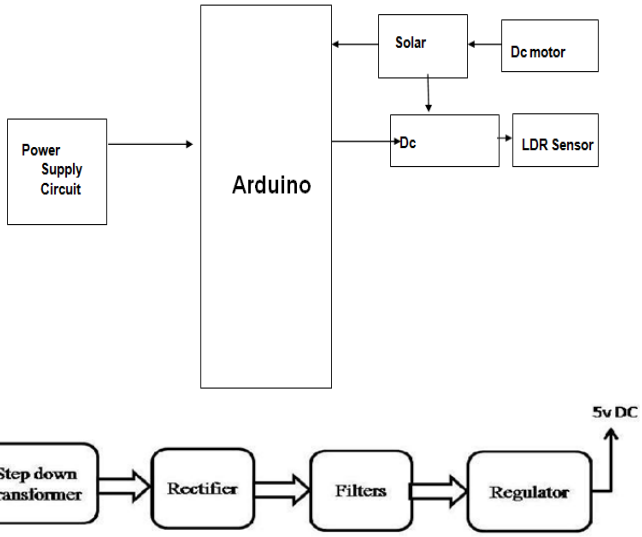
1. Memes
2. Arduino
3. 4 channel relay

4. DC Motors
5. Wheel
6. Water Motor for the water sprinklersystem.

2.1 Block diagram

"Solar Tracking System" is a power generating method from sunlight. This method of power generation is simple and is taken from natural resource. This needs only maximum sunlight to generate power. This paper helps for power generation by setting the equipment to get maximum sunlight automatically.

This system is tracking for maximum intensity of light. When there is decrease in intensity of light, this system automatically changes its direction to get maximum intensity of light



2.2 Methodology

Mems:

FIG: 2.1 MEMS

1. Microelectromechanical systems (MEMS), also written as micro-electro-mechanical systems (or microelectronic and microelectromechanical systems) and the related micromechatronics and microsystems constitute the technology of microscopic devices, particularly those with moving parts. They merge at the nanoscale into nanoelectromechanical systems (NEMS) and nanotechnology. MEMS are also referred to as micromachines in Japan and microsystem technology (MST) in Europe.

ARDUINO

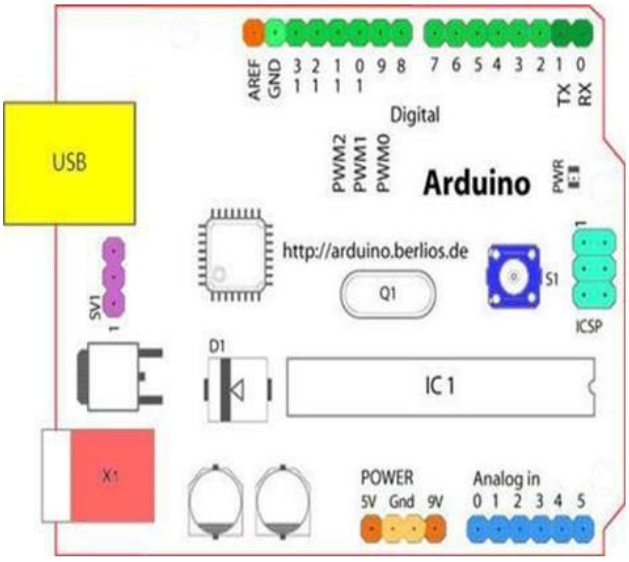


FIG.2.2 ARDUNIO

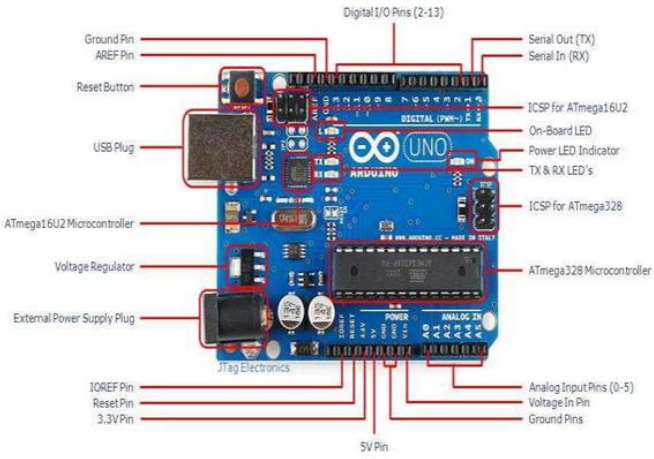


FIG: 2.2.1 ARDUINO BOARD

2.3 Testing and Result

Testing of the circuit

1. Utilization of this machine can reduces the time and also reduces the human effort. Just we need to charge the batteries completely before we use.
2. And a small problem we get here is balancing on the machine so by seeing this we have advanced it.
3. This machine can also be run without person standing on it . A person can control it by sitting at one place by connecting the mobile through Bluetooth

3. ADVANTAGES AND DISADVANTAGES:

Advantages:

1. Smart Batteries which are rechargeable, compact, can last longer can be adopted. Also they could charge

up quickly.
2. Manufacturing drawings can be made for future prototype testing and in-depth analysis.
3. The steel frame used can be replaced with another frame made up of composite material which is both lighter and stronger than steel.
4. This concept can be developed further to work on both AC & DC power.

Disadvantages:

1. For spraying water droplets evenly there is a requirement of constant water supply.
2. There is a chance of water getting evaporated from the sprinkler irrigation when the surrounding environment is windy and high in terms of humidity.
3. There is a chance of the nozzles of the sprinklers getting clogged due to the deposit of debris and sediments from water that is used.
4. There is a requirement of continuous power supply for operating the sprinkler irrigation system.

4. APPLICATIONS

1. This system is used in the railway stations and hospitals
2. It can be use on the vast floors as it takes less time than manual floor cleaning
3. Many other organizations can take this sagway under use

5. CONCLUSION

The mobile obstacles in the roadway or with the changing ground, even the opening of a door from the Segway (only carried out in Saarbrücken) was mastered, although this was a new and not an easy activity for the riders.

Only in one of the 14 tests the device slightly hit the door. It became clear that after a short riding practice the handling of the Segway in standard situations was no problem at all, reactions to unforeseeable incidents however needed a longer exercising, if the riders were not to react falsely.

REFERENCES:

1. Kinderverkehrsunfälle in Kaiserslautern Karin Sodtke (1983)
2. Zeitreihen des Kraftfahrzeugverkehrs an strategischen Linien in Großstädten Sebastian Fleck, Jürgen Göttsche, Hartmut H. Topp (1984)
3. Verkehrskonzept Universität Kaiserslautern Norbert Diener, Jürgen Göttsche (1985)
4. Straßenplanungvor Gericht –Ortsumfahrung Eltville/Wallufim Verwaltungsgerichtsverfahren Volker Böhn, Norbert Diener (1985).

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

DESIGN & IMPLEMENTATION OF CONVOLUTION NEURAL NETWORKS

[1]M A Sameer, [2]M. Iliyas, [3]Azeem Hussain, [4]Aaqib Ihraz
[2]Professor, [1,3,4]Assist. Professor
[1,2,3,4]Shadan College of Engineering and Technology, Hyderabad.
[1]Sameerk87@gmail.com

Abstract- Full end-to-end text recognition in natural images is a challenging problem that has received much atten- tion recently. Traditional systems in this area have re- lied on elaborate models incorporating carefully hand-engineered features or large amounts of prior knowl- edge. In this paper, we take another method and combine the representative power of large, multilayer neural networks together with recent developments in unsupervised feature learning, which allows us to use a common framework to train highly-accurate text detec- tor and character recognizer modules. Then, using only simple off-the-shelf methods, we integrate these two modules into a full end-to-end, lexicon-driven, scene text recognition system that achieves state-of-the-art performance on standard benchmarks, and popular streets

1 INTRODUCTION

Extracting textual information from natural images is a challenging problem with many practical applica- tions. Unlike character recognition for scanned docu- ments, recognizing text in unconstrained images is com- plicated by a wide range of variations in backgrounds, textures, fonts, and lighting conditions. As a result, many text detection and recognition systems rely on cleverly hand-engineered features [5, 4, 14] to repre- sent the underlying data. Sophisticated models such as conditional random fields [11, 19] or pictorial structures [18] are also often required to combine the raw detec- tion/recognition outputs into a complete system.

In this paper, we attack the problem from a differ- ent angle. For low-level data representation, we use an unsupervised feature learning algorithm that can auto- matically extract features from the given data. Such algorithms have enjoyed numerous successes in many

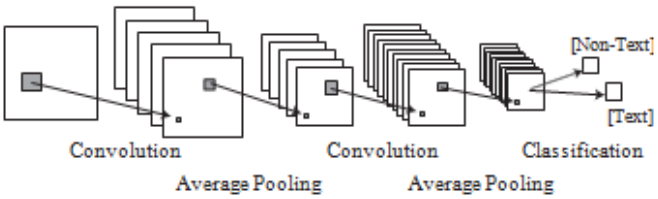


Figure 1. CNN used for text detection.

related fields such as visual recognition [3] and action recognition [7]. In the case of text recognition, the system in [2] achieves competitive results in both text detection and character recognition using a simple and scalable feature learning architecture incorporating very little hand-engineering and prior knowledge.

We integrate these learned features into a large, discriminatively-trained convolutional neural network (CNN). CNNs have enjoyed many successes in simi- lar problems such as handwriting recognition [8], visual object recognition [1], and character recognition [16]. By leveraging the representational power of these net- works, we are able to train highly accurate text detection and character recognition modules. Using these mod- ules, we can build an end-to-end system with only sim- ple post-processing techniques like non-maximal sup- pression (NMS)[13] and beam search [15]. Despite its simplicity, our system achieves state-of-the-art perfor- mance on standard test sets.

2 LEARNING ARCHITECTURE

In this section, we describe our text detector and character recognizer modules, which are the essential building blocks of our full end-to-end system.Given a 32-by-32 pixel window, the detector decides whether the window contains a centered character. Similarly, the recognizer decides which of 62 characters (26 upper- case, 26 lowercase letters, and 10 digits) is in the win- dow. As described at length in Section 3, we slide the

Figure 2. Examples from our training set.
Left: from ICDAR. Right: synthetic data

detector across a full scene image to identify candidate lines of text, on which we perform word-level segmentation and recognition to obtain the end-to-end results.

For both detection and recognition, we use a multi- layer, convolutional neural network (CNN) similar to [8, 16].Our networks have two convolutional layers

for detection with n1 = 96 and n2 = 256 is shown in with n1 and n2 filters respectively. The network we use (n1 = 115 and n2 = 720) is used for recognition. Figure 1,while a larger,but structurally identical one

We train the first layer of the network with an unsupervised learning algorithm similar to [2, 3]. In particular, given a set of 32-by-32 grayscale training images1 as illustrated in Figure 2, we randomly extract

ZCA whitened [6] to form input vectors x(i) ∈ R64, i ∈ m8-by-8 patches,which are contrast normalized and

{1, ..., m}. Wethen usethe variant of K-means described in [2] to learn a set of low-level filters D∈

R64×n1 .For a single normalized and whitened 8-by-8 patch x, we compute its first layer responses zbypera scalar activation function: z = max{0, |DTx| − α}, whereα= 0.5 isahyperparameter. forming inner product with the filter bank followed by

Given a 32-by-32 input image, we compute z for every 8-by-8 sub-window to obtain a 25-by-25-by-n1 first layer response map. As is common in CNNs, we average pool over the first layer response map to bring its dimensions to 5-by-5-by-n1. We stack another convolution and average pooling layer on top of the first layer to obtain a 2-by-2-by-n second layer response map.

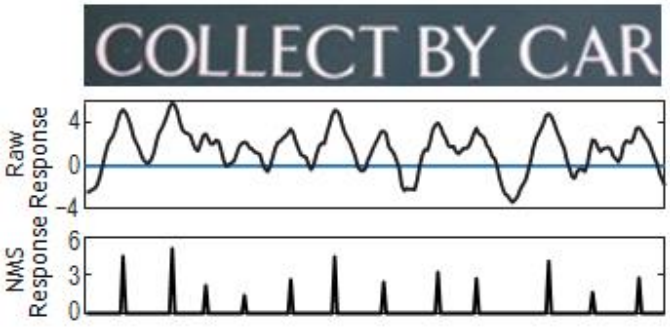


Figure 3. Detector responses in a line.

3 END-TO-END PIPELINE INTEGRATION

Our full end-to-end system combines alexiconwith our detection/recognition modules using post- processing techniques including NMS and beam search. Here we assume that we are given a lexicon (a list of tens to hundreds of candidate words) for a particular im- age. As argued in [18], this is often a valid assumption as we can use prior knowledge to constrain the search to just certain words in many applications. The pipeline mainly involves the following two stages:

(i) We run sliding window detection over high resolution input images to obtain a set of candidate lines of text. Using these detector responses, we also estimate locations for the spaces in the line.

(ii) We integrate the character responses with the can- didate spacings using beam search [15] to obtain full end-to-end results.

First, given an input image, we identify horizontal lines of text using multiscale, sliding window detec- tion. At each scale s, we evaluate the detector response

Rs[x, y] at each point (x, y) in the scaled image.As

acters at the right scale produce positive Rs[x, y]. We apply NMS [13] to Rs[x, r] in each individual row r to

shown in Figure 3, windows centered on single char- estimate the character locations on a horizontal line. In particular, we define the NMS response

$$\square\ R_s[x, r] \text{ if } R_s[x, r] \geq R_s[x', r], \quad (1)$$

These outputs are fully connected to the classification layer. We discriminatively train the network by back-

the L2-SVM classification error,2 but we

fix the filters in the first convolution layer (learned from K-means). Given the size of the networks, fine-tuning is performed using multiple GPUs.

non-zero R˜s[x, r],we form a line-level bounding box where δ is some width parameter. For a row r with Lr with the same height as the sliding window at scale

s.The left and right boundaries of Lr are defined as

min(x) and max(x), s.t.R˜s[x, r] >0.This yields a

1Our dataset consists of examples from the ICDAR 2003 train- ing images [10], the English subset of the Chars74k dataset [4], and synthetically generated examples.

2In the form of a squared hinge loss: max{0, 1 − θTx}2 .

set of possibly overlapping line-level bounding boxes. We score each box by averaging the nonzero valuesof R˜s[x, r].We then apply standard NMS to remove all

L's that overlaps by more than 50% with another box

bounding boxes L˜.Since gaps between words produce of a higher score, and obtain the final set of line-level sharply negative responses,we also estimatepossible

space locations within each Lr by applying the same NMS technique as above to the negative responses.

After identifying the horizontal lines of text, we jointly segment the lines of text into words and recog- nize each word in the line. Given a line-level bounding box L and its candidate space locations, we evaluate a number of possible word-level bounding boxes using a Viterbi-style algorithm and find the best segmentation scheme using a beam search technique similar to [9].

character recognizer across it and obtain a 62 × N score

To evaluate a word-level bounding box B, we slide the matrix M , where Nis the number of sliding windows

M (i, j) suggests a higher chance that the character with within the bounding box. Intuitively, a more positive index i is centered on the location of the jth window.

Similar to the detection phase,we perform NMSover

to be present. The other columns of M are set to $-\infty$. M to select the columns where a character is most likely

Wethen find the lexicon word $w*$ that best matches a

score matrix M as follows: given a lexicon word w, compute the alignment score

Table 1. Cropped word recognition accu- racies on ICDAR 2003 and SVT

Benchmark	I-WD-50	I-WD	SVT-WD
Our approach	90%	84%	70%
Wang, *et al*. [18]	76%	62%	57%
Mishra, *et al*. [11]	82%	-	73%

4 EXPERIMENTAL RESULTS

In this section we present a detailed evaluation of our text recognition pipeline. We measure cropped character and word recognition accuracies, as well as end-to-end text recognition performance of our system on the ICDAR 2003 [10] and the Street View Text (SVT) [18] datasets. Apart from that, we also perform additional analysis to evaluate the importance of model size on different stages of the pipeline.

First we evaluate our character recognizer module on the ICDAR 2003 dataset. Our 62-way character classifier achieves state-of-the-art accuracy of 83.9% on cropped characters from the ICDAR 2003 test set. The best known previous result on the same benchmark is

81.7% reported by [2]

Our word recognition sub-system is evaluated on images of perfectly cropped words from the ICDAR 2003 and SVT datasets.Weuse the exact same test setupas [18]. More concretely, we measure word-level accu-

$$S_M^w = \max_{l \in L_w} \sum_k M(w_k, l_k) \quad (2)$$

where lw is the alignment vector3 between the charracy with a lexicon containing all the words from the acters in w and the columns of M . Sw can be com-ICDAR test set (called I-WD), and with lexicons conputed efficiently using a Viterbi-style alignment algosisting of the ground truth words for that image plusrithm similar to [17].4 We compute Sw

50 random "distractor" words added from the test set

the highest scoring word $w*$. We take SB = Sw to be words and label the word-level bounding-box B with the recognition score of B.

Having defined the recognition score for a single bounding box, we can now systematically evaluate possible word-level segmentations using beam search [15], a variant of breadth first search that explores the top N possible partial segmentations according to some heuristic score. In our case, the heuristic score of a candidate segmentation is the sum of the SB's over all the resulting bounding boxes in a line of text L. In orderto deal with possible false positives from the text detection stage, we threshold individual segments based on their recognition scores. In that way, segments with low recognition scores are pruned out as being "non-text."

3For example, lw = 6 means the 4th character in w aligns with the 6th column of M , or the 6th sliding window in a line of text.

4In practice, we also augment Sw with additional terms that en- courage geometric consistency. For example, we penalize character spacings that are either too narrow or vary a lot within a single word.

(called I-WD-50). For the SVT dataset, we used the provided lexicons to evaluate the accuracy (called SVT-WD). Table 1 compares our results with [18] and the very recent work of [11].

We evaluate our final end-to-end system on both the ICDAR 2003 and SVT datasets, where we locate and recognize words in full scene images given a lexicon. For the SVT dataset, we use the provided lexicons; for the ICDAR 2003 dataset, we used lexicons of 5, 20 and 50 distractor words provided by the authors of [18], as well as the "FULL" lexicon consisting of all words in the test set. We call these benchmarks I-5, I-20, I-50 and I-FULL respectively. Like [18], we only consider alphanumeric words with at least 3 characters. Figure5 shows some sample outputs of our system. We fol- low the standard evaluation criterion described in [10] to compute the precision and recall. Figure 4 shows precision and recall plots for the different benchmarks on the ICDAR 2003 dataset.

As a standard way of summarizing results, we also

Figure 5. Example output bounding boxes of our end-to-end system on I-FULL and SVT bench- marks. Green: correct detections. Red: false positives. Blue: misses.

Table 2. F-scores from end-to-end evalua- tion on

Benchmark	I-5	I-20	I-50	I-FULL	SVT
Our approach	.76	.74	.72	.67	.46
Wang, *et al*. [18]	.72	.70	.68	.51	.38

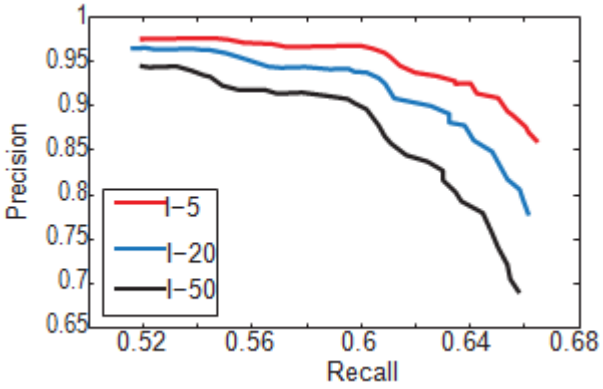


Figure 4. End-to-end PR curves on ICDAR 2003 dataset using lexicons with 5, 20, and 50 distractor words.

report the highest F-scores over the PR curves and compare with [18] in Table 2. Our system achieves higher F-scores in every case. Moreover, the margin of improvement is much higher on the harder benchmarks (0.16 for I-FULL and 0.08 for SVT), suggesting that our system is robust in more general settings.

In addition to settings with a known lexicon, we also extend our system to the more general setting by using a large lexicon L of common words. Since it is infea- sible to search over all words in this case, we limit our search to a small subset P∈ L of "visuallyplausible" words.Wefirst perform NMS on the score matrixM across positions and character classes, and then threshold it with different values to obtain a set of raw strings. The raw strings are fed into Hunspell5to yield a setof suggested words as our smaller lexicon P , Using this simple setup, we achieve scores of 0.54/0.30/0.38 (precision/recall/F-score) on the ICDAR dataset. This

5Hunspell is an open source spell checking software available at http://hunspell.sourceforge.net/. We augment its default lexicon with a corpus of English proper names to better handle text in scenes.

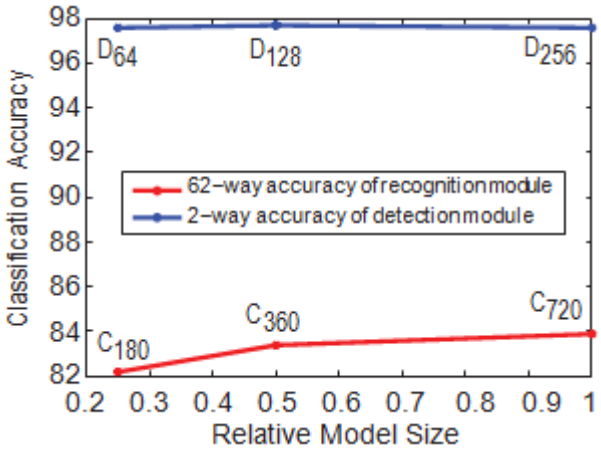


Figure 6. Accuracies of the detection and recognition modules on cropped patches

is comparable to the best known result 0.42/0.39/0.40 obtained with a general lexicon by [14].

In order to analyze the impact of model size on different stages of the pipeline, we also train detection and tional filters. The detection modules have n2 = 64 and recognition modules with fewer second layer convolu- 128 compared to 256 in our full model. We call the detection modules D_{64}, D_{128} and D_{256} respectively. Similarly, we call the recognition modules C_{180}, C_{360} and C_{720},which corresponds to n2= 180,360 and 720.

The smaller models have about 1/4 and 1/2 number of learnable parameters compared to the full models.

To evaluate the performance of the detection mod-

Table 3. Classification and end-to-end re- sults of different recognition modules

Recognition module	C_{180}	C_{360}	C_{720}
Classification accuracy	82.2%	83.4%	83.9%
End-to-end F-score	.6330	.6333	.6723

ules, we construct a 2-way (character vs. non-character) classification dataset by cropping patches from the ICDAR test images. The recognition modules are evaluated on cropped characters only. As shown in Fig-ure 6, the 62-way classification accuracy increases as model size gets larger, while the 2-way classification re- sults remain unchanged. This suggests that larger model sizes yield better recognition modules, but not necessar- ily better detection modules.

Finally, we evaluate the the 3 different recognition modules on the I-FULL benchmark, with D256 as the detector for all 3 cases. The end-to-end F-scores are listed against the respective classification accuracies in Table 3. The results suggests that higher character classification accuracy does give rise to better end-to-end results. This trend is consistent with the findings of [12] on house number recognition in natural images.

5 CONCLUSION

In this paper, we have considered a novel approach for end-to-end text recognition. By leveraging large, multi-layer CNNs, we train powerful and robust text detection and recognition modules. Because of this increase in representational power, we are able to use simple non-maximal suppression and beam search tech- niques to construct a complete system. This represents a departure from previous systems which have gener- ally relied on intricate graphical models or elaborately hand-engineered systems.As evidence of the powerof this approach, we have demonstrated state-of-the- art results in character recognition as well as lexicon- driven cropped word recognition and end-to-end recog- nition. Even more, we can easily extend our model to the general-purpose setting by leveraging conventional open-source spell checkers and in doing so, achieve per-formance comparable to state-of-the-art.

REFERENCES

1. D. C. Ciresan, U. Meier, J. Masci, L. M. Gambardella, and J. Schmidhuber. High performance neural net- works for visual object classification. Technical Report IDSIA-01-11, Dalle Molle Institute for Artificial Intel- ligence, 2011.
2. A. Coates, B. Carpenter, C. Case, S. Satheesh,
3. B. Suresh, T. Wang, D. J. Wu, and A. Y. Ng. Text de-tection and character recognition in scene images with unsupervised feature learning. In ICDAR, 2011.
4. A. Coates, H. Lee, and A. Y. Ng. An analysis of single-layer networks in unsupervised feature learning. In AIS-TATS, 2011.
5. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Performance Enhancement by Cluster Head Selection Based On Residual Status of Energy and Buffer in WSNs" is accepted in INTERSCIENCIA Journal (SCIE Journal) on 16th December 2019.
6. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar " Efficient Energy Routing Protocol Based on Energy & Buffer Residual Status (EBRS) for Wireless Sensor Networks" International Journal of Engineering and Technology (Scopus), Vol. 9. Issue no. 1S5 pp. 33-37, in December 2019.
7. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy-efficient Routing Protocol for Life Enhancement in Wireless Sensor Networks" Recent Patents on Computer Science (Unpaid Scopus),Vol.12,no.1. pp. 01-10, 2019.
8. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy-Efficient Routing Protocol Based on Mobile Sink Node in Wireless Sensor Networks" International Journal of Innovative Technology and Exploring Engineering (Scopus), Vol.8, Issue-7, pp 1788-1792, 2019.
9. Amairullah Khan Lodhi, M. S. S. Rukmini "Energy-Efficient Routing Protocol for Node Lifetime Enhancement in Wireless Sensor Networks" International Journal of Advanced Trends in Computer Science and Engineering (Scopus), Vol. 8. No.1.3. pp. 24-28, 2019.
10. Amairullah Khan Lodhi, Mohammad Iliyas, Safiya Kaunain "Design of 8-4 and 9-4 Compressors For high-Speed Multiplication" Journal of Applied Science and Computations (JASC)–Volume.6. Issue.6. pp. 2056-2068 in June 2019.
11. Amairullah Khan Lodhi, Sindhu S. Kale "Development on Gas Leak Detection and Location System Based on Wireless Sensor Networks: A" International Journal of Engineering Trends and Technology (IJETT)–Volume 12. in 2014.
12. Amairullah Khan Lodhi, S. R. Madkar, Prof. A. V. Karande "Wireless Monitoring of Soil Moisture & Humidity using Zigbee in Agriculture" International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Volume.10. Issue.4. pp. 817-821 in October 2014.
13. A. K. Lodhi, Prashant R. Gade "Review of Poly House Control System" International Journal of Advanced (IJAIEM), Volume.2. Issue.3. pp. 76 in February 2014.
14. Y. Netzer, T. Wang, A. Coates, A. Bissacco, B. Wu, and
15. A. Y. Ng. Reading digits in natural images with unsu-pervised feature learning. In NIPS Workshop on Deep Learning and Unsupervised Feature Learning, 2011.
16. A. Neubeck and L. Gool. Efficient non-maximum sup-pression. In ICPR, 2006.
17. L. Neumann and J. Matas. A method for text localiza-tion and recognition in real-world images. In ACCV, 2010.
18. S. J. Russell, P. Norvig, J. F. Candy, J. M. Malik, and
19. D. D. Edwards. Artificial intelligence: a modern ap-proach. Prentice-Hall, Inc., Upper Saddle River, NJ, USA, 1996.
20. Z. Saidane and C. Garcia. Automatic scene text recogni-tion using a convolutional neural network. In Workshop on Camera-Based Document Analysis and Recognition, 2007.
21. S. Sarawagi and W. W. Cohen. Semi-markov con-ditional random fields for information extraction. In NIPS, pages 1185–1192, 2004.
22. K. Wang, B. Babenko, and S. Belongie. End-to-end scene text recognition. In ICCV, 2011.
23. J. J. Weinman, E. Learned-Miller, and A. R. Hanson. A discriminative semi-markov model for robust scene text recognition. In ICPR, Dec. 2008.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

TRUST MANAGEMENT SCHEME FOR CLUSTERED WIRELESS SENSOR NETWORKS

[1]H. A. Abdus Samad, [2]Ayaz Shaikh, [3]A. Haseeb,[4] M. A. Sameer
[1,2,3,4]Asst. Prof, Dept of ECE
[1,2,3,4]Shadan College of Engineering & Technology, Hyderabad

Abstract— In this work, we propose a new lightweight Group- based Trust Management Scheme (GTMS) for wireless sensor networks, which employs clustering. Our approach reduces the cost of trust evaluation. Also, theoretical as well as simulation results show that our scheme demands less memory, energy, and communication overheads as compared to the current state-of-the-art trust management schemes and it is more suitable for large-scale sensor networks. Traditional trust management schemes developed for wired and wireless ad hoc networks are not well suited for sensor networks due to their higher consumption of resources such as memory and power. Furthermore, GTMS also enables us to detect and prevent malicious, selfish, and faulty nodes.
Index Terms—Trust evaluation, trust modeling, trust management, security, sensor networks.

1 INTRODUCTION

RUST in general is the level of confidence in a person or a thing. Various engineering models such as security, usability, reliability, availability, safety, and privacy models incorporate some limited aspects of trust with different meanings [1]. For example, in sensor network security, trust is a level of assurance about a key's authenticity that would be provided by some centralized trusted body to the sensor node (SN) [2], [3]. In wireless ad hoc and sensor network reliability, trust is used as a measure of node's competence in providing required service [4], [5], [6], [7]. In general, establishing trust in a network gives many benefits such as the following:

1. Trust solves the problem of providing correspond- ing access control based on judging the quality of SNs and their services. This problem cannot be solved through traditional security mechanisms [8].
2. Trust solves the problem of providing reliable routing paths that do not contain any malicious, selfish, or faulty node(s) [9], [10].
3. Trust makes the traditional security services more robust and reliable by ensuring that all the communicating nodes are trusted during authentication, authorization, or key management [11].

For Wireless Sensor Networks (WSNs), we visualize that trust management is a cooperative business rather than an individual task due to the use of clustering schemes such as LEACH [12], PEGASIS [13], TEEN [14], and HEED [15] in

● R.A. Shaikh, H. Jameel, B.J. d'Auriol, S. Lee, and Y.-J. Song are with the Department of Computer Engineering, Kyung Hee University, Global Campus, Seocheon-dong, Giheung-gu, Yogin-si, Gyeonggi-do, Suwon 449- 701, Korea.
E-mail: {riaz, hassan, dauriol, sylee}@oslab.khu.ac.kr, yjsong@khu.ac.kr.
● H. Lee is with the Division of Computer and Communication Engineering, Korea University, Anam-dong, Seongbuk-gu, Seoul 136-713, Korea.
E-mail: heejo@korea.ac.kr.
Manuscript received 9 Apr. 2008; revised 13 Aug. 2008; accepted 2 Dec. 2008;
published online 11 Dec. 2008. Recommended for acceptance by J.C.S. Lui.
For information on obtaining reprints of this article, please send e-mail to: tpds@computer.org, and reference IEEECS Log Number TPDS-2008-04-0133. Digital Object Identifier no. 10.1109/TPDS.2008.258.

real-world scenarios. Moreover, SNs can also be deployed in the form of groups [16], which are willing to collaborate with each other in order to process, aggregate, and forward collected data [17]. This highlights the fact that these clustering schemes and group deployments enable SNs to fulfill their responsibilities in a cooperative manner rather than individually. Therefore, establishing and managing trust in a cooperative manner in clustering environment provides many advantages. Such as, within the cluster, it helps in the selection of trusted cluster head by the member nodes. Similarly, the cluster head will be able to detect faulty or malicious node(s). In case of multihop clustering [15], [18], it helps to select trusted en route nodes through which a node can send data to the cluster

head. During intercluster communication, trust management helps to select trusted en route gateway nodes or other trusted cluster heads through which the sender node will forward data to the base station (BS).

A number of trust management schemes have been proposed for peer-to-peer networks [19], [20], [21] and ad hoc networks [22], [5], [23]. To the best of our knowl- edge, very few comprehensive trust management schemes (e.g., Reputation-based Framework for Sensor Networks (RFSN) [24], Agent-based Trust and Reputation Manage- ment (ATRM) [25], and Parameterized and Localized trUst management Scheme (PLUS) [26]) have been proposed for sensor networks. Although, there are some other works available in the literature, e.g., [6], [7], [27], [28], and so forth, that discuss trust but not in much detail. Within such comprehensive works, only ATRM [25] scheme is specifi- cally developed for the clustered WSNs. However, this and other schemes suffer from various limitations such as these schemes do not meet the resource constraint requirements of the WSNs and, more specifically, for the large-scale WSNs. Also, these schemes suffer from higher cost associated with trust evaluation specially of distant nodes. Furthermore, existing schemes have some other limitations such as dependence on specific routing scheme, like PLUS works on the top of the PLUS_R routing scheme; depen- dence on specific platform, like the ATRM scheme requires 1045-9219/09/$25.00 © 2009 IEEE

Published by the IEEE Computer Society

an agent-based platform; and unrealistic assumptions, like the ATRM assumes that agents are resilient against any security threats, and so forth. Therefore, these works are not well suited for realistic WSN applications. Thus, a light- weight secure trust management scheme is needed to address these issues.

In this work, we propose a new lightweight Group-based Trust Management Scheme (GTMS) for clustered WSNs. The GTMS consists of three unique features such as

- GTMS evaluates the trust of a group ofSNsin contrast to traditional trust managementschemes that always focusontrustvaluesofindividual nodes. This approach gives usthebenefitof requiring less memory to store trust records at each SN in the network.
- GTMS works on two topologies: intragroup topol-

ogy where distributed trust management approach is used and intergroup topology where centralized trust management approach is adopted. This meth- odology helps to drastically reduce the cost asso- ciated with trust evaluation of distant nodes.

- GTMS not only provides a mechanism to detect malicious nodes but also provides some degree of prevention mechanism.

These and other specific features (e.g., independent of any specific routing scheme and platform and so forth) collectively make the GTMS a new, lightweight, flexible, and robust solution that can be used in any clustered WSNs. The rest of this paper is organized as follows: Section 2 describes related work. Section 3 contains definitions, description on representation of trust value, and assump- tions. Section 4 proposes trust modeling and evaluation mechanism of the GTMS. Sections 5 and 6 provide theoretical and simulation-based analysis and evaluation of the GTMS, respectively. Section 7 concludes this paper

and suggests some future directions.

2 RELATED WORK

Researchwork ontrustmanagement schemes forWSNs is in its infancy. To our knowledge, very few trustmanage- ment schemes have been proposed suchasRFSN[24], ATRM [25], and PLUS [26]. Although, there are some other works available in the literature, e.g., [6], [7], [27], [28] and so forth, that discuss trust but not in much great detail.

Ganeriwal and Srivastava [24] proposed RFSN, where each SN maintains the reputation for neighboring nodes only. Trust values are calculated on the basis of that reputation and they use Bayesian formulation for represent- ing reputation of a node. RFSN assumes that the node has enough interactions with the neighbors so that the reputa- tion (beta distribution) can reach a stationary state. However, if the rate of node mobility is higher, reputation information will not stabilize. In RFSN, no node is allowed to disseminate bad reputation information. If it is assumed that “bad” reputation is implicitly included by not giving out good reputation, then in that case, the scheme will not be able to cope with uncertain situations [28].

Boukerche et al. [25] have proposed an ATRM scheme for WSNs. ATRM is based on a clustered WSN and calculates

trust in a fully distributed manner. ATRM works on specific agent-based platform. Also, it assumes that there is a single trusted authority, which is responsible for generating and launching mobile agents, which makes it vulnerable against a single point of failure. ATRM also assumes that mobile agents are resilient against malicious nodes that try to steal or modify information

carried by the agent. In many applications, this assumption may not be realistic.

Yao et al. [26] have proposed PLUS for sensor network security. The authors adopt a localized distributed approach and trust is calculated based on either direct or indirect observations. This scheme works on top of their own defined routing scheme called PLUS_R. In this scheme, the authors assume that all the important control packets generated by the BS must contain a hashed sequence number (HSN). Inclusion of HSN in controlpacketsnot only increases the size of packets resulting in higher consumption of transmission and reception power but also increases the computational cost at the SNs. Also, whenever a judge node receives a packet from another node i, it will always check the integrity of the packet. If the integrity check fails, then the trust value of node i will be decreased irrespective of whether node i was really involved in maliciously making some modification in a packet or not. So, node i may get unfair penalty.

Recently, Liu et al. [27] have proposed a very simple trust management scheme for Resilient Geographic Routing (T-RGR). Their trust algorithm works in a fully distributed manner, in which each node monitors the behavior of one- hop neighbors. In the T-RGR scheme, authors have used many predefined threshold values that make their scheme nonadaptive. Also, in their scheme, each node only relies on its direct monitoring for calculating trust value, which makes it vulnerable against collaborative attacks.

3 DEFINITIONS, REPRESENTATION, AND ASSUMPTIONS

3.1 Definitions

Our proposed GTMS calculates the trust value basedon direct or indirect observations. Direct observations represent the number of successful and unsuccessful interactions and indirect observations represent the recommendations of trusted peers about a specific node. Here, interaction means the cooperation of two nodes. For example, a sender will consider an interaction as successful if the sender receives an assurance that the packet is successfully received by the neighbor node and that node has forwarded the packet toward the destination in an unaltered fashion. Thus

- The first requirement, i.e., successful reception, is achieved on reception of the link layer acknowledgment (ACK). IEEE 802.11 is a standard link layer protocol, which keeps packets in its cache until the sender receives an ACK. Whenever the receiver node successfully received the packet, it will send back an ACK to the sender. If the sender node did not receive the ACK during a predefined threshold time, then it will retransmit that packet.
- The second requirement, i.e., forwarding of the packet, is achieved by using enhanced passive acknowledgment (PACK) by overhearing the transmission of a next hop on the route, since they are within the radio range [10].

If the sender node does not overhear the retransmission of the packet within a threshold time from its neighboring node or the overheard packet is found to be illegally fabricated (by comparing the payload that is attached to the packet), then the sender node will consider that interaction as an unsuccessful one. If the number of unsuccessful interactions increases, the sender node decreases the trust value of that neighboring node and may consider it as a faulty or malicious node.

3.2 Representation of Trust Value

Generally, a trust value is considered to be a numerical quantity lying between 0 and 1 (inclusive) assuggested earlier in [5], [22], and [29] or between 1 and 1 (inclusive) as described in [4] on a real number line. In this paper, we use trust value as an integer in the interval between 0 and 100 (inclusive). However, other ranges, for example base2 ranges, could be used as well. Although presenting the trust values as a real number or integer may not play an important role in traditional networks, but for SNs this issue is of critical importance due to limited memory, and transmission, reception power. This change will give us benefits such as: Representation of trust value [0, 100] as an unsigned integer (1 byte) saves 75 percent of memory space as compared to trust values represented as a real number (4 bytes). Less number of bits need to be transmitted during the exchange of trust values between SNs. This gives us the benefit of less consumption of transmission and reception power.

4 GROUP-BASED TRUST MANAGEMENT SCHEME

The proposed trust model works with two topologies. One is the intragroup topology where distributed trust management is used. The other is intergroup topology where centralized trust management approach is employed. For the intragroup network, each sensor that is a member of thegroup calculates individual trust values for all groupmembers. Based on the trust values, a node assigns one of the three possible states: 1) trusted, 2) untrusted, or 3) uncertain to other member nodes. This three-state solution is chosen for mathematical simplicity and is found to provide appropriate granularity to cover the situation. After that, each node forwards the trust state of all the group member nodes to the CH. Then,

centralized trust management takes over. Based on the trust states of all group members, a CH detects the malicious node(s) and forwards a report to the BS. On request, each CH also sends trust values of other CHs to the BS. Once this information reaches the BS, it assigns one of the three possible states to the whole group. On request, the BS will forward the current state of a specific group to the CHs.

Our group-basedtrustmodelworksinthreephases:

1) Trust calculationatthenodelevel,2)trustcalculation attthecluster-headlevel,and3)trustcalculationatthe BS level.

4.1 Trust Calculation at the Node Level

At the node level, a trust value is calculated using either time-based past interaction or peer recommendations. Whenever a node y wants to communicate with node x, it first checks whether y has any past experience of commu- nication with x during a specific time interval or not. If yes, then node x makes a decision based on past interaction experience, and if not, then node x moves for the peer recommendation method.

4.1.1 Time-Based Past Interaction Evaluation

Trust calculation at each node measures the confidence in node reliability. Here, the network traffic conditions such as congestion, delay, and so forth should not affect the trust attached to a node; this means that the trust calculation should not emphasize the timing information of each interaction too rigidly. Therefore, we introduce a sliding time window concept, which takes relative time into consideration and reduces the effects of network conditions on overall trust calculation. If real-time communication is a requirement, as is the case in most real-world applications, this timing window concept does not provide any hin- drance when it comes to real-time delivery of packets. The communication protocol in such applications is always accompanied with time stamps, and thus any node that delays the delivery of packets by taking advantage of the sliding timing window will be detected straightforwardly.

The timing windowΔtis used to measure the number of successful and unsuccessful interactions. It consists of several time units. The interactions that occur in each time unit within the timing window are recorded. After a unit of time elapses, the window slides one time unit to the right, thereby dropping the interactions done during the first unit. Thus, as time progresses, the window forgets the experi- ences of one unit but adds the experiences of the newer time unit. The window length could be made shorter or longer based on network analysis scenarios. A sample scenario of the GTMS time window scheme is illustrated in Fig. 1. The time window Δt consists offiveunits.Duringthefirst unit of Δt1, the number of successful and unsuccessful interactions is 4 and 2, respectively, and during the whole

Δt1 interval, the number of successful and unsuccessful interactions is 29 and 15, respectively. After the passage of the first unit, the new time interval Δt2 drops the interaction values that took place during the very first unit of Δt1S4;U2 and only consider the values of the last four units of Δt1 plus values of one recent unit added on the right ðS ¼ 6;U¼ 2Þ.

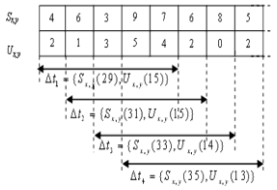


Fig. 1. Sliding time window scheme of GTMS.

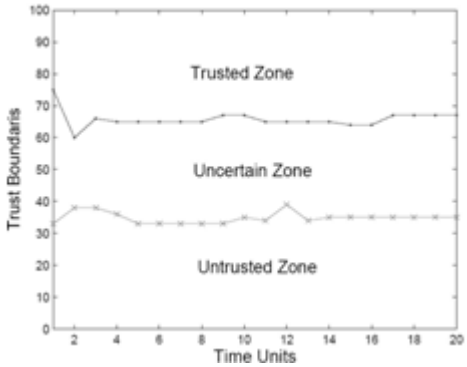


Fig. 3. Adaptive trust boundaries creation.

Fig. 2 shows the behavior of time-based past interactions trust values against successful and unsuccessfulinterac- tions. When we do not get even a single successful interaction, the trust value remains 0. With an increase in successful interactions, the trust value increases but stays humble if the number of unsuccessful interactions is also considerably high. For example,with60unsuccessfuland 50 successful interactions, the trust value is 45.

After calculating the trust value, a node will quantize trust into three states as follows:

where ½•] is the nearest integer function, Rx represents the set of trustful nodes for node x, Mx represents the set of untrustful nodes for node x, and n is the total number of nodes that contains trustful, untrustful, and uncertain nodes.

4.1.2 Peer Recommendation Evaluation

Let a group be composed of n uniquely identified nodes. Furthermore, each node maintains a trust value for all other nodes. Whenever a node requires peer recommendation, it will send a request to all member nodes except for the untrusted ones. Let us assume that j nodes are trusted or uncertain in a group. Then, node x calculates the trust value of node y as follows:

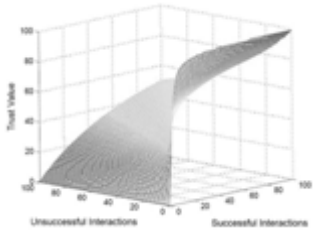


Fig. 2. Time-based past interaction evaluation.

where ½•] is the nearest integer function, Tx;i is the trust value of the recommender, and Ti;y is the trust value of node y sent by node i. Here, Tx;i is acting as a weighted value of the recommender that is multiplied with the trust value Ti;y, sent by the recommender, such that the trust value of node y should not increase beyond the trust value between node x and the recommender node i.

4.2 Trust Calculation at the Cluster-Head Level

Here, we assume that the CH is the SN that has higher computational power and memory as compared to other SNs.

4.2.1 Trust State Calculation of Own Group

Inordertocalculatetheglobaltrustvalueofnodesina manner as individual nodes keep record of other nodes. Trust values of a group are calculated on the basis of either past interaction or information passed on by the BS. Here, we are not considering peer recommendations from other groups in order to save communication cost. Let us suppose CHiwantstocalculatethetrustvalueðTi;j)ofanother cluster j. Then, it can be calculated by using either time- based past interaction ðPIi;jÞevaluation or by getting recommendation from the BS ðBRi;jÞ as shown below:

group, CH asks the nodes for their trust states of other exacttrustvaluesduetotworeasons.First,thecommunication overhead would be less as only a simple state is to be forwarded to the CH. Second, the trust boundaries of an individual node vary from other nodes. A particular trust value might be in a trusted zone for one node, whereas it may only correspond to the uncertain zone for another node. Hence, the calculation of the global trust state of nodes in a group would be more feasible and efficient if we only calculate it using the trust states.

Let us suppose there are n þ 1 nodes in the group including the CH. The CH will periodically broadcast the

4.3 Trust Calculation at Base Station Level

The BS also maintains the record of past interactions with CHs in the same manner as individual nodes do, as shown below: nodes to the CH. The variable, s, can take three possible states:

trusted, uncertain, and untrusted. The CHwill maintain these trust states in a matrix form, as shown below:

where ½•] is the nearest integer function, SBS;ch is the total number ofsuccessful interactionsof BS withCH during time Δt, and UBS;ch is the total number of unsuccessful interactions of BS with CH during time Δt.

Let us suppose there are jGj groups in the network. BS periodicallymulticastsrequestpacketstotheCHs.On request, the CHs forward their trust vectors, related to the where TMch represents the trust state matrix of cluster head ch, and sch;1 represents the state of node 1 at cluster head ch. The CH assigns a global trust state to a node based on the relativedifferenceintruststatesforthatnode. Weemulatethis relative difference through a standard normal distribution. recommendations of other groups based upon past interactions, to BS as given by !T ch ¼ ðTch;1; Tch;2; ... ; Tch;jGj—1Þ.

On reception of trust vectors from all the CHs, the BS will calculate the trust value of each group in a manner shown below:

m and the standard deviation is m=3. The CH defines the following standard normal random variable for a node j:

where TBS;ch is the trust value of the CH i at the BS, TGi;G1 is the trust value of group G1 at group Gi, and jGj represents

the total number of groups in the network.

