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ON "CHALLENGES & OPPORTUNITIES FOR TECHNOLOGICAL INNOVATION IN INDIA" (COTII - 2020)

12th-13th DECEMBER, 2020

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To nourish the students, blossom them into tomorrow's world class professionals and good human beings by inculcating the qualities of sincerity, integrity and social ethics.

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सत्यमेव जयते

—:संदेश:—

यह अत्यंत उल्लास का विषय है कि दिनॉक —**12 ,o 13 fnlEcj 2020** को अम्बालिका इंस्टीट्यूट ऑफ मैंनेजमेण्ट एण्ड टेक्नोलॉजी द्वारा e-International Conference on "Challenges & Opportunities for Technological Innovation in India" (e-COTII-2020)का आयोजन किया जा रहा है। इस संस्थान ने पिछले कुछ वर्षो में अपने परीक्षा परिणाम और विद्यार्थियों के प्लेसमेंट के माध्यम से न केवल सम्पूर्ण प्रदेश में बल्कि देश के अग्रणी तकनीकी संस्थानों में अपने को प्रतिस्थापित किया है।

सम्पूर्ण विश्व बहुत तेजी से आगे बढ़ रहा है। भारत को इस दौर में आने के लिए तकनीकी एवं प्रबन्धन के क्षेत्र में नित्य नये प्रगतिशील कदमों की आवश्यकता है, और दुनिया में हो रही आधुनिक उपलब्धियों का जहॉ संज्ञान रखना है, वहीं विशेषज्ञों को आमंत्रित करके प्रदेश का अग्रणी संस्थान होने के नाते नये कदम, नयी खोज एवं नये सिद्धान्तों के लिए अवसर भी प्रदान करना है। भविष्य में यदि देश को शीर्ष स्थानों में शामिल होना है तो सिर्फ चलना ही नहीं पड़ेगा बल्कि अन्य को पीछे छोड़ते हुये आगे बढ़ना भी होगा।

मुझे आशा ही नहीं पूर्ण विश्वास भी है कि अम्बालिका इंस्टीट्यूट ऑफ मैंनेजमेण्ट एण्ड टेक्नोलॉजी द्वारा अन्तर्राष्ट्रीय संगोष्ठी का आयोजन अपने अभीष्ठ को प्राप्त करने में पूरी तरह से सफल रहेगा। मैं, अम्बालिका परिवार को इस कदम के लिए हृदय के अन्तस्थल से बधाई देता हूॅ एवं इस अवसर पर संगोष्ठी के स्मारिका के प्रकाशन पर अपनी शुभकामनायें ज्ञापित करता हूॅ।

ससम्मान,

आपका

(प्रमोद तिवारी)

प्रो० विनय कुमार पाठक
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डॉ० ए०पी०जे० अब्दुल कलाम प्राविधिक विश्वविद्यालय
उत्तर प्रदेश, लखनऊ
Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
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DATED 10.12.2020

MESSAGE

I am pleased to know that Ambalika Institute of Management and Technology, one of the leading institute of AKTU; would be organizing an e-International Conference on Challenges & Opportunities for Technological Innovation in India (e-COTII-2020), sponsored by AICTE New Delhi, scheduled on 12th -13th December, 2020. India is a developing Country and it needs new innovation in all the areas of Science, Engineering, Technology, Management, and Other various sectors. Technological innovations have become very important tool for the development, growth and sustainability in the present scenario.

We at Dr. A. P. J. Abdul Kalam Technical University wish to record our appreciation for such initiatives being taken by the Management and Faculty Members of Ambalika Institute of Management and Technology, Lucknow, for the faculty of any Technical Institution, it is very important to remain aware of the technological developments around the world. The challenges involved in filling of the technological gaps, are always taken care of, provided there exist opportunities which can off-set the toughest of challenges. The opportunities are in plenty as far as the scope for the innovative technologies is concerned.

I am sure, this International Conference will meet the Challenges in Technological innovations and will provide the vibrant platform for Technocrats Scientist, Managers, and Research Scholars, to share their views in building our great nation.

I extend my heartiest wishes for the grand success of the international conference and for the publication of souvenir on this auspicious occasion.

With regards,

(Prof. Vinay Kumar Pathak)

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MESSAGE

I am very happy to know that the e-International Conference on Challenges and opportunities for Technological Innovation in India has been widely accepted by the academic world.

It is my belief that the world has reached this highly scientific and technologically advanced stage only because somebody somewhere in every generation from last thousands of years has been innovating on existing technologies and devising newer approach to fulfill the human needs. We observe this change in every sphere of human activity, be it communication - from papyrus to mobile phones, emails and cloud based communications, be it travel - from walking to animal deployment to surface transport to air travel to space travel and perhaps eventually to time travel.

There is no end to progress in technology so long as our engineers and Management Persons will continue to evaluate challenges, recognize opportunities and innovate a unique never before approach. We at Ambalika continuously in a position to innovate in what we know best - Creating world class engineers and management peoples. I am sure that this large gathering of high profile academicians, Research Scholars and Industry Persons from various fields will be the vibrant platform for innovating teaching methodologies to set new standards for others to emulate.

I convey my best wishes for grand success of the **e-International Conference on** Challenges & Opportunities for Technological Innovation in India (e-COTII-2020), scheduled on 12th -13th December, 2020 and also for the publication of proceedings at this moment.

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12/12/2020			
S.No	Timing	SESSION 1: (INAUGRAL SESSION)	
1	10:00-10:10 AM	Lamp lightning	All distinguished guest & college key persons
2	10:10-10:14 AM	Saraswati Vandana	AIMT Students
3	10:14-10:15 AM	National Anthem	
4	10:15-10:20 AM	Corporate Video	
6	10:20-10:25 AM	Welcome Speech	Shri Ambika Mishra (CEO AIMT & Patron eCOTII-2020)
7	10:25-10:30	Address by Guest of Honour	Prof. Vineet Kansal (Pro. VC AKTU Lucknow)
8	10:30-10:40 AM	Address by Guest of Honour	Prof. J.P. Pandey (Vice Chancellor, MMMUT Gorakhpur)
9	10:40-11:00 AM	Address by Chief Guest	Prof. Vinay Kuamr Pathak (Vice Chancellor, AKTU)
10	11:00-11:10 AM	Vote of thanks	Dr. S. Q. Abbas, Convener of the Conference
Session-2, KEY NOTE SESSION -1			
1	11:15-11:45 AM	Key Note Address 1	Prof. Vineet Kansal (Pro. VC AKTU Lucknow)
2	11:45-12:15 PM	Key Note Address 2	Prof. Shekhar Verma(IIIT Prayagraj)
3	12:15-12:45 PM	Key Note Address 3	Prof. Kumar Anubhav Tiwari, Finland
7	12:45 - 1:30 PM	LUNCH	
Session-3, Technical Session-1			
			Session Chair/Co-chair
1	1:30-4:30 PM	Invited talk followed by paper presentation	Prof. S.P. Tripathi, (Rtd) IET, Lucknow
12/13/2020			
1	09:45-10:00 AM	Welcome Speech	Dr. Alok Mishra, Co-Convener
Session-4, KEY NOTE SESSION -2			
1	10:00-10:30 AM	Key note address 4	Prof. Zia Abbas, IIIT, Hyderabad
2	10:30-11:00AM	Keynote address 5	Prof. Neelam Sharma, Director, MAIT, Delhi
3	11:00-11:30AM	keynote address 6	Prof. Deepti Mehrotra, Amity School of Computer Science, Noida
Session-5, Technical session-2			
1	11:30 -01:30 PM	Paper Presentation	Prof. S. P. Tripathi, (Rtd) IET, Lucknow
LUNCH 1:30- 2:30 PM			
1	01:30 - 3:30 PM	Paper Presentation	Prof. S.P. Tripathi, (Rtd) IET, Lucknow
2	3:30 - 4 :30 PM	Valedictory and vote of thanks	Dr. P. K. Dwivedi, Co-Convener of the Conference

Ambalika Institute of Management and Technology, Lucknow, India

e - International Conference On "Challenges & Opportunities for Technological Innovation in India"(2020)

Index

Channel Transmission Time Calculations in a Digitally Wavelength Tunable Optical Filter System

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***Abstract* –** Channel transmission time calculations for a digitally wavelength tunable optical filter system are presented. This method of finding transmission time can be used for any similar kind of Semiconductor Optical Amplifier (SOA) and wavelength selection element based tunable optical filter system. By using this method routing decisions for different channel wavelengths can be taken. The method can be used for any number of channels to be filtered through these types of systems.

***Index Terms* -** Optical Filter, Digitally Tunable, Transmission Time, Routing.

I. INTRODUCTION

Tunable optical filter system [1-7] is one of the most important subsystems of any optical communication network. These filters can dynamically choose the wavelengths to be transmitted by using a tuning mechanism or selection system. The selection system routes the desired wavelength to the output while blocks all other wavelengths. One of the most popular selection systems is electrical tuning system which offers high speed and computer compatibility and controllability. Recently, a digitally tunable optical filter system [2] was designed for wavelength selective switching based optical network, in which selection of output wavelengths was done by giving combinations of '0' and '1' at the inputs of SOAs (Semiconductor Optical Amplifiers). The filter system used 2 splitters, 12 two-by-two (2×2) wavelength-selection elements with thin-film filters, 7 SOAs and 1 four-by-one (4×1) combiner. The selected wavelength reached at the combiner output after transmission and/or one or more reflections from the wavelength selection elements. The idea presented in that work [2] used lesser number of SOAs in comparison to other digitally tunable filter systems [3]. This work presents transmission time calculations for different channel wavelengths transmitted through that system. These transmission time calculations can be used to analyse the timing performance of the system.

II. SYSTEM DESCRIPTION

Fig. 1 shows the block diagram of the system designed in reference [2]. The twelve wavelengths reach inputs of SOA_{11}, SOA_{12} and SOA_{13} via splitters. The SOAs and wavelength selection elements constitute wavelength selection and routing stage. The channel wavelengths are routed to different paths by a twelve 2x2 wavelength selection elements arrangement. The wavelengths filtered by this arrangement reach to SOA_{21}, SOA_{22}, SOA_{23} and SOA_{24} on the output side for final transmission by Semiconductor Optical Amplifiers. The wavelengths at the output of SOA_{21}, SOA_{22}, SOA_{23} and SOA_{24} reach to the output via a combiner. The wavelength selection elements transmit the filtered wavelength to diagonally opposite output port. The rejected wavelengths are reflected towards next wavelength selection element. Functioning of wavelength selection element is shown in fig. 2.

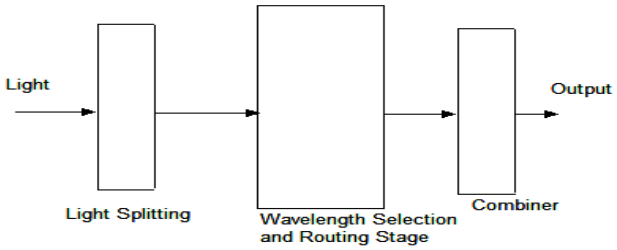

Fig. 1. Block diagram of digitally tunable optical filter system.

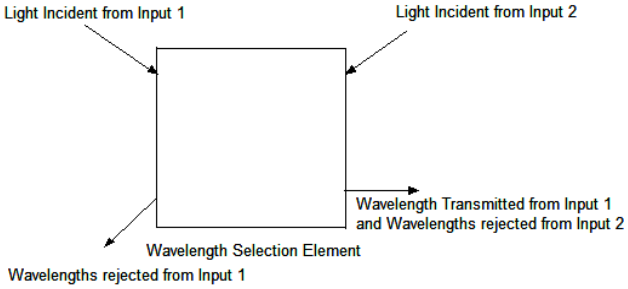

Fig. 2. Block diagram of wavelength selection element.

III. THEORY AND CALCULATIONS

By looking into the paths followed by each channel wavelength between input SOAs and output SOAs in reference [2], the delay time equations can be written as

$$t_{\lambda 1} = t_t + t_f \quad (1)$$

$$t_{\lambda 2} = t_{r\lambda 2\lambda 1} + t_t + t_f \quad (2)$$

$$t_{\lambda 3} = t_{r\lambda 3\lambda 1} + t_{r\lambda 3\lambda 2} + t_t + t_f \quad (3)$$

$$t_{\lambda 4} = t_{r\lambda 4\lambda 1} + t_{r\lambda 4\lambda 2} + t_{r\lambda 4\lambda 3} + t_t + t_f \quad (4)$$

$$t_{\lambda 5} = t_t + t_{r\lambda 5\lambda 1} + t_f \quad (5)$$

$$t_{\lambda 6} = t_{r\lambda 6\lambda 5} + t_t + t_{r\lambda 6\lambda 2} + t_f \quad (6)$$

$$t_{\lambda 7} = t_{r\lambda 7\lambda 5} + t_{r\lambda 7\lambda 6} + t_t + t_{r\lambda 7\lambda 3} + t_f \quad (7)$$

$$t_{\lambda 8} = t_{r\lambda 8\lambda 5} + t_{r\lambda 8\lambda 6} + t_{r\lambda 8\lambda 7} + t_t + t_{r\lambda 8\lambda 4} + t_f \quad (8)$$

$$t_{\lambda 9} = t_t + t_{r\lambda 9\lambda 5} + t_{r\lambda 9\lambda 1} + t_f \quad (9)$$

$$t_{\lambda 10} = t_{r\lambda 10\lambda 9} + t_t + t_{r\lambda 10\lambda 6} + t_{r\lambda 10\lambda 2} + t_f \quad (10)$$

$$t_{\lambda 11} = t_{r\lambda 11\lambda 9} + t_{r\lambda 11\lambda 10} + t_t + t_{r\lambda 11\lambda 7} + t_{r\lambda 11\lambda 3} + t_f \quad (11)$$

$$t_{\lambda 12} = t_{r\lambda 12\lambda 9} + t_{r\lambda 12\lambda 10} + t_{r\lambda 12\lambda 11} + t_t + t_{r\lambda 12\lambda 8} + t_{r\lambda 12\lambda 4} + t_f \quad (12)$$

where $t_{\lambda n}$ is the delay time for the nth wavelength between input and output SOAs; the values of 'n' are [2] $n = 1,2,3..... ...12$; $t_{r\lambda n\lambda m}$ is the time taken by the nth wavelength to go into the wavelength selection element for λ_m center wavelength, and coming back after reflection; t_t is the time taken by

the n^{th} wavelength in passing through the wavelength selection element with λ_n center wavelength; t_f is the time taken by the λ_n wavelength in passing through the fibers.

TABLE I. DELAY TIME FOR DIFFERENT CHANNEL WAVELENGTHS THROUGH THE SYSTEM

Wavelength	Delay Time (ps)	Average Delay Time (ps)
λ_1	20	45
λ_2	30	
λ_3	40	
λ_4	50	
λ_5	30	
λ_6	40	
λ_7	50	
λ_8	60	
λ_9	40	
λ_{10}	50	
λ_{11}	60	
λ_{12}	70	

If $t_{r\lambda n\lambda m} = t_t = t_f = 10\,ps$ for $n = 1,2,3..... ...12$ and $m = 1,2,3.....,12$. The calculated delay times are

$$t_{\lambda 1} = 20\,ps,$$
$$t_{\lambda 2} = 30\,ps,$$
$$t_{\lambda 3} = 40\,ps,$$
$$t_{\lambda 4} = 50\,ps,$$
$$t_{\lambda 5} = 30\,ps,$$
$$t_{\lambda 6} = 40\,ps,$$
$$t_{\lambda 7} = 50\,ps,$$
$$t_{\lambda 8} = 60\,ps,$$
$$t_{\lambda 9} = 40\,ps,$$
$$t_{\lambda 10} = 50\,ps,$$
$$t_{\lambda 11} = 60\,ps$$
and $t_{\lambda 12} = 70\,ps$.

The average delay time for the system is $45ps$. The delay times of different channels are also listed in table 1. The center wavelengths of filters used in wavelength selection elements are listed in table 2. The Channel 1 wavelength is 1291nm and the channel 12 wavelength is 1611nm. These wavelengths are as per International Telecommunication Union-Telecommunication (ITU-T) recommended grid for Coarse Wavelength Division Multiplexing (CWDM).

TABLE II. LIST OF CHANNEL WAVELENGTHS

Channel	Center Wavelength (nm)
1	1291
2	1311
3	1331
4	1351
5	1471
6	1491
7	1511
8	1531
9	1551
10	1571
11	1591
12	1611

The wavelength routed through the shortest routing path will have minimum transmission time. While the wavelength routed through the longest routing path will have maximum transmission time. The wavelengths have transmission times ranging from 20ps to 70ps.

IV. CONCLUSION

The transmission time calculations for all channels of a recently proposed 12 channel digitally wavelength tunable optical filter system are given. This method of calculating transmission time can also be used in similar type of systems to analyse the timing performance of the system and to optimise the system performance by decreasing the wavelength routing lengths. The method can be used for any number of channel wavelengths to be filtered.

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Implementation and Statistical Analysis of De-noising Techniques for Standards Image

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Abstract: This study intends to provide an exhaustive treatise on various image de-noising techniques; analysis and testing using standard images. Expelling noise from digital images is a major test for the analysts working in the field of Digital Image Processing. The main aim of this study is to provide a literature survey of some popular de-noising techniques concentrating on spatial-scale space, for example, wavelet based methodology and Contour let approach, have been scrutinized and plays out their near investigation. Further, in this study, different types of noise models, such as Poison Noise, Gaussian noise, speckle noise, and salt & pepper noise, have been used. Moreover, the correlations of acknowledgment of various picture de-nosing strategies have been assessed utilizing full reference assessment measurements. For instance, PSNR (Peak Signal-to-Noise Ratio) and RMSE (Root Mean Square Error). Investigation of results shows the Contour let Transform based de - nosing technique exhibits promising results both, quantitatively and qualitatively.

Keywords: Image denoising, Threshold, Wavelet transform, Contour let transforms.

1. BACKROUND

Obtaining, putting away, and preparing of digital images are as yet turning out to be an ever increasing number of significant applications in our everyday life. De-noising, smoothing, and simplification are central problems in digital image processing. All three of them aim at enhancing the quality of an image either to a human observer or as pre-processing step for a computer vision system. Image de-noising is the major portion of digital image processing which includes research based on algorithm and routine goal oriented image Processing. Further, it deals with reduction of degraded images that are seen in the image obtained. Degradation occurs due to blurring and noise that is incorporated in the image by various sources.

Noisy sort of a channel can hampered and affect the noise in the medium of transmission which produce mistakes during transmission and quantization of the information for advanced capacity [1-2]

Besides, every part in the imaging chain, for example, film, lenses, digitizer, and so on, add to the degradation. Image de-noising has applications in fields.

It can be well understood by assuming an example such as in the clinical imaging, where physical provisions intended for the top notch imaging which are required in the analysing of images[3].

Image de-noising is one of the required tasks in image processing for better analysis and vision. There are several noises which can degrade the quality of images. There are various types of noise models including multiplicative and additive noises. There are various sorts of noise models including multiplicative and additive noises. These are speckle noise, Gaussian noise, Poisson noise, salt and pepper noise, etc. Gaussian noise is equally disseminated over the sign. Salt and pepper noise is a short time of noise. This introduces error in data transmission. There are many types of de-noising method which are used as a image restoration technique for all type of noisy images. These are linear smoothing, Median filtering, De-noising using local statistics, wavelet and contourlet based methods.

The different quality presentation estimating files, for example, Signal-to-Noise Ratio (SNR), Peak-Signal-to-Noise Ratio (PSNR) and Mean-Square-Error (MSE) among original and restored image.

Wavelet transform are numerical functions that analyse image as indicated by scale or resolution. This procedure permits to consider the signal in various resolution or at various windows. For case, if the examination of signal is done in an enormous window, highlights of huge measurement can be seen, be that as it may whenever showed up in a little window, highlights of little measurement can be taken note.. Notwithstanding, Wavelet Transform experiences constrained directionality [4-7]. Thus, in order to overcome the limitations of Wavelet Transform, Contour let Transform was introduced. Image compression, image de-nosing, earthquake prediction, radar, human visions are some of the applications of Contour let Transform.

2. LITERATURE REVIEW

Many researchers, proposed various de-noising technique like Wiener filtering, Wavelet based thresholding, Contour let based de-nosing, etc. A detail survey of the de-noising strategies having a place with various classes has been done, individually.[7]proposed Wiener and Median filtering algorithms to de-noise picture with various kinds of noise, for example, Gaussian noise and Speckle noise, Salt and Pepper noise that are either presented in the picture during catching or incorporated into the picture during transmission. Analysis of result shows that the performance of Wiener filter is better than Median filter in case of Speckle and Gaussian noisy image, while the performance of the Median filter is better than Wiener filter in case of Salt & Pepper noisy image. [10] describe and implemented different image de-noising techniques and their performance comparatively assessed. Analysis of result shows that the wavelet based de-nosing technique has proved to be good for de-noising of natural images because of their sparseness energy compactness, and correlation properties, when compared to other image de-noising techniques. [12] Proposed to research the reasonableness of various wavelet bases and the size of various neighbourhoods, alongside various threshold plans. Investigation of results shows that Wavelet based picture de-noising calculations displays great outcomes regarding PSNR, when contrasted with different systems. [19] Describe stationary wavelet transform based de-noising techniques to remove noises form the images. Analysis of results shows that the performance of stationary wavelet transform yields good results in terms of SNR, in response to other techniques. [28] proposed Contour let Transform based de-noising technique to reduce noises form the standard images. Analysis of results shows that Contour let Transform de-nosing technique outperforms other wavelet based de-nosing techniques in terms of various evaluation metrics, along with visual analysis.

3.1 TYPES OF NOISES IN IMAGES

During picture obtaining the optical signals get changed over into electrical which at that point gets changed over into digital signal. At each procedure of transformation noise gets added to the picture. The picture can likewise get noisy during transmission of the picture as digital signals. The sorts of noises are:

i) Gaussian noise
ii) Salt and Pepper noise
iii) Shot noise (Poisson noise)
iv) Speckle noise

3.1.1 Gaussian Noise

This isalso called as electronic noise as it shows up in the amplifiers or receivers and consistently scattered over the signal. It indicates that the entire pixel in noisy picture is almost similar to summation of genuine pixel esteem along with arbitrary Gaussian circulated noise esteem. As distinct nature of radiation of warm articles and thermal vibration of atoms, this is created by characteristic sources [16-18]. It can be expressed as (bell shaped probability distribution function) follows:

$$P(g) = \frac{1}{\sqrt{2\pi\sigma^2}} \qquad \ldots(3.1)$$

where g shows the gray level, m is the mean or average of the function, and σ is the standard deviation of the noise.

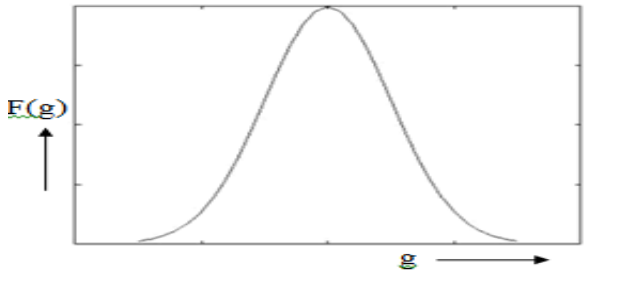


Fig 3.1- Gaussian Distribution

3.1.2 Salt and Pepper Noise

Salt and Pepper is an (acoustic) sort of noise, which is otherwise called power spikes, sharp sounds, noise make commonly expected in data transmission. The corrupted pixels are relegated on the other hand to maximum otherwise to base worth, creates picture in to a look of 'salt and pepper'[18].

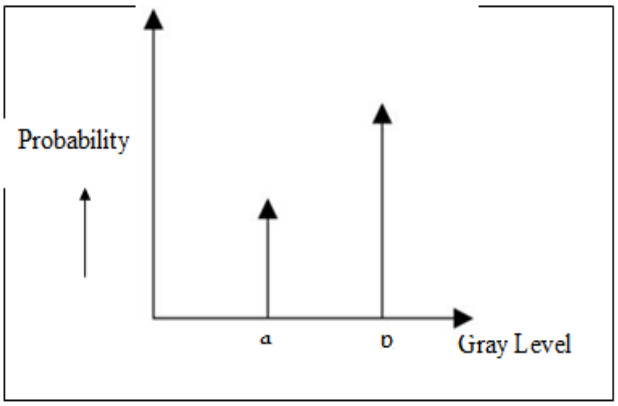


Fig 3.2- Probability Density Function for Salt & Pepper Noise

In a case of 8-bit image, the ordinary value for pepper noise is 0 and for salt noise is 255. It is likewise produce by weaknesses of pixel components in the camera sensors, timing errors in the digitization process, or deficient memory areas [17].

3.1.3 Poisson Noise (Shot Noise)

It is also known as quantum or shot noise. Because of the analytical idea of electromagnetic waves such as visible lights, X-rays and gamma rays, the nearness of this noise is can be seen [7]. The noise followed by Poisson distribution and can be expressed as follows:

$$P(f_{(pi)} = k) = \frac{g^{\propto_i} e^{-lambda}}{\propto -1!\ a^{\alpha}} \qquad \ldots (3.2)$$

3.1.4 Speckle Noise

Speckle noise is a sort of multiplicative noise. It shows up in all coherent imaging frameworks, for example, laser, acoustics, and Synthetic Aperture Radar (SAR) symbolism [16-17]. The probability density function of speckle noise shows gamma distribution, and is given by

$$F(g) = \frac{g^{\propto -1} e^{\frac{-g}{a}}}{\propto -1!\ a^{\alpha}} \qquad \ldots (3.3)$$

where variance is α and g is the gray level.

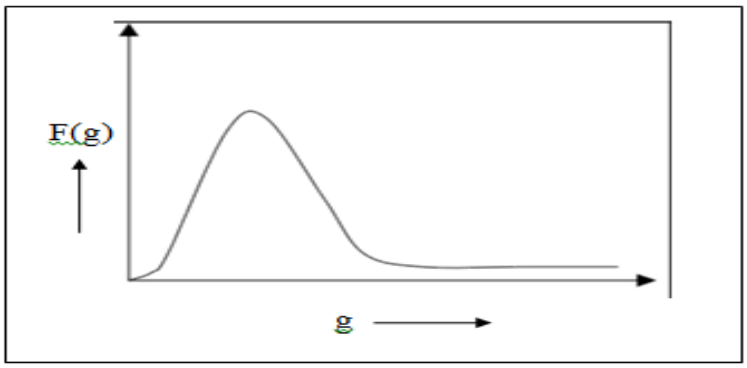


Fig 3.3- Gamma Distribution

3.2 IMAGE DE-NOISING USING SPATIAL-SCALE DOMAIN BASED TECHNIQUES

A few changes of multi-Scale transform based picture de-noising techniques exist, for example, Discrete Wavelet Transform (DWT), and Stationary Wavelet Transform (SWT). The following part gives a detailed review and technique of MST mostly CT Stationary Wavelet Transform and Discrete Wavelet Transform based de-noising techniques which have been selected for this examination [19-24].

3.2.1 De-noising of Image using DWT (Discrete Wavelet Transform)

Discrete Wavelet Transform, for the most part, it would be relevant to discuss when all is said in done about Fourier Transform. Fourier expressed that all periodical function can be communicated as a total of sine and cosine of distinct frequencies; each multiplied by a different coefficient [14-19]. Fourier transform change a signal from the time-amplitude to the recurrence amplitude domain. Images are treated as 2-D discrete functions. To utilize Fourier transform to consider images, Discrete Fourier Transform (DFT) is utilized. FT is a reversible transform, which implies the original signal can be retrieve through the Inverse Discrete Fourier Transform (IDFT). Notwithstanding, FT has a shortcoming i.e. it doesn't bring the information about the time at which the particular recurrence exists in the signal. Fourier Transform just taking the different frequencies in a signal and can't distinguish when those frequencies happened. To abolish this downside, Wavelet Transform (WT) was occurring. Wavelet Transform (WT) can be worthwhile than Fourier transform, since they are rely upon functions that are limited in both space and recurrence/scale [15]. Wavelet Transform delivers a - multi-resolution structure. With this setting, the signal can be dissolve into segments that amass the information at a specified scale i.e. different frequencies are considered with different resolutions [24-27]..A 2-Dimentional signal may break down by passing it throughout an analysis filter bank in DWT (Discrete Wavelet Transform) and it is followed by decimation process. At every decomposition level, it is hold by high and low pass filter. An image pass through this filter, started decaying in to two signals.

