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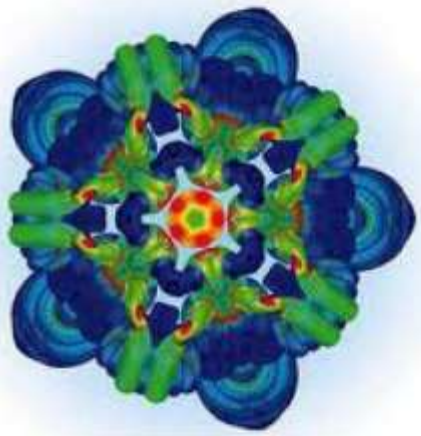
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Height Variation Study of Bundled Tube Structures Using Etabs

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***Abstract**: The development of new structural forms of tall buildings and flexible structural systems in super tall buildings are vulnerable to lateral loads. For desirable performance of these buildings, we require better understanding of interaction between building and heavy lateral loads. This paper summarizes the research work on the effectiveness of various configurations of multi-storeyed bundled tube structure of irregular shape in plan and elevation subjected to lateral load and on the performance of structural elements against lateral loads providing different heights and configurations of bundled tube structures and also performance under lateral loading. Analytical model of the building is developed and analysed using structural analysis and design software, ETABS 2016. The behaviour of building components was examined and compared on the basis of displacement, story drift, and base shear.*

I. Introduction

Nowadays tall buildings are icons of our modern society. The goal of all super-tall projects is not simply to be the world's highest building; it's to embody the world's highest aspirations. As with all super-tall projects, difficult structural engineering problems needed to be addressed and resolved. Bundled tube structural system is one of the most efficient structural system against heavy lateral loads. Besides being efficient structurally and economically, the bundled tube is innovative in its potential for versatile formulation of architectural space. The bundled tube structure means that efficient towers no longer had to be box- like appearance, they could become sculpture of any shape

A. Tubular and bundled tubular structures

The tube is a structural engineering system that is used in high-rise buildings, enabling them to resist lateral loads from wind, seismic pressures and so on. It acts like a hollow cylinder, cantilevered perpendicular to the ground. The tube system can be constructed using concrete, steel or a composite of both. In its simplest form, closely-spaced columns are tied together with deep spandrel beams through moment connections as part of the external perimeter of the building. The rigid frame that this assembly of columns and beams forms results in a dense and strong structural 'tube' around the exterior. Since lateral loads can be resisted by this stiff exterior framing, interior columns can be located at the core and are fewer in number. The interior can be simply framed for gravity loads and floor space is left free from columns.

The bundled tube system involves, instead of one tube, several individual tubes interconnected to form a multi-cell tube. Together they work to resist the lateral loads and overturning moments. The increase in stiffness of the structure is apparent. The system allows for the greatest height and the most floor area. Not only is this system economically efficient but it also allows for more versatile building designs, adopting interesting shapes and bundled in dynamic groupings rather than being simply box-like towers.

B. Advantages of Bundled tube structural systems

- Sufficient lateral stiffness.
- Building acts as a unified system of stiffened tubes.
- Aesthetically appealing.
- The interaction between the individual tubes and the belt beams at mechanical floor levels allows the building to attain its extreme height.
- These frames take the gravity loads from above and redistribute them evenly onto the tubes below.
- Their columns are more evenly stressed than in the single tube structure and their contribution to the lateral stiffness is greater.

II. Ojectives

- Development of analytical model of a typical bundled tube building providing different configurations using ETABS.
- Manual calculation of gust factor.
- Observe the effectiveness of bundled tubular structure in building technology with respect the base shear, story displacement & drift.
- Identify the vulnerability of bundled tubular building among the models considered for seismic action and high wind load.
- Assessment of structural behaviour of bundled building related to varying height on comparing of all results obtained and reaching conclusions.

III. Software used

Modeling and analysis were done using ETABS (Extended 3D (Three-Dimensional) Analysis of Building Systems) 2016. ETABS is a structural analysis and design software. ETABS have a great versatility in loading, analysis and design process of a building system. It can be used for linear, non-linear, static and dynamic analysis and for the design and detailing of any type of building.

IV. Modelling

A single tubular structure with regular plan of area 324 sqm at base is modelled for the study. For the height variation study of two bundled system four groups and the same of three bundled system three groups of different floor levels are chosen. At the base of the buildings 2 or 3 modules form a bundled structure of 18×18m, grouped and arrive intact through the first 60 floors, finishing at different heights and creating a form with multiple levels. The building is supposed to be used for both commercial and residential purposes (mixed use type). Centre to centre distance between outer columns is 3m and that of inner columns is 6m. Belt beam is provided at every 20th floor height at the middle outer columns. Thus every 20th floor is considered as mechanical floors for the super elevators provided in the building. Refer to table 1&2 and Figure 1 , 2 & 3 which show parameters of building design and plan of different storey level respectively.

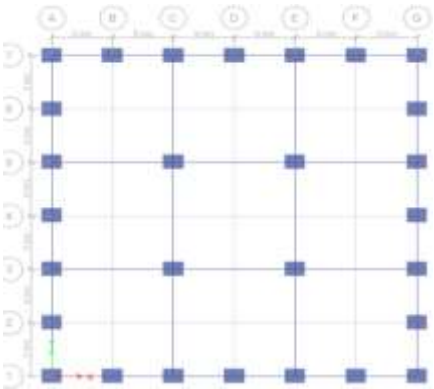


Figure 1. Plan of single tube structure

A. On bundling of two tubes

Here, bundling of two tubular structures is done to form a single building, the model details are given in table 1.

Table 1 Model details of two bundled building

	Group 1	Group 2	Group 3	Group 4
Combination of storey levels on each tube	80+80	100+100	120+120	140+140
	70+80	90+100	100+120	120+140
	60+80	80+100	90+120	90+140
	50+80	70+100	80+120	70+140
		60+100	60+120	

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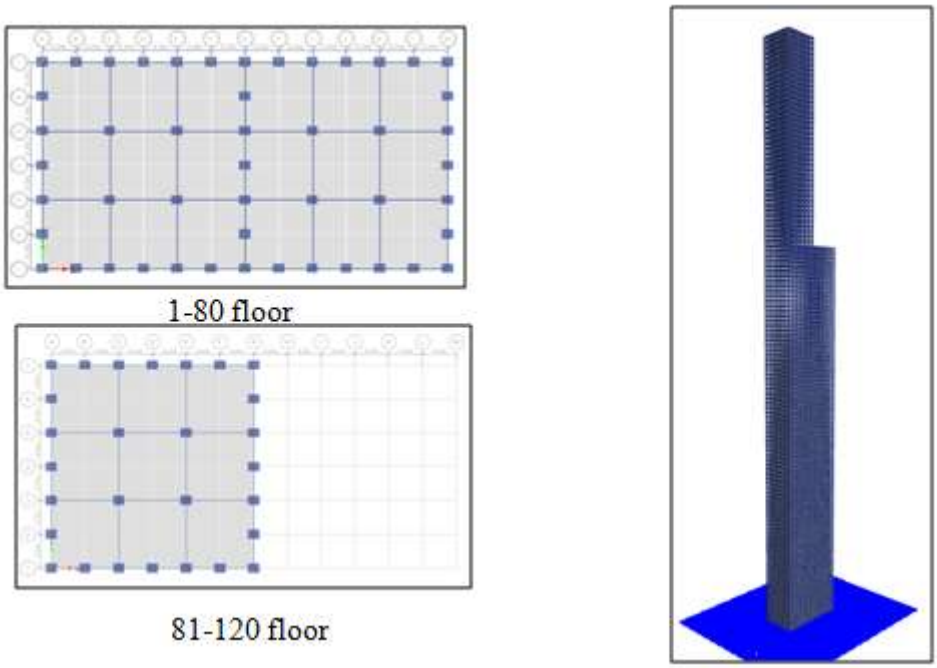


Figure 2. Plan and rendered view of two bundled structure

B. On bundling of three tubes

Here, bundling of three tubular structures is done to form a single building, the model details are given in table 2.

Table 2 Model details of three bundled building

	Group 1	Group 2	Group 3
Combination of storey levels on each tube	80+80+80	90+90+90	120+120+120
	60+70+80	70+80+90	80+100+120
		60+75+90	60+90+120

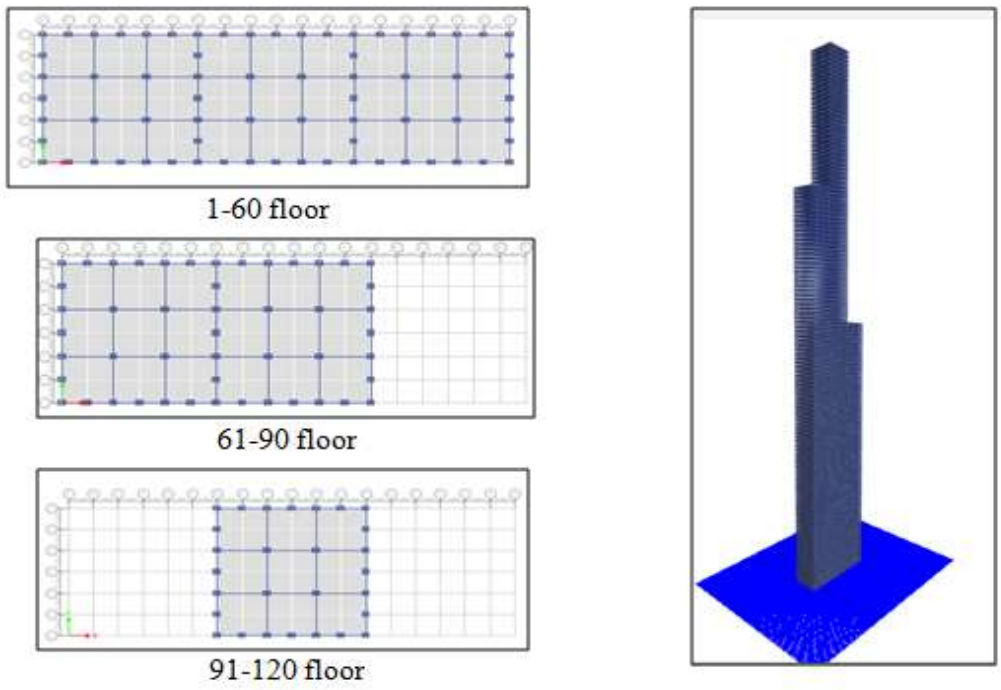


Figure 3. Plan and rendered view of three bundled structure

C. Description of models

Building type : Commercial (Mixed use)

- Location : Trivandrum (Kerala)
- Foundation : Rafted Pile Foundation
- Super structure : RCC Framed tubular structure
- Outer walls : Curtain wall of dark Tinted Glass
- Floors : As per table 2
- Floor height : 3.0 m (each)
- Seismic Zone : 3
- Design as per IS codes

Table 1 Parameters of structure

Sl. No	***Particulars***	***Data***
1	Storey height	• 3 m for all storey except ground storey • Ground 3.5m
2	Beam Size • Outer Beams • Inner Beams • Belt beam	800 x 800 mm 250 x 250 mm 800 x 1000 mm
3	Column Size	1000 x 800 mm
4	Slab Thickness	250 mm
5	Grade of Materials and Concrete	• M_{30} for all beams and slab except belt beam • M_{40} for all columns and belt beam • Fe415 steel for rebar

Load calculation

Static Load

- Live load = 4 kN/m²
- Dead load

  Self-weight of slab = 6 kN/m²

  Floor Finish = 1 kN/m²

  Total load on slab = 7 kN/m²

Seismic parameters considered

Seismic zone	III
Zone factor	0.16
Soil type	Medium
Importance factor	1.5
Response reduction factor	5

For static and dynamic response spectrum analysis, earthquake load calculation can be done directly by ETABS. And the load combinations are as per IS code with 'auto load combination' setting in ETABS.

V. Analysis

A. Wind analysis

As per IS 875 part III, tall building/structures are 'wind sensitive' and shall be designed for dynamic wind loads. For calculation of along wind load and response the Gust factor method is used. Flexible slender structures and structural elements shall be investigated to ascertain wind induced oscillations or excitations along and across the direction of wind. In general following guidelines are used for examining wind induced oscillations,

- Buildings or closed structures with a height to minimum lateral dimension ratio more than 5, and
- Buildings or closed structures whose natural frequency in first mode is less than 1.0 Hz

Both the guidelines are

Along wind load on a structure on a strip area (Ae) at any height (z) is given by,

$$F_Z = C_t A_e p_z G$$

Where,

F_z = Along wind load on a structure at any height z corresponding to strip area Ae,
C_t = Force coefficient for the building,
A_e = Effective frontal area considered for the structure at height z,
p_z = design pressure at height z due to hourly mean wind obtained as $0.6\ Vz^2 (N/m^2)$
G = Gust factor, and is given by:

$$= 1 + g_t r \sqrt{[B(1+\varphi)^2 + (SE/\beta)]}$$

Where,

g_t = peak factor of afluctuating load
r = roughness factor

The value of '$g_t r$' is given in (Figure 8*)

B = background factor, (Fig. 9*)
SE/β = measure of the resonant component of the fluctuating wind load
S = size reduction factor (Figure 10*)
E = Measure of available energy in wind stream (Fig. 11*)
β = Damping co-efficient (from table 34*)
φ = $g_t r/4$

* Figures and Tables of IS 875 part III

Dynamic wind analysis is done for all the models. The analysis is entirely carried out by the software ETABS The manually calculated value of gust factor, G is multiplied with wind load during analysis procedure**.**

VI. Comparison of analysis result

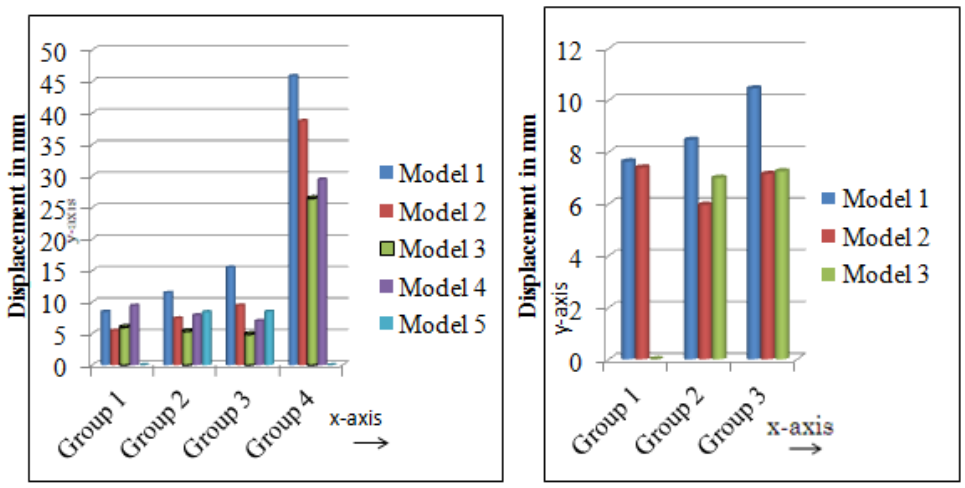


Figure 5. Maximum storey displacement

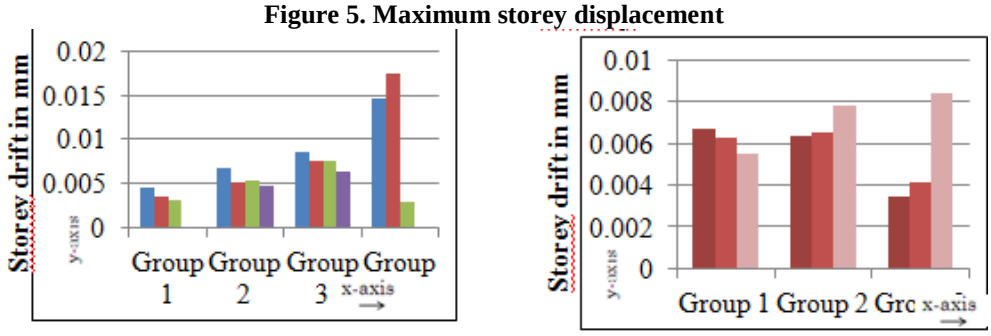


Figure 6. Maximum storey drift

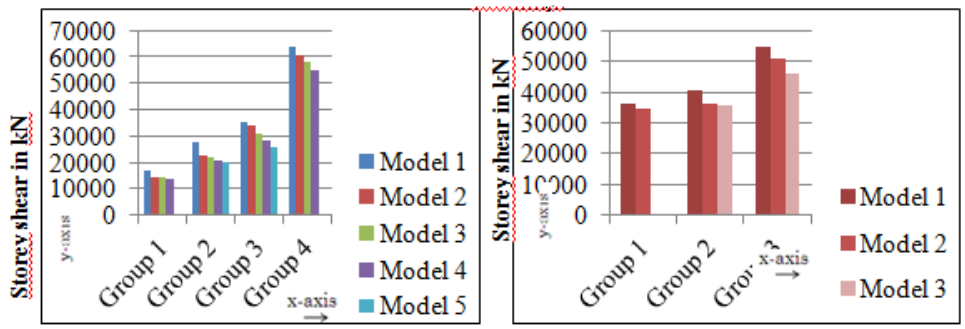


Figure 7. Maximum storey shear

Inference

The analysis results can be summarized as follows,

Table 4 Observations from analysis results

Name	Two Bundled structure	Three bundled structure
Group 1	70+80 floors	60+70+80 floors
Group 2	80+100 floors	70+80+90 floors
Group 3	90+120 floors	80+100+120 floors

- 140 storey buildings shows poor performance

VII. Conclusion

Bundled tube structural system is one of the most efficient structural systems against heavy lateral loads. For a two and three bundled structure about 80 floor structure shows better performance on analysis result & greater than 120 floors cannot be recommended because the structure will become more slender. Otherwise the building can be designed for four or nine bundled structure since they are comparatively more efficient than two or three bundled tube systems. The future of structural design of super-tall and mega-tall structures

lies in development of new technology and that should be based upon need and evolvement towards enhanced efficiency.

VIII.Future scope

Future studies of following areas related to bundled structure can be done

- We can compare the wind analysis results with wind tunnel testing methods
- Considering the increased interest in sustainable architecture that includes energy-efficient design, the research on this tubular design direction can be expected
- Shear lag is a very important behavior for tubular structures
- Bundled tubular structures with asymmetric configuration and innovative architecture.
- Usage of composite material for building construction and effects of damping mechanisms

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Experimental Investigation on Partial Replacement of Concrete in the Tension Zone

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***Abstract**: Partial replacement of the concrete below the neutral axis is an idea that can create reduction in weight and savings in materials. The material should be such that the bond between the material and steel should be strong enough same as between the steel and concrete. In this paper studies the effect of partial replacement of concrete in the tension zone with light weight materials compare to concrete.. In this work the investigation is carried out for the strength and behavior of beam partially replaced below neutral axis by using bamboo, Mangalore tiles and wooden blocks .By using these materials the dead weight and the cost of the section will become reduces. Beam with different infill materials are need to test and comparing the various results with conventional beam.*

***Keywords**: Infill materials, Partial replacement of concrete, Tension zone, Compression zone*

I. Introduction

Reinforced concrete is being used in most of construction activities. Reinforced concrete construction for high-rise buildings provides inherent stiffness, mass, and ductility. Occupants of concrete towers are less likely to perceive building motions than occupants of comparable tall buildings with non-concrete structural systems. A major economic consideration in high-rise construction is reducing the floor to floor height. Using a reinforced concrete flat plate system, the floor to floor height can be minimized while still providing high floor to ceiling heights. As a result, concrete has become the material of choice for many tall, slender towers.

In recent days the problem faced by the construction industry is acute shortage of raw materials. Researchers have been investigating many alternative materials to suite the Indian scenario. Rice husk, saw dust, light weight aggregates, copper slag, fly ash, are some of the materials experimented. Concrete is the primary structural component that exists in buildings and bridges.

. Concrete below the neutral axis act as a stress transfer medium between the two zones. Therefore the concrete below the neutral axis is known as sacrificial concrete. In the beams the concrete below the neutral axis does not take any tension. Hence the replacement of this concrete can reduce the materials used for construction that physical conditions are verified for in filled beam. The fields of architecture and construction still offer numerous possibilities of reaching the goals set by directives on energy efficiency in buildings. Looking for alternative, eco- friendly solutions in residential and public building construction remains our most vital task, whose holistic problem solving requires knowledge integration. Timber has been used as a building material for over 400,000 years. It is the most common and best-known material for house construction including framing of floors, walls and roofs. Timber is natural and renewable. It has a high strength to weight ratio and is easy to work with, making it especially useful where only basic technology and procedures are available. Consequently it has become one of the most widely used materials and it is found in large quantities. The many varieties of softwoods and hardwoods have allowed for flexible use of timber in building.

II. OBJECTIVE OF THE STUDY

- To study an advanced method by replacing some amount of the concrete below neutral axis of beam.
- To study the load versus deflection characteristics.
- To study the ultimate load carrying capacity of the beam.
- To reduce the amount of material, weight and cost of the reinforced concrete.
- To compare load carrying capacity of concrete beam replaced with bamboo, Mangalore tile and wooden blocks with conventional beam.

III. SCOPE OF STUDY

Several studies are carried out on replacement of concrete below neutral axis of beam. From the referred literature reviews, it is understood that in RC beams less stressed concrete in and near the neutral axis can be replaced by some material. Different types of in filled materials like brick, hollow pipes, grade variation of concrete, terracotta hollow blocks and expanded polystyrene sheets etc are also experimented gives good result in reducing the self- weight. In this work the investigation is carried out the strength and behavior of beam partially replaced below neutral axis by using Mangalore tile, wooden block an bamboo and also the ultimate load carrying capacity and is compared to control beam.

IV.LITERATURE REVIEW

Balamurugan.R.et.al (2017) investigation of the lightweight aggregate concrete placed below the neutral axis has been done to create reduction in weight and savings in materials. As compressive stresses are induced in the zone above the neutral axis, compressive strength of the concrete lying above neutral axis is very important parameter. Hence comparing a reinforced LECA concrete sandwich beam with a reinforced concrete solid beam in terms of flexural strength. The beam is investigated in terms of crack load and deflection curves.

Mita Ann Zachariah (2016**)** Conducted an experimental investigation is on partial replacement of concrete below the neutral axis by placing bricks with spacing and without spacing. Specimens of solid RC beams and two composite beams with different variations are casted and tested under two-point flexure loading. The results of Load deflection relationship, Load strain relationship, first crack, Ultimate load, concrete saving and reduction of Self weight of the beam are compared and effects are studied.

S.Manikandan,.et al (2015)conducted an experimental study on flexural behavior of reinforced concrete hollow core sandwich beams. This paper presents details of the studies carried out on flexural behavior of Hollow Core Sandwich RC Beams with different core shapes. The experimental program consists of casting and testing of RC beams of size 1500mmx150mmx200mm with and without hollow core in tension zone. To study the flexural behavior, all beams are tested after 28 days curing by applying loads at 1/3rd points. The performance of Hollow Core Sandwich Beams under flexure is similar when compared with conventional solid beams.

AkhrawatLenwari (2009) presented the effects of the two types of fiber sheets, namely, carbon and glass fiber sheets, on the flexural behaviors of reinforced concrete (RC) beams when they are bonded to the tension zones of the beams. A total of eight full-scale beams were tested in the experiments. The flexural strength and stiffness of RC beams were found to increase significantly after the installation of fiber sheets. An analytical model based on the principle of virtual work was developed to predict the load-deflection relationship of the hybrid beams.

V.METHODOLOGY

1. Material collection
2. Parameter study on materials
3. Arrival of mix design
4. Preparation of beam specimens
5. Testing of beam specimens under two point loading on loading frame
6. Result and discussion

VI.MATERIAl TEST RESULT

Test	Material	Equipment Used	Values Obtained
Specific Gravity	PPC	Le chatelier flask	3.15
Specific Gravity	Fine Aggregate	Pycnometer	2.7
Specific Gravity	Coarse Aggregate	Vessel	2.94
Workability	M30 Concrete	Slump cone apparatus	100mm

VII. MIX DESIGN

Cement	350
Fine aggregate	890
Coarse aggregate	416
Water cement ratio	0.04
Mix ratio	1:2.54:3.20:0.04

VIII EXPERIMENTAL INVESTIGATION

Total Sixty four beams were reinforced as flexural beams with three numbers of 16mm of diameter bars in the tension zone and two numbers of 12mm diameter bars in the compression zone. All beams were provided with 7 numbers of 6mm diameters steel stirrups. Beams were tested in 7,14 and 28 days with simply supported and were subjected to two point loads symmetrically placed at equal distance from the center line of the slab

Specimen Details	Designation	No. Of Specimens
Control Beam	CB	3
Beam partially replaced below neutral axis by using bamboo without spacing	BBWTS	3
Beam partially replaced below neutral axis by using bamboo with spacing	BBWS	3
Beam partially replaced below neutral axis by using wooden blocks without spacing	BWWTS	3
Beam partially replaced below neutral axis by using wooden blocks with spacing	BWWS	3
Beam partially replaced below neutral axis by using Mangalore tiles without spacing	BMWTS	3
Beam partially replaced below neutral axis by using Mangalore tiles with spacing	BMWS	3

IX. TEST PROCEDURE

The beams were tested under two point loading with simply supported end condition. Specimens are tested in a loading frame 2000kN (200tone) capacity with an effective span of 1100mm.Load cell of 200kN capacity with a least count of 1kN is used to measure the applied load. The load is increased in stages till the failure of the specimen in the case of monotonic loading and at each stage of loading deflection at mid span is found out using a dial gauge

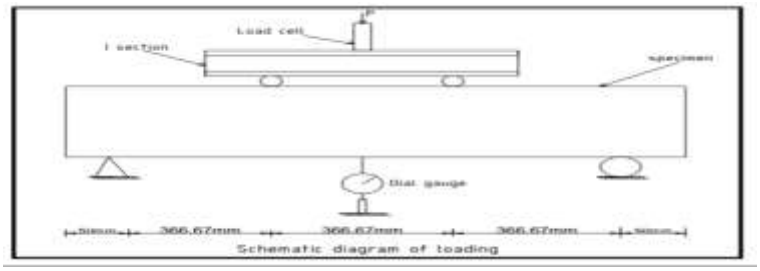


Fig 1 Experiential Set Up Of Beam Specimen

X. EXPERIMENTAL RESULT

Table 2 shows ultimate load and ultimate deflection for CB, BBWTS And BBWS

Specimen	Test for 7 day		Test for 14 days		Test for 28 days	
	Ultimate load	Deflection	Ultimate load	Deflection	Ultimate load	Deflection
CB	42	3.6	72	5.1	146.4	8.4
BBWTS	46.2	3.5	76.3	5.6	153	8.9
BBWS	46	3.5	75	5	151	8.8

Table 3 shows ultimate load and ultimate deflection for CB, BWWTS And BWWS

Specimen	Test for 7 day		Test for 14 days		Test for 28 days	
	Ultimate load	Deflection	Ultimate load	Deflection	Ultimate load	Deflection
CB	42	3.6	72	5.1	146.4	8.4
BWWTS	43	3.6	73	5.1	147	8.4
BWWS	42	3.6	72.5	5.1	146	8.38

Table 4 shows ultimate load and ultimate deflection for CB, BMWTS And BMWS

Specimen	Test for 7 day		Test for 14 days		Test for 28 days	
	Ultimate load	Deflection	Ultimate load	Deflection	Ultimate load	Deflection
CB	42	3.6	72	5.1	146.4	8.4
BMWTS	41	3.5	70	5.	143	8.23
BMWS	40	3.5	70	5.	142	8.2

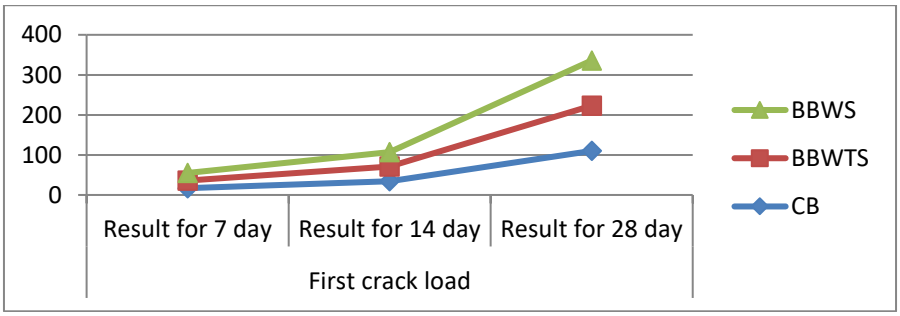


Fig load deflection behavior of first crack load for CB, BBWTS and BBWS

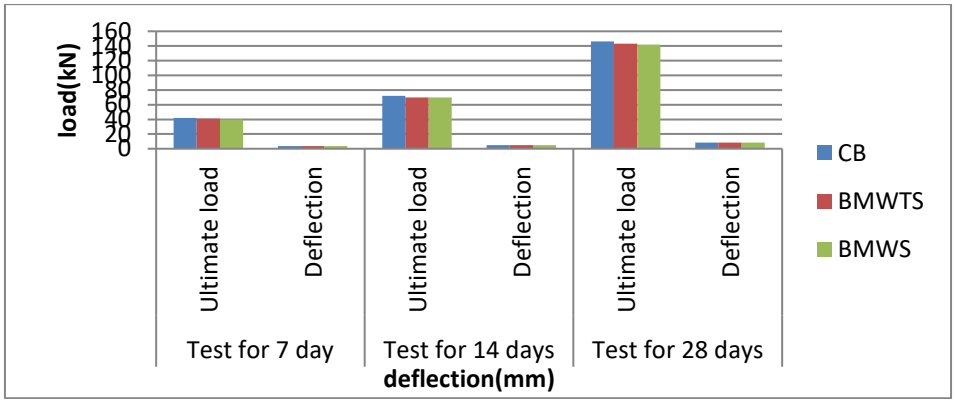


Fig 3 load deflection behavior of first crack load for CB, BWWTS and BWWS

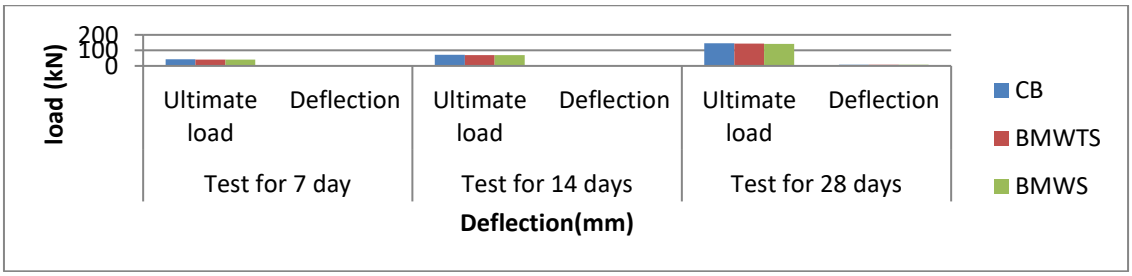


Fig 3 load deflection behavior of first crack load for CB, BMWTS and BMWS

XI.CONCLUDING AND REMARKS

Based on preliminary and experimental investigation results the following conclusions were obtained.

- M30 grade normal concrete was developed.
- All the fresh property values suggest the mix to be stiff plastic nature
- The mechanical properties of developed concrete mix such as compressive strength, splitting tensile strength and flexural strength were found to be 32.33N/mm^2,4.23N/mm^2 and 5.54N/mm^2
- For 7 day 14 day and 28 day testing of BBWTS and BBWS shows strength greater than that of the normal beam CB
- For 7 day 14 day and 28 day testing of BWWTS and BWWS shows strength same as that of the control beam
- For 7 day 14 day and 28 day testing of BMWTS and BMWS shows strength small variations lower than that of the control beam due to the water absorbing nature of Mangalore tiles.
- Flexural behaviors of reinforced concrete beam with partially replaced concrete in the tension zone with various materials are similar to that of the conventional beam.
- Self weight of beams can be reduced by use of light weight materials compare to concrete below the neutral axis f the beam.
- Economy and reduction of weight in beams depends on the percentage of replacement of concrete by light weight materials.
- The weight of the structure is reduced due to the usage of light weight materials when compare to concrete. So that the overall weight of the structure also reduced.
- The cost of the partially replaced beam is comparatively less than that of conventional beam. So it can be practically used.

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FREE VIBRATION ANALYSIS OF FUNCTIONALLY GRADED MATERIAL PLATES

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Abstract: *In this study, the following boundary conditions of FGM plate are considered: (i) all edges are simply supported (SSSS) (ii) two adjacent edges are simply supported and other two adjacent edges are clamped (SSCC). Functionally Graded Material Plate are assumed to be isotropic and effective material properties of FGM plate are graded in thickness direction. The present finite model is established using ANSYS parametric design language code in the ANSYS platform. Parametric investigation is carried out for different supporting conditions, plate-aspect ratios, effect of material gradient index of FGM plates.*

Keywords: *Functionally Graded Plate, First-order shear deformation theory, Non-dimensional frequency parameter, Material gradation index, aspect ratio (b/a).*

Introduction

Materials have played an important role in the development of our society. The scientific use of base materials available in various inorganic and organic compounds has paved the way for the development of advanced polymers, engineering alloys, structural ceramics, etc.. Therefore, composites are a class of advanced materials made by combining one or more materials in the solid state with different chemical and physical properties. These composite materials offer superior properties compared to their original materials and are also light in weight. Functionally graded materials (FGMs) are the advanced materials in the family of engineering composites consisting of two constituent phases with continuous and smoothly variable composition. FGMs are an advanced class of composite materials with variable material properties over the change in dimension. De-lamination is a major concern issue in the reliable design of advanced fiber reinforced composite laminates. In laminated composites, the separation of layers caused by high local inter-laminar stresses leads to a destruction of the load transfer mechanism, a reduction in stiffness, and a loss of structural integrity, resulting in a final structural and functional failure . In Functionally Graded Materials, due to the gradual change in the material property from one surface to the other, it can eliminate inter-laminar stresses due to sudden change in material properties. These advanced materials with developed gradients of the composition, structure and properties in preferred direction/ orientation, are superior to a homogeneous material of similar constituents. In functionally graded material mechanical properties such as Young's modulus of elasticity, Poisson's ratio, modulus of elasticity, and material density varies smoothly and continuously in the preferred direction of structural member. The FGM materials and their composition are selected based on the function that the material has to perform. Ceramic metal FGMs are commonly used as thermal barrier coating material, where the ceramic surface will withstand temperature and the metal matrix will provide strength.

Methodology

- Literature survey to understand the behaviour and properties of carbon woven composite beams
- Fixing the objectives of the thesis
- Study of ANSYS software
- Modelling
    - Model 1 – FGM plate with aspect ratio 0.5
    - Model 2- FGM plate with aspect ratio 1
    - Model 3- FGM plate with aspect ratio 1.5
- Analysis
- Comparison of results

- Conclusion

Objective

In the field of twisted FGM plate, very little research work have been done. This thesis deals with the free vibration analysis of FGM plates. The study aims to model the FGM plate using shell element, and solve the free vibration problem using finite element method. The influence of various factors such as gradient index, aspect ratio and various boundary conditions on the natural frequencies are studied.

modelling

The finite element modelling was done using ANSYS 16 software. A 3-D 8-Node Structural Solid Shell element (SOLSH190) is used for analysis in ANSYS APDL. The functionally graded material section is considered as an equivalent laminate section for the finite element modelling. In this analysis 16 number of laminate layers section are considered approximately to represent the FGM. For this study an Al/ZrO2 FGM Square plate having b/a =1.0, a/h = 20 (where a, b, h are width, length and thickness of the plate respectively) was taken. Models of various layouts are shown below.

Figure 1 Model Of fgm plate section Used For analysis In ANSYS

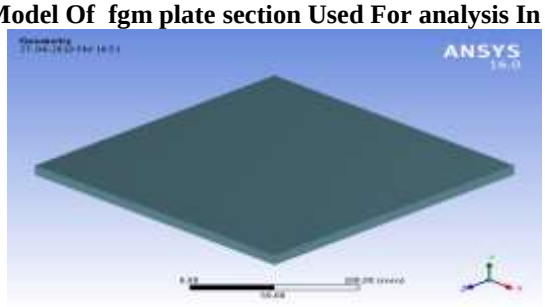


Figure 2 Model Of fgm plate section Used For analysis In ANSYS

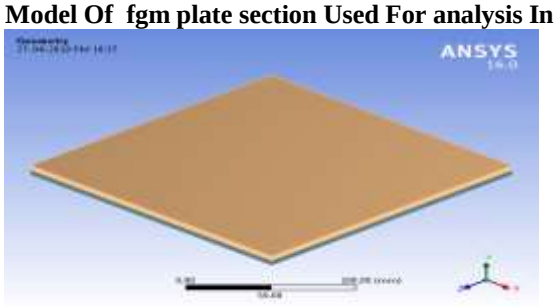


Figure 3 Model Of fgm plate section used For analysis In ANSYS

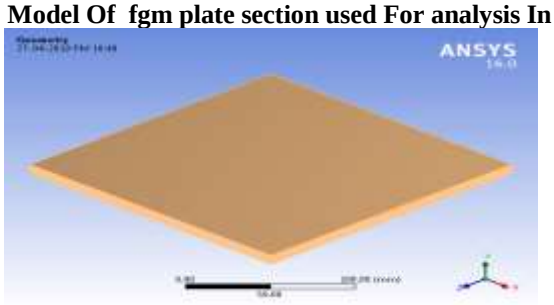


Table I Shows variation of frequency with gradient index

Boundary condition	frequency		
	N=0	N =0.5	N=1
	6.52	5.59	4.4
	7.86	6.68	5.3
ssss	15.90	13.67	11
	17.42	14.58	11.88

Results and discussion

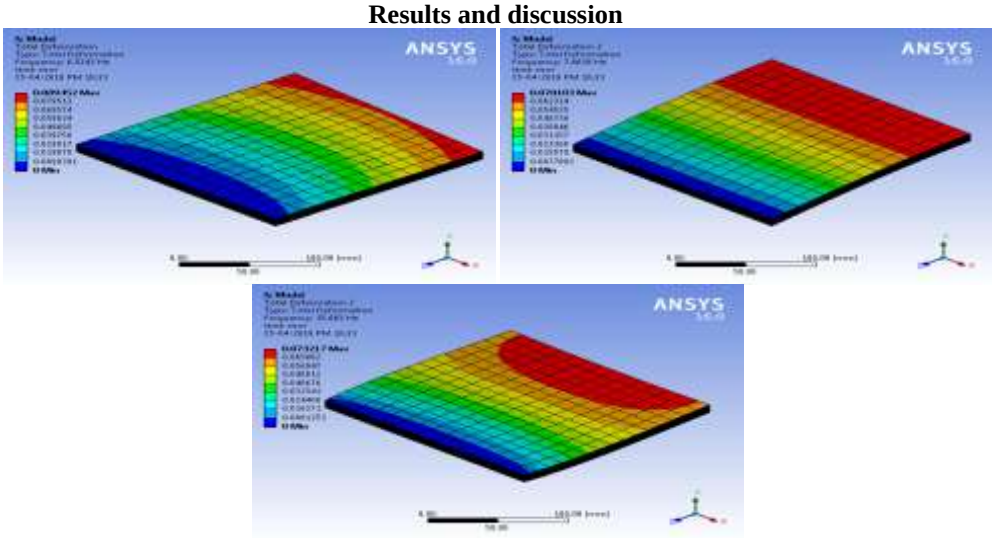


Figure 4 fgm plate with aspect ratio 1 (first , seconda and third mode shape):

VI . Conclusion

An extensive study of free vibration analysis of square and rectangular functionally graded material plates subjected to both uniformly distributed load and Thermo mechanical loading I presented. Analysis is performed using ANSYS 15.0 APDL software. A Solid-Shell element (SOLSH190) based on first-order shear deformation theory is used for above analysis.. Results obtained from above analysis is in good agreement with those available in literature. The following important conclusions are observed from the result obtained from free vibration analysis considering various parameters viz. different material gradient, plate aspect ratio thermal loadings and various combination of boundary conditions.

A. It is concluded that free vibration frequency of FGM plate is maximum for pure ceramic (n=0) and minimum for metal (n=∞) & decreases gradually as volume fraction index n increases. By increasing value of material gradient index n, sharing of ceramic(ZrO_2) phase in FGM plate decreases and sharing of Aluminium phase increases which tends t reduce the stiffness of FGM plate and thereby reducing the natural frequency, because th Young's Modulus of Aluminium is 151GPa and Young's Modulus of Zirconia is 70GPa.

B. It is concluded that an increase in plate aspect ratio, leads to decrease in stiffness of plate, and consequently the value of non dimensional frequency parameter decreases.

C. To study influence of boundary conditions of plate, a set of two types of boundary conditions i.e., SSSS, and SSCC are considered here. It is expected that stiffer boundaries yield higher value of non-dimensional frequency parameter whereas less stiff boundaries correspond to lower values of non-dimensional frequency parameter. In above analysis, order of non dimensional frequency parameter is SSCC>SSSS. It means that Simply Supported and Clamped (SSCC) boundary condition is stiffer than Simply Supported (SSSS) boundaries are very less stiff.

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CYCLIC PERFORMANCE OF DAMPERS IN CHEVERON BRACED STEEL FRAME

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Abstract*: Several advantages of yielding dampers in controlling seismic energy have attracted attention of many researchers in designing new buildings and retrofitting existing structures. In recent decades, various shapes and substances of such dampers have been used in engineering structures and their behavioral features especially including the energy dissipating capacity have been assessed. The cyclic performance of circular, rectangular, square, elliptical and comb teethed dampers are placing in chevron braced steel frames to obtain most suitable geometric shape for dampers and the effect of placement of dampers are also analyzed. Total deformation, equivalent elastic strain, shears elastic strain, life and hysteresis are analyzing in different geometries and most suitable placement of dampers are also analyzing.*

Keywords*: Elliptical Damper, Hysteresis, Energy Dissipation, Chevron Braced Frame*

I.Introduction

One main structural and seismic engineering problem which is of most importance is to find solutions for reducing forces exerted upon the main structural members. During an earthquake event, a huge amount of energy is imposed to the structure. In structures which are designed using conventional methods, the plastic deformations of portions of the structure such as connections, would cause partial energy dissipation. However when the amount of energy exceeds the structure capacity, it might cause failure of the structure by damaging main members. In case that the induced damages are local, they do not lead to collapse but the high cost of reconstruction becomes problematic. Hence, providing devices and systems which could prevent damage to the main structural members through absorbing the input energy would be essential.

The main purpose of this paper is to prevent damage to the building by using dampers of different geometries in chevron braced steel frame under cyclic loading configuration. The use of damper element will not only prevent serious damages to the structure and also loss of lives and property but also it will ensure that the structure can be repaired and made serviceable as soon as possible with minimum cost. It is anticipated that, during an earthquake the damage will occur only on the damper which can be easily replaced.

Recently various energy dissipation devices have been applied to protect structures from earthquake induced ground motions. For economic use of energy dissipation devices or passive dampers in multi story structures, it is essential to determine the appropriate location for damper installation throughout the stories.

II.Methodology

The modeling was done using Creo Pro software and the analysis was done using ANSYS 16 SOFTWARE, so as to check the accuracy and percentage of variation. The cyclic performance of dampers in cheveron braced steel frames was analyzed using ANSYS.

- Literature survey of previous works related to dampers
- Fixing the objectives of the thesis
- Study of Pro-e and ANSYS software
- Modelling using Pro-e software
- Model 1 - cyclic performance of chevron braced frames with elliptical dampers
- Model 2 - cyclic performance of chevron braced frames with circular dampers
- Model 3 - cyclic performance of chevron braced frames with rectangular dampers
- Model 4 - cyclic performance of chevron braced frames with square dampers
- Model 5 - cyclic performance of chevron braced frames with comb teeth dampers
- Analysis using ANSYS workbench
- Comparison of results and to choose the best geometry for dampers
- Model 6 - cyclic performance of chevron braced frames with elliptical dampers orientation set 1
- Model 7 - cyclic performance of chevron braced frames with elliptical dampers orientation set 2
- Model 8 - cyclic performance of chevron braced frames with elliptical dampers orientation set 3
- Model 9 - cyclic performance of chevron braced frames with elliptical dampers orientation set 4
- Model 10 - cyclic performance of chevron braced frames with elliptical dampers orientation set 5
- Model 11 - cyclic performance of chevron braced frames with elliptical dampers orientation set 6
- Model 12 - cyclic performance of chevron braced frames with elliptical dampers orientation set 7
- Analysis using ANSYS workbench
- Comparison of results and to choose best orientation set
- Arriving at conclusion

III .Objective

- To find the total deformation, equivalent elastic strain, equivalent stress, strain energy, life, damage of models
- To analyze the cyclic performance of dampers in circular, rectangular, elliptical, square and comb teeth geometries in chevron braced steel frames and to find the most efficient geometry for dampers
- To analyze the placement effect of dampers in chevron braced steel frames and choosing the best orientation set

IV.Modelling

The models are modeled using Creo Pro software and then exporting to ANSYS 16 sotware, so as to check the accuracy and percentage of variation. The cyclic performance of circular rectangular, elliptical, square and comb teeth geometry dampers in chevron braced steel frames are analyzed and compared to get most efficient

geometry for dampers. Also dampers are placing in 7 different orientations and most effective orientation is analyzed from their comparison. The models are modeling in Creo pro software and importing it to ANSYS for their analysis

Fig 1 model of cyclic performance of chevron braced frames with elliptical dampers



Fig 1 model of cyclic performance of chevron braced frames with circular dampers

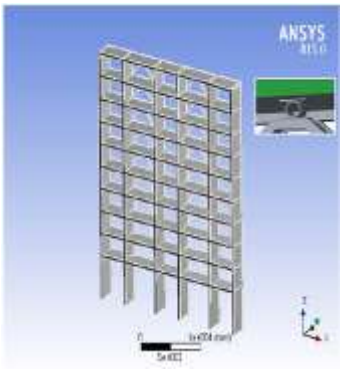


Fig 2 model of cyclic performance of chevron braced frames with rectangular dampers

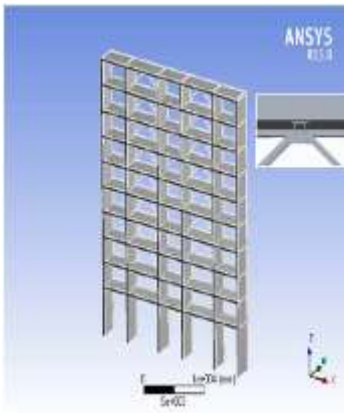


Fig 3 model of cyclic performance of chevron braced frames with square dampers

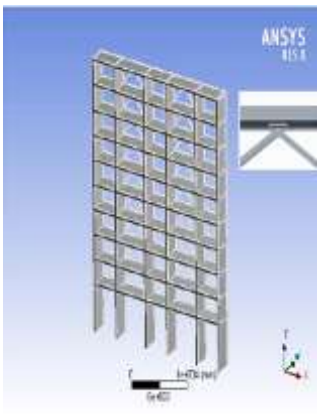


Fig 4 model of cyclic performance of chevron braced frames with comb teeth dampers

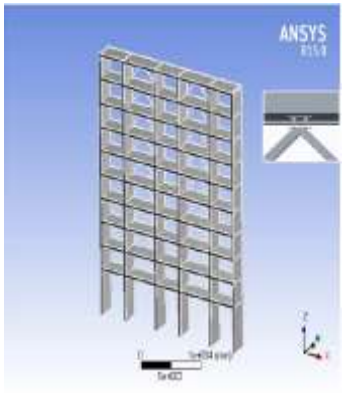


Fig 5 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 1

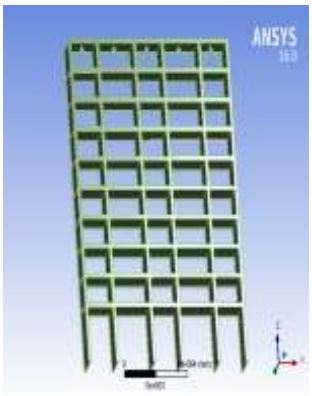


Fig 6 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 2

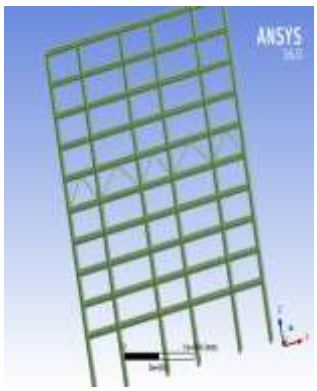


Fig 7 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 3

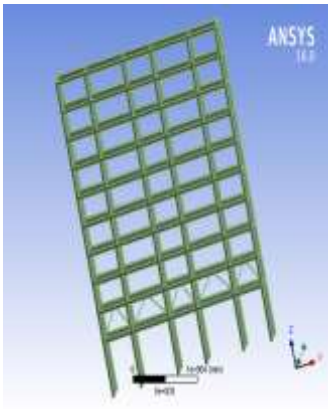


Fig 8 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 4

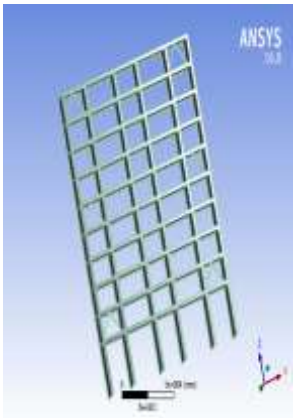


Fig 9 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 5

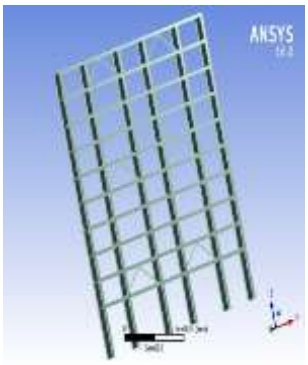


Fig 10 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 6

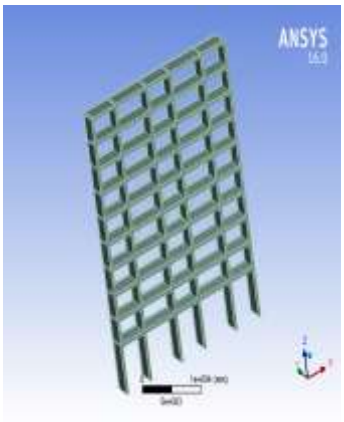


Fig 11 model of cyclic performance of chevron braced frames with elliptical dampers orientation set 7

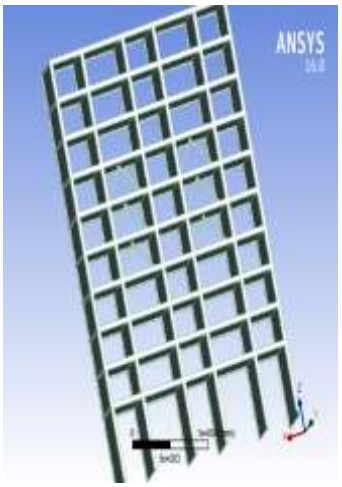


Fig 12 total deformation of frame in elliptical damper

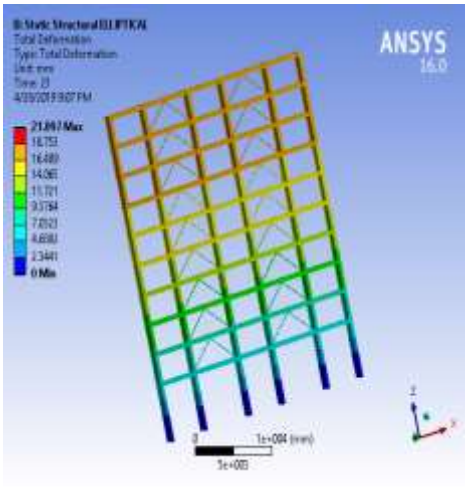


Fig 13 Equivalent elastic strain of frame in elliptical damper

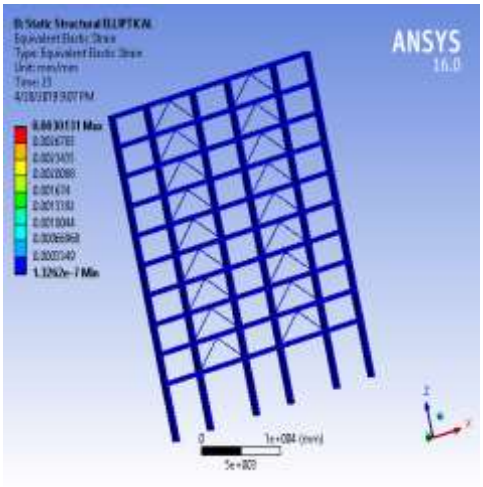


Fig 14 equivalent elastic stress of frame in elliptical damper

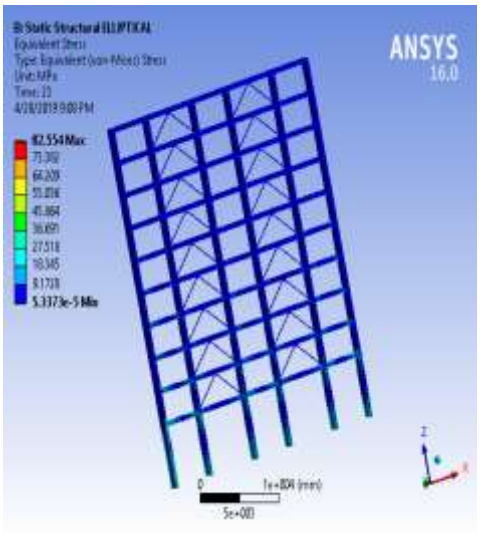


Fig 15 strain energy of frame in elliptical damper

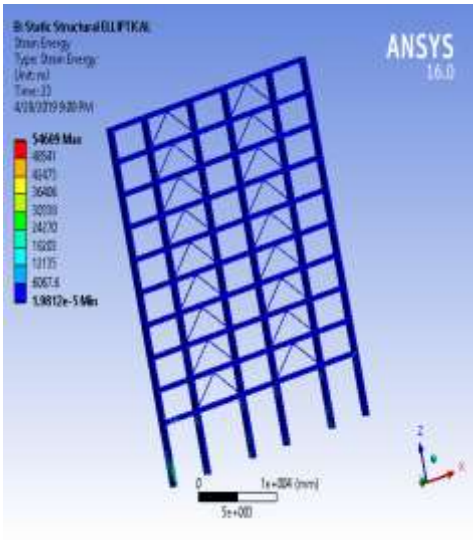


Fig 16 life of frame in elliptical damper

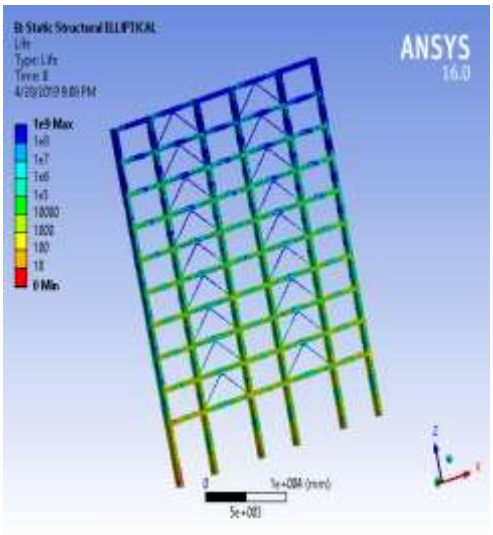
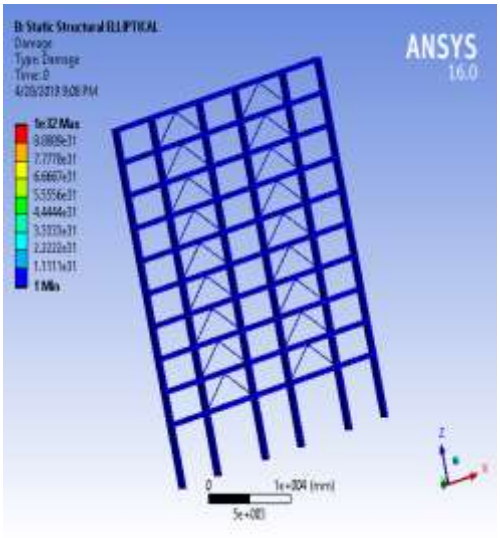


Fig 17 damage of frame in elliptical damper



V.RESULTS

Table 1 comparison of cyclic performance of elliptical dampers in various orientation sets

	Set 1	Set 2	Set 3	Set 4	Set 5	Set 6	Set 7
Total deformation (mm)	20.56	18.60	18.46	20.20	20.32	18.53	18.69
Equivalent elastic strain (mm/mm)	0.00261	0.00245	0.00220	0.00251	0.00200	0.00238	0.00260
Equivalent stress(MPa)	70.613	70.029	72.920	62.645	72.640	71.302	71.592
Strain energy(mJ)	51849	51827	59792	51022	50407	51951	51920
Life	1e9	1e9	1e9	1e9	1e9	1e9	1e9
Damage	1e32	1e32	1e32	1e32	1e32	1e32	1e32

VI . Conclusion

From the analytical values obtained the following conclusions can be made

- From the comparison of total deformation in using elliptical dampers in orientation set 1 obtained as 20.56mm and set 1 is the most wrong set
- The less total deformation is obtained as 18.46mm in set 3
- Equivalent elastic strain of set 3 is 0.00200 is the lesser value
- Strain energy of the orientation sets are increasing in the order as set 5,4,2,1,7,6,3
- The higher value of strain energy is 59792mJ and is set 3
- On the basis of this comparison orientation set 3 is choosen as the best orientation set from proposed sets

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NON-LINEAR ANALYSIS ON MECHANICAL BEHAVIOUR OF S460N HIGH STRENGTH STEEL BOLTED CONNECTION USING ANSYS

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Abstract: *In construction, S460N is currently the most normally used high strength structural steel. This paperpresents a numerical investigation on the mechanical behaviour of S460N high strength steel with bolted connections. To simulate the phenomenon of damage accumulation of bolt bearing and to investigate the failure mechanism of tear out and splitting, the framework of ductile metal damage was used in the numerical model. The model was validated with static tension test results of S460N high strength steel with bolted connections. Based on static tensile test of S460N high-strength steel bolted connection joints, influences of high-strength steel on material strength and bolt arrangement pattern on bearing capacity and deformation of connections was analyzed. According to the differences in pretension, end distance and pitch between bolts and the ratio of thicknesses of the main plate and cover plate, the finite element modeling, theoretical calculations, and test results were compared. A quantitative analysis was carried out for mechanical property of high-strength steel bolted connections, and the applicability of relevant standards was investigated.*

Keywords *: S460N High strength steel, Bolted connection, Pitch, Pretension, End distance, Non linear analysis*

I. Introduction

Composite Structural steel is a standard construction material that is made from specific grades of steel and formed in a range of industry standard cross-sectional shapes. Structural steel grades are formed with specific chemical compositions and mechanical properties specifically for particular applications. The mechanical properties of structural steel are also very important to its classification, and subsequently its application.With the improvement of steel production technology and maturation of corresponding welding materials and connection technology, novel high-strength steel materials have been successfully applied in many buildings globally and favorable social and economic benefits have been achieved.

Recently, the construction technology places emphasis on high performance construction materials to produce innovative structures. Light weight and thin elements are particularly attractive for architectural and aesthetic reasons as well as for the reduction of environmental impact of construction. The concrete industry rapidly developed high performance concrete to provide an answer to this demand. Gradually, these classes of concrete entered into the market of structures formerly dominated by steel. Sheet piles, lock doors and structures for industrial plants are examples of such a tendency. The way to face this competition is to develop strategies to better exploit the benefits of high performance steels.

High performance steels in construction, commonly classified as high strength steels, represent a family of steels with a yield stress of 460 N/mm2 (S460N) and above. The benefits of the use of these steels can be utilized in braced frames for which stiffness, in the form of deflections or drift limits for complying with serviceability limit states, does not govern design. Modern design codes adopt the semi-continuous/partially-restrained philosophy for the design of this type of framing in recognition of the economic benefits. This is a rational design method for plastically designed frames. It accounts for the interaction between members and joints. Thus, global frame analysis requires the characterization of the full nonlinear moment-rotation response of the joints, i.e. joints must be designed for strength, stiffness, rotation capacity and ductility. In particular, the important features of a joint in semi-continuous framing are that it is ductile and partial strength. In practice, space and load requirements often necessitate using multiple fasteners whose end distance and/or bolt spacing is less than sufficient to develop the maximum strength of each bolt individually. Moreover, individual bolts of a

multiple-fastener joint do not necessarily load up evenly, and the stress distribution, which is often assumed, is inadequate. This results in the failure and damage accumulation in bolted joints.
The similarity between the predicted and actual behavior of the steel connections is contingent upon the validity of the design assumptions and details of the components of the designed structure.
.

II. Summary of Literature survey

It was found that the deterioration of mechanical properties of steels under external loading factors was dependent on steel grades. Influence of increased edge and end distance on bearing capacity of the connection was minimal after standard value of the structure was observed. The ductility and energy dissipation of the test specimen increased with greater impact velocities. The bearing capacity and deformation of specimens for high-strength steel increased as pitch increased when bolts were under transversal arrangement. The reduction of ultimate bearing resistance in splitting failure is explained by the increasing of lateral tensile stress at the tip of plate end with the decrease of edge distance. The experimental studies showed that, due to strain hardening in the end plate, a significant strength reserve existed beyond the yield load of the connection. Good agreement between the results obtained from the experiments and simulations were observed..

III. Finite Element Analysis

The Finite Element Method (FEM) is a numerical technique for finding approximate solutions to boundary value problems for partial differential equations. It is also referred to as Finite Element Analysis (FEA). FEM subdivides a large problem into smaller, simpler parts called finite elements. The simple equations that model these finite elements are then assembled into a larger system of equations that model the entire problem. FEM then uses the variation methods from the calculus of variations to approximate a solution by minimizing an associated error function.

A typical Finite Element Analysis work involves:

1) Dividing a domain of problem into a collection of sub-domains, with each sub-domain represented by a set of element equations to the original problem
2) Systematically recombining all sets of element equations into a global system of equations for the final calculation. The global system of equations has known solution techniques, and can be calculated from the initial values of the original problem to obtain a numerical answer.

Every complete Finite Element Analysis consists of three separate stages:

1) Pre-processing / Modeling: This stage involves creating an input file which contains an engineer's design for a Finite Element Analyzer, also called a solver.
2) Processing / Finite Element Analysis: This stage produces an output visual file.

Post-processing / Result generation: This stage is a visual rendering stage that generates the resulting report, image, animation etc., from the output file

IV. Objectives

1. Non linear analysis of the damage accumulation and failure mechanism of tearing and splitting in bolted joint.
2. Validation with a static tension test on high strength steel bolted joint.
3. Influences of high-strength steel on material strength and bolt arrangement pattern on bearing capacity and deformation of connections.
4. Comparison of the variations in finite element modeling and numerical analysis result according to the differences in pretension, end distance and pitch between bolts and the ratio of thicknesses of the main plate and cover plate
5. Investigation of the applicability of relevant standards.

VI. Validation of Software

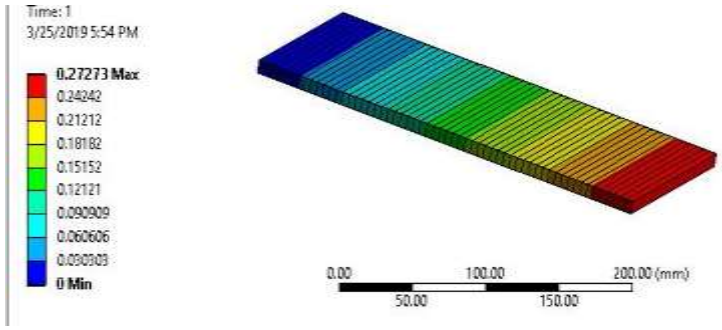
This chapter deals with the validation of results for the deformation of an end bolted steel plate under tension, obtained by the FE numerical analysis of the model developed in ANSYS, with that of the theoretical value calculated with the equation. The dimensions, properties and loading of the steel plate modeled are as follows:

- Length = 288mm
- Width = 132mm
- Thickness = 8mm
- Area =1056mm

- E= 2 x 10^5 N/mm^2
- P = 500000 N

$$\Delta = \frac{PL}{AE}$$

Figure 1Deflected shape of rectangular section



With the values obtained theoretically, the numerical analysis (FEA) in ANSYS has been validated and hence proved appropriate for our study.

VII. Methodology

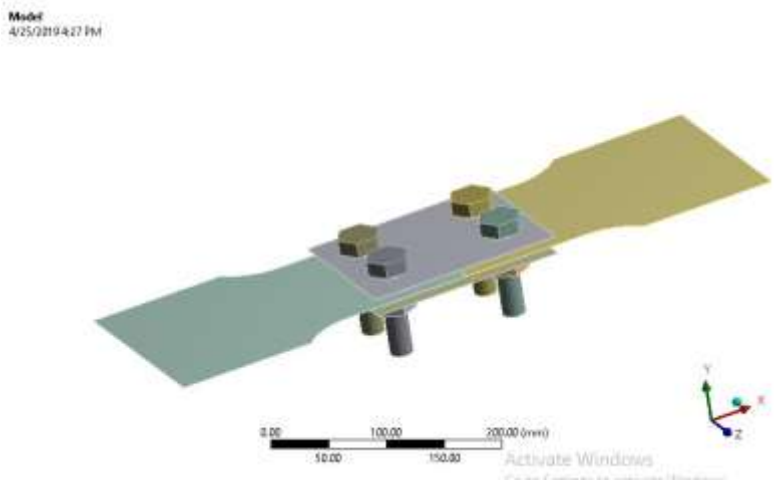
This chapter explains the methodology adopted in carrying out the project work, listed out in points as follows:

- Data collection
- Literature review
- Validation of numerical analysis with the results of theoretical evaluation.
- Numerical analysis with material data and loading as input parameters and the following as variable parameters:
  - Bolt preload
  - Pitch
  - End distance
  - Ratio of thicknesses of main plate and cover plate
- Comparing the results for the variable parameters.
- Deriving scientific inferences and conclusions from the result analysis

- Modelling

Four composite C channels with different openings such as circular, rectangular, hexagonal and A double cover butt joint of S460N grade steel plates connected with 10.9 grade high strength bolts is modeled in ANSYS as shown in Fig.2

Figure 2 model



VIII. Finite Element Modelling in Software

In this study the load-deflection and stress-strain analysis were conducted with varying values of pitch, end distance and thickness ratio. The analyses were performed in both longitudinal and transverse directions, using 16 different models in each.
The pitch, end distance and thickness ratio values used for the 16 models in each longitudinal and transverse study are tabulated as follows:

Table 1 Model details

Model details			
Model	Pitch (mm)	End distance(mm)	Thickness ratio
T1	55	33	1
T2	66	33	1
T3	77	33	1
T4	44	33	1
T5	55	33	0.5
T6	66	33	0.5
T7	77	33	0.5
T8	44	33	0.5
T9	66	44	1
T10	66	44	0.5
T11	66	22	1
T12	66	22	0.5
T13	55	44	1
T14	55	44	0.5
T15	44	22	1
T16	44	22	0.5

IX. Resullts and discussion

The analysis results are obtained in the form of remote displacement at remote points, equivalent stress and strain. They are represented in form of stress-strain curve for each model, as follows

A Comparison of effective stress in various models

Table 2 Comparison of effective stress

Comparison of effective stress	
Model	Effective stress (Mpa)
T1	787.54
T2	754.34
T3	698.67
T4	598.76
T5	678.564
T6	650.763
T7	701.21
T8	729.57
T10	597.345
T11	580.456
T12	654.678
T13	721.45
T14	720.45
T16	698.67

Fig 3 effective stress on model

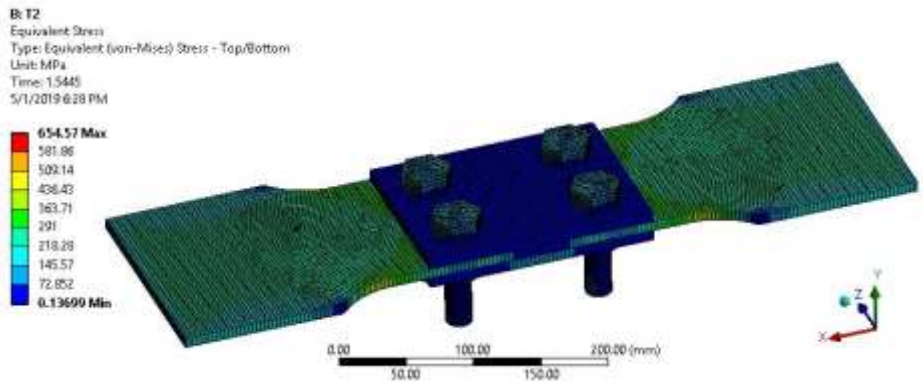


Table 3 Comparison of Total deformation

Comparison of Toal deformation	
Model	Effective stress (mm)
T1	3.567
T2	3.245
T3	3.784
T4	2.984
T5	4.005
T6	4.287
T7	4.005
T8	4.127
T10	2.593
T11	2.897
T12	3.765
T13	4.235
T14	4.341
T16	3.754

Fig 4 Comparison of effective stress

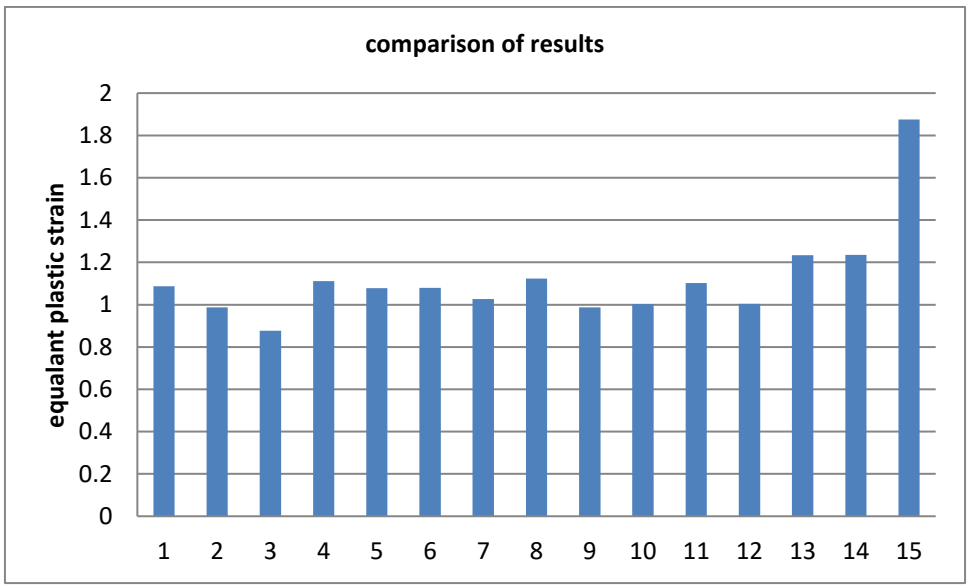
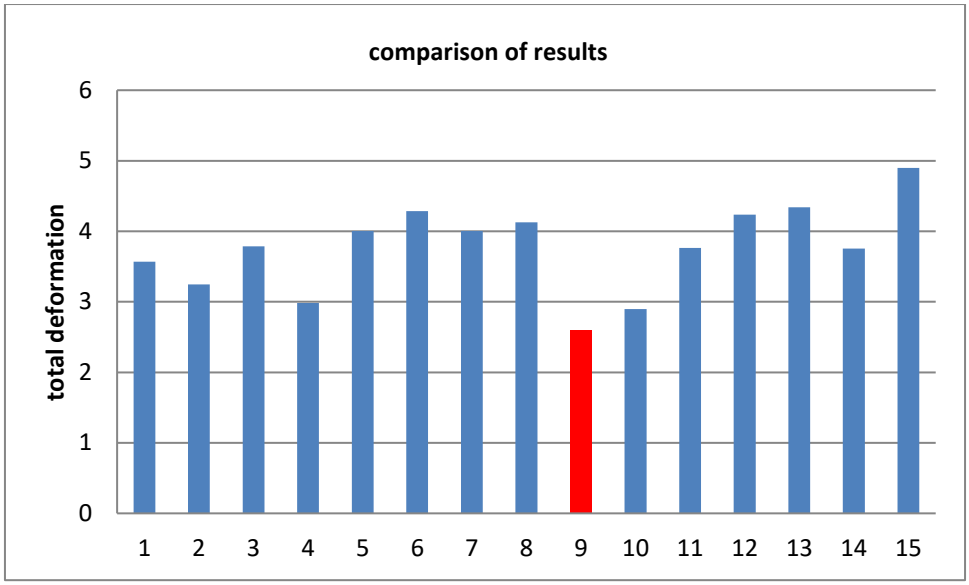


Fig 5Comparison of Total deformation



X Conclusion

The main objective of this research is to analyse the buckling load variation on composite C channel with and without openings. The analytical results illustrated in the present study showed that the buckling load varied with the change in composite materials and also with the change in shape of openings, stacking sequence of ply angle and the centre to centre distance between the openings. Based on the analytical results, the following conclusions are drawn:

- Parameters, such as bolt arrangement pattern, pitch and end distance mechanical properties of connection were studied
- Failure mode of bolted connection joints were closely related to bolt arrangement pattern
- When bolts were under transverse arrangement, specimen equivalent stress presented a linear growth with end distance and bolt pitch
- For S460N steel large deviation occurred in the result of total deformation in two direction
- When bolts were under transverse arrangement, six models had relatively uniform deformation
- In transverse arrangement T3 model showed lesser deformation
- Concluded than 3.5d0 as pitch is better for transverse arrangement
- 2d0 end distance is best in transverse direction
- Model T9 and T10 showed larger deformation
- Pitch of 3d0 is better for longitudinal direction
- End distance of 2d0 is the best option for longitudinal direction
- Longitudinal arrangement showed lesser deformation than transverse arrangement

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NUMERICAL ANALYSIS IN PERFORMANCE OF THERMAL POWER PLANT SILOS

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Abstract*: Silos are the commonly used storage structure in production industries such as cement factories, power plant structure etc. when a silo is used in thermal power plant structures it should be capable of storing ashes with high temperature. In this thesis design and analysis of fly ash and bed ash silo for thermal power plant structures were carried out with various material linings inside the silos and comparing. In this thesis, the study is based on koradi power plant. The height and diameter of silos are different and they are connected by staircase.*

Keywords*: Silos, ANSYS, Wind load, Seismic loads, Indian Standards*

Introduction

A silo is a structure for storing bulk materials. A cement silo is essential equipment used for ready-mix concrete batching plant and for concrete products making machines. Elevated reinforced concrete Silos are playing important role in every production industries because of the demand for production. More particularly power production from thermal power plant structures is increasing day by day and producing huge amount of wastes such as fly ash and bed ash. To store those ashes in power plant we need a good storage container say Silo which should satisfy the basic requirements of the power plant. Silos can be constructed as a single one or as group of two or more. Special care should be taken in design and analysis of Silo since it is a high rise structure with heavy load. This is accomplished by discussing the relevant primary research literature (Design and comparison of types of silos in Koradi power plants, IJERT).

In present situation, failures are occurring in thermal power plant silos due to high temperature in it. This thesis introduces different linings inside the silos for improving their thermal performance. The linings are Magnesia lining, fire brick lining, red brick linings. These linings are given to both fly ash and bed ash silo. The maximum thermal capacity of the silos is find out and they are compared with normal concrete and steel silos.

Methodology

The analysis was done using ANSYS 16 software, so as to check the accuracy and percentage of variation. The silos were analyzed using ANSYS software.

Literature survey to understand the previous works associated with silos.

- Fixing the objectives of the thesis
- Study of PRO e and ANSYS software
- Modeling in PRO e software
- Model 1 - fly ash steel 1010 Red brick
- Model 2- fly ash steel 1010 Fire brick

- Model 3- fly ash steel 1010 Magnesia
- Model 4 - fly ash concrete 1010 Red brick
- Model 5- fly ash concrete 1010 Fire brick
- Model 6- fly ash concrete 1010 Magnesia
- Model 7 - bed ash steel 1010 Red brick
- Model 8- bed ash steel 1010 Fire brick
- Model 9- bed ash steel 1010 Magnesia
- Model 10 - bed ash concrete 1010 Red brick
- Model 11- bed ash concrete 1010 Fire brick
- Model 12- bed ash concrete 1010 Magnesia
- Analysis of models
- Comparison of results

The finite element modeling was done using ANSYS 16 software. The models of silos were created using the PRO e software. The variations are given in interior lining of the silos. The main purpose of introducing these linings is to analyze the thermal performance of each material and to choose best one in each configuration.

Objective

- To design and analyze silos using in thermal power plant for the storage of bed ash and fly ash
- To find the temperature and total heat flux
- To analyze temperature performance of silos
- To analyze and compare temperature effect, wind effect, vertical pressure, hoop stress of these two silos

Modelling

In this work Fly ash Silo and Bed ash Silo are spaced at a distance of 6 m and having overall height of 25 m & 21.76 m, diameter of 9.3 m & 6.3 m, capacity of 750 m3 & 170 m3 respectively. Location of Thermal power plant structure was taken as Zone II for seismic consideration. Load considerations were based on IS: 875-1987-Part 1 for dead load, Part 2 for live load, Part 3 for wind load and IS:1893 (Part 1) 2002 for Seismic load. Analysis was carried out in STAAD PRO by stiffness matrix method. Reinforced concrete design was carried out based on IS: 456- 2000 and SP-16. The conditions considering are fully filled, half filled and empty.

Fig 1 Transient thermal with fly ash steel 1010 along red brick (Fully filled)

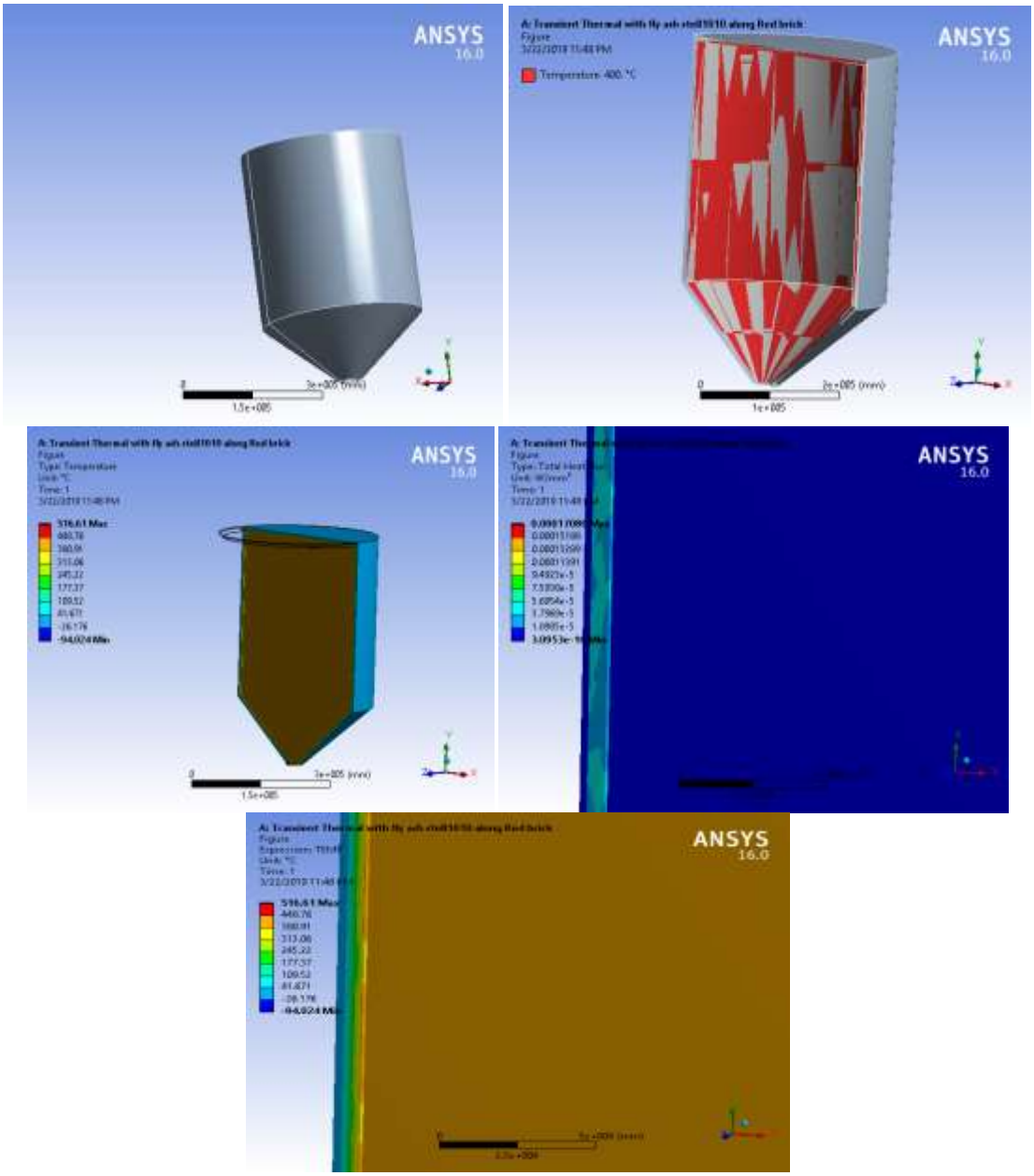


Fig 2 Transient thermal with fly ash steel 1010 along fire brick (Fully filled)

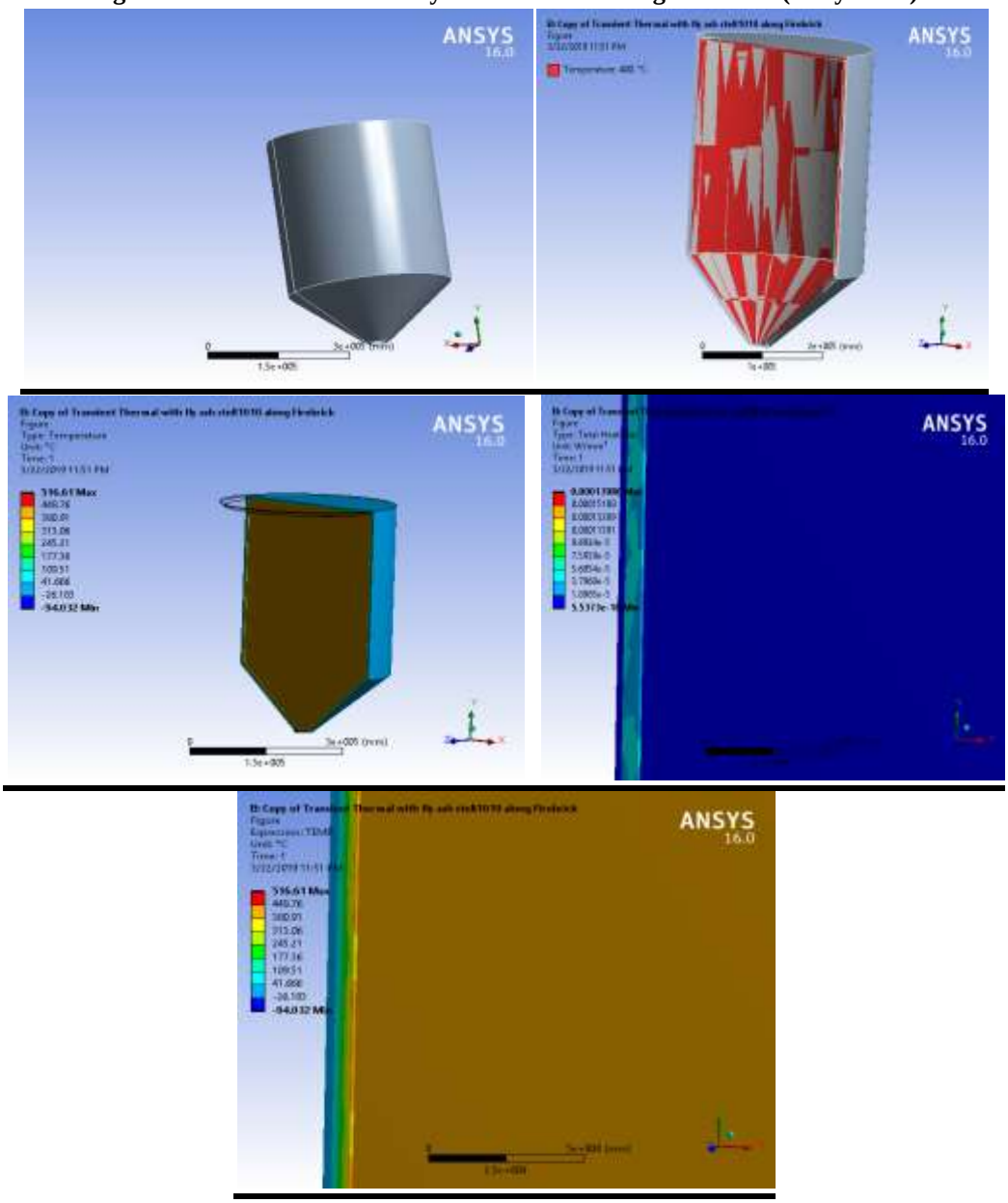


Fig 3 Transient thermal with fly ash steel 1010 along with Magnesia (Fully filled)

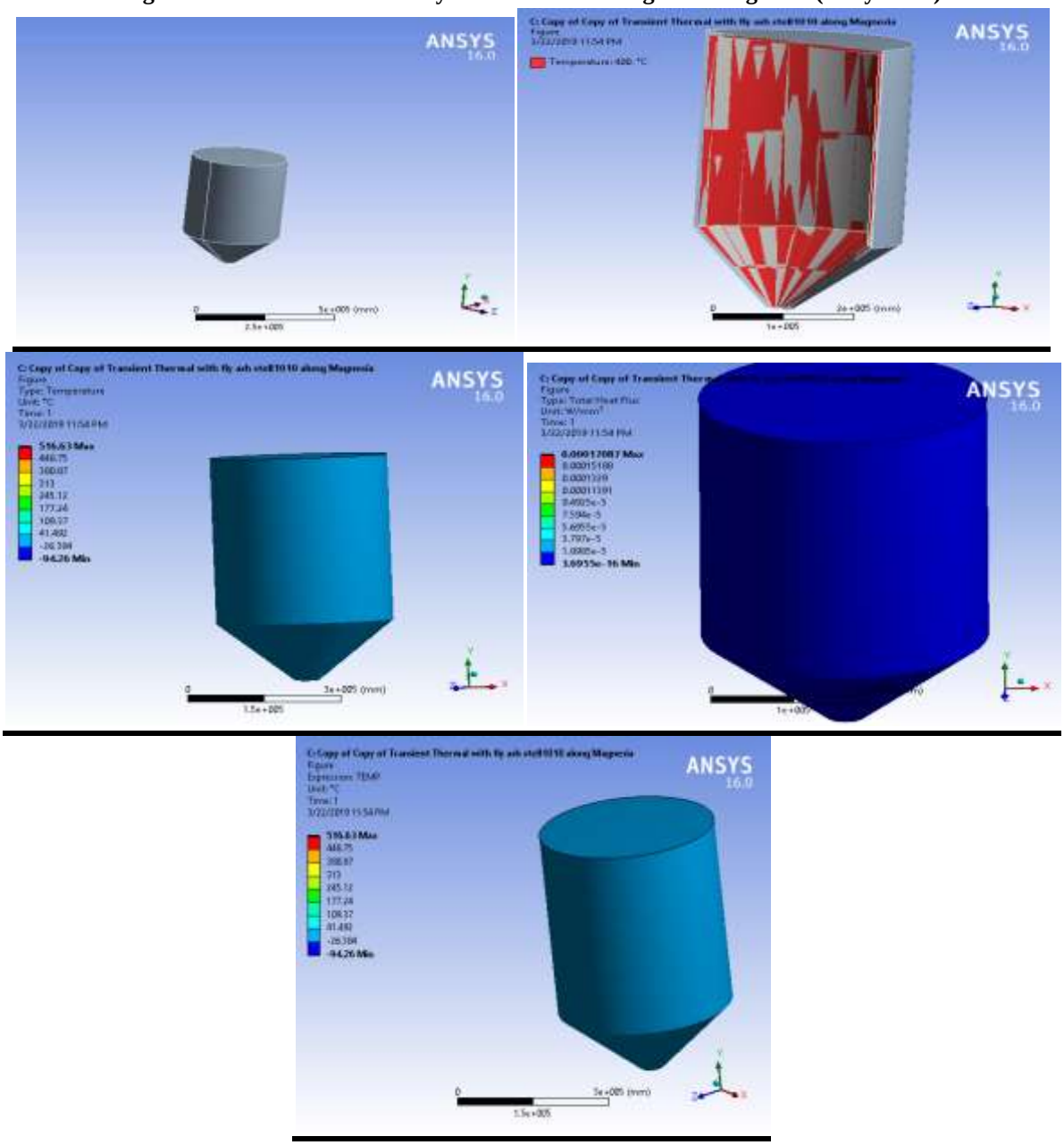


Fig 4 Transient thermal with fly ash concrete along red brick (Fully filled)

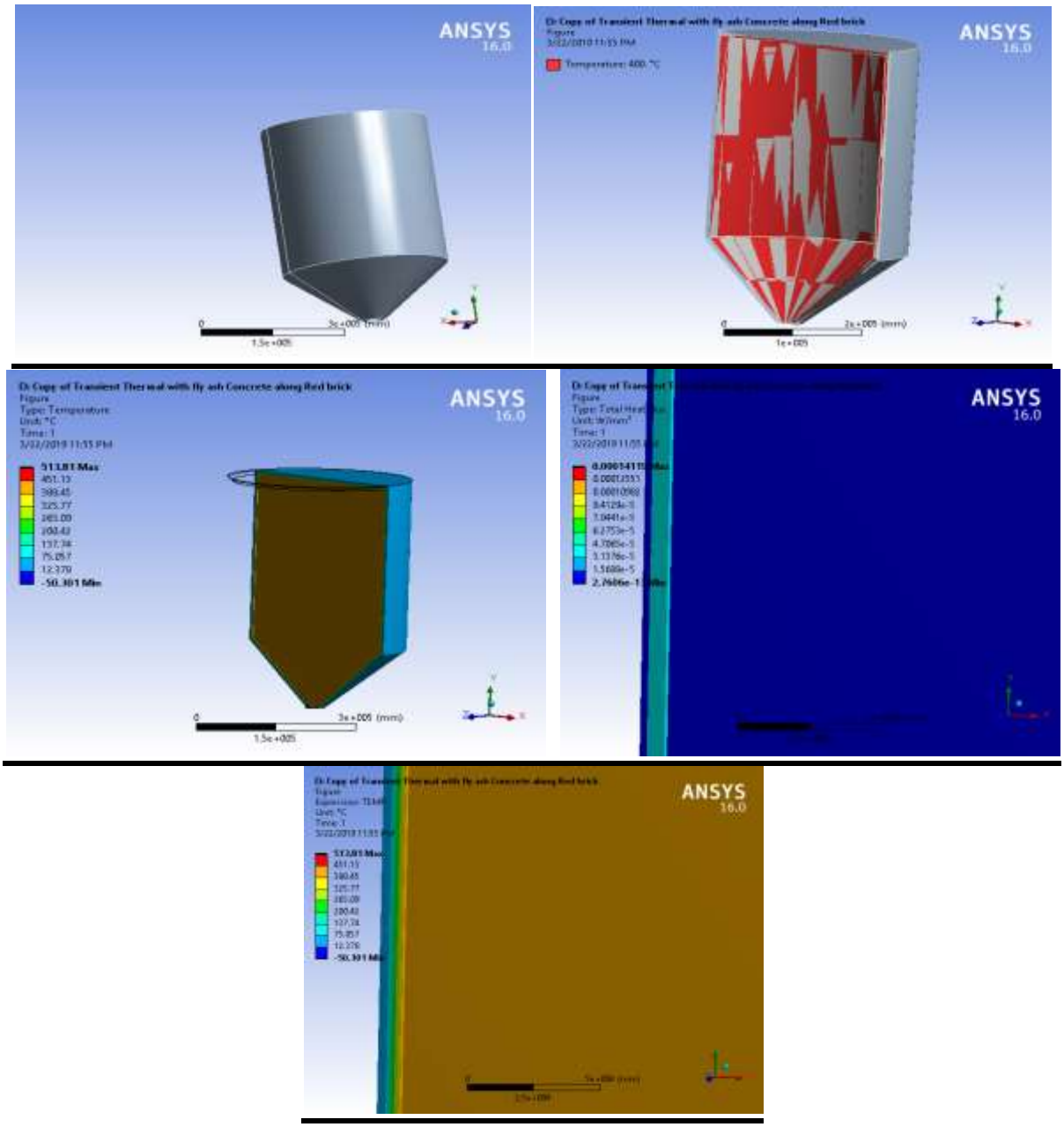


Fig 5 Transient thermal with fly ash concrete along fire brick (Fully filled)

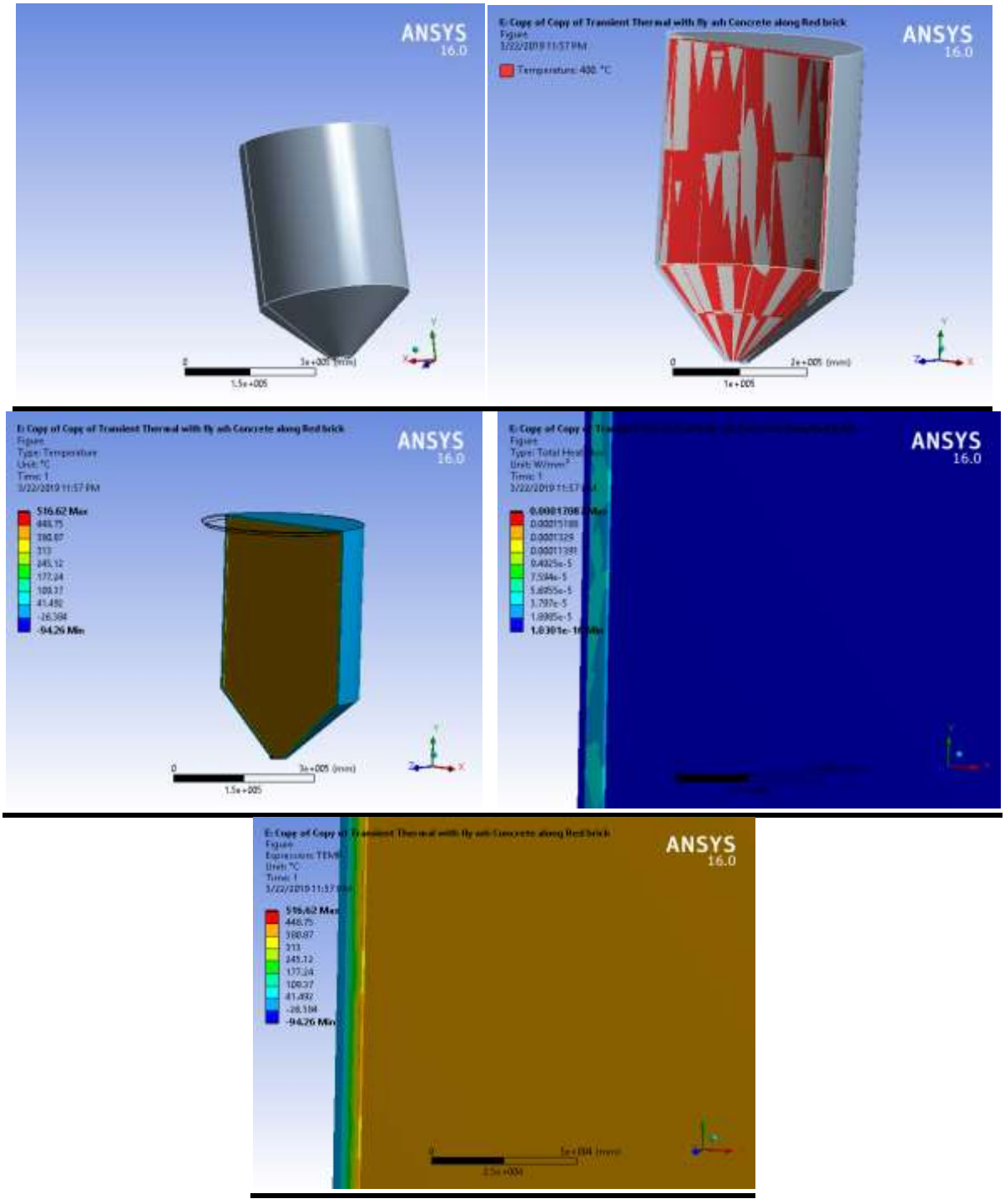


Fig 6 Transient thermal with fly ash concrete along Magnesia (Fully filled)

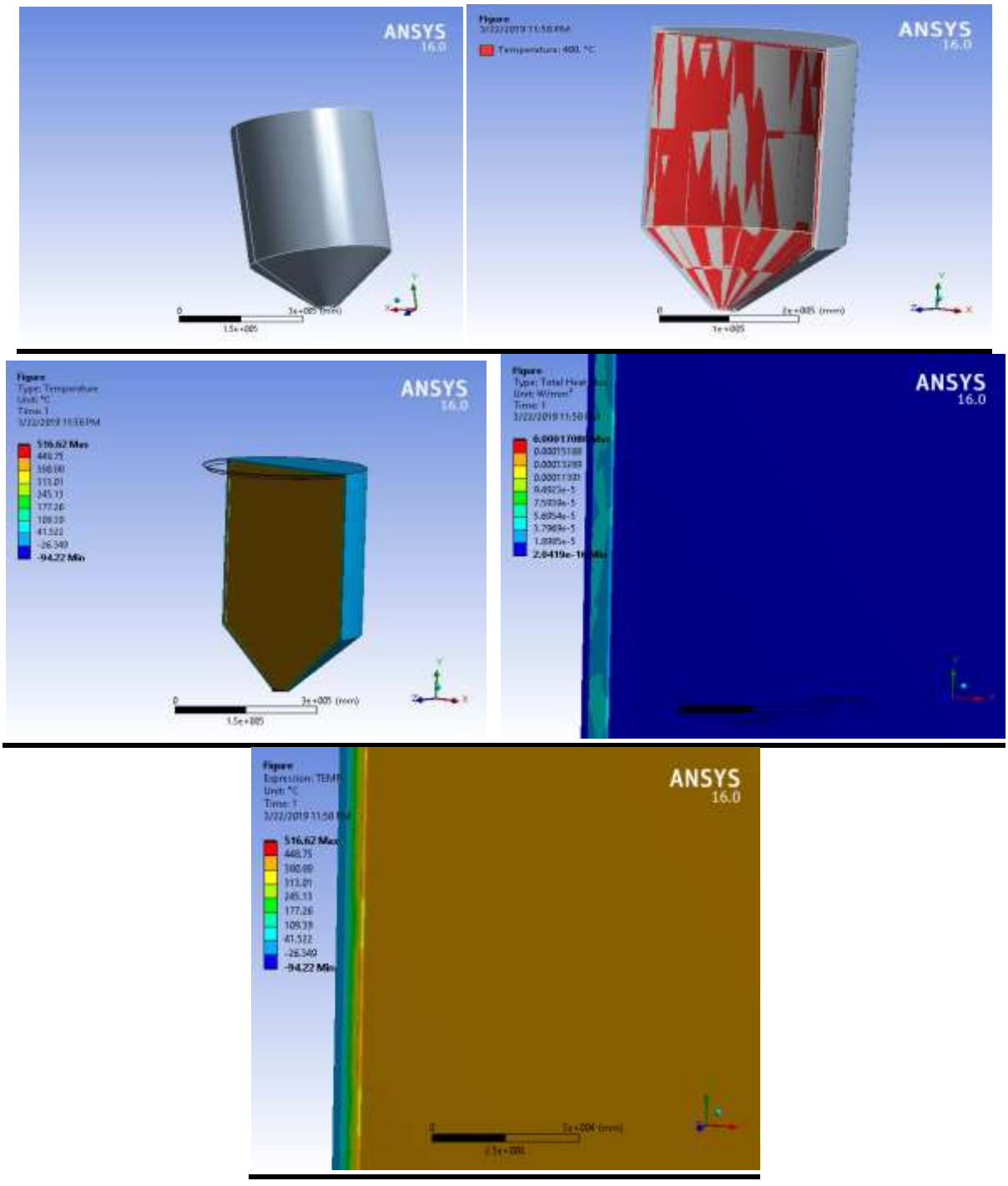


Fig 7 Transient thermal with fly ash steel 1010 along with red brick (Half filled)

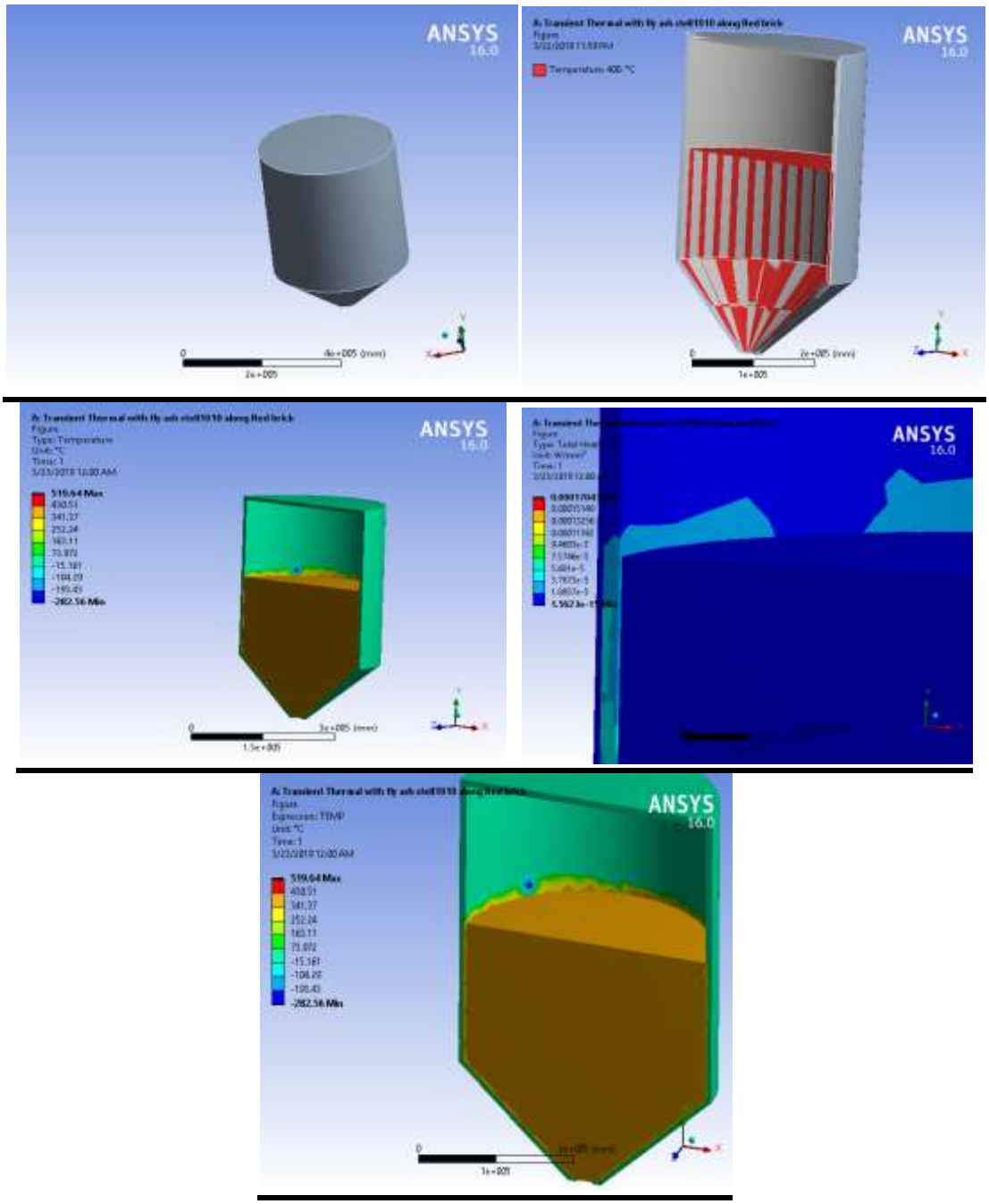


Fig 8 Transient thermal with fly ash steel 1010 along with fire brick (Half filled)

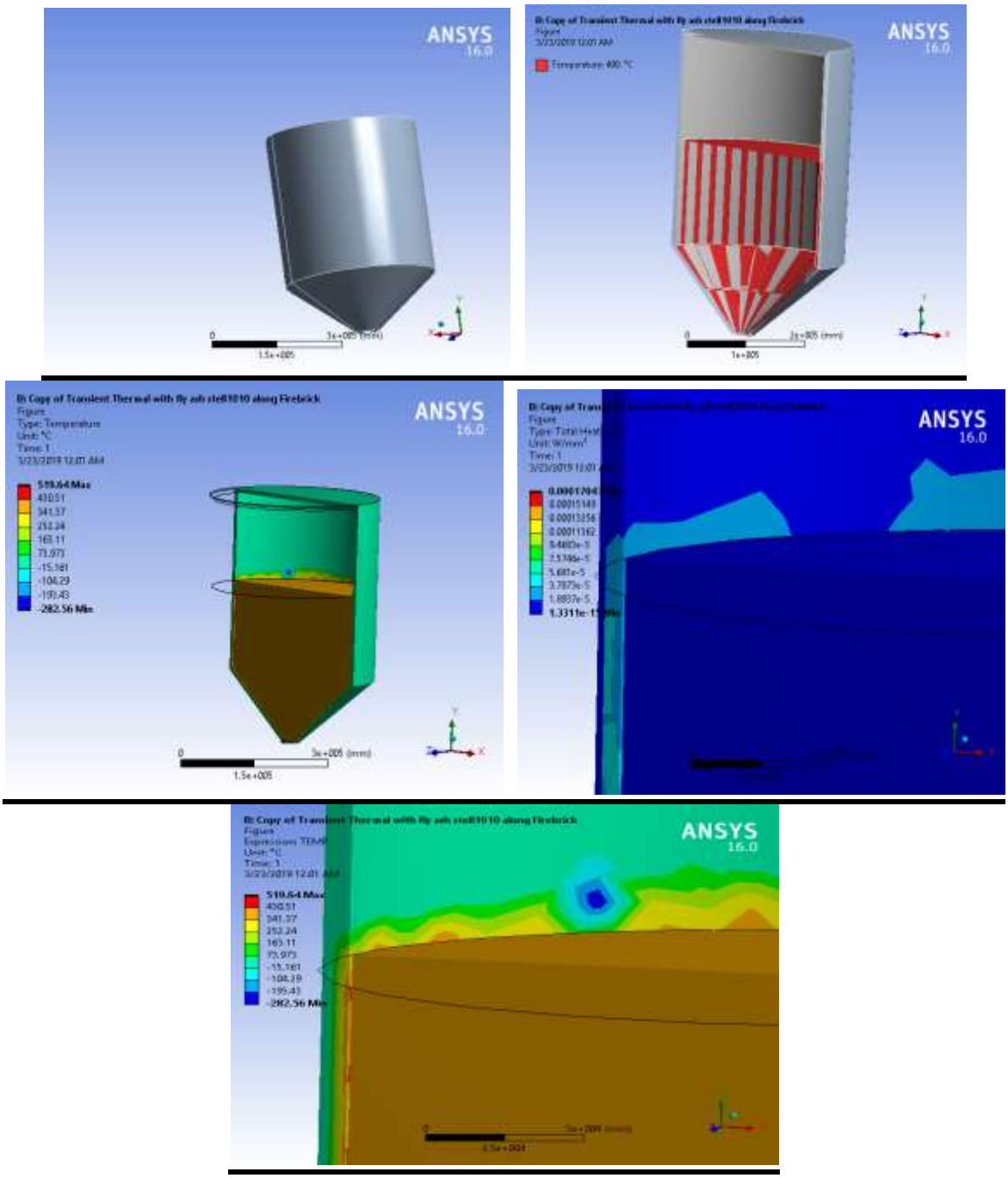


Fig 9 Transient thermal with fly ash steel 1010 along with Magnesia (Half filled)

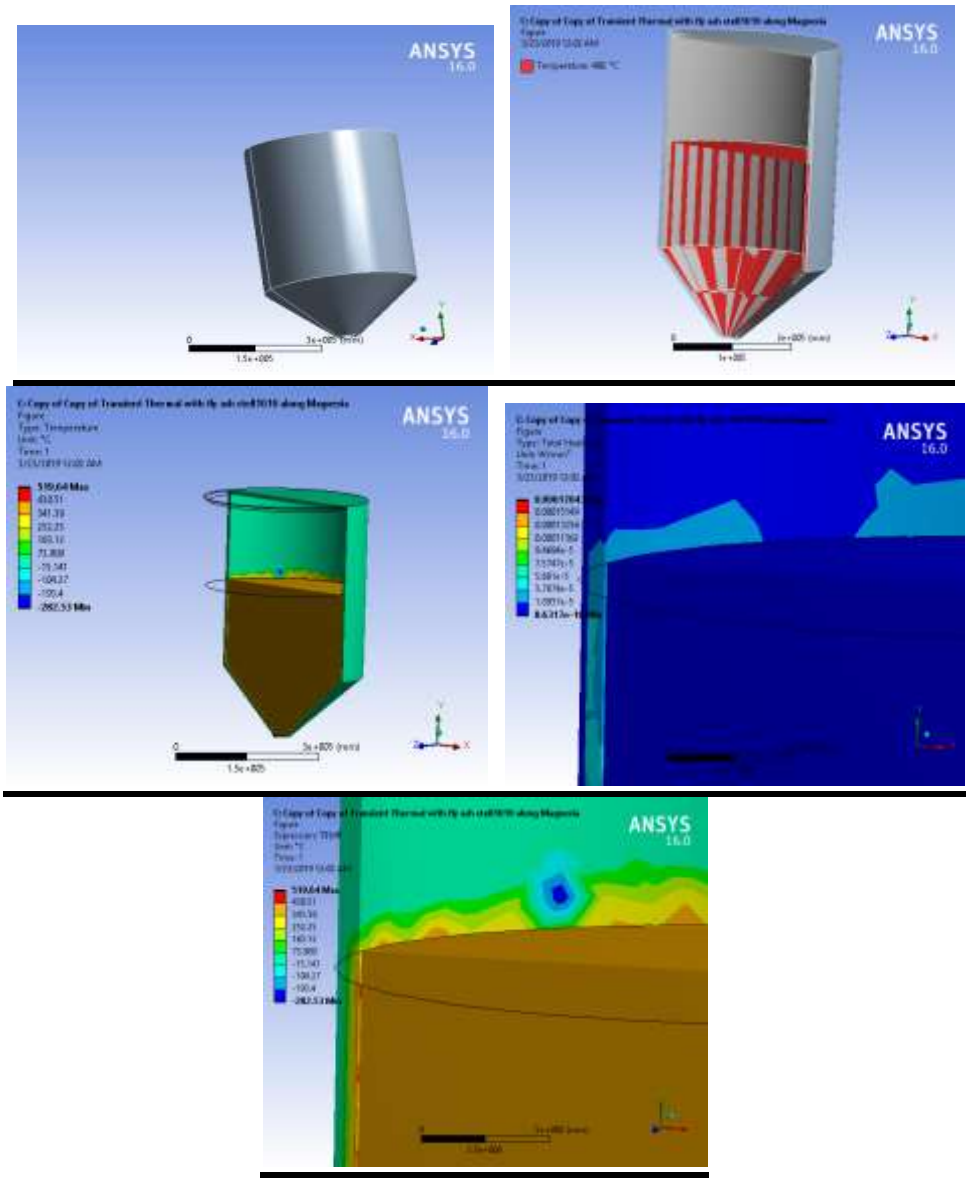


Fig 10 Transient thermal with fly ash concrete along with red brick (Half filled)

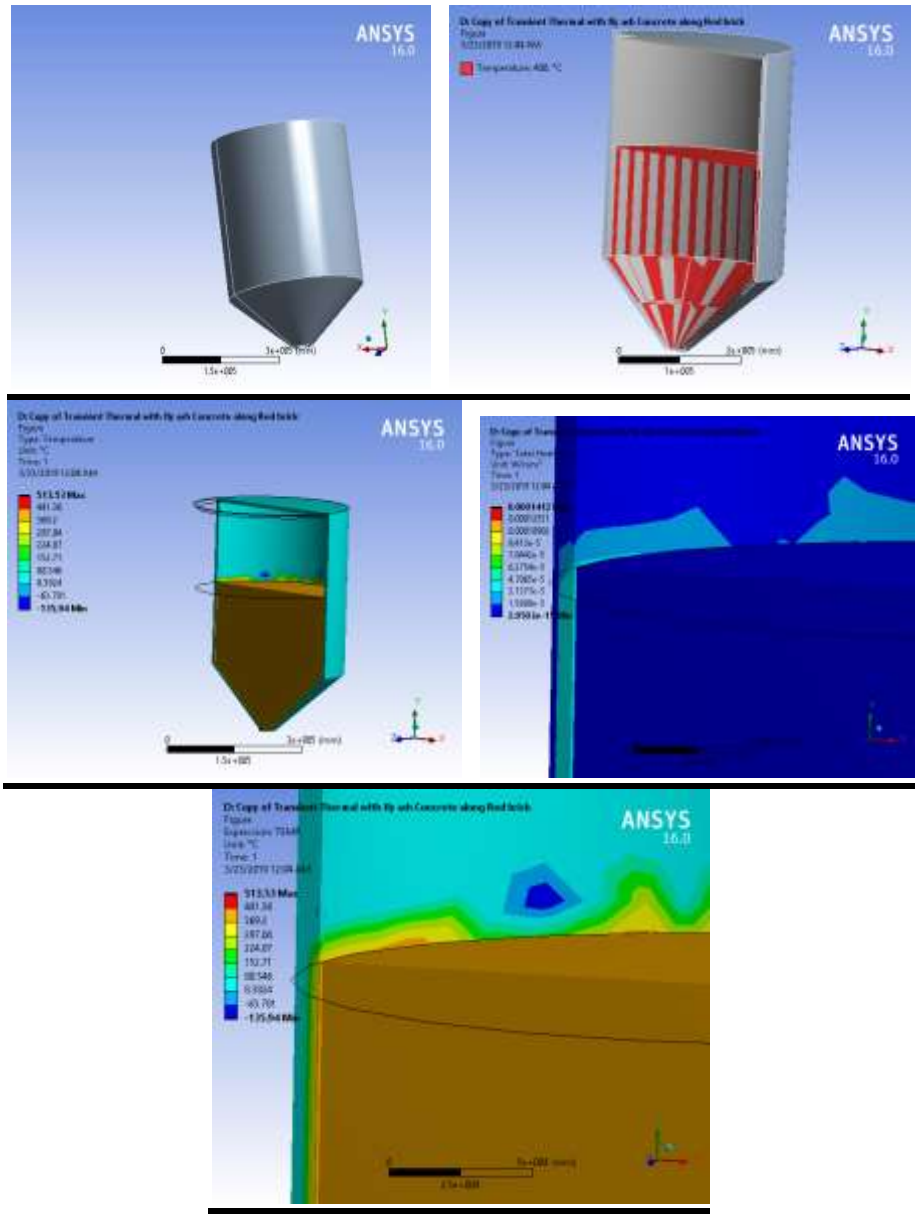


Fig 11 Transient thermal with fly ash concrete along with fire brick (Half filled)

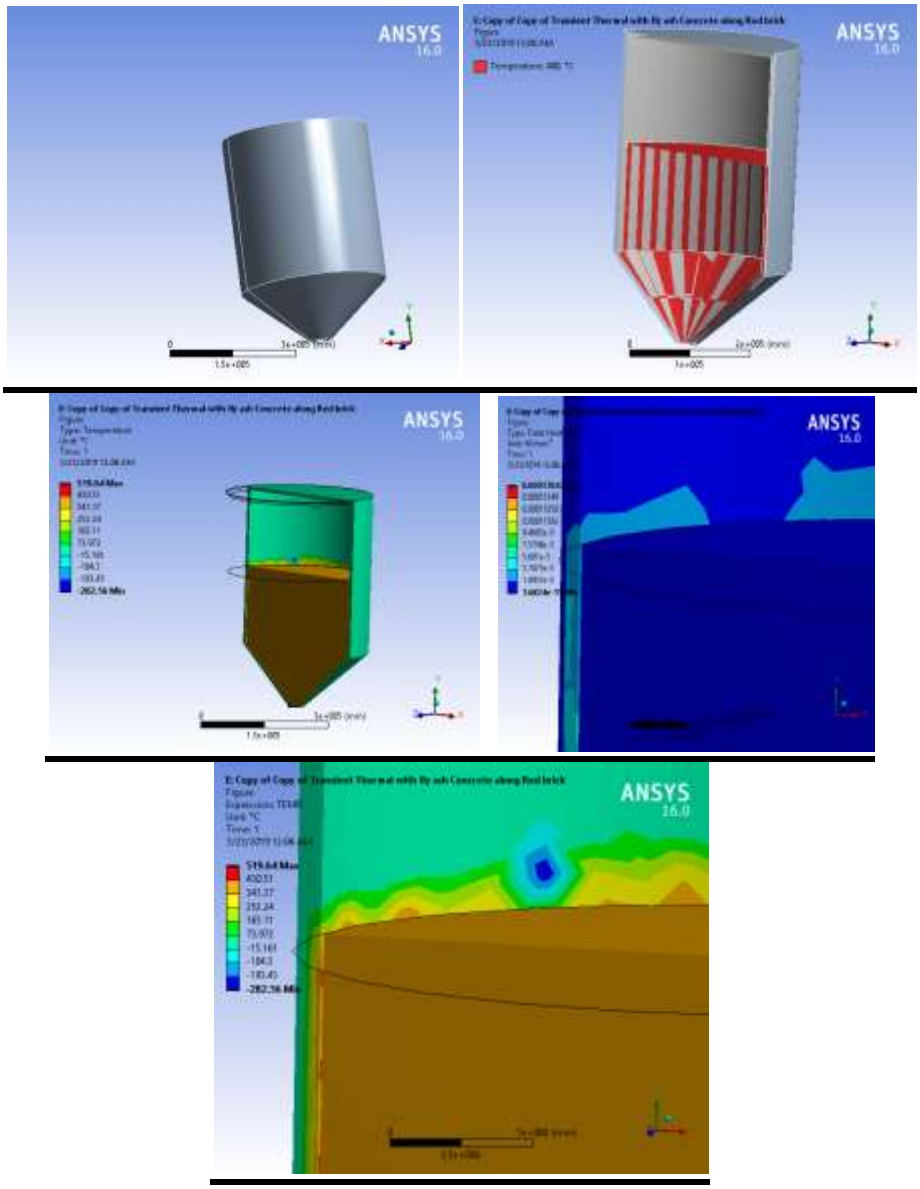
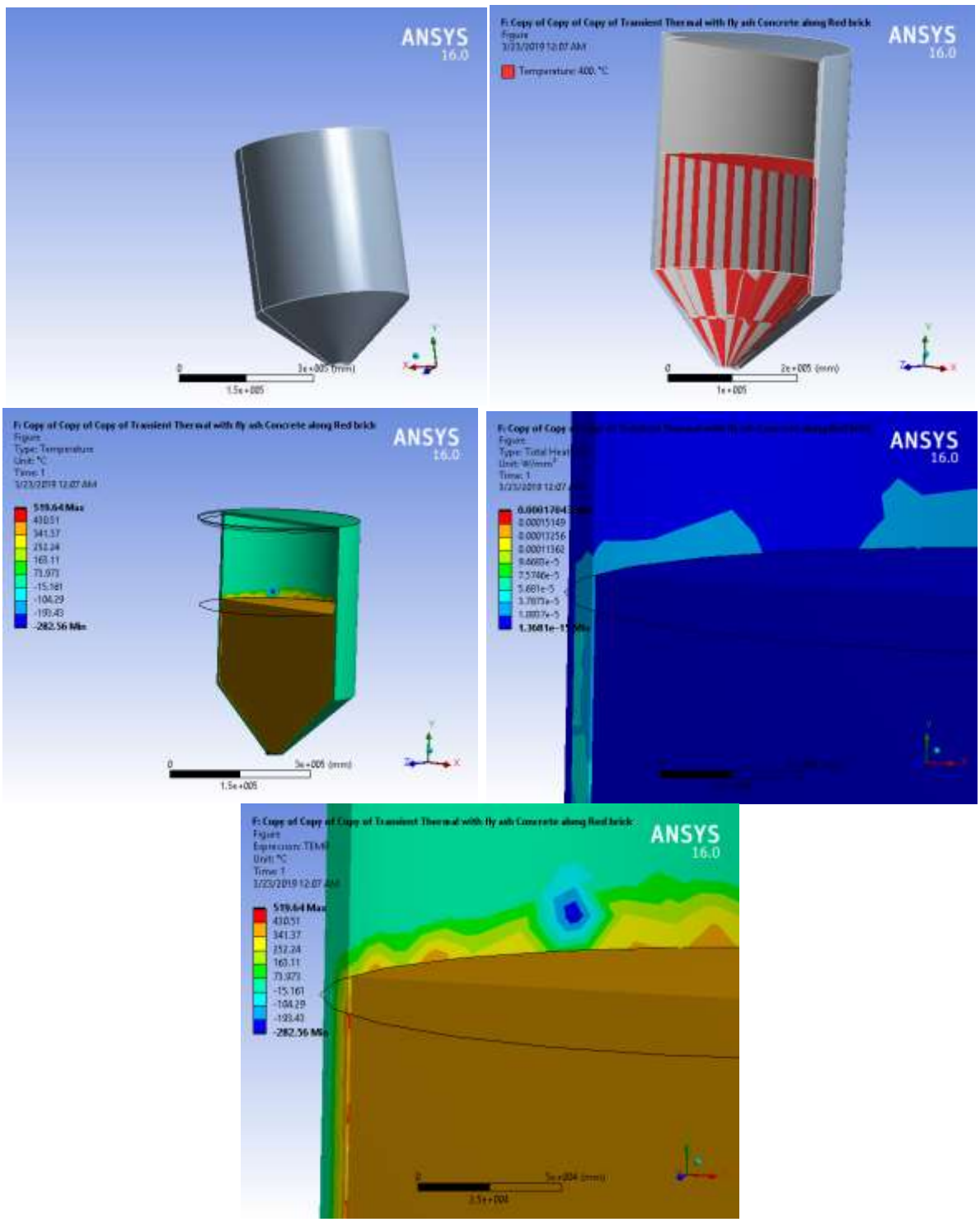


Fig 12 Transient thermal with fly ash concrete along with fire brick (Half filled)



RESULT

Table 1 Fully filled fly ash steel 1010 and concrete

		Temperature ˚C	Total heat flux W/mm2
Fly ash steel 1010	Red brick	516.61	0.00017086
	Fire brick	516.61	0.00017086
	magnesia	516.63	0.00017087

Fly ash concrete	Red brick	513.81	0.00014119
	Fire brick	516.62	0.00017087
	magnesia	516.63	0.00017086

Table 2 Half filled fly ash steel 1010 and concrete

		Temperature ˚C	Total heat flux W/mm2
Fly ash steel 1010	Red brick	519.64	0.00017043
	Fire brick	519.64	0.00017043
	magnesia	519.64	0.00017043
Fly ash concrete	Red brick	513.53	0.0001412
	Fire brick	519.64	0.00017043
	magnesia	519.64	0.00017043

CONCLUSION

When compared to steel silos, performance of concrete silos are better due to its easy construction and maintenance.

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Acknowledgments

We would like to take this opportunity to thank all those who have whole heartedly lent their support and contributed in this project. We are sincerely thankful to our HOD, Mrs.Anu A for giving us an opportunity to work on this project. We are sincerely thankful to our guide, Ms.Divya .S.Dharan for her valuable, inspiring and timely guidance and assistance throughout the course of the project.

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THE IMPACT OF REINFORCEMENT RATIO ON RC BEAM WITH CORROSION SUBJECTED TO SHEAR & BENDING

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***Abstract**: Many conventionally reinforced concrete (CRC) structures are exposed to conditions that can lead to corrosion of the embedded reinforcing steel. Engineers often must evaluate the existing structures that exhibit corrosion induced damage. This project mainly focused on the behaviour of RC beams exhibiting various levels of corrosion damage to the transverse steel or stirrups with different reinforcement ratios. FEmodelling techniques were developed to isolate the different contributions of corrosion damage to structural response of Reinforced Concrete (RC) beams subjected to shear and bending. Corrosion damage parameters include, concrete cover spalling due to expansion of corrosion products; uniform stirrup cross sectional loss from corrosion;severe corrosion damage conditions were considered for the study. Tensile reinforcement ratios of 1.01 & 1.68 were considered for the study. The analysis was done by using ANSYS 19.1.*

I. Introduction

Reinforced concrete structures are widely used in civil engineering construction. Most of these structures may become deteriorated with time due to corrosion, freezing and thawing cycle, sulphate attack and physical damage from impacts. Such deterioration may lead to inadequate flexural or shear strength of the concrete structures. Many conventionally reinforced concrete (CRC) structures are exposed to conditions that can lead to corrosion of the embedded reinforcing steel. These include coastal structures subjected to wind-born salt spray and seawater as well as bridges subjected to de-icing salt. Engineers often must evaluate existing structures that exhibit corrosion-induced damage and only limited information is available for condition assessment and structural evaluation. A tool that has become widely used for analysis of structures is Finite Element (FE) analysis; however, application to corrosion-damaged structures requires modelling assumptions. This paper presents modelling details for Finite Element Analysis of CRC beams with corrosion damage to shear reinforcement (stirrups) with different reinforcement ratios.

Finite element analysis has been widely used in engineering applications. FE analysis of concrete structures has been performed using a number of different concrete models, with one of the most common being the smeared cracking approach. The method was employed for behaviour evaluation of RC members. The effects of corrosion were modeled by reducing the geometry of concrete and steel rebar elements and by modifying the constitutive models of concrete and steel as well as bond between the two materials. The approach applied to analysis of concrete beams with corrosion damage to transverse reinforcement for structural capacity prediction is new.

This study uses a commercially available finite element code. The individual contributions of cover spalling due to expansion of corrosion products, rebar debonding from the concrete, and cross-sectional area loss from corrosion are isolated and combined to predict the relative contributions to strength and deformation capacity reduction.

II. Methodology

The analysis was done using ANSYS 19 SOFTWARE, so as to check the accuracy and percentage of variation. The Reinforced concrete (RC) beam was analysed using ANSYS and then validated the results with manual formula. Comparing manual and software results, almost same results were obtained but software value reduced by 1.9%. This variation lies within the permissible limit.

- Literature survey to understand the behaviour and properties of carbon woven composite beams
- Fixing the objectives of the thesis
- Study of ANSYS software
- Modelling
- Model 1 – RC beam with 1.01 % Ro undamaged
- Model 2 – RC beam with 50% stirrup corrosion (1.01%)
- Model 3 – RC beam with 50% stirrup corrosion with spalling(1.01%)
- Model 4 – RC beam with severe corrosion condition(1.01%)
- Model 5 – RC beam with 1.68 % Ro undamaged
- Model 6 – RC beam with 50% stirrup corrosion (1.68%)
- Model 7 – RC beam with 50% stirrup corrosion with spalling(1.68%)
- Model 8 – RC beam with severe corrosion condition(1.68%)
- Comparison of results
- Conclusions

The finite element modeling was done using ANSYS 19.1 software. The models of RC beams were created using the software. The variations are given to reinforcement ratios & corrosion parameters. The reinforcement ratios used for the study are 1.01% & 1.68%. The corrosion parameters used for the study are uniform stirrup cross sectional loss, spalling and severe corrosion condition.

III .Objective

- To study the effect of reinforcement ratio on RC beam.
- To study the impact of corrosion damage on the capacity and behaviour of beam.
- To determine the total deformation under loading.
- To determine maximum equivalent stress & strain

IV.Modelling

The RC beams were analysed using ANSYS 19. The reinforcement ratios used for the analysis are 1.01% &1.68%. The corrosion parameters considered for the study are uniform stirrup cross sectional loss ,spalling and severe corrosion condition.