4.2.2 Trust Calculation of Other Groups

During group-to-group communication, the CH maintains the record of past interactions of another group in the same

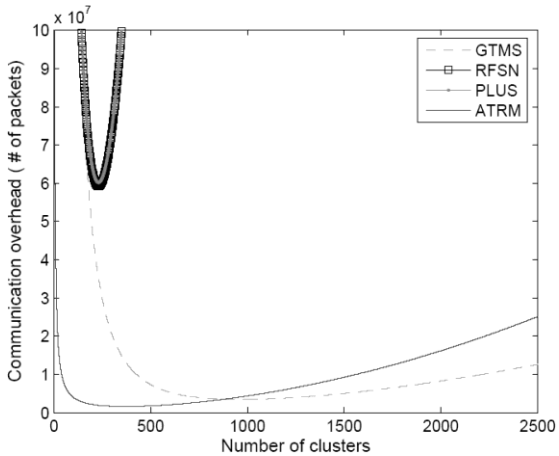


Fig. 4. Communication overhead: Number of nodes ¼ 10; 000.

TABLE 3

Node ID	Past interactions with other groups based on time window						Peer recomm. from BS	Trust value
	$S_{x,y}$			$U_{x,y}$				
	t_1	⋯	t_n	t_1	⋯	t_n		
2 bytes	2 bytes	⋯	2 bytes	2 bytes	⋯	2 bytes	1 byte	1 byte

.

5 SIMULATION-BASED ANALYSIS AND EVALUATION

5.1 Simulation Environment

We have performed simulation using Sensor Network Simulator and Emulator (SENSE) [40]. We have deployed three different sized sensor networks consisting of 144, 225, and 324 SNs. More details about these networks are available in Table 5. Nodes are static and are organized in a grid fashion. The first, second, and third networks are comprised of 16, 25, and 36 clusters, respectively. These

TABLE 2
Trust Database at SN

Node ID	Past interactions based on time window						Peer recomm.	Trust value
	$S_{x,y}$			$U_{x,y}$				
	t_1	$\cdots$	t_n	t_1	$\cdots$	t_n		
2 bytes	2 bytes	$\cdots$	2 bytes	2 bytes	$\cdots$	2 bytes	1 byte	1 byte

TABLE 4
Memory Requirement of Trust Management Schemes

	Sensor node	cluster head
GTMS	$(n-1)(4+4\Delta t)$	$(\lvert G\rvert+\sigma-2)(4+4\Delta t)$
RFSN	$33(n-1)$	$33(G+\sigma-2)$
PLUS	$32.375(n-1)+28$	$32.375(G+\sigma-2)+28$
ATRM	$30n+8(k-1)$	$30(G+\sigma)+2(4k-19)$

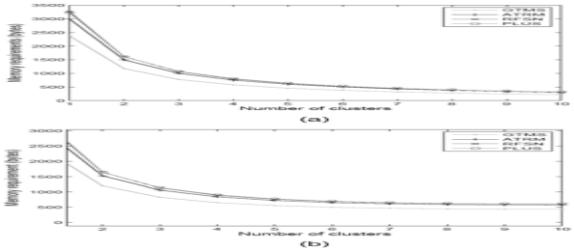


Fig. 5. Memory requirement: N ¼ 100 and Δt ¼ 5 units. (a) At SN. (b) At cluster head.

numbers are chosen to make all clusters in equal size of nine nodes. Each network comprises of one BS that is located at the middle of the corresponding terrain. In all three networks, we used free space wireless channel, IEEE

802.11 MAC protocol, and a simplified version of DSR routing protocol (without route repairing). At the applica- tion layer, we have developed our own generic and simple Trust Exchange Protocol (TExP) that consists of six fields:

1. SourceID: contains the identity of the source node.
2. DestID: contains the identity of the destination node.
3. Protocol ID: represents the identity of the trust management protocol, e.g., GTMS, RFSN, and so forth.
4. Type: is used to identify the type of the packet such as request packet, response packet, acknowledgment packet, and so forth.
5. Payload: field is of variable size containing the data specific to the type and protocol, such as trust value, identity of evaluating node, and so forth.
6. SendT: contains the sending time of the packet.

TABLE 5
Sensor Network's Specifications

Network size	No. of clusters	Terrain
144 nodes	16	$600m \times 600m$
225 nodes	25	$800m \times 800m$
324 nodes	36	$1000m \times 1000m$

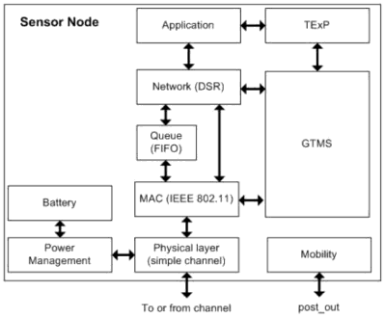


Fig. 6. SN architecture.

The objective of the TExP protocol is to exchange the trust values between communicating nodes in an efficient manner. SN architecture based on SENSE [40] is shown in Fig. 6, which shows the interactions between GTMS, TExP, and other components. The rest of the specifications of an SN is defined in Table 6.

5.2Comparison

For the purpose of comparison, wehaveimplementeda peer recommendation scenario. During simulation, in each cluster, random number of source nodes are selected, which perform peer recommendation with the other nodes. Also, each cluster head will perform peer recommendation with neighboring cluster heads only. In the simulation, we have only compared our proposed GTMS with the RFSN scheme because both are independent of anyspecificrouting scheme and platform. We did not implement the ATRM scheme because it requires some specific agent-based platform. Also, we did notimplementPLUSbecauseit works on the top of its own defined routing protocol.

TABLE 6
SN's Specifications

Initial battery of each sensor node	$1 \times 10^6 J$
Power consumption for transmission	$1.6W$
Power consumption for reception	$1.2W$
Power consumption in idle state	$1.15W$
Transmission power of the antenna	0.0280
Transmission and Reception gain	1.0
Carrier sense threshold	$3.652e^{-10}W$
Receive power threshold	$1.559e^{-11}W$

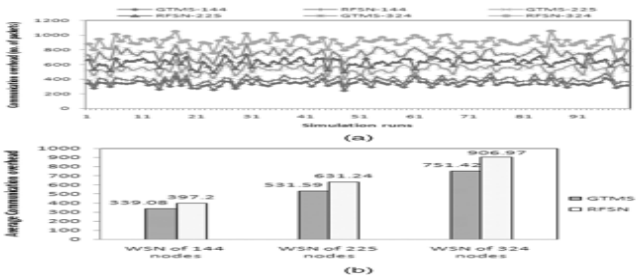


Fig. 7. Average communication overhead analysis (100 simulations).
(a) Communication overhead. (b) Average communication overhead.

as compared to the RFSN scheme for the network of 144, 225, and 324 nodes, respectively.

Communication overhead also affects the energy con- sumption of the SNs. That effect is visible in Fig. 8, which shows that GTMS also consume less energy as compared to the RFSN scheme.

6 CONCLUSION AND FUTURE DIRECTIONS

With the emergence of widespread use of WSNs, the need of a proper trust management scheme is strongly felt. In this work, we have proposed a robust lightweight GTMS for clustered WSNs. GTMS uses a hybrid trust management approach, which reduces the cost of trust evaluation. We showed that our scheme is memory efficient and consumes less communication overhead. We also proved that the GTMS is intrusion tolerant and provides protection against malicious, selfish, and faulty nodes.

In many application scenarios [41], [42], SN identities should remain hidden for achieving identity anonymity. So, the challenging problem is how to establish and maintain trust between communicating nodes in an identity anon- ymous environment. This motivates future work.

APPENDIX A

A.1 Communication Overhead

A.1.1 RFSN

When node i wants to interact with node j, it will send n — 2 peer recommendation requests at the maximum. In re- sponse, node i will receive n — 2 responses. If node i want

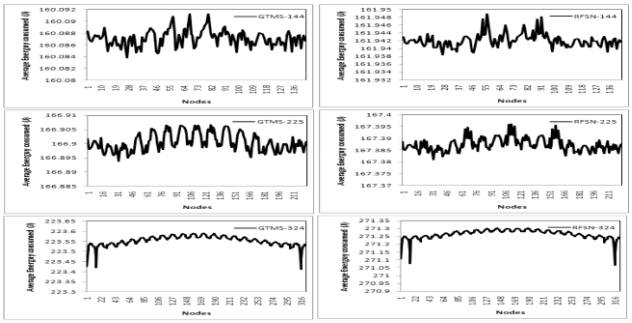


Fig. 8. Average energy consumption at each node (100 simulations).

7 ACKNOWLEDGMENTS

This research was supported by the MKE (Ministry of Knowledge Economy), Korea, under the ITRC (Information Technology Research Center) support program supervised by the IITA (Institute of Information Technology Advance- ment) (IITA-2009-(C1090-0902-0002)) and was supported by the IT R&D program of MKE/KEIT [10032105, Development of Realistic Multiverse Game Engine Technology]. This work also was supported by the Brain Korea 21 projects and Korea Science & Engineering Foundation (KOSEF) grant funded by the Korea government (MOST) (No. 2008-1342). The corre- sponding author is Sungyoung Lee.

REFERENCES

1. L.J. Hoffman, K. Lawson-Jenkins, and J. Blum, “Trust beyond Security: An Expanded Trust Model,” Comm. ACM, vol. 49, no. 7, pp. 95-101, July 2006.
2. . Shi and A. Perrig, “Designing Secure Sensor Networks,” IEEE Wireless Comm., vol. 11, no. 6, pp. 38-43, 2004.
3. H.S. Ng, M.L. Sim, and C.M. Tan, “Security Issues of Wireless Sensor Networks in Healthcare Applications,” BT Technology J., vol. 24, no. 2, pp. 138-144, Apr. 2006.
4. A.A. Pirzada and C. McDonald, “Establishing TrustinPure Ad-Hoc Networks,” Proc. 27th Australasian Computer Science Conf. (ACSC ’04), pp. 47-54, Jan. 2004.
5. Y.L. Sun, W. Yu, Z. Han, and K.J.R. Liu, “Information Theoretic Framework of Trust Modeling and Evaluation for Ad Hoc Networks,” IEEE J.SelectedAreasinComm.,vol.24,no.2, pp. 305-317, Feb. 2006.
6. R.A. Shaikh, H. Jameel, S. Lee, S. Rajput, and Y.J. Song, “Trust Management Problem in Distributed Wireless Sensor Networks,” Proc. 12th IEEE Int’l Conf. Embedded Real-Time Computing Systems and Applications (RTCSA ’06), pp. 411-414, Aug. 2006.
7. M. Momani, S. Challa, and K. Aboura, “Modelling Trust in Wireless Sensor Networks from the SensorReliabilityProspec- tive,” Innovative Algorithms and Techniques in Automation, Industrial Electronics and Telecomm., T.S. et al., ed., pp. 317-321, Springer, 2007.
8. J.P. Walters, Z. Liang, W. Shi, and V. Chaudhary, “Chapter 16: Wireless Sensor Network Security: A Survey,”

Security in Distributed, Grid, and Pervasive Computing, Y. Xiao, ed., pp. 367- 410, CRC Press, 2006.
9. Z. Liu, A.W. Joy, and R.A. Thompson,"A Dynamic TrustModel for Mobile Ad Hoc Networks," Proc. 10th IEEE Int'l Workshop Future Trends of Distributed ComputingSystems(FTDCS'04), pp. 80-85, May 2004.
10. S. Buchegger and J.-Y.L. Boudec, "Self-Policing Mobile Ad Hoc Networks by Reputation Systems," IEEE Comm. Magazine, vol. 43, no. 7, pp. 101-107, July 2005.
11. T. Grandison and M. Sloman, "A Survey of Trust in Internet Applications," IEEE Comm. Surveys and Tutorials, vol. 3, no. 4, 2000.
12. W.B.Heinzelman,A.P.Chandrakasan,andH.Balakrishnan, "An Application-Specific Protocol Architecture for Wireless Microsensor Networks," IEEETrans.WirelessComm.,vol.1, no. 4, pp. 660-670, Oct. 2002.
13. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy Efficient Wireless Sensor Networks: A Survey on Energy-Based Routing Techniques" IEEE 3rd International Conference on Electrical, Electronics, Communication, Computation Technologies, and Optimization Techniques (ICEECCOT), conducted by GSSSIETW, Mysuru, on14th & 15th Dec 2018.
14. Amairullah Khan Lodhi, M. S. S. Rukmini "Energy-Efficient Routing Protocol for Node Lifetime Enhancement in Wireless Sensor Networks" International Conference on Modern Technology in Engineering Research & Management (ICMTERM–2019), conducted by Siddhartha Institute of Engineering and Technology, Hyderabad, on 1st & 2nd May' 2019.
15. Amairullah Khan Lodhi, Syed Abdulsattar "Energy and Security Aware Reactive Routing for Wireless Sensor" 73rd International Conference on Science, Engineering & Technology (ICSET), Medina, Saudi Arabia, conducted by Researchfora on 25th & 26th September 2017.
16. Amairullah Khan Lodhi, Syed Abdulsattar "Cluster Head Selection by optimized ability to restrict packet drop in Wireless Sensor Networks" 1stInternational Conference on Soft Computing in Data Analytics(SCDA 2018), conducted by SSCE, Srikakulam.
17. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar " Efficient Energy Routing Protocol Based on Energy & Buffer Residual Status (EBRS) for Wireless Sensor Networks" National Conference on Vlsi, Signal Processing & Communications (NCVSCOMS-2019), conducted by ECE Dept, VFSTRU, Vadlamudi, Guntur, on 6th & 7th Sept' 2019.
18. Amairullah Khan Lodhi, Syed Abdulsattar "Energy Efficient and Secure Intrusion Detection Algorithm for Maximum Coverage in WSN" in CAS Ph.D. forum, Organized by CAS IEEE / EDS Societies, Hyderabad Section, on 16th July 2016.
19. Amairullah Khan Lodhi, Syed Abdulsattar "Performance Improvement in Wireless Sensor Networks by Removing the Packet Drop from the Node Buffer" is accepted in ICMPC -2020 (GLA University).
20. Amairullah Khan Lodhi, Syed Abdulsattar "Lifetime Enhancement Based on Energy and Buffer Residual Status of Intermediate Node in Wireless Sensor Networks" is accepted in iCASIC-2020 (VIT, Vellore).
21. Amairullah Khan Lodhi "Low Power VLSI Designing Techniques in Semiconductor Devices" International Conference on Systemics, Cybernetics and Informatics (ICSCI-2011), in May 2011.
22. Amairullah Khan Lodhi, Nikhat Nawaz "Real-Time Object Detection for An Unmanned Aerial Vehicle Using an FPGA Based Vision System" New Innovations in Computations and Electronics'NICE-10, in October 2010.
23. Amairullah Khan Lodhi, Syed Shafi Ahmed "Minimization of Power Consumption in FPGA's by Enumeration the State Machine Designs" International Conference on Emerging Trends in Engineering (ICETE-10), in February 2010.
24. Amairullah Khan Lodhi, Nikhat Nawaz "Watermarking and Compression of Digital Image Using WT and SPIHT" Futuristic Advancements on Computing and Electronics'FACE-09, in March 2009.
25. Amairullah Khan Lodhi, Mohammad Iliyas, Safiya Kaunain "Design of 8-4 and 9-4 Compressors For high-Speed Multiplication" Journal of Applied Science and Computations (JASC)–Volume.6. Issue.6. pp. 2056-2068 in June 2019.
26. Amairullah Khan Lodhi, Sindhu S. Kale "Development on Gas Leak Detection and Location System Based on Wireless Sensor Networks: A" International Journal of Engineering Trends and Technology (IJETT)–Volume 12. in 2014.
27. Amairullah Khan Lodhi, S. R. Madkar, Prof. A. V. Karande "Wireless Monitoring of Soil Moisture & Humidity using Zigbee in Agriculture" International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Volume.10. Issue.4. pp. 817-821 in October 2014.
28. A. K. Lodhi, Prashant R. Gade "Review of Poly House Control System" International Journal of Advanced (IJAIEM), Volume.2. Issue.3. pp. 76 in February 2014.
29. Vishal V Lodhi, Amairullah Khan, Puranik "Dynamic Resource Management of Cognitive Radio Networks Via Fuzzy Logic Technique" International Journal of Engineering Research & Technology (IJERT), Volume.2. Issue.12. pp. 205-2711 in December 2013.
30. Amairullah Khan Lodhi, Ingole Snehal Diliprao, Kale Sindhu Subhas "Wavelet-Based Texture Feature For Content-Based Image Retrieval" International Journal of Engineering Technology & (IJETAE), Volume.3. Issue.12. in December 2013.
31. A. K. Lodhi, Apeksha L. "Wide Band Speech Coding and It's Application" International Journal of Engineering Research and Technology, Volume.2. Issue.6. in October 2013.
32. Lodhi A.K., Honrao Sachin B. "Solar Energy Based Automated Irrigation System" International Journal of Electronics Communication and Computer Engineering

(IJECCE), Volume.4. Issue.5. pp. 205-2711 in September 2013.
33. Amairullah Khan Lodhi, Sachin R Gaikwad, Pushpak Khapke "Wireless Power Transmission" International Journal of Emerging Technology and Advanced Engineering (IJETAE), Volume.2. Issue.13. pp. 584-587 in May 2013.
34. AK Lodhi, G Parveen Baburao Kamble "Automatic Restaurant Order System Using ZigBee" Excel Journal of Engineering Technology and Management Science, Vol.1, Issue.3, in December 2012.
35. Amairullah Khan Lodhi, Syed Abdul Sattar, M. A. Nayeem "Efficient Low Power Design in FPGA's by Enumerating the State Machine Encoding" Global Journal of Computer Application and Technology (GJCAT), Volume.1. Issue.2. pp. 166-170 in May 2011.
36. H. Chan, A. Perrig, and D. Song, "Random Key Predistribution Schemes for Sensor Networks," Proc. IEEE Symp. Security and Privacy, pp. 197-213, May 2003.
37. C. Karlof, N. Sastry, and D. Wagner, "TinySec: A Link Layer Security Architecture for Wireless Sensor Networks," Proc. Second Int'lConf.EmbeddedNetworkedSensorSystems(SenSys'04), pp. 162-175, Nov. 2004.
38. H. Tijms, Understanding Probability: Chance Rules in Everyday Life. Cambridge Univ. Press, 2004.
39. Xbow, mica2 series, http://www.xbow.com, 2008.
40. B.K. Szymanski, SENSE: Sensor Network Simulator and Emulator, http://www.ita.cs.rpi.edu/sense/index.html, 2008.
41. S. Olariu, Q. Xu, M. Eltoweissy, A. Wadaa, and A.Y. Zomaya, "Protecting the Communication Structure in Sensor Networks," Int'l J. Distributed Sensor Networks, vol. 1, pp. 187-203, 2005.
42. S. Misra and G. Xue, "Efficient Anonymity Schemes for Clustered Wireless Sensor Networks," Int'l J. Sensor Networks, vol. 1, nos. 1/ 2, pp. 50-63, 2006

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

RESOURCE ORGANIZATION OF COGNITIVE RADIO NETWORKS VIA FUZZY LOGIC TECHNIQUE

[1]Amairullah Khan Lodhi, [2]Mohammed Riyaz, [3]Syeda Sameena Shireen, [4]Shaikh Ayaz Pasha4
[1] Asscociaste Professor, [2,3,4]Assist. Professor
[1,2,3,4]Shadan College of Engineering & Technology, Hyderabad
lakresumes@gmail.com

Abstract: The spectrum is a scarce resource and must utilize efficiently, the cognitive radio is a prospective solution for underutilized spectrum. Introduction of flexibility and intelligence in the wireless devices and applications have introduced the concept of Cognitive Radio. This objective has inspired various research activities on going which included the decision making aspects. In this work, a decision making process in cognitive radio is analyzed using fuzzy logic system, in which Dynamic Resource Management of Cognitive Radio Networks is effectively done. The fuzzy logic tool is very helpful for complex or uncertain process where it is difficult to develop mathematical model. Cognitive radio (CR) is a promising technology to solve the challenging spectrum allocation problem. So that, we have selected three descriptive factors for choosing the aggregation weight in dynamic resource management such as Nodes control, Nodes Link state amount and Nodes Link state time. The efficiency of the decision making process in cognitive radios is analyzed. Based on linguistic knowledge 5 rules are set up. The output of the fuzzy logic system gives the probability of the decision based on the three descriptive factors. Recognizing that fuzzy logic inference can better handle uncertainty, fuzziness, and incomplete information in node convergence report, Fuzzy Convergence is developed as a novel approach to aggregate wireless node control with affordable message overload. We show how fuzzy logic system can be used for decision making operation in cognitive radio

1. INTRODUCTION

Spectrum scarcity is one of the biggest challenges that the modern world is facing. The efficient use of available licensed spectrum is becoming more and more critical with increasing demand and usage of the radio spectrum. Different researches show that the usage is not uniform throughout the licensed spectrum rather it is heavy in certain parts of the spectrum and has portions that are utilized inefficiently.

Some researchers even claim that more than 70% of the licensed frequency band is not in use, most of the time. So, there is much room for work yet in the unutilized parts or the inefficiently utilized parts of the spectrum, to overcome the spectrum scarcity problem.

Different researches are in progress and ways are being found to efficiently utilize the available licensed spectrum. One of the ways is the use of Cognitive Radio, according to this; the already licensed spectrum can be used more efficiently by introducing artificial intelligence, the decision making to be specific, in the radio. This enables the radio to learn from its environment, considering certain parameters. Based on this knowledge the radio can actively exploit the possible empty frequencies in the licensed band of the spectrum that can then be assigned to other processes in such a way that they dont cause any interference to the frequency band that is already in use.

This makes the efficient usage of the available licensed spectrum possible. The users that are allocated the licensed frequency bands of the spectrum are the primary users and the users that are allocated the empty frequencies within the licensed frequency band, according to their requested QoS specifications, are known as the secondary users or the cognitive users. They are called as the secondary users as they utilize the unused spectrum resources only, on non-interfering basis, with the primary users.

This paper will focus on the implementation of different spectrum allocation techniques for these secondary users, based on Fuzzy logic Algorithms and an evaluation of the performance of these techniques using Matlab coding. This work will focus on the decision-making process mainly, with an assumption that the radio environment has already been sensed and the QoS requirements for the application have been specified either by the sensed radio environment or by the secondary user itself [4].

2. COGNITIVE RADIO CYCLE

The three cognitive tasks:

- Radio-scene analysis, which encompasses the following: estimation of interference temperature of the radio environment; detection of spectrum holes.
- Channel identification, which encompasses the following: estimation of channel-state information (CSI); prediction of channel capacity for use by the transmitter
- Transmit-power control and dynamic spectrum management. Tasks 1) and 2) are carried out in the receiver, and task 3) is carried out in the transmitter.

From this brief discussion, it is apparent that the cognitive module in the transmitter must work in a harmonious manner with the cognitive modules in the receiver. In order to maintain this harmony between the cognitive radios transmitter and receiver at all times, we need a feedback channel connecting the receiver to the transmitter. Through the feedback channel, the receiver is enabled to convey information on the performance of the forward link to the transmitter.

The cognitive radio is, therefore, by necessity, an example of a feedback communication system. One other comment is in order. A broadly defined cognitive radio technology accommodates a scale of differing degrees of cognition. At one end of the scale, the user may simply pick a spectrum hole and build its cognitive cycle around that hole. At the other end of the scale, the user may employ multiple implementation technologies to build its cognitive cycle around a wideband spectrum hole or set of narrowband spectrum holes to provide the best expected performance in terms of spectrum management and transmit-power control, and do so in the most highly secure manner possible.

In the following subsections we provide an overview of the three main steps for the cognitive cycle: i.e., spectrum sensing, spectrum analysis, and spectrum decision.

Spectrum sensing

A cognitive radio identifies from the information available in the spectrum, the empty frequencies and the portions of the spectrum that are in use, by sensing the spectrum.

Spectrum analysis

Once identified the empty frequencies, their characteristic are determined, in order to make the allocation of the best possible frequency band among them, to the secondary user, according to the QoS requested by it. This includes the determination of the data rate, the transmission mode, and the bandwidth of the transmission.

The Cognitive Radio can then change its parameters according to the spectrum analysis carried out in the above manner to allocate it to the secondary user.

Spectrum decision

On the basis of the above spectrum analysis, the decision for the allocation of the best possible frequency band to be assigned to the secondary user is taken. This spectrum decision lies among the identified empty frequencies in the spectrum sensing process. Once the operating spectrum frequency band is determined, the communication can be performed over this spectrum frequency band. However, there is still the dynamic spectrum access part to be considered for scheduling purpose, as the radio environment changes over time and space, the cognitive radio should keep track of the changes of the radio environment, at real time. If the current spectrum band in use becomes unavailable, the spectrum mobility function is performed, it must vacate the spectrum for the primary use, and move to a better virtually unlicensed frequency band, maintaining the ongoing communications along with a fair scheduling among the users and spectrum sharing by them, in such a manner that no interference is observed among them. Any environmental change during the transmission such as primary user appearance, user movement, or traffic variation can trigger this adjustment [2].

2. Fuzzy logic architecture

The principle structure of FLC mainly consists of as shown in fig.

1. Fuzzification module
2. Knowledge base
3. Inference engine.
4. Defuzzification module.

1. Fuzzification module

The fuzzification module (FM) performs the following functions

Normalization

Performs a scale transformation (i.e. an input normalization) which maps the physical values of current process state variables into a normalized universe of discourse (normalized domain) When a nonnormalized domain is used then there is no need of scale transformation.

Fuzzification

Performs so called fuzzification which converts a point-wise (crisp), current process state variable into a fuzzy set, in order to make it compatible with the fuzzy set representation of the process state variable in the rule-antecedent. Fuzzification when inference is individual rules base firing.

2. Knowledge base

The knowledge base of FLC consists of a database and rule base.

Data base

The basic function of database is to provide the necessary information for the proper functioning of fuzzification module, the rule base and the defuzzification module. This information includes.

- Fuzzy sets (membership functions) representing the meaning of the linguistic values of process state and control o/p variables
- Physical domains and their normalized counterparts together with the normalization and denormalization factors
- Information concerning quantization factors for discretized domain

Rule base

The basic function of an rule-base is to represent in a structured way the control policy of an experienced process operator and / or control engineer in the form of a productions rule such as

if (process state) then (control output) The if part of such a rule is called the rule-antecedent and is a description of a process state in terms of a logical combination of atomic fuzzy propositions. The then part of the rule is called the rule-consequent and is again a description of the control output in terms of logical combinations of fuzzy propositions. These propositions state the linguistic values, which the control output variables take whenever the current process state matches (at least to a certain degree) the process state description in the rule-antecedent.

3. Inference engine

There are two basic approaches employed in the design of the inference engine of a FLC.

1. Composition based inference (firing)
2. Individual rule based (firing)

Composition based inference

In this case the meanings of each individual rule are aggregated into one fuzzy relation describing the meaning of the overall set of rules. Then inference or firing with these fuzzy relations is performed via the operation composition between the fuzzified crisp input and the fuzzy relation representing the meaning of the overall set of rules.

Individual-rule based inference

In this case, first each single rule is fired.

1] Computing the degree of match between the crisp input and the fuzzy sets describing the meaning of rule-antecedent and

2] Clipping the fuzzy set describing the meaning of the rule-consequent to the degree to which the rule-antecedent has been matched by the crisp input.

Finally, the clipped values for the control output of each rule are aggregated, thus forming the value of the overall control output [1].

Defuzzification module

The functions of the defuzzification module (DM) are

Defuzzification

Converts the set of modified control output values into a single point-wise value.

Demoralization

Maps the point-wise value of the control output onto its physical domain. It is not needed if non- normalized domains are used [6].

3. RESULT AND DISCUSSION

In cognitive radio network, the decision making of resource management is based on knowledge of the operational environment. The rule based decision making scheme consider various parameters such as Nodes control, Nodes Link state amount, Nodes Link state time and Aggregation weight. The fuzzy approach is discussed in this section, with design steps required to construct fuzzy inference system are mentioned as follows

- Identify the inputs, outputs and status of CRs.
- Partition the universe of discourse or the interval spanned by each variable into a number of fuzzy subsets, assigning each a linguistic label.
- Assign or determine a membership function for each fuzzy subset.
- Assign the fuzzy relationships between the inputs or states fuzzy subsets on the one hand and the outputs fuzzy subsets on the other hand, thus forming the rule-base.
- Choose appropriate scaling factors for the input and output variables in order to normalize the variables.
- Fuzzify the inputs to the decision making scheme.
- Use fuzzy approximate reasoning to infer the output contributed from each rule.
- Aggregate the fuzzy outputs recommended by each rule.
- Apply defuzzification to form a crisp output.

The functional block diagram of a fuzzy inference system used in the proposed approach is as shown in Figure 2, in which crisp inputs are converted to fuzzy inputs by using process of fuzzification. When inputs are applied to the mamdani FIS then inference engine computes the output set corresponding to each rule. The defuzzifier then computes a crisp output from the number of fuzzy If-Then rules.

A fuzzy system with a p-inputs and single output is described by a collection of l linguistic If-
Then rules is given
where, are the fuzzy sets
representing the lth antecedent pairs and is the fuzzy
set representing the lth consequent. For set of conjunctive rules, the aggregated output for the l rules is given by,
The weighted average method is the most frequently used technique for defuzzification but usually restricted to symmetrical output membership function and is given by,
Where, is the algebraic sum and is the centriod of each symmetric membership function. Here, we design fuzzy inference system to solve the opportunistic spectrum access problem in CR networks. Expert knowledge for selecting the best suitable SU to access the available band is collected based on three antecedents such as, nodes control, state amount and link state time, with one consequent as aggregation weight. Based on the knowledge of linguistic variables, Five If-Then fuzzy rules are used to take the decision for opportunistic spectrum management, which is shown in Table 1.
In this work, using rule based fuzzy logic system, we combine the above three descriptors to determine optimal solution to assign spectrum opportunistically. After analyzing the characteristics of link state aggregation data, the Fuzzy Convergence prototype system is built for evaluating node control in link states, and it is developed with the fuzzy logic inference technique. Specifically, the system could handle imprecise or uncertain information collected from the wireless nodes. Adopting link state aggregation characteristics, three important design criteria are suggested: (a) The network bandwidth consumption required to exchange local convergence for hot spots could be extremely high.
Thus, a control plane for link states is capable of considering the unbalanced link states. (b) Fr lesser impact from small users, a control plane should not apply the same evaluation cycle for all nodes. The super users can be updated more often than the small users. (c) Given a link state number, it makes sense to evaluate the large link states more often than the small users. (c) Given a link state number, it makes sense to
evaluate the large link states more often than the small ones.
Figure 3 illustrates system works by performing two major inference steps: local convergence calculation and global control aggregation. It shows the local convergence calculation for link states. In local convergence calculation, nodes perform fuzzy inference on local parameters to get the local convergence.
The fuzzy inference mechanism can catch uncertainties information and is self-adjusting. Adaptively, it can track the variation of local parameters, such as interference power, interference power, bandwidth of a frequency band, path loss index, and so on.
In global control aggregation, the Fuzzy Convergence system aggregates local convergence collected from all nodes to generate a global control for each node. The system adopts fuzzy inference to get the global control aggregation weights. The aggregation weights are identified using three variables: the nodes control, the link state aggregation date, and the link states amount.
In a full-scale P2P control plane, the number of fuzzy inference rules should be extended to several hundreds. Also, Table 1 lists some frequently used fuzzy inference rules to Fuzzy Convergence system construction [3].
In fuzzy inference system, three antecedent propositions can be expressed in fuzzy partitions such as Bad, Good for Input-1, Low, Very Low, High, and Very High for Input-2, Old and New for Input-3. The consequence i.e. the aggregation weight is divided in to three levels which are Small, Medium and Large.
We use triangular membership functions to represents input as well as output parameters of decision making structure. MFs are shown in Figure 4(a) (b) (c) (d), since we have three antecedents and three fuzzy subsets, we need to set up 5 rules for this fuzzy system. Then, we design rules, which will be depending on various operating conditions and human knowledge. According to rules as follows,
: IF Noodes control is and Nodes Link state amount is and Nodes Link state time
is THEN Aggregation weight is

Condition	Rules
The nodes control is good and the link state amount is high	The aggregation weight is large
The nodes control is good and the link state amount is low	The aggregation weight is medium
The nodes control is bad	The aggregation weight is small

the link state amount is very high and the link state time is new	The aggregation weight is large
the link state amount is very low and the link state time is very old	The aggregation weight is small

Condition	Rules
The nodes control is good and the link state amount is high	The aggregation weight is large
The nodes control is good and the link state amount is low	The aggregation weight is medium
The nodes control is bad	The aggregation weight is small
the link state amount is very high and the link state time is new	The aggregation weight is large
the link state amount is very low and the link state time is very old	The aggregation weight is small

4. SIMULATION RESULTS

To evaluate the response of fuzzy system in CRs, we randomly generated normalize sequence values of three descriptors as Nodes control was a random value in the interval [-1 1] and its Nodes Link state amount in [0 2.5] with third parameter as Nodes Link state time were normalized to [-1 1]. The output of fuzzy decision making, ie the aggregation weight was selected to access the available spectrum was computed and Figure 5 (a) (b) (c) represents the opportunistic dynamic resource management decision surface for the cognitive user.

Fuzzy Logic provides a different way to approach a control or classification problem. Fuzzy approach requires a sufficient expert knowledge for the formulation of the rule base, the combination of the sets and the defuzzification. The employment of fuzzy logic might be helpful, for very complex processes, when there is no mathematical model for highly non-linear processes or if the processing of expert knowledge is to be performed [5].

The results show that, optimum dynamic resource management in cognitive network. The decision making operation will enable the resource management opportunistically which will in turn improve spectrum utilization. It is important to investigate some solutions to prevent some users from using spectrum ineffectively and solve the mobility management problem in order to keep a high QoS of cognitive radio.

The above equation represents output of fuzzy inference engine used in dynamic resource management for cognitive radio network. Table 1 shows the rules corresponding to the parameters used for decision making operation. For every input (x1; x2; x3), the output y of the designed system is computed as

From above equation, we get 4D surface, but it is impossible to plot visually so that we fix one of three variables. The optimized decision making result is obtained with help of fuzzy logic technique.

5. CONCLUSION

Recognizing that fuzzy logic inference can better handle uncertainty, fuzziness, and incomplete information in node convergence report, Fuzzy Convergence is developed as a novel approach to aggregate wireless node control with affordable message overload. A mamdani fuzzy inference system is based on experiences from a group of network experts, so that an acceptable decision can be obtained. As a result, we represent the opportunistic resource management in terms of decision surface. In this work, the resource management for the future heterogeneous network is illustrated. The analysis indicates that the fuzzy logic interference could be a clearly effective for distributed management in heterogeneous wireless

environment. The Fuzzy Convergence is designed as a mechanism to enable efficient spectrum etiquettes, and it enables each node to dynamically decide on an affordable message overhead in terms of local information. Also, with the performance advantages in dense or clustered networks environment.

REFERENCES

1. Y. Chawathe, S. Ramabhadran, S. Ratnasamyz, A Case Study in Building Layered DHT Applications, SIGCOMM05, August, 2005, Philadelphia, Pennsylvania, USA, pp.1-12

2. S. M. Mishra, A. Sahai and R. Brodersen, "Cooperative Sensing Among Cognitive Radios", in Proc. of IEEE International Conference (ICC 2006), June 2006, pp. 1658- 1663
3. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy Efficient Wireless Sensor Networks: A Survey on Energy-Based Routing Techniques" IEEE 3rd International Conference on Electrical, Electronics, Communication, Computation Technologies, and Optimization Techniques (ICEECCOT), conducted by GSSSIETW, Mysuru, on14th & 15th Dec 2018.
4. Amairullah Khan Lodhi, M. S. S. Rukmini "Energy-Efficient Routing Protocol for Node Lifetime Enhancement in Wireless Sensor Networks" International Conference on Modern Technology in Engineering Research & Management (ICMTERM–2019), conducted by Siddhartha Institute of Engineering and Technology, Hyderabad, on 1st & 2nd May' 2019.
5. Amairullah Khan Lodhi, Syed Abdulsattar "Energy and Security Aware Reactive Routing for Wireless Sensor" 73rd International Conference on Science, Engineering & Technology (ICSET), Medina, Saudi Arabia, conducted by Researchfora on 25th & 26th September 2017.
6. M. M. Perianu and P. Havinga, D-FLER: A Distributed Fuzzy Logic Engine for Rule-basedWireless Sensor Networks, Ubiquitous Computing Systems,2010,Springer

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

DESIGN & IMPLEMENTATION OF MEMORY ARCHITECTURES IN QUANTUM DOT CELLULAR AUTOMATA TECHNOLOGY

[1]Mohammed Riyaz, [2]Md Mukram Ali, [3]Shaikh Ayaz Pasha, [4]Amairullah Khan Lodhi
[1,2,3]Assist. Professor, 4Professor
[1,2,3,4]Shadan College of Engineering & Technology, Hyderabad.
[4]Aditya College of Engineering, Beed
lakresumes@gmail.com, [2] mohammedmukram786@gmail.com

.

Abstract: The QCA technology is used for designing and implementation of digital circuits efficiently due to its features like smaller feature size, high speed, low power dissipation and high switching frequency. These characteristics prompt memory cell architecture and implementation in QCA as an appealing choice for manufacturing storage devices. CMOS technology is experiencing power dissipation, short channel effects and quantum effects problems with its relation to chip size, which makes it too hard for integrating more transistors, reaching its scaling limits. Quantum Dot Cellular Automata (QCA) is one of emerging nanotechnologies in recent times to overcome this flaw. This paper discusses architectures of several line and loop based memory cells to compare in terms of density, low power, complexity and switching frequency and to deduce an architecture method which is significant for designing memory cells

Keywords: Quantum Dot Cellular Automata, memory cell, architecture, density, complexity, low power

1. INTRODUCTION

In CMOS computing components are becoming smaller in size based on the Moore's law. This has caused CMOS based computing devices to experience several limitations (Misra et al., 2014). Some of important CMOS limitations are high power consumption, interconnection effects, short channel effects, fabrication difficulties and its high cost as a result of CMOS devices, high performance capability and device density which is making difficulties for CMOS technology advancement (Bhoi et al., 2021).

A new alternative paradigm for conventional CMOS technology in nanotechnology called QCA technology has emerged which overcomes flaws which are experienced with CMOS technology (Misra et al., 2015). The QCA technology used quantum cells, which makes it reversible in nature and has a relatively small feature size, low power dissipation and low delay compared to conventional CMOS (Bhoi et al., 2017).

The QCA technology features are very suitable for implantation of memory cells, while designing QCA memory cell architecture, important issue to consider is switching frequency and feedback paths so that so that arrangement of clocking zones are accurate in order for correct operation by means of pipelining (Frost et al., 2002).

Memory architecture, designing in QCA technology cannot be done similar to that of CMOS technology due to QCA's unique characteristics like the placement of the cells, clocking need to be considered so that memory is always in movement.

In this paper, our objective is to discuss and study memory architectures, which are broadly based on the prior line based and loop based memory cell designs, then discuss both line and loop based memory designs for their characteristics like density, low power, design complexity and latency. Lastly, we conclude why loop based architecture design approach of memory cells is suitable.

The paper organization is as follows. Section II briefly discusses fundamentals of QCA technology such as QCA cells, clocking schemes of QCA, and basic QCA gates and memory in motion. Section III discusses existing line and loop based memory cell architectures.

2. FUNDAMENTAL OF QCA TECHNOLOGY

2.1. QCA Cell

A QCA cell consists of four quantum dots placed at each of four corners of a square shaped cell as shown in Figure 1. Two electrons can move diagonally in between any two quantum dots due to coulombs interaction. Based on the position of electrons, polarization of the QCA cell is determined. There are only two possible states of a QCA cell based on polarizations -1 and +1. The QCA cell is in state low or logic '0', if electrons are diagonally arranged on the left side of a QCA cell, then the polarization of the cell is considered to be -1. The QCA cell is in state high or logic '1', if electrons are diagonally arranged on the right side of a QCA cell then polarization is cell is considered to be +1.

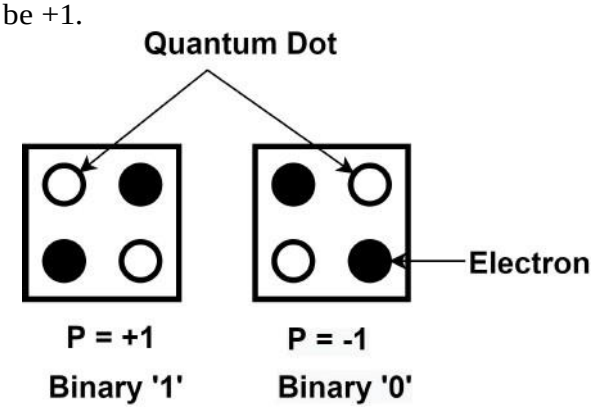


Figure 1. QCA Cell and its Polarization

2.2. Clocking Scheme in QCA

Clocking of cells in QCA technology is vital during the implementation of any circuit in order to synchronize and switching states or phases of cells for the data to flow correctly. There are four clocks shown in Figure 2, which can be applied during implementation where each clock is in phase difference of 90 degrees.

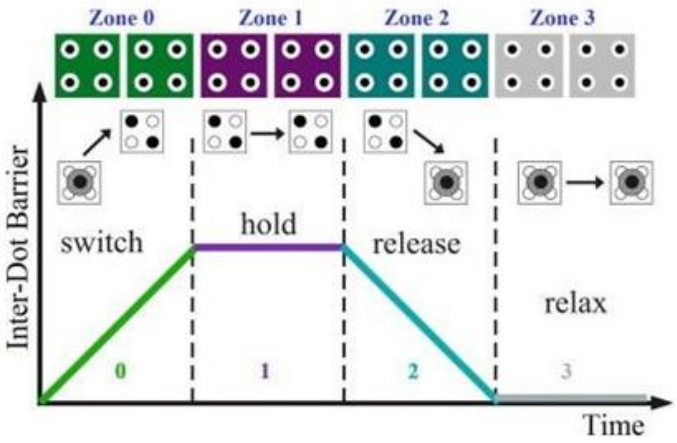


Figure 2. Clocking Schemes in QCA

2.3. Basic QCA Gates

The basic QCA gates are inverter and majority gates, which are vital components during designing. The majority gate consists of five QCA cells shown in Figure 3a, where middle cell is a driver cell. It has three input cells and one output cell. The output of majority gate is majority states of its input value. By changing any one of input majority gates to polarization -1, an AND gate is realized. Similarly, if any one of input of majority gate is fixed as polarization +1, an OR gate is realized.

A QCA inverter has QCA wire which is broken in such way they are parallel to each other as in Figure 3b. The last cell is of opposite polarization of that of first cell due to coulomb attraction force.

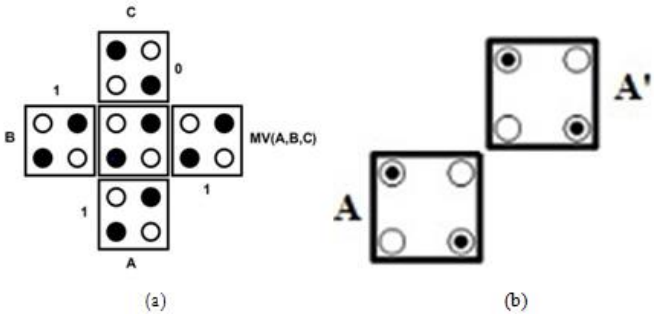


Figure 3. Basic QCA gates (a) Majority gate, (b) Inverter

3. QCA MEMORY CELL ARCHITECTURE REVIEW

For QCA technology memory implementation, the memory should always be in motion. The memory cells are connected as a loop, the memory should move continuously through these cells. The loop is divided into all four clock zones to hold information shown in Figure 4b. Memory architecture can employ serial or parallel process (Frost et al., 2002)

In QCA technology, memory cell design to keep memory in motion has broadly two architectural approaches, namely line based and loop based shown in Figure 4 presented in (Heikalabad et al., 2016). Below we review how data movement is maintained, clocking employed and operation of several memory cells based on line (Figure 4a) and loop based architectural approach (Figure 4b).

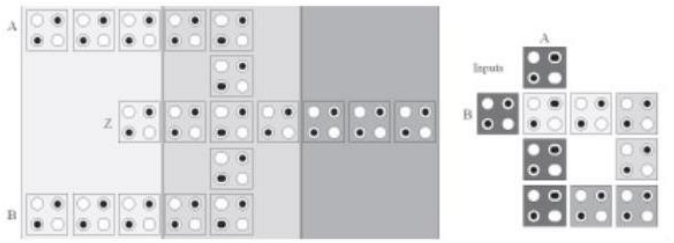


Figure.4. QCA Memory cells (a) Line based, (b) Loop based

3.1. Line Based Approach of Memory Cells

Types of approach for designing of memory cells are reviewed below. Line based approach needs to have a QCA wire with a clocking technique so that data needs to propagate back and forth.

In (Vankamamidi et al., 2005a), used parallel memory architecture and topology is based on two lines. So, it has advantages over (Vankamamidi et al., 2005b), as there is no delay for a bit to read or write since only one bit is stored in each memory cell. This helps in reduction of delay and clock cycles compared to serial memory architecture. A basic bidirectional line is used for storing of memory data, data is moved along this line back and forth. Read or write of data is done in four process steps, hence it employed three clock cycles for implementation of memory cells. To make a memory in motion on the line, two more clock cycles are used to relax and hold for adiabatic switching.

A two phase clock cycle is used by this memory cell in (Taskin et al., 2006), which is used for synchronization. A bi-directional line is used for rotation of stored data and uses a parallel memory architecture. Only one clock generator is used for generating two clock cycles. An advanced two phase parallel architecture is presented in (Taskin et al., 2008). This architecture has a majority gate at core of memory cells. Depending on memory operation, it can act as a majority gate or as a memory line.

In (Song et al., 2020) is a serial process, so many bits are stored in each memory cell. So, the delay depends on the number of bits present in memory cell when it needs to perform read or write operation. It requires dual level clocking across three memory tiles (which were presented) for input, loop and output. Thus, each memory tile has three clock cycles. Memory cells and memory line share same clocking zones irrespective of its word size.

3.2. Loop Based Approach of Memory Cells

In (Berzon et al., 1999) presented a memory cell implementation done using a SQUARES formalism for the address circuit logic realization components. A majority gate acts as SRAM is used as for realizing write logic to the loop. A shift closed loop is implemented based on SQUARES which employs four clocking zones. The loop output is pipelined to shift register. To load register, read signal is required and specified bit is written on output bit line. The shift, loop holds the data for all counter cycles. A series of the XNOR gates are used in array for implementing comparator circuitry. As all bits stored use the same read or write circuit, delay is same as that of bits stored. Additionally, density is more, using lots of clock cycles.