Coefficients of low pass filter collects the normal substance of the 2-Dimentional signal (at an average operation). Moreover, coefficients of high pass filter gather the detail of the image such as lines and edges indicates disparities operation and the mechanism is then devastated by two [20-24]. The 2-Dimensional signal is filtered alongside the column and decimated by two. It is also noted that from that point which is trailed with filtering the sub image alongside the column, devastated by two.

This processes splits the 2-Dimentional signal into 4 bands which is Approximation band that consists of coarse information and three detail bands. Theses band are horizontal, vertical and diagonal respectively. They also contain the precise information like as points, edges and lines [23].Further, at each level of disintegration, the image is split into low and high frequency components and the low-frequency components can be further decomposed until the desired resolution is reached [20-22]. Methods for the de-noising of images by DWT have been discussed in section 2.4.1.

3.2.2 De-noising of Image using SWT (Stationary Wavelet Transform)

This can be understood that Discrete Wavelet Transform (DWT) is not a shift-invariant transform. Along these lines, so as to dispense with this issue that SWT, a development of DWT conspires, known as 'a' trous' algorithm, which is presented [19-21].

A 2-D filter got from scaling function in Stationary Wavelet Transform algorithm. Here, two kinds of pictures have been generated. First one is a similarity picture whereas the other one is a point by point picture which is known as wavelet plane. This plane is use to relate to vertical, horizontal and diagonal coefficients, but in the range of 2^j and 2^(j-1) resolution. It is figured as the disparity between two back to back approximations I_(l-1) and I_l levels.

All the estimate pictures accomplish, by applying this deterioration, have indistinguishable number of segments and columns from the first picture, since channels at all level are up-inspected by embeddings zeros between the channel coefficients, make the size of the picture same [22-24]. The general activity for the picture de-noising in the Contour let and Wavelet area embraced can be order as follows (Fig. 2.5):

3.3.3 De-noising of image by Contour let Transform (CT)

In order to minimize the level of disadvantage of wavelet and curvelets, (Do and Vetterli, 2005), recently spearheaded another arrangement of picture portrayals named contour lets, which is a "true" 2-dimensional change that can taking the natural diagnostic structures data of pictures which provides adaptable number of directions [24-26].

Contour let Transform expected by Do and Vetterli is a real two-dimensional transform, which is based on non-separable filter banks and offers an efficient directional multi-resolution image representation. The CT is also known as Pyramidal Directional Filter Bank (PDFB). Implementation of the CT is achieved via two major steps: first, the Laplacian Pyramid (LP) is accustomed to taking the point discontinuities, and afterward continue by a Directional Filter Bank (DFB) to join point discontinuities into straight structures [26-30].

4. RESULT AND ANALYSIS

4.1.1 Visual (Qualitative) Investigation

Noticeable correlation of de-noised pictures is achieved for the emotional (subjective) evaluation, since, it is a clear, yet one of the successful strategy for surveying preferences and hindrances of any de-noising procedure. The de-noised pictures are outwardly evaluate as far as various parameters as recorded beneath::

1. CR (Colour Radiometry)
2. SO (Shape of the object)
3. ES (Edge Sharpening)

These parameters utilized for consider of visual appraisal. For representation purposes, De-noising processes grouped from 'Excellent' to 'Poor.' It is depicting in Table 4.1.

Table 4.1 Evaluation of image quality using qualitative method

Grade	Absolute	Relative measure
a	Excellent (E)	Excellent in the cluster
b	Good (G)	Less than excellent point
c	Above	Better than the average in
d	Average (A)	Average level in cluster
e	Below	Lower than the average level
f	Poor (P)	The lowest in the cluster

4.1.2 Quantitative Analysis

The exactness of de-noising strategies have been assess scientifically by testing RMSE, and PSNR. Since, these measurements give the phantom and architectural data of the de-noised picture. De-noised picturewillserve as a best monitor and it can be also understand that the spatial and architectural closeness data of first picture should satisfy the accompanying condition and these

accompanying conditions must be fulfilled (Table 4.2).Accomplishment and precision of de-noising approach can be executed with this parameters.

4.1.2.1 Root Mean Square Error

The RMSE is the priceless execution appraisal measure when unique picture is exist. RMSE is a decent proportion of precision [19-21].

$$RMSE = \sqrt{\sum_{i=1}^{M}\sum_{j=1}^{N}\frac{\left(F(i,j) - R_o(i,j)\right)^2}{M \times N}} \quad \ldots (4.1)$$

Here, M and N represents the size of the image is M∗N and$F(i,j), R_o(i,j)$express the gray value of the pixel in the row i and in the column j of the image. There would be a less change between them due to lower RMSE.

4.1.2.2 Peak Signal-to-Noise Ratio

Distortion of the de-noised picture is compute by PSNR parameters with the correlation of original picture. Estimation of PSNR ought to be high for the less measure of picture distortion. [18-21].

$$PSNR = 10\log\left(\frac{255}{RMSE}\right)^2 \quad \ldots (4.2)$$

The detail which are utilized in the filter acknowledgment assessment are Root Mean Square Error (RMSE) and Peak Signal to Noise Ratio (PSNR) [22]. De-noised picture would be the best ration data of genuine picture, is the one that has satisfied the accompanying conditions (Table 3.2).

Table 4.2 Standard and Error norms for Individual Quantitative Indicators

Metric	Standard norm	Error norm
RMSE (Root Mean Square Error)	(0)	(> 0)
PSNR (Peak Signal-to-Noise Ratio)	(ND)	(> 1)

4.2 Visual Examination

The assessment of accuracy has been done visually for each type of datasets. Different greyscale images such as Lena1 and boat1 images, at different noise variance, are helpful in calculating the performance of de-noising techniques. Under these investigations, the images of pixel size 512×512 are taken into account for simulation point of view.

a) Survey of Lena Image degraded by Gaussian Noise intended for other Noise Variances

This can be easily understood that the spatial data of all de-noised pictures have become advanced under the identification of boisterous picture bring up that the little appearance that were not observable in the loud picture are currently be unique and recognizable. Fig. 4.1 depicting-

noised pictures produced with various de-noising strategies intended for various clamor variances utilizing a given threshold.

Actual Image

Corrupted image under Gaussian noise

 Corrupted image under Gaussian noise (Noise Variance = 0.05)	 corrupted image under Gaussian noise (Noise Variance = 0.10)	 corrupted image under Gaussian noise (Noise Variance = 0.15)
 (a) De-noising by DWT	 (b) De-noising by DWT	 (c) De-noising by DWT
 (d) De-noising by SWT	 (e) De-noising by SWT	 (f) De-noising by SWT


(g) De-noising by CT


(h) De-noising by CT


(i) De-noising by CT

Fig. 4.1- De-Noised Images obtained by different de-nosing technique intended for Dataset DS-I, corrupted by Gaussian Noise.

Investigation of Lena Images corrupted by Salt & Pepper Noise, intended for different Noise Variances


Actual Image


Corrupted image under Salt & Pepper


Corrupted image under Salt &


Corrupted image under Salt &


Corrupted image under Salt &

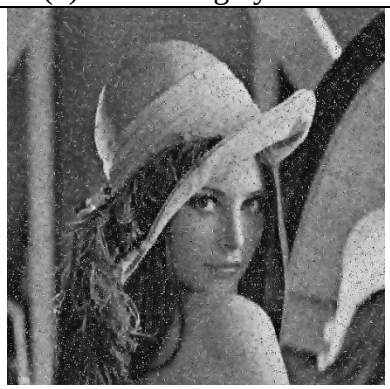
Pepper (Noise Variance = 0.05)	Pepper (Noise Variance = 0.10)	Pepper (Noise Variance = 0.15)
 (a) De-noising by DWT	 (b) De-noising by DWT	 (c) De-noising by DWT
 (d) De-noising by SWT	 (e) De-noising by SWT	 (f) De-noising by SWT
 (g) De-noising by CT	 (h) De-noising by CT	 (i) De-noising by CT

Fig. 4.2- De-noised images caused by different De-nosing technique intended for DS-I corrupted by Salt and Pepper Noise

Table 4.3 De-noising techniques comparison with the help of visual object detection

Data set	Noise	Noise Variance	De-noising Technique		
			DWT	SWT	CT

			Colour	Shape	Edge	Colour	Shape	Edge	Colour	Shape	Edge
DS-I	GAUSSIAN NOISE	0.05	AA	A	A	A	AA	AA	G	G	AA
		0.10	A	A	AA	A	A	AA	A	AA	AA
		0.15	A	A	A	A	A	A	A	A	A
	SALT & PEPPER NOISE	0.05	A	A	A	AA	A	A	AA	AA	AA
		0.10	A	A	AA	A	A	AA	A	A	AA
		0.15	A	A	A	A	A	A	A	A	A

Subsequently, it very well may be suggested that CT de-nosing procedure for various commotion variances recover well and yields the better acknowledgment. It may also suggest that the management of spectral, spatial and structural comparability information canfollow on the basis of SWT and DWT de-nosing technique.

4.3 Quantitative Investigation

Analysis and examination of consequences accomplished by various de-noising processes have been completed utilizing quantitative parameters. It is seen that a wide range of commotions make intensifying in the picture quality, suggesting about loss of information. De-noising of degraded image is performed using CT, SWT and DWT techniques. Here, in this study, different threshold has been considered.

4.3.1 Investigation on the basis of Root Mean Square Error

4.3.2 The lower Root Mean Square Error esteem shown higher precision for most of part, measure regarding image unwavering quality. The consequences of Root Mean Square Error (RMSE) produced with different image de-nosing strategies intended for various datasets are mastermind in Table 4.4. Table 4.4 represents the perception intended for Root Mean Square Error of Lena image of different commotion changes.

Table 4.4 Perception intended for Root Mean Square Error of Lena Images changes by Gaussian &Salt and Pepper of various Noise Variances

Data Set	Noise	Noi	RMSE		
			De-noising		
			D	S	C
DS-I	Gaussian	0.0	6	4	3
		0.1	6	4	4
		0.15	6	5	4
	Salt and Pepper Noise	0.05	5	4	4
		0.10	8	6	5
		0.15	9	8	7

4.3.3 Investigation on the basis of Peak Signal to Noise Ratio

Extensively, higher estimations intended for Peak Signal to Noise Ratio infer that the less estimation of picture distortion. Computation of Peak Signal to Noise Ratio value for various de-nosing strategies is classified in Table 4.5.

a) Investigation of DS-I dataset

A high incentive intended for Peak Signal to Noise Ratio (PSNR)is observed for CT based de-noising method (Table 4.5). CT technique resulted a great quality de-noised picture with higher Peak Signal to Noise Ratio values in the contrast by other MST based de-nosing methods at the end of day. In addition, de-noised picture accomplished with DWT method yielded low estimation of Peak Signal to Noise Ratio among all procedures. It may due to the reason of constrained directional selectivity have by the DWT system, which causes artefacts in the subsequent de-noised picture.

Table 4.5 Comparison of Peak Signal to Noise Ratio (PSNR) for Lena Images corrupted by

Gaussian, Salt & Pepper and Speckle Noise at different noise variances

Datas	Kind	Noi	PSNR Metric		
			De-noising		
			D	S	C
DS-I	Gaussi	0.0	2	2	2
		0.1	2	2	2
		0.15	2	2	2
	Salt and Pepper Noise	0.05	2	2	2
		0.10	2	2	3
		0.15	2	2	2

Table 4.6 Representation of best de-nosing technique in terms of different datsets and evaluation metrics

	Quality Metrics	
Dataset	RMSE	PSNR
	De-noising Method	De-noising Method
DS-I	CT	CT

5. CONCLUSIONS

The present study has investigated the performance of various image de-noising techniques for standard Lena image. From the result and analysis, the following conclusions can be drawn:

i) Visual and statistical analysis of result suggests that the CT method can be best developin efficient de-nosing technique in terms of producing high quality images, along with good preservation of spatial quality.

ii) It can be concluded from this study is thatanalysis of non-stationary 2-D signals in the context of de-nosing can be analyzed effectively by using Contourlet Transform based de-noising technique, followed byStationary Wavelet Transform based de-noising technique.

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Mobile Cloud Computing: Inflicted Changes and Challenges by Global Pandemic

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Abstract: In the current global pandemic scenario, every aspect of one's daily life including Cloud Computing in Mobile world also known as Mobile Cloud Computing (MCC) is virtually affected. In today's world these mobile devices or what we say smart phone devices have a huge purification in our society from different category of people to different level of application such that it has created a revolution in the communication path, jobs, education etc and so, has cloud computing. Almost all companies and educational institutions have switched to a remote working i.e., Work from home environment. According to a Devan Adams, analyst at Omdia, data center operators are getting massive increase in usage of resources due to closure of schools, work at home mandates. This requires new rules, new norms, more reliability, scalability and security over cloud.
In the current COVID-19 scenario, IT infrastructure services such as IaaS, CaaS, PaaS all are experiencing negative impacts due to financial viability. The rapid increase in storage, application, analysis and implementation of such huge data requires improvised software platforms and infrastructure needs, more over serious challenges related to security, privacy, connection quality hardware device issues etc. are growing. This paper briefs about what is Mobile Cloud Computing , how it works, how the current scenario has developed and changed from the pre-COVID-19 situation and hence, concludes with challenges faced and their possible solutions along with future research scopes.
Keywords-Mobile Cloud Computing, Global Pandemic, Revolution, Remote Working

1. Introduction :

Throughout the Global pandemic there has been a huge increase in mobile subscriptions due to extensive internet usage by increasing number of users. Today's advancement in cloud computing is providing significant benefits to mobile users as most of the work is now being done on mobile. The primary vendors that dominate the Mobile Cloud as well as Cloud are Amazon, Terremark worldwide, IBM and Salesforce.com.
Cloud infrastructures and platforms supply large-scale computing power with elastic scalability and higher resource sharing and usage. Mobile Cloud Computing has certain advantages such as:

- Computing and storing efficiency: By offloading demanding workloads and large data to the cloud, the mobile device can limit the amount of processing power and data storage that it requires
- More Powerful mobile apps: Since the mobile device now has access to a powerful cloud on the back end, there lies an ability to create more powerful mobile applications.

- Energy efficiency: Maximum of the resource-intensive work in mobile applications can be offloaded to the cloud, which means that mobile clients can focus more on reducing energy consumption without trading off on performance.
- Thin Mobile Clients: Less resource demands on the mobile devices that achieve better overall performance when coupled with a cloud platform. This gives the ability to put down the mobile clients, to the extent that they only handle user interaction and offload all application work and the data to the cloud

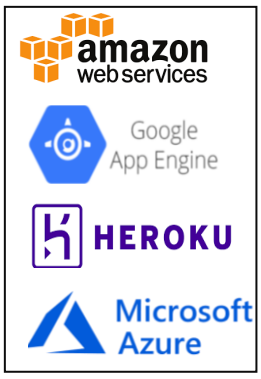

Figure 1: Cloud Computing Services

Figure 2: Cloud Computing Services

2. Mobile Cloud Computing

MCC can be defined as a framework where the data storage along with the data processing happens which is outside the mobile device. Mobile Cloud Applications move the power of computing and storage away from mobile devices and move them to cloud, which brings MC and the applications to not just mobile phone users but a much wide range of subscribers of mobiles. Example-

- **Drop box which offers cloud storage, letting the user access their files in the 'Drop box' from** their android devices which can be synced to mobile devices.
- **Amazon Cloud Player** which is used to store and play MP3 files, where 'Cloud Drive' serves as a hard drive set in the cloud. Users can play and stream their MP3, using an application, Amazon 'Cloud' MP3 application.

In the past 8 months, there is a remarkable or significant increase of mobile subscriptions because of the speedy growth and advancements in mobile cloud computing and wireless technology.
During this pandemic also cloud computing is providing remarkable benefits to mobile users as cloud infrastructure or framework and computing power with high resources sharing and usage. Many

limitations in mobile computing may overcome as the advantages of it, offers mobile access application services in a convenient way.

Some of its unique advantages are: Flexibility- Mobile Cloud Computing is flexible as the data can be accessed from anywhere and at any time, only proper internet connection and a device is required.

- Economical- Applications developed for cloud computing has abolished the cost of hardware and has become one of the most cost-efficient method for using and maintaining it.
- Backup and Recovery- Data can be easily backed up and retrieved when in need with the help of mobile cloud applications.
- Multiple Platform Availability- Multiple platforms such as Android, IOS, and many more are available for the cloud computing applications. The cloud can modify and access data regardless of from which platform it is.

MCC is one of the most leading edge of modern technologies in the current scenario.MCC has demonstrated itself to be highly beneficial or favorable for all the smart phone users and cloud-based service providers. MCC integrates the fast-growing Cloud Computing Applications market with the ubiquity smart phone. In this technique, some mobile applications are developed which are user friendly and are powered and organized by using cloud computing technology by cloud service providers. This technique of 'mobile cloud' enables the developers to build applications which are designed chiefly for mobile users without being bound to the operating system of the mobile device or the storage capacity of data. Data processing and data storage is carried out of the mobile device.

We can differentiate MCC, as it gives allowance to devices to run cloud-based web applications which is distinct from other native applications.

Here the users can access the store applications and the data associated with them any time on the internet just by subscribing to the cloud services. Now-a-days the trend has slightly shifted towards the services and convenience offered by mobile cloud as compared to mixture of web-based and native applications.

Serious efforts have been acknowledged by the researchers to form a strong and concerted platform, which can be termed as 'Third Platform which would connect or pair mobile and cloud in future. Many such predictions by experts also transpires the uprising of MCC which has given its users a better means to access and store their data with the latest techniques of data synchronization, better performance and improved reliability. Because of such beneficial aspects lot of people are inclining towards MCC for their smart phones.

Mobile Devices Wireless Internet Cloud Network Technologies

Fig 3: Mobile Cloud Computing Architecture

Mobile Cloud Computing confirms the impact of certain trends and factors. Here are some of the factors that have had an astonishing impact:

- **Enhancement of broad band coverage:** Better connectivity in such a pandemic is being furnished to our mobile devices via 4G, Wi Fi, fixed wireless etc.

- **Profuse Storage**: Cloud technology based mobile applications are considered to be more capable than any smart-phone, as it offers ample storage space. This technique of Cloud server-based computing framework which is accessible through mobile interface of an app is in contrast to the limited data-storage space and processing power in a mobile device.
- **Blooming Technologies**: Advanced technologies like HTML5, CSS3, Hyper-Visor virtual machines for smart-phones, cloudlets and Web 4.0 etc play a basic role in MCC's rising popularity by contributing lot many technologies.
- **Latest Trends**: We can have 24/7 access to business applications and other collaborative services which are enabled by smart phones and aided to increase the productivity from anywhere, at any given time.

Cloud Computing serves as the future of mobile devices. It cannot be denied that the interface of MCC has enabled us to accommodate videos, music files, digital images and more, out of our smart-phones.

3. Reasons behind considering MCC as the future of mobile devices

- **Extension of Battery Life:** Mobile devices battery usage is reduced **a**s the vital role of processing the data is handled by the cloud.
- **Rich Storage Space:** Mobile users now need not to worry about their device's limited storage capacity or go for buying memory cards because of the **e**normous storage capacity provided by cloud services to mobile users.
- **Improvement in data-synching techniques:** Cloud storage services allow their users to store and manage their data by providing speedy data synchronization between the device or any device chosen by the user. Here elimination of problems of storing all the data files and maintaining a separate backup gives a glimpse of benefits which users enjoy.
- **Enhancement in processing facilities:** Through the processor mobile device's speed and performance can be determined. Nevertheless, in mobile cloud computing, almost all or most of the processing is performed at the cloud level. This reduces the load off the device and thereby enhances its overall performance.
- **Superior user-experience:** MCC concept came so that the users can enjoy the benefits by using this platform. It is always the user not the developers who benefits the most. The broad spectrum of benefits which are offered by this platform makes for an optimum productivity and an enhanced user experience.

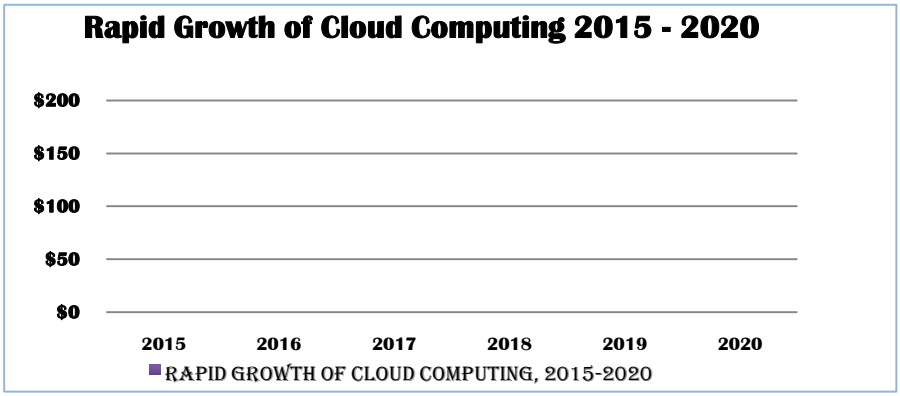

Figure 4: Rapid Growth of Cloud Computing in 2015-2020

Scope to embrace new technologies: MCC can easily adjust to the ever-evolving nature of technologies. It is capable enough to perform efficiently with all the upgrades in cloud computing methods and changes in the smart-phones' designs and features.

Impact of the global pandemic

By 2020, COVID-19 pandemic has changed all sorts of institutions and businesses on a high level. This has helped the cloud emerge stronger than ever before. Internet and its surroundings have become the most valuable. We see how the service providers are coping up with this sudden rise in demand for infrastructure

Productivity with Social Distancing

Since no physical interaction is acceptable in society, industries, educational institutions, business organizations all have adopted certain digital solutions such as online working, webinars, online classes etc. as an alternative to live presence. Many nations like Europe and the US are hiring employees at non-essential businesses to work from home that to with or without time boundations. Schools and universities are arranging online live lectures, tests and exams through forms and other video conferencing platforms. Little do people know where all this data of recorded classes and live sessions is going? It is all getting uploaded to the cloud.
Apps such as Slack, Zoom, Microsoft teams, Cisco WebEx, Google all have seen record breaking growth during this whole period. According to a Microsoft blog from March, Microsoft Teams has seen a usage spike of 775% in Italy. The virtual desktop also saw 300% usage rise.

4. Challenges :

1. Increased customer traffic != increased revenue

- 290 million Zoom users no one is paying for the servers,so where is this money coming from? Obviously Zoom is paying from their pocket
- There is 20% increse in Netflix usage , people are still paying the same amount as earlier but definalty people are watching much more than earlier and Netflix has to service all that increasing usage which doesn't represent the increase in revenue. According to a report , Netflix has recently signed 18 million new users but other companies like Netflix that are providing similar services might not be getting this much demand but have to pay for servers
- Ad traffic has increased tremenduously ,all sites such as Facebook Google etc are used for ads and news , local sites are getting more visitors to which they need more and more servers but businesses aare closed and revenues are down to there isnt enough money to handle the increase in traffic.

2. Financial impact of covid 19 on cloud consumption

- In 2012 EC2 was 80% of Amazon's of all spend today also majority of spend is on Cloud Compute
- There is still a finite amount of compute servers futhure dificuilt position is of Mobile Cloud henceforth it is the most afftected by increasing demand , volatility and also the tremenduous surge in demand increases in the bandwidth

3. How can one pay and consume these resources ?

1. On demand instaances- pay as you go model it is flexible but one has to pay full price and with time it gets extremely expensive
2. Long term reserved capacity- this represents reserved instances such as 1 year, 3 year,regional etc. saving plans that are recently intorduced essential commitment to either 1 or 3 year packages to pay . 50 to 70% savings can be made. But here you are locked in,if the business goes south you still have to pay for the servers for the coming time there is not so much liquidity.
3. Highly affordable spot instaanes – here customers can save 75% to 90% .

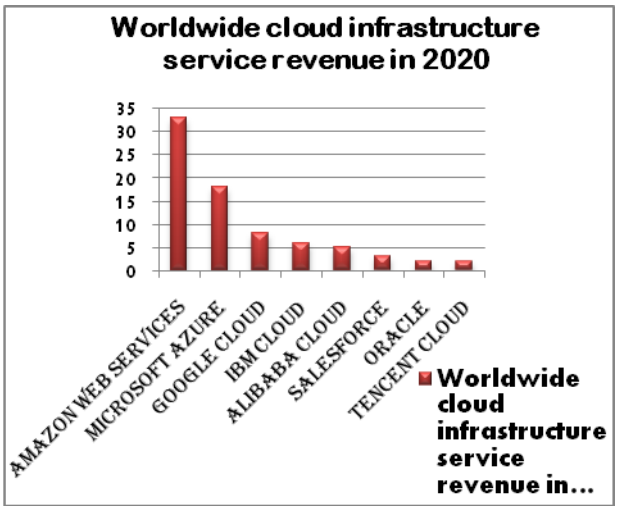

Fig 5: Worldwide cloud infrastructure service revenue in 2020

5. Solution to Financial Crisis - Spot Instances

Where the business is not necessarily blooming for the increase in trafic,spot instatnces seem extremely attractive .Spot instaatnces represent the spare capacity of buffer that amazon has and there is that caveat that they can pull the plug in any given time and give it to someone who has long-term capacity/reserve/on demand capacity because they are paying more leaving the availabitly and staability issue aside from aa financial perspective this is the best way,as you arent locked in ,neighter you are commtiing to any reserved time,its best afforable solution.

6. Additional considerations for spot instances

- Gracefully draining and relaunching instances during actual interruptions
- Invorporate other pricing models such as reserved instances and savings plans
- Handling unique scaling and sizing issues for containerized workloads
- Ensuring data and IP persistence for tateful workloads

5. The Story of Two Companies:

- Leading SPORTS APPArel company
  - DIY spot instnces for their stagin envirnment untill COVID-19
  - Lost entire stating environment due to reliance on specific 2-3 spot instance types
- Leading IN-APP VIDEO PLATFORM (specializes in video game ads)
  - Has been using Spot.io for over 2 year for production
  - Increaded online gaming =increased in-game ads=40% increase in EC2 usage since February
  - Saved $1.5 million on EC2 spend, $700k in just March

Since Covid-19 spot instance markets are similar to holiday season treands with greater constraints on availability.Poin-in-time data will not help predict where markets are heading. Knowing that capacity of an instance family is currently deep,does not predict what it will be like in 2 hours.Different markets move in different cycles

How spot.io can help

- More data=better decisions
- Proactive spot instance replacements
- Blended usage of spoly instances , on -demand instances and reserved capacity

Fig 6: Cloud Computing Services

Solutions : Since cloud trafic has increased, there is a requirement of more and more servers and a better infrastructure in order to cope with the rising demands.
Problem: Charing high prices from all customers might seem an easy way to cloud providers but is actually not.
High costs for small things seem to much to users which they might not be willing to pay, so amount should be reduced so that all kinds of users may afford.
A funding solution can be to collaborate with greater businesses for whom the cloud providers may advertise and inturn take monetary support for servers and cloud maintenance.
Technical solutions : There may exist type of storage(high quality, low quality) in all mobile Cloud services as there is in services google photos where there are types of storage namely Normal (Regular) and Express,for which user has to pay different amount.
At last, there is also a problem that all jobs and businesses are in crisis right now, and people are not getting proper wages and almost every third person is facing difficulty in coping with expenses and at this high time, sudden rise in cloud service prices is proving to drag people further down

Cloud and Mobile Cloud providers should provide more employment opportunities and help people make their own money by working from home as well as offline,This would encourage more and more people to earn via cloud computing and hence more people would generously spend on availing various advanced services leading to overall growth of the cloud industry.

6. Conclusion :

There is a silver lining to today's new and renewed intrest in mobile cloud computing .Changes in business that were once unthinkable have happened overnight and so has in technology.Today it is easier to accept that cultures and processs must change to allow cloud computing to work properly . The acceptance and tremenduos increase in usage of cloud in all fields is a major shift.This lockdown has had its pros and cons but the technological boom has been the dream of all. One could've never imagined such tremendous growth in tech world that too in field of cloud computing at such a high level and in such less time.By this paper we conclude that no matter how many challenges this Pandemic has brought there are so many fiesible solutions to reduce cost issues, meet infrastructure requirements, advancement in mobile technologies, solve harware issues, fix connectivity issues. There is such a wide scope of further researchs in the field of Mobile Cloud Computing because at the end, Mobiles are the future.