Figure 1 Model of RC beam with reinforcement ratio 1.01 %

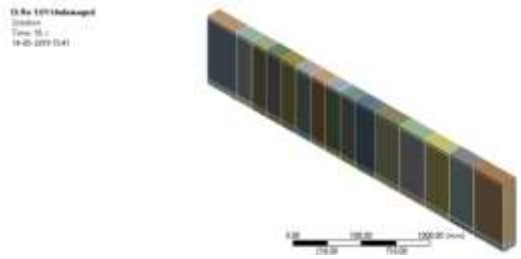
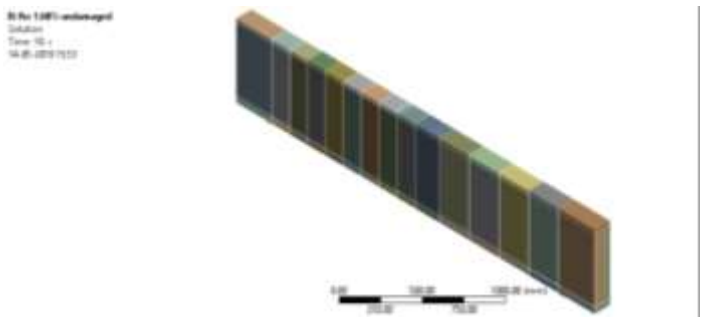


Figure 2 Model of RC beam with reinforcement ratio 1.68%



V. Results and discussion

The total deformation, maximum & minimum equivalent stress & strain obtained from ANSYS are listed in tables below.

Figure 4 RC beam with Ro 1.68% undamaged section (Total deformation)

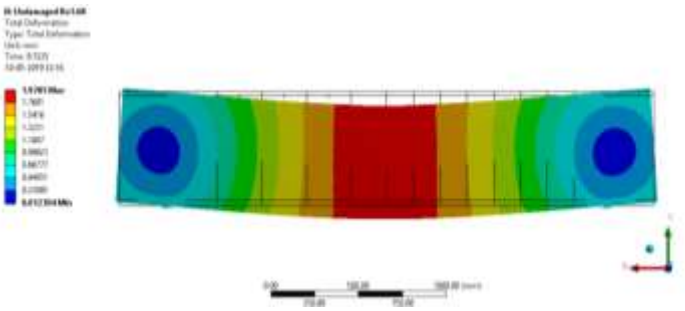


Figure 5 RC beam with Ro 1.68% undamaged section (Maximum equivalent stress)

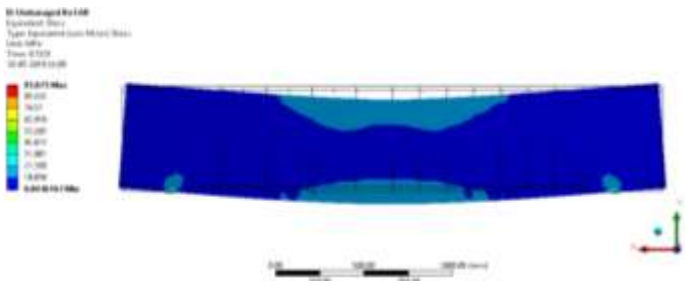


Figure 6 RC beam with Ro 1.68% undamaged section (Maximum equivalent strain)

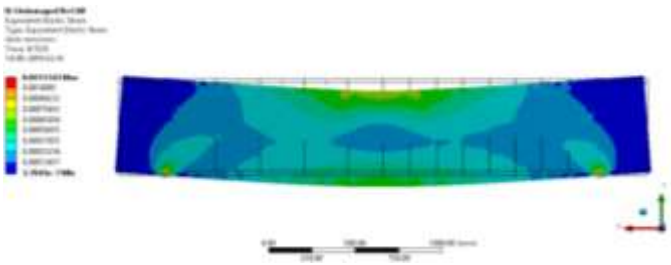


Table1 Analysis results of RC beam with reinforcement ratio 1.01%

MODEL	TOTAL DEFORMATION (mm)	EQUIVALENT STRESS (MPa)	EQUIVALENTSTRAIN
Model 1 - undamaged	1.8171	91.726	0.0011343
Model 2 – 50% uniform stirrup corrosion only	1.6176	88.4635	0.00109145
Model 3 – 50% uniform stirrup corrosion with spalling	1.465	82.5229	0.00108165
Model 4 – severe corrosion	1.364	77.5823	0.00030364

Table 2 Analysis results of RC beam with reinforcement ratio 1.68%

MODEL	TOTAL DEFORMATION (mm)	EQUIVALENT STRESS(MPa)	EQUIVALENT STRAIN
Model 1 - undamaged	1.9785	95.875	0.001135
Model 2 – 50% uniform stirrup corrosion only	1.779	92.6125	0.00109145
Model 3 – 50% uniform stirrup corrosion with spalling	1.627	86.6719	0.00103692
Model 4 – severe corrosion	1.452	77.3121	0.00100523

VI . Conclusion

From the analytical values obtained the following conclusions can be made

- When the reinforcement ratio increased the compressive strength of concrete increased.
- Load carrying capacity of beam is also get increased.
- The FE result shows that the corrosion damage reduced the load carriying capacity & deflection at the maximum load of RC beams.
- Cover spalling reduced the load carrying capacity compared with the undamaged concrete beam.
- The 50% uniform stirrup cross sectional loss had relatively small impact on strength.
- For the severe corrosion condition the load and deformation capacity were significantly reduced

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We would like to take this opportunity to thank all those who have whole heartedly lent their support and contributed in this project. We are sincerely thankful to our HOD, Mrs Anu A for giving us an opportunity to work on this project. We are sincerely thankful to our guide, Mrs KarthikaGopifor her valuable, inspiring and timely guidance and assistance throughout the course of the project..

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Seismic Performance Assessment of RCS & RCC Building With Damper Using ETABS

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Abstract: *Composite RCS frames integrates reinforced concrete columns with structural steel beams, providing several advantages over conventional steel and concrete moment resisting frames. The RCC Structure is no longer suitable because of increased dead load and stiffness. There is great potential for increasing volume of steel in construction. Primary goal of my project is to fill this knowledge gap and facilitate the greater acceptance and use of composite RCS systems as a viable alternative to conventional lateral resisting system in comparison with ordinary RCC building, by evaluating the performance of RCS system in severe seismic zone IV. Regular and irregular RCS and RCC frame buildings are designed according to IS Codes of practice and analyse using ETABS software. Response spectrum and pushover analysis are used to assess the seismic performance of RCS building and compared with equivalent RCC structure. Also compare both RCC and RCS building by with and without dampers. In my study Fluid Viscous dampers (FVD) are used to evaluate the response of RCC and RCS buildings. The main task of a structure is to bear the lateral loads and transfer them to the foundation. Since the lateral loads imposed on a structure are dynamic in nature, they cause vibrations in the structure. In order to have earthquake resistant structures, fluid viscous dampers have been used.*

Keywords: *Seismic Performance Assessment, RCS Structure, RCC Structure, Response Spectrum, Pushover Analysis, Fluid Viscous dampers (FVD).*

I. Introduction

Steel and concrete are widely used construction materials. Use of steel in structure permits slender sections with good tensile strength, increased ductility and reduced buckling. Concrete, on the other hand, possess good compressive strength, corrosion protection and thermal insulation. In order to derive the optimum benefits from both materials composite construction is preferred.In RCS system structural steel beam generally I section, is connected to the RC columns and slabs through shear connectors, which enables flow of stresses through the members thereby improving overall rigidity and load capacity of the structure.In spite of the various advantages of hybrid systems, their use has been constrained mainly due to the insufficient knowledge about the behavior and design of composite members and their connections. This is significant particularly for moderate to high seismicity regions with concern about structural performance in the inelastic range.Innovative applications of composite steel and concrete structures provide attractive alternatives to conventional steel or reinforced concrete systems. RCS moment-resisting frame systems, consisting of Reinforced Concrete (RC) columns and Steel (S) beams, take advantage of the inherent stiffness and damping, as well as low-cost of concrete, and the lightweight and construction efficiency of structural steel RCS frame systems have shown to possess several advantages from economic and construction viewpoints compared to either RC or steel frame systems. RC columns are approximately 10 times more cost-effective than steel columns in terms of axial strength and stiffness. On the other hand, steel floor systems are significantly lighter compared to RC floor systems, leading to substantial reductions in the weight of the building, foundation costs, and inertial forces. From the construction viewpoint, RCS buildings are generally built by first erecting a steel skeleton with light columns, which for medium- or high-rise buildings could be as high as 8 to 10 stories. This steel frame then allows the simultaneous performance of several construction tasks at different floor levels, such as placing of steel deck, pouring of concrete slabs, and encasement of the light steel columns by RC columns. So aim of my project is to study the seismic performance of the RCS system for buildings in comparison with the ordinary RC buildings. Also compare both RCC and RCS building by with and without dampers.

Damping plays important role in design of Earthquake Resistant Structures, which reduces the response of the structure when they are subjected to lateral loads. There are many different types of dampers in use. In my study Fluid Viscous dampers (FVD) are used to evaluate the response of RCC and RCS buildings. The main task of a structure is to bear the lateral loads and transfer them to the foundation. Since the lateral loads imposed on a structure are dynamic in nature, they cause vibrations in the structure. In order to have earthquake resistant structures, fluid viscous dampers have been used. In the present study the software ETABS 2017 have been used. Using Response spectrum analyses the response of both RCC and RCS buildings considered in the present study is evaluated and compared with and without FVD.

II. Objectives

The main objective of the present work is to-

- Analyze and design RCC and RCS building using Indian standard code
- Study seismic response of tall regular and irregular RCC &RCS building using response spectrum analysis using ETABS.
- Study the effect of joint deformation on the behavior of tall regular and irregular RCC &
- RCS frames through push over analysis using ETABS.
- Compare the response of a building (both RCC&RCS) with and without the use of dampers.

III. Design Particulars

Design particulars includes material properties, section and load details. Those details are discussed in following tables.

Table 1: description of the RCC model

No. of Storey	G+15
Typical Floor height	3.5m
Ground Floor height	2m
Plan dimension	20 m x 20 m
Beam size, b1	300x500 mm
Column size	
c1	450x550 mm
c2	450x900 mm
Thickness of slab	200 mm
Concrete grade	M 25(beams, slabs)
	M 45(column)
Rebar Grade	HYSD 500
Design Strengths	
Fy	500MPa
Fu	545MPa
Dead load on slab	1 kN/m2
Live load on slab	3 kN/m2
Seismic load	As per IS 1893:2002
Load Combinations	As per IS 1893:2002
Seismic Zone	Zone 4
Type of Soil	Medium Soil
Importance Factor (I)	1
Response Reduction Factor (R)	5

Table 2: description of the RCS model

No. of Storey	G+15
Typical Floor height	3.5m
Ground Floor height	2m
Beam size, b1	300x500 mm
Column size	
c1	450x900 mm
c2	450x900 mm
Thickness of slab	200 mm
Concrete grade	M 25(beams, slabs)
	M 45(column)
Rebar Grade	HYSD 500
Design Strengths	
Fy	500MPa
Fu	545MPa
Dead load on slab	1 kN/m2
Live load on slab	3 kN/m2
Seismic load	As per IS 1893:2002
Load Combinations	As per IS 1893:2002
Seismic Zone	Zone 4
Type of Soil	Medium Soil
Importance Factor (I)	1
Response Reduction Factor (R)	5
Steel I/Wide Flange	ISMB450@50Kg/m

IV. Modelling

Three types of tall symmetrical buildings i.e. building with regular plan, plan irregularity and vertical irregularity, located in seismic zone IV have been considered. The modelling of the buildings and earthquake loads are in accordance with IS: 1893-2002[1] and IS: 456-2000[2]. For comparison purpose same building plan is considered for RCS and RCC frame model. Fluid viscous dampers are provided in each storey by DEC (damper at exterior corner) method.

- Total 18 models representing RCS &RCC each have been modelled using ETABS.
- Building modelled for structural elements such as beam, column and slab.
- To ensure integral action vertical structural members and diaphragm provided in each storey.
- Fluid viscous dampers are provided in each storey by dec (damper at exterior corner) method.

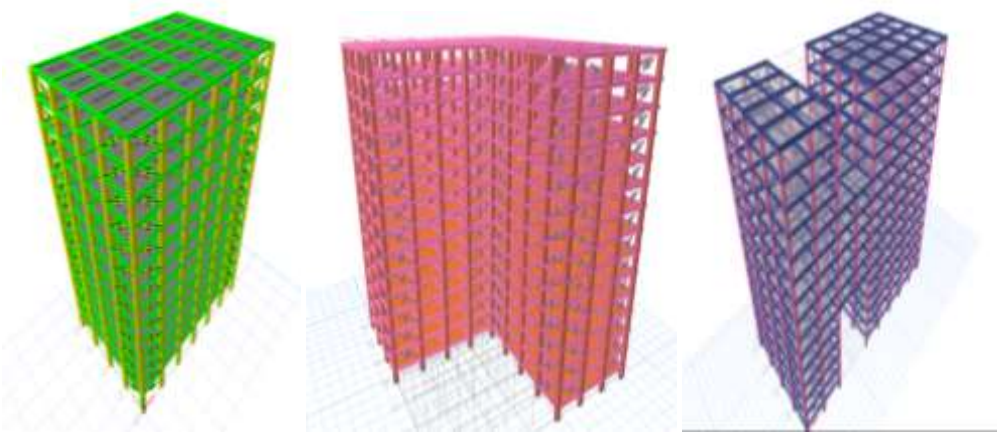


Fig. 1 Frame models 3D view

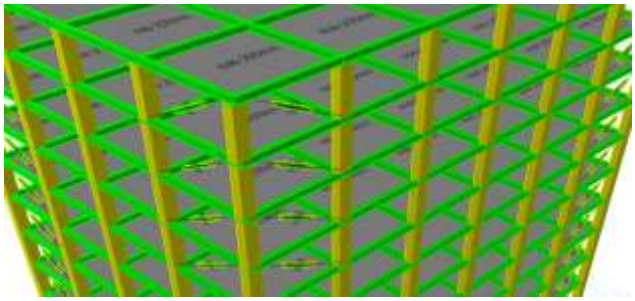


Fig. 2 Damper positioning in corners

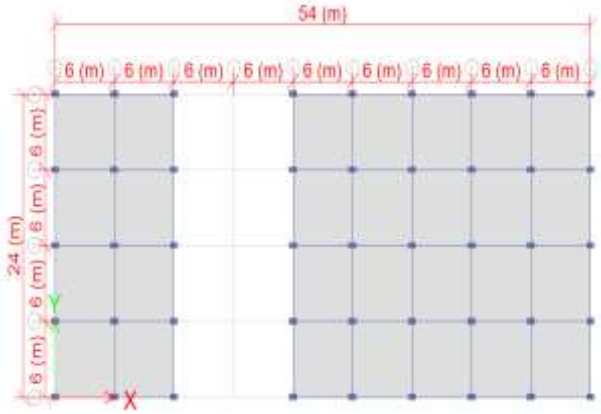


Fig. 3 H shaped building plan

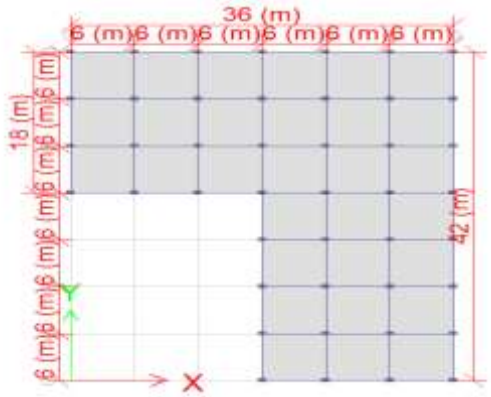


Fig. 4 L shaped building plan



Fig. 5 Regular frame plan

V. Model analysis procedure

Response spectrum analysis-

- Defined mass source.
- Defined response spectrum acceleration function.
- Defined and assigned load cases like dead, live and super dead load and earth quake load in both direction (EQX&EQY).
- Assigned response spectrum load case(spec x &spec y)
- Defined load combination.
- Results are obtained after analysis and checked base reaction and response of building such as time period of vibration, frequency and displacement.

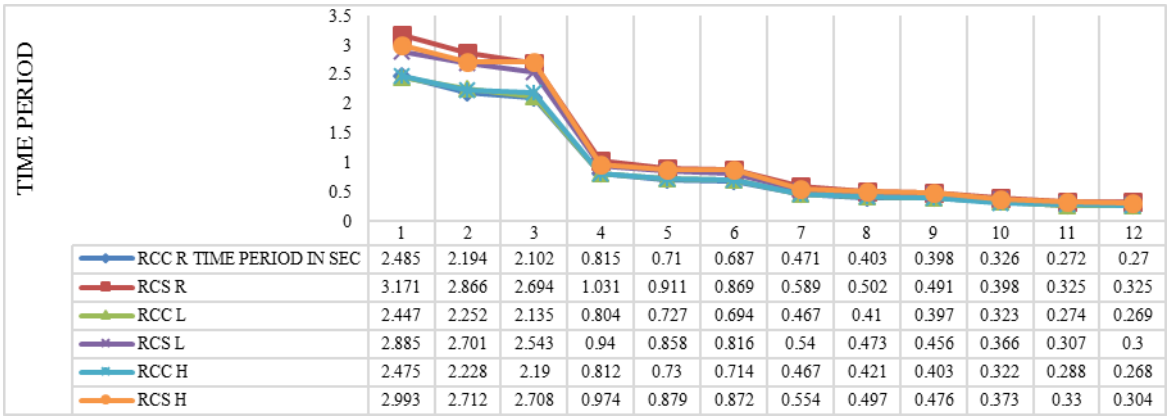
Pushover Analysis-

- Defined and assigned member properties, sections, load cases and mass source.
- Hinges are assigned to the beams and column member as per ATC 40.
- Hinge property for beam are assigned as M3 and for column PM2M3.
- Defined nonlinear static load case push x and push y.
- Linear static analysis is performed and design check is carried out.

VI. Analysis result

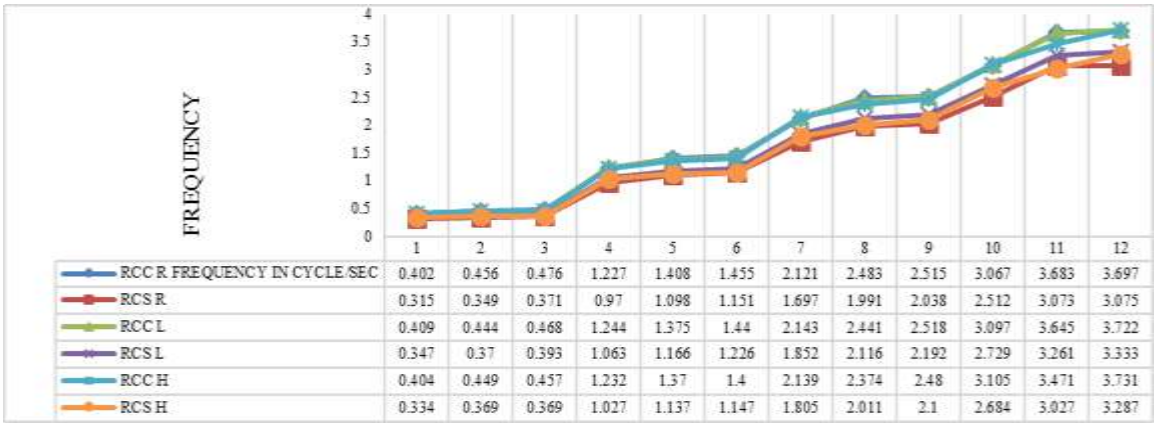
Response spectrum results-

For RCS and RCC comparison
Time Period and Frequency



	1	2	3	4	5	6	7	8	9	10	11	12
RCC R TIME PERIOD IN SEC	2.485	2.194	2.102	0.815	0.71	0.687	0.471	0.403	0.398	0.326	0.272	0.27
RCS R	3.171	2.866	2.694	1.031	0.911	0.869	0.589	0.502	0.491	0.398	0.325	0.325
RCC L	2.447	2.252	2.135	0.804	0.727	0.694	0.467	0.41	0.397	0.323	0.274	0.269
RCS L	2.885	2.701	2.543	0.94	0.858	0.816	0.54	0.473	0.456	0.366	0.307	0.3
RCC H	2.475	2.228	2.19	0.812	0.73	0.714	0.467	0.421	0.403	0.322	0.288	0.268
RCS H	2.993	2.712	2.708	0.974	0.879	0.872	0.554	0.497	0.476	0.373	0.33	0.304

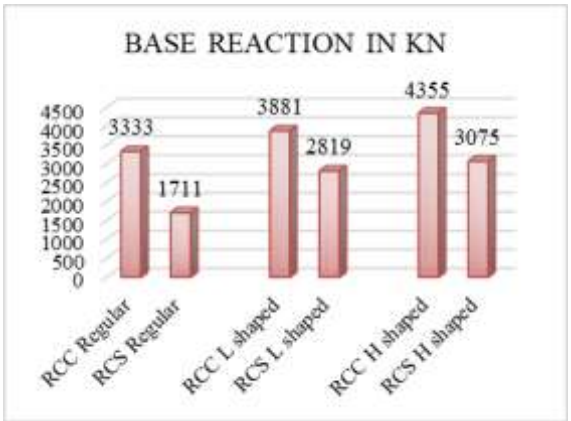
On comparing the time period of RCC and RCS structure it is clear that the time period is more for RCS structure than RCC. And the time period is more for RCS regular building and less for L shaped building. The time period of RCC regular building reduced to 22% on comparing to RCS regular. For RCC L shaped building the time period reduced by 16 % and RCS H shaped building the time period reduced by 18% on comparing to their corresponding RCS structures.

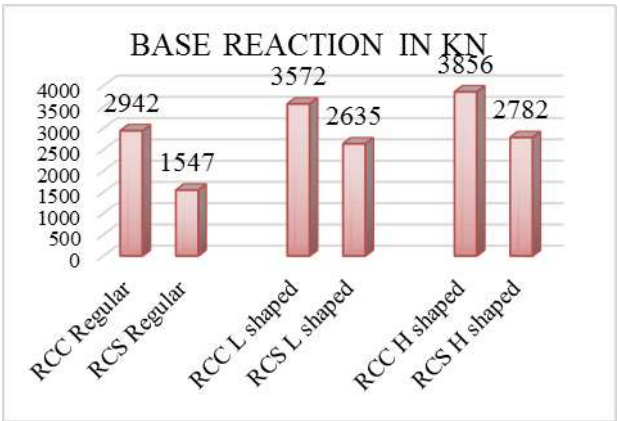


	1	2	3	4	5	6	7	8	9	10	11	12
RCC R FREQUENCY IN CYCLE /SEC	0.402	0.456	0.476	1.227	1.408	1.455	2.121	2.483	2.515	3.067	3.683	3.697
RCS R	0.315	0.349	0.371	0.97	1.098	1.151	1.697	1.991	2.038	2.512	3.073	3.075
RCC L	0.409	0.444	0.468	1.244	1.375	1.44	2.143	2.441	2.518	3.097	3.645	3.722
RCS L	0.347	0.37	0.393	1.063	1.166	1.226	1.852	2.116	2.192	2.729	3.261	3.333
RCC H	0.404	0.449	0.457	1.232	1.37	1.4	2.139	2.374	2.48	3.105	3.471	3.731
RCS H	0.334	0.369	0.369	1.027	1.137	1.147	1.805	2.011	2.1	2.684	3.027	3.287

On comparing the frequency of RCC and RCS building the frequency is lesser for RCS building. The frequency is lesser for RCS regular building and higher for RCC L shaped building. The frequency of RCS regular building reduced to 20% on comparing to RCC regular. For RCS L shaped building the frequency reduced by 15 % and RCS H shaped building the frequency reduced by 18% on comparing to their corresponding RCC structures.

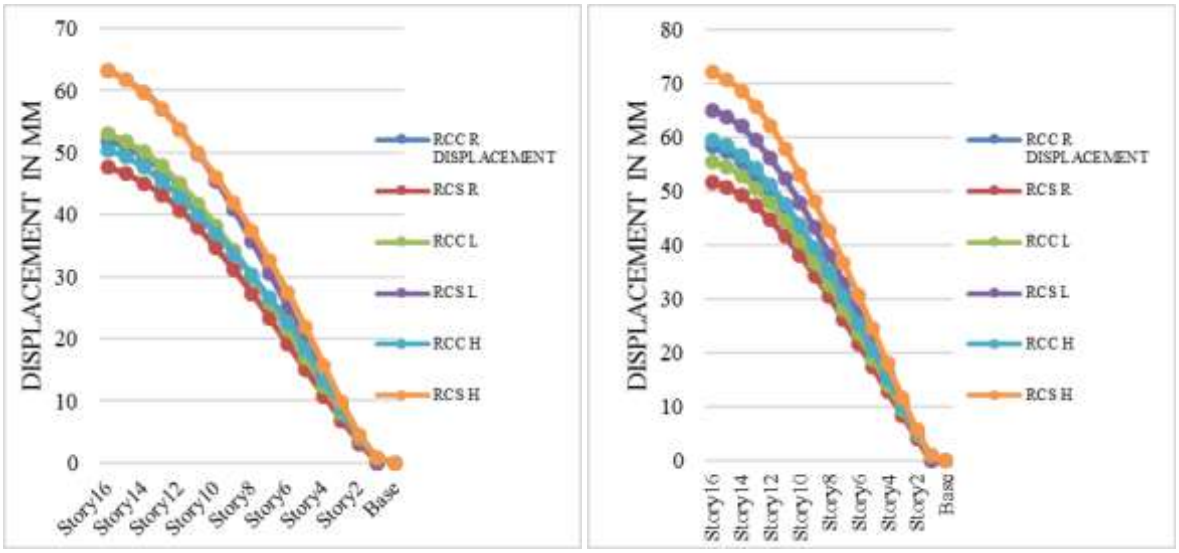
Base Reaction-





From the comparison values in figure it can be clearly found that the base reaction is low for RCS building in comparing to RCC building, in addition to that the base reaction in x direction is less with respect to y direction base reaction value. RCS regular buildings base reaction in X direction is less comparing to RCS building .Among the comparison the base reaction for RCS regular building is less and RCS H shaped building is more. The base reaction is reducing to almost or equal to 50% for RCS building for all typed of structures.

Displacement-



On comparing the displacement of RCC and RCS building the displacement is more for RCS building. The displacement is lesser for RCS regular building and higher for RCC H shaped building.

For structures with and without damper

Time Period and Frequency- The time period increases by using dampers in the structure. Among RCC &RCS structures the time period of RCC is increasing more on comparing to RCS structure. The time period of RCS structure with damper increases by 35% on comparing to structure without damper. Similarly the RCC&RCS L structure have 40% increase in time period on comparing to structure without damper.

The frequency decrease by using dampers in the structure. Among RCC&RCS structures the frequency of RCC is more on comparing to RCS structure. The time period of RCS structure with damper decrease 40% on comparing to structure without damper. Similarly the RCC & RCS L,H structure have 40% decrease in frequency on comparing to structure without damper.

Base Reaction- The base reaction of RCS structure with damper is less on comparing to RCC structure with damper. The graph clearly shows that the base reaction decreases by using dampers. The RCC building with damper have more base reaction than RCS structure. The base reaction of regular RCS regular building with damper decreases to 50% on comparing to RCC regular building with damper .similarly for RCC regular building with damper the base reaction decreases to 60% comparing to RCC regular building without damper. The base reaction of regular RCC L building with damper decreases to 32% on comparing to RCC L building without damper .similarly for RCS L building with damper the base reaction decrease to 49% comparing to RCS L building without damper. The base reaction of regular RCC H building with damper decreases to 47% on comparing to RCC H building without damper .similarly for RCS H building with damper the base reaction decreases to 50% comparing to RCS H building without damper.

Displacement- On comparing the displacement of RCC and RCS building the displacement is lesser for RCS building. The displacement is lesser for RCS regular building and higher for RCC H shaped building. By the use of dampers the displacement of RCC and RCS structures are reducing considerably.

Pushover Analysis Result- Analysis is carrying in three types of tall symmetrical buildings'

- REGULAR FRAME MODEL
- L SHAPED MODEL
- H SHAPED MODEL

Capacity Spectrum

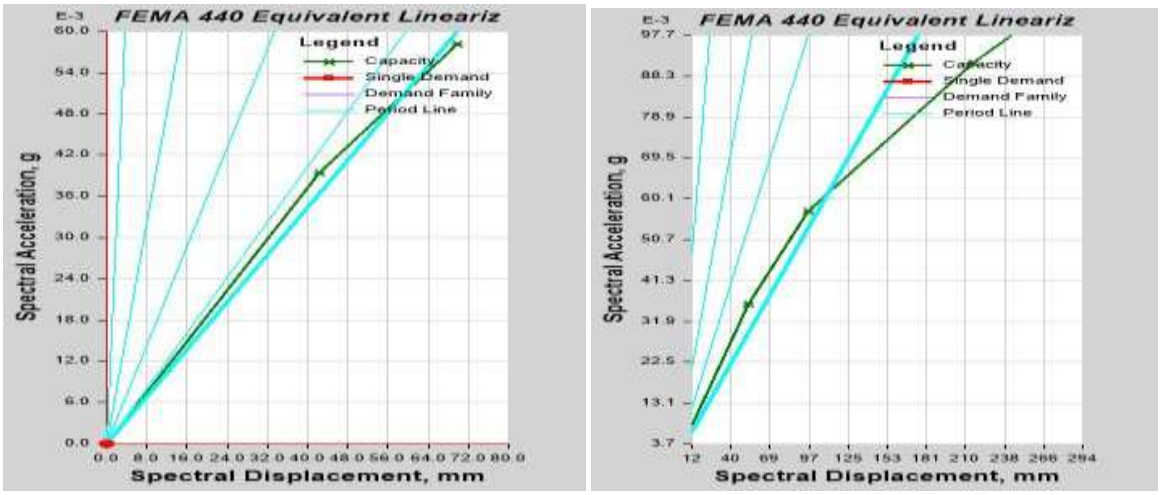


Fig Capacity Spectrum for Regular RCC and RCS buildings

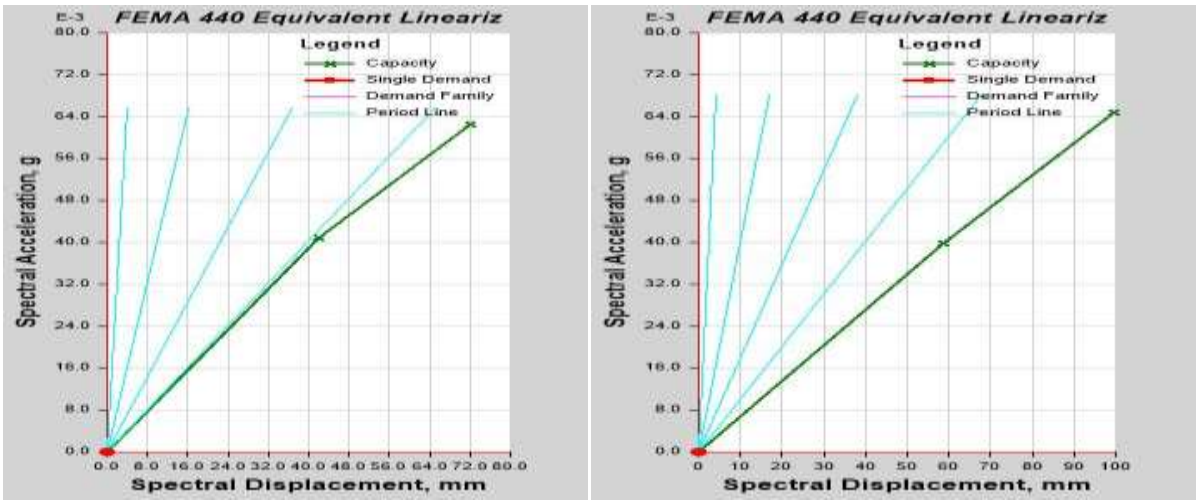


Fig Capacity Spectrum for L shaped RCC and RCS buildings

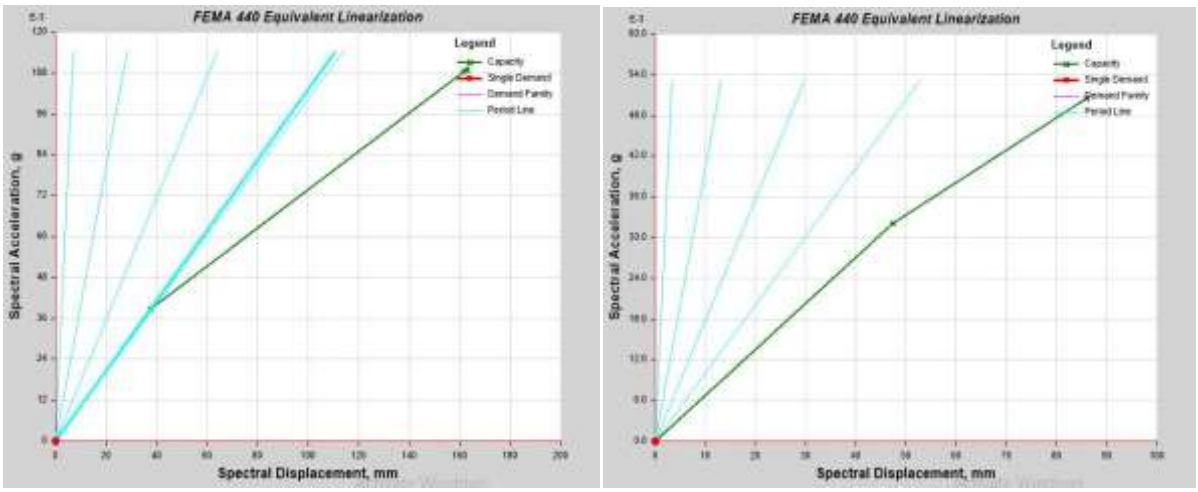


Fig Capacity Spectrum for H shaped RCC and RCS buildings

From the capacity spectrum shown above it is clear that the performance of RCS building is better than RCC structure. RCS structure behaves linear till the maximum base shear capacity reaches. For RCC structure the curve is almost linear.

Pushover curve

Table 3: push over curve result for performance level

TYPE OF MODEL	DISPLACEMENT (mm)	BASE FORCE (kN)	PERFORMANCE LEVEL
RCS Regular	67.6	3670.314	B TO IO
RCC Regular	54	5099.35	IO TO LS
RCS L shaped	73.8	5130	B TO IO
RCC L shaped	54	5099.35	IO TO LS
RCS H shaped	67.3	4470.3506	B TO IO
RCC H shaped	55.8	4130	IO TO LS

The pushover curves results shows that the displacement is more for RCS and base shear is more for RCC structures .Among the 6 types of building analysed the RCS regular building have lesser base shear. From the performance level it is clear that the RCS structure fall under the level of B to IO so it is safer under seismic condition.

VII. Conclusion

- The increase in time period and subsequent decrease in frequency of RCS in comparison to RCC structure shows that the intrusion of structural steel has increased the flexibility of the structure with reduced stiffness.
- The increase in period of vibration with decrease in frequency may reduce the buckling and damage to the vertical load bearing members.
- The results of response spectrum and pushover analysis show that displacement of RCS is more as compared to RCC building. This may be due to direct transfer of loads on steel beam rather than concrete. Hence, because of the ductile nature of steel and increased flexibility, RCS structure undergoes relatively more displacement.
- The use of FVD reduces the displacement of both RCC and RCS structures. Thus makes RCS structures more seismic resistant than RCC.
- Use of damper reduces frequency of oscillations and increase the flexibility of the structure.
- From the pushover analysis result, the performance of RCS structure is established in the range B to IO, indicating that the building can be occupied immediately post-earthquake. The building is operational with negligible damage. This means that the structure possess good strength and adequate seismic resistance whereas the performance level of RCC structure is found to be in the range IO to LS. This means that the structure has suffered some damage. Thus it can be said that the strength of RCC structure is relatively less. An important point to note here is that though the time period and displacement of RCS is more as compared to RCC structure but the damage is less in case of RCS building.
- The base shear decreases with decrease in mass and increase in flexibility of the structure. A flexible structure would experience less acceleration, whereas a stiff structure such as RCC would offer higher resistance resulting in high base shear.

VIII. Acknowledgment

First and foremost, praise and thanks goes to God and Parents for the blessing that has bestowed upon me in all my endeavours. I am deeply indebted to **Ms. Jasmine O** Assistant Professor of Structural Engineering Division, my advisor and guide, for the motivation, guidance and patience throughout the project work.

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DYNAMIC STABILITY ANALYSIS OF CABLE STAYED SUSPENSION HYBRID BRIDGE

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Abstract:The demand of long span bridge is increasing with development in the infrastructure. To achieve maximum central span in bridges is a motivating rational challenge for engineers. The cable-stayed bridge has better structural stiffness and suspension bridge has ability to offer longer span thus composition of above two structural systems could achieve very long span cable-stayed suspension hybrid bridge.
In bridge structures, loss of critical members and associated collapse may occur due to several reasons, such as wind, earthquakes, traffic loads and potentially some blastloadings. The present paper aims to verify the numerical comparative seismic analysis of the response of cable-stayed suspension hybrid bridge for fan type stay cable arrangements with H shape pylon, in which the main objective is to propose the best structural configurations from a seismic point of view. A finite element (FE) model for a suspension bridge, cable-stayed bridge and cable stayed suspension hybrid bridges are developed by using ANSYS 19.1 and analysed statically and dynamically for this research purpose. The bridge model has steel deck which is supported by total of 80 stays. Total length of this bridge is 820m with 460m mid-span.

Keywords*:* Cable-Stayed-Suspension (CSS) Hybrid Bridge, Seismic analysis, Cable stayed bridge, Suspension bridge, ANSYS

I. Introduction

Bridge is a structure built to span across a valley, road, body of water, or other physical resistance, for the purpose of providing passage over an obstacle. Bridges are those marvels in civil engineering tool kit which help in connecting the places located on other side of bank. Varieties of bridges have evolved from history. Of them one is Cable stayed Suspension Hybrid Bridge (CSHB)
The cable-stayed-suspension hybrid bridge is a new cable-supported bridge developed from the traditional cable-stayed bridge and suspension bridge. The design benefits from the main advantages of each system, and also makes up for the deficiencies in the structural behavior, construction, economy and the wind stability of traditional suspension and cable-stayed bridges. Therefore, this hybrid becomes an attractive design alternative for long and particularly super long-span bridges.
Cable supported bridges are typically employed to overcome medium or long spans, because of their structural, economical and aesthetic properties. Such characteristics arise from an enhanced combination of the structural components of the bridge, which are essentially girder, cable system and pylons. The cable elements can be arranged following cable-stayed or suspension configurations. Moreover, in the case of hybrid cable-stayed suspension (HCS) bridges, the cable system is defined by presence of stays, hangers and main cable, leading to bridge structures, which, typically, present better performances than conventional ones based on pure suspension and cable-stayed configurations. Cable supported bridges, especially for long spans, are defined through a large number of cable elements, which lead to highly statically indeterminate structures. As a result, post-tensioning stresses and cross-sections of the cables can be considered as design variables, which must be determined to identify the bridge configuration under dead and live loading, enforcing the lowest steel quantity involved in the cable-system and the optimum performance of the structural elements

II. Summary of Literature survey

From the literature survey, it can be observed that a lot of study has been carried out in advances the dynamic characteristics of suspension bridges and cable stayed bridges achieved through the use of finite element method. Here a question arises that what will be the optimum design combination for a long span bridge in

terms of deformation. It is studied in this project. Therefore, in this study the effects of wind, seismic effects and cable loss scenarios in long span bridges are analysed. Also, a finite element model for aSuspension, Cable stayed and CSSH bridges are designed and analyses using static/dynamic methods.

III.Finite Element Analysis

The analysis of bridge has been done by using ANSYS 19.1 software. Response Spectrum Method is adopted for the analysis. Before analysis all the required elements of the structure needs to be defined earlier like material properties, loads, size of members etc. After the analysis the results like Total deformation. Directional deformations, frequency variations etc. are observed and used for comparing the cross section of the structures**.**
ANSYS is an American Computer-aided engineering software developer headquartered south of Pittsburgh in Cecil Township, Pennsylvania, and United States. ANSYS publishes engineering analysis software across a range of disciplines including finite element analysis, structural analysis, computational fluid dynamics, explicit and implicit methods, and heat transfer. ANSYS is a general purpose software, used to simulate interactions of all disciplines of physics, structural, vibration, fluid dynamics, heat transfer and electromagnetic for engineers. So ANSYS, which enables to simulate tests or working conditions, enables to test in virtual environment before manufacturing prototypes of products. Furthermore, determining and improving weak points, computing life and foreseeing probable problems are possible by 3D simulations in virtual environment.

IV.Objectives

- To analyse and optimize the material suitability of Cable Stayed Suspension Hybrid Bridge (CSSH)
- To study the failure mechanism of bridge due to the breakage (or loss) of cables
- To analyse the structural components that suffer the most damage due to seismic loadings
- Identify the damage mechanism and mode of failure in long span bridges subject to wind action
- Identify the optimum combination for a long span bridge by using ANSYS

V. Scope of the Project

The scope of this project is to analyse the long span bridges with different cross sections with different boundary conditions. This project considering the laterals forces like wind load and seismic loads for structural analysis. And the effectiveness of stresses and lateral deformations are also studied.

VI.Validation of Software

Suspension bridge modal analysis is used to determine the vibration characteristics of the structure itself, and its purpose is to prevent the structural resonance, resonance has a heavy damage to the structure, so the engineering sector tries to avoid this phenomenon as much as possible in the design and construction process. In the study presented by Bangsheng Xing et.al, on "ANSYS Analysis of Suspension Bridge". ANSYS Mechanical work bench 19.1, static structural is used for the analysis.
In this method, suspension bridge is modelled in ANSYS 19.1 as shown in Fig.1

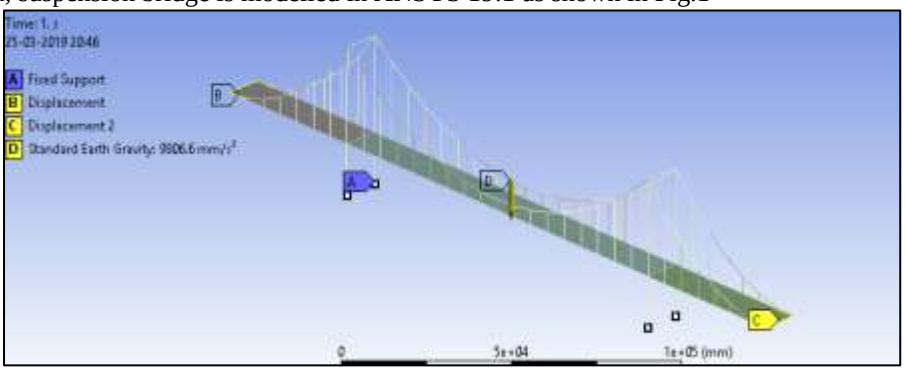


Fig 1 Geometrical view of suspension bridge

The results obtained from manual calculation and ANSYS 19.1 software as shown in Table 1
Table Comparison of Results

Table 1 Validation of software

Mode	Frequency (Hz) from journal	Frequency (Hz) ANSYS 19.1	% variation with respect to journal
1	0.493	0.473	4.05
2	0.678	0.681	0.44
3	0.868	0.854	1.61

It is observed that Frequency values obtained from software has a maximum variation of 4.05%. According to the manual of ANSYS 19.1 by computers and structures the maximum permissible variation is limited to 10%. Here the obtained variation of result is within the limit. Thus the software was validated..

VII. Methodology

- Literature survey to understand the behaviour and properties of ultra large capacity endplate joint.
- Fixing the objectives of the thesis
- Study of ANSYS software
- Modelling
  Model 1- Suspension bridge
  Model 2- Steel Suspension Bridge
  Model 3-Suspension bridge with cable loss
  Model 4- Steel Suspension Bridge with cable loss
  Model 5- Cable Stayed Bridge
  Model 6- Steel Cable Stayed Bridge
  Model 7- Cable Stayed Bridge with cable loss
  Model 8- Cable Stayed Bridge with cable loss
  Model 9- Cable Stayed Suspension Hybrid Bridge (CSSH)
  Model 10- Steel Cable Stayed Suspension Hybrid Bridge
  Model 11- Cable Stayed Suspension Hybrid Bridge with cable loss
  Model 12- Steel Cable Stayed Suspension Hybrid Bridge with cable loss
- Analysis
- Comparison of results
- Conclusion

Table 2 Dimension of elements

MEMBERS	E (Mpa)	A (m^2)	I_X (m^4)	I_Y (m^4)
PYLON	2×10^{11}	25	52.08	52.08
MAIN CABLE	2×10^{11}	0.502	0.0198	0.0198
SUSPENSION CABLE	2×10^{11}	0.1963	0.003	0.003
CROSS MEMBER	2×10^{11}	12.5	26.04	6.51

Table 3 Material properties

Property	**Steel**	**Concrete**	**Unit**
Density	7850	2300	kg m^{-3}
	Isotropic elasticity		
Young's modulus	2E+11	3E+10	Pa
Poisson's ratio	0.3	0.18	
Bulk modulus	1.6667E+11	1.5625E+10	Pa
Shear modulus	7.6923E+10	1.2712E+10	Pa

VIII. Finite Element Modelling in Software

Modeling of structure had a prime importance in the software analysis. Structure modeled and their properties are assigned to them for its realistic nature. These are done using ANSYS 19.1 software. A simulation similar to the structure is thus modeled in the software before analysis to obtain accurate results. Therefore, element in modeling should include maximum properties similar to actual structure. Bridges having main span 820m and height 130m is considered for the study. Models with different boundary conditions are modelled and are as shown below

Figure 2suspension bridge

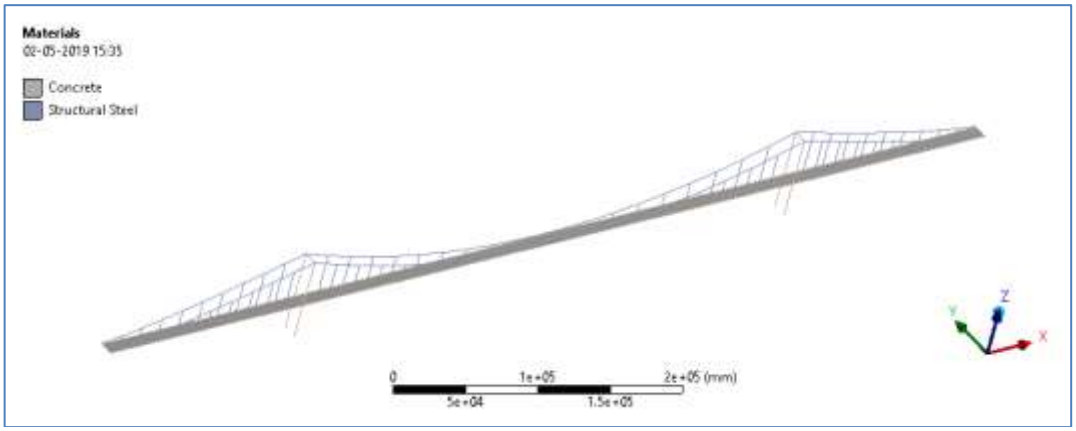


Figure 3Cable stayed bridge

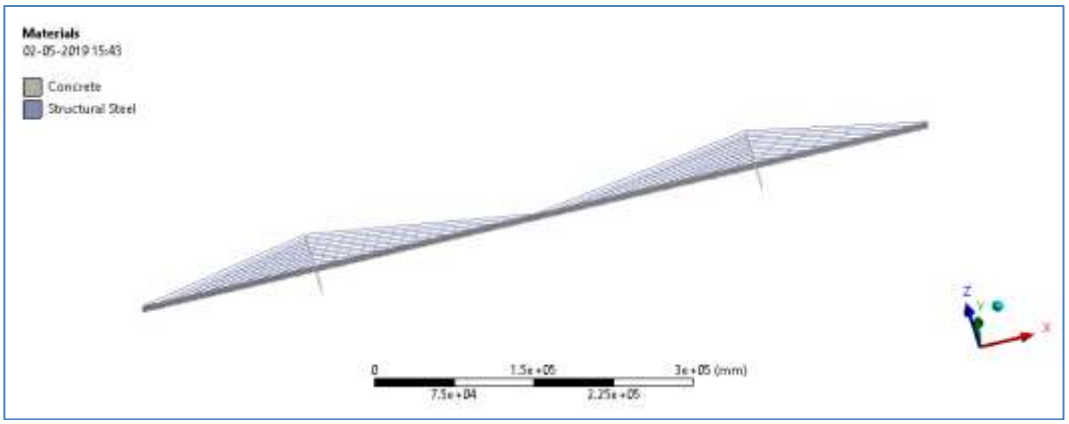
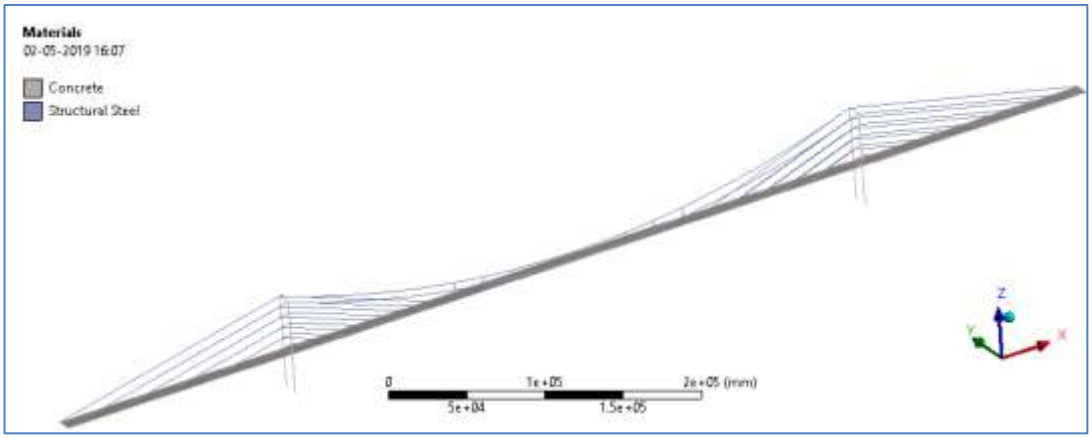


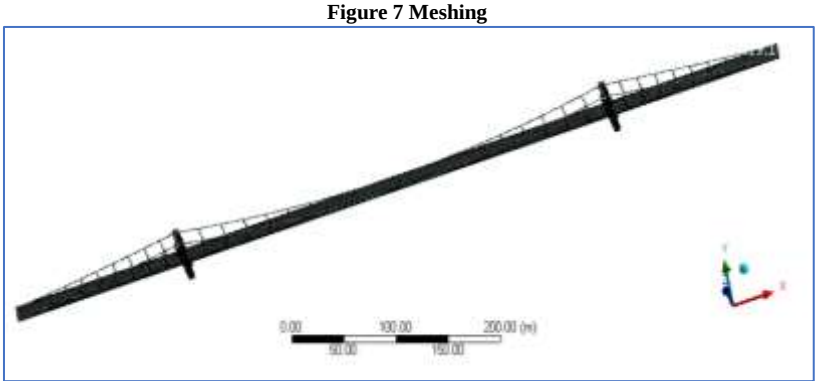
Figure 4Cable stayed suspension hybrid bridge



IX.Meshing

ANSYS Meshing is a general-purpose, intelligent, automated high-performance product. It produces the most appropriate mesh for accurate, efficient multiphysics solutions. A mesh well suited for a specific analysis can be generated with a single mouse click for all parts in a model. Full controls over the options used to generate the mesh are available for the expert user who wants to fine-tune it. The power of parallel processing is automatically used to reduce the time you have to wait for mesh generation.

Figure 7 Meshing



X. Resullts and discussion

XI.Directional deformation (X Axis)

Directional deformation can be put as the displacement of the system in a particular axis or user defined direction. Here obtain directional deformation along X direction of all the models and compare the results.

Table 4 Directional deformation (XAxis)

	Total deformation (mm)
modal 1	55.86
modal 2	58.97
modal 3	65.19
modal 4	66.4
modal 5	93.4
modal 6	77.17
modal 7	94.2
modal 8	99.13
modal 9	0.165
modal 10	0.236
modal 11	0.192
modal 12	0.235

Figure 8 Directional deformation (XAxis)

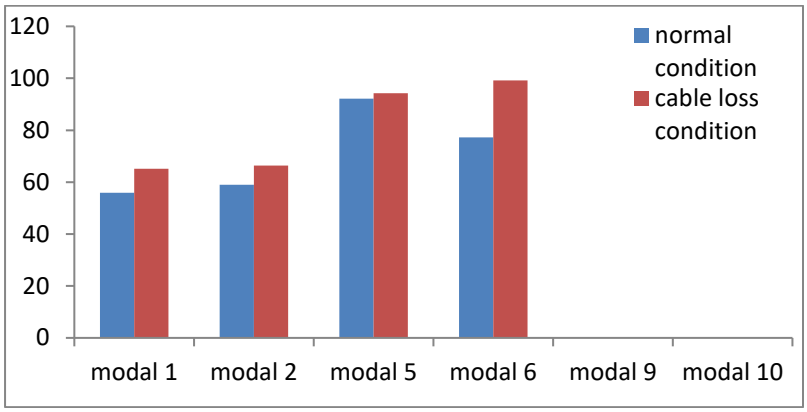
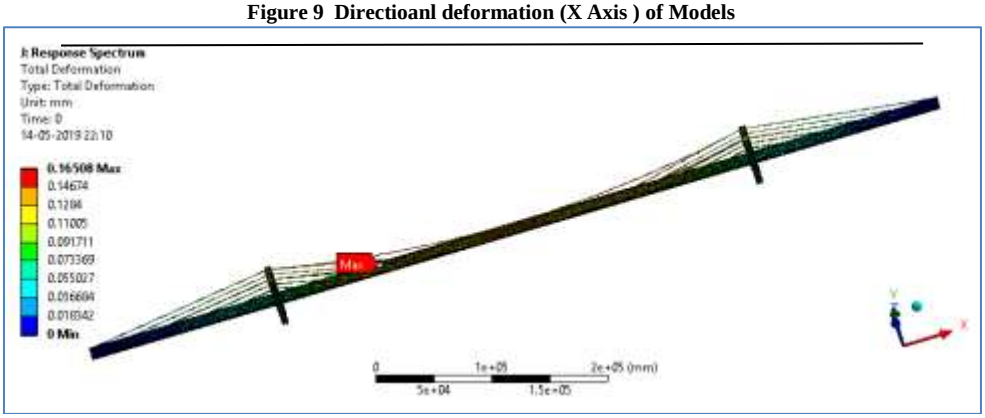


Figure 9 Directioanl deformation (X Axis) of Models



B. Directional deformation (Y Axis)

Directional deformation can be put as the displacement of the system in a particular axis or user defined direction. Here obtain directional deformation along Y direction of all the models and compare the results.

Table 5 Directional deformation (YAxis)

modal 1	7.44
modal 2	8.62
modal 3	28.42
modal 4	36.9
modal 5	6.65
modal 6	17.21
modal 7	9.82
modal 8	18.34
modal 9	0.016
modal 10	0.02
modal 11	0.02
modal 12	0.028

Figure 10 Directional deformations (Y Axis)

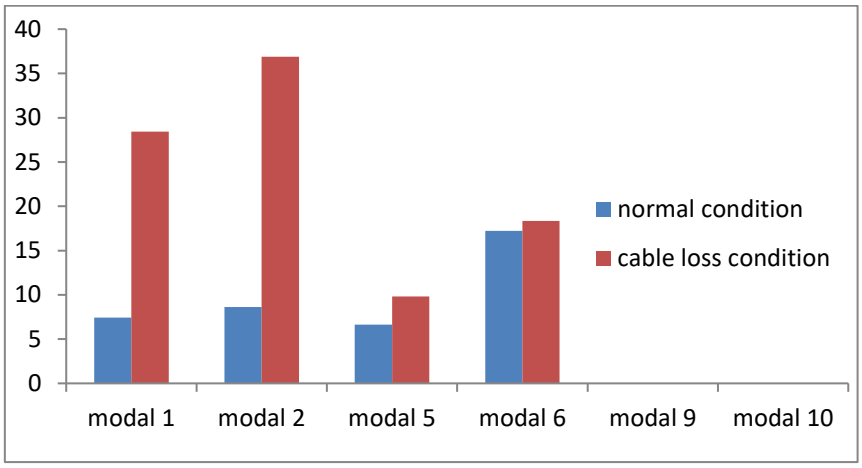
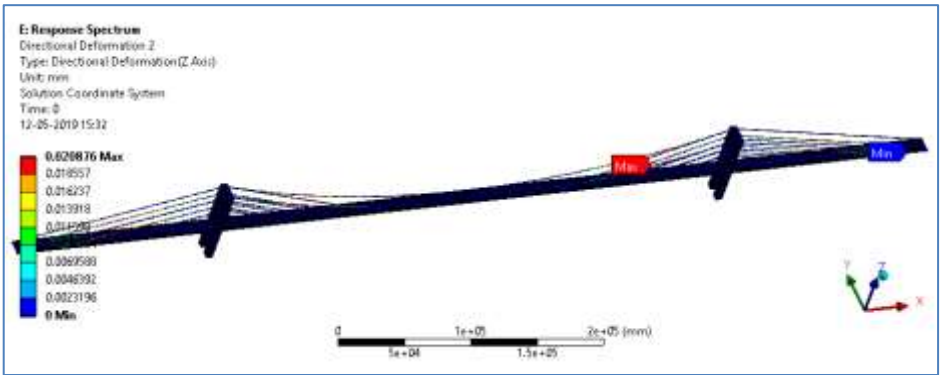


Figure 11 Directional deformation (Y Axis) of Model 5



C. EFFECT IN STRUCTURAL COMPONENTS

The earthquake loading is also one of the most important and potentially extreme loading for the bridge structures, since several bridges have suffered during the past large earthquakes; even some of them completely collapsed. For long span bridges, pier, deck and cables were affected by seismic loading significantly and in need of special attention.

Table 6 Effect in structural components

	DECK	PIER	CABLES
model 1	48.43	0.12	55.86
modal 2	57.97	0.28	58.717
modal 5	7.46	0.045	77.17
modal 6	8.33	0.19	93.39
modal 9	0.129	0.105	0.165
modal 10	0.179	0.106	0.203

Figure 12 Effect in structural components

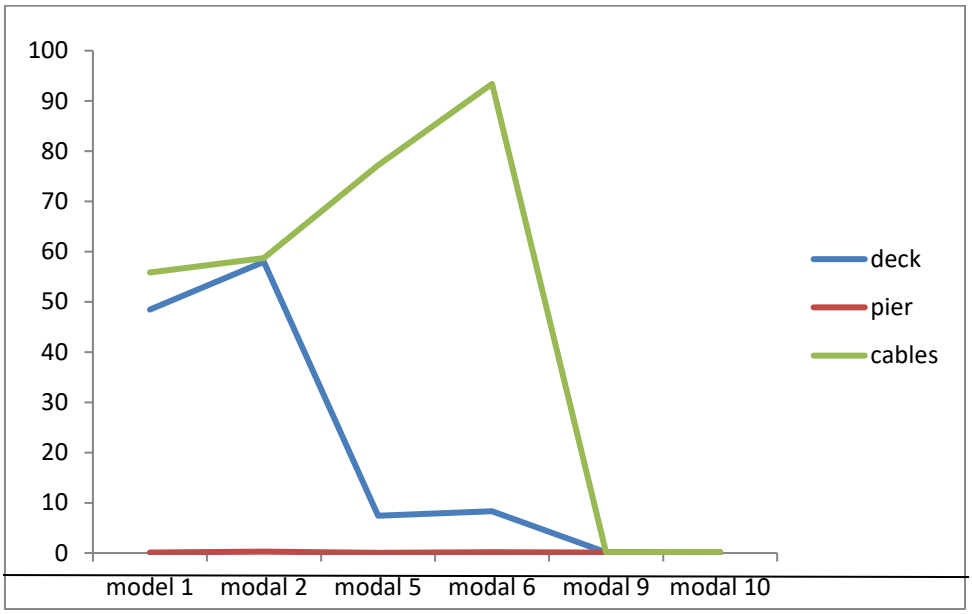
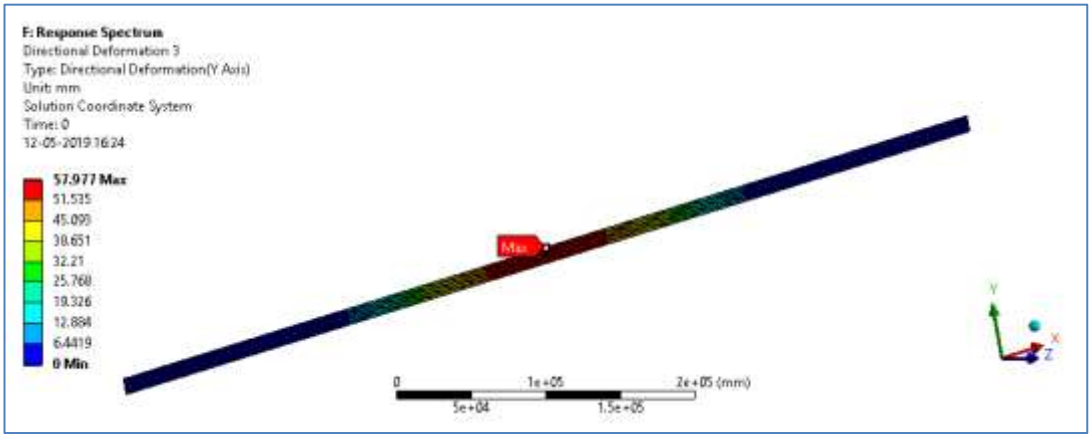


Figure 13 Effect in structural components



XI. Conclusion

Dynamic responses of a cable-stayed suspension hybrid bridge under several severe conditions (such as sudden loss of cable, wind loading and seismic loading) were studied in this thesis. Finite element (FE) models of a cable-stayed suspension hybrid bridge developed and analysed statically and dynamically as part of this research. Commercial FE programs, namely, ANSYS were used.

- The material suitability of Cable Stayed Suspension Hybrid Bridge is the combination of concrete and steel
- In suspension bridge, loss of main cables leads to progressive collapse. In cable stayed bridge considered in this study, loss of one or even two cables did not trigger a progressive collapse. In CSSH bridge loss of one or even two cables did not trigger a progressive collapse and the deformation is very less compared to other bridge configurations.
- The loss of the longest back stays are the most critical ones
- The top stays adjacent to the towers were found to be the most critical ones in terms of maximum tensile stress induced in the cables during seismic actions. No cable loss occurred during these earthquake loading scenarios.
- The stress in the towers remained below the yield strength of steel in all of the considered seismic loading scenarios. In the deck, the sections in the main span were identified as the most critical sections in terms of stresses induced in the deck during earthquake loading scenarios.
- The results show that cable-stayed-suspension hybrid bridge has good wind stability, Generally in all the models the wind effect is less.

- The CSSH hybrid bridge is confirmed to be superior to the suspension and cable stayed bridge with the same span length

XII. References

The heading of the References section must not be numbered. All reference items must be in 8 pt font. Please use Regular and Italic styles to distinguish different fields as shown in the References section.Number the reference items consecutively in square brackets (e.g. [1]). When referring to a reference item, please simply use the reference number, as in [2]. Do not use "Ref. [3]" or "Reference [3]" except at the beginning of a sentence, e.g. "Reference [3] shows". Multiple references are each numbered with separate brackets (e.g. [2], [3], [4]–[6]).

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XIII. Acknowledgments

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Analytical Study of Effect of Wind over Door Opening of Wind Turbine Tower

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Abstract*: With increasing demand of sustainable energy, the production of wind power by using wind turbines have become increasingly important over the last few decades. The tower is provided with a door for the inspection and maintenance of the equipment's inside the tower. The main objective of this paper is to investigate the stresses around the door opening of wind tower for the load case. The loading of the tower generates the stresses around the door opening and these stresses will analyze for static analysis using the FEM software ANSYS R15 as there is more probability of having crack near the door opening. Analysis of the opening with stiffeners are also carried out. For analysis wind load is considered along the side of the opening.*

Keywords*: Wind tower, Stress, ANSYS R15, Static analysis, Stiffeners*

I. Introduction

Wind turbines have been used for at least 3000 years, mainly for grinding grain or pumping water, while in sailing ships the wind has been an essential source of power for even longer. From as early as the thirteenth century, horizontal-axis windmills were an integral part of the rural economy and only fell into disuse with the advent of cheap fossil-fuelled engines and then the spread of rural electrification. The use of or wind turbines to generate electricity can be traced back to the late nineteenth century with the 12 kW DC windmill generator constructed by Brush in the USA and the research undertaken by LaCour in Denmark. However, for much of the twentieth century there was little interest in using wind energy other than for battery charging for remote dwellings and these low-power systems were quickly replaced once access to the electricity grid became available.

Commercial wind power generation in India began in 1986. Many of the older low-capacity (< 500 kW) wind turbines installed more than 10 to 12 years ago occupy some of the best wind sites in India. These turbines need to be replaced with more efficient, larger capacity machines. One of the immediate benefits after repowering the old wind turbines is that more electricity can be generated from the same site. A study on repowering potential conducted by WISE for the Ministry of New and Renewable Energy estimated India's current repowering potential at approximately 2,760 MW16. However due to a lack of policy guidelines and incentives for repowering, concerns are raised on a number of subjects including disposal of old machines, fragmented land ownership in existing wind farms, clarity on the feed-in tariff offered to newly repowered projects and constrained evacuation of the extra power generated.

Wind power is a mature and scalable clean energy technology where India holds a domestic advantage. India has an annual manufacturing capacity for over 9.5 GW ofwind turbines today. The country is seeing about 3 GW in annual installations under the 12th Plan target. This modest pace of utilization of the country's wind power manufacturing and resource potential so far is attributable to several factors, including lack of an appropriate regulatory framework to facilitate purchase of renewable energy from outside the host state, inadequate grid connectivity, high wheeling and open access charges in some states, and delays in acquiring land and obtaining statutory clearances. The broader global economic slowdown has reduced expectations for the fiscal year 2012-13 from the wind sector, which is still coping with the reduction of the Accelerated Depreciation benefit from 80 percent to 35 percent in the first year of a wind turbine's operation.

II. Scope

To extract energy from wind, Wind turbines emerged as one of the most efficient ways of converting the kinetic energy in wind into mechanical power. Now a day's wind turbines are installed in many countries. Steel towers

for multi megawatt turbine consist usually of several conical steel segments which are welded together to sections. These sections are connected by bolted flange connection. A typical feature of these towers is the presence of a manhole cut-out near the bottom, serving purposes of accessibility into the tower for maintenance of the electrical and mechanical equipment. This paper helps to increase the lifetime of wind turbine tower by reducing the effect of wind over the door openings.

III. Objectives

1) To analyse the wind turbine tower with door opening

2) To analyse the wind turbine tower with different stiffeners around the door opening and to comparing the stresses

The entire document should be in Times New Roman or Times font. Other font types may be used if needed for special purposes.Recommended font sizes are shown in Table 1.

IV. Methodology

Modelling of wind turbine tower with door opening and different stiffeners around the opening is carried out using ANSYS R15 software and the von mises stresses are compared.

A. *Basic Assumptions*

- The basic structural model of the tower is represented by an equivalent long, slender cantilever beam built from segments (modules) having different but uniform cross-sectional properties. The tower is cantilevered to the ground, and is carrying a concentrated mass at its free end approximating the inertia properties of the nacelle/rotor unit. This mass is assumed to be rigidly attached to the tower top.
- Material of construction is linearly elastic, isotropic and homogeneous. The tower has a thin-walled circular cross-section.
- The Euler-Bernoulli beam theory is used for predicting deflections. Secondary effects such as axial and shear deformations, and rotary inertia are neglected.
- Distributed aerodynamic loads are restricted to profile drag forces. A two dimensional (2D) steady flow model is assumed.
- Nonstructural mass will not be optimized in the design process. Its distribution along the tower height will be taken equal to some fraction of the structural mass distribution.
- Structural analysis is confined only to the case of flapping motion (i.e. bending perpendicular to the plane of rotor disk).
- Under any load combination (including any load safety factors), the material of the load bearing structural elements of the tower should remain in the linear elastic region of its stress-strain diagram i.e. no plastic deformation has occurred.

B. *Description of Structure*

We have model wind turbine towers for 3MW. The dimension of the uniform thickness tower is at the base the outer diameter is 4.5m and the inner diameter is 4.462m at the top the outer diameter is 3.8m and the inner diameter is 3.762m and the thickness is 38mm throughout. The height of the tower is 100m. (Table 1). Door opening dimension is seen in Figure 1. Door opening with different stiffeners seen in Figure 2.

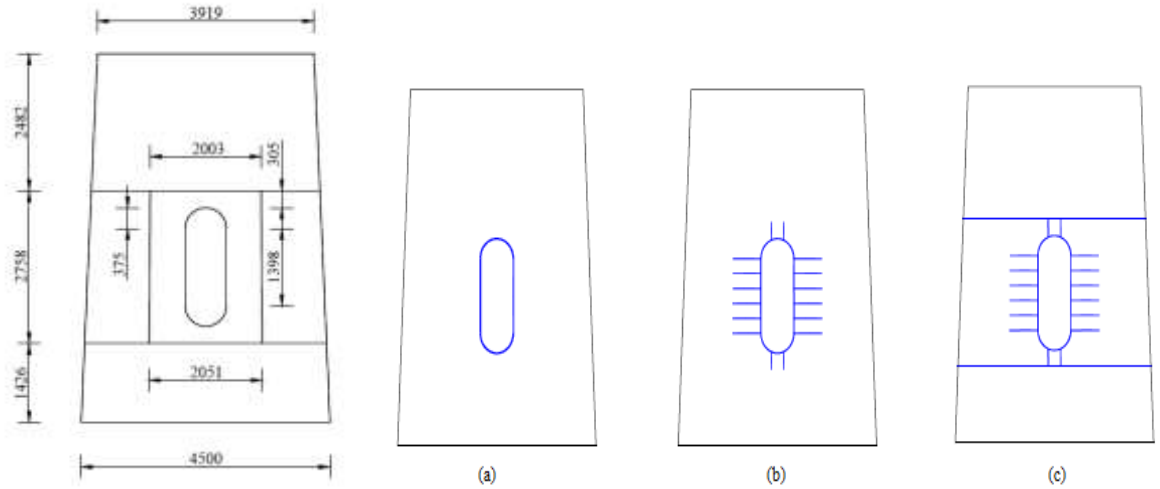
C. *Material Used*

S355 is most commonly used material in wind turbine tower.
S355 is a high strength, low alloy steel that finds its best application where there is need for more strength per unit of weight. Less of this material is needed to fulfill given strength requirements than is necessary with regular carbon steels.
In addition, S355 is noted for its increased resistance to atmospheric corrosion.
It is commonly used in structural applications, heavy construction equipment, building structures, heavy duty anchoring systems, truck frames, poles, liners, conveyors, boom sections, structural steel shapes, and applications that require high strength per weight ratio.

Table 1: Dimension of the Tower

	Dimension of uniform tower with opening	*Dimension of uniform tower with stiffeners around the opening*
Outer diameter at base	4.5 m	4.5 m
Inner diameter at base	4.462 m	4.462 m
Outer diameter at top	3.8 m	3.8 m
Inner diameter at top	3.762 m	3.762 m
Thickness at base	38 mm	38 mm
Thickness at top	38 mm	38 mm
Height	100 m	100 m

Figure 1: Door Opening DimensionFigure 2: Type 1, Type 2, Type 3 Stiffeners



D. *Load Calculation*

1. *Basic Wind Speed*

Basic wind speed is based on peak gust velocity averaged over a short time interval of about 3 seconds and corresponds to mean heights above ground level in an open terrain. Basic wind speed for some important cities/towns is also given in IS Code [3].

2. *Design Wind Speed*

The basic wind speed (Vb) for any site shall be obtained from IS code [3] and shall be modified to include the following effects to get design wind velocity at any height (Vz) for the chosen structure:

a) Risk level
b) Terrain roughness, height and size of structure; and
c) Local topography.

It can be mathematically expressed as follows:

$$Vz = Vb\ k1\ k2\ k3 \quad (1)$$

Where,
Vz = design wind speed at any height z in m/s
k1 = probability factor (risk coefficient)
k2 = terrain, height and structure size factor and
k3 = topography factor

3. *Design Wind Pressure (Pz)*

The design wind pressure at any height above mean ground level shall be obtained by the following relationship between wind pressure and wind velocity:

$$Pz = 0.6\ Vz^2 \quad (2)$$

Where, Pz = design wind pressure in N/m^2 at height z, and Vz = design wind velocity in m/s at height Z.

4. *Wind Force (Fz)*

When calculating the wind load on individual structural elements such as roofs and walls, and individual cladding units and their fittings, it is essential to take account of the pressure difference between opposite faces of such elements or units. For clad structures, it is, therefore, necessary to know the internal pressure as well as the external pressure. Then the wind load, F, acting in a direction normal to the individual structural element or cladding unit is:

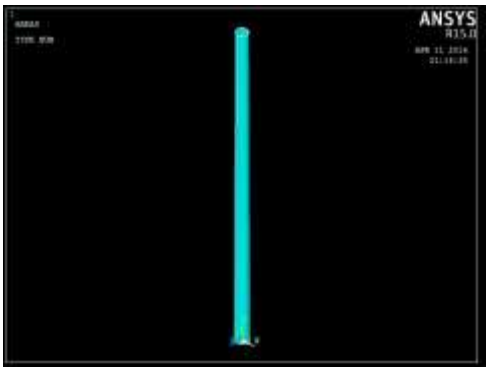
$$F = (cpe - cpi)\ A\ Pz \quad (3)$$

Where, cpe = 0.95
The wind force comes out as 670.250 KN and wind pressure comes out as 1915 N/m_2 with the design wind speed as 56.47 m/s and basic speed 44m/s for Vadodara. Also k_1 is taken as 1.07 for tower with design life 100 years, k_2 is taken as 1.20 for 100 m height for terrain category-1 and for class-c and k_3 is taken as 1.0.

V. Finite Element Analysis

The static analysis is performed by using three-dimensional (3D) finite element models created with Finite Element Analysis (FEA) program ANSYS. In static analysis the loads which are not varying with time is calculated which includes displacement analysis, principal stress and Von Mises stresses.
Fixed boundary conditions are assumed at the lower end of the tower for all analyses. Quadrilateral tetrahedron shell elements (4-node element) are used for the tower wall. High strength structural steel grade S355 with yield stress of 355 MPa is used for all structures. Beam element are used for stiffeners. Figure 3 shows the area model of the tower.

Figure 3: Area Model of the Tower in ANSYS

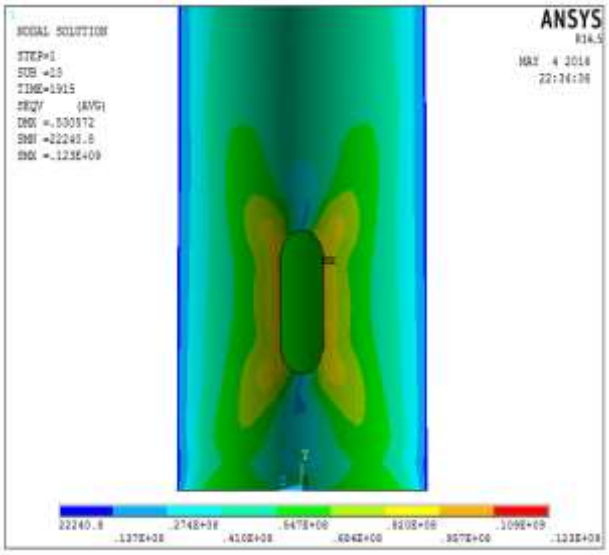


VI. Results

A. *Tower with Door Opening*

The maximum stress at the door opening when load is applied along the side of door opening was to be 123N/mm^2.

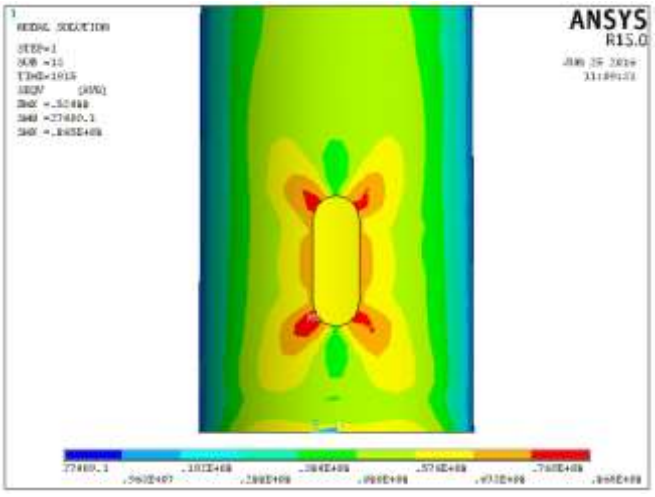
Figure 4: Von Mises Stress Diagram of Tower with Door Opening



B. *Door Opening with Type 1 Stiffener*

When the door opening is provided with ring stiffener the stress is found to be 86.5 N/mm^2.

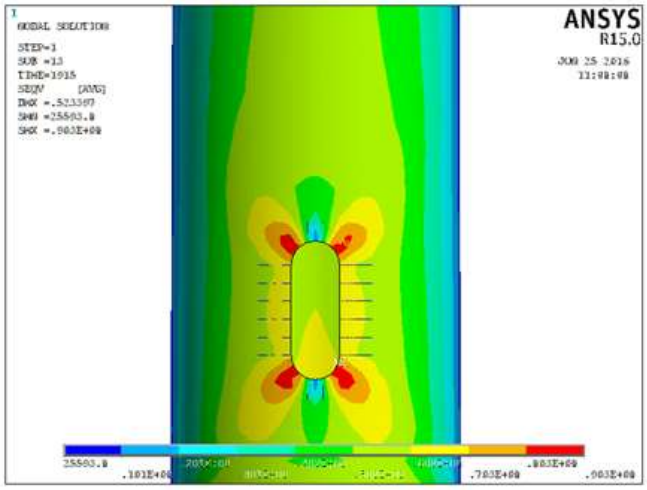
Figure 5: Von Mises Stress Diagram of Door Opening with Type 1 Stiffener



C. *Door Opening with Type 2 Stiffener*

Opening is provided with a set of horizontal and vertical stiffeners locally around the ring the stress is found to be 96 N/mm^2.

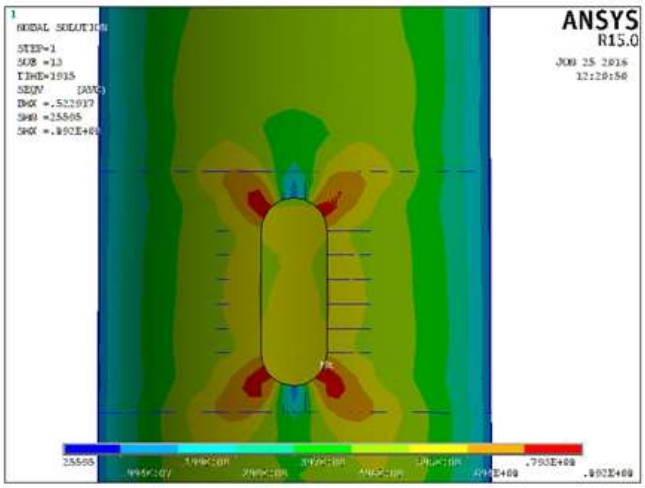
Figure 6: Von Mises Stress Diagram of Door Opening Type 2 Stiffener



D. ***Door Opening with Type 3 Stiffener***

Opening is provided with a set of horizontal and vertical stiffeners locally around the ring and two circumferential rings above and below the door the stress is found to be 89 N/mm^2.

Figure 6: Von Mises Stress Diagram of Door Opening Type 3 Stiffener



VII. Conclusions

Initially the turbine tower with door opening was considered to check the stresses near the door opening and to compare it with the other options. Tower with door opening the stress is 123 N/mm^2 and the opening is provided with ring stiffener the stress is 86.5 N/mm^2. Opening is provided with a set of horizontal and vertical stiffeners locally around the ring the stress is found to be 96 N/mm^2. Opening is provided with a set of horizontal and vertical stiffeners locally around the ring and two circumferential rings above and below the door the stress is found to be 89 N/mm^2.

From this it is to be concluded that opening with ring stiffener is better to reduce the stress around the openingwhen the tower is subjected to wind load along the side of the door opening.

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Experimental Study of RC One-way Slab with Opening Strengthened using Steel plate with Steel Connectors

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Abstract: Introducing openings in reinforced concrete slabs can severely weaken the slabs due to the cut out of both concrete and reinforcing steel. There are several traditional approaches to strengthen slab with openings. However these approaches can be expensive. In this work one way slab specimens with and without openings are cast and studied the flexural strength capacity. The openings with varying size and shape are provided in the maximum bending zone and slabs are tested under two point loading system and studied the ultimate load carrying capacity of slabs. To improve the flexural strength of slab specimens, strengthening technique is incorporated ie, steel plate with steel connector. Strengthening technique of slab systems by employing a combined action of steel plates with steel connectors. Steel connectors improve the bonding between steel plates and concrete and also confinement of concrete. The strengthening technique are provided around the opening. Finally some evaluations of test results are done for determining the performance of strengthening technique. Then compare the first crack load and ultimate load of slab with and without opening and strengthened using steel plate and also studying the effect of size and shape of opening.

Keywords: Reinforced concrete slab, Slab with openings, Steel plate, Steel connectors,Confinement

Introduction

The technology is developing and demands for consumer goods is increasing everyday, therefore producers require big machines and larger manufacturing factories to meet these needs. Each factory has its own unique structure, so each factory must be specially designed. While engineers and architects are designing these special structures, they require designs such that one fits all needs. These designs also include many challenges for situating cable channels, water and gas pipes, ventilation gaps and fire-extinguishing system. Structures may need lots of openings of various sizes and shapes. The prediction of the placement of opening at the slabs cannot always be made during the design stage of the building. Designers must compensate for the negative effects of these openings. The size of these opening can range from very small to large resulting in an adverse effect on the structural behaviour of the slab. However, the large openings the static system may be changed when it needs to remove a significant amount of concrete and reinforcement bar. This may lead to decrease in ability of the structure to resistance the applied loads and the structural requirements. Openings will reduce the load carrying capacity, stiffness, energy dissipation capacity and ductility of the slab.

As complete replacement or reconstruction of the structure will not be cost effective, strengthening or retrofitting is an effective way to strengthen the same. The most popular techniques for strengthening of RC slab have evolved the use various FRP, steel jacketing and external epoxy bonded steel plate. Other common strengthening technique involves construction of steel jackets which is quite effective from strength, stiffness and ductility considerations. However it increases overall cross sectional dimensions leading to increase in self weight of structures and is labour intensive. By wrapping FRP sheets retrofitting of concrete structures provided a more economical and technically superior alternative to the traditional techniques in many situations. FRP system can also be used in areas with limited access where traditional techniques would be impractical.

The traditional method used in the strengthening of concrete structure is steel. Although steel bonding technique is simple, cost effective and efficient. Strengthening technique of slab systems involve employing a combined action of steel plate and steel bolts. Steel bolts were inserted in the concrete mass while steel plates were bonded to the concrete surface at the upper and lower sides of the slab using epoxy resin and with the aid of the tightened steel bolts. The integration of steel plates, steel bolts and the confining pressure on the slab make up the strengthening technique. These technique is used to strengthen the opening on flexural strength of the RC

one way slab with central opening by steel plate with steel connectors and compared them with slabs without opening. Then to compare the first crack load and ultimate load of slab with and without opening and strengthened using steel plate and also studying the effect of size and shape of opening.

Experimental Program

Materials

A.Cement

In the present study ordinary Portland cement of 53 grade conforming to IS 12269-1987 has been used. The various properties of cement are examined. The specific gravity of cement found to be 3.12.

B.Coarse Aggregate

Coarse aggregates used for this study consists of locally supplied granite type coarse aggregate of nominal size 12mm. The specific gravity for 12mm aggregate is 2.70. As per IS: 2386 (part III)-1963, laboratory tests were conducted on coarse aggregate to determine the different physical properties.

C.Fine Aggregate

Those fractions from 4.75mm to 150 microns IS sieve are termed as fine aggregate. The manufactured sand (M sand) is used as fine aggregate conforming to the grading zone II of IS: 383-1970. The specific gravity of fine aggregate found to be 2.50.

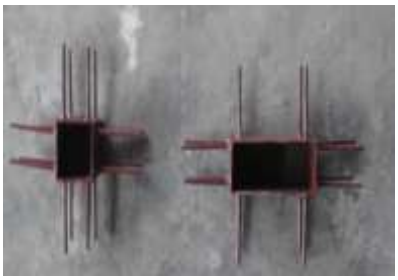
D.Water

Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement. In the present investigation, potable water was used.

E.Steel plate with steel connector

Strengthening technique of slab systems by employing a combined action of steel plates with steel connectors. Steel connectors improve the bonding between steel plates and concrete and also confinement of concrete. Strengthening techniques improves the flexural and shear capacity and limits cracks. In this work 3mm thick steel plate with steel connector is used as shown in figure.1

Fig 1 steel plate with steel connectors



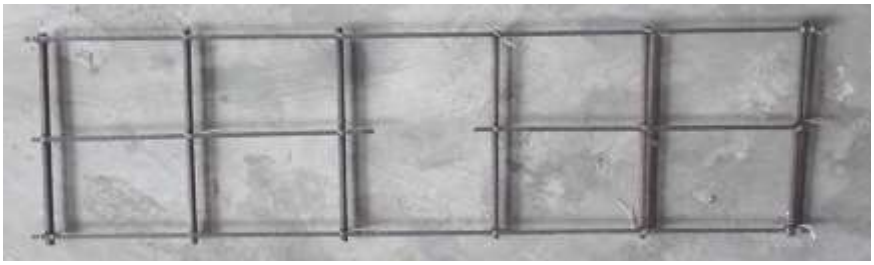
F.Steel Reinforcement

Main reinforcement bar are chosen as 6#10mm diameter @160mmc/c and distribution reinforcement bar are chosen as 3#10mm diameter @ 120mmc/c. Nominal cover of 25mm are chosen in this work. Figure 2 and figure 3 shows reinforcement cage of the slab with and without opening.

Fig 2: Reinforcement cage of slab without opening



Fig 3: Reinforcement cage of slab with opening



G.Mix Design

Concrete mix of M30 was used for all the slabs and it was designed as per IS: 10262-2009 and the mix proportion was obtained as1:2.89:3.14 (cement: fine aggregate: coarse aggregate). The water cement ratio was 0.40.

III. Experimental Work

A.Slab specimens and Specimen details

In this Work one way reinforced concrete slab specimens designed with dimensions of 1000mm length, 400mm width and 90mm thickness. Two different square opening of (80mm,110mm)sides and rectangular opening of ((125x50)mm and (175x70)mm) sides, two shape of opening with different opening area(square and rectangle) are tested. These openings are situated in the maximum bending zone. Totally eighteen specimens are manufactured. One of them is tested without opening as a reference specimen and remaining seventeen are tested with opening and strengthened using steel plate. Table1 shows the slab designation details of the test specimens.

Table 1: slab designation details

Sl No:	Specimen Details	Designation
1	Slab without Opening	CS
2	Slab with square opening of size (80x80)mm	SSO1
3	Slab with square opening of size (110x110)mm	SSO2
4	Slab with rectangular opening of size (125x50)mm	SRO1
5	Slab with rectangular opening of size (175x70)mm	SRO2
6	Slab with square opening of size (80x80)mm strengthened using steel plate	SOSP1

7	**Slab with square opening of size (110x110)mm strengthened using steel plate**	**SOSP2**
8	**Slab with rectangular opening of size (125x50)mm strengthened using steel plate**	**ROSP1**
9	**Slab with rectangular opening of size (175x70)mm strengthened using steel plate**	**ROSP2**

B. Experiment Set up

The specimens were tested in a loading frame of 2000kN (200t) capacity with an effective span of 1000mm by keeping the slab in horizontal position with two point loading system of 33.33cm internal loading distance and hinge at a distance of 2.5cm from the end support. The load was applied on top of the slab until the hair line cracks were identified and first crack load was noted. Further the loading was continued until the ultimate load was obtained. At each stage of loading deflection at mid span and quarter span was found out using a dial gauge. figure 4 shows the schematic diagram of test set up and figure 5 shows the test setup of slab specimen

Fig 4: Schematic Diagram of Test setup

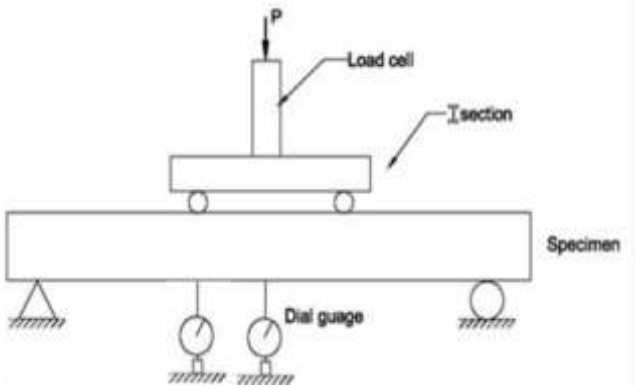


Fig 5: Test Setup of Slab Specimen



IV. Test Results And Discussion

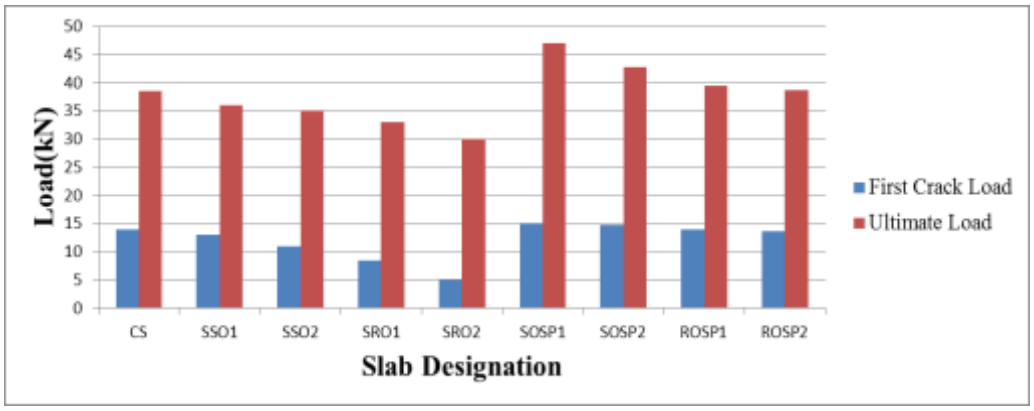
In this study eighteen oneway slab specimens were tested. These slabs were identical in length, width and thickness, but different in the size and shape of openings.All slabs were tested under two point loading condition

in the loading frame of 200tonne capacity. According to these variables first crack load and ultimate load are different from each slab to another. Table 2 shows the First crack load,ultimate load and corresponding % decreasing or increasing in for ultimate load for all slab specimens. figure 6 shows the bar chart for comparison of first crack load and ultimate load of slab specimens with and without opening and strengthened specimen.

Table 2: First crack load and ultimate load for various slab specimens

Sl No	Designation	First crack load(kN)	Ultimate load(kN)	Percentage decreasing or increasing in ultimate load
1	CS	14	38.6	Reference
2	SSO1	13	36	-6.74
3	SSO2	11	35	-9.33
4	SRO1	8.5	33	-14.51
5	SRO2	5	30	-22.28
6	SOSP1	15.1	47	+21.76
7	SOSP2	14.8	42.8	+10.88
8	ROSP1	14	39.5	+2.33
9	ROSP2	13.6	38.7	0.26

Fig 6: Comparison of FCL and UL of CS, slab with opening and slab with opening strengthened using steel plate



It can be seen that from table, the ultimate load capacity of SSO1 and SRO1 which have same opening ratio of 1.5% with different opening shape are less than of reinforced concrete slab without opening by about 6.74% and 14.51%. Same as the ultimate load capacity of SSO2 and SRO2 which have same opening ratio of 3% with different opening shape are less than that of reinforced concrete slab without opening by about 9.33% and 22.28%. The results demonstrated that square opening outperformed in ultimate load as compared to square opening. By strengthening with steel plate at the openings, it was found that SOSP1 and SOSP2 showed 21.76%

and 10.88% increase in ultimate load and ROSP1 and ROSP2showed 2.33% and 0.26% increase in ultimate load when compared to CS.

V. Crack Behaviour And Failure Modes

The crack behaviour and failure modes of different slabs tested in the experimental program are discussed below.

A Slab without opening(CS)

The CS was tested by applying the point loads gradually. The first hair crack was visible at a load of 14kN. As the load increased beyond the first crack load many inclined cracks were also developed and the first visible crack started widening. With further increase in load the slab finally failed at a load of 38.6kN exhibiting a wider crack. Figure 7 shows the crack pattern of CS without opening.

Fig7: Crack pattern of control slab without opening



B Slab with square opening

The slab SSO1 and SSO2 was tested by applying the point loads gradually. The first hair crack was visible at a load of 13kN and 11kN respectively. As the load increased beyond the first crack load many cracks also developed at the opening and the first visible crack started widening. With further increase in load the slab with opening failed at a load of 36kN and 35kN. It was found that the ultimate load carrying capacity was decreased by 6.74% and 9.33%. As the size of the opening is increased the ultimate load carrying capacity is decreased. Figure 8 and Figure 9 shows the crack pattern of slab with square opening of size (80x80) mm and (110x110)mm.

Fig 8: Crack pattern of slab with square opening of size (80x80)mm

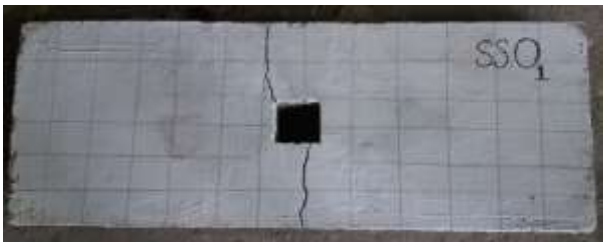


Fig 9: Crack pattern of slab with square opening of size (110x110)mm



C. Strengthened slab

The crack pattern of strengthened slab was found to be similar to that of control slab without opening. Crack patterns were visible on the openings. Due to strengthening of steel plate with steel connectors under each slabs the crack pattern was not visible at the opening. When the ultimate load was attained, the strengthened slab experienced debonding failure. Fig 12, Fig 13, Fig 14 and Fig 15 shows the crack pattern of slab with steel plate of different opening.

Fig 12: Crack pattern of slab with steel plate of square opening of size (80x80)mm



Fig 13: Crack pattern of slab with steel plate of square opening of size (110x110)mm



Fig 14: Crack pattern of slab with steel plate of rectangular opening of size (125x50)mm



Fig 15: Crack pattern of slab with steel plate of rectangular opening of size (175x70)mm



VI. Conclusions

The scope of this study is to investigate the effects of one way reinforced concrete slab with and without opening. Size and shape of opening are the main parameters in this experimental study.Totally eighteen specimens are manufactured. One of them is tested without opening as a reference specimen and remaining seventeen are tested with opening and strengthened slab specimen. Results obtained from the conducted study are, The ultimate load capacity of SSO1 and SRO1 which have same opening ratio of 1.5% with different opening shape are less than of reinforced concrete slab without opening by about 6.74% and 14.51%.The ultimate load capacity of SSO2 and SRO2 which have same opening ratio of 3% with different opening shape are less than that of reinforced concrete slab without opening by about 9.33% and 22.28%.By inclusion of opening in the slab the load carrying capacity of the slab decreases s compared to CS. The decrease in slab stiffness enhanced development of crack due to stress concentration around the opening edges.Slab with square opening outperformed in ultimate load as compared to rectangular opening. Because in rectangular opening as the size of the opening is increased then width of the slab is reduced. As the width of the slab is reduced then ultimate load carrying capacity is decreased.By strengthening with steel plate at the openings, it was found that SOSP1 and SOSP2 showed 21.76% and 10.88% increase in ultimate load and ROSP1 and ROSP2showed 2.33% and 0.26% increase in ultimate load when compared to CS.

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Study on Structural Behavior of Bubble Deck Slab Using ANSYS

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***Abstract**: Bubble deck slab is a method of virtually eliminating all concrete from the middle of a floor slab, which is not performing any structural function, thereby dramatically reducing structural dead weight. High density poly ethylene (HDPE) hollow spheres replace the in-effective concrete in the center of the slab, thus decreasing the dead weight and increasing the efficiency of the floor. The void spaces in between bubbles are filled by concrete. By introducing the gaps, it leads to 30 to 50% lighter slab which reduces the loads on the columns, walls and foundations, and of course of the entire building. The advantages of the bubble deck slab are less energy consumption both in production, transport and less emission of exhaust gases, especially CO_2 . Nowadays bubble deck slab are used as roof slab, floor slab, storey slab etc. and studies are doing about the wide range applicability of bubble deck slab.*

This paper summarizes the research work on the study of structural behavior of bubble deck slab in which bubbles arranged in different cases are analyzed and its structural behaviors are compared with conventional slab. From the studies, the most better slab is find out and it is taken for further analysis work.

I. Introduction

In building constructions, the slab is a very important structural member to make a space. And the slab is one of the largest member consuming concrete. The main obstacle with concrete constructions, in case of horizontal slabs, is the high weight, which limits the span. For this reason major developments of reinforced concrete have focused on enhancing the span reducing the weight or overcoming concrete's natural weakness in tension. In a general way, the slab was designed only to resist vertical load. However, as people are getting more interest of residential environment recently, noise and vibration of slab are getting more important, as the span is increased; the deflection of the slab is also increased. Therefore, the slab thickness should be increase. Increasing the slab thickness makes the slabs heavier, and will increased column and foundations size. Thus, it makes buildings consuming more materials such as concrete and steel reinforcement. To avoid these disadvantages which were caused by increasing of self-weight of slabs, the Bubble Deck slab system, also known as void slab, was suggested. The invention of a new type of hollow core slabs was a breakthrough at the turn of 20th and21st centuries. During the first decade there have been many studies on the feasibility of using the hollow core technology. Bubble deck slab Technology is a method of virtually eliminating all concrete from the middle of a floor slab, which is not performing any structural function, thereby dramatically reducing structural deadweight. In this technology it locks ellipsoids between the top and bottom reinforcement meshes, thereby creating a natural cell structure, acting like a solid slab. High density polyethylene (HDPE) hollow spheres replace the in- effective concrete in the centre of the slab, thus decreasing the dead weight and increasing the efficiency of the floor.

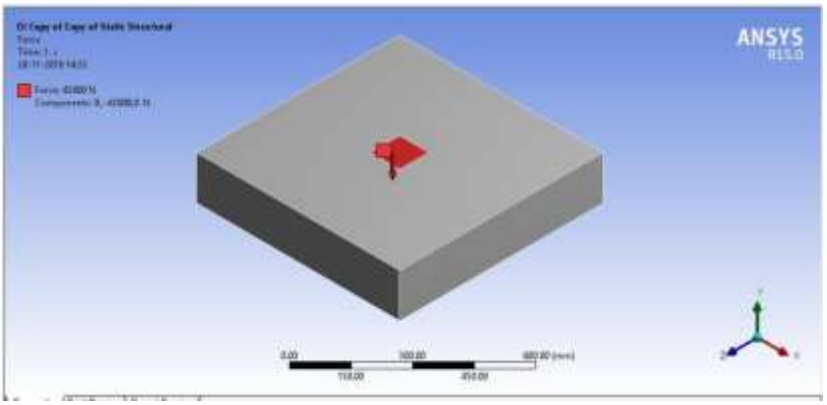
II. Objectives

1) Make the use of hollow spherical HDPE balls in RC slab.
2) Generate a model of conventional slab and bubble deck slab in different cases.
3) Make comparison study between normal and bubble deck slab.
4) Better slab obtained from the study are taken for further analysis.

III. Software validation

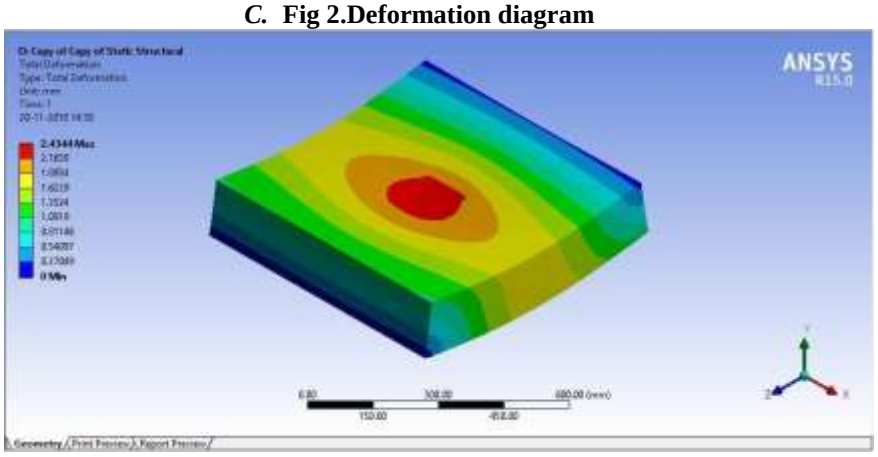
A. Loading diagram

Fig 1.Loading diagram



B. Deformation diagram

C. Fig 2.Deformation diagram



Result obtained from the analysis satisfies the result from corresponding published values and the software validation completed.

IV. Modeling and Analysis

A. Conventional slab

Fig 3.Conventional slab



Fig 4.Stress diagram 90.987MPa

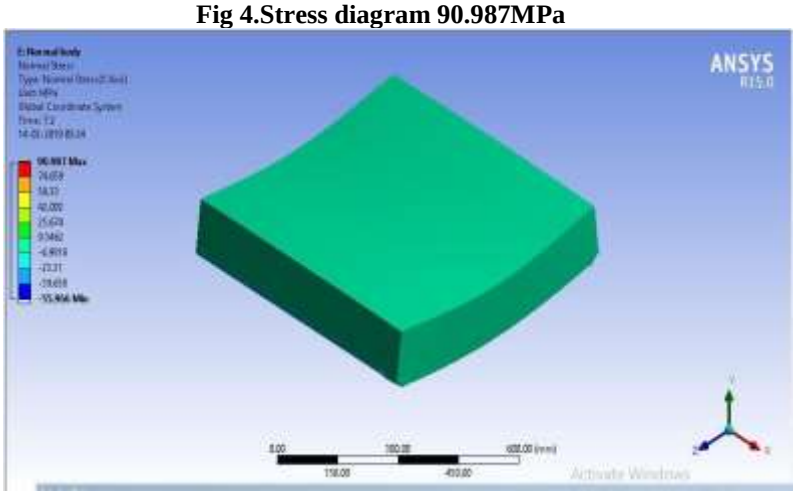


Fig 5.Strain diagram 0.815

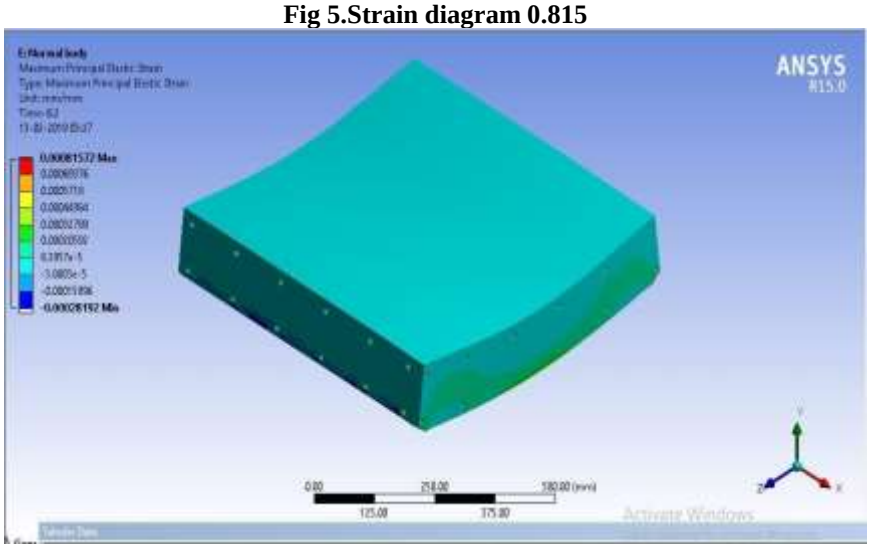
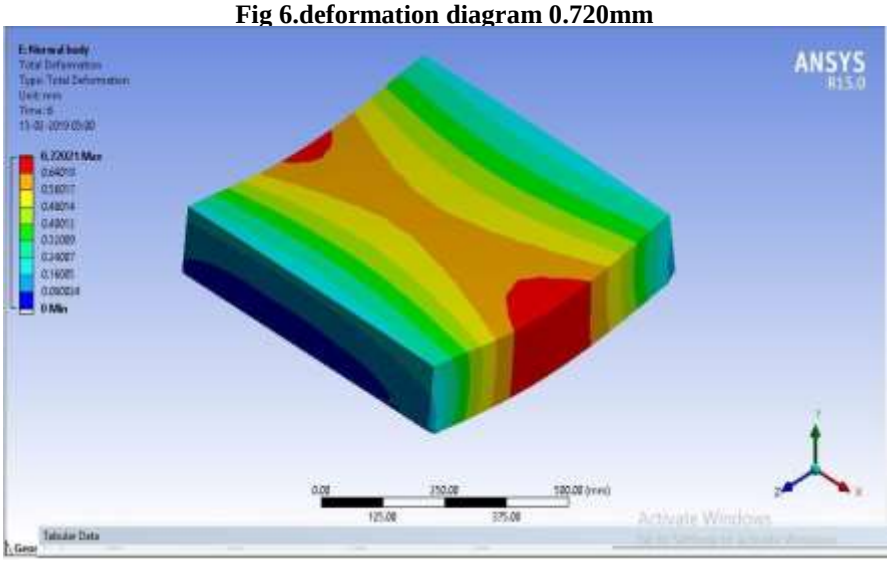


Fig 6.deformation diagram 0.720mm



B. Normal bubble deck slab

Fig 7.Normal bubble deck slab

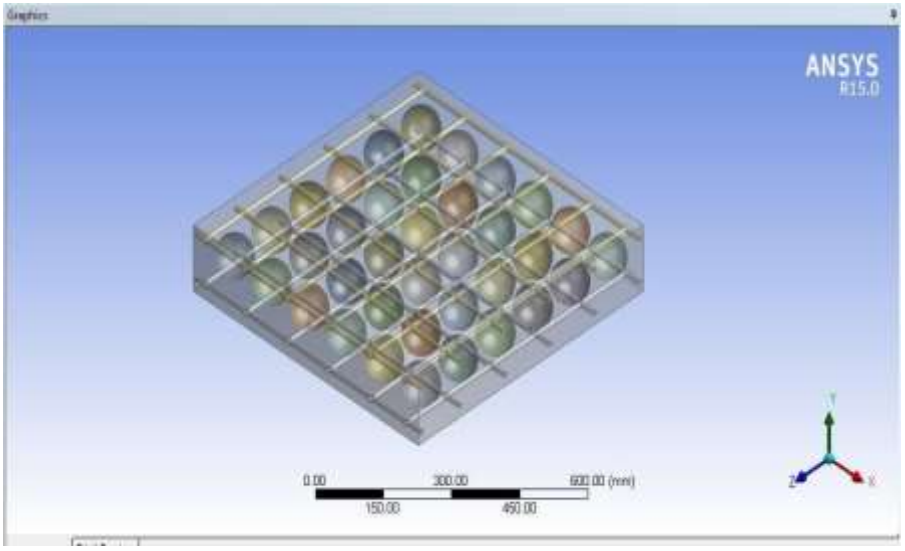
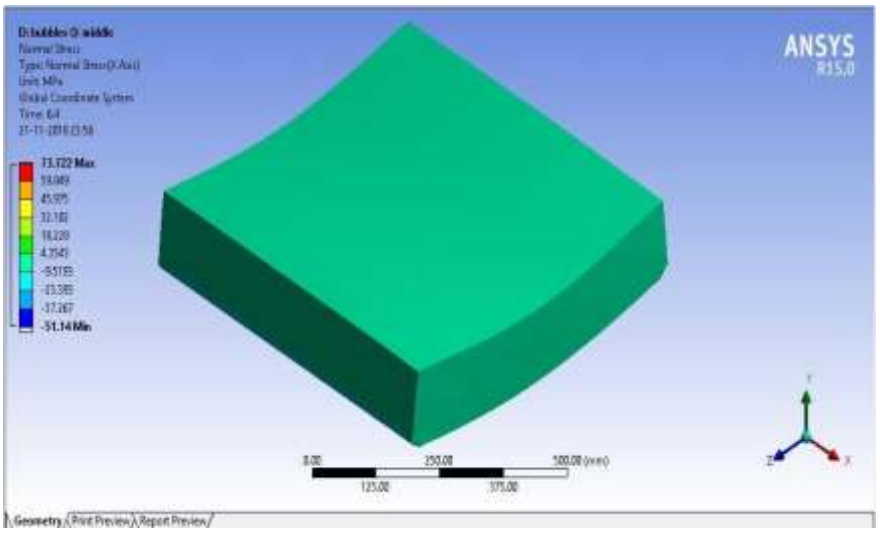


Fig 8.Stress diagram 73.722MPa



+

Fig 9.Strain diagram 0.657

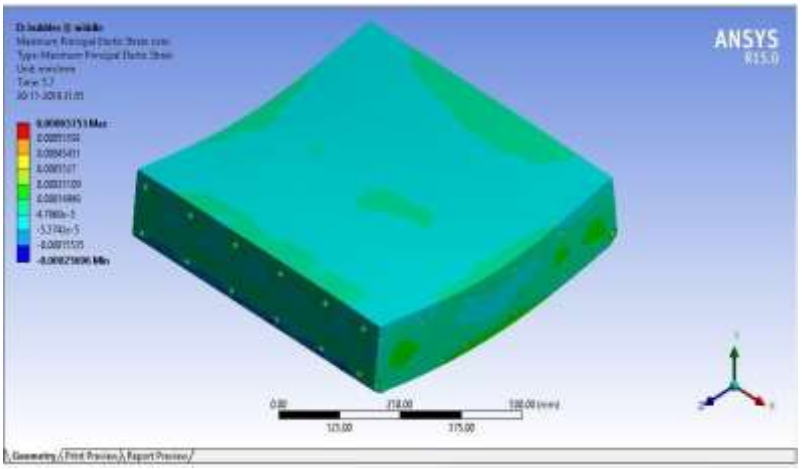
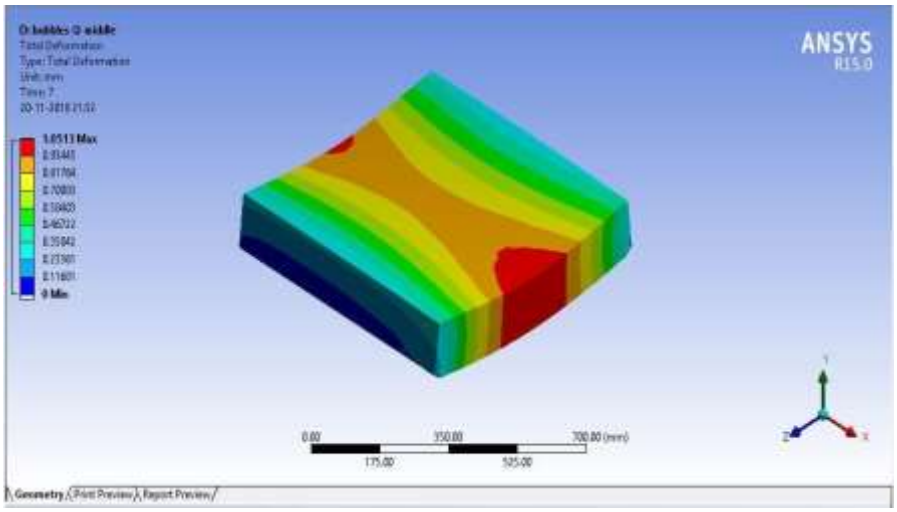


Fig 10.deformation diagram 1.051mm



C. Bubble deck slab with bubbles arranged in tension zone

Fig 11.Bubbles arranged in tension zone

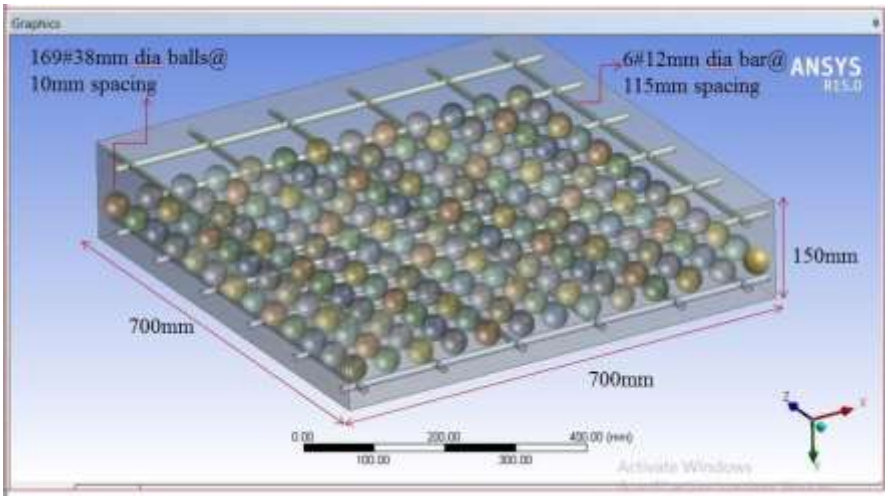


Fig 12.Stress diagram 85.637MPa

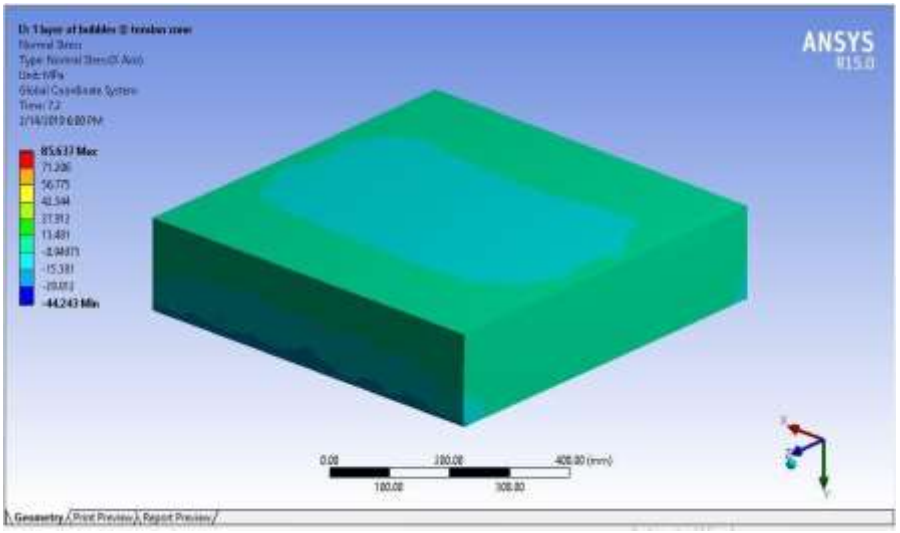


Fig 13.Strain diagram 0.677

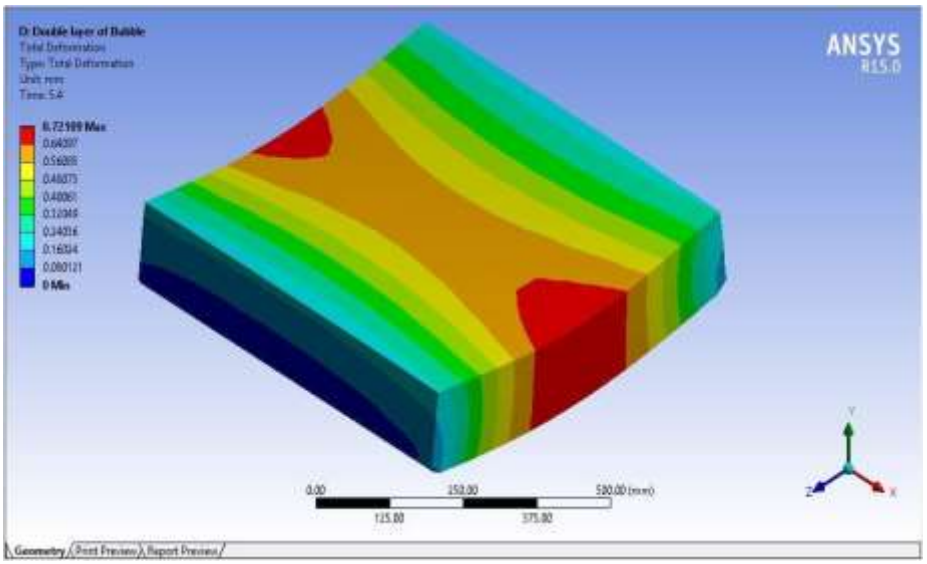
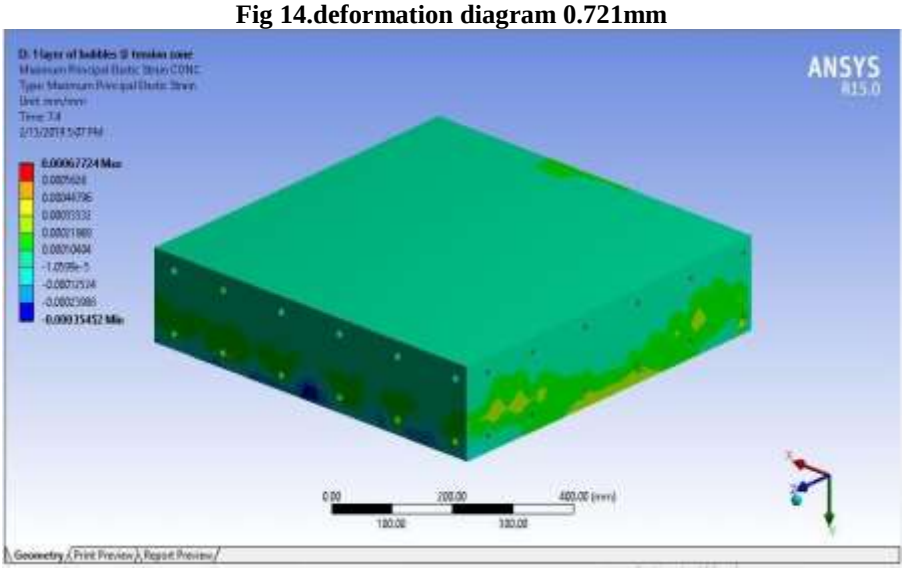


Fig 14.deformation diagram 0.721mm



V. Analysis Results

Table 1.Properties comparison table

Cases	Stress (N/mm^2)	Strain	Deformation (mm)	Failure load (kN)
Conventional slab	90.987	0.815	0.720	600
Normal bubble deck slab	73.720	0.657	1.051	710
Bubble deck slab with bubbles in tension zone	85.630	0.677	0.988	660
Bubble deck slab with double layer bubbles in tension zone	87.024	0.699	0.722	620

Normal bubble deck slab shows better properties than other 3 models. It is taken for further analysis

VI. Conclusion

To investigate and identify the methods for reducing the weight of the slab system is the need of the present. Bubble deck Technology is the innovative system that eliminates secondary supporting structure such as beams reinforced concrete columns or structural walls. Bubble Deck will distribute the forces in a better way (an absolute optimum) than any other hollow floor structures. Because of the three dimensional structure and the gentle graduated force flow the hollow areas will have no negative influence and cause no loss of strength. Bubble Deck behaves like a spatial structure as the only known hollow concrete floor structure, the tests reveal that the shear strength is even higher than presupposed, this indicates a positive influence of the balls. The finite model of the bubble deck slab was modeled for the study using ANSYS. theory related to the ANSYS, material modeling and the material behavior of concrete, HDPE Bubbles were studied.

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ANALYSIS OF CORRUGATED STEEL PLATE SHEAR WALLS

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Abstract*: Corrugated plates are used in the field of civil engineering, architecture, marine transportation, container body, sheet piling, web plates in bridge girders etc. They are found in decking, roofing and sandwich plate structures. These are light, easy to form and can provide higher load carrying capacity than flat plates. Their higher depth due to the corrugations attribute to higher structural rigidity. Corrugated plates have higher stiffness to weight ratio and high strength to weight ratio. For a high performance structure, corrugated plates can be recommended because of the above special structural features, properties and low fabrication cost. Corrugated Steel Plate Shear Wall construction is relatively new, innovative and efficient lateral force resisting construction. This system has great advantages compared to other similar systems such as reinforced shear walls and steel braces. In this study, ANSYS finite element software is used to analyse trapezoidal and sinusoidal corrugated steel plate shear wall under cyclic loading condition. A parametric study is conducted on geometrically different corrugated Steel Shear Walls for the detailed investigation on the seismic performance of the steel plate shear wall system. Many profiles of trapezoidal corrugated plate are also analysed based on ANSYS finite element software in order to choose the optimum shape between them and carry greater loads with less deflection and stresses.*

Keywords :*Trapezoidal corrugated plates, Sinusoidal corrugated plates, Loading, Parametric study*

I.Introduction

The corrugated metal sheet was first invented at the beginning of the nineteen century, but after the second world war when the developments in the car industry and the important to save material in construction, gave a large push on the development of the cold formed elements in the construction world. The high inherent stiffness of corrugated profile along with high, strength to weight ratio, makes the corrugated plates a versatile construction material in marine structures, girders, decking, sheet piling, roofing, wall cladding and even as blast walls on offshore installations. Corrugated plates undergo bending due to transverse loading and buckling due to inplane compressive loads. Corrugated plates are used in the field of civil engineering, architecture, marine transportation, container body, sheet piling, web plates in bridge girders etc. They are found in decking, roofing and sandwich plate structures. These are light, easy to form and can provide higher load carrying capacity than flat plates. They are shaped into alternate ridges and grooves. Corrugated plates are plates with inbuilt stiffness. Their higher depth due to the corrugations attribute to higher structural rigidity.

A. Corrugated plates

Corrugated plates are plates with corrugated profiles. Due to trapezoidally or sinusoidally corrugated profiles, such plates achieve higher strength than flat plates without any external reinforcement. This advantage ensures that corrugated plate structures are widely accepted in various structural designs in engineering, such as decking, roofing and sandwich plate cores structures. The precise analysis of corrugated plates is difficult; it includes analysis of the sheets that lie in different planes for trapezoidally corrugated plates or in shell structures for sinusoidally corrugated plates. Buckling control of corrugated plates is performed by overall and local buckling. The local buckling mode of the corrugated plates is formed in flat panels of the trapezoidal corrugated plates, primarily, and along the horizontal edge. A large amount of computation time and effort is consumed. This is not necessarily because approximated solutions are enough for engineering applications.

II.Corrugated Steel Plate Shear Wall

Steel shear walls have been used in the construction of high-rise structures in most advanced seismic countries, such as the United States, Japan and Canada, for almost three decades. This system has great advantages compared to other similar systems such as reinforced concrete shear wall and steel braces. The benefits of this system include high ultimate bearing, perfect plasticity, high energy absorption capacity, appropriate stiffness, reduced structural weight, lower foundation construction costs, better quality and high-speed construction. The overall structures of steel shear walls consist of boundary elements such as beams and columns, with infill steel plates in the spaces between them. Steel shear walls can be constructed in two types: unstiffened and stiffened.

III. Objectives

- Many profiles of trapezoidal corrugated plate are analysed based on ANSYS finite element software in order to choose the optimum shape between them and carry greater loads with less deflection and stresses.
- Comparison of deflection for trapezoidal and sinusoidal corrugated plate.
- Determine ultimate load, ductility and stiffness as function of shear wall geometry and then evaluate and compare the behaviour of Corrugated Steel Plate Shear Walls on the basis of analysis result.
- Analyse unstiffened and stiffened trapezoidal and sinusoidal corrugated plates.

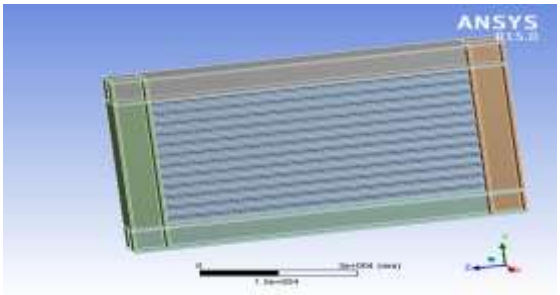
IV. Model Description

SPSWs were modelled and analysed using ANSYS 15.0 finite element software. In order to ensure high accuracy in modelling and analysis, convergence and mesh refinement studies are performed. A typical finite element model is shown in below. Fixed support was provided as boundary condition at bottom of the shear wall. To simulate earthquake load and further to investigate the behaviour of shear wall two types of loading programs were employed, quasi static cyclic loading and monotonic loading. Quasi static cyclic load simulations were performed under displacement controlled loading. Quasi- static displacement control loading sequence applied at the top of the wall. This work is carryout by providing boundary element as Indian standard. ISMB 225 was selected as beam and column element. 1.25mm selected as infill plate thickness. The panel size selected as 2000mmx1500mm. In this work modeling was done by changing of corrugation angle of trapezoidal corrugated steel plate shear wall.The infill plate thicknesses found to be an important geometric property of shear wall system. Increase in thickness in small range will leads to a large increase of stiffness of the shear wall system. The stiffness performance of the one-storey steel shear wall system with sinusoidal and trapezoidal corrugated plate under in-plane load.

V. Finite Element Modelling In Software

The finite element modeling was done ANSYS 15.0 software.
Trapezoidal corrugated steel plate shear wall was created by changing the corrugation angle with 0º,60º,90º.Angle of inclination changed with respect to x axis. Analysis was done by using a single storey steel plate shear wall.

Figure 1 Trapezoidal corrugated SPSW with 0^0 corrugation angleFigure 2 Trapezoidal corrugated SPSW with 60^0 corrugationangle.



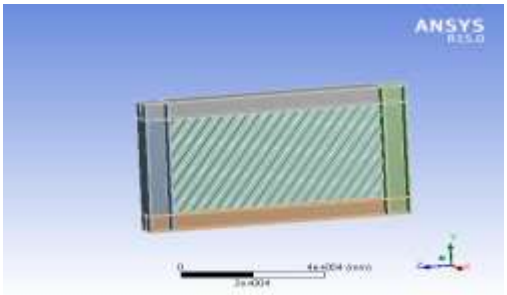
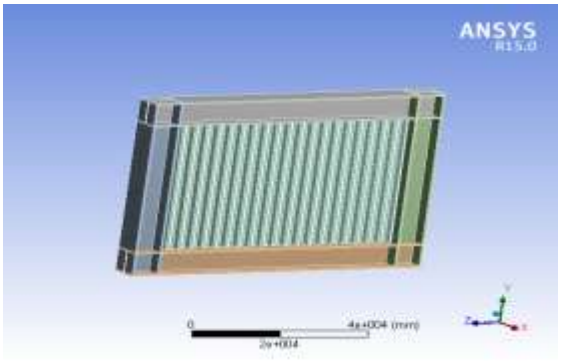


Figure 3 Trapezoidal corrugated SPSW with 90^0 corrugation angle Figure 4 Sinusoidal corrugated SPSW



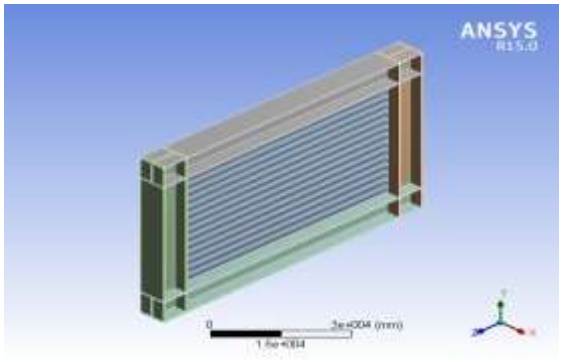
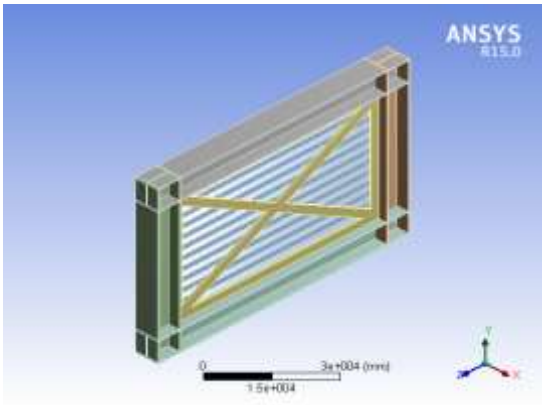


Figure 5Double diagonal strut stiffened trapezoidal SPSWFigure 6 Single diagonal strut stiffened sinusoidal SPSW



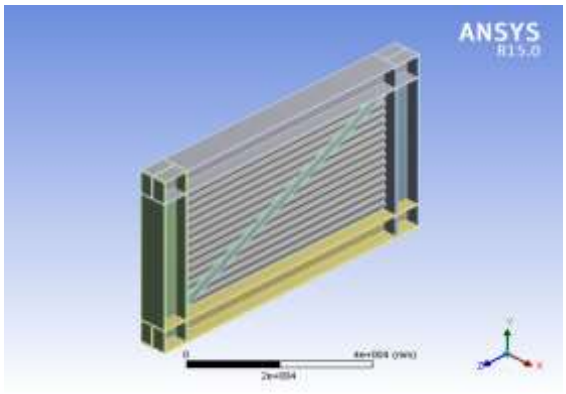
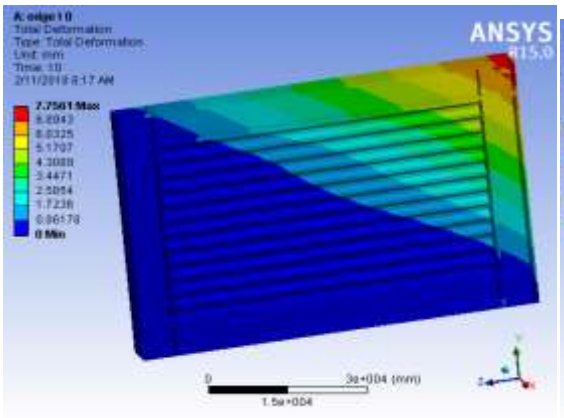


Figure 7 Deformation of Trapezoidal corrugated SPSW with 0^0 angle.