In (Vankamamidi et al., 2005b), a RAM memory cell using QCA technology is presented. The individual single layer RAM cell has read or write circuitry. By using a memory loop, data is stored. When read or write line are polarized to 1, input enters the loop and continuously circulates. If read or write line is polarized to 0, data in a loop are given to output. To achieve read or write circuitry AND, OR and inverter gates is used, making design simple. A total of 158 cells is utilized for memory cell layout. To design a more bit RAM. The memory can hold more than two bits if we employ parallel process architecture.

In (Dehkordi et al., 2011) presents two memory cells modified using the inherent capabilities of QCA. The programming of majority gate and clocking techniques are employed for circuitry design. Firstly discussed memory cell is based on S- R latch design which forms a memory loop for holding data. Memory cell utilizes 100 cells with seven clocking zones and over all delay of 4 clock cycles to implement RAM cell circuitry. In second memory cell is based on D latch. D latch is a memory loop which holds data which is used in RAM cell designing. The RAM cell uses a total of 63 cells, but utilizes 12 clock zones, making the overall delay of RAM cell to 4 clock cycles. In (Hashemi et al., 2012) presents a novel memory cell with set/ reset capability. The D flip flop is level and edge triggered is introduced which is used as a storage memory loop for RAM cell circuitry. Set/reset is used to activate the memory cell. A 2:1 multiplexer which is presented, is also used for realizing memory circuitry. Total 109 cells are used to realize D flip flop based memory cell with a

delay of 1.75 clock cycles.

In (Angizi et al., 2015), D latch is realized using a majority gate, which is presented. This Majority gate acting as D latch is used in realizing RAM cell. This design is simple and has improved in the area, but is has low speed computation.

In (Fam et al., 2019), a D latch using the advanced clocking mechanism is presented which used as a memory loop in realizing RAM cell of a single layer. It has simple design for read or write circuitry with total utilization of 55 cells and delay of 2.5 clock cycles.

In (Heikalabad et al., 2016) presents a five input minority gate, which is used in the comparison circuitry in CAM cell. A S-R latch memory loop is also employed for storing memory in read or write circuitry of CAM cell. This design uses 100 cells for design of CAM cell and delay of 2 clock cycles making it more speed operation. The (Khosroshahy et al., 2017) introduced a majority gate of five inputs which is used as a component in the comparison circuitry of the single layer CAM cell. This cell uses read or write circuitry same as that of (Fam et al., 2019), but is more area efficient.

In (Taskin et al., 2008), a low power XOR gate is presented which is used in the comparison circuitry in the CAM cell of a single layer. Additionally, read or write circuitry is reduced and has advanced clocking mechanism compared to prior works which has significantly less area and power.

In (Heydari et al., 2019) a set or rest RAM cell is presented. A majority gate of low power is presented which is used to set or reset RAM cell output. It has a considerable low area and delay with efficient switching energy. In (Heydari et al., 2019) and (Mubarakali et al., 2019) are RAM cell crossover structures, where (Mubarakali et al., 2019) uses an S-R latch based memory loop and (Sadoghifar et al., 2018) used novel D latch based memory loop. Both these memory cells have reduced wastage area, reduced cell count.

In (Song et al., 2020) presents an asynchronous RAM cell with set and reset capability. The set and reset of RAM cell are done by 2 to 1 multiplexer which is also presented. The proposed RAM cell is of multilayer structure with improved area and delay with efficient scalability.

4. DISCUSSIONS

The line and loop based memory cell's architecture are discussed and compared in terms of density, low power, complexity and latency.

4.1. Latency

The clock zones for line based memory cell structures require additional clocking in order to facilitate flow of data through a QCA wire, and storing of data needs additional clocking zones making implementation of such memory cell complex. Whereas loop based memory cell structures use a feedback path loop though, where data is circulated and stored easily though there is difficulty in employing efficient clocking mechanisms. The loop based memory cell implementation is more preferred as it doesn't require additional clock zones. The delay of parallel memory cell architecture is less compared to serial memory cell architecture as in parallel only one bit is stored in memory loop, so during read or write operation there is no additional delay wherein in serial access, more bits stored in each memory cell which use shared read or write circuitry, making delay equal to that of word size in memory loop.

4.2. Density

The implementation of memory cell through feedback path has significantly reduced the number of cells as read or write circuitry plus a memory loop is included within same where data is continuously circulated. Additionally, novel components and techniques are introduced for read or write circuitry implementation using a feedback path like latches, multiplexers, decoders etc. Which further reduces wastage areas and size comparable to a line based memory cells where it requires additional clock generators decoders and read or write circuits individually. So, the size of memory loop implementation in loop based architecture is significantly less compared to that of line based design.

4.3. Low Power

The decreased number of clock zones and density in loop based architecture significantly yields low power dissipations. Low power components in recent times are used to implement a memory cell in feedback fashion which further decrease high power considerations. The line, based memory cells, though easy to design have additional cells, wastage areas, additional clocking doesn't yield an overall power efficiency.

4.4. Design, Complexity

The line, based memory cells are very simple to design and implement even if it has disadvantages in speed, power and size. There is little scope for advancement of line based memory cell techniques

(Sodoghifar et al., 2018).

The loop based memory cell circuitry designing and implementation needs considerations in clocking and layout mechanisms as memory loop is significantly smaller in size thus raising difficulty and need for using efficient clock zones within that memory loop. The architectural layout is further needed to be researched and apply novel advanced design techniques to reduce wastage areas, gates and clocking. Research is thus needed to find efficient novel architectural design techniques and advanced novel clocking in order to implement efficient memory cells.

The loop based memory cells have an overall efficiency compared to line based memory cells, even if there is complexity in design of loop based memory cells. No advancement in research for line based memory cell designing techniques further make loop based memory cells more preferable.

5. CONCLUSION

There is a steady advancement in research of loop based memory cells where researchers are finding new techniques for designing and clocking in order to achieve efficient and better performed memory cells in terms of smaller density, low power and fast speed. The line, based memory cells wherein has little to no scope for further advancement and improvement of memory cells in order to yield a better performed memory cell.

REFERENCES

1. Misra, N.K., Wairya, S. and Singh, V.K., (2014), An inventive design of 4* 4 bit reversible NS gate. IEEE International Conference on Recent Advances and Innovations in Engineering (ICRAIE-2014), pp. 1-6.
2. Bhoi, B.K., Pathak, N., Kumar, S. and Misra, N.K., (2021). Designing digital circuits using 3D nanomagnetic logic architectures. Journal of Computational Electronics, pp.1-16.
3. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy Efficient Wireless Sensor Networks: A Survey on Energy-Based Routing Techniques" IEEE 3rd International Conference on Electrical, Electronics, Communication, Computation Technologies, and Optimization Techniques (ICEECCOT), conducted by GSSSIETW, Mysuru, on14th & 15th Dec 2018.
4. Amairullah Khan Lodhi, M. S. S. Rukmini "Energy-Efficient Routing Protocol for Node Lifetime Enhancement in Wireless Sensor Networks" International Conference on Modern Technology in Engineering Research & Management (ICMTERM–2019), conducted by Siddhartha Institute of Engineering and Technology, Hyderabad, on 1st & 2nd May' 2019.
5. Amairullah Khan Lodhi, Syed Abdulsattar "Energy and Security Aware Reactive Routing for Wireless Sensor" 73rd International Conference on Science, Engineering & Technology (ICSET), Medina, Saudi Arabia, conducted by Researchfora on 25th & 26th September 2017.
6. Amairullah Khan Lodhi, Syed Abdulsattar "Cluster Head Selection by optimized ability to restrict packet drop in Wireless Sensor Networks" 1stInternational Conference on Soft Computing in Data Analytics(SCDA 2018), conducted by SSCE, Srikakulam.
7. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar " Efficient Energy Routing Protocol Based on Energy & Buffer Residual Status (EBRS) for Wireless Sensor Networks" National Conference on Vlsi, Signal Processing & Communications (NCVSCOMS-2019), conducted by ECE Dept, VFSTRU, Vadlamudi, Guntur, on 6th & 7th Sept' 2019.
8. Amairullah Khan Lodhi, Syed Abdulsattar "Energy Efficient and Secure Intrusion Detection Algorithm for Maximum Coverage in WSN" in CAS Ph.D. forum, Organized by CAS IEEE / EDS Societies, Hyderabad Section, on 16th July 2016.
9. Amairullah Khan Lodhi, Syed Abdulsattar "Performance Improvement in Wireless Sensor Networks by Removing the Packet Drop from the Node Buffer" is accepted in ICMPC -2020 (GLA University).
10. Amairullah Khan Lodhi, Syed Abdulsattar "Lifetime Enhancement Based on Energy and Buffer Residual Status of Intermediate Node in Wireless Sensor Networks" is accepted in iCASIC-2020 (VIT, Vellore).
11. Amairullah Khan Lodhi "Low Power VLSI Designing Techniques in Semiconductor Devices" International Conference on Systemics, Cybernetics and Informatics (ICSCI-2011), in May 2011.
12. Amairullah Khan Lodhi, Nikhat Nawaz "Real-Time Object Detection for An Unmanned Aerial Vehicle Using an FPGA Based Vision System" New Innovations in Computations and Electronics'NICE-10, in October 2010.
13. Amairullah Khan Lodhi, Syed Shafi Ahmed "Minimization of Power Consumption in FPGA's by Enumeration the State Machine Designs" International Conference on Emerging Trends in Engineering (ICETE-10), in February 2010.
14. Amairullah Khan Lodhi, Nikhat Nawaz "Watermarking and Compression of Digital Image Using WT and SPIHT" Futuristic Advancements on Computing and Electronics'FACE-09, in March 2009.
15. Vishal V Lodhi, Amairullah Khan, Puranik "Dynamic Resource Management of Cognitive Radio Networks Via Fuzzy Logic Technique" International Journal of Engineering Research & Technology (IJERT), Volume.2. Issue.12. pp. 205-2711 in December 2013.
16. Amairullah Khan Lodhi, Ingole Snehal Diliprao, Kale Sindhu Subhas "Wavelet-Based Texture Feature For Content-Based Image Retrieval" International Journal of Engineering Technology & (IJETAE),

Volume.3. Issue.12. in December 2013.
17. A. K. Lodhi, Apeksha L. "Wide Band Speech Coding and It's Application" International Journal of Engineering Research and Technology, Volume.2. Issue.6. in October 2013.
18. Lodhi A.K., Honrao Sachin B. "Solar Energy Based Automated Irrigation System" International Journal of Electronics Communication and Computer Engineering (IJECCE), Volume.4. Issue.5. pp. 205-2711 in September 2013.
19. Amairullah Khan Lodhi, Sachin R Gaikwad, Pushpak Khapke "Wireless Power Transmission" International Journal of Emerging Technology and Advanced Engineering (IJETAE), Volume.2. Issue.13. pp. 584-587 in May 2013.
20. AK Lodhi, G Parveen Baburao Kamble "Automatic Restaurant Order System Using ZigBee" Excel Journal of Engineering Technology and Management Science, Vol.1, Issue.3, in December 2012.
21. Amairullah Khan Lodhi, Syed Abdul Sattar, M. A. Nayeem "Efficient Low Power Design in FPGA's by Enumerating the State Machine Encoding" Global Journal of Computer Application and Technology (GJCAT), Volume.1. Issue.2. pp. 166-170 in May 2011.
22. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy-Efficient Routing Protocol Based on Mobile Sink Node in Wireless Sensor Networks" International Journal of Innovative Technology and Exploring Engineering (Scopus), Vol.8, Issue-7, pp 1788-1792, 2019.
23. Amairullah Khan Lodhi, M. S. S. Rukmini "Energy-Efficient Routing Protocol for Node Lifetime Enhancement in Wireless Sensor Networks" International Journal of Advanced Trends in Computer Science and Engineering (Scopus), Vol. 8. No.1.3. pp. 24-28, 2019.
24. Amairullah Khan Lodhi, Mohammad Iliyas, Safiya Kaunain "Design of 8-4 and 9-4 Compressors For high-Speed Multiplication" Journal of Applied Science and Computations (JASC)–Volume.6. Issue.6. pp. 2056-2068 in June 2019.
25. Amairullah Khan Lodhi, Sindhu S. Kale "Development on Gas Leak Detection and Location System Based on Wireless Sensor Networks: A" International Journal of Engineering Trends and Technology (IJETT)–Volume 12. in 2014.
26. Amairullah Khan Lodhi, S. R. Madkar, Prof. A. V. Karande "Wireless Monitoring of Soil Moisture & Humidity using Zigbee in Agriculture" International Journal of Advanced Research in Computer Science and Software Engineering (IJARCSSE), Volume.10. Issue.4. pp. 817-821 in October 2014.
27. A. K. Lodhi, Prashant R. Gade "Review of Poly House Control System" International Journal of Advanced (IJAIEM), Volume.2. Issue.3. pp. 76 in February 2014.
28. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Lifetime and Performance Enhancement in WSN by Energy-Buffer Residual Status of Nodes and The Multiple Mobile Sink" TEST Engineering and Management (Unpaid Scopus), Vol.82, pp. 3835-3845 on 20th January 2020.
29. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Performance Enhancement by Cluster Head Selection Based On Residual Status of Energy and Buffer in WSNs" is accepted in INTERSCIENCIA Journal (SCIE Journal) on 16th December 2019.
30. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar " Efficient Energy Routing Protocol Based on Energy & Buffer Residual Status (EBRS) for Wireless Sensor Networks" International Journal of Engineering and Technology (Scopus), Vol. 9. Issue no. 1S5 pp. 33-37, in December 2019.
31. Amairullah Khan Lodhi, M. S. S. Rukmini, Syed Abdulsattar "Energy-efficient Routing Protocol for Life Enhancement in Wireless Sensor Networks" Recent Patents on Computer Science (Unpaid Scopus),Vol.12,no.1. pp. 01-10, 2019.
32. Sadoghifar, A. and Heikalabad, S.R., (2018). A Content-Addressable Memory structure using quantum cells in nanotechnology with energy dissipation analysis. Physica B: Condensed Matter, 537, pp.202-206

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

BLOCKCHAIN BASED PUBLIC INTEGRITY VERIFICATION FOR CLOUD STORAGE AGAINST PROCRASTINATING AUDITORS

[1]Mr. Sridhar Gummalla, [2] Mr. Humayun Khan, [3]Mr. Mohsin Mohammed
[1] Professor,[2]Associate Professor, [3] Assist professor
[1,2,3]Dept of CSE, SCET

Abstract :-The deployment of cloud storage services has significant benefits in managing data forusers. However, it also causes many security concerns, and one of them is data integrity. Publicverificationtechniquescanenableauser toemployathird-partyauditortoverifythedataintegrityonbehalfofher/him,whereasexistingpublicverificationschemesarevulnerabletoprocrastinating auditors who may not perform verifications on time. Furthermore, most of publicverification schemes are constructed on the public key infrastructure (PKI), and thereby sufferfrom certificate management problem. In this paper, we propose the first certificateless publicverification scheme against procrastinating auditors (CPVPA) by using blockchain technology.The key idea is to require auditors to record each verification resultinto a blockchain as atransaction. Since transactions on the blockchain are time-sensitive, the verification can be time-stamped after the corresponding transaction is recorded into the blockchain, which enables usersto check whether auditors perform the verifications at the prescribed time. Moreover, CPVPA isbuilt on certificate less cryptography, and is free from the certificate management problem. Wepresentrigoroussecurityproofstodemonstratethesecurityofthe CPVPA,andconductacomprehensive performance evaluationtoshowthatCPVPAisefficient

1. INTRODUCTION:-

The deployment of cloud storage services has significant benefits in managing data for users.However,it also causesmany security concerns,andone of themis dataintegrity.Publicverificationtechniquescanenableauser toemployathird-partyauditortoverifythedataintegrityonbehalfofher/him,whereasexistingpublicverificationschemesarevulnerabletoprocrastinating auditors who may not perform verifications on time. Furthermore, most of publicverification schemes are constructed on the public key infrastructure (PKI), and thereby sufferfrom certificate management problem. In this paper, we propose the first certificate less publicverification scheme against procrastinating auditors (CPVPA) by using blockchain technology.The key idea is to require auditors to record each verification result into a block chain as atransaction. Since transactions on the blockchain are time-sensitive, the verification can be time-stamped after the corresponding transaction is recorded into the block chain, which enables usersto check whether auditors perform the verifications at the prescribed time. Moreover, CPVPA isbuilt on certificate less cryptography, and is free from the certificate management problem. Wepresentrigoroussecurityproofstodemonstratethesecurityofthe CPVPA,andconductacomprehensive performance evaluationtoshowthatCPVPAisefficient.

2. EXISTING SYSTEM

In this paper, we have an existing system is the first certificateless public verification schemeagainstprocrastinatingauditors(CPVPA) byusingblockchaintechnology.CPVPAisbuiltonthecertificate less cryptography and avoids the certificate management problem. CPVPA, resistsmalicious auditors and procrastinating ones without introducing any trusted entity, where eachverification performed by the auditor is time-stamped by integrating it into a transaction of blockchain. The key idea is to require auditors to record each verification result into a blockchain as atransaction Since transactions on the blockchain are time-sensitive, the verification can be time-stamped after the corresponding transaction is recorded into the blockchain, which enables userstocheckwhetherauditors performthe verifications atthe prescribedtime.

Existing System Disadvantages:-

- Foreverytransactioninformationwillstoreinblock. Eachblockconnecttoanotherblocktheprocessofconnecting eachblockisknownasblockchainsystem.Foreverytransacti onmore time/energyisrequired.
- Whilecomparewithprivateblockchainsystem,Publ icblockchainisless secured.

3. LITERATURE SURVEY:-

1.Title:Privacy-
preservingDataAggregationComputinginCyber-PhysicalSocialSystems
Author: JiahuiYu,KunWang.
Year: 2018
Description:
In cyber-physical social systems (CPSS), a group of volunteers report data about the physicalenvironment through their cyber devices and data aggregation is widely utilized. An importantissueindataaggregationforCPSSistoprotect users'privacy.Inthisarticle,weusebitwiseXORand propose a bit-choosing algorithm to realize privacy-preserving min, k-th min, and percentilecomputation.Byouralgorithm,theaggregatorcan confirmwhetherauser'sdatavalueisequaltocertain value or within certain scale. Consequently, it is also possible to count the number of users satisfying given conditions. Our bit-choosing algorithm makes sure that the users send non-repetitionrepliestotheaggregatortoraisetheaggregationacc uracy.Weanalyzethecommunication cost and the achievable accuracy of our algorithm. Via performance comparisonagainstexistingprotocols,theefficiencyandacc uracy ofouralgorithmareverified.

2.Title:QueryinginInternetofThingswithPrivacyPrese rving:Challenges,SolutionsandOpportunities
Author:Hao Ren,HongweiLi,and YuanshunDai
Year: 2018
Description:
IoTisenvisionedasthenextstageoftheinformationrevolutio n,enablingvariousdailyapplicationsandprovidingbetterser vicebyconductingadeepfusion with cloudandfogcomputing.As thekeymission ofmost IoTapplications,datamanagement,especiallythefundamen talfunction-dataquery,haslongbeenplaguedbyseveresecurityandpriva cyproblems.Mostqueryserviceproviders,includingthebigo nes(e.g.,Google,Facebook,Amazon, andsoon)aresufferingfromintensiveattackslaunchedbyinsi dersoroutsiders.Asaconsequence,processing various queries in IoT without compromising the data and query privacy is an urgentand challenging issue. In this article, we propose a thing-fog-cloud architecture for secure queryprocessing based on well studied classical paradigms. Following with a description of crucialtechnical challenges in terms of functionality, privacy and efficiency assurance, we survey thelatestmilestone-likeapproaches,andprovideaninsightintotheadvantagesan dlimitationsofeachscheme. Based on the recent advances, we also discuss future research opportunities to motivateefforts to develop practical private query protocols in IoT.This article presents a case study andprovidesdetailaboutchallengesand approachesindataextraction,modeling,andvisualization.

3.Title:Efficientandsecureoutsourcingofdifferentially privatedatapublication
Author:JinLi, HengYe,WeiWang
Year: 2018
Description:
While big data becomes a main impetus to the next generation of IT industry, big data privacy, asan unevadable topic in big data era, has received considerable attention in recent years. To dealwith the privacy challenges, differential privacy has been widely discussed as one of the mostpopularprivacy-enhancingtechniques.However,withtoday'sdifferentialpri vacytechniques,itisimpossibletogenerateasanitizeddataset that cansuit differentalgorithmsor applicationsregardless of the privacy budget. In other words, in order to adapt to various applications andprivacybudgets,differentkindsofnoiseshaveto beadded,whichinevitablyincurenormouscostsforbothcom municationandstorage.Toaddresstheabovechallenges,inth ispaper,weproposeanovelschemeforoutsourcingdifferenti alprivacyincloudcomputing,whereanadditivehomomorph ic encryption (e.g., Paillier encryption) is employed to compute noise for differentialprivacy by cloud servers to boost efficiency. The proposed scheme allows data providers tooutsourcetheirdatasetsanitizationproceduretocloudservi ceproviderswithalowcommunicationcost. In addition, the data providers can gooffline after uploading their datasets andnoiseparameters, which is one of the critical requirements for a practical system. We present a detailedtheoretical analysis of our proposed scheme, including proofs of differential privacy and security.Moreover, we also report an experimental evaluation on real UCI datasets, which confirms theeffectivenessofthepropsedscheme.

4.Title:Asecureversatile
lightpaymentsystembasedonblockchain
Author:LinZhong,Qianhong Wu,Bo Qin.
Year: 2019

Description:
Ever-increasing transaction costs, serious network congestion, and low transaction rates in thecurrentblockchainsystemsrestricttheirextensiveuse.To relievefromthissituation,wepresenta secure versatile light payment (SVLP) scheme. The SVLP merely employs a digital signaturealgorithm and a one-way function and has similar security comparing to existing blockchainsystems, such as Bitcoin and Ethereum. The proposed scheme is of ultra-low power consumption, sincethepayersandpayeesonlyneedone-wayfunctionstoachievemultipletransactions,insteadof the costly digital signature algorithms. Furthermore, the processes of payment and refundingare flexible. This is due to the fact that the denomination in our scheme possesses divisibility andtheusersneednottoverifythepreimagesonthelongchain one-by-one.Finally,asthetransactioncanbetakenoff-chainandoffline,itcanbeevenusedinremoteareasor geologicaldisastersareaswhere communication infrastructures are lacked or destroyed. All these features indicate that ourschemeispracticalandversatile.

5.Title:Privacy-preservingattribute-keywordbaseddatapublish-subscribeserviceoncloudplatforms

Author:kanyang,kuanzhang.
Year: 2017
Description:
Datapublish-subscribeserviceisaneffectiveapproachtoselectivelyshare andselectivelyreceivedata.Towardsthehugeamountofdata generatedinourdailylife,cloudsystems,witheconomicalbut powerful storage and computing resources, are inevitably becoming the most appropriateplatformfor datapublicationandsubscription.However,cloudserverma yalsocuriousaboutboththe published data and the interests of the subscribers. In this paper, we propose a privacy-preservingAttribute-KeywordbaseddataPublish-Subscribe(AKPS)schemeforcloudplatforms.Specifically,i nordertoprotecttheprivacyofthepublisheddataagainstthecl oudserverandother none-subscribers,weemploytheattribute-basedencryptionwithdecryptionoutsourcingtoencrypt the published data, such that the publishers can control the data access by themselves andthe major decryption overhead can be shift from the subscribers' devices to the cloud server. Toprotectthesubscribers'interests,weproposeanewsearcha bleencryptiontoenablethesubscribersto selectively receive interested data. Different from existing symmetric searchable encryptionmethods, the AKPS can support multiple publishers and multiple subscribers, while none of twopublishers/subscribers share the same secret keys. Moreover, the publishers cannot act as thesubscribers,andviceversa.Toavoidbypassingaccess/su bscriptionpolicycheckingprocedure,theAKPS smartly ties both access policy and subscription policy by two secrets. One secret is usedto bundle the ciphertextand the tags together, while the other secretis used tobundle thesubscription trapdoor and the pre-decryption key together. The security proof and performanceevaluation show that the proposed AKPS scheme is provable secure in random oracle model andefficientinpractice.

4. PROPOSEDSYSTEM

In this, we propose first certificateless public verification scheme against procrastinating auditors(CPVPA) by using private blockchain technology with less power consumption. CPVPA withprivate block chain system avoids the energy and time consumption. while compare with publicblockchain,privateblockchainisverysecured.Permis sionednetworksplacerestrictionsonwhois allowed to participate in the network and in what transactions. The Email idea is to requireauditors to record each verification result into a blockchain as a transaction. Private block chainalso work same as like a our Existing but in this we are having less power and time consumptionwith a secure block chain. In private block chain system we are storing transactions informationwithasecure.

ProposedSystemAdvantages

- Comparetopublicblockchainprivateblockisveryse cured.
- Foreverytransactionwearesendingalertmailtouser anditsdecreaingtime/energyconsumption.

5. IMPLEMENTATION

Theorganizationofdistributedstorageadministrationshash ugeadvantagesinoverseeinginformation for clients. Notwithstanding, it likewise causes numerous security concerns, and oneof them is information uprightness. Open check procedures can empower a client to utilize anoutsider evaluator to confirm the information respectability in the interest of her/him, whileexisting openconfirmationplansaredefenselessagainsttarryingexa minerswhomaynotperformconfirmations on schedule. Besides, the majority of open check plans are built on people in publickey infrastructure (PKI), and along these lines experience the ill effects of declaration the boardissue. In this paper, we propose the principal certificateless public verification scheme againstprocrastinatingauditors(CPVPA)byutilizingblockc haininnovation.Thekeythoughtistoexpectinspectors to

record every confirmation result into a blockchain as an exchange. Since exchangeson the blockchain are time-delicate, the confirmation canbe time-stepped after the relatingexchangeisrecordedintotheblockchain,whichemp owersclientstocheckwhetherreviewersplayoutthe confirmations atthe endorsed time.In addition,CPVPAis based on certificatelesscryptography,andisfreefromtheendorsemen ttheexecutivesissue.Wepresent thoroughsecurityverifications to exhibit the security of CPVPA, and direct an extensive presentation assessment toshow thatCPVPA is effective.

We will find how to build CPVPA by using other blockchain systems. Constructing CPVPA byusing other block chain systems (eg: proofs of stake based block chain systems, Delegated proofof stake(DPoS), Byzantine fault tolerance) which can provide less energy consumption. It'srequires an elaborated design to achieve the same security to ensure the high efficiency. We willalso investigate how to utilize blockchain technology to enhance cloud storage systems in termsofsecurity,performance andfunctionality.

6. MODULE DESCRIPTION

1. UserInterface
2. User
3. Blockchain
4. Cloud server
5. Auditor

1. UserInterfaceDesign

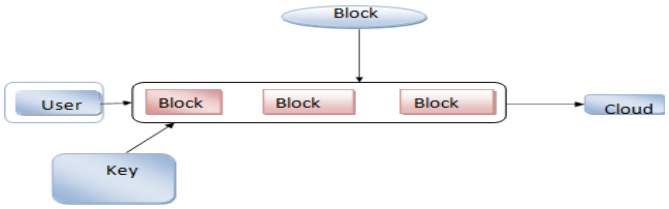
In this module we design the windows for the project. These windows are used for secure loginfor all users. To connect with server user must give their username and password then only theycan able to connect the server. If the user already exits directly can login into the server else usermustregistertheirdetailssuchasusername,passwordan d Emailid,into the server.

2.User

The user is the data owner, who outsources her/his data to the cloud server and accesses theoutsourceddataasneeded.Ifuserwantstostoreanyinform ation incloudfirstuser needtoregisterand login with a valid Email-Id and password. After data outsourcing, the user employs a TPA,agreesaverificationperiodwithTPA,andletTPAperio dicallyverifythedataintegrity.Foreveryverificationuser willgetmailnotificationsfromauditor forsecuritypurpose.Foreverytransactionkeygenerationpla ntwillgeneratekeyforauser.

3.Block Chain

Thisistheimportantmoduleinthisprojectbyusingthistechno logywearedividingthefiledescription intoblocksandconnectone byone usinghashcodemechanism.

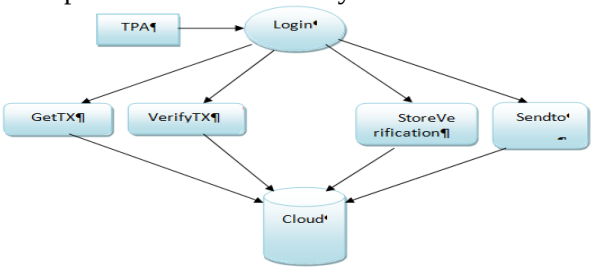


4.Cloud Server

Cloud will store the data of user. It will store all the transaction details of each and every useranditwillprovidesecurityforthosetransactionsanduser details.Andthetransactiondetailsgivento auditor for verification and after verication from the auditor it will store all the details of eachand everytransationwithverificationstatus.Andverificationstat usisprovided touser.

5.Third Party Auditor(TPA)

TPA works for the user. TPA receives the transaction details of users and verifies thosetransactions and forward the verification details to user. If TPA tries to get other user details thealertmessage senttothatparticularuserforsecurityreasons.



GIVENINPUTEXPECTEDOUTPUT:

➢ **UserInterfaceDesign**

Input :Toconnectwithserverusermustgivetheirusernam eandpassword.Output :Withvalidnameandpasswordtheycanabletoconne cttheserver.

➢ **User**

Input : If user wants to store any information in cloud first user need to register. After dataoutsourcing,the useremploys a TPA,agrees a verification period with TPA,andletTPAperiodicallyverifythedataintegrity. Output:Withvalidnameandpasswordtheycanabletoconnec ttheserver.Foreveryverificationuser will get mail notifications from auditor for security purpose. For every transaction keygenerationplantwillgeneratekeyforauser.

➢ **Block Chain**

Input:Inblockchainsystem,wewillstoretransactioninformationfromThirdpartyauditor(TPA)intodifferentblocksinblockchainsystem.
Input:Itwillprovidemoresecurityforinformation.Itwillworksbasedonhashcode.

- **Cloud Server**

Input :Firstcloudneedtologin.
Itwillstoreallthetransactiondetailsofeachandeveryusser.Atransactiondetailsgiventoauditorforverification.

Output

:Withvalidnameandpasswordonlycloudcanabletogethomepage. thetransactiondetailsgiventoauditorforverificationandafter verificationfromtheauditoritwillstoreallthedetailsofeachandeverytransactionwithverificationstatus.
Andverificationstatus isprovidedtouser.
Third PartyAuditor(TPA)
Input:TPAreceivesthe transactiondetailsofusers
Output: TPA receives the transaction details,verifies those transactions andforwards theverification details to user. If TPA tries to get other user details the alert message sent to thatparticularuserforsecurityreasons.

7. CONCLUSION:-

Inthispaper,wehaveproposedacertificatelesspublicverificationschemeagainsttheprocrastinating auditor, namely CPVPA.CPVPA utilizes the on-chain currencies, where eachverificationperformedbytheauditorisintegratedintoatransactionontheblockchainofon-chaincurrencies.
Furthermore, CPVPA is free from the certificate management problem. The securityanalysis demonstrates thatCPVPA provides the strongestsecurity guarantee compared withexistingschemes.Wehavealsoconductedacomprehensiveperformanceanalysis,whichdemonstrates that CPVPA has constant communication overhead and is efficient in terms ofcomputationoverhead.

REFERENCES:-

1. H.T.Dinh, C.Lee,D.Niyato,andP.Wang,“A survey ofmobilecloudcomputing:architecture, applications, and approaches,” Wireless Communications and Mobile Computing,2011.
2. P.Papakos,L.Capra,andD.S.Rosenblum,“Volare:context-awareadaptivecloudservicediscovery for mobile systems,” in Proceedings of the 9th International Workshop on Adaptive andReflectiveMiddleware,Bangalore,India,November302010,pp.32–38.
3. I.Roussaki,N.Kalatzis,N.Liampotis,P.Kosmides,M.Anagnostou,K.Doolin,E.Jennings, Y. Bouloudis, and S. Xynogalas, “Context-awareness in wireless and mobile computing revisitedtoembracesocialnetworking,”IEEECommunicationsMagazine,vol.50,no.6,pp.74–81,2012.
4. D.Yao,C.Yu,A.K.Dey,C.Koehler,G.Min,L.T.Yang,andH.Jin,“Energyefficientindoortracking onsmartphones,”Future GenerationComp.Syst.,vol.39,pp.44–54,2014.
5. J. Wu, I. Bisio, C. Gniady, E. Hossain, M. Valla, and H. Li, “Context-aware networking andcommunications:Part1,”IEEE CommunicationsMagazine,vol.52, no.6,pp.14–15,2014.
6. S.Nath,“ACE:exploitingcorrelationforenergy-efficientandcontinuouscontextsensing,”IEEETrans.MobileComputing,vol.12, no.8,pp.1472–1486,2013.
7. H.Simula,“The riseandfallofcrowdsourcing?”inProceedingsofthe46thHawaiiInternational Conference on System Sciences (HICSS), Wailea, HI, USA, January 7-10 2013, pp.2783–2791.
8. N.Madnani,J.Tetreault,M. Chodorow,andA. Rozovskaya,“They canhelp:Usingcrowdsourcing to improve the evaluation of grammatical error detection systems,” in Proceedingsof the 49th Annual Meeting of the Association for Computational Linguistics: Human LanguageTechnologies,Portland,OR,USA,June 19-242011,pp.508–513.
9. Z.Yang,C.Wu,andY.Liu,“Locatinginfingerprintspace: wireless indoor localization with littlehuman intervention,” inProceedingsofthe18thACMAnnualInternationalConferenceonMobileComputingandNetworking(Mobicom),Istanbul,Turkey,August22-262012,pp.269–280.
10. [Y. Zhao and Q. Zhu, “Evaluation on crowdsourcing research: Current status and futuredirection,” InformationSystemsFrontiers,vol.16,no.3,pp.417–434,2014.
11. D.Chakraborty,A.Joshi,T.Finin,andY.Yesha,“Service compositionformobileenvironments,”MobileNetworksandApplications,vol.10,no.4,pp.435–451, Aug.2005.
12. Y. Liu, J. Wu, Z. Zhang, and K. Xu, “Research achievements on the new generation internetarchitecture and protocols,” SCIENCE CHINA Information Sciences, vol. 56, no. 11, pp. 1–25,2013.
13. P. Dami´an-Reyes, J. Favela, and J. Contreras-Castillo, “Uncertainty management in context-aware applications: Increasing usability and user trust,” Wireless Personal Communications, vol.56,no.1,pp.37–53,2011.
14. M. Dong, T. Kimata, K. Sugiura, and K. Zettsu, “Quality-ofexperience (qoe) in emergingmobile social networks,” IEICE Transactions on Information and Systems, vol. 97-D, no. 10, pp.2606–2612,2014.
15. D. Chalmers and M.Sloman,“Qos and contextawarenessformobile computing,”inHandheld and Ubiquitous Computing, H.-W. Gellersen, Ed. Springer, 1999, vol. 1707, pp. 380–382.
16. K. Wac, A. Van Halteren, R. Bults, and T. Broens, “Context-aware qos provisioning in anm-health service platform,” International Journal of Internet Protocol Technology, vol. 2, no. 2,pp.102–108,2007.
17. P. Makris, D. Skoutas, and C. Skianis, “A survey on context-aware mobile and wirelessnetworking: On networking and computing environments’ integration,” IEEE CommunicationsSurveysTutorials,vol.15,no.1,pp.362–386,2013.

18. N. Fernando, S. W. Loke, and W. Rahayu, "Mobile cloud computing: A survey," FutureGenerationComp.Syst.,vol.29,no.1,pp.84–106,2013.
19. D. Yao, C. Yu, H. Jin, and J. Zhou, "Energy efficient task scheduling in mobile cloudcomputing," in Proceedings of the 10th IFIP International Conference on Network and ParallelComputing(NPC),Guiyang,China,September19-212013,pp.344–355.
20. A.M.OtebolakuandM.T.Andrade,"Supportingcontext-awarecloud-basedmediarecommendations for smartphones," in Proceedings of the 2nd IEEE International Conference onMobile Cloud Computing, Services, and Engineering (MobileCloud), Oxford, United Kingdom,April8-112014,pp.109–116.
21. H.J.LaandS.D.Kim,"Aconceptualframeworkforprovisioningcontext-awaremobilecloudservices,"in2010IEEE3rdInternationalConferenceonCloudComputing(CLOUD),Miami,FL,USA,July5-102010,pp.466–473.
22. A. Vallejo, A. Zaballos, J. Selga, and J. Dalmau, "Next-generation qos control architecturesfor distribution smart grid communication networks," IEEE Communications Magazine, vol. 50,no.5,pp. 128–134,2012

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

A HIERARCHICAL ATTENTION MODEL FOR SOCIAL CONTEXTUAL IMAGERECOMMENDATION

Dr.M.Raju, [1] Mr. Sridhar Gummalla, [2]Mr. Mohammed Osman, [3]Mr. MA Khader
[1]Professor,[2]Associate Professor, [3] Assist professor
[1,2,3] Dept of CSE, SCET

ABSTRACT- Image based social networks are among the most popular social networking services in recent years. With tremendous images uploaded every day, understanding users' preferences on user-generated images and making recommendations have become an urgent need. In fact, many hybrid models have been proposed to fuse various kinds of side information (e.g., image visual representation, social network) and user-item historical behavior for enhancing recommendation performance. However, due to the unique characteristics of the user generated images in social image platforms, the previous studies failed to capture the complex aspects that influence users' preferences in a unified framework. Moreover, most of these hybrid models relied on predefined weights in combining different kinds of information, which usually resulted in suboptimal recommendation performance. To this end, in this paper, we develop a hierarchical attention model for social contextual image recommendation. In addition to basic latent user interest modeling in the popular matrix factorization based recommendation, we identify three key aspects (i.e., upload history, social influence, and owner admiration) that affect each user's latent preferences, where each aspect summarizes a contextual factor from the complex relationships between users and images. After that, we design a hierarchical attention network that naturally mirrors the hierarchical relationship (elements in each aspects level, and the aspect level) of users' latent interests with the identified key aspects. Specifically, by taking embeddings from state-of-the-art deep learning models that are tailored for each kind of data, the hierarchical attention network could learn to attend differently to more or less content. Finally, extensive experimental results on real-world datasets clearly show the superiority of our proposed model

1. INTRODUCTION

There is an old saying "a picture is worth a thousand words". When it comes to social media, it turns out that visual images are growing much more popularity to attract users. Especially with the increasing adoption of smartphones, users could easily take qualified images and upload them to various social image platforms to share these visually appealing pictures with others. Many image-based social sharing services have emerged, such as Instagram1, Pinterest2, and Flickr3. With hundreds of millions of images uploaded every day, image recommendation has become an urgent need to deal with the image overload problem. By providing personalized image suggestions to each active user in image recommender system, users gain more satisfaction for platform prosperity. E.g., as reported by Pinterest, image recommendation powers over 40% of user engagement of this social platform.

Naturally, the standard recommendation algorithms provide a direct solution for the image recommendation task. For example, many classical latent factor based Collaborative Filtering (CF) algorithms in recommender systems could be applied to deal with user-image interaction matrix Successful as they are, the extreme data sparsity of the user-image interaction behaviourlimits the recommendation performance. On one hand, some recent works proposed to enhance recommendation performance with visual contents learned from a (pre-trained) deep neural network. On the other hand, as users perform image preferences in social platforms, some social based recommendation algorithms utilized the social influence among users to alleviate data sparsity for better recommendation . In summary, these studies partially solved the data sparsity issue of social-based image recommendation. Nevertheless, the problem of how to better exploit the unique characteristics of the social image platforms in a holistical way to enhance recommendation performance is still under explored.

2. LITERATURE SURVEY

1.TITLE: Toward the next generation of recommender systems: A survey of the state-ofthe-art and possible extensions.

AUTHOR: G. Adomavicius and A. Tuzhilin. YEAR: 2005
DESCRIPTION
This paper presents an overview of the field of recommender systems and describes the current generation of recommendation methods that are usually classified into the following three main categories: content-based, collaborative, and hybrid recommendation approaches. This paper also describes various limitations of current recommendation methods and discusses possible extensions that can improve recommendation capabilities and make recommender systems applicable to an even broader range of applications. These extensions include, among others, an improvement of understanding of users and items, incorporation of the contextual information into the recommendation process, support for multicriteria ratings, and a provision of more flexible and less intrusive types of recommendations.

2.TITLE: Influence and correlation in social networks
AUTHOR: A. Anagnostopoulos, R. Kumar, and M. Mahdian.
YEAR: 2008
DESCRIPTION
In many online social systems, social ties between users play an important role in dictating their behavior. One of the ways this can happen is through social influence, the phenomenon that the actions of a user can induce his/her friends to behave in a similar way. In systems where social influence exists, ideas, modes of behavior, or new technologies can diffuse through the network like an epidemic. Therefore, identifying and understanding social influence is of tremendous interest from both analysis and design points of view. This is a difficult task in general, since there are factors such as homophily or unobserved confounding variables that can induce statistical correlation between the actions of friends in a social network. Distinguishing influence from these is essentially the problem of distinguishing correlation from causality, a notoriously hard statistical problem. In this paper we study this problem systematically. We define fairly general models that replicate the aforementioned sources of social correlation. We then propose two simple tests that can identify influence as a source of social correlation when the time series of user actions is available. We give a theoretical justification of one of the tests by proving that with high probability it succeeds in ruling out influence in a rather general model of social correlation. We also simulate our tests on a number of examples designed by randomly generating actions of nodes on a real social network (from Flickr) according to one of several models. Simulation results confirm that our test performs well on these data. Finally, we apply them to real tagging data on Flickr, exhibiting that while there is significant social correlation in tagging behavior on this system, this correlation cannot be attributed to social influence.

3.TITLE: Neural machine translation by jointly learning to align and translate. AUTHOR: D. Bahdanau, K. Cho, and Y. Bengio
YEAR: 2015
DESCRIPTION
Neural machine translation is a recently proposed approach to machine translation. Unlike the traditional statistical machine translation, the neural machine translation aims at building a single neural network that can be jointly tuned to maximize the translation performance. The models proposed recently for neural machine translation often belong to a family of encoder-decoders and consists of an encoder that encodes a source sentence into a fixed-length vector from which a decoder generates a translation. In this paper, we conjecture that the use of a fixed-length vector is a bottleneck in improving the performance of this basic encoder-decoder architecture, and propose to extend this by allowing a model to automatically (soft-)search for parts of a source sentence that are relevant to predicting a target word, without having to form these parts as a hard segment explicitly. With this new approach, we achieve a translation performance comparable to the existing state-of-the-art phrase-based system on the task of English-to-French translation. Furthermore, qualitative analysis reveals that the (soft-)alignments found by the model agree well with our intuition.

4.TITLE: Attentive collaborative filtering: Multimedia recommendation with item and component-level attention
AUTHOR: J. Chen, H. Zhang, X. He, L. Nie, W. Liu, and T.-S. Chua
YEAR: 2017
DESCRIPTION
Multimedia content is dominating today's Web information. The nature of multimedia user-item interactions is 1/0 binary implicit feedback (e.g., photo likes, video views, song downloads, etc.), which can be collected at a larger scale with a much lower cost than explicit feedback (e.g., product ratings). However, the majority of existing collaborative filtering (CF) systems are not well-designed for multimedia recommendation, since they ignore the implicitness in users' interactions with multimedia content. We argue that, in multimedia

recommendation, there exists item- and component-level implicitness which blurs the underlying users' preferences. The item-level implicitness means that users' preferences on items (e.g. photos, videos, songs, etc.) are unknown, while the component-level implicitness means that inside each item users' preferences on different components (e.g. regions in an image, frames of a video, etc.) are unknown. For example, a 'view" on a video does not provide any specific information about how the user likes the video (i.e. item-level) and which parts of the video the user is interested in (i.e. component-level). In this paper, we introduce a novel attention mechanism in CF to address the challenging item- and component-level implicit feedback in multimedia recommendation, dubbed Attentive Collaborative Filtering (ACF). Specifically, our attention model is a neural network that consists of two attention modules: the component-level attention module, starting from any content feature extraction network (e.g. CNN for images/videos), which learns to select informative components of multimedia items, and the item-level attention module, which learns to score the item preferences. ACF can be seamlessly incorporated into classic CF models with implicit feedback, such as BPR and SVD++, and efficiently trained usingSGD. Through extensive experiments on two real-world multimedia Web services: Vine and Pinterest, we show that ACF significantly outperforms state-of-the-art CF methods.

5.TITLE: Context-aware image tweet modelling and recommendation

AUTHOR: T. Chen, X. He, and M.-Y. Kan YEAR: 2016

DESCRIPTION

While efforts have been made on bridging the semantic gap in image understanding, the in situ understanding of social media images is arguably more important but has had less progress. In this work, we enrich the representation of images in image tweets by considering their social context. We argue that in the microblog context, traditional image features, e.g., low-level SIFT or high-level detected objects, are far from adequate in interpreting the necessary semantics latent in image tweets. To bridge this gap, we move from the images' pixels to their context and propose a context-aware image bf tweet modelling (CITING) framework to mine and fuse contextual text to model such social media images' semantics. We start with tweet's intrinsic contexts, namely, 1) text within the image itself and 2) its accompanying text; and then we turn to the extrinsic contexts: 3) the external web page linked to by the tweet's embedded URL, and 4) the Web as a whole. These contexts can be leveraged to benefit many fundamental applications. To demonstrate the effectiveness our framework, we focus on the task of personalized image tweet recommendation, developing a feature-aware matrix factorization framework that encodes the contexts as a part of user interest modelling. Extensive experiments on a large Twitter dataset show that our proposed method significantly improves performance.

Finally, to spur future studies, we have released both the code of our recommendation model and our image tweet dataset.

6. TITLE: Nuswide: a real-world web image database from national university of Singapore

AUTHOR: L T.-S. Chua, J. Tang, R. Hong, H. Li, Z. Luo, and Y. Zheng.

YEAR: 2009

DESCRIPTION

This paper introduces a web image dataset created by NUS's Lab for Media Search. The dataset includes: (1) 269,648 images and the associated tags from Flickr, with a total of 5,018 unique tags; (2) six types of low-level features extracted from these images, including 64-D color histogram, 144-D color correlogram, 73-D edge direction histogram, 128-D wavelet texture, 225-D block-wise color moments extracted over 5x5 fixed grid partitions, and 500-D bag of words based on SIFT descriptions; and (3) ground-truth for 81 concepts that can be used for evaluation. Based on this dataset, we highlight characteristics of Web image collections and identify four research issues on web image annotation and retrieval. We also provide the baseline results for web image annotation by learning from the tags using the traditional k-NN algorithm. The benchmark results indicate that it is possible to learn effective models from sufficiently large image dataset to facilitate general image retrieval.

3. PROPOSED SYSTEM

In this paper, we develop a hierarchical attention model for social contextual image recommendation.