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Evolving Role of Cloud Computing in Higher Education

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Abstract: Distributed computing gives a mutual pool of figuring assets that can be quickly and flexibly provisioned and delivered as per the clients' interest to serve a wide and continually extending scope of data handling needs. Today, it is known as Cloud Computing and with its gigantic focal points this innovation is developing quickly and is being received in numerous applications including education. In this paper, we examine the Cloud Computing instructive climate and investigate how colleges and educational organizations may exploit it regarding cost as well as for productivity, dependability, adaptability, and security.

Keywords: Cloud Computing, Education,New Education, Educations Systems, Cloud in education, E education, Informative systems, Learning methods

I. Introduction

During the last twenty years the advancement of various kind of distributed computing has changed the working of logical and business applications. This progress has developed a few more up to date applications. The most recent advancement of disseminated figuring is Cloud Computing. It conveys the benefits self-ruling dependent on interest and gives adequate organization access, information asset climate and strong adaptability. It provides shared resources, software and information through Internet as a PAYGO (Pay-as-you-go) basis.

Cloud computing can be a welcomed option in the universities and educational institutes for studies. It gives a better choice and flexibility to the IT departments by building multipurpose computational infrastructure once and then uses it for several purposes for several times. Educating is presently not simply confined to homeroom with understudies. oday Education is vigorously subject to Information innovation. The pace of IT innovation is changing and which puts an all the more extra monetary weight on foundation. Cloud computing allows students access to homework wherever there's an internet connection, teachers to instantly upload learning materials and administrators to easily

collaborate with one another and save money on data storage. As per an estimate 25.4% is expected annual growth of cloud computing by 2027 in higher education. Another big draw of cloud computing in education is cost savings. The major advantages of cloud computing in education are: (1)

(a) Virtual Class rooms
(b) Lower hardware and software cost
(c) Cultural exposure
(d) Virtual training labs for educators and students
(e) Promotes E- Learning

Educational institutions are utilizing the cloud to increase connectivity between schools and their students. This is a long journey from the days of a floppy disk storage system and heavy textbooks that quickly went out of date. So, what's happening in this cloud-based educational revolution? It may seem overwhelming for your educational institution to delve into application modernization, but the positive impact of cloud computing on learning is significant.

II. Related Work

In the research Cloud Computing Framework for Ethiopian Higher Education Institutions proposed the implementation of a central hybrid cloud computing infrastructure that combines both the current local infrastructure of the universities as the private cloud and public cloud to enable the sharing of educational resources and collaboration within all universities in Ethiopia and the global educational community, so that Ethiopian higher institutions can enjoy the benefits of ICT in an efficient and affordable way.(2)

E-learning is essentially the computer and network-enabled transfer of skills and knowledge, which include applications and processes such as Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Many researchers developed several investigations last five years about the usability of e-learning in Kingdom of Saudi Arabia (KSA) and implemented a set of tools called Learning Management Systems (LMS), and Web-Based Instruction (WBI) and National Center for e-Learning and Distance Learning (NCeDL) which aims to support in the creation of electronic educational material, and providing an electronic venue for faculty members of any local university to utilize in creating e-courses through its own LMS called JUSUR (http://www.elc.edu.sa/portal) (3)
A roadmap was proposed in (4) for successful adoption of cloud computing in universities which involves the following steps:

a) Planning
b) Choosing the right deployment model
c) Choosing the most suitable service models
d) Vendor selection
e) Negotiating the SLA
f) Migration

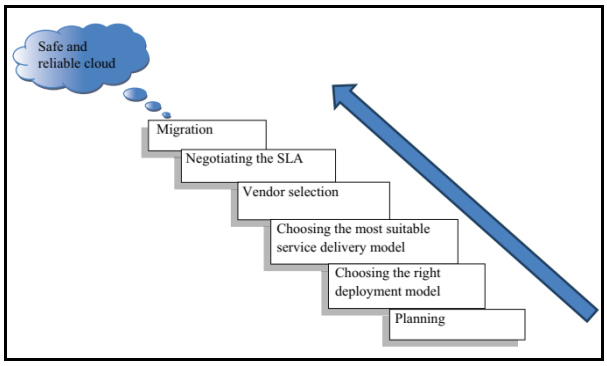

Figure 1: Roadmap for successful adoption of cloud computing (SLA: Service Level Agreement)

III. Cloud Computing in Today's Education

The Wild Rose school division in rural Canada, which comprises 19 schools and 4,800 students, for years maintained its own data center. But as demand rose, that became economically untenable, so storage was shifted to Microsoft's Azure cloud. The reported savings: $12,000 per year — plus an IT crew that was freed up to do other work. [2]

Following are the examples of few noted companies which are helping educational institutions in migration to the cloud:(2)

III. A- Google's initiative in Mountain View, Calif

Google is well known for its G-Suite productivity apps, which include Gmail, Hangouts, Calendar, Google Drive and Google Docs. The G Suite apps all live on the cloud. A special classroom version is called G Suite for Education, which includes extra features for apps like Google Docs, Sheets, Drive, Gmail and others. With the Explore tab, for instance, students can use natural language to input formulas in Sheets or get layout suggestions in Slides. Another product, Google Classroom, links Google's online cloud applications (like Calendar or Docs) so it's easier to complete or schedule assignments using a central hub.

Google App Education (GAE) as a new generation of cloud computing-based Web application development platform, enables its users such as the faculty, researchers and students and so on, to operate Web applications within the Google Infrastructure.GAE is available at no cost to institutions, universities and education community [5]. The teachers, students, and staff can share ideas more rapidly and get things done more adequately they have got an efficient communication and sharing tools. Google Apps Education Edition lets technical administrators provide a collection of Web-based messaging tools such as Google Mail, Google Talk, Google Sites , Google Video and Google Calendar to the faculty, students and staff for free in addition to productivity and collaboration tools such as Google Docs Package [6]

III. B - Microsoft's initiation in Redmond, Wash

Like Google, Microsoft also has a special version of its productivity apps geared towards students and educators: Office 365 Education. Office 365 is the cloud-based subscription version of Microsoft Office, which includes apps like Microsoft Word, PowerPoint and Excel. Instead of downloading software to your hard drive, you set up an Office 365 account and save all of your Office documents to the cloud for easy access. Office 365 Education has apps from the standard version, plus additional

classroom tools. Another bonus—Office 365 Education is free for students and educators (it starts at $70 per year for everyone else). The solution of Microsoft's cloud computing is also called Windows Azure, an operating system that allows the universities and colleges to run operating system applications and stores data by Microsoft server. Furthermore, the Azure Services Platform (ASP),includes services that allow the faculty, students and researchers to establish user identities, manage work flows, execute other functions such as Microsoft's online computing platform.

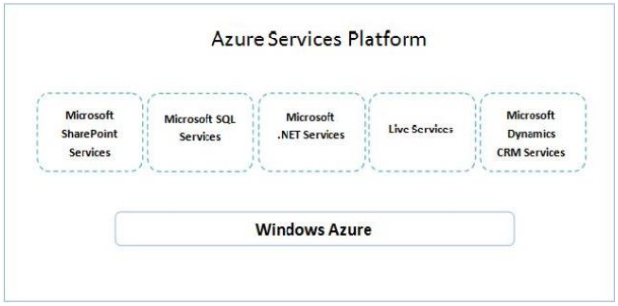

Figure 2: Azure Services Platform

Microsoft Live@edu is usable through popular web browsers for various types of operating systems. It is available at no cost, and it helps IT departments [7]: Reduce the costs for IT infrastructure, such as maintenance _ Minimize time spent maintaining e-mail systems and on strategic initiatives _ Provide flexibility and collaboration with peers and faculty _ Reduce the time evaluating risk and help make informed decisions about the use of educational cloud computing_ Improve high student expectations, including anywhere access to the latest technology _ Free on demand resources_ Test and deploy large-scales applications in different environment , Create applications that can be shared by many students simultaneously.

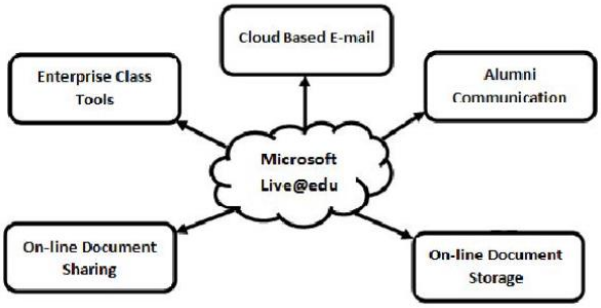

Figure 3: Features of Microsoft Live@edu

III. C - Amazon Cloud Services: Amazon Web

Amazon offers many cloud services, including: _ Amazon Elastic Compute Cloud (Amazon EC2): A web service that offers virtual machine and extra CPU cycles for the institutional organization. Figure 4 presents the services of Amazon EC2 [8], Amazon Simple Storage Service (Amazon S3): Allows the students, faculty and researchers to store items with a limited size in Amazon's Virtual storage_ Amazon Simple Queue Service (SQS): Offers different kinds of messages passing API, so that educators can talk to each other_ Amazon SimpleDB: A web service for running queries on a

structured data set in the cloud in real time_ Amazon Virtual Computing Laboratory (Amazon VCL): A free source implementation of a secure production level on-demand utility computing for accessing a wide-area of computational resources, storage and software. Figure 5 illustrates the implementation of VCL [9].

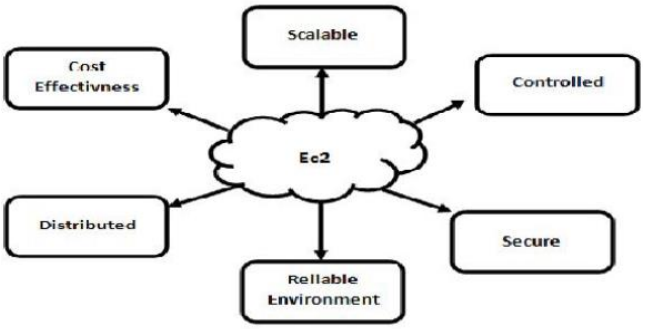

Figure 4: Amazon EC2 Services

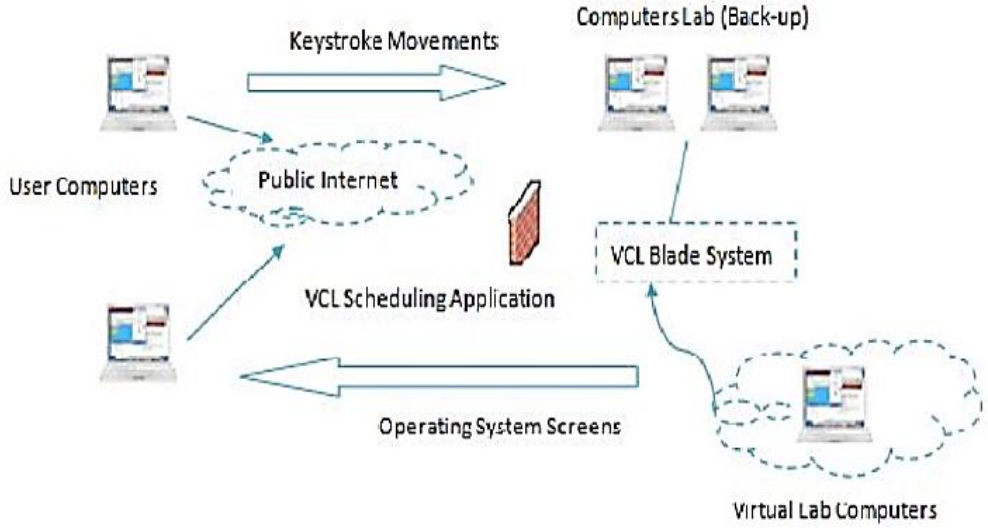

Figure 5: Implementation of Virtual Computer Lab (VCL)

III. D - Coursera's initiative Mountain View, Calif

Coursera offers a variety of online courses from established universities and instructors through its cloud platform. It also offers lessons on specific career skills and grants university-recognized degrees. For example, Coursera students can take online computer science classes offered by the University of Pennsylvania to get a master's degree in computer and information technology. [2]

III. E BLACKBOARD's Effort at Washington, D.C

Blackboard provides cloud-based learning software for grades K-12, as well as higher education and government. Its products include services such as Blackboard Classroom, which provides virtual classroom video conferencing, assignment management, classroom analytics and more. Using the company's cloud-based software, students and educators can access Blackboard's tools from any computer, smart phone or tablet.

III. F - VIRIDIS's Contribution at Austin

Viridis created a cloud-based software that connects community college students to job databases so they're matched to the right career post-graduation. College students use the Viridis platform while they're still in school to track their progress and what they're studying. Then Viridis uses that information to highlight specific skills and list the jobs they are most qualified for.
Other companies like Class Flow at Seattle, D2L at Kitchener, Canada, A Code Guru at Austin are also contributing in delivering the contents and training using cloud platform.

IV. Adopting the Cloud Services for education

The potential users of Education cloud are students, staff or academicians. Each user has their own credentials to access the respective cloud services. Adopting Software as a service (SAAS) of Education cloud, teaching staff can maintain the attendance, conduct online quiz and many more with the respective software packages. Adopting Platform as a service (PAAS) Institute can organize practical sessions as and when needed from Education Cloud. For e.g., developing projects like
mobile apps, web apps, etc. Adopting Infrastructure as a service (IAAS) Staff can upload their study materials or any related content on Education cloud and student can access these materials and content 24 x 7 x 365. (Figure 6)

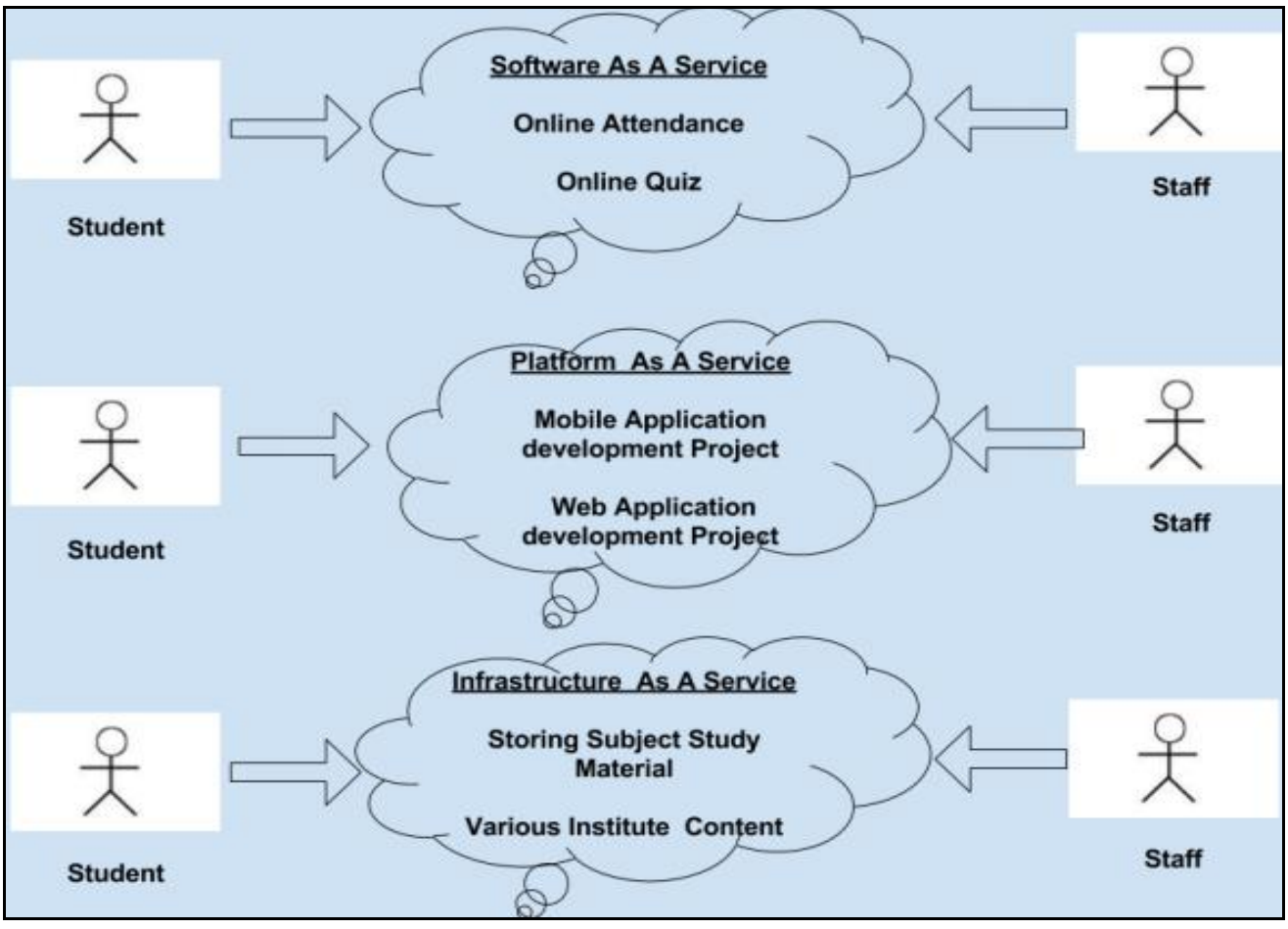

Figure 6: Adopting the Cloud Services for education

V. Challenges unique to Higher Education

Some cloud-computing requirements are the same across all industries. But colleges and universities face particularly:[10][11]

a) Robust security
b) Cloud Service failure
c) Data Privacy
d) right balance between public and private
e) Limited virtualization around the endpoint computing resources
f) Failure to exploit innovative, cost-saving initiatives, such as
g) business continuity or disaster recovery based in the cloud
h) Security inadequately focused at the application or server layer only
i) Lack of customer isolation using secure, scalable, multitenant services

VI. Benefits of cloud computing for institutions and students

With the development of educational cloud, new web applications such as Lecture Tools, Slide share etc. allows the lecturer to get their work done in their web browsers rather storing and carrying it on the hard drive. It gives the benefits such as:

a) Access the files from anywhere
b) 24 X 7 access to infrastructure and content
c) Software free or PAYGO
d) Stop worrying about additional software licenses
e) Share content more easily
f) Support for teaching and learning
g) Protection of environment by using green technologies
h) Increased exposure of new IT technologies to students
i) Reduced the cost to update infrastructure
j) Get things done without software hassles

VII. Conclusion and Future Scope

Innovative institutions of higher education seek to understand why and how to deploy cloud platforms efficiently and securely. Ultimately, their choices — regarding opportunities, approaches, and partners — have the promise to transform the role of IT in universities everywhere. In the next five years, institutions of higher education expect to cut 20 percent of their IT budget by moving applications to the cloud.7 That represents a major shift in approach across the industry — and a major opportunity to increase organizational efficiency, improve agility, and stimulate innovation. However, to support a smooth transition and optimal outcomes, college and university IT organizations must first develop a comprehensive cloud-computing strategy that addresses the challenges unique to each institution.

This paper presents educational cloud computing and how the universities and institutions are already taking advantage of it, not only in terms of cost but also efficiency security, reliability and portability. Several general examples of cloud computing in education such as Microsoft, Google App, IBM, Amazon and others were provided and a case study of the applications was presented and explored in more details [12]

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Use of Waste Materials in Repairing Roads

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Abstract: The most common sources of waste products are from the growth of various industries and increase in population. The type of waste which is most hazardous to the nature is the Plastic Waste. The main concern about the plastic waste is its non-biodegradability. According to recent researches plastic waste when mixed with bitumen gives it desired mechanical properties. Bitumen is primarily used in the construction of flexible pavements and when it is mixed with plastic waste it improves the water resistivity, capacity and stability of the mix. Laboratory test have proved that it can be used as a binder material in the bitumen mix for construction of flexible pavements. Plastic waste percentage in bitumen has to be checked. Marshal stability test is the most commonly used method to relate with field conditions. The samples used are made up with bitumen concrete commonly called Asphalt in which plastic content and bitumen are kept at various percentages in each of the sample. The tests have shown positive results and gives a scope of further practical implementations. The basic objective of the test is to find out the optimum percentage of plastic waste which can overrule the bitumen content in the mix for the design of flexible pavements. The basic intention behind this study is to replace bitumen by a conventional and non-biodegradable material which is the plastic waste.

Keywords: Flexible Pavements, Plastic Waste, Bitumen

INTRODUCTION

Disposal of various types of waste in different place from various sources has been a matter of concern from a long time. These materials cause different types of pollution to the environment. The plastic material is non-biodegradable making them inexhaustible in nature and start to collect at an exponential rate. The cost of extraction of good quality material has increased due to the effect of existence of these materials in our environment. Exponential increase in the population and the expansion of industries has resulted into the considerable disposal of the plastic wastes. The plastics that can be used are polyethene, polypropylene, polyamide, polyoxymethylene, polytetrafluoroethylene and polyethylene terephthalate. Thermoplastics have got properties by the help of which it expands and softens when heated and regains its normal shape at the room temperature. Thermoplastics can easily be moulded or shaped into various products such as milk jugs, floor coverings, credit cards and carpet fibers. These types of plastics are known as phenolic, melamine, unsaturated polymers, epoxy resin, silicone and polyurethane. Recent studies tell that plastics remain unchanged for more than 4500 years depending upon the rise in food demands and essentials. Also, the increasing population results into more waste generated from the households daily. According to surveys plastic constitutes 5% in municipal wastes which are toxic. Plastic bags are the most commonly found sources of plastic wastes, we come to see littering of plastics result into the choking of drains etc. this results into stagnation of water and results to ill hygiene of the locality. The only way to overcome these problems is to reuse the plastic effectively. During recent researches it has been inferred that waste plastic when mixed up with hot aggregate will form a fine plastic coat over it and when mixed up with the binder gives it a higher strength, high water resistance and enhanced performance over a period of time. Waste materials usually constitutes of plastic bags, laminated pouches, disposable cups etc. The use of plastic with bitumen in construction of flexible pavements not only increases its smoothness and life but helps in reducing the cost of project and also contributes into an ecofriendly environment. The plastic roads are found to give better results and performance compared to the conventional bitumen roads. The use of bitumen was reduced to 10% on introduction of plastic waste as filler materials. It also enhances the strength and performance of the roads. Plastic filling increases the melting point of the bitumen. The plastic waste mixing improves the abrasion and slip resistance of flexible pavements allows us to calculate splitting tensile strength when the plastic mixed is beyond 30% of the weight of the mix. There are specified mixing time, mixing temperature and modifier content for all polymers, in case of not following the specifications it may lead to premature failures. Plastic roads can prove to be a next step to developing India. This will also facilitate in overcoming the plastic disposal problems in the World.

OBJECTIVES:

Basic intention behind this research is to utilize the waste plastic efficiently in a constructive way such that it proves to be useful to the society.

Main objectives of this project work are:

- To coat the aggregates with waste plastic materials.
- Check the properties of various bitumen mixes.
- Check the properties of bitumen mix after the coating the waste plastic materials.

- Compare the bituminous mixes with plastic waste coating and conventional ones.

PROPOSED METHODOLOGY

The properties of aggregate and bitumen are investigated by following tests:

A. Test for aggregate

- Sieve Analysis of Aggregates
- Specific Gravity & Water Absorption Test [IS: 2386]
- Aggregate Impact Value Test [IS:2386(Part4)1963]
- Aggregate Crushing Value Test [IS:2386 (part 4) 1963]
- Flakiness & Elongation Index [is:2386 (Part1) 1963]

B. Test for Bitumen

- Penetration Test [IS 1203-1978]
- Softening Point Test [IS :1205-1978]
- Ductility Test[IS:105-1978]
- Viscosity Test
- Flash Point and Fire Point

C. Preparation of Design Mix

Plain Bituminous Mix: Bitumen is a black, oily, viscous material which is an organic byproduct of decomposed organic material and is naturally originated. Also known as asphalt or tar, bitumen was usually mixed with various materials throughout prehistory and all over the world for use as a sealant, adhesive, building mortar, incense, and decorative application on pots, buildings, or human skin. The material was widely used in waterproofing canoes and other ways of water transport.

A well-prepared design of bituminous mix is considered to result in a mix which is satisfactorily

- Strong
- Durable
- Resistive to fatigue and permanent deformation
- Environment friendly
- Economical etc

D. Selection of Mix Constituents

Blinder and aggregates are the two main constituents of bituminous mix. The section discusses some of the issues involved in selection of binder and aggregates.

1) Binder : Selection of binders is based on Simple Tests and other site-specific requirements. The test could depend on the different types of binder viz. penetration grade, emulsion, cutback, modified binder etc... For most of the test, the testing conditions are pre-fixed in the specifications. Temperature is a vital parameter which has a direct influence on the modulus and the aging of the binder. Superpave specifications [Superpave 1997, 2001] suggest that these acceptability test should be carried out at relative field temperature, not in the lab specified temperatures. This consideration is important because binders extracted

from various sources may show same physical properties at particular temperatures, but the performance may vary drastically at various temperatures. In Superpave specifications, only the acceptable testing values that are suggested, and not the test temperatures. The standard temperatures are extracted out of most prevalent maximum and minimum temperatures at the field at pre- mentioned probability level. Rolling Thin Film Test (RTFO), Rotational Viscometer, Pressurized Aging Vessel(PAV), Direct Tension Tester, Bending Beam Rheometer, Dynamic Shear Rheometer are the recommended tests in Super pave Binder Selections [Super pave 1997, 2001].

2) Aggregate: To judge the properties of aggregates there are number of tests recommended in the specifications like strength, toughness, angularity, clay content, hardness, durability, shape factors, adhesion to binders etc. Angularity is a property that ensures shear strength due to aggregate interlocking, and limiting flakiness assures that aggregates will not break during Compaction and Handling.

E. Various Mix Design Approaches:

There are number of approaches rather than a unified approach towards bituminous mix design, and each has its specific merits and demerits. Steps summarize some important bituminous design approaches as follows:

- Recipe Method
- Analytical Method
- Performance Related Approach
- Mix Design Method
- Empirical Mix Design Method
- Volumetric Method

Bituminous Mix Design are selected on the performance based approaches. There is a time to time change in requirement of a good Bituminous Mix Design.

F. Coated Bituminous Mix: Waste plastic generation is increasing day to day. The most common polymers are polyethylene; polystyrene and polypropylene sow an adhesive nature in the molten state. The plastic coated aggregate bitumen mix form better materials for the construction of flexible pavements and also shows higher stable values of Marshall Stability Values and suitable Marshall Coefficient. Hence most appropriate and easy method of plastic wastes is its use in flexible pavements. Polymer coated aggregates show a better result than the polymer modified bitumen under many aspects. The binding property and thermal behavior studies promoted a study on the bitumen-plastic waste blend and the properties to find the suitability of the blend for construction of roads. Various procedures that can be carried out for using plastic waste for the construction of roads:

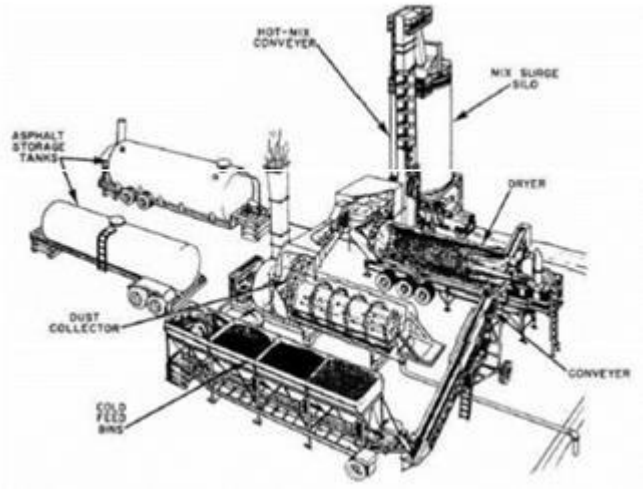
1) Mixing Procedure at Hot Mix Plant:

1) Step I: Plastics waste like bags, bottles made out of PE and PP cut into a size between 2.36 mm and 4.75mm using shredding machine. Care should be taken that PVC waste should be eliminated before it proceeds into next process.