Figure 8 Deformation of Trapezoidal corrugated SPSW with 60^0 corrugation Corrugation angle.



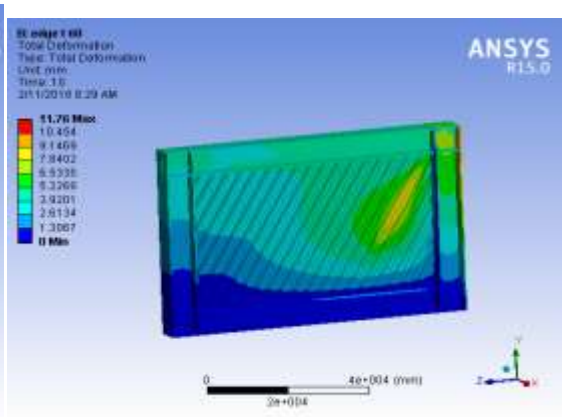


Figure 9 Deformation of Trapezoidal corrugated SPSW with 90^0

Figure 10 Comparison of results of load vs deflection of Corrugated angletrapezoidal corrugated with different angle

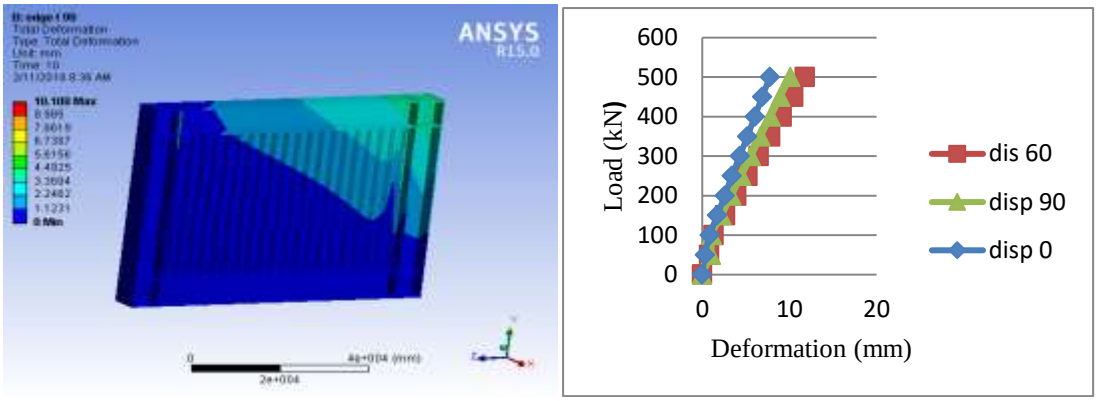


Figure 11 Load- displacement curves of trapezoidal corrugated plates with different thicknessplates with different thickness.

Figure 12 Energy- displacement curves of trapezoidal corrugated plates with different thickness.

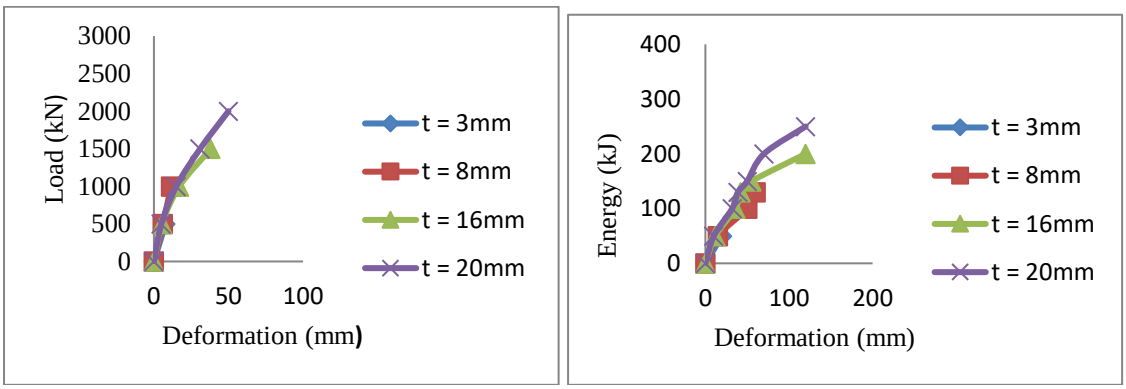
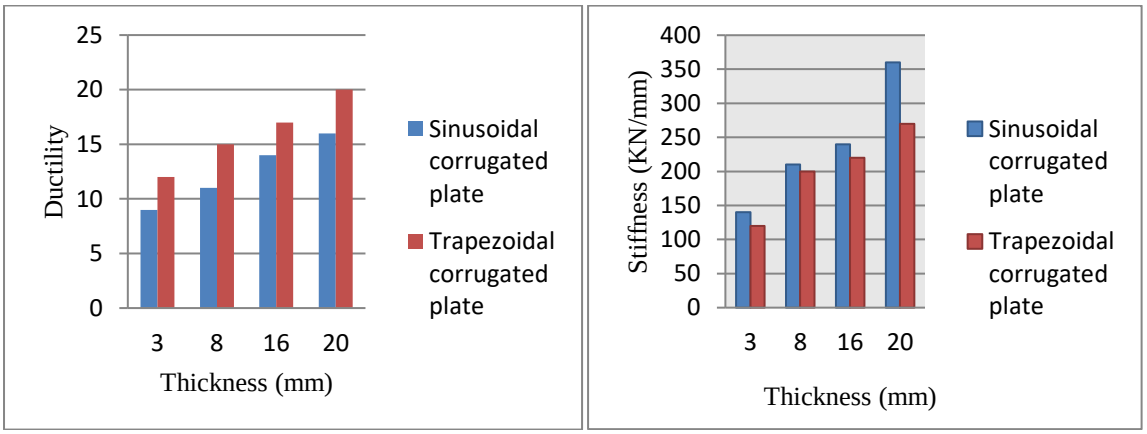


Figure 13 Comparison ductility of sinusoidal and trapezoidal corrugated plates

Figure 14 Comparison stiffness of sinusoidal and trapezoidal corrugated plate



VI. Results and Discussions

Steel plate shear wall with 0^0 angle of corrugation of infill plate has greater ultimate strength than other angles and 60^0 angles had less strength. Steel plate shear wall with 90^0 angle of corrugation of infill plate shows better result as compared to 60^0.With increasing corrugated plate thickness in steel shear walls, the ultimate bearing, ductility and stiffness increase significantly.The results obtained for sinusoidal and trapezoidal types of corrugated plates with similar corrugation depths show that increasing the plate thickness in sinusoidal plates

produces greater stiffness and ultimate bearing compared to trapezoidal plates, but the ductility of trapezoidal plate increased with thickness changes

.

VII.Conclusion

In this paper, an investigation into the geometric characteristics of sinusoidal and trapezoidal corrugated one-storey steel shear wall when subject to cyclic loading was carried out. The following results were obtained:

- Steel plate shear wall with 0^0 angle of corrugation of infill plate has greater ultimate strength than other angles and 60^0 angles had less strength.
- Steel plate shear wall with 90^0 angle of corrugation of infill plate shows better result as compared to 60^0.
- With increasing corrugated plate thickness in steel shear walls, the ultimate bearing, ductility and stiffness increase significantly.
- The results obtained for sinusoidal and trapezoidal types of corrugated plates with similar corrugation depths show that increasing the plate thickness in sinusoidal plates produces greater stiffness and ultimate bearing compared to trapezoidal plates, but the ductility of trapezoidal plate increased with thickness changes.
- The comparison of the results obtained for sinusoidal and trapezoidal corrugated plate show that the trapezoidal corrugated plates have better performance and are the corrugated plate needed for steel shear walls with specific weight, thickness, corrugation depth and length, and will ensure better ultimate bearing, ductility and stiffness.

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MEDICHAIN: BLOCKCHAIN BASED MEDICAL DATA SHARING

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Abstract*: Medical data is considered to be the most sensitive category of data. The distribution of patient's medical records results in diverse risks to patient's privacy as malicious activities on these records cause severe damage to the data. There is critical need for an innovation which ensures personalization, enabling patients to engage in the details of their healthcare and restore agency over their medical data. So we are proposing Medichain blockchain implementation, a new idea to cope up with these needs. Our system gives a comprehensive, immutable log and easy access for patients to their medical records which ensure improved medical aid for everyone. We also provide a platform for researchers or public health organizations to participate in the network as blockchain miners for their research purposes.*

Keywords:*Block chain, Ethereum, Smart Contracts, Network Security, Proof Of Work(POW)*

I. Introduction

Medical data is considered to be the most sensitive category of data. These data are handled by the hospital authority as their confidential data. A new innovation in the area of medical field has come up with an idea of sharing these data with the patients for their medical treatment purposes. But the major challenge we face here is the security issues. The distribution of patient's medical records results in diverse risks to patient's privacy as malicious activities cause severe damage to the data. The lack of coordinated data management and exchange means that health records are fragmented, rather than cohesive. Patients and providers may face significant difficulties in initiating data retrieval and sharing due to economic factors that encourage health information blocking. So, there is a critical need for an innovation that ensures personalization that enables patients to engage in the details of their health care and restoring agency of their medical data.

When designing new systems to overcome the existing barriers, we must ensure patient agency. Patients benefit from a transparent picture of their medical history. This plays a crucial role in establishing trust and continued participation in the medical system, as patients doubt the confidentiality of their records may hold back from full, honest disclosures or even avoid treatment. In the age of online banking and social media, patients are increasingly willing and able to manage their data on the web. However, proposed systems must recognize that not all provider records can or should be made available to patients and should remain flexible regarding such record- on boarding exceptions. Keeping all these in mind we use "Blockchain" technology to cope up with these needs.

Blockchain is a technology in which data are stored in blocks with a decentralized architecture. The blockchain uses public key cryptography to create an immutable, append only, timestamped chain of content. The copies of the blockchain are distributed on each participating node in the network. The Proof of Work algorithm used here secures the content from tampering which depends on a "trustless" model, where individual nodes must compete to solve computationally-intensive hashing exercises before the next block of content can be appended to the chain. These worker nodes are known as "miners" and the work required by the miners to append blocks ensures that it is very difficult to rewrite the history on the blockchain. Blockchain technology supports the use of "smart contracts", which allow us to automate through smart contracts on an Ethereum blockchain.

Our MediChain blockchain implementation addresses the four major issues highlighted above: fragmentation, slow access to medical data, system interoperability, patient agency, improved data quality and quantity for medical research. Here, the medical records are stored as the private information of the patients in their own respective blocks. These blocks of data are connected to form a decentralized peer-to-peer network. The peer

groups in this P2P network are hospital and users which includes both patient and researchers. We utilize Ethereum's smart contracts to create intelligent representations of existing medical records that are stored within individual nodes on the network. We construct the contracts to contain data about the record ownership, permissions and data integrity. We include on the blockchain a cryptographic hash of the record to ensure against tampering, thus guaranteeing data integrity. Thus our Medichain blockchain proposal proves to be an effective system for medical data sharing purposes.

II. Related works

A. Sharing Medical Data for Health Research: The Early Personal Health Record Experience

Engaging consumers in sharing information from personally controlled health records for research may promote goals of improving care and advancing public health consistent with the federal health Information Technology for Economical and Clinical Health Act. Understanding consumer willingness to share data is critical for advancing this model. The objective was to characterize consumer willingness to share PCHR data for health research and the conditions and contexts bearing on willingness to share. This provides high quality information but the major drawback is that large amount of data cannot be maintained.

B. Big Data Analytics in Healthcare: Promise and Potential

The main objective is to describe the promise and potential of big data analytics in healthcare. Big data analytics in healthcare is evolving into a promising field to prove insight from very large data sets and to improve outcomes while reducing costs. Its potential is great, however there are more challenges to overcome. Here the drawback of this paper is that obtaining data continuously is difficult.

C. Cloud Computing for Healthcare Research Information Sharing

With the widespread application of healthcare information and communication technology, constructing a sustainable and stable data sharing circumstance has attracted rapidly growing attention for both academic research area and healthcare industry. Cloud computing is one of long dreamed visions that matches the need of healthcare information sharing directly to various health providers over the internet, regardless of location and the amount of data. In this paper, they discuss important research tools that are related to health information sharing and integration in HC and investigate the arising challenges and issues. They describe many potential solutions to provide more opportunities to implement EHR cloud. The major drawback in this paper is security issues.

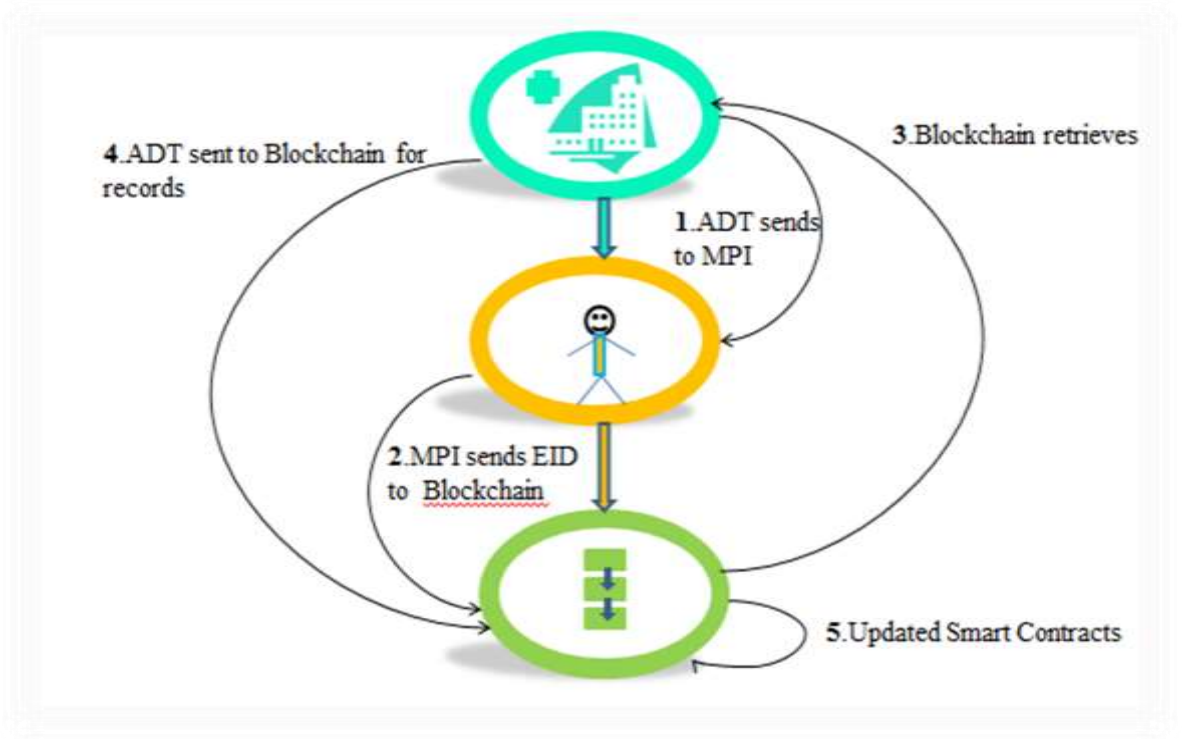
III. Design

In this section we tend to discuss the operation of the system in a very simplified method.The system add a typical method of storing and transferring of information as within the existing system, however in our system the safety of the hold on knowledge is ensured by the blockchain technology. By scrutiny to different existing system this technique is a lot of trusting in keeping with blockchain technology, records on a blockchain are secured through cryptography. Network participants have their own non-public keys that act as a private digital signature. If a record is altered, the signature can become invalid and therefore the peer network can understand that one thing is going on.

It is a redistributed and distributed across peer-to-peer networks that are regularly updated and unbroken in correct. As a result of they're not contained in a very central location, blockchains do not have a single point of failure and cannot be modified from one pc.

The system has primarily 3 phases like a Hospital part, a User part and therefore the Blockchain part in figure 1. The hospital part is that the initial part from wherever the information is retrieved, within the user part it requests the provider for the hold on knowledge and eventually blockchain part is wherever we tend to store the information.

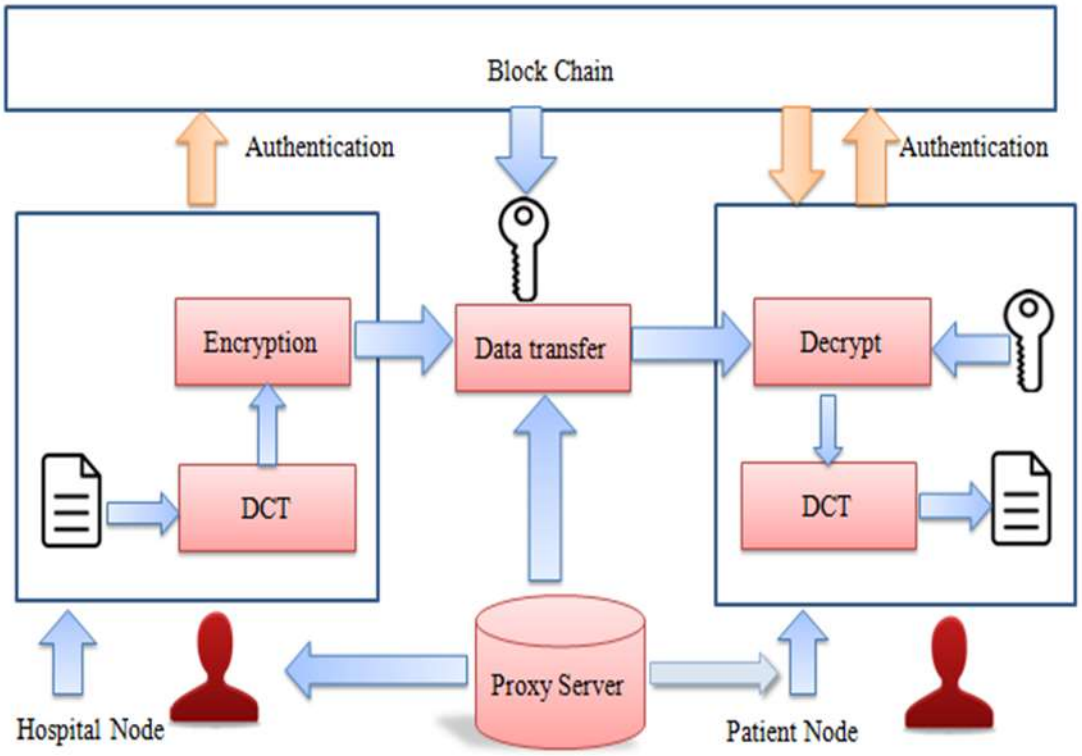
Figure 1 Working model of system



First method of the complete system is to send the abstract data type (ADT) to the message passing interface (MPI) to specify the behavior of the information. Then the message passing interface sends the enrollment ID (EID) to the blockchain for personalizing the hold on knowledge in a very distributed system. Once obtaining the EID, blockchain retrieve the information from provider here the hospital to store it within the separate blocks and keep it secure. Within the same time the abstract data type is additionally sent to the blockchain to clear the kinds of information. This manner blockchain stores all the information within the redistributed network and supply it to the users and to the researchers whenever requested.

The figure shown in figure 2is the elaborated diagram of our system. The most important part within the diagram is that the blockchain block. There are 2 completely different nodes for hospital and therefore the user. These nodes are documented by the blockchain. The proxy server block is a supervisor for all the communication and transactions between the 2 nodes. Whenever a user desires to access a hospital record, request is shipped to the hospital via proxy server and therefore the response to the current request is additionally sent back to the user through this proxy server. The communication is documented by the blockchain employing a key.

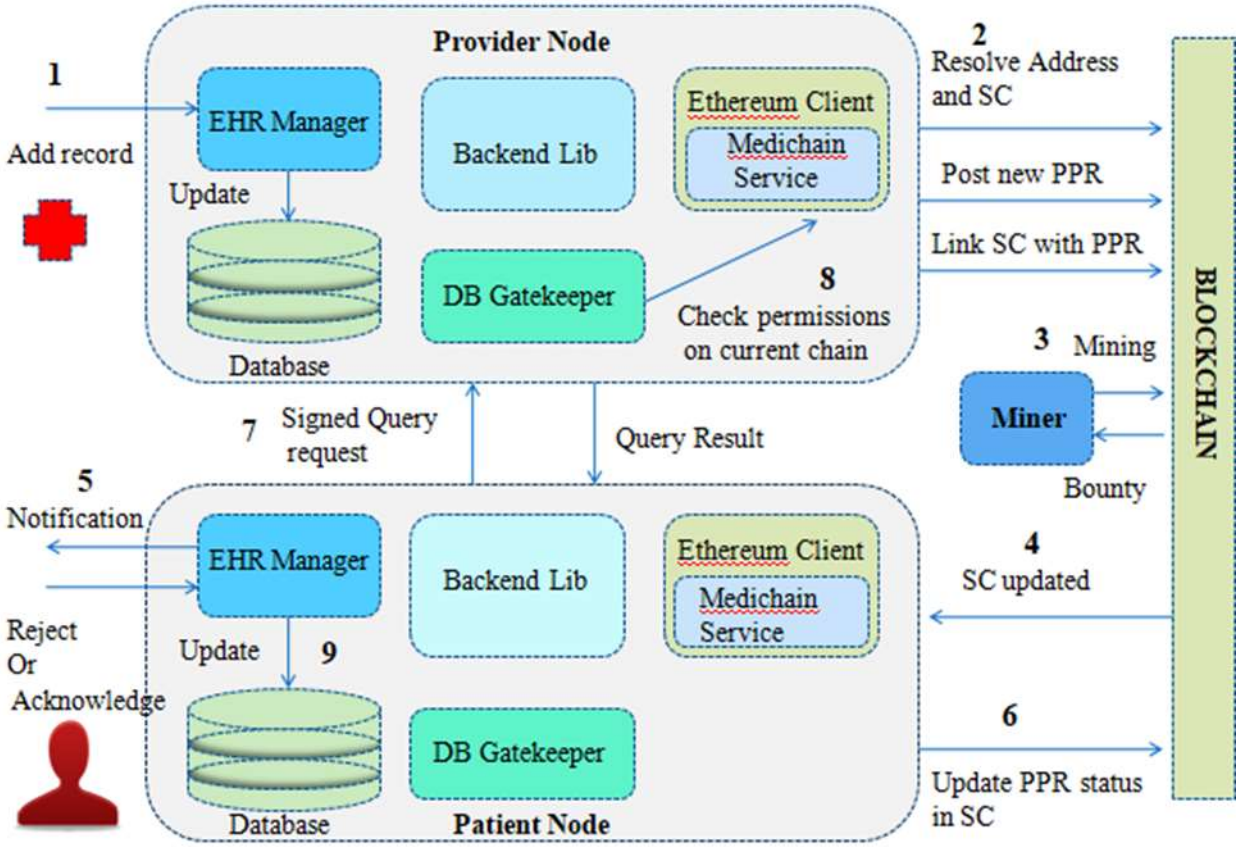
Figure 2 Block Diagram of the system



The communication flow is as follows: (1) User (here, patient node) sends letter of invitation for a anamnesis to the proxy server. (2) The proxy server processes this request and sends it to the hospital node. (3) Once letter of invitation arrives at the hospital node its sends the record within the kind of picture files as response. However the file cannot be transferred in just an equivalent image format. So, it is converted into a text file using Discrete Cosine Transfer function. (4) This file is then encrypted. (5) Its then documented by the blockchain employing a key at the info transfer block. (6) The file then transferred to the patient node. (7) Here, it's decrypted and converted back to original image format. Thus, the communication method is successfully completed.

The elaborated style of our project is shown in Figure 3. The parts of our system nodes are integrated with the present EHR infrastructure. Here we tend to assume that the care providers trustfully manage knowledge bases with patient data hold on servers with network security. The parts of our system nodes are EHR Manager, Backend Lib, dB Gatekeeper and Ethereum consumer. These parts are combined along to form a distributed system. There are primarily 2 modules the hospital module that is the provider node and therefore the user module that is the patient node. Once the hospital desires to feature a brand new record to the blockchain, it initially checks whether or not the address of the patient i.e., the ethereum address already exists within the blockchain. It locates the address and post the new provider patient record (PPR) to the blockchain so links the provider patient record to the summary contract (SC) that is the patient record history. Once a record is added to the Blockchain, it will be mined either by the researchers or by the patients. When a record is added the patient gets a notification that the patient will either reject or acknowledge, if the patient acknowledges then the record gets updated within the blockchain. If the patient desires to examine the new updated record it sends a signed query request to the provider node that then checks the permission, if the permission is granted the provider node (Hospital) offers the fresh updated record to the patient node (User).

Figure 3 detailed design



IV.Algorithm

When it is necessary to remove a record, it is required to add a Subtype b transaction to a blockchain using the algorithm for removing a record. The algorithm is initiated by a user with a role that has removal access right. The input for the algorithm is a user's public ID, record r_j (or entry e_j) that is intended for removal, and removal order RO_j. The algorithm is as follows:

1. Calculate hash h_j of record j;
2. Obtain a covert ID for a user's public ID and user's blockchain encryption key pair (PkID, DkID);
3. Select all transactions T with the covert ID from blockchain B;
4. Decrypt T using DkID;
5. Verify if a transaction from T contains h_j. If not, return false;
6. Find in T last transaction number j of a user with the covert ID;
7. Prepare transaction t, Type 1_j2_j3, Subtype b with hash h of record r or entry e, transaction number $j = j + 1$, and current time;
8. Encrypt t using user's public blockchain encryption key PkID;
9. Send t and RO_j to B (blockchain nodes only accept t when RO_j matches h_j); and
10. Verify if t is embedded in B; if not, repeat from Step 3.

V.Performance Analysis

The maximum block size indirectly defines the utmost variety of transactions carried among a block. This size thus controls the output earned by the system. Giant blocks incur slower propagation speeds that successively will increase the stale block rate. The block request management system dictates however information is delivered to peers within the network. Eventually, since all peers are expected to receive all blocks, a broadcast protocol is needed. The selection of the underlying broadcast protocol clearly impacts the hardiness and measurability of the network. Stale blocks talk over with blocks that aren't enclosed within the longest chain, e.g., due to concurrency, conflicts. Stale blocks are detrimental to the blockchain's security and performance as a result, they trigger chain forks—an inconsistent state that slows down the expansion of the most chain and ends up in vital performance and security implications. On the one hand, stale blocks increase the advantage of the adversary within the network (e.g., double-spending). On the other hand, stale blocks lead to further information measure overhead and are usually not awarded mining rewards.

In figure 4, we analyze memory utilization consistent with the amount of blocks within the chain and therefore the mining method performance. In our study content of each transaction is fixed at thirty character, if we tend to increase the amount of transactions in every block, the memory utilization will be reduced. If we store three transactions in one block, the memory utilization will be reduced by 33%. The reason will be explained by the subsequent equation:

$MU= C_b + C_t + C_d$

Where MU is memory utilization

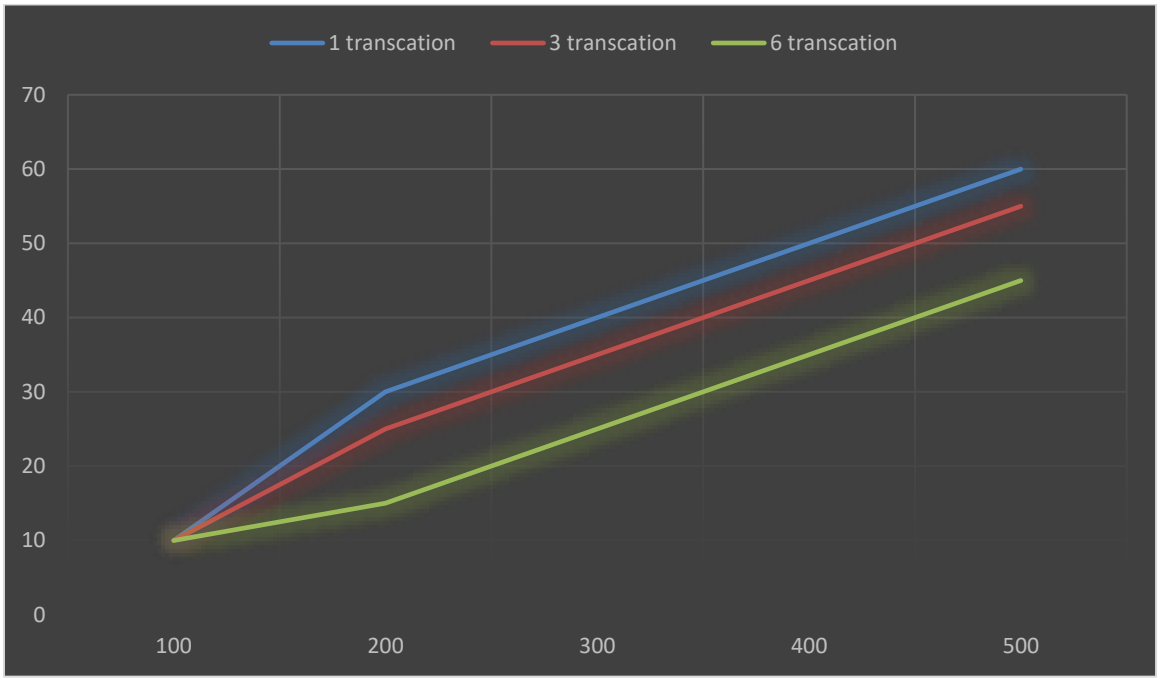
C_b – size of the block

C_t - size of one transaction

C_d- size of one character

In this experiment, the hash method is executed iteratively till the first 3 digits of the hash worth equal zero. At each iteration, the hash worth is combined with nonce, which will be exaggerated by one in every iteration. The execution time of Proof-of-Work method is random because of the hash condition. The amount of hash iterations till the condition is found to be random.

Figure 4 Performance Analysis Graph



VI.Future Enhancement

In future we will look into further development such as providing medical data of patients to government institutions and insurance companies. The main goal is to provide automatic and efficient security check and debugging.

VII.Conclusion

The MediChain provides a system that demonstrates however principles of decentralization and blockchain architectures contribute secured EHR systems. The MediChain authentication anamnesis access provides patients with their record review. Thus, our system could be a platform for storing and sharing medical data using the Blockchain technology with assured security.

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DIGISTORE: FILE STORING AND SHARING IN BLOCKCHAIN

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Abstract*: The files are normally stored and shared in a centralized way. All service requests today need some form of an individual's documents as proofs. By using centralized services, the procedure of record storage and access becomes vulnerable to data breaches, may even lead to the denial of services and are usually prone to theft from the intruders who would possibly be capable of obtaining the encryption keys. To make quicker audits, higher transparency and security, many purposes are designed using Blockchain. So we are proposing "DigiStore", an invulnerable decentralized storage framework using Blockchain technology that helps in efficient use of storage resources of users and provides a platform for issuing files and certificates in a digital format. Users can encrypt information for privacy. The goal is to get rid of the need for supplying original and physical identity-related or other essential documents for an individual's verification and move to a secured digital environment.*

Keywords*: Blockchain, Ethereum, Bitcoin, Handshake protocol, Data breaches.*

I.Introduction

The growth in technological development has led to the abrupt rise in the improvement of digital belongings & transactions. All request services or organizations need some type of documents for proofs. Rather than carrying physical documents, making it digitally helps a lot. Most of the people make use of centralized storage system to store their legit documents. Centralized storage is the storage of files, information and databases shared between computing servers over a network. A centralized database is stored, placed and maintained in a single site. Within Centralized systems, it is very hard to keep personal and secret documents. The method of document storage and its access become more prone to information breaches and may even lead to the denial of services. In the case of centralized storage, documents are usually prone to theft from the intruders who are successful of obtaining the encryption keys. One of the main technological advancement in the discipline of digital technology is the emergence of the decentralized Blockchain technology. Blockchain is a growing list of records, referred to as blocks, which are linked using cryptography. Each block includes a cryptographic hash of the preceding block, a timestamp and transaction data. Blockchain is best known as the data-sharing technology at the back of cryptocurrencies such as Bitcoin and Ethereum. Blockchain is a trusted, shared and public ledger of transactions. The Blockchain development technology provides the ease of storing and getting access to data in a decentralized way. Furthermore, the creation of the cryptocurrencies like Bitcoin, Ethereum, and others has also revolutionized the digital currency market.Thus to overcome the existing issues of centralized systems, we are imposing a Blockchain based "DigiStore", a platform for issuing and verifying files and certificates in a digital format. It is a distributed database that keeps a constantly developing list of transaction refers cryptographically secured for some tampering and revision. The decentralized DigiStore is constructed in a server less trend via Blockchain technology. Each blocks are linked to shape a peer-to-peer decentralized network. Here the peers are the users who wish to share or download the authorized documents. DigiStore has the potential to emerge as an essential device against fraud and corruption. Since the records are distributed throughout more than a few P2P network, DigiStore ensures the security of data by not having a single point of failure and offer an environment friendly.

II. Related Works

A. *Storj:A Peer-to-Peer Cloud Storage Network*

This is a peer-to-peer cloud storage network performing end-to-end encryption that let two users to pass and share data without dependence on a third party data provider. The displacement of central controls would remove most usual data failures and outages additionally increase security, privacy, and data control. A peer-to-

peer network and primary encryption serve as an answer for most problems are implemented. Our system differs from Storj which prevents overwriting on present files and prevents both client and host to cheat one another. For Storj, any misbehavior of a host can't be detected till the file is finally built by the client. In our case, any misbehavior can be detected very rapidly for the duration of the audit process. The client does not have to wait till it finally downloads the file back. This helps the client to abort the procedure and start the penalty procedure.

B. *Sia: Simple Decentralized Storage*

Another Decentralized Storage is the Sia which is a decentralized cloud storage platform that two intend to compete with current storage solutions, at both the P2P and organization level. Instead of storage renting from a centralized provider, every peers on Sia lease storage from every other. Sia only stores the storage contracts formed between parties, defining the terms of their arrangement. By making a contract, a storage company agrees to save a client's data, and to periodically submit proof of their continued storage till the contract expires. Here the host is compensated for each proof they submit, and penalized for lacking a proof. Clients do not want to personally verify storage proofs as they can genuinely upload their file and the community does the rest. In Sia, a host and consumer can share a secure channel, add and download data. To prove that the facts are saved securely, the host submits audits and these are logged in the Blockchain. The host receives Sia coins for every audit it performs. Sia does not defend if a renter frames a host. Here the drawback is that records are insecure while transmitting via the channel and data is not encrypted.

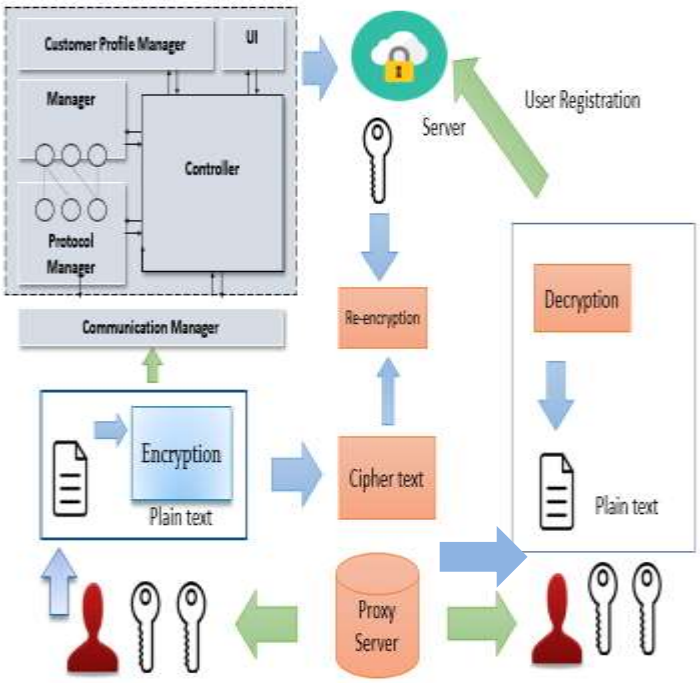
C. *Design of a Privacy-Preserving Decentralized File Storage with Financial Incentives*

The layout which combines a distributed storage with a privacy-preserving blockchain-based payment system to create incentives for participation while retaining person's privacy.This addresses the contradicting necessities by combining a privacy-enhanced payment scheme on the foundation of blockchain and smart contracts technology with a distributed storage system. Users can enter smart contracts with storage providers to exchange amounts of a digital currency against storage of file. Blockchain saves these contracts along with cash transfers, offering a way to reward people who make contributions their storage resources to the network. Here the drawback is that it consumes time due to large data allocation and computational overheads all through mining.

III. Design

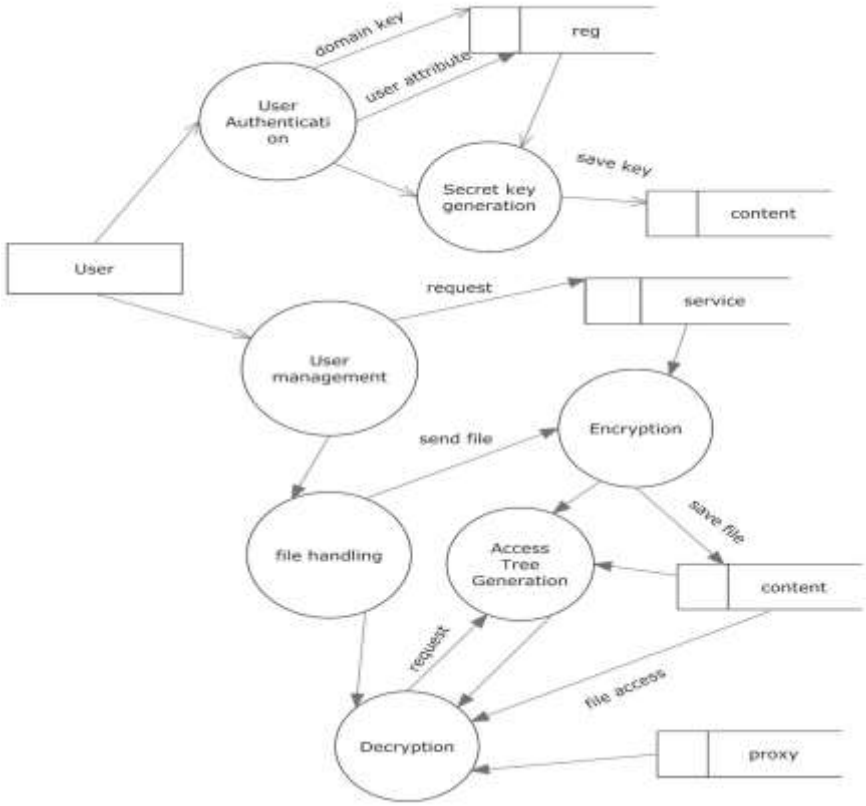
This section discusses the operation of the system in a simplified method. This system adds security features for storing and sharing files via Blockchain technology as within the existing system, the files are not secured and single point of failure causes loss of data. This project requires two systems one act as the proxy server while the other is used by client who desire to share or download the files.

Figure 1 Block Diagram of DigiStore



The block diagram of our project is shown in figure 1. From the user's local system, the image to be uploaded is encrypted using RSA algorithm. The image is first encrypted with public key of the user. The encrypted photograph is uploaded to the Proxy server or Controller by means of communication manager. Controller records and manages the entire activities takes place in Proxy server. It is aware of how many users registered currently logged-in users, and their activities. User Interface (UI) allows users to register, log in and make their services like upload, share, view, edit and download depend on their need. Customer Profile includes Register page where the person register with his personal details, login page where the user login with his username and password, File services where user can upload, share, view, edit or download images. Proxy server decides how the rest of the Blockchain re-encryption takes place. There the image is divided into blocks based on their size. Each block based on their tree structure is re-encrypted. Re-encryption is accomplished with the aid of using Identity Based Hierarchical Key Insulation encryption method. The image is saved with the aid of the file service in which the user demands. There establish a link betweenthe user and the file service he accessed. Based on this, key structure is generated relies upon on some section of the file service and user data. The key is no longer based on the facts itself, that's why this approach of re-encryption is used. In re encryption, key generated is dynamic that differ even for a user i.e.different key for that file provider and that domain. The decryption system takes with the aid of checking the access tree which is the reverse process of encryption.
The figure 2 shows the working model of the block diagram. When two users set up a connection via handshake protocol, the one person send request to get access to the file that different users upload. When he accept and give permission to access his file, the other user can download the image. Once he click on the download button, Proxy server checks whether the access trees of users are equal. If it matches, the photograph will be decrypted and gets downloaded in the user's local system. Again, the picture can't be study as it should be decrypted via the private key of the person that ensures digital signature.

Figure 2: Working Model of Block Diagram



III. Algorithm

1. Global-setup (λ): parameter λ, choose map groups (MG, MGT) of prime p > 2 λ, generators g, u, v←R G and a signature scheme Sig = (G1, S1, V1).
    - The global parameters are par:= {MGG, GT, g, u, v, Sig}.
2. Keygen (λ): user i sets his public key as Xi = g xi for a random xi ←R Z ∗p.
3. ReKeygen (xi,Xj): user i's private key xi and user j's public key Xj, generate the re-encryption key Rij = X 1/xi j = g xj/xi.
4. Enc1(m, Xi , par): to encrypt m ∈ GT under the public key Xi at the first level,

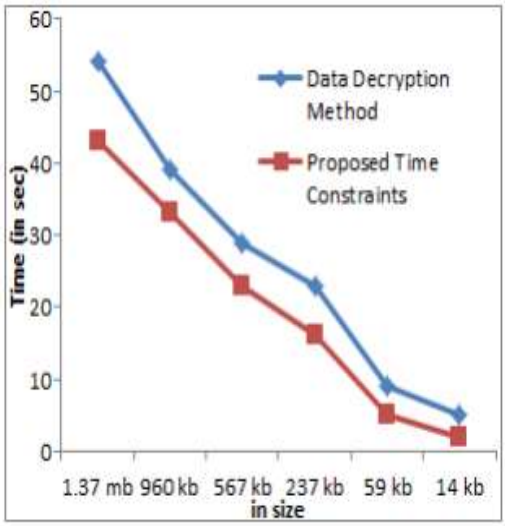
- Select a signature key pair (ssk, svk) ← G R (λ) and set S1 = svk.
- Generate a signature σ = S(ssk,(S3, S4)) on (S3, S4)
  - The ciphertext is Si = S1, S' 2, S'' 2, S'''2, S3, S4, σ.

5. Enc2 (m, Xi, par): to encrypt a message m ∈ GT under the public key Xi at level 2,
   - Select signature key pair (ssk, svk) ← G R (λ) and set S1 = svk.
   - Choose r ←R Z ∗ p and compute S2 = XriS3 = e(g, g) r · m S4 = (u svk · v) r
   - Generate a signature σ = S (ssk,(S3, S4)) on the pair (S3, S4).
     - The cipher is Si = S1, S2, S3, S4.
6. ReEnc(Rij , Si): on input of re-encryption keyRij = g xj/xi and a cipher Si = (S1, S2, S3, S4, σ),
7. Dec1(Sj ,skj): the validity of a level 1, the plaintext m = S3/e(S''2 , S''' 2) 1/xj is returned.– Dec2(Si , ski): if the level 2 cipher textSi = (S1, S2, S3, S4, σ) satisfies relations receiver i can obtain m = S3/e(S2, g) 1/

IV.Performance Analysis

The figure 3 shows the performance analysis of DigiStore which describes the data decryption method and proposed time constraints with respect to size and time. In the proposed system, when the size of the encrypted data will be high the time constraint will be less when compared with the existing system as the time delay between the node networks will be high. In the proposed system, it will reduce the delay between the nodes of the network.

Figure 3 Performance Analysis Graph



Whereas in the decryption method in the proposed system it will reduce the time delay between the node of the network in contrast to the existing system that the time delay and packet size will be very high in the network. The existing system causes much delay but in the proposed system, if the size of the data will be more, then it will reduce the time delay and decrypt within the minimum number of time. It provides that much security for the key as well as the data decryption.

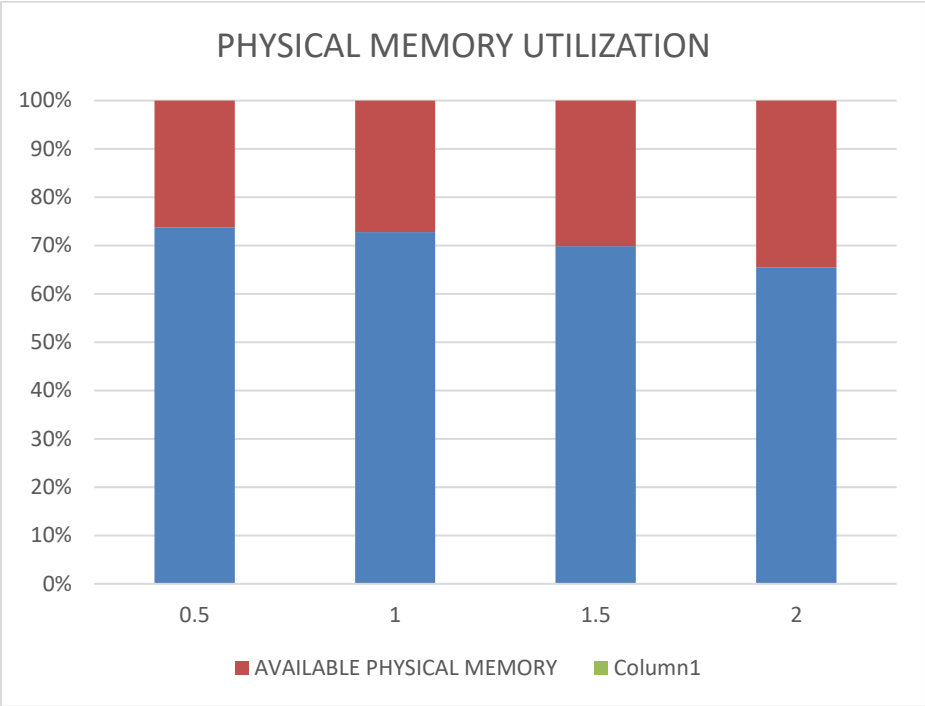
A. Physical Memory Utilization

For this, the rate of packets received is analyzed on certain intervals. If large amount of packets are arrived within a certain interval of time then it may be a malware. Also memory utilization is also analyzed. It was found that the malware detector is not utilizing much memory. It is tabulated in Table 1.

Table 1 Physical Memory Utilization

Time Interval(hr.)	Total physical memory	Available physical memory
0.5	1625	577
1.0	1625	608
1.5	1625	700
2.0	1625	856

Figure 4 Graphical Representation of Physical Memory Utilization



The memory utilization rate can be find out from figure 4
X-Axis –time
Y-Axis – percentage of memory utilized

VI. Future Enhancement

In the future, we would like to make this system to a mobile application for the ease of storing and sharing files. Also finds a way to lesser the time delay between the nodes in the network. It can be extended to a large software where government and Multi-National Companies can adopt DigiStore that helps in verifying the original documents and certificates of an individual digitally and securely.

VII. Conclusion

This paper proposes a secure framework for decentralized storage with Blockchain technology. DigiStore enjoys many features like confidentiality, information integrity, immutability and transparency. DigiStore also helps to delete the undesirable file for space utilization. The Blockchain decentralization storage can have number extra financial benefits, such as doubtlessly allowing the person to save on bandwidth since files are uploaded and downloaded from multiple nodes rather of from a single server.
Blockchain is database or ledger that is shared across a network. The ledger is encrypted such that only licensed events can access the data. Since the records are shared, the records will no longer be held through a single entity and is tamper resistant. It grants many areas of purposes and here we see how it will serve as a higher alternative to clouds storage. And additionally it is easy to see that using Blockchain will make file storage cheaper and much greater secure**.**

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A Review on various methods for malignant melanoma detection

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***Abstract**: Melanoma is one in all the foremost common and therefore the deadliest style of skin carcinoma. This is usually called malignant melanoma. This paper is a study about the techniques and methods used for melanoma detection. Skin Cancers can be mainly classify into two groups, Benign and malignant melanoma. malignant melanoma are often cured completely if it's detected early. Because benign and malignant melanoma have similarities in look at the initial stages. Therefore it's troublesome to differentiate each. this can be a main drawback with the initial stage carcinoma detection. solely an knowledgeable medical specialist can classify that one is benign which one is malignant. The detection process includes so many steps like preprocessing of image, segmentation of skin lesion object, extracting essential features and classification. Preprocessing stage of dermoscopy images aims the hair removal. Analysis become very complicated by the presence of hair. PDE-based image repair method, top-hat operator are some popular method for preprocessing. Segmentation can be done using K-means clustering, fuzzy c-means and statistical region merging (SRM) methods. Artificial neural networks, SVMs, Adaboost and KNN have been widely used for lesion classification. This paper compares various existing methods for malignant melanoma detection.*

***Keywords**: Dermoscopy, Border features ,Segmentation, lesion classification, concavity*

I. Introduction

The occurrence of dangerous skin cancer has been randomly increasing .Around 76,250 new cases of invasive melanoma were diagnosed in USA in 2012, with an estimated Number of nine one hundred eighty that lead to death Australia has one in all the best rates of carcinoma within the world over 1890 Australians die from carcinoma every year. malignant melanoma has the capability to quickly spread over the body. The most dangerous behaviour of malignant melanoma is that it can spread rapidly on the body completely via the lymphatic vessels and blood vessels. Thus, early diagnosis of melanoma is an important thing for the diagnosis of the disease. The usual clinical practice of melanoma diagnosis is a visual inspection by the dermatologist so clinical diagnostic accuracy is a bit disappointing. However dermoscopy may be a non invasive diagnostic procedure that connects clinical dermatology and dermatopathology ,which enables visual image of morphological features which are not discernible by evaluation with the eye. There are completely different techniques, like star scan, epiluminescence microscopy (ELM) cross-polarization epiluminescence (XLM), and side transillumination (TLM) , that will highly increments the morphological features that are pictured therefore they provide more rules for diagnosis to the medical specialist . However, the diagnostic accuracy may become very low if it is evaluated by an inexperienced dermatologists , since this technique needs slew of expertise to differentiate skin lesions..

The most important drawback in dermoscopy is that the diagnosis is highly dependent on judgment ability of dermatologist and is scarcely duplicatable. Application of computational intelligence strategies helps physicians additionally as dermatologists in quicker knowledge method to relinquish higher and better reliable diagnoses. The main purpose of this study is to combine, compare and evaluate latest algorithmic methods used for the various image processing techniques like preprocessing, classification, segmentation of skin lesions and discuss necessary problems influence the successful completion of disease detection. A brief and comprehensive review of feature extraction and choice algorithms that are up to now getting used for extracting numerous options of skin cancer is additionally provided. Analysis of a number of proposals is performed with relation to

many criteria, like segmentation of lesion, extraction of essential features, size of information sets, classification techniques and performance measures used in reporting the diagnosis results.

II. Related Work

A. Image Preprocessing

Feng-Ying et al. [1] proposed a robust algorithm for detecting hair automatically and repairing data in the hair removed region . Dermoscopic image contains hairs, which are handled as black structures. Closing based top hat operator is applied initial. Due to the non sensitivity of the morphological features based enhancing technique to the good and the bad hairs which assure the exactly binary result ,that the contrast between hairs and background is incremented largely . To correctly describe strong and weak hairs a special function called elongate feature function is suggested in the hair removal stage as a measure. By using elongate feature function as a measurement strategy we can easily describe the state of elongation for the objects that are in a band like appearances and thus by successfully extract hairs in the image.Lastly the hair removed data is maintained by using the PDE based image in painting and the enhanced image surface is become consistent with the visual evaluation from the dermatologists. By concatenating hair removal with image inpainting methodology in this paper the unsupervised problem of the maintenance of hair removed information are often resolved Terribly well which is an effcient approach to the correct diagnose for the malignant melanoma images with hairs. From the experiment results this method is practical and robust because the enhanced images can able to handle the necessary requirement of clinical diagnosis and the segmentation error Of the dermoscopy image containing hairs is effectively reduced after repairing the occluded information. The pre-processing step is used to filter noise in the digitized images and to overcome different lighten conditions.

Taouil Et al [2] use top hat morphological operator as image preprocessor for removing noise and save lesion border knowledge and employs snake technique to identify lesion border . Morphological operations work with two images. Original image and a structuring object . The primary binary morpho-logical operations, dilation and erosion, are naturally extended to gray scale by the use of min and max operations . In this work, the input data are gray scale image that can be thought as a collection of points in the Euclidean three dimensional space. So gray scale morphological operations also considered as three dimensional binary morphology. A main concept that relies on top hats using knowledge about the morph-logical features ,that aren't shared by the relevant image structures. Relevant structures can be occluded by employing an opening or closing operation by using a structuring object which does not suitable to recover these structures .Arithmetic subtraction is implemented the morphological white top hat and morphological black top hats, that are relies on this arithmetic difference. Sometimes it is easier to remove relevant objects rather than finding irrelevant objects. An important parameter in this transformation is the shape and size of the structuring element . This depends on the geometry of the structures to be found. If we wish to find dark valleys of width smaller than 'w' a black top hat with a structuring component slightly larger than 'w' ought to be employed in order to get rid of them in the closing step . These transformations produce a gray scale image.

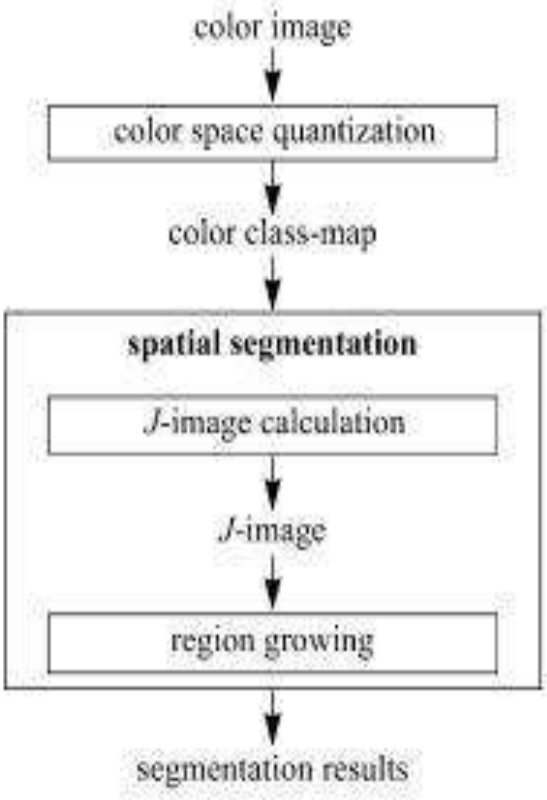
Kusumoputro et al[3] used PCA as a Preprocessor. Applied PCA to the originally training patterns, and in between the output and the target patterns utilized a cross entropy error function. Through PCA method, higher number of built-in features of the dermoscopy image like its color and the cancer shapes could be used as the input of the detection system. Leading to higher accuracy for computing the variations between ma1ignant cancer and the benign .. Extracted built-in features of the image are then processed by PCA. The purpose of PCA process is to decrease the amount of features of' the images into orthogonal features that still have the whole information. Since longer calculation time of the learning procedure is a main disadvantage in the back propagation network. the decreased amount of the features by PCA will reduced-number of the features by PCA will increase the computing speed without sacrificing the information. Mathematically, the PCA is solved through eigen decomposition of a matrix. By using PCA as the preprocessor of the neural network, helped to reduce the complexity and computing time, while for increasing the probability of not being trapped in local minima, a cross entropy error function is used, instead of usual quadratic error function

B. Segmentation

The color and texture areas in images and videos are segmented by using a novel unsupervised strategy ,which is explained in Yining et al[4] .Spatial segmentation and quantization are the two important independent steps employed in this proposed technique ,that is in the JSEG method. Colors present in the input picture are quantized to various indicative classes. Which helped to differentiate image regions in the initial step . Then the image pixels are take the place of by their appropriate color class labels, then generate a class map of the picture. This work emphasis on spatial segmentation, where a condition for a well segmentation through the

class-map is suggested. The class map outcome in the J image contains local windows, a condition for a well segmentation is applied to this result, in which strong and weak values belonging to the available borders and interiors of color and texture regions. Pictures relies in these multiscale J images are segmented by using a region increasing method. A similar strategy is applicable

Figure1: Schematic diagram of the JSEG algorithm for color image segmentation[4]



In Ganster et al [5] Segmentation of lesion in dermoscopic image is done by using FCRN. In order to achieve accurate and effcient skin lesion segmentation, construct a fully convolutional residual network based on residual blocks, which can take an random dimensioned picture as input and outcome an same-sized prediction score mask. After successive down-sampling operations in the original residual network, which results in the gradual reduction in the dimensions of feature map and become very small than that of the actual input image. To bridge the resolution gap so that both the learning and inference procedures can be performed in an efficient peer-to-peer type, use deconvolutional layers as the up-sampling operation to connect coarse predict maps and dense pixels predictions. Specifically, use deconvolutional layers to up sample small prediction maps and get the equal-sized prediction maps with input images. During the training procedure the weights of the deconvolutional layers can be trained. Compared with the original residual network, the advantage of the proposed FCRN is that it can make pixel-wise predictions, which is of valuable significance for the process of segmentation of skin lesion in the dermoscopic images. In such a full convolutional architecture, we can efficiently obtain accurate segmentation mask of an input dermoscopy image with a single forward propagation in the testing procedure. More importantly, Every single pixel in the image can be treated as an independent training sample in the training procedure, with the per-pixel-wise error back-propagation .Consequently, the number of equivalent training samples is greatly boosted, which is helpful to train very deep networks with a high number of parameters under limited training data. By harnessing the discriminative features learned from the very deep network, the proposed FCRN can produce good prediction maps of skin lesions. However, once rigorously searching the prediction maps, we find that the prediction maps neglect some detailed local information. The inbuilt reason of this phenomenon is that the deconvolutional layers are necessary to built an effcient peer to peer network contain big strides and hence only exploit object-level features in upper layers without suffciently leveraging the low-level spatial information in bottom layers of the network. Actually, once the FCRN goes deeper, the scale of receptive field is turning into larger and therefore the feature maps will capture additional international and abstract discourse options of epidermis contusion in. In contrast, the features from lower layers with smaller receptive fields can reflect the local structure information of skin lesions, which is also quite important for effective segmentation.

Otsu et al[6] proposed unsupervised and nonparametric and procedure for automatic selection of thresh-old for picture segmentation . A best threshold is chosen by the discriminant condition therefore on maximize the disjuncture of the resultant categories in grey levels. The procedure is incredibly Straight forward. Exploiting 0th and 1st order cumulative instances consist in gray level histogram. it is straightforward to develop the procedure to multi threshold problems. It is vital in image process to pick associate degree adequate threshold of grey level for extracting objects from their background. Large number of techniques has been suggested in this regard. In a excellent case, the histogram incorporates a intense and sharp natural depression between 2 peaks representing objects and background, severally, so the edge are often chosen at the lowest of this natural depression . However, for several real photos, it's typically tough to discover the natural depression bottom exactly, especially in such cases as once the natural depression is flat and broad, imbued with noise, or once the 2 peaks area unit are terribly unequal tall, typically producing no traceable depression. To overcome these difficulties of this paper proposes a technique that may be confined to the elementary case of threshold choice wherever solely the gray-level histogram success while not alternative a priori data. it's not solely necessary as a customary technique in image process, however conjointly essential for unsupervised choice issues in pattern recognition. it's a brand new technique from the point of view of discriminant analysis; it directly approaches the practicability of evaluating the "goodness" of threshold and mechanically choosing an optimum threshold.

A replacement algorithm for photo segmentation is explained in[7] koepler et al. The aim of this paper is to explain a quick and universal image segmentation algorithmic rule. Properties of this algorithmic rule are as follows. it's multiscale and pyramidic. In alternative terms, it'll not solely figure one segmentation, however a pyramid of segmentations from fine to coarse scales. Moreover, the coarser segmentation are going to be deduced from the finer by "merging" operations, with a pyramidic structure for the computation. This belongs to Marr's remark that textures "live" at many scales. Therefore, a discrimination algorithmic rule should offer totally different varieties of segmentations that rely on the size. As a consequence of this pyramidic structure, the computation time is in follow proportional to the dimensions of the data point. Moreover, this algorithmic structure can build it accessible to economical hardware implementation. The algorithmic rule is universal, that is, doesn't rely on any a priori data on the statistics of the image. Texture discrimination is achieved in keeping with a universal criterion depending on only a few parameters. more exactly, an image is outlined by a precise range of "channels" .In our segmentation algorithmic rule, the sole parameters are the weights connected to every channel, that is, the importance given to every channel as a segmentation criterion. However, these parameters may be fastened once and for all with reliable results.

F.Y. Xie et al [8] recommend an Automatic methodology for image segmentation exploitation SGNN seeded by genetic algorithmic program. Dermoscopy image segmentation algorithmic program is planned using collection of SGNN and thus the genetic algorithm(GA)Data Samples are chosen as seeds using genetic algorithm and exploiting the seeds as the starting neuron trees. Then SGNF is created by coaching the rest of the data samples by utilizing SGNN .The amount of clusters is fix by computing the sd index of cluster validity and cluster is filled by handling each neuron tree as a cluster since. SGNN usually provides unstable cluster segments as a results of sensitivity corresponding to the input order of the employment data samples. SGNN can optimize by taking genetic algorithm and SGNN together then stabilize the cluster result. within the post method part, the clusters are integrated into lesion and background skin, yielding the metameric dermoscopy image. A series of experiments on the proposed model and the automatic segmentation methods reveals the optimized model delivers better accuracy and segmentation result Generated a prototype for the automatic segmentation of epidermal contusion pictures supported by combining SGNN and genetic algorithm. SGNN is an efficient neural network having the qualities like simple network architecture and very fast learning capability. And also have an automatic organization ability. However, Typical SGNN is dependent to the inputting order of the coaching data samples and provides unstable cluster segments. SGNN can optimize by taking genetic algorithm and SGNN together then stabilize the cluster result. within the post method part, the clusters are integrated into lesion and background skin, yielding the metameric dermoscopy image. The clustering areas can be utilized to examine the color and texture of contusions and they can also be employed to acquire the contusion border features which is important for detection of malignant melanoma.

Nameirakpam et al[9] implements image segmentation by employing k-means clustering rule. Image segmentation a process where classification of a picture into completely different classes. several researches are implemented in the world of photo segmentation using the method of clustering. There are totally different ways and one of the foremost widespread methods is k-means clustering rule. K-means algorithmic program is an unsupervised rule and it's wont to partition the interest space from the background.However before applying K-means algorithmic program, initial we've to perform partial stretching sweetening to the image. Subtractive cluster methodology is information cluster methodology where it generates the centroid supported the potential price of the data points. Thus subtractive cluster utilized to induce the initial centers and these centers area unit utilized in K-means algorithmic program for the segmentation of image. Then finally medial filter is applied to the divided image to get rid of any unwanted region from the image. divided a picture by using k-clustering algorithmic rule, Then employing subtractive cluster to get the initial center of mass. At a similar time partial distinction stretching is utilized to reinforce the quality of original image and median filter is utilized to reinforce segmental image. and also the final metameric result is compare with k-means clustering algorithmic rule and that we will conclude that the planned agglomeration algorithmic rule has higher segmentation. The output pictures are tune by variable the hyper sphere cluster radius , then we can say that we will get totally different output. so we must always take the worth of hyper sphere cluster very rigorously. K-means rule and it's found that the planned methodology have higher performance result. within the future, will improve the standard of the output image a lot of by exploitation the morphological operation and obtain higher performance measuring.

C. Feature Extraction

The most common features mentioned in the literature on dermoscopic lesion classification involve color, texture, and shape [10][11][12]. Border properties are explained in [5][13.] It is important in handling pictures containing incomplete presentation of lesion objects. In the following, A set of most popular color and texture features along with a group of lesion border features that having major role on handling incomplete lesions are described below. These features are used in classification method.

a) Region Division on Dermoscopy Images

In [10], Celebi et al. computed features over three regions: lesion, inner region, and outer region. However, on images containing incomplete lesions, some color and structural asymmetry features cannot be calculated correctly using the division proposed in [10]. Therefore, we instead divide the lesion object into two regions: a diffusion region and an inner lesion region. Initially every contusion object is differentiated from the background skin by utilizing a combination of the sgnn technique and manual interaction .Then, Otsu's threshold [14] is utilized to segment the contusion into two region types. figure 2 is an example which presents the formation of these two regions. In[17] another method, features are extracted on both individual regions, as well as over the entire lesion region.

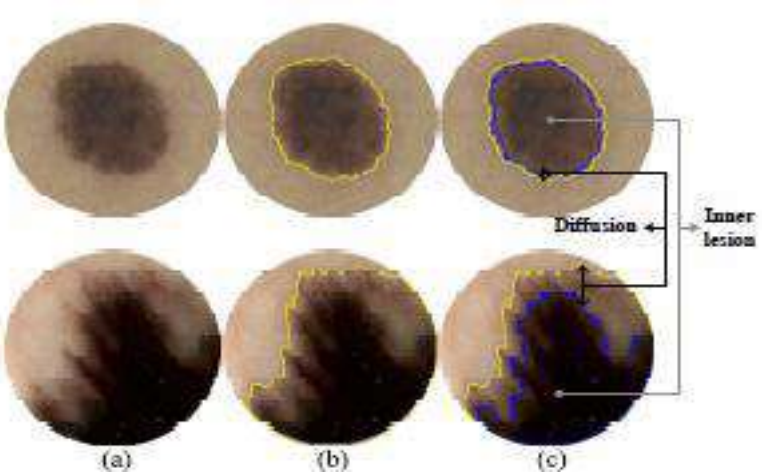


Figure2:Generation of two lesion regions. (a) Original lesion image. (b) Segmentation result on (a) Using SGNN. (c) Using SGNN followed by Otsus threshold.[17]

b) Description of Color and Texture Features

The color and texture features used are described by Celebi et al. in [10]. That are briefly summarized below
Color features

RGB features: 24 color features are acquired from every dermoscopy image, That are illustrated in rgb color space. 18 features are computed, where for each one of these three rgb planes two statistics are calculated for three segmented. The remaining six features are the ratios of corresponding statistics from inner and diffusion regions, similar to the standard deviation and mean of the channel.

LUV histogram distances: The LUV color space is coarsely quantized into 4x8x8 bins .The similarity in color between the transition region and inner region is represented as the L1-norm and L2-norm of the difference in histograms. Which provides two additional color features.

Color diversity: RGB color space is partitioned into16x16x16 bins. Then the number of the bins, into which there are pixels to be divided, is calculated. If the number of bins are larger, the more that likely the lesion is malignant. One feature is found here. (d) Centroidal distances: The distance between the brightness centroid and the geometrical centroid are computed when a segmented epidermal lesion component is provided. If the color distribution among the object is homogeneous then both the centroids are same. This is true even for incomplete objects. Three features are obtained by computing this distance from each RGB color space.

Texture features:

The spatial variations, randomness and correlations of local regional image brightness are important descriptions of possible malignancy. The GLCM based texture descriptor is a popular and widely used methods in the literature [15]. In[17] five statistical texture descriptors are calculated from the GLCM: the regional energy, entropy, contrast, inverse difference moment and correlation. These five statistics are also calculated over each of the 3 segmented regions (diffusion, inner lesion and the entire lesion). Again, the ratios of the 5 statistics on the diffusion and inner lesion regions are also calculated. All texture features extracted from each candidate lesion image is 20.

c). Description of Border Features

Border features in [5][13] utilized to express the degree of irregularity of border ,that are usually relies on measurements of texture,color or brightness Ganster et al. [5] calculated the gradient and normalized brightness values of border regions. Various Various sample stats like the minimum maximum average and variance were used as border features. Similar to the method in [5], the approach in [13] used a variety of gradient features to characterize border regions, including the mean and variance of the gradient magnitude along the candidate lesion border, as well as over 8 symmetric regions around the candidate border in three separate channels: color, texture and local skin darkness. These features [5][13] were only extracted on complete lesion objects. To acquire border features from incomplete objects, new border features are needed that can operate on incomplete lesions, thus weakening the dependence of lesion classification on perfect acquisition of dermoscopy images.

Lesion concavity features

Benign lesions tend to have roughly elliptical shapes with roundish convex borders that exhibit few con-cavities. Malignant lesions commonly exhibit highly irregular borders that can be characterized as having more frequent concavities. The convex hull is a useful tool for identifying border.concavities. Figure 3 shows the convex hull

of both malignant and benign segmented lesions. Use the lesion convex hull to define 6 feature parameters that are descriptive of the degree of concavities occurring on the lesion border.

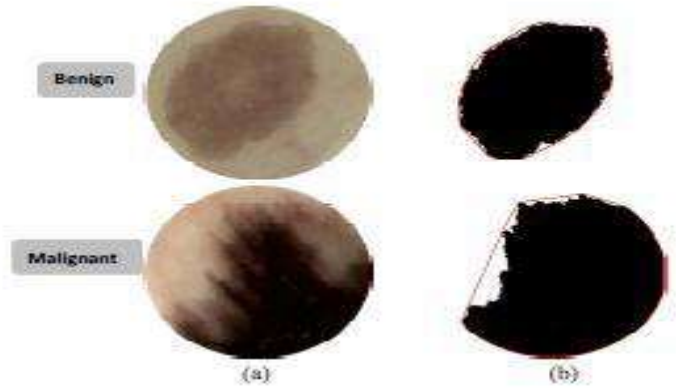


Figure2:Lesion regions and their convex hulls. (a) Dermoscopy images of benign and malignant lesions. (b) Segmented lesion regions, where red lines are superimposed convex hulls.[17]

D.Classification

Artificial neural networks, SVMs , Adaboost and KNN are very popular method for lesion classification .A large amount of things depends classification efficiency, like parameter settings, acquired features or combinations of features, and the quality of the data samples that are used for experimental evaluvation. On highly representative benign or malignant lesions, correct classification is easily achieved, yet on non-representative lesions, incorrect classifications often happen. Therefore, the difficult task is to achieve correct classification of non-representative lesions. Classification should implemented by an effective classifier. Classification is a common procedure related to a method in which concepts and components are identified, separated and understood .It is known as categorization.

Kusumoputro et al[3] suggested an ANN that is utilized to differentiate the melanoma as malignant benign or benign. based on shapes and relative color of skin contusion . To decrease the calculational diffculties, while incrementing the chance of not being in local minima of the BPNN, PCA is applied to the initial learning patterns, and used a cross entropy error function between the outcome and the target patterns. PCA method helps to get many more in-built- features of the melanoma image by its color and the shapes of lesion, which can be utilized as the input to the system.Usage of PCA method ensures the possibility of higher accuracy in computing the differences from the two classes, that is malignant or benign categories.

Ganster et al[5]construct a deep residual network to differentiate skin contusions according to the segmentation results. The architecture of the network is almost the same with that of the down-sampling path of the proposed FCRN for segmentation, The difference is that we add a 7x7 average pooling layer followed by the 16th residual blocks to acquire the global features. Some researchers invent an benefits of repositioning the Softmax layer by a linear SVM layer while coaching CNNs. Inspired by these findings, exploit two classifiers, Softmax classifier and SVM classifier, to yield 2 forecast and take their average to get the final outcomes. Note that the Softmax classifier and the SVM classifier are trained independently in an end-to-end way with the proposed residual network. During the training of classification network, automatically cut a picture part containing complete skin contusion from every dermoscopy picture and change the size of that image in to a prefixed size .When testing, also automatically cut the picture part containing the com-pletely segmented epidermal contusion and feed the size changed picture part into classification networks. To increment effciency and decrease overfitting, again use the technique of data augmentation to magnify the training dataset.

Celebi et al [10] used SVM for classification purpose. Now a days svm based classification methods seeks considerable attention in the machine learning society. because they have strong theoretical bases and very efficient practical performance. They relies on kernel-based learning algorithmic rules derived from the statistical learning theory. SVMs have several advantages over the more classical classifiers such as decision trees and neural networks. The support vector training performs optimization of a convex cost function. Therefore, there is no risk trapped at local minima as in the case of BPNN. Most learning algorithms implement the ERM principle which minimizes the error on the training data. And also, SVMs are relies on the SRM principle which minimizes the upper bound on the generalization error.So, The chance for over fitting in SVMs are very less when compared to the algorithms that exploits the ERM principle such as BPNNs. An important quality of SVMs is that they give a design in which different learning machine architectures are created by the respective selection of kernel in a uniform manner.

III. Conclusion

This paper discussed various methods and techniques used in malignant melanoma detection. Precisely we can say that image preprocessing detect the noises in the input image and remove them, here noise are hairs in the skin surface. Methods like partial differential equation based image impainting method, morphological closing-based top-hat operator, principal component analysis method etc are can be used. But all these method sufferes implementation difficulties in situations where non uniform light distributions occurs.So more steps like active contour, color enhancement, gray thresholding, hair removal, removal of dark regions of corners etc can be added for better results. For segmentation there are so many automatic methods are available. But for the exact results, manual interaction is needed. Classification can be implemented by using the classifieres like Artificial neural networks [3], SVMs [10], Adaboost [16] and KNN [5].These conventional methods posses disadvantages like reduced accuracy, required more computing time and storage space etc. So we require some new strategies which implements classification at low cost and complexity and ensuring accuracy.

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EFFICIENT SECURE DYNAMIC SEARCHABLE SYMMETRIC ENCRYPTION USING SECURE KNN SCHEME

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***Abstract**: Now a days health care services has becoming an emerging technology, Patient can store his/ her medical data on the cloud server. This is known as data outsourcing, Then only approvable doctor can use the data ,being the medical data is hypersensitive. This is remarkably reduce the workability of the stored data because of the struggling of searching over these privacy preserved data. Through the paper proposes two efficient accessible symmetric encryption schemes over outsourced medical data. First we employ fixed KNN and Cipher Text Object based Encryption. Second we use a method to solve the key distribution problem, In general Encryption schemes all users uses the same secret key .This causes the privacy revelation of data .Thus our second method will solve the above trouble. Compared to the existing schemes, this is best with regard to storage and searching capacity. At last we can prove the regulation of our algorithms on storage ,index making and query.*

***Keywords:** Object based Encryption, K-Nearest Neighbor, Symmetric encryption,Multikeyword search*

Introduction

Symmetric searchable encryption of cloud storage permit the clients to get back the uploaded documents want in a privacy preserving method, which becomes a main area of study. Dynamic schemes, In that schemes files can be joined or deleted,. Searchable symmetric encryption (SSE) admits a data owner deploy his/her secret data to an entrusted server, while exclusively returning data elements equivalent to a query without disclosing either the content of data or the keywords that is searched to the server. A primary solution is to redistribute encrypted files to the server, and store locally an index that affiliates each keyword to the group of file identifiers that containing the keyword.

The client finds the list of files that is identical to a desired query, and returned corresponding encrypted files from the server. This requires the client to keep a huge index and fulfill all required search and update calculations restrictedly.To eliminate that issues Secure KNN is used to propose efficient dynamic searchable encryption schemes.

Medical Management has been substantially analysed to upgrade the quality of medical services. By a huge quantity of medical data care providers must increase its scale to give better and fixed services. In medical computing ,Patients can distantly deploy his/her encrypted health documents to the server .In that case only approvable search doctors are permitted to access the documents, because the medical data is overly sensitive .Encrypted data cannot favor greater utility due to the complication of searching over the privacy preserved data.

To weaken that problem ,Efficient Searchable Symmetric Encryption Scheme has been considered in this paper. Many KNN based searchable schemes have been suggested to hunt over the encrypted data.

In such algorithms every search shares the same secret key it may cause privacy disclosure. That's why this research considers a privacy preserving efficient dynamic searchable encryption scheme. Actually the original offerings of this paper are

- ✓ We integrate the k-Nearest Neighbor and Object based Encryption techniques to put forward systematic dynamic searchable encryption
- ✓ We further suggest enhanced dynamic searchable symmetric encryption scheme to resolve the key division problem.

Compared to the existing algorithms, this is best with regard to storage and searching capacity.

Related Work

Previous Searchable Symmetric schemes can achieve ranked keyword search. Coventionally searchable symmetric encryption has been widely researched in the case of security. Initial work of searchable encryption was proposed by Song et al[1]. in which each individual word in the document is encrypted one by one. Goh introduced to hold Bloom filters to erect the indexes of data files.

All these previous schemes supports required keyword search it is not acceptable for cloud storage.

At a recent time many k-Nearest Neighbour (KNN) based schemes are established to hunt over th encrypted data[11] . In such systems all search users share the identical secret key ,which may lead to the exposure of secrecy. In [31] Kan yang proposed validating Efficient and Geometric Range Query with entry restriction over Encrypted Spatial Data.Geometric range search is one of the most basic queries presented on spatial data, Range query can be used to track points within the geometric entities such as triangles, circles, rectangles. The objective of geometric range search on a spatial dataset is to return points that are inside a particular geometric range. Range Searching Problem contains of a set of entities, to govern which object intersect with a query entity called range. Searchable encryption is a technique to perform searching queries on encrypted data without revealing privacy. Current paper propose an Efficient Geometric Range Query scheme that supports searching and access control over encrypted data by using secure K Nearest Neighbour computation .Chichen proposed [12] Efficient privacy preserving method by using clustering approach. According to the proposed clustering method,every document will be categorized into a particular cluster which has a condition on the least relevance score between unlike documents. If one of the new documents breaks that condition, a new cluster center will be added and the current document will be stored into that cluster . whether there is a cluster whose size increase above that limitation, this cluster will be partitioned into various clusters. Server evaluates the score between the keyword and document. If the cluster cannot satisfy the number of desired documents ,cloud server will return back to the header group of that cluster. Main demerit of the system is user cannot added files dynamically into the cloud server.In [13] k Ren proposed Privacy-Preserving Multikeyword Similarity Search Over Outsourced Cloud Data. We consider the multikeyword similarity search over outsourced cloud data. multiple keywords are specified by the data owner..Multi keyword similarity can be obtained by using distance metric.Ming Li [3] proposed an innovative framework that is suitable for data access control in Personal Health Records(PHR). PHR system is consider as multiple owner, multiple user system. For reducing key management complexity, users are divide into multiple user domains like public and personal. A PHR will be available to the users who are given the corresponding decryption key, while remain confidential to the rest of users.Here Attribute Based Encryption Scheme is used for data access control. In PHR system data is outsourced on data server over internet. For privacy and security of information, encryption techniques are. Cryptography is used to provide privileges

Proposed Work

System Model

This model consists of four Operations

1. **Key Generation Centre**: KGC is used to generate object based encryption key to encrypt the medical documents. The key is used to encrypt and decrypt data whatever the data is being encrypted or decrypted. Modern cryptographic systems include symmetric-key algorithms (such as DES and AES) and public-key algorithms (such as RSA).

2. **Patient**: A patient redistribute his/her documents to the server to give suitable and definitive data access to the approvable search doctors. To ensure the privacy patient encrypts his/her native documents under an access policy using object based encryption.To increase the competency generates some keyword for each redistributed document.The Suitable index is then created according to the keywords using the private key of fixed KNN algorithm.Then patient send the encrypted details and the corresponding indexes to the cloud.and then give the secret token to the approvable doctors.

3. **Cloud Server:**It is the middle creature which reserves the encrypted details and the specific indexes take in from the patients,and then hand over data access and search assistance to the recognized search doctors. When the search doctor transmit an encrypted query request to the server,it would answer a group of matching datas based on some assertive operations.

4. **Doctor**:A recognized doctor can accomplish the secret key from the patient, this secret key can be used to achieve trapdoors(Encrypted Query request).).Whenever the doctor needs to search the deployed credentials stored in the server ,she will create search keyword set. Then according to the keyword group, the doctor utilizes the key to create an encrypted query request and then send to the

cloud. At last she accepts the the similar credential collection from the server, and decrypts them with key received from the key generation centre.

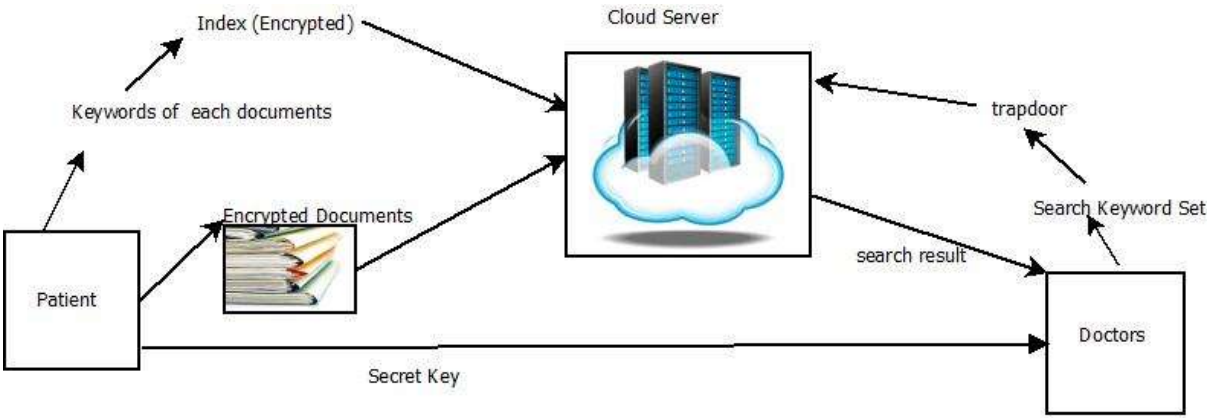


Figure 1:System Model

Design Goals

For the purpose of understanding secure dynamic searchable symmetric encryption ,the following objectives need to be achieved.

High Security: In medical care system secrecy conservation is very important, This is achieved through this system, because only encrypted documents are outsourced into the cloud server.

Multi-Keyword Search: Search Doctor can enter more than one keywords to search to better meet the requiresymmetric encrments. So It can achieve better efficiency of search.

*Access Control:*In previous schemes deliver the symmetric key to the authorized doctor directly,In this paper we use entity based encryption(Attribute Based Encryption).

*Key non sharing :*In general searchable scheme ,all search uses the same key So the encrypted query request generated by one user can be decrypted by other search user which causes the exposure of privacy.

Access Policy

In Cipher Text Attribute based encryption policy of the cipher text is associated with some attributes ,In this case we use AND and OR gates on multivalued attributes.Search user's secret key is associated with some attributes only this attributes satisfying the access policy can decrypt the documents.

III. a)PROPOSED SEDSSE_1 (SECURE EFFICIENT DYNAMIC SEARCHABLE SYMMETRIC ENCRYPTION)

Patient randomly generates a document vector based on the frequency that the keyword appears in the document. That is each bit in the document vector P[i]denotes the relevance of each keyword inside the document. A patient generates the secret key K = (B,$\underline{X_1}$,$\underline{X_2}$) B is a binary vector,$\underline{X_1}$ and $\underline{X_2}$ are two invertible matrices for encrypting the documents. B is a binary vector ,vector size is equivalent to the size of keyword. For eg (1010). B act as a splitting indicator to split the plain text vector P[i] into $P_a[i]$ and $P_b[i]$ which confuses the value of actual plain text vector. The vector S functions as a splitting indicator. if B[i] = 0 $P_a[i]$ and $P_b[i]$ can be both set as P[i].if B[i] =1 the value of P[i] will be randomly split into $P_a[i]$ and $P_b[i]$ such that($P[i]=(P_a[i] - P_b[i])$. Then ,the Encrypted index can be calculated as $(X_1^T * P_a, X_2^T * P_b)$

At last a key token will be deliver to the authorized search doctors. We can generate trapdoor or encrypted query request by the following way.System maintains a keyword dictionary T, including m keywords.

Firstly,the search doctor generates the keyword set for searching. Then, she creates a vector Q.

If the generated keyword k is in T the vector Q[i]=1 otherwise Q[i]=0.The binary vector B is a splitting indicator to split query vector into two sub vectors such as q_a and q_b ,if B[i] = 0 the value of Q [i] will be randomly splitinto q_a and q_b (Q[i] =(q_a –q_b).if B[i] = 1, q_a and q_b are both set as Q[i].Then, the encrypted search vector or trapdoor can be calculated as $(X_1^T * q_a, X_2^T * q_b)$ .After receiving trapdoor Calculate the score by taking the scalar product of encrypted document vector and encrypted search vector .Hence the search process can be performed. So the corresponding encrypted document can be retrieved whose score is maximum, Huge score denotes the equivalent document will be more applicable to the created keyword set.

III.b)PROPOSED SEDSSE_2 (Without Key Sharing)

In Basic symmetric encryption scheme each search users shares the identical secret key.That is the encrypted query request generated by a search user can be decrypted by other search users, which will reveal the privacy information of the search users. So propose a magnified scheme to solve the issue. Patient has a secret key

$K=(B,X_1,X_2)$, So we can avoid the key sharing problem by changing the matrix values X_1 and X_2 ,We can change X_1 as (X_1Y_1,X_1Y_2) where Y_1 and Y_2 are two invertible matrices .Search doctor uses the inverses of the matrices X_1 and X_2.Each search doctor uses $K=(B,X_1^{-1},X_2^{-1})$ For X_1 will be replaced as $(Y_1^{-1}X_i^{'},Y_2^{-1}X_i^{''})$. where $X_i^{'}$ and $X_i^{'''}$ are two randomly selected matrices $X_i^{'}+X_i^{''}=M_1^{-1}$.Similar to X_1 the matrix X_2 can also be replaced. The enhanced point is that we gain the keyword search secretly and the same time preserve the privacy that is each search doctor uses the different secret key which is created by the patient and then deliver to the corresponding search doctors.

I. SECURITY ANALYSIS

*Secrecy protection of documents,indexes and trapdoors:*Patients outsourced documents after encrypting for privacy preserving, Though the keyword sets of two documents indexes and encrypted request are dissimilar.In our existing schemes the same secret key shared by all the search users which causes the security problem.The authorized search user can decrypt the encrypted query request generated by another authorized search doctor, inorder to solve that problem we used to multiply X by Y is used to confuse the value of matrix X.

*Key not sharing in search:*In general encryption scheme ,all search users share the identical secret key,In this case every doctor uses different key , Because of using this one search user cannot decrypt encrypted query request of other authorized search users.

V. RESULTS

General searchable encryption have high updating complexity, In this scheme dynamic updating is possible.So the updating complexity is less . In previous schemes data is stored on the data owner side and search user side,In this paper most documents are embedded in the large storage space such as cloud server.Storage overhead ,index build time and encrypted query request generating time are more effective compared to the existing schemes.In Previous schemes More space is required for storage .In this Scheme large cloud storage is used for outsourcing data.So the Storage complexity is less

As the number of keywords increases that is used for searching index generation time is also increases.

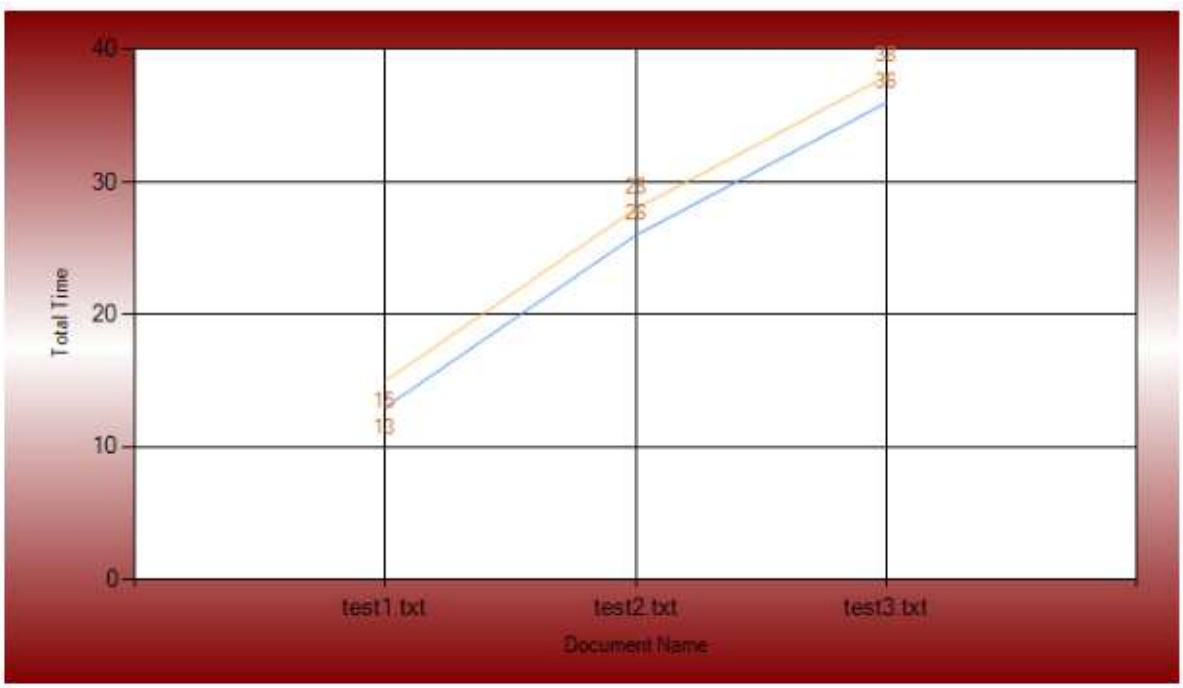


Figure 2 Index Build Time

In the above figure Total time denotes the index generation time.It Shows the index building time on each file uploaded.Blue colour indicates our proposed scheme.Yellow line indicates Existing Schemes.Through the figure Our Proposed scheme achieves lower time as compared to the eisting schemes.X axis denotes the name of the document.

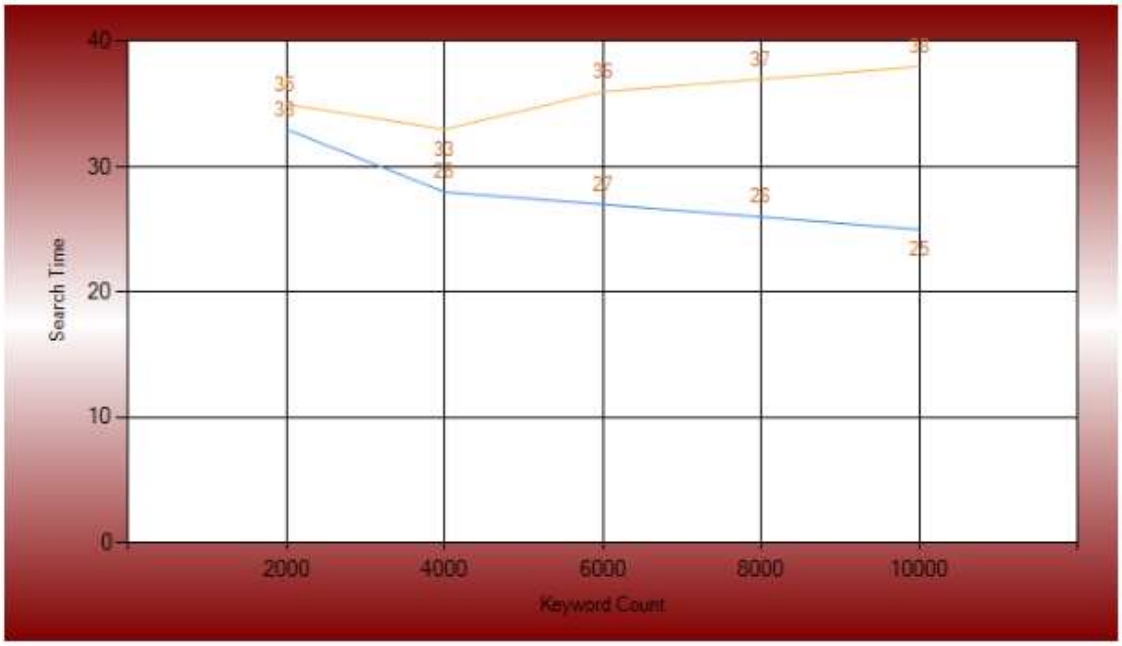


Figure 3 Trapdoor Generation time

In the above figure search time denotes the trapdoor generating time.that is the time taken for generating Encrypted search vector.X axis denotes the no of keywords used for searching .Blue colour indicates our Proposed scheme.,which achieves lower time even if the no of keywords increases.

Disadvantages

If the doctor searches the document using a set of 5 keywords, the search will be terminated,if you are not able to find a set of 5 keywords in 5x5 structure, and at present there is no provision to continue the search in other structures (with a set of keywords of size 4,3 etc...)

Enhancement

Keyword Structure Recreation and Build a Common Structure.Analyze all Keywords that the doctor wants to search. Then based on the large keyword sized vector recreate the size of remaining keyword vectors into large keyword sized vector. For Example First Search is done for a single keyword vector [a],then the search is carried out for a keyword set of size 2 such as [a,b].Eventually he searches using Keyword set of size 5 [a,b,c,d,e].Then he recreate all the previous Search vectors into 5 x 5 size vectors by adding 'Zeroes' to the remaining space. For example If we use single Keyword vector [a] and it is recreated as [a,0,0,0,0] and so on..

VI. CONCLUSION

In this paper we introduced two dynamic searchable symmetric encryption with high level of security. It enables searches over the encrypted data,multi keyword search enables efficient search,it can even better meet the requirements of doctor and achieve search efficiency.General searchable encryption schemes encrypt all documents with the same key.In this paper second scheme secure efficient dynamic searchable encryption scheme eliminate the key sharing problem.In our schemes achieve strong security, that is in medical care system contains more sensitive informations, So it gains high level of security.Document vector can be created according to the number of times the keyword is present in documents So multi keyword search is possible.It can better meet the requirements of search users. it may do efficient updating than general searchable encryption schemes.It can achieve access control by using attribute based Encryption.Eventually he searches using Keyword set of size 5 [a,b,c,d,e].Then he recreate all the previous Search vectors into 5 x 5 size vectors by adding 'Zeroes' to the remaining space. For example If we use single Keyword vector [a] and it is recreated as [a,0,0,0,0] and so on..

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Secure Role Based Access Control of data in the Cloud Computing

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Abstract*: Nowadays cloud storage is used for storing the large amount of user data. An organizational data is to be encrypted for security reasons. In an institution the data stored in cloud by admin need authorization from an authorized person. The issue of security of data stored in the cloud to control and preventing unauthorized access to the data. The Secure role based access control (SecRBAC) provides flexible access controls to authorized users and secure management of data by a two mapping protocols. Firstly User to Role and Role a Privilege on data. This method can be make use for secure storage of data in the cloud storage. But this model has a trusted administrator to manage all the user and role of organization. This paper presents identity based and proxy re-encryption algorithm used to protect user data in the cloud computing. The authorization models contain evaluator key for user enrollment and also used to secret key generating for authorized user. Proxy means entity and re-encryption means without decryption it contains one more encryption. Identity encryption means a type of public key cryptography. This type of authorization model will result in a technical improvement in knowledge of computer usage. Access to the storage cloud will be provided to only administrator of organization. User having higher role having ability to access the data of low level role's data.*

Keywords*: SecRBAC,Authorization,IBPRE,ProxyReencrypter*

I. Introduction

A public cloud is one based on the standard cloud computing model, in which a service provider makes resources, applications or storage, available to the public over the internet. Business people and other end users can license storage capacity from public cloud to store their digital data on a pay-per-use fashion. However, people cannot unduly trust the cloud service providers to host sensitive data, since the cloud providers and their employees can read this data regardless of data owner's access policy. To provide confidentiality, data owners upload cipher texts rather than plaintexts. This uploaded data can be shared among various end users. Cloud storage is a service where data is remotely maintained, managed and backed up. During these years, more data are outsourced to the public cloud forconstant storage including personal and business documents. But people cannotoverly trust the public cloud storage to protect sensitive data because it is visibleto the cloud service provider and their employees regardless of the data owner's access policy. Another problem with public cloud storage is the cloud serviceprovider can exaggerate the resource consumption without providing any verifiable records. Data owners who store files on cloud servers still want to controlthe access and keep the data confidential against the cloud provider and malicious users.

The secure Role Based Access Control (SecRBAC) where access control policies are defined in the form of new Role Based Encryption (RBE) scheme. This Role Based Encryption scheme includes RBAC policies on encrypted data stored in the cloud. In this RBE scheme the data owner will encrypt the data.The data owner also set the users of role who can access the data as a role based policy. If the user who want to access the data which is in encrypted form, if he satisfies the particular role assigned by the data owner and only then he having ability to decrypt the data. Only the users of role assigned by the data owner will get the decryption key after satisfying the particular role of user. After getting the decryption key user having ability to decrypt the data and having ability to see the original content of the file that owner has uploaded to the public storage cloud.

To protect the privacy of the data cryptographic techniques are applied to the in such a way that only authorized users can be access the data. The authorized users are specified by the access policies based on a role based method. The authorized users who satisfy the access policies having ability to decrypt the data using their private key, and no one else having ability to reveal the data content. Therefore, the problem of managing access

to data stored in the storage cloud is transformed into the problem of management of keys which in turn is determined by the access policies. The design of a secure RBAC based cloud storage system where the access control policies are enforced by a new role-based encryption (RBE). The Proposed RBE scheme is able to deal with role hierarchies, whereby roles inherit permissions form other roles. A user is able to join a role after the owner has encrypted the data for that role. The user having ability to access that data from then on, and the owner does not need to re-encrypt the data. A user can be revoked at any time in which case, the revoked user will not have access to any future encrypted data for this role. With new RBE scheme, revocation of a user from a role does not affect other users and roles in the system.

II. Related Works

Several data-centric approaches, mostly based on Attribute-based Encryption [5], have arisen for data protection in the Cloud [4]. In ABE, the encrypted ciphertext is labeled with a set of attributes by the data owner. Users are specified with a set of attributes defined in their private keys. The users can be able to access data (i.e., decrypt it) or not depending on the match between ciphertext and key attributes. The set of attributes needed by a user to decrypt the data is defined by the use of an access structure, which is specified as a tree with AND and OR nodes. There are two main approaches for attribute based encryption depending on where the access structure resides: Key-Policy ABE (KP-ABE) [5] and Ciphertext-Policy ABE (CP-ABE) [3]. In KP-ABE the access structure or policy is defined in the form of private keys of users. This allows to encrypt data labeled with attributes and then control the access to such data to authorized users by delivering the appropriate keys. However, in this case the policy is really defined by the key issuer instead of the encryptor of data, i.e., the data owner. So, the data owner should trust the key issuer for this to properly generate an adequate access policy. To solve this issue, CP-ABE proposes to include the access structure within the ciperthext, which is under control of the data owner. Then, the key issuer just asserts the attributes of users by including them in private keys. However, either in KP-ABE or CP-ABE, the expressiveness of the access control policy is limited to combinations of AND-ed and OR-ed attributes. The data-centric solution presented in this paper goes a step forward in terms of expressiveness, providing a rule-based approach following the RBAC scheme that is not tied to the limitations of current ABE approaches.

Moreover, the cryptographic operations used in ABE approaches usually restrict the level of expressiveness provided by the access control rules. Concretely, role hierarchy and object hierarchy capabilities provided by Sec-RBAC cannot be achieved by current ABE schemes. Moreover, private keys in ABE should contain the attributes of the user, which tights the keys to permissions in the access control policy. In SecRBAC, user keys only identify their holders and they are not tied to the authorization model. That is, user privileges are completely independent of their private key. Finally, no user-centric approach for authorization rules is provided by current ABE solutions. In SecRBAC, a single access policy defined by the data owner is able to protect more than one piece of data, resulting in a user-centric approach for rule management. Additionally, the proposed solution provides support for the ontological representation of the authorization model, providing additional reasoning mechanisms to cope with issues such as detection of conflicts between different authorization rules.

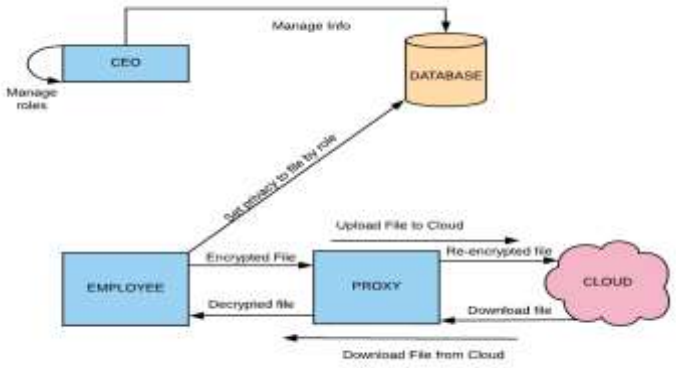
III. Proposed Work

SecRBAC makes use of cryptography to protect data when moved to the Cloud. Advanced cryptographic techniques are used to protect the authorization model in order to avoid the CSP being able to disclose data without data owner consent. Concretely, the solution is based on Proxy Re-Encryption (PRE). A PRE scheme is a cryptographic scheme that enables an entity called proxy to re-encrypt data from one key to another without being able to decrypt it. That is, given a couple of key pairs a and b, the proxy could re-encrypt a ciphertextca encrypted under a public key to another ciphertextcb that can be decrypted using b private key. The management of access control and security could become a difficult and error prone task in distributed systems like Cloud computing. Authorization models providing high expressiveness can help to control and manage security and to deal with this complexity. They can aid administrators with this task by enabling the specification of high-level access control rules that are automatically interpreted by system for this to behave as defined by the administrator. Role-Based Access Control is an authorization scheme supported by most of the current authorization solutions. In this approach, the authorization model makes use of the Role concept to assign privileges to subjects. A set of subjects can be assigned to one or more roles which, inturn, can be associated to a set of privileges. This provides more expressiveness to the authorization model, making it easier to manage privilege assignments through roles.

Consider an example where a company uploads to the Cloud a couple of documents called DocumentX and DocumentY which could be accessed only by the managers of the company. Also consider that Bob and Alice are managers of this company. Without role support in the authorization model, the company should define and

manage individual privilege assignments for every user and every document. That is, four privileges should bedefined in this example: Bob←DocumentX, Bob←DocumentY , Alice←DocumentX and Alice ←DocumentY . On the other hand, making use of roles, a Managers role could be defined to group all users that are managers of the company and two single privileges need to be defined: Managers←DocumentX and Managers ←DocumentY . Let us denote them p1 and p2, respectively. This provides more expressiveness to the model, making it more natural for the administrator to manage privileges, as well as avoiding the need to manage individual privileges.

This authorization model can be extended to hierarchical RBAC (hRBAC). Hierarchical RBAC enables the definition of role hierarchies. These hierarchies establish privilege inheritance between roles, making a child role to inherit all the privileges defined for parent roles in the hierarchy. The major motivation for adding role hierarchy to RBAC is to simplify role management. A child role r1 in T can be defined as member of another parent role r2 in T. It makes the system to consider instances belonging to any parent role, to be also belonging to its child roles in the hierarchy. Following the example, consider that Bob is a sales manager whereas Alice is a finance manager. Also consider that another document DocumentZ is only intended for sales managers. Both users should still have access to DocumentX and DocumentY, but only Bob should have access to DocumentZ. Making use of role hierarchies, two roles SalesManager and FinanceManager could be defined as children of the Managers role. Then, Bob would be assigned to SalesManager and Alice to FinanceManager instead of being both assigned to Managers. Another privilege p3 could be now defined as DocumentZ← Sales Mnager. This way, Bob would have access to DocumentZ by p3. Moreover, by privilege propagation through the role hierarchy, both users would still have access to DocumentX and DocumentY by p1 and p2. It should be noticed that privilege inheritance in this hierarchy is transitive. That is, if r1 in T is a child of r2 in T and r2 is a child of r3 in T, then r1 will inherit all the privileges from both r2 and r3.



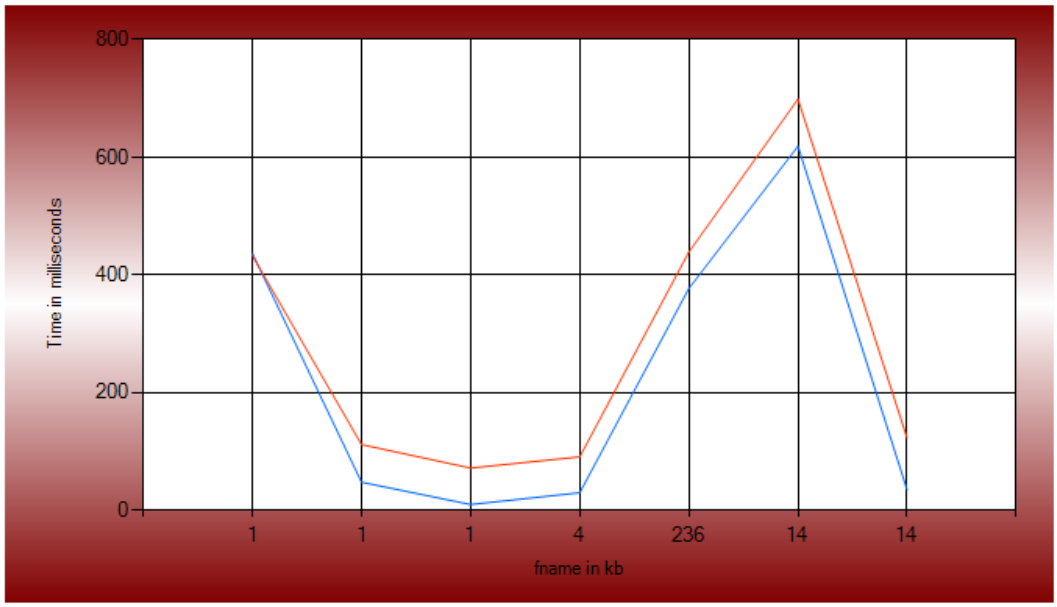
When moving data to the cloud, a self-protected package is generated by the data owner. This package contains: the encrypted data objects, the authorization rules and the corresponding re-encryption keys. Data objects are encrypted before uploading them to the Cloud in order to prevent the CSP to access them. This would enhance cryptographic operations like re-encryptions for large data objects. This approach consists in using a symmetric encryption algorithm (e.g., AES) to protect the data object itself. The encryption of data is done with a random symmetric key generated for the purpose of a single encryption. Then, this key is encrypted with the encrypt() function. With this procedure, potentially big objects (e.g., large documents) are encrypted using symmetric cryptography, whose algorithms are more efficient. In turn, more costly operations are only applied to the keys used for the symmetric encryption, which are usually small pieces of data of some bytes length. Authorization rules are defined by the data owner and directly mapped into the authorization model. This is done by including the corresponding elements in the binary relations. For instance, a rule that grants a subject s1 access to an object o1 would add an element g1=(s1, o1) to the binary relation Ga. Depending on the representation of the authorization model, the corresponding rule should be generated. An authorization service (AuthzService) acts as entry point to the PDP for Cloud services allowing to query it for authorization decisions. This module takes decisions upon a request from a user s1 to access to a piece of data o1 managed by the service. These decisions usually return an access granted or denied statement. For granted accesses, the response also contains the re-encryption chain that should be applied, together with the needed re-encryption keys.

The human mistake, equipment's fault, network connectivity problem, or any criminal intestinally may put our cloud storage on the risk. And changes into the cloud are also made very fast or frequently it can be called as data dynamics. However, still various successful techniques are lagging behind some critical issues like low cost, implementation complexity, security, time related issues. To overcome these issues by using Seed Block Algorithm (SBA). The SBA is used to recover the files in case of the file deletion or if the cloud gets destroyed due to any reason. Seed Block Algorithm consists of the Main Cloud and its clients and the Remote backup Server. Here, first Random number in the cloud and unique client id for each client. Then, whenever the client id

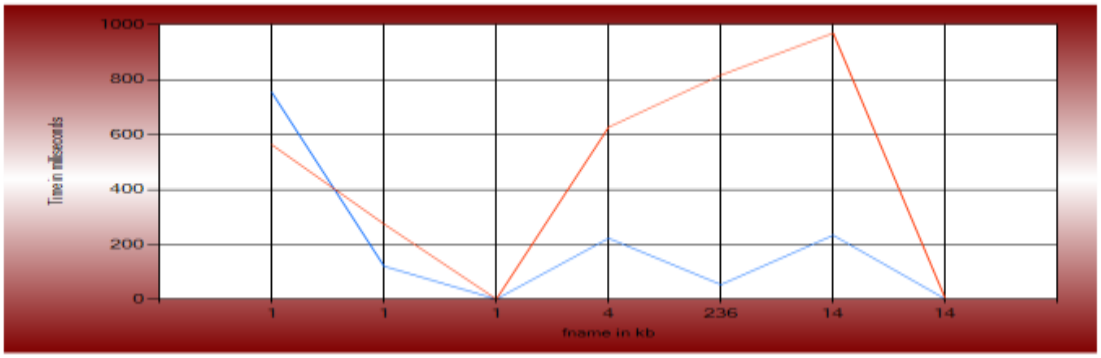
is register in the main cloud; then client id and random number is getting EXORed (⊕) with each other to generate seed block for the particular client. Whenever client creates the file then it is stored at the main cloud. When it is stored at main server, then the main file of client is being EXORed with the Seed Block of the particular client. And that EXORed file is stored at the remote server in the form of file. If either due to some reason files in main cloud crashed or damaged, then the user can get the original file back by EXORing file with the seed block of the corresponding client to produce the original file and return the original file back to the requested client or any modification done in the file. There is also calculating the hash function of data and stored it into the database. While uploading a file by any user can checking if any duplicates of file is available. If the file is available then there is no need of uploading it into the cloud and referece of older file is created. If any modification is done to the file will lead to regeneration of that file by checking the hash values. There is also role based and individual based access control of data is possible. Integrating the functionalities of individual based access control to the role based access control mechanism.

IV. RESULTS AND DISCUSSIONS

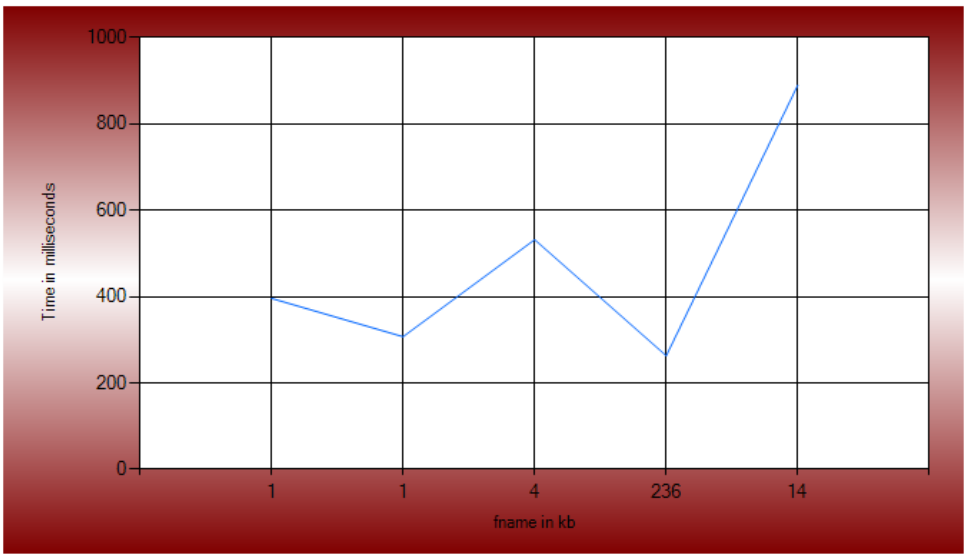
The implementation supports efficient key generation schemes by taking less time for key generation for encrypting data. Corresponding to the two approaches described It also allows the data owner to directly generate and store user keys in case he wants to distribute them by other means. When generating the key for data owner to upload the file. Then another key is generated and again encrypt the encrypted data,so that there should be double encryption taking place. The results are obtained by checking the time taken for encryption of data, key generation for first encryption done by data owner and for second encryption done by proxy side, the time taken for re-encryption, the time taken for decryption.The time may varies because of depending the performance of the system, the bandwidth of internet etc…



The above graph showing the time taken for first encryption using AES-256 and generating the key for encryption in data owner side. The x axis denotes the file in kilobytes and y axis denotes the time taken for encrypting the file and the time that is used to generate the key for encryption. The encryption of data takes more time than generating key for encryption.



The above graph showing the time taken for second encryption using RSA algorithm and generating the key for encryption in data proxy side. The x axis denotes the file in kilobytes and y axis denotes the time taken for re-encryption of the file and the time that is used to generate the key for re-encryption. The re-encryption of data takes more time than generating key for re-encryption.



The above graph showing the time taken for decyption. The x axis denotes the file in kilobytes and y axis denotes the time taken for decryption of the file. The time varies by the accordance of the size of file . It increases the performane oand also the security is increased by using best techniques. The security is improved and the unauthorized parties can not access the data.

V. Conclusion

Secure role base access control have contains a data-centric have proposal system for protect the cloud Computing. The process provides two encryption algorithms for secure all data, files and so on. They includes evaluator as a key generating function for data user to access the encryption key to convert cipher text to plaintext otherwise unknown language to known language. A data centric authorization solution has been proposed for the secure protection of data in the Storage cloud. Sec RBAC allows managing authorization following a rule-based approach and provides enriched role-based expressiveness including role and object hierarchies. Access control computations are delegated to the CSP, being this not only unable to access the data, but also unable to release it to unauthorized parties. Advanced cryptographic techniques have been applied to protect the authorization model. Is encryption key complement each authorization rule as cryptographic token to protect data against CSP misbehavior. The solution is independent of any PRE scheme or implementation as far as three specific features are supported. This paper solves the access control mechanism of data and also the file deletion and modification also checked and verified. The main purpose of making the system more reliable by

taking the advantage of data sharing, by the deletion of file in the cloud, it is recovered easily. The future work of this system is cost increases because of using remote servers for backupingdatas for regeneration of data.

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Verification of Ranked Keyword Search Results in Cloud Computing

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Abstract: *With the emergence of cloud computing, many people are liable to outsource their data to the cloud. Cloud computing provides massive benefits including easy access, decreased costs, flexible resource management etc. Encryption of sensitive information before being outsourced to a remote cloud, can preserve the data privacy. Secure keyword search over encrypted data stored in cloud has attracted the interest of many researchers recently. Most of existing researches are however, based on an ideal assumption that the cloud server is "curious but honest", which means that the search results are not verified. Therefore, a novel deterrent-based scheme is proposed to explore the problem of result verification for the secure ranked keyword search. With methodically designed verification construction, which data owners data are embedded in the verification data buffer, or how many data owners verification data are actually used for verification are unknown to the cloud server. A wrap function is also used to avoid the keyword-file association leak. All the cloud server is aware of is that, once it behaves dishonestly, the misbehavior can easily be discovered.*

Keywords: *Cloud Computing; data verification; deterrent.*

I. Introduction

With the massive benefits provided by cloud computing, many people are liable to outsource their data to the cloud. Enterprises of all sizes can make use of the cloud to extend innovation and collaboration. Despite of advantages provided by cloud computing, people and enterprise users are reluctant to outsource their sensitive data, including private photos, personal health records, and commercial confidential documents, to the cloud because of their own privacy considerations. Since the corresponding data owner directly loses control of over their sensitive data, once they are outsourced to a remote cloud. Thus, one means to protect the privacy of the outsourced data was encryption. But, data encryption can become an obstacle to traditional applications such as keyword searches based on plain text. To achieve data retrieval from these encrypted data, secure ranked keyword search has attracted the interest of many researchers. The main assumption is that the cloud server seems to be honest. In certain cases, the cloud server may be compromised and might behave deceitfully. A compromised cloud server might return wrong search results to data users, which means the cloud server can return forged search results. For example, the cloud may rank an advertisement higher than others, since the cloud can gain from it, or the cloud might return random large files or it can even return incomplete search results in huge time.A more challenging model is taken into account, where multiple data owners are present, and the cloud server would probably behave dishonestly. Based on this model, the problem of result verification is explored for the secure ranked keyword search. A novel deterrent-based scheme is used here. By means of carefully constructed verification data, the cloud server are unable to know which data owners, or how many data owners exchange anchor data which will be used for verifying the misbehavior of the cloudserver. Moreover, the cloud server are unable to know which data owner's data are embedded in the verification data buffer, or how many data owner's verification data are really used for the verification purpose. All the cloud server is aware of is that, once it behaves dishonestly, it would be discovered very easily. Finally, with specific analysis and in depth experiments, the potency and efficiency of the proposed schemes can be established.

II. Literature Review

Recently, there are many research works regarded with cloud computing's secure keyword search. The first keyword search securely over the cloud data was proposed by Wang et al. [1]. The ranked keyword search problem is explainedover encrypted cloud data, and it also provides an efficient protocol that satisfies the functionality of secure ranked search with some relevance score leakage against privacy of the keywords.

Firstly, in the ranked keyword search, different mechanisms was explored for designing effective ranked search schemes based on the searchable encryption framework. Secondly, the cloud server was prevented from learning the plaintext of either the data files or the searched keywords, and achieved a strong possible security strength when compared to the existing searchable encryption schemes. The user gets the ranked results without letting the cloud server learn any additional information rather than the access pattern and search pattern. However, the ranking is done on the user side, which might bring huge computation and post processing overhead. Moreover, large undesirable bandwidth will be consumed by sending back all the files. One possible way to reduce the communication overhead is to make the server to first send back all the valid entries. User can then decrypt the relevance score and can send cloud server another request so as to retrieve the most relevant files. To support ranked search over encrypted file collection effectively, a cryptographic primitive called order preserving symmetric encryption (OPSE) is used to obtain more practical performance. In this deterministic encryption scheme, the numerical ordering of theplaintexts are preserved by means of the encryption function. Thus by using order-preserving mapping, the server can accordingly rank the files as efficiently as for the unencrypted score. Based on the cryptographic approaches and information retrieval systems, Ibrahim et al. [2] proposed a multi-keyword search over the cloud server which is a ranked searchable encryption scheme. In order to speed up the search task a searchable index is constructed from the text collection. The searchable index must be upgraded into a rank-oriented searchable index so as to facilitate the ranking task. For this numerical relevance scores must be associated with each keyword-document entry in the searchable index. This has to be secured very well otherwise such scores will leak important statistical information about the underlying keywords to the adversary server. Therefore the most important thing is to understand how to encrypt these scores while preserving their ability to rank the relevant documents. Normally orderpreserving symmetric encryption primitive are used to encrypt the numerical relevance scores. But these primitive leaks the relative order of the scores to the adversary server. The privacy preserving mapping (PPM) primitive are used to tackle this problem, thereby securely preserving the values. The security of this primitive can be enhanced to prevent leaking anything, and improve its efficiency so as to fit the requirements of large-scale applications. The set of all relevance scores are encrypted with a randomized encryption scheme and each posting list are associated with a single Bloom filter to store the necessary information for ranking the individual documents of that posting list. Access pattern means that the association between the searched keywords and their corresponding document identifiers should be kept hidden from the cloud servers. The privacy preserving mapping (PPM) is enhanced to encrypt the relevance scores and at the same time it preserves the ability to perform the rank operation.A secure ranked multi-keyword search scheme that supports multiple data owners is proposed in [3]. The problem of secure ranked multi-keyword search in a multi-owner cloud model is explored. A novel secure search protocol is systematically constructed to enable cloud servers to perform secure search without knowing the actual value of both keywords and trapdoors. Different data owners to encrypt their files and keywords using different keys. An Additive Order Preserving Function is proposed to rank the search results and preserve the privacy of relevance scores between keywords and files. As such the most relevant search results are returned by the cloud server without revealing any sensitive information. Data owners use KeyGen to generate keys to encrypt both files and keywords. Keywords encryption are then carefully designed, each data owner will use a secret key to encrypt his keywords and thus the data users can perform secure search over the encrypted files.

III. PROPOSED WORK

This is a multi-owner multi-user cloud computing system model, as illustrated in Fig. 1, they are data owners, cloud server, and data users.

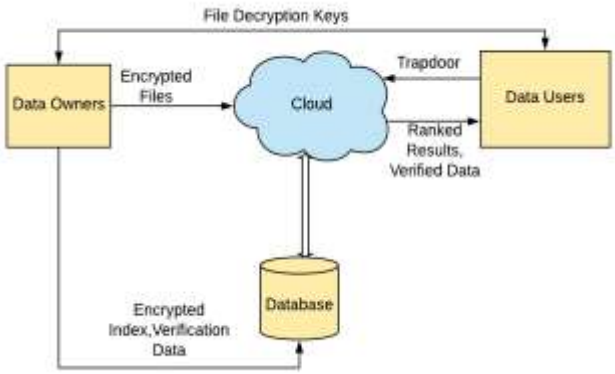


Fig 1: Architecture for verifying the ranked search result in cloud computing

First of all, each data owner constructs index by extracting keywords from his file collection. Index stores a list of mappings from keywords to the corresponding set of files that contains this keyword. Relevance scores are computed between keywords and files. For this, TF*IDF rule is used commonly. TF denote the term frequency, which means the number of times a keyword appears in a file. IDF denotes the inverse document frequency, which means division of the number of all files in the whole file collection by the number of filed that contains the keyword. Relevance score is computed as follows:

$$\text{Score}(w,F_d) = \frac{1}{|F_d|}(1 + \ln f_{d,w}) \ln(1 + \frac{N}{f_w})$$

Where, w denotes the given keyword, $|F_d|$ denotes the length of the file F_d, $f_{d,w}$ denotes the TF of w in file F_d, N denotes the total number of files in the f=collection and $f_w$denotes the number of files containing w.For each keyword, the data owner samples all the files from the corresponding file set, and the file IDs and relevance scores are obtained. Then these file IDs and relevance scores are exchanged as anchor data with other data owners uniformly at random. After obtaining the sampled data and anchor data, each data owner concatenates these data into a string. The encryption of the string is used as each owner's verification data. At last, each data owner outsources his encrypted files, indexes, and verification data to the cloud server. When an authorized data user wants to perform a ranked (top-k) secure keyword search over these encrypted files, he first generates his trapdoor (encrypted keyword) and submits it with variable k to the cloud server. The cloud server returns the top-k relevant files as a result of the received trapdoor. An authorized user then submits a secret verification request. A verification data buffer is further returned by the cloud server. Finally the data user can verify the search results by decrypting and recovering the verification data.In the threat model, both data owners and authorized data users are trusted. However, the cloud server is not trusted and hence it might probably behave dishonestly, which means that the cloud server not onlyaims to reveal the contents of encrypted files, keywords and verification data, but also tends to return false search results and contaminate the secret verification data. The assumption made is that a secret hash function is shared by the data owners and authorized data users. Eg :- SHA1.

IV. Verifying Ranked Top-k Search Results

A. Verification Construction Overview

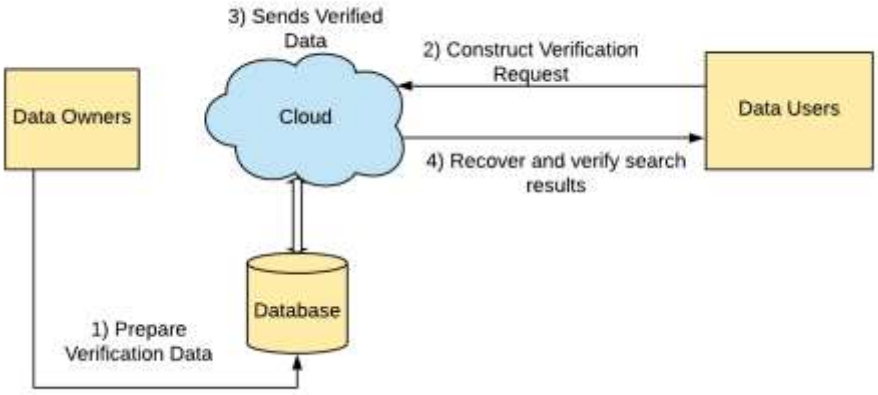


Fig 2: Verification Construction

B. Preparing the Verification Data

1) Sampling from orginal data

In sampling, firstly the data owner samples all the files in the original file collection. Secondly, the corresponding file IDs and relevance scores are extracted. Thirdly, the extracted file IDs and relevance scores are attached to the owner's ID. Assume that a data owner O_i has d files belonging to a keyword w_t. He samples Ψ files from the d files. The following algorithm shows the corresponding process. Firstly, O_i initializes the sampled data as $w_t||$i, where I denotes the owner $O_i's$ ID. Secondly, O_i ranks all files belonging to the keyword

w_t in the descending order of the relevance scores. Thirdly, O_i concatenates FID[0]||$RS_{0,t}$, where FID[0] means the file ID of the file $F_0$and $RS_{0,t}$ means the relevance score computed between the file $F_0$and keyword w_t.

Algorithm for Constructing Sampled Data

Input:$O_i's$ ID, number of sampled data: Ψ, and $w_t's$ file list: FID[d]
Output: Sampled data SD_i
1: Initialize sampled data $SD_i$to w_t||i
2: Rank w_t's file list FID[d] in descending order of relevance scores.
3: Concatenate FID[0]||$RS_{0,t}$ to SD_i
4: Uniformly and randomly generate Ψ-1 number set R where R[i] ∈ [1,d]
5: Rank R incrementally
6: for ind = 1 to Ψ-1 do
7: concatenate FID[R[ind]]||$RS_{R[ind],t}$ to SD_i
8: end for
9: return SD_i

2) ***Exchanging Data among Data Owners***

In the system model, there are multiple data owners. Each data owner do not know the total order for a given keyword. Thus the data owners are unable to verify whether the search results are top-k relevant to the search result or not. On such way to verify is to ask the cloud to return all the relevance scores to different users and let the users compute the top-k results. But this results in huge communication costa for the users. So, here the data owners are made to exchange certain amount of data. Cloud server are unable to know whether a data owner has interactive data of another data owners, since all the operations are performed among the multiple data owners. Thus, the obtained interactive data can be used as a secret data to detect the false search results.

C. Submitting Verification Request

In order to verify the obtained search results, the authorized data user specifies a set of data owners whose verification data need to be returned to support verification. This can be done easily by the data user by simply setting an ID set of his desired data owners. But, the ID set should not be seen by the cloud server. The fundamental reason is illustrated as follows: if the cloud server comes to know which data owner's data are being frequently verified, then the cloud sever can determine that these data owner's data as are very useful or sensitive, and hence these data owner's data would easily become attacker's targets. On the other hand, if the cloud server comes to know which data owner's data are rarely verified, the cloud server may maliciously filter out or even delete these dataowner's data as search results. Thus, a secret verification data construction is proposed to prevent the cloud server from knowing which dataowner's data are actually returned. The construction is as follows:Firstly, the data user enlarges the ID set of verification byinserting random IDs. Assume that if a data user wants to get an owner $O_i's$ verification data, he can add other n-1 data owner's ID in the set. Second, the data user attaches a data 0 or 1 to each ID. If the data user wants to return a data owner's verification data, then he attaches 1 to the corresponding ID, otherwise 0 will be attached. Third, the data user uses Paillier encryption to encrypt the attached 0 and 1. Paillier cryptosystem is a public key cryptosystem which has homomorphic properties. Here an assumption is made such that all the data owners and authorized data users share a key pair i.e. the public key PK and the private key SK for Paillier encryption. Thus 1 will be encrypted to E(PK,1) and 0 will be encrypted to E(PK,0). Since, Pallier encryption is well designed, the same data's cipher text will be different each time. Finally, the ID set together with the attached encrypted data set are submitted to the cloud server.

D. Returning the Verification Data

The cloud server prepares and returns the verification data on receiving the verification request. The cloud sever finds the verification data as specified by the secret ID set and then it performs all the computations on the cipher text i.e on the encrypted 1's and 0's and finally the verification data is returned to the data user. Therefore, the data user receives the verification data when the cloud finishes processing all the ID sets. Here an important factor is that, during the complete process of verification, the cloud is only able to view the encrypted sets. Hence, the cloud server are unable to know about which data owner's data are actually used for verification or returned for the verification purpose. Here, the verification data is returned by means of the homomorphic property of Paillier encryption. Finally, the verification data is returned which is unknown to the cloud. As from

the view point of the cloud, many owner'sdatas are processed but only the needed verification data is returned to the data user.