In addition to basic latent user interest modeling in the popular matrix factorization based recommendation, we identify three key aspects (i.e., upload history, social influence, and owner admiration) that affect each user’s latent preferences, where each aspect summarizes a contextual factor from the complex relationships between users and images.

PROPOSED SYSTEM ADVANTAGES

1.Naturally mirrored the hierarchical relationship of users’ interest.

2.Robust performance.

4. MODULE DESCRIPTION

In this paper, we study the problem of understanding users' preferences for images and recommending images in social image based platforms. An example of a typical social image application. Each image is associated with visual information. Besides showing likeness to images, users are also creators of these images with the upload behavior. In addition, users connect with others to form a social network to share their image preferences. The rich heterogeneous contextual data provides valuable clues to infer users' preferences to images. Given rich heterogeneous contextual data, the problem of how to summarize the heterogeneous social contextual aspects that influence users' preferences to these highly subjective content is still unclear. What's more, in the preference decision process, different users care about different social contextual aspects for their personalized image preference.

METHODOLOGIES

MODULES NAME:

This project having the following five modules:

1. User Interface Design 2. Admin 3. User 4. The learning algorithm of HASCUser Interface Design

In this module we design the windows for the project. These windows are used for secure login for all users. To connect with server user must give their username and password then only they can able to connect the server. If the user already exits directly can login into the server else user must register their details such as username, password and Email id, into the server. Server will create the account for the entire user to maintain upload and download rate. Name will be set as user id. Logging in is usually used to enter a specific page.

Admin

This is the second module in our project, where crucial functional requirements of the project will be carried out. The roles and responsibilities of the admin are listed below

Add Image Category: In this phase the admin can select different image types like 'Graphics', 'Photos', 'Vector' etc.

View Image Category: He can see all the categories he added.

Add Image Type: Basing on the category of the image selected admin will give name for which the users will upload the images basing on the Image category and type.

View Image type: Admin can view all the type of the images and their respective categories in this phase.

View Users: All the registered users in the project can be seen here.

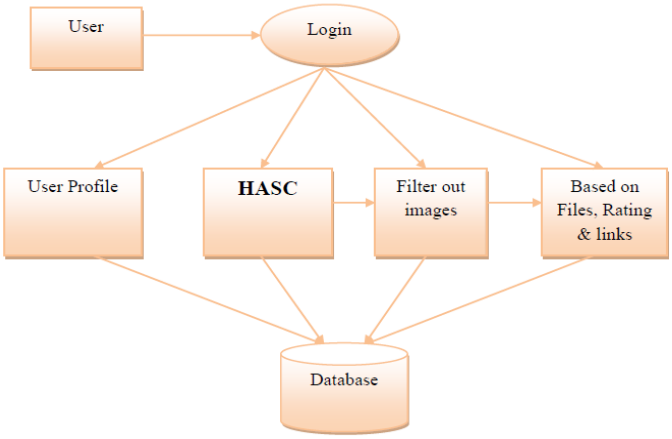
View User Requests: If any user want to register in to our website, First he should send a request to admin for which the acceptance mail will be sent by the admin to the user.

User

This is the third module in our project where our proposed algorithm will take effect basing on the data collected from the users. The functionality of the users in our project are listed below. In order to register in the site First user should send a request to admin for which the acceptance mail will be sent by the admin to the user, which consists of username and a secret key (For additional security). After the user had logged in he will be able to upload the images for the categories and image types which are given by the admin. For those images his/her friend scan give likes and rating. Basing on those data we will apply our algoritham and recommend images to the users (Upload History, Social Influence, Creator Admiration)

The learning algorithm of HASC

After data collection, in data pre-processing process, we filter out users that have less rating records and social links. We also filter out images that have less records. This leads to a smaller but denser dataset. Please note that the number of images is much more than that of the users. This is consistent with the observation that the number of images usually far exceeds that of users in social image platforms, as each user could be a creator to upload multiple images.



User Interface Design:

Input : Enter Login name and Password

Output : If valid user name and password then directly open the home page otherwise show error message and redirect to the registration page.

Admin:

Input : Admin Login name and Password

Output: If valid user name and password then directly open the admin home page otherwise show error message and redirect to the admin login page.

User:

Input : Enter all details Register & Login

Output : After the user had logged in he will be able to upload the images for the categories and image types which are given by the admin. For those images his/her friend scan give likes and rating.

The learning algorithm of HASC:-

Input : Data pre-processing process

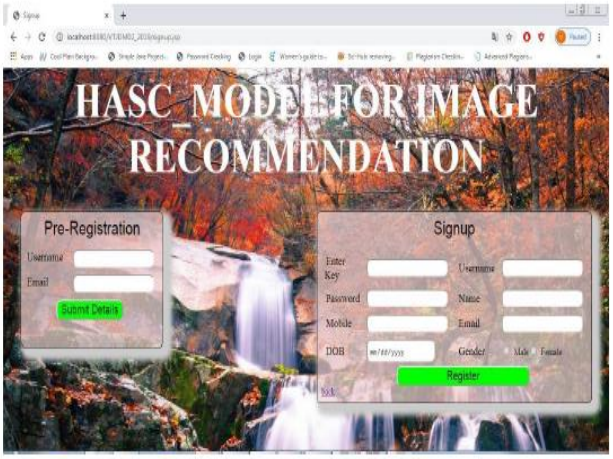
Output: This is consistent with the observation that the number of images usually far exceeds that of users in social image platforms, as each user could be a creator to upload multiple images

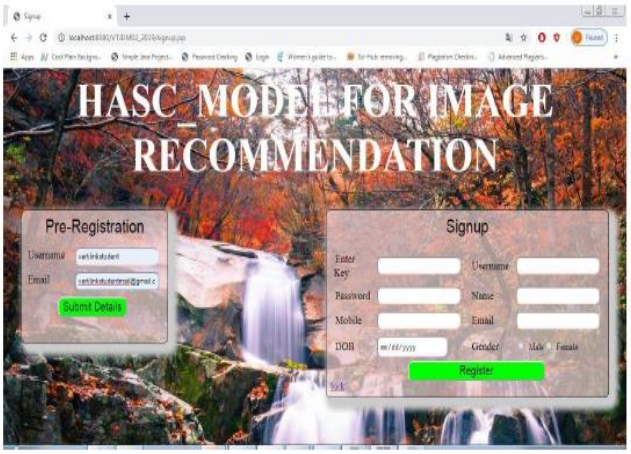
TECHNIQUE USED OR ALGORITHM USED

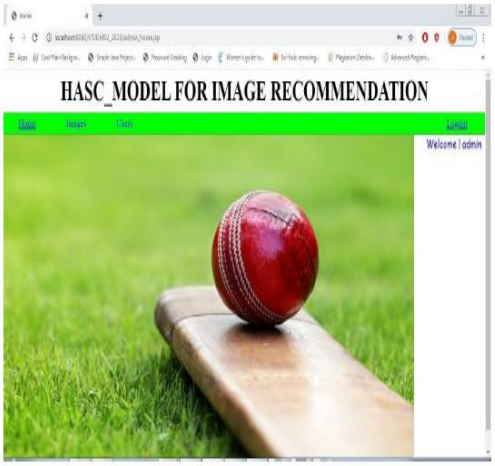
Hierarchical Attentive Social Contextual recommendation (HASC) model for image recommendation.

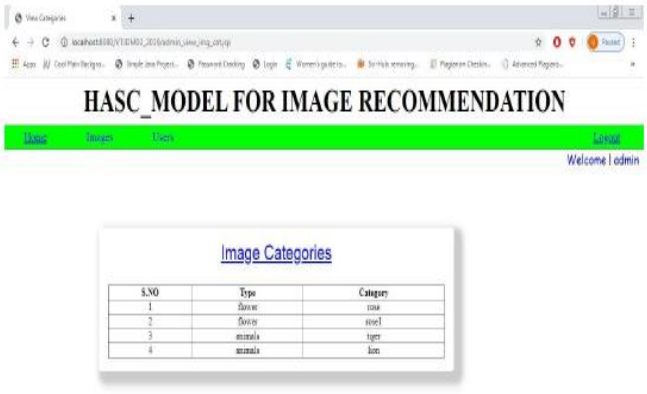
As shown in Fig. 3, HASC is a hierarchical neural network that models users' preferences for to unknown images from two attention levels with social contextual modeling. The top layered attention network depicts the importance of the three contextual aspects (i.e., upload history, social influence and creator admiration) for users' decision, which is derived from the bottom layered attention networks that aggregate the complex elements within each aspect. Given a user a and an image i with three identified social contextual aspects, we use al (l = 1; 2; 3) to denote a's attentive degree for aspect l on the top layer (denoted as the aspect importance attention with orange part in the figure). A large attentive degree denotes the current user cares more about this aspect in image recommendation process. Besides, as there are various elements within the pload history context la and social influence context sa. We use aj to denote a's preference degree for image j in the upload history context la (lja = 1), with a larger value of aj indicates that a's current interest is more coherent with uploaded image j by user a. Similarly, we use ab to denote the influence strength of the b to a in social neighbor context sa (sba = 1), with a larger value of ab indicates that a is more likely to be influenced by b. Please note that, for each user a and image i, different from the upload history aspect and the social influence aspect, the creator admiration aspect is composed of one element Ci (the creator). Thus, this aspect does not have any sub layers and it is directly sent to the top layer. We use three attention sub-networks to learn these attentive scores in a unified model.

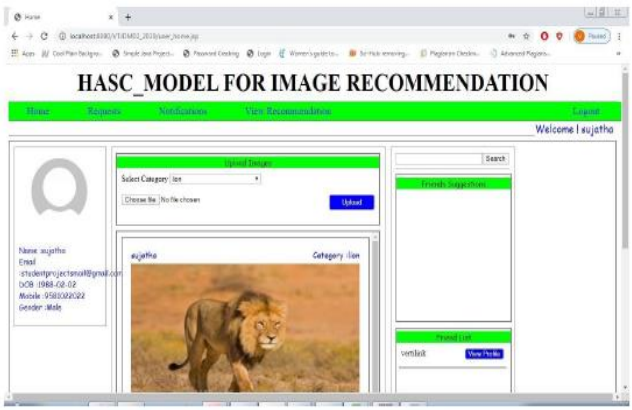
5. IMPLEMENTATION











6. CONCLUSION

In this paper, we have proposed a hierarchical attentive social contextual model of HASC for social contextual image recommendation. Specifically, in addition to user interest modeling, we have identified three social contextual aspects that influence a user's preference to an image from heterogeneous data: the upload history aspect, the social influence aspect, and the owner admiration aspect. We designed a hierarchical attention network that naturally mirrored the hierarchical relationship of users' interest given the three identified aspects. In the meantime, by feeding the data embedding from rich heterogeneous data sources, the hierarchical attention networks could learn to attend differently to more or less important content. Extensive experiments on real-world datasets clearly demonstrated that our proposed HASC model consistently outperforms various state-of-the-art baselines for image recommendation.

REFERENCES:-

[1] Flickr Statistics. https://expandedramblings.com/index.php/flickr-stats/, 2017. [Online; accessed 20-Jan-2018].

[2] G. Adomavicius and A. Tuzhilin. Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions. TKDE, 17(6):734–749, 2005.

[3] A. Anagnostopoulos, R. Kumar, and M. Mahdian. Influence and correlation in social networks. In KDD, pages 7–15. ACM, 2008.

[4] D. Bahdanau, K. Cho, and Y. Bengio. Neural machine translation by jointly learning to align and translate. In ICLR, 2015.

[5] J. Chen, H. Zhang, X. He, L. Nie, W. Liu, and T.-S. Chua. Attentive collaborative filtering: Multimedia recommendation with item and component-level attention. In SIGIR, pages 335–344. ACM, 2017.

[6] T. Chen, X. He, and M.-Y. Kan. Context-aware image tweet modelling and recommendation. In MM, pages 1018–1027. ACM, 2016.

[7] T.-S. Chua, J. Tang, R. Hong, H. Li, Z. Luo, and Y. Zheng. Nuswide: a real-world web image database from national university of singapore. In MM, page 48. ACM, 2009.

[8] P. Cui, X. Wang, J. Pei, and W. Zhu. A survey on network embedding. TKDE, 2018.

[9] S. Deng, L. Huang, G. Xu, X. Wu, and Z. Wu. On deep learning for trust-aware recommendations in social networks. TNNLSS, 28(5):1164–1177, 2017.

[10] L. Gatys, A. S. Ecker, and M. Bethge. Texture synthesis using convolutional neural networks. In NIPS, pages 262–270, 2015.

[11] L. A. Gatys, A. S. Ecker, and M. Bethge. Image style transfer using convolutional neural networks. In CVPR, pages 2414–2423, 2016.

[12] L. A. Gatys, A. S. Ecker, M. Bethge, A. Hertzmann, and E. Shechtman. Controlling perceptual factors in neural style transfer. In CVPR, pages 3985–3993, 2017.

[13] F. Gelli, X. He, T. Chen, and T.-S. Chua. How personality affects our likes: Towards a better understanding of actionable images. In MM, pages 1828–1837. ACM, 2017.

[14] F. Gelli, T. Uricchio, X. He, A. Del Bimbo, and T.-S. Chua. Beyond the product: Discovering image posts for brands in social media. In MM. ACM, 2018.

[15] Y. Gong and Q. Zhang. Hashtag recommendation using attention based convolutional neural network. In IJCAI, pages 2782–2788, 2016.

[16] G. Guo, J. Zhang, and N. Yorke-Smith. A novel recommendation model regularized with user trust and item ratings. TKDE, 28(7):1607–1620, 2016.

[17] R. He, C. Fang, Z. Wang, and J. McAuley. Vista: a visually, socially, and temporally-aware model for artistic recommendation. In Recsys, pages 309–316. ACM, 2016.

[18] R. He and J. McAuley. Vbpr: Visual bayesian personalized ranking from implicit feedback. In AAAI, pages 144–150, 2016.

[19] X. He, Z. He, J. Song, Z. Liu, Y.-G. Jiang, and T.-S. Chua. Nais: Neural attentive item similarity model for recommendation. TKDE, 2018.

[20] X. He, L. Liao, H. Zhang, L. Nie, X. Hu, and T.-S. Chua. Neural collaborative filtering. In WWW, pages 173–182, 2017.

[21] B. Hu, C. Shi, W. X. Zhao, and P. S. Yu. Leveraging metapath based context for top-n recommendation with a neural coattention model. In SIGKDD, pages 1531–1540. ACM, 2018. [22] L. Itti, C. Koch, and E. Niebur. A model of saliency-based visual attention for rapid scene analysis. PAMI, 20(11):1254–1259, 1998.

[23] M. Jamali and M. Ester. A matrix factorization technique with trust propagation for recommendation in social networks. In RecSys, pages 135–142. ACM, 2010.

[24] M. Jiang, P. Cui, F. Wang, W. Zhu, and S. Yang. Scalable recommendation with social contextual information. TKDE, 26(11):2789– 2802, 2014.

[25] T. N. Kipf and M. Welling. Semi-supervised classification with graph convolutional networks. In ICLR, 2017.

[26] Y. Koren. Factorization meets the neighborhood: a multifaceted collaborative filtering model. In KDD, pages 426–434. ACM, 2008.

[27] A. Krizhevsky, I. Sutskever, and G. E. Hinton. Image net classification with deep convolutional neural networks. In NIPS, pages 1097–1105, 2012.

[28] C. Lei, D. Liu, W. Li, Z.-J. Zha, and H. Li. Comparative deep learning of hybrid representations for image recommendations. In CVPR, pages 2545–2553, 2016.

[29] J. Li, M.-T. Luong, and D. Jurafsky. A hierarchical neural auto encoder for paragraphs and documents. arXiv:1506.01057, 2015.

[30] D. C. Liu, S. Rogers, R. Shiau, D. Kislyuk, K. C. Ma, Z. Zhong, J. Liu, and Y. Jing. Related pins at pinterest: The evolution of a real-world recommender system. In WWW, pages 583–592, 2017.

[31] Q. Liu, Y. Zeng, R. Mokhosi, and H. Zhang. Stamp: short-term attention/memory priority model for session-based recommendation. In SIGKDD, pages 1831–1839. ACM, 2018. [32] P.

Loyola, C. Liu, and Y. Hirate. Modeling user session and intent with an attention-based encoder-decoder architecture. In RecSys, pages 147–151. ACM, 2017.

[33] H. Ma, D. Zhou, C. Liu, M. R. Lyu, and I. King. Recommender systems with social regularization. In WSDM, pages 287–296. ACM, 2011.

[34] A. Mnih and R. R. Salakhutdinov. Probabilistic matrix factorization. In NIPS, pages 1257–1264, 2008.

[35] W. Niu, J. Caverlee, and H. Lu. Neural personalized ranking for image recommendation. In WSDM, pages 423–431. ACM, 2018.

[36] W. Pan and Z. Ming. Collaborative recommendation with multiclass preference context. IEEE Intelligent Systems, 32(2):45–51, 2017.

[37] B. Perozzi, R. Al-Rfou, and S. Skiena. Deepwalk: Online learning of social representations. In KDD, pages 701–710. ACM, 2014.

[38] X. Qian, H. Feng, G. Zhao, and T. Mei. Personalized recommendation combining user interest and social circle. TKDE, 26(7):1763– 1777, 2014.

[39] S. Rendle. Factorization machines with libfm. TIST, 3(3):57, 2012. [40] S. Rendle, C. Freudenthaler, Z. Gantner, and L. Schmidt-Thieme. Bpr: Bayesian personalized ranking from implicit feedback. In UAI, pages 452–461. AUAI Press, 2009.

[41] S. Seo, J. Huang, H. Yang, and Y. Liu. Interpretable convolutional neural networks with dual local and global attention for review rating prediction. In Recsys, pages 297–305. ACM, 2017. [42] K. Simonyan and A. Zisserman. Very deep convolutional networks for large-scale image recognition. In ICLR, 2015.

[43] P. Sun, L.Wu, and M.Wang. Attentive recurrent social recommendation. In SIGIR, pages 185–194. ACM, 2018.

[44] J. Tang, M. Qu, M. Wang, M. Zhang, J. Yan, and Q. Mei. Line: Large-scale information network embedding. In WWW, pages 1067–1077, 2015.

[45] J. Tang, X. Shu, G.-J. Qi, Z. Li, M. Wang, S. Yan, and R. Jain. Triclustered tensor completion for social-aware image tag refinement. PAMI, 39(8):1662–1674, 2017.

[46] Y. Tay, A. T. Luu, and S. C. Hui. Multi-pointer co-attention networks for recommendation. In SIGKDD, pages 2309–2318. ACM, 2018.

[47] P. Velickovic, G. Cucurull, A. Casanova, A. Romero, P. Lio, and Y. Bengio. Graph attention networks. In ICLR, 2018.

[48] D.Wang, P. Cui, and W. Zhu. Structural deep network embedding. In KDD, pages 1225–1234. ACM, 2016.

[49] S. Wang, Y. Wang, J. Tang, K. Shu, S. Ranganath, and H. Liu. What your images reveal: Exploiting visual contents for point-of-interest recommendation. In WWW, pages 391–400, 2017.

[50] L. Wu, Y. Ge, Q. Liu, E. Chen, R. Hong, J. Du, and M. Wang. Modeling the evolution of users' preferences and social links in social networking services. TKDE, 29(6):1240–1253, 2017.

[51] L. Wu, P. Sun, R. Hong, Y. Ge, and M. Wang. Collaborative neural social recommendation. TSMC: Systems, 2019.

[52] J. Xiao, H. Ye, X. He, H. Zhang, F. Wu, and T.-S. Chua. Attentional factorization machines: Learning the weight of feature interactions via attention networks. In IJCAI, pages 3119–3125.

[53] K. Xu, J. Ba, R. Kiros, K. Cho, A. Courville, R. Salakhudinov, R. Zemel, and Y. Bengio. Show, attend and tell: Neural image caption generation with visual attention. In ICML, pages 2048–2057, 2015.

[54] Z. Yang, D. Yang, C. Dyer, X. He, A. J. Smola, and E. H. Hovy. Hierarchical attention networks for document classification. In HLT-NAACL, pages 1480–1489, 2016.

[55] F. Zhang, N. J. Yuan, D. Lian, X. Xie, and W.-Y. Ma. Collaborative knowledge base embedding for recommender systems. In KDD, pages 353–362. ACM, 2016.

[56] Q. Zhang, J. Wang, H. Huang, X. Huang, and Y. Gong. Hashtag recommendation for multimodal microblog using co-attention network. In IJCAI, pages 3420–3426, 2017.

[57] S. Zhang, L. Yao, A. Sun, and Y. Tay. Deep learning based recommender system: A survey and new perspectives. CSUR, 52(1):5, 2019.

[58] S. Zhang, L. Yao, and X. Xu. Autosvd++: An efficient hybrid collaborative filtering model via contractive auto-encoders. In SIGIR, pages 957–960. ACM, 2017.

[59] Z. Zhao, H. Lu, D. Cai, X. He, and Y. Zhuang. User preference learning for online social recommendation. TKDE, 28(9):2522– 2534, 2016.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

PREDICTION AND DIAGNOSIS OF HEART DISEASE PATIENTS USING DATA MINING TECHNIQUE

[1]Mr. Sridhar Gummalla, [2]Mr. Runja Suvarna Rao, [3] Mr. Shazbaaz Mohammed
[1]Professor, [2] Associate Professor,[3] Assist professor
[1,2,3] Dept of CSE, SCET

ABSTRACT- We are living in a post modern era and there are tremendous changes happening to our daily routines which make an impact on our health positively and negatively. As a result of these changes various kind of diseases are enormously increased. Especially, heart disease has become more common these days. The life of people is at a risk. Variation in Blood pressure, sugar, pulse rate etc. can lead to cardiovascular diseases that include narrowed or blocked blood vessels. It may causes Heart failure, Aneurysm, Peripheral artery disease, Heart attack, Stroke and even sudden cardiac arrest. Many forms of heart disease can be detected or diagnosed with different medical tests by considering family medical history and other factors. But, the prediction of heart diseases without doing any medical tests is quite difficult. The aim of this project is to diagnose different heart diseases and to make all possible precautions to prevent at early stage itself with affordable rate. We follow 'Data mining' technique in which attributes are fed in to SVM, Random forest, KNN, and ANN classification Algorithms for the prediction of heart diseases. The preliminary readings and studies obtained from this technique is used to know the possibility of detecting heart diseases at early stage and can be completely cured by proper diagnosis

1. INTRODUCTION

There are so many diseases which affect us badly and one among them is Heart disease. It is a serious disease since we often hear that most of the people die out of Heart diseases and other kinds of similar diseases relates to heart[1-3] It is observed by most of the medical scholars that at many times most of the heart patients might not survive heart attacks and they die with it. In this paper we would like to deal with the four classification techniques which is use to prediction of heart disease[4-6]. Namely SVM, Random forest, KNN, ANN. The studies have been done by evaluating the medical profiles of people who undergoes treatment in JMMC (Jubilee Mission Medical College) Thrissur, by categorizing their age, sex, pulse rate, blood pressure as well as fasting blood sugar Etc. we chose those categories since it is observed that heart diseases are mainly studied likewise.

We hope there is always prime in studying about heart diseases. Our research we try to the possibility of detecting the heart diseases at early stage. It can completely cure the disease by proper diagnosis Heart Disease. Heart is the prime part in a human body. It is an operating system of our body. Other functions human body will badly affected the irregular function of heart Any disarray of the heart is Heart disease. Different from cardiovascular disease is the problems with the blood vessels and circulatory system as well as the heart. According to the cardiovascular disease is the leading cause of death in the UK, US, Canada, and Australia and will occur as a result of cardiovascular disease. Coronary heart disease, arrhythmia, and myocardial infarction are some examples of heart disease. Some important reasons of heart disease are age, smoking, diabetics, fatness, hereditary, depression, hyper tension, blood pressure, cholesterol etc. Usually cardio vascular disease can be use with surgery or medication. But its effective prevention is not yet being done. The effective prevention heart disease is also a target of the research.

2. EXISTING SYSTEM

• Many forms of heart disease can be detected or diagnosed with different medical tests by considering family medical history and other factors. But, the prediction of heart diseases without doing any medical tests is quite difficult.

• It can answer complex queries for diagnosing disease and thus assist healthcare practitioners to make intelligent clinical decisions which traditional decision support systems cannot. By providing effective treatments, it also helps to reduce treatment costs.

• To enhance visualization and ease of interpretation, it displays the results in tabular forms. The system uses various data mining techniques

• It might have happened so many times that you or someone yours need doctors help immediately, but they are not available due to some reason.

EXISTING SYSTEM DISADVANTAGES

• The system very well reduces its first drawback as the paper work is replaced by database and it can retrieve the values any time.
• Accuracy Issues: A computerized system alone does not ensure accuracy, and the warehouse data is only as good as the data entry that created it.
• The system is not fully automated, it needs data from user for full diagnosis.
• Can't get accurate result
• Untimely results are detected

3. LITERATURE SURVEY

1.TITLE : Heart disease diagnosis using data mining technique. AUTHOR : Babu, Sarath

YEAR : 2017

DESCRIPTION

Data mining is an advanced technology, which is the process of discovering actionable information from large set of data, which is used to analyze large volumes of data and extracts patterns that can be converted to useful knowledge. Medical data mining has a great potential for exploring the hidden patterns in the data sets of medical domain. These patterns can be utilized to do clinical diagnosis. These data need to be collected in a standardized form. From the medical profiles fourteen attributes are extracted such as age, sex, blood pressure and blood sugar etc. can predict the likelihood of patient getting heart disease. These attributes are fed in to K-means algorithms, MAFIA algorithm and Decision tree classification in heart disease prediction, applying the data mining technique to heart disease treatment; it can provide as reliable performance as that achieved in diagnosing heart disease. By this medical industries could offer better diagnosis and treatment of the patient to attain a good quality of services. The main advantages of this paper are: early detection of heart disease and its diagnosis correctly on time and providing treatment with affordable cost.

2.TITLE : Disease forecasting system using data mining methods AUTHOR : Banu, MA Nishara, and B. Gomathy.

YEAR : 2014

DESCRIPTION

The healthcare industry collects large amounts of healthcare information which cannot be mined to find unknown information for efficient evaluation. Discovery of buried patterns frequently goes unexploited. Heart disease is a term for defining a huge amount of healthcare conditions that are related to the heart. This medicinal condition defines the unpredicted health conditions that directly control all the parts of the heart. Different data mining techniques such as association rule mining, classification, clustering are used to predict the heart disease in health care industry. The heart disease database is pre-processed to make the mining process more efficient. The pre-processed data is clustered using clustering algorithms like K-means to cluster relevant data in database. Maximal Frequent Item set Algorithm (MAFIA) is used for mining maximal frequent patterns in heart disease database. The frequent patterns can be classified using C4.5 algorithm as training algorithm using the concept of information entropy. The results showed that the designed prediction system is capable of predicting the heart attack successfully.

3.TITLE : Diagnosis of heart disease patients using fuzzy classification technique AUTHOR : Krishnaiah, V.

YEAR : 2014

DESCRIPTION

Data mining technique in the history of medical data found with enormous investigations found that the prediction of heart disease is very important in medical science. In medical history it is observed that the unstructured data as heterogeneous data and it is observed that the data formed with different attributes should be analyzed to predict and provide information for making diagnosis of a heart patient. Various techniques in Data Mining have been applied to predict the heart disease patients. But, the uncertainty in data was not removed with the techniques available in data mining and implemented by various authors. To remove uncertainty of unstructured data, an attempt was made by introducing fuzziness in the measured data. A membership function was designed and incorporated with the measured value to remove uncertainty and fuzzified data was used to predict the heart disease patients.. Further, an attempt was made to classify the patients based on the attributes collected from medical field. Minimum Euclidean distance Fuzzy K-NN classifier was designed to classify the training and testing data belonging to different classes. It was found that Fuzzy K-NN classifier suits well as compared with other classifiers of parametric techniques.

4.TITLE : Predictions in heart disease using techniques of data mining AUTHOR : Gandhi, Monika, and Shailendra Narayan Singh.

YEAR : 2015
DESCRIPTION
As huge amount of information is produced in medical associations (healing facilities, therapeutic focuses) yet this information is not properly utilized. The health care system is "data rich" however "knowledge poor ". There is an absence of successful analysis methods to find connections and patterns in health care data. Data mining methods can help as remedy in this circumstance. For this reason, different data mining techniques can be utilized. The paper intends to give details about various techniques of knowledge abstraction by using data mining methods that are being used in today's research for prediction of heart disease. In this paper, data mining methods namely, Naive Bayes, Neural network, Decision tree algorithm are analyzed on medical data sets using algorithms.

5.TITLE : A survey of data mining techniques on risk prediction: Heart disease. AUTHOR :Purusothaman, G., and P. Krishnakumari.
YEAR : 2015
DESCRIPTION
Comparison of classification techniques in Data mining to find the best technique for creating risk prediction model of heart disease at minimum effort. In Data mining, different methods used to find risk prediction of heart disease. There are two types of model used in analysis of data. First one is applying single model to various heart data and another one is applying combined model to the data. The combined model also known as hybrid model. This paper provides a quick and easy understanding of various prediction models in data mining and helps to find best model for further work. This is unique approach because various techniques listed and expressed in bar chart to understand accuracy level of each. These techniques are chosen based on their efficiency in the literature. In previous studies of different researcher expressed their effort on finding best approach for risk prediction model and here we found best model by comparing those researcher's findings as survey. This survey helps to understand the recent techniques involved in risk prediction of heart disease at classification in data mining. Survey of relevant data mining techniques which are involved in risk prediction of heart disease provides best prediction model as hybrid approach comparing with single model approach.

6.TITLE : Human heart disease prediction system using data mining techniques AUTHOR : Thomas, J., and R. Theresa Princy.
YEAR : 2016
DESCRIPTION
Nowadays, health disease are increasing day by day due to life style, hereditary. Especially, heart disease has become more common these days, i.e. life of people is at risk. Each individual has different values for Blood pressure, cholesterol and pulse rate. But according to medically proven results the normal values of Blood pressure is 120/90, cholesterol is and pulse rate is 72. This paper gives the survey about different classification techniques used for predicting the risk level of each person based on age, gender, Blood pressure, cholesterol, pulse rate. The patient risk level is classified using data mining classification techniques such as Naïve Bayes, KNN, Decision Tree Algorithm, Neural Network. etc., Accuracy of the risk level is high when using more number of attributes.

4. PROPOSED SYSTEM

• The Heart Disease Prediction application is an end user support and online consultation project.
• Here, we propose a web application that allows users to get instant guidance on their heart disease through an intelligent system online.
• The application is fed with various details and the heart disease associated with those details.
• The application allows user to share their heart related issues.
• It then processes user specific details to check for various illness that could be associated with it.
• Here we use some intelligent data mining techniques to guess the most accurate illness that could be associated with patient's details.
• Based on result, system automatically shows the result specific doctors for further treatment.
• The system allows user to view doctor's details.
• The system can be use case of in emergency.
• The aim of this project is to diagnose different heart diseases and to make all possible precautions to prevent at early stage itself with affordable rate.
• We follow 'Data mining' technique in which attributes are fed in to SVM, Random forest, KNN, and ANN classification Algorithms for the prediction of heart diseases.

5. PROPOSED SYSTEM ADVANTAGES

• User can search for doctor's help at any point of time.
• User can talk about their Heart Disease and get instant diagnosis.
• Doctors get more clients online.
• Very useful in case of emergency.
• Better result accuracy.
• Reduced time complexity.

6. MODULE DESCRIPTION

In this research we offer transparent and controlled data access and processing, so that unauthorized users or untrusted servers cannot process passwords without client's authorization. Moreover, based on cryptographic mechanisms, our solution preserves privacy of users passwords and ensures secrecy.

METHODOLOGIES

MODULES NAME:

This project having the following six modules:

➢ User Interface Design
➢ Admin
➢ User
➢ Hospital
➢ Doctor
➢ Lab Technician

MODULE EXPLANATION

➢ User Interface Design

This is the first module of our project. User Interface Design plays an important role for the user to move login web page to user web page. This module has created for the security purpose. In this login page we have to enter login user id and password. It will check username and password is match or not (valid user id and valid password). If we enter any invalid username or password we can't enter into login web page to user page it will shows error message. So we are preventing from unauthorized user entering into the login page to user page. It will provide a good security for our project. So server contain user id and password server also check the authentication of the user. It well improves the security and preventing from unauthorized user enters into the network. In our project we are using jsp for creating design. Here we validate the login user and sever authentication.

➢ Admin

This is the second module of our project no registration for admin only for login with help of admin name & password. Dataset is a collection of related sets of information that is composed of separate elements. Admin having some options like Add Doctor Details, View User Details, View Feedback, View Doc Details & View Test reports also.

➢ User Module

1. Register (With Details like Age, Sex, etc.)
2. Login user then send to symptoms to hospital then get appointment to doctor.
3. Take the required tests provided by the doctor.
4. Based on the reports know the risk level then if risk is high then admit in hospital or if risk is low take the precautions and medicine provided by doctor.
5. System will accordingly view Doctor to consult.
6. Give Feedback & View Doctors

➢ Hospital

This is the fourth module of our project no registration for hospital only for login with help of hospital name & password. After login verify user's symptoms then provide appointment with doctor. Then according to doctors reports if user wants to admit then provide the admission in the hospital otherwise provide medicine details. And take care of details, reports, and admission details of the user.

➢ Doctor

This is fifth module in our project in this module based on doctor information it works. Admin already adding some doctors based on name & password login in to application. Then First doctor register in administration staff then the particular doctor authorized to this organization. After that every time login in to hospital then checks the patient's condition and doctor checks patient medical reports. Then check the risk level and then based on the risk level doctor will provide some suggestions to hospital staff (either admission or medication details).

➢ Lab Technician

This is the final module of our project after login lab technicians might collect samples, study and perform tests on body fluids, teeth, chemical compounds, biological specimens, or other fields of science. Lab techs use various types of machinery, lab equipment and complex computer programs to perform their tests. Lab techs also record their data or findings for study and scrutiny by doctors and physicians. Sending the attribute values & view the tests to conduct user.

GIVEN INPUT EXPECTED OUTPUT:

➢ User Interface

Input: Enter login name and password.
Output: If valid user means directly open the home page otherwise show the error message and redirect to the registration page.

➢ Admin

Input: Admin Login enter name, Password.
Output: Admin login then verify all information like add doctors, doctors details, test details & user details.

➢ User

Input: User Login enter name, Password.
Output: User login then send symptoms & get risk level.

➢ Hospital

Input: Hospital authentication name and Password.
Output: Hospital login then verify users symptoms after that sending to doctor.

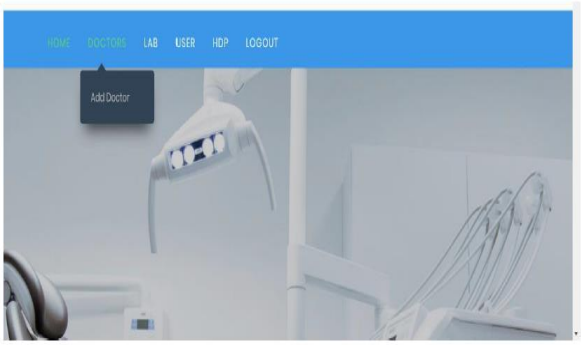
➢ **Doctor**

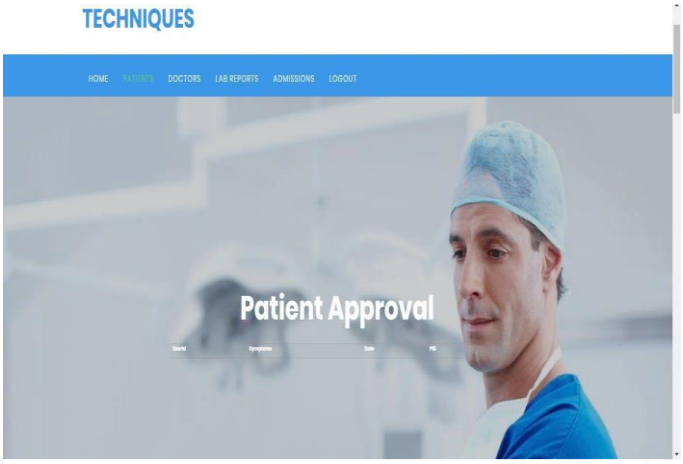
Input: Doctor login enter name & password.
Output: Doctor verifying symptoms then send for tests & checking risk levels

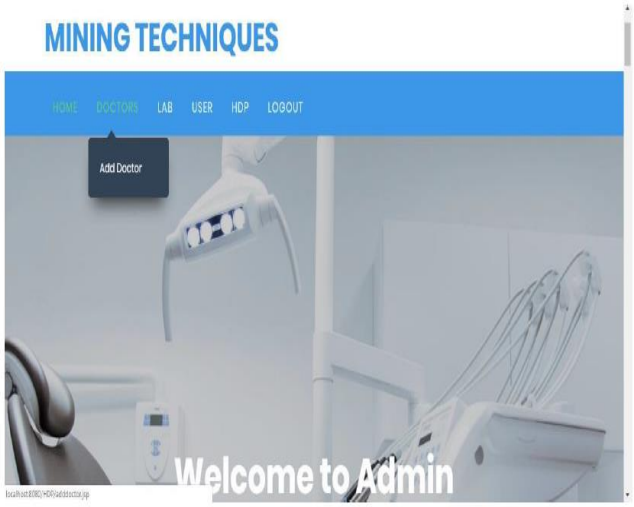
➢ **Lab Technician**

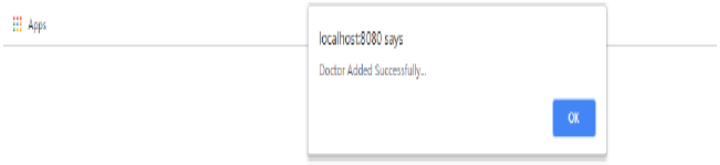
Input: Lab technician login enter name & password.
Output: Lab technician clicking on each symptoms then taken tests.

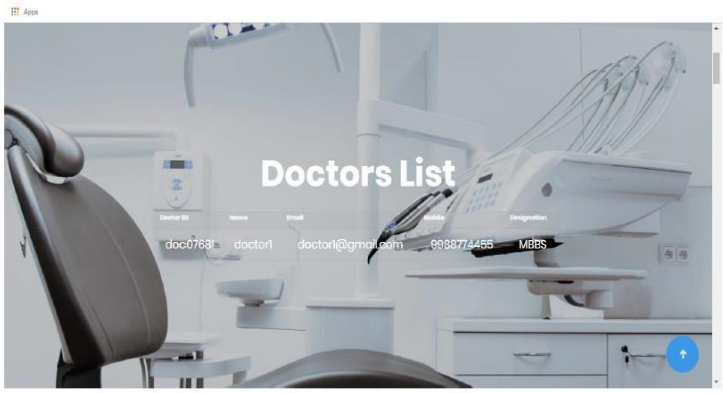
7. IMPLEMENTATION

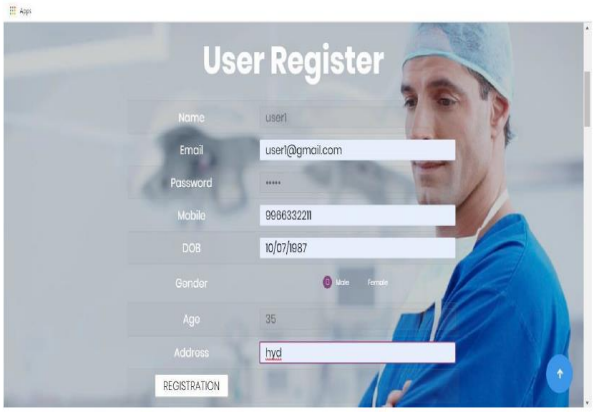


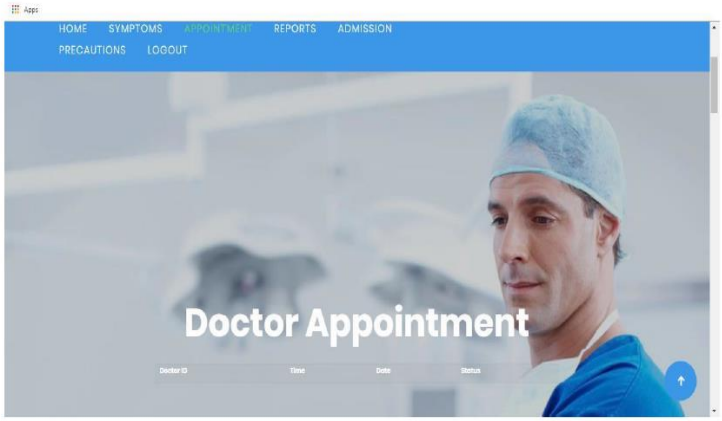


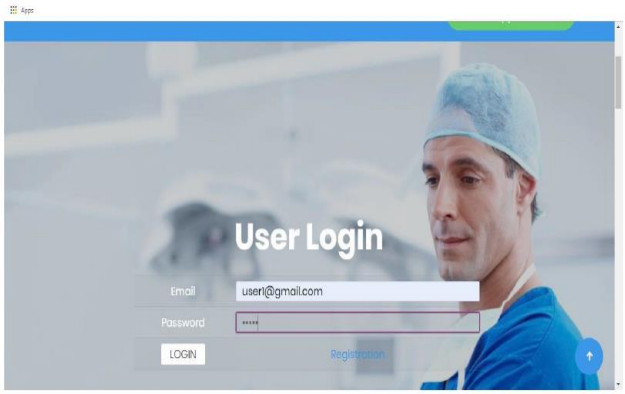


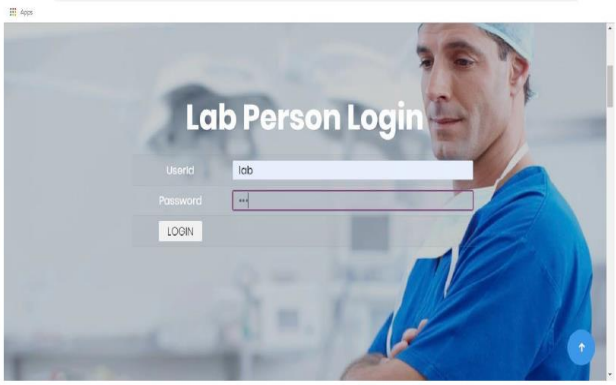


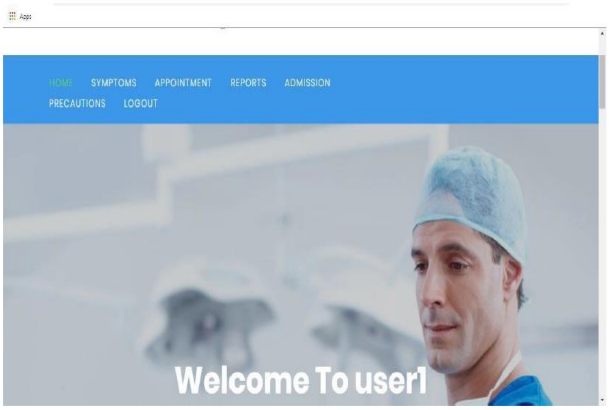


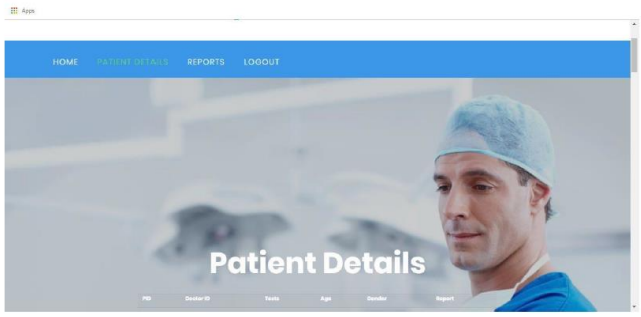


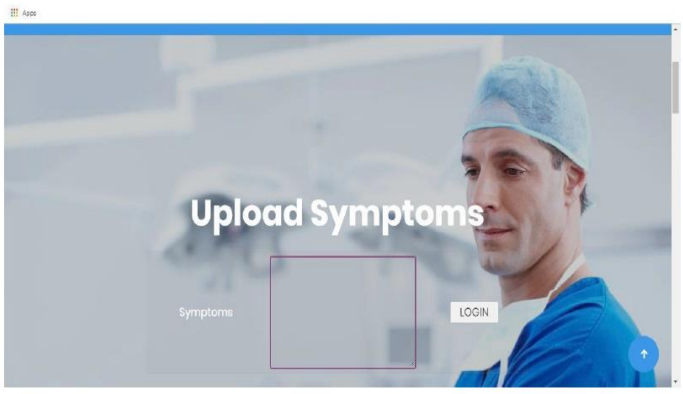












8. CONCLUSION

The main motivation of this project is to provide an insight about detecting and curing heart disease using data mining technique. For data mining, data were collected from jubilee mission hospital Thrissur. Collection of data was carried by interacting with patients one to one and jotting it down .The other mode of collecting data was from discharge summary of the respective patients .In such a way, a total 20 attributes of nearly 2200 and above patients were collected.This collected data were then sorted and arranged systematically in Excel format. Using this data, it can be subjected to different data mining algorithms. From the medical profiles twenty attributes are extracted such as age, sex, blood pressure and blood sugar etc. to predict the likelihood of patient getting heart diseases. These attributes are fed in to SVM, Random forest, KNN, and ANN classification Algorithms in which ANN gave the best result with the highest accuracy. Valid performance is achieved using ANN algorithm in diagnosing heart diseases and can be further improved by increasing the number of attributes.

REFERENCES

[1] Babu, Sarath, "Heart disease diagnosis using data mining technique."Electronics Communication and Aerospace Technology (ICECA), 2017 Internationalconference of.Vol. 1. IEEE, 2017.

[2]] Banu, MA Nishara, and B. Gomathy. "Disease forecasting system using data mining methods." Intelligent Computing Applications (ICICA), 2014 International Conference on. IEEE, 2014.

[3] Krishnaiah, V., "Diagnosis of heart disease patients using fuzzy classification technique.“ Computer and Communications Technologies (ICCCT), 2014 International Conference on. IEEE, 2014.

[4] Gandhi, Monika, and Shailendra Narayan Singh. "Predictions in heart disease using techniques of data mining." Futuristic Trends on Computational Analysis and Knowledge Management (ABLAZE), 2015 International Conference on. IEEE, 2015.

[5] Purusothaman, G., and P. Krishnakumari. "A survey of data mining techniques on risk prediction: Heart disease." Indian Journal of Science and Technology 8.12 (2015).

[6] Thomas, J., and R. Theresa Princy. "Human heart disease prediction system using data mining techniques." Circuit, Power and Computing Technologies (ICCPCT), 2016 International Conference on. IEEE, 2016.

[7] Banu, NK Salma, and Suma Swamy. "Prediction of heart disease at early stage using data mining and big data analytics: A survey." Electrical, Electronics, Communication, Computer and Optimization Techniques (ICEECCOT), 016 International Conference on. IEEE, 2016.