2) Step II: The aggregate mix is heated to 1650C and then it is transferred to mixing chamber. Similarly, the bitumen is to be heated up to a maximum of 1600C. This is done so as to obtain a good binding and to prevent weak bonding. During this process monitoring the temperature is very important.
3) Step III: At the mixing chamber, the shredded plastics waste is added over the hot aggregate. It gets coated uniformly over the aggregate within 30 to 45 seconds. It gives an oily coated look to the aggregate.
4) Step IV: The plastics waste coated aggregate is mixed with hot bitumen. Then this final resulted mix is used for laying roads. The road laying temperature is between 110oC 120OC. The roller used should be of is 8-ton capacity.

2) Mixing by Mini Hot Mix Plant:

1) Step I: Plastic waste made out of PE, PP and PS cut into a size between 2.36mm and 4.75mm using shredding machine.
2) Step II: Similarly, the bitumen is to be heated to a maximum of 1600C to have good binding and to prevent weak bonding. (Monitoring the temperature is very important)
3) Step III: At the mixing chamber the shredded plastic waste is to be added to the hot aggregate. It gets coated uniformly over the aggregate within 30 Secs, giving an oily look Plastic coated aggregate is obtained.
4) Step IV: Hot bitumen is then added over the plastic-coated aggregate and the resulting mix is used for road construction. The road laying temperature is between 1100C to 1200C. The roller used is 8-ton capacity.



G. Mixing by Central Mixing Plant (CMP)

The dry process is also carried out using central mixing plant. The shredded plastic is mixed with the aggregate in the conveyor belt. This is transferred into the hot cylinder. There aggregate is coated firstly with plastic and later on with the bitumen. The mixer so prepared is then loaded in the dipper lorry and transported for road laying. CMP gives a better control of temperature and better mixing of this material thus helping to have a uniform coating.

DATA COLLECTION AND ITS ANALYSIS

Investigation of plastic waste materials aggregates and bitumen requires various field test and lab tests. This section tells us about the physical requirement of aggregates and bitumen, the properties of plastic and preparation plastic waste materials for shredding on aggregates.

A. Aggregates

The aggregates are bound together either by cement or by bituminous materials. Sometimes, the rock dust itself when mixed with water forms slurry which behaves as a binding medium.

The aggregates may be classified into:

1) Natural Aggregates: Further classified into

- Coarse aggregates consisting of crushed rock aggregates
- Gravels and fine aggregates or sand

2) Artificial Aggregates

Stone aggregate used for road work should be hard, tough, durable and hydrophobic for bituminous surface. Gravel should be well graded (6.4mm to 38mm) and should have a fineness modulus of not less than 5.75. Sand should be sharp, well graded, clean of all silts, clay and organic matter.

The quantity of aggregates used in first coat of surface dressing should be 0.15 m3 per 10 m2 area of 12mm nominal size. On the other hand, the quantity of aggregate used in second coat of surface dressing should be 0.15 m3 per 10 m2 areas and of 10mm nominal size.

Sr. No	Test	Permissible values
1.	**Abrasion Test** **a. Using Los Angeles machine (max)** **b. Aggregates impact test (max)**	 **35%** **30%**
2.	**Stripping test (max)**	**25%**
3.	**Water absorption (expect in the case of slag) max**	**1%**
4.	**Soundness test: Loss with Sodium Sulphate 5 cycles (in case of slag only) max**	**12%**
5.	**Weight unit or Bulk density (in slag only)**	**1120 per m3**

Physical Requirements of Coarse Aggregates

Aggregate: Aggregate of 20mm, 10 mm, Stone Dust and Lime as Filler

B. Bitumen

Bitumen is most commonly used binder in pavements constructions. According to the definition given by the American Society of Testing Materials bitumen has been defined as "Mixtures of hydrocarbons of natural or pyrogenous origin, or combination of both, frequently accompanied by their non-metallic derivatives, which may be gaseous, liquid, semi-solid or solid, and which are completely soluble in carbon disulphide."

When petroleum crude is refined in a refinery, they are separated by fractional distillation in the order of decreasing volatility. On distillation of the residual bituminous residue, straight-run bitumen is obtained. This bitumen is known as penetration grade bitumen or steam refined petroleum bitumen. In most parts of India 80/100 and 180/200 grade bitumen is used. The grade of straight run bitumen is chosen depending upon the climatic conditions of the region in which surface dressing is to be constructed. The grade of basic bitumen is altered either by controlled refining or by mixing with diesel oil or other oils.

For single dressings on WBM base course, quantity of bitumen needed ranges from 17 to 195 kg per 10 m2 areas and 10 to 12 kg per 10 m2 area in case of renewal of black top surfacing. For second coat of surface dressing, the quantity of bitumen needed ranges from 10 to 12 kg per 10 m2 area. Bulk bitumen Lorries with tanks of capacity ranging from 5000 to 15000 liters are used to transport bulk bitumen. As per PMC, the bitumen content in a mix should be 4% of weight by total mix for B.M.

The paving bitumen available in India is classified into two categories:

- Paving bitumen from Assam petroleum denoted as A-type and designated as grades A35, A90, etc.
- Paving bitumen from other sources denoted as S-type and designated as grades S35, S90, etc.

Types of Bitumen used in India:

- Road Tar: This bituminous material is obtained by the destructive distillation of organic matters such as wood, coal shale etc. In the process of destructive distillation, the carbonation results in the production of crude tar which is further refined by distillation process.
- Cut-back bitumen: The asphaltic bitumen is very often mixed with comparatively volatile solvents to improve the workability of the material. The solvent gets evaporated leaving behind the particles together. This cutback bitumen is classified into slow, medium and rapid curing depending upon the type of solvent used.
- Emulsions: An emulsion is a mixture of normally two immiscible liquids. Asphalt gets broken up into minute globules in water in the presence of the emulsifiers. It improves the workability of bitumen or asphalt. As a result of emulsification, asphalt is available at normal temperature in the liquid form. Bitumen: 60/70, 80/100 grade bitumen.

C. Plastic Material

Plastics are usually classified by their chemical structure of the polymer's backbone and side chains. Some important groups in these classifications are

- Acrylics
- Polyesters
- Polyurethanes
- Halogenated plastics
- Silicones

There are two types of plastics:

- Thermoplastics: They are the plastics that do not undergo chemical change in their composition when heated and can be moulded again and again. Examples include polyethylene, polypropylene, polystyrene, polyvinyl chloride, and polytetra fluoro ethylene (PTFE).
- Thermosetting: In the thermosetting process, a chemical reaction occurs that is irreversible. The vulcanization of rubber is a thermosetting process. Before heating with sulfur, the polyisoprene is a tacky, slightly runny material, but after vulcanization the product is rigid and non-tacky.

D. Classification of Plastic Waste:

1) Polyethylene:

- LDPE (Low Density Poly-Ethylene): Low density poly-ethylene this plastic waste available in the form of carry bags generally in stores these plastic bags are very thin and also easily available.
- HDPE (High Density Poly-Ethylene): Generally High-density poly-ethylene type of plastic waste is available in the form of carry bags and easily available in the market.

3) Polypropylene:

This plastic may be available in the form of carry bags or solid plastic it's depend upon the use and need of the industries. It is available in the form of plastic bottles and mat sheets etc

RESULTS AND DISCUSSIONS

On the basis of above methodology, various aspects regarding the Polymer coated aggregates are being discussed below:

A. Aggregate Impact Value

The coating of plastics improves Aggregate Impact Value, thus improving the quality of the aggregate. Moreover, a poor quality of aggregate can be made useful by coating with polymers.

It helps to improve the quality of flexible pavement. This shows that the toughness of the aggregate to face the impacts. Its range should be less than 10%.

B. Aggregate Crushing Value

The aggregate with lower crushing value indicate a lower crushed fraction under load and would give a longer service life to the road. Weaker aggregate would get crushed under traffic load. It is clearly seen from Table- that plastic-coated aggregates shows the lower crushing value and which can be withstand to traffic load more efficiently than the plain

aggregates. The results show that the aggregates are within the range according to ISS. Its range should be less than 30-35%.

C. Specific Gravity

The specific gravity of an aggregate is an indirect measure of its strength. The more specific gravity the more is the strength. The value of specific gravity of plain aggregate is less as compare to that of plastic coated aggregate. Since aggregates having low specific gravity are generally weaker than those with higher specific gravity values, the results say that the specific gravity of the aggregates are increased increasing its strength. Its range should be within 2.5-3.0%.

D. Stripping Value

Stripping value gives the effects of moisture upon the adhesion of bituminous film to the surface particles of the aggregate. The plastic coating to aggregates gives the nil value of stripping. It indicates that the aggregates are more suitable for bituminous road construction than plain aggregates. The results obtained of the control specimen are within the range of the IRC standards whereas coating of the aggregate reduces the affinity of the aggregate towards water. Its range should be less than 25%.

E. Water Absorption

The aggregate is chosen also on the basis of the moisture absorption capacity. The aggregate when coated with plastics improved its quality with respect to moisture absorption. The coating of plastic decreases the moisture absorption and helps to improve the quality of the aggregate and its performance in the flexible pavement. The results show that the moisture absorption of the aggregate is within the range of IRC specifications which reduced to nil due to coating. Its range should be less than 10%.

F. Los Angeles Abrasion Value

The repeated movement of the vehicle will produce some wear and tear over the surface of pavement. This test gives that wear and tear in percentage. Under this study the percentage of wear and tear values of plastic coated aggregate is found to be in decreasing order with respect to the percentage of plastics. When the Los Angeles abrasion value of plain aggregate value is compared with the plastic-coated aggregates the values are less for coated aggregates.

The results obtained are within the range hence can be used for the construction. Its range should be less than 35%.

G. Results of tests on aggregates:

Percentage of Plastic	Moisture Absorption (%)	Aggregate Impact Value (%)	Aggregate Crushing Value (%)	Los Angeles Abrasion Value (%)	Specific Gravity	Stripping Value (%)
Control Specimen	1.7	5.43	19.2	13.42	2.45	8
PP8	Nil	4.91	13.3	10.74	2.7	Nil

			3			
PP10	Nil	4.26	9.82	9.41	2.85	Nil

Observation Table for Aggregates Test Results

H. Results of Tests on Bitumen:

Test	Result	Ranges
Ductility Test	77.50 cm	Min 40
Penetration value	63 mm	60-70 mm
Viscosity value	50.1 sec	-
Softening Point	48.250 C	45-600C
Flash Point Test	2800C	>650-175C
Fire Point Test	302	>650-175C

CONCLUSION

Plastic coating on aggregates is used for the better performance of roads. This helps to have a better binding of bitumen with plastic wasted coated aggregate due to increased bonding and increased area of contact between polymers and bitumen. The polymer coating also reduces the voids. This prevents the moisture absorption and oxidation of bitumen by entrapped air. This has resulted in reducing rutting, raveling and there is no pothole formation. The roads can withstand heavy traffic and show better durability.

1) Aggregate Impact value of control specimen was 5.43%. It reduced to 4.91% for PP8 and 4.26% for PP10. Reduction in value was 10% for PP8 and 22% for PP10. This shows that the toughness of the aggregate was increased to face the impacts.

2) Crushing Value was reduced from 19.2% to 13.33% and 9.82% for PP8 and PP10 respectively. Value reduced by 30% for PP8 and 48% for PP10. Low aggregate crushing value indicates strong aggregates, as the crushed fraction is low.

3) Specific Gravity of the aggregate increases from 2.45 for control specimen to 2.7 for PP8 and 2.85 for PP10 due to plastic coating.

4) Stripping Value was reduced from 8% for control specimen to nil for PP8 and PP10. This shows that coated aggregate is more suitable for bituminous construction than plain aggregates.

5) Water Absorption is also reduced to nil for PP8 and PP10 from 1.7% for control specimen.

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Cloud Computing with Improved e-Learning and Security: A Review

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Abstract: This paper reviews some recent developments in the field of cloud computing for improving e-learning experience and data confidentiality on security. Several approaches have been studied. In this paper the key features and advantages of these approaches have been highlighted in this paper. The paper also gives a brief analysis of these studies.

Keywords- Cloud, Public, Online, E-learning.

I. INTRODUCTION

Cloud computing is one of the most prominent areas of research these days cloud computing involves delivering of computing services on demand by the user. These services can include all services starting from storage to processing power. These services are offered on a pay-as-you-go basis. These services are getting popular day by day. These services are also being utilize for e-learning these days when online classes have become a mandatory requirement for the health and safety. However, a lot of improvement is still required in these e-learning services and security the resources and documents accessed by customer and service providers. These two are major issues in cloud computing. These two issues have been dealt in this paper and major developments on these two issues have been reviewed in this paper.

II. REVIEW

The paper [1] performed a study to identify ways to improve the learning process through the use of cloud computing technologies. The paper focused on requesting, creation, deployment, monitor of virtual laboratories using cloud computing. The paper also tried to reduce the complexity associated with these technologies.

The virtual laboratory cloud service introduced, in this paper created a new type of link between these cloud computing technologies an electronic or e-learning by offering virtual laboratory as a service to user.

In work [2], a technique to ensure data confidentiality and integrity was discussed a secured document sharing using visual cryptography was proposed. This technique not only ensured efficient storage and retrieval of a document file in cloud without any mathematical computations, but it also ensure data privacy. The complexity of the approach mentioned in this work was also much less standard algorithms.

In research [3], an approach for protecting data using visual cryptography technique dynamic data verification using algebraic signature and data dynamics using Cuckoo Hash Table (CHT) was presented. The scheme mentioned in this paper claimed to overcome various security flaws on remote storage. At the same time, the scheme was efficient and consumed less computational overhead on data protection.

The paper [4] presented a study on e-learning and cloud computing. The paper tried to find approaches to enhance the learning procedure using distributed computing advances. The effort was also made to reduce the unpredictability related with these advances. In this work IBM Tivoli Service Automation Manager and VMware Hypervisor were utilized for building a private cloud. The objective in this paper was to enhance the learning procedure by offering virtual lab as a service.

The paper [5], discussed different secure techniques that are used for secure cloud data storage. The paradigm of data storage and security challenges were dealt in this paper. The basics of cloud computing, data store and issues in accessing data from cloud service providers were also discussed in this paper. The paper also emphasized on executing service level agreement with its customers.

The research [6], introduced a cloud computing technology for online course. In this research, online course development based on a public cloud computing infrastructure was suggested the approach was claimed to be a more flexible framework easier and cheaper. The system suggested was also upgradeable and future enhancements were also possible in this system.

The paper [7] presented a strategy to improve agility in the current financial crisis with reference to use of cloud computing in higher education. The paper tried to found alternatives to the use of IT to obtain saving for this a adoption strategy was proposed. The strategy included five stages with focus on the evaluation of data and processes function application, at the same time creation of a correspondence between these aspects and the models, services, and applications available through cloud service provider. The model proposed also considered the education institutes architecture need of confidentiality, integrity etc.

In the work [8] author's investigated cloud computing impact on e-learning. The paper also concentrated on the need to identify security issues that are related to cloud based E-learning. The paper also introduced cloud computing, e-learning environment and benefits of cloud-based e - learning, in addition to security issues in cloud-based e-learning and security measure in cloud based e-learning. The paper also highlighted lack of adequate security in the existing technologies.

The work[9] presented an e-learning system architecture based on cloud computing the paper was based on the thought that there is a need to redesign the educational system for improving e-learning the paper also introduce the features of current e-learning.

The authors also present an idea to build e-learning cloud. The authors have also investigated architecture, construction method and external interface with the method. The scope of future work in this field was also discussed by authors in this paper.

In manuscript [10] cloud computing issues and benefits to modern education were explored. This manuscript focussed on work mode, services, business model, benefits, and issues in cloud computing e-learning technologies. It was found in this paper cloud learning in e-computing is feasible but there is a need to bring greater clarity on benefits of cloud computing so that a optimum number of user are able to use them. In paper [11], benefits of cloud computing for e-learning were explored. The challenges that are their in e-learning project management were also discussed. The paper also focussed on need of developing a system in order to measure efficiency cloud computing-based e-learning system. The paper also covered cost and risk management part of this idea also.

The paper [12] covered detailed aspects of cloud computing and e-learning using cloud computing. It also describes the benefits of using cloud computing in e-learning. The paper highlighted that cloud computing reduces the cost of organizations expenses and offers more powerful functional capabilities.

III.CONCLUSION

In this paper, some recent developments in the field of cloud computing for improving e-learning experiences and data confidentiality on security were reviewed. It was found that to improve e-learning experiences utilization of virtual laboratories using cloud computing has become popular. The distributed computing approach is most useful in this while IBM Tivoli service automation manager and VM were hypervisor have been utilized by the researcher for this. The need for upgradable and enhance able model by researchers have also been emphasized for improving security different security techniques have been tried by the engineers and researchers. Some researchers emphasized on service level agreement for data privacy while some relied on visual cryptography for document security.

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An Efficient Dynamic basis Direction-finding Protocol for Reliable Information diffusion in Mobile system Ad-Hoc Network

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Abstract: Ad-hoc cell phone networks have various kinds of security difficulties created by their collective systems setting and limited source availability. In this effort, we study in depth the dynamic source (DSR) and evaluate several potential attacks on it. My planned effort is an extension of the safe DSR protocol to the DSR, which includes tuning strategies to improve its performance. On such randomly chosen roads, mobility may also be high. I have planned a direction-finding protocol that uses connection quality data that is determined using the noise values of the received to select the routes during the process of route discovery. The protocol for direction-finding is based on a method of reactive route detection similar to the protocol for dynamic source direction - finding. The successful efficient Dynamic source (E-DSR) protocol is my planned process.

Keywords: Noise, SINR, MOBILE AD HOC NETWORK, Direction-finding Protocols, ad-Ad-hoc nets, Mobility.

I. INTRODUCTION

Ad-hoc Net: Computers with all esteem such as expediency mobility, ability and availability of disk storage have recently been replaced by laptop. Gigabytes storage capacity, soaring resolution tint display, and wireless communication adapters can now be fitted with the laptop. Since, this laptop can work with the battery power, the addict is free to move without having to worry about wired devices [1]. In a wireless ad - hoc system the devices communicate with each

other using a wireless physical medium without wired Communications. That is the reason why ad-hoc net is an identified as communications less net.

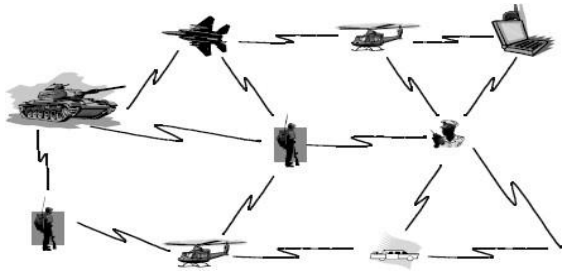

Figure 1. Overview of Mobile system Ad-hoc Net [7]

Mobile system ad-hoc nets (MOBILE AD HOC NETWORKs) can form separate groups of wireless terminals of net, but these may be connected to fixed net. A specific fundamental of ad-hoc nets is that they are configure themselves on-the-fly without intervention of a centralized administration. In the ad- hoc net node can not only act as end-system but also as an intermediate system (routers). It is probably for nodes which are not in the communication zone of each other, but allay can send and receive information from each other by intermediate nodes which can act as routers.
The above functionality gives another name to ad-hoc net as "multi-hop wireless net". The major characteristics which differentiate an ad-hoc net from a cellular net are the physical conditions and flexibility to changing traffic. Also the decrease characteristic of wireless media are nonlinear, energy efficiency will be superior and the increased superior capacity and spectral efficiency [2,5,6].

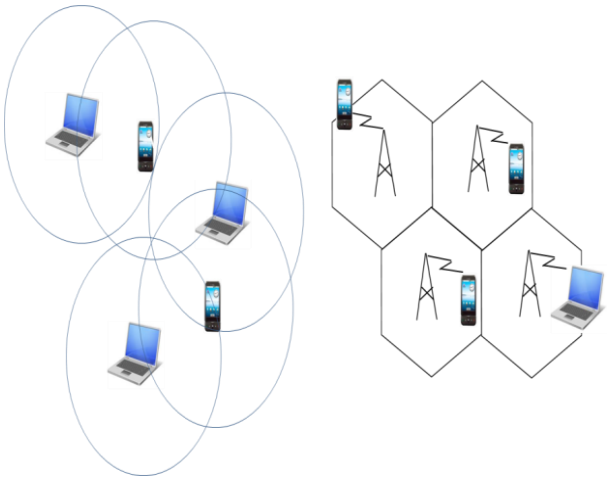

Figure 2. A differences between cellular and ad-hoc architecture, and hybrid

The planned protocols are deal with the limitation of ad-hoc nets like power consumption, short bandwidth and high error rates. The current protocols can classified into 2 types; Table-driven (proactive) and Demand-driven (reactive).

Table-driven direction-finding protocols tried to keep update, latest direction-finding information from each node to every other node in the net. These protocols want each node to keep one or more table to store their direction-finding information, and they answer to changes in the net topology by propagating up-to-date throughout the net in order to gain a consistent net view.
The zones in which they dissent are the number of direction-finding tables and the method by which changes in the net assembly are transmission. Some examples are Destination-Sequenced Distance-Vector Direction-finding (dsdv), CGSR (Cluster-head Gateway Switch Direction-finding), and Wireless direction-finding protocol. On the other side, the table-driven direction-finding protocols have different approach to crafting paths only when preferred by the source node [3]. When a node essential sending information to a desired endpoint, it start a route discovery procedure in the net. This process is completed once a path is establish or all possible routes are scanned.

II. Related Work Research problem

Wired nets have many restrictions in the real-world implementation of large nets because of preserving big net structures. While wireless nets have vast advantages over wired net, still they have boundaries because of maintaining infrastructure. In any critical setups like military attacks, disaster, earthquake flood and cyclone, etc., the net infrastructure can breaks down.
To overcome these restrictions researchers work on Ad-Hoc nets and Mobile system AD-HOC nets. Mobility of nodes is a significant things of MOBILE AD HOC NETWORK [4]. One of the main features of this Ad-Hoc net is dynamically alteration of topologies in different time. The direction-finding policy in MOBILE AD HOC NETWORK is quite complex issue. MOBILE AD HOC NETWORK direction-finding protocols are previously tested in different simulators like OMNET, NS3 etc. But still it has some limitations. To realize the importance of MOBILE AD HOC NETWORK direction-finding, in my work, i am focusing especially on MOBILE AD HOC NETWORK direction-finding protocols.

III. Results and Discussion

In figure 2.1 i had plotted Average End-to-End Delay (EED)[8] with increment in net mobility, the end-to- end delay of the information sessions are fluctuating at some mobility points and the general trade shows that the end-to-end delay increasing with the increment in the net mobility because as the mobility. This is because as the mobility increases, the number of routes that are broken during the communication process also increases, which increase the net mobility. This is Fig. 2.1: Average End-to-End Delay (EED) with increase in net mobility due to the fact that increment in the mobility means that the intermediate nodes on an active route can move from the routes which cause the route breaks.

As it can be observed that from the figure 2.1 that the end-to-end delay of my planned protocol is lower at low and moderate mobility nets because of the selection of routes that are consists with the links that has high lifetime this decreases the number of route breaks during the communication, which decreases the eed.

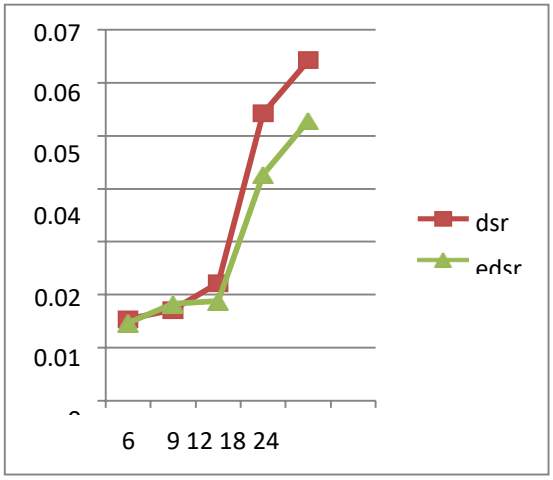

Figure.3. End To End Delay N/W Mobility

IV. CONCLUSION and FUTURE WORK

I have planned an efficient route discovery process that uses the link quality under consideration at each step during its route discovery process. My planned DSR [7] protocol shows that it is more effective for information transmission in moderate mobility and congested net than the traditional direction-finding protocols in MOBILE AD HOC NETWORKs. My planned efficient DSR direction-finding protocol uses the received signal power, interfering signal power and noise over a link to identify whether it is a stable radio link or not during the route discovery process. I have analyzed my planned work with the help of simulation results that are generated using the well-known net simulator called Exata.

.The EXATA version 2.0 supports six MOBILE AD HOC NETWORK direction-finding protocols only. In future, by using theoretical and empirical knowledge i will design MOBILE AD HOC NETWORK [15] environments in another simulator either in ns-2/ns-3 or Qual Net to observe the performance of DSR and E-DSR, other direction- finding protocols. Securing DSR still an open zone for research work. The present mechanisms like DSR able to protected the protocol with its signature allowances. But the overhead of cryptographic calculation still persevere in the DSR mechanisms. Efficient DSR is one of the steps near improving the direction-finding performance of protected protocols with help of a threshold process. The adaptive reply decision by an middle node helps to stabile the load of middle nodes which are over-burdened by signing and verification job of entering message

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Project Ri-pulser: Smart Way to Make this World a Better Place

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Abstract: The most powerful technology of the present and upcoming era is Artificial Intelligence which is helping to solve the most complex and unsolved problems of mankind. Artificial Intelligence is developing and advancing every field, making the lives of human more and more advanced and easy. In the upcoming decade AI will be able to sort things which are considered as disabilities in a smart way. Artificial intelligence (AI) makes it possible for machines to find out from experience, fits new inputs and performs human-like tasks.Today, technology has reached to a specific point where the machine can communicate with humans in a very far better way. Artificial Intelligence has entered our lives through such advancements. Life is going to depend on AI soon.Artificial Intelligence has miraculous applications in every field now, so if it can be used in the way to make this world a better place for every person, then that will be a great achievement in the history of development. To help others is what the humanity stands for.15 percent of the world population lives with some physical disability. They are dependent on anyone else for everything. But by introducing Artificial Intelligence as a helping hand to them so that they can be independent will prove to be one of the greatest accomplishments in the list of applications of AI.

The idea of this paper is to introduce Project Ri-Pulser which is a considerable step in contributing towards making this world a better place for all. This smart bracelet is especially for differently abled people as well as for fitness conscious persons. This bracelet will be a helping hand for the visually impaired as well as hearing impaired people by alerting them in various ways in which they can understand, tracking their movements and uploading it on cloud, and many more. It will also be tracking one's meals, calories, etc. so that one can get a report or feedback of their fitness and health on a daily basis. These features will be implemented using various Artificial Intelligence applications. Ri-Pulser will surely help us in achieving concrete steps towards a better future for everyone.

Keywords: AI, disabilities, miraculous, helping hand, Ri-Pulser, bracelet, fitness tracker, concrete, future.

I. INTRODUCTION

Artificial intelligence is providing a platform for producing real world applications at great scale and speed. It has become really important because of its human like capabilities, understanding, reasoning, communication and perception. Various analytical tasks can be performed very effectively using AI. AI is a technology that is changing every walk of life. AI is not upcoming futuristic vision, it is something which is here today and being integrated and deployed into a variety of sectors. Artificial intelligence isn't just changing lives; in some cases, it will save lives.

Currently around 10% of the world's population, or roughly 650 million people, live with a disability.[1]For many people with disabilities and those who care for them, daily lifemay not be

easy. Disabilities affect the entire family. Meeting the difficult needs of a person with a disability can put families under a great stress — emotional, financial, and physical. The biggest challenge for a visually impaired person is to move around places. Blind people can roam easily around their house without any help because they know the position of everything in the house. But when they need to go outside, they always need someone on which they are depended totally. Same applies on deaf persons as they are unable to hear sounds; they too need someone to guide them. Also, people with disabilities can be at higher risk for injuries when no one is around. The most valuable thing for a disabled person is gaining independence. A blind or deaf person can lead an independent life or go independently to anywhere with some specifically designed adaptive things for them.