E. Verifying the Search Results

On receiving the verification data, the data user decrypts the verification data using the corresponding private key SK. A data user can recover the verification data after decryption. The cloud server might contaminate the verification data to prevent the data user from recovering it and detecting its misbehavior. However, cloud will never be able to achieve this misbehavior. The valid reason behind this criteria is that the data user specifies only the encrypted data set, therefore the cloud is unaware of which data owner's verification data are returned by it. Hence, the cloud can never contaminate the verification data because its misbehavior will be detected by the data user.On receiving the data owner's verification data, the data user can further obtain all the sampled data and anchor data. The data user can further use it to determine whether the returned results are correct. After the verification procedure, the data user can find out if the cloud sever has misbehaved or not.

F. Recovering the Search Results

An attacker might analyse the query terms (the encrypted keyword) only by viewing the queries and results through a wireless channel. This means that an attacker may guess the queried keyword by only observing the queried keywords since the result of retrieval is keyword specific. Thus there was a need to avoid the keywords-file association leak in data encryption. To avoid this keyword-file association leak, the data user wraps the encrypted keyword into a tuple by adding some noise to it. Therefore, to perform the retrieval this tuple is used. Then, this tuple is sent to the cloud server along with number k. This wrap method renders the encrypted keyword undistinguishable from the attacker. Upon receiving the tuple, the cloud sever first makes sure that it is accessed by a legal user. If this is a legal user, then the tuple is unwrapped by the cloud sever. It further recovers the keyword and searches for this term in the index. After finding out the relevance scores , the top-k relevant files are returned to the data user. Finally, the data user can decrypt and recover the original files.

V. Results and Discussions

A verification scheme proposed here is novel deterrent based. For search result verification, each data owner constructs a secret verification data which is encrypted with the AES encryption. Therefore, the verification data is secure as long as the AES encryption is secure. The verification request is encrypted with Paillierencryption , the cloud server only conducts computation on the cipher-texts. Therefore, the verification process is secure as long as the Paillier encryption is secure.The cloud sever performs computations only on the cipher texts, during the complete process of verification. Hence, all the information are kept as a secret to the cloud server. Thus, there are few chances left for the cloud to misbehave. The proposed method not only confirms a strong deterrent against the potential attacks, but also makes sure that the cloud server does not misbehave.

VI. Conclusion

In this paper, the matter of verification is explored for the secure ranked keyword search, below the model where the cloud severs are mostly likely to behave deceitfully. A novel deterrent base scheme is proposed here which is completely different form the previous data verification schemes. Throughout the complete verification procedure, the cloud sever is unaware of which data owner's or how many data owner's are engaged in the verification process. Additionally, the cloud server does not know which data owner's data are present within the verification buffer. The only thing that the cloud server is aware of is that, once he misbehaves it can easily be found out by the data user. A more important factor is that the proposed scheme allows to limit the communication costs for the data users for the verification purpose according to their preferences. This is very useful to the resource limited data users. Finally, through analysis and in depth experiments, the potency and efficiency of the proposed schemes can be confirmed.

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VIII.Acknowledgments

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Effective Parallel Mining of Frequent Item Set in Hadoop Clusters

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Abstract*: Big data is a term that describes the large volume of data – both structured and unstructured – that inundates a business on a day-to-day basis. But it's not the amount of data that's important. ... Big data can be analyzed for insights that lead to better decisions . In the project proposed to an efficient data processing using Lshfp growth algorithm and grouping similar objects for obtaining better decisions. The traditional datamining is based on the fp growth algorithm focused on the load balancing, and distributed among the nodes of the clusters .The process is mainly based on map reduce which highly supported by Hadoop. Hadoop is a efficient popular frame work which supports map reduce and item set miningand using hdfs file storage .Map reduce is that which contains map phase and reduce phase. It aims to decrease network overhead and efficient processing.*

Keywords*:Frequent item set, map reduce, Hadoop*

I. Introduction

Datamining is the process of extracting information from the data in a huge dataset. Frequent item set mining is implemented on Hadoop. Hadoop is a frame work using map reduce. Frequent item set mining is created by inappropriate data partitioning techniques. So that it results less correlation, network traffic and computing loads. FIM is to solve network traffic, reducing computing loads and also the correlation. Map reduce is an efficient programming model on Hadoop. It stores as the clusters. It is an open source model and it solves the problems of huge amount of data and computation. APACHE Software Foundation is the developer of Hadoop. Frequent item set mining on Hadoop is an efficient parallel programming using map reduce.

Frequent mining set algorithms are divided into apriori schema and fp growth schema .apriori schema contains generate phase and prune phase. Fp growth is frequent pattern mining method without using candidate generation than apriori schema. Which creates a conditional pattern with the support. Frequent mining is a major issue for the sequence mining and association rule mining. Because of the speed and more amount of mining time and high computation. Map reduce is adopt to overcome these problems. Map reduce is processing dataset parallel and load balancing. It is an efficient method for FIM. Map reduce have two phases, map phase and reduce phase. The map phase that divides the task into n number of fragments. The input data small number of fragments as the key value and gives an intermediate result. Reduce phase taken the result of map phase and which gives the output of the collection values.

In a particular set of transactions, association rule mining or frequent itemset mining leads to find the rules that can be enable businesses to predict the occurrence of a specific item based on the occurrences of the other items in the transaction. This technique can used to analyze various types of datasets.

- **Basket data analysis** – To analyze the association of purchased items in a single basket or single purchase.
- **Cross marketing/Selling** – To work with other businesses that complement your business, but not your competitors. For example, vehicle dealerships and manufacturers have cross marketing campaigns with oil and gas companies for obvious reasons.
- **Catalog Design** – The selection of items in a business catalog are often designed to complement each other so that buying one item will lead to buying of another.
- **Medical Treatments** – Each patient is represented as a transaction containing the ordered set of diseases, and which diseases are likely to occur simultaneously or sequentially and can therefore be predicted

II. Existing system

Large number of algorithms are introduced for the map reduce framework. Map reduce is the work that counting the data set parallel. Apriori based frequent itemset mining [3] they proposed three algorithms that are Single pass counting (SPC) is the map reduce includes with frequency counting steps and the candidate generation. Fixed pass counting (FPC) is counting the candidate set with n different lengths after p phase. They also count their frequencies. Dynamic pass counting(DPC) is like fpc that n and p generating dynamically in each phase with number of generated candidates.

The basic apriori based on bottom up approach and it quickly results the short frequent item sets. Apriori algorithm have two stages:

- Generate phase
- Prune phase

Disadvantage of this apriori algorithm is, It is a combinatorial explosion and it didn't manage with long frequent items set, and also algorithm is generate a large number of candidate set and also the candidate using repeatedly. It is costly for each transaction to obtain the support value for candidate item set.

Eclat algorithm: It is first set based algorithm used for the vertical database layout. The items are stored in the cover and it is used as the tid list. It is an intersection based approach to calculate the support of item set. It is only suitable for less number of item sets and short time for frequent pattern generation than apriori algorithm. Disadvantage of this is it have a large tid list and takes large space to store candidate set. It required more time when tid is large.

Parallel fp growth: I t is a parallel mining algorithm. It mainly focused for load balancing and by equally partitioning data by the results of the fp growth. Parallel fp growth groups the iems in the fpming result. Parallel fp mining is not efficient neither memory nor speed. But it scans the whole database in the memory. But prohibitive in the case of big data.

FP growth algorithm: Fp growth algorithm is a frequent item set mining technique without the candidate generation. It is a tree based structure with minimum support. It scans the data and discard infrequent items. It counts the support value and displays in the descending order. The disadvantages are it may not fit in main memory. Execution time is large when it is complex compact data structure .

Recover data from big data is still a complex and time consuming approach. Mapreduce frame work using Hadoop and stream frame work using spark and SQL style processing geo-distributed frameworks .It is a very efficient processing methods for the large amount of locally distributed data .i.e many organizations are in different locations and datacenters across the globe ,or even in the same country. Here map reduce and spark based different methods , challenges and advantages are present in the Hadoop and spark. In Hadoop the output stored in the disc and spark is stored in the main memory. So the spark supporting real time computation, fast and efficient processing. But for the efficient geo-distributed big data processing ,the widely used method is the map reduce because it can implement in an efficient and fault tolerant manner in private and public clouds. Geo-distributed Big data support for geo-distributed applications, enrich datasets and big performance, providing geo-security and geo privacy mechanisms, handling dc failures and natural disasters**.**

III. Proposed System

1.1 Partitioning of Data

Data partitioning is based on voronoi diagram based partitioning . voronoidaigram technique is divided spaces into number of parts. For the selection of group select apivote(seed) at preprocessing phase. For each pivot

there is a corresponding transaction consisting of all data points closer to it .The regions for corresponding pivot are called voronoi cells.

1.2 Distance Metric

To calculate the correlation between the transactions is using Jaccardsimilarity . A Jaccard similarity value 1 indicates two transactions are highly correlated. The relation between of two transactions A and B is given as be

$$J(A,B) = (A \cap B) / (A \cup B)$$

J(A,B) is a value in between 0 to 1,if it is zero then row set is not compleatly equal, if it is 1 then the row set are same.

1.3 Selection of pivots using clops

Pivot selection is the major process in partitioning the data. CLOPE algorithm, proposed by Yiling Yang, Xudong Guan and Jinyuan You yet in 2002 and adopted by Nikolay Paklin in 2017. principally new clustering CLOPE algorithm which is a more efficient alternative to the existing k-means and c-means algorithms to perform a better clustering, compared to the already existing algorithms used at the meanwhile.

1.4 Partitioning Strategies

The two data partitioning strategies are MinHash and LSH-Based partitioning. MinHash has major role in the Locality Sensitive Hashing.

1.4.1 MinHash

MinHash is helps to to obtaining the similarity between two sets.. MinHashing technique is majoritively using for dimension reduction huge sets to the smaller sets called “signatures”.Two phases to generate signatures.

1) Characteristic matrix
2) MinHash Signatures

Characteristic matrix

Characteristic matrix can be from FList (frequent List) and original dataset. Where rows represent transaction and column denotes items in the transaction. For a given Dataset D= {T1, T2, .Tk}, which contains m items.

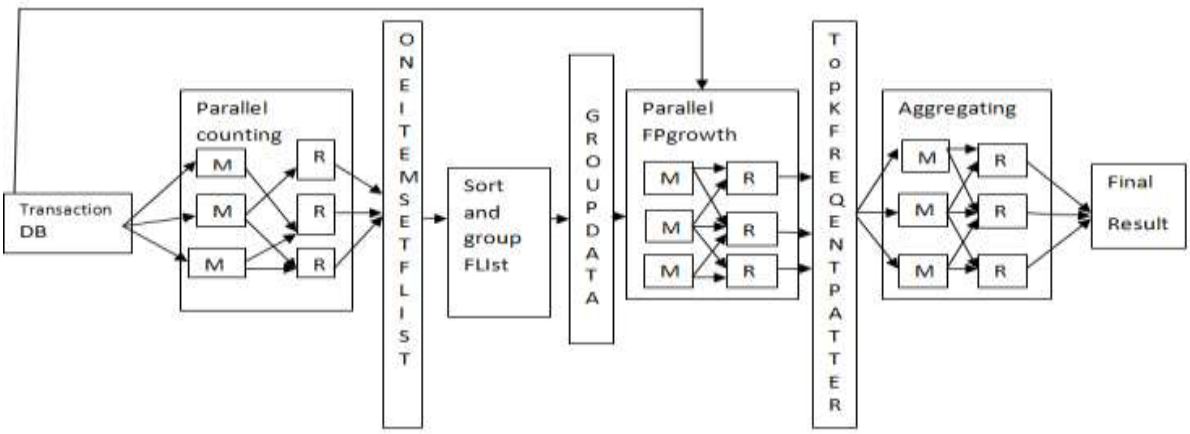
1.4.2 MinHash Signatures

Signature matrix can be constructed by characteristic matrix in every item and generates hash function. Characteristic matrix and signature matrix consist of same number of columns but very less rows, thereby reducing the dimensions.

LSH-Based partitioning

Based on the banding method, the signature matrix are divided into (b x r) where b represents the number of bands. Each band consists of maximum rows. For each band a hash function is defined. The function takes column of its corresponding band and hashes them to large number of buckets. We can use the same hash function.

Figure 1 System architecture of pfp



IV. Implementation

The implementation consist of three phases that selection of k pivotes and then it is the input of the coned phase map reduce. Frequent list item means the set of transactions (20050) with 17 attribute list. Taking frequent

list by using fp growth and they have a support value. Fp growth results with the combination of attribute list in the total transaction and its support value(number of transactions of x&y in the total transaction).

In the pivote selection stage first calculating the correlation by means of jaccard similarity. Jaccard similarity is the calculation of characteristic or pattern for selecting groups. Using k means creating pivote id. Using jaccard similarity there is four correlation values and connected to the pivote id(k means),corresponding frequent list(fp mining) and serial number(Db).The Db split to items and if it is in the first which is add to the array.

Algorithm 1: LSH-fp-growth

Input: FList, n pivots, DBi;
Output: Transactions for each Group id
1: MAP function contain(key as offset and values as Databasei)
2: load FrequentList(FList), m pivots;
3: Grouplist will be generated from the FList and m pivots
4: for each Transaction in Database perform
5: split the items in transaction and store it as items[]
6: for every item in items[] perform
7: if items is present in FList then store the item in b[]
8: if end
9: for end
10: put the Generated-signature matrix(b[]) into arraylist of signaturematrix;
11: For end
12: For every ((column)i in signature matrix) perform
13: divide column of the signature matrix into B bands with r rows;

14: Store the column in Hashbucket using hashmap
15: For end
16: if one band of column in signature matrix and pivot pk is mapped in to same bucket do
17: Assign j to the Gid;
18: Output contains Gid and new transaction tree of bi
19: If End
20: For each Grouplist (transaction≠i) do
21: if column in sigmatrix contains item in Grouplist then
22: Assign Gid to t;
23: Output contains Gid and new transaction tree of bi
24: If end
25: For end
26: Function end

Input: transactions corresponding to each Gid;
Output: frequent k-itemsets
28: Reduce contains key as Groupid and values as database
29: Load Grouplists;
30: perform Grouplist according to Gid
31: perform local fp growth
32: for all (Transaction in Database Gid) do
33: build FP tree for the transaction34: for end
35: for all element in b do
36: Define maxheap with the size n
37: perform TopnFpgrowth in maxheap
38: for all transaction in TopnFpgrowth
39: Output contains final transaction and support
40: for end
41: for end
42: function end

In the signature matrix take the array of items. Byte value for each item(>>24,>>16,>>8,value) and stores corresponding hash index 0,1,2,3 .it divides columns into b bands and r rows .Stored in the hash buckets.it results a new transaction tree with a groupid.

ALGORITHM 2 : Creation of SIGNATURE-MATRIX

Input: item transaction matrix of b[];
Output: generated signature matrix b[]
1: Function to generate signature matrix of b[]
2: For N number of hashfunction
3: Assign every value in MinHash to max integer;
4: For end
5: For each(j=0;j<numberOfhashfunction;j++)
perform
6: For every element in the b[ ] perform
7: Convert element to integer and store in value

8: Convert byte to hash of value and perform left shift 24 <- bytetohash[1];
9: Convert byte to hash of value and perform left shift 16 <- bytetohash[2];
10: Convert byte to hash of value and perform left shift 8 <- bytetohash[3];
11: Convert byte to hash of value <-bytetohash[4];
12: hashindex ← hashfunction [j]*hash(bytesToHash);
13: if(minhashvalue[j]) >hashindex then
14: minhashvalues[j]=hashindex;
15: if end
16: For end
17: For end
18: Function end

Reduce

Using groupid and database it build a local fp tree and using the maximum heap value by heapsort it generates a final result.(a: abc, adc, acd, b:abc ,bac, cab).

V. Results Discussion

Table 1: Data set Description

Dataset name	No.of Transactions	No.of distinct items	Average transaction length
Banking	**20050**	**5109**	**17**

The data is related with direct marketing campaigns of a Portuguese banking institution. The marketing campaigns were based on phone calls. Often, more than one contact to the same client was required, in order to access if the product (bank term deposit) would be ('yes') or not ('no') subscribed.

The ouput obtaining that in a cluster by calles a query. For example seconed mapreduce is more complicated and it results abc, adc, bdc. Then the final output for each item is a:abc,adc,acd etc With the maximum support.Here taken low ,moderate and high which indicates 0-30,30-70 ,70-100 support values with the id. Less memory utilization compare than other methods because of using the hashing techniques, so it I an efficient method. The results are analyzed and evaluated in terms of Accuracy , Memory usage , Execution time. The proposed method is compared with the existing method and the proposed work is implemented in VISUAL STUDIO 2010.

K-means clustering[1] was actually the first algorithm that was considered to be the most applicable for producing users-to-items recommendations based solely on performing the partitioning of n - observations into k - standalone clusters. According to the followingclope algorithm, each specific cluster normally consists of a pair of two datasets, one - for centroids and another one - for items belonging to a current cluster. Centroids typically represent central items of a cluster, having its features that are very common to each particular item that has been put into a cluster. Specifically, while using k-means clustering to produce users-to-items recommendation, dataset of centroids (i.e. cluster's central items) normally represents a set of users for which a list of recommended items is generated. Also, let's remind that the requirement for performing k-means cluster is that each cluster must contain at least one centroid (i.e. user) and a dataset of multiple items.

Clop algorithm perform a better clustering and produce more quality recommendations, we need another clustering algorithm that would use a different approach for measuring the similarity of observations which

features cannot be represented as numerical values, providing a desired quality of clustering, and, at the same time, reducing the computational complexity compared to the complex k-means clustering algorithm.

Impact of pivote number

Compared with clope and k means cluster algorithms running cost is lesser than kmeans algorithm with respect to the clopealgorithm,also shuffling cost equal in the kmeans and clop algorithm, with respect to the number of pivotes.

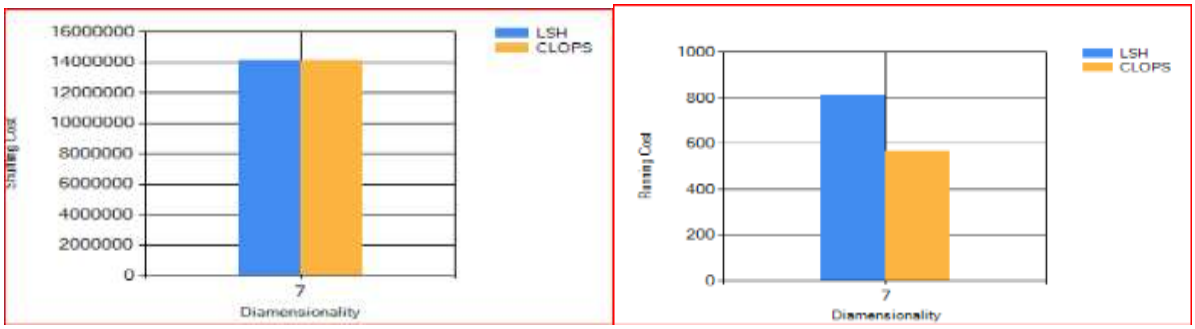
Figure 2: Running TimeFigure iv.Shuffling Cost



Impact of Diamensionality

Parallel frequent item mining algorithms kmeans and clops are equal in the case of shuffling cost.andclope is giving better running time than kmeans in the diamensionality when the diamensionality is 7. Clope giving the better performance than kmeans clustering with respect to the selection of pivotes.

Figure 3: Shuffling CostFigure vi.Running Time



VI. Conclusion

This paper, proposed parallel mining of frequent item set mining using map reduce. Initially, the direct marketing campaigns of data set is selected and uploaded . After that, the preprocessing technique is used to select the pivote and flist. These data are classified depends on threshold values and the clustering algorithm is used to detect the support values among clusters to discover frequent item. Finally, these frequent item set is used to order the data and the output is merged as groups in the cluster of hadoop. The proposed method is provide the high accuracy, less execution time and less memory usage. It provides the better result compared than existing. In future, the dimensionality of the nodes are increased in frequent item set mining on Hadoop.

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Credit Card Fraud Detection using Aggregation Strategies and Majority Voting

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Abstract: *The usage of credit cards for online as well as regular purchases has dramatically increased and so is the fraud related with it.Credit card fraud is a most popular word for fraud committed using a credit card.A large number of fraud transactions are occurring every day. Various types of present day techniques like data mining, genetic programming etc. are used to detect non genuine transactions. Many solutions were proposed in order to detect fraud transactions but they all faced some common disadvantages namely concept drift, class imbalance and verification latency. Also many learning strategies were proposed in order to prevent the aforementioned challenges but they all faced some disadvantages. This paper proposes a better learning strategy which comprises of training two classifiers with different sets of feedbacks and thus aggregating the probabilities provided by the classifiers for a single transaction in order to detect the alerted transaction. Main aim of this strategy is to increase the precision of classifier thus producing more accurate classification results. Also we use majority (plurality) voting in order to correctly identify label of a class by analyzing total number of votes produced by each classifier for a single transaction.*

Keywords: *Credit Card; Machine Learning; Random Forest; MLP; Aggregation; Majority Voting*

I. Introduction

Credit card Fraud is a seriously growing problem worldwide. Billions of dollars are lost every year due to fraud transactions. The most accepted payment mode is credit card for both online as well as offline transactions because people doesn't need to pay cash at every shop in all countries. Virtual card is used for online shopping and physical card is used for offline shopping. In a physical card based purchase, the cardholder will directly present his card to the merchant for making a payment. Fraudulent transactions are carried out in this type of purchase by stealing the credit card .If the card holder is not aware of the loss of his credit card, then there would be a substantial loss of money. If it is in the case of online payment mode, attackers need only a very little information like secure code, card number, and expiration date and so on. In these types of purchases the transactions would be carried out mainly through internet or telephone. It is very easy for the fraudsters to commit fraud if they know the card details. Genuine cardholders would have no clue about the fact that some attackers have their credit card information. These kind of frauds can be detected by analyzing the spending pattern of the cardholders and any kind of abnormalities can be figured out by observing unusual spending pattern from the usual one. Various techniques like Hidden Markov Model could be used for this purpose. Credit card fraud is one of the oldest, common and dangerous threat because of the widespread usage of credit cards and the convenience it offers to the customers. Credit card also provides various types of benefits like cash back, rewards point and discount offers during purchases which often tempt the customers to use credit cards instead of money for their shopping. The use of machine learning in fraud detection has become an interesting research topic in recent years. Different detection systems based on machine learning were successfully used to tackle this problem. This includes neural networks, hybrid model, support vector machines, peer group analysis and so on. Many strategies came into existence to detect fraud transactions but they all failed to identify fraud transactions accurately. This is mainly because fraudsters come up with new brilliant techniques to commit fraud transactions even without the system noticing the illegal action. Therefore it is very crucial to bring a credit card fraud detection strategy which accurately detects fraud transactions while successfully minimizing fraud cases. For that we come up with a new learning strategy which involves training the classifiers with feedbacks obtained from previous transactions with an aim to increase the precision and accuracy of the classifier thereby producing correct prediction. These feedbacks are provided to the classifier by means of an

alert feedback interaction mechanism. The classifier is updated with new set of feedbacks provided everyday which helps in increasing prediction accuracy. But we should make sure that the classifier is updated with correct feedbacks else this results in wrong prediction.

II. Literature Review

Many systems came into existence in order to detect fraud transactions. Some of these existing systems applied neural networks, Hidden Markov Model, Support Vector Machine, Genetic Algorithm, Logistic Regression and so on. A brief review about various existing systems are provided below.

P.Amarnath Reddy et al. [1] proposed a technique to detect credit card fraud using Hidden Markov Model. Fraud Transactions are detected using this technique while the transaction is being processed and not after the transaction is done. Hidden Markov Model helps to obtain greater amount of fraudulent transactions along with lesser false alarm rate. Also they included SMS functionality to card holders regarding the fraud transaction details so that the card holders can be notified in advance and would prevent fraud transactions to a great extent. A Hidden Markov Model is a finite set of states where each state is linked with a probability distribution. Transition between these states are controlled by a set of probabilities named as transition probabilities. For a specific state, a probable result can be obtained. It is only the result and not the state that is viewable for an outside observer. As a result, the states are masked from outside, therefore the name Hidden Markov Model is given. Hidden Markov Model is an apt solution for detecting fraud transactions for a great extent. An important advantage of HMM based method is the number of decrease of false positives identified as fraudulent by fraud detection system even they are really genuine. At first we need to find whether the transaction amount belongs to low, medium or high category. This method does not require fraud signatures and detect fraud transactions by analyzing the spending behavior of cardholder.HMM model detects fraud transactions by creating groups of training set and identify spending behavior of the customer. If the system makes sure that the transaction is a fraud transaction, then it raises an alarm and bank denies the transaction.

Sushmito Ghosh et al. [2] proposed a credit card fraud detection technique using neural network. The neural network was trained using instances of fraud occurred through lost cards, robbed cards, application fraud, counterfeit fraud, mail-order fraud and NRI fraud. The network detected significantly more fraud account with significantly less number of false positives as compared to rule based fraud detection methods. The neural network used in this fraud detection feasibility study is the P-RCE neural network The P-RCE is a member of the family of radial-basis function networks that have been developed for application to pattern recognition. The P-RCE is a three-layer, feed-forward network that is differentiated by the usage of two training passes through the dataset. The neural network used in this fraud detection feasibility study is the P-RCE neural network The P-RCE is a member of the family of radial-basis function networks that have been developed for application to pattern recognition. The P-RCE output layer consisted of a single cell that outputs a numeric response that can be considered as a fraud score. This is often comparable to credit scoring systems that produce a score, as opposed to a strict probability. The sole objective of neural network training process is to appear at a focused or trained network that produces a fraud score that ultimately provides the best ranking of credit card transactions. If the ranking was perfect, then all of the transactions with higher score above some threshold would be fraud and below this threshold, only good transactions would be ranked. We also use a rank curve to determine the fraud detection accuracy.

Masoumeh Zareapoor et al. [3] proposed a technique named Fraud Miner in order to detect fraud transactions. During the first training phase, legitimate transaction pattern and imposture transaction pattern of each customer are created from their legitimate transactions and imposture transactions, respectively, by using frequent item set mining method. Then during the testing phase, the matching or parallel algorithm detects and finds out the pattern to which each upcoming transaction matches more. If the transaction is matching more with legitimate pattern of the particular customer, then the algorithm returns 0 if transaction is a legitimate transaction and if the transaction matches more with imposture pattern then the algorithm returns 1 which means it is a fraudulent transaction. For pattern database construction, we need to separate each customer's transactions from the whole transaction database from each customers transaction set separate legitimate and imposture transactions. Then Apply Apriori algorithm to the set of legitimate transactions of each customer. This algorithm provides a group of frequent item sets. Take the largest frequent item set as the legitimate pattern corresponding to that customer and store these legitimate patterns in legitimate pattern database. At last apply Apriori algorithm to the set of imposture transactions of each customer. This algorithm provides a group of frequent item sets. Then we would take the biggest frequent items group as the imposture pattern corresponding to that customer. Then they store these imposture patterns in imposture pattern database. After finding the legitimate and imposture patterns for each customer, the fraud detection system checks these imposture and legitimate pattern databases in order to detect impostures. If a closer match is found with legitimate pattern of the corresponding customer, then the

matching or parallel algorithm returns 0 which shows a green signal indicating the bank to allow the particular transaction. If a closer match is found with imposture pattern of the corresponding customer, then the matching algorithm returns 1 giving an alarm to the bank to stop the particular transaction. Besides these, there are many other existing methods for detecting credit card frauds.

III. Real World Fraud Detection System Model

The below figure shows a real world fraud detection system (Real world FDS).

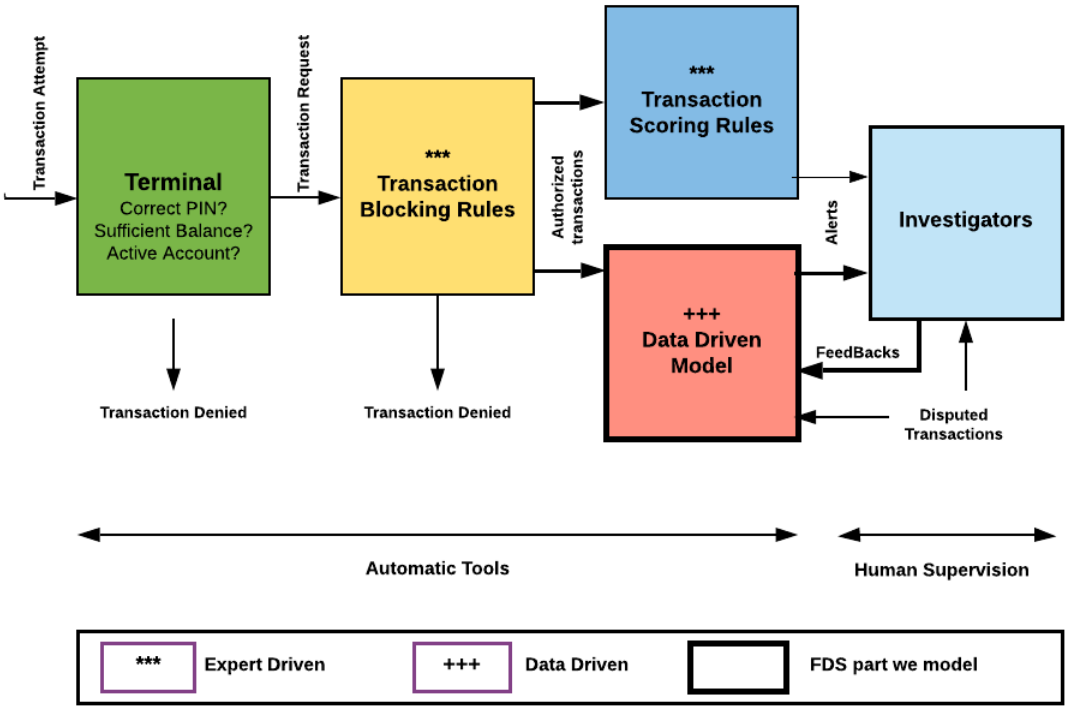


Fig 1: Figure illustrating the Layers of Control in a FDS

A. Modules in a Fraud Detection System

There are mainly five modules in a Real World Fraud Detection System. They are:-

a) Terminal
b) Transaction Blocking Rules
c) Transaction Scoring Rules
d) Data Driven Model
e) Investigators

Terminal

Terminal is the first layer of fraud detection system. All transaction attempts are made on this layer. Main job of terminal is to perform security checks on each transaction attempt. Security checks include checking the status of account i.e. whether active or passive, whether the PIN number is correct, whether the account has sufficient balance to make a payment and so on. Those transaction attempts that pass the security checks provided by the terminal is converted into a transaction request and is passed onto the second layer of FDS namely Transaction Blocking Rules. All other transaction attempts are denied.

Transaction Blocking Rules

Transaction blocking rules is the second layer of fraud detection system. Blocking rules are If-else or If-then statements that are manually designed by the investigators. An example of blocking rule include: If a Pin-based transactions is done in Europe and in Asia within 5 min from the same cardholder then deny the transaction. These blocking rules should be very precise and should raise only a very few false alarms. There should not be any genuine transaction to be blocked because of these blocking rules. Therefore these rules must be designed by the experts with utmost care. Those transaction requests that pass the transaction blocking rules are converted into an authorized transaction and is passed onto the third layer of FDS namely transaction scoring rules. Other transaction requests are denied.

Transaction Scoring Rules

Transaction scoring rules is the third layer of fraud detection system. Scoring rules are also If-else or If- then statements that are manually designed by the investigators. Scoring rules operates on feature vector and provides a score for each authorized transaction based on features. Higher the score, more likely the transaction to become a fraud. Therefore Scoring Rules act like a rule based classifier. An example of scoring rule include: If Internet transaction in fiscal paradise and amount greater than 1000, then fraud score = 0.90.These rules are easy to understand and faster to deploy but need manual revision when their performance drops. As a result these rules are expensive to maintain.

Data Driven Model (DDM)

Data driven model is purely data driven and uses a classifier to estimate the probability of each transaction to be a fraud. This probability is termed as the fraud score associated with each transaction. This layer cannot be manually modified by experts. The Data Driven Model is trained everyday by using a set of labelled transactions.DDM can only be updated if sufficient number of transactions are available.DDM or the classifier should be updated by using correct feedbacks otherwise it seriously affects the prediction or classification accuracy. Those transactions with higher fraud score is considered an alerted transaction and is sent to the fifth and final layer of FDS i.e. the Alert investigating team (Investigators).

Investigators

Investigators are human professionals who are experienced in dealing with alerted transactions. Investigators contact the corresponding cardholders to determine whether the alerted transaction is actually genuine or not. If cardholder says that was genuine, then that transaction would be labelled genuine and if the cardholder has no idea about such a transaction, then it would be labelled fraud and the corresponding credit card would be blocked. Those set of transactions labelled genuine and fraud are termed as feedbacks. These feedbacks are sent to the DDM (classifier) in order to update it. If the cardholder has responded quickly about the transaction to the investigator, then this type of feedback is termed as recent feedback .If the cardholder has not responded about a particular transaction, then that transaction would be labelled genuine after a specified number of days. These types of feedback is termed as Delayed feedbacks. The delay with which a class receives a label is termed as verification latency. Thus the DDM will be trained with these new set of feedbacks which results in better performance of the classifier. Investigator's feedback are the most recent supervised information available to FDS. The mechanism of sending the result (feedback) of alerted transactions back to the DDM (classifier) is termed as alert-feedback Interaction.

B. Drawbacks of Real World FDS

Some disadvantages of above system are mentioned below:-

a) Investigators can only verify a limited number of transactions per day.

b) Since unlabeled transactions are labelled as genuine after a specified number of days, the classifier would be updated with wrong feedbacks.

c) Decrease in classification and prediction accuracy.

d) Poor Performance.

e) Time consuming process.

IV. Proposed Learning Strategy

Since updating the DDM or classifier with wrong feedbacks results in decreased classification accuracy, we should ensure that feedbacks should be correct. Also the investigators cannot verify all the alerted transactions produced by the DDM because millions of transactions are processed every day and at least 20 \% of them would be alerted which would definitely be a large number. This much number of alerted transactions would not be verified by investigators and there is a large probability for them to skip some of them by chance. Also those transactions with higher fraud score or high probability for being a fraud would be considered as an alert. Not all of these would be a fraud transaction. When too much of false alarms are raised, investigators will skip further alerts thinking that they might also be false alarms. Therefore the DDM (classifier) should be trained in such a way that it should raise only precise alerts thereby increasing fraud detection performance. For that a better learning strategy is proposed.

A. Implementation of Proposed Learning Strategy

Proposed Learning Strategy consists of separately training the classifiers with two sets of feedbacks. One classifier is trained with recent feedbacks and other classifier is trained with Delayed Supervised Samples or simply Delayed feedbacks. Classifiers are trained with feedbacks of Q days and delayed samples of M days. In order to classify the transactions provided at day t+1, classifier updated with feedbacks from day 1 to day t is used. This means if we need to classify a transaction provided today, classifier updated with feedbacks till previous day (yesterday) is used. Therefore the classifier is being updated periodically to provide better performance. After that a single transaction is been provided. Both the classifiers provides a probability for the given transaction. This probability can be termed as the posterior probability and is the fraud score associated with the transaction. This posterior probabilities from two classifiers for a single transaction is aggregated by using the formula mentioned below in order to detect the final transaction to be alerted.

Equation for Aggregation: $P_{A_t}(+ \mid x) = \alpha P_{F_t}(+ \mid x) + (1-\alpha) P_{D_t}(+ \mid x)$

B. Techniques Used For Implementation

In this work we used Random Forest and Multi-Layer Perceptron as the two classifiers. Random Forest Classifier is trained with recent feed-backs and Multi-Layer Perceptron classifier is trained with delayed feed-backs. Both these classifiers provide a probability or fraud score for each given transaction.

Random Forest Classifier

Random forest [4] is an ensemble of decision trees. The basic idea behind ensemble methods is that a group of "fragile learners" come together to form a "powerful learner." Random forests has a larger number of decision trees. Here each individual decision tree is a "fragile learner," while all the decision trees taken together are a "powerful learner." When a new object is to be classified, it is run down in each of the trees in the forest. Each tree gives a classification output or "vote" for a class. The forest classifies the up to date object into the class having large number of votes. Random forests are quick and they can systematically handle unstable and big databases with thousands of features. .Random Forest is considered as highly accurate and robust method because of the number of decision trees taking part in the process. Random forest does not suffer from over fitting because it takes average of all predictions which cancels out the bias. Random forest algorithm can be used in both classification and regression problem and also it can handle missing values.

Multi-Layer Perceptron Classifier

Multilayer perceptron is a feed forward artificial neural network that maps set of input data into a set of appropriate output. It is a supervised learning algorithm that learns a function by training a data record .It is different from logistic regression, in that between the input and output layer, there can be more than one nonlinear layers termed as hidden layers. Main advantages of Multi-Layer perceptron is the capability to learn nonlinear models and the capability to learn model in real time. Neural network have been used to solve a number of difficult problems and these networks are particularly useful when the statistics associated with a mapping of received inputs to a desired output are not completely known or are non-linear. The MLP yields a simple feed forward network that accomplishes this mapping.

Weka

This work is carried out with the help of Weka which is a data mining tool. Weka is a group of machine learning algorithms for data mining missions. Weka holds tools for data pre-processing, classification, regression, clustering, association rules and visualization. Weka provides instant access to various types of classifiers like Random Forest, Naïve Bayes, Multi-Layer Perceptron, Decision Stump and so on. Mainly the dataset would be converted from CSV format to ARFF format so it could be easily read in Weka interface.

C. Benefits of Proposed Learning Strategy

a. Alerts only those transactions that both classifiers F_t and D_t most probably consider as fraud.

b. Assigns larger importance to feedbacks in order to get precise alerts

c. Improved Fraud detection Performance.

D. Algorithm for Proposed Learning Strategy

Require : Qand M, i.e., the number of days of feedbacks and delayed samples to use, respectively: F_t and D_t are the classifiers previously trained.

$T_{t+1} \leftarrow$ transactions at day t + 1.

For each transaction $x \in T_{t+1}$ **do**

Compute $PF_t (+ \mid x)$

Compute $PD_t (+ \mid x)$

Compute $PA_t (+ \mid x)$

Rank T_{t+1} according to $PA_t (+, .)$

Generate Alerts A_t

If update the classifier **then**

$F_{t+1} \leftarrow$ feedbacks from cards alerted in A_t

$F_{t+1} \leftarrow$ **TRAIN**($\{F_{t+1,\ldots\ldots},F_{t-Q}\}$)

$D_{t+1-\delta} \leftarrow$ transactions authorized at t+1-δ

$D_{t+1} \leftarrow$ **TRAIN**($\{D_{t+1-\delta,\ldots\ldots},F_{t-(\delta+M)}\}$)

Return F_t , D_t and A_t .

E. Feature Selection

When creating a credit card fraud detection system, it is very essential to use those features that allow accurate classification. Feature selection mechanism can be used to increase the accuracy and precision of classification process. Most of the attributes or features used in the data set would not be useful in classification, therefore we need to select some most important features that actually contribute to classification. We could use Random Forest Feature Selection algorithm for selecting relevant features. Random Forest provides us with two uncomplicated and simple methods for Feature selection. They are Mean decrease impurity and Mean decrease accuracy.

a) Mean decrease impurity

Random forest has a large number of decision trees. Each and every node in the decision tree is based on condition on single feature. This is designed in such a way so that the data records can be split into two parts with similar response values ending up in the same group. The measure based on which this particular condition is chosen is termed as impurity. In case of classification, it could be termed as gini impurity or information gain (infogain) and in case of regression trees, it is termed as variance. While training a tree, we can calculate the decrease in weighted impurity of tree by each feature. In case of a forest, we can take the average of impurity decrease by each feature and features are ranked based on this measure. But, we should be aware of few things while we are using impurity based ranking. At first, selecting features based on impurity reduction is inclined towards variables with greater number of categories.Secondly, if the data record has more than two correlated features, then any one of these features can be used as predictor and no one has preference over the other. But a problem faced is that, if one of them is used, then the importance of other features is significantly reduced because the impurity they have removed if selected is previously eliminated by the initial feature. Therefore they will have lower reported importance. If we need to use feature selection to reduce over-fitting, then it would not become an issue because this removes those features that are duplicated by other features. But in case of data interpretation, this can lead to incorrect conclusion like one of the variable is strong predictor and others in the same group has less important but in reality they are very close in terms of relationship with response variable.

b) Mean decrease accuracy

Another accepted feature choosing method is to directly evaluate the influence of each individual feature on accuracy of the model. The common idea is to permute the values of each individual feature and compute how much the permutation dwindles the accuracy of the model. Undoubtedly, for irrelevant variables, the permutation should have little to no effect on model accuracy, while permuting important variables should remarkably lowers it.

F. Majority Voting

Majority voting technique is often used in data grouping, which consists of a combined model with at least twoalgorithms. Each algorithm makes its own prediction forevery test specimen. The final output is for the one thatreceives the majority of the votes.In Majority Voting, we consider K target classes. When we provide an input, each classifier provides a prediction with respect to target class, producing a total of k predictions.i.e P_a ,P_b .....P_k.Main aim of majority voting is to produce a combined prediction for input x from all k predictions. And we could use a binary function to represent these votes. This family of classifiers are known as Majority vote classifiers or Majority vote learners. In this work, in order to increase the performance of fraud detection, we use this concept of majority voting with Random Forest, Multilayer Perceptron and Naive Bayes[5] as the three classifiers to predict the final output of each class. After that we sum the votes from all K classifiers for each class and the label that receives highest vote is the final or combined predicted class.

V. Results and Discussions

A. Dataset Information

The dataset used in this work contains transactions made by European credit card holders on September 2013.There are a total of 284807 number of transactions out of which 492 of them are fraud. Dataset is highly unbalanced because fraud transactions are very much lesser than genuine transactions. Dataset suffers from class imbalance problem. There are totally 31 attributes present. These attributes can be termed as features. It contains only numerical input variables which are a result of Principal Component Analysis (PCA) transformation. Due to confidentiality issues, they haven't provided original features and more background information about the data. The features that are PCA transformed are represented as V1 to V28.These features are PCA transformed in order to protect user identities and sensitive features. The only features that has not been PCA transformed are Time and Amount. Feature 'Time' represents the number of seconds elapsed between each transaction and first transaction in the dataset. Feature 'Amount' represents the transaction amount. Feature 'Class' is the response variables and takes value 1 in case of fraud and 0 in case of genuine transaction. The dataset is publicly

available for download at the following link: https://www.kaggle.com/mlg-ulb/creditcardfraud. Also dataset provided is in CSV format.

B. Experimental Results

Posterior probabilities provided by classifiers for a single transaction is taken and is aggregated using the equation provided. A threshold value T is set. Those probability value above that threshold is considered a fraud transaction and those below the threshold value is considered a genuine transaction. In this work, value of threshold T is set as 0.95.

TABLE I
RESULTS OF AGGREGATION

	Rank	Date	Slno	Trans_ID	Card_No	ag_value	Result
	1	Sep-08	12	T13	C12	0.95	Fraud
	2	Sep-06	11	T12	C11	0.94	Genuine
	3	Sep-02	2	T3	C2	0.94	Fraud
	4	Sep-02	4	T5	C4	0.94	Genuine
	5	Sep-04	9	T10	C9	0.93	Genuine
	6	Sep-02	3	T4	C3	0.93	Genuine

Majority voting is also implemented considering three classifiers Random forest, Naïve Bayes and MLP. The class is determined considering the majority of votes received for each label.

TABLE II
RESULTS OF MAJORITY VOTING

Trans_ID	Card_No	Classifier_1	Classifier_2	Classifier_3	Majoritycount	Class
T1	C0	0	0	0	0	Genuine
T2	C1	1	0	1	1	Fraud
T3	C2	0	0	0	0	Genuine
T4	C3	0	0	0	0	Genuine
T5	C4	0	0	0	0	Genuine
T9	C8	1	0	1	1	Fraud
T10	C9	0	0	0	0	Genuine

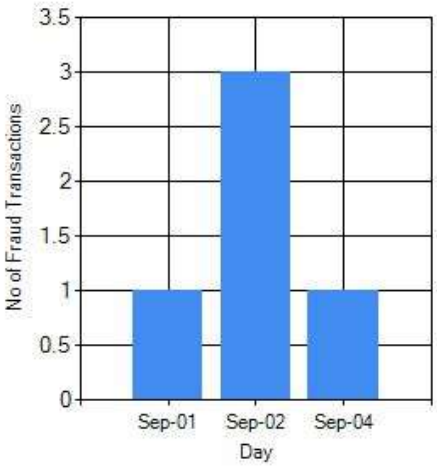
C. Performance Evaluation

Fraud detection performance is measured using two factors. They are alert precision and card precision.

a. Alert Precision

Alert precision can be defined as the number of fraud transactions in total number of alerts handled by the investigators in each day t. Alert precision is denoted by $P_k(t)$.

$$\mathrm{Pk(t)} = \frac{|\ \mathrm{TPk\ (t)}\ |}{k}$$

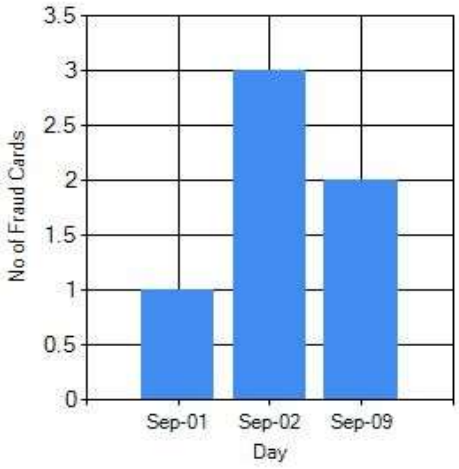


Here the graph is plotted to find the number of fraud transactions for few days in the month of September.

b. Card Precision

Card precision can be defined as the number of fraud cards among total number of cards handled by the investigators. Card precision is denoted by C_k (t).

$$Cp_k(t) = \frac{C_t^+}{\mathrm{k}}$$



VI. Conclusion

This paper proposed a novel learning strategy to identify precise alerts by training classifiers with correct feedbacks. For that one classifier is trained with recent feedbacks and other one is trained with delayed supervised samples or delayed feedbacks. Here larger importance is given to feedbacks. This strategy minimizes the chance for system to raise false alerts thus making the job of investigators simpler. Also the performance, accuracy and precision of the fraud detection system can be measured using various techniques. Here we could measure the alert precision and card precision. Precise alerts are raised because system alerts only those

transactions that both the classifiers consider fraud. In order to increase the accuracy of classification we can select relevant features instead of considering all the features which actually contribute to classification. Also majority voting is implemented to correctly identify the label of a class.

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Cloud Data Security by Fragmentation and Replication

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***Abstract**: Cloud computing is a model for appealing all inclusive, accommodating, on-ask for arrange access to a typical pool of configurable enrolling resources that can be immediately reserved and released with unimportant organization effort or pro center correspondence. This system accordingly accesses the security and performance issues in cloud. This system fragments the file, and fragmented files are replicated over the cloud .Only a single fragment of a particular file is stored on each node. This ensures no meaningful information is exposed to the attacker; even he got success with his attack. Moreover the fragments holding nodes are separated by T-coloring technique to minimize the chance of guessing the fragments locations by the attacker. This system enhances the data security and performance of cloud storage.*

***Keywords:** Cloud computing, Fragmentation, Replication, T-coloring.*

I. Introduction

Cloud computing is shared pools of configurable personal computer framework assets and larger amount benefits that can be quickly provisioned with insignificant administration exertion, frequently over the Internet. Cloud computing depends on sharing of assets to accomplish intelligibility and economies of scale, like an open utility.

Information must address security and protection, particularly with regards to overseeing delicate information. Reliance on remote cloud-put together framework implied going out on a limb with respect to the dangers of re-appropriating everything. Obviously, any cloud specialist co-op is required to oversee and defend the hidden equipment foundation of a sending. Be that as it may, your duties lie in the domain of client get to the board, and it's dependent upon you to deliberately gauge all the hazard situations. In spite of the fact that ongoing breaks of Visa information and client login accreditations are still new in the brains of people in general, steps have been taken to guarantee the wellbeing of information.

The two fundamental components of client's worries about the cloud innovation is the information security and security insurance. This paper intends to examine the different uncertain security dangers in cloud. It likewise portrays the upsides and downsides of the current security system. Additionally presents the current issues in distributed computing, for example, information honesty, information isolation, and security, etc. The inconveniences of the current framework are intensely relies upon the user′s utilized plan for information secrecy. This paper help us to over comes the security issues utilizing discontinuity and replication systems. Centrality and T-shading are the significant strategies utilized here.

II. Related Works

Kasif Bilal Marc Manazano [2] they analyzed the state of art data center network. Data center network can be classified into server centric or hybrid model. The timely data center networks are three tier, fat tree and dcell. Various data center network architecture requires special routing protocol and posses' deployment and management complexity. Their major contribution includes modeling Data center network topologies using multilayered graphs. They individually define a method for multilayered graphs and developed a Datacenter network graph topology generation tools. They measured the several robustness metric under various failure conditions. Robustness metrics are classified here are based on graph theory, metrics consider the service supported by the network. They considered classical robustness metrics as a learning aspect of the data center network as future work to generalize the robustness analysis of the state of the art datacenter network; they performed extensive simulation considering four failure scenario.

Lili Qiu Venkata N. Padmanabhan Geoffrey M. Voelker[3]: In this paper they defined the issues of Web server replica placement in detail and they propose several algorithms that can make the server placement

decision automatically. They expect that a client gets the majority of its substance from a similar imitation. So the investigation of imitation situation centers around the traffic stack produced by the customers while disregarding what content is really downloaded by customers. They utilizes situation calculation and assess the execution of the different arrangement calculations by reproducing their conduct on engineered and genuine system topologies and a few access follows from vast business and government Web servers They additionally address various handy issues when utilizing these calculations online in a substance dissemination system, and concentrate the affectability of the arrangement calculations to blemished data about customer remaining task at hand attributes. They reason that a voracious calculation for explaining the Web server reproduction situation issue can give content appropriation systems execution that is near ideal. Despite the fact that the insatiable calculation relies on evaluations of customer separation and load expectations, they find that it is moderately heartless to mistakes in these appraisals and thusly is a practical calculation for use in the general Internet condition where outstanding task at hand data will dependably be flawed.

Thanasis Loukopoulos, Ishfaq Ahmad[4], they targeted to define an appropriate replica distribute that minimize the network traffic. They also proposed a greedy heuristics called simple replicate algorithm and genetic algorithm based heuristics called genetic replication algorithm. They Evaluate both algorithm extensively and compare them against random search for the case where each object has equal probability to be occurred by any of the sites in the network; as well as the request pattern follows a normal distribution. They likewise handle information replication, for this situation where imitation designation was at that point performed however because of changes in these demand that adjustments are required. When the reproduction dissemination for the item is gotten, changes in access example would result in the calculation being kept running starting with no outside help which is tedious therefore they propose an expansion of GRA calculation called versatile GRA, that gives an officially acknowledged replication conspire and the adjustments in read and compose ask for specific article, it rapidly adjusts the copy appropriation is mirror the new requests. They assess the methodologies and surveyed the tradeoff between running time or arrangement quality. Their trial examination shows that the GRA configurations always outflank the covetous strategy as far as arrangement quality.

Dimitrios Zissis, Dimitrios Lekkas[5]In this paper they depicts the cloud security issues. They endeavor to demystify the exceptional security challenges presented in a cloud domain and illuminate issues from a security point of view. They propose a security arrangement, which use customers from the security load, by confiding in a Third Party. The Third Party is entrusted with guaranteeing explicit security attributes inside an appropriated data framework, while understanding a trust work between included substances, shaping leagues of mists. In this paper proposes utilizing a Trusted Third Party inside a cloud situation by empowering trust and utilizing cryptography to guarantee the privacy, respectability and realness of information and correspondences, while endeavoring to address explicit security vulnerabilities. The idea of trust against a Third Party, communicates the client's confidence in explicit operational, moral and quality attributes, while it additionally incorporates the affirmation of a base hazard factor. Unavoidably distributed computing will bolster an overflow of data frameworks as the advantages dwarf its weaknesses. cloud computing offers sending engineering. They have distinguished conventional plan standards of a cloud situation which come from the need to control important vulnerabilities and dangers. To do as such, programming building and data frameworks configuration approaches were embraced. Arrangement displays an even dimension of administration, accessible to every involved substance, that understands a security work through leagues, inside which basic trust is kept up.

Alessandro Mei, Luigi V. Mancini, Sushil Jajodia[6] proposed a totally dispersed designation calculation that enables every server to store at most one piece of a similar document this framework gives total accessibility, dependability. Appropriated part over a system with the end goal that no two piece are mapped to same server which enhances the affirmation of record as far as security and respectability. Indeed, even within the sight of an effective assault that bargains a subset of the record servers, the document secrecy and uprightness are safeguarded. As the read-compose designs and the area of the customers in the system change, the document distribution changes. This makes the calculation versatile. It gives a higher recurrence of composes that ensures higher classification. Evaluating where the section is perused and composed and accordingly keeping it close makes negligible expense and expands privacy .They propose a dynamic designation calculation which expecting stable read – compose recurrence designs moves pieces between server in such an approach to merge to a mapping with maximal unique affirmation. Furthermore, they propose a model to quantify the confirmation dimension of static and dynamic record assignment conspire in huge scale disseminated framework. They additionally talk about and break down the ideal unique assignment calculation that gives high confirmation, accessibility execution and versatility.

III. Preliminaries

1. Centrality

The centrality of a node in a graph provides the measure of the relative importance of a node in the network. The objective of improved retrieval time in replication makes the centrality measures more important. There are various centrality measures; for instance, closeness centrality, degree centrality, betweenness centrality, eccentricity centrality.

1.1 Betweenness Centrality

The betweenness centrality of a node n is the number of the shortest paths, between other nodes, passing through n. formally, the betweenness centrality of any node v in a network is given as:

$$Cb(v) = \sum_{a \neq v \neq b} \frac{\delta ab(v)}{\delta ab}$$

Where δab is the total number of shortest paths between a and b, and δab(v) is the number of shortest paths between a and b passing through v. The variable Cb(v) denotes the betweenness centrality for node.

1.2 Closeness Centrality

A node is said to be closer with respect to all of the other nodes within a network, if the sum of the distances from all of the other nodes is lower than the sum of the distances of other candidate nodes from all of the other nodes .N is total number of nodes in a network and d(v,a) represents the distance between node v and node a.

$$Cc(v) = \frac{N-1}{\sum a \neq v \;\; d(v,a)}$$

1.3 Eccentricity Centrality

The eccentricity of a node n is the maximum distance to any node from a node n

$$E(v_a)=\max_b d(v_a,v_b)$$

Where $d(v_a,v_b)$ represents the distance between node v_a and node v_b.

1.4 Degree Centrality

Degree centrality, which is defined as the number of links incident upon a node. The degree can be interpreted in terms of the immediate risk of a node for catching whatever is flowing through the network .It usually define two separate measures of degree centrality, namely in degree and out degree.

$$Cd(v) = \sum_{a \neq v} \frac{aij}{N-1}$$

2. T-Coloring

A graph G (V,E) and a set T containing non-negative integers including 0. The T-coloring is a mapping function f from the vertices of V to the set of non-negative integers, such that, |f(x)-f(y)| where(x,y)∈ E. The mapping function f assigns a color to a vertex. In simple words, the distance between the colors of the adjacent vertices must not belong to T

IV. SystemModel

Consider a cloud that consists of N nodes, each with its own storage capacity. $Node_i$ is the ith node $node_i$ is the total storage capacity of the nodes. cost (i, j) denotes the total time of all of the links within a selected path from $Node_i$ to $Node_j$. Fr_N denotes Nth fragment of the file while fr_N represents the size of Nth fragment. Read and write request represented $read_{Ni}$,$write_{Ni}$ respectively. Let Pr denote the primary node that store the primary copy of Fr_N.Replication scheme denoted by replica is also stored at Pr_n .$NrNr_k$ that represent the nearest node storing Fr_k.The centrality measure for $Node_i$ is represented by $centrality_i$ .Colors i can have two values uncolored and colored.The values of uncolored represent that the node is available for storing the fragment. colored shows that the node cannot store the file fragment. Let T be a set of integers starting from zero and ending on a prespecified number. If the selected number is three, then T {0,1,2,3} The set T is used to restrict the node selection to those nodes that are at hop-distances not belonging to T. To minimize the overall network transfer time. Total read time

$$Read_{ki} = rd\ fr_k\ cost(i, NrNr_i^k)$$

total time due to writing a fragment

$$Write_{ki}=wd_i^k\ fr_k(cost(i\ ,\ Pr_k)+\sum_{(j\in Rk)j\neq i} cost(Prk,j)))$$

The over Replication time

$$RT=\sum_{i=1}^{M}\ \sum_{k=1}^{N} Readki + Writeki$$

V. Proposed Work

In Cloud condition, if a document put away in a solitary hub increment the disappointment of security. Single assaults on a hub increment the possibility of putting entire framework under risk. The classification and uprightness of the framework additionally fails. In these cases frameworks, execution regarding recovery time can be upgraded by utilizing replication procedures. Replication expands the quantity of record duplicate inside the cloud network. This will additionally increment likelihood of assault on a solitary node. Replication depends the security of the system. Security, replication and execution are the fundamental for a huge scale system, as both are used to give administrations to the end user. These are adjusted highlights nobody must not be lower than other one. In this framework, a solitary hub ought not to hold whole file. Instead of holding whole record this framework parts the record into pieces and utilizes cloud for replication. The parts are dispersed such a way, that no more pieces are dispersed to a solitary node. This philosophy utilizes controlled replication, that implies it divided documents are reproduced just ones. Controlled replication improves the security of the system. Although, the controlled replication does not improve the recovery time to the dimension of full-scale replication, it fundamentally improves the security. Here the client sends the document to cloud manager. Cloud supervisor sections the record and in first stage he finds an appropriates hub for setting fragments. In the second stage he reproduced the document fragments. The cloud chief keeps record of the section situation and is thought to be a safe element. Fracture limit will be determined by the information owner. The information proprietor can indicate the discontinuity edge regarding either rate or the number and size of different fragments. Data proprietor may create a different document containing data about the piece number and size, for instance. Data proprietor of the record is the best contender to create fracture threshold. The proprietor can best part the document with the end goal that each piece does not contain noteworthy measure of data as the proprietor is discerning of the considerable number of realities.

When the record split into part. Cloud select an appropriates hubs for putting the pieces. The choice of cloud hubs is finished by concentrating on both security and execution as far as access time. Most focal hub to the cloud arrange give better access time to this reason here utilizations the centrality to diminish the entrance time. The centralities decide how focal a hub depends on various measures. In this philosophy actualize with four centrality measures to be specific: (a) betweenness, (b) closeness, (c) eccentricity .All of the parts are submitted on the plummeting request of centrality. So there is a plausibility that contiguous hubs are chosen for section position. These position techniques lessen the security by giving subtleties of the parts to the aggressor. To improve the security of the piece putting process another strategy is presented, T-coloring. It produces a non-negative arbitrary number and assembles the set T beginning from zero to the created irregular number. The set T is utilized to limit the hub choice to those hubs that are at jump separations not having a place with T. For this reason dole out hues to the hubs. At first all hubs are allocated as uncolored. When a part is set on the hub, the majority of the hubs inside the area at a separation having a place with T are doled out shaded. For this situation we lost a few hubs with high centrality however it expands better security. On the off chance that effective interruption to a solitary hub won't give any subtleties of different hubs holding parts. The aggressor can just continue speculating the area of different parts. The likelihood of a fruitful facilitated assault is incredibly minute. The procedure is rehashed until the majority of the sections are put at the hubs. Calculation one speaks to the piece position calculation After the putting sections to suitable hub, It likewise play out a controlled replication to build the accessibility and dependability and furthermore improve the recovery time.

Inputs and initializations:
Fr={Fr_1,Fr_2,...Fr_n}
fr=sizeof(fr_1),sizeof(fr_2),...sizeof(fr_n)}
colors={colored,uncolored}
centrality={$centrality_1$,$centrality_2$,..,$centrality_n$}
colors ←uncolored ∀i
centrality←$centrality_i$∀i
Compute:
for each Fr_k ^{e}Fr do
select $Node^j$ |$Node^j$ indexof(max($centrality_j$))
if $colors_s^i$ = uncolored and s_i>=o_k then
$Node^i$ ←Fr_k
nodei←$node_i$ -Fr
$colors_{si}$ ← colored
$Node_{Si'}$ ← distance(Node $_i$, T)
$Color_{si}$ ← colored
end if
end for

Fragment Allocation Algorithm

We place the fragment on the node that provides the decreased access cost with an objective to improve retrieval time for accessing the fragments for reconstruction of original file. While replicating the fragment, T-coloring is used for the separation of fragments. In case of a large number of fragments or small number of nodes, it is also possible that some of the fragments are left without being replicated because of the T-coloring. As discussed previously, T-coloring prohibits storing the fragment in neighborhood of a node storing a fragment, resulting in the elimination of a number of nodes to be used for storage. In such a case, only for the remaining fragments, the nodes that are not holding any fragment are selected for storage randomly.

After the putting sections to fitting node, it additionally plays out a controlled replication to expand the accessibility and dependability and furthermore improve the recovery time. We place the section on the hub that gives the diminished access cost with a target to improve recovery time for getting to the parts for reproduction of unique file. While duplicating the fragment, T-coloring is utilized for the detachment of parts. If there should arise an occurrence of countless or modest number of hubs, it is likewise conceivable that a portion of the parts are left without being reproduced in light of the T-coloring. As examined already, T-coloring precludes storing the piece in neighborhood of a hub putting away a part, bringing about the end of various hubs to be utilized for capacity. In such a case, just for the rest of the pieces, the hubs that are not holding any piece are chosen for capacity arbitrarily

for each Fr_k in Fr do
select $Node_i$ that has max(Read+Write)
if $colors_i$ = uncolored and $Node_i$ >=Fr_k then
$Node^i$ ←Fr_k
$node_i$←$node_i$-fr_k
$colors_i$←colored
$Node_{i'}$ ←distance(Node, T)
$Colors_i$←colored
end if
end for

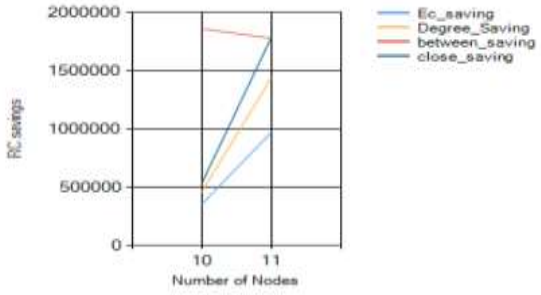
Algorithm for Replication

VI. Result Analysis

A. Number of Nodes:

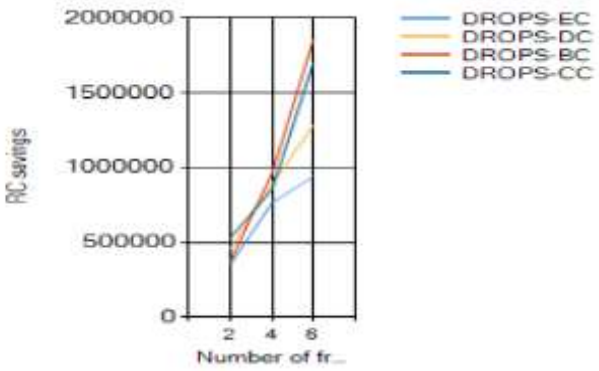
The execution of the position strategies and this procedure by expanding the quantity of nodes. And it assessed by utilizing four kinds of centrality against the replication cost. The decrease in system exchange time for a record is named as RC. between_saving represents the betweenness centrality, the close_saving represents closeness centrality, the Ec_saving represents Eccentricity centrality and the Degree_Saving represents Degree centrality This philosophy, did not utilize full-scale replication. Each section is recreated as it was once in the framework. The more modest number of copies of any part and detachment of hubs by T-coloring. Decreased the likelihood of finding that section by an aggressor. Along these lines, the expansion in the security level of

the information is joined by the drop in execution when contrasted with the similar strategies. The flightiness centrality performs better when contrasted with the degree centrality yet the closeness and betweenness indicates less execution when contrasted with degree centrality with higher erraticism are found nearer to all different hubs inside the network. The purpose behind this is hubs with higher unpredictability are nearer to all different hubs in the system that outcomes in lower RC esteem for getting to the pieces.



B. Number of Fragments

The expansion in number of document parts can strain the capacity limit of the cloud that, thus may influence the choice of the nodes. Security of the framework relies upon the number fragments. The numbers of cloud hubs are set to consistent number. With the different number of sections the assessment was performed. With the expansion in the quantity of sections the whimsy centrality gives preferable execution over degree centrality. Degree centrality gives preferable execution over the closeness and betweeness centrality. Graph plotted against Number of pieces and the replication cost. DROPS-EC represent the eccentricity, DROPSS-DC represents the degree centrality and DROPS-BC represents the betweeness centrality and DROPS-CC represent the closeness centrality.



VII. Conclusion

Cloud computing faces security issues like Loss or burglary of licensed innovation, Loss of command over end client activities, Malware contaminations that release a focused on assault; Contractual breaks with clients or colleagues. High security measures are required to protect data within the cloud. This ensures an increased security level by data replication. The data was fragmented and stored on multiple nodes separated by T-coloring. This technology gives high efficiency than full-scale replication techniques. The performance and data retrieval time efficiency got upgraded. The performance can be further enhanced by varying the number of nodes and capacity of nodes. The performance also increased by increase in the number of fragments.

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ANALYSIS OF ULTRA LARGE CAPACITY ENDPLATE JOINT USING ANSYS

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Abstract:*The bolted end plate joint is widely adopted as moment resistant beam to column sections where field welding is not provided. The ultra large capacity end plate joints are adopted in steel structures involving large spans or heavy loads. The conventional extended end plate joint arranged four bolts in the tension side and the moment resistance is controlled by this bolt number when beam sections remain same. In the case of large capacity endplate joint there are eight bolts in the tension side. If the moment resistance of large capacity end plate joint can't meet the requirement the number of bolts in the tension side should be increased. Such type of joints with an arrangement of twenty four bolts in total with half of them located in the tension side are known as ultra large capacity endplate joint. The existing literatures discussed about experimental investigation of ultra large capacity endplate joint and numerical analysis under monotonic loading. In this study specimens of ultra large capacity end plate joint were analysed using ANSYS under cyclic loading. Various parameters considered are end plate thickness and bolt preload. From the analysis determine Directional deformation (X Axis), Directional deformation (Y Axis) and Endplate deformation.*

Keywords*: Finite element analysis, cyclic loading, endplate,ultra large capacity, ANSYS*

IV.

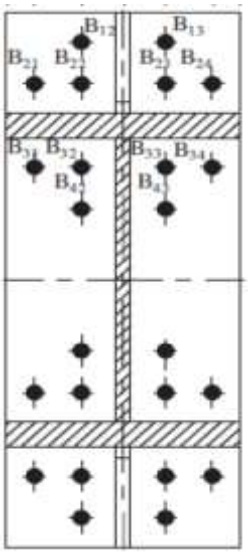
V. Introduction

Beam to column connections are neither ideally pinned nor ideally fixed and posses finite non zero stiffness. However they are classified as simple, semi rigid and rigid depending on the connection stiffness. Such a classification helps in simplifying the analysis of frames. Connection having a small stiffness can be assumed as pinned while a connection having a large stiffness can be assumed as fixed. In the former case the actual mid span bending moments will be less than what is designed for while in the latter case the mid span deflection will be more than that is calculated. Traditionally certain configurations are idealised as pinned and certain other configurations are idealised as fixed but with a variety of new configurations being used it is important to have guideline indicating the range of stiffness for which the idealization can be used without serious discrepancy between analysis and actual behaviour. The existing literatures discussed about experimental investigation of ultra large capacity endplate joint and numerical analysis under monotonic loading. In this study specimens of ultra large capacity end plate joint were analyzed using ANSYS under cyclic loading.When bolted joints are required in steel structures involving large span or heavy loads, ultra large capacity endplate joint with twelve bolts or sixteen bolts in tension should be applied if ordinary endplate joints or large capacity endplate joint can't meet the resistance requirement.The bolted endplate joint is widely adopted as moment resistant beam column joint in the situation were the field welding is not allowed or preferred.The conventional extended endplate joint arranged four bolt in the tension side, and the moment resistance is limited by an upper boundary controlled by this bolt number when the beam section keeps unchanged. When the resistance demand is larger than this upper boundary, the large capacity endplate joint with eight bolt in the tension side should be provided. It is to be used to provide larger resistance.If the moment resistance of large capacity endplate joint doesn't meet the requirements, the number of bolt in the tension side should be increased to sixteen and such joint form is referred as ultra large capacity endplate joint.

The extended endplate joint with an endplate welded at the end of the beam and connected to the flange of the column by bolts is among widely adopted beam to column joint in steel frames. This joint form has an

advantage in construction without field welding. Also large rotational stiffness and satisfactory ductility can be developed in this joint provided, it is properly designed. Endplate stiffeners are often applied to improve joint performance when the joint is designed as rigid one. Ultra large capacity endplate joint has an arrangement of thirty two bolts or twenty four bolts in total, with half of the bolt locate in the tension side.AS in large capacity endplate joint bolt in tension in ultra large capacity endplate joint are considered to develop a complex distribution of axial force. It should be noted that endplate with stiffeners which are recommended to improve joint performance, can experience a complex stress state.

Figure 1 Layout of beam column joint



VI.Summary of Literature survey

The above literatures investigate different type of end plate joints. Most of them analyze the effect of point load on the conventional and large capacity end plate joint. Determination of moment rotation curve, moment resistance and rotational stiffness in different conditions by varying bolt diameter and endplate thickness. The study of ultra large capacity end plate joint is only concentrated to experimental side and normal loading. In my study finite element analysis of ultra large capacity end plate joint under cyclic loading by varying end plate thickness, bolt pretension and stiffness using finite element package ANSYS 19.1

VII. Finite Element Analysis

The Finite Element Modelling (FEM) is a numerical technique for finding approximate solutions to Partial Differential Equations (PDE) and their systems. It is also known as finite element analysis.FEM has an inbuilt algorithm which divides very large problems into small elements which can be solved in relation to each other.FEM solves the equations using the Galerkin method with polynomial approximation functions. The solution is obtained by eliminating the spatial derivatives from the PDE.Algebraic equation systems are solved using numerical linear algebra methods. In solving partial differential equations, the major problem is to create the equation that approximates the equation to be analyzed, but is numerically stable, meaning that errors in the input and intermediate calculations don't accumulate and cause the resulting output to be meaningless.

The finite element method is considered to be the best way for solving partial differential equation over complicated domains, but when it changes as an example a solid state reaction with moving boundary, when the desired precision varies over the entire domain, or when the solution smoothness. Another instance is in weather prediction, where it is more important to have accurate predictions over highly developing nonlinear phenomena such as unpredictable natural calamities which happen, like cyclones rather than relatively calm environment. ANSYS can import data from various software such as CAD, SOLIDWORKS etc. It also enables to build geometry with its preprocessing abilities. Similarly in the same preprocessor, finite element model which is required for computation is generated. After defining loadings and carrying our analysis, results can be viewed as numerical and graphical.

VIII. Objectives

- Many profiles of ultra large capacity endplate joint are analysed based on ANSYS finite element software in order to choose the optimum configuration in each layout under cyclic loading.
- Determination of plastic strain distribution.
- Analysis of optimum configuration in each layout with stiffener.

- In order to determine the influence of endplate thickness and bolt preload in the performance of each layout.

IX.Scope of the Project

- Beam column joints are necessary in the case of providing steel sections in structures.
- Ultra large capacity endplate joints are very important in case of structures with large spans or heavy loads.
- It is applicable under different loading conditions and stiffeners are also provided to improve the strength.

X. Validation of Software

The analysis of beam column joint was done using ANSYS 19.1 software. So to check the percentage of variation of results and accuracy of results. A semi rigid beam column joint was shown in the figure 3.1.The joint is analyzed using ANSYS 19.1 software and validated with manual formulae. The obtained deflection was shown in Figure 3.2. For the validation purpose, the parameter which is used for analysis is rotation. The model considered for the analysis is shown in Figure 3.1.For this analysis a beam column joint with monotonic loading is considered.

Figure 2 Model of beam column joint

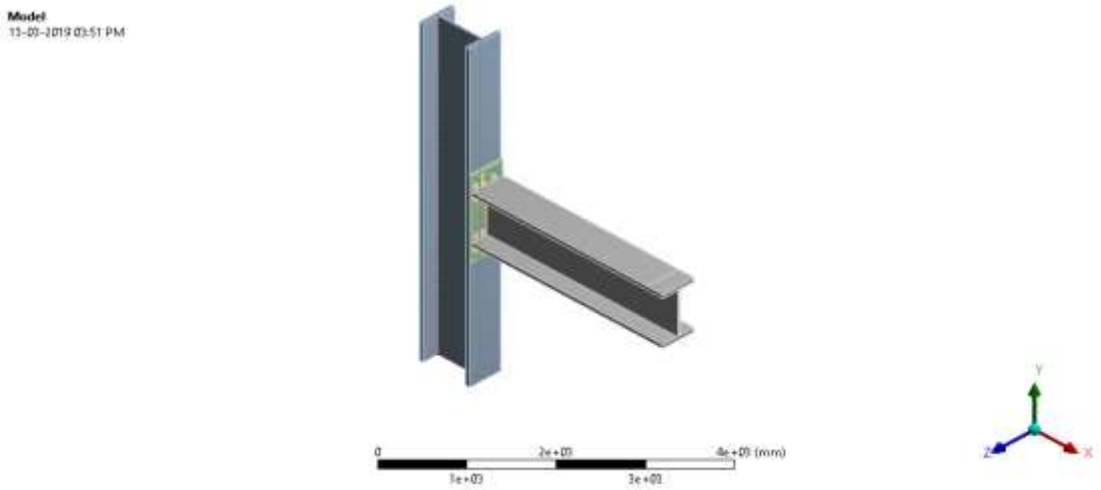


Figure 3 Deformation of model



Comparing manual and software results, almost same results were obtained but software was reduced 1.53 %from manual calculated result. This variation is lies within permissible limit .So the software are validated. The results obtained from manual calculation and ANSYS 19.1 software as shown in Table 3.2
Table Comparison of Results

Table 1 Validation of software

Parameter	By manual calculation	By software calculation
Rotation (Degree)	0.065	0.064

There was a variation of 1.53 % between manually computed and software results. The software result is 1.53 % higher than manual result and it is under permissible limit. So the software is validated.

XI.Methodology

- Literature survey to understand the behaviour and properties of ultra large capacity endplate joint.
- Fixing the objectives of the thesis
- Study of ANSYS software
- Modelling
  Model 1- Beam column joint with 25 mm thick endplate and 80% tightness
  Model 2- Beam column joint with 25 mm thick endplate and 90% tightness
  Model 3- Beam column joint with 32 mm thick endplate and 80% tightness
  Model 4- Beam column joint with 32 mm thick endplate and 90% tightness
  Model 5- Beam column joint with 36 mm thick endplate and 80% tightness
  Model 6- Beam column joint with 36 mm thick endplate and 90% tightness
- Analysis
- Comparison of results
- Conclusion

Table 2 Dimension of elements

Design of specimen	Profile	Web height (mm)	Web thickness (mm)	Flange width (mm)	Flange thickness (mm)
Beam	H 800 x 300 x 14 x 26	800	14	300	26
Column	H 800 x 300 x 14 x 26	800	14	300	26

Table 3 Material properties

Type	Young's modulus (N/mm^2)	Poisson's ratio
Beam	$2x10^5$	0.3
Column	$2x10^5$	0.3
Endplate	$2x10^5$	0.3

XII. Finite Element Modelling in Software

The finite element modelling was done using ANSYS 19.1 software. The models of ultra large capacity endplate joint were created using the software. The variations are given in bolt preload and endplate thickness. The various preloads given are 80% and 90%.The thickness of endplates are 25 mm, 32 mm and 36 mm.The models are analysed under cyclic loading. The main purpose of changing these parameters are to find the effect of these parameters in the performance of beam column joint and to choose best one in each configuration among this. Models of various layouts are shown below.

Figure 4 Model having 25 mm thick endplate

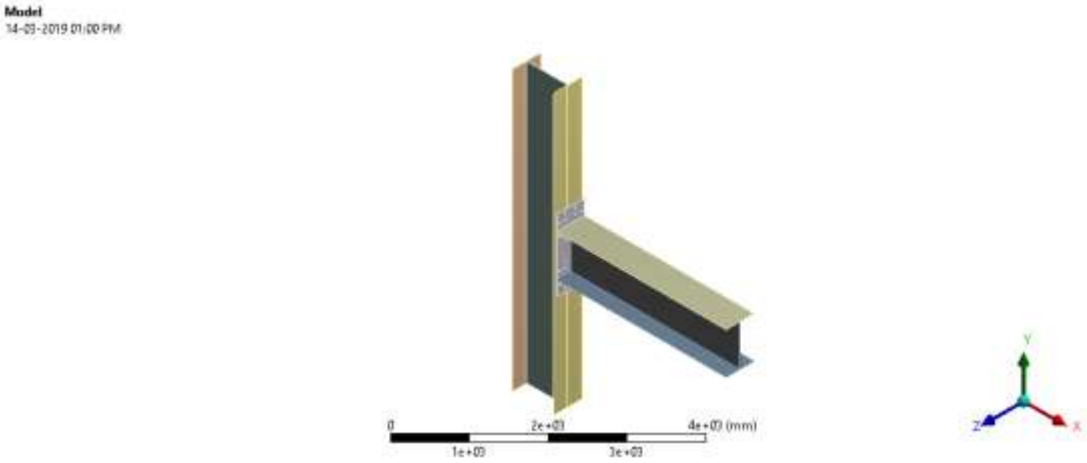


Figure 5 Model having 32 mm thick endplate

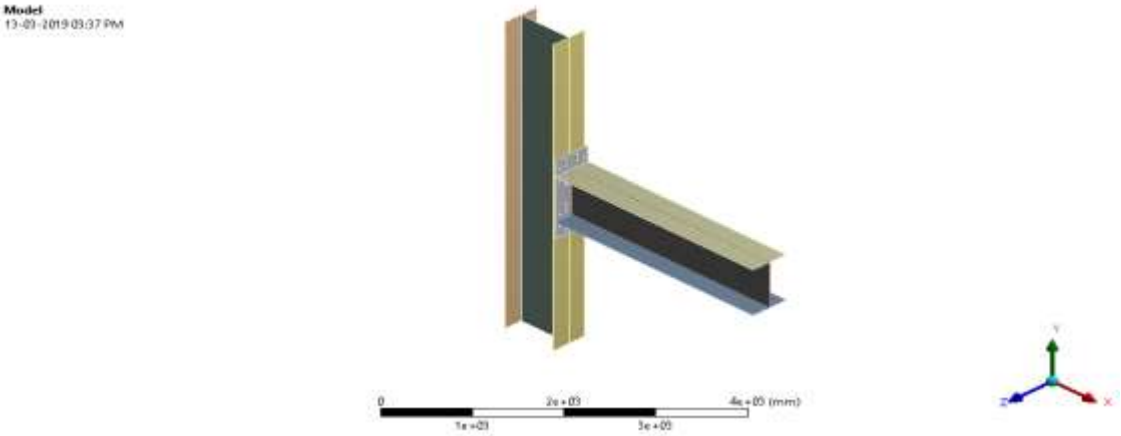
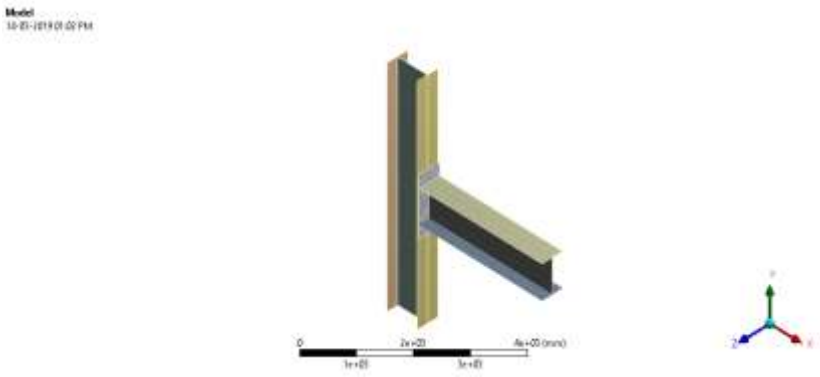


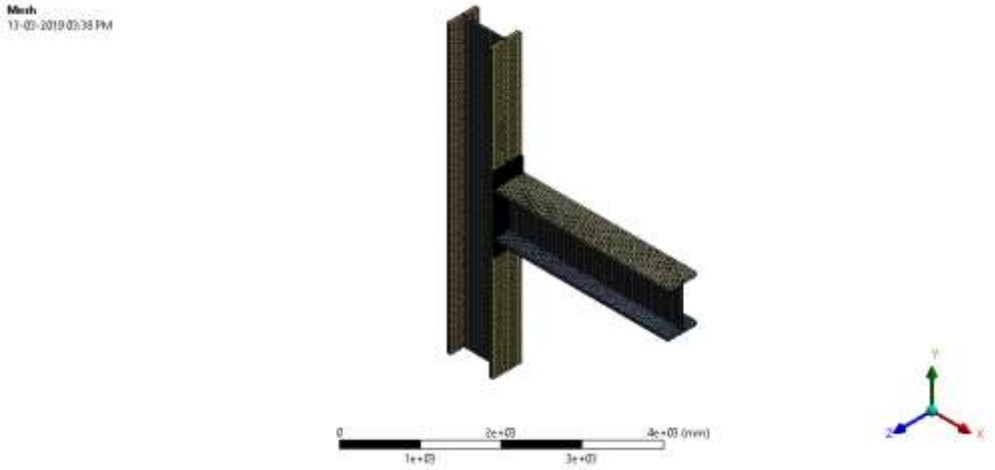
Figure 6 Model having 36 mm thick endplate



XIII. Meshing

Ultra large capacity endplate joints were one of the complex models. Therefore getting accurate results, the beams, column and endplate were meshing separately by using different element size. Meshing is defined as the process of dividing the whole component into number of elements so that whenever the load is applied on the component it distributes the load uniformly called as meshing. The accuracy that can be obtained from any FEA model is directly related to the finite element mesh that is used. These equations approximately represent the governing equation to interest via a set of polynomial functions defined over each element. As these elements are made smaller and smaller, as the mesh refined, the computed solution will approach the true solution.

Figure 7 Meshing



XIV. Resullts and discussion

XV. Directional deformation (X Axis)

Directional deformation can be put as the displacement of the system in a particular axis or user defined direction. Here obtain directional deformation along X direction of all the models and compare the results.

Table 4 Directional deformation (XAxis)

Model description	Directional deformation (X Axis) (mm)
Model 1	0.87151
Model 2	0.87143
Model 3	0.80283
Model 4	0.79644
Model 5	0.76844
Model 6	0.75457

Figure 8 Directional deformation (XAxis)

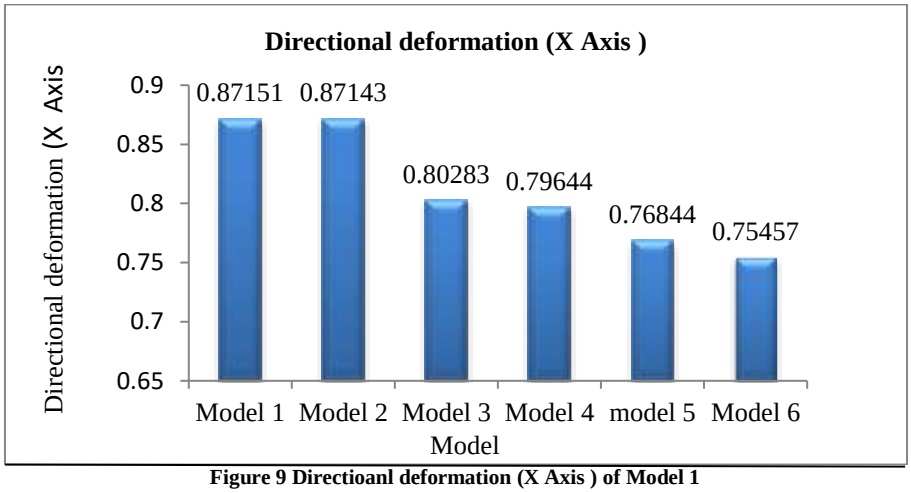
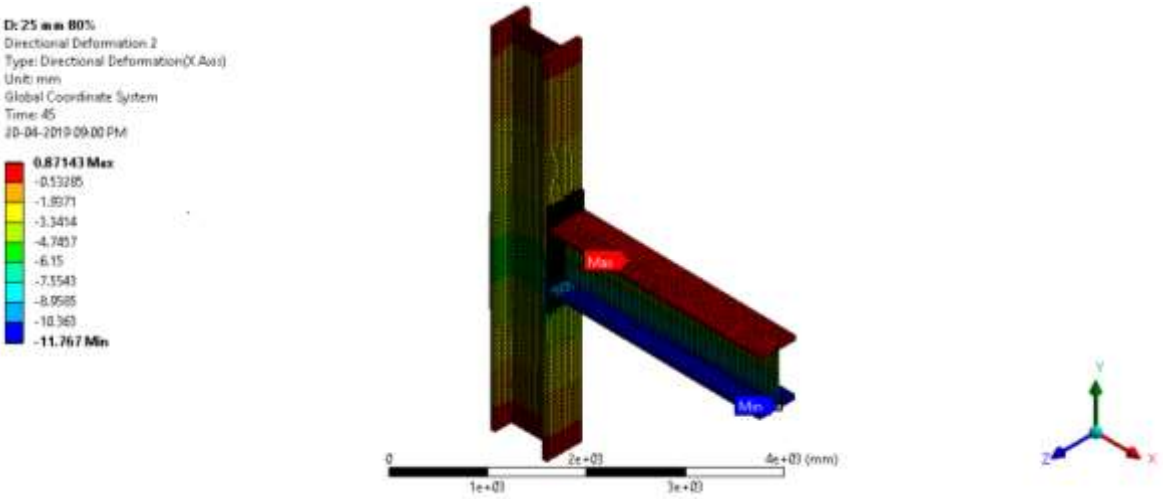


Figure 9 Directioanl deformation (X Axis) of Model 1



B. Directional deformation (Y Axis)

Directional deformation can be put as the displacement of the system in a particular axis or user defined direction. Here obtain directional deformation along Y direction of all the models and compare the results.

Table 5 Directional deformation (YAxis)

Model	Directional deformation (Y Axis) (mm)
Model 1	0.29628
Model 2	0.29263
Model 3	0.28434
Model 4	0.28385
Model 5	0.27531
Model 6	0.27238

Figure 10 Directional deformations (Y Axis)

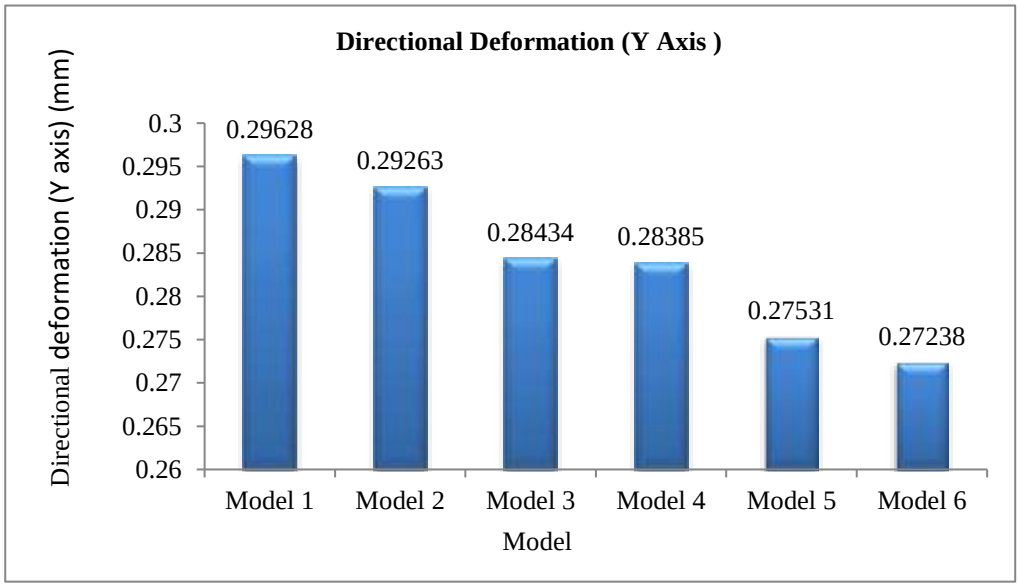
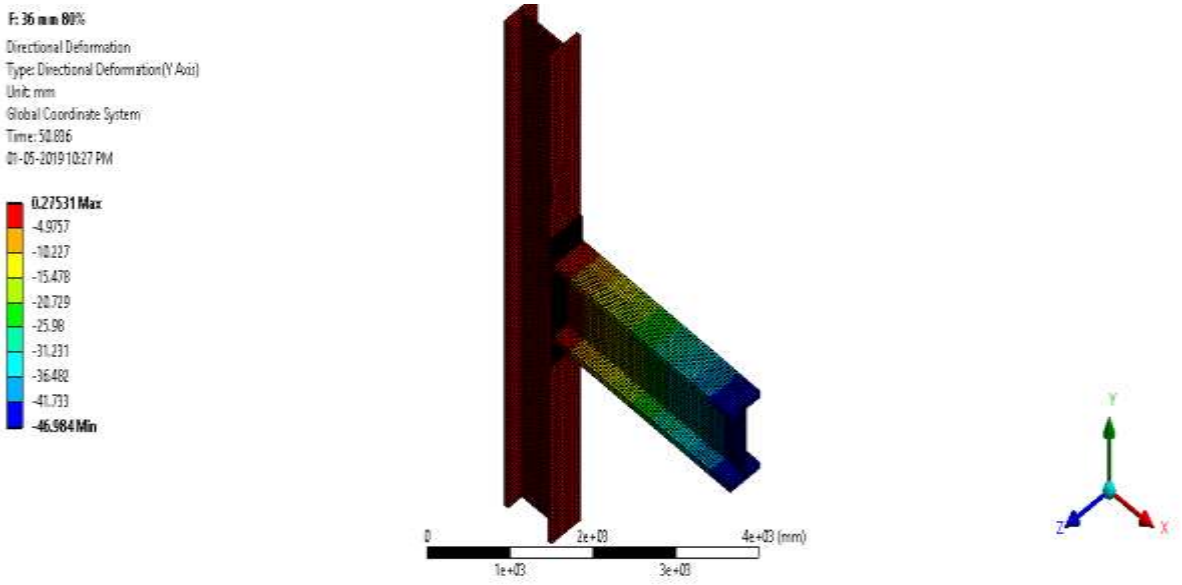


Figure 11 Directional deformation (Y Axis) of Model 5



XVI. Endplate Separation

The analysis of ultra large capacity endplate joint was done in twelve different models. Here the deformation of endplate in each model was analysed and compared. The total deformation of the endplate was defined as the sum of endplate deflection and vertebral body deformation.

Table 6 Endplate separation

Model	Endplate separation (mm)
Model 1	0.7178
Model 2	0.7168
Model 3	0.6857
Model 4	0.68544
Model 5	0.61683
Model 6	0.60529

Figure 12 Endplate separation

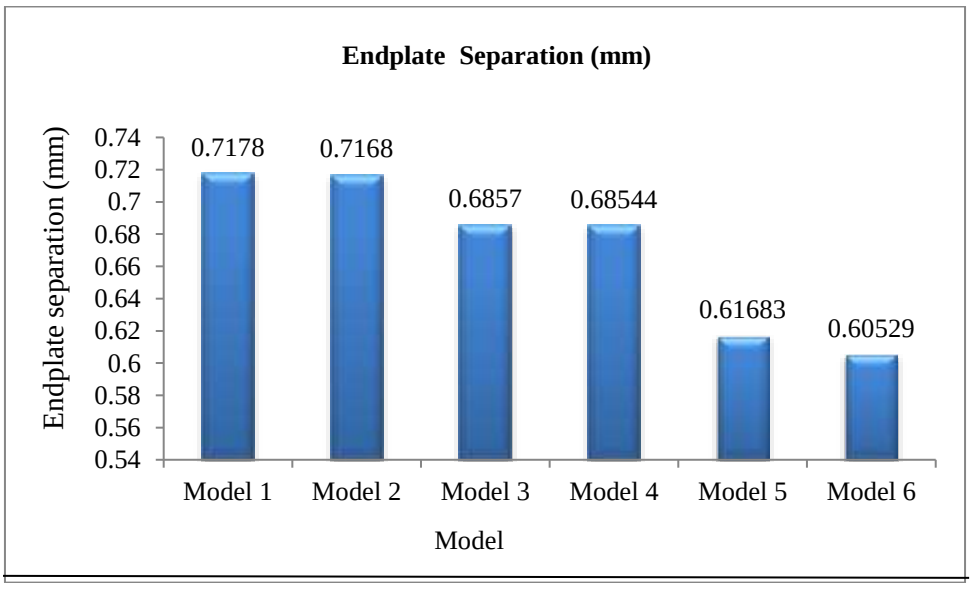
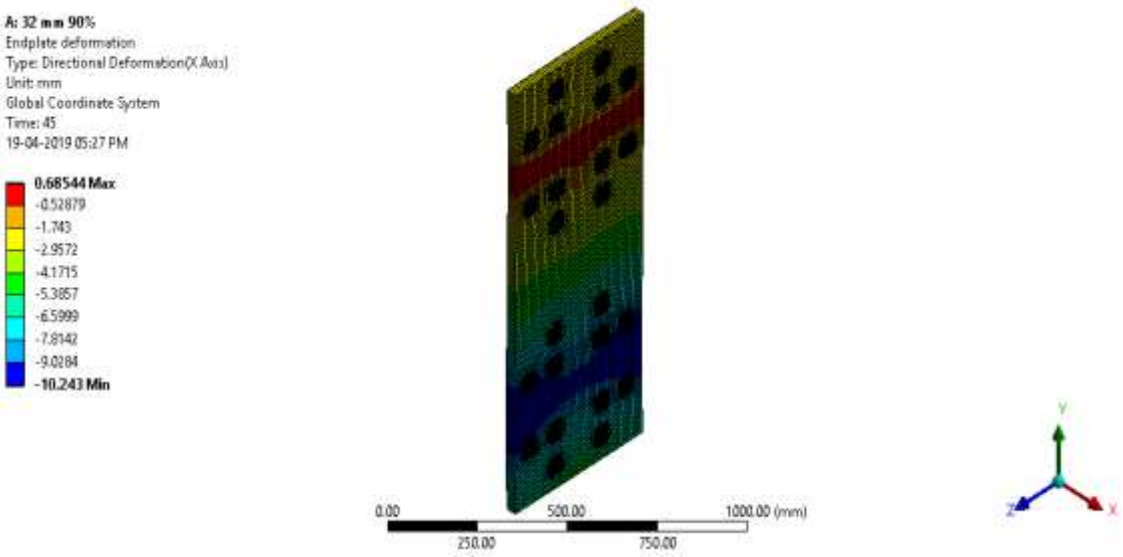


Figure 13 Endplate separation of model 4



XVII. Conclusion

In this study, at attempt was made to compare the directional deformation (x Axis),directional deformation (Y Axis) and endplate separation of ultra large capacity endplate joint by varying endplate thickness and bolt preload. Six models of ultra large capacity endplate joint were analyzed in this study. Following are the conclusions obtained from this work,

- Increment in the thickness of endplate reduces directional deformation (X Axis), directional deformation 9Y Axis) and endplate separation.
- Increment in the bolt preload reduces directional deformation (X Axis), directional deformation 9Y Axis) and endplate separation in all these models.
- Among these models sixth model having 36 mm thick endplate and 90 % bolt preload shows minimum deformation and endplate separation.
- The main aim of this study to find the influence of bolt preload and endplate thickness in the performance of beam column joint, and after analysis let conclude that both endplate thickness and bolt preload are the parameters influence the overall performance of beam column joint.

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XIX. Acknowledgments

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CP-ABE Based Cloud Side Access Control to Prevent EDoS Attacks in Public Cloud Storage

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***Abstract**: A public cloud is one dependent on the standard cloud computing model, in which a service provider makes resources, applications or storage, accessible to general society over the web. Diverse end users can license storage capacity from a public cloud to store their digital data on a pay-per-use fashion. Notwithstanding, individuals cannot unduly believe the cloud service providers to host sensitive information, since the cloud providers and their employees can read this data regardless of data owner's access policy. To give secrecy, cloud providers outsource cipher-texts instead of plaintexts. This transferred information can be shared among different end clients by using the Cipher Text Policy Attribute-Based Encryption (CP-ABE) algorithm. In many existing techniques, the cloud service provider cannot confirm whether a client can decrypt downloaded information. Hence, it needs to enable everybody to download to guarantee accessibility. Thus a malicious client can download any number of documents to dispatch economic denial of sustainability (EDoS) attacks. Be that as it may, the data owner pays for resource utilization. These issues ought to be settled in real-world public cloud storage. This paper proposes a challenge-response protocol to shield public cloud storage from EDoS attacks. In this work, a request monitor will inform the data owner if any client acts mischievously. Additionally, the proposed cloud side access control provides verified resource utilization.*

***Keywords**: Public Cloud Storage; CP-ABE algorithm; Access Policy; EDoS attack; Verifiable Resource Consumption*

I. Introduction

Cloud storage is a service where information is remotely kept up, managed and backed up. Amid these years, more information is uploaded to the public cloud for constant storage including individual and business documents. However, individuals cannot excessively believe public cloud storage to host sensitive information since it is visible to the cloud service provider and their employees regardless of the data owner's access policy. Another issue with public cloud storage is the cloud service provider can misrepresent the resource utilization without giving any irrefutable records. Data owners who store records on cloud servers still need to control the access and keep the information confidential against the cloud provider and noxious clients.

To give protection data owners can encode the data before transferring it to the cloud. Existing systems propose various encryption techniques, among which Cipher Text Policy Attribute-Based Encryption (CP-ABE) is one of the powerful encryption algorithms. In this algorithm, an access policy is assigned with the cipher-text. Consequently, simply the customers who satisfy this access policy will be able to obtain the plaintext. CP-ABE gives both fine-grained access control, and strong security. Notwithstanding, this access control is available only for data owners, which is deficient. If there is no cloud side access control the public cloud needs to empower everyone to download the files. Accordingly, the system ends up powerless against resource exhaustion attacks.

At the point when vindictive clients dispatch resource exhaustion attack on public cloud storage, the resource utilization will increment. The data owner needs to pay for the expanded resource utilization included by these attacks, which prompts an irrational financial burden. This attack is suggested as Economic Denial of Sustainability (EDoS) Attack, which infers payers are monetarily attacked. What's more, even documents are encrypted, unapproved downloads can lessen security by bringing comfort to offline analysis and spilling data file length or update frequency.

In the pay-as-you-go model, clients pay cash to the cloud service provider for storage services. The charge is chosen by resource usage. It is required for the cloud service provider to demonstrate to the payers

about real resource utilization. Something else, the cloud provider can charge more without being found. This is called resource consumption accountability. These sorts of issues must be settled in true public cloud storage so as to give better security. This paper proposes a challenge-response game based cloud side access control alongside the current data owner side access control. For each document transferred to the cloud a set of encrypted challenges is created. At whatever point a client send download request cloud side access control give the client an unused challenge. Just the clients who fulfill data owner's access policy will acquire the right key and can decrypt challenges. In the event that challenge decoding is successful cloud side access control enables the client to download the record. A request monitor will inform the data owner if any approved client gets into mischief. Likewise, the protocol gives verifiable resource consumption with the goal that the cloud service provider cannot overstate original resource usage.

II. Related Works

To give a fine-grained data owner side access control in public cloud storage, Attribute-based Encryption (ABE) [1], [2], [3] is introduced [7]. ABE can be two sorts, Cipher-text Policy-ABE (CP-ABE) and Key-Policy ABE (KP-ABE). CP-ABE inserts the policy into the cipher-text and thus, the client secret has the attribute set. Goyal proposed the fundamental KP-ABE in [2]. They made a capable technique to relate any monotonic formula as the methodology for client secret keys. Bethencourt foresaw the first CP-ABE in [3]. This arrangement used a tree access structure to show any monotonic equation as the policy for customer secret keys. Among ABE plans, CP-ABE [4], [6] is sensible in public cloud storage, in which the cipher-text is encoded under an access policy and just customers whose attributes satisfy the access policy can interpret the cipher-text. The first totally expressive CP-ABE was organized by Waters in [4], which used Linear Secret Sharing Schemes (LSSS) to make a cipher-text methodology. Lewko redesigned the Waters subject to an absolutely secure CP-ABE, anyway with some effectiveness misfortune, in [6].

The cryptography-based access control does not ensure the cloud provider against numerous different attacks. Since the cloud provider does not perform the access control, it cannot keep unapproved clients from getting to the resources. One attack which is caused by this restriction is Distributed Denial of Services (DDoS). These sort of attacks present noteworthy resource utilization in CPU, memory, I/O, and system [8]. The attacks can exist in public clouds [9], [10], [12]. In [10], the restriction of the cloud-side static resource allocation model is analyzed, including the danger of Economic Denial of Sustainability (EDoS) attacks. These attacks make a preposterous financial burden to public cloud clients. Some current works attempt to moderate EDoS attacks [14], [13]. In [14], the creators proposed an alleviation method by checking whether a solicitation originates from a cloud client or is produced by bots. In [38], the creators proposed a credit-based approach to recognize noxious customers. They treat the hidden application in a black box and do not completely inoculate the attack in the algorithmic and protocol level.

Some current works discuss the necessity of accounting resource utilization in the public cloud [16], [3], [17], [18]. In the writing [17], the writers talked about key issues and difficulties about how to accomplish accountability in cloud computing. In the literary works [16] and [3], the creators separately proposed a precise methodology for verifiable resource accounting in cloud computing. In any case, the accounting approach includes changes to the framework and requires the anonymous confirmation of clients, which is not bolstered in past frameworks. In [5] proposes a combined data owner side and cloud side access control for public cloud storage. In this strategy, a challenge-response game is utilized to confirm a client before downloading a document. Each client ought to get an unused challenge for verification. For verification, two conventions are utilized, which makes the framework progressively intricate. Compared to the relevant schemes the proposed system is time proficient and works viably in a convention level.

III. Preliminaries

This section provides the preliminary information on the cryptographic tools, the CP-ABE (in Section III-A) and the encryption with integrity guarantee AEAD (in Section III-B).

A. CP-ABE : Cipher text Policy Attribute-Base- Encryption

CP-ABE algorithm is a public key encryption strategy which is reasonable for public cloud storage. In CP-ABE, every customer has an attribute set and data owner encode their records with access control over this attribute set. Customers in the framework hold their own secret keys related to their attribute sets. The customer can acquire original contents just on the off chance that he has an attribute set which fulfills the access policy inserted with the encoded document. CP-ABE algorithm includes four main steps:

- $(MK_{pub}, MK_{sec}) \leftarrow$ Setup : Generates a master public key MK_{pub} and a master key MK_{sec}.
- $SK_i \leftarrow$ KeyGen (MK_{sec}, A_i) : It takes the master secret key MK_{sec} and the users attribute set Ai as the input and generates a secret key SK_i associated with the attribute set Ai.
- $C \leftarrow$ Enc (MK_{pub}, M, p):It takes the master public key MK_{pub}, the message M, and the access policy p as the input. It outputs the cipher-text C.

- M ← Dec (SK_i, C):It takes the cipher-text CT (embedded with access policy p) and the secret key SK_i as input. If the attribute set A_i satisfies the access policy A, it outputs the message M. Otherwise, outputs $\perp$.

B. Authenticated Encryption with Associated Data

Authenticated Encryption with Associated Data (AEAD) is symmetric-key encryption that gives both secrecy and integrity, for instance, AES-GCM. AEAD ties related data (AD) to the cipher-text and to the context where it should appear, with the objective that attempts to "reorder" a generous cipher-text into a substitute context, are perceived and expelled. The symmetric-key encryption AEAD for the key K and any message M comprises of two calculations AEAD = (Enc, Dec).

- CT ← Enc (K, M) : Outputs the cipher-text C for message M under key K.
- M ← Dec (K, C) : Recovers the plaintext M from C under key K, but outputs $\perp$ if the result is invalid.

IV. Proposed System

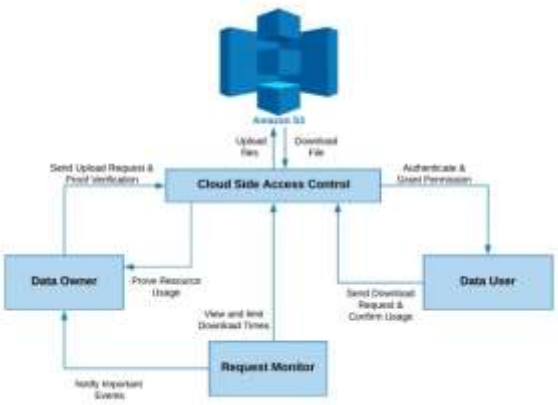
This section describe the proposed framework in detail.

A. System Architecture

Fig. 1 Shows the architecture of the proposed encrypted cloud storage with mitigation of EDoS attack and transparency of resource accounting. The proposed framework consists of four modules: Data Owner, Data user, Cloud side Access Control, Request Monitor.

- **Data Owner:** They are the owners and distributors of reports and pay for the resource usage on document sharing. As the payers for cloud benefits, the data owners need the straightforwardness of resource usage to ensure sensible charging. The data owners require the cloud service provider to legitimize resource usage. In this system, the data owner need not be online anytime.
- **Data User:** Data users need to procure a few records from the cloud service provider transferred to the distributed storage. They ought to be approved by the cloud provider before the download (to thwart EDoS attacks). The endorsed customers by then confirm the resource use for this download to the cloud provider.

Figure 1 System Architecture



- **Cloud-side Access Control:** The cloud side access control depends on a CP-ABE based challenge-response game. While redistributing an encoded record, the data owner firstly makes some irregular challenge plain-texts and the corresponding cipher-texts. The cipher-texts are identified with a similar access strategy with a specific record. For an approaching data user, the cloud server asks him/her to disentangle randomly picked challenge cipher-text. In case the customer shows the right outcome, which suggests he/she is endorsed in CP-ABE, the cloud-side access control allows the archive download.
- **Request Monitor:** Request monitor notifies the data owner if a data user misbehaves. It counts the number of download requests and send the information to the data owner.

B. Proposed Scheme

The framework is a combined cloud side and data owner side CP-ABE based access control to determine the issues of attack and resource accountability. The proposed system can counteract the EDoS attacks by giving the cloud server the capacity to check whether the client is approved in CP-ABE based scheme, without releasing any other data. There are two security requirements for the proposed scheme:

1) Unauthorized data users cannot download any files

2) The cloud provider cannot forge a significant proportion of the proofs for resource consumption.

To achieve the security requirements, the scheme consists of two components: 1) A cloud-side access control to block users whose attribute set A_i does not satisfy the access policy A; 2) A proof-collecting subsystem where the cloud provider can collect the proofs of resource consumption from users, and present to the data owners later. The proposed system is designed in such a way that data owner need not be online always. The procedure of the designed protocol is described in detail as follows:

☐ **Encrypt and Upload:**

This operation is implemented by an individual data owner independently, which can be divided into the following three steps:

1) The data owner uses AES encryption to encrypt the file. The data owner randomly selects a symmetric key k and uses the key to encrypt file F. Then the data owner encrypts the key k with CP-ABE under the access policy A.

$$T_0 \leftarrow \text{AES.Enc}(k,\text{"file"}\|F)$$
$$T_1 \leftarrow \text{ABE.Enc}(mpk,k,A)$$

2) The data owner randomly generates only *N* challenge plaintexts from the message space. The data owner generates the hashes of these challenges.

$$\text{Enchal}_i = \text{AES.Enc}(k,\text{"challenge"}\|\text{chal}_i)$$
$$T_2 \leftarrow \{\text{hash}_i\}_{i\epsilon N}\ T_3 \leftarrow \{\text{enchal}_i\}_{i\epsilon N}$$

3) The following tuple is uploaded to the cloud

$$T = (T_0, T_1, T_2, T_3)$$

☐ **Cloud Side Access Control:**

1) The cloud provider select one of the unused challenge enchal_i and send one of the following tuple to the user

$$(T_1, \text{enchal}_i)$$

The data user try to decrypt the key. Only the user who satisfies the access policy A will be able to obtain the key.

$$k \leftarrow \text{ABE.Dec}(sk_i, T_1)$$
$$\text{chal}_j' \leftarrow \text{AES.Dec}(k, \text{enchal}_i)$$

The data user sends chal_j' to the cloud provider.

2) The cloud provider checks $\text{hash}_i = \text{hash}(\text{chal}_j')$. If true cloud sends T_0 to the user, which can be decrypted with the session key k and the challenge is used. Otherwise the cloud aborts. The user response chal_i' is the proof of resource accounting.

☐ **Challenge Update:**

If the data owner wants to provide additional challenges, he only needs to be online for a short period, it is also supported. The update process is the same as that in the phase of *Encrypt and upload* under the same key k. We assume the data owner keeps a record of session keys either in local storage or outsourced to cloud in an encrypted form. As the plaintext space for challenges is sufficiently large, we assume no duplicated challenge plaintexts are generated.

☐ **Resource Accounting :**

Data owners and the cloud interactively implement this operation. Cloud provider send user responses chal_j'. The data owner keeps a record of the hashes of the uploaded challenges chal_i. The data owner checks whether the integrity holds. The data owner can accept resource accounting if

$$\text{Hash}\{\text{chal}_i\} = \text{Hash}\{\text{chal}_j'\}$$

V. Results and discussion

A. *Security Analysis*

EDoS attackers are those that do not satisfy the access policy (i.e., unauthorized users) but want to trigger the cloud provider to send something through the network, as a result the resource consumption increases. To thwart such attacks, the cloud provider uses authentication. The protocols only send a constant amount of bytes to the data user before it passes the cloud-side access control. To succeed a EDoS attack in our definition, the attacker has to first pass the cloud-side access control.

$$T_1 \leftarrow ABE.Enc(mpk,k,A)$$

$$Enchal_i = AES.Enc(k,"challenge"||chal_i)$$

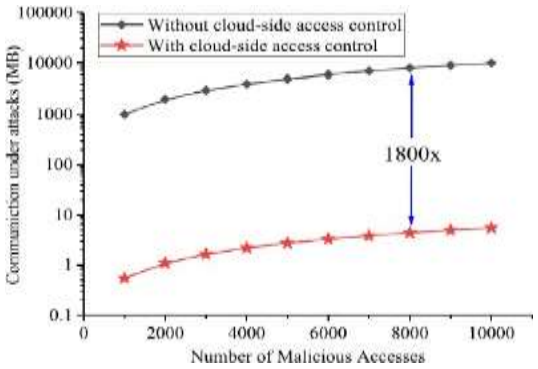
The user needs to output y such that $H(y) = H(chal_j)$. The possibility of guessing a correct y to satisfy this condition is negligible.

B. *Performance Analysis*

The experiment uses Amazon simple storage service, CP-ABE tool kit 0.11 and Netbeans IDE 8.0.2. The programming language in which system is implemented is core Java. The implementation is compatible with Windows versions 8.1 and above. The hardware requirements are given below:

- Processor : Intel Core i3
- RAM Capacity : 4GB
- Hard disk drive : 200GB
- System Type : 64bit

Figure 2 **Communication under attacks**



Alleviation against EDoS attacks is illustrated in Fig. 2 on how the data transfer capacity is spared when under the EDoS attacks. The inspiration driving the cloud-side access control is to diminish the communication under EDoS attacks. Exactly when there are malevolent requests, this cloud-side access control can decrease the correspondence overhead to 1/1800 if the file size is 1MB (as showed up in Fig. 2).

VI. Conclusion

This paper proposes a joined cloud-side and data owner side access control in scrambled distributed storage, which is impervious to EDoS attacks and gives resource consumption accounting. The framework supports subjective CP-ABE constructions. The constructions are secure against malignant data users and a covert cloud provider. The request monitor makes the framework proficient to recognize to EDoS attacks for the situation when malevolent clients colluded with approved clients. The data owner should be online just for a brief span period. The structure is time proficient and works in a convention level contrasted with relevant schemes.

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Feature Fused Location Prediction Based on Check-in Scenarios

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Abstract*: Location prediction usually refers to predicting the users next location based on his/her historical check-in records. Extracting and recognizing the peoples interest place,preference place and then predicting the future location.There are some challenging issues like sparsity,heterogeneous for forecasting the next location. In this paper, we propose a new feature fused location prediction approach based on check-in scenarios.By extracting features from check-in records and aggregate the probability value from each of the features.Geographical feature information is extracted using kernel density estimation model(context features),Collaborative information is extracted using factorization method(collaborative feature) and transition patterns of users check-in sequence is extracted using graphical method(content feature).The most common method for location prediction is based on spatial features. But it only examines the users location mobility sequence and it is not possible to give a prediction related to the time information.We put forward a new feature(temporal feature) by Time Dependent Location Prediction Algorithm(TDLP).Utilizing the score from each of the features and find which location has maximum probability value.*

Keywords*: location prediction; density estimation; factorization;category closeness; temporal feature.*

I. Introduction

Now a days, people share information about the places they visit with social media like facebook,twitter and others.There are so many check-in applications like foursquare,yelp etc.Using check-in data information from these applications,we can predict the location a user most likely to visit.There are some challenges for location prediction using these check-in data. The challenges includes sparsity and heterogeneous.Sparsity means there are possible number of places a user can visit.but it covers only small set of places. Heterogeneous contain different type of information like location information,temporal information,textual information etc. The main problem is variety that is these applications are not following the same patterns.So it is difficult to predict the location.Therefore we introduced a generalized concept feature fused location prediction to manage with the variety problem in location prediction.

In this paper, we have some features for predicting location which includes context feature,collaborative feature and content feature. To improve the relevance of location prediction we utilize these features in a fusion approach. This feature fused approach improves accuracy and generality. The first feature is context feature(spatial feature),it calculates the closeness of places and describes how the places are geographically related. This feature is extracted using kernel Density estimation method and also proposed mixture kernel density model.This mixture kernel density model is calculated based on the combination of place,district etc.The second feature is collaborative feature, considered users and the locations they visited from a collection of check-in records.This feature is extracted by matrix Factorization method and it helps to understand most users interest place,preference place etc.and also depict a re-weighting model to this approach.The third feature is content feature,here is the link between category and place.Each places contain different type of categories and users interested category may be different. Firstly,calculated the transition patterns of users check-in sequence category in a graphical representation and also observe the top ranked categories.Then extract the closeness using random walk based closeness extraction method.The next proposed feature is temporal feature,existing methods are usually difficult to generalize time related feature informations.The probability calculation method for temporal feature using Time Dependent Location Prediction algorithm(TDLP). The probability of a user to a particular location will get probability values from each of these four features.That is the probability to visit the next place is calculated by aggregating the probability value from the four features (Context,Collaborative and

Content).The place which has the maximum probability value,that is the place user has more chance to go. Now, From the dataset there are number of places users has not visited. From this, we can calculated to be visted probability.

II. Literature Review

There have been many methods for predicting the location.Some are suggested for travel route recommendation, future location prediction etc.There are different groups of work,one of the work is obtain from check-in datas distance proximity and geographical distribution to generate forecasting results.This type of work is applicable to increase users engagement with location-based services, it is a major to furnish attractive features, one of which is geographically pickout advertisements and coupons. To make advertizements and coupon delivery more practical, this is essential to predict the situation that is presumably to be visited by a user at the following step.In this work we utilize the check-in category information to profile the un- derlying user mobility pattern. We put forward a framework which uses a mixture hidden Markov model to forecast the category of user activity at the following step and then predict the most likely location given the calculated category distribution. The upper hand of representing the category level include a significantly reduced prediction space and a exact assertion of the semantic meaning of user tasks.

Jia-Dong Zhang et.al. [1] proposed mixed hidden Markov model. Location-based social networks have been acquiring increasing popularity in recent years. To enlarge users seize with location-based services, it is important to provide attractive features, one of which is geo-targeted ads and coupons. To make ads and coupon delivery more effective, it is essential to predict the location that is most likely to be visited by a user at the next step. However, an inherent challenge in location prediction is a huge prediction space, with millions of distinct check-in locations as prediction target. In this paper, utilized the check-in category information to model the underlying user movement pattern. They propose a framework which uses a mixed hidden Markov model to predict the category of user task at following step and then forecast the most likely place given the calculated category dissemination. The upper hand of showing the category level include a notably reduced prediction space and a accurate declaration of the semantic meaning of user activities.

Defu Lian et.al. [2] put forward weighted matrix factorization to forecast the next location. Place of interest (POI) recommendation has become an important means to help people come upon attractive locations. However, extreme sparsity of user-POI matrices build a severe challenge. To survive with this challenge, viewing mobility records on location based social networks (LBSNs) as deducible feedback for POI recommendation. They first propose to utilize weighted matrix factorization for this task since it usually serves collaborative filtering with implied feedback better. In addition to, researchers have recently uncover a spatial clustering phenomenon in human mobility behavior on the location based network, i.e., individual visiting locations tend to grouped together, and also indicated its effectiveness in place of interest recom- mendation, thus it is integrate it into the factorization model. Particularly, we supplement users and place of interests latent element in the factorization technique with area vectors of users and impact area vectors of place of interests, respectively. Then asses the proposed algorithm on a large-scale location based social network dataset. The outcome shows that weighted matrix factorisation is superior to alternative kinds of factorisation methods and which desentegration the agglomorative clustering phenomenon into matrix factorization upgrade recommendation performance.

Xing Xie et.al[3] suggested a new model Collaborative Exploration and Periodically Returning model (CEPR), relied on a novelity problem, Exploration Prediction (EP), which forecasts whether people will search for unvisited locations to visit, in the following. When people are predicted to do scrutiny, a state of the art recommendation algorithm, armed with collaborative social knowledge and assisted by geograph- ical impact, will be applied for finding the suitable candidates; otherwise, existing forecasting algorithm, integrating both regularity and the Markov model, will be put into use for figuring out the most proba- ble locations to visit, then perform case studies on check-ins and asses them on two large-scale check-in datasets with 6M and 36M records, respectively. The evaluation results estimates that EP attains 20percent- age classification error rate on each of the datasets, and that CEPR upgrades performances by as much as 30percentage compared to the traditional location prediction algorithms.

A. Problem Statement

A user check-in record is represented as r=u:l:t where u is the user,l is the location visited by the user,t is the time and location ,l is comprised of latitude and longitude. Here $C=c_1,c_2,c_3....$ C is the set of check-in record of

different users.Users check-in trajectory is represented as C_t=r_2,r_2,r_3... From these check- in records ,we get different types of features. By extracting all features,we get the probability values and combined them.

Problem statement [location Prediction]: The location prediction is to predict the preference probability p(l|u) i.e,a user u to an unvisited place l.

III. Proposed Work

A. Context Feature Extraction

Context feature refers to the geographical relation of places.It describes the density closeness between places.This feature is extracted using kernel density estimation method. Kernel density estimation method is used to find the probability density function of a random variable.We used two dimensional kernel Density Estimation method.We can calculate both visited and to be visited probabilities using this method.The basic steps for calculating Kernel density estimation as follows. Let L={ l_1,l_2,l_3,l_4..... }be the set of locations visited by the users and l_a= (x_a ,y_a).

Visited Probability

Step 1: For each user u, calculate the kernel location density as f(u|L,h) = K($l-l_a$)

Step 2: Derive the probability over places based on trajectory f(u|L,h) = 1/n$\sum_{a=1}^{n}$. K($l-l_a$)

Step 3: Kernel function K can be estimated as K($l-l_a$) = $\frac{1}{2\pi h}$ exp-($\frac{(x-xa)(y-ya)^2}{2h}$)

Here u is the user, L is the location trajectory(set of locations visited),h is the bandwidth,it is a fixed parameter,assume h=0.02,K is the kernel density constant value. l is comprised of latitude and longitude l_a= (x_a ,y_a) It is the first location, l_a is the second location which contains latitude and longitude (x_a and y_a.x,x_a are latitude of two places and y, y_a are the longitude of two places. Here l and l_a are already visited places. Subsititute the values in above equation and find probability value from context feature.

To be visited probability

Step 1: For each user u, calculate the kernel location density as f(u|L,h) = K(l^1-l_a)

Step 2: Derive the probability over places based on trajectory f(u|L,h) = 1/n$\sum_{a=1}^{n}$. K(l^1-l_a)

Step 3: Kernel function K can be estimated as K(l^1-l_a) =$\frac{1}{2\pi h}$ $exp\sum_{a=1}^{n}-(\frac{(x-xa)(y-ya)^2}{2h})$

The problem of an individual context feature extraction is sparsity problem. To solve this issue, we design a mixture kernel density method for a particular user u. Here we include different levels like place, district etc. We used Expectation-Maximization algorithm to extract the context feature weighting score.

Context Feature Extraction Algorithm

Step 1: Intialize kernel density method M^1, M^2, M^3... are the location level,district level,state level etc. Here we consider two levels place and district level.

Step 2: Set the intial non-negative weight value, N_k = ^{1} ,k=1 and d is the number of levels.

Step 3: Calculate the non-negative weight value,w^0= $\frac{1}{L}$ $\Sigma^L{}_{j=1}$ log($\Sigma^d{}_{k=1}$ N_k^0 M^k).

Step 4: Calculate the new weight value,w^{m+1}= $\frac{1}{L}$ $\Sigma^L{}_{j=1}$ log($\Sigma^d{}_{k=1}$ N_k^{m+1} M^k).

Step 5: if(| w^{m+1} − w^0|) > α,then finish the training process otherwise continue the above steps.

The mixture kernel density estimation can be calculated as p_{con}(l|U) = $\Sigma^n{}_{j=1}$P(l |L)

B. Collaborative Feature Extraction

This feature allows you to understand the places where people visits more and also learn about their interests, preferences etc. This feature is extracted from large group of check-in records. Here we also estimate the probability of visited and to be visited places. First create a user-location matrix using check-in record, where rows contains users and column contains locations. Each entry represents how many times a user visits a particular location.

$$\textbf{Visited Probability} = \frac{How\ many\ times\ a\ user\ visits\ particular\ place}{How\ many\ times\ total\ users\ visits\ that\ particular\ place}$$

To be Visited Probability

To be visited probability can be calculated using matrix factorization method. Matrix factorization method works by reducing user-location matrix into two lower dimensionality matrices.

$$Rc_{uxL} = U_{uxk} \ X \ L_{lxk}$$

Rc is the user check-in record. U represents the users location interest over latent space, k represents the location over latent space. In some places people may have never visited.such places there will be a value of zero. That is why matrix is sparse. To solve this sparsity problem,we introduced a re-weighting method of check-in matrix.

$$Re_{u,L} = 1+l \log(Re_{u,L} + 1), \text{ if } Re_{u,L} > 0; \text{ otherwise } 1$$
$$w_u = (\max(Re_{u,L}) \min(Re_{u,L})) /M$$

After calculating the weight used by the equation,assign zero check-ins with small weight and non zero check-ins with larger weight in the check-in matrix.So this re-weighting method reduces the sparsity and this weight can be used for finding the probability of collaborative feature. The probability of user u to a particular location l is estimated by

$$p_{colla}(l|u) = U_u \ L_l.$$

C. Content Feature Extraction

Places are represented with categories and the transition of a user from one place to another shows the flow of their interests. Here we also calculated the visited probability and to be visited probability. First construct a graph G(V,E) on the basis of a user visited category and estimated the category closeness,where each category is represented as a node in V, there exists edge in E. Weight of edge can be determined by how many times a user visits that particular transition pattern.

$$\textbf{Visited Probability} = \frac{How\ many\ times\ a\ user\ visits\ particular\ place}{How\ many\ times\ total\ users\ visits\ that\ particular\ place}$$

To be visited probability

For calculating to be visited probability, the closeness of categories must be extracted.

Step 1 : Observe the check in records of users and select a particular pattern of place where users visited.

Step 2 : Find out the users who visited that particular pattern of places and along with that find the categories in these locations.

Step 3 : Observe the category pattern that comes from these particular pattern of places.

Step 4 : Then find out the list of most visited categories and rank it.

The same steps will follow the rest of the pattern of places. From this we will get a list of top ranked category patterns(Tr).The transition pattern(c) is the category pattern of users visited places. There are also number of categories(c^1) the user does not visit. So what we find is the similarity between visited category and non visited category. The prediction probability of a user u to a particular location can be calculated by category closeness equation derived from random walk process

$$p_{cat}(l|u) = \sum_{c \in Tr}^{n} \cdot \sum_{c^1 \in C}^{n} l^1. \ \cap C_u \ sim(c, c^1)$$

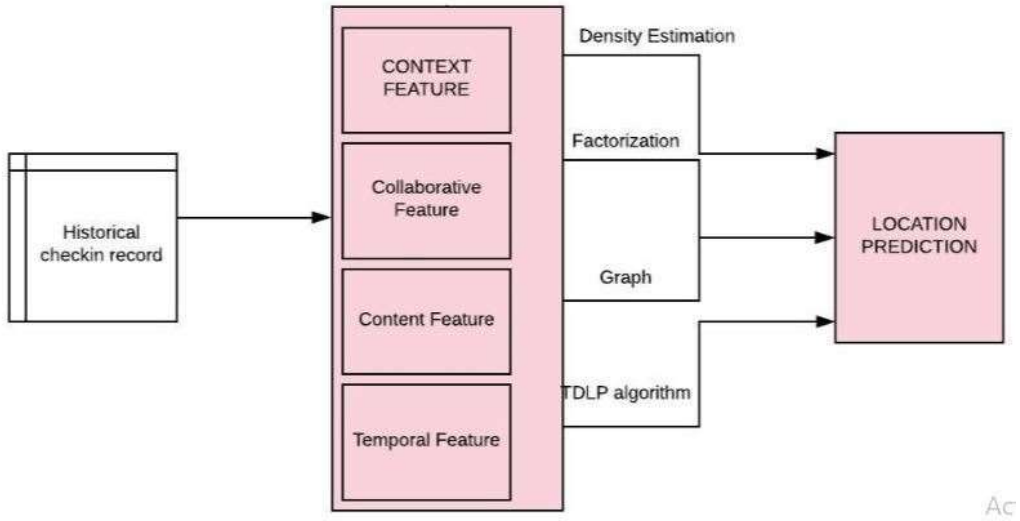


Figure 1: Location Prediction Block diagram

In order to increase the prediction performance we included a new feature called temporal feature.

D.Temporal feature

Existing methods for location prediction are related to geographical relation of places,peoples's interests,user visited places's category closeness etc. These are the features commonly used for next location prediction. Existing problems like sparsity,heterogeneous etc. Sparsity issues can be solved by mixture ker- rnel density model,re-weighting scheme etc. Category closenes extraction by mainly used markov chain method. But this method has some constraints. So here transition patterns are extracted using graphical method. This improves the limitation problem of Markov chain method.

Algorithm(Time Dependent Location Prediction Algorithm)

Global Variable : P(l_0, ,l_i,t,Δt), P(l_1, ,l_i,t,Δt)……

Pl_a = P(l_a,l_i,t,Δt)

Input:

l_i= Starting Location

t_{now}= Starting time

Δt = Transition time interval

$r = r^0, r^1, r^2$……. Transition time series for each location

$$M = P(l_0, l_0)\ldots\ldots\ldots\ldots\ldots P(l_m, l_n)$$

.

.

$$P(l_m, l_n)\ldots\ldots\ldots\ldots\ldots P(l_m, l_n)$$

M is the Location Probability Matrix

P_{curr}= The current probability with initial value of 1.

Output:

Begin:

For 0 ≤ a ≤ m

Begin

Get the next transition time $r^a{}_{.next}$ in r^a relative to t_{now}

If($r^a{}_{.next}$ - t_{now} ≥ Δt)

Begin

$P(l_a | l_i, t, \Delta t) = P(l_a | l_i, t, \Delta t) + P_{curr}$

Continue;

End

Else

Begin

$P_{curr} = P((l_a, I, | l_i, t, \Delta t)$

//Recursion

TDLP

End

End

End

IV. Result and Discussion

A. Dataset Information

Here we used Foursquare DAtset.It is the online-check-in records collected with in the places of Newyork.This dataset includes check-in usersid,venueid,venuecategory id,latitude,longitude,date and time.It contains 3112 users,3298 venues and 27149 check-ins.