[8] Thanigaivel, R., and K. Ramesh Kumar. "Boosted Apriori: an Effective Data Mining Association Rules for Heart Disease Prediction System." Middle-East Journal of Scientific Research 24.1 (2016): 192-200.

[9] Saboji, Rashmi G. "A scalable solution for heart disease prediction using classification mining technique." 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS). IEEE, 2017.

[10] Sowmiya, C., and P. Sumitra. "Analytical study of heart disease diagnosis using classification techniques." Intelligent Techniques in Control, Optimization and Signal Processing (INCOS), 2017 IEEE International Conference. IEEE, 2017.

[11] Bahrami, Boshra, and Mirsaeid Hosseini Shirvani. "Prediction and Diagnosis of Heart Disease by Data Mining Techniques." Journal of Multidisciplinary Engineering Science and Technology (JMEST) 2.2 (2015): 164-168.

[12] KolÃ˜ge, Elma, and Neki Frasheri. "A literature review of data mining techniques used in healthcare databases." ICT innovations (2012)

[13] Anbarasi, M., E. Anupriya, and N. C. S. N. Iyengar. "Enhanced prediction of heart disease with feature subset selection using genetic algorithm." International Journal of Engineering Science and Technology 2.10 (2010): 5370-5376.

[14] Chandra, Priti, and B. L. Deekshatulu. "Prediction of risk score for heart disease using associative classification and hybrid feature subset selection." Intelligent Systems Design and Applications (ISDA), 2012 12th International Conference on. IEEE, 2012.

[15] Ranganatha, S., "Medical data mining and analysis for heart disease dataset using classification techniques." (2013): 1-09.

[16] Shouman, Mai, Tim Turner, and Rob Stocker. "Using data mining techniques in heart disease diagnosis and treatment." Electronics, Communications and Computers (JECECC), 2012 Japan-Egypt Conference on. IEEE, 2012.

[17] Sonet, KM Mehedi Hasan, "Analyzing patterns of numerously occurring heart diseases using association rule mining." Digital Information Management (ICDIM), 2017 Twelfth International Conference on. IEEE, 2017.

[18] Sudeshna, P., S. Bhanumathi, and MR Anish Hamlin. "Identifying symptoms and treatment for heart disease from biomedical literature using text data mining." Computation of Power, Energy Information and Commuincation (ICCPEIC), 2017 International Conference on. IEEE, 2017.

[19] Soni, Jyoti, "Predictive data mining for medical diagnosis: An overview of heart disease prediction." International Journal of Computer Applications 17.8 (2011): 43-48.

[20] Jabbar, M. Akhil, Bulusu Lakshmana Deekshatulu, and Priti Chandra. "Heart disease prediction system using associative classification and genetic algorithm." arXiv preprint arXiv:1303.5919 (2013).

[21] Anooj, P. K. "Clinical decision support system: Risk level prediction of heart disease using weighted fuzzy rules." Journal of King Saud University-Computer and Information Sciences 24.1 (2012): 27-40.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

A PRACTICAL ATTRIBUTE-BASED DOCUMENT COLLECTION HIERARCHICAL ENCRYPTION SCHEME IN CLOUD COMPUTING

[1]Mr. Sridhar Gummalla, [2]Mrs. Vishalakshmi , [3]Ms. Nasreen Fatima
[1]Professor, [2]Associate Professor, [3]Assist professor
[1,2,3] Dept of CSE, Shadan College of Engg & Tech

ABSTRACT:
Ciphertext-policy attribute-based encryption can provide fine-grained access control and secure data sharing to the data users in cloud computing. However, the encryption decryption efficiency of existing schemes can be further improved when encrypting a large document collection. In this paper, we propose a practical Cipher text-Policy Attribute-Based Hierarchical document collection Encryption scheme named CP-ABHE By practical, we mean that CP-ABHE is more efficient in both computation and storage space without sacrificing data security. In CP-ABHE, we first construct a set of integrated access trees based on the documents attribute sets. We employ the greedy strategy to built the trees incrementally and grow the trees by dynamically combining the small ones. Then all the documents on an integrated access tree are encrypted together. Different to existing schemes, the leaves in different access trees with the same attributes share a same secret number which is employed to encrypt the documents. This greatly improves the performance of CP-ABHE. The security of our scheme is theoretically proved based on the Decisional Bilinear Diffie-Hellman assumption. Simulation results illustrate that CP-ABHE performs very well in terms of security, efficiency and the storage size of the ciphertext.

1. INTRODUCTION

Ciphertext-policy attribute-based encryption can provide fine-grained access control and secure data sharing to the data users in cloud computing. However, the encryption/decryption efficiency of existing schemes can be further improved when encrypting a large document collection. In this paper, we propose a practical Ciphertext- Policy Attribute-Based Hierarchical document collection Encryption scheme named CP-ABHE. By practical, we mean that CP-ABHE is more efficient in both computation and storage space without sacrificing datasecurity. InCP-A BHE,we first construct a set of integrated access trees based on the documents' attribute sets. We employ the greedy strategy to build the trees incrementally and grow the trees by dynamically combining the small ones. Then all the documents on an integrated access tree are encrypted together. Different to existing schemes, the leaves in different access trees with the same attribute share a same secret number which is employed to encrypt the documents. This greatly improves the performance of CP-ABHE. The security of our scheme is theoretically proved based on the Decisional Bilinear Diffie-Hellman assumption.Simulation results illustrate that CP- ABHE performs very well interms of security, efficiency and the storage size of the ciphertext.

2. EXISTING SYSTEM

ABE schemes, each document is encrypted individually and a data user can decrypt a document if her attribute set matches the access structure of the document. Existing ABE schemes can be divided into Key-Policy ABE (KP-ABE) schemes and Ciphertext- Policy ABE (CP-ABE) schemes. Both the KP-ABE and CP-ABE schemes are impractical to encrypt a large document collection. Existing techniques cannot provide fine-grained access control mechanisms to the encrypted documents The encryption process in existing system, is executed N times, leading to high computation complexity.

3. EXISTINGSYSTEM DISADVANTAGES

- The encryption process in both the two schemes is executed N times, leading to high computation complexity.
- There is a tradeoff between the size of the content keys' ciphertext and data users' secret keys.
- Decrypting the ciphertext is also time-consuming considering that each document is encrypted individually.

4. LITERATURE SURVEY:

Title : Ciphertext-Policy Attribute-Based Encryption
Author:
Year:
Description:
In several distributed systems a user should only be able to access data if a user posses a certain set of credentials or attributes. Currently, the only method for enforcing such policies is to employ a trusted server to store the data and mediate access control. However, if any server storing the data is compromised, then the confidentiality of the data will be compromised. In this paper we present a system for realizing complex access control on encrypted data that we call ciphertext-policy attribute-based encryption. By using our techniques encrypted data can be kept confidential even if the storage server is untrusted; moreover, our methods are secure against collusion attacks. Previous attribute-based encryption systems used attributes to describe the encrypted data and built policies into user's
keys; while in our system attributes are used to describe a user's credentials, and a party encrypting data determines a policy for who can decrypt. Thus, our methods are conceptually closer to traditional access control methods such as role-based access control (RBAC). In addition, we provide an implementation of our system and give performance measurements.
Title : Conjunctive, Subset, and Range Queries on Encrypted Data
Author:
Year:
Description:
We construct public-key systems that support comparison queries ($x \geq a$) on encrypted data as well as more general queries such as subset queries ($x \in S$). Furthermore, these systems support arbitrary conjunctive queries ($P\ 1\ A \cdots A\ P\ \ell$) without leaking information on individual conjuncts. We present a general framework for constructing and analyzing public-key systems supporting queries on encrypted data.

Title : Privacy-Preserving Multi-Keyword Ranked Search over Encrypted Cloud Data
Author:
Year:
Description:
With the advent of cloud computing, data owners are motivated to outsource their complex data management systems from local sites to the commercial public cloud for great flexibility and economic savings. But for protecting data privacy, sensitive data have to be encrypted before outsourcing, which obsoletes traditional data utilization based on plaintext keyword search. Thus, enabling an encrypted cloud data search service is of paramount importance. Considering the large number of data users and documents in the cloud, it is necessary to allow multiple keywords in the search request and return documents in the order of their relevance to these keywords. Related works on searchable encryption focus on single keyword search or Boolean keyword search, and rarely sort the search results. In this paper, for the first time, we define and solve the challenging problem of privacy-preserving multi-keyword ranked search over encrypted data in cloud computing (MRSE). We establish a set of strict privacy requirements for such a secure cloud data utilization system. Among various multi-keyword semantics, we choose the efficient similarity measure of "coordinate matching," i.e., as many matches as possible, to capture the relevance of data documents to the search query. We further use "inner product similarity" to quantitatively evaluate such similarity measure. We first propose a basic idea for the MRSE based on secure inner product computation, and then give two significantly improved MRSE schemes to achieve various stringent privacy requirements in two different threat models. To improve search experience of the data search service, we further extend these two schemes to support more search semantics. Thorough analysis investigating privacy and efficiency guarantees of proposed schemes is given. Experiments on the real-world data set further show proposed schemes indeed introduce low overhead on computation and communication.
Title : jPBC: Java pairing based cryptography Author:
Year:
Description:
It has been recently discovered that some cyclic groups that could be used in Cryptography admit a special bilinear pairing map that introduces extra structure to the group. Bilinear pairing maps were first used to break cryptosystems (see, for example,) and later it was realized that the extra structure could be exploited to build cryptosystems with extra properties. Boneh and Franklins identity-based encryption scheme is the most famous early example of what could be achieved using bilinear maps. After that, a plethora of cryptosystems have been designed using bilinear maps. No full and freely available implementation of pairing based cryptography was available until this work. Recent proposals fall short of this goal as either their source code is not available or because they support a limited range of elliptic curve. Moreover, neither one of

implements preprocessing that is crucial to reduce the computation time. In this work, we present jPBC a Java port of the PBC library written in C. jPBC provides a full ecosystem of interfaces and classes to simplify the use of the bilinear maps even for a non-cryptographer. jPBC supports different types of elliptic curves, preprocessing which can speedup the computation significantly and it is ready for the mobile world. Moreover a benchmark comparison between jPBC and PBC has been performed to measure the gap between the two libraries. Furthermore jPBC has been benchmarked on different Android mobile platforms.

Title : An Efficient Privacy-Preserving Ranked Keyword Search Method

Author:

Year:

Description:

Cloud data owners prefer to outsource documents in an encrypted form for the purpose of privacy preserving. Therefore it is essential to develop efficient and reliable ciphertext search techniques. One challenge is that the relationship between documents will be normally concealed in the process of encryption, which will lead to significant search accuracy performance degradation. Also the volume of data in data centers has experienced a dramatic growth. This will make it even more challenging to design ciphertext search schemes that can provide efficient and reliable online information retrieval on large volume of encrypted data. In this paper, a hierarchical clustering method is proposed to support more search semantics and also to meet the demand for fast ciphertext search within a big data environment. The proposed hierarchical approach clusters the documents based on the minimum relevance threshold, and then partitions the resulting clusters into sub-clusters until the constraint on the maximum size of cluster is reached. In the search phase, this approach can reach a linear computational complexity against an exponential size increase of document collection. In order to verify the authenticity of search results, a structure called minimum hash sub-tree is designed in this paper. Experiments have been conducted using the collection set built from the IEEE Xplore. The results show that with a sharp increase of documents in the dataset the search time of the proposed method increases linearly whereas the search time of the traditional method increases exponentially. Furthermore, the proposed method has an advantage over the traditional method in the rank privacy and relevance of retrieved documents.

Title : Searchable Symmetric Encryption: Improved Definitions and Efficient Constructions

Author:

Year:

Description:

Searchable symmetric encryption (SSE) allows a party to outsource the storage of his data to another party in a private manner, while maintaining the ability to selectively search over it. This problem has been the focus of active research and several security definitions and constructions have been proposed. In this paper we begin by reviewing existing notions of security and propose new and stronger security definitions. We then present two constructions that we show secure under our new definitions. Interestingly, in addition to satisfying stronger security guarantees, our constructions are more efficient than all previous constructions. Further, prior work on SSE only considered the setting where only the owner of the data is capable of submitting search queries. We consider the natural extension where an arbitrary group of parties other than the owner can submit search queries. We formally define SSE in this multi-user setting, and present an efficient construction.

5. PROPOSED SYSTEM

In this paper, we propose a practical Ciphertext-Policy Attribute- Based Hierarchical document collection Encryption scheme named CP-ABHE. we design an attribute-based document hierarchical encryption scheme named CP-ABHE which performs well in terms of computation and storage space efficiency. The scheme consists of two modules including integrated access tree construction and tree encryption. We first propose an algorithm to generate the integrated access trees for a document collection. Then, the documents that share an access tree are encrypted together. By practical, we mean that CP-ABHE is more efficient in both computation and storage space without sacrificing data security.

6. PROPOSED SYSTEM ADVANTAGES

- Significantly decrease the number of the access trees.
- All the documents that share an integrated access tree are encrypted together which can significantly improve the encryption/decryption efficiency.
- storage space is increase

7. MODULES

1. Data owner
2. Data user
3. Cloud server
4. Cloud authenticator

1. Data owner

This is the first module of this project. Data owner is responsible for collecting documents and assigning a proper attribute set to each document. The documents are

encrypted in two phases. Each document is first encrypted by a symmetric encryption algorithm with a unique content key. Then, the content keys are encrypted by ABE-schemes. At last, both the encrypted documents and content keys are outsourced to the cloud server.

2. Data user

This is the second module of this project. In this module, If data user wants to search require data in cloud first user need to register. After login user put request to owner and CA for authentication. The authorized data user can send query requests to the cloud server. For authorized user will get secret key for decrypt the data.

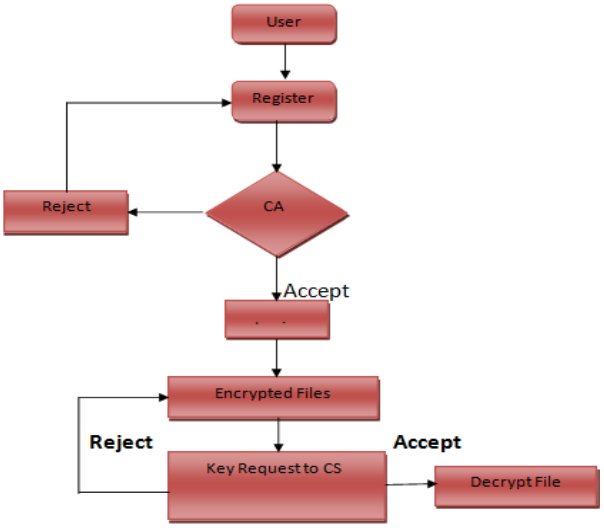
3. Cloud server

This is the second module but main module in this project. Cloud can login and able to get information about user and owner. The authorized data user can send query requests to the cloud server. For an authorized query, the cloud server employs a search engine to search the encrypted document collection and get the related cipher texts to the query

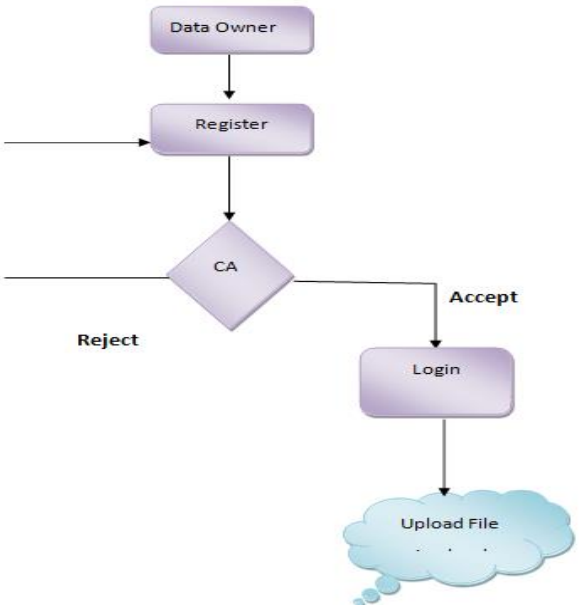
4. Cloud Authenticator

To search the interested documents in the cloud server, a data user first needs to register to the CA center. Then, the CA center assigns an attribute set to the data user and sends an attribute-related secret key to the data user. Once a query request is received, the cloud server first communicates with the CA center to check the identity of the data user and an ID certification message is received if thedata user is authorized.

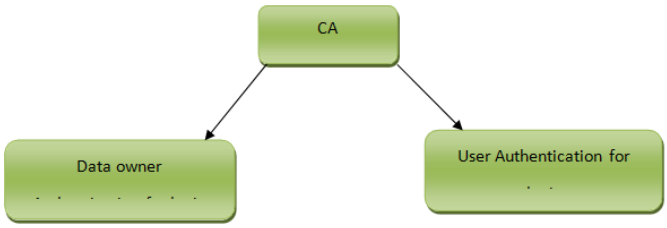
1. User Interface Design



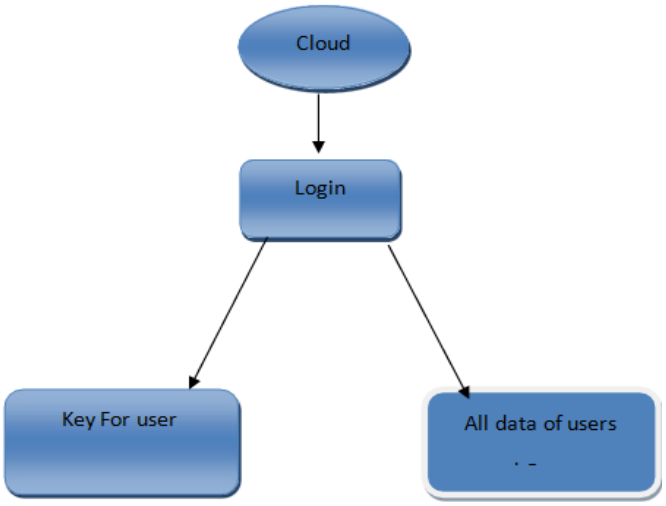
2. Data owner



3. Cloud authenticator (CA)



4. Cloud Server (CS)



8. RESULTS:

GIVEN INPUT EXPECTED OUTPUT:

User Interface Design

Input : Register to CA and get key, with the key only user can login. Give request to CS for Decrypted file.

Output : If CA accept request than user can login and CS will accept than only will get decrypted file.

Data Owner

Input : Register to CA and get key, with the key only owner can login.
Output : Once CA Accept owner's request than Owner can login and they upload file into Cloud server.
Cloud authenticator (CA)
Input : Will get Requests from User and Owner.
Output : If CA give acceptance than only they can move further steps.
Cloud Server(CS)
Input : Will get key request from user.
Output : If CS will accept key request than only user can decrypt the file And CS can able see all the users and owners activities.

9. CONCLUSION

We design a hierarchical document collection encryption scheme. We first design an incremental algorithm to construct the integrated access trees of the documents and decrease the number of trees. Then, each integrated access tree is encrypted together and the documents in a tree can be decrypted at a time. Different to existing schemes, we construct the secret numbers for the nodes of the trees in a bottom-up manner. In this way, the sizes of ciphertext and secret keys significantly decrease. At last, a thorough performance evaluation is provided including security analysis, efficiency analysis, and simulation. Results show that the proposed scheme outperforms KP-ABE and CP-ABE schemes in terms of encryption/decryption efficiency and storage space.

REFERENCE:

1. J. Bethencourt, A. Sahai, B. Waters, "Ciphertext-policy attribute-based encryption,SecurityandPrivacy,"IEEESymposiumon.IEEE,2007:321334.
2. D.Boneh,B.Waters,"Conjunctive,subset,andrangequerieson encrypted data," in Proc. of TCC, 2007, pp. 535-554.
3. N. Cao, C. Wang, M. Li, K. Ren, and W. Lou, "Privacy-preserving multikeyword ranked search over encrypted cloud data," IEEE Trans. Parallel Distrib. Syst., vol. 25, no. 1, pp. 222-233, Jan. 2014.
4. A. D. Caro, V. Iovino, "jPBC: Java pairing based cryptography," IEEE SymposiumonComputersandCommunications.IEEEComputer Society, 2011:850-855.
5. C. Chen et al., "An efficient privacy-preserving ranked key-word search method," IEEE Trans. Parallel Distrib. Syst., vol. 27, no, 4, pp. 951-963, Apr. 2016.
6. R. Curtmola, J. A. Garay, S. Kamara, and R. Ostrovsky, "Searchable symmetric encryption: improved definitions and efficient constructions," in Proc. ACM CCS, 2006, pp. 79-88.
7. H. Deng, Q. Wu, B. Qin, et al., "Ciphertext-policy hierarchical attributebased encryption with short ciphertexts," Information Sciences, 2014, 275(11):370-384.
8. Z.Fu,K.Ren,J.Shu,X.Sun,andF.Huang,"Enablingpersonalizedsearch over encrypted out sourced data with efficiency improvement,"IEEETrans. Parallel Distrib. Syst., vol. 27, no. 9, pp. 2546-2559, Sep. 2016.
9. P. Golle, J. Staddon, B. Waters, "Secure conjunctive key-word search over encrypted data," in Proc. of ACNS, 2004, pp. 31-45.
10. V. Goyal, A. Jain, O. Pandey, et al., "Bounded ciphertext policy attribute based encryption," Automata, languages and programming, 2008: 579591.
11. V. Goyal, O. Pandey, A. Sahai, et al., "Attribute-based encryption for finegrained access control of encrypted data," Proceedings of the 13th ACM conferenceonComputerandcommunicationssecurity.Acm,2006:89-98.
12. J. Han, W. Susilo, Y. Mu, et al., "Privacy-Preserving Decentralized KeyPolicy Attribute- Based Encryption," IEEE Transactions on Parallel & Distributed Systems, 2012, 23(11):2150- 2162.
13. J. Lai, R. H. Deng, C. Guan, et al., "Attribute-Based Encryption With Verifiable Outsourced Decryption," IEEE Transactions on Information Forensics & Security, 2013, 8(8):1343-1354.
14. . B. Lewko, T. Okamoto, A. Sahai, K. Takashima, B. Waters, "Fully secure functional encryption: Attribute-based encryp-tion and (hierarchical) inner product encryption," in Proc. EUROCRYPT, 2010, pp. 62-91.
15. A. Lewko, T. Okamoto, A. Sahai, et al., "Fully Secure Functional Encryption: Attribute-Based Encryption and (Hierarchical) Inner Product Encryption," International Conference on Theory and Applications of Cryptographic Techniques. Springer-Verlag, 2010:62-91.
16. J. Li, C. Jia, J. Li, et al., "Outsourcing encryption of attribute-based encryptionwithmapreduce,"InternationalConferenceonInformationand Communications Security. Springer-Verlag, 2012:191-201.
17. J. Li, W. Yao, Y. Zhang, et al., "Flexible and Fine-Grained AttributeBased Data Storage in Cloud Computing," IEEE Transactions on Services Computing, 2017:785-796.
18. X. N. Lin, F. J. Sha, Y. Wei, et al., "Outsourced attribute-based encryption with keyword search function for cloud storage," IEEE Transactions on Services Computing, 2016, PP(99):1-1.
19. C. Ling, C. Newport, "Provably secure ciphertext policy ABE," ACM ConferenceonComputerandCommunicationsSecurity.ACM,2007:456465.
20. W. Liu, J. Liu, Q. Wu, et al., "Practical Direct Chosen Ciphertext Secure Key-Policy Attribute-Based Encryption with Public Ciphertext Test," European Symposium on Research in Computer Security. Springer International Publishing, 2014:91-108.
21. Z.Liu,Z.Cao,D.S.Wong,"TraceableCP-ABE:HowtoTraceDecryption Devices Found in the Wild," IEEE Transactions on Information Forensics & Security, 2017, 10(1):55-68.
22. Z. Liu, Z. Cao, D. S. Wong, "White-Box Traceable Ciphertext-Policy Attribute-Based Encryption Supporting Any

Monotone Access Structures," IEEE Transactions on Information Forensics & Security, 2013, 8(1):76-88.
23. J. Ning, Z. Cao, X. Dong, et al., "Large Universe Ciphertext-Policy Attribute-Based Encryption with White-Box Traceability, 2014, 8713:5572.
24. T. Okamoto, K. Takashima, "Fully Secure Functional Encryption with General Relations from the Decisional Linear Assumption," CRYPTO. Springer Berlin Heidelberg, 2010:191-208

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

DYNAMIC MULTI-KEYWORD RANKED SEARCH BASED ON BLOOM FILTER OVER ENCRYPTED CLOUD DATA

[1]Mr. Sridhar Gummalla, [2]Mr. SUDHAN MADHU, [3]Ms. FARHA NAZNEEN
[1]Professor,[2]Associate Professor, [3] Assist professor
[1,2,3] Dept of CSE, Shadan College of Engg & Tech

Abstract— With the advantage of storage as a service many enterprises are moving their valuable data to the cloud, since it costs less, easily scalable and can be accessed from anywhere any time. The trust between cloud user and provider is paramount. We use security as a parameter to establish trust. Cryptography is one way of establishing trust. Searchable encryption is a cryptographic method to provide security. In literature many researchers have been working on developing efficient searchable encryption schemes. In this paper we explore some of the effective cryptographic techniques based on data structures like CRSA and B-Tree to enhance the level of security, hence trust. We tried to implement the search on encrypted data using Azure cloud platform.
Keywords: Searchable Encryption, Multi keyword, CRSA, B tree, Azure

1. INTRODUCTION

Cloud computing is one way of computing. Here the computing resources are shared by many users. The benefits of cloud can be extended from individual users to organizations. The data storage in cloud is one among them. The virtualization of hardware and software resources in cloud nullifies the financial investment for owning the data warehouse and its maintenance. Many cloud platforms like Google Drive, iCloud, SkyDrive, Amazon S3, Dropbox and Microsoft Azure provide storage services.

Security and privacy concerns have been the major challenges in cloud computing. The hardware and software security mechanisms like firewalls etc. have been used by cloud provider. These solutions are not sufficient to protect data in cloud from unauthorized users because of low degree of transparency [4]. Since the cloud user and the cloud provider are in the different trusted domain, the outsourced data may be exposed to the vulnerabilities [4]

[14] [5]. Thus, before storing the valuable data in cloud, the data needs to be encrypted [2]. Data encryption assures the data confidentiality and integrity. To preserve the data privacy we need to design a searchable algorithm that works on encrypted data [13].

Many researchers have been contributing to searching on encrypted data. The search techniques may be single keyword search or multi keyword search [11]. In huge database the search may result in many documents to be matched with keywords. This causes difficulty for a cloud user to go through all documents and have most relevant documents. Search based on ranking is another solution, wherein the documents are ranked based on their relevancy to the keywords [3]. Economical searchable encryption techniques help the cloud users especially in pay-as-you use model. The researchers combined the rank of documents with multiple keyword search to come up with efficient economically viable searchable encryption techniques. In searchable encryption related literature, computation time and computation overhead are the two most frequently used parameters by the researchers in the domain for analysing the performance of their schemes. Computation time (also called "running time") is the length of time required to perform a computational process for example searching a keyword, generating trapdoor etc. Computation overhead is related to CPU utilization in terms of resource allocation measured in time.

In this research work, we analyse the security problems in cloud storage and propose a solution for the same. Our contribution can be summarized as follows:

1. For the first time, we define the problem of secure ranked keyword search over encrypted cloud data, and provide such an effective protocol, which fulfils the secure ranked search functionality with no relevance score information leakage against keyword privacy.
2. Thorough security analysis showed that our asymmetric based ranked searchable encryption scheme using CRSA and B-tree indeed enjoys “as-strong-as-possible” security guarantee compared to previous searchable symmetric encryption (SSE) schemes.

3. Extensive experimental results demonstrate the effectiveness and efficiency of the proposed solution.

In the remainder of this paper, the following information is presented: in Section II, literature review in related area is discussed. Section III describes problem formulation. Section IV presents our proposed search schemes. Security analysis and performance analysis are presented in Section V. Finally, in Section VI, the paper concludes with some suggestions for future work.

2. LITERATURE SURVEY

The encryption on data is an effective way to protect the confidentiality of data in cloud. But when it comes to searching, efficiency gets low. In literature many research works are not efficient in searching specially for complex queries. This inefficiency may lead to leakage of valuable information to unauthorized peoples. Song et al, for the first time proposed the practical symmetric searchable method based on cryptography. In this scheme the file is encrypted word by word. To search for a keyword user sends the keyword with same key to the cloud. The drawback of this scheme is that the word frequency will be revealed. Goh et al tried to overcome the drawback of Song's scheme by constructing secure index table using pseudorandom functions and unique document identifier randomized bloom filters. Bosch et al worked on the concept given by Goh et al. and introduced the concept of wild card searches. The drawback of this scheme is that bloom filters may introduce false positives. In Chang's et al proposed scheme, an index is built for each document. The scheme is more secured compared to Goh's scheme since number of words in a file is not disclosed. The limitation of this scheme is that it is less efficient and does not support arbitrary updates with new words. Golle et al scheme allows multiple keyword searches with one encrypted query. But this scheme is not practical. Curtmola et al for the first time proposed the concept of symmetric searchable encryption (SSE), later on Kamara et al proposed an extended version of SSE called dynamic SSE (DSSE), where addition and deletion of documents can be performed in index table. All these schemes are based on single keyword search [22] [23] [24].

The first public key encryption with keyword search (PEKS) was proposed by Boneh et al. The scheme suffers from inference attack on trapdoor encryption method. Baek et al, Rhee et al improved hardness of security of Boneh's scheme. Baek's scheme introduces the concept of conjunction of keyword search. The public key encryption methods are computationally time consuming and complex that makes these algorithms inefficient. In Yang et al scheme the encrypted data is searched by individual users using a unique key allotted to them. The scheme suffers from key management. Boneh et al discussed functional encryption and related to conjunctional search, range queries and subset queries. Katz et al scheme is an updated version of Boneh's scheme and discussed predicate encryption for inner products and supports both conjunctions and disjunctions search on encrypted data [22] [23] [24].

There are many searching techniques implemented in the cloud. These techniques support only exact keyword search. Using fuzzy search the exact keywords are displayed along with similarity keywords and is analysed in [8]. This work concentrates on solving the problems of the user who searches the data with the help of fuzzy keyword on cloud.

Curtmola et al. [16], proposed a method where an inverted index (implemented using linked list) having document identifiers is maintained for each keyword. Every node in the list stores information about the position and the decryption key of the next node. The nodes from all inverted indexes are encrypted with random keys and are randomly inserted into an array. With this, by knowing position and decryption key of the first node of an inverted index, it is possible to find all documents which include the corresponding keyword. To improve the efficiency of the
above scheme, top-k single keyword retrieval schemes are proposed in the literature [17].

Much work has been done in privacy preserving multi-keyword search on encrypted data for cloud computing sector. In [11], a model is proposed that solves the problem of effective secure ranked keyword search over encrypted cloud data. Here, it proposes an existing cryptographic primitive, order-preserving symmetric encryption (OPSE). The disadvantages of this technique are: does not support multi-keyword, does not include IDF (define) for the calculation of scores, does not use advanced crypto techniques.

S.Buyrukbilen et al [18], introduce the first method that provides ranked results from multi-keyword searches on public-key encrypted data. By avoiding a linear scan of the documents and by parallelizing the computations to the possible extent, this method reduces the computational complexity of public key cryptosystem. The scheme encrypts keyword information of each document in a bloom filter [19], and hierarchically aggregate (using homomorphic encryption) the individual indexes into a tree structure. Client will do the query processing, and traverse the tree in best-first manner. The query is hidden from the server or cloud

provider by using an efficient private information retrieval (PIR) protocol [20]. In this method the indexes are split into multiple chunks, and use several CPUs in parallel to execute the user queries efficiently.

Wenhai Sun et al. [21], proposed a MRSE scheme that works on similarity based ranking. Here search index is created on the basis of term frequency and vector space. Search index is used for multi keyword search and ranking the search result. Search efficiency is improved by applying tree structure on index.

The future work being multi-keyword semantic search over the encrypted data has been represented in [6]. Considering the large number of data users and documents in the cloud, it is necessary to allow multiple keywords in the search request and return documents in the order of their relevance to these keywords. Here, privacy-preserving multi-keyword ranked search over encrypted data in cloud computing (MRSE) is proposed where among various multi-keyword semantics, it chooses the efficient similarity measure of coordinate matching and hence uses the cryptographic techniques. Therefore, it lacks integrity check of rank order in search result and privacy in stronger threat model. Synonym based multiple keywords ranked search over encrypted cloud data using balanced binary tree is proposed in [15]. Here author used symmetric encryption method for designing searchable encryption scheme and used b-tree for indexing.

Although many researchers across the globe have been investigating to identify a suitable privacy preserving technique for cloud domain, none of these solutions guarantee 100 percent privacy. There exists a wide range of research challenges. We therefore chose to work towards meeting this challenge.

3. PROBLEM FORMULATION

Searchable Encryption (SE) schemes maintain the confidentiality and privacy of owner's data by facilitating searching keywords directly on encrypted data. Users can upload their encrypted data to cloud. Later, the authorized users can perform private keyword search on encrypted data in cloud. Multiple domains like cryptography, indexing, storage etc. are involved in devising efficient, secure, SE algorithms over encrypted files. The participants of a secure search model in a cloud, typically involves data owner, data user and cloud server. Data owner encrypts the files and corresponding keywords based index files by using any known cryptographic algorithms. Both the encrypted files and index files are uploaded to the cloud server. The trapdoors (encrypted keywords) are used to search encrypted files by cloud server in cloud database.

A. System Model

Our system consists of 3 entities data owner, data user and the cloud server as shown in Figure 1.

1. Data owner encrypts the data files for securing the data in cloud using Commutative RSA (CRSA) before uploading into the cloud. They also define the access rights for the user who want to access those documents. The access right is a 2-state variable: permission granted or permission denied. Data owner creates an index tree based on B tree and encrypts the tree using CRSA.
2. Cloud server stores the encrypted data files and encrypted index tree. It accepts the encrypted keywords (trapdoor) and returns the matching data file based on their relevance.
3. Data user can search for encrypted data files in cloud with encrypted keywords (trapdoor). The purpose of using encrypted keywords is that even the cloud server must not be able to infer the contents of data files.

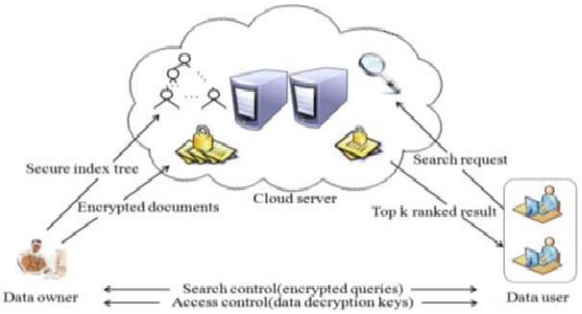


Figure 1: Searchable Encryption Architecture using CRSA

B. Threat Model

The threat model for our search scheme adopts "honest-but-curious" cloud server, that is the cloud server "honestly" follows the protocol specification, but it is "curious" to infer and analyze data (including indexes) in its storage and message flows received during the protocol in order to learn additional information.

C. Design Goals

The proposed solution addresses the following requirements

1. The search on encrypted document/file must be fully secure and cloud server must not be able to infer the contents of the documents in any way.
2. The search results must be ranked in order of relevance

To enable ranked searchable encryption for effective utilization of outsourced and encrypted cloud data under the aforementioned model, our system design should achieve the following security and performance guarantee. Specifically, we have the following goals: 1) Ranked keyword search: to explore different mechanisms for designing effective ranked search

schemes based on the existing searchable encryption framework; 2) Security guarantee: to prevent cloud server from learning the plaintext of either the data files or the searched keywords, and achieve the "as-strong-as-possible" security strength compared to existing searchable encryption schemes; 3) Efficiency: above goals should be achieved with minimum communication and computation overhead.

Existing systems:

Existing searchable encryption schemes [6] [15] [38] allow a user to securely search over encrypted data through keywords. These techniques support multi keyword search. The similarity measure "coordinate matching" in MRSE [6] has some drawbacks when used to evaluate the document ranking order. First, it takes no account of term frequency such that any keyword appearing in a document will present in the index vector as binary value 1 for that document, irrespective of the number of its appearance. Obviously, it fails to reflect the importance of a frequently appeared keyword to the document. Second, it takes no account of term scarcity. Usually a keyword appearing in only one document is more important than a keyword appearing in several ones. In addition, long documents with many terms will be favoured by the ranking process because they are likely to contain more terms than short documents. Hence, due to these limitations, the heuristic ranking function, "coordinate matching", is not able to produce more accurate search results. More advanced similarity measure should be adopted from plaintext information retrieval community. On the other hand, the search complexity of MRSE is linear to the number of documents in the dataset, which becomes undesirable and inefficient when a huge amount of documents are present.

Proposed system:

For our system, we choose the B-tree as indexing data structure to identify the match between search query and data documents. Specially, we use inner data correspondence, i.e., the number of query keywords appearing in document, to evaluate the similarity of that document to the search query. Each document is converted to a balanced B-tree according to the keywords and encrypted using CRSA. Whenever user wants to search, he/she creates a trapdoor for the keywords. Our aim is to design and analyse the performance of multiple keywords ranked search scheme using Commutative RSA algorithm and B-tree data structure for searchable index tree.

We designed a scheme based on secured ranked multiple keyword search over encrypted cloud data using CRSA. Further, we analysed its performance over B-tree based searchable index tree. In [6] [38], authors have studied the performance of RSA algorithm on B tree. We have used Microsoft's Azure platform to emulate the proposed system and to study its performance.

D. Preliminaries

Commutative Encryption (CRSA): The RSA cryptosystem is one of the optimum public key cryptography approaches. However, its overall robustness gets limited due to one way encryption and majority of existing RSA schemes suffer from reorder issues. Therefore, in order to make this system least complicated and more efficient, an approach called Commutative RSA has been proposed. In this scheme, the order in which encryption has been done would not affect the decryption if it is done in the same order. Encryption is the standard method for making a communication private. With the many cryptographic approaches, our system follows the commutative RSA algorithm. The mathematical scheme for performing this encryption is described by a pseudo algorithm presented below.

Let us consider two prime numbers $Prime\_P_p^{CRSA}$ and $Prime\_Q_q^{CRSA}$ initialized amongst all the group members.

Let and represent the group members required to communicate over the documents. To compute the encryption keys and decryption key pairs of the commutative RSA algorithm the parameters $Param\_N^{CRSA}$ and $Param\_\phi^{CRSA}$ are computed using the following

$$Param\_N^{CRSA} = [(Prime\_P_p^{CRSA}) \times (Prime\_Q_q^{CRSA})]$$

$$Param\_\phi^{CRSA} = [(Prime\_P_p^{CRSA} - 1) \times (Prime\_Q_q^{CRSA} - 1)]$$

From the above equations it is clear that

$$Param\_N_X^{CRSA} = Param\_N_Y^{CRSA}$$

and $Param\_\phi_X^{CRSA} = Param\_\phi_Y^{CRSA}$

and . $Param\_N_X^{CRSA}, Param\_E_X^{CRSA}$

are represented as

(and $(Param\_N_Y^{CRSA}, Param\_E_Y^{CRSA})$

is to be obtained.

$Param\_E^{CRSA}$

The . is obtained by randomly selecting numbers such that it is a co-prime of or in other terms

$$Hcf_{GCD}(Param\_E^{CRSA}, Param\_\phi^{CRSA}) = 1$$

Where $Fn_{GCD}(u, v)$ represents the greatest common divisor function between two variables and .

The decryption key pair of and is represented by $(Param\_N_X^{CRSA}, Param\_D_X^{CRSA})$ $(Param\_N_Y^{CRSA}, Param\_D_Y^{CRSA})$

and and the parameter $Param\_D^{CRSA}$ is computed based on the following equation

$$Param\ D^{CRSA} = (Param\ E^{CRSA})^{-1} Mod(Param\ N^{CRSA}$$

Let Enc_U represent the encrypted data . The encryption operation is defined as follows

$$Enc_U = U^{Param\_E^{CRSA}} Mod(Param\_N^{CRSA})$$

The commutative RSA decryption operation on the encrypted data is defined

$$Dec_Y = V^{Param\_D^{CRSA}} Mod(Param\_N^{CRSA})$$

B- Tree: A B-tree is a data structure as shown in Figure 2. The tree contains index nodes and leaf nodes. All leaf nodes are at the same level (same depth). Each index nodes contain keywords and pointers. Each node except root node in a B-tree with order n must contain keys between n to 2n keys. Each node also contains (number of keys + 1) pointers to its child nodes. If the root node is an index node then it must have at least 2 children. The insertion, deletion, search operations takes only logarithmic time.

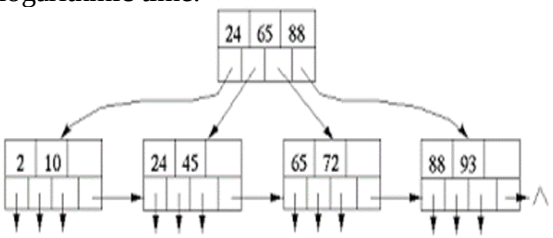


Figure 2: B tree data structure

4. SEARCHABLE ENCRYPTION SCHEME

To design an efficient multi-keyword searchable encryption scheme based on public key cryptography, we included the following modules.

Encryption Module: By using CRSA, data in a file can be updated dynamically without affecting the overall performance of searching on B-tree. If the encrypted indexed data is modified, re-indexing for the whole data is not needed. Similarly there is no need of re-encrypting the files in the database whenever the file is modified. This is a desirable feature as it reduces the computation time.

Data owner first generates secret and public key pair (EK, DK) using a standard public-key encryption scheme ie CRSA. Then owner makes the public key DK public and keeps the secret keys EK private. Documents {D | D1, D2,…, Dn} are encrypted using EK resulting in a ciphertexts {C | C1,C2,….Cn}. The generated C is stored in cloud database.

The constructed index based on B tree is also encrypted using CRSA, i.e each derived keywords {W| w1,w2,….wn}from a document is indexed in a tree and encrypted using CRSA. This results in a set of encryptions

{e| e1,e2,..en} where each ej (for) is defined as E_wj = CRSA_Enc (EK, wj), where E_wj denotes encrypted keyword.

Index Module: Index structures for huge datasets cannot be stored in main memory. Disk is a possible alternative. Storing it on disk requires different approach. The solution is to use more branches to reduce the height of the tree. For this we used B-tree data structure for each document. B-tree is a data structure of order n. The nodes are filled from n to 2n keys. Nodes are always at least half full of keys. The keys are within each node. A list of pointers is inserted between keys. These pointers help to navigate through tree. In general, a node with k keys has (k+1) pointers.

The design for creating and querying the index tree can be given by ALGORITHM-1, ALGORITHM-2 and ALGORITHM-3. ALGORITHM-1 and ALGORITHM-2 are used to create an index tree and ALGORITHM-3 describes how search can be performed on index tree.

ALGORITHM-1

Btree_insert (root, Key, Object_value)

Input: root pageID of a B-tree, the key and the value of an object.

//Inserts when Object_value doesn't exist in a B-tree

1. NODE = Disk_Read (root).
2. if NODE_x is full

(a) y = Allocate_Page(), z = Allocate_Page().

(b) Locate the middle object o stored in NODE_x.

- Move the objects to the left of object o into NODE_y.
- Move the objects to the right of o into NODE_z.
- If NODE_x is an index page,
- Then move the child pointers of NODE_x accordingly.

(c) NODE_ x: child [1] = NODE_y, NODE_x: child [2] = NODE_z.

(d) Disk_Write (NODE_x); Disk_Write (NODE_y); Disk_Write (NODE_z).

3. end if
4. Insert_Not_Full (NODE_x; Key; Object_value).

ALGORITHM-2

Insert_Not_Full (NODE_x, key, Object_value)
Input: an in-memory page NODE_x of a B-tree, the key and the value Object_value of a new object.
// This algorithm inserts when page of NODE_ x is not full.
// Insert the new Object_value into the sub-tree rooted by NODE_x.
1. if NODE_ x is a leaf page
(a) Insert the new Object_value into NODE_x, keeping Object_values in sorted order.
(b) Disk_Write (NODE_x).
2. else
(a) Find the child pointer NODE_x: child[i] whose key range contains Key.
(b) NODE_w = Disk_Read (NODE_x: child [i]).
(c) if NODE_w is full
• NODE_y = Allocate_Page ().
• Locate the middle object o stored in NODE_w. Move the objects to the right of o into NODE_y.
• If NODE_w is an index page, move the child pointers accordingly.
• Move o into NODE_x. Add a right child pointer in NODE_x pointing to NODE_y
• Disk_Write (NODE_x); Disk_Write (NODE_y); Disk_Write (NODE_w).
• If (Key < o. key), call Insert_Not_Full(NODE_w; KEY; Object_value);
else, call Insert_Not_Full(NODE_y; Key; Object_value).
(d) else Insert_Not_Full(NODE_w; Key; Object_value).
(e) end if
3. end if

The Disk_Read in ALGORITHM-1 reads the corresponding page from disk to memory and returns the location in memory that gets stored in node NODE_x. If the node NODE_x is full, allocate memory for 2 nodes and store the corresponding addresses in NODE_y and NODE_z. Find the middle object stored in NODE_x. Split the node NODE_x by moving the values to the left of middle object o in to NODE_y and right values of middle object o to NODE_z. If NODE_x is index page then move the pointers accordingly i.e. NODE_x: child [1] = NODE_y, NODE_x: child [2]=NODE_z. The NODE_x is promoted to higher level. This increases the height of the tree. Write all the values back to disk from memory by using Disk_Write operation. Else if NODE_x is not full then call Insert_Not_Full function. Insert_Not_Full function finds the path from root to leaf, and inserts the Object_value in to the leaf. Using the key range of the child pointer where the key of new object exists, the algorithm follows the pointer. The algorithm loops recursively on each of those nodes which are not full along the path till leaf level. The Object is inserted at the leaf level.

Search Module: Searching a B-tree is like searching a binary tree. Here instead of making a binary branching decision at each node, we make a multiway branching decision according to the number of the node's children.

Let's suppose cloud server has received n encrypted documents of this form, so that it now holds a set of encrypted documents {C|c1,C2,…,Cn}. Now, if user wants to retrieve the documents with keyword , he just needs to generate a secret trapdoor encrypted using CRSA i.e Enc_CRSA (w1, w2, ..). The trapdoor containing the encrypted keywords is sent as token to the server. The server then uses this trapdoor to match the encrypted keywords in index tree node. If match found stores the pointer to that document in encrypted database. The search continues for other encrypted keywords. The following ALGORITHM-3 gives the stepwise information about how search will be done on B-Tree.