Ri-Pulser is a project which is especially designed by observing the difficulties and need of the disabled persons. It will be of great use for the normal person as well. Ri-Pulser is a smart bracelet which will be helping blind and deaf persons in moving independently as well as it will be tracking path, food nutrients, obstacles, calories etc. It will be having microphone and magnetic QI for wireless charging. SIM Card port will also be present and in the case of emergency, SOS calls and messages will be sent. This project is going to be a huge hit for all types of people.

II. RI-PULSER

Ri-pulser; taken from English word Repulser which means a device which is used to deflect or repel objects or for flight stability. In the much similar way, Ri-Pulser will be a device which will sense the obstacles by the deflection of ultrasonic waves. Ri-Pulser is a project based on Artificial Intelligence and Robotics. It will be using sensors, GPS, virtual assistant Artificial Intelligence like Alexa, Magnetic Qi, SIM port, Microphone.

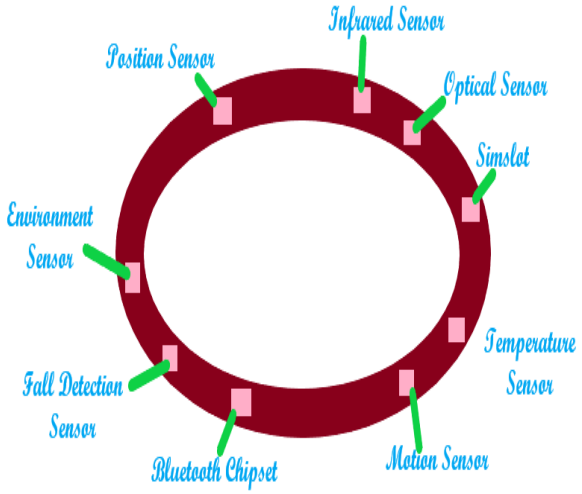

Fig. 1. Ri-Pulser: Smart Bracelet

III. COMPONENTS OF RI-PULSER

Ri-Pulserwill be having following components:

1. Infrared Sensors:

Infrared sensors will be used for obstacle detection. An IR sensor is a simple electronic device that emits and detects IR radiation to detect certain objects / obstacles in its range. Some of its features are heat and sensation of movement. object measurement and movement detection. There are five basic elements used in the standard infrared detection system: infrared source, transmission medium, optical element, infrared detectors or receiver and processing equipment. The media used for infrared transmission are vacuum, atmosphere and optical fibers. Two types of Infrared Sensors are: Active and Passive. Active infrared sensors have two components: infrared source and infrared detector. The power emitted by the infrared source is indicated by the power emitted by the infrared source is indicated by the object and then falls into the infrared detector. The infrared sensor does not use any infrared source and detector. The Quantum infrared type sensors provide high receiving performance.

- **Transmitter IR**
  The IR Transmitter acts as a source of IR radiation. According to Plank's Radiation Law, everything is a source of IR radiation in temple T above 0 Kelvin. In many cases black body radiators, tungsten lamps, silicon carbide, infrared lasers, LEDs of infrared wavelength are used as sources.

- **Transmission Medium**
  As the name suggests, the Transmission Medium provides a way for radiation to reach from the IR Transmitter to the IR Receiver. Machine,
  Atmosphere and optical fibers are used as interiors.

- **IR receiver**
  IR receivers are usually image diodes and image transistors. They can detect infrared radiation. The IR receiver is therefore also called the IR detector. Types of receivers are available based on the average power length, voltage and package.
  The Infrared sensor operates in the following order:

  An IR (transmitter) source is used to emit radiation of the required length.

  - This radiation reaches the object and is visible in the background.
  - The reflected radiation is received by the IR receiver.
  - Radiation-based IR Receiver is processed according to its intensity.

  Generally, the output of the IR Receiver is small and amplifiers are used to amplify the received signal.

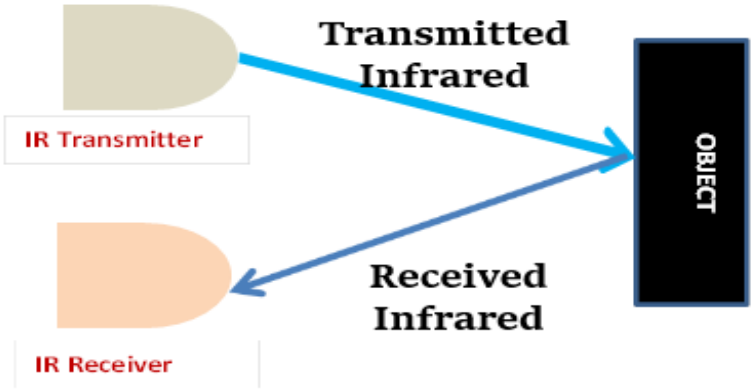

Fig. 2. Working of Infrared sensor

2**. Motion sensor:** Movement sensors allow us to measure how well the device is directed to space and how fast it is moving. The following sensors allow you to monitor the movement of the device:

- Accelerometer (Hardware): Determines the position of the device and its acceleration in a three-dimensional space, which you will use to detect earthquakes.

- Gravity (software): Calculates the shape of a device, returns a three-dimensional vector that shows direction and magnitude of gravity.

- Gyroscope (hardware): Measures the movement of the metal, returns the rotation rate around the axis of each device.
- Linear Acceleration (software-based): calculates device movement, returns a three-dimensional vector that shows the speed of each device's axis, without gravity.
- Rotation Vector (software-based): calculates device position, restores angle and axis - can simplify 3D calculation, provides rotation angle combined with rotation axis in which the device is rotated

3. Position Sensors: The following sensors allow you to determine the location or position of the device:

- Magnetic field: a three-axis digital compass that senses the carrying of the device relative to the north magnet.
- Proximity: Feel the distance to the sensor-measured object located very close to the device speaker.

4. **Environment Sensors:** The following sensors allow you to view natural structures or measure device context:

- Light feels the level of light that is set.
- Pressure feel air pressure (atmospheric pressure)
- The relative humidity is sensitive to air humidity.
- The temperature is felt by the air temperature present.

5. Falling Sensation: This sensor will detect a height of more than 1 meter and a change in angle of more than 45 degrees. Authorized numbers will be notified when a fall sensor is activated if the user does not respond to the "OK" device within a few minutes.

6. Hybrid Slot: The dual SIM slot supports both a SIM card and a MicroSD card in the second component.

7. Bluetooth chipset: They are integrated with the device to allow the user to communicate with the enabled product easily without an external adapter.

8. Temperature Sensor: Track temperature changes. When the body heats up more, the intensity of the exercise is reflected in the strength tracker.

9. Optical Sensor: This uses light on the skin to measure heart rate. Nerves can be used to measure blood flow to the capillaries, thus measuring heart rate.

IV. CONCLUSION

Ri-pulser is a social vision for people with physical disabilities or the elderly that will help them the most. All the technology and sensors used will provide the best user experience with all the advanced technology.

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www.disabledworld.com

Smart Farming: Issues and Challenges

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Abstract : The Smart farming concept utilizes the concept of IOT and Machine learning which basically deals with the monitoring of livestock and plants It keeps record and analyze the data which have been collected through sensors to find the most effective ways to deal with livestock and plants. Farmers these days face lot of problems regarding how to push the products to the limit with reduced cost and time and hence still maintain the quality of the product while the output's rate is high and in the other hand collecting and processing data manually can cause mistakes such as in calculation ,incorrect number or severe human error. The study of the behavior of livestock and a better suitable condition for plant using IOT approach a merely easy way to collect the data without using much manpower and there for save time-cost much better eco-friendly way to help the farmer to decide on what they should do by predicting the result using the data that is collected from the farm. The paper will present an overview of IoT and Machine Learning usage concept in farming in present scenario. The paper will also summarize the challenges that are there with implementation of these technologies. The project Smart Farming Using IOT aim to give dependable, reliable, flexible,fast and easy to understand system.
Keywords: IoT, Machine Learning, Smart Farming, IoT and Smart Farming

1.Introduction

In the past, the traditional method of agriculture or farming has been used or followed which resulted in poor productivity.In ancient times most of the farming processes were done hand by hand tools are made of rock the knowledge of farming was limited human was in the state of learning and gaining the knowledge to maximize their output but still, these knowledge and tools that they were using were not enough to handle all the procedures efficiently.ime by time, year by year the technology related to the agricultural field of study were improved by the human of each generation thus from tools made of rock to tools that are made of better quality metal gradually help the farmers to make the most out of the fields yet but still everything was still in something that can be pushed to farther point until the newer and better technology come.

Now a day the technology is far more than our ancestors can think of we can go travel into space, discover million of stars, people can contact through wireless devices making a cashless payment, travel to place from north to south using a plane ,fancy things are made in various field yes also with agriculture, we have no longer use only manmade tools and equipment to do farming but we do it with machines and refined knowledge that has been collecting from the past.

People learn from the past but still the problems remain how can they increase the profit and productivity accurately.Therefore advanced technology has been introduced to overcome this problem by using advanced technology which are IoT (Internet of things) and machine learning , the problems such

as low quality and less quantity of products has been reduced which lead to the best utilize of natural resources like soil and water and also help the farmers to study the nature of plants and animal leading to the major change in farming system from manual to automated system.

IoT refers as Internet of Things is an inter-related communication system from device to device in which the device such as sensor/any other devices communicate with the cloud or some kind of connectivity and then store the data. After that the data will be processed by the program to make an output out of it. IoT is used in various field such as medical, home appliance, courier service for medical IoT is used to connect the medical resource with health care service makes the faster and easier for patient to access specialized sensor can be equipped to keep track of the health of senior citizen even in payment system we can injected a thin sensor under our skin to use it as a credit card without carrying a physical card just by using our hand at the cashier.

In agriculture also IoT has been used in various works automation based technology of IoT like smart irrigation by using a sensor to manage the use of water efficiently, monitoring soil quality to find out what should be planted in this kind of soil to know the nature of the area and quickly fixed the problem without using any trial and error much less time taken, monitoring livestock keeping tracks of farm animals to know which area they like the most ,identify the quality of meat by using an ultrasound maintain the health of each animal live without manually doing it every time , monitoring humidity and temperature to find out which temperature and humidity will produce the most of product or what will the plant like these are what IoT can do in agricultural field it can do more of what I have described above maybe it can be an infinite use of IoT.

In the other hand Machine Learning which is the application of Artificial intelligence which is taught to automatically learn from the data that is obtained to perform without human intervention. Machine learning collects and analyze all the data that has been gathered from monitor and sensor and learn from that data and hence perform according to what the algorithm has been inserted such that the decision can be made from this process in example we can use machine learning to water plants by make it studies the suitable condition for plants to be watered such that the monitor as well as the sensor track livestock and collect all crucial data like body temperature ,heart's rateand if we train the AI to detect any strange number that may come from the animals the AI will alarm us about it.

To achieve smart farming, it is essential to deal with hardware as well as software that have to be used to combine both the physical devices that must measure the data and the suitable program to calculate and analyze the data.

The combination of IoT and machine provides an essential data which help us in minimizing environmental effects and maximize the quality and quantity of agricultural products.

2. Literature Survey

Various researchers have worked in this area and proposed algorithms and approaches to meet out the demands of smart farming. Liu et al. [1] suggested approach which is based on precision irrigation. Ersin et al [2] proposed an irrigation system that makes use of microcontroller. They justified their proposed system is quite efficient as compared to other conventional methods. Agarwal et. al.[3] proposed smart irrigation system. They utilized Raspberry pi and Arduino for developing such kind of smart system. Koprdaet al.[4] also proposed similar kind of smart irrigation system based on

microcontroller concept. Ahouandjinou et al. [5] demonstrated the usage of farm pest detection by making use of ultrasonic sensors. Goap et. al [6] proposed IoT based agriculture system whereas Smith et al. [7] used Machine Learning approaches for soil classification.

Kwok et al. [8] work suggested plant detection using deep learning and then based on plant type its appropriate irrigation amount required. Deep learning and altitude based economical irrigation approach has been discussed in the research by Wang, Muzzammel, Raheel et al. [9] .The study of current literature and work of various researchers emphasized active role of IoT and Machine Learning techniques in Smart Farming.

3. Smart Farming with IoT and Machine Learning

Machine learning along with the help of IoT system can improve detection and discrimination of weeds with least effected to the environment .Weeding can be schedule based on the data from IoT hardware instead of frequently using only chemically made herbicide with the help of Machine learning it will decide the condition in which the farmer should use herbicide or not , making lesser budget to use because of a better management and for plant's diseases that are caused by pest using pesticide is one of the best option to deal with it but the use of pesticide is very harmful to the environmentas well as the user hence that it should be proper used, by using pesticide for controlling diseases in open air, it is requires high budget and also very dangerous to use so with the help of IoT farmers are no longer need to use the pesticide by their own they can use devices that can accept an order wirelessly and let the device do its jobs less contact but more efficient preventing after effect from using harmful chemicals. Following activities can be managed by using these technologies and can improve the performance and productivity of farming-

- **Field management** proceeded by using different types of sensor such as moisture sensor, temperature sensor, air temperature sensor for detection of soil moisture, soil temperature, air temperature. The data which has collected through sensor would be analyzed to reach the optimize uses of the field and for better utilization of irrigation system and with the adaption of IoT system and machine learning algorithm water will be released based on the data that is sent from IoT devices to process it with machine learning algorithm find the best suitable time to water crops the value will be calculated based on the number that the user inserts in to the program and will only work based on that ,make it to automated irrigation system.

- **Species management** use the sensor for tracking real time weather condition and predict soil fertility by ANNs(Artificial neutral network) method. The information collected and develop further more to specify which type of species is suitable with this kind of soil and weatherand hence make an adaption to make more suitable condition for plants although species of plant will be easier to specify using machine learning training.
- **Collar and FBG** sensor are use for livestock monitoring, it tracks the behavior of cattle which indicate the health and well-being of livestock by comparing data that is collected periodically as the changes of behavior effects the health of livestock. Also the devices will track the location and posture of the livestock in real time with the help of GPS(Global positioning system) and mark the position of the livestock on the map if the animal is not present within the farm's range the farmer will still know the exact location of the animal using GPS's sensor that is injected under its skin.
- **Crop Management** -predicts the yielding rate by collecting data of crops in the field such as height ,width ,size of crops from a camera and then analyze by using image processing program measures by

visualized it on the grid calculates the size compare it to historical data of that crop , it will predict the suitable harvesting time based on the collected data make it more precise and harvest the most out of it then all the data will be stored to be used in future.

Use computer along with Machine learning algorithm to detect weed by placing cameras over the field so that the program will create images of the field from the start of the cultivating and then we train AI(using Machine learning) to detect the weeds on the field sperate from the real crops.

4. Challenges of Smart Farming

Smart Farming is a new vibe that utilizes the potential of latest technology trends like AI, IoT, Machine learning to improve the agriculture performance. The important aspect of smart farming is to implement various sensors and other devices which are used to collect relevant data required for analysis purpose. Technology is changing very fast hence to cater with the latest up-dations in the architecture is a difficult task besides that network bandwidth is also one of the issue in implementation of smart farming. There are various other challenges or issues that smart farming faces-

Standards interoperability
Interoperability is the major concern while implementation of Smart Farming architecture. The technology is growing leap and bounds, everyday some new IoT tools and platforms are hitting the market. These tools and platforms do not follow same standards and hence result into interoperability issues that lead to lack of uniform data analysis and visualization.

Lack of sufficient knowledge
At the center of smart farming we have the farmers who are not very comfortable with these technological aspects. Training farmers for the basic concepts and utilization of various smart devices is utmost important. Lack of knowledge will lead to disastrous results.

Internet Connectivity
Major hurdle in implementation of smart farming architecture is the poor internet connectivity in rural areas. Poor network bandwidth issues also make implementation of smart farming architecture quite difficult.

Scalability
Farmers have varied size of farms hence they need IoT devices that should be scalable in nature which means that the same technology should be applicable to all size of farms. These devices are in general configured manually hence it is also a concern area. The devices and tools used for smart farming should be self-configurable to draw maximum benefits.

Energy Consumption
This is another critical challenge in case of smart farming. To implement smart farming architecture lot of data centers, gateways and hubs are required to make sensors operable and lead to heavy energy consumption and it requires more energy sources to restock that energy.

Technology failure

Too much dependency on technology will lead to some serious risks for the crops too. Failure of technology at any point of time will lead to crop damages and can affect farmers. For example: failure of smart sensors can lead to overwatering or underwatering of crops and can have serious impact on crops.

Security Concerns

Security is a major concern and challenge as well in smart farming. Data theft, As the count of middleware technology, endpoints and IoT devices in active use in agriculture is increasing, the number of entry-points for malicious third-party programs is going up as well. Since the third-party attacks on a complex IoT system are often decentralized, detecting and removing them emerges as a big challenge.

5. Conclusion

IoT and Machine learning is going to be a game changer in modern agriculture in near future as we can see that many devices which can wirelessly use in the field can work like human and in spite of the initial cost that maybe higher than human in the first step of developing we could really see that in long term use it has much more ability to work than that of human crop's information can be collected more accurate while human can make a major mistake that will entirely destroy something machine will just straight up to the point and take whatever order from the user and work according to the program.In term of farm's product farmer can now focus on both quantity and quality while they still maintain the quantity of product along with that the quality can be maintain using set of data and AI training to find a solution for various problems that may occurred in the farm make the farm much more systematic like smart irrigation system farmer will have more time to focus on other parts of work. Though there are many challenges but still there are good prospects of using IoT and machine learning approaches in smart farming concept that can help farmer to maximize their product quality and quantity reduce future budget.

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Life Cycle Cost Analysis of Chilled Beam Technique vs Variable Air Volume Techniques

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Abstract- The aim of this paper is to determine the Life Cycle Cost (LCC) of two of the HVAC Techniques used for Air-Conditioning. The techniques which are discussed and analyzed are Variable Air Volume or Variable Refrigerant flow with Chilled Beam Technique.

Keywords: Sustainable, Saving Energy, Life Cycle Cost Analysis, Smart Construction Techniques-Chilled Beam, Energy-Efficient

1. INTRODUCTION

Concept of conserving resources for future generations is one in every of the most features that distinguish sustainable development policy from traditional environmental policy, which also seeks to internalize the externalities of environmental degradation**.** In order to attenuate dependence on the natural sources, we should always apply some innovative techniques to our building construction which will ultimately results in much energy efficient building without decreasing the comfort & quality of living.

Energy Conservation& Economy: Promote energy conservation through efficient energy use planning and building component and making it economical too. Energy efficiency building design plays a significant role because nowadays major part of the facility is consumed to run the heating ventilation air conditioning HVAC system. (The HVAC system alone totals to about 13.9% of the entire construction cost.) Comparing Energy efficient technology with the conventional technology. Make use of smart Construction Techniques like Chilled Beam Technique.

1.1 Need of Study: The movement toward sustainable building designs is being driven largely by environmentally-sensitive building owners and their occupants. It's seen that merely refining the system within the building we'll achieve energy efficiency and overall sustainable structure. A completely effective HVAC system must also solve many other indoor environmental matters that affect occupant comfort, productivity and health like ventilation air, air distribution, humidity control, noise levels, etc. Chilled beam systems are the perfect "green" solution for several buildings. There's also an overall comfort and economy for the employment of active chilled beam systems over other of the more conventional systems choices.

According to " India Chilled Beam Market Forecast & Opportunities,2019", the annual revenues for the country's chilled beam market are predicted to grow at a rate of around 108% during 2012-2019. Currently the chilled beam market in India is entirely import driven due to the absence of domestic

manufacturing. More and more green buildings in India are expected to put in chilled beams instead of traditional HVAC systems during the following five year.

1.2 HVAC (Heating, Ventilation & Air-Conditioning) Technology:

There are two basic varieties of HVAC i.e. **Centralized and Decentralized (Non-Centralized)**

- Non-Centralized consists of **Window & Split AC** that are generally installed in smaller projects like House, Shop, Stores etc.
- Centralized consists of **Packaged and Central Plant based** air conditioning (where the cooling loads are over 20 tons).

Packaged centralized air conditioning system: This sort of system incorporate all of the working parts in to atleast a unit; the evaporator, the condenser, and also the compressor are all located in one cabinet, which usually is placed on a roof or on a concrete slab next to the house's foundation. The air ducts are put along exterior walls of a house or along the roof, and they provide the flow of warm air inside the house to the unit, then back through the ducts so that cool air are often sent inside. This type of system is habitual among small commercial buildings but are hard to retrofit (install in a building that wasn't designed to receive it) because of the massive and big air ducts required.

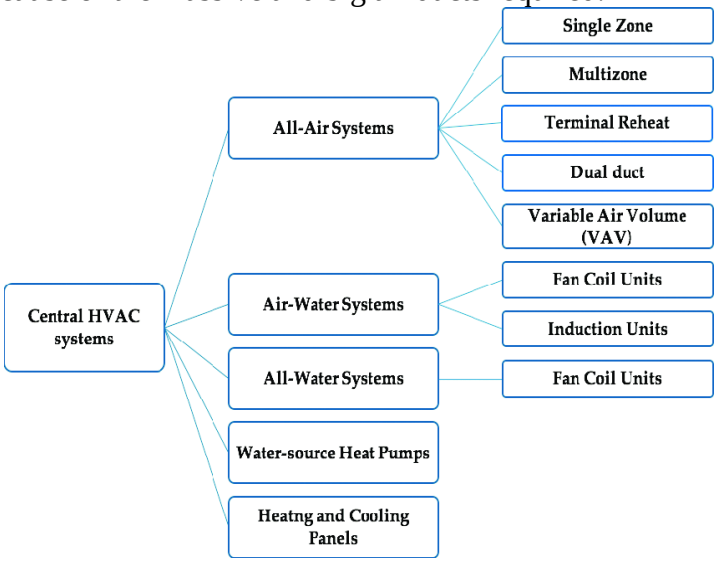

Figure:-1 Horizontal-hierarchy-representation-of-the-main-types-of-central-HVAC-systems

1.2.1 All Air System

1. **(Constant Air Volume):** CAV system that varies the temperature at a constant airflow.
2. **(Variable Air Volume):** The thermal energy transmit medium through the building delivery systems is air.

VAV units, or Variable Air Volume systems, supply same temperature air to an area while the volume of air differs as opposed to a conventional HVAC system which has same volume and varies the air temperature.

3. **(Variable Refrigerant Volume):** Variable refrigerant flow (VRF), also referred to as variable refrigerant volume (VRV), is an HVAC technology invented by Daikin Industries, Ltd. in 1982.

This refrigerant is conditioned by one or multiple outdoor condensing units, and is propagated within the building to multiple indoor units. VRFs make use of a refrigerant as the coolant and heating medium. VRV is a technology that substitutes the refrigerant volume in a system to match a building's precise requirements. With up to 64 indoor units connected to 1 outdoor unit, Each individual indoor unit decides the capacity it needs based on the current indoor temperature and requested temperature from the remote control (set point). The overall demand among all indoor units will determine how the outdoor unit adjusts the refrigerant volume and temperature accordingly.

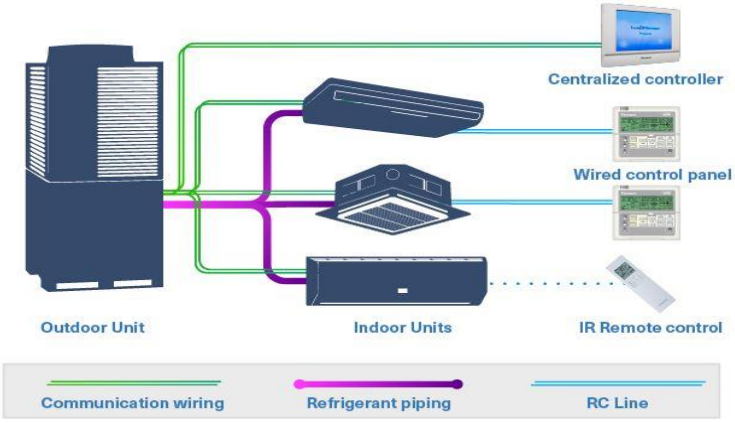

Figure:-2 VRF-air-conditioning-system

1.3 Overview of the chilled beam technique:

As relatively new in India, chilled beam systems are proven and are successfully being employed in Europe since a decade. The chilled beam system encourages outstanding thermal comfort, energy conservation and systematic use of space because of the high heat capacity of water used as heat transfer medium. It's an energy efficient HVAC technology which works on dry cooling principle.

Chilled beams system would be assessed which might show energy conservation and has potential to save 30-40% HVAC energy consumption to a traditional Air conditioned Building case.

1.3.1 History of chilled beam:

Chilled beams were developed in Norway in 1975, originally utilized in Scandinavia. Introduced in United Kingdom in 1990s and now used Worldwide due to its great advantages.

1.3.2 Process involved in the chilled beam technology:

Chilled beam systems utilize cold water circulating through pipes to chill the encompassing air. With the unit installed in or round the ceiling, the air it cools becomes heavy and falls towards the ground. The vacuum created by the cool air moving downwards is replaced by rising warmer air, which comes in contact with the chilled beams, and therefore the process resumes over and over, causing a constant and continuing airflow.

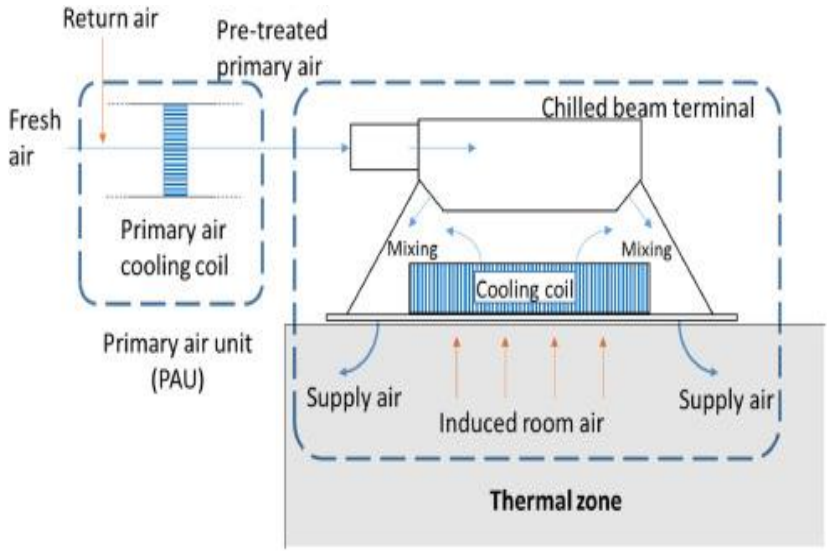

Figure:-3 Process involved in the chilled beam

2. Building details:

- The research is being conducted on a virtual building.
- The building chosen is intended to be an Educational building (University).
- The building is proposed to be located in Lucknow, Uttar Pradesh.
- The building comprises of Five Floors. i.e. (G+4) building.
- The building is of rectangular shape with its length equals to 307 feet and width equals to 119 feet and 9 inches. (307*119'9").
- The ground floor area of the building is about 36810 square feet. Hence, a total area of about 24,235.52 square feet out of the overall ground floor area is supplied with the conditioned air.
- Total Area to be air-conditioned (Primarily Cooling) in the building will be approximately equal to 129750 square feet.
- Height of each floor is taken around 12 feet.
- It comprises of different sections including the areas with and without air conditioning system.
- There are different kinds of spaces in the building as it is a commercial building such as Classrooms, Faculty rooms, Principal room, Library, Computer labs, Cafeteria, Lobby, Corridor, and many other spaces.
- The number of occupants that can be accommodated within each floor is estimated and depends upon the area for example the classes are designed for the strength of about 60 students and labs and libraries are designed for 100 students.
- The floor plan of each floor from Ground floor to fourth floor is attached below.