B. Experimental Result

Several prediction methods are chosen to compare the characteristics and improvement of our proposed method.The methods like wmf(weighted matrix factorization),Geomf(geographical matrix factorization) are used.Comparing these methods, we can see that the proposed method shows advantages over all other methods.The context feature value,collaborative feature value ,content feature value,and their aggregation values of a particular user shown in the table1 below.

slno	userid	context	collab	cont	aggreg	venue
655	rahul@gmail.c...	0.00046	0.83000	0.16700	0.00006	Nattakom
656	rahul@gmail.c...	5.89794	0.83000	0.33400	1.63503	Pathanapuram
657	rahul@gmail.c...	0.00698	0.83000	0.66800	0.00387	Thampanoor
NULL	NULL	NULL	NULL	NULL	NULL	NULL

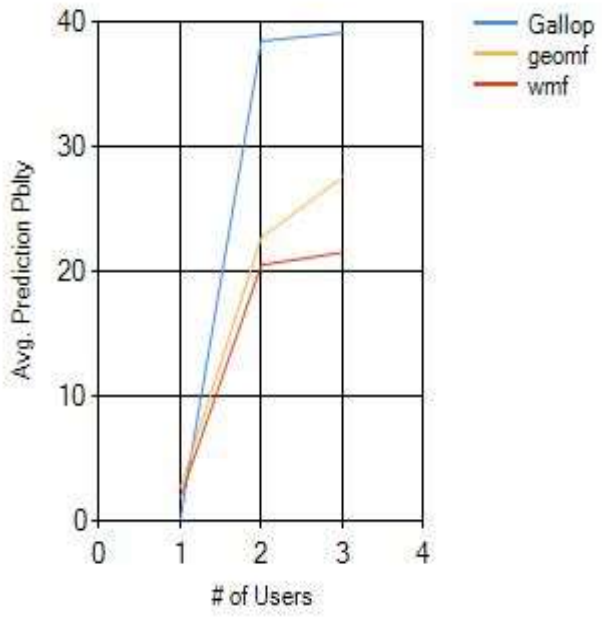
Table1: The probability values of three features

Comparison of two existing methods with our proposed method is shown in the table2.Here user_count represents the number of users at a particular time,place_count represents number of places,net_avg represents our proposed method ,context_val represents geomf(geographical matrix factorization) and collab_val represents wmf(weighted matrix factorization).

slno	user_count	place_count	net_avg	context_val	collab_val
243	1	10	0.13875	2.69145	1.90000
244	2	13	38.54035	22.76837	20.56667
245	3	15	39.18296	27.61633	21.56667
246	4	20	39.78727	29.85626	22.26527

Table 2: The probability values of three features for the performance evaluation.

The performance evaluation of proposed method compared with other methods,graphical representation is shown below. X axis represents the number of users and Y axis represents the prediction value. Gallop is our proposed method and other two methods are wmf(weighted matrix factorization) and geomf(geographical matrix factorization) . So we can see that gallop shows high performance.



.

Figure 1.1 Performance evaluation of gallop with existing methods.

Another graph is shown below which shows the comparison of collaborative method and weighted matrix factorization(wmf).This graph shows the performance evaluation of the above two methods. Here we can see that the collaborative method shows the higher performance.

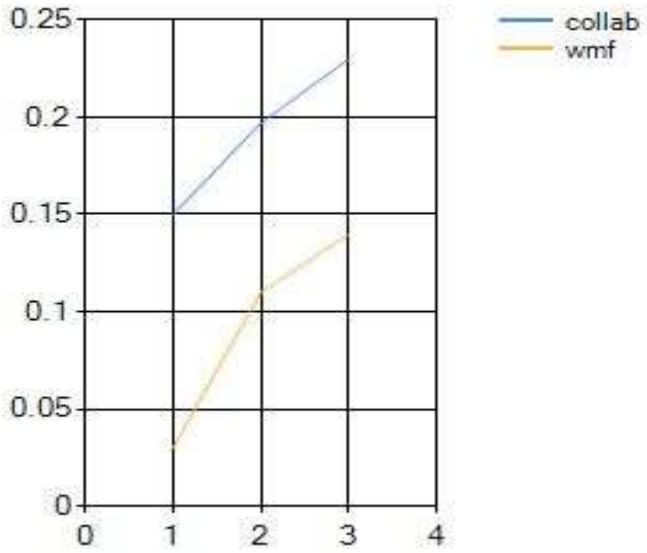


Fig 1.2 performance evaluation of collaborative feature method with weighted matrix factorization method.

V. Conclusion

This paper shows a new feature fused location prediction based on check-in scenarios.The probability values of context feature,collaborative feature,content feature are utilized and find the maximum probability value of

places to predict the next location of a particular user. Context feature values are extracted using kernel density estimation method, Collaborative feature is extracted using Matrix factorization method and Content feature values are extracted using Graphical method. Inaddition to this temporal feature,which is extracted using time dependent location prediction algorithm. This prediction approach improves the generality and also more advantages over the existing methods.

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Random DNA Encoding with DNA Cryptography and AES Encryption Algorithm to Enhance Data Security in Encrypted Cloud Domain

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Abstract*: Cloud computing is a set of massive amount of facts that are provided to a consumer over a network on a rented basis and with the capability to scale up or down their service requirements. Generally cloud computing services are delivered via a third party issuer who possesses the infrastructure for customers. Considering that cloud computing is rest on public network, so protection issues like data privacy, data safety, data confidentiality, and authentication is encountered. Regardless of the ability gains from the cloud computing, the protection is one of the important troubles which hamper the growth of cloud. The idea of supplying essential records to another corporation is troublesome; so that the clients want to be vigilant in how to handle the risks of data breaches on the new surroundings. In this perspective, we have chosen to make use of an aggregate technique to encrypt, encode and secure data by using encryption algorithms. This combination of encryption guarantees all of the safety scheme of confidentiality, data security and* verification, at the same time. In this paper, we have proposed to utilize a random DNA(RDNA) encoding and DNA cryptography combined with AES algorithm and OTP to guard confidentiality and security of data stored in cloud environment.

Keywords*: Data Confidentiality, Security, AES Encryption, DNA Encoding, RDNA, OTPGeneration.*

I. Introduction

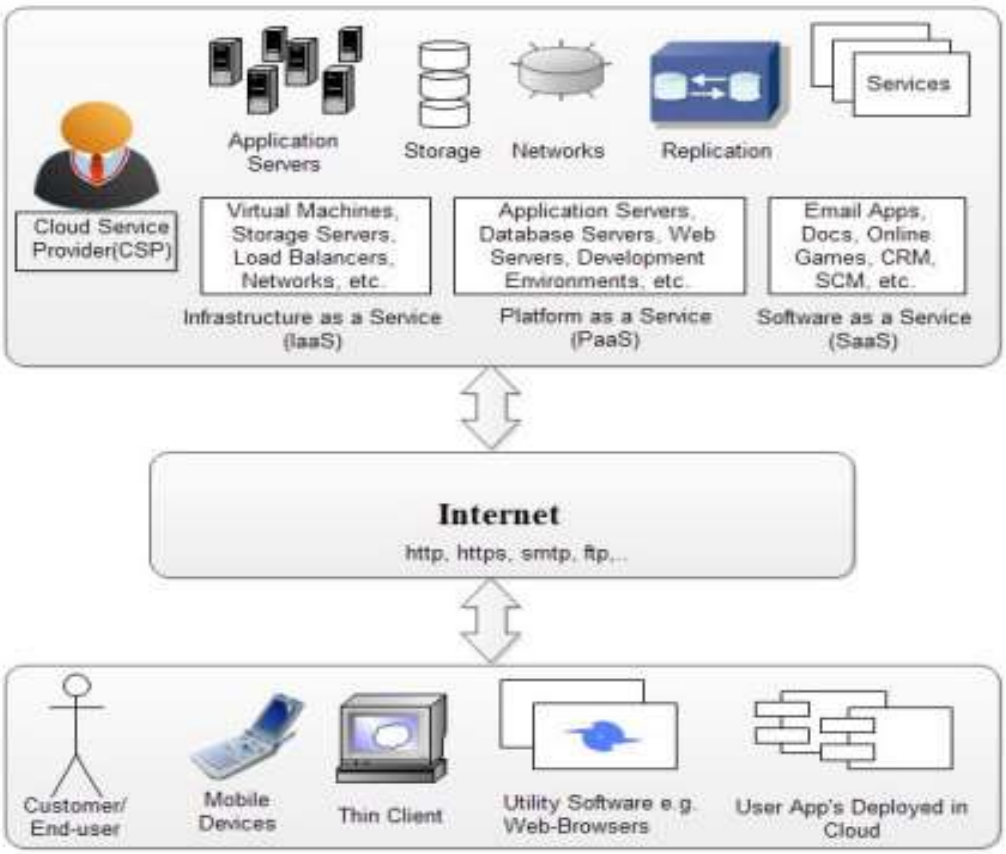
Computing as a service has seen an outstanding increase in recent years. The primary motivation for this boom has been the promise of dynamically scaling and deploying new services without retaining a committed computing infrastructure. Hence, cloud computing has begun to unexpectedly transform the manner companies view their IT resources. From a scenario of a single system organizations have been moving into cloud computing, where resources are available in abundance and the user has an extensive variety to choose from.

Cloud computing may be taken into consideration as a new paradigm which could provide reduced capital expenditure, operational risks, complexity and preservation, and multiplied scalability even as imparting offerings at different abstraction tiers. The three famous and generally used cloud standards are software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). In SaaS, software program with the related information is deployed by a cloud service company, and users can use it through the internet. In PaaS, a provider allows services to the users with software program applications which could clear up the particular duties. In IaaS, the cloud service company allows offerings to the customers with virtual machines and garage to enhance their enterprise competencies.

Cloud computing is a model for enabling convenient, on-demand community access to a shared pool of configurable computing resources that may be hastily provisioned and launched with service company interaction or minimal management attempt. Here, the customers need not to know the details of a specific technology while hosting their application, because the service is completely controlled by the Cloud Service Provider (CSP). Users can consume services at a charge this is set by using their particular desires. This on-

demand service can be furnished any time. CSP would take care of all of the necessary complicated operations on behalf of the person. It would offer the complete system which allocates the desired resources for execution of user applications and management of the entire system. Figure 1.1, depicts the graphical representation of the architecture of cloud computing.

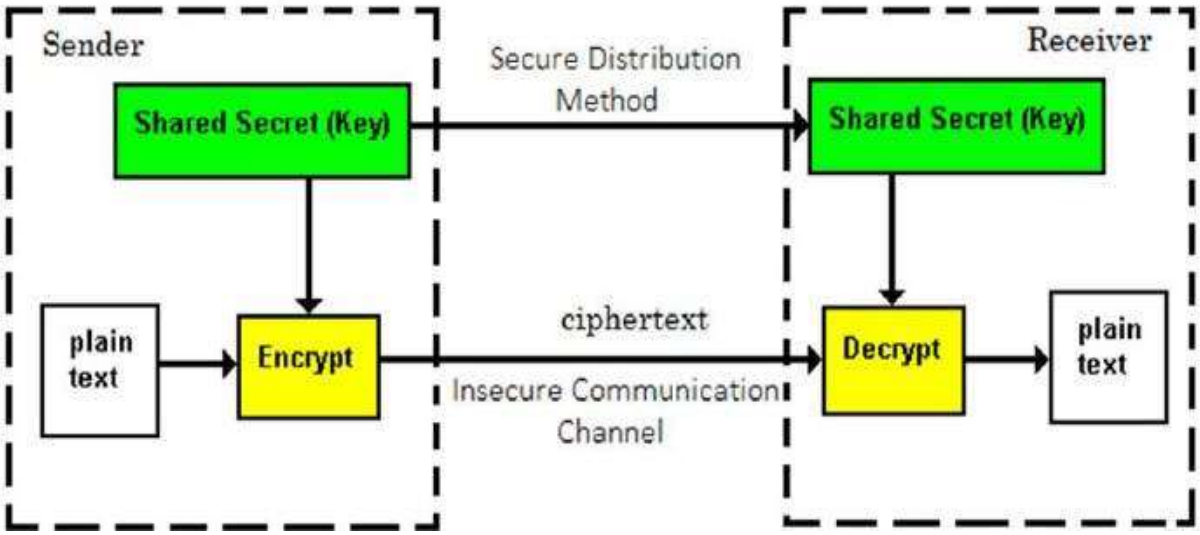
Fig 1 Cloud Computing Architecture



Data security and confidentiality have always been a major trouble in this era [4][5]. Within the cloud computing surroundings, it turns into particularly critical because the data is placed in specific locations even in all around the world. Data safety and privacy are the two essential factors about consumer's worries in the cloud computing. The protection of cloud systems poses a challenge to each the issuer and customers on the same time. Safety is a common problem for any era; however, in the cloud, protection leaks are the fundamental problem that prohibits human beings from fully adopting cloud structures. Storing sensitive and personal records on cloud servers is an important issue for clients. Currently, cloud providers protect their servers, in terms of data security and privacy. But, users are increasing in number and protect their information and privacy from attackers. Many incidents affecting users from frequent cloud failures and a success assaults.

Cryptography is the practice and study of techniques for secure communication in the presence of third parties. The art or science encompassing the principles and methods of transforming an intelligible message into one that is unintelligible, and then retransforming that message back to its original form .It is the scientific study of techniques for securing digital information. Cryptography can reformat and transform our data, making it safer on its trip between computers. The technology is based on the essentials of secret codes, augmented by modern mathematics that protects our data in powerful ways. Conventional encryption uses the original message, referred to as plaintext, and is converted into apparently random nonsense, referred to as cipher text. The encryption process consists of an algorithm and a key. The key is a value independent of the plaintext. Changing the key changes the output of the algorithm. Once the cipher text is produced, it may be transmitted. Upon reception, the cipher text can be transformed back to the original plaintext by using a decryption algorithm and the same key that was used for encryption.

Fig 2 Conventional encryption model



This paper proposes a random DNA encoding and DNA cryptography combined with AES algorithm and OTP generation to protect the user data stored in the cloud environment from the unauthorized access. This also ensures data confidentiality and security of data stored in cloud environment.

II. Issues In Cloud Computing

A. Confidentiality

Confidentiality ensures that the information in a computer system and transmitted information are accessible only for authorized parties.

B. Authentication

Authentication guarantees that the origin of a message or electronic document is correctly identified, with an assurance that the identity is not false.

C. Integrity

Integrity provides only authorized parties are able to modify computer system assets and transmitted information. Modification includes writing, changing status, deleting, creating and delaying or replaying of transmitted messages.

D. Non repudiation

Non repudiation means that neither the sender nor the receiver of a message be able to deny the transmission.

E. Access control:

Access control ensures that access to information resources may be controlled by or the target system.

F. Availability:

Availability means that computer system assets be available to authorized parties when needed [7] [9] [20].

III. Problem Statement

The confidentiality and security of customer's data become top priority for cloud providers. So, for efficient data protection we want a mechanism that gives secure encryption as well as data confidentiality. The associated works referred to above have focused on cloud security issues. They provided different mechanisms for information safety in cloud environment. Unique researches have focused on the fact that consumer normally has to get admission to big volumes of data from the cloud in a secured way. But the complexity of the cryptographic algorithm used is not take into consideration. The complexity of the algorithm at once impacts the

velocity of information accessed. We want a few algorithm with a purpose to assist in efficient and secured data access.

IV. DNA Cryptography

DNA cryptography is one of the rapid emerging technology which works on concepts of DNA computing. A new technique for securing data using the biological structure of DNA is called DNA cryptography [19]. DNA can be used to store and transmit data. The concept of using DNA computing in the fields of cryptography and steganography has been identified as a possible technology that may bring forward a new hope for **unbreakable algorithms.** Strands of DNA are long polymers of millions of linked nucleotides. These nucleotides consist of one of four nitrogen bases, a five carbon sugar and a phosphate group. The nucleotides that make up these polymers are named after the nitrogen base that it consists of: **Adenine (A), Cytosine (C), Guanine (G) and Thymine (T**). Mathematically, this means we can utilize this 4 letter alphabet Σ = {A, G, C, T} to encode information, which is more than enough considering that an electronic computer needs only two digits, 1 and 0, for the same purpose[1] [6] [8] [18].

V. AES Encryption

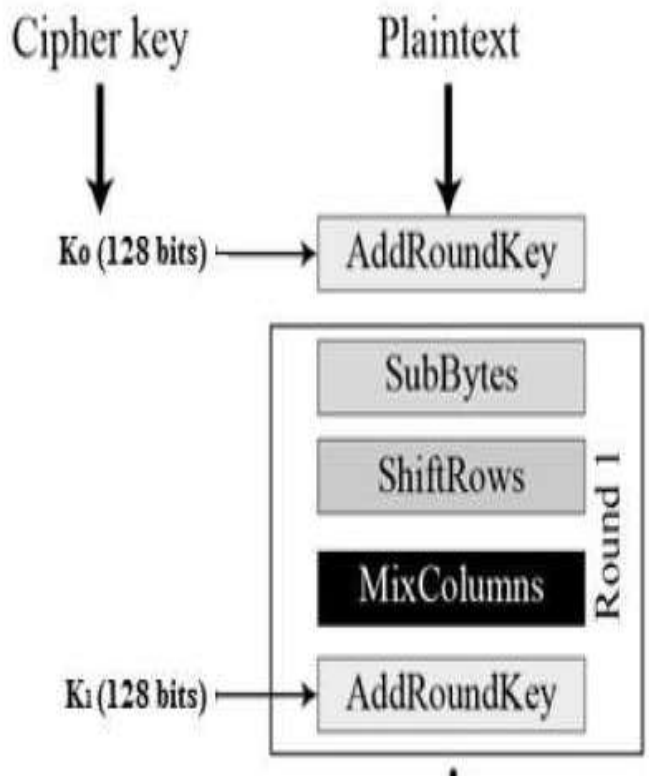
The more popular and widely adopted symmetric encryption algorithm likely to be encountered nowadays is the Advanced Encryption Standard (AES) AES performs all its computations on bytes rather than bits. Hence, AES treats the 128 bits of a plaintext block as 16 bytes. These 16 bytes are arranged in four columns and four rows for processing as a matrix.

The number of rounds in AES is variable and depends on the length of the key.

Encryption

Each round comprise of four sub-processes. The first round process is depicted below

Fig 3 AES Encryption



1.1 Byte Substitution (SubBytes)

The 16 input bytes are substituted by looking up a fixed table (S-box) given in design. The result is in a matrix of four rows and four columns.

Shiftrows

Each of the four rows of the matrix is shifted to the left. Any entries that 'fall off' are re-inserted on the right side of row. Shift is carried out as follows:

- First row is not shifted.
- Second row is shifted one (byte) position to the left.
- Third row is shifted two positions to the left.
- Fourth row is shifted three positions to the left.
- The result is a new matrix consisting of the same 16 bytes but shifted with respect to each other.

MixColumns

Each column of four bytes is now transformed using a special mathematical function. This function takes as input the four bytes of one column and outputs four completely new bytes, which replace the original column. The result is another new matrix consisting of 16 new bytes. It should be noted that this step is not performed in the last round.

Addroundkey

The 16 bytes of the matrix are now considered as 128 bits and are XORed to the 128 bits of the round key. If this is the last round then the output is the ciphertext. Otherwise, the resulting 128 bits are interpreted as 16 bytes and we begin another similar round.

Decryption

The process of decryption of an AES ciphertext is similar to the encryption process in the reverse order. Each round consists of the four processes conducted in the reverse order:

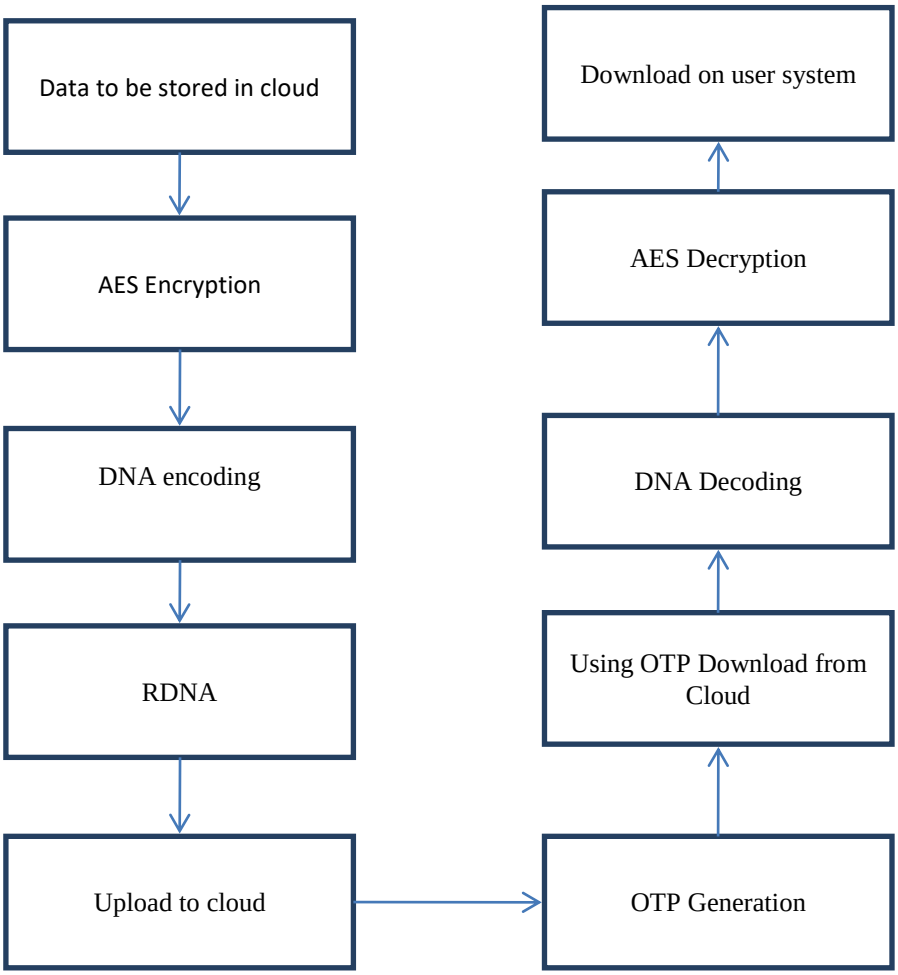
- Add round key
- Mix columns
- Shift rows
- Byte substitution

Since sub-processes in each round are in reverse manner, the encryption and decryption algorithms needs to be separately implemented, although they are very closely related.

Proposed Methodology

In this paper we aim at eliminating the confidentiality and security threats for cloud architecture by using encrypting techniques: DNA cryptography[3] and AES encryption. To deploy these strategies, we proposed a new architecture which can be used to layout a cloud system for higher security and reliability on the cloud servers at the same time retaining the facts integrity from consumer point of view. Our system consist of the following steps:

Fig 4 Proposed method



To perfrom AES encryption and decryption

Length of the input-output block and the state is 128 for AES algorithm. This is represented by Nb = 4, which reflects the number of 32-bit words (number of columns) in the state. For the AES algorithm 128, 192, or 256 bit is the length of the Cipher Key, K. Thekey length of the block is denoted by Nk and its value is 4, 6, or 8. This value reflects the number of 32-bit words (number of columns) in the Cipher Key. For the AES algorithm, during the execution of algorithm the numbers of rounds to be performed are dependent on the key size. Nr is used to represent the number of rounds. AES algorithm uses a round function for both its Cipher and Inverse Cipher. This function is composed of four different byte-oriented transformations: A) Using a substitution table (S-box) byte substitution, B) By different offsets shifting rows of the state array, C) mixing the data within each column of the state array, and D) adding a round key to the state. Number of round keys generated by key-expansion algorithm is always one more than the actual number of rounds present in the algorithm.The input (block size N_b, also known as plaintext) of the AES algorithm is converted into a 4 x 4 array, called a state. Four transformations, Add Round Key, Sub Bytes,Shift Rows and Mix Columns, perform various operationson the state to calculate the output state (the final cipher text) [20].

DNA encoding

In the binary digital coding, characters are encoded by two state 0 or 1 and a combination of 0 and 1 [13]. But in DNA digital coding bases can be encoded by using two bits as shown in table 1.

Table 1 DNA Encoding

Binary value	Nitrogenous bases in DNA
00	A
11	T
10	G
01	C

That is ADENINE (A) and THYMINE (T) or CYTOSINE (C) and GUANINE (G) extracted from public chromosomal database and used it for the implementation of DNA encoding. Here in this work, we are using ATGC as a key. Every basehas 2 bits like A=00, T=11, G=10, and C=01 and by using ATGC, key combinations is generated and give numbering respectively that is given into table. Obviously, by these encoding rules, there are 4! = 24 possible encoding methods. For DNA encoding, it is necessary to reflect the biological characteristics and pairing principles of the four nucleotides. Based on this principle, we know that:A (0) – 00 and G (3) – 10 make pairs,T (1) – 11 and C (2) – 01 make pairs.From the table 1, we can generate 64 bit key values and adding ATGC, we can generate 72-bit key (64 bits of key combination and 8 bits of ATGC). ATGC key is sending to the receiver side. In this work, every time the key value will be randomly change[2] [11] [12] [14] [15].

Create random DNA sequence

Create a random DNA (RDNA) strand by selecting DNA sequences from the digital databases. Select the random DNA and index it. Select the encoding and non-encoding regions randomly or based on the index values. Convert indexed RDNA into short fragments based on the length of DNA base pair, and a key valuebased on DNA. Remove the non-encoding region and the generated DNA sequence. Insert the DNA into non-encoding regions of thegenerated RDNA based on the index positions or randompositiondependingontheindexingruleselected. The resultant DNA sequence generated by DNA encoding isconvertedinto ASCII format and then into binaryformusingthe selected binaryrule. Upload the encrypted data in the binary form and store it in thecloud [1][2] [10] [16][17].

Plain text : source
ASCII value for plain text: 115 111 117 114 99 101
Binary encoding for each character in the plain text:s - 115 – 01110011 - CTAT

Upload data to cloud

After encryption and encoding the data in the binary form and stored it in the cloud environment. This data is incorporated with confidentiality and security.

OTP Generation

An OTP is generated randomly for each data and that OTP number send to the user as a valid number. Then the user can download the data from the cloud only with that OTP. OTP is a one-time password and it could not share with any one [1].

Conclusion and Future Work

In this paper, we have analyzed the data confidentiality and security problems confronted by user's personal information within the cloud environment and find a method to solve this problem. Data confidentiality and security can be thoroughly assured by means of use of other cryptographic algorithms, however the huge quantity of information in cloud computing positioned a difficulty to the idea. So, we have proposed a structure which can be applied in cloud environment for establishing a secure connection and for encrypting the data. The algorithms used for this are DNA cryptography key and AES Encryption. With assist of those two algorithms, we provide a four- step process for making the data confidentiality and security.

In future, we emphasize on the implementation of the proposed structure along with some modifications and different comparisons to reveal the effectiveness of our proposed structure.

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WEB BASED UTILITY SERVICE MANAGEMENT

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Abstract*: In present scenario, peoples are always busy, and are engaged with in a luxurious life. Peoples don't have time for their personal life. Every one of us would have a dream about a kind of house which doesn't have any maintenance issues. Everyone have a thought that life would be much better if no point of issue arises in getting a service at our door step. Our proposed method provides various services like Cleaning services, Pest control services, Plumbing services and repair services, Carpentry work, Painting services, Laundry services, Home computer repair service and many more. People can book a wide range of services, delivered by well qualified and background checked professionals from anywhere, anytime across their City. A very simple process is that the user can book services from our webpage by using their login page. Also he can communicate with experts.*

Keywords*: web project,, Hashing*

I. Introduction

Recently, people have burden to find a service expert professionals according to fulfil their expectations .They have no assurance about the quality of services and their identity. High bargaining for money than the standard market price were exist.Our method implemented to reduce the man power and for simplify our everyday life. It helps people with variety of home services. This innovative site allows for person to service expert professional. It allows person to login and communicate to experts. The Persons can book service like Beauty Services, Appliance repair and service, Cleaning services, Pest control services, Plumbing services, Electrical installation and repair services, Carpentry work, Painting services, Laundry services, Home computer repair service, Cars and bike servicing, Packers and movers services, Document services etc. This service boosts their communication and brings transparency in the system. It allows for person to Service expert professional or Service centre communication. The person can login and communicate to respective Experts. When Experts publish their services, the person can submit their grievances and complaints or book their Service to respective experts or authorities using their login on a separate complaints page and authorities will get access to that page regularly using their login id and passwords. A web project to help peoples with a variety of at-home services that simplify their everyday living. People can book a wide range of services, delivered by well qualified and background checked professionals from anywhere, anytime across their City. Web based utility service management connect you with experts in your locality who present appliances services at your convenience. With the right tools, best-fit products and a courteous professional, you can see that the quality of Appliances services offered by our experts surpasses the standard offered elsewhere. All you need to do is let us know your requirement in appliances services and schedule a convenient time for appliances at home. On confirming the booking, we will assign the best professionals for the job and send him or her to your place at the designated date and time to carry out the services to the people in a comfortable way without any difficulties.

II. Literature Review

Jeu Young Kim [6] proposed a method focused on IoT (Internet of Things). The home domain is the most important research area of IoT, because there expected accounts of home smart device for over 40 percent of connected device excepting mobile phone. Further more, enormous data is generated by home smart device. There is growing concern, but the previous works didn't address enough to manage and analyse home data. The purpose of this study is to describe and examine to manage the aggregated home IoT data based on SWO (Smart home Web of Objects), and SWO analytics platform. It shows the implementation of SWO analytics platform and a case study using real data from smart metering devices for analysis of appliance usage patterns**.**

Li Xuemei1 [2] proposed that Service Oriented Architecture as a new architecture to solve the problems. Also propose a two-layered design of an appliance, including device and service layers. The device layer corresponds to the physical device of the appliance controlled by vendor-specific interfaces. The service layer exhibits features of the device as self-contained services accessible via device-independent interfaces. Thus, the appliances are loosely coupled at the service layer without any centralized server. This enables more flexible, robust and load-balanced integrated services.

Xiaowei Xu¢Ó [3] proposed an approach to develop an unified Service-Oriented design pattern to build a network controller and service platform, and implement the home service bus with loosely-coupled systems, to make smart appliances become easier to build upon. The multilayer architecture of our system and its implementation, which follows the concepts of home service bus. Also presented and discussed several prototypes using the above principles, which connect environmental sensors and actuators with Web services

Eduard Turcan [4] proposed concepts of Smart Home, Connected Home, Home Networking or Home Communication are quite well known through the media. This interest towards home automation and control leads to a new view for the future home, a new life style, with new services and applications. This paper points out the key features of P2P technology that can boost the optimization of home automation. With this technology in place, find new benefits emerging for both households and real estate companies. Research directions for future work are also suggested.

Katsuya Suzuki and Masahiro Inoue [5] proposed a new home network system architecture where household appliances and network services work together by moving management functions of Home Gateway (HGW) onto network cloud. The architecture reduces costs and eases the management of services and applications. In this study, it implemented and evaluated the new architecture with recall Support System which supplies services of consumer electronics recall**.**

Xiaodong Wang [22] Proposed method for design and implement a smart home service middleware (SHSM) to support service integration and intelligent service invocation. SHSM implements a hierarchical structure and a complete service management framework which effectively integrates and operates heterogeneous service resources. SHSM constructs a rule driven application trigger scheme to automate application workflow for smart space environment. It present some use cases that show the overall utilization of the middleware and discuss the practical application scenarios

III. Method and Materials

PHP is a server-side scripting language, which can be embedded in HTML or used as a standalone binary. Proprietary products in this niche are Microsoft's active server pages, Macromedia's ColdFusion, and Sun's Java Server Pages. Some tech journalists used to call PHP"the open source ASP" because its functionality is similar to that of the Microsoft product—although this formulation was misleading, as PHP ASP was developed before. Over the past few years however, PHP and server-side Java have gained momentum, while ASP has lost mindshare, so this comparison no longer seems appropriate. Server-side scripting is a collection of super-HTML tags or small programs that run inside our Web pages—exception the server side, before they get sent to the browser. For example, we can use PHP to add common headers and footers to all the pages on a site or to store form-submitted data in adatabase.PHP is an official module of Apache HTTP Server, the market-leading free Web server that runs about 67 percent of the World Wide Web. This means that the PHP scripting engine can be built into the Web server itself, leading to faster processing, more efficient memory allocation, and greatly

simplified maintenance. Like Apache Server, PHP is fully cross platform, meaning it runs native on several flavours of UNIX, as well as on Windows and now on Mac OS X.

MySQL is a fast, easy-to-use RDBMS used being used for many small and big businesses. MySQL developed, marketed, and supported by MySQL LAB, which is a Swedish company. MySQL is an open source, SQL Relational Database Management System (RDBMS) that is free for many uses (more detail on that later). Early in its history, MySQL occasionally faced opposition due to its lack of support for some core SQL constructs such as sub selects and foreign keys. Ultimately, however, MySQL found a broad, enthusiastic user base for its liberal licensing terms, perky performance, and ease of use. Its acceptance was aided in part by the wide variety of other technologies such as PHP, Java, Perl, Python, and the like that have encouraged its use through stable, well-documented modules and extensions. MySQL has not failed to reward the loyalty of these users with the addition of both sub selects and foreign keys.

XAMPP is a free and open source cross-platform web server package, consisting mainly of the Apache HTTP Server, MySQL database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP is an easy to install Apache distribution containing MySQL, PHP and Perl. XAMPP is really very easy to install and to use just download, extract and start. It is used as a development tool, to allow website designers and programmers to test their work on their own Computers without any access to the Internet. Many important security features are disabled by default. XAMPP is sometimes used to actually serve web pages on the World Wide Web. A special tool is provided to password-protect the most important parts of the package. XAMPP also provides support for creating and manipulating databases in MySQL and SQL among others. Once XAMPP is installed we can treat our local host like a remote host by connecting using an FTP client. Using a program like File Zilla has many advantages when installing a content management system (CMS) like Joomla. We can also connect to writing a database enabled web page is incredibly simple.

IV. IMPLEMENTATION

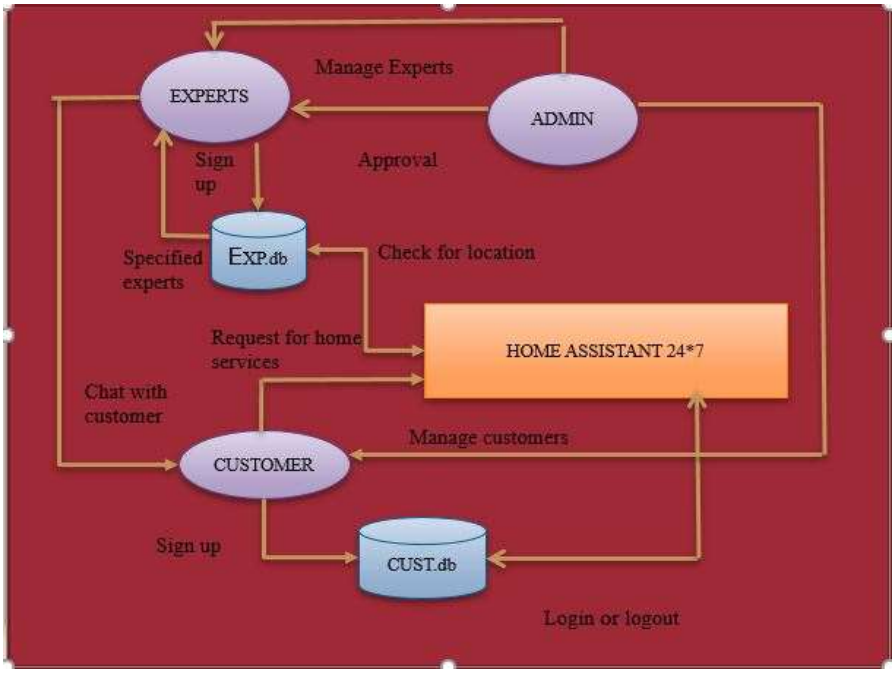


Figure 1: Architecture for the performance of user, expert and admin

Admin can approve experts unless the experts should not able to login to the site. Experts registered on the application will be verified by the Admin and experts approved by the admin only will be listed to the customer. Should able to view and manage the details of experts and customers. Admin can control the website settings. Admin can remove experts. Admin can view the complaints or tickets raised by the customers and take necessary actions against the corresponding experts. Experts can self-sign up in the application, but experts will be listed only after the verification process by the admin. Experts can login to the web site only after the

approval process. Experts can add their services and locations at the time of registration. Experts will do their services in on time according to the customer request. Can accept/reject request from customers and able to chat with customers. On confirming the booking, experts will send a message with the designated date and time to the requested customer to carry out the services. The customers are authenticated to the website by providing the credentials which they entered at the time of registration. Individual profile management for each customer is provided in this system .Customers should be able to search for experts in specified location and can send request to them.

V.Result and Discussion

It reduces the trouble for customers to search for the services and avoids from bargaining to get the profitable services to be done. Once the service is completed our customers are requested to rate the overall performance done by our professionals and ask for the valuable feedback or improvements to be done for a better service. If the customers are unsatisfied for some valid reasons, are turn policy is approved, or a re-service may be done to make feel convenient with our services.

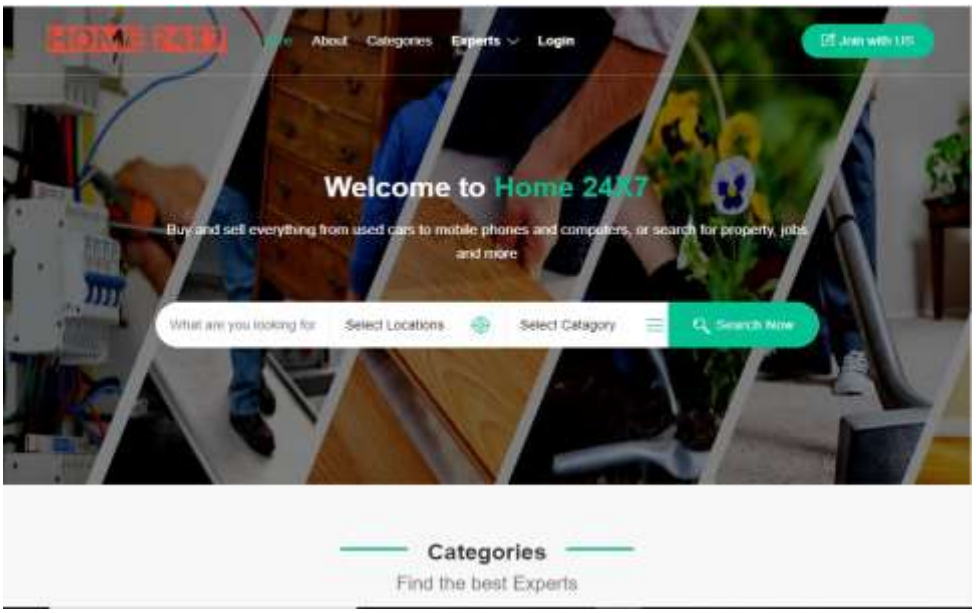


Figure 2: The first page where the user first sees

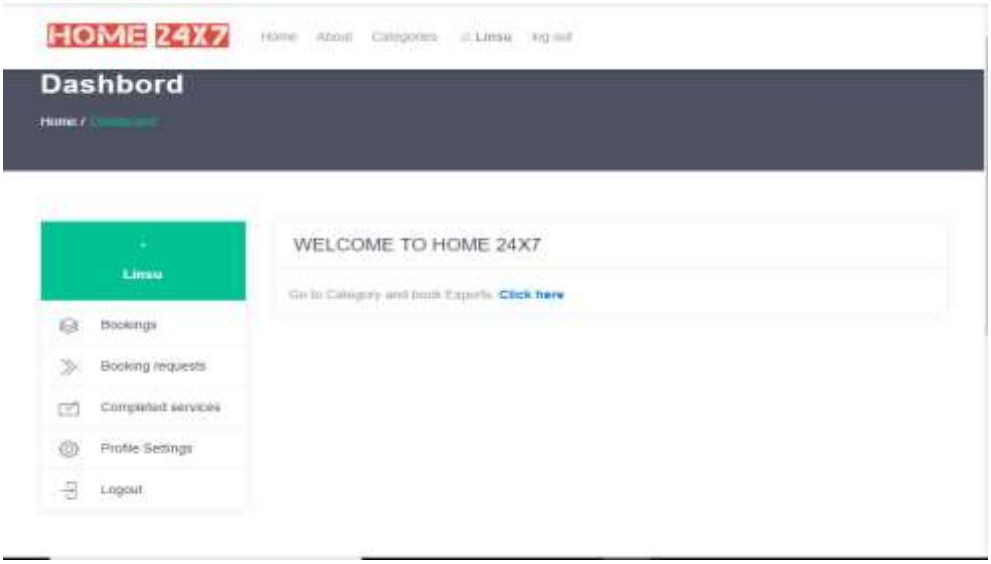


Figure 3: user's profile view and they can book their services

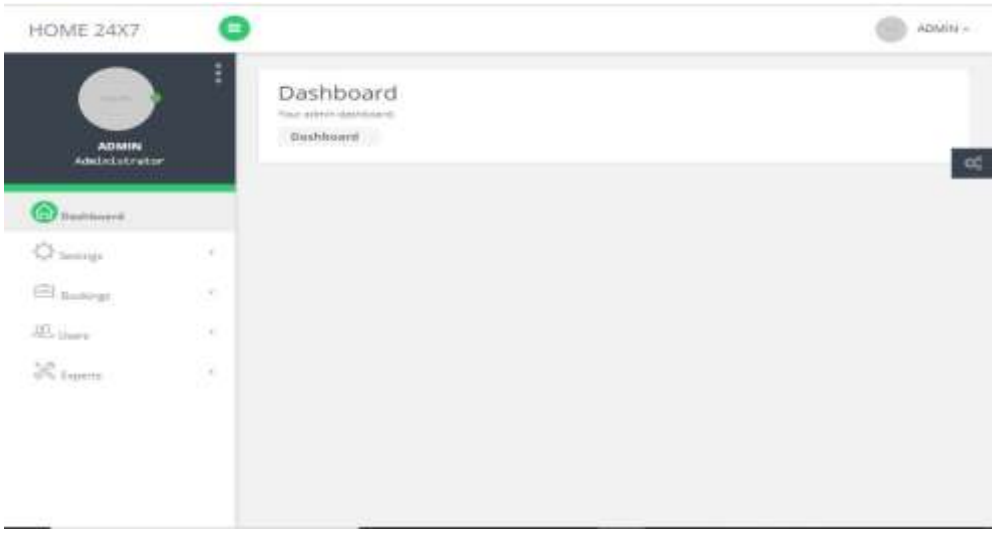


Figure 4: Admin can view the customer's and expert's requests

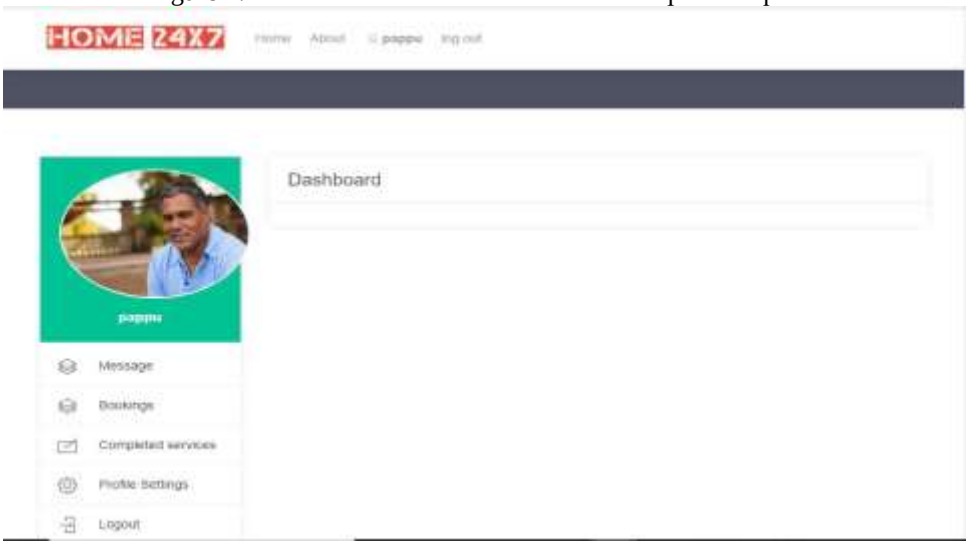


Figure 5: Experts profile view and their request from users

VI. Conclusion

Web based utility service management integrates various home services in home. It provides services according to the user's needs. After performing literature survey and studying other existing works, we proposed a technique that gives us better way to reduce manpower. In this system we have overcome certain drawbacks like complexity, high competition with vendors, incompatible standards and high costs and also providing a user-friendly interface on the host side so that they can perform easier. By using these systems can actually manage to make standard low cost.

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VLSI ARCHITECTURE FOR TRUE RANDOM NUMBER GENERATOR WITH COMPRESSION SCHEME

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Abstract*: True random number generators (TRNGs) are most critically required in cryptography and in various other applications including PIN/password generation, authentication protocols, key generation, random padding. Field-programmable gate arrays (FPGAs) is an ideal platform for hardware implementations of many of these security algorithms. This is a novel and efficient method to generate true random numbers on FPGAs by using DCM-based tunable BFD-TRNG. It has on-the-fly tunability through dynamic partial reconfiguration to improve randomness qualities. A simple post processing unit using Von Neumann corrector is used to eliminate any biasing in the generated random bits. Board selected is Xilinx Spartan-6 FPGA. In addition an improvement in VLSI architecture is done by using Run Length Encoding Compression scheme which reduces the memory utility in FPGA and also provide improved security. Thus it can also be used in CDMA applications.*

Keywords*: Digital Clock Manager (DCM), Dynamic Partial Reconfiguration (DPR), Field Programmable Array (FPGA), True Random Number Generator (TRNG), Beat Frequency Detection (BFD),Clock Management Tiles (CMT)*

I. Introduction

As embedded electronics continue to be integrated into our daily lives, security becomes an indispensable requirement for an embedded system. Therefore, it is essential that unpredictable random numbers are available in secure embedded systems. However, designing hardware to harvest random numbers is a challenge, since most digital circuits are primarily developed to behave in a deterministic digital manner. Producing unpredictable output is usually undesired for an integrated circuit, and is sometimes regarded as a design failure. A True Random Number Generator (TRNG) circuit is designed to be sensitive to a particular physical phenomenon when it is in use, and to be resistant to process variations and other unwanted random physical phenomena.

This is a novel and efficient method to generate true random numbers on FPGAs by using DCM-based tunable BFD-TRNG. Field-programmable gate arrays (FPGAs) is an ideal platform for hardware implementations of many of these security algorithms. It has on-the-fly tunability achieved through dynamic partial reconfiguration to improve randomness qualities. The TRNG utilizes this tunabilty feature for determining the degree of randomness, thus providing a high degree of flexibility for various applications. A simple post processing unit using Von Neumann corrector is used to eliminate any biasing in the generated random bit streams. Implementation is on Xilinx Spartan-6 FPGA. A pure digital implementation of a TRNG is highly demanded by modern-day applications. In addition an improvement in VLSI architecture is done by using Run Length Encoding Compression scheme which reduces the memory utility in FPGA and also provide improved security.
Finally we can also show that the random numbers generated can be used for CDMA application.The goal of this brief is the design, analysis, and implementation of an easy-to-design, improved, low-overhead, and tunable TRNG for the FPGA platform.

Development of this architecture allows on–the–fly tunabilty of statistical qualities of a TRNG by utilizing DPR capabilities of modern FPGAs for varying the DCM modelling parameters. This approach is only applicable for Xilinx FPGAs which provide programmable clock generation mechanism, and capability of DPR.DPR is a relatively new enhancement in FPGA technology, whereby modifications to predefined portions of the FPGA logic fabric is possible on–the–fly, without affecting the normal functionality of the FPGA[1]. Xilinx Clock Management Tiles (CMTs) contain Dynamic Reconfiguration Port (DRP) which allows DPR to be performed through much simpler means .Using DPR, the clock frequencies generated can be changed on–the–fly by

adjusting the corresponding DCM parameters. DPR via DRP is an added advantage in FPGAs as it allows the user to tune the clock frequency as per the need. Design techniques existto prevent any malicious manipulations via DPR which in otherways may detrimentally affect the security of the system [2].

This design is an improved FPGA based TRNGs, using purely digital components. Using digital building blocks for TRNGs, has the advantage that the designs are relatively simple and well-suited to the FPGA design flow, as they can suitably leverage the CAD software tools available for FPGA design. However, digital circuits exhibit comparatively limited number of sources of random noise, e.g.metastability of circuit elements, frequency of free running oscillators and jitters (random phase shifts) in clock signals. The TRNG is ring oscillator based and operated using Beat Frequency Detection (BFD) principle [3].When ring oscillator based BFD TRNG is used there is bias on the random bits generated. The design of ring oscillator biases the statistical properties of random bits generated. The random numbers generated using DCM circuitry requires more storage space and consumes more power.

How to overcome the problems in ring oscillator based BFD TRNG?

The problem of biasing the random bits generated in ring oscillator based BFD TRNG is overcome by replacing ring oscillators by DCM.DCM which is embedded in FPGA Xilinx CMT has the ability to divide or multiply the incoming clock frequency. Thus the required clock frequency can be obtained varying D and M parameters.

Another problem of more power consumption and storage space utilization is overcome by a lossless compression scheme called Parallel Run Length Encoding. Data compression implies sending or storing a small number of bits.Run Length compressions is a lossless method where original data after compression and decompression are exactly the same.No data will be lost and is safe. Redundant data is removed during compression and added during decompression.

Replace consecutive repeated occurrence of the symbol by 1 occurrence of a symbol followed by number of occurrences. This method is more efficient if the data uses only two symbols (0's and 1's) in bit patterns and 1 symbol is more frequent than other. Data is compressed by eliminating redundant bits and the same code must be substituted for the eliminated elements and based on this code receiver can reconstruct original data. In order to verify the data after compression, it is followed by decompression.

Contributions

The limitations of the beat frequency detection(BFD)-TRNG [3] when implemented on an FPGAdesign platform are investigated. To solve the shortcomings, an improved BFD-TRNG architecture suitable for FPGAbased applications.is proposed.

The rest of this brief is organized as follows. Section II discusses the preliminaries, followed by the proposed TRNG design in Section III. model of the proposed design together with compression scheme is discussed in Section IV. Section V describes the implementation and simulation results in Section VI. We conclude in Section VII.

II. BACKGROUND AND MOTIVATION

This section briefly describes the basic single phase BFD-TRNG modeland the DPR methodology utilizing DRP ports available inXilinx CMTs.

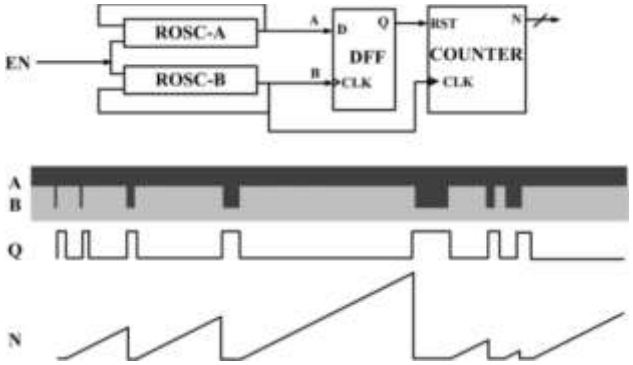
A. Single-Phase BFD-TRNG Model

This is the existing system. The BFD-TRNG circuit [3] is a fully digital TRNG, which uses jitter extraction by the BFD mechanism, which is implemented on a 65-nm CMOS ASIC. The BFD-TRNG circuit utilizes the frequency difference of two oscillators and oscillator jitter as the main sources of randomness.
The structure and working of the (single phase) BFD-TRNG is as follows:

1) The circuit consists of two quasi-identical ring oscillators of same construction and placement. There is physical randomness due to the process variation effects that aroused during CMOS manufacturing. The process variation that occurs during manufacturing is uncontrollable. One of the oscillators oscillates slightly faster than the other oscillator (ROSCB). The authors [3] proposed to employ trimming capacitors to further tune the oscillator output frequencies.

2) D flip-flop is used to sample the output of the other oscillator. The output of first RO is fed to the D-input of the DFF and the output of second RO is provided as the clock input of the DFF.
3) At certain time intervals (which is determined by the frequency difference of the two ROCs), the faster oscillator signal passes,catches up, and overtakes the slower signal in phase. Dueto random jitter, these capturing events happen at randomintervals, called "beat frequency intervals." As a result, theDFF outputs a logic-1 at different random instances.
4) The output of D flip-flop is provided to the counter. We can say that the counter is controlled by the DFF increments during thebeat frequency intervals. Counter gets reset when the D flip-flop sets. Due to the random jitter, the counter output ramps up to different peak valuesin each of the count-up intervals before getting reset.
5) The output of the counter is sampled by a sampling clockbefore it reaches its maximum value.
6) The sampled response is then serialized to obtain therandom bitstream. Hence the output of the counter forms the random bit streams.

Figure 1 Architecture of Single phase BFD TRNG



B. Shortcoming of the BFD-TRNG

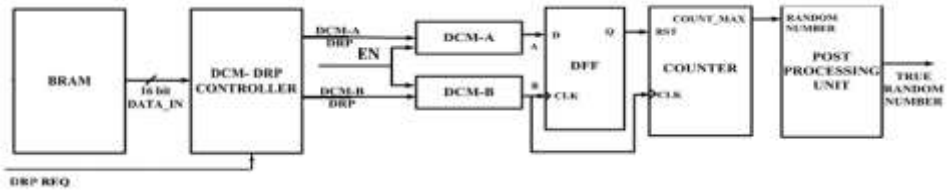
The main shortcoming of the BFD-TRNG circuit is that its statistical randomness is dependent on the design quality of the ring oscillators. Any design bias in the ring oscillators will affect the statistical randomness of the bit stream generated by the TRNG. Designs having the same number of inverters but placed at different positions generated different counter maximas. The same ring-oscillator-based BFD-TRNG implemented on when implemented on different FPGAs which belongs to the same family, again showed distinct counter maxima. As the ring oscillators are free-running, it is difficult to control to eliminate any design bias. The problem becomes complicated while using FPGAs, where it is often difficult to control design bias because a fine-grained designer control on routing in the FPGA design is absent. A simple way of tuning clock generator on Xilinx FPGAs, is by using phase-locked or the DCM. This is done by enabling dynamic reconfiguration via the DRPs. Thus the required clock frequencies can be generated by modifying values at the DRPs [1] on-the-fly, without needing to bring the device offline. We next describe the VLSI architecture for true random number generator with compression scheme suitable for FPGA platforms.

III. DCM based tunable BFD TRNG

A. Design Overview

Thus design eliminates all the disadvantages of single phase BFD TRNG. The two ring oscillators are replaced by two DCMs (Digital Clock Manager).By adjusting the modelling parameters (M and D), the required clock frequencies can be generated. The main source of randomness is the jitter present in the DCM circuitry.

Figure 2 Architecture of DCM based tunable BFD TRNG



The DCM module has greater control over the clock waveforms that are generated and hence initial calibration is not required [3].

Tunability is established by setting the DCM parameters using DPR capabilities via DRP ports. Hence it has greater flexibility than the ring-oscillator-based BFDTRNG. Similar to BFD TRNG the difference in the frequencies of the two generated clock signals is captured using a DFF. The DFF sets when the faster oscillator completes one cycle more than the slower one (at the beat frequency interval). A counter is driven by one of the generated clock signals and is reset when the DFF is set. The counter increases the throughput of the generated random numbers. It is found that the last three LSBs of the maximum count values reached showed good randomness properties. A simple post processing unit using Von Neumann corrector (VNC) [5] is used to eliminate any biasing in the generated random bits. VNC is a well-known low overhead scheme to eliminate bias from a random bit stream. In this scheme, any input bit "00" or "11" pattern is eliminated. If the input bit pattern is "01" or "10," only the first bit is retained. The last three LSBs of the generated random number are passed through the VNC. The VNC thus improves the statistical qualities with slight decrease in throughput.

B. Tuning Circuitry

The target clock frequency is determined by the set of parameter values actually selected. The random values reached by the counter as well as the jitter are related to the chosen parameters M and D .This makes it possible to tune the proposed TRNG using the predetermined stored M and D values. A safe operational value using combination of the D and M parameter are predetermined for DCM during the design time and stored on an on-chip clock RAM (BRAM) memory block in the FPGA.

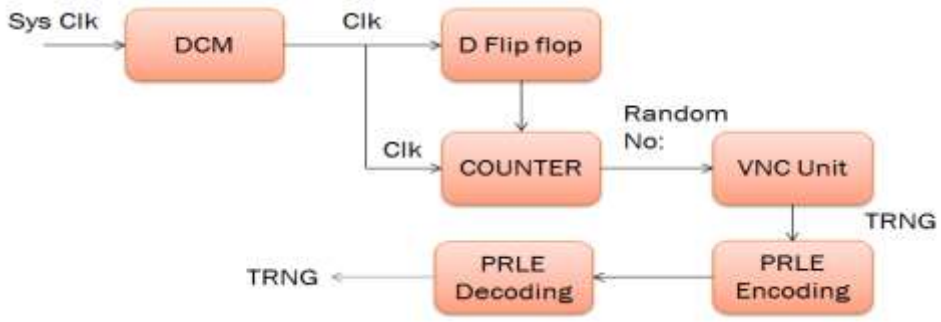
There are actually two different options for the clock generators—PLL or the DCM available in FPGA. But PLL is not used because there is negligible jitter between the waveforms generated by them. Since the BFD TRNGis critically dependent on the presence of jitter between the two generated clock waveforms, PLLs seem unsuitable as components of the proposed TRNG. Hence DCM is preferred to PLL.

The output of the DFF, i.e., the time interval after whichthe counter resets, is a random function. As a result, thecount value obtained when the counter resets is also a randomquantity. The counter resets automatically when the DFF sets, and the operation continues.

IV. DCM based tunable BFD TRNG WITH COMPRESSION SCHEME

The design regarding DCM circuitry and its architecture is clearly explained in Section III.In addition to this we introduce the PRLE Compression scheme which helps to save memory space and reduce the power consumption of random bit stream generated.

Figure 3 Architecture of DCM based tunable BFD TRNG with compression scheme



A. Explanation

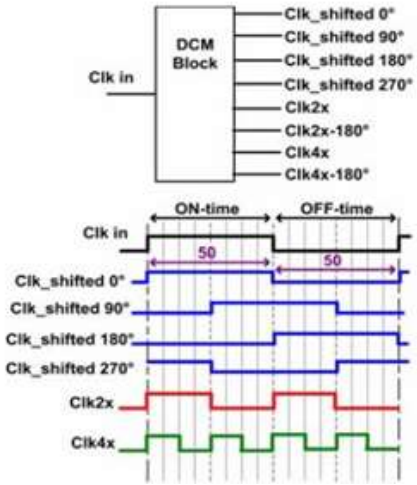
The system clock from FPGA is divided into 3 clocks by the Digital Clock Manager. First system clock is divided by 13, then by 256 and finally by 32 to provide it to D flip-flop and counter and also to select required baud rate. D flip-flop is used because it will store and output whatever logic level is applied to its data terminal as long as the clock input is HIGH. The output of D flip-flop is given to 6 bit synchronous up counter. The output of the counter is concatenated to form random numbers. A 13 bit random numbers are generated. To eliminate the

design bias on the random bits generated, it is allowed to pass through a post processing unit called Von Neumann Corrector. When the input to VNC is 00 or 11 they are completely eliminated and if 01 or 10, the first bit is retained. To reduce the memory utilization and save storage space a compression scheme called PRLE is used. It is followed by decoding which finally forms the TRNG. In addition we can also explain that these random numbers can also be used for CDMA application in future.

B. DCM (Digital Clock Manager)

A digital clock manager (DCM) is an electronic component available on some FPGAs .It is useful for manipulating clock signals inside the FPGA, and to avoid clock skew which would introduce errors in the circuit. FPGA boards grow in size and capabilities, such capabilities include the Digital Clock Manager- DCM resources. DCM is a clock management system that enables input clock frequency duplication, multiplication and division in addition to generating four different phase shifting clock versions: 0, 90, 180 and 270, maintaining the same 50/50 ON-time/OFF-time relationship. Where Clk in is the input clock to the DCM block as shown in Fig, which, in turn, produces four different versions of clock phase shifts: Clk_shifted 0 , Clk_shifted 90 , Clk_shifted 180 and Clk_shifted 270°. Also the DCM gives double and four times the input clock, Clk2x and Clk4x, and along with their inverted signals, Clk2x_180 and Clk4x_180 respectively.

Figure 4Digital Clock Manager



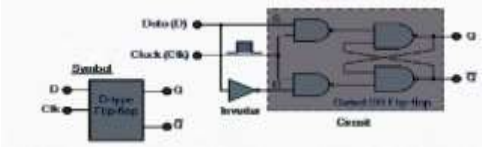
DCMs have the following applications:

- Multiplying or dividing an incoming clock (which can come for outside the FPGA or from a Digital Frequency Synthesizer [DFS].
- Making sure the clock has a steady duty cycle.
- Adding a phase shift with the additional use of a Delay-locked loop.
- Eliminating clock skew within an FPGA design

C. D flip-flop

It is a modified form of SR Flip-flop with inverter between S and R inputs for single data input D. It simplifies complex circuits, less chance of mistakes and intermediate state is eliminated. The D flip-flop will store and output whatever logic level is applied to its data terminal so long as the clock input is HIGH. The main applications are in counters, data transfers, register, and frequency division circuits.

Figure 5D Flip-flop



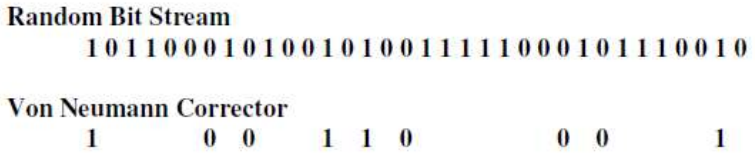
D. Counter

In this design counter used is a synchronous 6 bit up counter. The counter outputs are converted to pseudo codes. The 3rd bit and 4th bit of counter are used for VNC Correction, as they are unbiased. The other bits of counter are concatenated together with VNC bits to form the random bit stream.

E. Post Processing unit (VNC)

Von Neumann created asimple unbiasing procedure for random binary bits. Bits are paired together; if the twobits are equal they are thrown out. If the first bit in the remaining pairs is a 1, then a 1 isused as the result while if the first bit of the pair is a 0, then a 0 is the result as seen in the Figure 6.
The Von NeumannCorrector can result in as few as twenty-five percent of the original bit stream. The random bit stream generated at the output of VNC is of 13 bits.

Figure 6Von Neumann Corrector



F. PRL Encoding and Decoding Compression scheme

An unbiased random sequence cannot be compressed. Therefore, acompression procedure can also be used to unbias the bits of a random number generator.A compression unbiasing procedure, however, also reduces the number of random bits.If the sequence of random bits is compressed to a great extent, the number of availablebits can be significantly reduced.

Data compression is the "compression ratio", or ratio of the size of a compressed file to the originaluncompressed file.

There are two types:
1. Lossless data compression
2. Lossy data compression

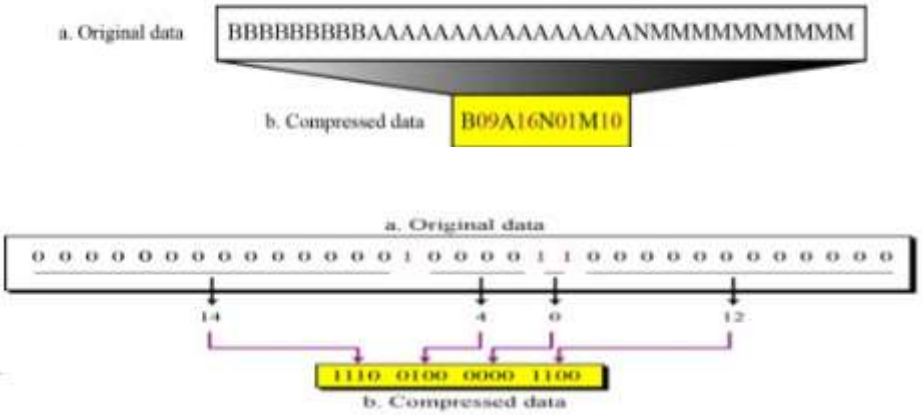
Lossless data compression is used when the data has to be uncompressed exactly as it was before compression and is used in our design. Text files are stored using lossless techniques, since losing a single character can in the worst case make the text dangerously misleading .However, there are strict limits to the amount of compression that can be obtained with lossless compression. Lossy compression, works on theassumption that the data doesn't have to be stored perfectly. Much information can be simply thrown away from images, video data, and audio data, and when uncompressed such data will still be of acceptable quality. Compression ratios can be an order of magnitude greater than those available from lossless methods.
Data compression implies sending or storing a small number of bits.Run Length compression is a lossless method where original data and the data after compression and decompression are exactly the same.No data will be lost.Redundant data is removed during compression and added during decompression.

How?
Replace consecutive repeated occurrence of the symbol by 1 occurrence of a symbol followed by number of occurrences.Method is more efficient if the data uses only two symbols (0's and 1's) in bit patterns and 1 symbol is more frequent than other.

Example:
If input data is 11111000111100001000000 1
In RLE it is written as (1,4)1000(1,4)(0,4)10000001
The other data cannot be compressed as they are not consecutive.Only expansion takes place if data is in the form 101010.To overcome this problem Parallel RLE is used.Data compressed by eliminating redundant bits and the

same code must be substituted for the eliminated elements and based on this code receiver can reconstruct original data.

Figure 7PRLE



In our design if there are four consecutive ones they are replaced by four zeros. Hence memory storage is reduced and less power consumption. For other bits, they are transmitted as such. Decoding is done to ensure whether same output is obtained from VNC.13 bit random number is generated.

V. Project flow and Implementation

- Development of DCM
- Development of D flip- flop
- Development of 6 bit synchronous up counter
- Development of Post processing unit
- Integration with PRLE Compression scheme

VHDL Coding is done in Xilinx 14.5 ISE. Each of the parts are implemented separately and finally integrated. It is then simulated and loaded on a customised board (Mojo board) with Spartan 6XC6SLX9.Thus 13 bit long random number stream is generated.

Figure 8Project Flow



VI. Simulation and Results

The section deal with the RTL Schematic, TechnologySchematic, and Simulation Results of DCM based tunable BFD TRNG with compression schemeasshown in Figure 3.

Figure 9RTL Schematic of DCM based tunable BFD TRNG

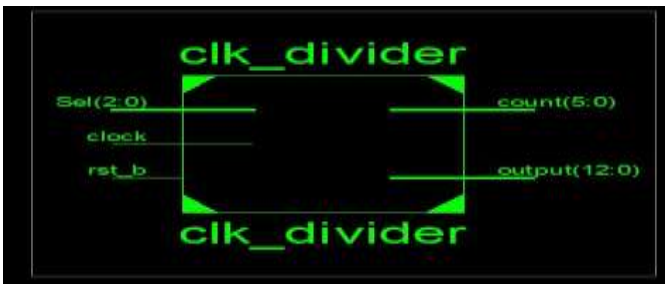


Figure 10Design Summary of DCM based tunable BFD TRNG

Device Utilization Summary				
Slice Logic Utilization	**Used**	**Available**	**Utilization**	**Note(s)**
Number of Slice Registers	133	11,440	1%	
Number used as Flip Flops	133			
Number used as Latches	0			
Number used as Latch-thrus	0			
Number used as AND/OR logics	0			
Number of Slice LUTs	271	5,720	4%	
Number used as logic	267	5,720	4%	
Number using O6 output only	188			
Number using O5 output only	60			
Number using O5 and O6	19			

Figure 11Simulation waveform of DCM based tunable BFD TRNG



Figure 12Implementation of DCM based tunable BFD TRNG on MOJO-V3 board



Figure 13RTL Schematic of DCM based tunable BFD TRNG

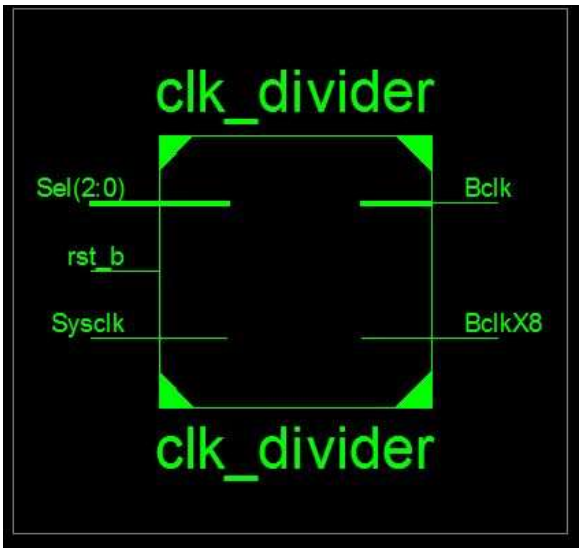


Figure 14Simulation waveform of DCM

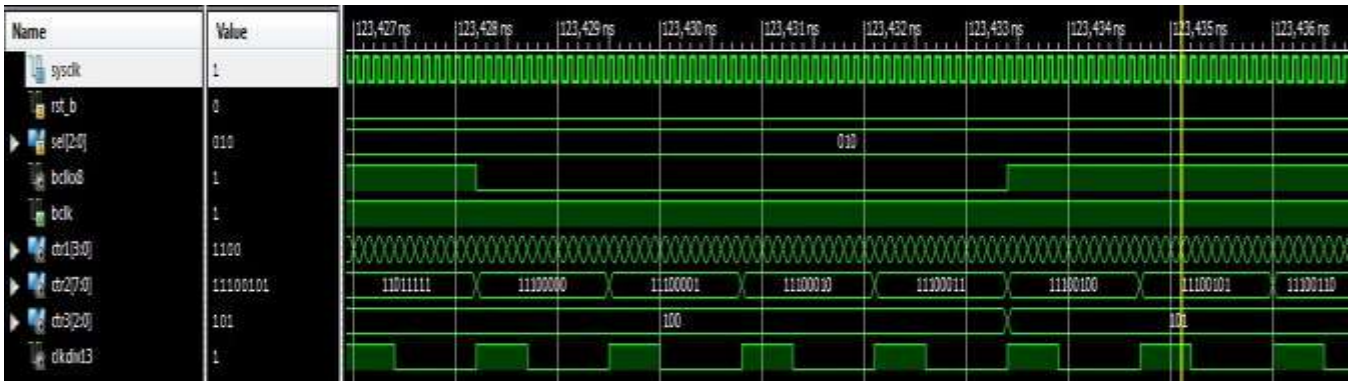
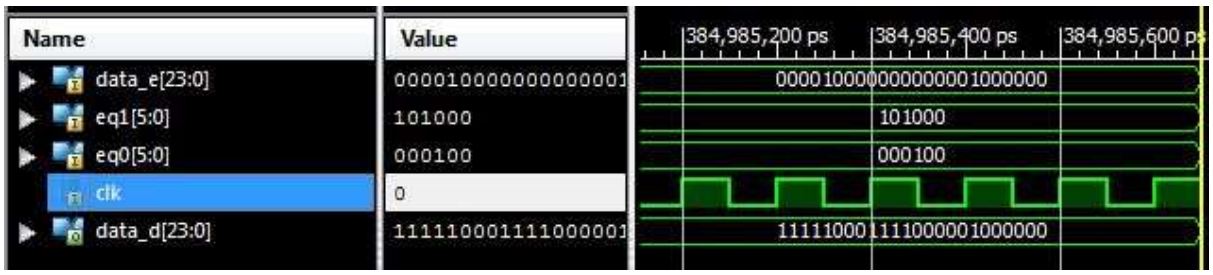


Figure 15Simulation waveform of PRLE Encoding



Figure 16Simulation waveform of PRLE Decoding



A. Abbreviations and Acronyms

DCM – Digital Clock Manager
FPGA – Field Programmable Gate Array
TRNG – True Random Number Generator
DPR – Dynamic Partial Reconfiguration
BFD – Beat Frequency Detection
PRLE/D – Parallel Run Length Encoding/Decoding

VII. CONCLUSION AND FUTURE SCOPE

This Thesis describes an improved fully digital tunableTRNG for FPGA-based applications, based on theprinciple of BFD and clock jitter, built-inerror- correction capabilities and with compression scheme. The Random NumberGenerator is truly random as the seed value is takenfrom Jitter source. Hence it completely avoids thepossibility of determinism which is risk factor inPseudo Random Number Generators. It is also mucheasier to implement as compared to other hardware and due to compression it consumes less amount of memory space and power consumption. Random Number Generators which use electrical noise require a much complex hardwaresetup to generate randomness.

The TRNG utilizes this tunability feature fordetermining the degree of randomness, thus providinga high degree of flexibility for various applications. Random number generator design is an exciting field,every year new requirements and designs are derived.In addition to various applications like cryptography, in future it can be used for CDMA application

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SMART HAND SIGN INTERPRETER WITH SENSOR FUSION

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Abstract: *Gesturing is an instinctive way of communicating to present a specific meaning or intent. Therefore, research into sign language interpretation using gestures has been explored progressively during recent decades to serve as an auxiliary tool for deaf and mute people to blend into society without barriers. A smart sign language interpretation system using a wearable hand device is proposed to meet this purpose. The wearable system utilizes three flex sensors and an 3-axis accelerometer sensor to distinguish the American Sign Language. The entire system mainly consists of three modules: a wearable device with a sensor module and a processing module, a display unit mobile application module. Sensor data are collected and analyzed using Arduino Uno microcontroller. Subsequently, the recognized data is further transmitted to a mobile device through IoT by using a Wi-Fi module. An Android based mobile application was developed with a text-to-speech function that converts the received text into audio voice output.*

Keywords: *Internet of Things (IoT); Gesture recognition; Mobile application; Sign language recognition; Arduino Uno; 3-axis accelerometer.*

I. Introduction

Sign language plays a vital role for deaf and mute people to communicate among themselves or with normal people in a non-verbal manner. Gestures are the primary method to convey messages, which are usually conducted in a three-dimensional space, known as a signing space [1], through an integration of manual and non-manual signals. Manual signals commonly correspond to hand motions and hand posturing, whereas non-manual signals correspond to an external appearance such as mouth movements, facial expressions, and body orientation [2]. Nevertheless, sign language has not been standardized globally. Each nation has developed its own sign language, such as the American Sign Language (ASL) and German Sign Language (GSL). However, each sign language varies slightly within different regions of the same country. Hence, it can be a challenge to develop a standardized sign language interpretation system for use worldwide. In a previous study, sign languages have been recognized using two major techniques, i.e., vision and non-vision approaches [3].

In fact, vision method is the major technique applied for sign recognition in the past decades. A system that uses a camera to observe the information obtained through hand and finger motions is the most widely adopted visual-based approach [4]. Tremendous effort and study has gone into the development of vision-based sign recognition systems worldwide. Indeed, vision-based gesture recognition systems can be subdivided into direct and indirect approaches.

A direct approach detects the hand gestures based on the RGB color spaces of the skin color. For instance, [5] identified Indian Sign Language (ISL) using the scale invariance Fourier transform (SIFT) algorithm by searching the matched key points between the input image and images stored in a database. Meanwhile, an indirect approach identifies the fingers and hand gestures based on the RGB color spaces segmented based on different colors for each finger using a data glove. A possible segmentation method using RGB color spaces along with a hand glove for gesture detection [6] method utilizes the RGB color space values extracted from a captured hand gesture image of a data glove, and compares the values with those stored in a database.

The exploitation of a vision-based method is greatly affected by the processing of the images, such as image filtering, background cancellation, color segmentation, and boundary detection. For instance, diverse and

uncontrolled background images can influence the skin color segmentation or movement detection. Indeed, many researchers have failed to address these complications, and no solid solutions have yet been proposed. Consequently, a non-vision based method is an alternative approach [7]. This method typically utilizes flex and motion sensors to measure the flexion of fingers and the orientation of the hand, respectively. But the limited accuracy, transmission range as well as improper utilization of sensors made it incompatible to the user.

Therefore the project aims at the development of a sign language interpretation system by analyzing hand and finger gestures from a smart wearable device. The finger gestures are observed through the flexion of the flex sensors, whereas the hand gestures are examined based on the hand motion through the orientation derived from an accelerometer sensor. The gestures are recognized using a Arduino Uno microcontroller implemented in the wearable device. The gestures are then received using an Android based mobile application through IoT by using a WEMOS Wi-Fi module, and text is displayed on the mobile device screen. Moreover, a text-to-speech service is also available in the mobile application, which instantly converts the received texts into audible outputs. The system provides more accurate output without any delay makes it compatible as well as reliable to the user.

II. Related Work

Using the concept of gestures, few attempts have been made in the past to recognize the gestures made using hands but with limitations of recognition rate and time which include:

a. Using CMOS camera
b. Leaf switches based glove
c. Copper plate based glove
d. Utilizing flex sensor and Bluetooth wireless transmission

A. Using CMOS Camera

CMOS camera transmits image data via UART serial port. The UART performs serial-to-parallel conversions on data received from a peripheral device (CMOS camera in this case) and parallel-to-serial conversion on data received from the CPU (Microcontroller in this case).
Hand gestures were detected using CMOS camera by 3 steps

a. Capturing the image of the gesture
b. Edge detection of that image
c. Peak detection of that image

Disadvantage: Highly expensive, latency and each image occupy 50KB of memories.

B. Leaf Switches Based Glove

These are similar to normal switches but these are designed in such a way that when pressure is applied on the switch, the two ends come into contact and the switch will be closed. These leaf switches are placed on the fingers of the glove such that the two terminals of the switch come into contact when the finger is bent.

Disadvantage: After prolonged usage, the switch instead of being open when the finger is straight, it will be closed resulting in improper transmission of gesture [8].

C. Copper Plate Based Glove

In this prototype, a copper plate is fixed on the palm as ground [9]. The copper strips indicate a voltage level of logic 1 in rest position. But when copper strips come in contact with the ground plate, the voltage associated with them is drained and they indicate a voltage level of logic 0.

Disadvantage: The use of copper plate makes the glove bulky which makes it unsuitable to use it for a long time.

D. Utilizing Flex Sensor and Bluetooth Wireless Transmission

Flex means „bend" or "curve". Flex Sensor is a resistive sensor which changes its resistance as per the change in bend or curvature of it into analog voltage. Collected and analyzed these sensor data's and transferred wirelessly to a mobile device through Bluetooth.

Disadvantage: Proper utilization of sensors is not happened here. The communication range is limited. Delay in output formation.

III. Proposed Work

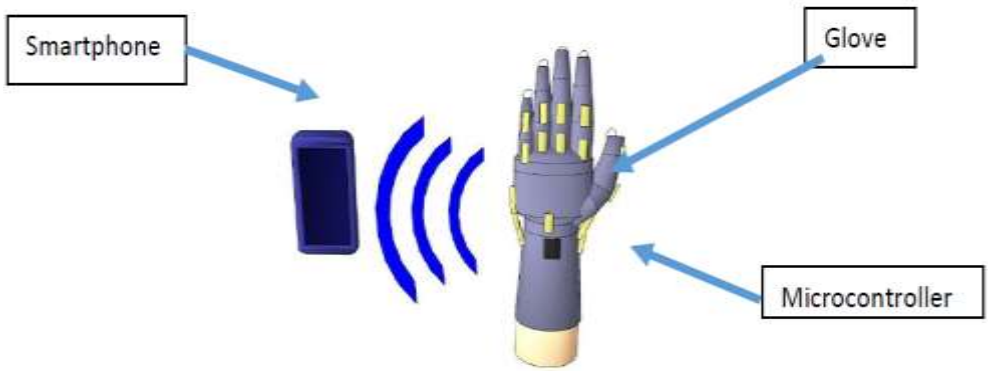
The design consists of one glove with several subsystems: a sensor subsystem, a processing subsystem, a wireless transmission subsystem, and the output subsystem. A rendering of the design is shown in Figure1.

The sensor system is made up of two main components: the flex sensors and an accelerometer sensor. Each type of sensor will provide its own unique data to the processor so that the processor can recognize subtle differences between gestures. For the purpose, the flex sensors are used to determine the flexion of each finger of the hand. The positions of each finger are key determinants of which gesture is being performed. Hand movement derived from the accelerometer in three orientations: pitch, roll, and yaw. The calculation of each orientation is similar depending on the axis used. These sensors will have an analog output directly into analog input pins of the microcontroller.

After all sensor outputs are connected to the microcontroller input, the processing can begin using a machine learning algorithm. Although it would be possible to hard-code each gesture into the microcontroller algorithm, this would create difficulties when updating or expanding the number of recognizable gestures. The initial approach will be a lookup table with some machine learning aspects. It will use a library of training data to learn from the average sensor inputs for each gesture, with tolerances for each gesture set by the machine learning algorithm. The tolerances are flexible so that the glove will be able to adapt to different users.

The recognized sensor data needs to be transmitted from processing subsystem to an output device. Thus the sensor data's are wirelessly transmitted by using a Wi-Fi module, by utilizing IOT based wireless communication technique. Thereby enabling long distance communication from anywhere in the world [10].

Figure 1 Proposed system Design.



This system is the final step in implementing translation. After the gesture has been recognized, the output will transmitted to a Smartphone via Wi-Fi. Then, the name of the recognized gesture will be printed on the smartphone's screen so that people who are watching the Smartphone can understand the gesture. This subsystem can be implemented with a serial communications terminal app, of which many are available on the Google Play store [11]. In order to obtain more accuracy in output and to make system more reliable, an Android based mobile application need to be developed.

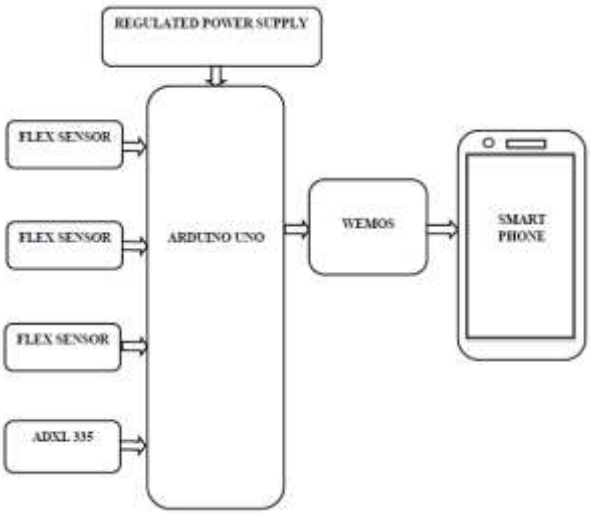
The basic functionality of the app is to wirelessly connect a device to the glove, receive sensor data from the glove, run the glove's classification algorithm, and writes the output clearly to the Smartphone screen. In addition to that application features a text-to-voice conversion software, so that the phone would "speak" the translated gesture, and increasing the number of known gestures potentially up to thousands of gestures. These features are intended to reduce the complexity of using the glove in everyday and emergency situations [12].

IV. System Design

The entire system is divided into three distinct modules: a sensor module, processing module, and application module. The sensor and processing modules are implemented in the smart wearable hand device, whereas the application module operates in an Android-based mobile device. The flex sensor and accelerometer sensor (ADXL335) data's are collected using an Arduino Uno microcontroller.

The flexions of fingers are obtained using three flex sensors, and the orientation of hand is recorded using an accelerometer sensor (ADXL335). Finger gestures are exploited through the flexion of flex sensors placed on the top of the finger.

Figure 2 Block Diagram of Proposed system



The flex sensor and accelerometer sensor data are collected using an Arduino Uno microcontroller. The features are extracted from the sensor data and serve as inputs to the built-in SVM classifier to determine the sign language [13]. Later the extracted data's are further transmitted to a mobile device through an internet connection, by using a WEMOS Wi-Fi module. The recognized sensor data's from Arduino Uno microcontroller are simply transmitting through an IOT platform by using this WEMOS Wi-Fi module. The project utilizes MQTT protocol to transfer these data's through an IOT platform. The wireless transmission to a remote location without any delay can be achieved through this module.

An Android-based sign interpretation application is utilized for receiving classified sign gestures from the smart wearable device and further displaying the results on the screen. And a text-to-speech service is also implemented in the application. The service converts the received text into an output, which is played back concurrently by the mobile device speaker [14].

V. System Flow

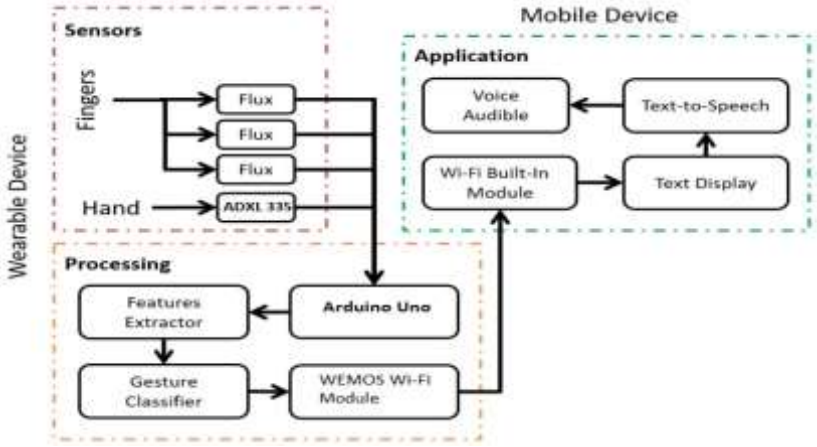
The proposed smart hand wearable sign interpretation system comprises of three distinct modules: a sensor module, processing module, and application module, as shown in Figure 3. The sensor and processing modules are implemented in the smart wearable hand device, whereas the application module operates in an Android-based mobile device. The flex sensor and accelerometer data are collected using an Arduino Uno microcontroller. The features are extracted from the sensor data and serve as inputs to the built-in SVM classifier to determine the sign language. The detected sign is translated into text and transmitted to a mobile device using a WEMOS Wi-Fi module. The received text is displayed on the mobile screen. Concurrently, the automated text-to-speech service translates the text into an audible voice to be played by the built-in speaker of the mobile device. Detailed description of each section is shown below.

A. Preprocessing

The preprocessing section mainly includes the sensor module.the flex sensors and an accelerometer are used to detect hand gestures. The flexion values varied among the different the amount of bend. The resistance value for a less bending figure is smaller as compared to a more bending figure. Thus, the differences among the signs are not discernable from the raw flex sensor values. To solve this issue, the sensor values were normalized based on the computed mean and standard deviation of each flex sensor for each subject into a range of [0, 1]. The normalized values are computed individually for each sensor. Thus, the mean and SDs of flex sensors are computed separately for each sensors readings.

Meanwhile, each hand movement was derived from the accelerometer sensor in three orientations: pitch, roll, and yaw. The calculation of each orientation is similar depending on the axis used [15]. The flex sensors and accelerometer sensor data are gathered at a sampling rate of 100 Hz.

Figure 3 Sign interpretation system consisting of sensor module, processing module, and application module.



Processing section is further divided into 2. Feature extraction and sign classification stages. Both are done within the microcontroller unit. Features from the hand and finger gestures are extracted through the feature extraction stage and extracted sign are classified through sign classification stage.

B. Feature Extraction

The flexion degree is split into three regions in each vector. The first region is denoted as "no bend" or "slight bend," which is associated with a normalized flexion value. The second region is considered as a "partial bend" with the associated normalized flexion value, and the last region is a "complete bend" with associated normalized flexion value. Each flexion degree is given corresponding threshold values, which is associated with each finger movement. Here the flexion degree's are considered as; for a slightly bend region in one finger can denoted as 'A', a partially bend region in the same finger can be considered as 'B', and for a completely bending region, denoted as 'C'. Thus the flexion values of each of the three fingers have three distinct threshold values. Combinations of these values offer's a large number of sensor data, which the user can be obtained as flexion readings. In order to determine the hand motion, standard deviation (SD) of the angular reading from the accelerometer sensor is computed for each axis. The SD is a measure that is used to quantify the amount of variation or dispersion of the motion readings. For this hand motion is considered along three different axis: X, Y and Z axis respectively. Each of three axis is given particular threshold values, so that any change in the orientation of hand results in change in this threshold value. That can be considered as motion of hand in a particular direction. So here also we can set the threshold values as A, B, and C for each corresponding axis. Therefore each axis has three particular threshold values, which will change for the particular hand motion. Thereby the features from the hand gestures can be extracted [16].

C. Sign Classifier

The signs are classified into classes using a support vector machine (SVM) [17]. An SVM is a binary supervised learning classifier, that is, the class labels can take the values of +1 and -1. The training procedure used a quadratic optimization algorithm to derive structural axes to separate the training dataset into *n* numbers of a hyperplane. The points positioned around the separating hyperplane line are known as support vectors (SVs) and their distance to the hyperplane line is known as the margin. Optimization of the SVM is calculated by finding the smallest distance among all SVs. The values of +1 and -1 are expressed as correctly classified and incorrectly classified respectively. There are more than two classes that are being classified. To obtain an M-class of the SVM classifiers, a set of binary classifiers need to be constructed, where each binary classifier is trained to distinguish one class from the rest. The results are then integrated to form a multi-class classification according to the maximal output of each binary classifier xj, which is also known as the confidence value and j is referred to each binary classifier. Thus, x belongs to the class with the largest confidence value. In fact, there will be gestures that belong to none of the sign classes or the aforementioned "neutral" class in a real-world application, and thus any gesture with a confidence value of less than 0.5 (50%) is considered as an "invalid" class. The feature vector x is built using a particular number of features, which are the normalized flex sensor data for three fingers, computed SDs of angular readings from the accelerometer sensor.

D. Wireless Transmission

The extracted sign classified data's are further transmitted to a mobile device through IoT [18]. Here a WEMOS Wi-Fi module is used in order to transfer the sensor data to a Smartphone wirelessly through a internet connection [19]. WEMOS is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The recognized sensor data's from Arduino Uno microcontroller are simply transmitting through an IoT platform by using this WEMOS Wi-Fi module. The project utilizes MQTT protocol to transfer these data's through IOT. MQTT (Message Queuing Telemetry Transport) is an ISO standard publish-subscribe-based messaging protocol. It works on top of the TCP/IP protocol. It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited. The publish-subscribe messaging pattern requires a message broker. An MQTT system consists of clients communicating with a server, often called a "broker". A client may be either a publisher of information or a subscriber. Each client can connect to the broker. Information is organized in a hierarchy of topics. When a publisher has a new item of data to distribute, it sends a control message with the data to the connected broker. The broker then distributes the information to any clients that have subscribed to that topic. The publisher does not need to have any data on the number or locations of subscribers, and subscribers in turn do not have to be configured with any data about the publishers. So it provides the user to transfer and access the recognized sensor data from anywhere in the world, at any time without any delay.

E. Mobile Application

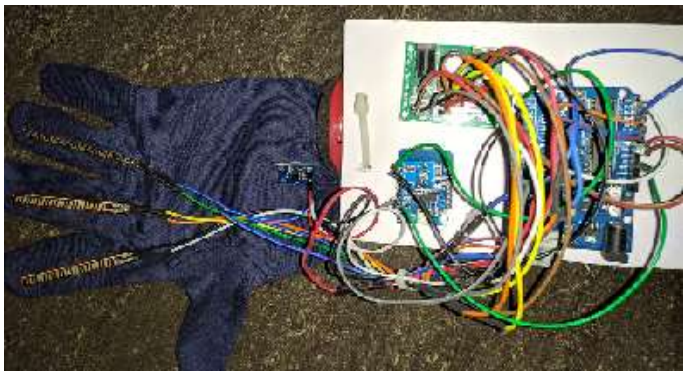
The classified sign gestures from the smart wearable device are transmitted to the sign interpretation application stored in mobile handset. An Android-based sign interpretation application is utilized for receiving classified sign gestures from the smart wearable device and further displaying the results on the screen [20]. And a text-to-speech service is also implemented in the application. The service converts the received text into an output, which is played back concurrently by the mobile device speaker. As the sensor data's are transmitted through IoT, the project need to connect to an internet connection. For that make sure of a valid internet connection while operating the entire project. After obtaining proper internet connection, just tap on the "disconnected" button provided on application user interface. Then application show's "connected". At the bottom of the application, a popup message shows that "subscribed". By these commands it means that the device has already connected to the remote server, from where the application gets the recognized sensor data from the user handheld smart glove. Through this application the user can assign whatever voice output need to be obtained as output through the audio speakers of the Smartphone for a particular sensor data. So the user can give the preferred voice output as his/her wish. In order to feed database, the user need to click on the "list data" option provided on the menu on the top right end of the application. Then by clicking on the add button, add menu will open, there the user can see the sensor data for a particular flexion of finger and movement of hand. So considering these sensor data, the user can write a sentence or word that is to be spell through the speaker for that particular motion. So each sensor data can be provided with a distinct voice output. And there is a provision for updating the sensor data and also removes the duplicated database from the added list. As it utilizes the device memory to store the preferred database, the application provides the user to store as many combinations of database without any restriction of memory of the application.

After setting all the user preferences, the application starts working. Whenever a sensor data is received, it will provide voice output corresponding to the databases that are stored in application for that particular sensor data. And it also displays its corresponding text on application display screen. If more than one sensor data is recognized at a time, it shows "audio is already playing". There is no limitation in range or distance for this application, as the user can access these data from anywhere in the world and the only needed is a valid internet connection.

VI. Implementation and Results

Disabled use these gloves to convert sign performed by them into speech. From the convenience of simple flex sensors and accelerometer sensor (ADXL335) makes the user able to interact with others in more comfortable and easier manner [21]. And transmission of these data's through IoT makes it possible to communicate people from anywhere in the world. This makes it possible for the user to not only interact with their community but with others also and they can also live normal life. The end product is a cheap and simplistic design making it easy for users to interact with. The system shown in the figure 4 is capable of recognizing signs more quickly. Furthermore real time recognition ratio of nearly 99% can be easily achieved.

Figure 4 Smart Hand Sign Interpreter Hardware.



The sensor module consisting of three flex sensors and an ADXL335 makes it possibly to detect maximum number of combination of gestures [22]. The microcontroller Arduino Uno extract these sensor data's and transmit the data's through IoT by using a WEMOS WI-Fi module [23]. An android based mobile application "Smart Hand Sign Interpreter" is developed, that receives these sensor data's and display it onto the application interface and is incorporated with an text-to-speech conversion software the translates the received text into spoken words. The output audio can be heard through Smartphone inbuilt speaker system.

The system can provide long distance communication, as the data from the Arduino Uno are transferred through IoT by utilizing MQTT protocol. So transferring efficiency and speed will be higher. So the user can communicate with any people from anywhere in the world without any delay. The only need is that the android application, that is to be installed in the sender and the receiver Smartphone. The application interface provides numerous features, that the user can use it easily. Once the application connects the server, starts receiving the sensor data simultaneously. The user can list his/her preferred voice output data for each sensor data in "list data" option provided in the application menu. The user can store whatever data in it, such as alphabets, word, or sentences. By clicking on the "+" button provided in the application, the menu will open to add new data as shown in figure 5. There we can add the sensor data as well as corresponding voice output by simply typing the sensor reading and corresponding sentence that is to be played back through the speakers. Sensor data received by the application will be displayed on the screen. As there are three flex sensors and an accelerometer, the output obtained will be "AAAAAA" as shown in the figure 6. First three alphabet shows the three flex sensor readings, for that each flex sensor can take three readings A, B, or C according to its bend. The last three alphabets show the hand orientation along X, Y, and Z axis respectively, that are recorded by using ADXL335. So the change in these alphabets denotes change in the sensor data or the sensor data corresponds to flexions and orientation of hand. As many combination of sensor data can be obtained through this configuration. The listed data's are all stored as databases in phone memory.

Figure 5 List of Database in Application.



Whenever the application receives the sensor data, the application search for the database that matches the sensor data. And if it is present, then it will play through the mobile inbuilt speaker. As the sensor data's are transmitted through IoT, the only need is the internet. The output is as fast as it can be usable in real time applications. The system provides fast and accurate output makes it compactable and reliable to the user.

Figure 6 Smart Hand Sign Interpreter Smartphone Application



VII.Conclusion

The technology could mean a new way for several people with hearing and speech impairment to verbally communicate and connect to people around them. The project aims to lower the communication gap between the deaf or mute community and the normal world. The deaf and dumb people use their standard sign language which is not easily understandable by common people. Smart hand sign language recognition system for deaf and dumb people makes it possible to reduce this gap by using flex sensors and accelerometer, and was successfully executed with high accuracy. An Android based mobile application with text-to-speech conversion feature is also developed in order to convert the sign language into text and voice output which is easily understandable by the people. As the sensor data are transmitted through IoT, there is no limitation in range of communication. The system provides accurate and fast output from anywhere in the world. In this way the project is very well useful for deaf and dumb people and for other robotics applications etc...

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A Comparative Study of Traffic Scene Classification Based on Deep Learning

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Abstract: *Intelligent traffic surveillance system plays a vital role in modern day traffic analysis. Numerous ways have been developed to streamline the process of analyzing traffic. The classification of the traffic scene during some period of time in an area require more effort even the couple of proximity sensors can calculate the track of moving the vehicle, but they are not economical. In this paper proposes a classification of traffic scene based on deep learning with Convolution Neural Network (CNN). The proposed method performs training and testing of data on the inception v3, resnet 50 and mobile net architecture. The experiment results show that the classification accuracy of three models on the Camvid dataset.*

Keywords*: CNN, deep learning, traffic scene classification*

I. Introduction

At present, the application of deep learning greatly improves the accuracy of image classification tasks. Many deep networks have achieved good results on the task of image classification. Traffic scene classification is an important and challenging task in intelligent transportation systems, which has a wide range of applications. In this paper, we propose Traffic scene classification based on deep learning. Intelligent traffic surveillance system plays a vital role in modern day traffic analysis. Numerous ways have been developed to streamline the process of analyzing traffic. The classification of the traffic scene during some period of time in an area require more effort even the couple of proximity sensors can calculate the track of moving the vehicle, but they are not economical. In this paper proposes a classification of traffic scene based on deep learning with Convolution Neural Network (CNN). Deep learning techniques improve segmentation accuracy. The proposed method performs training and testing of data on the inception v3, resnet 50 and mobile net architecture. Comparison between these three models based on accuracy. The experiment results show that the classification accuracy of three models on the Camvid dataset.

II. Convolution Neural Network (CNN)

CNN is a machine learning technique that is inspired by human brain. Many CNN architectures have emerged.eg AlexNet, VGNet, GoogleNet, ZFNet. This is designed to map image data to an output variable. These find applications in image classification, image and media recognition.

Convolutional Layer: Feature detection and extraction happens in convolutional layer. Each layer has its own set of kernels. This consists of 2 convolutional layers, 2 pooling layers using max pooling function and 2 fully connected layer.

Activation Function: After the convolutional layer, the activation function is applied. Rectified Linear Unit (ReLU).

Pooling Layer: I follows the convolutional layer. This is used to eliminate unimportant information from feature maps. This is achieved by using a pooling function such as max pooling, average pooling. This pooling function is applied to feature map regions of size n*n. Omitting the max pooling layers does not ruin the accuracy.

Fully Connected Layer: This is the final layers in CNN's. The computational units in a fully connected layer are connected to every unit of previous layer. This is one dimensional.

III. Proposed Methodology

In proposed methodology contain two phases training and testing phase. Dataset used here is camvid dataset. In training phase feature extraction is done after pre processing. It is based on deep learning with convolutional neural network. The extracted features are given into the classification model. In testing phase feature extraction is done with the test image. The extracted features are given into the classification model. These two features are compared and class is predicted. In this project three classes are used vehicle, pedestrian and traffic light. Mobile net, resnet50 and inception v3 are the classification models are used. The experiment results show that the classification accuracy of three models on the Camvid dataset. The project flow is given in the fig.1 scheme:

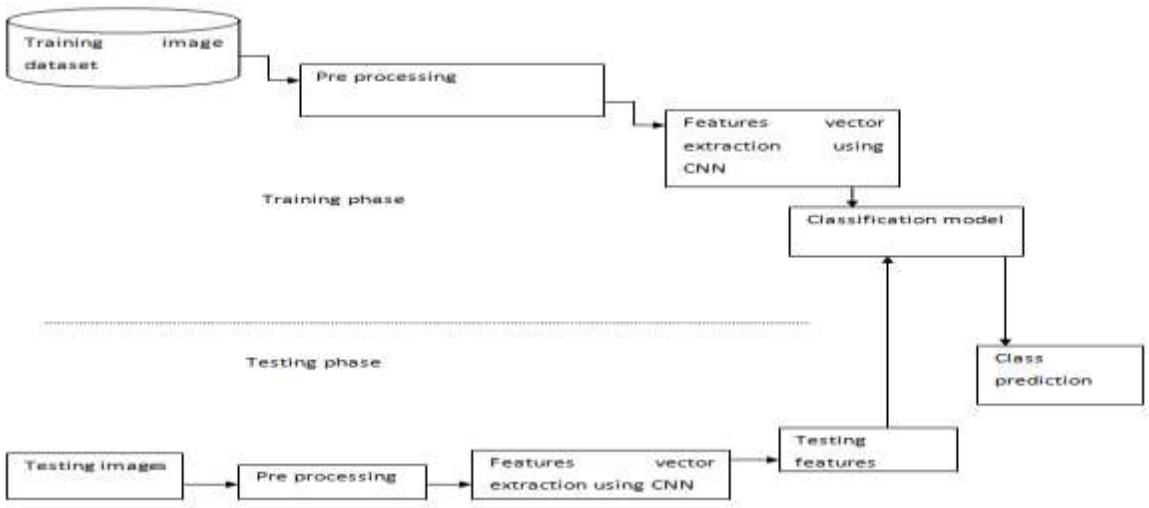


Fig.1. Project Flow

IV. Experiment Results And Analysis

In this section analysis of result is done. The classification models are given the accuracy and validation accuracy. Compare these three models based on classification. The result is analyses.

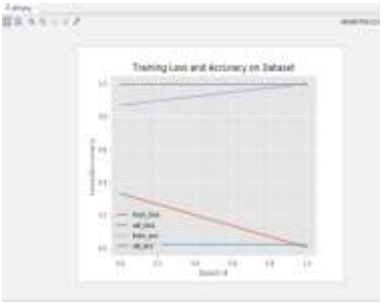


Fig.2.A Training Loss and Accuracy of Resnet 50

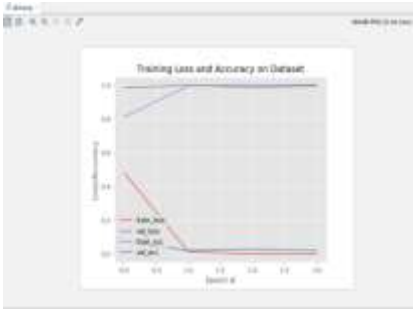


Fig.2.B Training Loss and Accuracy of Mobile Net

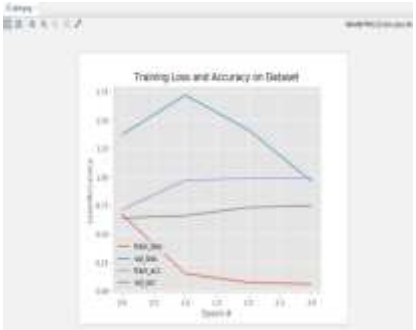


Fig.2.C Training Loss and Accuracy of Inception V3

A. Resnet 50

ResNet-50 is a convolutional neural network that is trained on more than a million images the network is 50 layers deep and can classify images into 1000 object categories. The network has an image input size of 224-by-224

B. Mobile Net

MobileNets are based on a streamlined architecture that uses depth-wise separable convolutions to build light weight deep neural networks. We introduce two simple global hyper-parameters that efficiently tradeoff between latency and accuracy. These hyper-parameters allow the model builder to choose the right sized model for their application based on the constraints of the problem. We present extensive experiments on resource and accuracy tradeoffs and show strong performance compared to other popular models on ImageNet classification. We then demonstrate the effectiveness of Mobile Nets across a wide range of applications and use cases including object detection, fine grain classification, face attributes and large scale geo-localization.

C. Inception V3

Inception v3 is a widely-used image recognition model that has been shown to attain greater than 78.1% accuracy on the ImageNet dataset. The model is the culmination of many ideas developed by multiple researchers over the years the model itself is made up of symmetric and asymmetric building blocks, including convolutions, average pooling, max pooling, dropouts, and fully connected layers. Batch norm is used extensively throughout the model and applied to activation inputs. Loss is computed via Softmax.

Table 1 Comparison of accuracies for various models.

Parameters/classification models	Resnet50	Mobile net	Inception v3
Accuracy (%)	89.1	99.5	99.1
Validation accuracy (%)	97.9	99.7	73.4
Training time(s)	2272	373	491
Model size (MB)	98	16	92
Testing time(s)	4.65	2.2	5.85

V. Conclusion

This paper proposes a framework for classification system by combining deep learning with Convolution Neural Network (CNN). These approaches are applied in a various classification models such as resnet 50, inception v3 and mobile net. Obtain the class prediction on testing. Vehicle, pedestrian and traffic lights are the three classes are used. The experimental results show that compared with the the different models. Comparatively mobilenet gives better accuracy than inceptionv3 and resnet 50. The classification test result of this is suitable for traffic scene of three types of Vehicle, pedestrian and traffic lights in different scenarios and has achieved good results.

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PERFORMANCE ANALYSIS OF FULLADDERS USING FINFET TECHNOLOGY

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***Abstract**: In this paper, different types of full adder design logic is reported. The design was implemented using LT spice technology in 180nm technology. Performance parameters such as power, delay, and layout area were compared with the existing designs such as complementary pass-transistor logic, transmission gate adder, transmission function adder, hybrid pass-logic with static CMOS output drive full adder, and so on. For a supply at 180-nm technology, the average power consumption was found to be extremely low with moderately low delay resulting from the deliberate incorporation of very weak CMOS inverters coupled with strong transmission gates. The same types of adders design is implemented using FinFET technology and then extended to memresistor technology at a supply voltage of 5V. Adders are implemented in different technological levels and performance parameters are determined.*

***Keywords:** Full Adder; Complementary Metal Oxide Semiconductor (CMOS); L T spice ; FinFet; Memresistor*

I. Introduction

Adder core is the most critical building block in microprocessor and digital signal processors. Addition is the most commonly used arithmetic operation. It is a speed limiting element as well. A full adder core has three inputs A, B, AND Carry in (Cin) and two output sum and carry out (Cout).The complex arithmetic circuits such as subtraction, multiplication, and division function usually can be realized by the co-operation of multiple adders. Increased usage of the battery operated portable devices, like cellular phones, personal digital assistants (PDAs), and notebooks demand VLSI, and ultra large-scale integration designs with an improved power delay characteristics. Full adders, being one of the most fundamental building blocks of all the aforementioned circuit applications, remain a key focus domain of the researchers over the years. Different logic styles, each having its own merits and bottlenecks, was investigated to implement 1-bit full adder cells. The designs, reported so far, may be broadly classified into two categories: 1) static style and 2) dynamic style. Static full adders are generally more reliable, simpler with less power requirement but the on chip area requirement is usually larger compared with its dynamic counterpart. Different logic styles tend to favour one performance aspect at the expense of others. Standard static complementary metal–oxide–semiconductor (CMOS), dynamic CMOS logic, CPL, and TGA are the most important logic design styles in the conventional domain. The other adder designs use more than one logic style, known as hybrid-logic design style, for their implementation. These designs exploit the features of different logic styles to improve the overall performance of the full adder.

II. Related Work

Various low-power full adders with output driving capability have been presented in literature . By applying the principle of mirror, the conventional CMOS full adder (denoted as CMOS) is realized as Fig.1 [1]. The Full adder design in static CMOS with complementary PMOS and NMOS [1].This adder is based on regular CMOS structure (pull-up and pull-down network), which uses both NMOS and PMOS transistors. These transistors are arranged in a structure formed by two complementary networks.

In static CMOS, the NMOS transistors only need to pass O's and the PMOS only pass 1 's, so the output is always strongly driven and the levels are never degraded. This is called a fully restored logic gate Pull-up network is complement of pull-down. Below schematic is a Full adder cell of 28 transistors which is implemented by using CMOS technique

Advantages: One of the most significant advantages of this full adder was its high noise margins and thus reliable operation at low voltages. The layout of CMOS gates was also simplified due to the complementary transistor pairs.

Disadvantages: But the use of substantial number of transistors results in high input loads, more power consumption and larger silicon area. Pass Transistor logic: pass transistors are single FETs that pass the signal between drain and source terminals instead of a fixed power supply value.

The basic difference of pass-transistor logic compared to the CMOS logic style is that the source side of the logic transistor networks is connected to some input signals instead of the power lines. The advantage is that one pass-transistor network (either NMOS or PMOS) is sufficient to perform the logic operation, which results in a smaller number of transistors and smaller input loads. Transmission gate:

An electrical feature of the transmission gate and pass transistor is that there are no direct signal connection to the power supply Vdd or ground .

1.No isolation between the input and output.
2. Output progressively deteriorates as it passes through various stages.

In this design, the PMOS-network is fully identical to the NMOS-network rather than being the conduction dual. The fully symmetric schematic topology significantly simplifies the layout design. This configuration consumes smaller power, yet its drawback comes from slower speed due to the node O C having to drive heavy load. Based on transmission gates, a full adder with driving capability is shown in Fig. 2 [1]. Since the transmission full adder, denoted as TFA, has simpler schematic than the conventional CMOS full adder shown in Fig.1. The TFA needs fewer MOS transistors in comparison with the previous one. The transistor count of TFA is 26, while the conventional CMOS full adder requires 28 transistors. TFA provides buffered outputs of the proper polarity for both sum (S) and carry-out (Co). Its disadvantage is slow speed and high power consumption. Fig. 3 [1] shows pass transistor logic (PTL) full adder. Due to using exclusive-OR and exclusive-NOR (XOR/XNOR) with the full voltage swing output, the PTL-based full adder (PTLA) could operate at full-swing signal voltage and needs less MOS transistors. However, the pull-up and pull-down transistors in XOR/XNOR module cause too much delay and drive too much loading. As a result, the whole full adder is slower down and consumes more power. A hybrid pass-logic with static CMOS output drive full adder (HPSC) is proposed to feature hybrid CMOS logic style, as shown in Fig. 4 [1]. In HPSC circuit, XOR and XNOR functions are simultaneously generated by pass-logic module with only six transistors, and propagated to the successive CMOS module to produce full-swing outputs. Two complementary transistors form the feedback loop to overcome the weak signals caused by pass transistors. They restore the non full-swing output by either pulling it up through PMOS to supply voltage or down through NMOS to ground. Due to the need of restoring and driving both modules for sum and carryout, the pass-logic module eliminate the whole propagation speed of the full adder The proposed full adder circuit is represented by three blocks as shown in Fig. 5(a) [2] . Module 1 and module 2 are the XNOR modules that generate the sum signal (SUM) and module 3 generates the output carry signal (Cout). Each module is designed individually such that the entire adder circuit is optimized in terms of power, delay, and area. These modules are discussed below in detail.

A. Modified XNOR Module

In the proposed full adder circuit, XNOR module is responsible for most of the power consumption of the entire adder circuit. Therefore, this module is designed to minimize the power to the best possible extend with avoiding the voltage degradation possibility. Fig. 5(b) [2] shows the modified XNOR circuit where the power consumption is reduced significantly by deliberate use of weak inverter (channel width of transistors being small) formed by transistors Mp1 and Mn1 Fig. 5(b)[2] . Full swing of the levels of output signals is guaranteed by level restoring transistors Mp3 and Mn3 [Fig. 5(b)]. Various XOR/XNOR topologies have already been reported in [3] and [4]. The XOR/XNOR reported in [4] and [5] uses four transistors but at the cost of low logic swing. To the contrary, the XOR/XNOR reported in [3] uses six transistors to get better logic swing compared with that of 4 T XOR/XNOR [12]–[14]. In this paper also, the XNOR module employed 6 T, but having different transistor arrangement than that of 6 T XOR/XNOR [3]. The modified XNOR presented in this paper offers low-power and high-speed (with acceptable logic swing) compared with 6 T XOR/XNOR [3].

B. Carry Generation Module

In the proposed circuit, the output carry signal is implemented by the transistors Mp7, Mp8, Mn7, and Mn8 as shown in Fig. 6. The input carry signal (Cin) propagates only through a single transmission gate (Mn7 and Mp7), reducing the overall carry propagation path significantly. The deliberate use of strong transmission gates (channel width of transistors Mn7, Mp7, Mn8, and Mp8 is made large) guaranteed further reduction in propagation delay of the carry signal.

III. Proposed Work

In this system five type of full adders such as conventional adder, complementary pass transistor logic(CPL), Hybrid pass-logic with static CMOS (HPSC), Transmission function full adder(TFA), Hybrid full adder are implemented in CMOS technology and the performance parameters such as power and delay are determined. The same circuits are implemented using FINFET technology and analyse the parameters in both technology.

A. CMOS Technology

CMOS are based on the concept of using complimentary pair of transistor for switching. It is a combination of two networks: The pull up networks and pull down networks. CMOS logic design can be classified into static CMOS and dynamic CMOS.

a) Static CMOS Design

In static CMOS logic circuit at every point in time, each gate output is connected to either VDD or GND via a low resistance path. It's a combination of pull up transistor and pull down transistor. The PDN is constructed using NMOS device while PUN is constructed using PMOS devices. The PDN is ON When all the inputs are high and is OFF when all the controlling inputs are low while the PUN acts as an inverse switch that is ON when the controlling inputs are low and OFF when the controlling inputs are high.

b) Dynamic CMOS Design

An alternate logic style for CMOS design, that obtain similar result as that of static design while avoiding static power dissipation and reduces number of transistors. In dynamic design with addition of a clock signal input, it uses a sequence of precharge and conditional evaluation phases. A basic dynamic CMOS gate consist of n transistors (PDN);whose output is precharged to Vdd by a P transistors and conditionally discharged by n transistors connected to Vdd .The operation of this circuit is divided into two major phases based on the clock signals.

- Precharge: When clk is zero the output node Vout is precharged to Vdd by PMOS transistor m1 .During that time ,the evaluate NMOS transistor m2 is off. so that the pull down is disabled.
- Evaluation: When clk is one the precharge transistor m1 is ON if the inputs are such that the PDN conducts then low resistance path exists between Vout and gnd; the output is discharged to gnd. if the pdn is off; then the precharged value remains stored on the output capacitance .Once Vout is discharged , it cannot be discharged again until the next precharge operation.

The main objective of the paper is to analyse five types of adder circuits such that as cmos adder , TFA , HPSC, Pass transistor based full adder in two two technology levels using LT spice and performance parameters such as power, delay are compared.

The adder circuits such that as CMOS adder , TFA , HPSC , Pass transistor based full adder are implemented using LT Spice tool. LT Spice is a analog circuit simulator with integrated schematic capture and waveform viewer. It was explicitly written to outperform analogous tools for sale from software companies in the interest of being used for in-house IC design as part of Linear Technology Corporation's competitive advantage as a semiconductor company. This is a reasonable strategy despite the plethora of existing commercial SPICE offerings. , It is the best simulators developed by the concerns that actually need them and not software companies.

Now, what is unusual about LT spice is that is it also freely distributed in the interest of allowing potential customers to simulate LTC products in a faster simulator. Further, the freely distributed version is not crippled to limit its capability in the hope that it will be useful.

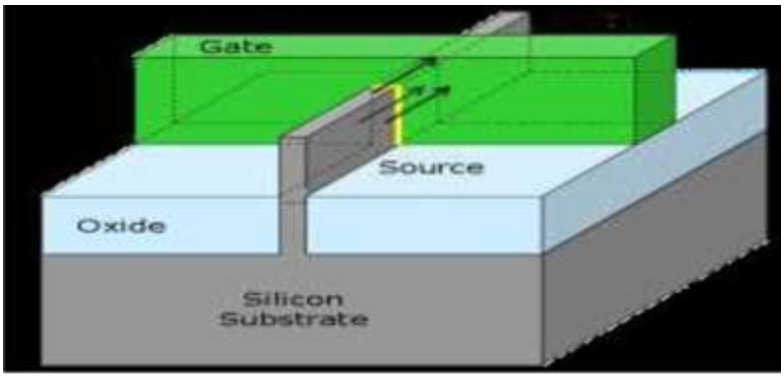
This is a unique situation for a SPICE simulator and has made LT Spice's popularity no less than fantastic. LT spice is overwhelmingly the most widely distributed and used SPICE program in the industry to date. It has become the de facto standard SPICE program

B. FinFET Technology

The scaling of conventional MOSFET transistor has become increasingly difficult because of its large short channel effects below 32nm Technology. Scaling down of MOS device dimensions' width and length also leads to lower performance and higher average power consumption. Fin-type field effect transistors (FinFET) are promising substitute for bulk MOS at the nanoscale. This is because the fabrication technology of FinFET is almost the same as that of the conventional MOS transistor [7]. Due to the fact, fabrication process is similar, FinFETs can easily substitute Mosfets in the near future. FinFETs are the double gate (DG) transistors family and are basically quasi-planar in nature. They are termed as quasi-planar because of the fact that the current direction is parallel to its wafer and the channel is formed perpendicular to it. FinFETs gate terminal can either be shorted or independently controlled to offer rich design space [8]. The two electrically coupled gates and thin silicon body of the FinFET are known very well from literature to suppress the short channel effects [4].

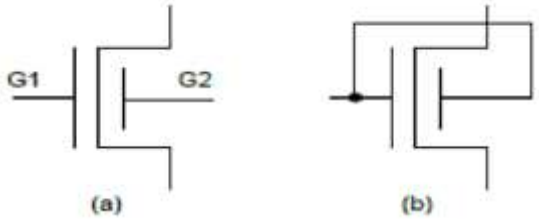
Dynamic MOS logic circuits are used in high performance VLSI chips in order to achieve very high system performance. Noise is a major issue in design of dynamic logic circuits. In deep submicron region noise tolerance of dynamic logic circuit is very poor and they are more prone to logic failure [10]. There are various noise sources in dynamic logic circuits which are charge sharing noise, leakage noise, crosstalk noise, power and ground noise, substrate noise, etc. FinFETs having diverse design options and better control over channel provides low power configurations and higher noise tolerance . A double gate transistor is built on an SOI substrate, and is based on the earlier DELTA (single gate) transistor design. The distinguishing characteristic of the FinFET is that the conducting channel is wrapped by a thin silicon "fin", which forms the body of the device [8]. Over 45nm technology, there is significant reduction in Average power consumption when FinFET is used instead of MOSFET. The basic structure of FinFET is shown in Figure 1.

Figure 1 Basic Structure of FinFet Technology



The FinFET device structure consists of a silicon fin surrounded by shorted or independent gate on either side of the fin, typically on silicon insulator substrate. FinFET has two gates, which can be operated independently or tied together. The threshold voltage at one gate can be controlled with the help of voltage at the other gate.

Figure 2 FinFet Configuration (a) Independent Gate (b) Shorted Gate



a) Power Analysis

Power measurement is being one of a key factor for designing a current VLSI circuits. Overall power loss includes static and dynamic losses.

$$P_{total} = P_{static} + P_{dynamic}$$

Conflict to early days, as a dynamic power losses conquered any additional form of power losses, with a latest move to UDSM level designing; currently static power losses too have become a major worry. There are two types of Power losses they are

- Static Power loss: Power leakage is calculated during the continuous flow of Voltage. Dynamic Power loss in which power leakage is calculated during the turning on and off of a circuit.

- Delay or Lag Analysis: As a raise in count of inversion levels in series will lead to a enhancement in lag of a circuit. Interconnect capacitance, junction capacitance, Inter wire capacitance, intra wire capacitance; each of these capacitances will matters for the improved delays. Logical effort(C/I) details for all these factors quantitatively. Dynamic circuits were built with the purpose to utilize the internal capacitances to grip some important information which in case of static circuits is merely because of delays. These circuits sustained to be very beneficial when fast operation.

IV. Design Approach of The Proposed Full Adders

In the system , the full adders such as conventional adder, CPL, HPSC, TFA, Hybrid Adder are implemented using FinFet technology. The performance parameters such as power and delay are determined and compared it with the same adders implemented in the CMOS technology.

Figure 3 HPSC Full Adder

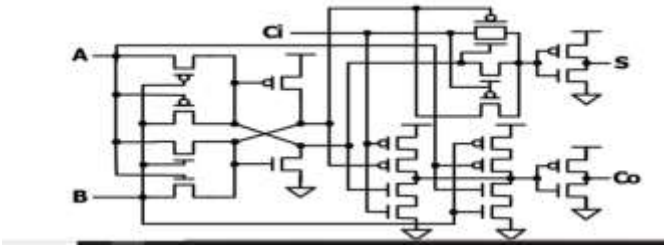


Figure 4 Conventional CMOS Full Adder

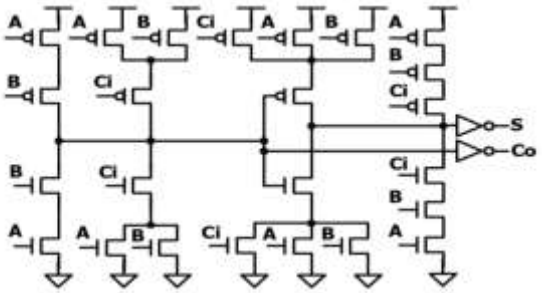


Figure 5 Transmission Function Full Adder

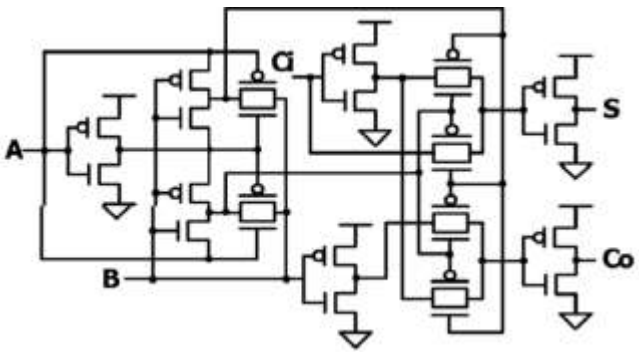


Figure 6 Complementary Pass Transistor Based Full Adder

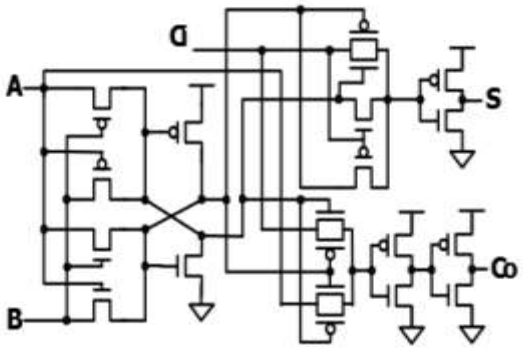
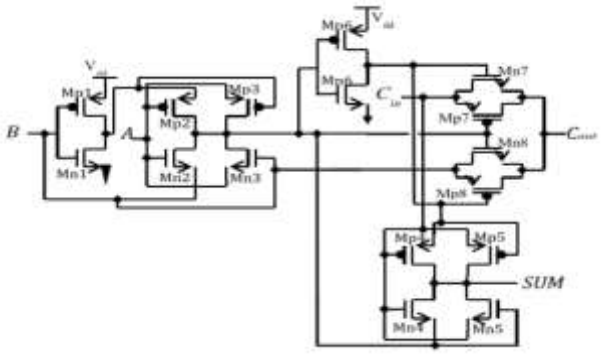


Figure 7 Hybrid Full Adder



V. Implementation and Results

Different Full Adders such as TFA, Conventional CMOS, Complementary Pass Transistor Logic, Hybrid Full Adder and HPSC Full Adder are implemented using L T Space technology is shown below.