ALGORITHM-3

Search_Query (root, trapdoor)
Input: root, trapdoor containing keyword to be searched.
Output: pointer to the documents containing the keywords; NULL if non-exist.
1. NODE_x = Disk_Read (root).
2. if NODE_x is an index node
(a) If there is an object o in NODE_x such that o:key = keyword, return o: value.
(b) Find the child pointer x: child [i] whose key range contains key.
(c) Return Search_Query(NODE_x:child[i], key).
3. else If there is an object o in NODE_x such that o:key
= keyword, return o:value.
Otherwise, return NULL.
4. end if.

The ALGORITHM-3 takes trapdoor and root as input and searches for the keywords match in cloud database. The Disk_Read reads the corresponding root page from disk to memory and returns the location in memory that gets stored in node NODE_x. If NODE_x is index node then trapdoor is checked to see for keyword match. If found returns the corresponding document pointed by the node. Otherwise based on keyword, search will move to the child of NODE_x using pointers. The search continues recursively. Otherwise if NODE_x represents leaf then return the pointer to document if search succeeds otherwise NULL.

Ranking Module: In large databases, it is quite likely that the keyword might be matching with more number of documents. It is cumbersome for a user to decrypt and go through all the documents. Therefore there is a need for ranking the documents based on their relevance to the keywords. In our scheme we used (TF * IDF) to rank the documents. TF is the term frequency i.e. occurrence of keywords in a document and IDF is inverse document frequency i.e. total number of documents divided by number of documents containing the keyword. Similarity measure is used to find the rank based on relevance. For this, we maintain two vectors one for storing TF weight and other to store IDF weight.

Platform Used: Microsoft Azure is a cloud service provider. It provides storage as a service to the customers. Azure architecture contains roles, i.e. the worker role and the web role as shown in Figure 3. The web role is used for designing UI, whereas worker role is used to run background asynchronous applications. The workers in the B-tree provide search encryption services which support the multi-keyword search application. The workers are defined as whereis

search provided by the worker. The encrypted index tree is created by tree builder function using encrypted keyword contents (worker A). Cloud users (web role) enter the keywords for search. The B-tree based tree search algorithm

i.e. searches for the encrypted keywords in index tree. The search results are obtained using query on index tree and using tree search algorithm. Relevance score for ranking the search results is calculated using search algorithm, the index tree and database (worker B) as explained above in rank module. The system architecture of the azure cloud search over an encrypted data by the worker and web role is shown in Figure 3.

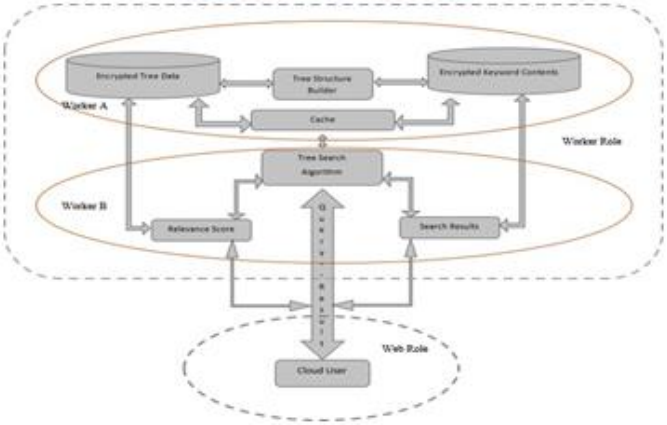


Figure 3: Architecture of searchable encryption scheme in Azure

5. PERFORMANCE ANALYSIS

The security of the designed system is provided by using CRSA. As long as private key (encrypted) is kept secret the cloud provider cannot deduce index tree or documents set. Since trapdoor is also encrypted using CRSA, the provider cannot make out the keywords inside the trapdoor maintaining the confidentiality at index and query level. The documents in cloud storage are also protected, since documents are encrypted using CRSA. Without having the decryption key it is highly hard to decrypt the documents thus provides security at storage level.

To be useful and usable, databases must support operations, such as search, deletion and insertion of data. For large organizations the databases are huge in size and cannot be maintained entirely in memory. By using balanced B-trees to construct the index for the data we can improve the search efficiency. B-tree minimizes the disk I/O (disk read and disk write) by copying a block of data (page) containing many records at a time into memory. This in turn improves the search efficiency. Asymptotically, Searching an unsorted database without indexing will have a worst case running time of O(n), where n represents the number of keywords. If the same data is indexed with a B- Tree, the same search operation will run in logarithmic time

i.e O(log n).

Result Analysis: The privacy preserved multi-keyword search based on the encrypted cloud data has been designed. The system model presented has been developed on Visual Studio 2010 framework 4.0 with C#. The overall system has been developed and implemented with Microsoft Azure cloud platform.

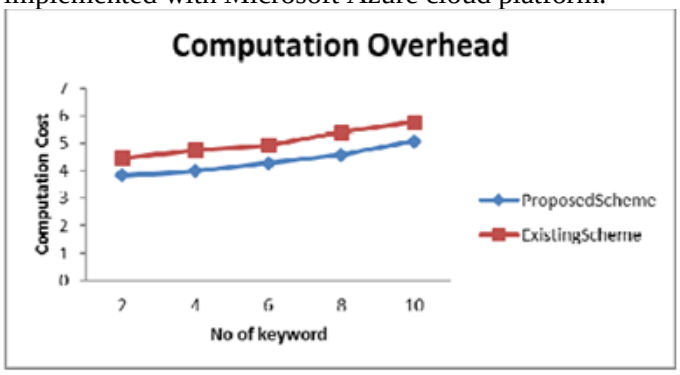


Figure 4: Computation Overhead

Figure 4 depicts the computation overhead in seconds based on the number of keywords. In this study, we compared the performance of our proposed system with the RSA based system proposed in [15]. Results clearly show that even for 10 keywords, the overhead computation using CRSA is low as compared to the RSA based system [15]. For example, RSA based system takes approximately 4.5 seconds for searching 2

keywords, whereas our proposed CRSA based scheme takes only 4 seconds. The computation cost for search increases linearly in both schemes. But from Figure 4 it is evident that our proposed CRSA based scheme performs better even under increased number of keywords.

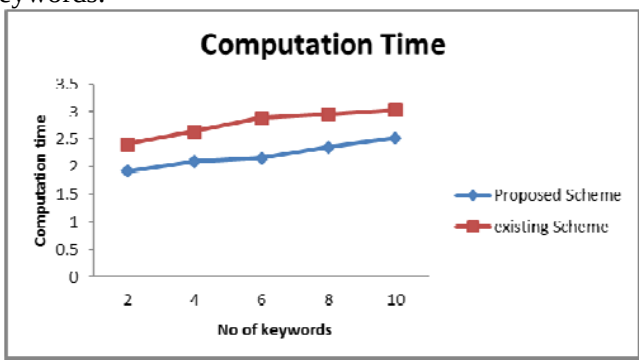


Figure 5: Time Comparison

The graph in Figure 5 plotted above makes the comparison of the search computation time in seconds of our proposed system against the RSA based system. For two keywords search, the time taken by the RSA based scheme is approximately 2.5 seconds, whereas our proposed system takes approximately 0.5 seconds less. As the number of keywords increased for search, the computation time for search also increases linearly in both schemes. But CRSA based scheme is found to perform better.

Thus it is evident that encryption algorithm CRSA with B Tree as index tree performs better than RSA and B tree Combination.

6. CONCLUSION AND FUTURE WORK

This work uses CRSA asymmetric algorithm for encrypting data files and index tree based on B-tree. CRSA increases the data security and improves privacy of data by its commutative nature. Using CRSA, data in a file can be updated dynamically without affecting the overall performance of searching on B-tree. In our proposed system, if encrypted data is modified, re-encrypting for the whole data is not needed. This is a desirable feature as it reduces the computation time.

The future work would concentrate on using Elliptic Curve Cryptography (ECC) encryption technique for better performance. Further, we intend to analyze the behavior of our proposed system(s) for multiuser environment.

REFERENCES

1. M. Armbrust et al., 'Above the Clouds: A Berkeley View of Cloud Computing,' Feb 2009.
2. S. Kamara and K. Lauter, 'Cryptographic cloud storage,' in RLCPS, January 2010, LNCS. Springer, Heidelberg.
3. A. Singhal, 'Modern information retrieval: A brief overview,' IEEE Data Engineering Bulletin, vol. 24, no. 4, pp. 35–43, 2001.
4. Cloud Security Alliance, 'Security Guidance for Critical Areas of Focus in Cloud Computing,' http://www.cloudsecurityalliance.org, 2009.
5. R. Brinkman, 'Searching in encrypted data,' in University of Twente, PhD thesis, 2007.
6. Ning Cao; Cong Wang; Ming Li; Kui Ren; Wenjing Lou, 'Privacy- Preserving Multi-Keyword Ranked Search over Encrypted Cloud Data,' Parallel and Distributed Systems, IEEE Transactions on , vol.25, no.1, pp.222,233, Jan. 2014
7. Dawn Xiaoding Song; Wagner, D.; Perrig, A., 'Practical techniques for searches on encrypted data,' Security and Privacy, 2000. S&P 2000. Proceedings. 2000 IEEE Symposium on ,doi: 10.1109/SECPRI.2000.848445 vol., no., pp.44,55, 2000
8. J. Li et al., 'Fuzzy Keyword Search Over Encrypted Data in Cloud Computing,' Proc. IEEE INFOCOM '10 Mini-Conf., San Diego, CA, Mar. 2010.
9. M. Li et al., 'Authorized Private Keyword Search over Encrypted Data in Cloud Computing,' 31st Int'l. Conf. Distributed Computing Systems, 2011, pp. 383–92.
10. D. Boneh, G. D. Crescenzo, R. Ostrovsky, and G. Persiano, 'Public key encryption with keyword search,' in Proc. of EUROCRYPT, 2004.
11. C. Wang et al., 'Secure Ranked Keyword Search Over Encrypted Cloud Data,' Proc. ICDCS '10, 2010
12. Wenjun Lu; Varna, A.L.; Min Wu, 'Confidentiality-Preserving Image Search: A Comparative Study Between Homomorphic Encryption and Distance-Preserving Randomization,' Access, IEEE, vol.2, no., pp.125,141, 2014
13. W. K. Wong, D. W. Cheung, B. Kao, and N. Mamoulis, 'Secure knn computation on encrypted databases,' in Proc. of SIGMOD, 2009.
14. K. Ren, C. Wang, and Q. Wang, 'Security Challenges for the Public Cloud,' IEEE Internet Computing, vol. 16, no. 1, pp. 69-73, 2012.
15. Zhangjie Fu et al, 'Multikeyword Ranked Search Supporting Synonym Query over Encrypted Data in Cloud Computing', IEEE Conference, 2013.
16. R. Curtmola, J. A. Garay, S. Kamara, and R. Ostrovsky, 'Searchable symmetric encryption: improved definitions and efficient constructions,' in ACM CCS, 2006.
17. P. Naresh, K. Pavan kumar, and D. K. Shareef, 'Implementation of Secure Ranked Keyword Search by Using RSSE,' International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 2 Issue 3, March – 2013.
18. S.Buyrukbilen and S.Bairas, 'Privacy preserving ranked search on public key encrypted data,' in Proc. IEEE International Conference on High Performance Computing and Communications (HPCC), November 2013.
19. B. H. Bloom, 'Space/time trade-offs in hash coding with allowable errors,' Communications of the ACM, vol. 13, no. 7, 1970, pp. 422– 426.

20. C. Gentry and Z. Ramzan, 'Single-database private information retrieval with constant communication rate,' in ICALP, pp. 803– 815.2005.
21. Sun, W., Wang, B., Cao, N., Li, M., Lou, W., Hou, Y.T., Li, H., 'Privacy-preserving multikeyword text search in the cloud supporting similarity-based ranking,' Proceedings of the 8th ACMSIGSAC symposium on Information, computer and communications security, ACM, pp. 71–82.2013.
22. Prasanna B.T, C.B. Akki, 'A Survey on Homomorphic and Searchable Encryption Security Algorithms for Cloud Computing,' Communicated to International Journal of Information Technology and Computer Science, November, 2014.
23. Prasanna B.T, C.B. Akki, 'A Comparative Study of Homomorphic and Searchable Encryption Schemes for Cloud Computing,' Communicated to International Journal of Communication Networks and Distributed Systems, November, 2014.
24. Prasanna B.T, C.B. Akki, 'A Survey on Challenges and Security Issues in Cloud,' Presented in conferencepresented in Conference on Evolutionary Trends in Information Technology, May 20-22 2011, at Visvesvaraya Technological University, Belgaum, Karnataka

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

DYNAMIC ROUTING WITH SECURITY CONSIDERATIONS

[1] Dr.Muntha Raju, [2]Mr. Mohammed Osman , [3] Mr. Zameer SK 3
[1] Professor , [2] Associate Professor , [3] Assist professor
[1,2,3] Dept of CSE, Shadan College of Engg & Tech

Abstract: Security has become one of the major issues for data communication over wired and wireless networks. To enhance the security of data transmission, existing system works on the cryptography based algorithms such as SSL, IPSec. Although IPSec and SSL accounts for great level of security, they introduce overheads. A mass of control messages exchanging also needed in order to adopt multiple path deliveries from source to destination. Different from the past work on the designs of cryptography algorithms and system infrastructures, we will propose a dynamic routing algorithm that could randomize delivery paths for data transmission. The algorithm is easy to implement and compatible with popular routing protocols, such as the Routing Information Protocol in wired networks and Destination-Sequenced Distance Vector protocol in wireless networks, without introducing extra control messages. An analytic study on the proposed algorithm is presented, and a series of simulation experiments are conducted to verify the analytic results and to show the capability of the proposed algorithm.

Keywords: dynamic routing, routing protocols, Routing Information Protocol, Destination-Sequenced Distance Vector protocol, Bellman Ford algorithm

1. INTRODUCTION

In the past decades, various security-enhanced measures have been proposed to improve the security of data transmission over public networks. Existing work on security-enhanced data transmission includes the designs of cryptography algorithms and system infrastructures and security-enhanced routing methods. Their common objectives are often to defeat various threats over the Internet, including eavesdropping, spoofing, session hijacking, etc. Among many well-known designs for cryptograph based systems, the IP Security (IPsec) and the Secure Socket Layer (SSL) are popularly supported and implemented in many systems and platforms. Although IPSec and SSL do greatly improve the security level for data transmission, they unavoidably introduce substantial overheads especially on gateway/host performance and effective network bandwidth. For example, the data transmission overhead is 5 cycles/byte over an Intel Pentium II with the Linux IP stack alone, and the overhead increases to 58 cycles/byte when Advanced Encryption Standard (AES) is adopted for encryption/decryption for IPsec. Another alternative for security-enhanced data transmission is to dynamically route packets between each source and its destination so that the chance for system break-in, due to successful interception of consecutive packets for a session, is slim. The intention of security- enhanced routing is different from the adapting of multiple paths between a source and a destination to increase the throughput of data transmission.

OBJECTIVE

The main objective is to propose a dynamic routing algorithm to provide security enhanced data delivery without introducing any extra control messages. The objective of this work is to explore a security enhanced dynamic routing algorithm based on distributed routing information widely supported in existing wired and wireless networks. We aim at the randomization of delivery paths for data transmission to provide considerably small path similarity (i.e., the number of common links between two delivery paths) of two consecutive transmitted packets. The proposed algorithm should be easy to implement and compatible with popular routing protocols, such as the Routing Information Protocol (RIP) for wired networks and Destination- Sequenced Distance Vector (DSDV) protocol for wireless networks, over existing infrastructures. These protocols shall not increase the number of control messages if the proposed algorithm is adopted. An analytic study will be presented for the proposed routing algorithm, and a series of simulation study will be conducted to verify the analytic results and to show the capability of the proposed algorithm.

MOTIVATION

In Static Routing, the routes are entered manually. It is the best solution when we have small networks, and the networks do not change very often. When we say change

we mean new host and networks are not frequently added are removed. While dynamic route are best suited when the network structure is very dynamic. Dynamic routes use network resources to learn where all host are, and the structure of the network. To enhance the dynamic routing with security considerations. We choose randomization of path deliveries with the help of the Dynamic Routing Protocol namely DSR (Dynamic Source Routing).

2. THEORETICAL BACKGROUND

PRESENT SYSTEM

Present network on security enhanced data transmission includes the designs of cryptography algorithms and system infrastructures and security-enhanced routing methods. Their common objectives are often to defeat various threats over the internet, including eavesdropping, spoofing, session hijacking, etc. Among many well-known designs for cryptography based systems, the IP Security and the Secure Socket Layer are popularly supported and implemented in many systems and platforms. Although IP Security and SSL do greatly improve the security level for data transmission, they unavoidably introduce substantial overheads, especially on gateway or host performance and effective network bandwidth.

LITERATURE SURVEY

Some popular routing protocols related to the present system are:

1. Adaptive Routing
2. Multipath Routing
3. Zone Routing Protocol

ADAPTIVE ROUTING

Adaptive routing describes the capability of a system, through which routes are characterized by their destination, to alter the path that the route takes through the system in response to a change in conditions. The adaptation is intended to allow as many routes as possible to remain valid (that is, have destinations that can be reached) in response to the change. People using a transport system can display adaptive routing. For example, if a local railway station is closed, people can alight from a train at a different station and use another method, such as a bus, to reach their destination. The term is commonly used in data networking to describe the capability of a network to 'route around' damage, such as loss of a node or a connection between nodes, so long as other path choices are available. There are several protocols used to achieve this:

- RIP
- OSPF

Systems that do not implement adaptive routing are described as using static routing, where routes through a network are described by fixed paths (statically). A change, such as the loss of a node, or loss of a connection between nodes, is not compensated for. This means that anything that wishes to take an affected path will either have to wait for the failure to be repaired before restarting its journey, or will have to fail to reach its destination and give up the journey.

MULTIPATH ROUTING

Current routing schemes typically focus on discovering a single "optimal" path for routing, according to some desired metric. Accordingly, traffic is always routed over a single path, which often results in substantial waste of network resources. Multipath Routing is an alternative approach that distributes the traffic among several "good paths instead of routing all traffic along a single "best" path. Equal-cost multi-path (ECMP) is a routing technique for routing packets along multiple paths of equal cost. The forwarding engine identifies paths by next-hop. When forwarding a packet the router must decide which next-hop (path) to use.

ZONE ROUTING PROTOCOL

The Zone Routing Protocol (ZRP) was introduced in 1997 by Haas and Pearlman. It is either a proactive or reactive protocol. It is a hybrid routing protocol. It combines the advantages from proactive (for example AODV) and reactive routing (OLSR). It takes the advantage of pro- active discovery within a node's local neighborhood (Intrazone Routing Protocol (IARP)), and using a reactive protocol for communication between these neighborhoods (Interzone Routing Protocol (IERP)). The Broadcast Resolution Protocol (BRP) is responsible for the forwarding of a route request. ZRP divides its network in different zones. That's the nodes local neighborhood. Each node may be within multiple overlapping zones, and each zone may be of a different size. The size of a zone is not determined by geographical measurement. It is given by a radius of length, where the number of hops is the perimeter of the zone. Each node has its own zone.

RELATED WORKS

Lou et al. proposed a secure routing protocol to improve the security of end-to-end data transmission based on multiple path deliveries. The set of multiple paths between each source and its destination is determined in an online fashion, and extra control message exchanging is needed. Bohacek et al. proposed a secure stochastic routing mechanism to improve routing security. Similar to the work proposed by Lou et al. A set of paths is discovered for each source and its destination in an

online fashion based on message flooding. Thus, a mass of control messages is needed.

Yang and Papavassiliou explored the trading of the security level and the traffic dispersion. They proposed a traffic dispersion scheme to reduce the probability of eavesdropped information along the used paths provided that the set of data delivery paths is discovered in advance. Although excellent research results have been proposed for security enhanced dynamic routing, many of them rely on the discovery of multiple paths either in an online or offline fashion. For those online path searching approaches, the discovery of multiple paths involves a significant number of control signals over the Internet.

THREATS TO THE EXISTING SYSTEM

Aside from the threat of unauthorized users accessing your network and eavesdropping your internal network communications by connecting with your wireless LAN (WLAN), there are a variety of threats posed by insecure or improperly secured WLAN‟s. Here is a brief list with descriptions of some of the primary threats:

Rogue WLAN's

Whether your enterprise has an officially sanctioned wireless network or not, wireless routers are relatively inexpensive and ambitious users may plug unauthorized equipment into the network. These rogue wireless networks may be insecure or improperly secured and pose a risk to the network at large.

Spoofing Internal Communications

An attack from outside of the network can usually be identified as such. If an attacker can connect with your WLAN, they can spoof communications that appear to come from internal domains. Users are much more likely to trust and act on spoofed internal communications.

Theft of Network Resources

Even if an intruder does not attack your computers or compromise your data, they may connect to your WLAN and hijack your network bandwidth to surf the Web. They can leverage the higher bandwidth found on most enterprise networks to download music and video clips, using your precious network resources and impacting network performance for your legitimate users.

Network Eavesdropping or Network Sniffing

It is a network layer attack consisting of capturing packets from the network transmitted by others' computers and reading the data content in search of sensitive information like passwords, session tokens, or any kind of confidential information. The attack could be done using tools called network sniffers. These tools collect packets on the network and, depending on the quality of the tool, analyze the collected data like protocol decoders or stream reassembling.

3. PROPOSED CHANGES TO THE EXISTING SYSTEM

INTRODUCTION

Each and every node in the network maintains a routing table which consists of the destination node, an estimated minimal cost to send a packet to the destination, the list of next nodes that can be chosen to reach the destination and the history record for packet deliveries. History of each packet delivery is considered in each case. The best aspect of this method is that there will no extra control messages. The data received will not show any evidence of security. The message to be sent is divided into number of packets. The source node will be distributing all the packets to different neighboring nodes from the list of next hops by considering the history.

The packet size has the most profound effect on the number of packets sent across the network. Here whatever the packet size and number of packets may be, no two consecutive packets will take the same path. Suppose, the complete data to be sent is divided into 12 packets and the possible next-hops are 10. 10 packets will be delivered to

10 different nodes and the remaining 2 will be sent through two different nodes among the available next hops. Care has to be taken such that the path similarity is minimum. If the receiver can get a clarification that the packets are dynamically routed, our work is done. Each computer will have a unique address to communicate with each other. In order to enable the computers to communicate with each other on a network, the concept of the hostname is included. The hostname was just a simple string of alphanumeric characters and a hyphen can also be used .Now it is a Fully Qualified Domain Name (FQDN) that absolutely and uniquely identifies every computer connected to the Network. Example of the hostname is: mypc-1477h123 An Internet Protocol address (IP address) is also a unique identifier for a computer or device on a TCP/IP network or a numerical label assigned to each device (e.g., computer, printer)participating in a computer network that uses the Internet Protocol for communication. Networks using the TCP/IP protocol route messages based on the IP address of the destination. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number among the four can be zero to 255. For example, 192.168.10.01 could be an IP address. We propose that if the Host Name or the IP Address or any secure information that receiver also known (that information discuss before any data send) of the node

which is the first hop from the source is printed along with the data packet delivered through it, the receiver can ensure that the data packets are received in a secured way i.e. through different paths. Since IP Address is rather difficult to remember as they are not particularly descriptive, we can specify a computer by a Host Name rather than a number string. It is preferred to print Host Name along with the data packet. If this is implemented, the received data will be as follows, [host name 1] [data in the first packet] [host name 2] [data in the second packet]…… [Host name n] [Data in the last packet]. By this an assurance that the data packets received are dynamically routed with minimum path similarity can be achieved. In our proposed work we are also adopting vulnerability evaluation in both node as well as path. The vulnerable node is one in which is having more number of connections. The vulnerable path is one in which is having more nodes to reach the destination links between two delivery paths) of two consecutive transmitted packets. The node which is having more number of connections, that node is said to be vulnerable node. This evaluation will reduce the chance of getting hacked. The path which is having more number of nodes to cross, that path is said to be vulnerable path. These evaluations will be useful in future routing. The proposed algorithm is easy to implement and compatible with popular routing protocols, such as the Routing Information Protocol in wired networks and Destination-Sequenced Distance Vector Protocol in wireless networks, without introducing extra control messages.

METHODS APPLIED

BELLMAN FORD ALGORITHM

Bellman Ford algorithm computes single source shortest paths in a weighted digraph. For graphs with only non-negative edge weights, the faster Dijkstra‟s algorithm also gives solution to the problem. Thus, Bellman Ford is used for graphs with negative edge weights. Bellman Ford‟s basic structure is very similar to Dijkstra‟s algorithm, but instead of greedily selecting the minimum-weight node not yet processed to relax, it simply relaxes all the edges, and does this |V|-1 time, where |V| is the number of vertices in the graph. The repetitions allow minimum distances to accurately propagate throughout the graph, since, in the absence of negative cycles; the shortest path can only visit each node at most once. Unlike the greedy approach, which depends on some specific structural assumptions derive from positive weights; this straight forward approach extends to the general case.

ROUTING INFORMATION PROTOCOL

The Routing Information Protocol (RIP) is a distance vector routing protocol, which employs the hop count as a routing metric. The hold down time is 180 seconds. This protocol prevents routing loops by implementing a limit on the number of hops allowed in a path from source to destination. The maximum number of hops allowed for RIP is 15. The hop limit, however, also limits the size of networks that RIP can support. A hop count of 16 can be considered an infinite distance and used to deprecate inaccessible, inoperable, or otherwise undesirable routes in the selection process. RIP implements the split horizon, route positioning and hold-down mechanisms to prevent in-correct routing information from being propagated. These are some of the stability features of RIP. It is also possible to use the Routing Information Protocol with Metric-based Topology Investigation (RMTI) algorithm to cope with the count-to-infinity problem. With its help, it is possible to detect every possible loop with a very small computation effort.

DESTINATION SEQUENCED DISTANCE VECTOR ROUTING

Destination-Sequenced Distance-Vector Routing (DSDV) is a table-driven routing scheme for ad-hoc mobile networks based on the Bellman Ford algorithm. The main aim of the algorithm was to solve the routing loop problem where each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present or else an odd number is used. The routing information is distributed among the nodes by sending full dumps infrequently and smaller updates more frequently which are incremental. The procedure in section of the router is as follows. If a router receives a new information, them it uses the latest sequence number. If the sequence number is same as the one which is already present in the table, then the route with the better metric is used. And the left over entries which have not been updated for a while are called stale entries. Such entries and the routes using those nodes as next hops are deleted.

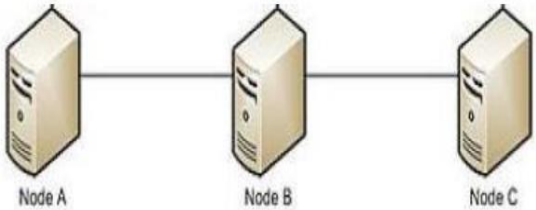


Figure-1

RANDOMIZATION PROCESS

Consider the delivery of a packet with the destination t at a node Ni. In order to minimize the probability that packets are eavesdropped over a specific link, a

randomization process for packet deliveries. In this process, the previous next hop hs for the source node s is identified in the first step of the process. Then, the process randomly picks up a neighbouring node in excluding hs as the next hop for the current packet transmission. The exclusion of hs for the next hop selection avoids transmit- ting two consecutive packets in the same link, and the randomized pickup prevents attackers from easily predicting routing paths for the coming transmitted packets.

ROUTING TABLE MAINTAINENCE

Let every node in the network be given a routing table and a link table. We assume that the link table of each node is constructed by an existing link discovery protocol, such as the Hello protocol. On the other hand, the construction and maintenance of routing tables are revised based on the well-known Bellman-Ford algorithm. Bellman-Ford algorithm computes single source shortest paths in a weighted digraph. For graphs with only non- negative edge weights, the faster Dijkstra's algorithm also gives solution to the problem. Thus, Bellman–Ford is used for graphs with negative edge weights. Bellman–Ford,,s basic structure is very similar to Dijkstra's algorithm, but instead of greedily selecting the minimum-weight node not yet processed to relax, it simply relaxes all the edges, and does this |V | − 1 times, where |V | is the number of vertices in the graph. The repetitions allow minimum distances to accurately propagate throughout the graph, since, in the absence of negative cycles, the shortest path can only visit each node at most once. Unlike the greedy approach, which depends on some specific structural assumptions derived from positive weights, this straightforward approach extends to the general case.

4. CONCLUSION AND FUTURE SCOPE

Implementation of the Randomization process and Routing Table Maintenance. An analytic study on the proposed algorithm will be presented, and a series of simulation experiments will be conducted to verify the analytic results and to show the capability of the proposed algorithm.

The Routing Table of Node-A in the network-

Destination	Next Hop	Number of Hops	Sequence Number
A	A	0	A46
B	B	1	B36
C	B	2	C28

Figure-2

3.3 ROUTING AND SECURITY CONSIDERATIONS

For security purpose, for delivering a data packet we use randomization process and maintain routing table based on bell-men ford algorithm.

REFERENCES

1. T.H. Cormen, C.E. Leiserson and R.L. Rivest, Introduction to Algorithms.
2. D. Collins, Carrier Grade Voice over IP. McGraw-Hill, 2003.
3. G. Malvin, Routing Information Protocol (RIP) Version 2 Carrying additional Information, Request for comments (RFC 1723), Nov. 1994.
4. Secure Socket Layer (SSL), http://www.openssl.org/, 2008.
5. P. Erdo¨s and A. Re´nyi, “On Random Graphs,” Publicationes Math.Debrecen, vol. 6.
6. Lou, Wenjing, and Yuguang Fang. "A multipath routing approach for secure data delivery." Military Communications Conference, 2001. MILCOM 2001.
7. Communications for Network-Centric Operations: Creating the Information Force. IEEE. Vol. 2. IEEE, 2001.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

ELECTRONIC MARKETPLACE FOR COMPUTING CAPITAL WITH BLOCK-CHAIN TECHNOLOGY

[1]Mr. Sridhar Gummalla, [2]Mr. Syed Hussain, [3]Mr. Mekala Reddy
[1]Professor , [2]Associate Professor, [3]Assist professor
[1,2,3] Dept of CSE,Shadan College of Engg & Tech

ABSTRACT

We developed a blockchain-based E-marketplace. A decentralized E-marketplace platform utilizing the blockchain technology is implemented. We use the self-enforcement of smart contracts to secure the deposit and process the payment. Each transaction is verified through the blockchain and is recorded to the decentralized ledger. This enables trustless transactions since the smart contract is self-executed. The smart contract is able to perform credible transactions without trusted third parties, and the transactions on the blockchain are trackable and irreversible. Therefore, both the buyer and the seller cannot breach the contract. All processes are recorded on the blockchain including the product launch, purchase, delivery, and payment. It is trackable and could be submitted to courts as electronic evidence to solve the transaction disputes.

1.2 OBJECTIVE

The smart contract is able to perform credible transactions without trusted third parties to improve the customer experience by the efficient delivery of the content and the rapid responses to the customers' demands. It will bring some benefits such as increase traceability, tamper resistant, and ensures that trust is achieved without the need for centralized power. Better experience in pervasive e-commerce.

1.3 EXISTING SYSTEM

- The current e-marketplace ecosystem evolved from Internet technologies.
- It plays an important role in the global economy.
- But the existing system is unable to improve the customer experience by the efficient delivery of the content and the rapid responses to the customers' demands.

More time and cost is required

1.1PROPOSED SYSTEM

- In this paper we use the self-enforcement of smart contracts to secure the deposit and process the payment.
- Each transaction is verified through the blockchain and is recorded to the decentralized ledger.
- The smart contract is able to perform credible transactions without trusted third parties, and the transactions on the blockchain are trackable and irreversible.

Unable to meet customer demands

PROPOSED SYSTEM ADVANTAGE

- Able to improve the customer experience by the efficient delivery of the content and the rapid responses to the customers' demands.
- Better experience in pervasive e-commerce

3. Conclusion

The pervasive applications are able to improve the customer experience by the efficient delivery of the content and the rapid responses to the customers' demands. Therefore, to have a better experience in pervasive e-commerce, it is very important to ensure the normal execution of all aspects to complete the purchase. We believe that the blockchain-based E-marketplace can offer many advantages for e-commerce, that will bring some benefits such as increase traceability, tamper resistant, and ensures that trust is achieved without the need for centralized power. It also means that consumers have greater transparency and power. There is no central control, which prevents from the monopoly of large companies. The smart contract brings some benefits are overbooking prevention, double-spending prevention, lower transaction costs, and fraud prevention. As we know, bitcoin is the first cryptocurrency and it is truly borderless. It also means the payment will be efficient, fast, and cost-reduced for blockchain-based electronic marketplace. Currently, we are wrapping up our system, blockchain technology, and decentralized application to build a public chain for future experiments.We also anticipate the application of blockchain technology in mobile computing advertising.

REFERENCE

[1] S. Nakamoto, "Bitcoin: A peer-to-peer electronic cash system," 2008.

[2] G. Wood, "Ethereum: A secure decentralised generalised transaction ledger," pp. 1–32, 2014, in Ethereum project yellow paper.

[3] K. Christidis and M. Devetsikiotis, "Blockchains and smart contracts for the internet of things," IEEE Access, vol. 4, pp. 2292–2303, 2016.

[4] H. Lycklama `a Nijeholt, J. Oudejans, and Z. Erkin, "Decreg: A framework for preventing double-financing using blockchain technology," in Proceedings of the ACM Workshop on Blockchain, Cryptocurrencies and Contracts, ser. BCC '17. New York, NY, USA: ACM, 2017, pp. 29–34. [Online]. Available: http://doi.acm.org/10.1145/3055518.3055529

[5] A. Azaria, A. Ekblaw, T. Vieira, and A. Lippman, "Medrec: Using blockchain for medical data access and permission management," in 2016 2nd International Conference on Open and Big Data (OBD), Aug 2016, pp. 25–30.

[6] C. Hall, C. Alt, L. Q. Q. Cuong, and S. Moss-Pultz, "Bitmark: The property system for the digital environment." 2016. [Online]. Available: https://bitmark.com/assets/bitmark-technical-white-paper.pdf

[7] Y. Zhang and J. Wen, "An IoT electric business model based on the protocol of bitcoin," in 2015 18th International Conference on Intelligence in Next Generation Networks, Feb 2015, pp. 184–191.

[8] F. Tian, "An agri-food supply chain traceability system for china based on rfid amp;amp; blockchain technology," in 2016 13th International Conference on Service Systems and Service Management (ICSSSM), June 2016, pp. 1–6.

[9] H. Zhu and Z. Z. Zhou, "Analysis and outlook of applications of blockchain technology to equity crowdfunding in China," Financial Innovation, vol. 2, no. 1, p. 29, Dec 2016. [Online]. Available: https://doi.org/10.1186/s40854-016-0044-7

[10] S. Wang, Y. Yuan, X. Wang, J. Li, R. Qin, and F. Wang, "An overview of smart contract: Architecture, applications, and future trends," in 2018 IEEE Intelligent Vehicles Symposium (IV), June 2018, pp. 108–113.

[11] J.-H. Wu and T.-L. Hsia, "Developing e-business dynamic capabilities: An analysis of e-commerce innovation from i-, m-, to u-commerce," Journal of Organizational Computing and Electronic Commerce, vol. 18, no. 2, pp. 95–111, 2008.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

ENHANCED SECURITY FOR ONLINE EXAMS USING GROUP CRYPTOGRAPHY

[1]Dr.Muntha Raju, [2] Mr. Runja Suvarna Rao, [3] Ms. Rizwana Khatoon 3
[1]Professor[2] Associate Professor, [3] Assist professor
[1,2,3] Dept of CSE , Shadan College of Engg & Tech

ABSTRACT: Online exam is field that is very popular and made many security assurances. Then also it fails to control cheating. Online exams have not been widely adopted well, but online education is adopted and using allover the world without any security issues. An online exam is defined in this project as one that takes place over the insecure Internet, and where no proctor is in the same location as the examinees. This project proposes an enhanced secure filled online exam management environment mediated by group cryptography techniques using remote monitoring and control of ports and input. The target domain of this project is that of online exams for any subject's contests in any level of study, as well as exams in online university courses with students in various remote locations. This project proposes a easy solution to the issue of security and cheating for online exams. This solution uses an enhanced Security Control system in the Online Exam (SeCOnE) which is based on group cryptography with an e-monitoring scheme.

1. INTRODUCTION:

Education has expanded rapidly. Even so, the off-line test is usually chosen as the evaluation method for both off-line education and online education. The se- curity of online examinations remains a problem. In some cases, the person writing the exam on a networked computer is moni- tored by a proctor at some predetermined location. But, the requirement for an exam location goes against the accessibility, the major attraction of e-learning or distance learning. The requirement may also negate the cost savings generated by e-learning or pose obstacles for remote students. Simplification and automation of educational processes are other benefits of online educatio, and online exams inherit these advantages.

To remove the requirement for human intervention in secure online exam management so as to capitalize on the advantages of online processes, this paper proposes a solution to the issue of security and cheating for online exams. This solution uses an en- hanced Security Control system in the Online Exam (SeCOnE) which is based on group cryptography with an e-monitoring scheme. The cryptography supports enhanced security control for the online exam process, as well as authentication and in- tegrity. The e-monitoring provides a proctor function to remote examinees to prevent cheating, and thus removes the require- ment of having to go to a fixed location. The target of this paper is online exams for mathematics or English contests in middle or high school, and exams in online university courses with stu- dents at remote locations. This paper addresses the problem of administering an online exam at a fixed time with the same ques- tions for all examinees, just like an off-line exam, but without re- stricting the physical location of the examinees. As the SeCOnE system enables many kinds of tests to be given online, it can pro- vide teachers with better evaluation standards for students and may contribute to improving the quality of education.

Requirements For A Secure Online Exam

The requirements for a secure online exam are as follows.

- Accessibility Online exams should be possible without re- gard to location and time.
- Monitoring The absence of proctoring on online exams may relax the examinees and encourage cheating. Therefore, it is necessary for an online exam manage- ment system to have some monitoring method to prevent and to detect cheating.
- Management Online exam management includes

problem creation, problem sheet distribution, answer sheet collec- tion, marking, grade posting, and handling of appeals. The cost savings of online exams mitigate the burden of exam enforcement and induce many examinees located at very remote sites to participate in the exam. Educators can ob- tain more objective standards for evaluation.

The automatic management of exams lets the examinees know their exam performance very quickly. Online exams permit both edu- cators and examinees to achieve their objectives efficiently.
An online exam should also have the following features.

- Authenticity The identities of the examinee, examiner, marker, and proctor should be all authenticated and veri- fied at every step in the online exam process, because it is difficult to identify them "face-to-face" online.

Existing System:

- Different cheating patterns exists in current system including copying the answers of others, exchanging answers, searching the Internet for answers, using the data and software saved on the student's local computer and discussing the exam by e-mail, phone, or instant messaging.

Disadvantages:

1) Level of communication between teachers and students decreases.
2) The tendency to cheat by students increases.
3) The system must rely on students' honesty or their having an honor code

Proposed System:

- This project proposes a solution to the issue of security and cheating for online exams. This solution uses an enhanced Security Control system in the Online Exam (SeCOnE) which is based on group cryptography with an e-monitoring scheme.
- The cryptography supports enhanced security control for the online exam process, as well as authentication and integrity. The e-monitoring provides a proctor function to remote examinees to prevent cheating, and thus removes the requirement of having to go to a fixed location. The target of this project is online exams of any type and exams in online university courses with students at remote locations.
- Project proposes administering an online exam at a fixed time with the same questions for all examinees, just like an off-line exam, but without restricting the physical location of the examinees. As the SeCOnE system enables many kinds of tests to be given online, it can provide teachers with better evaluation standards for students and may contribute to improving the quality of education.

Advantages:

1) Online exam management system having some monitoring method to prevent and to detect cheating.
2) Without regard to location and time.
3) Avoid intercepting or interfering with communications during an online exam.

An Enhanced Security Control In The SeCOnE System:

A. Architecture of the SeCOnE System

As shown in Fig. 1, all entities in the SeCOnE system per- form their roles as members of either group
or . re- ceives the problems and the right answers from, and then distributes the problems and collects the answer sheets from . A proctor monitors the examinees through using the mon- itor data in . Through , an examinee belonging to and managed by, can take the online exam. The group agents andcreate a set of public and private keys [20] for each group. They distribute this set of keys to their group members at each exam, and exchange the public keys with each other. The public key of each group is used for secure intergroup commu- nications.
For secure communications among group members, they use the symmetric keys created by the Diffie- Hellman key exchange [21].

B. Equipment

The examinees' computers should be equipped with We- bcams and microphones. High-quality Webcams are readily available now and are constantly improving [22], [23]. There- fore, the use of Webcams in online exams is not considered unreasonable.

C. The SeCOnE System Software

The SeCOnE system software is divided into two parts de- pending on the role, that is, whether it is on the client side, or server side. The operating system of the examinees' computers and the proctor's computer is assumed to be Windows XP or Windows 2000. However, the program semantics are not confined to Win- dows because the APIs to control the examinee's computer and to handle the multimedia data are also available in Linux and Unix environments.

Fig. . The system architecture of SeCOnE.

1) Server Side:

- **Scheduler**

As shown in Figs. through the Examiner/Ex-
aminee management module, obtains the temporary identity of the examinerfrom directly when an online exam is set up. The identity is encrypted with the symmetric key shared byand . To input the problems, the right answers, the exam duration, and the time assigned for each problem, the examiner is verified through with by the Exam Setup Management module in .

Through the Problem/Answer Management module, the problems, the right answers, and the time allocated to the problems are saved in the database (DB), which is accessed only by . When connects to with its identity,and its IP, , the Examiner/Examinee management module.

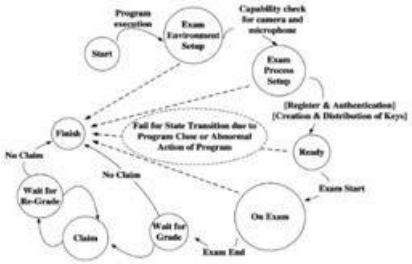


Fig. . Online exam client state transition diagram.

Fig. . Monitor server architecture.

Sends them to and requests the verification of the ex- aminee. Asis encrypted with ,cannot know its identity nor can verify the
examinee. After the verification,savesand
in the DB and sends to . Then, it sends the prob- lems and the time assigned for the examto through the Exam Process Management module. According to the exam management policy of the SeCOnE system, at the end of the exam or earlier, the answer sheets submitted by the examinees are delivered to the Exam Process Management module, which saves the answers in the DB, then the Grade Management module marks them with the correct answers provided by . The grades are also kept in the DB. The an- swer sheets marked by can be referenced by through the Grade Management module when subjec- tive questions are included in the problems. The grades are distributed to the s after all the examinees have submitted their answer sheets. If an examinee, whose identity is, is not satisfied with his or her grade , he or she sets up an appeal to through the Exam
Process Management module. The claim is delivered to through the Claim Manage- ment module, and a regrading is initiated. The Time Control module manages the exam time, and the Exam State Management module checks the states of all s according to Fig. 4. The Authentication Management module is responsible for the integrity checking of the communication messages and the examinee authentication. The inquiries from the examinees during the exam are managed by Question management. Inquiries are saved in the DB first so that can provide the replies for them one by one. When the replies are checked by the Question Management module, they are immediately transmitted to the ,

which sent out the questions. Secure intragroup communication goes through the Intragroup Communication Control module in . This module manages the symmetric keys shared between and the other members in .

• Monitor ServerAsshown in Fig. , when the Examinee Management module in receives the examinee's IP from, it prepares a directory to save the monitor data of the examinee in a file server. The module also verifies the examinee by comparing the IP with that from as shown in Fig. 2. The monitor data are saved with the reference photos for the examinees from ; the photos were taken when authenticated the exam- inees. During or after the exam, a proctor connecting through

can verify an examinee by comparing the stored reference photo and the monitor data. TheOnline Exam Client Handler module notifies the ports to which video, audio, and screen captures of are sent. Then, the three types of the monitor data are managed through the Video Stream Management, Audio Stream Management, and Screen Capture Management modules, respectively. Before the exam starts, a proctor should connect to through and test.

2. CONCLUSION:

This paper describes how the SeCOnE system provides both a secure online exam management and a scheme for the preven- tion and detection of cheating using e- monitoring. The measures for preventing and detecting cheating proposed in this paper cover cheating methods identified for the online exam process via computer or Internet, although it may not address all possible cheating methods. This paper is targeted towards exams admin- istered through the Internet at a fixed time with one problem set, but without any restriction on the exam location. A powerful feature is that SeCOnE can be applied to an exam administered at different times. In this case, the examiner should prepare as many problem sets as there are exam times, in order to prevent cheating during the exam. One overhead cost for this system is in the preparation of the equipment, such as Webcams and microphones, to monitor and to authenticate the entities. A net- work load due to monitor data transfer and the storage is another overhead to be considered, but this is not a major obstacle when data compression is used and more monitor servers are prepared.

REFERENCES:

1. Golden Gate University [Online]. Available: http://www.ggu.edu/cy- bercampus/DegreesCourses/ClassSchedule
2. Univ. Phoenix Online [Online]. Available: http://online.phoenix.edu/ Degree_Programs.asp
3. New York University [Online]. Available: http://www.scps.nyu.edu/ areas-of-study/online/
3. C.-R. Jordi, H.-J. Jordi, and D.-J. Aleix, "A secure E-exam manage- ment system," in Proc. 1st Int. Conf. Avilabil., Reliab. Security, 2006.
4. TOEFL [Online]. Available: http://www.ets.org/bin/getprogram.cgi?Source=toefl&newRegURL=&test=TOEFL&greClosed=new &greClosedCountry=China&browserType=Other &toeflType=&redirect=&t_country1=group_Kore a%28Rok%29
5. C. C. Ko and C. D. Cheng, "Secure Internet examination system based on video
6. monitoring," Internet Res.: Electron. Netw. Appl. Policy, vol. 14, no. 1, pp. 48–61, 2004
7. The Blackboard Northern Illinois Univ. [Online]. Available: http://www.blackboard.niu.edu/blackboard/
8. C. Rogers, "Faculty perceptions about e- cheating during online testing," J. Comput. Sci. Colleges, vol. 22, no. 2, pp. 206–212, 2006.
9. D. L. McCabe, L. K. Trevino, and K. D. Butterfield, "Cheating in aca- demic institutions: A decade of research," Ethics Behav., vol. 11, no. 3, pp. 219–232, 2001.
10. W. L. Goffe and K. Sosin, "Teaching with technology: May you live in interesting times," J. Econom. Educ., vol. 36, no. 3, pp. 278–291, 2005.
11. J. C. Adams and A. A. Armstrong, "A Web- based testing: A study in insecurity," World Wide Web, vol. 1, no. 4, pp. 193–208, 1998.
12. D. Agarwal, O. Chevassut, M. R. Thompson, and G. Tsudik, "An in- tegrated solution for secure group communication in wide-area net- works," in Proc. IEEE Symp. Comput. Commun., 2001, pp. 22–28.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

COMPARATIVE ANALYSIS OF CAPITAL MARKET AND PERFORMANCE

[1]Dr. Khaleeq urRaheman, [2]Mohammad Ikramullah Aman, [3]Husna Zafar
[1] Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana.
[2] Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana.
[3] Assistant Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana

ABSTRACT- Stock futures are derivative contracts that provide you to get or sell a couple of stocksat a set price by a specific date. Once you get the contract, you are obligated to uphold the conditionsof the agreement. It allows hedgers to shift risks to speculators.It gives traders a competent notion of what the futures price of a stock or value of an index mayvery well be. Based on the existing future price, it can help in identifying the near future demandand offer of the shares.Since it really is predicated on margin trading, it allows small speculators to participate and tradein the futures market by paying a little margin rather than the whole value of physical holdings.
KEYWORDS: Comparative Analysis of capital market and performance

1. INTRODUCTION:

This undertaking will be useful for people who need to put resources into a cash related exchangeor who need to consider the showcase of securities exchange and this task divulgences andrecommendations are helpful to get benefits for an extended length and passing inspectors.Relative financing cost impacts trading scale through changes in capital streams. Regardless,capital streams are not coordinated by relative development cost alone. For instance, in India andChina capital inflows as outside direct undertaking (FDI) are happening an aftereffect of higherpace of return that remote analysts (i.e., overall affiliations) might want to acquire in these nationsthan in their nuclear family economies.