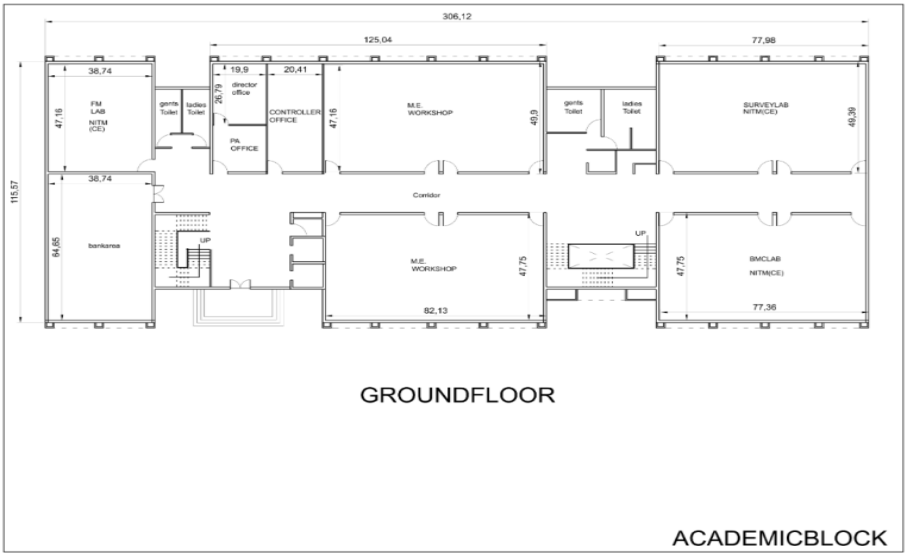

Figure: 4 Ground Floor Plan Proposed

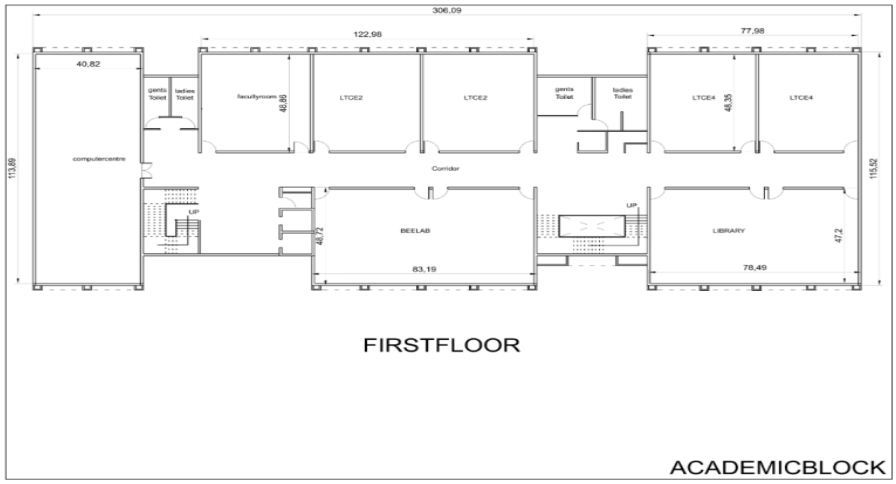

Figure: 5 First Floor Plan Proposed

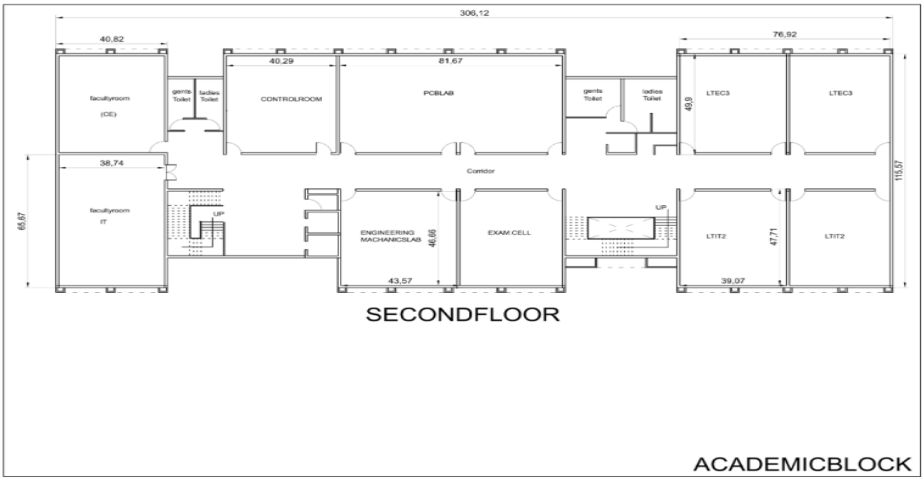

Figure:-6 Second Floor Plan Proposed

Figure: 7 Third Floor Plan Proposed

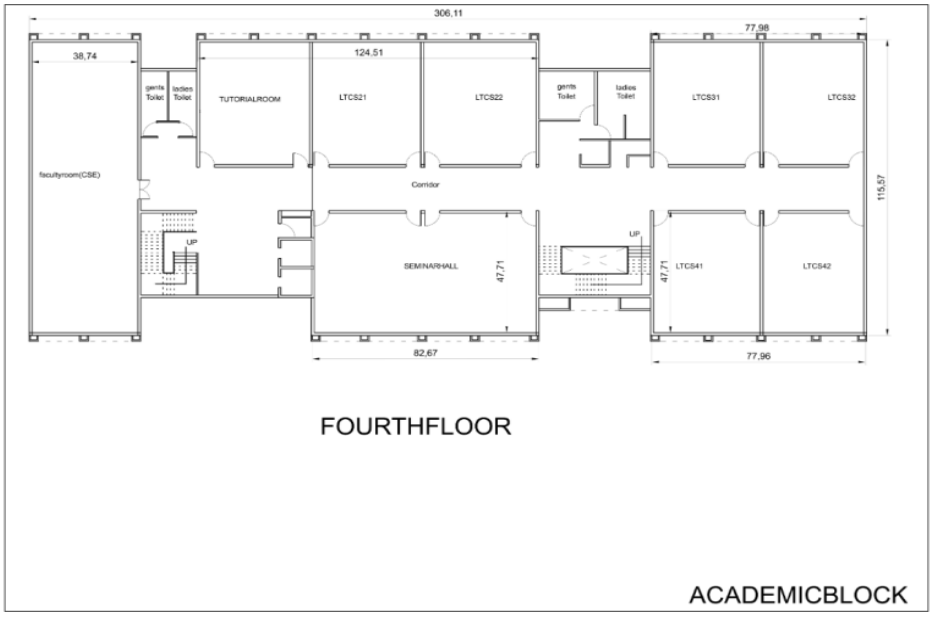

Figure: 8 Fourth Floor Plan Proposed

3. Heat Load:

- The net heat load estimated for the entire building is 1297.5 T.R. (By the help of HAP 5.10 Software).
- The heat load required for the respective floors from ground floor to fourth floor is

FLOOR	Heat Load Details
Ground floor	242.36 TR
First floor	255.92 TR
Second floor	251.05 TR
Third floor	270.55 TR
Fourth floor	277.62 TR

Table 1:- Heat Load Required per floor

4. COST DETAILS:-VRV/VRF System.(Daikin)

4.1.1 Outdoor units:

Table 2:- COST OF OUTDOOR UNITS BY VRV SYSTEM

S.NO.	OUTDOOR UNITS	QTY	ESTIMATED RATE	TOTAL AMOUNT
1	56 HP cooling only [RXQ56ARY6]	6	9,49,412.00	56,96,472.00
2	50 HP cooling only [RXQ56ARY6]	3	8,56,665.00	25,69,995.00
3	40 HP cooling only [RXQ56ARY6]	5	6,73,465.00	33,67,325.00
4	34 HP cooling only [RXQ56ARY6]	9	5,82,918.00	52,46,262.00
5	32 HP cooling only [RXQ56ARY6]	1	5,49,435.00	5,49,435.00
6	30 HP cooling only [RXQ56ARY6]	13	5,19,835.00	67,57,855.00
7	26 HP cooling only [RXQ56ARY6]	3	4,58,371.00	13,75,113.00
8	24 HP cooling only [RXQ56ARY6]	6	4,28,771.00	25,72,626.00
	TOTAL COST OF OUTDOOR UNITS			**2,81,35,083**

4.1.2 Indoor units:

S.N.	INDOOR UNITS	QTY	ESTIMATED RATE	TOTAL AMOUNT
1	5.6 HP [FXFSQ140ARV16]	168	47,912.00	80,49,216.00
2	5.0 HP [FXFSQ140ARV16]	135	45,318.00	61,17,930.00
3	4.0 HP [FXFSQ140ARV16]	6	43,888.00	2,63,328.00
	TOTAL COST OF INDOOR UNITS			**1,44,30,474**

Table 3:- COST OF INDOOR UNITS BY VRV SYSTEM

4.1.3 Refrigerant Piping:-

Table 4:- COST OF Refrigerant Piping By VRV SYSTEM

S.NO	Refrigerant Piping	Qty	Estimated rate	Total Amount
1	41.27 mm dia (OD) with 19 mm thick insulation	1250	1,558.00	19,47,500.00
2	34.9 mm dia (OD) with 19 mm thick insulation	1060	1,183.00	12,53,980.00
3	28.58 mm dia (OD) with 19 mm thick insulation	1260	869.00	10,94,940.00
4	22.2 mm dia (OD) with 19 mm thick insulation	1180	706.00	8,33,080.00
5	19 mm dia (OD) with 19 mm thick insulation	1260	620.00	7,81,200.00
6	15.86 mm dia (OD) with 19 mm thick insulation	1350	535.00	7,22,250.00
7	12.7 mm dia (OD) with 19 mm thick insulation	1350	403.00	5,44,050.00
8	9.5 mm dia (OD) with 19 mm thick insulation	1350	330.00	4,45,500.00
	TOTAL COST OF REFRIGERANT PIPING			**76,22,500**

4.1.4 Other Installations:-

S.NO	Other Installations	Qty	Estimated Rate	Total Amount
1	Supply, fixing & commissioning of BHF kit for connecting two outdoor. **Make- Daikin**	55	9,013.00	4,95,715.00
2	Supply, fixing & commissioning of Imported Y-Joint or Refnets. **Make-Daikin**	309	5,331.00	16,47,279.00
3	Supply, fixing & commissioning of Corded/Cordless remote contoller for the indoor unit. **Make- Daikin** [BRC7M632F-6] and [BRC1C62-9]	309	2,169.00	6,70,221.00
4	Supply, installation, testing and commissioning of Centralized Remote Controller as per specification & Complete in all respect. **Make- Daikin [DCS302CA61]**	42	23,488.00	9,86,496.00
				37,99,711

Table5 :- COST OF OTHER INSTALLATIONS BY VRV SYSTEM

TOTAL COST:-Variable Refrigerant Volume (Krishna Refrigeration)

- (Outdoor + Indoor +Refrigerant piping + Installations) Cost:- 5,39,87,768
- Installation cost & other cost will be around 3crores. (Data By the dealer associated)
- Total Amount without GST:- **8,16,35,878.00 (Installation)**

*(GST will paid at extra 18%).

5. COST DETAILS OF ACB (Active Chilled Beam) by (TROX)

Chilled Beam Size (1800*600) DID604 (4 way)

Total number of chilled beams required: 2653
Cost of ONE Trox Chilled beam :

TROX Model	Qty	Unit	Price
DID604-MY-LR-2-G-HL-A1/593x1793/P1/RAL9010/0/0	1	No.	**In** $740.0

Table 6:- TROX MODEL UNIT COST0

ACB:- DID604 (Four discharge), DID632 (Two discharge)

ONE DOLLAR= 75.62 INR, 740 DOLLAR = 55,958.8 INR (as on 20 march 2020)
Total number of chilled beams required:-2653.
So the Price of chilled beam system will be 2653* 55,958.8 = 14,84,58,696 INR.
GST will paid at extra 18%.

Total cost = 14,84,58,696. (Installation)

6. Maintenance & Operation cost details:-

- Maintenance cost is 4500 Rupees Per HP Per Year.(By Krishna Refrigeration)
- Required Load in (HP) is 1572.72(By the heat load calculation).
- Maintenance cost is Clean coil and condensate system for chilled beam is 30 dollars for each chilled beam for a period of four years.
- For one year = 30/4= 7.5 dollar for one chilled beam (one dollar =75.90 INR as on date 23 april 2020).
- Operation cost details is given below.

It is to be noted that The Conventional System is costing at around 30000-35000 per Ton. WHILE The Chilled Beam System cost around 100000-150000 per Ton.

6.1 Cost of System Comparison(Economic parameter of sustainability):

Cost	Conventional System	Chilled Beam System
1)Initial cost of the system	**8,16,35,878.00**	**14,84,58,696**
2)Maintenance cost for (1 year)	**70,74,900**	**15,10,220.25**
3)Operation cost for (1 year)	**6,49,06,220**	**1,59,67,705**

Table 7: COST COMPARISON

7. Energy Savings Details:

HVAC System	**VRF**	**ACB**
Total Conditioned Area (sq. feet)	1,29,750	1,29,750
Energy Consumption*	2254	554
Annual Power 8 hour / day	5408852	1330642
Electricity Charge Rupees. 12/-	₹ 6,49,06,220	₹ 1,59,67,705
Each Year Energy Saving		₹ 4,89,38,515
Maintenance Saving		₹ 55,64,679.75
Total Saving / Year		**₹ 5,45,03,194.8**

*Annual Power details= 300days (approx.)*8*Energy consumption *Electricity charge= 12*Annual power details.

Table 8: ENERGY SAVINGS DETAILS COMPARISON AND RESULT

8. LIFE-CYCLE COST ANALYSIS :

- For **Life-Cycling Cost Analysis**, a study period of **20 years** is taken into consideration. In this Initial cost, Energy costs (Operating cost) and costs for Maintenance are calculated separately for their future value.
- For **LCCA**, they are converted to present value with the help of discount factor.
- In India, present discount factor by Reserve Bank of India (RBI) is 8%.
- For calculating Present Value following equation is used,

$$\mathbf{(PV) = FV / (1+r)^n}$$

PV= Present Value
FV= Future Value n years hence
R= Discounted rate
N = Number of periods over which the cash flow occurs.

8.1 LCC for Conventional HVAC System:

1) Initial cost of the system = 8,16,35,878.00 (Present value)
2) Maintenance cost for (1 year) = 70,74,900
3) Maintenance cost for (20 years) = 14,14,98,000
Present value for Maintenance cost = **30358142.3**
4) Operation cost for (1 year) = 6,49,06,220
5) Operation cost for (20 years) = **64906220*20**
Present value for Operation cost = **278510263.**
LCC = 8,16,35,878 + 30358142.3 + 278510263 = 39,05,04,283

8.2 LCC for ACB HVAC System:

1) Initial cost of the system = 14,84,58,696.
2) Maintenance cost for (1 year) = 15,10,220.25
3) Maintenance cost for (20 years) = 3,02,04,405
Present value for Maintenance cost = **6480300.95**
4) Operation cost for (1 year) =1,59,67,705
5) Operation cost for (20 years) = 31,93,54,100
Present value for Operation cost = **68516849**
LCC= 14,84,58,696 + 6480300.95 + 68516849.7 = 22,34,55,847.

8.3 CONCLUSION:

- **LCC == 39,05,04,283** (VRF TECHNOLOGY / TRADITIONAL TECHNOLOGY/ CONVENTIONAL TECHNOLOGY)
- **LCC == 22,34,55,847** (ACB TECHNOLOGY)

DIFFERENCE BETWEEN THE LCC OF VRF AND ACB TECHNOLOGY IS 16,70,48,436.

- On the basis of cost savings% = (167048436/390504283)*100 = 42.766%

- LEED Rating:- (13 points)
- **Conclusion- From this study it is clear that LCC for ACB is much less than that of VRF technology.**

9. Vital Points leading towards Conclusion:

- Both systems will generally have the same installed refrigeration and heating and as a result, common chiller and boiler plants.
- **The main differences are in the air handling systems.**
- With the greatly reduced primary airflows and static pressures of Active Chilled Beam systems the fan energy savings over "all air" systems can be dramatic, particularly in buildings with relatively high sensible load densities.
- While this is true for both single duct and fan-powered VAV systems, the savings are even more dramatic in the latter case as all the fans and motors in the VAV terminal units are eliminated.
- With respect to the installed cost of Active Chilled Beam systems, the terminal units normally cost more as typically more of them are required. There are, however, offsetting installed cost savings in the system.
- The size and cost of the central air handlers and ductwork/risers in the Active Chilled Beam system are significantly reduced due to the reduced in primary airflows.
- The cost of the building's overall electrical infrastructure may also be reduced due to much lower fan power requirements.
- Wiring expenses are reduced as there are no main power connections to the Active Chilled Beams.
- Controls are also often less expensive as the Active Chilled Beams are controlled by simple low voltage zone valves.
- In addition there are also ongoing maintenance cost savings.
- The Active Chilled Beams have no moving parts and do not require regular maintenance (other than infrequent vacuuming of the unit's coil as required).
- Reduces ceiling space
- •Compared to large VAV systems 50,000 CFM and greater, a chilled beam system can reduce ceiling space by as much as **18 inches** •Compared to small VAV systems 20,000 CFM and less, a chilled beam system can reduce ceiling space by as much as 12 inches.
- An additional **8 – 10 LEED points** can be achieved.
- Chilled beams have no moving parts and require no regular maintenance.
- Mostly the maintenance cost involves Filter change, Clean coil and condensate system and fan motor replacement and maintenance.
- Fan coil unit, VAV, VRV are some of the conventional HVAC systems.
- **Operating Costs:-** Although total pump energy is generally somewhat higher, this is more than offset by the reduction in fan energy
- A one inch diameter water pipe can transport the same cooling energy as an 18 inch square air duct.
- Depending on system design, kW/ton is improved by utilizing relatively warmer water temperatures through the chilled beams**.**
- Higher chilled water temperatures used by chilled beams may allow chiller efficiencies to increase by as much as 35%.

Thrusts of the Big Data Analytics: Tools &Techniques

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Abstract-Today, the volume, variety and speed of data is growing. Many applications generate huge data streams at extremely high speeds, such as smart internet, sensor networks, video surveillance, telecommunications data, cameras, network data, and medical data. Twitter, LinkedIn and Facebook are examples of companies in the social media space. Other uses of big data focus on streaming valuable movies, taking careful care of network traffic, or updating production processes. The conceptual attempt to integrate the method into a coherent design of a reference structure was limited. The reference frame design and related classification are designed to promote frame design and technology selection in the development of a large data system. One of the main challenges posed by these parallel data applications is that the connection between distributed functions often results in large amounts of data transmission over the network. To report this problem, we found that the industry is constantly striving to build a network infrastructure for high-capacity, high-capacity, and low-latency data centers. We also believe that the academic community is already focusing on promoting effective network optimization mechanisms for big data analysis. Due to the rapidly growing interest in and importance of big data for education, industry and society, the development of solutions for processing data and extracting knowledge from datasets and a certain urgency for decision makers to progress. Many studies have shown the benefits of using big data in different departments. The work of this chapter discusses various tools and methods of big data analysis.

Index Terms- Big Data, Big Data Analytics, Tools, Techniques.

I. INTRODUCTION

Lots of information about large data sets and a wide range of data speeds and features, making it difficult to model them using traditional methods and tools. We are in an era of unparalleled big data, where the combined speed of data expansion and accelerating data growth opens up a whole new world of space. To better understand all of this data, researchers are developing and experimenting with great tools to find secret methods, unknown information, and other useful information in big data. Because of the vast amount of information involved, many technologies and maps have been developed to provide added capabilities and real-time research. Therefore, many models, software, hardware and technology are specifically designed to extract knowledge from Big Data. With a wide range of information technology, information can be obtained that can make better choices for key areas of development, such as health, labor economy, energy and natural disaster predictions. Security and confidentiality are major problems in most data due to high volume, high speed, many types of large-scale large maps, different source and source information, data retrieval, data compression between and others. Being one of the main

challenges posed by a data comparison platform, communication between job distributions often leads to a lot of data transfer over the website. To meet the high bandwidth requirements, we are seeing a growing body of data center building built as a continuous push by Google, Microsoft, Amazon, and Facebook to build data center connections. high capacity and low capacity. latency connected tens of thousands of servers. The usefulness of the information can be taken away from other applications, such as monitoring traffic communications or improving productivity of display numbers. Many different types of different technologies and architecture have been used in the implementation of a wide range of subject matter applications. In addition, in these communication networks, we are also witnessing focused efforts on training to develop communication technologies that accelerate the elaboration of data. Big Data analysis has been thoroughly researched in education; However, some industry advances and new technologies have been much discussed.

Big data: According to the Oxford English Dictionary, "big data" is a term defined as "a very large set of data that can be analysed by calculation to show patterns, behaviours, and combinations, particularly related to human behaviour and interactions". Begoli [1] conducted a short, state-of-the-art study of artists and foundations, which is rich in a variety of detailed data. The study covered the use of information technology, the basics of knowledge acquisition and tax generation. Chen and Zhang also studied large data [2], Their work focuses on a variety of information and challenges, methods and technologies, basic design, and future research.

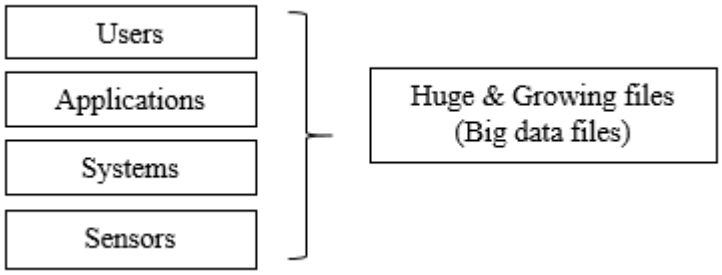

Figure 1: Big Data Sources

Big Data Properties: The three 5 V characteristics of Big Data are volume, velocity and diversity.
Purpose: This means a large amount of data generated in our digital domain every second, minute, hour, and day. The amount of data, storage and processing increases. Pet bytes are very large in size as long as they are measured similarly to Exabyte and Zetta.

Speed: If the processing of big data analytics has increased by reducing the response time. Today, data are presented in all types of models. The information was created by creating a business area program. Unstructured text documents, e-mail Mail, video, audio, commercial and industrial transactions.

Diversity: Lack of reliability as most major data sources are external. Speed refers to the speed at which large data is created or moved from one point to another, and storage and analysis is desired. Real-time data processing to link production speeds as they are produced is the main goal of big data analytics.

Meaning: To use different data types to learn values from data sets.

Reality: Big data has different forms- structured like ERP data, semi-structured like email. Data such as unstructured emails, tweets and audio and video.

Big Data Analysis Processing: One of the responsibilities of data analysis, the data theme is the collection and processing of data in the correct analysis section of the department. Data preparation steps include the following steps.

1. Data collection: data can be browsed from a wallet as a bird's-eye view or accessed online by deleting.
2. Data analysis: the appropriate analysis method depends on the data format.
3. Data cleanup: assessment responses and other data files are largely missing. Sometimes there are many codes for things like not asking, not knowing, and refusing to answer. And there are almost always mistakes. A simple policy is to remove or ignore defective records.
4. Creating data structures: When reading data, it is necessary to store them in a data structure devoted to the query that we pay attention to. If data is stored in memory, creating a data structure is usually the way to go. If not, a database is created, which is usually the data structure of memory. Most databases suggest linking values from keys, so it helps as vocabulary. The following critical steps are required to process Big Data:

(i) fast data upload.
(ii) fast processing of applications to meet the real-time prediction requirement.
(iii) maximum and efficient use of storage space.
iv) Adaptation to a highly dynamic workload model.

Larger data includes reduced maps. A similar programming process is suitable for many data producers. Includes two main sections, mapping and subtraction. In the map, the questionnaires are divided into small questions and assigned to different nodes in the same distribution system and process. The reduced load combines the performance of all mapping tasks and provides a single project.

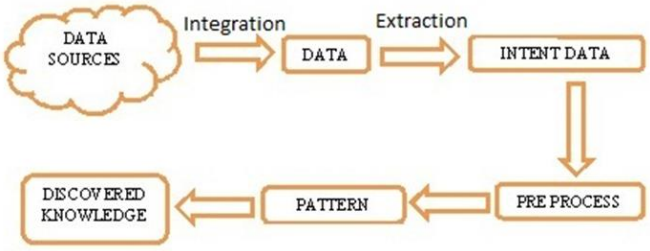

Figure 2: Big Data Analytics Processing.

Multiple data analysis methods: Increasing data, organizations trying to take advantage of big data use too much data in previous contributions and better decisions. New tools and techniques are also needed for more detailed data. The emergence of big data blocks everything from the data itself to spooling, enabling and ultimately search selection. The Learning Machine is a model that enables the device to learn beyond time and skill, and also without programmable clarity. Machine learning is part of smart definition that focuses heavily on machine learning from their experience and creates predictions based on their abilities. It encourages machines to make data-driven decisions rather than being programmed to perform a specific task. Machine learning algorithms are learned using a series of

data exercises to build a model. Assuming that new information is hosted in the machine learning algorithm, it is predicted on the basis of the model. The assumption is checked for accuracy, and if the accuracy is good, the machine learning algorithm is dispensed with. If the command is not accepted, the machine learning algorithm is re-qualified with an improved technical information set.

These programs / algorithms are designed to detect and progress over time as new information becomes available. Technical research methods can be defined in three types.

"Try to learn the ways - Educate me!"

"I don't support learning methods - learning"

"Strengthen learning methods - My life is my law! (Strikes and roads)"

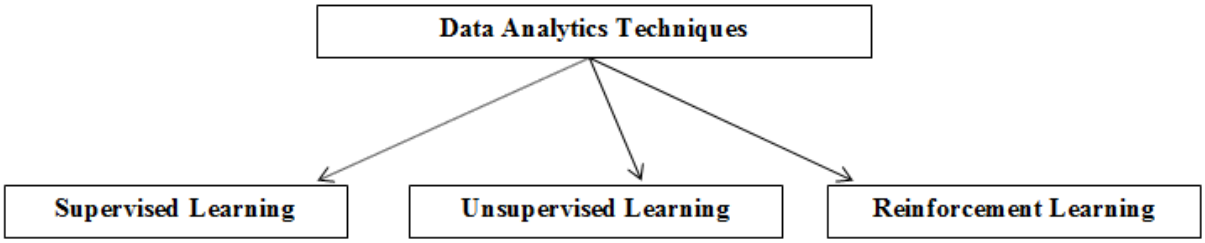

Figure 3: Big Data Analytics Techniques.

(1) Supervised technique: Supervised learning technique is a method by which you can you can reflect that learning is guided by training. As a teacher, we have a rotating data set, and the character trains the model. After learning the model, he can start guessing or making a decision after receiving new data. The supervised technique indicates where the data is collected and verified, and the study data is labeled. Funds are marked where it is known exactly what happened to the data, and therefore to the history of the data variables. Supervised learning consists of training the system based on labeled data, and this includes a manual that can convey any input that could teach the system by accepting its perspectives. Regression is an example of a supervised learning algorithm such as linear regression, decision trees, vector machine support, nearest neighbor K, Naive Bayes classifier, random forest, and neural networks. Many of these supervised methods cannot be used in wireless networks, and the results are regulated because the learning methods are based on data generation. Supervised learning is where you use an algorithm to learn the function of a map from input to output.

Y = f (X), where (x) is the input variable and (y) is the output variable.

The goal is to provide the map function so well that when you receive new input data (x), you can expect those data output variables (Y).

Classification: when the output variable is of a category such as "black" or "yellow".

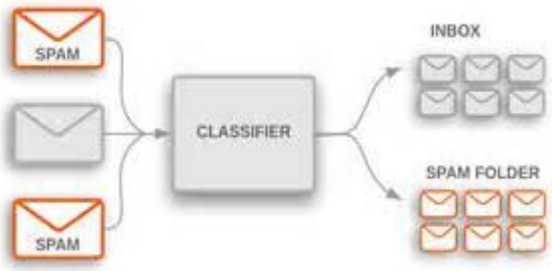

Figure 4: Classification

Withdrawal: When output variables are actual values, such as "Rupee" or "Meter".