Figure 8 Conventional CMOS

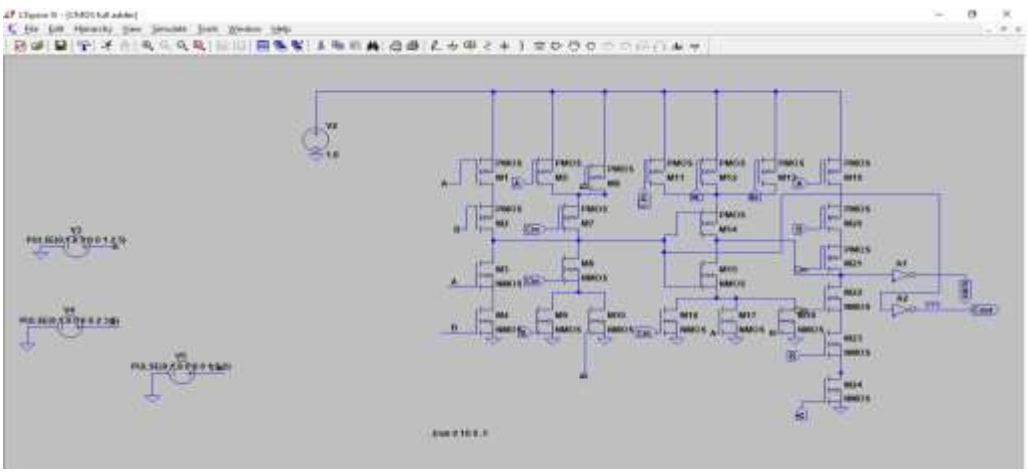


Figure 9 complementary pass transistor logic

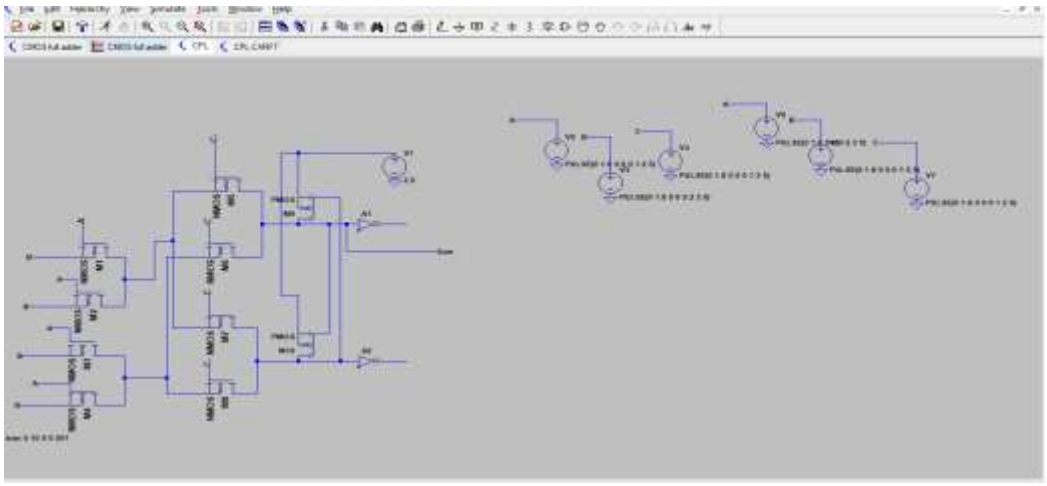


Figure 10 HPSC Full Adder

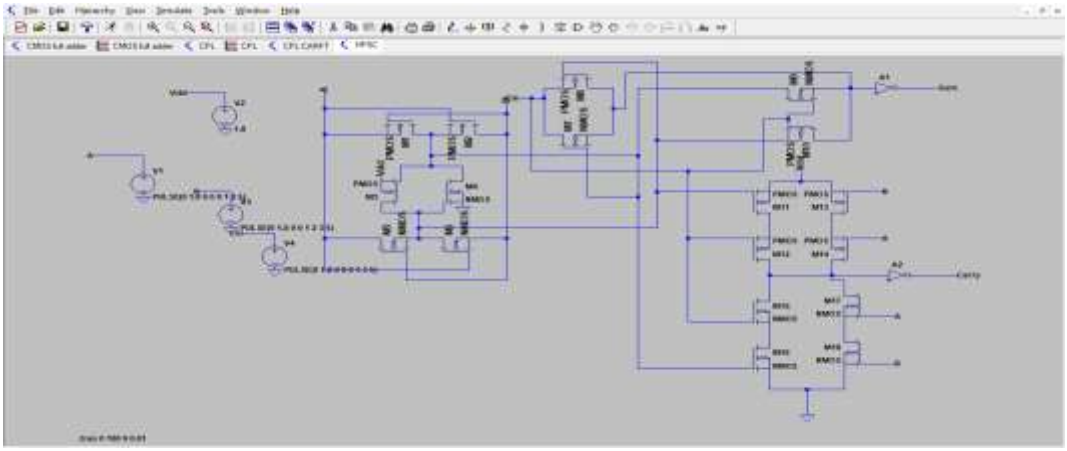


Figure 11 Hybrid Full Adder

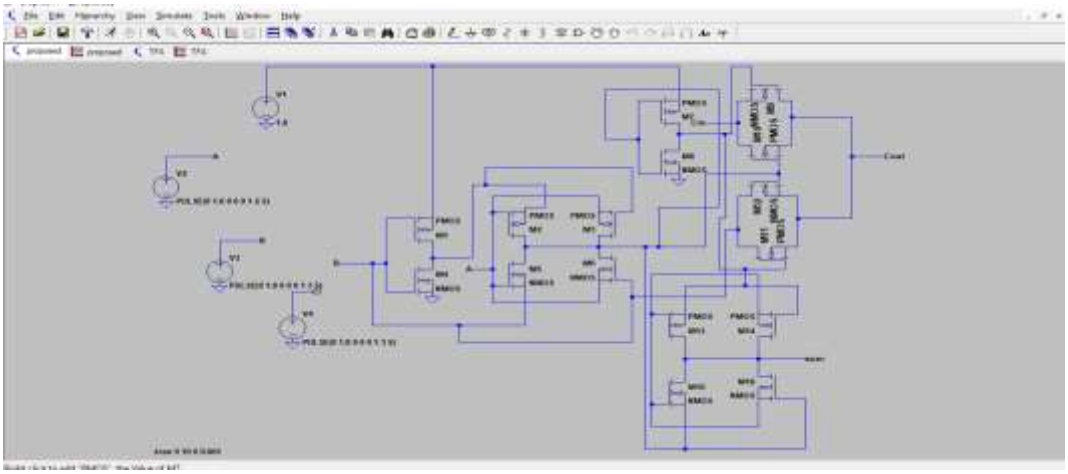


Figure 12 Transmission Function Full Adder

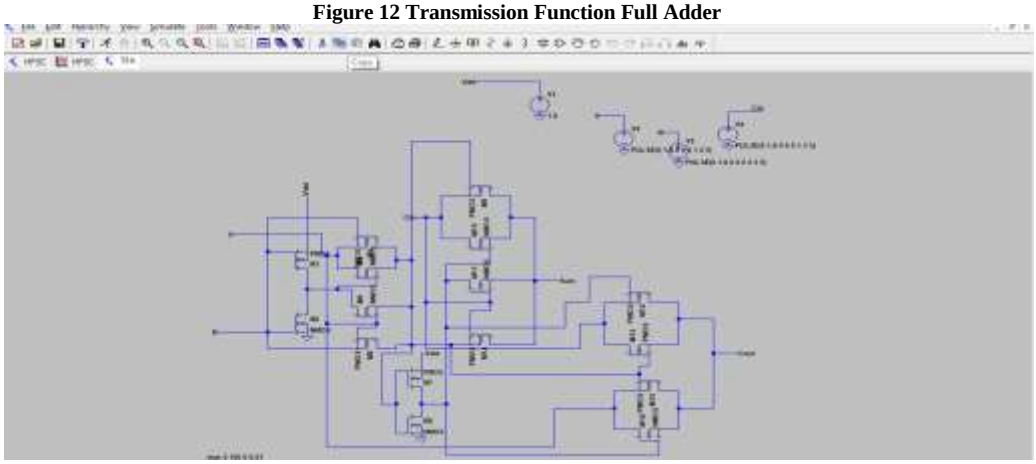


Table 1 CMOS Technology

Adders	Delay	Power	Power*Delay
Conventional adder	8.374ms	29.26µW	245.03nJ
CPL	7.312ms	7.281µW	53.238nJ
HPSC	4.4134ms	43.29µW	191.05nJ
TFA	0.614ms	24.96µW	15.32nJ
Hybrid adder	0.33ms	35.144µW	11.59nJ

Figure 13 Conventional CMOS

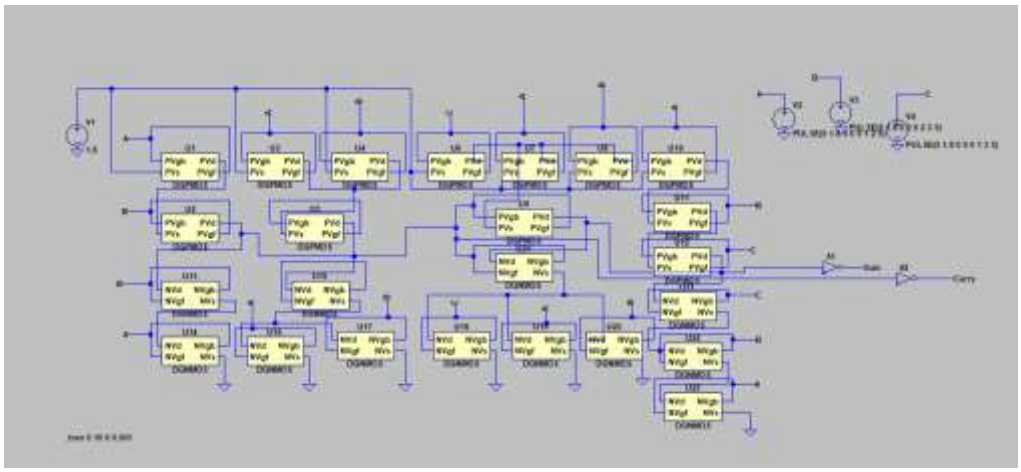


Figure 14 CPL based Full Adder

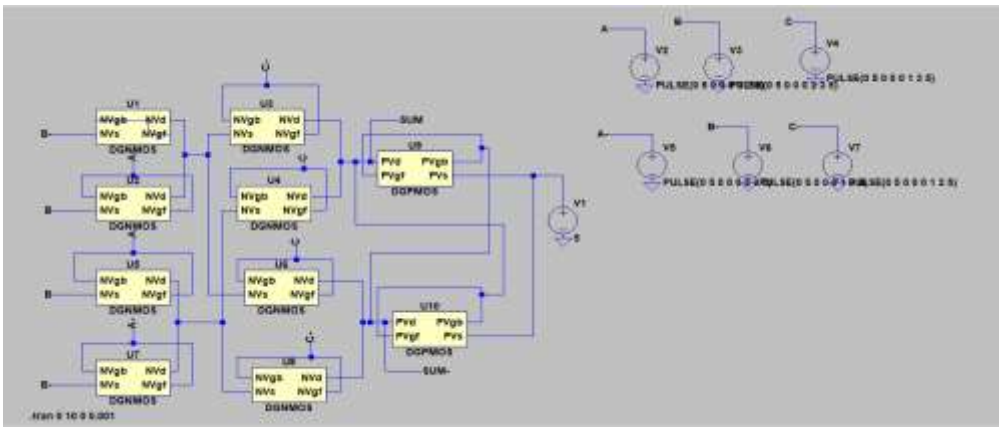


Figure 15 HPSC Full Adder

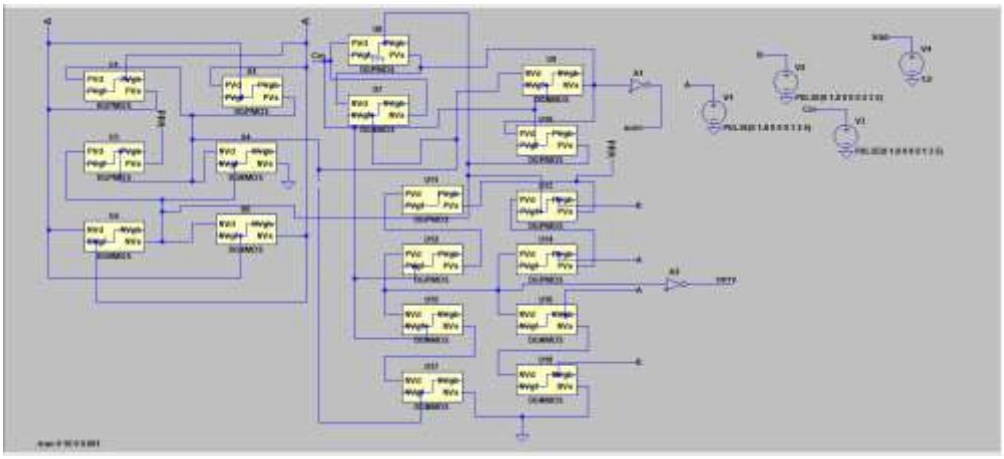


Figure 16 TFA Full Adder

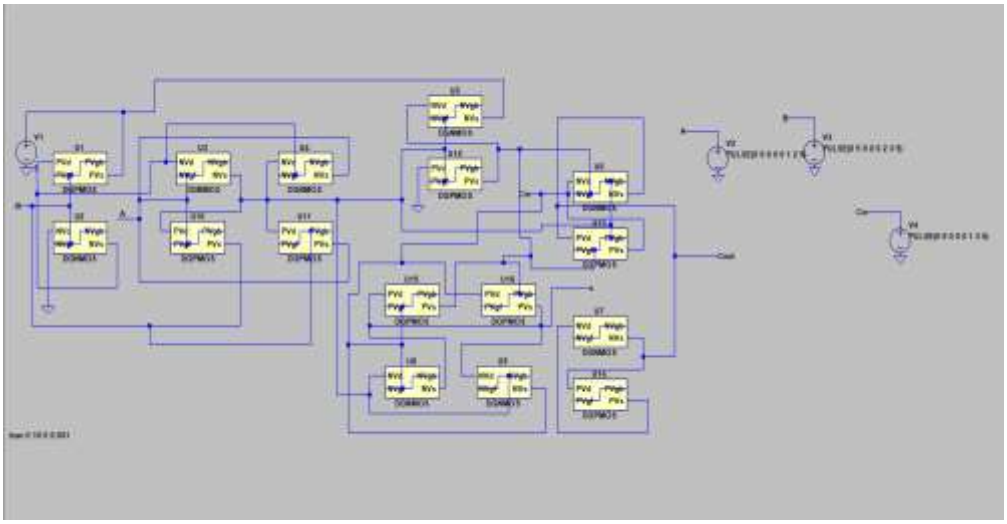


Figure 17 Hybrid Full Adder

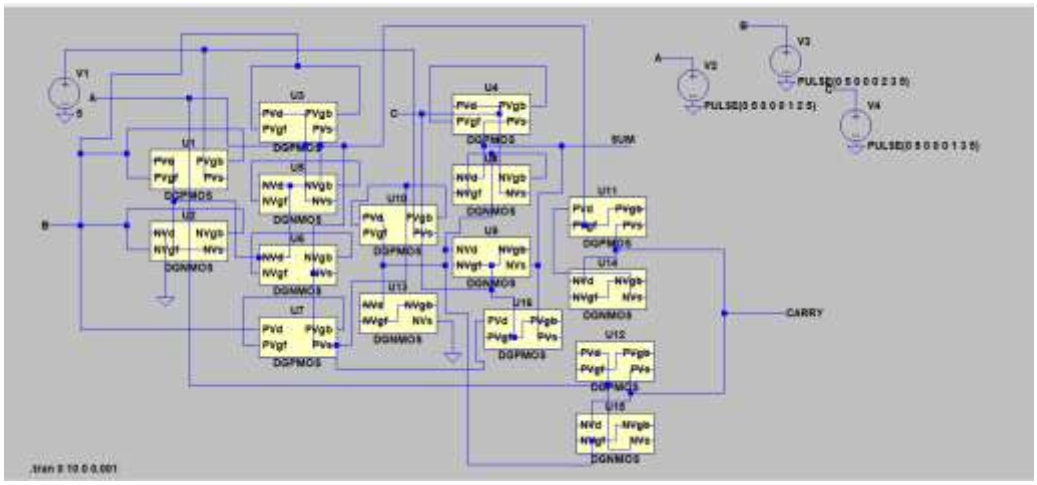


Table 2 FinFet Technology

Adder	Delay	Power	Power*Delay
Conventional adder	1.264ms	9.90µW	1.264nJ
CPL	7.78ms	0.290µW	2.256NJ
HPSC	1.41ms	6.1707µW	8.70nJ
TFA	9.32ms	1.8430µW	17.177nJ
Hybrid adder	0.42ms	0.06994µW	0.03217nJ

VI. Conclusion

In this paper low power, high speed full adders has been proposed using CMOS technology and extended to FinFet technology. The simulation was carried out using LT Spice tool. The simulation results established that the proposed technology known as FinFet technology offered improved PDP compared with the existing CMOS technology. The proposed technology is implemented at 45nm technology at 1.8V power supply and obtained almost thrice the efficiency of CMOS technology.

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IOT BASED COMPARISON OF WI-FI AND BLUETOOTH RELIABILITY FOR ENVIROMENTAL MONITORING USING MQTT

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***Abstract**: The recent changes in climate have increased the importance of environmental monitoring, making it a topical and highly active research area. This field is based on remote sensing and on wireless sensor networks for gathering data about the environment. Recent advancements, such as the vision of the Internet of Things (IoT), the cloud computing model, and cyber-physical systems, provide support for the transmission and management of huge amounts of data regarding the trends observed in environmental parameters. The current work presents three different IoT-based wireless sensors for environmental and ambient monitoring: one employing User Datagram Protocol (UDP)-based Wi-Fi communication, one communicating through Wi-Fi and Hypertext Transfer Protocol (HTTP), and a third one using Bluetooth Smart. Message Queuing Telemetry Transport (MQTT) protocol is introducing for removing disadvantages and for better result instead of other two protocols. All of the presented systems provide the possibility of recording data at remote locations and of visualizing them from every device with an Internet connection, enabling the monitoring of geographically large areas. The development details of these systems are described, along with the major differences and similarities between them. The feasibility of the three developed systems for implementing monitoring applications, taking into account their energy autonomy, ease of use, solution complexity, and Internet connectivity facility, was analyzed, and revealed that they make good candidates for IoT-based solutions.*

***Keywords**: Internet of Things (IoT); Sensors; Mobile application; Bluetooth; Wi-Fi; Arduino Uno; 3-axis accelerometer.*

I. Introduction

THE current advances in the fields of technology and economy are having a significant impact over the environment, and have led to serious concerns regarding pollution and climate change. In the report released in 2014, the Intergovernmental Panel on Climate Change confirms that human activities are having an unequivocal and continuously increasing influence on the climate system, with recent changes that are unprecedented over decades to millennia [1]. In this context, environmental monitoring represents a fundamental instrument for gathering relevant information about the ecosystem, leading to new knowledge and understanding, and for ultimately implementing adaptation and mitigation actions that address the degradation of the biosphere [2]. Another related field currently gaining attention is the monitoring of the ambient in indoor spaces. It has been shown that this is important not only for the comfort and health of building occupants [3], but also for the reduction of greenhouse gas emissions [4].

The most common parameters being monitored include the temperature, humidity, rainfall, atmospheric pressure, light intensity, air quality, affected by pollutants such as CO2, CO, SO*x* , volatile organic compounds, and many others. One of the immediate benefits brought by the acquisition of such physical proprieties, like soil moisture, temperature, and salinity, can be seen in agriculture, where significant water resource savings can be achieved [5]–[7]. The majority of monitoring applications rely on WSNs, motivated by the indisputable advantages they bring: lower costs due to the replacement of cables, variable network topologies, scalability, and lower maintenance and commissioning expenses [8]. Wireless sensors and sensor networks have been successfully used in the implementation of solutions belonging to various fields, including environmental monitoring [9]–[11], natural disaster prevention [12], current consumption monitoring in large buildings [13], monitoring systems for the dosimetry of radiology operators in healthcare applications [14], [15], location

tracking of people, assets or hazardous gases [16], [17], gear condition surveillance [18] and process control [19] in industrial environments, and many others. The most widely used protocols in applications having less tight latency and reliability requirements, such as environmental monitoring, consist of ZigBee (IEEE 802.15.4) [6], Wi-Fi (based on IEEE 802.11) [20], and Bluetooth (IEEE 802.15.1) [21]. Being based on IEEE 802.15.4, a standard that offers low costs and low power at low data rates, ZigBee is extensively used in a wide range of monitoring and control application that require wireless connectivity. These solutions provide energy-efficient designs, but cannot comply with tight latency and reliability requirements and require additional hardware for packaging data and for transmitting them to the Internet. Wi-Fi is a popular networking technology based on the IEEE 802.11 set of standards that offers higher transmission range and throughput compared to IEEE 802.15.4, with the cost of higher energy consumption.

The development of low power Wi-Fi devices, like the RN131C/G from Roving Networks and the ESP8266 from Espressif Systems, made this technology more and more attractive for implementing wireless sensing applications. The sensors based on this type of modules take advantage of the existing infrastructure, have native IP-network compatibility, and can use protocol ie, MQTT (Message Queuing Telemetry Transport, eliminating the need for applications that encapsulate the data for transmitting them and it can help to reduce the disadvantages of the system by using the other two protocols like UDP (User Datagram Protocol) and HTTP (Hypertext Transfer Protocol),In fact, vision method is the major technique applied for sign recognition in the past decades. A system that uses a camera to observe the information obtained through hand and finger motions is the most widely adopted visual-based approach [4]. Tremendous effort and study has gone into the development of vision-based sign recognition systems worldwide. Indeed, vision-based gesture recognition systems can be subdivided into direct and indirect approaches to the Internet.

Bluetooth Low Energy (BLE), or Bluetooth Smart, was introduced in 2010 with the goal of extending the application domain of Bluetooth to power-constrained devices, such as wireless sensors, and has seen a continuous evolution since then [21].Here, comparing the reliability of both Wi-Fi and Bluetooth module can be done. However, the implementation of monitoring applications with Internet connectivity requires the use of Bluetooth Internet gateways for sending and receiving measurement data. In industrial settings, where heavy interference are present, and the reliability of data transmission, high update rates, determinism, and high availability are of great importance, the WirelessHART (IEC62591), ISA100 wireless (IEC62734), and the IEEE 802.15.4.e layer 1 and 2 standard are used [22]. These provide reliable and secure low-power wireless operation for noncritical monitoring and control applications. Sensor networks rely on the Internet for transmitting information to central stations, where further processing can be performed on the acquired data. The placement of sensors in locations situated at large distances from the server or the base station, taking advantage of the Internet, allows the gathering of environmental data from large geographical areas. This is made possible by development of new transceivers with longer ranges and lower power consumption, which can establish Internet connections.

The structure of this paper is as follows. The next section describes some of the solutions that have been developed for implementing monitoring applications. Section III describes the proposed system. Section IV presents two different Wi-Fi-based solutions that allow the recording of environmental data at remote locations and the visualization of data from every device with an Internet connection, while Section V details a system based on the newly developed Bluetooth Smart protocol. An analysis of these systems is provided in Section VI, along with the advantages and drawbacks identified in each one of the three cases when implementing IoT-based monitoring solutions. The last section gives the concluding remarks.

II. Related Work

The literature has reported a large number of research efforts that make use of wireless sensors for achieving monitoring applications.

Donno *et al.* [25] propose a solution where self-powered Radio-frequency identification tags, equipped with temperature, light, and acceleration sensors, are used. The device has the ability to harvest RF energy and its operation has been validated through two real-world experiments, in which the acquired data are collected by a host PC with the help of a reader antenna. The design achieved a transmission range of up to 10 and 20 m in fully passive and battery-assisted-passive modes, respectively. The proposed system can be used for monitoring the ambient or outside weather parameters, and, if the host PC is provided with an Internet connection, can be part of an IoT-based solution. Reference [26] presents an open-source wireless mesh networking module for environmental monitoring, with the aim of promoting this kind of routing in such applications. This is based on a low-cost RF transceiver, with more compact and less complex code than the one of a ZigBee design, and works in connection with a sensor node.

The system was compared to an off-the-shelf product, XBee, with the conclusion that it can offer comparable or even better performance than commercial items. Other systems for monitoring applications belonging to different fields, all based on ZigBee, are reported in [6], [13], and [27]. The major drawback of these consists in the requirement for a gateway in case data has to be sent over the Internet, a basic requirement for IoT scenarios.

Various monitoring solutions based on BLE technology have appeared and are gaining ground especially in home automation, after its introduction in 2010 [21].

The work in [28] consists in the development of a novel energy management approach for smart homes based on BLE enabled wireless networks. By offering low power, low cost, and reduced device dimensions, the authors believe that this technology has a high potential of becoming important for both the IoT and for smart homes. This trend will also be sustained by the availability of native support offered by current mobile devices, compared to IEEE 802.15.4, which will also reduce the cost of BLE devices. The simulation results show that this approach contributes to the reduction of peak load demand and electricity consumption charges, ultimately leading to monetary savings. Furthermore, it has been shown that the performance of the proposed BLE network is better than the one obtained in the case of IEEE 802.15.4 in terms of packet delivery ratio, delay, and jitter. With the continuous improvements brought to the protocol, such as the support for mesh networking, and the extension of the range offered, it is believed that this technology will be taken into consideration for implementing environmental monitoring applications.

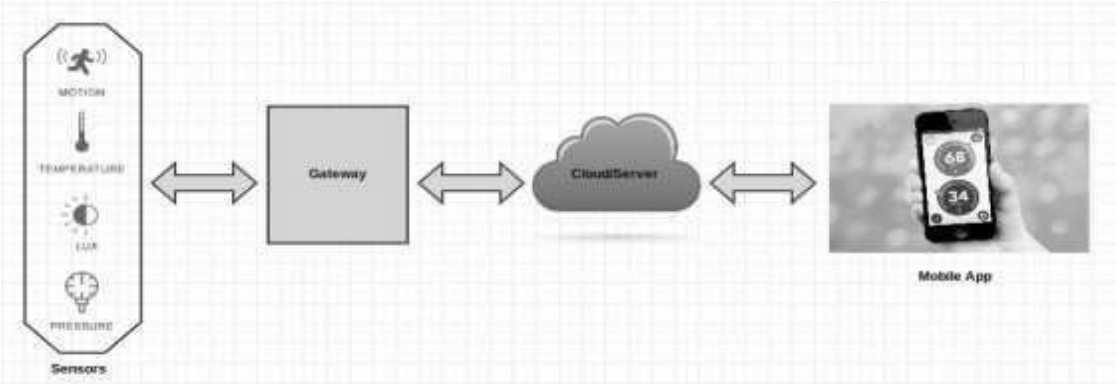
In [29], we reported the development of Wi-Fi sensors sending temperature and relative humidity measurements to a base station using UDP. A battery lifetime of 2 years with a 20 min measurement cycle was achieved. This encouraged the development of a device using HTTP, for investigating the power efficiency of this more reliable solution, from the communication point of view.

III. Proposed Work

The proposed system keeps track on the parameters such as moisture, temperature, humidity, rainfall, gas content and earthquake intimation with the help of the real time sensors. These parameters are continuously monitored by an open source platform called Thingspeak for an interval of every 2 minutes. The data can be viewed in any one of the three formats such as JSON, XML and CSV. The sensors in the proposed system collect the data such as the temperature, humidity, soil moisture, pollution level, rain water level and movement in the earth surface.

The Wi-Fi network helps in the process of sending the collected data to the open source platform, Thingspeak. Alternate to that, an app is made for the purpose of viewing the collected data in even more easier manner. Through the application/Thingspeak, the user will be able to know about the status of his/her own agricultural land and counter-measures can be taken after the keen observation of the parameters of the land.

Figure 1 Proposed system Design.



It is nowadays finding profound use in each and every sector and plays a key role in the proposed environmental monitoring system too. IoT converging with cloud computing offers a novel technique for better management of data coming from different sensors, collected and transmitted by low power, low cost microcontroller "Arduino UNO". An open source website, Thingspeak is used where the measurement of the parameters are updated. Thingspeak is an open source Internet of Things application and API to store and retrieve data from the sensors using the MQTT Protocol over the Internet.

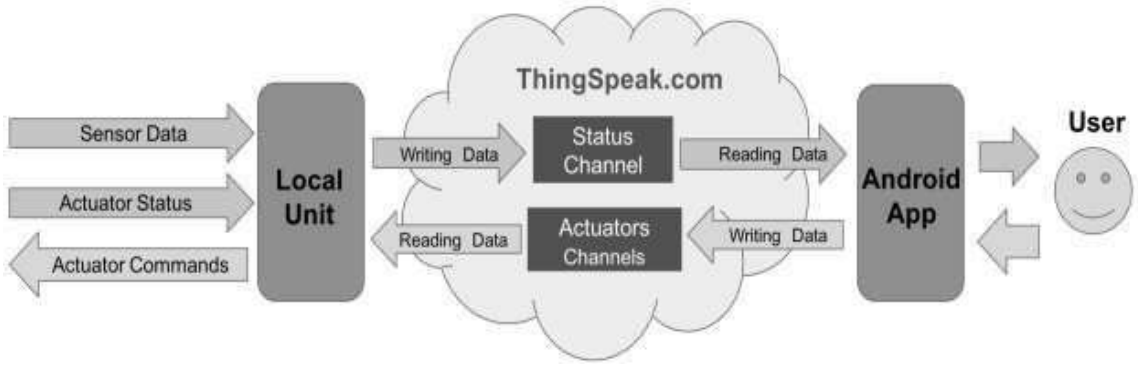
Thingspeak is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. The cloud utilizes the operations of Graphical visualization and available in the form of virtual server for the users and the objects are communicated with the cloud via possible 'wireless internet connections' available to the users and the majority objects uses the sensors to tell regarding the environmental analogue data.

The IoT helps bring all things together and permits us to communicate with our very own things. The measurements thus received can be viewed in these scripts such as JSON, XML and CSV. In the proposed system, the environmental parameters

IV. System Design

The system keeps track on the environmental parametres like moisture,temperature, humidity,rainfall,gas content,earthquake intimation etc. with the help of real time sensors.
The Wi-Fi and Bluetooth helps in the process of sending the collected data to the open source platform using android application in the data's are to be known, then finally comparing the reliability of both the technologies ie, Wi-Fi and Bluetooth can be done.
Internet of Things refers to the rapidly growing network of connected objects that are able to collect and exchange data using embedded sensors. In each and every sector IoT plays a key role in the proposed environmental monitoring system too. IoT converging with cloud computing offers a novel technique for better management of data coming and stores it.

Figure 2 Block Diagram of Proposed system



Six sensors are connected to the arduino uno board, we can connect more sensors to the board.The flex sensor and accelerometer sensor data are collected using an Arduino Uno microcontroller. The Arduino microcontroller is not only for technical audience but is intended for designers and artists as well because of its focus to usability based on its design which helps to achieve the intended goal.It is the primary component of the framework. In addition, it is an open source microcontroller device with easily accessible software/hardware platform and is compatible with many sensors available. Everything needed for its working is present on the board. The sensors are DHT 11,gas sensor,ADXL,flame detector, moisture sensor and ultrasonic sensor.
DHT 11 sensor is used for measuring pressure and humidity, gas and flame detectors are used to detect the presence of poisonous gases and flame. ADXL used as vibration sensors for detecting the presence of earthquakes. Moisture is used to detects the presence of moisture content in the soil, ultrasonic is used to detect the rain water level, all these data's are transmitted or read by the microcontroller Atmega 16 and then transmitted to the base station using MQTT protocol. Two technologies are used to processing the data's in the base station and transmitted to the mobile phones by using android applicaton based on IoT. And finally the reliability of ble and Wi-Fi can be done.

V. System Flow

The proposed system comprises of three distinct modules: a sensor module, processing module, and application module. The sensor and processing modules are implemented in the first section and second, whereas the application module operates in an Android-based mobile device. The sensing data's are collected using an Arduino Uno microcontroller. The features are extracted from the sensor data, processed and transmitted. The processed data's are transmitted to a mobile device using a WEMOS Wi-Fi module. The received text is displayed on the mobile screen. Concurrently, the data's can be viewed in the mobile phone as applications. Then the reliability of ble and Wi-Fi can be done.Detailed description about Wi-Fi section, protocol section, BLE is given below.

A. Solutions Based On Wi-Fi

The two sensors that communicate using Wi-Fi technology are based on the same hardware, the difference between the two consisting in the protocol that was used, namely MQTT. The generic architecture of the devices based on Wi-Fi technology is presented in Fig. 1. It consists of the application processor, a CY8C3246PVI-147 [30] programmable system on chip microcontroller (PSoC 3) produced by Cypress Semiconductor, a wireless local area network (LAN) module, RN-131C/G [31], and the temperature and relative humidity sensor (SHT21 [32]), all powered by a 3 V CR123A 1500 mAh battery.

The choice of using a separate application processor removes the possibility of interfering with the communication stack on the WLAN module. Therefore, the processor in the developed devices is in charge with performing all the actions for the proper operation of the device, namely, power management, acquisition of data from the sensing unit, and communication.For transmitting the data to a base station, a serial link between the PSoC 3 device and the communication module, and an API (application programming interface), called WiFly, are used. The motivation for selecting the RN-131C/G wireless module consists in its low-power operation, providing 4 Ma during sleep and short 210 mA pulses during transmission. The development of other cheaper wireless modules based on the IEEE 802.11 set of standards, such as the ESP8266 from Expressif, will multiply the range of possible solutions.

However, with a current larger than 20 μA in deep sleep mode, newer approaches for achieving power efficiency in the designs using it will have to be investigated [33]. The prototype of the developed Wi-Fi sensor is presented in Fig. 2.detect hand gestures. The flexion values varied among the different the amount of bend. The resistance value for a less bending figure is smaller as compared to a more bending figure. Thus, the differences among the signs are not discernible from the raw flex sensor values. To solve this issue, the sensor values were normalized based on the computed mean and standard deviation of each flex sensor for each subject into a range of [0, 1].

The normalized values are computed individually for each sensor. Thus, the mean and SDs of flex sensors are computed separately for each sensors readings. Meanwhile, each hand movement was derived from the accelerometer sensor in three orientations: pitch, roll, and yaw. The calculation of each orientation is similar depending on the axis used [15]. The flex sensors and accelerometer sensor data are gathered at a sampling rate of 100 Hz.

Figure 2 Wi-Fi environmental sensor block diagram.



B. MQTT Protocol

MQTT is a Client Server publish/subscribe messaging transport protocol. It is light weight, open, simple, and designed so as to be easy to implement. These characteristics make it ideal for use in many situations, including constrained environments such as for communication in Machine to Machine (M2M) and Internet of Things (IoT) contexts where a small code footprint is required and/or network bandwidth is at a premium.

a. Features

- MQTT stands for Message Queuing Telemetry Transport .It is described as a machine-to-machine (M2M) / IoT connectivity protocol.
- This protocol is so lightweight that it can be supported by some of the smallest measuring and monitoring devices, and it can transmit data over far reaching, sometimes intermittent networks.
- MQTT is a publish/subscribe messaging transport protocol that is optimized to connect physical world devices and events with enterprise servers and other consumers.
- MQTT is designed to overcome the challenges of connecting the rapidly expanding physical world of sensors, actuators, phones, and tablets with established software processing technologies.
- Therefore, the MQTT protocol represents an ideal messaging protocol and is able to provide routing for small, cheap, low power and low memory devices in vulnerable and low bandwidth networks.

b. Functionality of MQTT

- MQTT algorithm consists of Broker, publish and subscribe.

- The MQTT messages are delivered asynchronously **("push")** through publish subscribe architecture.
- The MQTT protocol works by exchanging a series of MQTT control packets in a defined way.
- Each control packet has a specific purpose and every bit in the packet is carefully crafted to reduce the data transmitted over the network.
- A MQTT topology has a MQTT server and a MQTT client. MQTT client and server communicate through different control packets.

The signs are classified into classes using a support vector machine (SVM) [17]. An SVM is a binary supervised learning classifier, that is, the class labels can take the values of +1 and -1. The training procedure used a quadratic optimization algorithm to derive structural axes to separate the training dataset into *n* numbers of a hyperplane. The points positioned around the separating hyperplane line are known as support vectors (SVs) and their distance to the hyperplane line is known as the margin. Optimization of the SVM is calculated by finding the smallest distance among all SVs. The values of +1 and -1 are expressed as correctly classified and incorrectly classified respectively. There are more than two classes that are being classified.

To obtain an M-class of the SVM classifiers, a set of binary classifiers need to be constructed, where each binary classifier is trained to distinguish one class from the rest. The results are then integrated to form a multi-class classification according to the maximal output of each binary classifier xj, which is also known as the confidence value and j is referred to each binary classifier. Thus, x belongs to the class with the largest confidence value. In fact, there will be gestures that belong to none of the sign classes or the aforementioned "neutral" class in a real-world application, and thus any gesture with a confidence value of less than 0.5 (50%) is considered as an "invalid" class.

The feature vector x is built using a particular number of features, which are the normalized flex sensor data for three fingers, computed SDs of angular readings from the accelerometer sensor.

C. Solution Based On Ble

Bluetooth Smart is getting an increasing amount of attention lately, and, therefore, a solution employing this technology was also developed. However, the scenario in this case is a completely different one, as presented in Fig. 3. Here, the system consists of power harvesting beacons for the acquisition of environmental data, communicating in a wireless network without dedicated infrastructure. The gateway in this case is a mobile one, and can be a smartphone that receives the data when it is situated in the sensor's range. From here, the data can be sent to a server, using the mobile device's connectivity capabilities. By using the location obtained by the mobile gateway, geographical data and the time can be added to the recorded values, increasing their complexity and relevance.

One simple example consists in the achievement of a smart city's map showing the changes in the environmental parameters, such as temperature or air quality, over time. This would imply the deployment of large numbers of BLE sensors in different locations and a background application running on the citizen's smartphones, acting as mobile forwarders of data to the cloud. In this direction, a BLE beacon that periodically measures the temperature and relative humidity in the air, the atmospheric pressure, and the light intensity was developed.

The wireless sensor polls the sensors every one minute and broadcasts BLE advertisements containing the acquired data every 3 s. The application running on the mobile gateway continuously scans for BLE advertisement packets and, if in range of one of the beacons, it receives and processes them.

The application can display the values measured by the attached sensors locally or is able to send them to a cloud platform in an IoT scenario. Its main components mounted on the printed circuit board consist of a CYBLE-022001-00 programmable radio on chip module supporting BLE wireless communication (EZ-BLE PRoC Module), produced by Cypress Semiconductor [36], an SHT21 temperature and relative humidity sensor, an MPL115A2, absolute pressure sensor [37], an OPT3001 digital ambient light sensor [38], a bq25504 ultra low-power boost converter with battery management for energy harvester applications [39], and two solar cells [40] for extending the operation of the device and the battery lifetime. Two separate power supplies are used, one for the CPU and Bluetooth chip and the other for the sensors. For reducing the power consumption, the latter can be turned off, when the sensors are not in use.

The application running on the BLE Module instantiates a BLE generic access profile broadcaster that advertises the temperature, relative humidity, atmospheric pressure, and light intensity values in no connectable advertising mode. All these values are read through the I2C bus to which all the sensors are connected. The environmental values are continuously updated, as soon as a new measurement is performed. The device wakes up every 3 s, for sending an advertisement packet, and takes the measurements from the sensors using the communication interface every minute. After the device acquires the data from the attached sensors, it updates

the advertisement payload with new data, advertises, and goes back to low power mode, for minimizing the power consumption.

The data are stored in the Manufacturer Specific Data field (0xFF) of the advertisements, as integer values on two bytes. An additional byte is added for signaling the status of the accumulator, indicating the event in which the voltage goes under a previously set lower limit. The initial analysis of the power consumption of the developed BLE beacon indicates that it is able to assure the power levels required for stand-alone operation, with the solar cells being capable of charging the accumulator within a single sunny day. Fig. 12 presents the current drawn by the device during the initial phase of testing and evaluation of the developed device. The average current is 12.7 mA for a period of 140 ms, when communicating with the sensors and sending an advertisement packet. A single advertisement packet is sent in a 3 ms time frame, with an average current of 7.8 mA. The first manufactured prototype consumes below 40 μA in sleep mode.

The Android application, that can run on mobile devices, implements a GATT (Generic Attribute Profile) observer with the following functions: the scanning of BLE advertisements from devices in the vicinity for receiving the data; the display of the received data under a list form and their storage into a cloud platform; the visualization of location coordinates (latitude, longitude),associated with the data, on a Google map. The environmental data acquired from the beacons, displayed in a list item, can be sent to a cloud platform using HTTP POST or GET requests.

Figure 3 Environmental Monitoring System Based On BLE..



The extracted sign classified data's are further transmitted to a mobile device through IoT [18]. Here a WEMOS Wi-Fi module is used in order to transfer the sensor data to a Smartphone wirelessly through a internet connection [19]. WEMOS is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The recognized sensor data's from Arduino Uno microcontroller are simply transmitting through an IoT platform by using this WEMOS Wi-Fi module.

The project utilizes MQTT protocol to transfer these data's through IOT. MQTT (Message Queuing Telemetry Transport) is an ISO standard publish-subscribe-based messaging protocol. It works on top of the TCP/IP protocol. It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited. The publish-subscribe messaging pattern requires a message broker. An MQTT system consists of clients communicating with a server, often called a "broker". A client may be either a publisher of information or a subscriber. Each client can connect to the broker. Information is organized in a hierarchy of topics.

When a publisher has a new item of data to distribute, it sends a control message with the data to the connected broker. The broker then distributes the information to any clients that have subscribed to that topic. The publisher does not need to have any data on the number or locations of subscribers, and subscribers in turn do not have to be configured with any data about the publishers. So it provides the user to transfer and access the recognized sensor data from anywhere in the world, at any time without any delay.

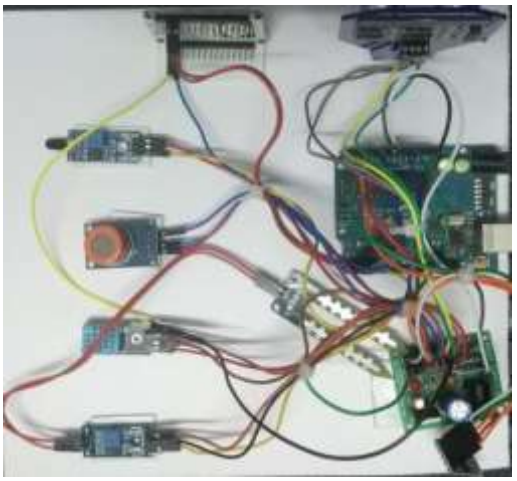
VI. Implementation and Results

The software part programming through Arduino Uno software (IDE). It is easy to write code and upload it to the board. C and C++ language are used for programming. In this proposed system we have used environmental monitoring sensor's like ADXL, DHT11, moisture, gas ,flame, ultrasonic. For these sensor's we have denoted some specific conditions or the threshold values. As per their climate the value will be change and the controlling action will be taken by relays which is connected to the output side. And the changed data of atmospheric sensor's we can observed for analyzing on the screen of serial monitoring using arduino uno kit.

The unit price for the developed devices is approximately Ł30, each one of them being manufactured using commercial off-the-shelf components, with the most expensive parts being the communication modules. However, with the continuously increasing adoption of IoT, it is expected that the prices for this ICs will

drop.The analysis presented in this paper represents a starting point for the selection of a direction in the implementation of IoT-based environmentalmonitoring applications, providing an overview of the potential and challenges of each one of thethree developed wireless sensors.

Figure 3 environmental monitoring system.



The three developed systems were analyzed from the perspectives of power consumption, network design flexibility, and complexity, as presented in Table I. The applications running on the developed wireless environmental sensors are similar, all of these being duty-cycled systems, that spend most of the time in sleep mode, and wake up periodically for taking measurements and sending the data to the server. As seen in the previous sections, testing revealed that in the case of Wi-Fi, MQTT based communication leads to a larger number of lost packets and satisfactory power consumption.

BLE advertisements packets are sent every 3s, and are updated every minute, rates that eliminate the possibility of losses in the case of a fixed BLE Internet gateway. However, when mobile devices are used for receiving advertisement data, such as smartphones, the packets are received only when the devices are within range (maximum 50 m). An important observation consists in the fact that in the case of Wi-Fi, the largest component of power consumption and active time lies in the activity of the communication module, while in the case of BLE, it is given by the sensing unit. As the power consumption analysis shows, a considerably larger amount of power is consumed during Wi-Fi data transmission compared to the BLE case. This is why a design with more than one sensor was considered for the BLE device.

Nevertheless, this does not affect the lifetime of the BLE sensor that can operate autonomously using the 3.7 V and 120 mAh accumulator in combination with the two solar cells in the design. The power consumption of the Wi-Fi devices shows that energy harvesting elements could be added to the design, especially in the case of UDP-based communication. For achieving an optimal design for Wi-Fi sensors, the use of six solar cells identical to the ones present in the BLE system is required. If the server receiving data from the sensors is in the same subnet, a standalone system that makes use of the existing IEEE 802.11 infrastructure is achieved, and the transmission of data is not affected by Internet connection losses. However, an Internet connection is required for visualizing the received information, provided through the use of a Web server, and for implementing an IoT solution. In case of BLE, forwarder devices (smartphones in the proposed system that make up a mobile infrastructure), that send the measurement data received from the sensors to the Internet, are required.

VII. Conclusion

Three different wireless sensors for implementing IoT-based solutions for environmental monitoring were designed, developed, and analyzed. All of them are fabricated using commercial off-the-shelf discrete components and provide facile access to the Internet using a minimum of additional hardware and software resources. The analysis of the three implementations revealed the fact that Wi-Fi and BLE are two technologies suited for monitoring applications that can successfully compete with the widely used ZigBee protocol. As expected, Wi-Fi consumes more energy but enables the development of solutions with reduced total cost of ownership through the use of the existing infrastructure. The third solution, employing Bluetooth Smart communication, has also been proven to be efficient, and the promising results encourage the development of systems based on this technology. Furthermore, the refinement of the protocol and the addition of mesh networking capabilities to BLE devices will make it even more attractive for implementing such solutions. The analysis of the developed systems also indicate the fact that, with the availability of increasingly energy efficient transmission modules, power harvesting is applicable also to Wi-Fi technology, until recently considered to be

too power hungry for designing wireless sensors. The analysis presented in this paper represents a starting point for the selection of a direction in the implementation of IoT-based environmental monitoring applications, providing an overview of the potential and challenges of each one of the three developed wireless sensors.

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MAMMOGRAM ANALYSIS USING CONVOLUTIONAL NEURAL NETWORK

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***Abstract**: Mammography is the most effective method for early detection of breast diseases. Early detection is the key for improving breast cancer prognosis. However it is difficult for radiologist to provide both accurate and uniform evaluation for enormous mammograms generated in widespread screening. The estimated sensitivity of radiologist in breast cancer screening is only 75%but the performance would be improved if they are prompted with location of abnormalities. Breast cancer CAD system can provide such help and they are important and necessary for breast cancer control. CNN can be used for this detection. Promising results have already obtained which depict efficacy of deep learning for breast cancer detection. This is an ongoing research and further developments are made by optimizing CNN architecture and also employing pre trained networks which will hopefully lead to higher accuracy measures.*

***Keywords**: CAD(Computer Aided Diagnosis), CNN(Convolutional Neural Network), Mammogram,MIAS,SGDM*

I. Introduction

Breast cancer is leading cause of fatality among women and the most prevalent non skin cancer in women. Mortality of breast cancer is second highest among all cancer deaths in women. Early detection of cancer can aid in good recovery and prolongs patient life. Currently the most effective method for early detection and screening of breast cancer is mammography. Micro calcification and masses are two important early signs of disease. Mammogram possess a unique problem due to lot of inter observer variations which occur while diagnosing breast cancer through mammogram.

Purpose of CAD in radiology is to improve diagnostic accuracy as well as consistency of radiologists using computer output as a guide. Since radiologists make diagnostic interpretation based on judgments which are subjective and radiologists tend to miss micro calcification and masses which are not visible clearly in mammogram. Intra observer and inter observer variability play important role in diagnostic accuracy. Reading digital mammogram is very challenging task for radiologists because mammograms are low quality images and radiologists inter observation rate vari es. CAD helps radiologists in interpreting mammogram for mass detection and classification. Since 70% of biopsies of suspected cancers turned out to be benign, it is important to develop CADs that distinguish benign and malignant lesions. Combination of CAD scheme and expert's knowledge improves detection accuracy. Detection sensitivity without CAD is 80% and with CAD is up to 90%. Women and men with first degree relative having history of breast cancer are most prone to the disease.

Mammography is a low dose X-ray through which we can visualize breasts internal structure. CNN is used for feature extraction and differentiation between normal and abnormal categories. Deep learning is a machine learning technique in which a computer model performs classification directly learning from text, image or sound. Models are trained on large set of dataset and CNN architectures containing many layers. Deep learning is used to detect cancer cells automatically. Training a deep convolution network from start is difficult since it needs large amount of data for training. One way is to fine tune an existing pre trained network .

Various research groups have focused on mammogram analysis and interpretation for early diagnosis of breast cancer. Initially, the statistical features of mass present in mammogram have been extracted for the diagnosis purpose. They have used various statistical texture features such as uniformity, smoothness and third moments which utilize gray value or histogram of masses for classification. They have used texture features derived from SGLD matrices for classification of masses as normal or abnormal. Forty numbers of mass abnormalities have been considered, out of which 21 are circumscribed masses, 19 are speculated masses and 104 are normal mammograms. A total of 280 features are extracted from each mass and classification accuracy is 77% for normal or abnormal classification. However, not all known mass types are considered for experiment and large set of features are used. A total of 22 benign and 27 malignant masses are considered and accuracy obtained was only 71.09%. further not all well known mass types are considered. Around 164 textural and spatial features have been used for classifying micro calcifications. However the effect of these texture features on mass classification is not defined and not known. It is known that the statistical features depend on gray value of mass. However, the gray value of mammogram tend to change due to over enhancement or in presence of noise.

II. Literature survey

CNN was applied on MIAS dataset to detect breast cancer. Since CNN requires large amount of data for training to achieve high accuracy, training and testing were done on most available dataset on internet. 322total images of size1024x1024, of which 133 abnormal and 189 normal images. Out of 133 abnormal images, it had 6 classes of abnormality which included asymmetry, architectural distortion, calcification, circumscribed masses, speculated masses and miscellaneous. Dataset was randomly divided.70%for training and30%for testing. MATLAB2017a used for implementation.

Research was conducted on 651 mammograms from publicly available dataset. 80% of masses were detected automatically. For 20% cases, location of mass has to be provided manually to detect masses , it was implemented on MATLAB R2015a.

Each mass described by shape feature vector consisting 17 shape and margin properties. Mass classified into 4 which is difficult than comparing into normal, benign or malignant. Images were collected from DDSM. They were classified using C5.0 decision tree classifier.

Discusses methods for mass detection and classification and compares their advantages and drawbacks. Average performance of 5 radiologists , computerized scheme with ANN alone and computerized hybrid system. Evaluated ability of different classifiers. Sensitivity level over 70% on Nijmegen dataset achieved at specificity of one FP.

Aim of author is to evaluate texture characteristics of hippocampus from MR images to help physicians determine candidate hippocampus for surgery. MR images of 20 epileptic patients were studied. Intracranial EEG results and surgery outcome were used as gold standard. Hippocampus were manually segmented by expert from TI weighted MR images. Segmented region were mapped on corresponding FLAIR images for texture analysis. Average energy features calculated from 2D wavelet transform of whole hippocampus volume. 2D wavelet transform calculated both from original slices as well as from slices perpendicular to principal axis of hippocampus. In order to calculate 3D wavelet transform each hippocampus is rotated to fit in a rectangular prism and empty areas are filled by extrapolating intensity values. Resulting features are combined with volume feature and compare their ability to distinguish between normal and abnormal hippocampus using linear classifier and fuzzy c mean clustering algorithm. Proposed texture features can correctly classify the hippocampus.

III. Proposed Work

One of the most powerful supervised deep learning technique is CNN. Final structure of CNN is very similar to regular neural network where there are neurons with weights and biases. In addition just like in regular nets it uses a loss function called cross entropy or softmax and an optimizer. CNN has convolutional layers, pooling layers and flatten layers. CNN are mainly used in image classification. In images there seems to be little correlation between 2 individual pixels unless they are close to each other. This leads to the idea of convolutional layers and pooling layers.

Convolutional layer is the very first layer where we extract features from images in dataset. Due to the fact that pixels are only related to adjacent and close pixels, convolution allows to preserve relationship between different parts of image. Convolution is basically filtering image with smaller pixel filter to decrease size of image without loosing relationship between pixels. When we apply convolution to 5x5 image using 3x3 filter with 1x1 stride we end up having 3x3 output.

When constructing CNN it is common to insert pooling layer after each convolution layer to reduce spatial size of representation to reduce parameter counts which reduces computational complexity. Pooling layer also helps with overfitting problem. Pooling size is selected to reduce amount of parameters by selecting maximum, average or sum values inside pixels

Figure 1 convolution of 5x5 pixel image with 3x3 pixel filter

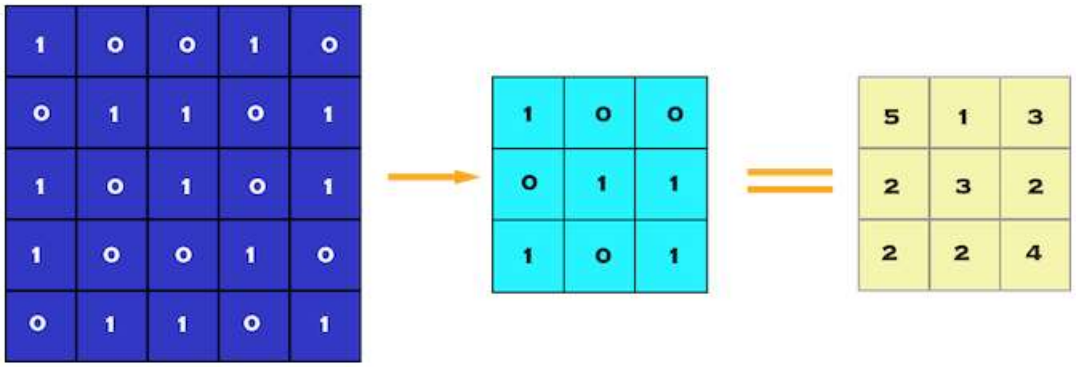
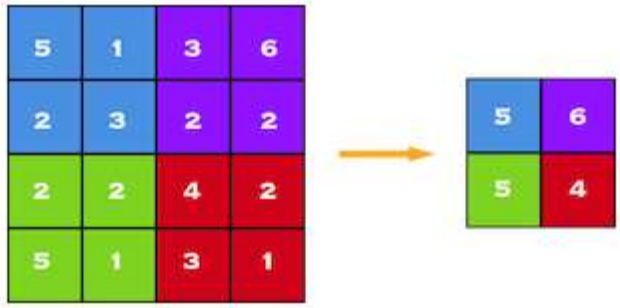
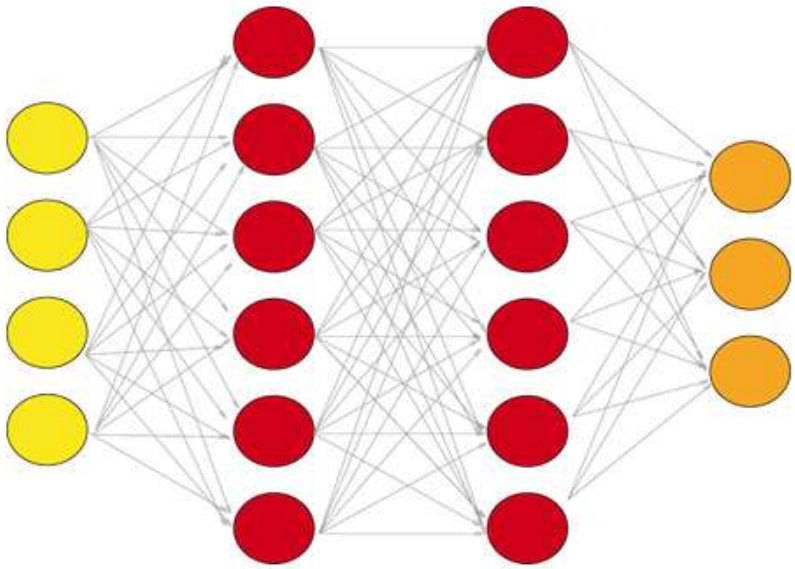


Figure 1: Convolution of 5 x 5 pixel image with 3 x 3 pixel filter (stride = 1 x 1 pixel)



Max Pooling by 2 x 2

In a fully connected network each parameter is linked to one another to determine true relation and effect of each parameter on labels.



A fully connected layer with two hidden layers

IV. Dataset

CNN requires large amount of data for training to achieve high accuracy . due to less availability of large dataset training and testing were done on most available dataset on internet. Dataset used for this research is MIAS.

Machine learning is a class of artificial intelligence method which allows computer to operate in self learning mode, without being explicitly programmed. It is very interesting and complex topic which could drive future of technology.

CNN is a special architecture of artificial neural network proposed by Yann Le Cun in 1988. CNN uses some features of visual cortex. One of the most popular uses of this architecture is image classification. Face

book uses CNN for automatic tagging algorithm. Amazon uses CNN for generating product recommendation. Google uses CNN for search through among user's photos.

Main task of image classification is acceptance of input image and following definition of its class. This is a skill that people learn from their birth and are able to easily determine that image in picture is an elephant. But the computer sees the picture quite differently.

Instead of image computer sees an array of pixels. If image size is 300x300, size of array will be 300x300x3 where 300 is width, next 300 is height and 3 is RGB channel values. Computer assigns a value from 0 to 255 to each of these numbers. This value describes intensity of pixel at each point. To solve this problem computer looks for characteristics of base level. In human understanding such characteristics include trunk or large ear. For computer these characteristics are boundaries or curvatures. And then through groups of convolutional layers computer constructs more abstract concepts. Image is passed through series of convolutional non linear pooling layer and fully connected layer and then generates output.

Figure 2 Block Diagram of Proposed system

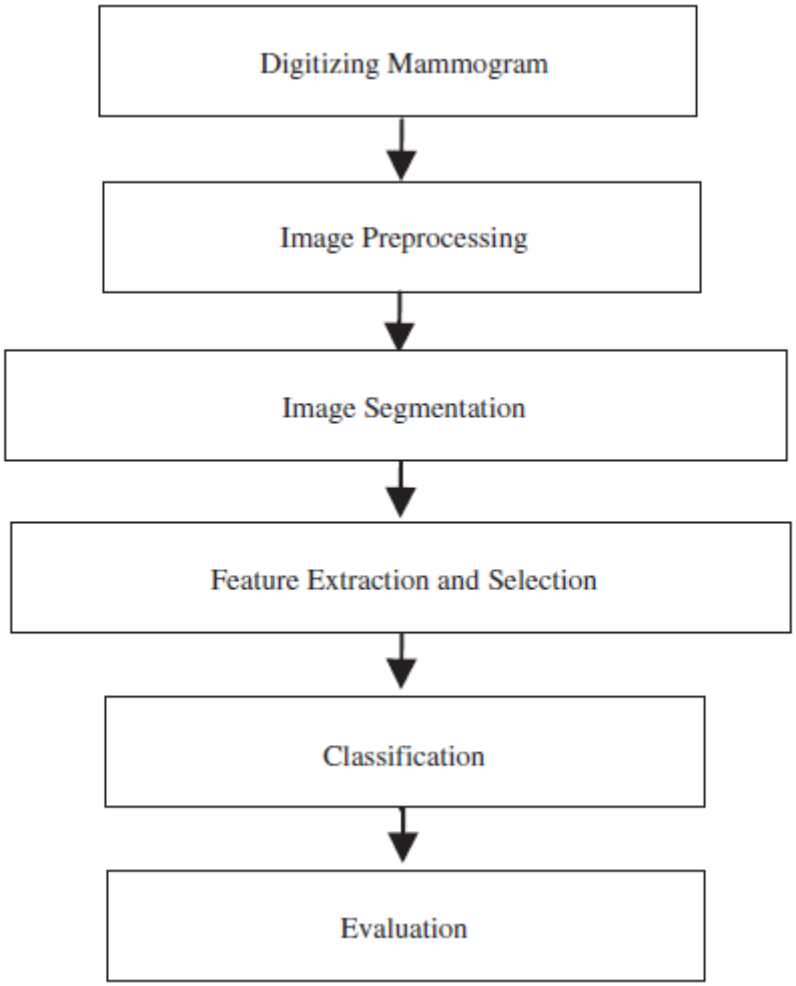


Image acquisition involves capturing image in the suitable form. Reading mammograms is a very demanding job for radiologists .Their judgments depend on training, experience ,and subjective criteria. Even well-trained experts may have an inter observer variation rate of 65–75% [9]. Computer aided diagnosis (CAD) systems may help radiologists In interpreting mammograms for mass detection and classification .Since 65–90% of the biopsies of suspected cancer turned out to be benign, it is very important to develop CADs that can distinguish benign and malignant lesions..The combination of CAD scheme and experts' knowledge would greatly improve

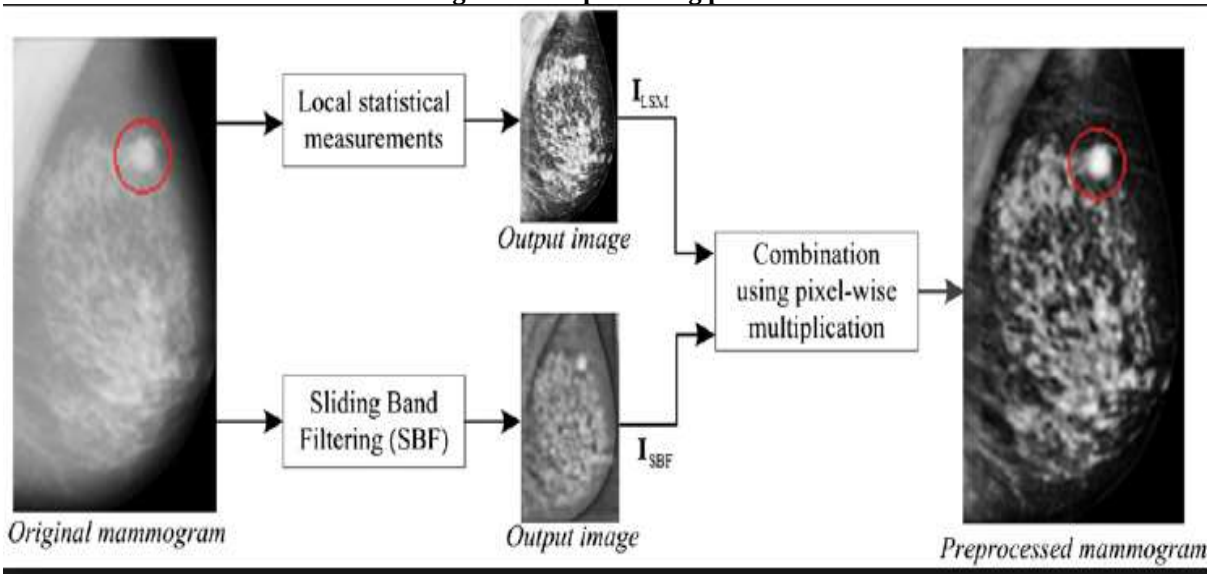
the detection accuracy. The detection sensitivity without CAD is 80% and with CAD up to 90%[10]. Most of the mass detection CAD schemes involve the phases described in Fig. 1. First, image pre processing of the digitized mammogram can suppress noise and improve the contrast of the image. Second, image segmentation is defined by most of the articles about mass detection as locating the suspicious regions. It is different from the common definition of segmentation in image processing. In the third phase, features are extracted and selected for classifying lesion types or removing false positives. Finally, the detection/classification of masses will be conducted. Although the CAD schemes were independently developed using different data sets of limited size, most of the schemes yielded similar performance, 85–95% true positive rate, with 1–2 false positives in an image. In this survey, the methods of five major research areas: pre processing, image segmentation, feature extraction and selection, mass detection/classification, and performance evaluation will be studied.

V. System Flow

A. Preprocessing

Preprocessing of image aims at selectively removing the redundancy present in captured images without affecting the details that play a key role in the overall process. It improves the quality of the data by redundancy artifacts. Digital image processing deals with manipulation and analysis of images by using computer algorithm so as to improve pictorial information for better understanding and clarity. It involves the manipulation of images to extract information to emphasize or de emphasize certain aspects of the information contained in the image or perform image analysis to extract hidden information. Raw image data direct from a camera may have a variety of problems hence not likely to produce the best computer vision results. Image pre processing is required to correct problems that would otherwise adversely affect feature description. It is used for reducing image noise, highlighting edges or displaying digital images. Pre processing involves operations that are normally required prior to the main data analysis and extraction of information. It helps to achieve the required level of smoothing of the image.

Figure 2 Pre processing phase



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B. Segmentation

Image segmentation technique may be classified into two main groups, depending on the approach of the concerned algorithm. First algorithm is discrete contour models and second algorithm is region growing. The first are based on edge detection techniques. An edge image shows each object in edge points that have to be linked to obtain the close connected boundaries that are required for image segmentation, but the result of edge point linking is not exact. On the contrary, in region growing methods , the region is generally set in advance.

Thus this algorithm is poor when the object outline has a random shape. Here a new method is introduced that effectively combines both information concerning the boundaries and the core of image structures.

C. Morphological filtering

Morphology means study of topology or structure of objects from their image. Morphological operations are based on relations of two sets, one is an image and the second is a small probe, called a structuring element. The structuring element systematically traverses the image and its relation to the image in each position is stored in the output image. Dilation and erosion are fundamental morphological operations. Dilation expands an object to the closest pixels of the neighbourhood. Dilation is used to fill small holes and narrow gulfs in objects. Dilation is the operation of assigning to each pixel the maximum value of the neighbourhood. If the original size needs to be preserved, then dilation is combined with erosion. Erosion shrinks the object. Erosion is the operation of assigning to each pixel the minimum value found over a neighbourhood of the corresponding pixel. Structuring element is a function of two variables that specifies the desired local gray level property. Value of the structuring element is added or subtracted for calculating maximum or minimum levels in the neighbourhood.

D. Feature extraction

Feature extraction is low level image processing operation usually done as first operation on an image. Feature selection or classification deals with extracting attribute that result in some quantitative information of interest or are basic for differentiating one class of object from the other .Feature extraction and classification are done with CNN. Convolutional layer is always the first layer. Image is entered into it. Reading begins at top left of the image. Software selects a small matrix there called filter. Filter produces convolution. It moves along input image. Filter's task is to multiply its value by original pixel value. All these multiplications are summed up. One number is obtained in the end. Since image is read only at the upper left corner, it moves further and further right by one unit performing similar operation. After passing filter across all positions, matrix is obtained but smaller than input matrix. This operation from human perspective is analogous to identifying boundaries and simple colours on image. But in order to recognize trunk or ear, whole network is needed. Network consists several convolutional layers mixed with non linear and pooling layers. When image passes through one convolutional layer , output of first layer become input for second layer. And this happens with every further convolutional layer.

Non linear layer is added after each convolution operation. It has an activation function which brings non linear property. Without this property, network would not be sufficiently intense and will not be able to model response variable.

Pooling layer follows non linear layer. It works with width and height of image and performs down sampling on them. Thus image volume is reduced. This means that if some features are identified in previous convolution then a detailed image is no longer needed for further processing and it is compressed to less detailed picture.
Fully connected layer is attached after series of convolutional , non linear and pooling layers. This layer takes output information from convolutional network. Attaching FCL to end of network results in N dimensional vector where N is amount of classes from which model selects desired class.

VI. Methodology

For training SGDM is used. Optimum results were obtained by tuning parameters like base learning rate, mini batch and max epoch. CNN is trained from scratch for the application. Network layers in CNN works as a detection filter for the purpose of specific patterns or features present in an image. First layers of a CNN detect large features which can be interpreted easily. Next layers detect small features that are more abstract. Last layer is able to make very detailed classification by merging all the features detected by the previous layers.

DCNN contains 7 layers with weights as shown in figure. The first four layers are convolutional layers and the remaining three are fully connected layers. The inputs of DCNN are gray scale images. Each neuron computes a dot product of weights to the local region which is connected to the input volume. We have used 4, 16 and 80 number of filters of size (2,3,5), padding of size(3,2,1) along all edges of the input layer. Filter size [3 3] specifies filters of height 3 and width 3. Each filter is slided across the width and height of the input.

Figure 3 Complete flow of CNN

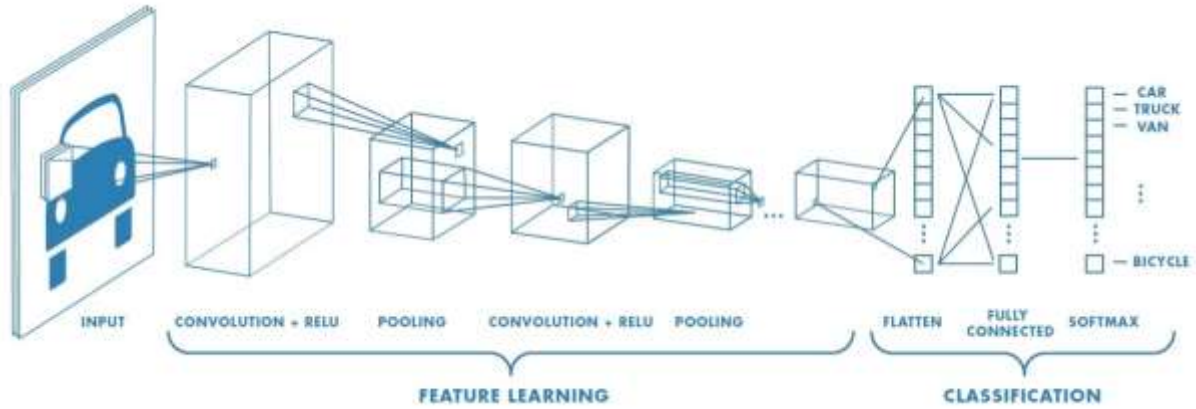
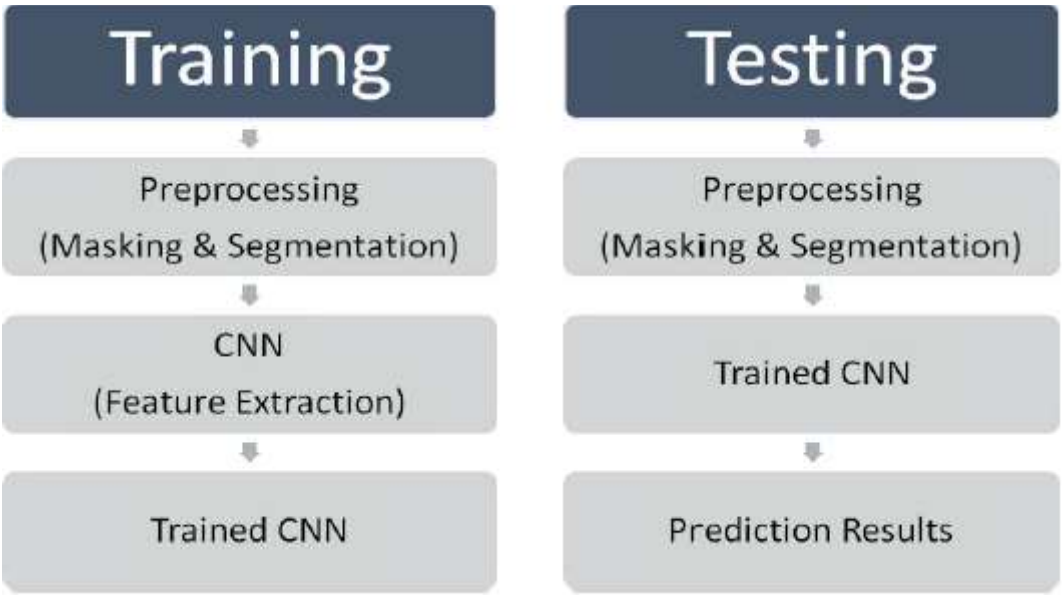


Figure 4 METHODOLOGY OF PROPOSED SYSTEM



Original data was of size 1024 by 1024. Training is performed by first dividing the dataset into 2 classes as normal and abnormal where 150 and 100 images were used for training and testing respectively.

Filters were used of different sizes (2,3,5). Also we tried splitting each training and testing dataset automatically and manually by 70:30 ratio and we got different results. The data trained randomly yield better results as compared to without randomizing it automatically. Proposed method is good and it has introduced deep learning for breast cancer detection. Satisfactory results have been obtained. It is an ongoing research and further developments are underway by optimizing the CNN architecture and also employing pre trained networks which will probably lead to higher accuracy.

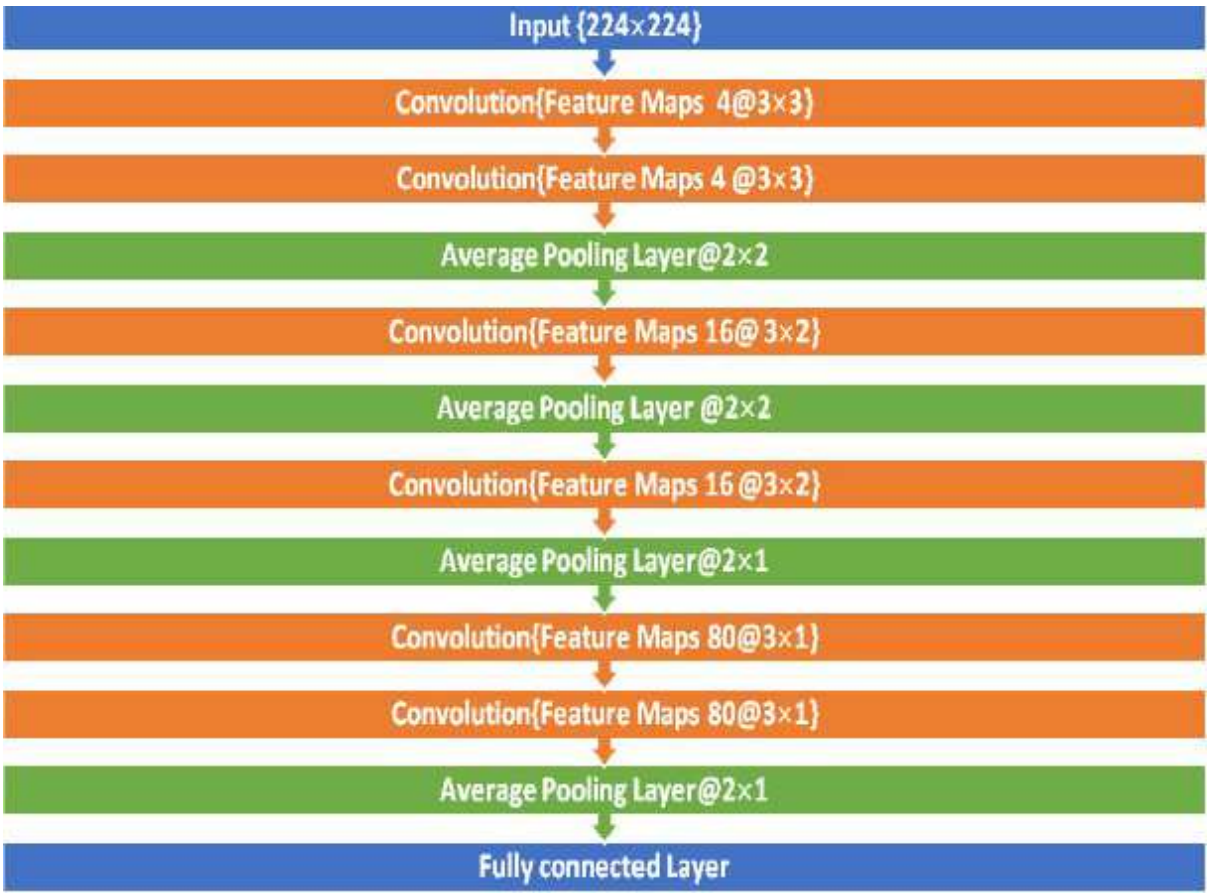
Dataset was pre processed where the images were of size 1024 by 1024 were resized to224 by 224. Noise was removed by applying morphological operations like binarization and masking to extract the ROIs. Morphological operations are used for describing and extracting image component regions.
Dataset was further divided into 2 classes, one class containing normal images and the other having abnormal images. Here we trained and tested the pre processed dataset with same 3 filter sizes(2,3,5) where we also tested the data with and without randomizing it. Satisfactory results were obtained on all filter sizes.

Segmentation process was carried out by giving raw images as the input on which morphological closing was applied. Morphological closing did the erosion of dilation by a structuring element, which performs the noise removal. Opening helps in removal of small objects while the closing eliminates small holes. Connected components CC detected connected regions in the binary images. Among all those extracted connected regions, largest connected area was selected for masking. Masking was applied at the end to set the background pixel values as zero.
In supervised machine learning, model is trained by input data and expected output data. In model construction it begins with the object. After adding sufficient number of layers model is compiled. During model compilation it is important to write loss function which shows accuracy of each prediction made by model.

Model is trained using input data and expected output data. Progress is visible in console when script runs. At end it will report final accuracy of model. In model testing second set of data is loaded. This dataset is never seen by model and hence its true accuracy is verified. After model training is complete, model shows right result which can be saved. In model evaluation, saved model can be used in real world.ie model can be used to evaluate new data.

Over fitting is the phenomenon when constructed model recognizes examples from training samples but works relatively poor on examples of test sample. Batch size is the number of training examples in one forward or backward pass or for one epoch. One epoch is one forward pass and one backward pass over all training examples. Steps per epoch or number of iteration is the total number of steps to declare that one epoch is finished and begin the next. Validation steps are total number of steps to validate before stopping.

Figure 5 ARCHITECTURE OF CNN



VII. Conclusion

This study implemented the Convolution neural networks on mammograms for detection of normal and abnormal mammograms. This deep learning technique is used on mammograms MIAS dataset by extracting features from sub-divided abnormal classes to the normal class. Different filter sizes and pre processing techniques were used on the original data to remove noise factors which can lower the accuracy of the overall network. It was also noted that proper segmentation is mandatory for efficient feature extraction and

classification. Masking and segmentation based on morphological operations significantly improved the classification result

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BUCKLING ANALYSIS OF COMPOSITE C CHANNEL BY USING ANSYS 19.1

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***Abstract**: Composite materials are those materials made from two or more constituent materials with significantly different physical or chemical properties which are combined to produce a material with characteristics different from the individual components. Composite C channels are commonly used in engineering structures such as aerospace, ship building and civil engineering construction. Buckling is an instability phenomena that causes failure on a structure. This paper studies the buckling analysis of composite C channels by using Finite Element software ANSYS. In this paper the variation of buckling load on composite C channel by providing different ply angle conditions and also the variation of buckling load when different openings such as rectangle, circular, hexagonal and triangle with varying centre to centre distance between the holes are analysed. The composite materials used are GFRP and Carbon-Epoxy sheets*.

***Keywords**: composite C channel, buckling, ply angle, finite element analysis, ANSYS*

I. Introduction

Composite materials are those materials made from two or more constituent materials with significantly different physical or chemical properties that are combined to produce a material with characteristics different from the individual components. Composite C channels are commonly used in engineering structures such as aerospace, ship building and civil engineering constructions. The main advantage of composite materials is the ability to tailor the mechanical properties for a specific application. Corrosion resistance, weight reduction and superior weathering and chemical resistance are the other advantages. Buckling is an instability phenomena that causes failure on a structure There are many types of failures in engineering structures. Some of them include creep, fatigue, alternate stresses, bending, buckling etc. Buckling takes place in columns, plates, shells, and other structures of regular or irregular geometry. In this project only buckling of laminated composite plates has been considered. If the loads applied to a flat plate are low then there is low no observed distortion of the plate however as the load is increased then the equilibrium configuration of the plate changes into no flat configuration. Thus the plate in the case becomes unstable. The minimum load at which the equilibrium is disturbed is called as the critical buckling load. A composite has dual character. It is made up of two or more materials which when combined give different properties than their original characteristics. These materials have important properties like they are light in weight because the combined properties give rise to significant weight loss character. Thus they have high strength and high stiffness compared to their weight. Also in a composite the properties are affected by the degree of composition of the parent materials. Thus the properties can be altered by changing the composition of the composite. In composites the two components are called as fibre and matrix. The fibres are the main load bearing members and the matrix, which has low modulus and high elongation, provides the necessary flexibility and also keeps the fibres in position and protect them from the environment.

The use of carbon fibre composite materials for advanced structural applications has increased markedly over the last 20 years or so. This is due, essentially, to the considerable increase in the knowledge base of such materials over this period as a direct consequence of sustained research and development. The structural response and failure mechanisms of composite construction are, indeed, quite different to those of similar conventional metal structures. This is due, in the main, to the anisotropic nature of typical carbon fibre composite materials whereby it is possible, depending on lay-up configuration, to experience the effects of a number of mechanical couplings.-linear nature. Thin-walled composite channel-section beams subject to pure

bending were considered. Buckling were analyzed. For many years, analytical-numerical and FE models were employed to calculate the bifurcation buckling load of the profile under consideration. Those investigations were mainly aimed at:

- validation of the analytical-numerical and FE models
- checking an influence of the layer arrangement on buckling load

The thin-walled profiles under consideration were made of GFRP layers and carbon epoxy layer.

Figure 1 Layout of beam column joint



II. Summary of Literature survey

From the literature review it is revealed that the temperature variation have significantly reduced the buckling load and also the buckling are significantly influenced by aspect ratio, antisymmetric lay-up, boundary condition, material anisotropy etc. There are only a few works available in the literatures of the buckling analysis of composite C channels. So my aim is to study the buckling load variations of composite C channels with different openings on the web by using finite element package ANSYS 19.1.

III. Finite Element Analysis

The Finite Element Modelling (FEM) is a numerical technique for finding approximate solutions to Partial Differential Equations (PDE) and their systems. It is also known as finite element analysis.FEM has an inbuilt algorithm which divides very large problems into small elements which can be solved in relation to each other.FEM solves the equations using the Galerkin method with polynomial approximation functions. The solution is obtained by eliminating the spatial derivatives from the PDE.Algebraic equation systems are solved using numerical linear algebra methods. In solving partial differential equations, the major problem is to create the equation that approximates the equation to be analyzed, but is numerically stable, meaning that errors in the input and intermediate calculations don't accumulate and cause the resulting output to be meaningless.

The finite element method is considered to be the best way for solving partial differential equation over complicated domains, but when it changes as an example a solid state reaction with moving boundary, when the desired precision varies over the entire domain, or when the solution smoothness. Another instance is in weather prediction, where it is more important to have accurate predictions over highly developing nonlinear phenomena such as unpredictable natural calamities which happen, like cyclones rather than relatively calm environment. ANSYS can import data from various software such as CAD, SOLIDWORKS etc. It also enables to build geometry with its preprocessing abilities. Similarly in the same preprocessor, finite element model which is required for computation is generated. After defining loadings and carrying our analysis, results can be viewed as numerical and graphical.

IV. Objectives

- Validation of software.
- Variation of Buckling loads on composite C channel without openings when GFRP and Carbon Epoxy are used as composite material.
- Variation of buckling load with different ply angle conditions on C channel with and without opening.
- Variation of buckling load with respect to spacing between openings.
- Variation of buckling load on various openings when GFRP is used as composite material.
- Variation of buckling load on various openings when carbon epoxy is used as composite material.
- Comparative study of buckling loads on C channels

V. Scope of the Project

- Composite C channels have the potential to completely transform the way we construct bridges, rail LRT, mining and tunneling, retaining walls, and other sensitive waterside buildings.
- Composite C channels are very important in case of structures with large spans or heavy loads.
- It is applicable under different loading conditions and stiffeners are also provided to improve the strength.

VI. Validation of Software

Validation is the documented process of demonstrating that a system or process meets a defined set of requirements. For the validation purpose, buckling load of a rectangular section was calculated. The cross-section of rectangular section considered for the analysis is shown in Figure 2 and its model in Figure 3.

The equation for buckling was derived in ***1757***, by the *Swiss mathematician Leonhard Euler*. The column will remain straight for loads less than the critical load. The critical load is the greatest load that will not cause lateral deflection (buckling). For loads greater than the critical load, the column will deflect laterally. The critical load puts the column in a state of *unstable* equilibrium. A load beyond the critical load causes the column to *fail* by *buckling*.

$$Pcr = n \pi^2 E I / L^2 \qquad (1)$$

Figure 2 Cross-section of rectangular section

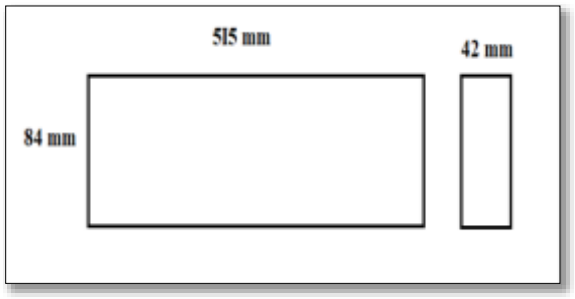
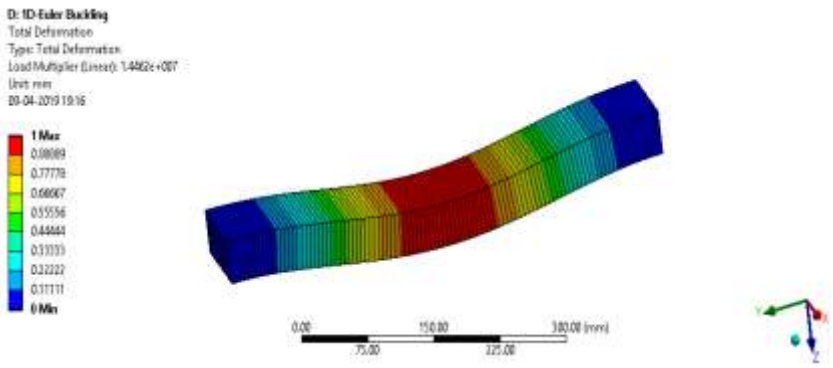


Figure 3 Deflected shape of rectangular section



Comparing manual and software results, almost same results were obtained but software value reduced 6.28% from manual calculated result. As per the software manual, the maximum percentage variation is limited to 10%. This variation lies within permissible limit .So the software was validated

Parameter	By manual calculation	By software calculation
Buckling load(N)	1.543×10^7	$1.446\text{x}10^7$

VII. Methodology

- Literature survey to understand the behaviour and properties of composite C channels.
- Fixing the objectives of the thesis
- Study of ANSYS software
- Modelling

  Four composite C channels with different openings such as circular, rectangular, hexagonal and triangular opening and a normal C channel was designed.

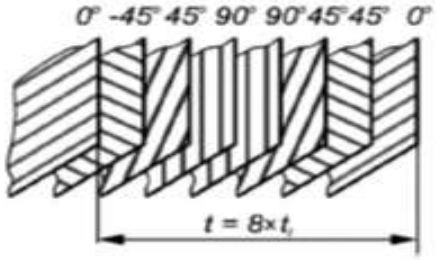
  The area of the opening is fixed by considering the area of a PVC pipe of diameter

  The composite materials adopted were GFRP layers and carbon epoxy layers

  The centre to centre distance between the holes was not fixed and the distances adopted were 190 mm, 180 mm and 170mm.

  The composite materials were arranged in 8 layers with different ply angle layups as shown in Figure 3.

Figure 4 Arrangement of layers



The ply angles adopted were:

- P1 45º / -45º / 90º / 0º
- P2 0º / -45º / 45º / 90º
- P3 90º / 0º / 90º/ 0º
- P4 0º / 90 º / 0º / 90º
- P5 90º / 45º / 45º / 0º
- P6 45º / -45º / 45º / -45º

- Analysis
- Comparison of results
- Conclusion

The cross-section of the composite channel is shown in Figure 5.The details of the composite C channel is shown in Table 2 and the material properties are shown in Table 3

Figure 5 Cross-section of C channel

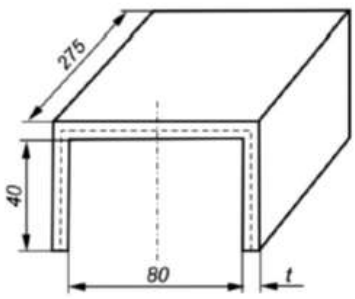


Table 2 Details of C channel

Length of channel	275 mm
Width of channel	84mm
Thickness of channel	4 mm
Thickness of each ply	0.25 mm
Number of layers	8
Hight of channel	42 mm

Table 3 Material properties for GFRP

Young's Modulus X direction	38500MPa
Young's Modulus Y direction	8100MPa
Young's Modulus Z direction	8100MPa
Poisson's Ratio XY	0.27
Poisson's Ratio YZ	0.27
Poisson's Ratio XZ	0.27
Shear Modulus XY	20000MPa
Shear Modulus YZ	20000MPa
Shear Modulus XZ	20000MPa

Table 4 Material properties for Carbon-Epoxy

Young's Modulus X direction	61340MPa
Young's Modulus Y direction	61340MPa
Young's Modulus Z direction	6900MPa
Poisson's Ratio XY	0.04
Poisson's Ratio YZ	0.3
Poisson's Ratio XZ	0.3
Shear Modulus XY	19500MPa
Shear Modulus YZ	2700MPa
Shear Modulus XZ	2700MPa

VIII. Finite Element Modelling in Software

The finite element modelling was done using ANSYS 19.1 software. The models of composite C channels with different openings were created using the software. The variations are given in the centre to centre distance between the holes and in the arrangement of layers in them. The various centre to centre distance between the holes given are 190 mm, 180 mm and 170 mm. The composite materials adopted were GFRP layers and carbon epoxy layers and this layers are arranged in 6 diferent layups as mentioned earlier. Buckling analysis of each models were done and the corresponding buckling loads were calculated. Thus 72 different cases are analysed on each composite material and hence a total of 154 cases were analysed. The main purpose of changing these parameters are to find the effect of these parameters in the performance of composite C channel and to choose best one in each configuration among this. Models of various layouts are shown below.

Figure 6 composite C channel without opening

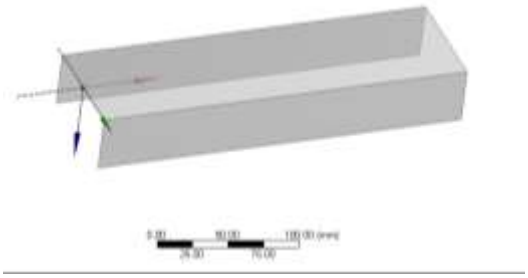


Figure 7 C channel with circular opening



Figure 8 C channel with rectangular opening

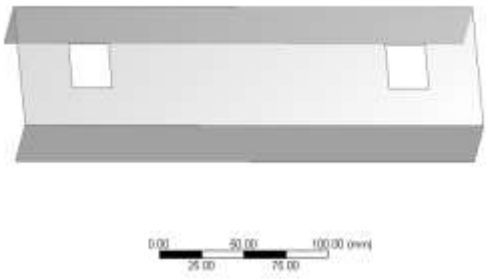


Figure 9 C channel with hexagonal opening

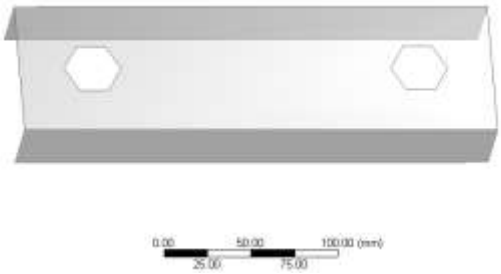
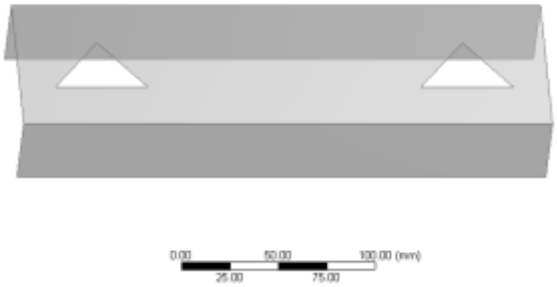


Figure 9 C channel with triangular opening



IX. Resullts and discussion

Four different models of composite C channels with openings such as circular, rectangular, hexagonal and triangular openings and their variants were designed and buckling loads were calculated. Models of composite C channels were designed by using GFRP layers and carbon epoxy layers. The area of the opening was fixed by calculating the area of a PVC pipe of diameter of 31mm. The variations are given in the centre to centre distance between the holes and in the arrangement of layers in them. The composite material was arranged in 8 layers with different ply angles. Thus 72 different cases are analysed on each composite material and hence a total of 154 cases were analysed.

A Effect of opening on c channel

To study the effect of opening on C channel, four different openings such as circular, rectangular, hexagonal and triangular was considered and also the centre to centre distance between the holes was not kept constant.

Table 5 Buckling loads for C channel with circular opening when GFRP was used as a composite material

Buckling load for Circular opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	183.17	183.83	185.26
0º / - 45º / 45º /9 0º	157.22	157.93	158.36
90º / - 45º / 45º / 0º	174.21	184.09	184.78
90º / 0º / 90º / 0º	145.18	145.48	145.59
0º / 90º / 0º /9 0º	126.02	126.06	126.84
45º / - 45º / 45º / - 45º	155.28	155.82	156.28

Table 6 Buckling loads for C channel with rectangular opening when GFRP was used as a composite material

Buckling load for Rectangular opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	181.13	183.89	183.89
0º / - 45º / 45º /9 0º	148.31	147.94	147.94
90º / - 45º / 45º / 0º	183.51	184.44	184.44
90º / 0º / 90º / 0º	145.7	145.81	145.81
0º / 90º / 0º /9 0º	125.93	126.66	126.66
45º / - 45º / 45º / - 45º	155.84	156.31	156.31

Table 7 Buckling loads for C channel with hexagonal opening when GFRP was used as a composite material

Buckling load for Hexagonal opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	180.58	183.57	185.6

0º / - 45º / 45º /9 0º	155.43	157.79	158.53
90º / - 45º / 45º / 0º	130.28	131.71	148.53
90º / 0º / 90º / 0º	145.3	145.54	145.7
0º / 90º / 0º /9 0º	125.16	125.54	125.86
45º / - 45º / 45º / - 45º	155.74	156.37	156.86

Table 8 Buckling loads for C channel with triangular opening when GFRP was used as a composite material

Buckling load for Triangular opening			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	174.45	177.5	182.15
0º / - 45º / 45º /9 0º	146.95	155.36	155.82
90º / - 45º / 45º / 0º	175.75	181.63	182.38
90º / 0º / 90º / 0º	135.05	144.64	144.7
0º / 90º / 0º /90º	124.39	124.78	124.83
45º / - 45º / 45º / - 45º	167.69	169.25	172.07

Table 9 Buckling loads for C channel with circular opening when carbon-epoxy was used as a composite material

Buckling load for Circular opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	587.19	502.07	502.62
0º / - 45º / 45º /9 0º	490.42	491.34	491.94
90º / - 45º / 45º / 0º	490.42	491.34	491.94
90º / 0º / 90º / 0º	463.58	465.64	466.63
0º / 90º / 0º /9 0º	463.58	465.64	466.63
45º / - 45º / 45º / - 45º	515.55	515.93	516.54

Table 10 Buckling loads for C channel with rectangular opening when carbon-epoxy was used as a composite material

Buckling load for Rectangular opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	501.57	502.15	502.69
0º / - 45º / 45º /9 0º	490.73	491.32	491.92
90º / - 45º / 45º / 0º	490.73	491.32	491.92
90º / 0º / 90º / 0º	462.55	465.67	466.26
0º / 90º / 0º /9 0º	462.55	465.67	466.26
45º / - 45º / 45º / - 45º	515.46	515.83	516.45

Table 11 Buckling loads for C channel with hexagonal opening when carbon-epoxy was used as a composite material

Buckling load for Hexagonal opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	501.36	501.88	503.29
0º / - 45º / 45º /9 0º	490.38	491.07	492.53
90º / - 45º / 45º / 0º	555.38	449.24	492.53
90º / 0º / 90º / 0º	464.3	465.33	466.72
0º / 90º / 0º /9 0º	464.3	465.33	466.72
45º / - 45º / 45º / - 45º	515.3	515.72	517.24

Table 12 Buckling loads for C channel with hexagonal opening when carbon-epoxy was used as a composite material

Buckling load Triangular opening (kN)			
Ply angle	c/c distance (190 mm)	c/c distance (180 mm)	c/c distance (170 mm)
45º / - 45º / 90º / 0º	524.77	560.39	567.49
0º / - 45º / 45º /9 0º	520.69	559.38	566.57
90º / - 45º / 45º / 0º	520.69	559.39	566.57
90º / 0º / 90º / 0º	501.6	532.55	532.64
0º / 90º / 0º /9 0º	501.6	532.55	532.64
45º / - 45º / 45º / - 45º	529.34	562.99	571.22

B Effect of stacking sequence on c channel without opening

Table 13 Buckling loads on C channel without opening when GFRP was used as composite material

Ply angle	Buckling load (kN)
45º / - 45º / 90º / 0º	284.83
0º / - 45º / 45º /9 0º	252.61
90º / - 45º / 45º / 0º	264.2
90º / 0º / 90º / 0º	251.76
0º / 90º / 0º /9 0º	239.54
45º / - 45º / 45º / - 45º	293.7

Table 14 Buckling loads on C channel without opening when Carbon Epoxy was used as composite material

Ply angle	Buckling load (kN)
45º / - 45º / 90º / 0º	833.38
0º / - 45º / 45º /9 0º	832.26
90º / - 45º / 45º / 0º	832.26
90º / 0º / 90º / 0º	813.77
0º / 90º / 0º /9 0º	813.77
45º / - 45º / 45º / - 45º	840.42

Figure 10 Graph showing the maximum buckling loads on C channel without opening when GFRP was used as composite material

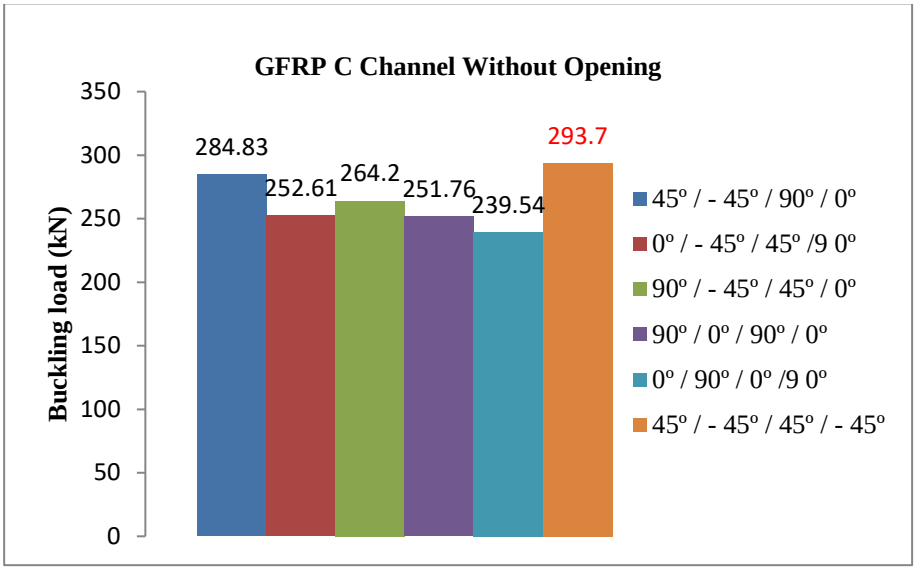
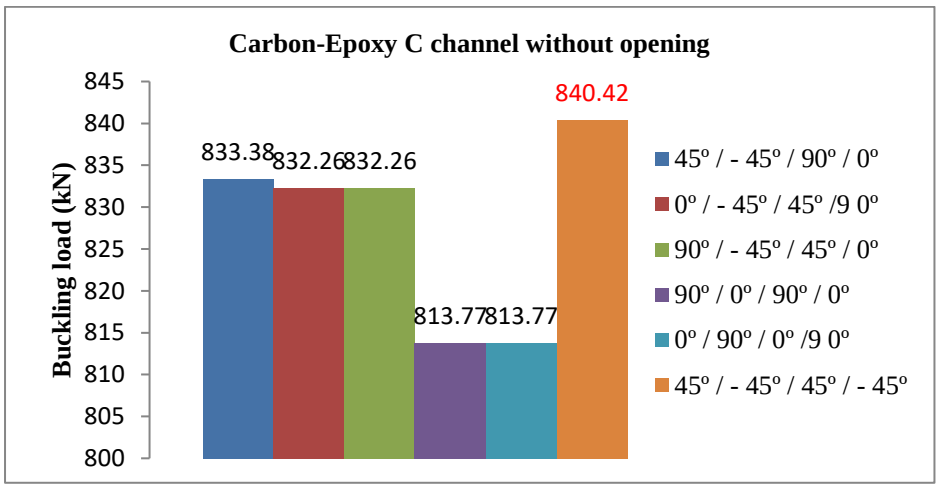


Figure 11 Graph showing the maximum buckling loads on C channel without opening when Carbon Epoxy was used as composite material



X Conclusion

The main objective of this research is to analyse the buckling load variation on composite C channel with and without openings. The analytical results illustrated in the present study showed that the buckling load varied with the change in composite materials and also with the change in shape of openings, stacking sequence of ply angle and the centre to centre distance between the openings. Based on the analytical results, the following conclusions are drawn:

- The buckling load was obtained maximum for the stacking sequence of [45º / - 45º / 45º / - 45º]s and minimum for [0º / 90º / 0º /90º]s when both GFRP and Carbon epoxy was used as composite material for C channel without opening.
- The buckling load was obtained maximum for C channel with hexagonal opening when the stacking sequence was (45º / - 45º / 90º / 0º)s and centre to centre distance 170mm when GFRP was used as the composite material
- The buckling load was obtained minimum for C channel with triangular opening when the stacking sequence was (90º / 0º / 90º / 0º)s and centre to centre distance 190mm when GFRP was used as the composite material.
- The buckling load was obtained maximum for the C channel with triangular opening when the stacking sequence was (45º / - 45º / 90º / 0º)s and centre to centre distance 170mm when Carbon-Epoxy was

used as the composite material

- The buckling load was obtained minimum for C channel with rectangular opening when the stacking sequence was (90º / 0º / 90º / 0º)s and (0º / 90º / 0º /9 0º)s with centre to centre distance 190mm when Carbon-Epoxy was used as the composite material
- The effect of shape of the openings varies with the type of composite material adopted.
- The buckling load has increased as the centre to centre distance between the openings decreased.
- Buckling load was obtained maximum when the stacking sequence for GFRP is (45º / - 45º / 90º / 0º)s and (45º / - 45º / 45º / -45º) for Carbon-Epoxy.
- Buckling load was obtained minimum when the stacking sequence for both the composite material is [0º / 90º / 0º /90º]s

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XII. Acknowledgments

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Bio Signal Empowered Wheel Chair

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Abstract: *One of the most potentially useful applications for increasing the mobility of disabled and elderly persons is wheel chair implementation. In this paper a new method to control the movements of a wheel chair is being presented. In order to send different command signals to control the wheel chair movement we have used EOG techniques, so that control is made by means of the ocular position. Traditional EPWs (electric powered wheel chair) are normally controlled by users via joysticks, which cannot satisfy the needs of severely disabled persons. A communication support interface controlled by eye movements being developed for such individuals will be more effective. For that a motorized wheelchair was considered. The motor control commands are given based upon the bio signal level which depends on eye ball movement. Bio signals (EOG in this work) are tapped from skin surface of human body and are then processed to produce control signals which in turn generate command signals to control the device for the required task. The EOG analysis and offline control of wheel chair where done successfully. By following the online implementation of the work it will be able to control the machine with the help of bio signals, thereby people with disabilities will be able to do all their daily activity without external help.*

Keywords: *Wheel chair design; Controller design; Eye modeling; Electro oculogram*

I. Introduction

Seventy five percent wheel chair users rely on manual wheel chairs. Paralyzed stroke patients are unable to normally communicate with their environment. For these patients, the only part of their body that is under their control, in terms of muscular movement, is their eyeballs. Some research in this area has focused on investigating new efficient communication tools for paralyzed patients for translating their eye movements into appropriate communication messages. Our motivation is to increase the quality of life of these patients using an HCI that provides an efficient communication channel. Also, the growing use of the computer, both in work and leisure, has led to the development of PC-associated handling applications, mainly using graphic interfaces. This way, the traditional methods of control or communication between humans and machines (joystick, mouse, or keyboard), that require a certain control motor on the part of the users, they are supplemented with others that allow their use for people with severe disabilities. Among these new methods it is necessary to mention voice recognition or visual information. For example, using voice recognition it is possible to control some instruments or applications by means of basic voice commands or write a text in "speech and spell" applications. Other options are based on videooculography (VOG) or infrared oculography (IORG) for detecting gesture or eye movements, on infrared head-operated joystick for detecting head movements or even on electrooculographic mouse for displacing a pointer on a screen.

Considering EOG signal properties, EOG-based HCI systems are more efficient than EEG-based systems in some cases compared with the EEG, EOG signals have the characteristics as follows: the amplitude is relatively high, the relationship between EOG and eye movements is linear, and the waveform is easy to detected. Considering the characteristics of EOG mentioned above, EOG based HCI is becoming the hotspot of bio-based HCI research in recent. If the bio potential signal is acquired in a larger amplitude, it is less affected by electronic noise. Because the EOG signals are relatively higher than the EEG signals, the EOG-based HCI is more efficient than the EEG-based HCI. The EOG signals can practically be acquired and conditioned with more ease.

As a review of the state of the art of electrooculogram (EOG) systems, there are several EOG-based HCI applications for different purposes in the literature. As an eye based human–computer interaction, wearable EOG goggles, which uses wearable electrooculography for recognition of reading activity, and a control system based on EOG and voluntary eye blink for control of computer functions with eye movements, have recently

been developed. For controlling movable systems, using horizontal and vertical eye movements, two and three blinking signals are classified, and a movable robot is controlled.

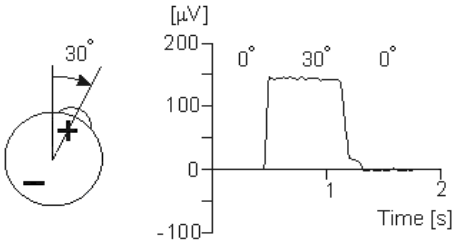
The ultimate goal of this project is to provide paralyzed patients with an efficient, faster, and accurate means of communication. Accessing each point of hardware and software causes the possibility of trying different paradigms and making future modifications on the system probable. EOG systems can be used in the medical field (long-term examinations of eye movements), home care systems (monitoring of disabled or elderly people), research (psychological), game industry (as a new input device), and consumer electronics (new interfaces).

II. Electrooculogram

A. Origin of the EOG signal

Electrooculography is a method used for measuring the potential difference between the front and back of the eyeball. The EOG can thus be used for detection of eye movements and blinks. The eye is a dipole with the positive cornea in the front and the negative retina in the back and the potential between cornea and retina lies in the range 0.4- 1.0 mV. When the eyes are fixated straight ahead a steady baseline potential is measured by electrodes placed around the eyes. When moving the eyes a change in potential is measured as the poles comes closer or farther away from the electrodes, see fig 1. The sign change depends on the direction of movement.

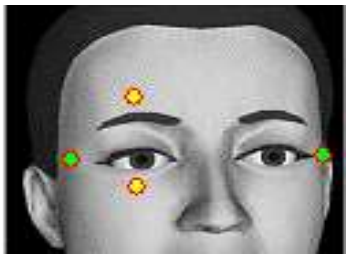
Figure 1 Eye ball movement towards right



B. Measurement of EOG

EOG is measured by placing electrodes around the eyes. Usually silver-silver chloride electrodes are used as they show negligible drift and develop almost no polarization potentials. The electrodes should be placed as near the eyes as possible to maximize the measured potential. To reduce the impedance between skin and electrode, the skin must be cleaned carefully before measurement and electrode paste should be used. It is important to be able to separate horizontal eye movements from vertical, and eye movements from eye blinks. By using different kinds of electrode placements the obtained recordings can be either vertical or horizontal. In vertical recording electrodes are placed under and above the eye, and in horizontal recording they are placed at the outer edges of the eyes. Vertical recording is usually monocular, which means that the recording is made across one eye, whereas horizontal recording usually is binocular.

Figure 2 . Electrode Placement

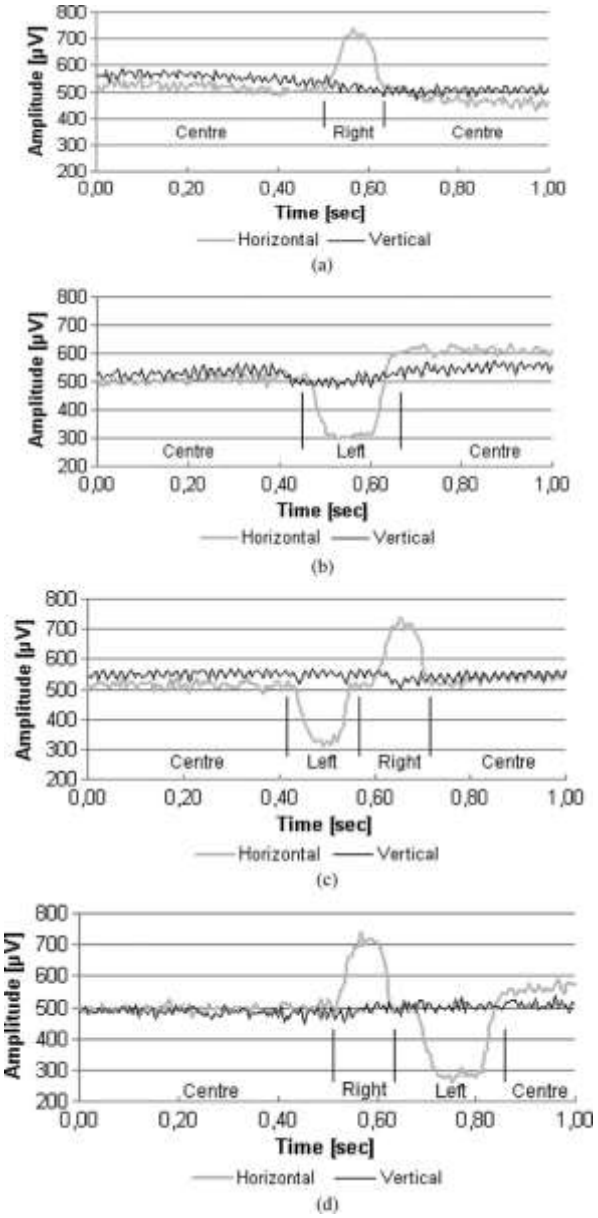


A. EOG Recordings

As shown in figure.2 electrodes has been placed under unshielded environmental conditions. For different eye movement EOG signals are recorded. These recordings are shown below. The figures for the corresponding recorded signals are given here.

1) *Horizontal movements*:

Fig 4. EOG recordings for vertical eye movements.
(a) From the center up. (b) From the center down
(c) Center–up–down. (d) Center–down–up

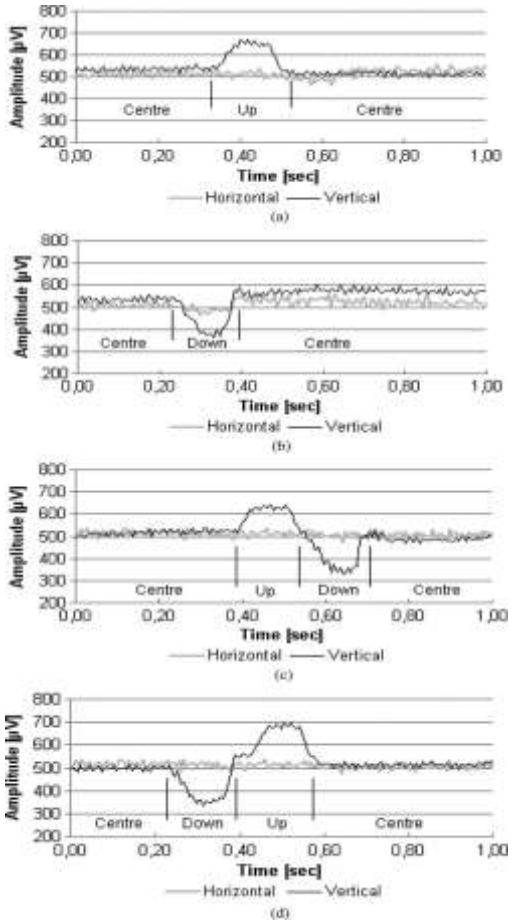


For lateral eye movement only the signals that are acquired from the horizontal electrodes are changed, the vertical signals almost have no change. For vertical eye movement only the signals that are acquired from the vertically placed electrodes are changed, the horizontal signals almost have no change.

Certain complications exist in the online implementation of the system and because of that the offline implementation of the system is actually done. Based on the recorded signal the eye modeling was done in visual basics. The visual basic is an event connecting software. The modeling was done in such a manner that, the eye ball movement in the model can be controlled based upon the signal level.

2) ***Vertical movements*****:**

Fig 4. EOG recordings for vertical eye movements. (a) From the center up. (b) From the center down (c) Center–up–down. (d) Center–down–up.



III. Eye Modeling

The EOG signal acquisition and pattern recognition were done and seen that due to the noise problems, drift, patient attention problems etc., the signal was not being in a steady state or not an exact sinusoidal signal. It was near sinusoidal wave. The signals obtained were approximated to be a sine wave and their average values were taken as the feature for pattern recognition. Based on that an eye modeling was done in visual basics by taking this signal value as the bench mark.

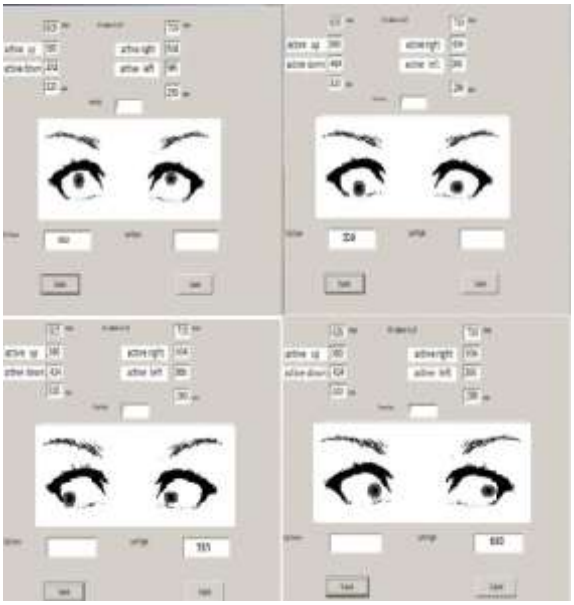
Up – Down & Left – Right Signal Activation

For detecting the vertical eye ball movement, by considering the peak voltage value of the recorded signal as shown in figure 3 & 4, the average voltage value was calculated. The average voltage value for the eye ball movement was taken as the threshold voltage value for moving the eye ball in the eye model. The eye modeling was done in such a concept that as the threshold voltage was crossed then the eye ball in the eye model will take the necessary as to move up/down.

Here for voltage value between 320 µV and 424 µV the eye ball moving downside will be activated, for voltage value between 424 µV and 580 µV the eye ball will stay in the central position of the eye itself, for voltage value between 580 µV and 625 µV the eye ball moving upwards will be activated. Similarly for voltage value between 290 µ V and 366 µV the eye ball moving left side will be activated, for voltage value between 366µ V and 634 µV the eye ball will stay in the central position of the eye itself, for voltage value between 634 µV and 710 µV the eye ball moving right side will be activated. If the voltage entered is 600µV, which is greater than 580µV ie the threshold voltage for upside eyeball movement and it was seen that in the model the eye ball has taken the necessary action such as to move upside. If the voltage entered is 350µV, which is lesser than 424µV and greater than the minimum voltage 320µV ie the threshold voltage for downside eyeball movement and it was seen that in the model the eye ball has taken the necessary action such as to move downside. If the voltage

entered is 310µV, which is lesser than maximum voltage value 710µV and greater than 634µV ie the threshold voltage for downside eyeball movement and it was seen that in the model the eye ball has taken the necessary action such as to move left. If the voltage entered is 300µV, which has crossed the threshold voltage value 366µVand greater than the minimum voltage value 290µV and it was seen that in the model the eye ball has taken the necessary action such as to move right.

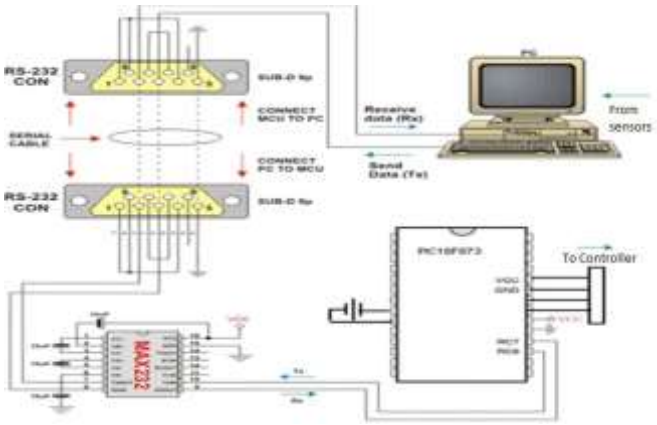
Fig 5. Eye model with eye ball in up, down , left, right positions.



IV. Feature Extraction

Corresponding to the eye ball movement number are generated using the program and was being taken through the serial port present in the PC as shown in figure 6. Through the serial port it outputs 2 when eye ball moves up, 1 when eye ball moves down, 3 when eye ball moves right, 4 when eye ball moves left, 0 under conditions of input voltage not exceeding the threshold voltage and outputs a command out of limit when the input voltage entered is beyond the maximum or minimum value. Corresponding to each number given to the PIC through the serial interfacer (Max 232) the PICs output port was enabled such as to output 0000 (0) corresponding to 0, 0001 (1) corresponding to 1, 0010 (2) corresponding to 2, 0101(5) corresponding to 3 & 1001 (9) corresponding to 4.

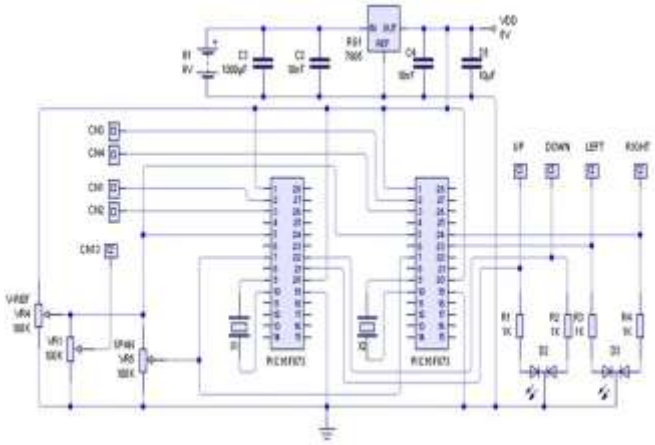
Fig.6 PC to Sensor Interface



V. Controller Design

In the controller part design two PICs are used separately to program both the up-down and left-right command generation. A 5V Regulator is being used to supply necessary voltage to the PICs. The circuit is capable of handling both Analog and digital signals. The PIC 16f873A is being selected for programming using PIC simulator. For the real time signal acquisition this controller circuit can handle analog signals, so that the PIC was programmed such as that to condition the EOG signals and to activate the output ports proportional to the eye ball movement. But here in this case based on the eye model digital values will be read by the PICs and will enable its output port proportionally such as that through the port C the output can be taken out correspondingly under each case of eyeball model.

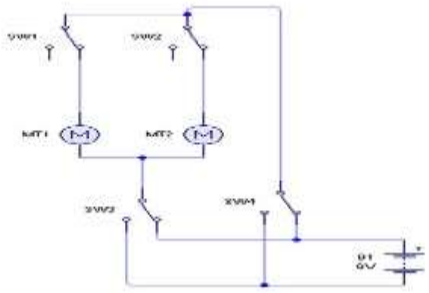
Fig.7 Controller which can handle both analog and digital signals



VI. Wheel Chair Design

In the wheel chair design part two dc geared motors and a castor wheel was used in the hardware part. A castor wheel and two normal back wheels where provided. A caster (or castor) is an undriven, single, double, or compound wheel that is designed to be mounted to the bottom of a larger object (the "vehicle") so as to enable that object to be easily moved.. The two motors are arranged in such a fassion with the four relays that as the relay/ switch was activated owing to the controller input based upon the eye ball movement then the wheel chair will take the necessary action such as to move forward/ backward, right/left.

Fig.8 Motor control with relay



In the figure. 8 for eg if up signal is activated then sw3 will be switched and the motor moves in forward direction. If down signal is activated then sw4 will be switched and the motor moves in backward direction. Similarly with the case of both left and right motion.

Fig.9. Motor Driver Circuit including Relay Driver

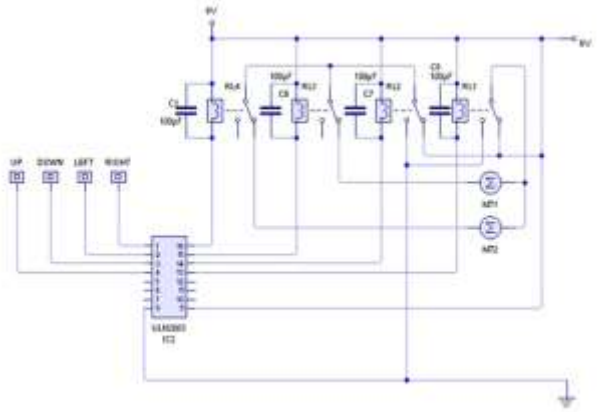
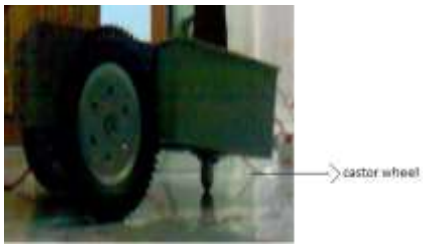


Fig.10. Wheel chair model



VII. Results

The hardware model of wheel chair developed is capable to move 0-360 degree. The time duration for performing each action is very small. Within the range of milli seconds it is performing the different (4 direction) movements. The wheel chair movement was based upon the signal level under vertical as well as horizontal eye ball movement.

Fig.11. Wheel chair taking forward backward left as well as right movement

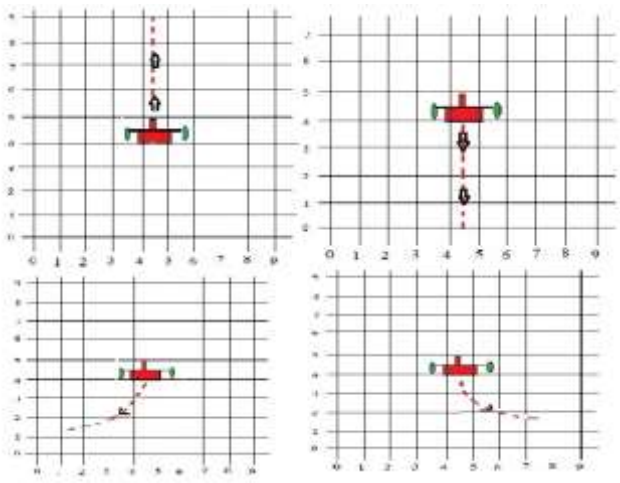


Fig.9. Wheel chair taking forward backward left as well as right movement

The four different movements of the wheel chair corresponding to the eye ball movements are:

- Wheel chair in forward direction when looking upward
- Wheel chair in backward direction when looking downwards
- Wheel chair taking left when eye ball turns left

- Wheel chair taking right when eye ball turns right

VIII. Conclusion & Future Scope

A new channel for communicating with the environment using only eye movements was established with the new system. By the work it is promised to answer the questions in the beginning ie, we can recognize the pattern from EOG signals to control machine interface. Also the offline implementation of the wheel chair guidance system using EOG signals were done successfully. Bio signals (EOG in this work) are tapped from skin surface of human body and are then processed to produce control signals which in turn generate command signals to control the device for the required task (In this work the wheel chair movement) Many applications can be developed using EOG because this technique provides the users with a degree of independence in the environment. Therefore, any improvement in the convenience of this technique would be of great potential utility in the future. The offline implementation of the wheel chair guidance scheme based on electro-oculographic signal is the work done. The real time implementation of this similar work can be done in future.

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Indigenous Women Safety Gadget Using Raspberry Pi

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Abstract: *The rise in crime rates against women has brought a lot of attention to safety concerns of women all over the world. In this scenario, this paper presents and focuses on implementing a safety gadget that ensures women safety. This gadget uses Raspberry Pi module, Camera, SIM808 module and zapper circuit. The camera captures image which is uploaded to twitter API in real time manner, which serves as evidence and can assist in future investigation process. The GPS part of SIM808 module obtains the location of the person in terms of latitude and longitude. This along with an emergency message can be sent to three predetermined numbers using the GSM part. The gadget consists of a circuit which produces shock, which is a single phase inverter used for self-defense. This circuit can cause muscular contractions which result in immense pain. It will give the woman sufficient time to escape.. All these components are interfaced and controlled by a powerful system on a chip (SoC) Raspberry Pi module. Thus this gadget ensures the safety of women.*

Keywords: *Raspberry Pi module, SIM808, zapper circuit, GPS, Twitter API*

I. Introduction

With the advancement of technologies, we have a variety of safety gadgets are available in the market. These devices can help a woman in a dangerous situation to a certain extent. They provide mechanism to contact others and call for help in dangerous situations. But the problem is that during an emergency situation, the woman may not be able to operate the smart phone and protect herself [6]. She cannot set alert function, her geographical location to the police & family members immediately, when they are in risk situation. To eliminate these difficulties we introduce an Indigenous Women Safety Gadget.

This gadget includes a powerful System on a Chip (SoC) which is implemented Raspberry Pi B+ module, PiCamera, SIM808 module, buzzer and a zapper circuit. The camera captures image of the attacker which is then uploaded into twitter without any delay, which will serves as evidence and can assist the investigation process. The GPS part of SIM808 module obtains the real time location of the person in terms of latitude and longitude [4]. This along with an emergency message is sent to three predetermined numbers using GSM module [7]. In addition to this the gadget consists of a zapper circuit that produce electric shock, which can be used for self defense. The zapper circuit can cause muscular contractions which result in immense pain. This will give the woman sufficient time to escape. All these components are interfaced to the Raspberry Pi module which uses a a button to trigger camera, zapper circuit, SIM 808 & buzzer. Thus this gadget ensures the safety of woman and helps her feel safe.

This system focuses on a security system that is designed solely to serve the purpose of providing security to women so that they never feel helpless while facing such social challenges. Our primary goal of this project is to ensure every woman in our society to feel safe and secured.

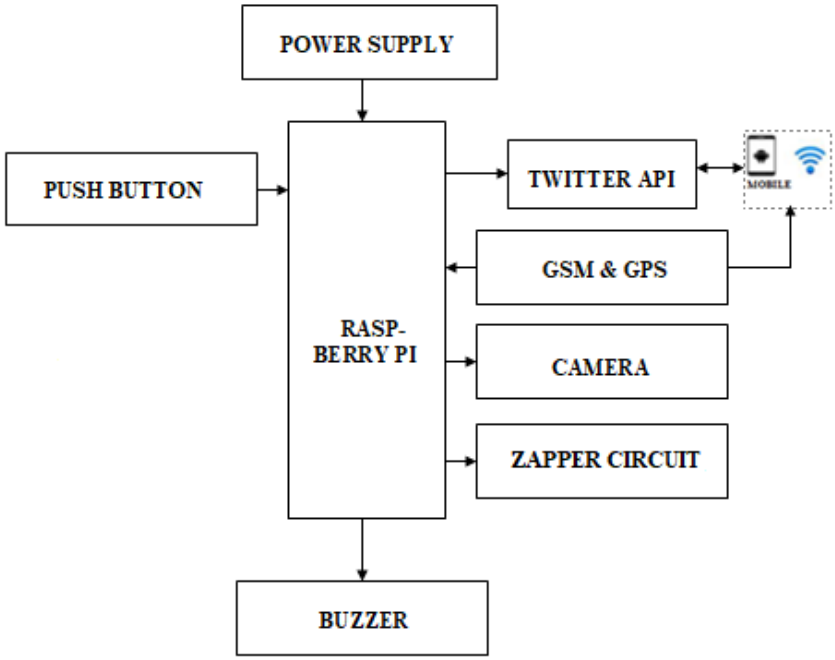
Swapnali N.G *et al* [1] introduces an electronic jacket to protect women using Raspberry Pi, camera, shock circuit, buzzer, GPS and GSM modules. The shock circuit is used to injure the attacker and camera captures image of the attacker. The GPS module updates the location of the woman and the GSM module sends this location along with an alert message to three predefined numbers. Yatharth Choudhary *et al* **[**2] presents a quick responding mechanism that helps women during trouble is proposed. Woman can press the button attached to the device and the location information is sent as an SMS alert to few pre defined emergency numbers in terms of latitude and longitude. The microcontroller used is PIC16877A. It is interfaced with a push button, a GPS module, a GSM modem and a speech circuit (ISD1820PY). If the switch is pressed, it activates the speech circuit to capture the attention of the people nearby for help. Sriranjini R [3] explains a safety device which consists of a microcontroller, a temperature sensor, a heartbeat sensor and an emergency pushbutton switch. On sensing the emergency situation, this device fetches the current location of woman and sends it to emergency

contacts via GSM module. The safety device also includes a bright LED flash, a siren, and a shock giver circuit which is intended to hurt the attacking or abusing person.

II. Proposed System

The main part of this product is the Raspberry Pi module. It has extended 40-pin GPIO header, 4 USB 2.0 ports and CSI camera port for connecting a Raspberry Pi camera. By pressing a button, the program for capturing image and subsequently uploading it to twitter is run. The photo taken with the camera module will be around 2.4MB. This image is then uploaded into twitter using a python program. For uploading image into twitter, we need to create a Twitter API by applying for a developer account at developer.twitter.com. After the developer account has been created and approved, we need to register the application with Twitter to get keys. These keys allow you to access Twitter account from the Python program using the Twitter API. We need these four keys to connect to the Twitter account from the Python program. Once we have the API keys, they must be stored as variables in a python file by making a connection with the Twitter.

Figure 1. Block Diagram of Indigenous Women Safety Gadget



With an emergency situation the user can press the power switch, the high-frequency oscillator composed of the transistors and the step-up transformer is energized using the 9V DC supply generating a high-frequency alternating current of about 18 kHz, boosted by step-up transformer to about 500V. This high voltage is then further processed using a ladder network, which is made up of three 1N4007 diodes and capacitors. This network steps the step-up transformer output to approximately three times its original value and we get around 1500V which gets stored inside a high voltage PPC capacitor positioned at the extreme end of the ladder network. This stepped up 1500V is then terminated, which now becomes armed with this high voltage and when a person touches the terminated end, he instantly gets electrocuted through this high voltage discharge from the PPC capacitor. The location tracking section uses a SIM808 module, which is a GSM and GPS two-in-one function module. The GPS part will obtain the location of the woman in terms of latitude and longitude. Thus the accurate location of the woman at the time of the attack is obtained. This location along with an alert message is sent to predefined set of numbers using the GSM module. Upon receiving this alert message and location, help can be sent to the woman in need.

A. RPi Camera

The Raspberry Pi camera is used to take high-definition video, as well as stills photographs. The module has a five megapixel fixed-focus camera which supports video modes and still captures. There are numerous third-party libraries built for this, including the Pi camera Python library. The camera consists of a small circuit board, which connects to the Raspberry Pi's Camera Serial Interface bus (CSI) connector via a

flexible ribbon cable. The camera's image sensor has a native resolution of five megapixels and has a fixed focus lens. The image captured by the camera is uploaded into twitter.

Figure 2. Raspberry Pi Camera v2



B. SIM808

SIM808 module is a GSM and GPS two-in-one function module. It is based on the latest GSM/GPS module from SIMCOM, supports GSM/GPRS Quad-Band network. It combines GPS technology for satellite navigation. It features ultra-low power consumption in sleep mode and integrated with Li-Ion batteries for charging circuit, so that it gets super long standby time and convenient for projects that use rechargeable Li-Ion battery. It has high GPS receive sensitivity. Besides, it also supports A-GPS that available for indoor localization. The module is controlled by AT command via UART and supports 3.3V and 5V logical level.

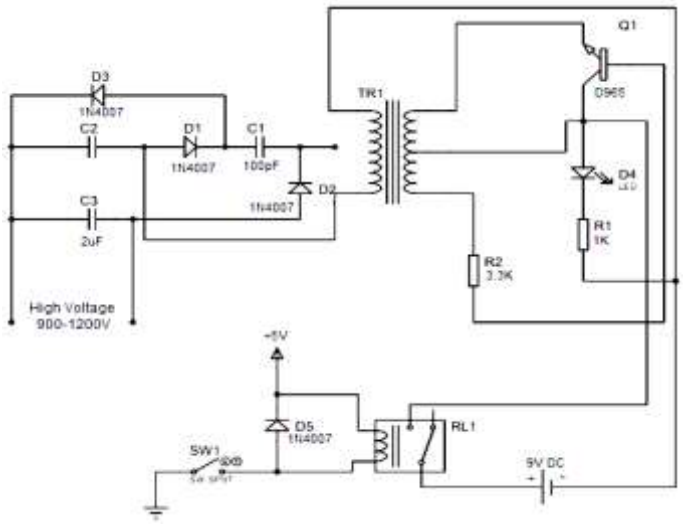
Figure 3. SIM808 Module



C. Zapper circuit

The zapper circuit is used to injure the attacker in a limited level. Current is enabled through a transistor which allows the current to flow through a primary coil, inducing voltage in the secondary coil and secondary coil in return induces voltage in feedback coil. This counter voltage in the feedback coil causes the transistor to stop conducting and the magnetic field in the ferrite core to collapse via electrical energy from secondary coil. This process helps the transistor to conduct again, repeating the process and creating pulsed DC. The changing magnetic field induces high voltage in the secondary coil. Voltage induced in the secondary coil depends on the ratio of number of turns of primary and secondary winding. This voltage will be in order of a few hundreds or thousands. This voltage is now further boosted using a combination of Diodes and Capacitors in a ladder network. The circuit has a non-polarized capacitor which is connected in parallel with the output terminals for storing high voltage and discharge during operation.