2. MARKET AND PERFORMANCE:

The affiliation coefficient is a genuine measure that forms the idea of the relationship between thegeneral enhancements of the two factors. The degree of attributes for the relationship coefficientobliged by 1.0 on a level out worth explanation or between - 1.0 to 1.0. In the event that therelationship coefficient is more obvious than 1.0 or not really - 1.0, the affiliation estimation ismisinformed. A relationship of - 1.0 shows an ideal negative relationship, while a relationship of1.0 displays an ideal positive affiliation. A relationship of 0.0 shows zero or no relationshipbetween the improvement of the two components

Above all else, make it unsurprising to work together in India. The most noteworthy need for anyfinancial specialist is to believe that the ref won't change the standards of the game halfway, in anyevent not all of a sudden.

There have been numerous changes in the previous not many years that have brought India'spositioning up in the simplicity of working together by around 100 positions. In any case, Indianassembling has scarcely mixed. A considerable lot of the choices have made more alarm thanenergy in view of their suddenness and intervention. Speculators need long haul security of termsof working together more than quick simplicity before submitting billions, particularly ingreenfield ventures.

3. LITERATURE REVIEW :

In India to succeed, India needs to decide. Beginning with the GARR proposition of2009, India's financial arrangement making has been directed by the state's need of blocking chargespillage and expanding its duty income. Observation and examination of business have overwhelmed the advancement and backing of venture. The worry for condition has additionally been applied obtusely to make it hard to set up new manufacturing plants.

The legislature has done a great deal to bring down the expense of working together; for instance,the ongoing lure of 17 percent charge for interest in assembling if creation starts beforeOctober 2023. Many state governments have shortened or suspended work security laws to add tothe arrangement. In any case, financial specialists are frightened by the suddenness and mediationof these choices. They need significant serenity more than the present arrangement.

The second thing that India needs to make fabricating

blast is digitization and robotization of assembling. New advancements consistently grow industry byacquiring new pioneers, newfinancial specialists and better laborers, which prompts production of new interest, yield andemployments.

The covid emergency has made a lucky opening for quick enlistment of innovation in assembling.Every emergency separates protection from change and the scars of emergency persuade allpartners to guarantee that they don't endure a similar destiny once more.

The lockdowns featured the weakness of creation to illness and bans. Indeed, even as industrialfacilities revive, they have continued with just halfway staff and creation. The more mechanizedand associated production lines have fared much better and their representatives have kept onworking and get paid.

Exercise scholarly, most makers are rethinking the capital-work condition. As investors comearound to tolerating additional underlying expense for continuous incomes, the interest fordigitized, computerized fabricating is set to blast. Indian assembling can't stand to be out of syncwith this worldwide move.

Obviously, mechanization will forestall reclamation of a great deal of the positions lost to the coviddisturbance. A ton of more established laborers should discover elective occupations or getretrained to rival more youthful, computerized local specialists.

We should guarantee that in certain vital regions, India demands high nearby worth expansion withthe goal that not exclusively will it get the most recent innovation, it will likewise prompt theredesigning of our laborers' abilities. Like China constrained Airbus to make traveler planes andGE to make stream motors locally, the size of our market gives India the influence to get theindividuals who wish to take an interest in our business sectors, fabricate a more prominent extentof their segments and items in India.

Indeed, this change is an incredible open door for Indian assembling to eat into the administrationdivision's incomes. As propensities for social separating and touchless utilization create, theinterest will move towards items that can be introduced, utilized and overhauled through web of things. Digitization of items would permit makers to have direct relationship with the clients andget more for their yield by transforming items into administrations. Mechanical clients wouldincline toward having advanced twins of their basic gear with the producers for remote executioncontrol and prescient upkeep.

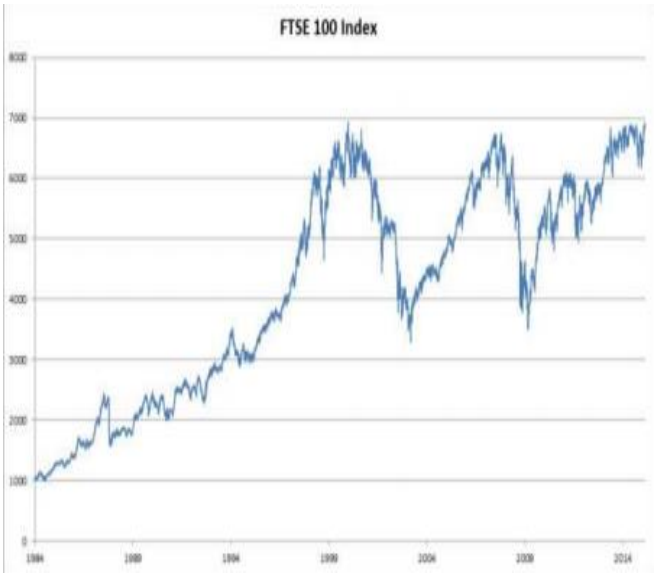
The third thing that India must do to make producing a major piece of its economy is make itsimple to import and fare. Locally arranged assembling is consistently wasteful and inflationary.Insurance from ruthless acts of remote contenders is essential however a more noteworthy needmust be given to making economic agreements to pre-empt such practices.

Indian organizations need consolation and backing for both sending out from India and assemblingabroad. Except if Indian makers become essential to worldwide gracefully chains, their capacityto ingest the best advancements and make the best items, best case scenario costs will stayconstrained. At last, the most open economies make the fiercest contenders.

Giving assembling the most elevated need is the best way to resuscitate Indian economy and keepits development stable. Covid has made an open door for a reset of the assembling area and Indiacan't bear to neglect this chance.

Note to perusers: Make In India — Reboot is a progression of articles that will investigateapproaches to revive fabricating in India.

4. DATA ANALYSIS:



We have a genuinely decent framework to help new businesses in the beginning period, which isin the scope of 50,000 to 150,000 for every startup. In this way, that framework is functioningadmirably. Also, when they develop, the expectation is that VCs will support it however that issomewhat powerless.

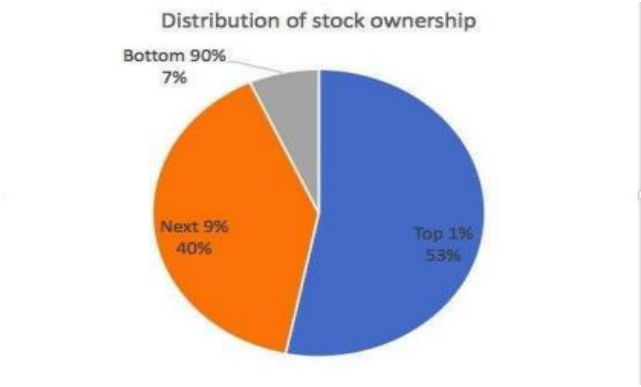
We have to proactively work with financial specialists, when they come, we should not say 'alrightthis is our information, you pick the one and go', rather we work with them and disclose to themwhy they can get amped up for this and we cooperate to subsidize.

This is the place our genuine test begins. I don't think there are supports that can give anyone $520million until further notice. In India that is not occurring for

dangerous thoughts.

I have by and by sent numerous notes to the administration where a case has been made sayingthat correct now private species are not coming would we be able to have a plan to increase their

subsidizing. Would we be able to have a hazard thought store or profound tech support for theinitial two years or three and check whether different VCs come We need to think of an answeron the off chance that we need to hold the best of our advancements.



5. RESEARCH METHODOLOGY:

Data source

• Primary data source: Interviews, singular overviews

• Secondary data source: Internet, sees, destinations, association brouchers, resource reports, etc.

• Statistical instruments:- coefficient association using MS surpass desires web gadget Test plan

• Past 5 years Quantifiable gadgets

• coefficient relationship

As it will require some investment, we should depend on inner things on account of which a greatdeal of apparatus has been oiled up pleasantly. There's a great deal of between departmental,between pastoral large picture advancement occurring.

Investors are seeing that we can convey and ideally that will begin bringing some cash. Theadministration has comprehended that they need to keep their development capital prepared andcontinue subsidizing them to react to this time.

That will occur in scholarly science just as business visionary parts of it.

India's issues are unique in relation to worldwide issues. They require an understanding andindigenous advancements are the best answers for them, COVID or not.

6. DISCUSSION:

Market in India crushedchina is second most grounded economy thusly any stoppage will have impact on the worldeconomy due to their things demand drops they have a standout amongst other copper buyer soany progressively moderate deals will have sway in metals and it will when everything is said indone be compelled time if influence isn't dead genuine.

Any stoppage will affect

1 Indian it affiliations remuneration comes areound45% of different essential itrelationship thusly any stoppage hampers its improvement affiliations.

2 Dollar and rupee looking over happens on account of premium and nimbly thusly thislikewise recognize important development in differentiation in protections trades Endrelationship of thing and dollar have sway on protections trade and economy any log jam by andlarge improvement or in any huge economy like usa and china have sway on stock exchange andeconomy like thing front .

So any impact, considering, mental than central and routinely is obliged and recovers in couple ofmonths.

Various supports like us puts on iranindias significant supplier of bothersome of india so right byand by need to pig out spend more to get deftly as a result of buying from the elective countriesor section plan in genuine cash other than dollar

7. CONCLUSION:

India's assembling segment has neglected to stay aware of the development of the general economyand a lot of the nation's yield has contracted to around 15 percent. Since the 1990s, India's monetaryapproach creators have given all their affection to administrations and assembling has retreated toa below average status in the economy. Feeble motivating forces and unbalanced exchange accordshave guaranteed that India's utilization development has not profited Indian makers much.

Much commotion has been made over the previous decade about reestablishing assembling to itssituation of the maker of occupations and financial soundness, however a lot of what has been donehas neglected to dazzle speculators.

REFERENCE:

Destinations

Destinations

1. Chen, L. what's more, Wong, A. (2004), Is Rate of Stock Returns a Leading Indicator of OutputGrowth? On the off chance that there ought to be an event of Four East

2. Asian Countries, Unpublished. In, M. Shahbaz, N. Ahmed and L. Ali (2008), Stock MarketDevelopment and

3. Money related Growth: ARDL Causality in Pakistan, International Journal of Finance andEconomics, 14: 182-195.

BOOKS

4. Foreign Exchange Arithmetic-M.jeevanandam

5. International cash related organization Prasanna Chandra

6. International cash related organization P.G.Apte

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

TO STUDY THE EFFECTIVENESS OF PERFORMANCE APPRAISALSYSTEM ATCAPITAL IQ INDIA PVT LTD

[1]Mr. Mohd Zakir Ali,[2]Mohammad Ikramullah Aman, [3]Mrs.Shaik Shameem
[1] Assistant Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana.
[2]Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana.
[3] Assistant Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana

ABSTRACT:Performance Appraisal has been considered as the most significant and indispensable tool for an organisation, for the information it provides is highly useful in making decisions regarding various personnel aspects such as promotion and merit increase. Performance measures also link information gathering and decision-making process which provide a basis for judging the effectiveness of personnel sub-divisions such as recruiting, selection, training and compensation.This research will concentrate on examining the effect of the performance appraisal on individual as well as on the organisations. The sample size of 100 has been chosen from the CAPITAL-IQ PVT LTD. The data used for study is primary data collected through the help of questionnaire filled by the samples. The data was evaluated with the help of statistical tools i.e., descriptive statistics. The findings of the research show that.Performance appraisal in CAPITAL-IQ meets the most important function of performance appraisal itself that is improvement of performance. Performance appraisal in the past helped them in getting promotion. Employees find their superior to be helpful and co-operative.

KEY WORDS:
Performance Appraisal, Recruitment, Selection, Training, Personal Qualities, Employer, Employee, Feedback, Compensation

1 INTRODUCTION:

Performance Appraisal (PA) has been considered as the most significant an indispensable tool for an organisation, for the information it provides is highly useful in making decisions regarding various personnel aspects such as promotion and merit increase. Performance measures also link information gathering and decision-making process which provide a basis for judging the effectiveness of personnel sub-divisions such as recruiting, selection, training and compensation.Constant appraisal of each associate should be to contribute by all chances towards the achievement of its objective. hierarchic feasibility is as all now and again as possible separated and body capability. In like manner, since the organization exists to accomplish the objectives, the PA of accomplishment that individual specialists have in achieving this individual objective is critical to pick hierarchic adequacy. The assessment of at any rate gainful specialists is at the social gathering their objective to return to a crucial piece of human in spite of the pros.

1.2 NEED FOR THE STUDY:

Performance appraisal should be a positive experience and contribute to the overall welfare of the organization. If done properly, performance appraisal is a very effective tool to improve performance, productivity and for developing employees. It helps individuals to do better, raises self-esteem and motivation. To give appraisal data concerning the degree of accomplishments and course of an operator. Evaluation of an employee's performance helps to take management decisions on transfers, promotions, increments etc. 2. Performance appraisal helps to ascertain the training and development needs of the employer. It ensures basic data concerning staff and right now outline of their commitments.

1.3 OBJECTIVES:

1. To identify the factors for appraising the performance of employees.
2. To assess the techniques used by the company in appraising performance of employees.
3. To suggest measures to improve performance of employees.

1.4RESEARCH METHODOLOGY

Research Design:

A Descriptive Research Design has been adopted and a Survey Method has been used.

Survey method was careful used and a structured questionnaire was administered through personal contact method to employees of CAPITAL IQ. The instrument is a self- completion questionnaire delivered to the respondents personally by the researcher.

Sources of Data collection

Primary Data

Primary data was collected from the employees of CAPITAL IQ.

Secondary Data

The secondary data sources included.

- Available research work in national and international journals
- Data existing on websites
- Text books, magazines & newspapers.

Sampling Plan:

Sampling Method

Stratified sampling method and convenient sampling method were used.

Population comprised of total number of employees working in CAPITAL IQ Kondapur Village, Serilingampally Mandal, Hyderabad, Telangana, India.

Sample size

100 Employees were randomly selected from different departments and different levels of the organisation using the above-mentioned methods.

Period of Study:

The primary data was collected from the employees of the organization and the project was completed during 6-month period from Jan 2019 to May 2019.

Survey Instrument

The survey instrument is a questionnaire consisting of 20 questions related to employee performance appraisal of the organization. The questionnaire consisted of dichotomous and multiple-choice questions.

Study Area

This study was conducted in CAPITAL IQ Kondapur Village, Serilingampally Mandal, Hyderabad, Telangana, India.

Participants

Respondents were the employees of the CAPITAL IQ

1.5 LIMITATIONS OF THE STUDY:

1. The findings cannot be generalized for the whole population.
2. Many employees carry apprehension and to some extent hesitation in undergoing appraisal and evaluation, hence may express inaccurate perception towards the services.
3. There are chances that the people may not deliberately report their true opinion owing to some bias.
4. The secondary data collected for this study may also carry limitations inherent in it indicating that accuracy of results of this study depends on the accuracy of data collected from both primary and secondary sources.

2 REVIEW OFLITERATURE:

2.1 THEORETICAL BACKGROUND

2.1.1 PERFORMANCE APPRAISAL

Performance Appraisal is a method of determining and measuring the performance of employees working in an organization. It is a means company to identify how much their employees are contributing to it. Performance appraisal is also termed as employee appraisal, annual review, or performance review. It is an effective tool which helps in recognizing the strengths and weakness of employees thereby understanding their abilities for further development and growth. Recognizing of potentials of all employees helps in placing the right man in the right position which helps in improving productivity.

Performance appraisal helps managers in accessing actual worth of their employees which helps in deciding their pay and bonuses. Managers are able to provide feedback to their employees regarding their performance and provide them with training accordingly. It helps in taking various important decisions like promotion, demotivation, and termination for employees. It helps in regularly comparing the operations of employees with targeted plans and taking necessary actions if any deviations are detected. Fair allocation of funds is necessary as it is limited to every company. As showed up by Ronald Benjamin, "performance appraisal acknowledges World Health Organization can get realness delivers, information's master's ob their improvement decides to mastermind needs picks productivity, sees the people World Health Organization considered the to be entryway as moved".

Promotion Decisions

Performance appraisal is a tool which helps managers to take promotion or demotion decisions. This method assesses the performance level of employees. Efficient workers can be promoted to a higher level whereas inefficient one can be demoted.

Provides Feedback

2.1.2 Six modern performance appraisal methods

With the right performance appraisal method, organizations can enhance employee performance within the organization. A good employee performance review

method can make the whole experience effective and rewarding.

1. Management by Objectives (MBO)

Management by objectives (MBO) is the appraisal method where managers and employees together identify, plan, organize, and communicate objectives to focus on during a specific appraisal period. After setting clear goals, managers and subordinates periodically discuss the progress made to control and debate on the feasibility of achieving those set objectives.

This performance appraisal method is used to match the overarching organizational goals with objectives of employees effectively while validating objectives using the SMART method to see if the set objective is specific, measurable, achievable, realistic, and time-sensitive.

At the end of the review period (quarterly, half-yearly, or annual), employees are judged by their results. Success is rewarded with promotion and a salary hike whereas failure is dealt with transfer or further training. This process usually lays more stress on tangible goals and intangible aspects like interpersonal skills, commitment, etc. are often brushed under the rug.

Performance management- Management by Objectives appraisal method

Incorporating MBO into your performance management process

To ensure success, the MBO process needs to be embedded in the organizational-wide goal setting and appraisal process. By incorporating MBO into the performance management process, businesses can improve employee's commitment, amplify chances for goal accomplishment, and enable employees to think futuristically.

Ideal for: Measuring the quantitative and qualitative output of senior management like managers, directors, and executive (business of any size)

Common reason for failure: Incomplete MBO program, inadequate corporate objectives, lack of top management involvement

Steps to implement a successful MBO program:

Every manager must have 5-10 goals expressed in specific, measurable terms

Manager can propose their goals in writing, which will be finalized after review

Each goal needs to include a description and a clear plan (list of tasks) to accomplish it

Determine how progress will be measured and how frequently (minimum quarterly)

List down corrective actions that will be taken if progress is not in accordance with plans

Ensure that goals at each level are related to the organizational objectives and levels above/below

2. 360-Degree Feedback

360-degree feedback is a multidimensional performance appraisal method that evaluates an employee using feedback collected from the employee's circle of influence namely managers, peers, customers, and direct reports. This method will not only eliminate bias in performance reviews but also offer a clear understanding of an individual's competence.

This appraisal method has five integral components like:

1. Self-appraisals

Self-appraisals offer employees a chance to look back at their performance and understand their strengths and weaknesses. However, if self-appraisals are performed without structured forms or formal procedures, it can become lenient, fickle, and biased.

2. Managerial reviews

Performance reviews done by managers are a part of the traditional and basic form of appraisals. These reviews must include individual employee ratings awarded by supervisors as well as the evaluation of a team or program done by senior managers.

3. Peer reviews

As hierarchies move out of the organizational picture, coworkers get a unique perspective on the employee's performance making them the most relevant evaluator. These reviews help determine an employee's ability to work well with the team, take up initiatives, and be a reliable contributor. However, friendship or animosity between peers may end up distorting the final evaluation results.

4. Subordinates Appraising manager (SAM)

This upward appraisal component of the 360-degree feedback is a delicate and significant step. Reportees tend to have the most unique perspective from a managerial point of view. However, reluctance or fear of retribution can skew appraisal results.

5. Customer or client reviews

The client component of this phase can include either internal customers such as users of product within the organization or external customers who are not a part of the company but interact with this specific employee on a regular basis.

Customer reviews can evaluate the output of an employee better, however, these external users often do not see the impact of processes or policies on an employee's output.

Advantages of using 360-degree feedback:

Increase the individual's awareness of how they perform and the impact it has on other stakeholdersServe as a key to initiate coaching, counselling, and career development activities.
Encourage employees to invest in self-development and embrace change management
Integrate performance feedback with work culture and promote engagement
Ideal for: Private sector organizations than public sector organisations as peer reviews at public sector organizations are more lenient.
Common reason for failure: Leniency in review, cultural differences, competitiveness, ineffective planning, and misguided feedback

3. Assessment Centre Method

The concept of assessment centre was introduced way back in 1930 by the German Army but it has been polished and tailored to fit today's environment. The assessment centre method enables employees to get a clear picture of how others observe them and the impact it has on their performance. The main advantage of this method is that it will not only assess the existing performance of an individual but also predict future job performance.
During the assessment, employees are asked to take part in social-simulation exercises like in-basket exercises, informal discussions, fact-finding exercises, decision-making problems, role-play, and other exercises that ensure success in a role. The major drawback of this approach is that it is a time and cost intensive process that is difficult to manage.

Advantages of the assessment centre method:

Enhance a participant's knowledge, boost his/her thought process, and improve employee efficiencyCan be tailored to fit different roles, competencies, and business needs
Offer an insight of the employee's personality (ethics, tolerance, problem-solving skill, introversion/extroversion, adaptability, etc.)
Ideal for:Manufacturing organizations, service-based companies, educational institutions, and consulting firms to identify future organizational leaders and managers.
Guidelines to implement assessment centre practice:
Use job analysis to determine the components of effective performance
Identify performance metrics that can be measured using this assessment center
Classify meaningful and relevant candidate behavior in the assessment process
Find assessment techniques that can ideally elicit ideal behavioral information
Spot assessors and assessee's excluding immediate supervisors
Provide thorough training to assessors and reviewers
Maintain a system of performance records for each candidate
Review records and reward employee or provide training accordingly

4. Behaviorally Anchored Rating Scale (BARS)

Behaviorally anchored rating scales (BARS) bring out both the qualitative and quantitative benefits in a performance appraisal process. BARS compare employee performance with specific behavioral examples that are anchored to numerical ratings.
Each performance level on a BAR scale is anchored by multiple BARS statements which describe common behaviors that an employee routinely exhibits. These statements act as a yardstick to measure an individual's performance against predetermined standards that are applicable to their role and job level.
The first step in BARS creation is generation of critical incidents that depict typical workplace behavior. The next step is editing these critical incidents into a common format and removing any redundancy. After normalization, the critical instances are randomized and assessed for effectiveness. Remaining critical incidents are used to create BARS and evaluate employee performance.

Advantages of using BARS:

Enjoy clear standards, improved feedback, accurate performance analysis, and consistent evaluationEliminate construct-irrelevant variance in performance appraisal ratings by emphasis more on specific, concrete, and observable behaviors
Decrease any chance for bias and ensure fairness throughout the appraisal process
Ideal for:Businesses of all sizes and industries can use BARS to assess the performance of their entire workforce from the entry level agent to c-suite executives

Common drawbacks of BARS:

High chance for subjectivity in evaluations
Hard to make compensation and promotion decisions
Time-consuming to create and implement
Demands more from managers and senior executives

5. Psychological Appraisals

Psychological appraisals come in handy to determine the hidden potential of employees. This method focuses on analyzing an employee's future performance rather than their past work. These appraisals are used to analyze seven major components of an employee's performance such as interpersonal skills, cognitive abilities,

intellectual traits, leadership skills, personality traits, emotional quotient, and other related skills.

Qualified psychologists conduct a variety of tests (in-depth interviews, psychological tests, discussions, and more) to assess an employee effectively. However, it is a rather slow and complex process and the quality of results is highly dependent on the psychologist who administers the procedure.

Specific scenarios are taken into account while performing psychological appraisal. For instance, the way in which an employee deals with an aggressive customer can be used to appraise his/her persuasion skills, behavioral response, emotional response, and more.

Advantages of psychological appraisals:

Extract measurable, objective data about not just an employee's performance but also potential

Can be deployed easily when compared with other performance appraisal methods

Offer introverted or shy employees a platform to shine and prove their potential

Ideal for:Large enterprises can use psychological appraisals for an array of reasons including development of leadership pipeline, team building, conflict resolutions, and more.

Common reasons for failure:

Absence of proper training, lack of trained professionals to administer reviews, and nervousness or anxiety of candidates can skew results.

6. Human-Resource (Cost) Accounting Method

Human resource (cost) accounting method analyses an employee's performance through the monetary benefits he/she yields to the company. It is obtained by comparing the cost of retaining an employee (cost to company) and the monetary benefits (contributions) an organization has ascertained from that specific employee.

Advantages of the human cost accounting method:

Effectively measure the cost and value that an employee brings to the organization

Help identify the financial implications that an employee's performance has on the organization's bottom line

Ideal for:Startups and small businesses where the performance of one employee can make or break the organization's success.

Implementation of human resource cost accounting method:

Identify the gap between the market and the current package of an employee

Determine the monetary and non-monetary value that an employee brings to the table

List down the things that an employee achieved in the review period (increase in the subscriber count, improvement in revenue, number of new deals won, etc.,)

A future-focused employee performance appraisal method

Choosing the right performance appraisal method is more critical than ever since it reflects what you think of your employees and how much you care about employee morale. Once you've found an ideal performance review method for your needs, the next step is implementing it properly to eliminate critical performance gaps and address pressing issues that impact ROI.

3.RESULTS AND DISCUSSION DATA ANALYSIS& INTERPRETATION:

4.2.Performance appraisal rating is used to

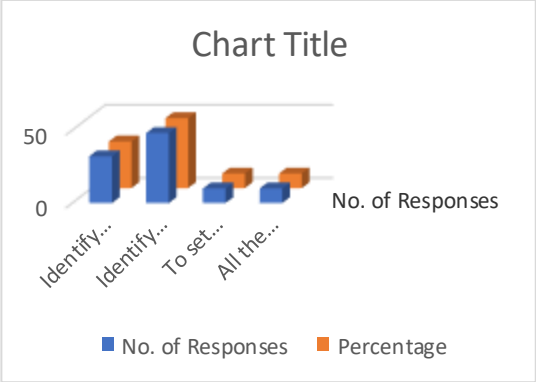
(a) Identify areas of progress in performance

(b) Identify areas of growth and advancement

(c) To set goals

(d) All the above mentioned

s.no	Options	No. of Responses	Percentage
1	Identify areas of progress in performance	32	32
2	Identify areas of growth and advancement	48	48
3	To set goals	10	10
4	All the above mentioned	10	10
	total	100	100

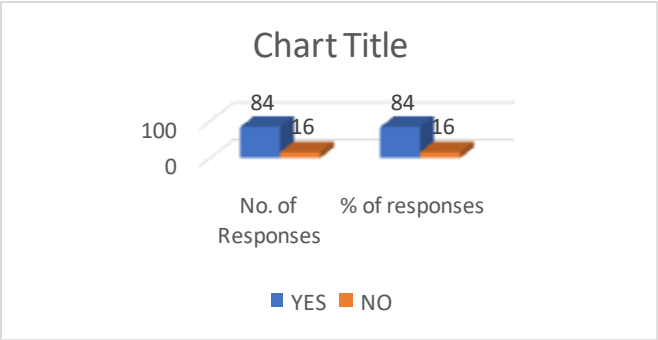


INTERPRETATION:

In the above pie chart 48%of the employees identify areas of growth and advancement,32% of employees identify areas of progress in performance.

4.4. Do you feel that an employee gets motivated due to Performance appraisal?
(a) YES (b) NO

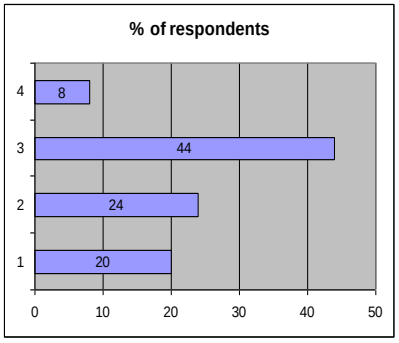
s.no	Options	No. of Responses	% of responses
1	YES	84	84
2	NO	16	16
	Total	100	100



Interpretation:
Above chart shows that84% of the employees said thatthey getmotivated with Performance Appraisal and 16% of the employeesare not content.

4.5. What are the variables required while assessing a person?
(a) Relational adequacy (b) Team building abilities
(c) Self Motivating Abilities (d) Initiative

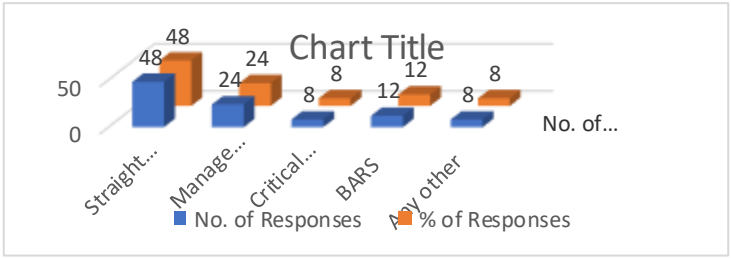
s.no	Options	No. of Responses	% of responses
1	Relational adequacy	20	20
2	Team building abilities	24	24
3	Possesses Self Motivating Abilities	44	44
4	Initiative	8	8
	Total	100	100



Interpretation:
Variables required while assessing a person exhibits that44% ofemployees have self motivating abilities, and 24% of employees possess team building abilities, 20% of employees relational adequacy,8% of the workers are ready to take initiative.

4.6. Which technique you are utilizing for Performance appraisal?
(a) Straight Ranking Method(b) MBO(c) Critical Incidents Method
(d) BARS(e) Any other

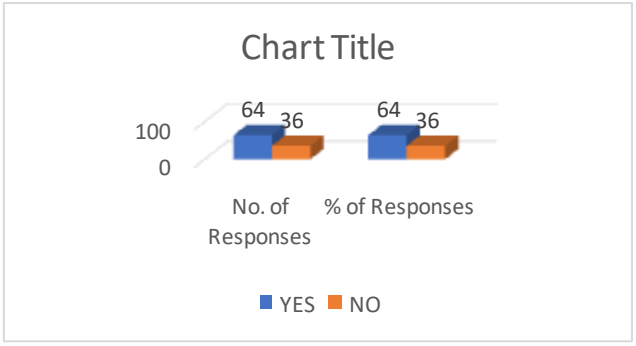
s.no	Options	No. of Responses	% of Responses
1	Straight Ranking Method	48	48
2	ManagementBy Objective	24	24
3	Critical Incidents Method	8	8
4	BARS	12	12
5	Any other	8	8
	Total	100	100



Interpretation:
In the above chart shows that 48% of employees say straight ranking method was being used,24% says MBO method,12% says bars method,8% says critical incident method

4.7. Is it costly to appraise a performance?
(a) YES (b) NO

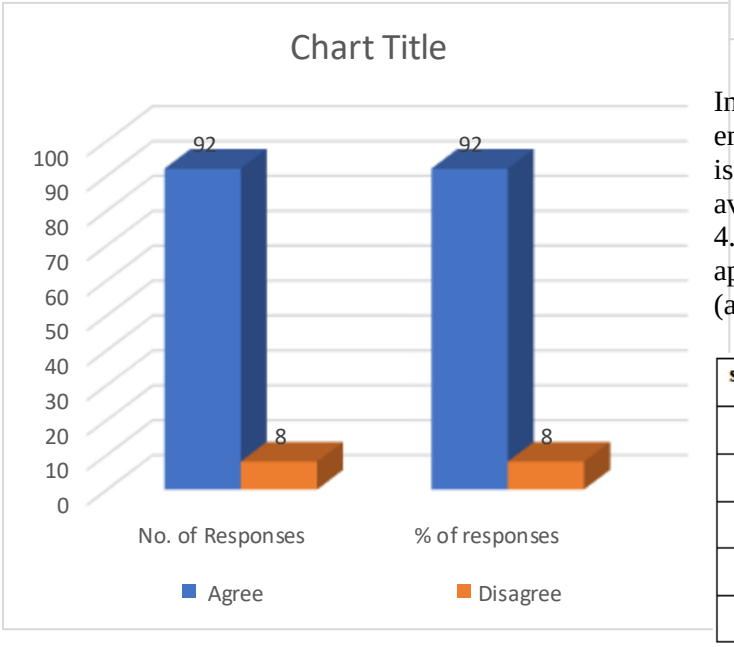
s.no	Options	No. of Responses	% of Responses
1	YES	64	64
2	NO	36	36
	TOTAL	100	100



Interpretation:
In the above chart shows that 64% of the employees says that it is costly to appraise a performance, 36% of employees says that it is not costly to appraise a performance.

4.8. Do you agree with officials giving you feed back to improve your performance?
(a) Agree (b) Disagree

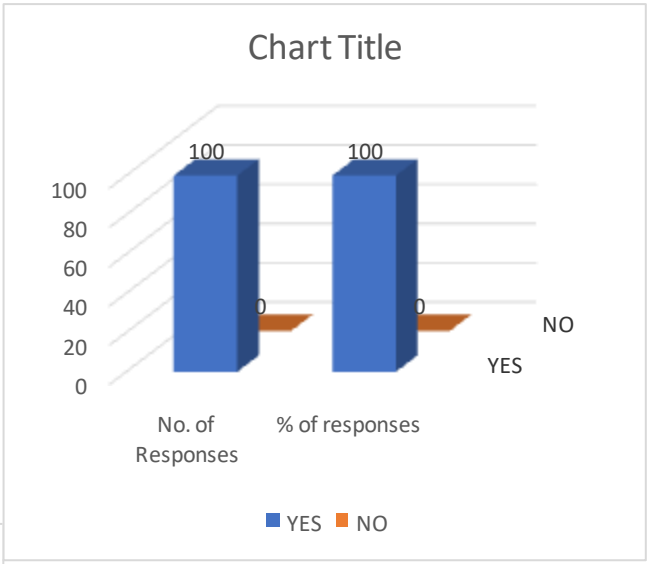
s.no	Options	No. of Responses	% of responses
1	Agree	92	92
2	Disagree	8	8
	TOTAL	100	100



Interpretation:
In the above chart shows that92% of employees perceive that officials are giving feed back to improve performance and 8% of employees not agree

4.9. Have you had the option to communicate all troubles and issues which you have been confronting in your area of work?
(a) YES (b) NO

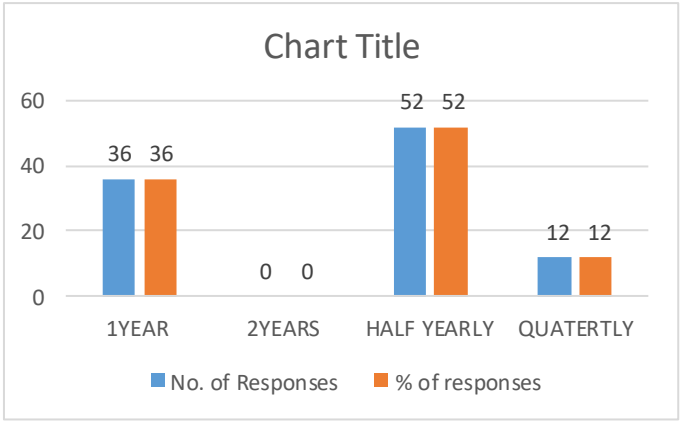
s.no	Options	No. of Responses	% of responses
1	YES	100	100
2	NO	0	0
	TOTAL	100	100



Interpretation:
In the above chart shows that the 100% of the employeesthe option to communicate all troubles and issues which you have been confronting atworkis available.

4.10. what should be the frequency of performance appraisal?
(a) 1year (b) 2years (c) half yearly (d) Quarterly

s.no	Options	No. of Responses	% of responses
1	1YEAR	36	36
2	2YEARS	0	0
3	HALF YEARLY	52	52
4	QUATERTLY	12	12
	TOTAL	100	100



INTERPRETATION

In the above chart shows that the52% of the employees says that to conduct in half yearly and 36% says to conduct in 1 year and 12% says that to conduct in quarterly

FINDINGS

1.
00% of the workers suggest that the performance appraisal is required in an organization.

2.
8%of the employees identify areas of growth and advancement,32% of employees identify areas of progress in performance after appraisal.

3. 64% of employees says that it is tedious to appraise a performance and 36% of the employees says no.

4. 84% of the employees said that they get motivated with Performance Appraisal and 16% of the employeesare not content.

5.
ariables required while assessing a person exhibits that 44% ofemployees have self motivating abilities, and 24% of employees possess team building abilities, 20% of employees relational adequacy,8% of the workers are ready to take initiative.

6.
8% of employees say straight ranking method was being used, 24% says MBO method,12% says bars method,8% says critical incident method

7. 64% of the employees says that it is costly to appraise a performance, 36% of employees says that it is not costly to appraise a performance.

8. 92% of employees perceive that officials are giving feed back to improve performance and 8% of employees not agree.

9. 100% of the employeesperceive thatthe option to communicate all troubles and issues which you have been confronting at work is available.

10.
2% of the employees says that to conduct in half yearly and 36% says to conduct in 1 year and 12% says that to conduct in quarterly

3 CONCLUSIONS

Performance Appraisal has been considered as the most significant an indispensable tool for an organisation, for the information it provides is highly useful in making decisions regarding various personnel aspects such as promotion and merit increase. Performance measures also link information gathering and decision making process which provide a basis for judging the effectiveness of personnel sub-divisions such as recruiting, selection, training and compensation. To identify the factors for appraising the performance of employees. To identify the techniques used by the company in appraising performance of employees. To suggest measures to improve performance of employees Performance appraisal help in improving themselves and also their performance in various aspects of the job. It also conveys the fact that the evaluation procedure meets all the specified standard of good performance appraisal system. Performance appraisal in CAPITAL-IQ meets the most important function of performance appraisal itself that is improvement of performance. Performance appraisal in the past helped them in getting promotion. Performance appraisal must be done on regular basis. The criteria must be informed to the officers well in advance. To giveimportance to quality of work. To give ranking more scientifically on work done rather than the immediate superior remarks. Personal qualities of the employees Should be given weightage

Suggestions

Employees relations must be improved and a supportive environment and team spirit attitude must be developed and the workers must be trained to be ready to take initiative.

Management by Objective and 360 degrees performance appraisal techniques should be implemented and effectively put into practice.

Performance appraisal must be done on regular basis that is quarterly to keep a effective control on the performance of employees.

The criteria must be informed to the officers well in advance.

To give importance to quality of work

Togive ranking more scientifically on work done rather than the immediate superior remarks

Personal qualities of the employees should be given weightage.

REFERENCES:

1 Aberdeen Group . 2010. Employee performance management: The alpha and the omega of talent strategy and business execution. Boston, MA: Aberdeen Group. Accessed at http://www.aberdeen.com/aberdeen-library/6361/RA-employee-performance-management.aspx.

2 Anderson, Theodore Wilbur, Hsiao, Cheng. 1982. Formulation and estimation of dynamic models using panel data. Journal of Econometrics18(1): 47–82.

3 Schultz, W. (2006). Behavioral theories and the neurophysiology of reward. Annual Review of Psychology Vol. 57: pp. 87-115.

4 Latham, G.P., Borgogni, L. & Petitta, L. (2008). Goal setting and performance management in the public sector,International Public Management Journal, 11:4, 385-403, DOI: 10.1080/10967490802491087

Cook, J. & Crossman, A. (2004). Satisfaction with performance appraisal systems: A study of role perceptions, Journal of Managerial Psychology, Vol. 19 Issue: 5, pp. 526-541.

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

TO STUDY THE EFFECTIVENESS OF RECRUITMENT AND SELECTION PROCESS USING SOCIAL NETWORK

[1]MR. Mohd Mustafa Ali Shahriyar,[2]Mohammed Ikramullah Aman, [3]Mohammed Arif Hussain
[1]Assistant Professor,Department of Business Administration, hadan College of Engineering & Technology, Hyderabad, India, 500 008.
[2]Professor, Department of Business Administration, Shadan College of Engineering & Technology, Hyderabad, India, 500 008.
[3]Assistant Professor, Department of Business Administration, Shadan College of Engineering & Technology, Hyderabad, India, 500 008

ABSTRACT:The main motivation of this paper is the usage of social media and social network, in specific LinkedInin the recruitment and selection procedure. Millennial are predicted to make up three fourths of the global workforce in the future years. This generation is significant and different from the older generation due to their presence during the complete overhaul of our society and tectonic shifts taking place in the tech sector. Their expectations, needs and requirements are completely different from those of previous generations. In the past few years internet and social media has taken over every aspect of our lives. The millennial generation has been one of the biggest drivers of this rapid expansion. Social media is one of the most effective tools as it holds the power to generate awareness about causes and form relationships. An average millennial spends a significant portion of their day on a social networking site. In the paper, the researcher has tried to establish a study on how employers can effectively use social media to recruit employees that are the right fit for their vision, mission and culture. The researcher has tried to highlight practices of employers to attract prospective employees to apply for vacancies in the company. The research methodology used is secondary data collected via analytics reports, articles and research papers. The effective use of social media is also analyzed by the use of multiple case studies. The study is significant as it contributes to understanding social media and practices adopted by the human resource department to attract potential talent.
KEYWORDS: Social Media, Recruitment, Selection, Strategies, Millennials, Talent.

1 INTRODUCTION:

Social networking sites (SNSs) can be viewed as instruments to filter job candidates in the selection period. This could have negative or positive results for job candidates based on the subject material of any SNS profile. puts it this way: Online social media sites offer you a screening instrument for job candidates. It is improbable that a job candidate would actually connect provocative photos, detailed descriptions of sexual escapades, or maybe a summary of hobbies which has funneling beer and recreational drug make use of on his/her resume. But with only a couple of clicks of the mouse, you are able to figure out all kinds of revealing info about prospective candidates'. From a management standpoint, using SNSs in recruitment and selection processes entails pitfalls and promises for HR professionals. The promises within the recruitment phase are talked about first, since it's also the very first stage in the resourcing process. The promises in the selection period are reviewed in section 4.3.2. The literature applied to each chapter four and also chapter five is conducted from diverse, mostly American sources as well as positioned in the context of the frame of mine of reference.

Need of the study:

In order to study the recruitment management by using social networking platforms.

- To determine and recommend measures because of the improvement on the recruitmentprograms.
- Create a talent pool of applicants to allow the choice of perfect prospects for thebusiness.
- Determine future and present demands of the group along with its personnel planning and work analysisactivities.
- Meet the companies legal and social responsibilities about the structure of its workforce.

OBJECTIVES:

- In order to learn the recruitment and selection process in SUMEGA TECHNOLOGIES Ltd,Hyderabad.
- To understand how the new applicants are recruited and also positioned in SUMEGA TECHNOLOGIES Ltd,Hyderabad.

- In order to understand the amount of total satisfaction of people concerning selection and recruitment process at SUMEGA TECHNOLOGIES Ltd, Hyderabad.
- In order to understand the policy to be able to satisfy the manpower requirements of SUMEGA TECHNOLOGIES Ltd with personnel who have the required credentials, aptitude, skills, and are ideal as per organizationalneeds.

2 RESEARCH METHODOLOGY

➢ The investigation method adopted is RANDOM SAMPLING TECHNIQUE? Sample size? hundred respondents? Sampling unit? SUMEGA TECHNOLOGIES LTDSampling Area –HYDERABAD

TOOLS FOR DATA COLLECTION:

❖ UsingQuestionnaire

3 REVIEW OF LITERATURE:

Online recruiting is about finding making connections as well as quality candidates with them. And social networking is where individuals spend time online to express interact and ideas with oneanother.

Based on GlobalWebIndex, the typical internet user has over five social networking accounts. People go to these various communities to share what is on their converse and mind with like-minded people. Like a town center, social networking sites have grown to be the center point for web interaction.

Sites as LinkedIn, Facebook, Twitter & a couple of others provide recruiters a huge chance to join with prospects - many of whom wouldn't be discovered through classic sources.

Almost all businesses work with social networking to recruit candidates but only some are doing it effectively. In this guide, we will discuss the advantages of social media recruiting and several ways you are able to link up with talented individuals online.

How you can recruit on social media Every business ought to improve its very own distinctive social media recruiting strategy. Here are a few fundamental ideas the company of yours is able to use to getstarted:

Get involved in the proper conversations. The secret to recruiting on social networking is to slice through the racket and get the appropriate folks. Becoming productive in Using hashtags and linkedin groups are excellent ways to get the job openings of yours before candidates you wish to apply. For instance, #devjobs or #NYChiring will help you reach the best candidates on Twitter.

Take a gentle strategy and promote the culture of yours. Social media recruiting has gone beyond posting roles that are open from company accounts. You must also share content which shows your organization is a great spot to work so you are able to naturally attract candidates. Everyone loves talking about organizations with unique cultures so this particular content type typically becomes a great deal of shares.

Do not ignore the niche networks. Of course, everybody and their parents are on Facebook, Twitter and LinkedIn these days.

The following are 8 positive aspects of utilizing social networking during your recruitment advertising strategy:

1. INCREASES JOBVISIBILITY

Now, basically every perfect choice you might think about for virtually any situation at your organization is on social media. Facebook loves an active user base of more than 2.19 billion. Twitter is fashionable for the capability to host job search chats and numerous Generation and millennials X group are active users of LinkedIn as a job huntingplatform.

Anywhere you seem, you see social networks serving as amazing platforms for determining and recruiting gifted people to work for the customers of yours. Obviously, couple of more platforms are able to achieve as many individuals as social networking, meaning you're prone to find the caliber of talent various other platforms can not match.

2. HIGHER QUALITY CANDIDATES

Self-reported statistics from a lot of companies show they get good quality candidates every time they recruit via social media sites. A particular huge reason this's the situation is because nearly all folks you are going to find on social networking are tech savvy, a fundamental necessity to land some task in modern industry.

Furthermore, they're prone to be in the know regarding emerging business trends, adding to the abilities they bring on the family table. What is more, in case you choose to use the employees of yours to announce brand new openings at the company of yours via social networking, odds are that the people you are going to hire won't just stay longer at your organization, they'll also be more effective than those you will hire through some other platforms.