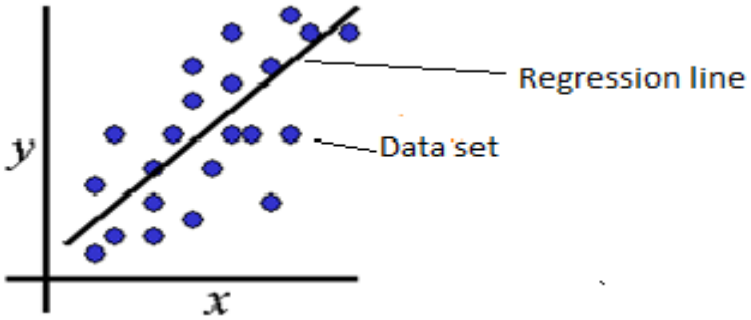

Figure 5: Regression

(2) Unsupervised learning: The goal of careless learning is very classic, with a basic configuration or a difference in direction of the data. These are called uncontrolled learning because, unlike supervised direct learning, there is no clear answer and teacher.

$$Y = f(X)$$

The algorithms are unclear about their ideas, but they are data-driven and interesting in nature. Unsupervised learning problems can be grouped specifically as summation and association problems.

Collection: The problem with collections is that you want to find groups for your data.

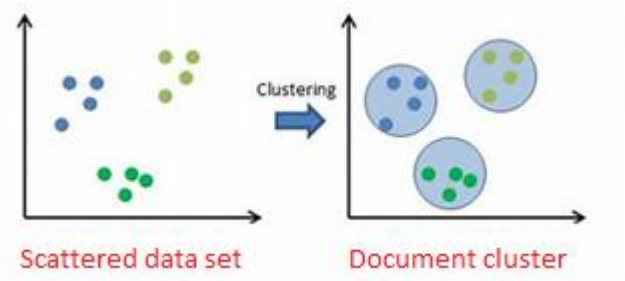

Figure 6: Clustering

Association: Where you want to discover rules that define large shares of your data, such as people that buy X also tend to buy Y.

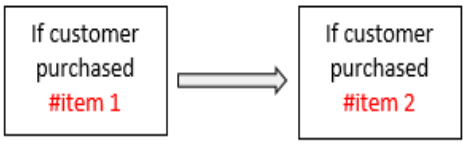

Figure 7: Association.

(3) Reinforcement Technique: It is about gaining appropriate action to maximize the salary in a given situation. Several software is used to find the best possible behavior or to perform the tracking that should occur in a given situation. Reinforced learning shifts from supervised learning to providing training data with answer keys so the model qualifies for the correct answer in reinforced learning. So there is no answer but the reinforcement agent will exercise the right. Must be done for the given work in the absence of a training dataset it is guaranteed to be learned from experience. The main feature of the empowerment technique is that there is no boss, it's just real numbers or reward signals, chronological decisions play a key role in empowerment issues; feedback is constantly delayed, not immediate, and execution. Agent filling out the results becomes.

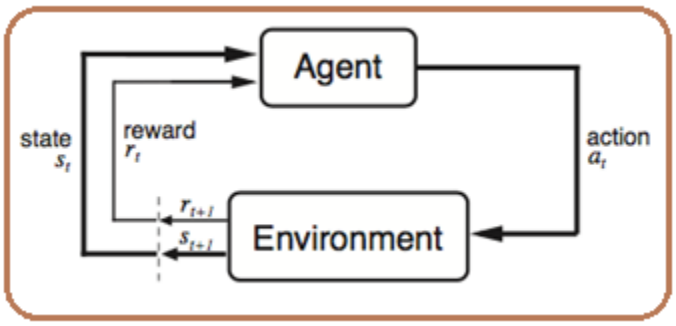

Figure 8: Reinforcement.

Big data analysis tools:

Data is invaluable until it is presented as information that can help management make decisions. We have one of the most important big data software on the market. This software helps you store, analyze reports, and do more with big data.

Apache Hadoop: Apache Hadoop is a program for aggregating grouped files and managing big data. Manages a large set of tool data from the classic Map Reduce Hadoop program. It is an open source framework written in Java and offers cross-platform support. A key advantage of Hadoop is the Hadoop distributed file system script, which can contain any type of data (video, images, JSON XML, and plain text) in a single file system. Apache Hadoop support devices are very useful for R&D purposes, providing sloppy data access, highly scalable and highly available facilities located in a computer cluster. But sometimes concerns about the universe of the disk arise from the triple duplication of the data mentioned above.

CDH: The goal of CDH is to bring this technology to the enterprise level. It is completely open source and offers free complete platforms for sharing, Apache Hadoop, Apache Spark, Apache Impala, and more, allowing you to react, process, manage, explore the classics and provision unlimited data for the benefits of Cloudera distribution. When enabling Hadoop deployment, the cloud manager takes care of the Hadoop cluster, its seamless implementation and less complex management, it is extremely secure and confidential. There are some issues, however, such as somewhat complex UI features, graphics for CM services, and a few recommended approaches. As far as customization goes, it sounds confusing.

Cassandra: Apache Cassandra distributes NoSQL databases built to handle large amounts of data with high availability on a variety of service servers. Cassandra's fee for a structured language to interact with the Cassndra awards database - there is no single fact that quickly handles big data, structured cameras, locks, mechanical pantomimes, inconvenient scalability Simple circular architecture but some obstacles require additional work to troubleshoot. The grouping can be changed. And no screws at the row level.

Knime: Konstanz Info Miner is an open source device simplified for ease of explanation. You get up and out of Assimilation, Exploration, Data Extraction, Data Extraction, Text Extraction, and Organizational Intelligence. Knime's advantages are simple ETL tasks that go well with other experience and rhetoric, an ironic set that is well served by workflow systems. Compact, easy to configure, automates many work-intensive tasks with no persistence issues. But the downside is data. The control can be expanded with almost any RAM and integrated into the image database.

Knime: Constance Information Miner is an open source tool for continuous review, absorption, surveys, data digging, text digging and enterprise intelligence. Nyme's advantages are simple ETL functions, good integration. Along with other information and phrases, a bunch of irritating systems, well-maintained and organized workflows, time-wasting automation, persistent problems and ease of refining, but the disadvantage - skill. Processing data can be upgraded, using all RAM and integrated with image databases

Datawrapper: Datawrapper is a visualization tool that allows administrators to quickly create simple, accurate, and embedded images. The advantage of Datawrapper is that it gives access to the device. It works well with all kinds of beliefs. Keep only a mercury tablet or desktop. Cooperate fast. All notes are transferred to one house. No need for excessive customization and switching and encryption. But the color range can change

Mongo DB: Mongo DB is a centralized database of NoSQL documents written in C, C ++ and JavaScript. Key features include spooling, temporary queries, BSON pattern activation, interrupting, indexing, replay, and calls. Use client-side JavaScript, no strategies, outdated team, management services, load predictions, and event storage. Benefits - Easy to learn, guidance for various mechanisms, hassle-free installation and repair, low reliability and cost, slowness for semi-analysis and guaranteed usability.

Lumify: Lumify's main attractions include full-text search, conceptualization, 2D and 3D drawing, reflection patterns, unit connection analysis, screen graphics integration, spatial analysis, and support analysis. With video and audio, real-time connectivity in multiple workplaces, Lumify's advantage with Amazon AWS is secure and easy to use.

HPCC: High Performance Compute Set (HPCC) is a comprehensive description of the large data on a supercomputer's desktop. Also known as Data Analysis Supercomputer, this tool is written in C ++ and Enterprise Control language.

Storm: Apache Storm is a cross-platform distributed flow and error-tolerant real-time computer environment. Written in Clojure and Java, his style focuses on special nozzles and pins, providing a basic tone of facts and deals to confirm the clusters scattered along the almighty recording stream.

Apache SAMOA: Advanced Massive Online Analysis (SAMOA) is an open source platform for large data mining and machine learning. Distributed machines for streaming allow you to set up a learning rule and monitor the distributed currents coming to your computer. The closest add-on to the Apache SAMOA is the BigML tool.

Talend: Talend's big data integration product includes an open workshop on big data, installations and connectors - Hadoop and NoSQL, Citizens Support only, and tools and links to MapReduce and Spark

Rapidminer: Rapidminer is a cross-platform for ML disciplinary training and an environmentalist for detailed predictions.

Qubole: The Qubole Data Facility is a complete database of your own data management tools that you can research and improve on your own. This gave the informants much of the trading impact of an administrative position.

Tableau: Tableau is a program that tests the business for intelligence and analysis with a combination of drugs that support the top global agencies to see and understand their information. The program includes three key features: Tableau Desktop (for researchers), Tableau Server (for developers) and Tableau Online (for the cloud).

R: R is one of the most comprehensive statistical package details. It is written in the C, FORTRAN, and R programs that are used by the creators and databases.

Elastic Search: the most widely used technical engineering. This comes as an integrated solution with assembly data and engine logs and details and visual level settings, and three types of add-ons called flexible sharing.

OpenRefine: OpenRefine is an open source information processing and monitoring tool for dusting, repairing, extending, and enhancing performance.

Stata Wing: The Stata Wing is a statistical tool that analyzes events and landscapes.

CouchDB: an open-source, cross-platform NoSQL database, written in the Erlang language, which uses the same currency.

Pentaho: Pentaho is a functional organization for data analysis and analysis. Related to real-time information to improve digital understanding.

Flink: Apache Flink is a split cascade, an open source space for detailed information and ML. Written in Java and Scala, it is responsible, stable, scalable, and efficient.

Data Cleaner: Data Cleaner is a version of most Python-based applications.

Kaggle: Kaggle is an open source information platform for show, important models and open dress sets.

Busy Parts: Apache Hive is a Java-based cross-platform toolkit that supports database information, queries, and details.

Spark: Apache Spark is an open source database for ML data analysis. And low-cost computing including Java, Python, and R.

IBM SPSS Modeler: SPSS is an intelligent software for data analysis and research. This tool loads slogans and scraps together to create everything from research data to machine learning. It is very important to pour everything and adjust.

OpenText: Big Data Analysis OpenText is a comprehensive data analysis solution designed for businesses and analysts that allows easy and fast data entry, analysis and analysis.

Oracle Data Mining: ODM is the first data analysis and analysis tool that allows you to create, manage, organize and manage and share your Oracle data.

Teradata: Teradata Company offers information about agricultural product warehouses and service areas. Teradata analytics platform combines analytics and analytics, analytics software, analytics, AI tools, and many different types of data in one way.
BigML: With BigML, you get real-time monitoring software. Expensive Superfast offers a complete platform where you can batch create and share and fax.

Silk: Silk is a basic data collection based on an open source list of topics that often focus on different collections of data.

CartoDB: The CartoDB Fermium software is a cloud computing framework service that is an intelligent neighborhood and data management tool.

Charito: Charito is a very popular source of information about data, built into SQL and built into configuration management.

Plot.ly: Plot.ly compiles a GUI that is designed to transfer and parse data in a grid and use the statistics tool. Disclosure can be combined. He quickly drew a chart.

BlockSpring: BlockSpring defines a new method and approach for data retrieval, communication, API data management and modeling, thereby reducing the load on central IT.

OctoParse: OctoParse is a cloud-centered web environment that is useful for setting up any web page without encoding.

Issues and Challenges in Big Data:

(1) Challenges with big and big data features.
(2) Administrative and crisis issues, human resources and human resources.
(3) Technical issues and constraints (such as inaccurate tolerance, data variability, data quality and data quality).
(4) Storage and transfer issues and constraints.
(5) Managing problems and challenges.
(6) Confidentiality and security issues and challenges (security, data management, data privacy and integrity, and responsive security in terms of infrastructure).

II. CONCLUSION

Evaluating valuable data from additional information is an unfortunate issue for Big Data. Building bridges and blocking everything else. There is no big data here, new policies need to be created. In terms of reliability, the biggest concerns of Big Data are its privacy, reputation, access and security. Large amounts of data are stored in the cloud business. From this chapter it is recognized that excellent analytical tools / techniques have their focus. Some are designed for intensive work, while others are good for analysis. Every big data technology has its own functions. Various techniques are used in analysis, including statistical analysis, machine learning, data mining, logic analysis, and data stream processing. Big data includes scaling systems, benefits and challenges. Therefore, more research is needed to identify, analyze and store Big Data as well as improve online integrity assessment.

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IHDPS Fuzzy Rule-based Expert Knowledge System for Students academic Performance Evaluation using Machine learning & Data Mining Techniques

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***Abstract*:** As flexibility and agility become key success factors of competitive era of technical Universities. Every school, colleges and universities strongly focus on improvement of the student's performance by applying fair evaluation methods. Performance of students is difficult to assess before the final results are declared. Major factors that affect on performance are the attendance of students in their theory and laboratory sessions, the exam grades they obtained in internal exams and the exam grades they obtained during term work evaluation. The ability to support the decision & prediction making process in oil business industries, Medical diagnosis etc. also becomes a critical issue. Performance of students is difficult to assess before the final results are declared. Major factors that affect on performance are the attendance of students in their theory and laboratory sessions, the exam grades they obtained in internal exams and the exam grades they obtained during term work evaluation. Also, university is a very large domain and student's data are generally stored in various distributed and heterogeneous data repositories which may span across different organizations, administrative domains & departments. Such distributed data repositories can be integrated within data grid environment by implementing data grid middleware. Therefore, we have developed a fuzzy logic based expert system which assists the process of decision making of student's performance evaluation within data grid environment. All information (statistical measures, statistical parameters, statistical decisions, probabilities of significance and fuzzy measures) is used as input for a fuzzy rule based expert system. This system has been developed by taking the data of students of technical Institutions & Universities .The system will utilize the fuzzy logic theory and develop the decision making process based on fuzzy rules to assess whether a student gets very poor, poor, good, average or excellent performance. This research paper presents a rule-based expert knowledge system i.e. web-based Hybrid expert system, called Intelligent Hybrid Decision & Prediction System (IHDPS) to addresses how engineering knowledge can be dynamically represented and efficiently utilized in oil business industries, medical diagnosis, Universities etc. The fuzzy rule-based expert knowledge system, called web-based Intelligent Hybrid Decision & prediction System (IHDPS), is designed and implemented using the rule-based inference, reasoning & decision making approach. The distinctive technical contributions of (IHDPS) focus on three critically integrated elements: (1) a spreadsheet software for interpreting and evaluating performance data, (2) a fuzzy knowledge rules for time-series pattern recognition, and (3) an embedded application component.

***Keywords*:** web-based Hybrid expert system, cyber-enabled .NET Expert System Shell (NESS), Intelligent Hybrid Decision & prediction System (IHDPS), Fuzzy Logic, Data Grid, OGSA-DAI, Multi-agent Systems.

A. INTRODUCTION

There are several factors are needed to be considered which affect the performance. Major factors that affect on performance are the attendance of students in their theory and laboratory sessions, the exam grades they obtained in internal exams and the exam grades they obtained during term work evaluation. It is possible to analyze these factors qualitatively such as poor, very good, average, excellent etc. Even though quantitative figures are available such as 55% attendance in theory session, 80% marks in internal exam, 70% marks in the term work evaluation; it cannot directly be used for performance assessment. Suppose in the grading process of student's performance, the borderline between a good performance and a bad performance is 50%. Suppose the student got 49% during the grading process. Can this performance considered as a bad? Or if it is 50%, can it consider as a good? So, assessing student's performance is the area in which strict rules often do not represent the real situation.

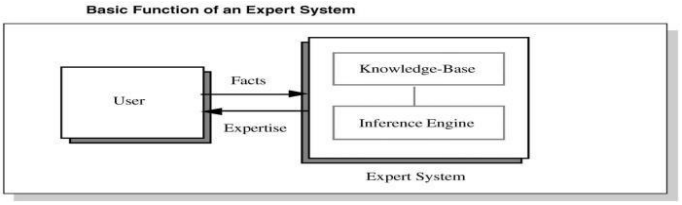
These are the criteria according to which the teachers can realistically assess students in order to evaluate their performance. There are two main reasons why above classical logic systems cannot deal with problems in which knowledge is approximate. They do not provide a means for representing the meaning of propositions expressed in a natural language when it is imprecise, and they do not provide a mechanism for inference in the cases where knowledge is represented symbolically along with its meaning.
As we can clearly see from the above discussion, developing a system for student's performance evaluation based on strict and rigid rules would not be a truthful evaluation process. Therefore, we need systems that will deal with knowledge, which is rather imprecise or incomplete as human routinely and subconsciously place things into classes whose meaning and significance are not well defined. Fuzzy logic provides a way of representing the behavior of systems which are either too complex or too imprecise.

Moreover, university is a very large domain and student's data are generally stored in various distributed and heterogeneous data repositories which may span across different organizations and administrative domains. Such data repositories can be integrated within data grid environment by implementing data grid middleware. Therefore, we have developed a fuzzy logic based expert system which assists the process of decision making of student's performance evaluation within data grid environment. The system accomplishes decision making process to assess student's performance. The implemented experimental system leverages of OGSA-DAI (Open Grid Services Architecture Data Access and Integration) workflow execution functionality and out-of-the-box activities for data access, integration, transformation and delivery.

To overcome the above challenges, this paper designs and develops a web-based Hybrid expert system, called Intelligent Hybrid Decision & prediction System (IHDPS), using cyber-enabled NESS technology. The objective of this research is to address how the engineering knowledge can be dynamically represented and efficiently utilized to support shop floor production control and job dispatching.

An IHDPS is A Computer Program Designed To Simulate The Problem-Solving behavior of an Expert in a Narrow Domain or Discipline. "An expert system is a computer system that emulates, or acts in all respects, with the decision & prediction making capabilities of a human expert."

Fig. 1 Functionality of the IHDPS



B. DEVELOPMENT STRATEGIES OF THE IHDPS

Expert systems (ES) are a branch of artificial intelligence to mimic human reasoning and accumulate domain expertise in decision & prediction making. They include a reasoning mechanism called an inference engine that executes a logical sequence of rules and makes calculations to produce answers to a particular problem-solving task. Each type of ES has a corresponding inference technique and knowledge representation approach. It surveys and classifies ES methodologies into the following domains, e.g., rule-based systems, knowledge-based systems, neural networks, fuzzy expert systems, object-oriented methodology, case-based reasoning, and intelligent agent systems.

In any expert systems development, the most important aspect is to find an expert in that specific domain. The expertise here does not mean just possession of knowledge or qualification but involves problem solving skills that need be sharpened in a particular domain.

Knowledge base-

- Obtainable from books, magazines, knowledgeable persons, etc.
- Stores all relevant information, data, rules, cases, and relationships used by the expert system.

Inference engine -

- Draws conclusions from the knowledge base.
- Seeks information and relationships from the knowledge base and provides answers, predictions, and suggestions in the way a human expert would computes.

Rule-

- A conditional statement that links given conditions to actions or outcomes.

Fuzzy logic-

- A specialty research area in computer science that allows shades of gray and does not require everything to be simply yes/no, or true/false.

Backward chaining-

- A method of reasoning that starts with conclusions and works backward to the supporting facts.

Forward chaining

- A method of reasoning that starts with the facts and works forward to the conclusions.

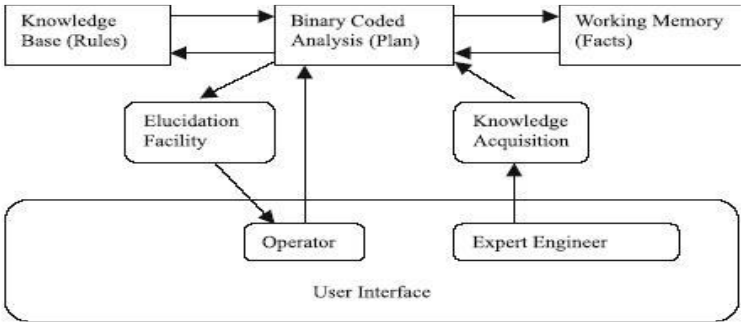


Fig. 2 Rule based Hybrid decision & prediction system
With 3- tier architecture

C. INTELLIGENT HYBRID DECISION & PREDICTION SYSTEM

Hybrid systems seem to be combinations of fuzzy logic with neural networks. It supports inference chains and neural net training strategies, providing a coherent system for exploiting the advantages of the conventional rule-based expert systems. The pioneering applications of neural nets for implementing expert systems as reported in literature may be classified into the following two categories:

Fuzzy logic rule based expert knowledge systems: Is it entirely based on neural network technology? The simplest case is to deal with implicit, fuzzy knowledge using a neural net associative memory. In these applications, explicit rules of decision & prediction making are not available or may not be necessary, e.g. machine fault diagnosis etc. The complicated cases could be to acquire rules using neural net structure and make the system capable of explaining the decision & prediction making procedure. Fuzzy logic starts with concept of fuzzy sets. Fuzzy set is a set containing elements that can have partial degree of membership unlike in crisp sets, in which element either belongs to set or not, there is nothing like partial membership. For example, age can be considered as linguistic variable whose members are young and old.

2) Hybrid (inference chains & neural nets): Is it treat neural nets and rule as inference elements and use such elements alternatively in the inference process as and when appropriate? In these systems, rules are used for explicit knowledge inference and neural nets for implicit knowledge inference. For instance, neural nets are often used for pre-processing to reduce the noise in the field input, so that rules can be more accurately activated. Also, in some applications a neural net may serve as the central inference engine and rules may be used for pre-processing and post-processing.

D. Categorization

Category 2 includes all the intuitive hybrid systems exploiting the potential benefits of the advanced technology of both neural nets and rule based systems for improving the quality of expert systems in real life applications. Applications take the advantage of rule based techniques for improving the neural nets performance. In its knowledge acquisition phase, it involves rules and neural net learning algorithms, while in the consultation phase; it is only a neural associative memory.

Category 1 applications attempt to develop some alternative neural framework for implementing expert systems. Since category 2 and 1 applications are application specific and usually involve

neural net model development.

We may conclude that a hybrid expert system shell should focus on supporting the category 2 applications, provide some mechanisms to support category 1 applications. In addition to the features of a traditional rule based expert system shell the following facilities should be provided:

- Built-in neural/semantic net components;
- A way of chaining neural nets with rules;
- A neural net training strategy that can be programmed using rules.
- A lower level neural net for input data pre-processing.
- A higher level rule base has been first introduced as a Rules are **"IF THEN"** statements that have a left-hand side model in. hybrid IHDPS shell should be able to support arbitrary inference chains.

E. KNOWLEDGE REPRESENTATION

Knowledge representation is concerned with the way in which information might be stored and associated in the human brain, usually from a logical perspective (not biological). Knowledge base was extensively indexed and made content addressable, so that any system using it can control the way in which different pieces of knowledge were activated without having to know exactly how they are stored? Sufficient care has to be taken to organize and integrate different pieces of knowledge from the problem solving point of view. The knowledge representation used here is a symbolic representation, which helps in nonnumeric computation in which symbols and symbol structures could be constructed as standing for various concepts and relationship between them.

ES can be broadly categorized into three knowledge representation techniques, i.e., Fuzzy rule-based, case-based, and frame-based. The Fuzzy Rule-based expert system (RBES), also called knowledge- based expert system (KBES), gathers a set of factual data (e.g., program descriptions/degree requirements) and produces actions (e.g., recommendations/schedule) by interpreting the data with a set of predefined rules . RBES needs to collect, extract, and manage adequate domain knowledge constantly.

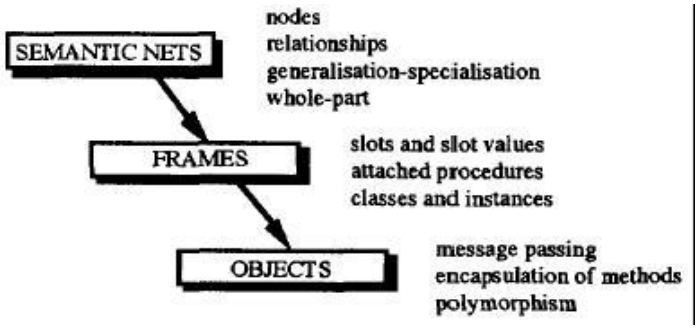


Fig. 3 Knowledge Representation Formalisms

The main Fuzzy knowledge base components of this system are

- Fact base, which represents the initial state of the problem, and Rule base, which contains the operators that can transform the problem state in to a solution.
- The inference engine matches these facts against the rules to see which rules are applicable.

Fuzzy Knowledge Base: The fuzzy system support decision-making by using the knowledge which is accumulated in the knowledge base of the fuzzy expert system. The knowledge bases contain large number of simple if-then rules and are formed by collecting knowledge from various domain experts. The fuzzy system draws inference by integrating the rules based on the fact supplied by the user. Example: if p is A then q is B, Where A and B are linguistic values defined by fuzzy sets on the ranges P and Q, respectively. The part of the rule "if p is A" is called the antecedent or premise, while the part of the rule "then q is B" is called the consequent or conclusion.
Different human beings have different interpretation for various terms. Consider the term "young", Ex-age >60. Suppose, two sets are there, a set A which defines the people above 60 years of age to be considered old and set B consists of the people less than 60 years of age as young. What can be said about person whose age is 50? According to classical set theory, that person is considered as young. But if talk about real world, we can't say exactly that person is young. So to represent this type of data, fuzzy set is needed which determines up to which degree that person belongs to set A and set B. Fuzzy set is useful for representing linguistic variables. A fuzzy set A in X is defined as a set of ordered pairs.

$$A = \{x, fA(X)\ I\ \ x\ Ɛ\ X\}$$

Where fA(X) is called the membership function of x in A. This function maps each element of X to a membership value between 0 and 1. A membership function is a curve which shows the mapping of an input space to a membership value between 0 and 1 .

Firstly, factors are identified that may affect student's performance either directly or indirectly by interacting with students. After identifying the factors, some values are assigned to the factors based on their effect on student's performance and then the fuzzification of these values is done and knowledge base is created which is a collection of simple if then rules. All these steps are discussed in the later section in detail.

Fuzzy Inference Engine: It matches the fact supplied by the user with the rules that are superimposed in the knowledge base of the expert system and applies some logic to draw inference. Various fuzzy operators and implication method are used for inference process.
It works in a **cyclic** manner as follows:

- MATCH the facts against the rules.
- CHOOSE which rule instantiation to fire.
- EXECUTE the actions associated with this rule.

Part (IF-portion) and a right-hand-side part (THEN portion). Fact based represents the initial state of the problem. It is data from which inferences are derived. When the parameter of fact in the inference engine is changed, the result of inference will also be updated. The NESS inference engine controls the overall execution. It works in a match-choose-execute cycle. Whenever the rules match with existing facts, it chooses which rules to fire. The execution engine enacts the right-hand-side actions associated with the firing rules.

IHDPS can capture the (senior) expert's know-how on design solutions; they involve the construction and usage of the following modules:

- Knowledge Base (KB)
- Inference Engine
- User's Interface.

This research presents a rule based knowledge system run on the .NET Expert System Shell (**NESS**) platform to addresses how engineering knowledge can be dynamically represented and efficiently utilized in decision & prediction & prediction making. The knowledge system, called Intelligent Hybrid Decision & prediction System (**IHDPS**), is designed and implemented using the rule-based inference and reasoning approach. The distinctive technical contributions of IHDPS focus on three critically integrated elements: -

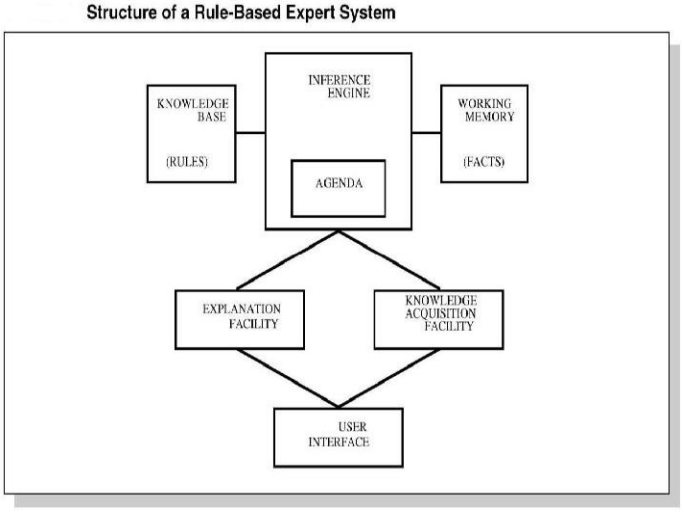


Fig. 5 Fuzzy Rule based Hybrid expert decision & prediction system

The distinctive technical contributions of IHDPS focus on three critically integrated elements:

(1) Spreadsheet software for interpreting and evaluating student's academic performance data.
(2) Knowledge Based rules for recognizing time-series patterns.
(3) An embedded system application component.