Figure 4. Zapper Circuit



III. Result

The Indigenous Women Safety Gadget is an efficient women safety device. It captures the image of the attacker and uploads it to twitter, which serves as an evidence at the time of investigation. The SIM808 module acts as a tracking unit and sends the location of the women to three predefined numbers. The zapper circuit used in the system provides the woman a self defense mechanism. It can incapacitate the attacker for some time so that the women can get away and call for help.

IV. Conclusion

In today's world, women are facing a lack of security concerns which is taking place around the world especially across India. The indigenous women safety gadget will deal with critical issues faced by women in the near past and will help to solve them with technologically sound equipment's and ideas. The proposed device is security measure designed for the safety of women. This system will help the girl when she is danger. Using this, she can protect herself and also call for help in an emergency situation. She can make rescue of her in danger situations and never feel helpless at any situation and can protect her by herself. The culprits face will be captured by camera so that it serves as evidence. Having a mechanism to defend women against an attack is very important in the present day situation. It allows them to go by their daily chores without worrying about the safety and helps to overcome the fear that makes every woman in the country to worry about her safety. The crimes can be brought to an end with the help of real time implementation of our system.

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GESTURE VOCALIZER USING ATMEGA328

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***Abstract**: Gestures are the sign languages which are originated by the bodily actions. Hand gesture is a sign language used by dumb people to communicate. Normally the dumb people find difficulties in communicating to common people with gestures, since other people may not understand their sign language. Here arises the importance of this project which is mainly focusing on mute and deaf individuals. Here gesture vocalizer is an electronic device which is a microcontroller based system. The gestures are identified by the bend of flex sensors. The system will detect the gestures as input and gives the output in the form of message or audio, mainly aiming to help the mute and deaf people to come up with their difficulties and to find an efficient solution. A data glove which is a simple cloth is driving gloves fitted with flex sensors along each of the finger. The flex sensors attached to each finger will detect the gesture shown by the corresponding finger, convert it into corresponding voice and also displays it on the LCD screen. The DF Player selects the voice message for the corresponding binary value given from the microcontroller and the PAM8403 amplifies the voice. The system is fully fitted on the glove so that the person using the system can carry along them anywhere they go. ATmega-328 is the microcontroller used to implement the system.*

***Keywords**: ATmega328, flex sensors, DF Player, LM386*

I. Introduction

The Communication plays a vital role in human life. It is defined as the exchange of information, or the use of common system, sign, behaviour, a verbal or written messages; a system of routes; techniques for effective transmission of information, ideas and also helps people to develop relationships with others. Speech and gestures are natural medium that uses different means of words and expressions for communication in everyday life. Gestures are the medium of communication in deaf and mute people. They show bodily actions to communicate to express their feelings. Dumb people normally uses gesture signs to communicate within. When a speech impaired person speaks to a normal person, the normal person finds it difficult to understand and communicate back to them. It is because the normal people are not trained on the areas of the sign languages.

Many researches on this topic have been carried out using various techniques in terms of hardware and software implementations. Gesture recognition is classified into main two categories i.e., sensor-based [1] and vision-based techniques [2]. In vision-based recognition mainly image processing techniques are used and the main disadvantage is, technique includes complex algorithms for data processing. The sensor-based technique offers greater mobility. Paper [4] is based on K-L Transform to detect the different hand gestures. The system consists of five steps: skin filtering, palm cropping, edge detecting, feature extraction, and classification. The hand is detected using skin filtering and palm cropping was performed to extract out only the palm portion of the hand. The extracted image was processed using canny edge detection technique to extract the outline of images. After palm extraction, the features of hand were extracted using K-L Transform technique and finally the input gesture was recognized using proper classifier. As this technique uses image processing and complex algorithms, it is difficult to implement a portable system. But our system is very simple as it uses only a flex sensor for the identification of gestures. Gesture vocalizer is a microcontroller based system which enables the sensors to detect the bending of the hand and also the said values correspond to each hand gestures are then played as voice messages as well as it is displayed on the LCD screen. Thus it will be helpful for both deaf and mute people.

II. Motivation of The Project

In today's world, there is a demand for automatic appliances with the increase in level of material comfort; there is a sense of urgency for developing circuits that would ease the complexity of life. The communication between audio-vocally impaired people poses a much tedious task. They, throughout the world

use sign language to communicate with others; this is possible for those who have undergone special trainings. Common people face difficulties to understand the gesture language. The motivation of this project is the problem faced when dumb peoples communicate with blind, deaf and normal communities.

Hence in the project, the flex sensors are used which used by the dumb people. They bend along the length, then the resistance vary and hence it actuates the memory where the voice messages are stored and this message is conveyed through the speaker. This process is done by the microcontroller. By the use of this project the difficulties faced by the mute peoples are reduced to a level.

III. Working Of The Proposed System

ATmega-328 is the microcontroller IC which is embedded on Arduino UNO. It takes the instructions taken by the flex sensors and processes it to the audio processing module. The instructions to be spoken are stored in the audio processing unit. Then the voice is amplified and can hear through the speaker.

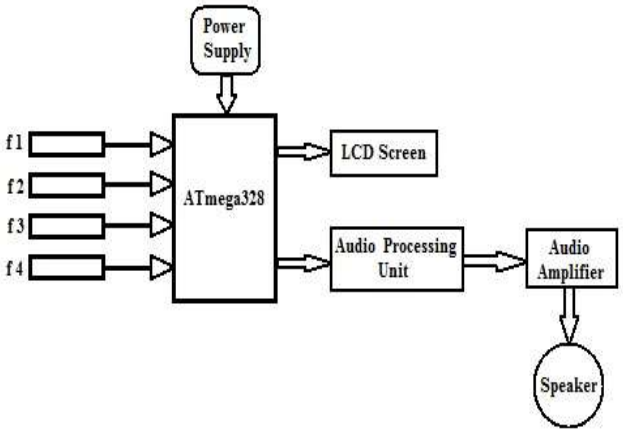


Fig 1: *Block diagram of the system*

There is a resistance variation in the flex sensor when it is bend along the length. This variation is detected by the microcontroller with various proportions. Then the controller produces binary signals corresponding to the gestures shown. This signal is accepted by the audio processing module. The module actuates the word or sentence for the given signal. It is then amplified by the audio amplifier and then fed to the speaker.

IV. Implementation Of The System

Components Required

The proposed system consists of following components:

A. ATmega-328

B. Flex sensors

C. DF Player Mini

D. LM386

E. LCD

F. Speaker

G. Power Supply

A. ATmega-328

The ATmega-328 is an 8-bit and 28 pin AVR RISC based single-chip microcontroller. The device operates between 1.8 – 5.5 volts. It has 32KB of internal memory. It has an EEPROM of 1KB and SRAM of 2KB. This microcontroller IC is embedded on Arduino UNO and it's the main part of Arduino. The pins PC0-PC5 of ATmega-328 are used as analog pins in Arduino, similarly, PD0-PD7 and PB0-PB5 of ATmega-328 are used as digital pins in Arduino.

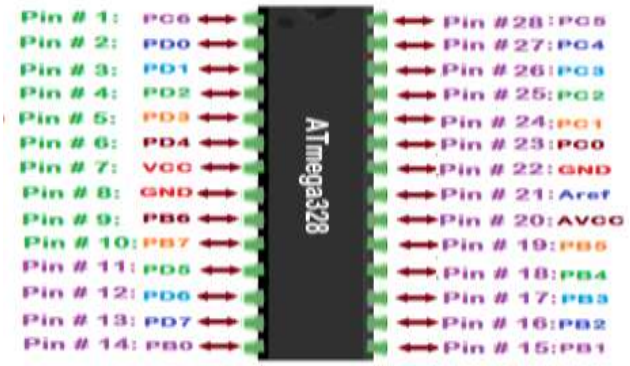


Fig 2: *ATmega-328*

B. Flex Sensor

The flex sensor is a variable resistor. When the flex sensor is bend along the length, the resistance will increase i.e., the resistance of the sensor depends on the surface linearity. One side of the sensor is printed with a polymer ink which has conductive particles embedded in it. When the sensor is in straight position, the particles are in normal mode and produce a resistance about 30KΩ. When it is bending, the distance between the particles increase and produces a resistance about 70KΩ at 90˚ bend.

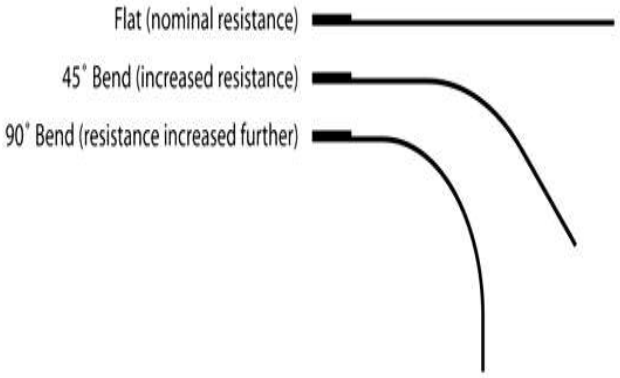


Fig 4: *Flex Sensor*

C. DF Player Mini

DF Player mini is an integrated, low cost mp3 module whose output is a simplified audio that can be connected directly to the speakers. Here this is used as the audio processing module. It can be combined with microcontroller, enabled for Rx/Tx communication. The module has an SDcard slot and supports bothFAT16 and FAT32 file system. The sampling rate of the module is upto 48KHz. It has a built-in 3W amplifier.

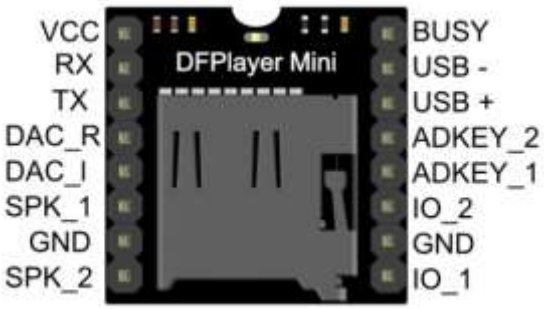


Fig 5: *DF Player Mini*

D. LM386

The LM386 is a power amplifier designed for low voltage consumer applications. The internal gain is set to 20dB to keep external part count low, but the addition of an external resistor and capacitor between pins 1 and 8 will increase the gain to any value from 20 to 200. The inputs are ground referenced while the output automatically biases to one-half the supply voltage. The quiescent power drain is only 24mW when operating from a 6-V supply.

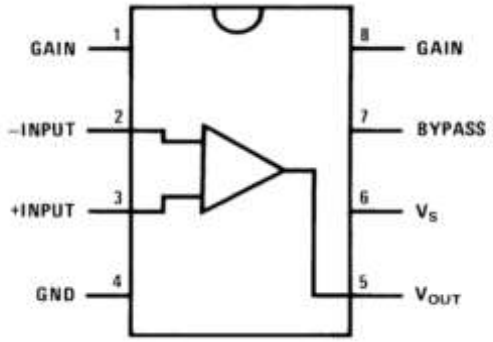


Fig 6: *LM386*

V. Conclusion

This paper describes about the design and working of the system which is mainly focused for dumb, deaf and blind people to communicate with one another and with the normal people. This system converts sign language into voice which can easily understandable by blind and normal
people and also into some text form, to aid the deaf people as well. Our system is a portable one and has less computational time as well as fast response in real time applications. It is user friendly so can be used in public places very conveniently.

In future, the system can be made more compact and accurate. The present system may not give 100% accurate outputs. This is because of high sensitivity of the sensors. The system can be modified to train on a limited database that should be made to handle more gestures. It can modified to such a way that it can vocalize gestures and movements of animals. Also it can be applicable for virtual reality applications.

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SECOND GENERATION HIGHWAY WIND TURBINE MOUNTED ON STREET-LIGHT POLE

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Abstract: *The objective of the project is to design and modify the existing highway windmill. To address the current limitation of the highway wind mill. Also, to implement other advancements in the windmill to meet the needs in the highway. The second generation focus on producing electricity not only from the impact wind energy but also from the vibration and noise produced by the moving vehicles along the solar power thus make it a complete hybrid system. The power obtained can be utilized for lightning the street light and other public amenities like highway patrol using automated drones and charging of electric automobiles.*

Key words*: Impact wind energy; Miniature harvester; Outside sound trapper.*

I. Introduction

Today world is facing an energy shortage due to the increase of the average consumption of energy per capita. This leads to continues decrease of the world storage of oil and natural gas. Also the pollution problems have been highlighted as the source of stress on the ground life. Therefore renewable energy sources have drawn tremendous interest worldwide. Wind energy is the fastest growing source of clean energy. Even though the first wind turbine was build around 900 A.D [1],wind power is today a small addition to the world energy demand when compared to coal, nuclear, hydro and oil. However, today there is a global discussion about the green house effect[2] exist or not and if any oil crisis is waiting to happen[3].

Typically, the streetlights are powered from the electricity transmitted through transmission line. Self powered streetlights can be seen along highways using solar panels. The vertical axis wind turbine are also mounted to produce power from the impact wind energy (caused by movement of the automobiles). These highway wind mills can be made more efficient if alternative power source can be adopted in the same. One such is the vibrations produced by the automobile which can be harvested by miniature harvester which is placed inside the street light post and an outside sound trapper to capture the noise of the traffic.

Combining all the three power producing unit, unlimited power can be produced to power up the highway. Other purpose such as highway patrolling using automated drones which will be charged wirelessly from the highway wind mill.

II. Existing Highway Wind Mills

The high way wind mill are vertical axis wind turbine mounted on the street light post. Street light are proposed at the locations where pedestrian movement is dense. The most commonly used blade design for the high way wind mills are helical or Gorlov model. The high way wind mill works on the impact wind energy. As the auto mobiles moves on the highways, there is a creation of front and back pressure column on the both side of the road. The pressure column is created due to the imbalance of high pressure or low pressure energy band created by auto mobiles due to these pressure band, wind flow and create pressure thrust. The pressure thrust of can be converted into mechanical energy can be converted into electrical energy.

In 2012, the mechanical engineering students from younus college of engineering and technology, Kerala made a prototype of their wind mill (next generation highways potential for wind power). Figure 1 shows a computer animated design of highway wind turbine proposed by mechanical engineering students of Younus college of engineering and technology, Vadakkevila, Kollam, Kerala, India. In figure 2 the students Nabeel B, Firoz T S, Krishna Raj B, Kannan Raj, Arun S, Shaiju mon T K, and Akhil Ganesh demonstrate a working prototype of their design (Highway Helical Wind Turbine Project, next generation highways potential 2012). Although this project was a remarkable milestone towards fossil free energy goals, it was unsuccessful in

achieving its benefits because of its over dependence on impact wind energy from automobiles. Many attempts were done by individuals and organizations to improve this model. Unfortunately, most of which were unreliable.

Figure 1 Computer stimulation of highway wind turbine



Figure 2 Mechanical engineering students in India displaying highway wind turbine



Although this design was notable idea it has quite a failure. There are some critical drawbacks with these design. The complexity of the blade design and although the impact wind energy is reliable it depends on many factors such as the intensity or frequency of vehicle traffic, size of the automobile, speed of the automobile etc.

There have been attempt by several individual and group to modify this design by introducing solar power but it does not get a worldwide acceptance. So an improved version of the highway wind mill which is hybrid and has more application is required.

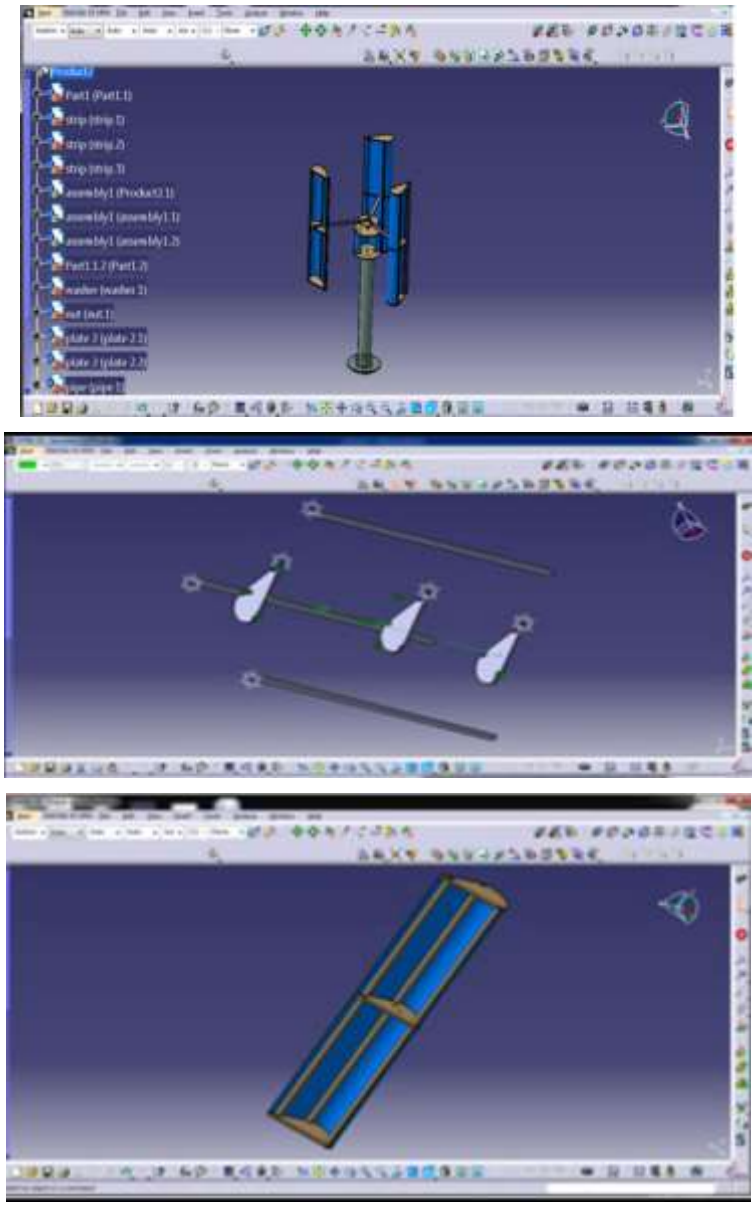
III. Second Generation Highway Windmill

The second generation highway windmill not only comprise of a vertical-axis wind turbine mounted on a streetlight pole but also other electric power production units. The power production unit embedded within are of three different units. The vertical axis wind turbine (H-Darrieus) to capture the impact wind energy from the vehicles. The miniature harvester and outside sound trapper to utilize the noise and vibration produced by the moving vehicle on highway. The photo-voltaic cells harness the solar energy.

A. Vertical-Axis Wind Turbine

The material used for the wind turbine blade is Aluminum. The main reason for choosing Aluminum as the material is because of its light weight and cheap availability in India. The design for the blades are H-Darries models. The major advantage for these type of blades are that they depend only on the drag force. The drag force can be easily obtained by the impact wind energy from the automobile.

Figure 3 Cad Design of the Blades



B. *Sound Harnessing Equipments*

The Sound Harnessing equipment comprise of two modules – SOUND TRAPPER AND THE MINIATURE HARVESTER.

Sound Trapper: This Module Is Placed Outside near the bottom of the streetlight pole (that is near to the batteries). This sound trapper module is capable of converting even a small frequency noise into electricity. A microphone is used to capture the noise from the vehicle. The circuit-diagram is shown in Fig(4).

Figure 4 - Circuit diagram of sound trapper.

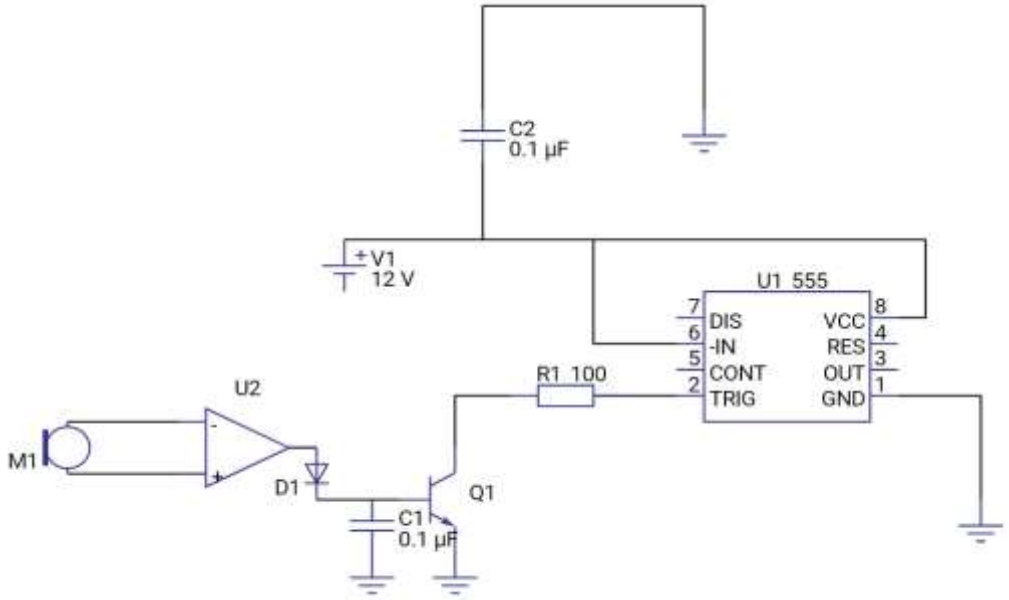
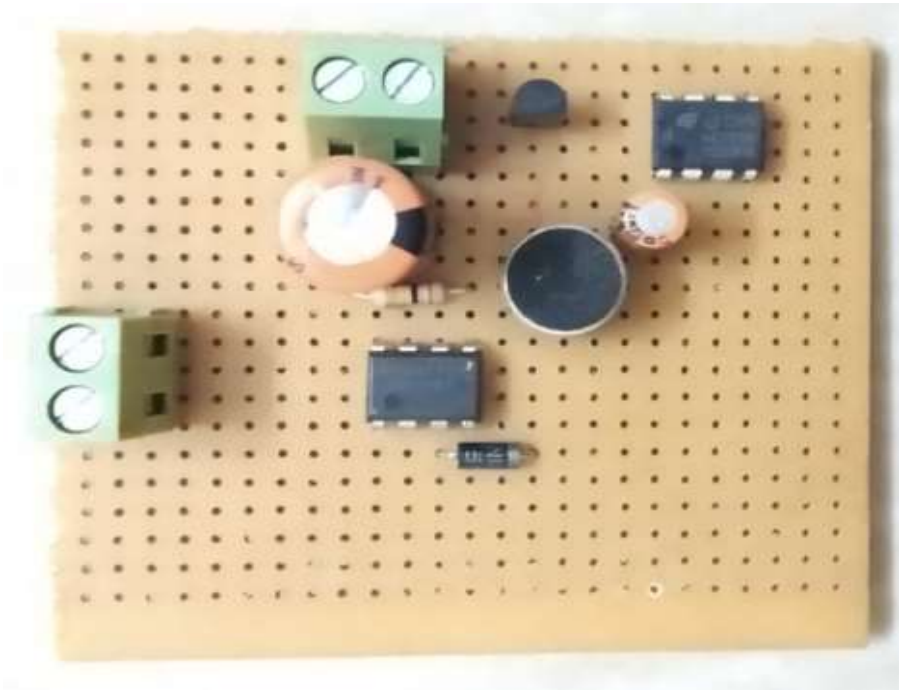


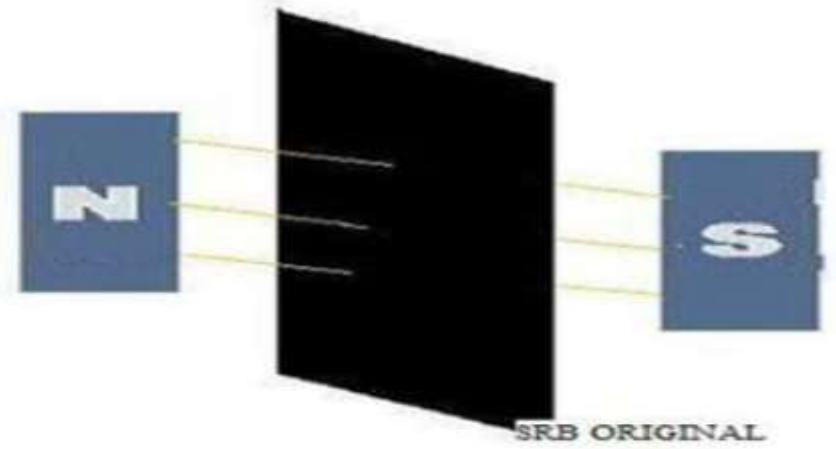
Figure 5 Working model of sound trapper



Miniature Harvester:The main miniature harvester which is placed inside the streetlight pole works as per the Faraday's law. The thin curtain like diphagram will get fluctuated by the oscillation and pressure created by the sound waves and a conductor attached to it in between a magnetic bars produces motional emf when the fluctuation in diphagram produces movement in the conductor.

GENERATED VOLTAGE = EMF = Velocity of conductor *magnetic field*length of conductor[4]

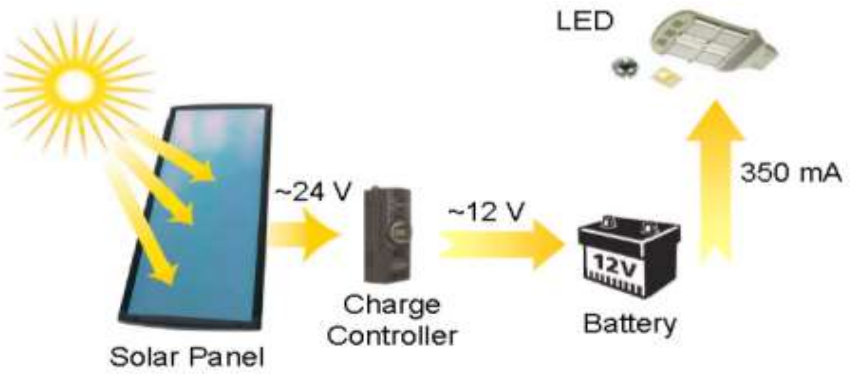
Figure 6 Model for miniature harvester



C. SOLAR ENERGY HARNESSING

The solar-streetlight are now very common everywhere. The street lighting is closely related to people's daily life. A good LED street lighting system is characterized with high efficiency ,high energy saving, long life, high color rendering index and environmental protection which not only has a great significant on energy saving of the city lighting, but also has a close relationship with people health and economic development. So it is noticeable issue how to design a reasonable system. The following basic components are required Solar cells, LED lamp, control box (charger, controller, battery).

Figure 7 Block diagram for solar to LED



IV. Manipulation of the Second Generation Highway Wind Mills

Street light are provided at toll plazas, truck lay by, bus lay by, inter changes and build up areas along the highways. Usually street light are proposed at the location where pedestrian movement is dense. The second generation highway windmill can provided unlimited power for lighting up the highways.

Beginning in July 2018 severe food effected the south Indian state of Kerala due to unusually high rainfall during the monsoon season. The rescue of people and mobility of relief items for the flood victims were limited to daylight since the power supply was interrupted even in the highways. Even though in most parts of the national highway in Kerala, the streetlights were self powered by solar energy it could not help the situation. Since the solar panels were large in size, they were easily blown off by the wind leaving the roads in dark. In future this can be avoided by implementing second generation highway windmill which unlike the other self powered street light has different source power generation without over depending on any one source.

V. Future Scope

The world is now in a time of transition from fossil-fuel to clean energy. In the coming future, the IC engines will be replaced. Our automobiles will completely run on electricity. Then, the highway wind mills can act as a charging hub which can charge the batteries of the vehicle if run out of power on the highways. The Second Generation Highway Wind Turbines can act as a wireless charging Hub for the Highway patrolling Drones. In

the near future, the self automated drones will be used to monitor the highways to avoid dumping of waste and other material on the highways. It will also increase the safety in the highways.

VI. Conclusions

Even though the highway wind mills mounted on the streetlight pole was a notable idea, It was quite a failure. This was because of the high cost of production of the wind turbine blades and over dependences on one source of energy. The second generation highway windmills can overcome this disasterous failure of its first generation. By implementing H Darrieus model blade instead of Helical blades reduce the complexity in blade design and reduce the wind cut in speed of 3m/s to 1.5m/s[5]. Also providing other source of energy production like the solar and sound energy harnessing device the windmill can provide limitless power in the highways at all seasonable weathers.

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VIII. Acknowledgements

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FLOOD PREPAREDNESS FOR BETTER RESPONSE LOGISTIC PERSPECTIVE

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***Abstract**: Every year disasters caused thousands of injuries, deaths and devastating economic damages. Despite the technologic improvements, mankind is still desperate against disasters. Disasters continue to cause physical and psychological damages. Disaster preparedness, disaster management and disaster response are important actions for minimizing the damage of the disasters. Though, selecting suitable measures in disaster preparedness is a difficult task. Some mitigation measures, which include making dams and updating building codes, prove ineffective and can themselves become a source of further vulnerability. Therefore, the importance of preparedness cannot be ignored, and the relief distribution aspect needs to be appraised as a measure of disaster preparedness. This research is conducting in Kottayam district based on the severe flood affected in Kerala State during August 2018.This study is focused on flood preparedness for better response. It is based on relief demand.*

***Keywords**: Preparedness, Response, Facility location model, Flood, Decision making, Multi-objective Model*

I. Introduction

A disaster is a serious phenomenon that occurs in a relatively short period of time that affects the functioning of a community or society that is widespread and incurs human, material, economic or environmental consequences and is more affected by the ability of the community or society. Disasters frequently occur around the world and are no longer considered as a separate event. Disaster occurs in two types: man- made disaster and natural disaster. Incidents caused by man are a consequence of technological threats. Examples of heavy fires, road accidents, industrial accidents, oil spills and nuclear explosions / blasts, wars and targeted attacks may also be included in this category. A natural disaster is a natural process or phenomenon that may result in loss of life, damage, or other health effects, property damage, loss of livelihoods and social and economic disruption or environmental damage. As such, crisis management has become a hot topic in urban development and human security. It aimed at reducing damage caused by disasters. It includes planning and coordination of all practices in damage reduction, preparedness, response and first aid, restoration-restructuring processes. It refers to managing both the risk and the consequences of the event. It is a systematic process aimed at reducing the negative impact or consequences of adverse events. Shortly, Disaster Management means planning, coordination and management of all phases of disasters. This paper is focusing on the flood management. However, some flood management methods are ineffective and can be a further vulnerability. For example, flood channels, flood dams and other public works provided to protect community from floods can turn into communities if they be unsuccessful. Though, choosing appropriate measures to prepare for flood is a complex task. Hence, the significance of preparedness cannot be uncared for and the distribution of relief should be measured as a measure of disaster preparedness.

This study focuses on flood preparedness for a better response. Objective of this study is to propose a framework for supply chain model based on relief demand for maximizing coverage area and minimizing distribution cost. Several parameters are not recognized before the disaster, whereas relief demand is a key parameter in disaster preparedness modeling. The decision maker wants to identify the properties of comfort relief demand. At this time 7 influencing factors of relief demand are recognized and proposed a facility location model. This experiment is conducted on the basis of data collected from Kottayam district Kerala state in India based on Kerala flood, August 2018.

II. Literature Review

Rubel das (2018) is a paper based on the preparedness of disaster. In this paper preparedness along with ssresponse during a disaster is considered. Here introducing a logistic model based on response and preparedness. The model developed by considering factors that influence the relief demand and also the challenges that faced. The model is not yet developed but theoretically proposed in seven places and results are analyzed. In this explains fixing of local warehouses can increase a maximum coverage of demand points and reduce the cost factor and it increases the social satisfaction. Nick Loree, and FelipeAros-Vera(2018) explains a mathematical model to determine the location of points of distribution and inventory allocation in Post-Disaster Humanitarian Logistics. The model minimizes facility position, logistics, and deficiency costs and allows for demand nodes to be served from several point of distributions. This is significant in conditions when one point of distribution may not have the inventory to serve the entire demand points that it has been assigned. This paper highlights the significance of considering the temporal part of the system and resulting communal costs in facility location. Chawis Boonmee, Mikiharu Arimura, and Takumi Asada(2017) explains a optimization models for the emergency humanitarian logistic. It is based on facility location problems on the basis of problem types and data modeling types and to examine the pre- and post-disaster circumstances by means of facility location. Four models were investigated here: deterministic, stochastic, robust, and dynamic. This paper attempted to survey the objectives, conditions, application, case studies, facility location types, disaster types, solution methods, and emergency humanitarian logistic facility location problem categories. Fei He and ,Jun Zhuang (2016) explains the decision making process at exante and ex post disaster stages, develop a two-stage dynamic programming model that optimally allocates preparedness and relief expenditures. In this paper numerically and analytically solved the model and provided new insights by sensitivity analysis. Kunz, N., Reiner, G. and Gold, S(2014) in this paper suggested that difficulties arise from destroyed transport and communication, custom clearance procedures, and operational bottlenecks at key access points.De la Torre, L. E., Dolinskaya, I. S. and Smilowitz, K. R (2012) in this explains throughout interviews with aid organizations, reviews of their publications, and a literature review of operations research models in transportation of relief goods This paper deals an analysis of the use of such models from the Perspective of both practitioners and academics. José Holguín-Verasa,1, Miguel Jaller b, Luk N. VanWassenhovec, Noel Pérezd, Tricia Wachtendorfe (2012) it explains that analysis of the differences between commercial and humanitarian logistics, pinpoint research gaps that need to be filled to enhance both the efficiency of humanitarian logistics and the realism of the mathematical models designed to support it. John B. Coles a , Jun Zhuang a, JustinYates (2011) it explains the disaster response and recovery efforts following the January 12th, 2010 Haitian earthquake through the eyes of eighteen(18) different relief agencies. Gatignon, A., Van Wassenhove, L.N. and Charles, A(2010) it explains Evaluating the decentralized supply chain's performance in responding to humanitarian crises through an analysis of the IFRC's operations during the Yogyakarta earthquake in 2006.Sheu, J.B(2010) it explains a dynamic relief-demand management model for emergency logistics operations under imperfect information conditions in large-scale natural disasters. Rawls, C. G., and Turnquist, M. A(2010) it explains a two-stage stochastic mixed integer program (SMIP) that provides an emergency response pre-positioning strategy for hurricanes or other disaster threats.

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III. Methodology

Problem is identified first through the studying the conditions faced during flood. Then through literature surveys different methods adopted during disasters are identified and studied. From the study a suitable model is selected and modified. Then the disaster management plan of the state was studied. From the plan past details regarding flood were obtained. As per literature survey a model based on relief demand is planned to adopt in the current situation. For that data regarding demand points in each location of Kottayam were collected. Based on the demand point different local warehouses are identified and distributed to get an optimized number of local warehouses and fixing facility location model. The modified mathematical model is solved with the help of software.

IV. Factors Of Relief Demand And Challenges On Preparedness

From the extensive literature review, factors influencing relief demand and the various challenges on preparedness are identified. Table 1 depict the 7 influencing factors of relief demand and Table 2 depict the challenges on disaster preparedness

Table 1: factors influencing relief demand

Sl no	Factors	Description
1	Characteristics of disasters	Disasters in different dimensions include frequency, familiarity, duration, and severity, range of effects, destructive potential and duration of the warning period.
2	Compatible social factors	Racial and ethnic differences affect a wide range of perceptions and behaviours, including perceptions of threats, fears of danger,

		understanding and belief in dangerous information science, and attitudes towards agencies that have preparedness information.
3	Emergency Sheltering	As a disaster destroys homes and other social services, victims generally react differently after a disaster. A response team needs to predict the victim's movement after a tragedy.Emergency shelter, which occurs during and after the incident, is self-contained and based on usefulness.
4	The ratio of ignorant people	The role of women in childcare engages them in a daily activity that may relate them to a variety of harmful factors, such as earthquakes and building collapse. Personal characteristics, such as age and physical capacity, are also likely to play an important role in preparing and responding
5	History Of Hazards	In general, literature shows that previous experience increases the level of preparedness and effective performance during the accountability period.
6	Social Link	Strong and broad social ties generally have a positive impact on emergency preparedness Behavior. Strong bonds were positively related to the income and the presence of children. Family home links and other forms of social participation are also sources of warning messages, as people use their social networks to approve official alert messages.
7	Revenue	Household preparedness is positively associated with income. Since income is positive Concerning access to better and safer housing, low-income families are at greater risk. Older and non-combustible buildings that are vulnerable to earthquake crash are an important source of cheap housing for low-income citizens in earthquake-prone settlements.

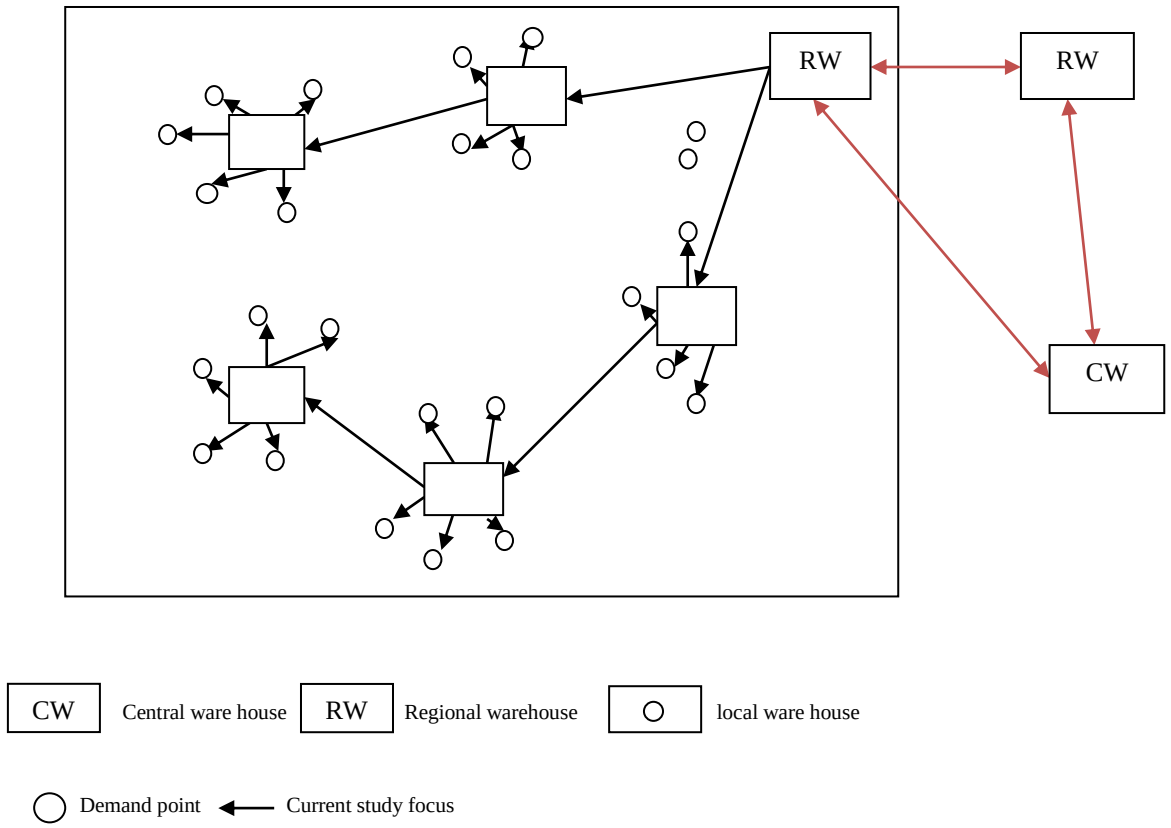
Table 2:Preparedness challenges

Sl no	Challenge	Description
1	Location modeling tool	Facility location issues can be divided into four main categories: minisum facility location problem, covering problems, minimax facility location problem and obnoxious facility location problems. Input parameters for these models include relief demand, location, shelter, transport costs and fixed costs. The objective functions of these models include minimum time, minimum cost, minimum distance, minimum number of facilities and coverage with the maximum number of demand points.
2	Distribution metrics	An important and challenging component of relief distribution is the allocation of goods to the stakeholders. In many cases, the victim needs to buy more than enough goods and relief agencies should have limited supplies.
3	Use of facilities in a period other than natural disaster	Many inventories, such as food and medicine, expire. The expiration date in a time-dependent inventory is difficult to store.

V. Network Preparation

Figure 1 shows the network of warehouses (W) and demand points (P). The central warehouse (CW) and regional warehouses (RWs) are interconnected through transportation network links. Though CW is the core source of relief goods, relief goods stocked in one RW can be transferred to a further RW by using large trucks. Considering the RW network efficiency, we assume that RW is located at the edge of the designated area. Demand points (Ps) are in disaster-affected areas. Victims create temporary sheltering in the P. Usually; large trucks are utilized to transfer relief goods from RW to the demand points. Various demand points cannot be accessed and served due to the transport network links and geolocation constraint. Visiting many demand points again and again in a single trip takes longer truck operation time. As a result, such a distribution system can lead to full satisfaction of some demand points or failure to deliver relief goods to other demand points. Therefore, assume that to establish a local warehouse (LW) at different points can solve the accessibility problems of demand points. The RW can communicate with another RW and also with LW. This relief distribution system has the potentiality to mitigate accessibility constraint by strategically establishing an LW at optimally computed locations under time-constraints.

Figure 1: Network of relief distribution



VI. MATHEMATICAL MODEL

Optimized LWs in the relay distribution system can not only function the system in terms of reducing the hours of operation of the truck, but also the economic benefits associated with the number of facilities. Location problems are studied in many aspects and several models in the literature. These models assume that integrated facilities do not need interconnectivity. In our system, LWs need to connect so that a truck can move to the next LW. Therefore, this system uses the concept that one-to-one delivery system.

Parameters

N_w Number of allowable LWs
C_R Communication range (distance unit)
A_R Accessibility range (distance unit)
Z_{ij} Distance between LW at i to LW at j

Decision variables

$$lw_i = \int_0^1 \begin{matrix} if\ a\ LW\ is\ located\ at\ Pi \\ otherwise \end{matrix}$$

$$rw_i = \int_0^1 \begin{matrix} if\ the\ RW\ is\ located\ at\ Pi \\ otherwise \end{matrix}$$

$$y_i = \int_0^1 \begin{matrix} if\ Pi\ is\ covered\ by\ LW \\ otherwise \end{matrix}$$

$$X_{ij} = \int_0^1 \begin{matrix} if\ an\ LW at\ i\ and\ another\ LW (or\ the\ RW) is\ at\ j\ and\ d_{ij} \le C_R \\ otherwise \end{matrix}$$

If points i and j are too far away ,ie.,out of C_R, truck cannot serve the LW at j.

The objective function is

$max \sum_{i=1}^{N} yi - \sum_{i=1}^{N} \sum_{j=1}^{N} Z_{ij} X_{ij}$ ……(1)

Here,Z_{ij} is a distance between the points LW at i and LW at j.The objective function maximizing the coverage through y_i.Additional LWs will increase coverage in the disaster-affected area. However,the second item shows that additional LWs will increase cost. The weight of each component may be different and depends on the strategy of the decision maker.

Constraints are as follows

$\sum_{i=1}^{N} lw_i = N_w$ ……..(2)

$\sum_{i \in N} rw_i = 1$ ……..(3)

$lw_i + rw_i \le 1 \quad \forall i$ ……(4)

$lw_i \leq yw_j \qquad \forall i Z_{ij} \leq A_R$ ……..(5)

$y_i \leq \sum_{j \in N | Z_{ij} \leq A_R} lw_j$

…….....……..(6)

$lw_i + rw_i \leq \sum_{j \in N | Z_{ij} \leq C_R} lw_j$

…….....(7)

$X_{ij} \leq lw_i \qquad \forall Z_{ij} \leq C_R$……..…(8)

$X_{ij} \leq lw_i + rw_j \quad \forall Z_{ij} \leq C_R$…….....(9)

$X_{ij} \geq lw_i + lw_i + rw_j - 1 \qquad \forall Z_{ij} \leq C_R$…….. (10)

$lw_i \leq \sum_{j \in N} X_{ij} \quad \forall i \in N$……..…….. (11)

$rw_i \leq \sum_{j \in N} X_{ij} \quad \forall i \in N$……..…… (12)

Equations [2] and [3]

- LWs cannot be more than a certain number, and only one RW will be established.
- Equation [2] = an equality constraint.
- If we change equation [2] to inequality constraints, the model will decide on a number of LWs to maximize the objective function.

Equation [4]

- LW and a RW cannot be in the same position.

Equation [5]

- If an LW is established; all Ps within accessible range will be covered.

Equation [6]

- If a P is covered, then there must be an LW within distance AR.

Equation [7]

- If an LW is established at i, there should be a further LW within distance CR.

Equations[8] to [10]

- Transportation operating constraints.
- If the distance between LW at i and LW at j is less than CR, then the network link between the LW at i and the LW at j can be established.

Equations [11] and [12]

- The connectivity of the network.

VII. RESULT AND DISCUSSION

The model is run using python version 3.7.3 and another python package pulp version 1.6.9.Table 3 shows the optimized result of the model. Our objective was to find an optimal number of local warehouses could increases the coverage of the designated area and reducing the distribution cost. Based on the accessibility criteria LW can access a maximum of 13 demand points Result shows that the objective function is optimized to a value 57.18 by establishing 7 LWs. In that point 80 demand points are covered with a total link distance of 22.82.

Table 3: Result of relief distribution

N	Nw	Max coverage LW*13	Actual Coverage	Total Zij	Objective function	Time(sec)
80	10	130	80	29.63	50.37	3060
80	9	117	80	28.62	51.38	2940
80	8	104	80	25.54	54.46	2700
80	7	91	80	22.82	57.18	2580
80	6	78	72	20.33	51.67	2400
80	5	65	63	22.31	40.69	2520

VIII. Conclusion

Proposed model aims to find maximizing coverage area and minimizing distribution cost. Result shows that better performance can be gained if local warehouses are established by following the proposed model. This model can be used in any type of disasters. Some of the limitations of the model is no method is available to make a comparison between coverage of Ps and connectivity of LWs. Theoretically the model is proposed but in real life executing the model may be difficult task.

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DEVELOPING AN SHE PERFORMANCE MODEL IN CONSTRUCTION INDUSTRY KERALA

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Abstract: *Infrastructure development is the sign of the nation's wealth. Construction sector plays an important role in satisfying the socio-economic goals as well as job opportunities for a larger community. The potential hazards involved in the construction activities are too high as compared to any other sectors due to the complexity of the project, lack of skilled labours and challenges in the construction. Sometimes these challenges negatively affect the project completion and its constraints. Safety, Occupational Health and Environmental (SHE) management is a vital part of construction management to reduce the occupational illness, injuries and fatality rate thereby providing better work environment. This paper analyses the importance of SHE management and the performance indices of the SHE management. The paper prioritizes the inhibiting factors of SHE management using Analytical Hierarchical Process (AHP). Finally the paper develops a SHE performance model by integrating performance indices and inhibiting factors of SHE managementusing Amos software, which can be recommended for the construction industry, Kerala for accelerate SHE performance and to improve better Safety, Occupational Health and Environmental practices.*

Key words: *Safety, Occupational Health and Environmental (SHE) management,Analytical Hierarchical Process (AHP), Performance Indicators, SHE performance model*

1. INTRODUCTION

Construction sector has a vital role in contributing GDP to any nation's economy. The sector contributes huge number of employment opportunities in every levels of society. The sector has high rate of uncertainty and potential hazards. Due to this uncertainties and potential hazards, the construction sector is suffered from high rate of fatality and health issues. Sometimes these issues may cause delays in work, cost overrun and delays in accrual benefits. SHE management helps to reduce the accident rate, occupational illness and negative impact on environment. SHE management is an approach to safeguard the resource of the project such as man, machine, materials and money from unfavorable conditions. There are many literatures available on Safety and occupational health in construction sector. This paper elaborates the study in occupational health, safety and environmental management.

David et al., (2015) analyzed the importance of occupational safety and health in the construction industry. The integration of occupational safety and health will drive down accidents and occupational injuries, will reduce costs, will create better working conditions andhelp the construction industry move towards sustainability. Rajaprasad and Chalapathy (2016) analyzed the accident trends in Indian construction industry in terms of safety indices. Sevilay and Ozorhon (2017) explained about devise followed by the project managers and implementation strategies and actions to improve project success. Xianguo et at., (2015) presented a systematic Structural Equation Modeling (SEM) based approach for Prospective Safety Performance Evaluation (PSPE) on construction sites and provided insights in to cause effect relationship among safety performance factors and goals, which facilitate the improvement of safety performance in construction industry.Seyyedand Zahra (2012) explained 32 accident caution models which are helpful in explaining the situations in the construction sector. Domino Theory of Accident Caution explains the need of SHE management in the construction site. According to the Domino theory of Accident Caution the accident is occurred in multiple stages, it gives enough warning before the unfavorable condition.Wissam et al., (2009) analyzed the BIM with 4D CAD simulation model and proved that the model was more beneficial to the designers.

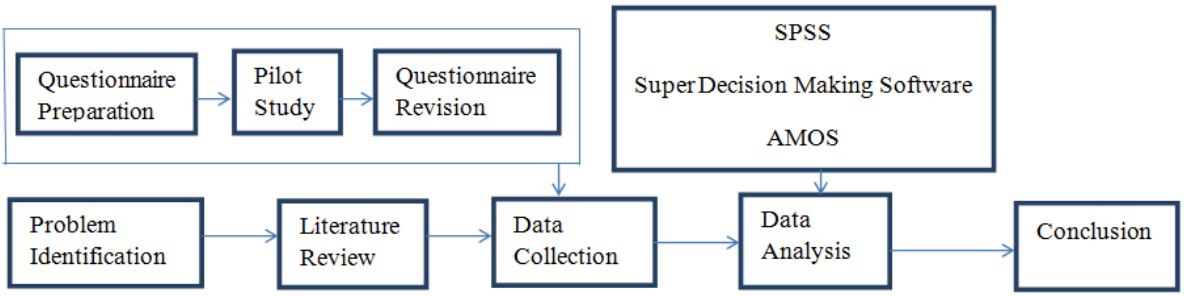
This paper explores the combination of safety, health and environment management in construction industry. Now a day's the construction projects are suffered from safety, health and environmental issues. Some major

accidents are reported from the financial years 2013- 2014 to 2017- 2018. These issues have enlighten the need of SHE management in the construction project. The objectives of the paper are to analyze the importance of safety, occupational health and environment management, prioritize the inhibiting factors using Analytical Hierarchical Process (AHP) and to identify the SHE performance indices. A SHE performance model is prepared by integrating the inhibiting factors and the performance indices of SHE management. This paper is aimed to develop a SHE performance model for construction industry in Kerala which will help to analyze the SHE performance of the project by integrating the critical inhibiting factors of SHE management. This will helps to analyze cost and time overrun of the construction project due to injuries and fatalities.

II. METHODOLOGY

The methodology is proposed to meet the objectives as mentioned above. Problem identification was done from the literature reviews and present scenarios in construction industry in the state of Kerala in India. Data collection was done through the questionnaire analysis. Sample size is selected as 110. Pilot study is conducted in 4 companies. The questionnaire is revised on the basis of pilot study. Data is collected from 80 companies and 30 clients, which include private - public and private public partnership projects. The questionnaire study mainly focused on the employees, contractors and the clients. The questionnaire has two sections, section A designed for the identification of inhibiting factor of safety, occupational health and environment management. Finally section B analyses the performance indices of safety, occupational health and environment management. The questionnaire was self-framed and the analysis done by Statistical Package for the Social Sciences (SPSS) software. On the basis of data collected, inhibiting factors are prioritized using super decision making software by AHP approach and performance indices regression model is prepared. Finally a SHE performance model will be developed using AMOS helps to improve performance of the construction industry.

Fig 1: Methodology



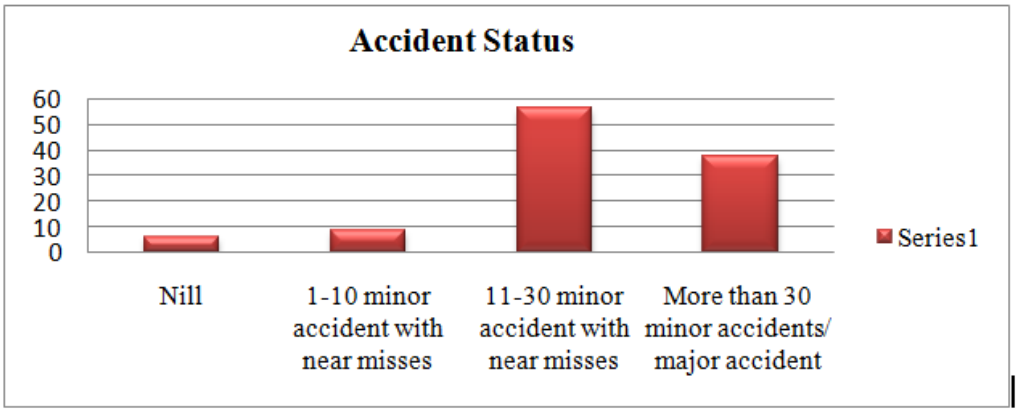
III. DATA ANALYSIS

Questionnaire analysis was conducted in 180 companies which are engaged in private and public construction projects.

A. NEED OF SHE MANAGEMENT

Based on the questionnaire data collection, the accident in Kerala is represented below.

Fig 2: Accident Status of the Construction Companies in Kerala



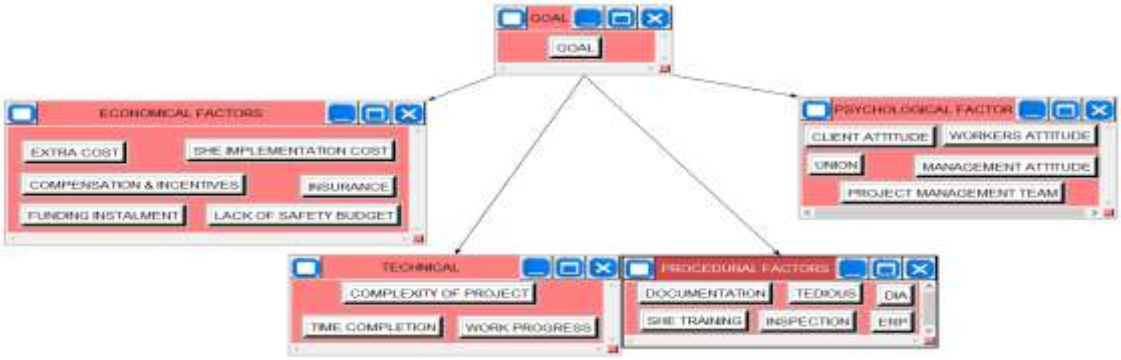
Around 57 companies were reported as they have suffered from 11-30 minor accidents. Approximately 6 companies have answered that their construction site is free from accidents. 96% of the companies are reported

with safety, occupational illness and environmental issues.Heinrich's triangle/ accident triangle explained by Heinrich which insights in to the accident status and the profit loss. According to accident triangletime and money consumes in 10 severe accidents is equal to thetime and money consumed in 30 minor accidents same as the time and money consumed in 600 near misses and are similar totime and money consumed in 1 major accident with 1 death.Ice Berg's theory described about the loss involved in an accident and it has two aspects: Direct and Indirect cost. Indirect cost cannot be visible and which is approximately 2/3 of the direct cost.

B. PRIORITIZATION OF INHIBITING FACTORS

Inhibiting factors of SHE management are identified using questionnaire. The reliability of the questionnaire is obtained as 0.844 and the factor analysis performed with the help of SPSS. Inhibiting factors are categorized in to 4 factors namely; economical, procedural, psychological and the technical factors. These factors are prioritized using Analytical Hierarchical Process (AHP).

Fig 3: AHP - Prioritization of Inhibiting Factors of SHE Management



Analytical Hierarchical Process (AHP) is done with the help of super decision making software. This will helps to rank the inhibiting factors according to its criticality of inhibiting factors.

Table 1: Prioritization of Inhibiting Factors of SHE Management

Factors	Sub – components	Prioritizes	Rank
Economical	Safety Budget (SB)	0.36745	4
	SHE Implementation Cost (SHEIMC)	0.32073	5
	Extra Cost (EC)	0.17787	7
	Funding Installment (FINS)	0.06774	13
	Compensation and Incentives (CIN)	0.04247	17
	Insurance (INS)	0.02375	20
Psychological	Client Attitude (CA)	0.60129	2
	Management Attitude (MA)	0.24069	6
	Project Management Team Work (PMTW)	0.05319	14
	Workers Attitude (WA)	0.05275	15
	Union (UNIN)	0.05208	16
Technical	Complexity of Project (COM PR)	0.76850	1
	Work Progress (WP)	0.12286	11
	Time Completion (TC)	0.10864	12
Procedural	SHE Training (TR)	0.45627	3
	Inspection (IN)	0.16756	9
	Documentation (DO)	0.13064	10
	Tedious Procedure (TE)	0.17714	8
	Disciplinary Action (DIA)	0.03980	18
	Emergency Response Plan (ERP)	0.02857	19

C. IDENTIFICATION OF PERFORMANCE INDICES

Performance indices are the indicators of SHE performance. It measures the safety in the construction site.

1. Safety Budget: The budget is allocated for SHE management for the safe work execution and better environmental conditions.
2. Near misses: Incidents that does not result in to injury or loss of property.
3. Man hour: Total work time required for the work.
4. Man day loss: The number of day loss due to accidents/ injury.
5. Severity rate: number of lost days due to the severe incidents experienced in the site.
   SR = (Total number lost workdays/ Total number of recordable incidents).
6. Frequency rate: is the number of occupational accidents with leave for 1000000 worked hours, it can be calculated as (number of accidents with sick leave X 1 000 000) /number of worked hours.
7. Incident rate are an indication of how many incidents have occurred, incident rates tend to be viewed as an indication of something that is wrong with a safety system.
   IR= (Number of Injuries X 200,000)/Number of Employee labor hours worked.
8. Loss Time injury (LTI): loss of time due to injuries.
9. Loss Time accident (LTA): loss of time due to injuries.

Performance indices are identified with the help of questionnaire analysis. The reliability value of questionnaire is 0.928 and the factor analysis is done and one factor is extracted.

Table 2: Multiple Regression Analysis on SHE Performance Indices

Sl. No	Dependent Variable	Independent Variable	R square	F statistics	Durbin-Watson	Regression model
1	LTA	NM, NA,MH,MDL	0.253 POOR FIT	8.911 [0.000<0.001]	1.333 [1.5 – 2.5]	2.123+0.178 NA+ 0.263 MH+ 0.031 MDL+0.006 NM
2.	LTI	NM, NA,MH,MDL	0.177 POOR FIT	5.634 [0.000<0.001]	1.152 [1.5 – 2.5]	2.636+0.478 NA+0.119 MH-0.048 MDL-0.298 NM
3.	SR	NM, NA,MH,MDL	0.640 GOOD FIT	46.572 [0.000<0.001]	2.085 [1.5 – 2.5]	1.325+ 0.413 NA+ 0.105 MH+0.054 MDL-0.062 NM
4.	FR	NM, NA,MH,MDL	0.890 GOOD FIT	221.83 [0.000<0.001]	2.064 [1.5 – 2.5]	0.491+0.513 NA- 0.517 MH+0.856 MDL+0.197 NM
5.	IR	NM, NA,MH,MDL	0.738 GOOD FIT	73.980 [0.000<0.001]	1.568 [1.5 – 2.5]	1.019+0.279 NA+0.137 MH+0.271 MDL+0.150 NM

NM- Near Misses, NA- No. of Accidents, MH- Man Hour, MDL- Man Days Lost, SB – Safety Budget

Table shows the multiple regression analysis on the SHE performance indices, and which insights that SR, FR and IR are more efficient to explain the SHE performance in the construction site than LTA and LTI.

D. SHE PERFORMANCE MODEL

The SHE Performance model is developed by integrating Inhibiting factors and the SHE performance indices of SHE management by AMOS software.

D.1 Measurement Model 1

Prioritized inhibiting factors are used for preparing measurement model with 5 major factors and they are further divided in to 20 critical factors.The measurement model consists of 20 independent and 5 dependent variables. SHE performance indices which includes 7 factors. There are 7 independent variables with one dependent variable called SHE performance. Table 3 shows the model fit indices of measurement model and the values are within the limit. This ensures that the model is good fit one.

Fig 4: Measurement Model 1

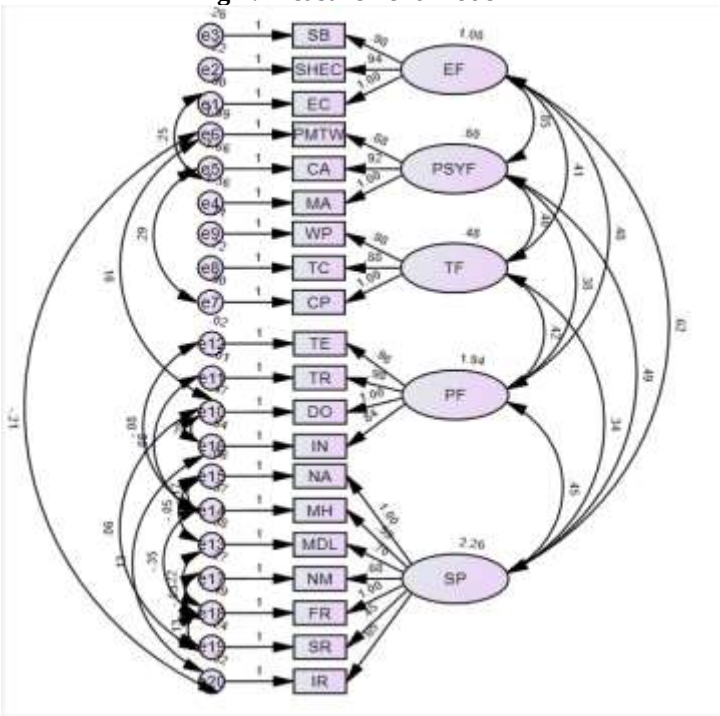


Table 3: Model Fit Indices of Measurement Model 1

Model Fit Indices	Measurement model 1	Range	Remarks
CMin/DF	1.823	1<DF< 5	Good Fit
GFI	0.833	0.538-1	>.70 ACC
IFI	0.931	0 – 1	<.90 GD
TLI	0.915	0 – 1	<.90 GD
CFI	0.930	0 – 1	<.90 GD
RMSEA	0.087	0 – 1	<0.088AC

D.2. SHE Performance Model

SHE performance model is developed by the integration of SHE inhibiting factors and the SHE performance indices. The purpose of the model is to analyze the impact of SHE inhibiting factors on the SHE performance. The measurement models are prepared and combined in to the structural model. Model fit indices of the structural models are tabulated in Table 5 and the values are within the limits.

Fig 5: SHE Performance Model

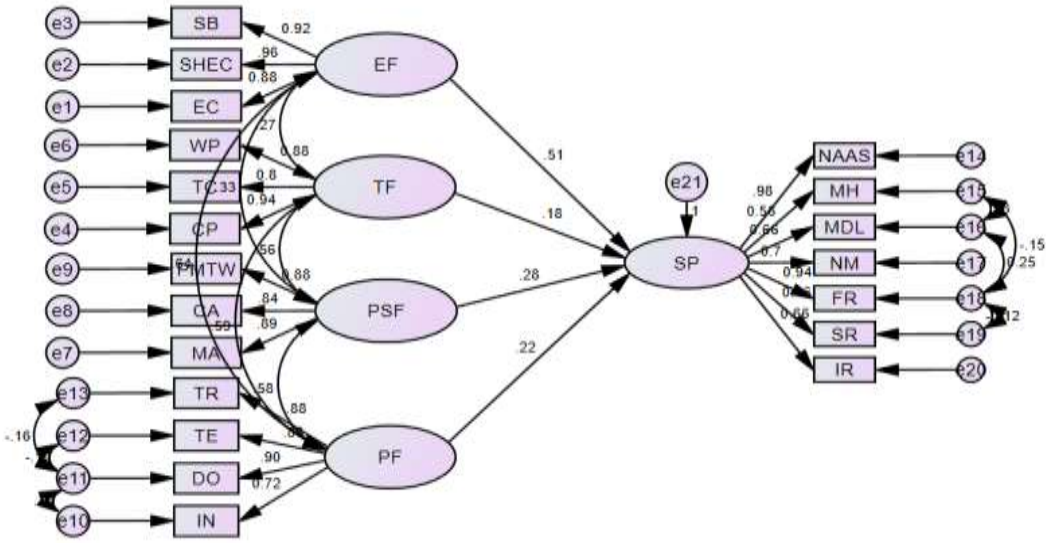


Table 5: Model Fit Indices of Structural Model

Model Fit Indices	Structural Model	Range	Remarks
C Min/DF	1.828	1<DF< 5	Good Fit
GFI	0.797	0.538-1	>.70 ACC
IFI	0.921	0 – 1	>.90 GD
TLI	0.915	0 – 1	>.90 GD
CFI	0.920	0 – 1	>.90 GD
RMSEA	0.087	0 – 1	<0.088AC

The model proves that the inhibiting factors of SHE management not only inhibit the SHE implementation but also have an impact on SHE performance. Economic factorsand the psychological factors have more influence on SHE performance. Profit is the bottom level of these factors and the management is more concerned about their profit margin. More concentration on these factors can make a better safety, health and environmental culture.

IV. CONCLUSION

SHE Performance model indicated the influence of inhibiting factors of SHE management on the SHE Performance. SHE Performance Model indicated the influences of each inhibiting factors on SHE performance. Economic factors can more influence on the SHE performance and SHE implementation. The government should strictly follow their safety rules and regulations to improve the safety culture in the construction sector. Safety training and awareness program can improve the psychological aspects towards the SHE management. Safety budget allocation in the construction projects improve SHE performance. BIM 360 Field is a better suggestion for construction sector. The BIM 360 Field can be used in every stages of the construction, such as design, construction and maintenance.

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FEASIBILITY STUDY FOR PREPAREDNESS OF ORGANIZATION IN LEAN GREEN SIX SIGMA INITIATIVE

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Abstract*: It is the need of the time to develop and implement a platform where three philosophies like lean, green and six sigma can be integrated. The philosophies when implemented alone or partially cannot bring the best results but when integrated they complement each other compensating their independent disadvantages. The paper aims at defining a feasibility study that is mandatory for the preparedness of an organization in lean green six sigma initiatives and the feasibility study is being analyzed using SPSS software.*

Keywords*: Lean green six sigma framework initiative, questionnaire survey, SPSS*

I. Introduction

Nowadays, the industries face a lot of challenges from global competition, environmental regulations, thrust for high quality and economic performance. With the growing pressure from the global competitors, companies are bound to improve their quality and effectiveness of their operation system along with meeting their social and environmental responsibility with economic gains [1]. Manufacturing philosophies like lean manufacturing, green manufacturing and six sigma are widely adopted by the companies all over the world to face this situation and improve their performances .Most of the companies have adopted the practices of these philosophies in partial manner and implemented as independent practices. But the practices of lean, green and six sigma concepts are better when incorporated. They complement each other and once integrated can increase each of their advantages.

Electronics manufacturing industries in India are facing strong competition globally in all aspects [2].These industries face lots of problems compared to other Indian sectors. Hence these industries are taking steps to reduce the expenditures, wastages, maximize the resource utilization and improve quality in a global level. For tackling this situation electronics companies in India have adopted advanced quality manufacturing techniques like lean, green and six sigma concepts. The authorities so far implemented these practices independently and struggle to develop common objectives and strategies. If these practices are integrated on a common platform and develop a common strategy, the effectiveness of the implementation of these practices can be increased [3]. The high cost of production in many sectors has forced companies to offer their products at high prices thus failing to attract customers. Small and medium sized enterprises in Indian electronic and electrical industry face high competition challenges from international companies thus application of lean manufacturing is considered a competitive advantage. Lean manufacturing helps in improving the quality of products offered and increasing profits and revenues through reduction of wastes [4].

Even though there are a lot of publications available related to these three philosophies, very few discuss about the integration of them. Some of the publication shows the integration of two of the three philosophies thereby achieving better performance in their goals. Therefore, many companies are interested in integrating these three philosophies. But there is no common model available to integrate these concepts especially in electronics sector.

The industries in Kerala also faces the same issues related to integration and are finding ways to solve the problems. There are industries that have partially implemented this integration but are trying for the full integration. This framework is an effective way of achieving social, economic and environmental dimensions. This paper helps in conducting a feasibility study for the lean green six sigma initiatives that could lead onto a framework integrating the three philosophies in an organization. This is the only feasibility study done in an electronics manufacturing company which could be extended to other organizations.

II. Literature Review

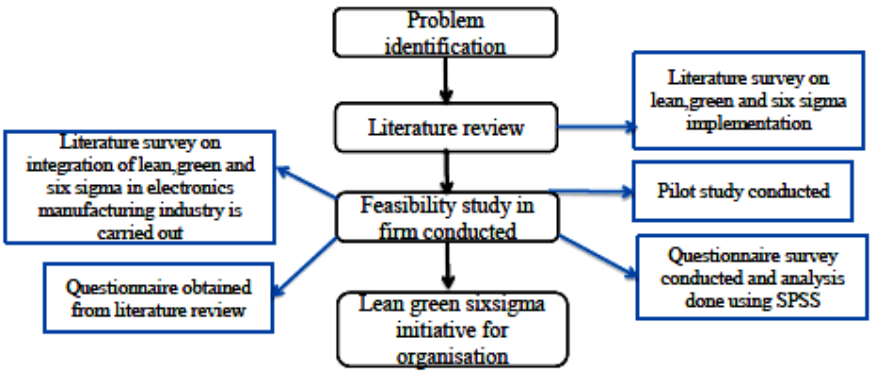
The questionnaire was obtained from the paper [5], where they have conducted a feasibility study for the preparedness of lean green six sigma initiatives in an organization. The paper has made this study in four different sizes and type of organization. They have tried to integrate the three philosophies onto a single platform. The feasibility study is the initiative for the development of a framework that can integrate the three philosophies like lean, green and six sigma. The developed framework in a systematic approach that will be able to achieve the goal of improving the quality and environmental impacts [6]. The study [7] shows the standard score based on a scoring developed by BEF framework. GL2SPI (green lean six sigma preparedness index) is to measure the organization's readiness to implement GL2S (green lean six sigma).The GL2SPI is calculated as the arithmetic mean of different criteria. The different criteria are six lean green and six sigma parameters i.e., leadership and people, green and lean six sigma tools ,process improvement, strategy and planning, stakeholders and result and knowledge management. A score of criteria when higher than 40 percent confirms that the organization is able to start GL2S journey. The lean green and six sigma readiness index is an arithmetic mean of the six lean green and six sigma parameters.

Every organization finds it difficult to integrate the philosophy into their main stream added to that integrating them is much more difficult. All these papers showed that the lean, green and six sigma could be integrated in organizations to deal with their setbacks.

III. Methodology

The methodology conducted for the paper is shown in the Figure 1.The problem was identified as integrating the three paradigms and implementing it. The literature review was done by incorporating all the publications related to lean, green and six sigma. The pilot study was initiated with the view of integration of the three philosophies in an electronics company. The study helped to understand more about the nature of the subject and the operations involved. A questionnaire obtained from literature review was subjected to a pilot study. The pilot study conducted in the organization obtained that the questions are good enough to start the feasibility study. The questionnaire is a 5-point likert scale with 27 questions as variables. This questionnaire was a testing for the preparedness of organization for lean green and six sigma initiatives. This helped in establishing the framework of integrating the three philosophies lean green and six sigma in the company. The methodology of the paper consists of adopting a framework if the questionnaire is feasible in the organization which is shown in figure 1.

Figure 1.Methodology adopted



IV. Feasibility Study

The feasibility study is being initiated with the help of a questionnaire obtained from a literature review.The data obtained from the questionnaire is analysed using SPSS software. The population consists of workers from all levels. The population chosen is 1750 and the sample size taken is 315.The reliability statistics is found to have cronbach's alpha as 0.802 which shows that the questionnaire is acceptable. The KMO of sampling adequacy is 0.856 and Bartlett's test of sphericity has significance level less than 0.05 shows that factor analysis can be useful for the data. This is represented in figure2.

Figure 2.KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.856
Bartlett's Test of Sphericity	Approx. Chi-Square	5333.771
	df	351
	Sig.	.000

Then exploratory factor analysis is done and identified six factors. The twenty seven variables are categorised under six factors as shown in figure 3.

Figure 3. Exploratory Factor Analysis

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
VAR00001	.964					
VAR00009	.933					
VAR00006	.930					
VAR00004	.866					
VAR00005	.822					
VAR00002	.725					
VAR00007	.690					
VAR00008	.689					
VAR00003	.664					
VAR00013		.903				
VAR00010		.898				
VAR00011		.827				
VAR00012		.805				
VAR00017			.822			
VAR00014			.801			
VAR00016			.789			
VAR00015			.784			
VAR00027				.878		
VAR00026				.856		
VAR00025				.855		
VAR00021					.797	
VAR00022					.757	
VAR00024					.743	
VAR00023					.639	
VAR00019						.863
VAR00020						.836
VAR00018						.829

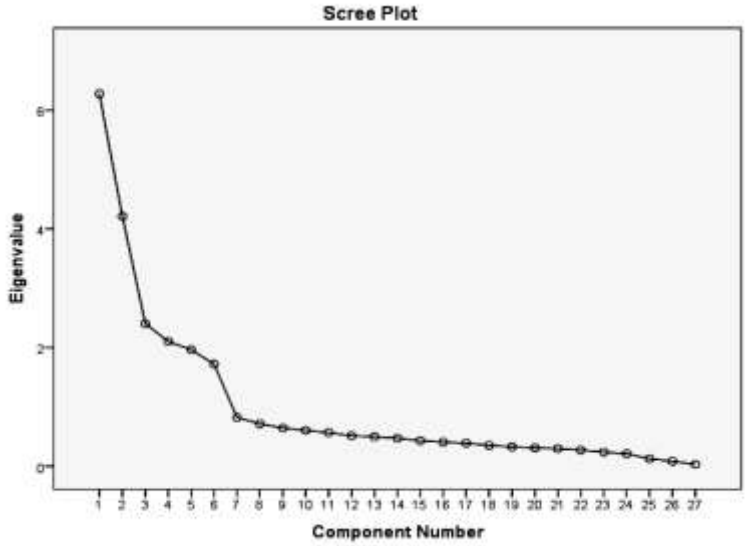
Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 5 iterations.

The scree plot shows the number of factors generated by the analysis and which factors are to be retained in an exploratory factor analysis. This is shown in figure 4.

Figure 4.Scree plot



The variance explained by the initial solution, extracted components and rotated components is displayed as figure 5.The table has the initial eigen values which says the eigen values greater than one were extracted and first six principal components form the extracted solution. The extracted components say 69% of the variability in the twenty seven variables corresponds to first six variables and thereby can reduce the complexity of the data set by using these six components. The six components obtained are named as leadership and people, green and lean six sigma tools, process improvement, strategy and planning, stakeholders and result and knowledge management.

Figure 5.Total Variance Explained

Total Variance Explained

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.276	23.245	23.245	6.276	23.245	23.245	6.097	22.581	22.581
2	4.214	15.608	38.853	4.214	15.608	38.853	3.150	11.665	34.246
3	2.403	8.900	47.753	2.403	8.900	47.753	2.758	10.217	44.462
4	2.102	7.787	55.540	2.102	7.787	55.540	2.279	8.442	52.904
5	1.965	7.279	62.818	1.965	7.279	62.818	2.230	8.261	61.165
6	1.721	6.376	69.194	1.721	6.376	69.194	2.168	8.029	69.194
7	.823	3.048	72.242						
8	.716	2.651	74.892						
9	.645	2.389	77.281						
10	.604	2.238	79.519						
11	.567	2.101	81.620						
12	.515	1.906	83.527						
13	.497	1.840	85.367						
14	.473	1.752	87.119						
15	.431	1.596	88.715						
16	.407	1.507	90.222						
17	.389	1.442	91.664						
18	.352	1.303	92.968						
19	.327	1.211	94.178						
20	.308	1.139	95.318						
21	.298	1.103	96.421						
22	.274	1.015	97.436						
23	.238	.882	98.318						
24	.212	.786	99.104						
25	.126	.465	99.569						
26	.084	.311	99.880						
27	.032	.120	100.000						

Extraction Method: Principal Component Analysis.

The descriptive statistics is done with the help of the software. The six factors are taken as criteria of lean green and six sigma parameters considered for an organization. The maturity levels of the lean green and six sigma parameters are 62.2% for leadership and people,83.2% for green and lean six sigma tools, 91.8% for process improvement,86.7% for strategy and planning,60.7% for stakeholders and 84.2% for result and knowledge management. The arithmetic mean of lean green and six sigma parameters as lean green and six sigma readiness

of organization is 78% which is higher than the lean green and six sigma readiness index which is 40%. The organization profile is shown as figure 6 as bar chart and in figure 7 as radar chart.

Figure 6.Organization profile as bar chart

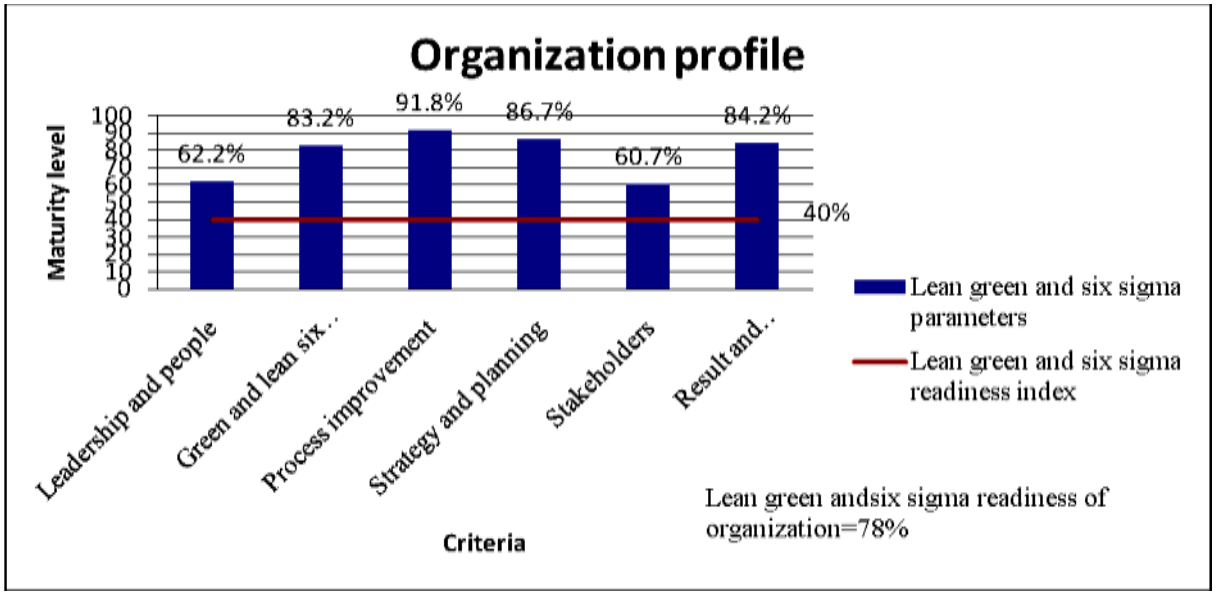
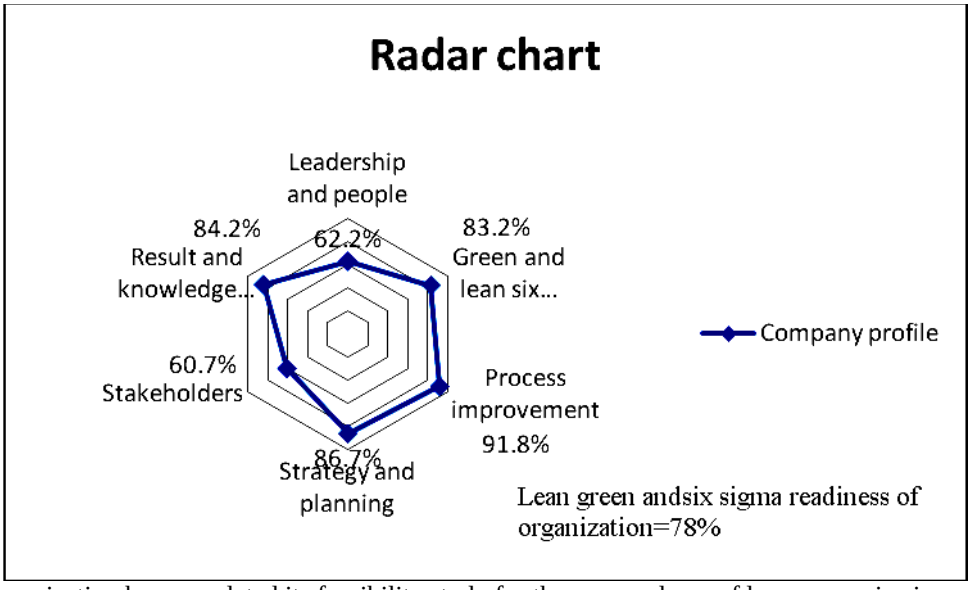


Figure 7.Organization profile as radar chart



Now, the organization has completed its feasibility study for the preparedness of lean green six sigma initiatives. The company is ready to initiate a project incorporating the lean green six sigma framework.

V. Conclusion

The framework can be adopted in an organization only if the feasibility study is acceptable. The feasibility study is done by a questionnaire survey. The survey is analyzed using software named SPSS. The reliability is 0.802 for the population of 1750 workers .Six factors are obtained as criteria for the lean green and six sigma parameters. The lean green and six sigma readiness of organization is 78% thereby the framework can be adopted in the organization.

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LEAN SIX SIGMA IMPLEMENTATION FRAMEWORK FOR TEXTILE INDUSTRY

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***Abstract**: Lean and Six Sigma are two quality tools recommended for the manufacturing industries to reduce the lead time and the number of defectives in order to increase quality and profit. Thus, we can increase the customer satisfaction and process performance. In this paper, we are utilizing the benefits of both lean and six sigma methodology. This paper proposes a Lean Sigma framework to reduce the defect occurring in the final product of textile industry and to reduce the lead time. This paper also conducts the economic feasibility of a new layout after conducting assembly line balancing. Also, a six sigma project charter is developed to help the top management to implement and analyze six sigma easily.*

***Keywords**: Lean; Six Sigma; Framework; textile industry; cause and effect diagram; Capability study; Pareto chart; Line Balancing*

I. Introduction

Textile is one of the leading sectors in the Indian economy in terms of production, exports, employment and contribution to the national economy. The application of these management techniques in the business will bring long term stability in the market and better company reputation. Nowadays, textile industry is facing problems like increase in defectives and also increase in lead time. Lean and Six sigma are two quality techniques for this problem. These management tools are viewed as a systematic , scientific, statistical and smarter approach to create quality innovation and total customer satisfaction.

This paper explores Lean Six Sigma (LSS) project and program success in the textile and apparel industry. This paper presents depictions of LSS implementations and the resulting economic impact for a textile company (Adikorley, R.D., Rothenberg, L. and Guillory, A., 2017).The paper proposes a Lean Sigma framework to reduce the defect occurring in the final product of textile industry. This paper contributes towards the research upon a structured implementation of LSS in textile industry where it addresses the issues faced by previous works regarding LSS implementation in SMEs (Rajat Ajmera,Prabhuling Umaralani, and K G Valase 2017).This article aims to identify and analyse the differences and complementarities in the production decision areas for each one of the three models; (2) to identify the competitive priorities that lead to the best performance as a result of policies followed in the decision areas as a result of the adopted model (Drohomeretski, E., Gouvea da Costa, S.E., Pinheiro de Lima, E. and Garbuio, P.A.D.R., 2014).The paper has combined sustainable manufacturing with Six Sigma, which is the most useful tool for continuous improvement, to create a systematical framework for manufacturing practitioners to achieve sustainable manufacturing. The framework has given detailed steps from problem definition to achieving leadership in sustainability in order to maintain the efforts (Min Zhang,et al.2014).The paper gives a balanced viewpoint on continuous improvement and innovation, avoiding a position of advocacy of one versus the other. The paper provides practical guidance as to how such a holistic approach should be constructed and identify the critical role that LSS plays (Roger W. Hoerl & Martha M.Gardner 2014).This research paper reports the case study of implementing this L6QMS-2008 model in a textile mill and thereby achieving annual savings of 2 million INR (Karthi, S., Devadasan, S.R., Selvaraju, K., Sivaram, N.M. and Sreenivasa, C.G., 2013).This study explains the different tools and principles of lean. The use of lean manufacturing in the textile industry was studied in this research through interviews, plant tours and case studies. A model for implementing lean tools

and principles in a textile environment was developed (Hodge, G.L., Goforth Ross, K., Joines, J.A. and Thoney, K., 2011).

This paper emphasizes the lean six sigma concepts and possible area of lean six sigma applications in textile industry. Lean Six sigma is a combination of waste elimination and process improvement techniques. Lean Manufacturing and Six Sigma. Lean Six Sigma (LSS) concept is the integration of two quality management concepts which are Lean Manufacturing and Six Sigma whereby it attempts to increase the scope and size of improvements achieved by either concept alone. DMAIC are applied with lean environment to achieve bottom line results. Many researchers have been discussing about integrating Lean Manufacturing and Six Sigma to form Lean Six Sigma (LSS) as the latest quality management concept. The integration of both models will increase the sigma level in organizations complemented by the elimination of non-value added activities which leads to greater results than either system can achieve alone. This paper aims to provide a structured LSS framework which can be adopted in the SME label in order to reduce waste and variation in their production; aiming to increasing productivity while reducing the cost of production.

II. Methodology

The methodology conducted for the paper is shown in the Figure 1.The literature review was done by incorporating all the publications related to Lean and Six Sigma. DMAIC methodology for six sigma implementation is used in this project. In the define stage, current problems in the industry is defined. After that in measure stage, defects and defectives are measured. Current line balancing is also done. Cause and effect diagram is drawn by brain storming with the managers and quality assurance team. Layout is also drawn. In Analyze stage, data's are analyzed. Capability study and Pareto analysis is conducted using Minitab software. In improve phase, suggestions are given to reduce the defects and a new layout is designed to reduce the lead time. Also, six sigma project charter is developed to help the industry to implement six sigma and also to help in the control phase.

III. Six Sigma Implementation

The data has been taken for the number of defectives and defects from a set of batches. Using these data ,percentage defectives, dpmo and sigma level was calculated. Inorder to find the root causes, pareto chart and cause effect diagram was drawn using minitab software.After finding the root causes,measures are taken to reduce the defectives.

A. Interpretation of root causes

- From the pareto chart ,we can see that 80% of the causes are due to measurement defects and stitching defects.
- 80% of the measurement defects are due to standardization and 20 % are due to labor carelessness.
- Also, 80% of stitching defects are caused by unskilled labor and 20% are due to lighting problem.
- Through standardization of measurements, 80% of the measurement defects can be reduced.
- By proper training, we can reduce 80% of the stitching defects.
- Using measurement standardization, measurement defects can be reduced.
- Standard size chart is displayed
- Standard size Demo is created using cardboard for all the sizes.

Through six sigma implementation, sigma level is increased from 2.1 to 2.3

B. Increasing the production

The production capacity is not used properly. Because of: -

- • Unorganized floor settings resulting in the loss of time for the stacking of raw and finished goods.
- • Lack of cleanliness influences the workers attitude.
- • Too much time consumption in different floors for the search of particular item.
- • Due to the disorganized system in the store, mixing up of the orders and delay in the orders has become very frequent.
- • Due to lack of storefront, customer orders take too much time due to material selection time.

In order to solve all these problems, the layout is modified. Set , sort out , shine and standardize the material and floor settings. There by, reducing the material selection time in the process flow. There by speed up the production process and increase in in-process inventory. The in- process inventory is found to be more in stitching section. By increasing 10 tailors in the stitching section, in-process inventory can be reduced. That results in increased production.

III. IV.COST BENEFIT ANALYSIS

COST OF ADDING TAILORS	**BENEFIT OF ADDING TAILORS**
SALARY FOR 10 STAFFS =10*7000 =70,000 NUMBER OF PRODUCTS =1820 COST OF PRODUCTS=27,30,000	• Material selection time will reduce to 10 min. • Transporting material to stitching section 1 min. • Transporting material from stitching to ironing will reduce to 1 min. • By increasing 10 tailors and 1 cutter, the production can increase from 230 to 280 (products/day).

V. FRAMEWORK

The framework is developed on the basis of six sigma methodology. Different problems are found out using brain storming. Four types of problems may occur due to product, process, people and machine. These problems are measured by counting the number of defectives and by current line balancing. Analyze the problems using capability study, cause and effect diagram, Pareto chart and assembly line balancing. From the analysis, a new layout is developed to reduce the lead time. Six sigma project charter is developed that helps the organization to implement six sigma and to analyze the profit associated with it.

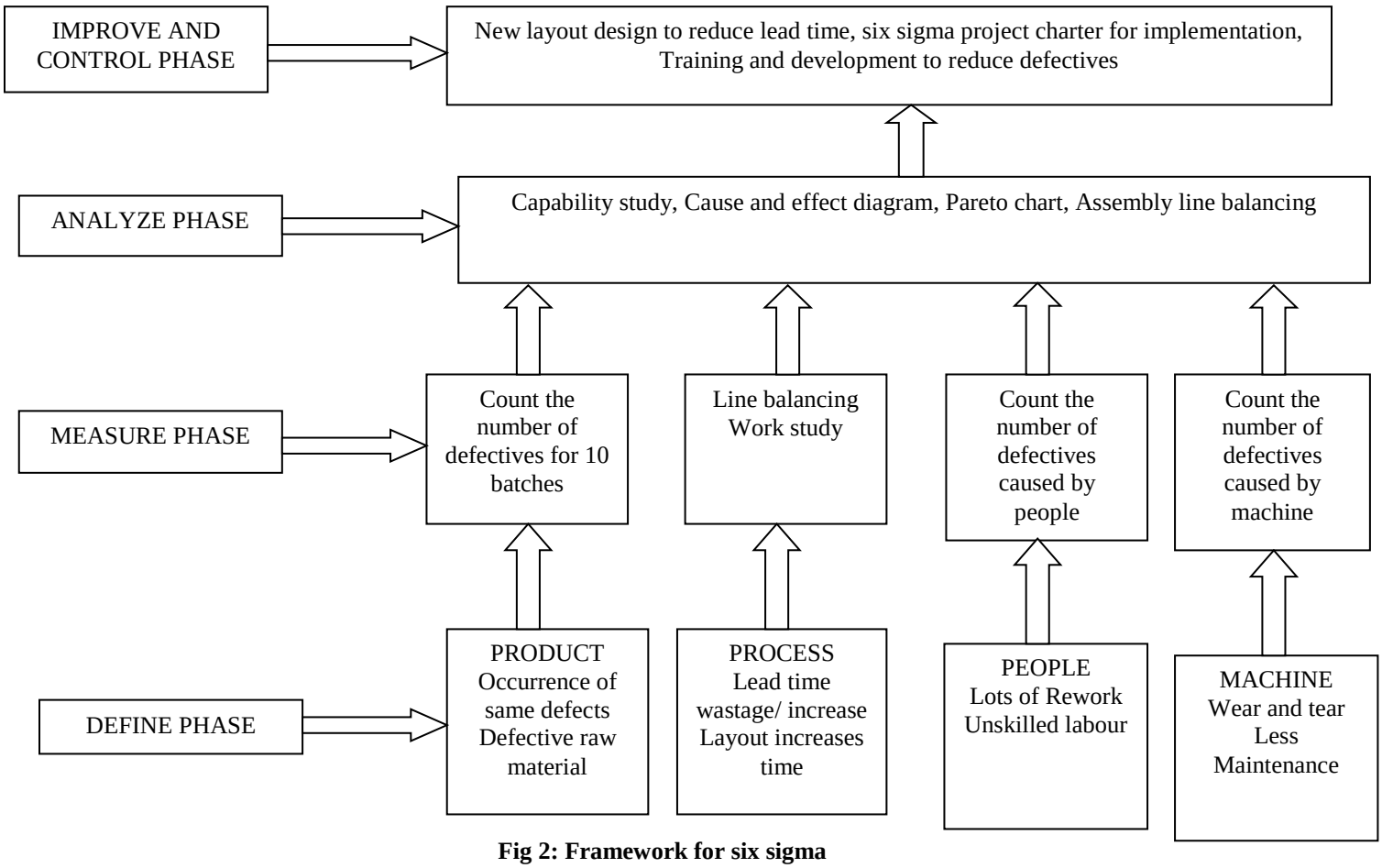


Fig 2: Framework for six sigma

VI. CONCLUSION

Minimizing defect is an important factor for ensuring the quality of products. Manufacturing the quality product is essential to sustain in this global competitive market. This study applies lean six sigma in order to find out the major defects, their root causes and then suggests logical solutions in order to minimize those defects. The developed framework can help any textile industry to achieve six sigma level easily. Any textile industry can follow this framework for six sigma implementation. The problem of material handling and storage in a more organized way is done by designing a new layout using assembly line balancing and LCR algorithm. Also a new training and development system is introduced to the workers for reducing the defects. By changing the layout, long assembly line into work cells, the assumed worker multi-skilling seems effective as well as communication between operators is fast and accurate. The other benefits observed are the reduction in rework and the decrease in production time of the garment.

The same approach can be applied to other products of the company which will reduce lots of defects. Thereby, total quality can be increased and hence the profit. As the minimization of defects is a continuous process, further implementation of this methodology will improve the productivity .Many medium scale textile industries in India need to aware about the lean six sigma concepts and this implementation will trigger a positive wave across the textile industries and become more competitive.

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Application of Green Synthesized Silver Nanoparticle in Food Packaging

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***Abstract**: Nanotechnology is a field that is burgeoning day by day, making an impact in every spheres of human life. Application of nanoparticles in food industry is emerging rapidly. Fruits and vegetables having natural waxy coating is not enough to offer protection against water loss and high respiration rate, thus results in weight and protein losses. Green synthesized silver nanoparticles have a beneficial application in fruits and vegetables coating. Silver nanoparticles were successfully synthesized from silver nitrate through a simple green route using the leaf of piper betle. Silver nanoparticles have a broad spectrum of antibacterial activity against both gram-negative and gram-positive bacteria, and there is minimal development bacterial resistance. Due to their stable nature and antimicrobial property, silver nanoparticle can be utilized as a remedial purpose especially in food coating. Application of such silver nanoparticle incorporated films have improved antimicrobial property which makes this method more effective. This film increases the shelf life of fruits and vegetables when compared to control with respect to weight loss and color change. These results shows silver nanoparticle incorporated sodium alginate coated vegetables and fruits are suitable for preservation. In this study, silver nanoparticles synthesized from piper betle leaf were incorporated in to sodium alginate to form film which can be used to coat fruits and vegetables.*

***Keywords**: Nanotechnology, Green synthesis, Silver nanoparticle, Antibacterial activity, Nanocoating*

I. Introduction

In many agriculture-based countries, the major problem is to keep the fruits and vegetables safe and fresh until they reach the consumers' hands. The U.S. Centers for Disease Control and Prevention estimates around 76 million cases of food borne illness in the United States each year, resulting in about 5000 deaths. Edible coatings and films are currently used on variety of foods, including fruits, vegetables, meats, chocolates, candies, bakery products, and French fries. The basic functional properties of edible coatings and films depend on the characteristics of the film-forming materials used for its preparation. At present, the primary film-forming materials used to construct edible coatings and films are polysaccharides and proteins. Generally, lipid-based films are good moisture barriers, but they offer little gas transfer resistance and have poor mechanical strength. In contrast, biopolymer-based films are often good oxygen and carbon dioxide barriers, but they offer protection against moisture migration.

Nanotechnology is most active research areas in modern material science. There have been impressive developments in the nanotechnology field in the recent past years. Nanotechnology is termed as the synthesis, characterization, exploration and application of nanosized (1-100nm) particles for the development of technology. It deals with the materials whose structure show significantly novel and improved physical, chemical, and biological properties due to the nano-scaled size. Because of their size, nanoparticles have a larger surface area than that of macro-sized materials. Nanoparticles exhibit new or improved properties based on specific characteristics such as size and morphology.

The synthesis and characterization of novel metal nanoparticles such as silver, gold and platinum is an emerging field of research due to their important application in the field of biotechnology, bioengineering, textile engineering, water treatment, metal based consumer products, and other areas, electronics, magnetic, optoelectronics, and information storage. It has been reported that since ancient times silver metal is known to have antimicrobial wide applications. Silver nanoparticles are used to treat infections in open wounds, chronic ulcers and in textiles, home water purification systems, medical devices, cosmetics, electronics, and household

appliances catalysis, bio sensing, imaging, drug delivery, nano device fabrication, and in medicine treatment of brucellosis, anti-inflammatory, mosquito larvicidal.

Utilization of biological materials in synthesis of nanoparticles is one of the main topics in modern nano science and nanotechnology. In the present investigation, the silver nanoparticles were synthesized by using the leaf extract of *Piper betle*. The synthesized nanoparticles can characterized by UV-Vis spectroscopy, X-ray diffraction (XRD), scanning electron microscope (SEM), transmission electron microscope (TEM), energy dispersive X-ray analysis (EDAX), and Fourier Transform Infrared Spectroscopy (FTIR). The observation of the peak at 450 nm in the UV-Vis spectra for leaf synthesized silver nanoparticles reveals the reduction of silver metal ions into silver nanoparticles. Further, XRD analysis confirms the crystalline nature of the synthesized silver nanoparticles. The TEM images show that the leaf synthesized silver nanoparticles were within the size of about 7–50 nm and 9–30 nm, respectively. The FTIR analysis is to identify the possible functional groups involved in the synthesis of silver nanoparticles. Further, the antibacterial activity of the green-synthesized silver nanoparticles was examined against plant pathogens. This property of silver nanoparticles is a beneficial application in the field of agricultural nanotechnology.

Silver nanoparticles is the most recent advances in the application and development of coatings for fresh and minimally processed fruits, discussing wide range of compounds that can be used in the formulation of coatings depending on target application, the available and potential techniques to characterize coated commodities. Have they focusing on the development of new technologies that allow for a more efficient control of coating properties and functionality, and incorporation of nutritional and anti-microbial ingredients to the coatings.

Over the past decade, there has been a strong push toward the development of silver-containing materials for commercial use that exhibit antimicrobial or bacterial resistance. Chemical synthesis methods produce a toxic substance as by-product, therefore green synthesis of nanoparticles is reliable because it does not use toxic chemicals in the synthesis protocols.

The term nanocoatings in food applications correspond to thin layers of nano-materials applied onto surfaces of highly perishable foodstuff, such as fresh-cut fruits and vegetables. Fruits and vegetables were coated in low molecular of silver nanoparticles or using sterile cotton swab thrice. Overall encapsulation has been done after drying of vegetables in time period, and stored at room temperature. Samples were stored in aseptic condition for 28 days for further analysis. The use of protective nano-coating with silver nanoparticle has become a topic of great interest in the field of food nanotechnology because of their potential for increased shelf life of many food products.

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Objective of the study are

- Synthesis of silver nanoparticle using *piper betle* leaf extract.
- Study on antimicrobial properties of extracted silver nanoparticle.
- Study on the effect of coating using silver nanoparticle on tomato.

II. Methodology

A. Collection of plant leaves

Leaves of plant *Piper betle* were collected. The chosen leaves are of having high antimicrobial as well as antioxidant properties.

B. Preparation of leaf extract

Primarily the leaves were washed under running water and dried. Then it was finely cut and weighed. 20g of finely cut betle leaf is boiled in 200ml of double distilled water for 3 minutes. Using whatmann no.1 filter paper the boiled solution is filtered out. Filtrate obtained is stored at 4˚C for two weeks.

C. Synthesis of silver nanoparticles from leaf extract

3ml of silver nitrate solution is added in a conical flask and 90ml of distilled water was added into it. Then the solution is taken in a 250ml of Erlenmeyer flask and 10ml of leaf extract is added into silver nitrate solution kept at room temperature.

D. Characterization of silver nanoparticles

1. Digital photo calorimeter

The production of silver nanoparticles was monitored using calorimeter. For these the prepared extract was taken in a cuvette and placed in the calorimeter. The analysis of photometer showed an absorbance peak at 400-450nm wavelength range, which correspond to silver nanoparticles production.

2. Colour change

As the leaf extract was mixed in the aqueous solution of silver ions complex, it started to change the colour from yellowish to brown colour due to the reduction of silver ions, which may be indication of silver nanoparticle. The reduction of silver ions into silver particle during exposure to leaf extract is followed by the colour change from yellow to brown.

E. Antimicrobial activity

Antibacterial activity was studied by using agar disc diffusion method. 1.68gm of nutrient agar is mixed with 60ml of distilled water and boiled the solution until bubble appeared on the top surface of the beaker. 2 petriplates were prepared for antibacterial activity. Nutrient agar solution was poured on to 2 petriplates in laminar air flow. Plates were swabbed with different organisms such as *E.coli*, and *Salmonella*. Then 40µl of silver nanoparticles were taken and poured on the prepared plate. Plates were placed in the incubator for 24 hr. After 24hr the plates were observed to obtain antimicrobial activity.

F. Film preparation

Sodium alginate was weighed to 2.5g and dissolved in 25ml of glass-distilled water by mixing slowly with a magnetic stirrer for 30 min; 1ml of glycerol was added to the medium, and the temperature of the mixture was increased until it started to boil. Mixing was then ceased, and the solution was boiled for 5 min. After the mixture had cooled to room temperature, silver nanoparticles (80 µl /ml) were added to it. This mixture was further stirred for 20 min and then spread evenly onto a glass plate, which had been previously cleaned and wiped with ethanol. The plates were placed in an incubator, and the thin film was dried at room temperature for 24hr.

G. Film coating procedure

Surface-sterilized tomatoes were taken for sodium alginate coating with silver nanoparticles. The silver nanoparticle incorporated thin films were directly coated on tomato. And excess coating was allowed to drain completely. Then the coating was dried in air blower equipment. Coated and uncoated tomatoes were kept at room temperature for further analysis.

III Results and discussion

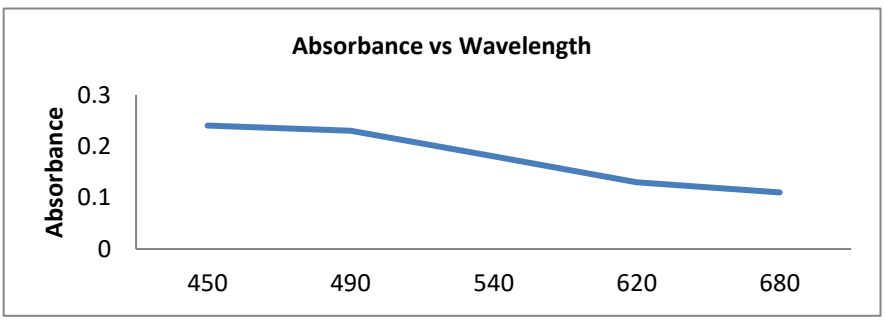
A. Green synthesis of silver nanoparticle

Piper betle was used to produce silver nanoparticle. The reduction of silver ions into silver particle during exposure to leaf extract is followed by the color change from yellow to brown. As the leaf extract was mixed in the aqueous solution of silver ions complex, it started to change the color from yellowish to brown color due to the reduction of silver ions, which may be indication of silver nanoparticle.

B. Photo calorimetric analysis of silver nanoparticles

The leaf extract showed to synthesize the silver nanoparticle by the indication of suitable surface resonance (SPR) with the high band intensities and peak under visible spectrum. Silver nanoparticle shows maximum absorbance 0.24 at 450 nm. Increase of absorbance indicates that amount of silver nanoparticles increases. The peak level of silver nanoparticle is in between 400- 500 nm. The absorbance of silver nanoparticle solution under different wavelength is given as graphical representation below.

Graph 1 Absorbance of silver nanoparticle for different wavelength



C. Antimicrobial activity of silver nanoparticles

Silver nanoparticles have an adverse effect on bacteria. Zone of inhibition formed indicated that silver nanoparticle has efficient antimicrobial activity against pathogenic bacteria. The mechanism behind the destruction of organisms is by detaching silver ions from nanoparticles and it get attached to the cell wall of microbes. It will lead to the death of microbes. For E coli, the zone of inhibition of silver nanoparticle is 10mm while the zone of inhibition in salmonella is 14mm. The green synthesized silver nanoparticles could be of immense use in medical field for their efficient anti-microbial function. This Zone formation clearly shows the antimicrobial activity of silver nanoparticle

Figure 1 Zone of inhibition of *E.coli*



Figure 2 Zone of inhibition of *salmonella*



D. Coating with thin film of silver nanoparticle on tomato

While coating with thin film of sodium alginate incorporated silver nanoparticle tomato shows characteristic changes in color and weight. Coating was done under sterile condition and room temperature.

E. Color change

After checking the color change during storage period in control color change of tomato occurs from reddish to light yellowish red and in coated sample color remains the same as from 1st day to 20th day.

Figure 3 Coated sample 1st day



Figure 4 Coated sample after 10 days

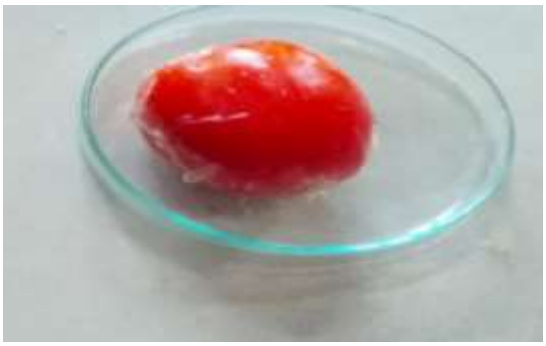


Figure 5 Coated sample after 20 days



Figure 6 Control sample 1st day



Figure 7 Control sample after 10 days



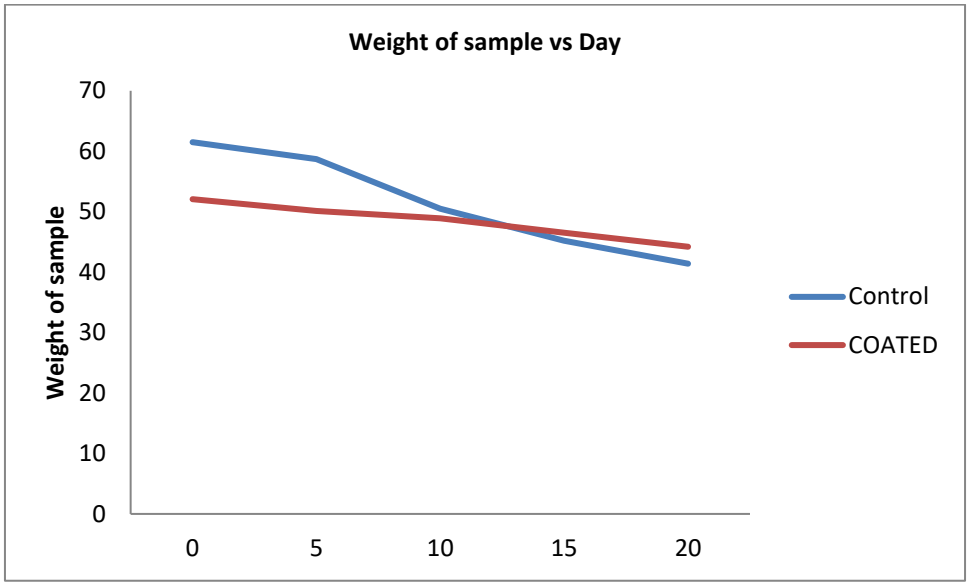
Figure 8 Control sample after 20 days



F. Weigh loss

Coated and uncoated tomatoes were weighed regularly to determine the weight loss. It depends upon transpiration of tomato and permeability of coating material. Characteristic weight loss of coated tomato and control during the storage period is given as graphical representation.

Graph 2 Weight losses vs days



IV. Conclusion

Silver nanoparticles were successfully synthesized using *Piper betle* leaf extract. The present study represents a clean, non-toxic as well as eco-friendly procedure for synthesising silver nanoparticle. This technique gives us a simple and efficient way for the synthesis of nanoparticle. Silver nanoparticles are bactericidal. Due to their stable nature and antimicrobial property, the silver nanoparticles can be utilized as a remedial purpose especially in food coating. The nanoparticle incorporated food particles are of great concern. In conclusion this green chemistry approach toward the synthesis of silver nanoparticle poses several advantages. Applications of such silver nanoparticle incorporated films have improved antimicrobial properties which make this method more effective.

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VIBRATION ANALYSIS OF WOVEN CARBON FIBRE REINFORCED COMPOSITE BEAMS OF VARIOUS CROSS-SECTIONAL SHAPES

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***Abstract**: Composite materials reinforced with woven fabrics are now increasingly used for various structural applications due to its in-plane properties. Vibration characteristics of carbon/epoxy composite beams await increased attention in structural industries such as aerospace, automotive, machine tools, marine industries. Study of Passive damping vibration helps to mitigate the vibrations. Laminated composite sections possess high stiffness to weight ratio with enhanced durability characteristics. But these light weight structures are likely to undergo large amplitude vibration leading to failure of the structure.. However, being light weight, they are prone to undergo large deformation and excessive vibration. Hence, it is very much important to predict the vibration behavior of these composite beams accurately.*

***Keywords**: Woven Carbon Reinforced composite Beam; Vibration Analysis; Mode shapes; harmonicresponse ;ANSYS*

Introduction

Beams are fundamental models for the structural elements of many engineering applications and have been studied extensively. A promising approach for developing a solution for structural vibration problems is provided by an advanced numerical discretisation scheme, such as; finite element method (FEM). The fiber-reinforced composite materials are ideal for structural applications where high strength-to-weight and stiffness-to-weight ratios are required. Composite materials can be tailored to meet the particular requirements of stiffness and strength by altering lay-up and fibre orientations.. So the research and development of composite materials in the design of aerospace, mechanical and civil structures has grown tremendously in the past few decades. It is essential to know the vibration characteristics of these structures, which may be subjected to dynamic loads in complex environmental conditions.

If the frequency of the loads variation matches one of the resonance frequencies of the structure, large translation/torsion deflections and internal stresses can occur, which may lead to failure of structure components. A variety of structural components made of composite materials such as aircraft wing, helicopter blade, vehicle axles, and turbine blades can be approximated as laminated composite beams, which requires a deeper understanding of the vibration characteristics of the composite beams.

The practical importance and potential benefits of the composite beams have inspired continuing research interest. A number of researchers have been developed numerous solution methods in recent 20 years.

MandarChati, journal is based on the dynamic analysis of cracked beam. In this paper, modelling of the opening and closing of the crack as a multi degree of freedom. Piecewise linear system definition of an effective natural frequency called the bilinear frequency.K.Vigneshwaran studied about the damping properties of different fibre orientations such as 0˚, 45˚ and 90°were studied.Jaehong Leean analytical model was developed to study the flexural – torsional vibration of laminated composite beam with i section. The model was found to be efficient in analysing free vibration problem

Methodology

The analysis was done using ANSYS 19 SOFTWARE, so as to check the accuracy and percentage of variation. The cantilever beam was analysed using ANSYS and then validated the results with manual formula. Comparing manual and software results, almost same results were obtained but software value reduced by 1.7164%. This variation lies within the permissible limit.

- Literature survey to understand the behaviour and properties of carbon woven composite beams
- Fixing the objectives of the thesis
- Study of ANSYS software

- Modelling
- Model 1 – I section under cantilever and simply supported condition
- Model 2- box section under cantilever and simply supported condition
- Model 3- channel section under cantilever and simply supported condition.
- Analysis
- Comparison of results

The finite element modeling was done using ANSYS 19.1 software. The models of woven carbon fiber composite beams were created using the software. The variations are given in lamina angles.. The main purpose of changing these parameters are to find the effect of these parameters in the performance of composite beams and to choose best one in each configuration among this. The beams were analyzed for cantilever, and simply supported conditions

III .Objective

- To find the natural frequencies ,mode shapes ,damping ratio of box ,channel and I sections
- To study about the variations in vibration behaviour under varied thickness an orientations of layer.
- To analyse the beams in fixed, cantilever conditions and simply supported conditions.
- To study the response of beams under harmonic and transient loads.

IV.Modelling

The beam analysed was assumed to have four layers of composites with 1.25mm thickness. The lamina angles were changed .the beams were analysed for 0^0,45^0,90^0,45^090^0.The beam section is assumed to be fixed at one of its ends. The beams are also analysed for simply supported condition. The beams are analysed for behaviour under various damping ratios.

Figure 1 Model Of I section Used For analysis In ANSYS

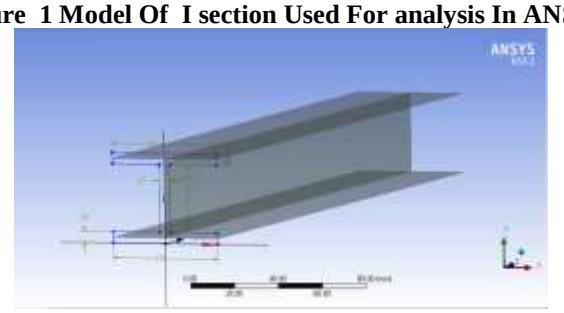


Figure 2 Model Of box section Used For analysis In ANSYS

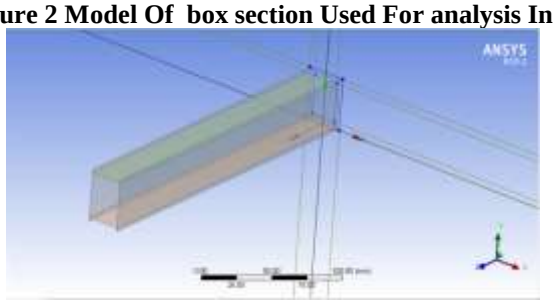
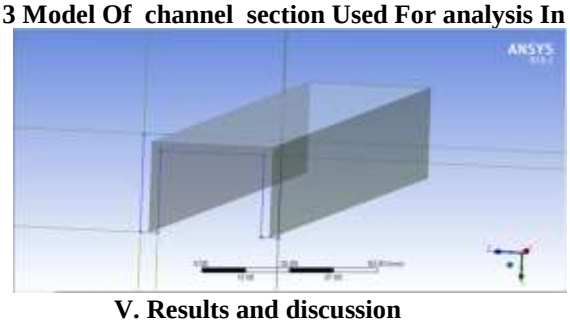


Figure 3 Model Of channel section Used For analysis In ANSYS



V. Results and discussion

Natural frequencies obtained from ANSYS are listed in tables and graphsAnd mode shapes are presented by graphs for different boundary conditionsFinally, complete content and organizational editing before formatting.

Figure 4 Cantilever I section with 4 layers with 0^0laminae angle (first mode shape)

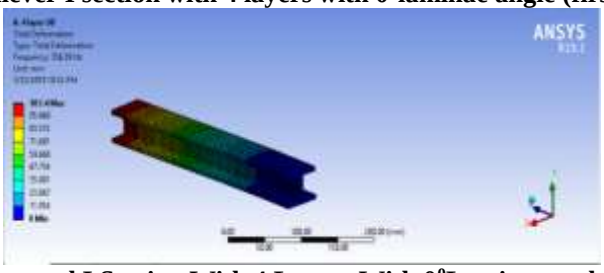


Figure 5 Simply Supported I Section With 4 Layers With 0^0Laminaeangle (First Mode shape)

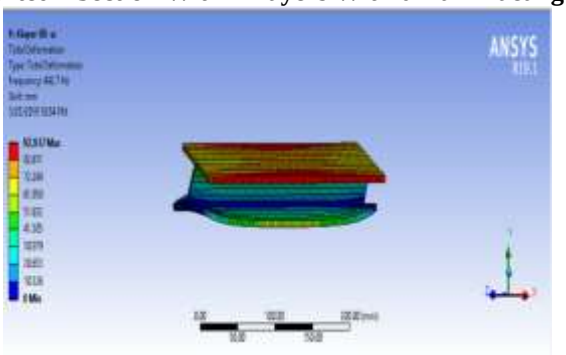


Table1 showing the variation of mode shapes with laminae angle for a cantilever I section

NUMBER OF LAYERS	LAYER ORIENTATAION	FIRST MODESHAPE	SECOND MODESHAPE
4	0/0/0/0	356.39	432.81
	45/-45/45/-45	312.7	390.45
	90/-90/90/-90	356.39	432.81
	45/90/-45/-90	337.56	416.52

Table2 showing the variation of mode shapes with laminae angle for a simply supported I section

NUMBER OF LAYERS	LAYER ORIENTATAION	FIRST MODESHAPE	SECOND MODESHAPE
4	0/0/0/0	442.7	865.86
	45/-45/45/-45	461.3	928.31
	90/-90/90/-90	442.7	865.86
	45/90/-45/-90	452.09	897.12

Figure 6Cantilever box section with 4 layers with 0^0laminae angle (first modeshape)

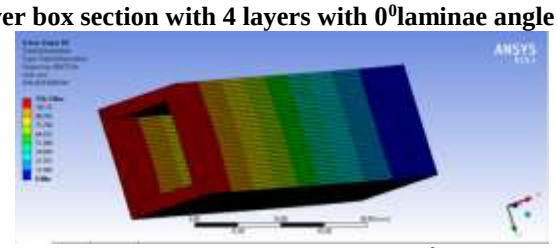


Figure 7 Simply supported box section with 4 layers with 0^0 lamina angle (first mode shape)

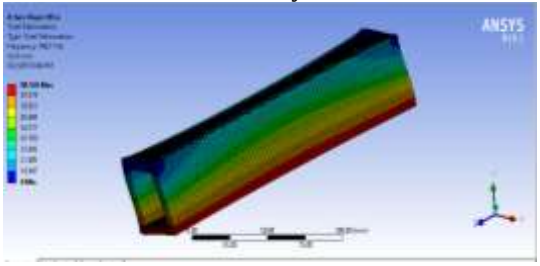


Table 3 showing the variation of mode shapes with laminae angle for a cantilever box section

NUMBER OF LAYERS	LAYER ORIENTATAION	FIRST MODESHAPE	SECOND MODESHAPE
4	0/0/0/0	630.75	647.77
	45/-45/45/-45	332.09	428.18
	90/-90/90/-90	385.25	731.52
	45/90/-45/-90	399.76	662.26

Table4 showing the variation of mode shapes with laminae angle for a simply supported box section

NUMBER OF LAYERS	LAYER ORIENTATAION	FIRST MODESHAPE	SECOND MODESHAPE
4	0/0/0/0	746.11	1573.1
	45/-45/45/-45	1036.6	1535.2
	90/-90/90/-90	904.46	1812.7
	45/90/-45/-90	917.16	2060.8

Table5 showing the variation of mode shapes with lamina angle for a cantilever channel section

NUMBER OF LAYERS	LAYER ORIENTATAION	FIRST MODESHAPE	SECOND MODESHAPE
4	0/0/0/0	450.01	511.47
	45/-45/45/-45	450.86	465.9
	90/-90/90/-90	453.45	511.65
	45/90/-45/-90	460.98	484.16

Table 5 showing the variation of mode shapes with lamina angle for a simply supportedchannel section

NUMBER OF LAYERS	LAYER ORIENTATAION	FIRST MODESHAPE	SECOND MODESHAPE
4	0/0/0/0	1372.3	1665.5
	45/-45/45/-45	1383.7	1518.3
	90/-90/90/-90	1352.5	1672
	45/90/-45/-90	1383.7	1613.2

VI . Conclusion

From the analytical values obtained the following conclusions can be made

- The number of laminated layers of composites provided does not depend on the mode shapes of the beams
- The maximum values of natural frequencies' are obtained for 90^0 orientation of layer
- The higher values of mode shapes are obtained for channel sections under simply supported conditions.
- The tensile & flexural strengths are superior in case of 90 degree fibre orientation
- Specimen sustain greater load at 90 degree orientation specimens than in other orientations.

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STRENGTH STUDY OF STIFFENERS ON CASTELLATED BEAM WITH VARIOUS OPENINGS

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***Abstract**: Castellated beams are fabricated by cutting I section in zigzag way and re-joining it in such a way that the depth of the parent I section is increased. Hence due to increase in depth of beam the load carrying capacity of the parent I section is increased with the same quantity of material. The limitation of castellated beam is the stress concentration around the opening which reduces the stability and shear carrying capacity of the beam. To reduce the stress concentration and to improve the shear carrying capacity, stiffeners are introduced. In this paper castellated beams are fabricated for hexagonal, octagonal, oval and elliptical openings. The beam is analyzed using Finite Element Analysis in ANSYS software. The deformation and stress distribution for the castellated beam for various openings with stiffeners are calculated and the values are compared.*

***Keywords**: stress concentration; hexagonal; octagonal; oval; elliptical; deformation*

I. Introduction

Use of steel as structural member in structure is rapidly gaining interest now a day due to their various advantages such as the better satisfaction with the flexible architectural, durability, strength to weight ratio, design, low inclusive cost and environmental protect as steel is manufacture to precise and uniform shapes. So generally, steel sections are safe in strength requirement, however, sections do not satisfy serviceability requirements.Castellated beams are fabricated from wide flange I-beam. The web of the section is made cut along horizontal x-x axis. The two halves are then welded together to produce a beam of greater depth without any increase in the weight. Hence, due to increase in depth of beam load carrying capacity of the parent I section is increased with same quantity of material.However, the presence of the holes in the web will change the structural behavior of the beam from that of plain webbed beams.The advantages of the castellated beam are they have cheap labor cost. The limitation of castellated beam is the stress concentration around the opening which reduces the stability and shear carrying capacity of the beam. To reduce the stress concentration and to improve the shear carrying capacity, stiffeners are introduced.Two types of stiffeners, diagonal & vertical stiffeners are introduced on the castellated beam. Vertical stiffeners on the solid portion of castellated beam and diagonal stiffeners on the hole openings The openings made in the webs are of hexagonal, octagonal, oval and elliptical in shape. There are several analytical tools available for analyzing castellated beams. Among all the available analytical methods, finite element analysis (FEA) offers a better option**.** This method discretizes the continuum into finer elements, making it somewhat tedious and complex to handle manually. Computer assisted programs make the use of finite element method quick easier.Directional deformation, Equivalent stress and Normal stress are studied.

II. Literature Review

These are some of the conclusions from various literature reviews,

- When improving the behavior of castellated beam by adding spacer plates and steel rings, the flexural stiffness and ultimate strength of the castellated beam is increased.
- In the study of castellated beam with varying depth of web opening, the structural behaviour of castellated steel beam will be different from that of the solid web beams.
- In the design Comparison of Castellated Beam for Different Parameters, by changing ratio of depth of opening to the depth of beam, it is seen that as ratio increases stresses are also increases.
- In the finite element analysis of castellated beam, the results show that the local failure of castellated beam is one of the major issues due to lack of shear transfer area.

III. Objectives

- Castellated beam with hexagonal, octagonal, oval and elliptical openings with a depth of opening 140mm and 130mm are modelled.
- Vertical and diagonal stiffeners are introduced.
- To study the deformation.
- To study the equivalent stress.
- To study the normal stress.
- Compare the results obtained for the various stiffeners on the four different openings.