3. BETTER EMPLOYER BRANDAWARENESS

Social recruiting is efficient, not only in looking for you the perfect choice, but also in boosting the visibility of the brand name of yours. By advertising brand new positions on social networking, you strengthen the brand of yours and make some amount of trust among prospective employees.

People view manufacturers that have a powerful social media presence as far more confident. Thus, it will work

your company effectively to build a strong social media presence, not only since you would like to look for personnel that are excellent , but also because doing this will develop trust among prospective customers and make it a coveted spot to work.

4. REDUCE COST OFHIRE

Recruiting could be a really costly undertaking. Social recruiting is less expensive, but can still set you back substantial amounts of cash. Each of the exact same, the value you receive from the hires you get via social media platforms makes this particular method extremely cheap.

Without having a doubt, recruitment costs via social networking are nearly constantly, less than those of some other techniques. A very simple Facebook ad may for example help you more than 2 times much more exposure than the conventional recruitment methods like classified advertisements within the dailies and also job boards.

5. OPENS THE DOOR TO ENGAGEMENT

Imagine a brand which has taken the time of its to produce the market of its, including using tools as Grow to naturally grow on social networking, but discovers itself struggling to

participate with the followers it's gathered. Such a brand might gain from a social networking post of any job opening.

As interested people seek out more info about the job opportunity, the social networking page of yours gets more engagement. A few interested people are going to post on the comments section, others will show their supporters & close friends, while others will give you an immediate information to the inbox of yours.

These conversations help keep your page busy and also provide you with the chance to participate with prospective employees. Several of these're people who'd never ever have applied for a task at your organization had you used other recruitment platform.

Recruiters that understand the way to create almost all of the recruitment opportunities offered on social networking will let you know that several of these social interactions are much better compared to one-on-one interviews.

At any rate, you are able to have numerous chats with many likely candidates on social media sites, and just call a number of them to further the discussion in person at your company premises later. Moreover, you will find a number of social recruitment resources you are able to wear which to help you do it quickly and worry free. These include Jobcast, Bullhorn Reach, Jobvite, Work4 Labs, and also LinkUp.

6. ALLOWS YOU TO TARGET YOUR VACANCIESMORE

Social recruitment includes amazing power to laser target particular groups of individuals for the readily available vacancies. On LinkedIn for example, you are able to attempt to talk about the job postings in a few industry specific LinkedIngroups.

On this particular platform by yourself, you can find a huge number of organizations for professionals in nearly each and every market you are able to imagine: from designers to HR employees, to freelance writers, to finance experts. Having said that, remember to publish your recruitment communications in a way that wouldn't be deemed annoying.

The thought is attracting prospective applicants, not overwhelm them with promises of bliss in case they receive a task at the business of yours. Though such promises could be correct, prospective people might begin to open you plus the company of yours as con artists or maybe spammers, ultimately undermining the reliability of yours and destroying the likelihood of yours of receiving high talent via the socialplatform.

Twitter hashtags additionally allow for clever recruitment methods. You are able to also think about asking the workers of yours to talk about the available vacancies within the social circles oftheirs.

7. SCREEN The CANDIDATES ofyours

It's currently an open secret that companies use social networking to get a thorough understanding of the individuals they've employed at the companies of theirs. Lots of people see social networking platforms as free spaces just where they are able to express the frustrations of theirs, discuss the causes of theirs as well as share the experiences of theirs while they go through the times of the lives. What you may not understand is that possible employers also check out applicants on social media.

Social media sites offer them a much deeper view of who they're intending to hire. It provides insights into the individuals character actually letting them determine what their aspirations are and what they're able to count on after they employ them to work in the company of theirs.

Screening potential employees ensures you work with those individuals who align with the company values of yours and culture.

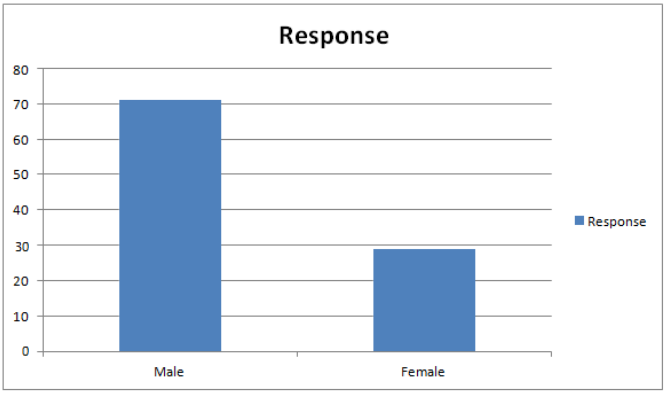
8. SHORTENS HIRING TIME

The standard techniques of recruitment typically take more time compared to social media recruitment methods. Which means that when you've an open place you need loaded in the quickest time possible, social media is the platform to consider. Social media sites not

just succeed simple and quickly to speak with applicants, it also allows them to react more quickly. As an outcome, great work relationships usually emerge.

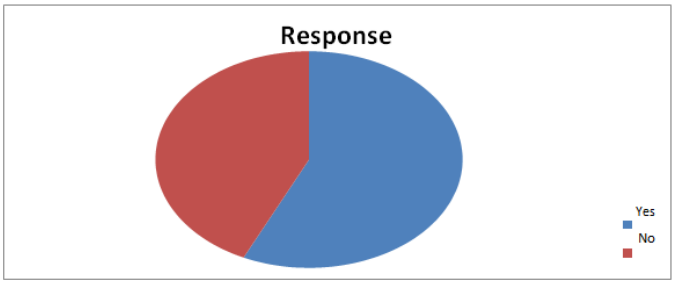
4 DATA ANALYSIS ANDINTERPRETATION:

Gender:	Response	Percentage
Male	71	71%
Female	29	29%
Total	100	100%



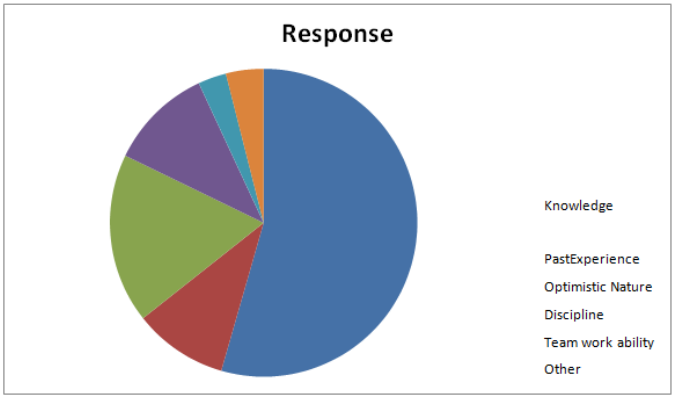
Interpretation: - From the above data from the survey 71% sumega technologies employees are responded males and remaining 29% sumega technologies employees are responded females.

1. Is the resume screening and shortlisting method used by the organization is satisfactory?	Response	Percentage
Yes	57%	57%
No	43%	43%
Total	100%	100%



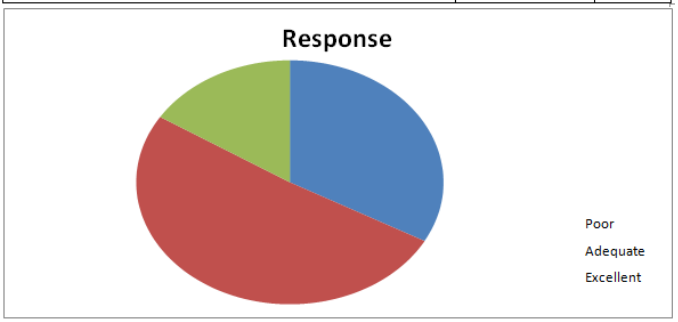
Interpretation: - 57% sumega technologies employees are responded Yes , 43% sumega technologies employees are responded told No .

2. Which is the most important quality the organization looks for in a candidate?	Response	Percentage
Knowledge	55	55%
past Experience	10	10%
Optimistic Nature	18	18%
Discipline	11	11%
Team work ability	3	3%
Other	4	4%
Total	100	100%



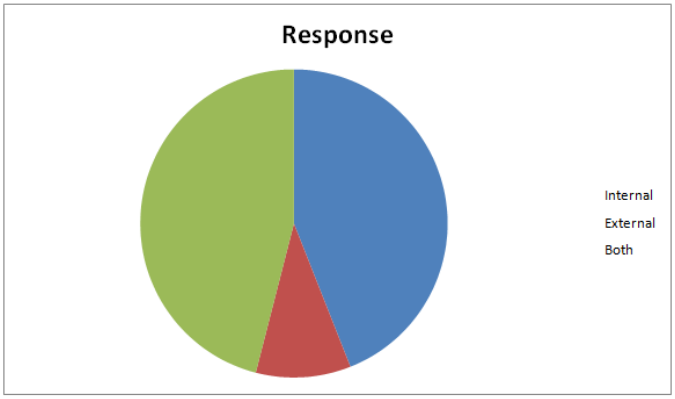
Interpretation: - 55% sumega technologies employees are responded Knowledge , 10% sumega technologies employees are responded told past Experience , 18% sumega technologies employees are responded said Optimistic Nature , 11% sumega technologies employees are responded replied Discipline , 3% sumega technologies employees are
responded answered Team work ability , 4% sumega technologies employees are responded responded Other .

3. How would you rate the HR department's performance in recruitment and selection?	Response	Percentage
Poor	33	33%
Adequate	51	51%
Excellent	16	16%
Total	100	100%



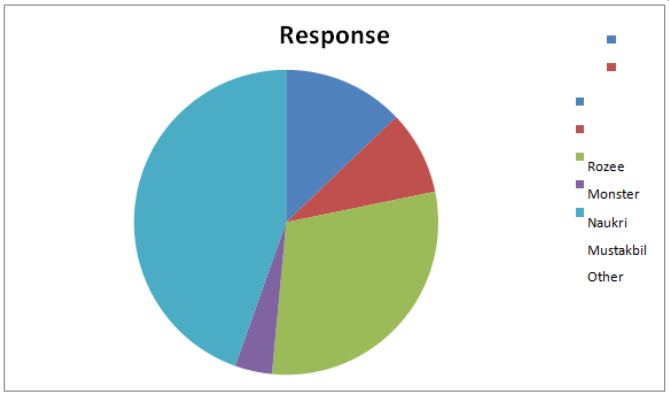
Interpretation: - 33% sumega technologies employees are responded Poor , 51% sumega technologies employees are responded told Adequate , 16% sumega technologies employees are responded said Excellent.

4. What are the sources for recruitment and selection?	Response	Percentage
Internal	44	44%
External	10	10%
Both	46	46%
Total	100	100%



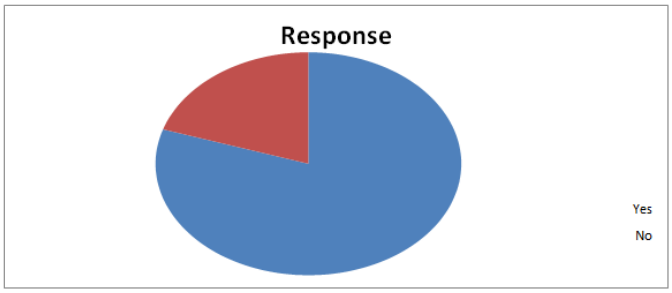
Interpretation: - 44% sumega technologies employees are responded Internal , 10% sumega technologies employees are responded told External , 46% sumega technologies employees are responded said Both .

5. Which recruitment website you use?	Response	Percentage
Rozee	13	13%
Monster	9	9%
Naukri	30	30%
Mustakbil	4	4%
Other	45	45%
Total	100	100%



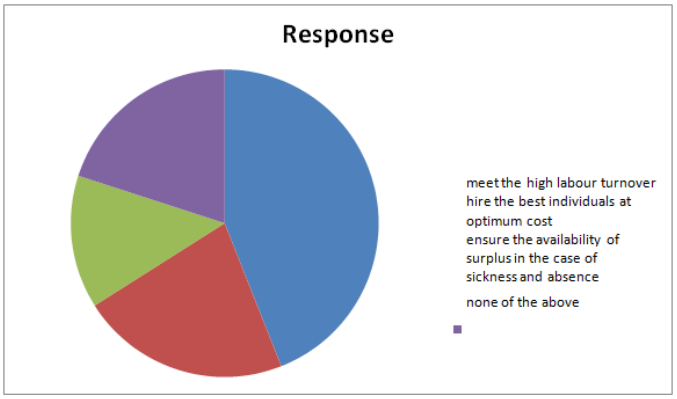
Interpretation: - 13% sumega technologies employees are responded Rozee , 9% sumega technologies employees are responded told Monster , 30% sumega technologies employees are responded said Naukri , 4% sumega technologies employees are responded replied Mustakbil , 45% sumega technologies employees are responded answered Other .

6. Do you think that E-Recruitment is an effective way to gather quality resumes than the old traditional method of gathering?	Response	Percentage
Yes	80	80%
No	20	20%
Total	100	100 %



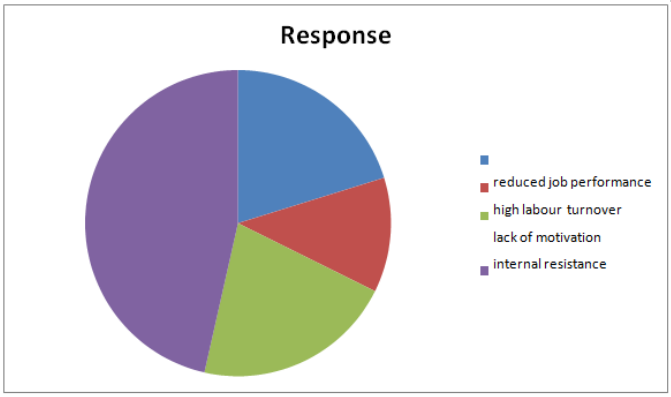
Interpretation: - 80% sumega technologies employees are responded Yes , 20% sumega technologies employees are responded told No.

7. The primary aim of recruitment and selection process is to	Response	Percentage
meet the high labour turnover	44	44%
hire the best individuals at optimum cost	22	22%
ensure the availability of surplus in the case of sickness and absence	14	14%
none of the above	20	20%
Total	100	100%



Interpretation: - 44% sumega technologies employees are responded meet the high labourturnover , 22% sumega technologies employees are responded told hire the best individuals at optimum cost , 14% sumega technologies employees are responded said ensure the availability of surplus in the case of sickness and absence , 20% sumega technologies employees are responded replied none of the above .

8. Which of the following is the most serious problem that might arise due to excessive reliance on internal recruitment?	Response	Percentage
reduced job performance	20	20%
high labour turnover	12	12%
lack of motivation	21	21%
internal resistance	46	46%
Total	100	100%



Interpretation: - 20% sumega technologies employees are responded reduced job performance
, 12% sumega technologies employees are responded told high labourturnover , 21% sumega technologies employees are responded said lack of motivation , 46% sumega technologies employees are responded replied internal resistance .

5 FINDINGS, SUGGESTIONS ANDCONCLUSION:

FINDINGS

The are some main advantages of using social network as mean of recruitment the price and the easiness of reaching higher-quality candidates because it has been found that individuals who frequently use social networks tend to be “early adopters” of innovation and tend to be more technically savvy (Sullivan, 2009). Also it helps to find hard-to-reach candidates identifying the best candidate for the open position. There are positive effect on the return of investment (ROI) with dramatically reducing sourcing costs and there has been found that posting jobs on LinkedIn is more likely to deliver results than a single description on a job board (Sullivan, 2009). If social networks are used properly the company becomes the choice of the employer because of the good reputation that gets through your online activities. The benefits of using social networks seem as a good enough reason to use it especially because of their easiness of use. It has to be taken into account that even thought it is easy to use it can work just if the company has a good advertising strategy of their activity and job opening on LinkedIn because of course without a large network with people who are looking employment this strong tool cannot work properly. Also, the profile of the candidate should be updated and accurate in order to help the recruitment process. As much as social network can be useful, as illustrated in the research by Starcke in 1996 the danger of online recruitment could be the danger of the income of too much résumés, the increased number of applicants, tracking difficulties and the fact that not everyone has access or the knowledge to use the Internet. In fact IRS Employment Review in 2005 found that 74% of the organizations received inappropriate responses while advertising on the Internet.

6 SUGGESTION

Recruit for Innovation

A business's originality tactic begins with just who they use. There are lots of strategies the best resourceful businesses make use of to make sure they take the very best individuals in to the group to push originality.

Do not recruit consumers only love yourself Creating high doing revolutionary teams must begin within the recruitment operation. Nearly all recruitment procedures include hardly much more than a few of interview. Frequently the procedures are organized to locate clones of ourselves, and therefore, dissuade variety. She discovered that instead of getting probably the most competent candidates because of the project, employing administrators had been much more prone to recruit men and women they believed they may be buddies with - individuals preferthem.

Stay away from the urge being blinded by parallels when choosing fresh hires? rather, think about regardless of whether you're taking somebody inside the staff who's totally different from the additional users, particularly of terminology of their set of skills, encounters and understanding.

Therefore instead of merely permit originality occur by opportunity, be strategic regarding whom you recruit, the way you practice individuals as well as the way you produce an originality way of life.

7 CONCLUSION

This thesis explored the subject of utilizing SNSs in the recruitment and selection process using a literature study. Based upon the literature, the promises and also pitfalls from the chapters result in a theoretical framework around the use of SNSs by HR professionals. The objective of the framework was making companies informed about the effect of utilizing SNSs over the decision making process of getting job candidates,

provide them with an advice, if and to what extent groups must use info from SNSs. In additional words: To what degree do the benefits outweigh the drawbacks of utilizing job applicants' info from SNSs in the recruitment and selection process?' Literature study confirmed HR professionals use SNSs often in the United States during the recruitment and selection process. SNSs had been especially utilized after obtaining a rsum and before the job interview. Using SNSs wasn't determined by the amount where SNSs is usually utilized to determine job candidates, but on how info on SNSs was perceived as additional dependable and also valuable. The gathering of info through the social media profiles of job candidates has both disadvantages and advantages.

REFERENCES:

1 Aspiridis, G., Kazantzi., V., Kyriakou, D. (2013). Social networking websites and their effect in contemporary human resource management-a research approach.Mediterranean Journal of Social Sciences, 4 (1), ISSN 2039-9340.

2 Bowerman, E. (2013). 75% of American Workforce is Actively Seeking or Open to New Jobs, Jobvite's Annual Social Job Seeker Survey Reveals — Jobvite. Retrieved May 10, 2013, from http://recruiting.jobvite.com/company/press-releases/2012/75-of-american-workforce-is-actively-seeking-or-open-to-new-jobs-jobvite-s-annual-social-job-seeker-survey-reveals/

3 Boydell, M. (2002). Internet recruitment helps HR careers. Canadian HR Reporter, Feb 11 2002, Canada.

4 Calvò-Armengol, A. & Jackson,O.M., (2004). The effects of social networks on employment and inequality.The American Economic Review,94(3), 426-454.

5 Cherry, K. (2010).The everything psychology book: An introductory guide to the science of human behavior. Avon, Mass: Adams Media

6 Data Gem (2011, May 16). LinkedIn Thrives Across All Markets. Retrieved May 11, 2013, from http://www.comscoredatamine.com/2011/05/linkedin-thrives-across-all-markets/

7 Foot, M. & Hook, C., (2008), Introducing Human Resource Management, 5th ed. Edinburg: Pearson Education Limited

8 Heider, F. (1958).The psychology of interpersonal relations.New York, Wiley.

9 Jonhson, and Turner, (2003). International Business: Themes and Issues in the modern global economy. Ed. Routledge

10 Kaplan, A.M. &Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media.Business Horizons, 53, 59-68.

11 Kessler, R., (2006), Competency-Based Interviews, Franklin Lakes, NJ, USA: The Career Press.

12 Krebs, V. (2004).An Introduction to social network analysis. Retrieved on May 12 from http://www.orgnet.con/sna.html

13 Lewin, K. (1939). Field Theory and Experiment in Social Psychology: Concepts and Methods. American Journal of Sociology, 44(6).

International Research Journal in Global Engineering and Sciences (IRJGES)
ISSN : 2456-172X - www.irjges.com - Cosmos Impact Factor (Germany) : 5.195
Volume 4, Issue 3 – Special Issue

TO STUDY THE EFFECT OF HRD STRATEGIES ON PERFORMANCE OF THE ORGANIZATION

[1]Shaik Shameem, [2]Dr. Mohammad Ikramullah Aman,[3]Syed Abdul Mannan
[1] Assistant Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana
[2]Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangana.
[3] Assistant Professor, MBA Dept, Shadan College of Engineering and Technology, Peerancheeru, Hyderabad, Telangan

ABSTRACT:Over recent years there has been an increasing interest in the field of human resource management. Organizations should prefer to maximize wealth through maximizing their human capital.This study is to determine the extent to which strategic Human Resources Development is practiced at the ICICI Bank, to identify the human resource development strategies adopted by the organisation also to assess the synchronisation of HRD strategies and organisational mission.
The results show that 100% of respondents interviewed agreed that the ICICI Bank have a fully-fledged Human Resources Development unit.
The study shows that 67% of respondents accepted that there is a documented Human Resource Development strategy that guides the ICICI Bank while 33% stated that human resource development strategy does not exist at the ICICI Bank.
Out of the respondents interviewed 35% stated that human resource development policies existed in the ICICI Bank of while 33% of the respondents said that it did not exist, the other 32% of the respondents did not give any response.
From typically the research findings it had been revealed that human resources advancement is practiced and everything the particular respondents were aware associated with the several HRD practices transported out within the ICICI Bank. The particular predominant HRD practiced are usually training and Career Development Strategy as compared to knowledge management and organizational learning. It has been further revealed that numerous forces both internal plus external influenced the HRD practices in the ICICI Bank. With regard to instance the ISO qualification of the ICICI Bank required that employees are trained to be able to comply with ISO needs.
KEYWORDS:
Human resource Development, Strategy, Mission, Total Quality System, Employee Performance, Competitive Advantage.

1. INTRODUCTION:

Strategic Human Resources Development
Human resources management emphasizes that employees are critical to attaining sustainable competitive advantage, that human resources practices need to be integrated with corporate strategy and that human resources professionals help organization controllers to meet both efficiency and equity objectives
Need for study
Despite of all the benefits enjoyed through the Strategic Human Resources Development, employees time and again complain of many shortfalls. Such problems are affecting the consistency in organizational performance. Few Empirical research is available in the context of banking sector in Hyderabad Therefore, considering all these difficulties and challenges in the background the researcher was prompted to take this topic that is study of strategic human resources development practice at ICICI bank.

Objective of the study

1. To determine the extent to which strategic Human Resources Development is practiced at the ICICI Bank.
2. To identify the human resource development strategies adopted by the organisation.
3. To assess the synchronisation of HRD strategies and organisational mission.
4. To study the effect of HRD strategies on performance of the organization.
5. To give suggestions to improve the human resource development in the organizations.

2. RESEARCH METHODOLOGY

Research Design:
A Descriptive Research Design has been adopted and a Survey Method has been used.
Survey method was careful used and a structured questionnaire was administered through personal contact

method to employees of ICICI bank after their office hours. The instrument is a self- completion questionnaire delivered to the respondents personally by the researcher.

Sources of Data collection

Primary Data

Primary data was collected from the employees of ICICI.

Secondary Data

The secondary data sources encompassed.

- Available research work in national and international journals
- Data existing on websites
- Text books, magazines & newspapers.

Sampling Plan:

Sampling Method

Simple random sampling method and convenient sampling method were used.

Population comprised of total number of employees working in ICICI bank Attapur Branch.

Sample size

30 Employees were randomly selected from the bank. As the bank did not give permission to conduct the survey inside the premises of bank due to their policies, employees were contacted at random outside the bank immediately after the banking hours using the above-mentioned methods.

Period of Study:

The primary data was collected from the employees of the bank and the project was completed during 45 days period from April 2019 to May 2019.

Survey Instrument

The survey instrument is a questionnaire consisting of 11questions. The questionnaire consisted of dichotomous and multiple-choice questions. A five-point Likert scale was used which indicated strongly agree, agree, neutral, disagree and strongly disagree.

Study Area

This study was conducted in ICICI bank B.P.R Towers, Attapur, Rajendra nagar. Hyderabad. Telangana, 500048.

Participants

Respondents were the employees of the ICICI bank.

Limitations of the Study

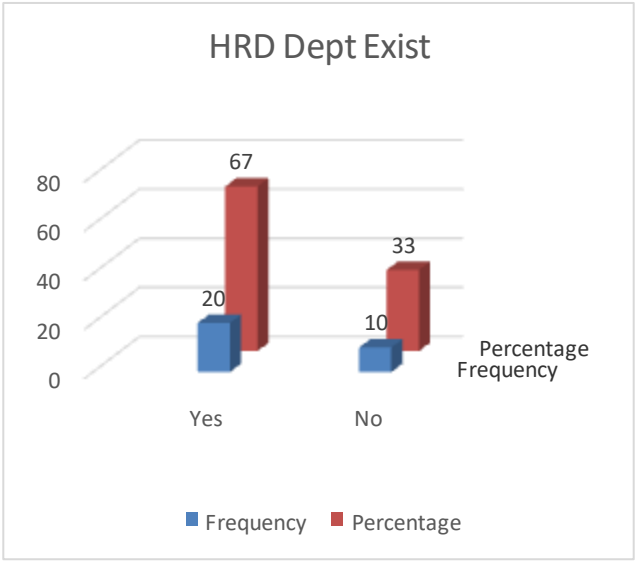
1. The study recounts to one specific sector that is banking sector and not others.
2. The study was limited to only one branch in the city of Hyderabad in the state of Telangana. The expectations and perceptions of one state may vary from one state from another.
3. Respondents belonging to private sector were only selected, hence cannot be generalised for all the banks.
4. The findings of the study are entirely dependent on the sample and cannot be generalised for the whole population.
5. Many respondents have hesitations, hence may not express perceptions.

3. DATA ANALYSIS AND INTERPRETATION

1. Does the organization have a fully-fledged HRD department?

Table 1: Fully fledged Human Resources Development Unit

Options	Frequency	Percentage
Yes	**20**	**67**
No	**10**	**33**
Total	**30**	**100**

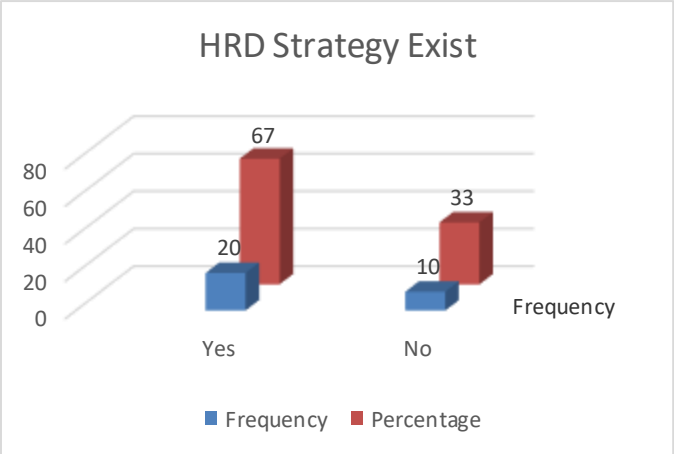


The results above show that 100% of respondents interviewed agreed that the ICICI Bankhave a fully-fledged Human Resources Development unit.

2. Is there a documented human resource development strategy that guide the organization?

Table 2: Documented HRD Strategy

Response	Frequency	Percentage
Yes	**20**	**67**
No	**10**	**33**
Total	**3**	**100**

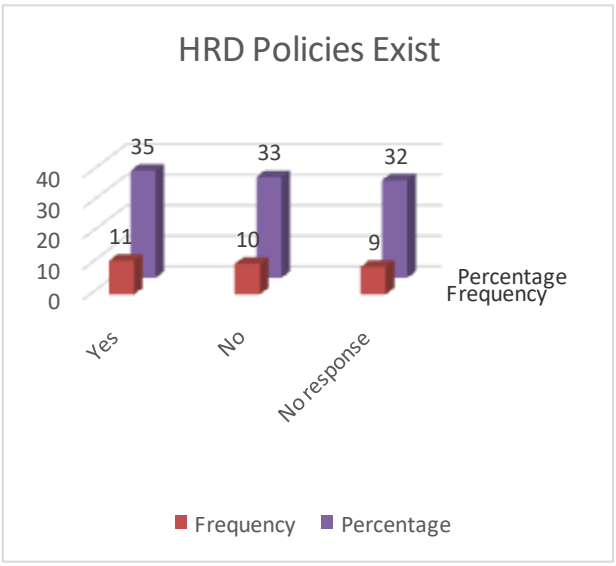


The study shows that 67% of respondents accepted that there is a documented Human Resource Development strategy that guides the ICICI Bank while 33% stated that human resource development strategy does not exist at the ICICI Bank.

3. Are there any policies regarding HRD in this organization?

Table 3: Human Resource Development Policies

Response	Frequency	Percentage
Yes	**11**	**35**
No	**10**	**33**
No response	**09**	**32**
Total	**30**	**100**

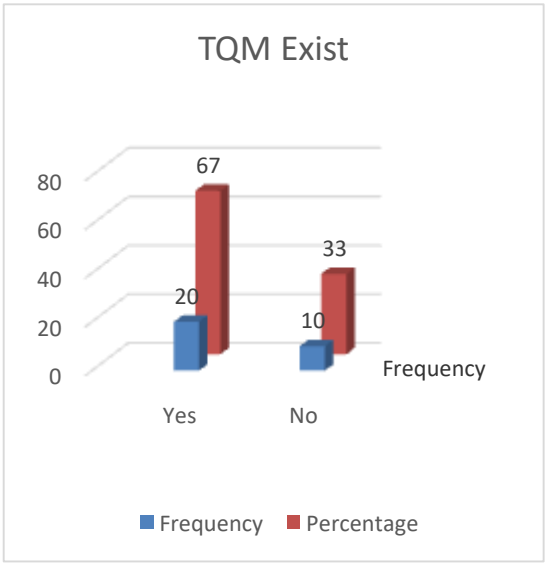


Out of the respondents interviewed 35% stated that human resource development policies existed in the ICICI Bankof while 33% of the respondents said that it did not exist, the other 32% of the respondents did not give any response

4. Does the ICICI Bank have a total quality management system?

Table 4: Total Quality Management Systems

Response	Frequency	Percentage
Yes	**20**	**67**
No Response	**10**	**33**
Total	**30**	**100**

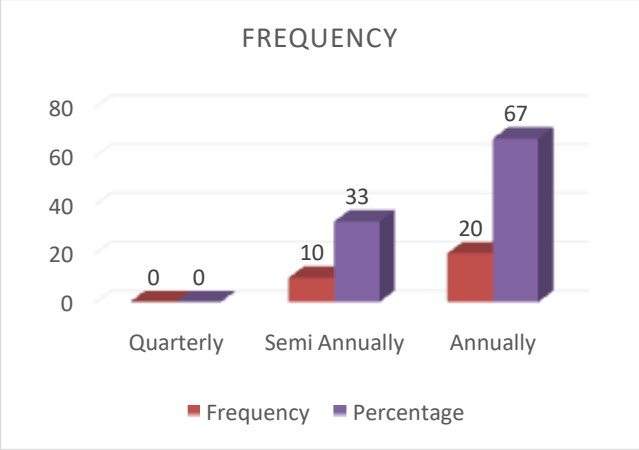


The table 4 above shows that 67% of the respondents interviewed agreed that there was a total quality system which exists in the ICICI Bank.

5. How often do you assess and evaluate learning and training?

Table 5: Frequency of Training Pattern

Options	Frequency	Percentage
Quarterly	00	00
Semi Annually	10	33
Annually	20	67
Total	30	100

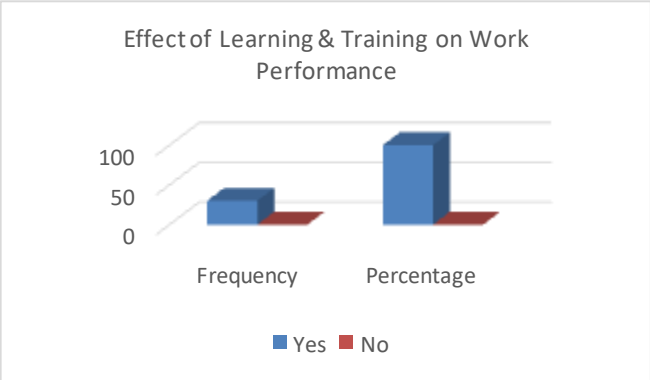


Responses on the training pattern in the ICICI Bank shows that 67% of the respondents said that training was carried out annually, the other 33% of the respondents said that training was carried out semi-annually.

6. Does Learning and training improved work performance at the ICICI Bank?

Table 6: Learning and training improved Work Performance

Option	Frequency	Percentage
Yes	30	100
No	00	00
Total	30	100

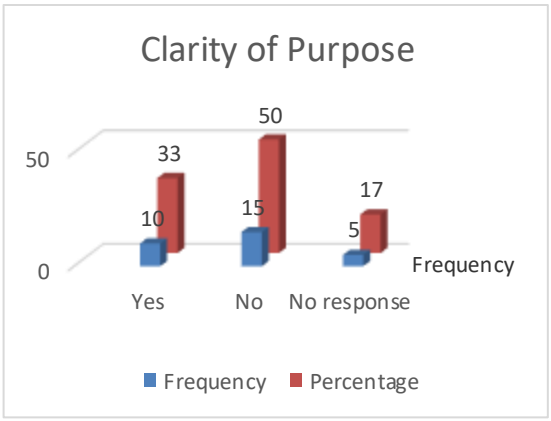


The study shows that all the respondents interviewed agreed that learning and training had improved work performance of staff at the ICICI Bank. This obviously indicates that learning and training are variables that improve work performance in most organizations especially at the ICICI Bank.

7. Is the purpose of learning and organizational learning clear to all employees?

Table 7: Clarity of purpose of Organizational learning clear to all employees

Response	Frequency	Percentage
Yes	10	33
No	15	50
No response	05	17
Total	30	100

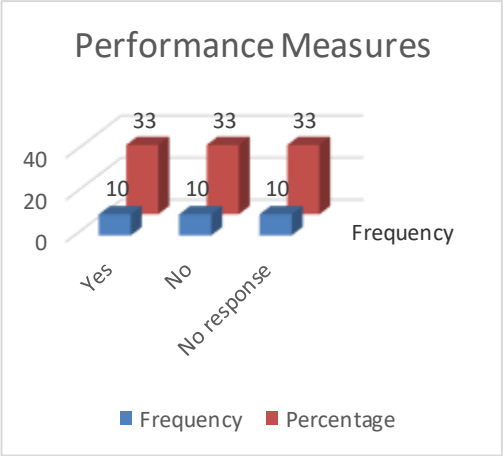


The analysis shows that 33% regarding the respondents interviewed suggested that the objectives regarding organizational learning were clear to all staff, the 50% of the respondents said that the objectives weren't clear at the ICICI Bank while 17% did not give any reply in connection with objectives organizational understanding.

8. Does your HRD system incorporate performance measures?

Table 8: Incorporation of Performance Measures in the Human Resource Development system

Response	Frequency	Percentage
Yes	10	33
No	10	33
No response	10	33
Total	30	100

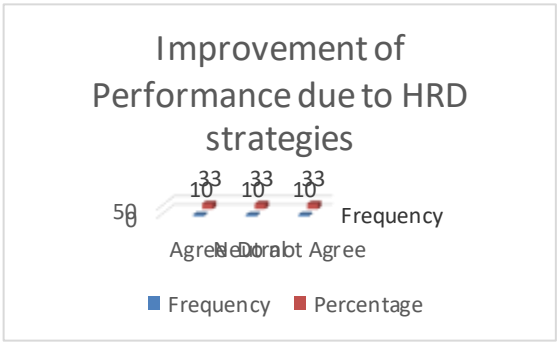


From the respondents interviewed 33% mentioned that performance measures were incorporated in the Human Resource Development system while 33% of the respondents agreed that performance measures were not incorporated in the ICICI Bank while 33% of the respondents interviewed did not give response.

9. Do you agree that there been any improvement in terms of performance after implementing particular HRD strategies?

Table 9: Improvement of performance on implementation of particular Human Resource Development strategies

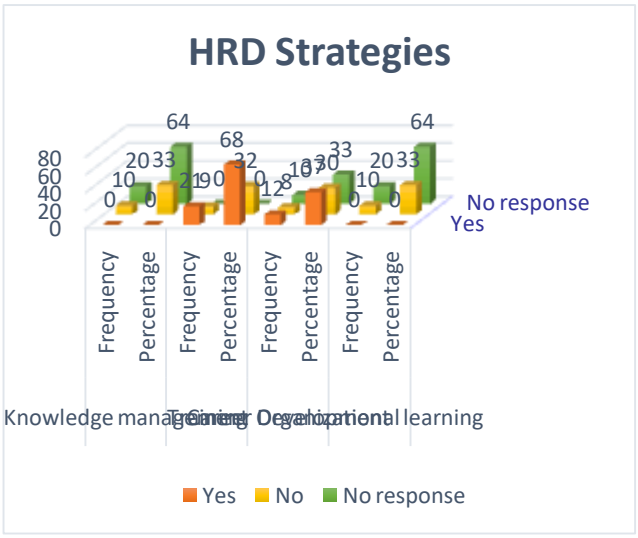
Response	Frequency	Percentage
Agree	**10**	**33**
Neutral	**10**	**33**
Do not Agree	**10**	**33**
Total	**30**	**100**



As indicated from the table above 33% of the respondents agreed that performance has improved tremendously particularly on Human Resource Development Strategies at the ICICI Bank, 33% of the respondents stated that performance improvement had not been realized yet while 33% did not give any respond.

10. What are the HRD strategies commonly used in your firm?

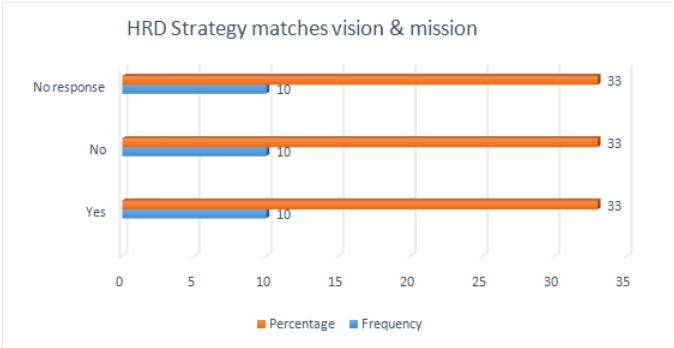
Response	Knowledge management		Training		Career Development		Organizational learning	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	00	00	21	68	12	37	00	00
No	10	33	09	32	08	30	10	33
No Response	20	64	00	00	10	33	20	64
Total	30	100	30	100	30	100	30	100



As indicated from the table above 68% of the respondents agreed that the organization have implemented Training Programs to improve the performance and 37% say that Career Development Strategy have been implemented as Human Resource Development Strategies at the ICICI Bank, whereas none of the employees find the implementation of Knowledge management and Organizational learning in the organisation.

11. Does the HRD policy/strategy match the ICICI Bank's mission and vision?

Response	Frequency	Percentage
Yes	10	33
No	10	33
No response	10	33
Total	30	100



33% of employees opine that the HRD policy/strategy matches the ICICI Bank's mission and vision, whereas others express a different opinion.

4. FINDINGS, CONCLUSIONS ANDRECOMMENDATIONS

FINDINGS

1. The results show that 100% of respondents interviewed agreed that the ICICI Bank have a fully-fledged Human Resources Development unit.
2. The study shows that 67% of respondents accepted that there is a documented Human Resource Development strategy that guides the ICICI Bank while 33% stated that human resource development strategy does not exist at the ICICI Bank.
3. Out of the respondents interviewed 35% stated that human resource development policies existed in the ICICI Bank of while 33% of the respondents said that it did not exist, the other 32% of the respondents did not give any response.
4. 67% of the respondents interviewed agreed that there was a total quality system which exists in the ICICI Bank.
5. Responses on the training pattern in the ICICI Bank shows that 67% of the respondents said that training was carried out annually, the other 33% of the respondents said that training was carried out semi-annually.
6. The study shows that all the respondents interviewed agreed that learning and training had improved work performance of staff at the ICICI Bank. This obviously indicates that learning and training are variables that improve work performance in most organizations especially at the ICICI Bank.
7. The analysis shows that 33% regarding the respondents interviewed suggested that the objectives regarding organizational learning were clear to all staff, the 50% of the respondents said that the objectives weren't clear at the ICICI Bank while 17% did not give any reply in connection with objectives organizational understanding.
8. From the respondents interviewed 33% mentioned that performance measures were incorporated in the Human Resource Development system while 33% of the respondents agreed that performance measures were not incorporated in the ICICI Bank while 33% of the respondents interviewed did not give response.
9. 33% of the respondents agreed that performance has improved tremendously particularly on Human Resource Development Strategies at the ICICI Bank, 33% of the respondents stated that performance improvement had not been realized yet while 33% did not give any respond.
10. 68% of the respondents agreed that the organization have implemented Training Programs to improve the performance and 37% say that Career Development Strategy have been implemented as Human Resource Development Strategies at the ICICI Bank, whereas none of the employees find the implementation of Knowledge management and Organizational learning in the organisation.
11. 33% of employees opine that the HRD policy/strategy matches the ICICI Bank's mission and vision, whereas others express a different opinion.

5. CONCLUSIONS

The goal of the study was to determine the extent to which often human resources development is usually practiced at the ICICI Bank. From typically the research findings it had been revealed that human resources advancement is practiced and everything the particular respondents were aware associated with the several HRD practices transported out within the ICICI Bank. The particular predominant HRD practiced are usually training and Career Development Strategyas compared to knowledge management and organizational learning. It has been further revealed that numerous forces both internal plus external influenced the HRD practices in the ICICI Bank. With regard to instance the ISO qualification of the ICICI Bank required that employees are trained to be able to comply with ISO needs. Additionally, different technological, economic and social changes impact their various strategies. The particular computerization of the numerous processes in the ICICI Bank needed that employees in this region are trained how in order to use the various techniques. The necessity to attract and maintain qualified staff is furthermore a major contributing element to their HRD methods. From the literature evaluation it is important that organizations match their particular strategic HRD. It had been however established that HRD at the ICICI Bank confronts some challenges as an illustration supervising and examination is not really completed after

training, which will help assess typically the cost-effectiveness of HRD inside the organization. More so, that is evident that you have zero documented HRD policies in addition to strategies that assist typically the ICICI Bank when implementing typically the strategies. Other areas that have been in dire need regarding attention as displayed with the study is the want for all employees to be able to aware of the targets of HRD practices. The very first process in strategic HRD is needs assessment. Typically, the ICICI Bank needs to carry out needs' assessment regularly in an attempt to determine what they genuinely need, plan and put into action regarding HRD. The additional major challenge is the particular fact that trained workers are leavingfor other jobs.The particular findings of the research have shed sufficient gentle to draw pertinent findings concerning the extent to which usually human resources development will be practiced. The numerous technological, financial and interpersonal changes gave rise in order to a quantity of structural plus strategic changes that furthermore impacted employees leading in order to implementation of various HRD practices such as coaching, knowledge management, organizational studying. It is however worth noting that will no such type of modifications may be fully implemented without challenges. The ICICI Bank need to put mechanisms in spot when planning for the adjustments.

Recommendations

Numerous issues arise from the particular study this call with regard to the following recommendation.

First of all,the ICICI Bank must sanction policies that connect with HRD. The policies have to be recorded in order to guide the administration and employees in the particular implementation of HRD methods.

Secondly the HRD auditing systems should be organization that will help examine the cost-effectiveness of recruiting development practices at the particular ICICI Bank.

In addition, there should be continuous checking and analysis of workers after any HRD exercise has been carried away.

If the ICICI Bank offers no capacity to keep track of and evaluate it may outsource. Since performance evaluation is not a powerful technique per se because the done once 12 months. Finally,the management ought to have a proactive strategy to handling HRD problems.

REFERENCES:

1. Daljeet Kaur , Quality Of Work Life In Icici Bank Ltd, Chandigarh, International Research Journal , August 2010 Issn- 0975-3486 Rni: Rajbil 2009/30097 Vol I *Issue 11
2. Dr. Ch.AbdulRehman, SaimaSardar, Usman Yousaf and AsadAijaz(2011), 'Impact of HR Practices on Employee Engagement in Banking Sector of Pakistan', Vol2, No 9, January 2011, Interdisciplinary JournalOf Contemporary Research in Business, 378-386
3. Godwin's Booke and Dickenson, "Needs Assessment", Human Resource Executive, Vol.7, 1996, p.21-27.
4. Huselid, (1995), 'Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance,' Academy of Management Journal, 38, 3, 635–672.
5. Iqbal Adnan (2010), An ampirical assessment of demographic factors, organizational ranks and organizational commitment, International Journal of Business and Management,5(3), 16-27
6. Kaya Nihat (Sep 2010),'An exploratory analysis of the influence of human resource management activities and organizational climate on job satisfaction in Turkish Banks', International Journal of Human Resource Management, vol.21,issue 11,p2031-2051, 21p.
7. Kilam, I.K. (2007). HRD in Public Sector Banks – A study (Part II). PNB Monthly Review vol. 29, No.05, 14-24
8. Kothari.C.R.(1988) – Research Methodology – methods & techniques – WileyEastren Ltd., New Delhi, p- 189 & 340.
9. Miles Mary, 1992. The Effective Manager: Semi-Tough, McGraw Hill. Misumi J and MF Peterson, 1985. "The Performance Maintenance Theory of Leadership: Review of a Japanese Research Program," Administrative Science Quarterly, 30,198-223.
10. Porter, L.W., "A Study of Perceived Need Satisfaction in Bottom and Middle ManagementJob", Journal of Applied Psychology, 1961, Vol. 45, Issue No. 1, pp. 1-10.
11. Rao.T.V.,Verma K.K., Khandelwala.A.K., Abraham.S.J., "Alternative approachesand strategies of human resource development", Rawat Publication, New Delhi,1997 , p- 35.
12. Srinivas Lakkoju, March2014, "An Empirical Analysis of Managerial and non-managerial HRD climate perceptions in SBI and KVB through internal and extyernalcomparision: A case study conducted in Andhra Pradesh",Indian Journal of Industrial Relations,Vol 41, issues 1, p51-72, 22p
13. Tiwari.S.K, Chaudhary M.K. and Bhowmick. A., 'An Evaluation of Orientation Programmes of the Academic Staff College (ASC) BHU, with reference to other ASC's in India'. University News, New Delhi, 46 (44) November 03-09, 2008 pp 13-17-21.
14. VijilaKennedy(2007), "Do HRD Practices Differ Among the Categories of Indian Commercial Banks?", ICFAI Journal of Management Research, Vol. 6, Issue 12, p33-42.
15. Yattoo N.A. (2000), "Executive Development in Banking Industry, Sarup& Sons, New Delhi, pp. 1-4.