IV. Methodology

- Study of related literatures.
- Modelling by ANSYS
- Analysis
- Comparison of results.
- Arriving at conclusion

V. Numerical Study

A. Structural Description

HE 300 B Section is selected. Specimen details are given below;

Table I shows specimen details of HE 300 B

Specimen Details	Dimension (mm)
Width of flange	300
Thickness of flange	19
Thickness of web	11
Overall depth	300
Length of beam	3000
Depth of openings	140 &130
Thickness of stiffener	5

B. Data Inputs for Modelling

The main input data for modelling the structure are the following properties of steel:

Table II shows data inputs for modelling

Modulus of Elasticity (MPa)	$2x10^5$
Poisson's ratio	0.3
Density ($Kg/m^{3)}$	7850

C. Finite Element Models

Figure 1 Castellated beam with hexagonal opening with vertical stiffener at a depth of 140mm

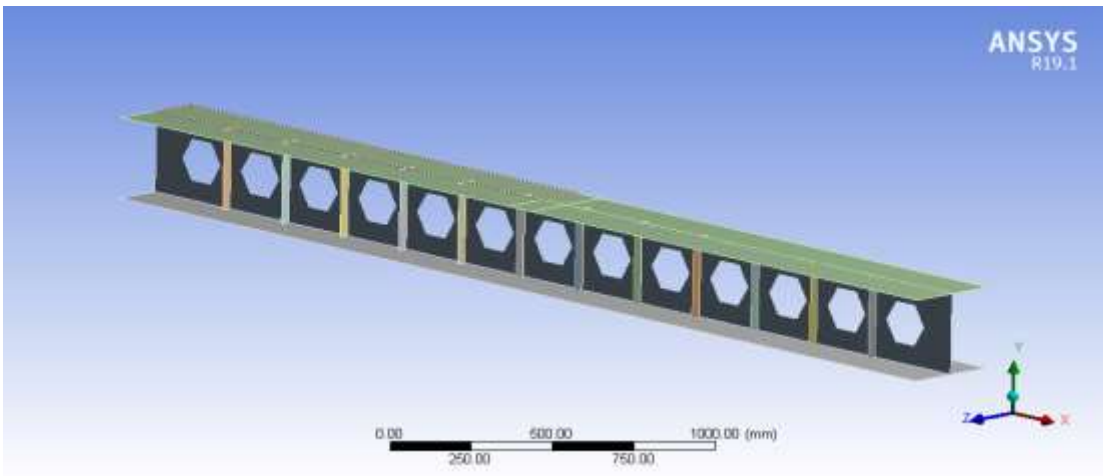


Figure 2 Castellated beam with octagonal opening with vertical stiffener at a depth of 140mm

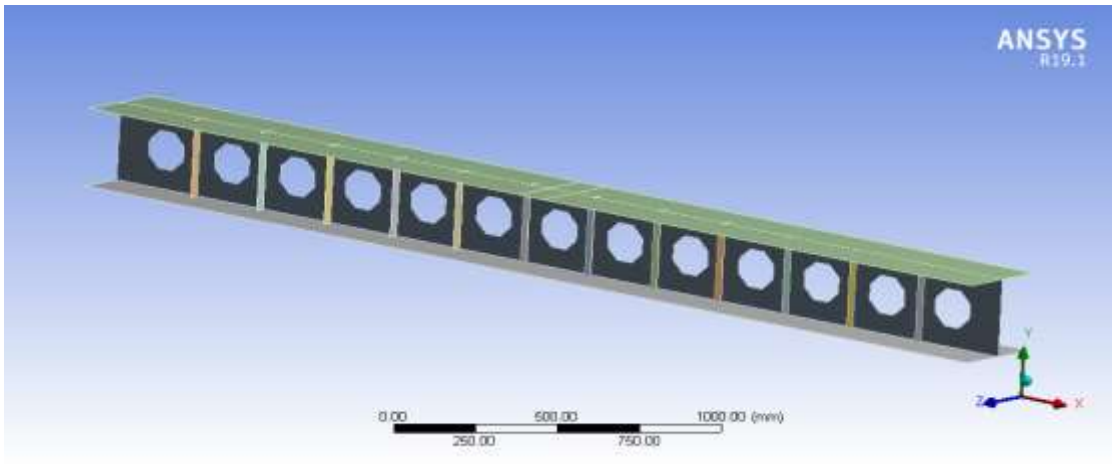


Figure 3 Castellated beam with oval opening with vertical stiffener at a depth of 140mm

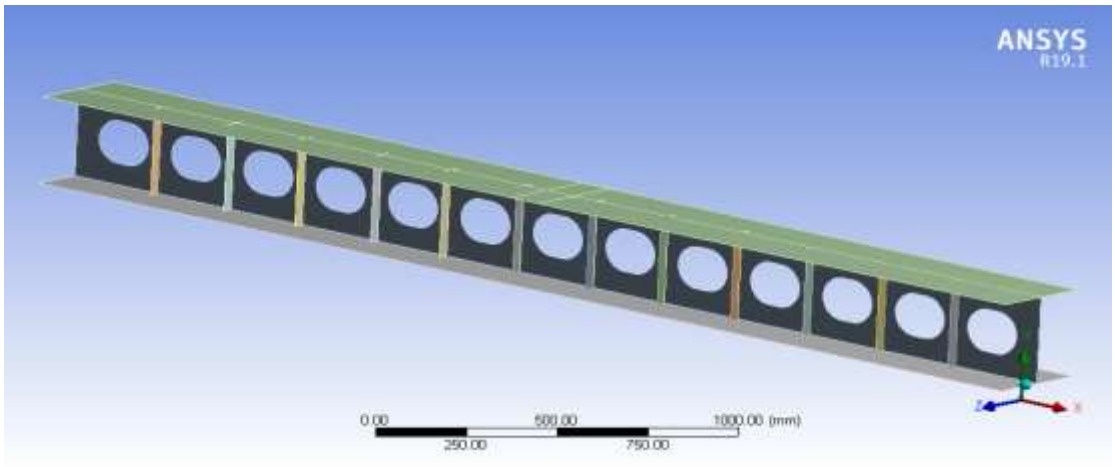


Figure 4 Castellated beam with elliptical opening with vertical stiffener at a depth of 140mm

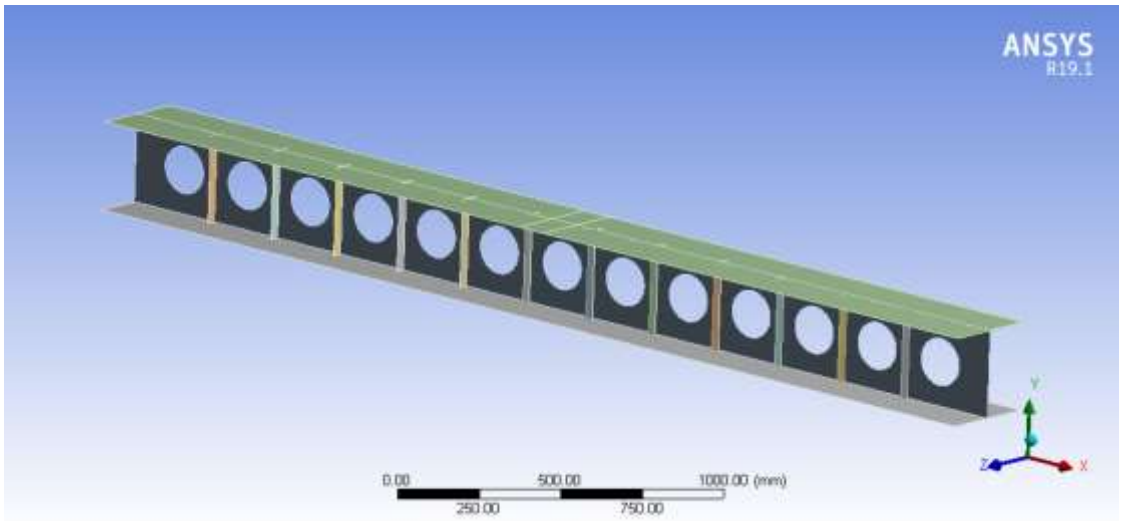


Figure 5 Castellated beam with hexagonal opening with diagonal stiffener at a depth of 140m

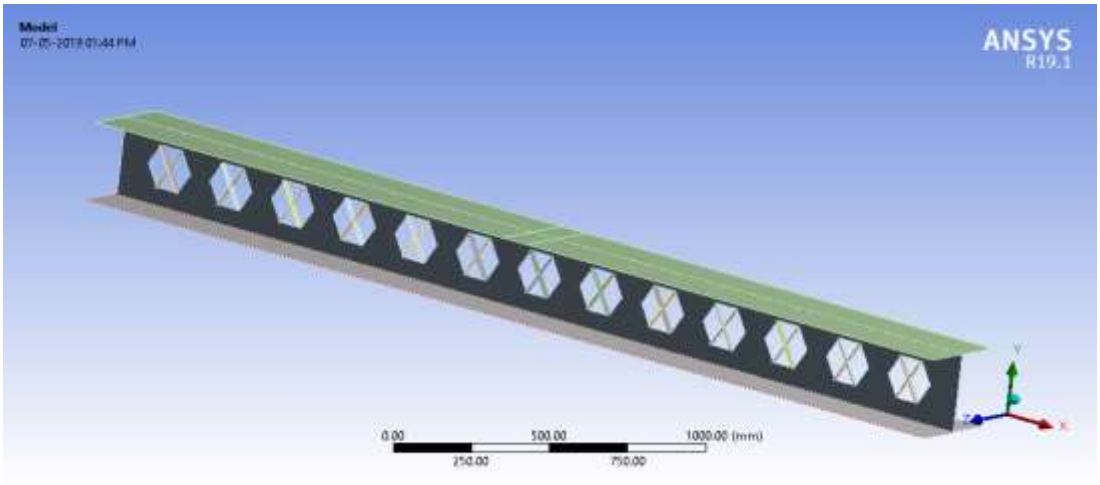


Figure 6 Castellated beam with octagonal opening with diagonal stiffener ata depth of 140mm

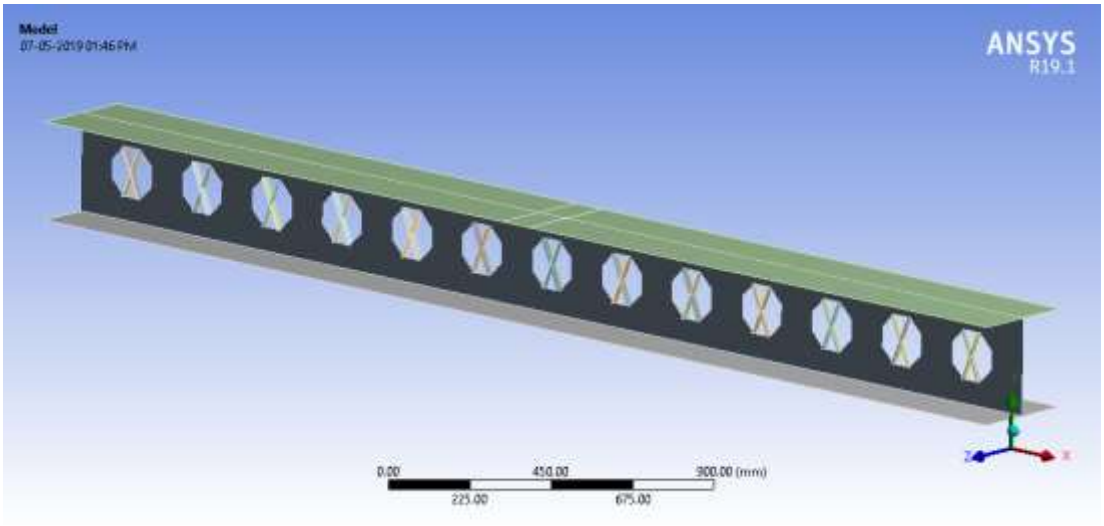


Figure 7 Castellated beam with oval opening with diagonal stiffener at a depth of 140mm

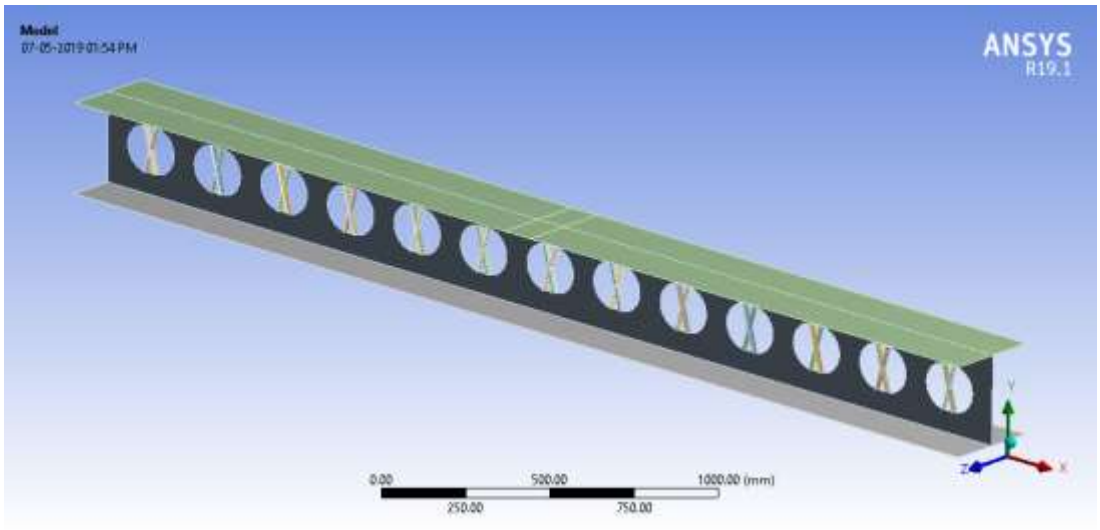
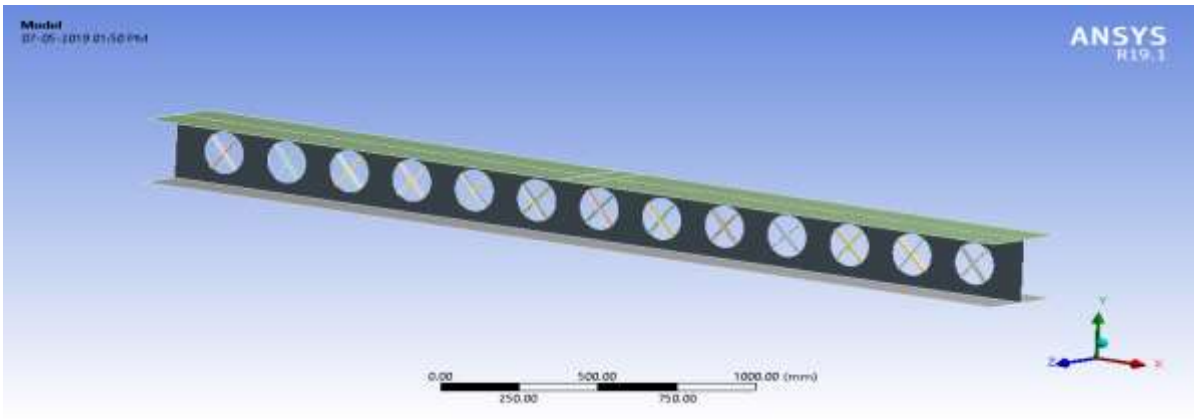


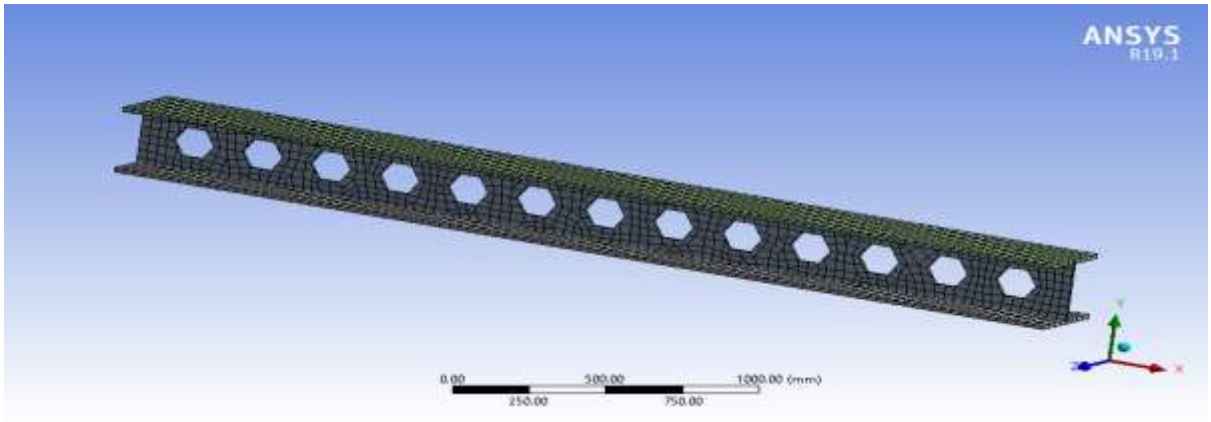
Figure 8 Castellated beam with elliptical opening with diagonal stiffener at a depth of 140m



D. Meshing of Model

It is important to select the mesh size in finite element analysis. A good mesh means accurate results with better convergence but also has time consideration. A very fine mesh model will always provide accurate results but will require excessive computer time. In this analysis, suitable numbers of elements were carefully chosen for the models based on mesh convergence studies in order to obtain accurate results.

Figure 9 Meshed Model



E. Results and discussion

The results for the castellated beams with hexagonal, octagonal, oval and elliptical openings were obtained in terms of deformations for particular loading, represented in software simulated models. The equivalent stress and Normal stress values are also obtained with simulation.

Figure 10 Directional deformation for castellated beam with elliptical opening with vertical stiffener at a depth of 140mm

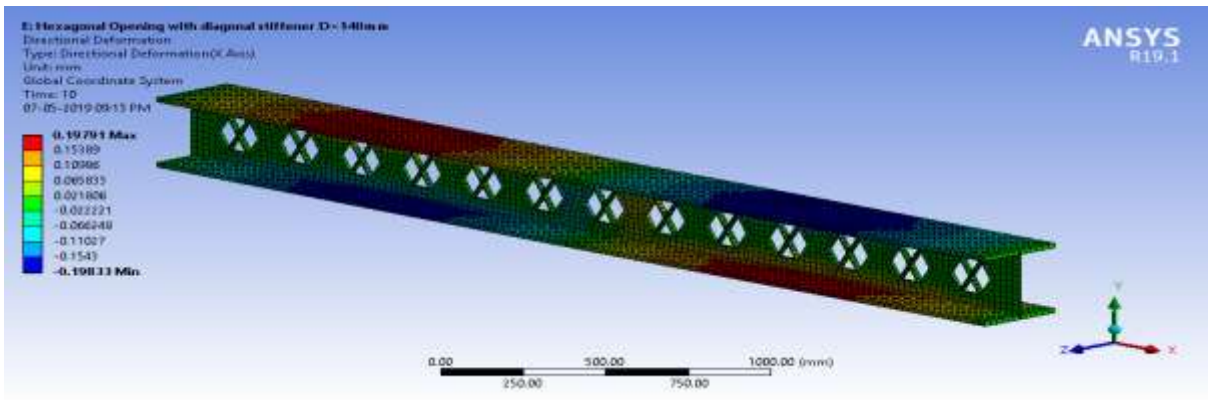


Figure 11 Equivalent stress for castellated beam with elliptical opening with vertical stiffener at a depth of 140m

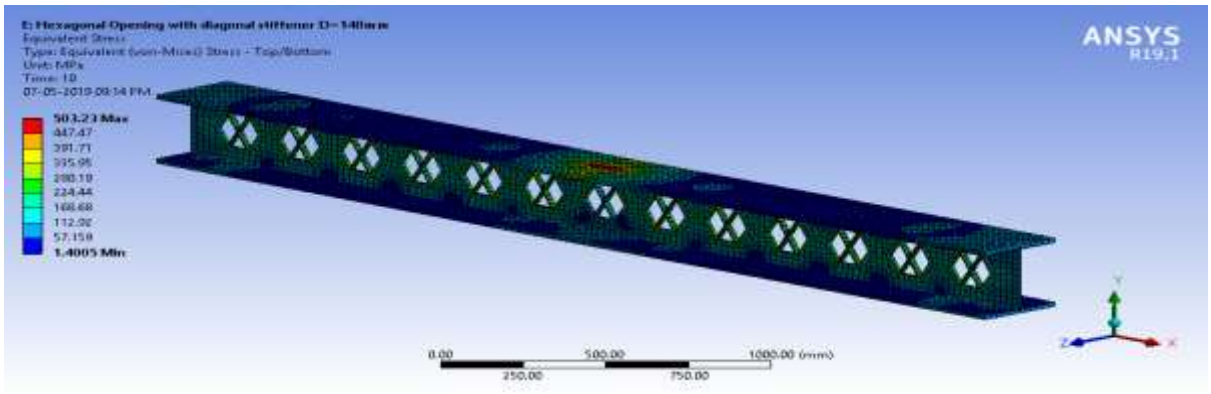


Figure 12Normal stress for castellated beam with elliptical opening with vertical stiffener at a depth of 140mm

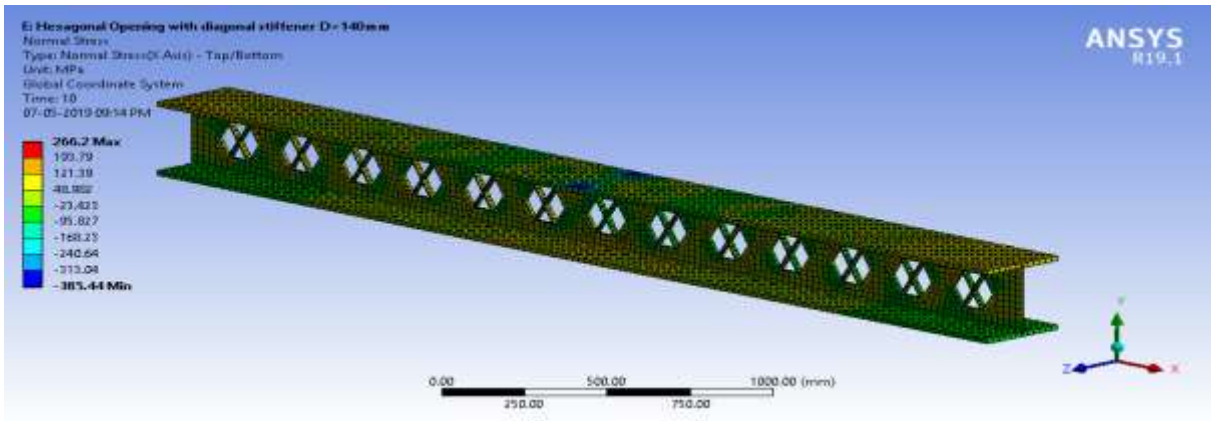


Table 3 shows the analysis values for the castellated beam

		Directional deformation (mm)	Equivalent stress (MPa)	Normal stress (MPa)
Hexagonal opening with 130mm depth of opening	Without stiffener	0.19307	502.17	234.56
	With vertical stiffener	0.19188	502.86	254.33
	With diagonal stiffener	0.18988	502.94	256.12
Hexagonal opening with 140mm depth of opening	Without stiffener	0.20194	502.45	244.48
	With vertical stiffener	0.1998	503.15	265.74
	With diagonal stiffener	0.19791	503.23	266.2
Octagonal opening with 130mm depth of opening	Without stiffener	0.20596	502.92	246.6
	With vertical stiffener	0.20396	503.25	269.91
	With diagonal stiffener	0.20216	503.35	270.95
Octagonal opening with 140mm depth of opening	Without stiffener	0.21343	502.73	259.4
	With vertical stiffener	0.20141	503.25	269.56
	With diagonal stiffener	0.20111	503.67	272.07
Oval opening with 130mm depth of opening	Without stiffener	0.17315	501.05	248.26
	With vertical stiffener	0.17136	502.24	253.91
	With diagonal stiffener	0.17065	502.27	262.42
Oval opening with 140mm depth of opening	Without stiffener	0.19341	502.17	251.6
	With vertical stiffener	0.18961	502.82	252.45
	With diagonal stiffener	0.1794	503.31	263.99
Elliptical opening with 130mm depth of opening	Without stiffener	0.18825	502.05	229.72
	With vertical stiffener	0.18697	502.75	250.53
	With diagonal stiffener	0.18668	503.62	253.74
Elliptical opening with 140mm depth of opening	Without stiffener	0.19028	502.12	232.33
	With vertical stiffener	0.18804	502.78	251.78
	With diagonal stiffener	0.18744	503.62	282.26

For Comparison purposes the values of equivalent stress and normal stress are used. These values provide an average variation between the models. Equivalent stress is the maximum stress at which the structure begins to yield. It is a mathematical equivalent of the principal stresses. Usually used for ductile and for some composite structures.
The equivalent stress and normal stress for each model are obtained analytically and are illustrated below.

Figure 13 Equivalent stress for castellated beam with hexagonal opening at 130mm depth of opening

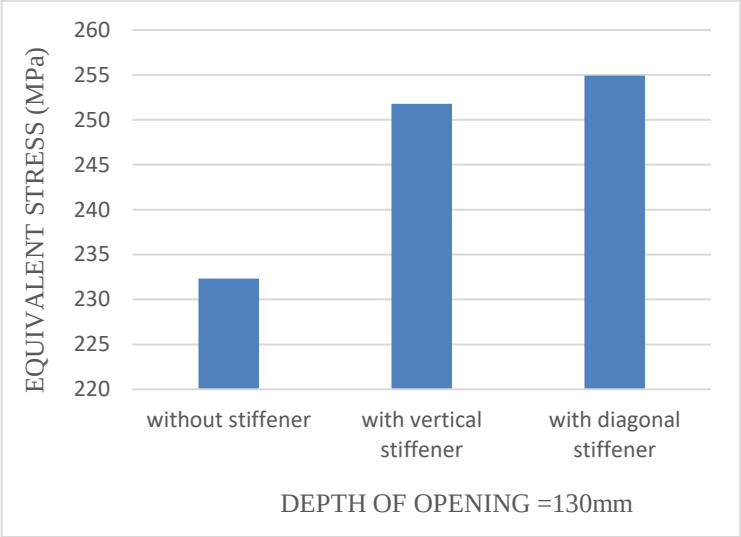
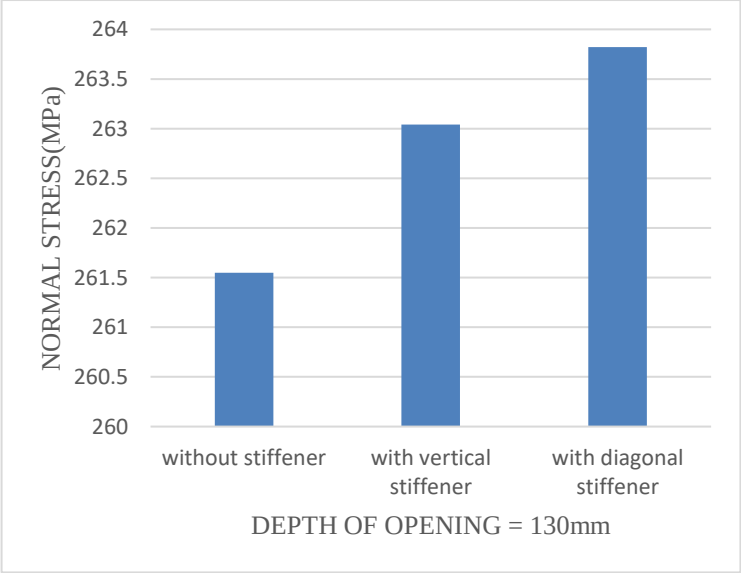


Figure 14 Normal stress for castellated beam with hexagonal opening at 130mm depth of opening



VI. Conclusion

- It can be concluded that castellated beams are well accepted for industrial buildings, power plant and multistorystructures, were spans are more with its economy.
- From the four cases, oval opening gives better results than hexagonal, octagonal and elliptical openings. Oval openings have lesser directional deformation and greater stress than other types of openings.
- Deflection can be effectively reduced by providing diagonal stiffeners in the shear zone of the web opening than vertical stiffeners.

- Shear failure is more near the holes than the solid web, hence diagonal stiffeners provided on the opening of the web is effective than the solid portion
- As the depth of the opening increases deformation increases.
- Therefore, castellated beam with diagonal stiffeners are good for aesthetic purpose, long span construction and cost effective purpose

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Experimental study of beams with openings strengthened using AFRP

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Abstract*: Openings in beams are provided mainly for the passage of ducts pipes and ducts which are essential to accommodate services like water supply, air conditioning, electricity, telephone and computer network. These openings are mainly designed to reduce weight and height of structure. The transverse openings in beams causes stress concentrations near the openings which affects the overall stability of structures. In this paper rectangular beam with square and circular holes are compared. Aramid Fiber Reinforced Polymer (AFRP) is used to strengthen the beam. AFRP are wrapped in the two different patterns: Horizontally and vertically directions. The effect of AFRP on the beam with openings, initial crack load and ultimate load at failure are discussed.*

Keywords:*Rectangular Beam, AFRP, Electricity, Transverse openings, concentration, circular holes*

I. Introduction

In the construction of modern buildings, a network of pipes and ducts is necessary to accommodate essential services like water supply, sewage, air-conditioning, electricity, telephone, and computer network. Usually, these pipes and ducts are placed underneath the beam soffit and for aesthetic reasons are covered by a suspended ceiling, thus creating a dead space. Passing these ducts through transverse openings in the beams leads to a reduction in the dead space and results in a more compact design. For small buildings, the savings thus achieved may not be significant, but for multistorey buildings, any saving in storey height multiplied by the number of stories can represent a substantial saving in total height, length of air-conditioning and electrical ducts, plumbing risers, walls and partition surfaces, and overall load on the foundation. The height of the pipes or service ducts will range from two centimeter to half a meter.

Utility pipes and ducts are necessary to accommodate essential services in a building. Opening reduces the storey height and material cost. Openings can be circular, square, or rectangular, triangular or trapezoidal in shape. Opening maintains the original behavior of the beam termed as a small opening. Behaviour of the beam changes and decreases the stiffness of the beam drastically, then the opening is termed as a large opening. Openings in beams results in the decrease of flexural and shear strength and formation of local cracks around the opening. Opening leads to disturbances and discontinuities in the normal flow of stresses around the opening.

In this study AFRP is used for strengthening of beams.. In AFRP the reinforcement is aramid fiber which provides the strength. Aramid fibers (AFRP) are high strength fibers that are better known for their use in bullet- and fire-resistant clothing. High strength, high elastic modulus, and high abrasion resistance make these fibers well suited for fiber reinforced polymer (FRP) reinforcement and strengthening applications.

In this paper, a detailed experimental program was conducted. The main objectives of the experimental investigations were :

- To determine the mechanical properties such as compressive strength, splitting tensile strength and flexural strength of M30 grade concrete.
- To evaluate the first crack load and ultimate load carrying of the beam with and without opening.
- To investigate the effect of size and shape of opening.
- To study the flexural behavior of strengthened beam using AFRP.
- To compare the load deflection behavior, energy absorption capacity of beam specimen.
- To compare the results of various strengthening techniques and find out the best strengthening technique.

II. Experimental Program

In the experimental program, a total of thirty eight reinforced concrete beams were tested to failure under two point loading to investigate the structural behavior including ultimate load, failure mode and load deflection. The openings region was strengthened by AFRP laminates to re-gain the loss of structural capacity.

A. Test specimen

The test specimen was 1200 mm long with a rectangular cross section of 150 x 200 mm. The first and second groups of beams with and without hole were tested without strengthening were considered as control specimens. The third and fourth group of beam with square and circular openings strengthened by AFRP sheets.

B. Reinforcement details

Main reinforcement bar at bottom are chosen as 2 nos of 12 mm diameter bars and at top are chosen as 2 nos of 8 mm diameter bars. Stirrups chosen are 2 legged 8 mm diameter bars at 150mm center to center spacing. Beams were simply supported and were subjected to two point loads symmetrically placed at equal distance from the center line of the beam. Further details of the cross section of the beams are shown in Fig.1 shows reinforcement cage of the beam.



Fig.1. Reinforcement cage of the beam

C. Casting and curing

The concrete was placed into the mould immediately after mixing and well compacted. The test specimens were remolded at the end of 24 hours of casting. They were cured in water for 28 days. After 28 days of curing the specimen were dried in air and white washed. Then all the beams were loaded up to the first crack and control beams were loaded up to the ultimate load. Fig 2



Fig.2. Control Beam



Fig.3 Beam with one square opening



Fig.4. Beam with two square openings



Fig.5. Beam with three square openings



Fig.6. Beam with one circular opening



Fig.7. Beam with two circular openings



Fig.8 Beam with three circular holes

D. Test Procedure

The specimens were tested in a loading frame of 2000 kN (200t) capacity with an effective span of 1000 mm by keeping the beam in horizontal position with two point loading system of 33.33 cm internal loading distance and hinge at a distance of 2.5 cm from the end support. The load was applied on top of the beam until cracks were identified and first crack load was noted. Further the loading was continued until the ultimate load was obtained. At each stage of loading deflection at midspan was found out using a dial gauge. Fig 9 shows the schematic diagram of test set up.



Fig.9Test set up of Beam without opening and Square opening

E. Beam designation

Table 1 shows the Beam designations

SL No.	Specimen Details	Designation
1	Control beam	CB
2	Beam with one circular opening	BCO1
3	Beam with two circular openings	BCO2
4	Beam with three circular openings	BCO3
5	Beam with one square opening	BSO1
6	Beam with two square openings	BSO2
7	Beam with three square openings	BSO3
8	Beam with one circular opening strengthened by AFRP horizontally	BCOH1
9	Beam with two circular opening strengthened by AFRP horizontally	BCOH2
10	Beam with three circular opening strengthened by AFRP horizontally	BCOH3
11	Beam with one circular opening strengthened by AFRP vertically	BCOV1
12	Beam with two circular opening strengthened by AFRP vertically	BCOV2
13	Beam with three circular opening strengthened by AFRP vertically	BCOV3
14	Beam with one square opening strengthened by AFRP horizontally	BSOH1
15	Beam with two square opening strengthened by AFRP horizontally	BSOH2
16	Beam with three square opening strengthened by AFRP horizontally	BSOH3
17	Beam with one square opening strengthened by AFRP vertically	BSOV1
18	Beam with two square opening strengthened by AFRP vertically	BSOV2
19	Beam with three square opening strengthened by AFRP vertically	BSOV3

F. Result and Discussion

All beams were tested under two point loading condition in the loading frame of 2000kN capacity. Load was applied by hydraulic jack, then these beams were loaded up to the first flexural cracking.
The AFRP wrapped specimens showed improvement in the properties compared to control beam.

Table 2. First crack load and Ultimate load for various beam specimens

SL No.	Beam designation	First crack load (kN)	Ultimate load (kN)
1	CB	24	42
2	BCO1	19	35
3	BCO2	20	36
4	BCO3	22	38
5	BSO1	12	28
6	BSO2	14	31
7	BSO3	17	33

Table 3 First crack load and ultimate load for strengthened beam specimens

SL No.	Beam designation	First crack load (kN)	Ultimate load (kN)
8	BCOH1	26.8	54
9	BCOH2	27.1	56
10	BCOH3	29.5	58
11	BCOV1	17	48
12	BCOV2	22	50
13	BCOV3	24	56.3
14	BSOH1	24.1	47
15	BSOH2	25	50
16	BSOH3	26	52
17	BSOV1	16	46
18	BSOV2	20	48.5
19	BSOV3	22	50

G. Failure Modes

Beam without opening (CB)

The control beam was tested by applying the point loads gradually. The first crack was visible at a load of 28kN. As the load increased beyond the first crack load, many inclined cracks were also developed and the first visible crack started widening. With further increase in load, the beam finally failed at a load of 55kN exhibiting a wider crack. The control beam failed in the flexural mode due to the yielding of internal tensile steel reinforcement. The flexural cracks were developed at midspan and then extended to compression region

Beam with circular openings

The beams BCO1, BCO2, BCO3 were tested by applying the point loads gradually. The first hair crack was visible at a load of 20kN, 22kN and 26kN respectively. As the load increased beyond the first crack load many cracks also developed at the openings and the first visible crack started widening. With further increase in load the beam with opening failed at a load of 44kN, 50kN, and 53.5kN for BCO1, BCO2 and BCO3 respectively exhibiting a wider crack. It was found that the ultimate load carrying capacity was decreased by 20%, 9.1% and 2.73% by comparing with the CB. As the number of openings is increased the ultimate load carrying capacity is increased because openings having equal area of cross section.

Beams with square openings

The beams BSO1, BSO2 and BSO3 were tested by applying the point loads gradually. The first hair crack was visible at a load of 14kN,16kN and 19.5kN respectively. As the load increased beyond the first crack load many cracks were also developed at the opening and the first visible crack started widening. With further increase in load the beam with square opening failed at a load of 36kN, 40kN and 42.5kN exhibiting a wider crack. Compared to circular openings the ultimate load carrying capacity is decreased for specimens with square openings. The ultimate load capacity of BSO1, BSO2 and BSO3 with equal area for the openings increased by 34.6%, 27.3% and 22.8% by comparing with CB. On comparing with circular openings the load carrying capacity of the square openings get reduced. Fig10 shows the comparison of first crack load and ultimate load of beam without openings and openings.

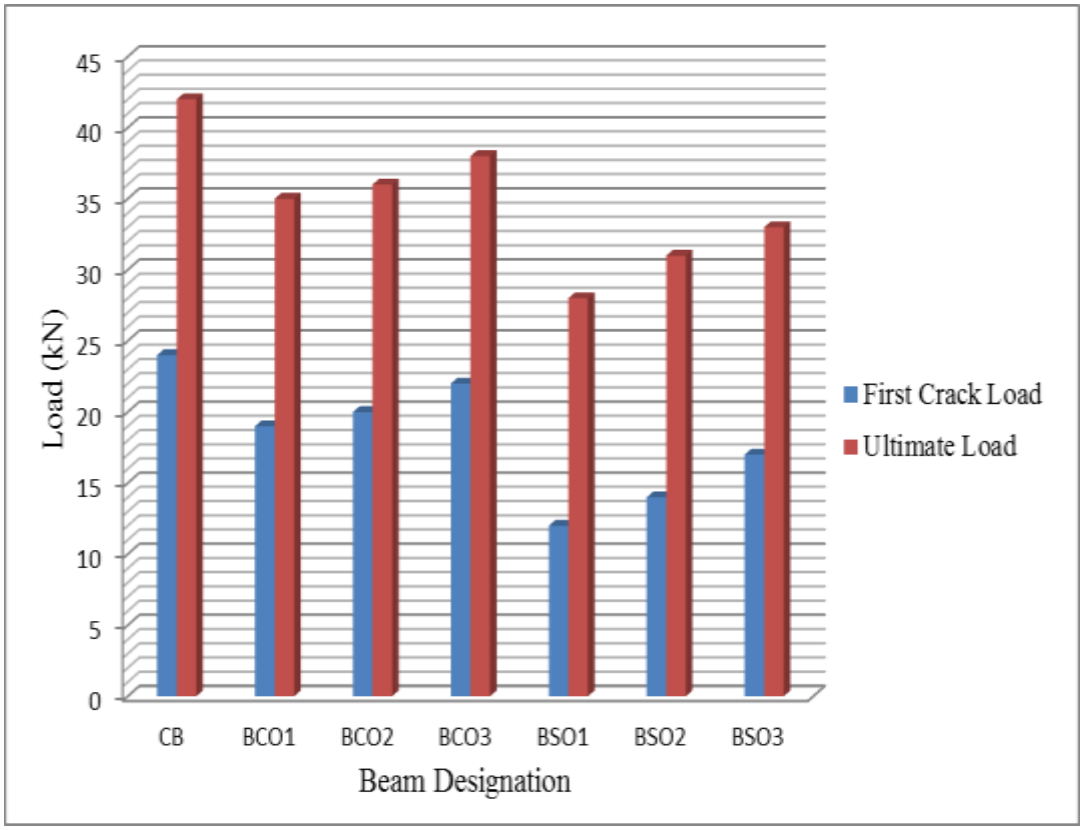


Fig 10 : Comparison of first crack load and ultimate load of beam with and without openings

Strengthened beams

In the case of the strengthened beam the AFRP sheet is wrapped in both horizontal and vertical direction. It is clear from the table showing the comparison of the first crack load and ultimate load in strengthened is that the beam with circular holes wrapped AFRP in horizontally shows the best load carrying capacity.

H. Conclusion

1) The ultimate strength of the beam with circular openings is higher than the beam with square openings.
2) The ultimate strength of the circular opening is about more than the control beam.
3) As the number of openings increases (of equivalent area) the load carrying capacity also increase.
4) The beam strengthened with AFRP shows high load carrying capacity as compared to unstrengthened beam

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NUMERICAL ANALYSIS IN STRENGTH OPTIMIZATION OF HOLLOW CFDST COLUMNS

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Abstract: *Concrete Filled Double Skin Steel Tube (CFDST) is a creative innovation of composite steel concrete construction, which is formed by two concentric steel tubes separated by a concrete filler. CFDST columns have many advantages like, increase in section modulus, enhancement in stability, lighter weight, good damping characteristics, better cyclic performance and also has a higher fire resistance period than the CFST columns, due to the inner tubes of the composite columns being protected by the sandwiched concrete during fire. It is thus expected that concrete filled double skin steel tubes (CFDST) have a potential of being used in building structures. It is also used in transmission towers, bridge piers. One of the objective of the simulations is to replicate results from a series of experiments that first subjected CFDST columns to different levels of seismic damage by applying cyclic lateral loading, and then fire testing of the same specimens in a furnace. The numerical simulations should parallel the experiments in the loading sequence. A finite element model is developed to assess the loading and thermal analysis. The main aim of this paper is to determine the impact of different geometrical factors on the buckling and post buckling of columns and the effect of its strength in thermal conditions.*

Keywords: *Concrete-Filled Double Skin Steel Tube, transmission towers, thermal conditions;*

I. Introduction

Composite columns are widely used in the construction of modern buildings, even in the regions of high seismic risk. Composite columns combines the advantages of both steel and concrete namely light weight and high strength of steel, speed of construction and stiffness, damping and inherent mass of concrete. Composite columns are of different forms: steel encased concrete section, concrete filled steel tubular section, concrete filled FRP tube, steel reinforced concrete section, concrete filled double skin tubular column (CFDST). Concrete-filled steel tubular (CFST) columns have been widely used in the construction of framed structures in high-rise buildings due to their fine-looking appearance, high-bearing capacity and ductility, fast construction and cost-saving features. However, the main disadvantage of the CFST column is that the steel tube is exposed, thus leading to a lower fire resistance compared with concrete encased steel composite columns or even conventional reinforced concrete columns. CFST columns A creative innovation of composite steel-concrete construction is the concrete-filled double skin steel tube (CFDST), which is formed by two concentric steel tubes separated by a concrete filler. CFDST is a composite construction, the inner hollow steel section acts as formwork and reinforcement for the concrete. In recent years, it was proposed by several researchers that concrete filled double skin steel tubes (CFDST) be studied for their strength as a column or a beam. Advantages of CFDST over CFST include: increase in section modulus; enhancement in stability; lighter weight; good damping characteristics and better cyclic performance. It is expected that the CFDST columns can obtain a higher fire resistance period than the CFST columns, due to the inner tubes of the composite columns being protected by the sandwiched concrete during fire. It is thus expected that concrete filled double skin steel tubes (CFDST) have a potential of being used in building structures. The concrete fill prevents the outer steel tube from buckling inwards whilst the steel prevents the concrete from deforming laterally, under compressive loads. Concrete delays the local buckling of hollow steel section and hence improves the ductility of the section. This

paper investigates, using finite-element (FE) analysis, the impact of various geometrical factors on CFDST columns and its effect on thermal conditions.

II. Summary

From the literature reviews the effects of high strength steel CFST columns under fire condition and axial load is analysed and a finite modal is developed for investigation. Experiments are conducted to determine its strength under these conditions. In this study we are discussing about the deformations, stresses and plastic strain in various geometrical factors and the thermal effects are also analysed.

III. Finite Element Analysis

ANSYS offers a comprehensive range of engineering simulation solution sets providing access to virtually any field of engineering simulation that a design process requires. ANSYS software can be used for projects such as construction of high rise buildings, industrial buildings, stadiums, for seismic analysis, for construction of nuclear, wind and thermal power plants, offshore and marine structures , bridges, dams, tunnels, foundations etc., and for geological and soil mechanics problems also. ANSYS simulation software gives designers the ability to assess the influence of wide range of variable in a virtual environment. ANSYS provides preprocessing, post processing and solving capability tools for mesh generation and solving any type of element, for any application. ANSYS solution provides tools for all aspects of offshore simulation .ANSYS provide a wide variety of element that can be used for 1-D, 2-D and 3D problems for analysis purpose.

One problem faced in the design of structures is buckling, in which structural members collapse under compressive loads greater than the material can withstand. Examples include the local failure of a box girder of a bridge or an aluminum beverage can crinkling when compressed. Using ANSYS Workbench Simulation functionality provides many tools to aid users in solving geometric instability problems, ranging from linear (eigen value) buckling to nonlinear, post-buckling analyses. Eigen value buckling analysis is a good approximation technique that, although less precise than nonlinear buckling analysis, is a relatively quick and easy way to determine, for example, critical loads that induce buckling and possible buckling modes (that is, the different ways the structural member can deform). The solution time for eigen value buckling typically is significantly faster than a nonlinear buckling analysis, meaning that a great amount of useful information comes at a relatively cheap computational price.

IV. Objectives

- To compare the impact of geometrical factors on buckling of columns
- To compare the total deformation and reaction force of different geometrical parameters.
- To compare the total equivalent plastic strain and reaction force of different geometrical parameters.
- To compare the equivalent stress and equivalent strain of different geometrical parameters.
- To analyse the strength of columns in thermal conditions.

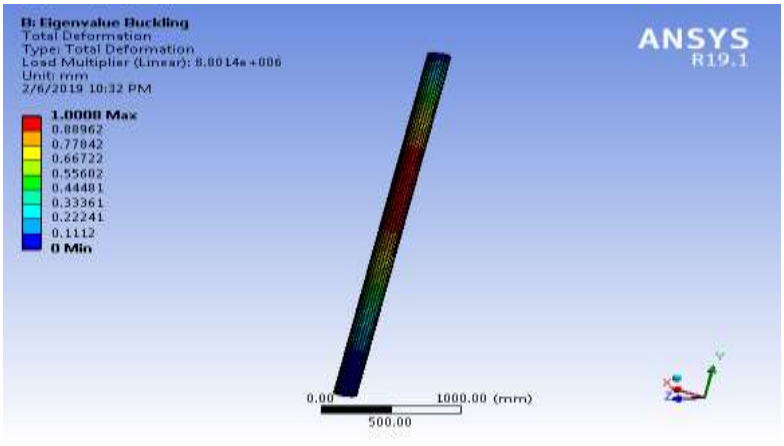
V. Scope of Project

- Various geometrical parameters of the composite columns are analysed and compared.
- types of elements used in the column include SOLID65, SOLID185, SHELL type. CFDST columns exhibits a higher strength, higher bending stiffness
- essential to analyse various geometrical factors which can help reduce the buckling effects in columns. And also the effect of temperature in columns is analysed.

VI. Validation of Software

The Validation object enables you to evaluate the quality of mapping across source and target meshes. It provides quantitative measures that help in identifying regions on the target where the mapping failed to provide an accurate estimate of the source data. In order to analyse the buckling load, a model is designed with the following dimensions outer tube diameter-166mm,outer tube thickness-5.04mm, inner tube diameter-114.10mm, inner tube thickness-5.20mm, total length-3600mm. Two remote displacements are acting on either ends, and a force of 1N is acting at the top of column on y direction downwards. The deformed column is shown in figure 1. The buckling load the column can carry, as given by software is 88.10400 x 10^5 KN

Figure 1 Deformed Model



Comparing the manual and software results ,almost same results were obtained, The variation liees within the permissionable limit. The buckling load results obtained from both manual calculation and software The results are shown in Table 1

Table 1 Validation of Software

Result obtained analytically (KN)	Result obtained by software (KN)	Variation in %
88.1985804×10^5	88.10400×10^5	0.2

Therefore the percentage variation between analytical and software method is 0.2%

VII. Methodology

- Data collection
- Literature Review
- Validation
- Variation of inner and outer tube thickness
- Numerical Analysis
- Comparing the Results
- Conclusion

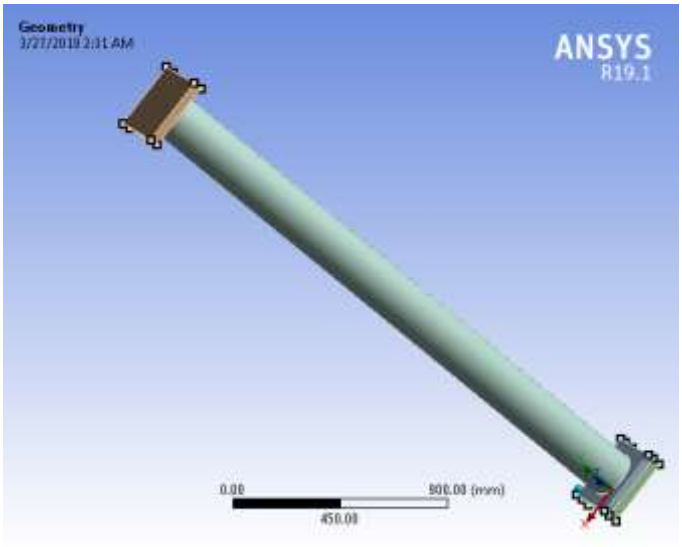
VIII. Models

Concrete filled double skin tubular column consists of two steel tubes of different thickness with concrete sandwiched between them. Two steel plates are also placed on either ends.The specifications of the tubes are: Outer diameter of tube 203.2mm, Outer tube thickness 2.79mm, Inner diameter of tube 127mm, Inner tube thickness 2.29mm, Length of Column 2705mm, Bottom plate size 300mm, Bottom plate thickness 40mm, Top plate thickness 50mm. A pressure of 3.45MPa is applied on top and a remote displacement is given in the x direction at the top The five models are shown in Table 2 and the column is shown in Figure 2

Table 2 Models with Dimensions

Models	Outer tube thickness(mm)	Inner tube thickness(mm)
Model 1	2.29	2.29
Model 2	2.35	2.29
Model 3	2.45	2.29
Model 4	2.55	2.29
Model 5	2.79	2.29

Figure 2 Model



IX. Meshing

ANSYS Meshing is a general-purpose, intelligent, automated high-performance product. It produces the most appropriate mesh for accurate, efficient multiphysics solutions. A mesh well suited for a specific analysis can be generated with a single mouse click for all parts in a model. Full controls over the options used to generate the mesh are available for the expert user who wants to fine-tune it. The power of parallel processing is automatically used to reduce the time you have to wait for mesh generation.

For a quick analysis or for the new and infrequent user, a usable mesh can be created with one click of the mouse. ANSYS Meshing chooses the most appropriate options based on the analysis type and the geometry of the model. Especially convenient is the ability of ANSYS Meshing to automatically take advantage of the available cores in the computer to use parallel processing and thus significantly reduce the time to create a mesh. Parallel meshing is available without any additional cost or license requirements. In CFDST columns a mesh size of 15mm is used throughout the column, with 42997 number of nodes. The meshing is shown in Figure 3

Figure 3 Model showing Meshing



X. Results and Discussion

a. Directional Deformation

Total deformation is the vector sum of all directional displacements of the system. The total deformation of all the five models are shown in Table 3 and model is shown in Figure 4

Table 3 Total Deformation of Models

MODELS	TOTAL DEFORMATION (mm)
1	50.584
2	172.14
3	62.474
4	49.38
5	43.495

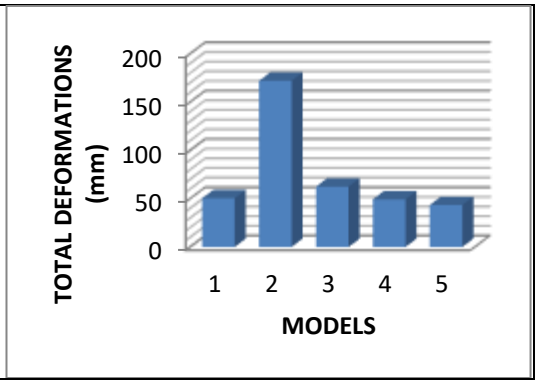
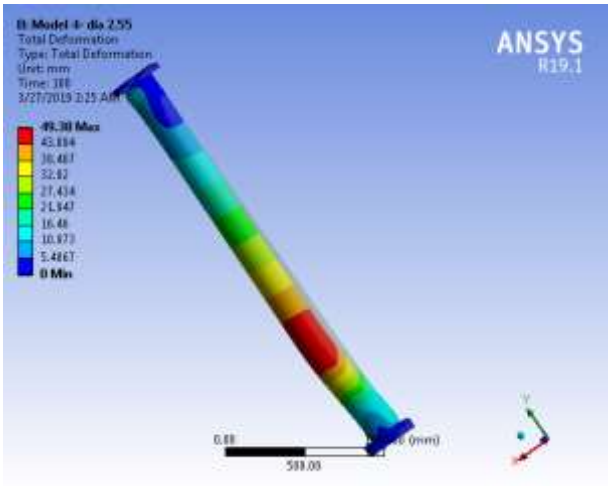


Figure 4 Total Deformation of Models



b. EQUIVALENT (VON-MOSES) STRESSES

Von Moses stress is a value used to determine if a given material will yield or fracture. It is mostly used for ductile materials, such as metals. The von Mises yield criterion states that if the von Moses stress of a material under load is equal or greater than the yield limit of the same material under simple tension The stresses of all five models anre shown in Table 4 and the model is shown in Figure 5

Table 4 Equivalent (Von-Moses) Stresses of Models

MODELS	EQUIVALENT STRESS (Mpa)
1	1030.3
2	977.31
3	1292.4
4	1222.7
5	611.04

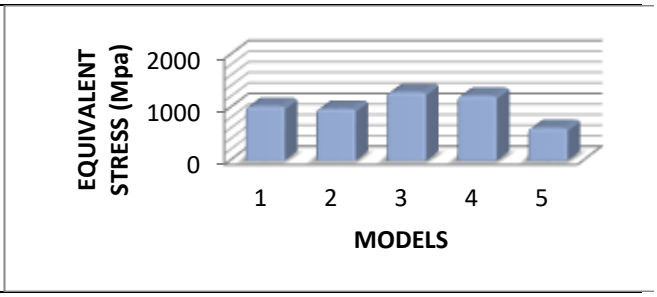
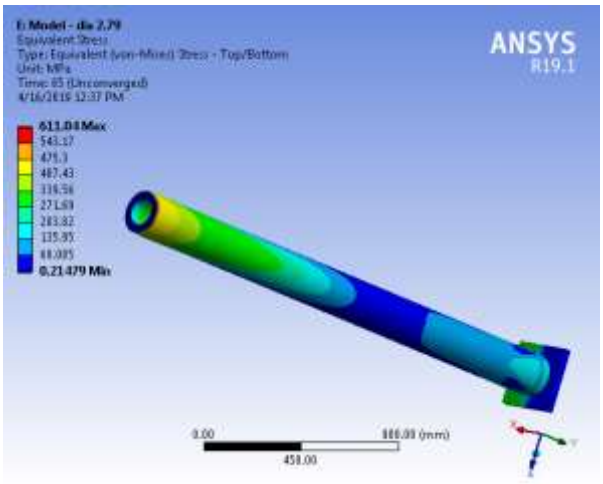


Figure 5 Equivalent (Von-Moses) Stresses of Models



c. Equivalent Total Strain

The equivalent total strain gives a total value of strain in any engineering body. The total strain components are calculated by addition of components of elastic, plastic, thermal, and creep strains and then equivalent total strain is calculated from total strain components.The total strain of all five models are shown in Table 5 and model is shown in Figure 6

Table 5 Equivalent total strain of all models

MODELS	EQUIVALENT TOTAL STRAIN (mm)
1	0.711
2	0.587
3	0.915
4	0.856
5	0.397

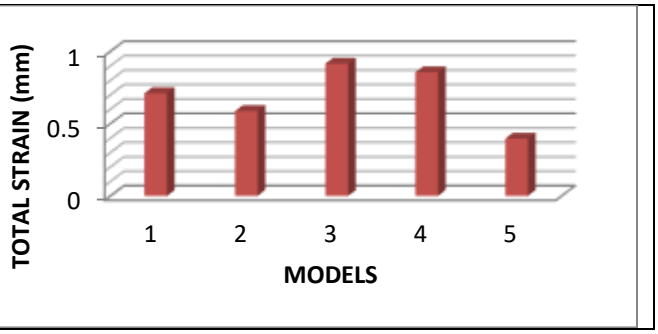
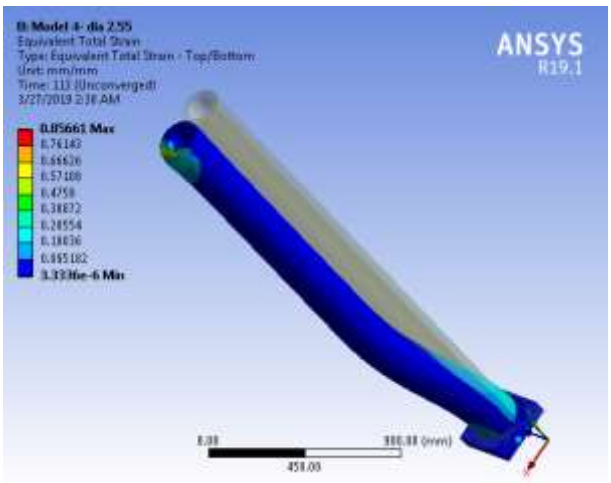


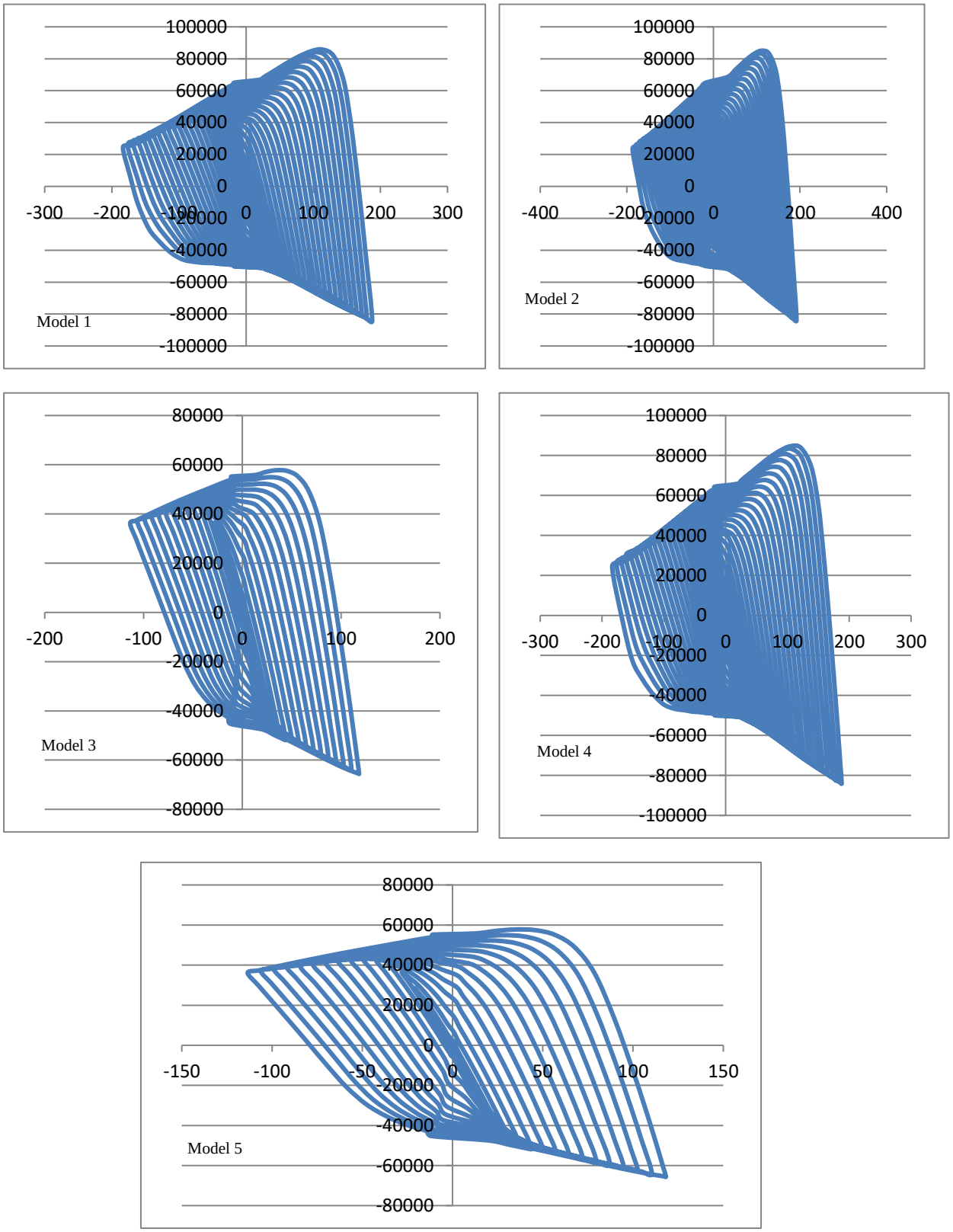
Figure 6 Equivalent Total Strain of Models



XI. Plotting Graphs

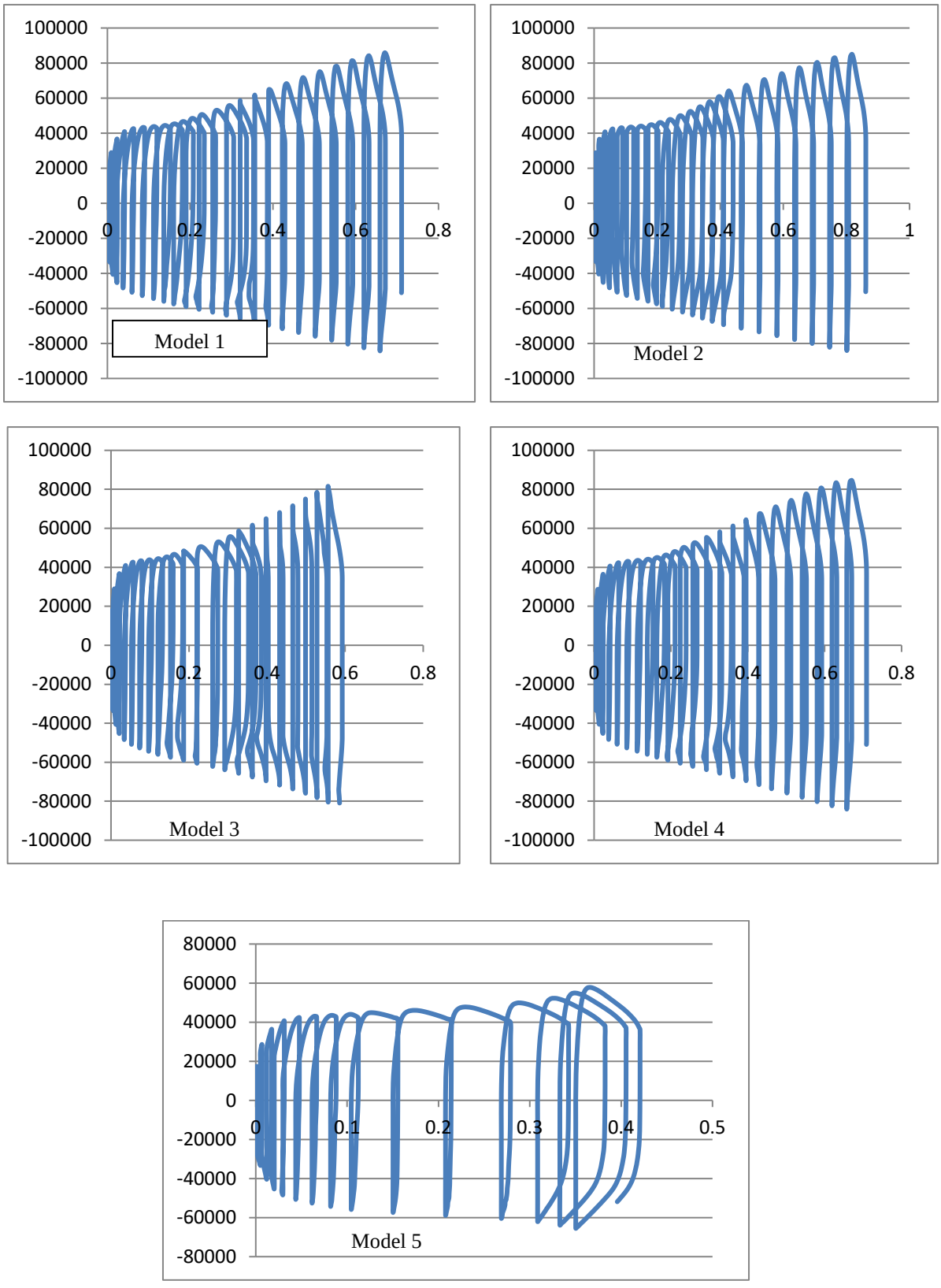
a. Graph is plotted between total deformation versus reaction force. Shown in Figure 7

Figure 7 Graph is plotted between total deformation versus reaction force



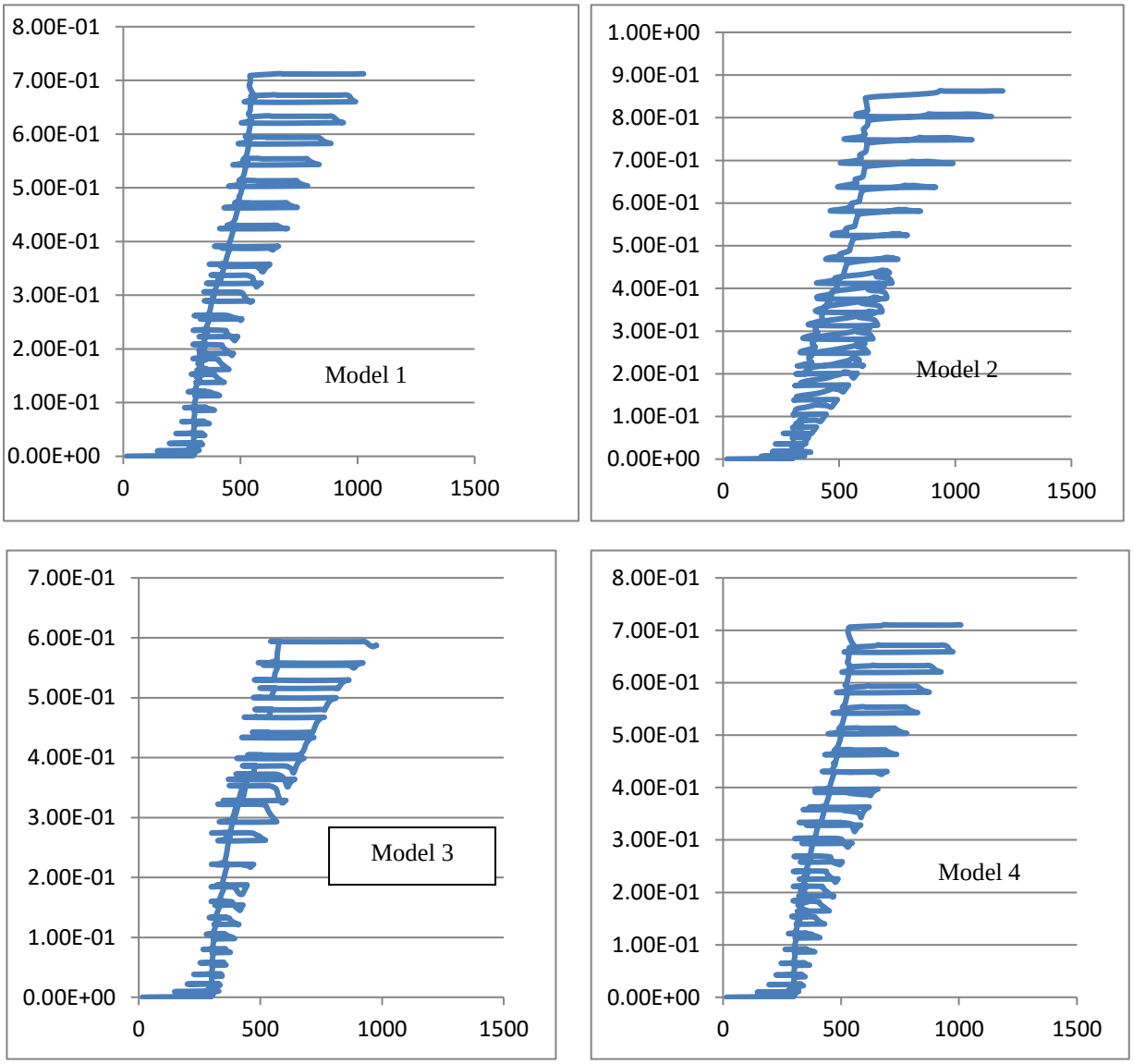
b. Graph is plotted between equivalent plastic strain versus force, Shown in Figure 8

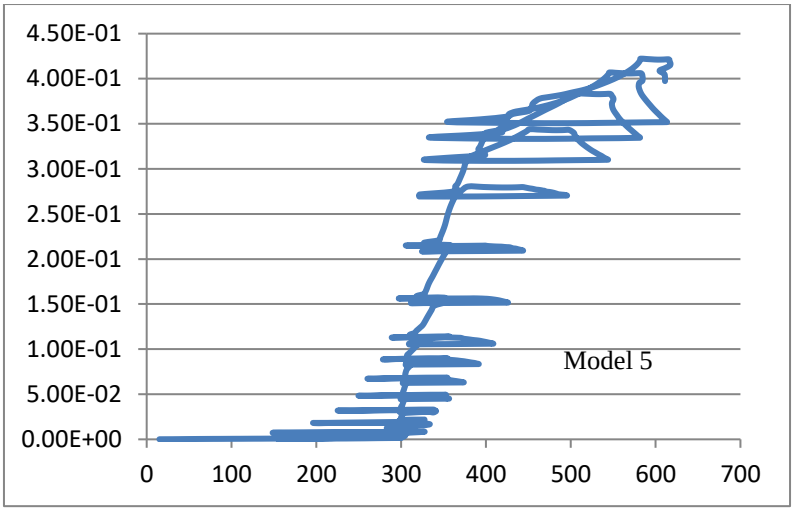
Figure 8 Graph is plotted between equivalent plastic strain versus force



c. Graph is plotted between equivalent stress versus equivalent total strain. Shown in Figure 9

Figure 9 Graph is plotted between equivalent stress versus equivalent total strain





XII. *Effect of temperature on model*

- Model with least deformation, stress and strain is subjected to fire at the bottom and the following results were obtained

Figure 10 Bottom of column subjected to fire

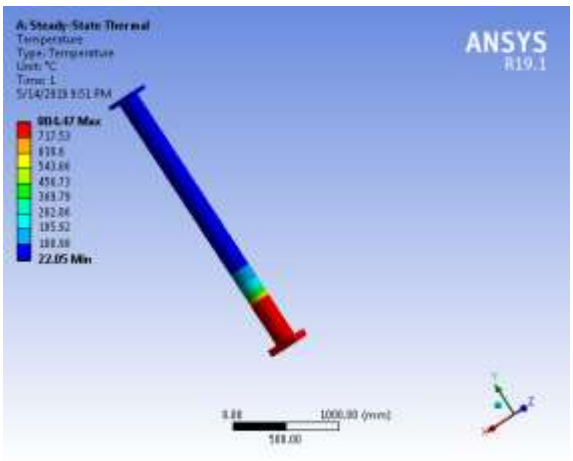


Figure 11 Total deformation of column

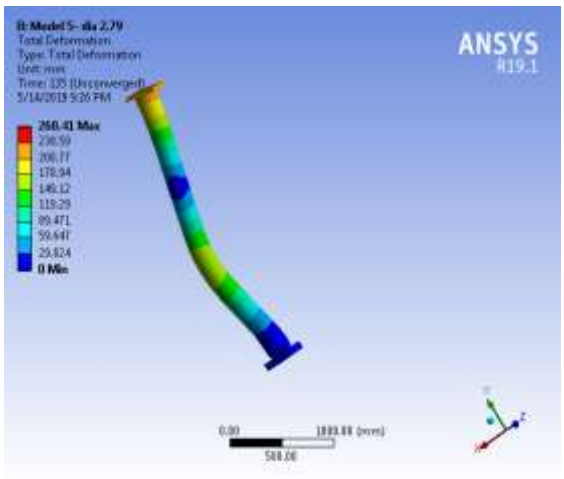


Figure 12 Equivalent total stress of column

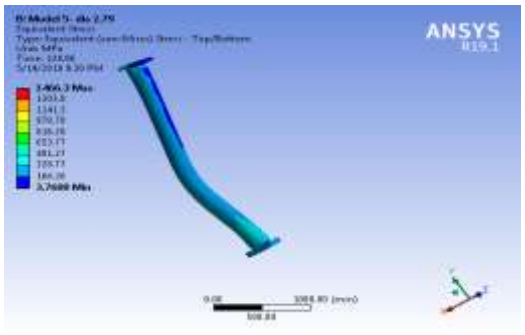
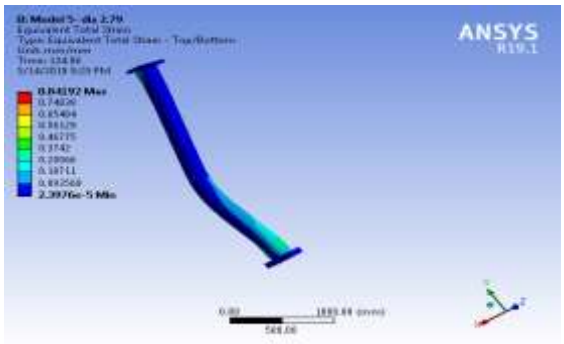


Figure 13 Equivalent total strain of column



Total deformation of 268.41mm, stress of 1466.3Mpa and strain of 0.841mm is obtained.

- The following graphs are obtained

Figure 14 Total Deformation versus Reaction Force

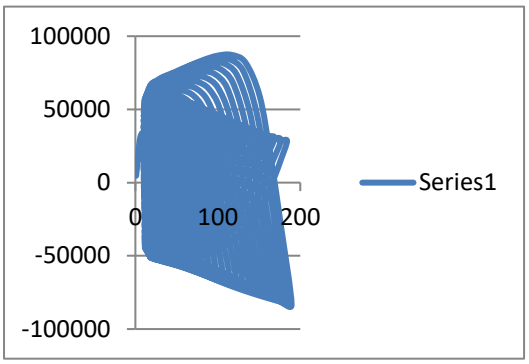


Figure 15 Equivalent plastic strain versus Reaction Force

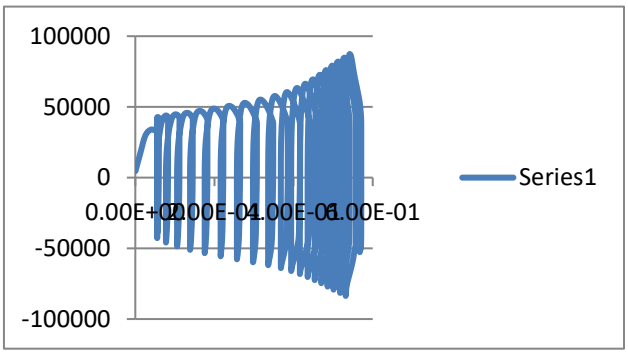
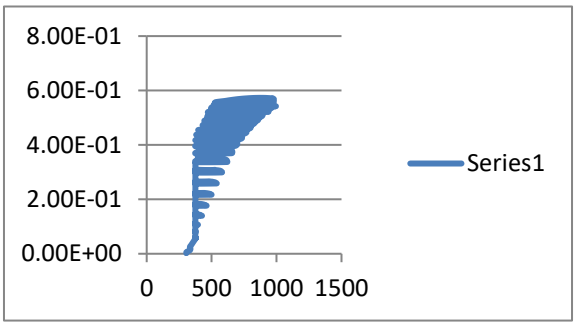


Figure 14 Equivalent stress versus Equivalent total strain



XIII. Conclusion

The static analysis of concrete filled double skin tubular columns has been done using finite element method, using ANSYS software. The project is done to study total deformation, equivalent von-moses stresses, total strain on columns with varying geometrical factors

From the results and discussions the following conclusions were obtained

- The outer tube and inner tube thickness of the CFDST columns are analysed.
- Model 5 showed least deformations compared to other models.
- Model 5 showed least equivalent total stress compared to other models.
- Model 5 showed least total strain as compared to other models.
- The graph between total deformation versus reaction force, equivalent stress versus reaction and equivalent stress versus total strain is obtained.
- The thermal conditions of Model 5 is analysed.

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EXPERIMENTAL STUDY ON STRENGTH OF SELF COMPACTING CONCRETE BY INCORPORATING GLASS FIBRE AND METAKAOLIN

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Abstract: Self-compacting concrete (SCC) is an innovative concrete that does not need vibration for placing and compaction. It is capable of flowing under its own weight, completely filling formwork and achieving full compaction, even in the presence of congested reinforcement. Manufacture of cement results in a lot of environmental pollution as it includes the discharge of CO2 gas. It is also important for engineers to develop eco-friendly material, as the environment is getting affected day by day by the increasing construction activities. The physical and mechanical properties of all the materials were carried out. In this study, the mix proportion is achieved by incorporating Indian Standards and through a number of trial mixes by changing and balancing the powder content and water-powder ratio. The main objective of the Paper is to explore the strength of Self-Compacting Concrete. The main objective of this research work is to investigate the strength of Self Compacting Concrete with varying percentages of Metakaolin (mineral admixture) by incorporating glass fibre. Investigations are made to study the Flexural, Compressive and Tensile properties of concrete. Metakaolin used as a cementatious material, it partially replaced with cement in SCC to enhance the strength. In this experimental study, the mechanical properties such as compressive strength, split tensile strength, flexural strength of concrete comprising several percentage of Metakaolin by weight of cement are studied. Metakaolin concrete mix with improved mechanical properties is selected as the optimum metakaolin concrete mix. And to optimum mix glass fibre is added by volume of concrete.

Keywords: Metakaolin, Glass fibre, Flexural strength, Compressive strength, Tensile strength, Self Compacting Concrete.

I. INTRODUCTION

1.1 GENERAL

The invention of self compacting concrete (SCC) can be considered as a major evolution in the construction industry. Self compacting concrete is a concrete which has little resistance to flow so that it can be placed and compacted under its own weight without any external vibration. SCC offers many advantages compared to ordinary concrete. The main advantage is in the elimination of mechanical compaction. There are many more advantages in terms of technology, working environment and health monitoring. The high fluid nature of SCC makes it suitable for placing in difficult conditions and also in slender sections with congested reinforcement. SCC can also help in easier placement of concrete, better surface finish, uniform consolidation etc. The present study focuses on the workability characteristics and strength parameters of SCC containing fly ash and dolomite powder. The cement used for the study was 53 grade ordinary Portland cement which has been partially replaced by fly ash and dolomite powder, based on the guidelines of European Federation of producers and contractors of specialist products for structures (EFNARC). The significance of concrete in modern society cannot be underestimated. There is no escaping from the impact of concrete on everyday life. Concrete is composite material and is made up of filler and a binder. Typical concrete is a combination of fine aggregate (sand), coarse aggregate (rock), cement, and water. Nowadays the usage of concrete is rising from time to time due to the speedy development of construction industry. The usage of concrete is not only in building construction but moreover in other areas such as road construction, bridges, harbor and much more. Thus technology in concrete has been developing in many ways to improve the quality and properties of concrete. One of the technological advances in improving the quality of concrete is Self-Compacting Concrete. It flows

under its own weight filling all the voids and spaces and attaining full compaction even in the presence of highly congested reinforcements.

It was developed by Okamura and associates in Japan during 1988 and considered as an extremely workable concrete that can flow over densely reinforced and complex structural elements. It adequately fills all voids without any segregation, excessive bleeding and the need for vibration or other mechanical consolidation. The unique characteristics of SCC are a fast rate of concrete placement with very less time. SCC offers a very high level of homogeneity; minimize the concrete void spaces and also offers the superior level of finishing and durability of the structure.

SCC also achieves similar engineering properties and durability as traditional vibrated concrete. In recent years, the use of SCC has gained a wider acceptance. India has established itself as one of the world's fastest growing economies and this growth has brought with it a significant improvement in construction activities. Currently, the construction sector in India is developing at the rate of 10% per annum. The prototype of self-compacting concrete was first completed in 1988 using materials already on the market. The prototype performed satisfactorily with regard to drying and hardening shrinkage, heat of hydration, denseness after hardening, and other properties. This concrete was named "High Performance Concrete." and was defined as follows at the three stages of concrete. At almost the same time, "High Performance Concrete" was defined as a concrete with high durability due to low water-cement ratio by Professor Aitcin. Since then, the term high performance concrete has been used around the world to refer to high durability concrete.

1.2 REQUIREMENTS OF SCC

1. Ability to flow into and completely fill intricate and complex forms under its own weight (flow ability).
2. Ability to pass through and bond to congested reinforcement under its own weight-(pass ability).
3. High resistance to aggregate segregation-(segregation resistance).
4. The required flow ability achieved with the help of super plasticizer.
5. The cohesiveness or viciousness of the mixture ensured by increased powder content and reduced coarse aggregate content.
6. Stabilizing agents (viscosity modifying agents) are usually needed so that small changes in water content do not adversely affect the cohesiveness of SCC.

Cost is always a major factor in the development of SCC concrete mixtures and can be designed to filler material as a cement replacement, thereby optimizing strength and minimizing cost, and also the ecological trend aims at restraining the use of natural raw materials in the field of building materials and hence there is an increased concentration in the use of alternative materials (waste) from various industrial activities, which offerings significant advantages in economic, energetic and environmental terms.

Metakaolin is attained from natural Kaolin clay, by heating this clay at a temperature of 650˚C - 900˚C. Research findings in the last decade clearly establish that ductility of certain structural members can be greatly enhanced with the use of fibres. Using fibres to carry loads across micro-cracks in a hardened concrete in structural design is still a novel practice. Fibres are added not only to enhance the property of tensile strength, but also mainly to control the cracking, avoid coalescence of cracks, and to avoid the behavior of the material by bridging of fibres diagonally the cracks. The focus of this project is to study the effect of self-compacting concrete by the addition of Metakaolin of various percentages as a partial replacement for cement.

1.3 SELF-COMPACTING CONCRETE (SCC)

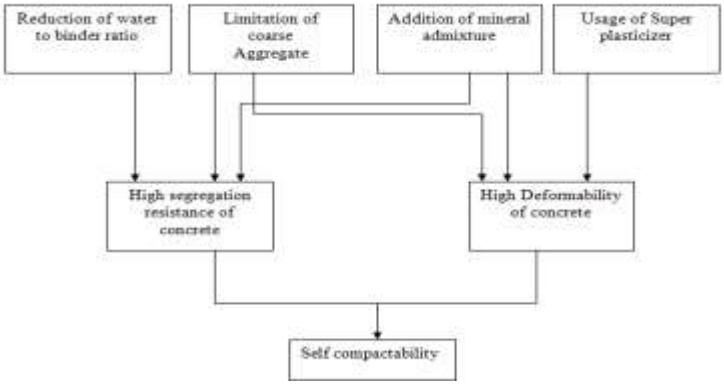
Self-compacting concrete refers to a special type of concrete that can be compacted to every corner of the formwork, purely by means of its own self-weight and without the need for vibrating or compaction. The need for self compacting concrete is particularly because conventional concrete tends to present a problem with regard to inadequate consolidation in thin sections or areas of congested reinforcements, which leads to a larger volume of entrapped air and compromises the strength and durability of concrete.SCC was developed initially in Japan in the 1980s when contractors were experiencing a severe shortage of skilled manpower. Due to its inbuilt assurance of uniform placement and full compaction it is now becoming a revolution in concrete technology. For several years beginning in 1983, the problem of the durability of concrete structures was a major topic of interest in Japan. To make durable concrete structures, sufficient compaction by skilled workers is required. However, the gradual reduction in the number of skilled workers in Japan's construction industry has led to a similar reduction in the quality of construction work. The necessity of this type of concrete was proposed by Okamura in 1986. Studies to develop self-compacting concrete, including a fundamental study on the workability of concrete, have been carried out by Ozawa and Maekawa at the University of Tokyo. The prototype of self-compacting concrete was first completed in 1988 using materials already on the market. The prototype performed satisfactorily with regard to drying and hardening shrinkage, heat of hydration, denseness after hardening, and other properties.

This concrete was named "High Performance Concrete." and was defined as follows at the three stages of concrete

1. Fresh: self-compactable
2. Early age: avoidance of initial defects
3. After hardening: protection against external factors

Super-plasticizer enhances deformability and with the reduction of water/powder, segregation resistance is increased. High deformability and high segregation resistance are obtained by limiting the amount of coarse aggregate. These two properties of mortar and concrete, in turn, lead to self-compacting ability limitation of coarse aggregate content. The use of SCC in India was actually mattered of academic interest in the initial stage. This was the case owing for higher initial cost compared to the traditional method of concreting.

Fig. 1.1 shows the basic principles for the production of SCC



1.4 OBJECTIVES OF THE WORK

From the literature review it is evident that no studies have been reported on the properties of Metakaolin incorporated glass fibre self compacting concrete. In this context, an experimental investigation was planned to study the mechanical properties and behavior of self compacting concrete. The following objectives were formulated for the present investigation

1. To prepare trial mixes to obtain the required mix design.
2. Assessment of fresh properties of SCC including flowability, resistance to segregation, filling ability by conducting different tests as per the European guidelines for SCC (EFNARC)
3. To find out the optimum percentage of metakaolin partially replacing cement with metakaolin.
4. To study the effect of various percentages glass fibres on the optimum metakaolin percentage.

1.5 SCOPE OF THE WORK

The study is limited to the SCC with optimum metakaolin replacement and optimum glass fibre. This study will also promote the researchers to conduct more experimental investigation in this area which will naturally standardize the use of such materials with better engineering properties.

LITERATURE SURVEY

2.1 GENERAL

Self-consolidating concrete (SCC) is defined as ''a concrete that, without the influence of additional consolidation energy, flows and completely fills the spaces between the reinforcement and the formwork only under the influence of its own mass''. Generally, SCC is used for special constructions or in precast plants. In some cases, the choice of SCC instead of ordinary concrete depends on other factors besides absence of vibration, such as dense reinforcement, novel form of construction; economic benefit (i.e. reduced construction time connected to the absence of Vibration, reduced labour cost), environmental conditions. Nowadays, many precast plants overall in the world are using SCC because of advantages connected to the absence of vibration such as reduced hearing problems of workers, maintenance costs and energy consumption. These advantages balance the increased material costs. Recent and relevant publications, investigating the behavior of SCC with metakaolin and glass fibre leading up to the current research project are reviewed in the subsequent sections of this chapter.

2.2 REVIEW OF LITERATURE

Ozawa et.al (1989) completed the first prototype of SCC by means of materials already on the market. By using different types of super plasticizer, he studied the workability of concrete and developed a concrete which was very workable. The viscosity of the concrete was investigated using the v-funnel test. Other experiment carried out by Ozawa focussed on the effect of mineral admixtures like Fly Ash and Blast Furnace Slag on the flowing ability and segregation resistance of SCC. He establish out that the flowing ability of concrete improved when Portland cement was partially replaced with fly ash and blast furnace slag.

EFNARC (2002) investigated that the SCC flows alone under its dead weight up to leveling, airs out and consolidates itself thereby without any entry of additional compaction energy and without a nameable segregation. Due to the greater content of powder, SCC may offer extra plastic shrinkage or creep than ordinary concrete mixes. These criteria should therefore be considered during designing and specifying SCC. A concrete mix can only be categorized as Self-Compacting Concrete if the requirements for all the three characteristics are satisfied, ie. Filling ability, passing ability and segregation resistance, and introduce a standardized test procedure for SCC Categorization.

Okamura et.al (2003) carried out experiments to study the flowability of Self-Compacting Concrete. A model frame work was used to observe how SCC could pass through obstacles. Okamura proposed an easy system of mix proportioning procedure for SCC. Accordingly, the coarse aggregate content was fixed as 50% of the solid volume; the fine aggregate content as 40% of mortar volume and w/c ratio in volume as 0.9 to 1.1.

Prof. Shriram H Mahure et.al (2014) made an attempt to study the fresh and hardened properties of SCC using metakaolin (MK) as partial replacement of cement in different percentages in addition to filler.Modified Nan-Su method has been used for design mix. MK is used to replace the cement content by three various percentages (10%, 20% and 30%).In this paper, the partial replacement with MK was done for M30 grades of concrete. To fulfill the requirement of SCC in the fresh state and evaluate flow characteristic using slump cone, V-funnel, & L Box test and fixing the dosage of superplasticizer (HRWRA) as per EFNARC guidelines and also fix the water /powder ratio. The optimum percentage of replacement of metakaolin is obtained was 30%. The test result was obtained for a curing period of 7, 28 and 90 days. The result indicates that 2 to 6% increase in 28-day strength and the split tensile strength and flexural strength also increased by 2 to 3% compared to the 28-day strength.

D.Anjali et al. (2015) made an attempt to investigate the mechanical properties of metakaolin (MK) in SCC. The cement was replaced by metakaolin with 15%. The strength of SCC specimens was increased up to 12% higher than CVC specimens in compression and 30% higher than CVC in the split tensile test. The optimum percentage of replacement of metakaolin is obtained was 15%. It also shows that additions of chemical admixtures resulted in segregation of concrete and bleeding.

Osman Gencel et.al (2011) had conducted the study on the workability and mechanical performance of steel fiber-reinforced self-compacting concrete with fly ash. They had prepared five mixes with fiber variations were 0, 15, 30, 45 and 60 kg/m^3. Water/cement ratio, fly ash, cement and superplasticizer contents were kept constant at 0.40, 400, 120 and 6 kg/m^3, respectively. The test results indicated that, the improvement in compressive strength does not always increase with a larger content of fibers. Mix 2 has the highest compressive strength value of 58.6 Mpa. Especially the effect of steel fiber inclusion in flexural strength was remarkably high at 51.7%. Fibres stop concrete from a sudden failure since randomly distributed steel fibres bridge internal micro cracks and transfer the load by stitching the cracks in the concrete. Splitting tensile strength results show an increase of 23.3% for mix 3. The modulus of elasticity was improved only marginally with increasing fiber content. A significant improvement in the energy absorption and ductility in compression is achieved by adding fibers to concrete.

B. Krishna Rao et.al (2010) performed a study to compare the properties of plain normal compacting concrete (NCC) and SCC with steel fiber. Ten SCC mixtures and one NCC were investigated in this study. The content of the cementitious materials was maintained constant (600 kg/m3), while the water/cementitious material ratio is kept constant 0.31. The self-compacting mixtures had a cement replacement of 35% by weight of Class F fly ash. The variables in this study were aspect ratio (0, 15, 25 and 35) and percentage of volume fraction (0, 0.5, 1.0 and 1.5) of steel fibers. Slump flow time and the final diameter, J-Ring, V-funnel and L-Box were performed to assess the fresh properties of the concrete. Compressive strength, splitting tensile strength and flexural strength of the concrete were determined for the hardened properties. A marginal enhancement in the ultimate strength was observed. The addition of fiber-enhanced the ductility significantly. The optimum volume fraction (V) and aspect ratio of fiber for higher performance in terms of strength was found to be 1.0 percent and 25. The results indicated that high-volume of fly ash can be used to produce steel fiber reinforced self-compacting concrete, even though there is some increase in the concrete strength because of the use of steel fiber and high-volume of fly ash.

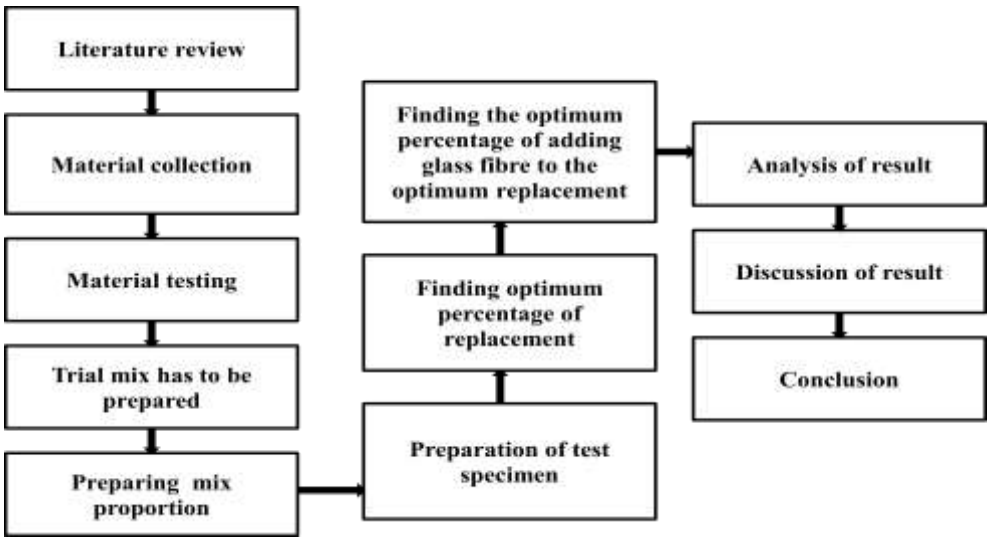
Abhishek Sachdeva et.al (2015) studied the effect of steel fibre in self-compacting concrete (SCC) with variation from 0.35%, 0.70% and 1% by weight of cement and also viscosity modifying agent (VMA) varied from 0.1 to 0.2% by weight of cement. The ability of flow was measured with a slump-flow test, V-funnel test and L-Box test. They used fly ash in steel fibre self-compacting concrete (SF-SCC). It was observed that compressive strength in case of 0.35% steel fibre mix was more than that of control mix and 0.70% steel fibre mix was more than that of 0.35% mix and compressive strength of 1% steel fibre is more than that of 0.35% and 0.70% mix. So it is found that with the increase in steel fibre, compressive strength also increased.

Milind V. Mohod (2012) studied the effect of fibers on the strength of concrete for M 30 grade by varying the percentage of steel fibers in concrete. Fiber content were varied by 0.25%, 0.50%, 0.75%, 1%, 1.5% and 2% by volume of cement. Cubes of size 150mmX150mmX150mm to check the compressive strength and beams of

size 500mmX100mmX100mm for checking flexural strength were casted. All the specimens were cured for the period of 3, 7 and 28 days before crushing. The results of fiber reinforced concrete for 3days, 7days and 28days curing with varied percentage of fiber were studied and it has been found that there is significant strength improvement in steel fiber reinforced concrete. The optimum fiber content of the compressive strength of cube is found to be 1% and 0.75% for flexural strength of the beam. Also, it has been analyzed that with the increase in fiber content up to the optimum value increases the strength of concrete. The Slump cone test results revealed that workability gets reduced with the increase in fiber content.

METHODOLOGY

3.1 METHODOLOGY



3.2 EXPERIMENTAL INVESTIGATION

The main objectives of the present study were to design Self-Compacting Concrete
(SCC) with proper replacement of cementations materials by metakaolin and glass fibre. Mix design was carried out according to the suggestions of EFNARC and study on the properties of fresh concrete and hardened concrete. The parameters considered for the proposed study were flowability, passability, cube compressive strength, split tensile strength and flexural strength

3.3 MATERIAL PROPERTIES

The properties of each material in a concrete mix were studied at the early stage. Different tests were conducted for each material as specified by relevant IS codes. Ordinary Portland cement, fine aggregate, coarse aggregate, super plasticizer, mineral admixtures and water were used for making the various concrete mixes considered in this study. Here metakaolin was introduced as a partial replacement for cement.

3.3.1 CEMENT

Cement is an essential constituent of a concrete mixture. The role of cement is first, to bind the sand and the coarse aggregates together and second, to fill the voids in between sand and coarse aggregates particles to form a compact mass. The use of high grade cement deals 10 to 20% savings in cement consumption in addition to high strength. For the current work, Ordinary Portland cement (OPC) of 53 Grade confirming to IS 12269-1987 was used.

Table 3.1 Test results of cement

Sl No.	Property	Result	Requirements as per code
1	Specific Gravity	3.12	_
2	Fineness (%)	5.2	Not more than 10%
3	Standard consistency (%)	27.6	26% - 38%
4	Initial setting time (min)	80	Not less than 30 min
5	Final setting time (min)	315	Not less than 600 min

3.3.2 FINE AGGREGATE

Fine aggregates are the particles which are used to improve the uniformity and workability in a concrete mix and it also assists the cement paste to hold the coarse aggregate particles in suspension. This improves the plasticity in the mix and prevents the segregation of aggregate particles. For the present study, manufactured sand (M-sand) was used as fine aggregate. Material properties of the same were determined. Tests were done as per IS: 2386 - 1986 to determine the properties of M-sand.

Table 3.2 Test results of msand

SL. No	Properties	Result
1	Specific Gravity	2.5
2	Fineness modulus	2.75

3.3.3 COARSE AGGREGATE

The size of the aggregate between 20mm and 4.75mm is considered as coarse aggregate. Laboratory tests were conducted on coarse aggregates to determine the different physical properties as per IS 383 (Part III)-1970. Fineness modulus is the index of coarseness or fineness of material. It is an experiential factor obtained by adding cumulative percentage of aggregate retained on each of the standard sieves and dividing this by 100. This test was conducted for particle size aggregates between 12mm and 6mm. They were considered as per code IS 2386 – Part I.0. This method is useful for finding the particle size distribution of aggregates.

Table 3.3 Test results of coarse aggregate

Property	Values
Water absorption (%)	4.6
Specific gravity	2.71
Bulk Density(g/cc)	1.543
Porosity (%)	0.455
Void ratio	0.84

3.3.4 METAKAOLIN

Metakaolin differs from other supplementary cementitious materials (SCMs), like fly ash, silica fume, and slag, in that it is not a by-product of an industrial process; it is manufactured for a specific purpose under carefully controlled conditions. For this study Metakaolin was obtained from English Indian Clay Limited, Thonnakkal.



Fig. 3 Metakaolin

Table 3.4 Test results of metakaolin

Sl No.	Property	Result	Requirements as per code
1	Specific Gravity	2.7	-
2	Fineness (%)	1	Not more than 10%
3	Standard consistency (%)	43	-
4	Initial setting time (min)	80	Not less than 30 minutes
5	Final setting time (min)	360	Not more than 600 minutes

3.3.5 WATER

Water is the most essential and least expensive ingredient of concrete. It strongly participates in the chemical reaction with cement. It helps to form the strength giving cement gel, the quantity and quality of water required to be observed into very carefully. For the current study, clean drinking water was used for the casting and curing of the test specimens.

3.3.6 GLASS FIBRE



Fig. 3.1 Metakaolin

Alkali Resistant (AR) Glass Fibers are designed specifically for use in concrete. They are manufactured from a specially formulated glass composition with an optimum level of Zirconia (ZrO_2) to be suitable for use in concrete. AR Glass Fibers are particularly suitable for Premix GFRC and other mortar and concrete reinforcement applications. They have high tensile strength and modulus, do not rust like steel, and are easily incorporated into concrete mixes.

3.3.7 SUPERPLASTICIZER

Super plasticizers or high range water reducing admixtures are the necessary components of SCC. Conplast sp 430 is used to attain the required workability. Conplast SP 430 is based on sulphonated naphthalene polymers and supplied as brown liquid instantly dispersible in water. Conplast SP430 has been specially formulated to give high water reduction up to 25% without loss of workability or to produce high quality concrete of reduced permeability. The volume of the conplast used in self-compacting concrete is taken as 1% of the volume of the cement.

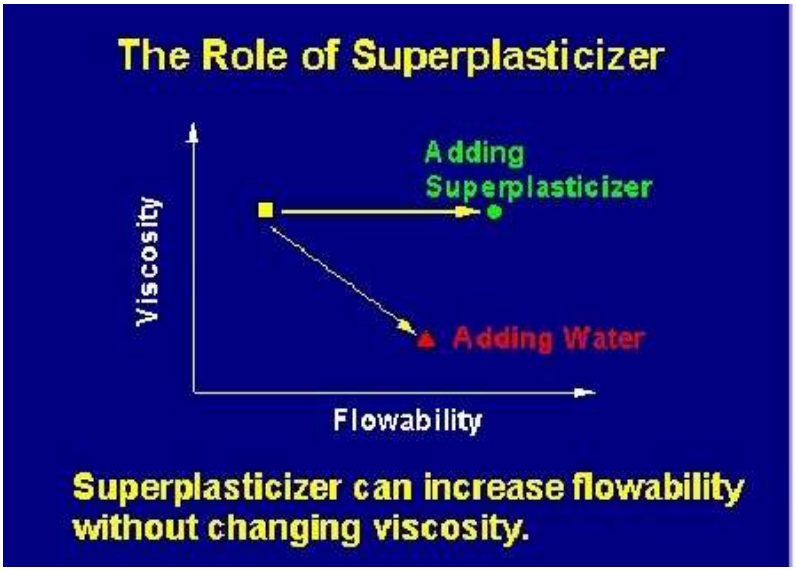


Fig. 3.2 showing the action of super plasticizer

3.4 ADVANTAGES OF SELF-COMPACTING CONCRETE

Self-compacting concrete has been described as the most revolutionary development in concrete construction for decades, proved beneficial economically because of a number of factors, which includes:

1. Shortening of construction period
2. It eliminates noise due to vibration: effective especially at concrete products plants and reduce man power in site
3. Better surface finishes
4. Easier placing
5. Improved durability
6. Greater freedom in design
7. Safer working environment

3.5 DISADVANTAGES O SELF COMPACTING CONCRETE

1. More precise measurement and monitoring of the constituent materials.
2. Requires more trial batches at laboratory as well as at ready-mixed concrete plants.
3. Costlier than conventional concrete based on concrete material cost (exception to placement cost).

3.6 WORKABILITY TEST METHODS

3.6.1 SLUMP FLOW TEST

The slump flow test aims at investigating the filling ability of SCC. It measures two parameters: flow spread and flow time T50. The former indicates the free, unrestricted deformability and the latter indicates the rate of deformation within a defined flow distance.



Fig.3.3 Slump flow table Fig.3.4 Lifting cone Fig.3.5 Slump Flow

3.6.1.1 TEST PROCEDURE

1. Place the cleaned base plate in a stable and level position.
2. Fill the bucket with 6 to7 litres of representative fresh SCC and let the sample stand still for about 1 minute (± 10 seconds).
3. During the 1 minute waiting period pre-wet the inner surface of the cone and the test surface of the base plate using the moist sponge or towel, and place the cone in the centre on the 200 mm circle of the base plate and put the weight ring on the top of the cone to keep it in place. (If a heavy cone is used, or the cone is kept in position by hand no weight ring is needed).
4. Fill the cone with the sample from the bucket and without any external compacting action such as Roding or vibrating. The surplus concrete above the top of the cone should be struck off, and any concrete remaining on the base plate should be removed.
5. Check and make sure that the test surface is neither too wet nor too dry. No dry area on the base plate is allowed and any surplus of the water should be removed the moisture state of the plate has to be 'just wet'.
6. After a shortest (no more than 30 seconds for cleaning and checking the moist state of the test surface), lift the cone perpendicular to the base plate in a single movement, in such a manner that the concrete is allowed to flow out freely without obstruction from the cone, and start the stopwatch the moment the cone looses contact with the base plate.
7. Stop the stopwatch when the front of the concrete first touches the circle of diameter 500 mm. The stopwatch reading is recorded as the T50 value. The test is completed when the concrete flow has ceased.
8. Measure the largest diameter of the flow spread, $\boldsymbol{d_{max}}$and$\boldsymbol{d_{perp}}$, the one perpendicular to it, using the ruler (reading to nearest 5 mm) and care should be taken to prevent the ruler from bending.
9. Clean the base plate and the cone after testing

3.6.2 L-BOX TEST

The method aims at investigating the passing ability of SCC. It measures the reached height of fresh SCC after passing through the specified gaps of steel bars and flowing within a defined flow distance. With this reached height, the passing or blocking behavior of SCC can be estimated.



Fig.3.6 Before Filling concrete



Fig.3.7 After Filling, Before Release of concrete



Fig.3.8 After Release of concrete

The J-ring test aims at investigating both the filling ability and the passing ability of SCC. The J-ring flow spread indicates the restricted deformability of SCC due to blocking effect of reinforcement bars and the flow time T50J indicates the rate of deformation within a defined flow distance. The blocking step quantifies the effect of blocking.



Fig.3.9 Before Filling concrete





Fig.3.10 After Release of concrete

Table 3.5 Mix proportion for SCC

Cement (kg)	Fine aggregate (kg)	Coarse aggregate (kg)	Super plasticizer (% of cement)	Water (kg)	Remark
500	910	750	2.2	190	SCC

The SCC mix proportion adopted is as follows: cement 500 kg, Fine aggregate 910 kg, coarse aggregate 750 kg, water 190 liter and superplasticizer dosage 2.2 for 1 m3 concrete.

3.8 PREPARATION OF TEST SPECIMEN

The cement, sand, coarse aggregate, superplasticizer and water are mixed in the mixer and metakaolin were added to the mix. The concrete was then placed into the moulds. The casted specimens were demoulded after 24 hours of casting and were kept in a curing tank for curing.



Fig. 3.11 Casted specimens

3.9 TESTS ON HARDENED CONCRETE

3.9.1 COMPRESSIVE STRENGTH

Cubes are used to determine the compressive strength of concrete. The dimension of the cube is 150mm X 150mm X 150mm. At first, the cube mould is prepared by connecting it properly with nuts and bolts. Then, it is thoroughly applied with grease in all the nuke and corner of the mould. Now, the dry mix consisting of the cement, fine aggregate, coarse aggregate and the replacements are added and mixed thoroughly. Now water is added slowly to the dry mix and the concrete is prepared. Now the prepared concrete is poured into the mould. Then it is allowed to set for 24 hours and then demoulded. Then compressive test is carried out by testing it in Compressive Testing Machine at 7th and 28th day.



Fig. 3.12 Experimental setup for testing of cube

3.9.2 SPLITING TENSILE STRENGTH

Spliting tensile Strength Cylinders are casted to determine the split tensile strength of the concrete. The dimension of the cylinder where height is 300mm and diameter is 150mm. At first, the cylinder mould is prepared by connecting it properly with nuts and bolts. Then, it is thoroughly applied with grease in all the nuke and corner of the mould. Now, the dry mix consisting of the cement, fine aggregate, coarse aggregate and the replacements are added and mixed thoroughly. Now water is added slowly to the dry mix and the concrete is prepared. Finally leveling is done in the mould. It is allowed to set for 24 hours and then de molded. Now the tensile test is carried out.



Fig. 3.13 Split tensile test setup

3.12.3 FLEXURAL TEST

Beam tests are done to evaluate flexural strength property of concrete. It is a measure of an unreinforced concrete beam to resist failure at bending. Beam specimens of size 100mm×100mm×500mm were tested for determining the flexural strength. The flexural strength was determined after 7th and 28th days water curing.



Fig. 3.14 Flexural strength test setup

4. RESULTS AND DISCUSSION

4.1 GENERAL

The workability and strength studies were conducted with various percentages of Metakaolin according to the procedures described in the previous chapter and the optimum metakaolin dosage was found out. The optimum metakaolin dosage was added with various percentages of glass fibre and the fresh and hardened properties were studied. The test results obtained was tabulated and a detailed analysis and discussion on the results are presented in this chapter.

4.2 FRESH PROPERTIES SCC WITH METAKAOLIN

To fulfill the condition of SCC in the fresh state and measure flow characteristic using slump cone, V-funnel, & L-box tests and to fix dosage of super plasticizer as per EFNARC guidelines and fix the dosage of water /powder ratio was required.

4.3 WORKABILITY OF SCC MIX

Table 4.1 Workability of SCC mix

Sl. No	Method	Unit	SCC mix value	Typical Range	
				Minimum	Maximum
1	Slump Flow Test	mm	703	650	800
2	T_{50} cm Slump Flow	sec	3.05	2	5
3	L-Box Test	h2/h1	0.9	0.8	1
4	J – Ring Test	mm	6	0	10

4.4 FRESH PROPERTIES OF SCC CONTAINING METAKAOIN

Table 4.2 Workability of SCC mix

No.	Method	Unit	SCC containing metakaolin					
			0%	5%	10%	15%	20%	25%
			703	711	723	730	722	701
2	T_{50} cm Slump Flow	sec	3.05	3.3	3.2	3	3.1	3.07
3	L-Box Test	h2/h1	0.9	0.83	0.9	0.91	0.867	1.3
4	J – Ring Test	mm	6	6.3	6.54	6.7	6.91	7

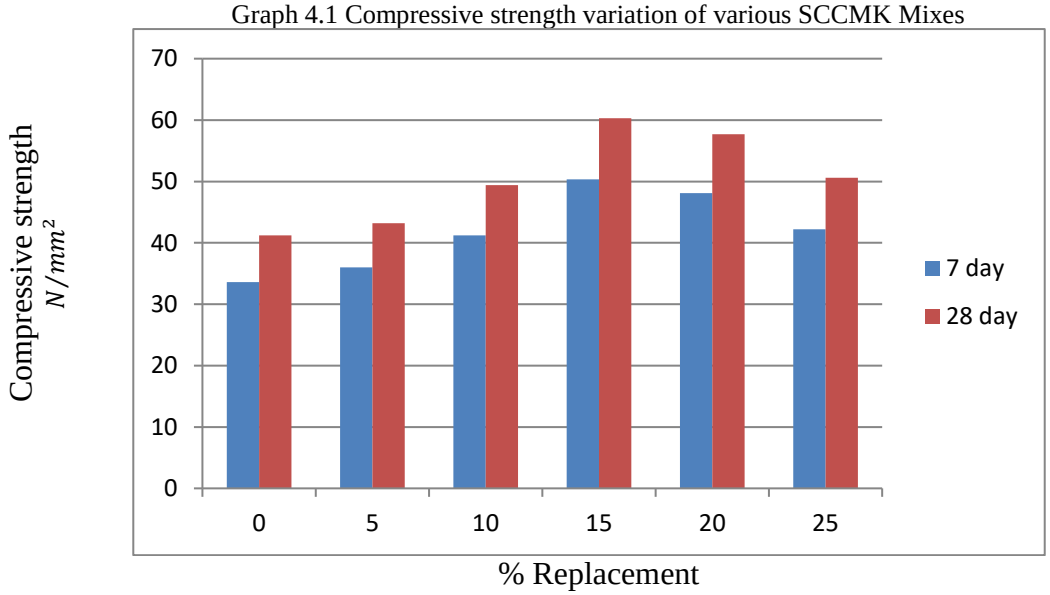
4.5 HARDENED PROPERTIES FOR SCC WITH METAKAOLIN

4.5.1 Compressive strength

Table 4.3 Compressive strength variation of various SCCMK Mixes

Replacement of cement with Metakaolin (%)	Compressive Strength	
	7th day	28th day
0	33.6	41.2
5	36	43.2
10	41.211	49.4
15	50.332	60.3
20	48.1	57.7
25	42.2	50.6

Graph 4.1 Compressive strength variation of various SCCMK Mixes



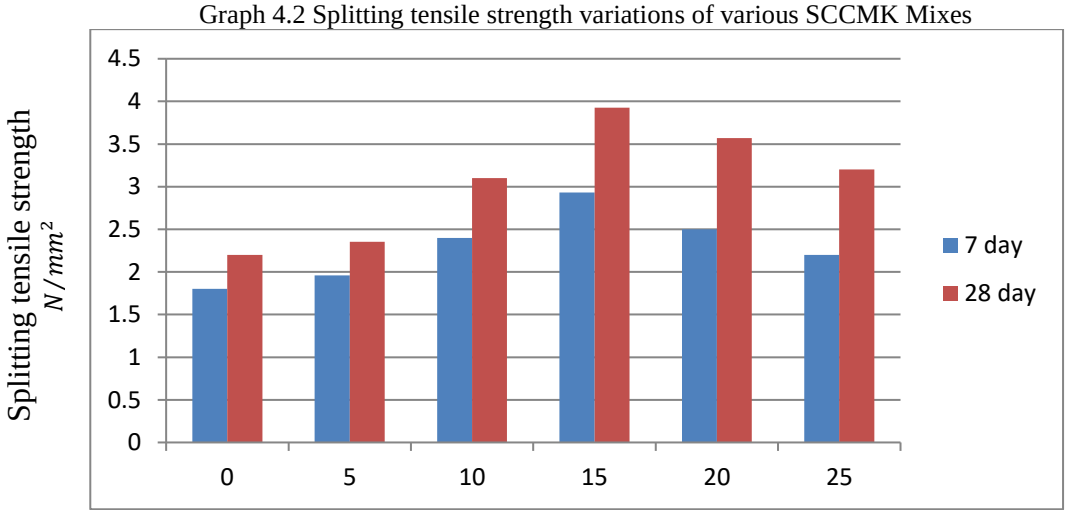
The compressive strength values varied from 33.6 to 42.2 N/mm² for 7 days strength. Also, it varied from 41.2 to 50.6 N/mm² for 28 days. It was found that the compressive strength seems to be increasing up to M3 mix. After that, it shows a decreasing trend, and up to M5 mix, the compressive strength is more than the target strength of SCC. So it is to be concluded that cement can be partially replaced by metakaolin up to 15%. Beyond 15%, the mix does not satisfy SCC property.

4.5.2 SPLITING TENSILE STRENGTH

Table 4.4 Splitting Tensile strength variation of various SCCMK Mixes

Replacement of cement with Metakaolin (%)	Split tensile Strength	
	7th day	28th day
0	1.8	2.2
5	1.96	2.352
10	2.4	3.101
15	2.93	3.927
20	2.5	3.571
25	2.2	3.2

Graph 4.2 Splitting tensile strength variations of various SCCMK Mixes



The splitting tensile strength values varied from 1.8 N/mm2 to 2.2 N/mm2 at 7 days strength. Also, it varied from 2.2 to 3.2 N/mm² for 28 days. It was found that the split tensile strength seems to be increasing up to M3 mix. After that, it shows a decreasing trend, and up to M5 mix, the split tensile strength more than the target strength of control mix. So it is to be concluded that cement can be partially replaced by metakaolin up to 15 % for SCC. Beyond 15%, the mix does not satisfy SCC property.

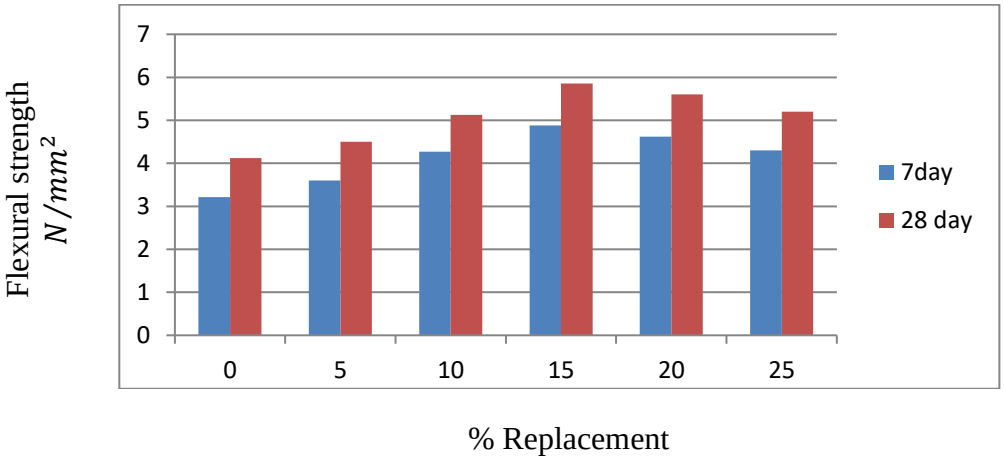
4.5.3 Flexural strength

Table 4.5 Flexural strength variation of various SCCMK Mixes

Replacement of cement with Metakaolin	Flexural strength	
	7th day	28th day
0	3.213	4.122
5	3.6	4.5
10	4.273	5.128
15	4.881	5.858

20	4.623	5.6
25	4.3	5.2

Graph 4.3 Flexural strength variations of various SCCMK Mixes



The flexural strength results were found in the range of 3.2 N/mm2 to 4.3 N/mm2 for 7 days strength. Also, it varied from 4.1 to 5.2 N/mm² for 28 days. It was found that the flexural strength seems to be increasing up to M3 mix. After that, it shows a decreasing trend, and up to M5 mix, the flexural strength more than the target strength of control mix. So it is to be concluded that cement can be partially replaced by metakaolin up to 15%. Beyond 15%, the mix does not satisfy SCC property.

4.5.4 CONCLUSION OF TEST RESULTS OF SCC WITH MK

The percentage of metakaolin was evaluated based on two criteria such as maintaining minimum cement content and obtaining maximum strength and also satisfy SCC property. The maximum hardened properties were obtained for SCCMK15, which is taken as the optimum value. By observing the results, at 25% replacement of cement by metakaolin, there will be a decrease in the strength.

4.5.5 WORKABILITY TEST FOR SCC CONTAINING OPTIMUM METAKAOLIN AND GLASS FIBRE

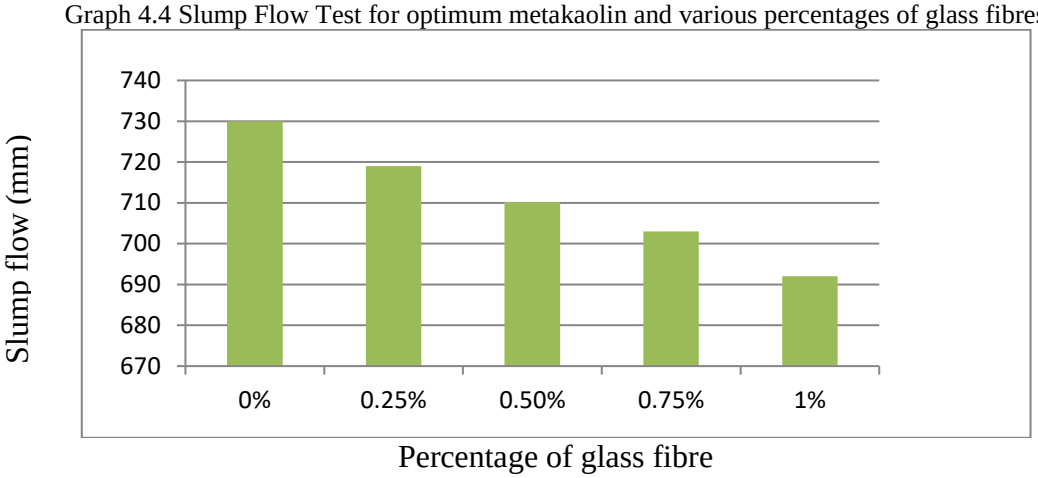
4.5.5.1 Slump test

Slump test was conducted on various mixes to determine the filling ability. The values for slump flow value and T50cm Slump Flow for various SCC Mixes are given below

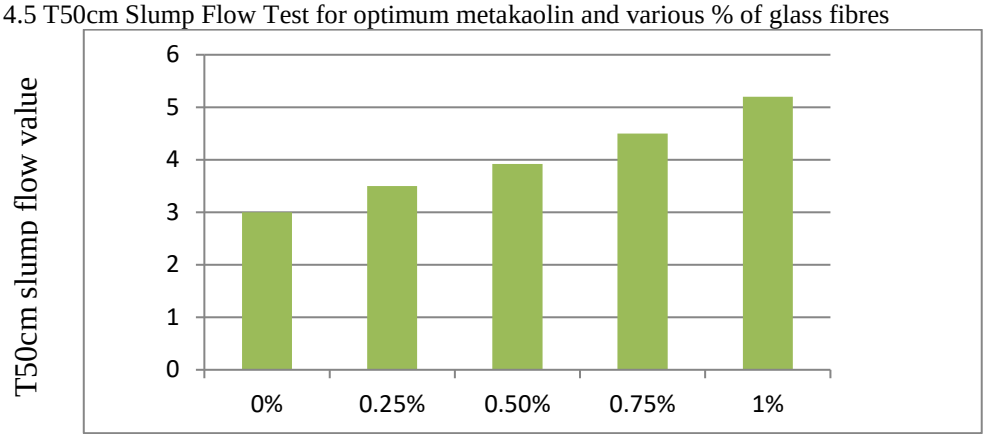
Table 4.6 Slump flow test for various metakaolin glass fibre mixes

Types	0%	0.25%	.5%	.75%	1%
Slump flow	730	719	710.2	700	690
T50 slump flow	3	3.5	3.92	4.5	5.2
L-Box test	0.91	0.87	0.826	0.81	0.74
J Ring test	6.7	6.99	7.2	8.8	10.6

Graph 4.4 Slump Flow Test for optimum metakaolin and various percentages of glass fibres



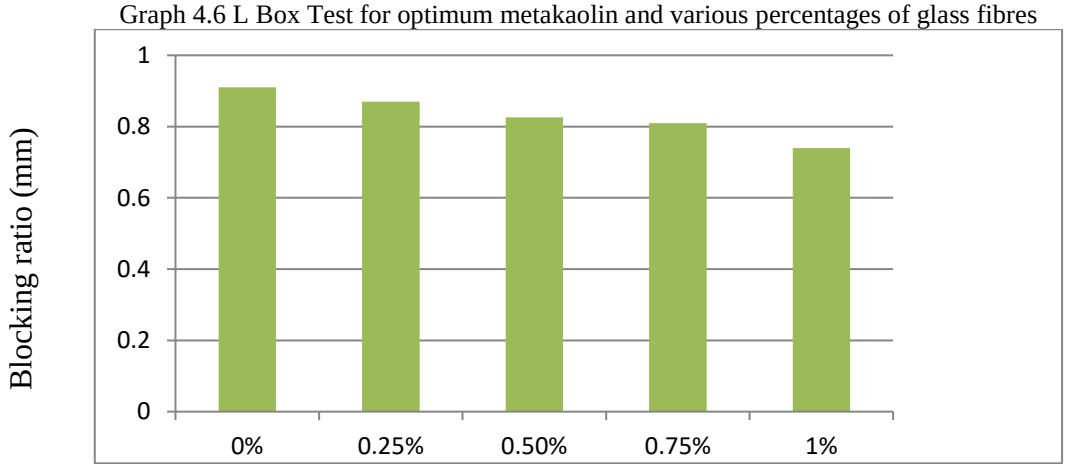
Graph 4.5 T50cm Slump Flow Test for optimum metakaolin and various % of glass fibres



From the Graph 4.5 and graph 4.4 it is evident that with increasing glass fibre. Slump flow value decreases and T50 slump flow value increases. The slump flow value and T50 slump flow is maximum for 0% and minimum for 1%.

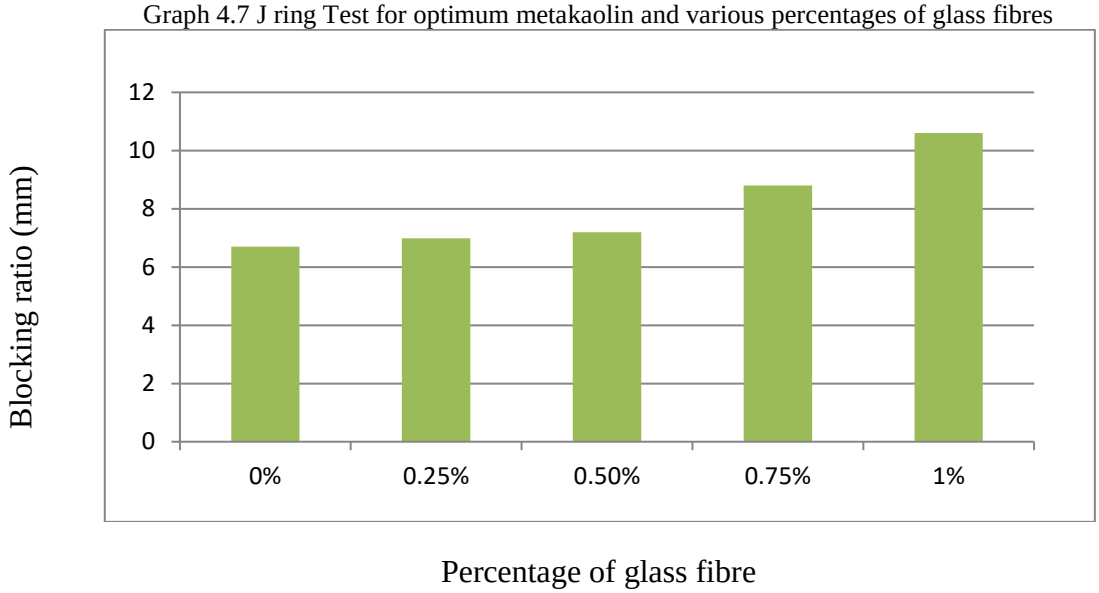
4.5.5.2 L box test

Graph 4.6 L Box Test for optimum metakaolin and various percentages of glass fibres



Blocking ratio was obtained for all mixes to determine the passing ability of mix to pass between reinforcement. The obtained values are shown in Graph 4.6. It shows that when fibre content increases, passing ability of concrete decreases and for Glass fibre with 1% it did not satisfy the limit of workability.

Graph 4.7 J ring Test for optimum metakaolin and various percentages of glass fibres



The test aims at investigating both the filling ability and the passing ability of SCC. The obtained values are shown in Graph 4.7. Addition of glass fibres increased the J-ring value.

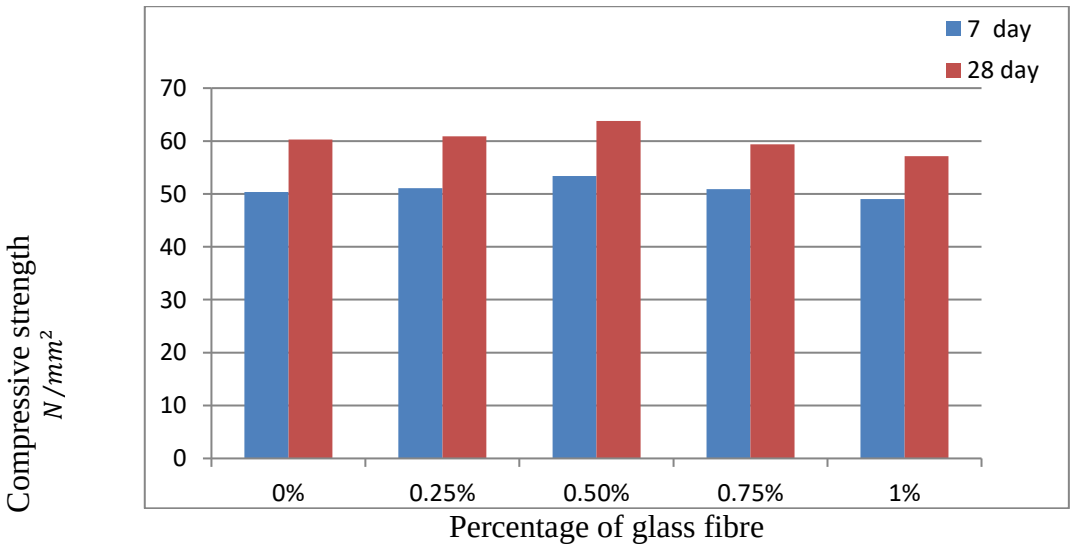
4.5.6 HARDENED PROPERTIES OF SCC CONTAINING OPTIMUM METAKAOLIN AND GLASS FIBRE

4.5.6.1 Compressive strength

Table 4.7 Compressive Strength of optimum metakaolin and various percentages of glass fibres

Percentage Replacement of cement with (15%) Metakaolin and various % of Glass fibre	Compressive Strength (N/mm2) 7 day	Compressive Strength (N/mm2) 28 day
0%	50.332	60.3
0.25%	51.11	60.9
0.5%	53.36	63.8
0.75%	50.9	59.38
1%	49.01	57.11

Graph 4.8 Compressive Strength of optimum metakaolin and various % of glass fibres



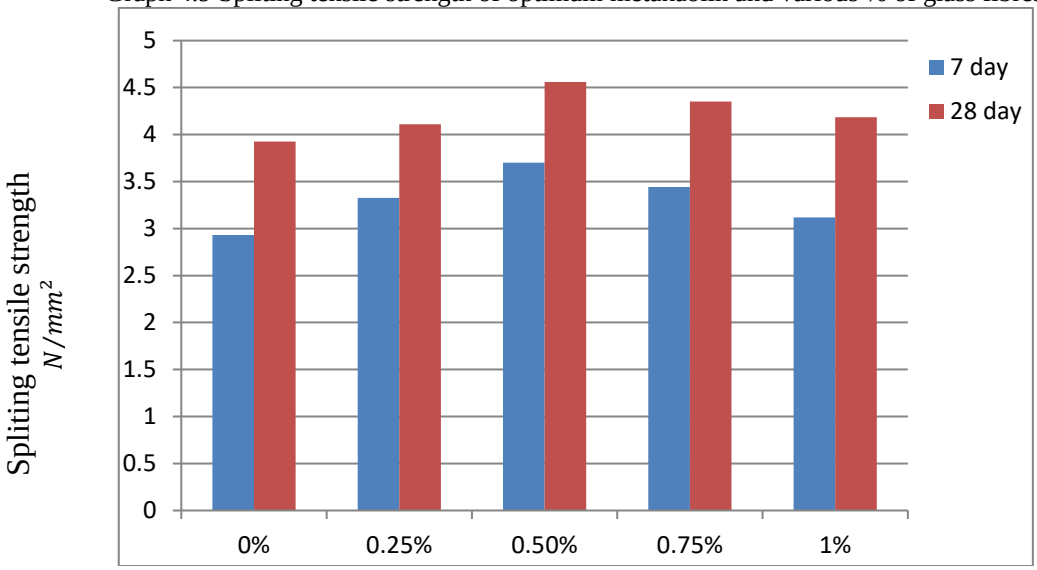
The compressive strength of MKGFSCC mix showed increase in strength as the glass fibre content was increased. The optimum Glass fibre mix is 0.50% (Graph 4.8) and with increasing glass fibre addition, the compressive strength started to show a declining trend.

4.5.6.2 Split tensile strength

Table 4.9 Spliting tensile strength of optimum metakaolin and various % of glass fibres

Percentage replacement of cement with (15%) Metakaolin and various % of Glass fibre	Spliting tensile strength (N/mm^2) 7 day	Spliting tensile Strength (N/mm^2) 28 day
0%	2.93	3.927
0.25%	3.325	4.11
0.5%	3.7	4.56
0.75%	3.441	4.35
1%	3.12	4.185

Graph 4.9 Spliting tensile strength of optimum metakaolin and various % of glass fibres



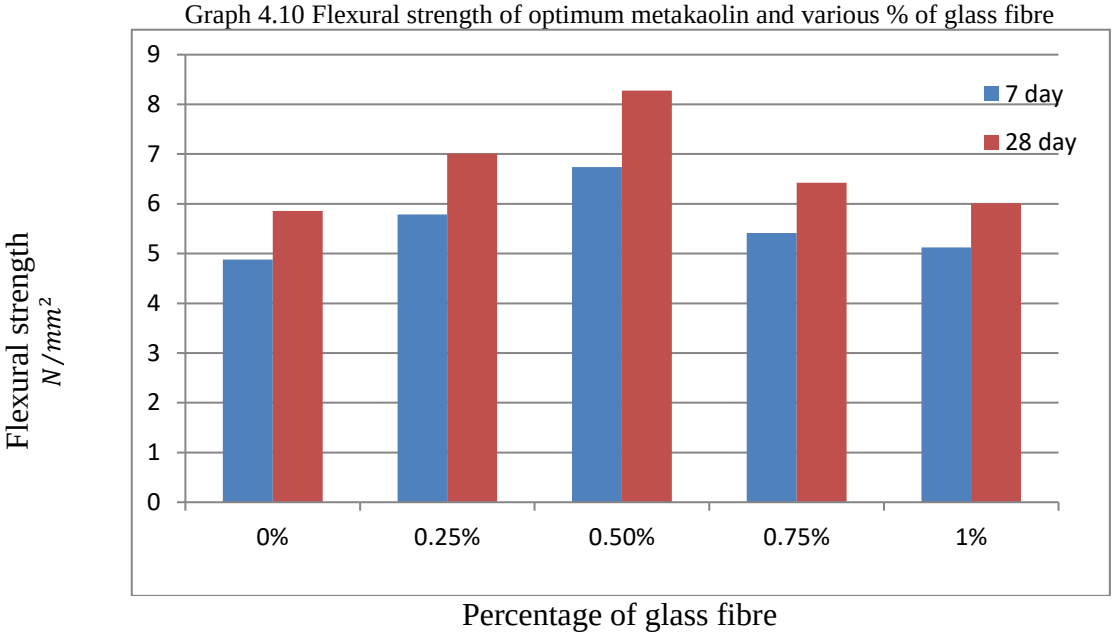
The Spliting tensile strength increases with increase in fibre content. The optimum Glass fibre mix is 0.50% (Graph 4.9) and with increasing glass fibre addition, the Spliting tensile strength started to show a declining trend.

4.5.6.3 Flexural strength

Table 4.10 Flexural strength of optimum metakaolin and various % of glass fibre

Percentage Replacement of cement with (15%) Metakaolin and various % of Glass fibre	Flexural strength (N/mm^2) 7 day	Flexural strength (N/mm^2) 28 day
0%	4.881	5.858
0.25%	5.789	7.011
0.5%	6.741	8.277
0.75%	5.411	6.426
1%	5.125	6.01

Graph 4.10 Flexural strength of optimum metakaolin and various % of glass fibre



The flexural strength increases with increase in fibre content. The optimum Glass fibre mix is 0.50% (Graph 4.10) and with increasing glass fibre addition, the flexural strength started to show a declining trend. The enhancement in flexural strength can be attributed to impart sources of strength gain, toughness, and ductility.

4.5.7 CONCLUSION OF OPTIMUM METAKAOLIN AND GLASS FIBRE

The workability reduced with higher percentage of micro glass fibre addition in optimum metakaolin and for mix 15 % metakaolin with 0.50 % of fibre is the best combination. Beyond this percentage, it does not satisfy SCC property.

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