In this proposed system, the facts provided by the users are the factors that are affecting the performance of the student. Based on the factors provided by the user, and by using the rules that are already superimposed in the system, the system automatically tells whether the performance of the student will increase or decrease or remain consistent. Mapping of input variables to output variables is shown in following Fig 6 (Mapping of I/P to O/P variables)

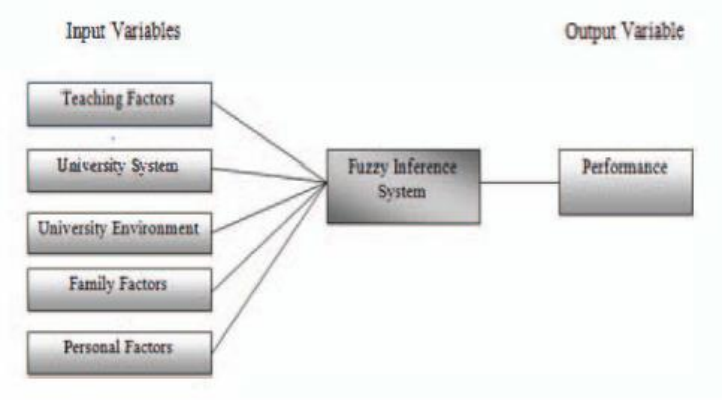


Fig 6 (Mapping of I/P to O/P variables)

OGSA-DAI (OPEN GRID SERVICE ARCHITECTURE DATA ACCESS AND INTEGRATION): A DATA GRID MIDDLEWARE TO ACCESS AND INTEGRATION OF DATA FROM SEPARATE DATA RESOURCES

To establish a data grid environment, a data grid middleware technology named OGSA-DAI (Open Grid Services Architecture Data Access and Integration) has been used. The OGSA-DAI has been studied and set of mechanisms have been identified to use data grid services. Open Grid Services Architecture Data Access and Integration (OGSA-DAI) is a project that develops middleware solution to assist with access and integration of data from separate data resources via the data grid

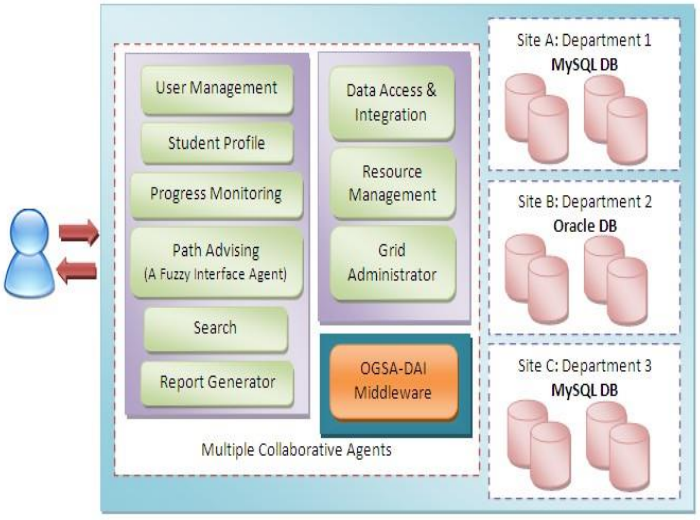


FIGURE 7 ARCHITECTURAL VIEW OF FUZZY LOGIC BASED EXPERT SYSTEM FOR STUDENT'S PERFORMANCE EVALUATION IN DATA GRID ENVIRONMENT

In a university, there are several different departments existing and they may manage their student's data individually and in disparate form. The system is able to integrate these distributed and heterogeneous data repositories in the data grid environment. As discussed earlier, a data grid is realized through OGSA-DAI, a data grid middleware. As configuration of the data grid is a complex and tedious tasks, data grid formation should be performed with minimum human intervention. Agents are the sophisticated software entities that work proactively on behalf of its users. So, we have developed an agent based interface to provide data grid services to users. The multi and Integration Services (GGF-DAIS) work group. OGSA DAI is a database centric middleware solution which mainly provides the data virtualization services.

AGENT-BASED INTERFACE TO DATA GRID SERVICES

Configuration and deployment of data grid is a complex and lengthy task. Therefore, data grid services should be offered with minimum user intervention. To facilitate the access of data grid middleware services, we have implemented different collaborative agents those are working together to provide the core, user & knowledge level services to the users.

Users are interacting with agents in order to access OGSA-DAI services. Agents are autonomous, adaptive and cooperative by nature and emerging as dynamic, flexible and extensible mediators for facilitating grid services in a data grid environ- ment. Agents are working proactively with minimum user intervention and offer various data grid services to its users agent system provides a scalable environment to integrate this data grid to perform the knowledge extraction and delivery process and hides the heterogeneity of the database nodes from the users and handles the data access and integration in an efficient manner. Once the data grid is formed, we have integrated a knowledge-based component by realizing fuzzy logic. This system performs knowledge extraction and delivery of data or information retrieved from data grid which helps students and teachers to evaluate student's performance and assist them in the decision making process at a certain level.

Figure 7 presents the architectural view of student's perfor mance evaluation system. We can see from the figure that there are multiple collaborative agents working together as a part of multi-agent system environment. There are mainly three entities of the system. They are distributed & heterogeneous data repositories reside in data grid, data grid middleware and multiple collaborative agents to configure and manage the data grid.

We can see the database nodes in figure 7 that contain different relational data resources (e.g. MySQL, Oracle, SQLServer etc.). These databases are distributed or located at geographically different sites. Each site may contain different relational (RDBMS) database type and schema. Also, each site contains necessary data to perform evaluation i.e. attendance, exam marks and teamwork evaluation marks of respective student. We have used horizontal fragmentation strategy where student's databases may store at different sites (in different departments), having different data tuples but having similar table schemas. More departments (i.e. database nodes) can be added in the data grid according to requirement with help of agent based interface. The agents access and integrate the necessary data (attendance, exam marks and teamwork evaluation marks) from this database grid through OGSA-DAI and then apply fuzzy set theory and logic to provide knowledge-based assistance. Apart from relational resources (MySQL, Oracle, etc.), XML and file-based data resources may also integrate with necessary modification.

III. FUNCTIONAL SPECIFICATIONS & RESEARCH METHODOLOGY OF FOR IHDPS FUZZY RULE-BASED EXPERT KNOWLEDGE SYSTEM DEVELOPMENT

The specification of each system module is defined in detail same like SDLC phases. IHDPS consists of four main modules.

The four modules support four roles of participants in the System platform, The IHDPS is designed and developed in the following SDLC stages:

Stage 1 Requirements gathering and system analysis

- Knowledge management module
- Rule management module

- System administration module
- Project management module

Stage 2 Operational scenario designs

- External Application environment
- Rule authoring environment
- Rule execution environment

The effective use of a IHDPS - KBS is with respect to two main objectives:

- To support a successful transfer of knowledge from Senior expert engineering designers to junior designers.
- To allow the human expert to use knowledge skills & experience from others within the organization without sacrificing the productivity and design quality.

The development of the fuzzy rule based expert system for students academic performance analysis is carried out in the order as shown in below following Fig. 8 (Research Methodology of IHDPS Fuzzy Rule-based Expert Knowledge System)

Fig.8 (Research Methodology of Fuzzy IHDPS)

A. Data Collection

It is the very first step that is to be carried for the development of the fuzzy expert system for the student performance analysis as it helps in identification of factors that may be affecting students' performance. Firstly, five major factors namely, teaching methodology, university system, university environment, personal reasons and family issues are identified by interacting with highly experienced authorities. These critical factors are further subdivided into 36 sub factors like sometimes the students don't have clear vision, don't have knowledge about the subject, due to which he/she ultimately faces difficulties in studies. Sometimes due to lack of proper guidance, students are unable to get good marks, etc. Then, one to one formal interaction with approximately 1000 students of AKTU pursuing B.Tech in CSE or ECE is performed to identify what factors are affecting particular students.

B. Categorization

We categorized students by comparing their performance in X and XII standard with their performance in B. Tech. in university. Categorization is done as the students whose performance remains consistent, the Students whose performance are increasing and the students whose performance are decreasing respectively. Graphs in "Fig 4", "Fig 5" and "Fig. 6 " respectively are depicting the pattern for performance.

C. Data Analysis

Once the data is collected and categorized, it is further analyzed to check the quality of the data so gathered. Quality involves checking the data as per expectations of experts (experienced authorities) or not.
This analysis is done to check whether the data provide useful results or not. Based on the information collected from the students as well as from experts, all the identified sub factors are ranked according to their role in student's performance and some values are assigned to them. Major factors are also weighted according to their role in student's performance. This step also helps in formulation of rules.

For example: When one to one interaction is performed, it is found that large number of students say that among all the family factors, their performance are affected by "over expectation of their parents", so it is assigned the highest value among all the family factors. In this way, we assigned the value to all the sub-factors. The sub-factors which are more affecting factors, have been assigned value '2' and the least affecting factors have been assigned value' l' and rest have been kept as '1.5'.

D. Fuzzy System Design

This phase involves the designing of the fuzzy expert system for student's performance analysis. Once the rule formation is done, these rules must be incorporated into the knowledge base of the expert system so that the inference can be drawn by the system. The input i.e. the major factors are fuzzified and are represented in the form of linguistic variables and we have used trapezoidal membership function to assign fuzzy membership to each variable. Fuzzy Linguistic Variables and their membership values are shown in Table I.

TABLE I. FUZZY LINGUISTIC VARIABLES AND THEIR MEMBERSHIP VALUES

Factors	**Fuzzy Input Variables and their Membership range**			**Fuzzy Output Variables and their Membership range**		
	Low	***Avg***	***Severe***	***Decrease***	***Consistent***	***Increase***
Personal Factors	0-3	2-8	7-17.5	0-10	8-30	25-45
Family Factors	0-1.5	0.75-3	2.25-6			
University Environment	0-1	0.5-2.5	2-4.75			
University System	0-1.5	0.75-3.75	3-7.5			
Teaching Factors	0-2	1-5	4-10.5			

Result Analysis: First of all, interaction with student is performed to identify the factors that are affecting their academic performance and then the IHDPS fuzzy expert system will automatically calculate students academic performance analysis tell about the performance of the student. The user interface will be designed & developed by considering all the major 5 factors e.g. Teaching - Learning process Factor, University Examination evaluation System Factor , Overall University academic environment Factor , Family & personal Factor. The interviewer marked the factors based on answer given by the student.

When the user clicks the finish button, the values of all the major 5 factors are calculated which is the sum of values of their sub-factors is. After that, these values are mapped to the inputs of the fuzzy variables. The fuzzy input variables and output variables are shown in "Fig. 9" and example fuzzification of input variable is shown in "Fig. 10".

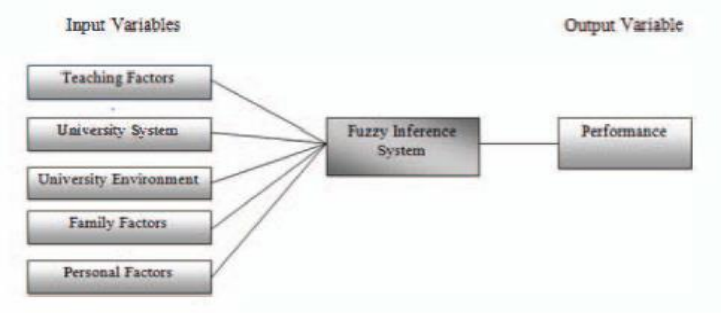


Fig. 9 Mapping of Fuzzy I/P to O/P variables

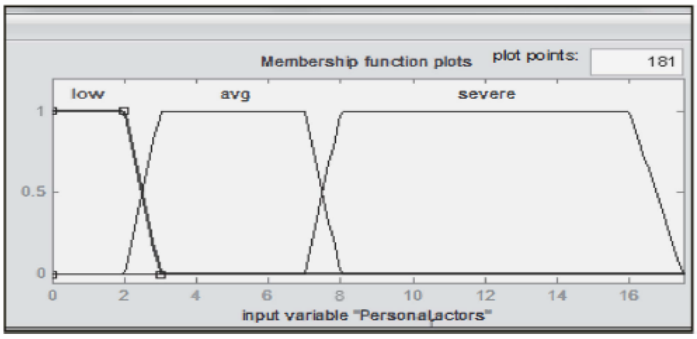


Fig. 10. Fuzzification of input variables

Rules Formation: After fuzzification, rules are constructed. The knowledge base of the fuzzy expert system stores knowledge in the form of the rule and the fuzzy system draws inference by using these rules. So for engineering the knowledge base, the formation of rules takes place. This is the most important task as the performance of the overall system depends on the accuracy of the rule. The rule in the fuzzy system is in simple if-then statements. These if-then rule statements are used to formulate the conditional statements that are a part of fuzzy logic. For example if p is A then q is B , Where A and B are linguistic values defined by fuzzy sets on the ranges. P and Q, respectively. The part of the rule "if p is A" is called the antecedent or premise, while the part of the rule "then q is B" is called the consequent or conclusion. We constructed approx. 250 rules for Fuzzy Rule Based Expert System for Student Performance Analysis.

Apply Fuzzy Operators and Implication Method: The rules are used for implications. Facts are provided by the user that matches with the fuzzy rules in the knowledge base and the output is obtained. The most commonly used implication method is Mamdani Min Implication method.

IV. TECHNICAL SPECIFICATIONS (MACHINE LEARNING & DATA MINING TECHNIQUES) FOR IHDPS FUZZY RULE-BASED EXPERT KNOWLEDGE SYSTEM DEVELOPMENT

Data mining classification & machine learning techniques that can also be used in these types of projects:-

1) Decision Tree Induction (ID3,C4.5 & CART) Method
2) K-Nearest Neighbor Classifier Approach
3) Support Vector Machine learning Approach
4) Bayesian Classification Approach
5) Case-Based Reasoning Approach
6) Soft Computing, inference nets & Neural network With MATLAB

Domain Specific Multiple Collaborative Agents

We have developed the following domain specific agents: User Management Agent, Student Profile Agent, Progress Monitoring Agent, Path Advising Agent (A fuzzy Interface Agent), Search Agent and Report Generator Agent. The following is the detail of the services offered by each agent. Table 1.1 shows the responsibilities of each agent.

Table 1.1: Domain Specific Multiple Collaborative Agents with their Responsibilities

Agent	Responsibility
User Management Agent	New user registration, Verification and management
Student Profile Agent	Get student's basic details like profile, course announcement etc. from related database grid node, Display all details to student, Interact with data access & integration agent
Progress Monitoring Agent	Calculate the necessary data to measure the student's performance, Interact with data access & integration agent.
Path Advising Agent (A Fuzzy Interface Agent)	Perform fuzzification and defuzzificaion processes, A knowledge based agent possess decision making capability.
Report Generator Agent	Generate the report and charts to show the student's performance, Generates the fuzzy graphs
Search Agent	Search for different requests according to the user's requirements, passes the output to relevant user

Data Grid Service Agents

The agent enabled data grid model offered core, data and user level services. Through these services, the client applications and users may get access to digital objects of the data grid environment. The typical

agents namely resource management agent, data access & integration agent and grid administrative agent provide the above said services. Table 1.2 shows the responsibilities of each data grid service agents.

Table 1.2: Data Grid Service Agents with their Responsibilities

Agent	Responsibilities
Resource Man agement Agent	Data grid node establishment through user-friendly and automated way, Hides the com-plexity of development and execution of the configuration script from user, Provides a standardized interface to manage data grid nodes
Data Access & Integration Agent	Interact with OGSA-DAI, Allows data resources to be accessed, manipulated, integrated and federated across the net- work such as LAN or WAN,
Grid Administra-tive Agent	Monitors the data grid nodes, shows the active data grid nodes, Automatically switch between original and backup nodes as and when necessary to avoid single point of failure.

V. FUZZY INFERENCE PROCESS THROUGH IMPLEMENTATION OF A FUZZY INTERFACE AGENT

We have developed a fuzzy interface agent (i.e. path advising agent) which implements fuzzy inference process on behalf of users. There are mainly five components in a fuzzy inference process execution. They are Crisp Values, Fuzzification, Fuzzy Inference Engine, Fuzzy Knowledge base and Defuzzification. The fuzzy expert system takes three input parameters for its calculations: - Attendance, Internal Exam Marks and Teamwork Marks and generates one output parameter as a result i.e. Performance. The input parameters are supplied by the data access & integration agent. Data access & integration agent takes all these values from distributed and heterogeneous databases that reside in a data grid environment. The fuzzy inference agent matches the input provided by the corresponding rules of the rule base and produces a result fuzzy set. The given output defuzzifies value of the result fuzzy set. Student's performance evaluation with a fuzzy expert system comprised with three steps:

I. Fuzzification of input & output parameters

Fuzzification of input parameters is carried out using input variables and their membership functions of fuzzy sets. We have formed a set of linguistic variables with respect to their input parameters as well as output parameter. Fuzzification of performance is carried out by using three input parameters and their associated membership functions. For each input parameter, we have defined three linguistic values and membership functions. The fuzzy set of all three input parameters (attendance, internal exam evaluation and term work evaluation) and their associated membership functions are given in Table 1.3.
For output variable, we have defined five linguistic values and membership functions. The fuzzy set for output parameter (per- formance) and its associated membership functions are given in Table 1.4.

Table 1.3: Fuzzy Set for Input Parameters

Linguistic Values	Membership Function	Interval
Poor	Trapezoidal R	(3,5)
Good	Triangular	(3,5,7)
Excellent	Trapezoidal L	(5,7)

Table 1.4: Fuzzy Set for Output Parameter

Linguistic Values	Membership Function	Interval
VeryPoor	Trapezoidal R	(1,3)
Poor	Triangular	(1,3,5)
Average	Triangular	(3,5,7)
Good	Triangular	(5,7,9)
Excellent	Trapezoidal L	(7,9)

II. Determination of fuzzy rules and inference method

Fuzzy rules are the rules determine input and output membership functions that will be used in inference process. The decision, which the fuzzy inference system makes, is derived from the rules. These rules are a set of "If-Then" statements that are intuitive and easy to understand as they are written in common English declarations. We have derived and framed the following rules for the system to generate an expert advice on student's performance evaluation.

RULE 4: IF Attendance IS poor AND Exam_Evaluation IS good AND Termwork_Evaluation IS poor THEN Performance IS VeryPoor;
RULE 27: IF Attendance IS excellent AND ExamEvaluation IS excellent AND TermworkEvaluation IS excellent THEN Performance IS Excellent;

Inference Method: An output fuzzy set is obtained from the input variables and rules by applying the inference procedure. We have used the Mamdami's max-min inference method as it is typically used in modeling human expert knowledge and it is given below

III. Defuzzification of performance value

Defuzzification is the process of converting fuzzy set (fuzzy number) into crisp value set. The output value obtained is a fuzzy set, so to get a single output value, defuzzification is needed. It is the process of producing a quantifiable result in fuzzy logic based on given fuzzy sets and corresponding membership degrees.
Several methods have been developed so far for defuzzification. In our experimental system, we have used Center of Gravity (CoG) Method (also known as CoA – Center of Area) for defuzzification. System can also be defuzzified on Centroid method, Bisector, SOM, LOM, MOM to test the robustness of the rules and knowledge engineering of tool.

The Table II shows that the ranks of the performance values by using different defuzzification techniques are approximately same. So, we are getting the same result by using different

defuzzification techniques. This also shows that the system which we developed is vigorous & rigorous.

VI. RESULTS & DISCUSSIONS

The analysis of user requirements is an important and often overlooked issue in fuzzy rule based IHDPS expert system development. The developed system shows the advantages of using Object-orientated analysis and design for the development of expert systems:-

It is observed that, to store the data of students, the different universities may use different storage systems and data formats with differences in their schema, access rights, metadata attributes and many more. Therefore, there is a need of the system which provides a single and a virtualized view of such institutional data assets and allows data provides of universities to retain control of their

$$\mu_c(y) = \max_k[\min[\mu_A(input(i), \mu_B(input(j))]], k = 1, 2, 3, 4 \ldots r.$$

data. As a result, we have developed a system which operates in a data grid environment and new institution may add as a new database grid node in the system without much modification in code. Also, the system offers scalability and extensibility and implemented a strategy used to avoid a single point-of-failure.

The system evaluates the performance of the students at regular interval, generates the appropriate reports for the same and makes these reports available to the students. The reports are generated on regular interval as a part of a continuous evaluation process and provide a chance for the students to increase their performance rate before the final exams are conducted. The university may accomplish the assessment of their student's performance in a timely and user friendly manner. Also, the performance may disaggregate by universities, instructor, gender, ethnicity, economic status and disability have a meaningful impact on the achievement of students throughout their career.

VII. CONCLUSIONS & FUTURE PERSPECTIVE

This expert system assesses the performance of the student based on the various five factors by using fuzzy logic. This fuzzy expert system for student performance analysis helps in identifying the major factor that are affecting the student's performance and counsel the student. By identifying the factors on which the performance of particular student depends, the performance of that student can be improved by working on the factors which are responsible for the degradation of their performance. So, this system is useful in improving the performance of the student. It can be implemented in any university or college. As the factors considered in this system, are in accordance with technical institutions, Universities. So, this system can also be extended to include more factors that may affect the performance of the student.

This work can further be extended for evaluating teachers overall performance based on fuzzy logic techniques under uncertain facts in the decision making process. We can also propose an optimization model and an interactive online Faculty Performance Appraisal System provides faculty's with meaningful appraisals that encourage professional learning and growth.

To assess the performance of individual faculty in the institutions by integrating planning and review in the areas viz., Feedback from students, Teachers self appraisal, Assessment by peers, and Results of University exams by providing a structure Online Interactive Interface that possesses potential related assessment data of Faculty in educational institutions. The evaluation of teaching activity can be defined as the systematic evaluation of teaching performance according to the professional role and contribution required to reach the objectives of the course taking into consideration the institutional context.

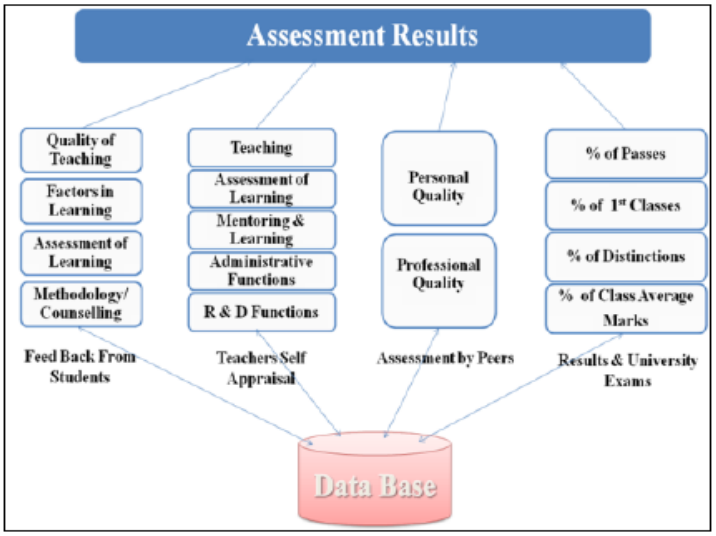


Fig. 11 Architectural Modal For Faculty Performance Assessment

This research work presented here enhances business intelligence and quickening decision making process by providing knowledge based component through fuzzy set theory and fuzzy logic that leads to a novel model. A fuzzy logic based expert system evaluates student's performance on regular basis and advise them on their state of progress. The system uses the data grid service agents in order to expose the heterogeneous and distributed databases in grid environment. Moreover, it implements the fuzzy interface agent to realize the knowledge-based component, which assists the users in the decision making process at a certain level.
Following are some more application areas where IHDPS is extensively applied:

1. LONG RANGE WEATHER FORECASTING
2. PETROLEUM (HYDROCARBON) EXPLORATIONS
3. SEISMIC DATA ANALYSIS
4. MEDICAL DIAGNOSIS
5. AI AND EXPERT SYSTEMS
6. MINERAL & ORE DEPOSIT EXPLORATION IN THE EARTH
7. UNIVERSITIES, AERODYNAMIC, SPACE FLIGHT SIMULATIONS, ETC.

VIII. Acknowledgment

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Kerberos Based Security for Administrations System

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Abstract: The Emergency administrations numbers are generally utilized in various nations, It is a three-digit number, which is utilized for various crisis administrations like rescue vehicle, police and fire. A few nations are having a solitary crisis number for all crisis administrations and there are likewise some different nations which are having diverse crisis numbers for various crisis administrations. The prevalence of these crisis numbers are expanding step by step, because of this notoriety, counterfeit crisis calls or trick calls or hang-up calls are likewise expanding and such kind of calls are a wastage of time as well as squandering bunches of crisis assets and in light of bogus considering ordinarily the required individuals can't get the crisis administrations and in numerous nations these phony calls are exceptionally basic on the grounds that there is no arrangement of giving discipline on counterfeit calling.

In this paper we have proposed a model 'KB-ESERV' which provides a proper authentication of a person before registering for a SIM card and it provides an inbuilt application of emergency services with the other applications of mobile. This model will not only stop the fake calling but also the forgery of SIM cards.

Keywords **-** Authentication Server (AS), Kerberos, and Kerberos Based Emergency Services System (KBESERV), Subscriber Identity Module (SIM Card).

I. INTRODUCTION

For a crisis administration, client just dial the crisis number and trust that the administrator will answer "number, please?" at that point the client will tell his/her required service[1].

These sort of Emergency administrations are profoundly utilized in numerous nations. Numerous nations are having a solitary three-digit number of all the crisis administrations like USA, UK, Australia and so on and there are additionally some different nations like India, Iran, Egypt and so forth. having various numbers for various crisis services[1] and due to the prevalence of crisis benefits the phony calls are additionally expanding step by step and these phony calls are burning through the time as well as squandering the crisis assets in light of the fact that in numerous nations there is no arrangement of discipline and furthermore having an absence of appropriate confirmation during purchasing of SIM card. There are loads of individuals who are purchasing boundless SIM cards through bogus recognizable proof in light of the fact that there is no arrangement of breaking point in SIM cards purchasing and furthermore an absence of legitimate confirmation of records of various ID's.

In this paper, we have proposed a model KBESERV which utilizes idea of Kerberos. In this model there is no arrangement of submitting reports during purchasing of SIM card. Client will just purchase the SIM card and he/she will embed the SIM card into his/her versatile and afterward the confirmation will start. After confirmation, his/her SIM card will work. This model has additionally an arrangement of giving 2 to 3 set number of SIM cards. Client can utilize the crisis administrations through inbuilt application, known as crisis administrations. In this application client will get all the crisis administrations and client can either utilize the programmed voice call or manual voice require the relating crisis administration.

For the phony calling there will likewise be an arrangement of discipline by the Government of individual nation

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II. RECENT INCIDENTS

In 2009, there was a news that A sequential wrench guest who was utilizing a gave phone has tormented 911 with around 2,000 phony Emergency calls during the time of a half year and sending firemen and police on wild goose chases[2].

In India which is No. 1 in street mishap demise as indicated by report of WHO on 'Decade of Action for Road Safety 2011-2010'[3]. The phony calls are exceptionally normal.

In July 2013 in India, a man called the 108 complementary number for crisis rescue vehicle administration. The rescue vehicle secured 47 km and didn't discover any crisis there. In a few cases it is likewise seen that individuals living in far off regions utilizing the rescue vehicle administration as a method of transportation[4].

In Belgium it was discovered that about one out of each three calls made to the crisis administrations were phony calls or superfluous calls. The phony calls are additionally expanding delay in the handling of genuine crisis calls. In 2011,The caution places got about 2,560,000 calls for rescue vehicle, police, fire and out of them just 815,000 or 31% of those calls were not genuine emergencies[5].

As indicated by the updates on April 29,2013, In city of Hyderabad, India, it was discovered that of the 50,000 calls which were made to the 'Dial 100 framework' (which is constructed for the most part for those residents who are searching for police help during crises) around 20,000 calls were fake[6].

In may 2013 in Mumbai, India, The dharavi police captured a multi year elderly person who was selling SIM cards based on manufactureddocuments[7].

There are such huge numbers of rising occurrences identified with SIM card cheats where prepaid cards are given without checking the archivesof user[8]

These sort of Forgeries of SIM cards are additionally expanding the occurrences of phony calling and this is going on simply because of the absence of appropriate SIM Card validation. Now and then Unintentional calls are likewise happened when an individual or telephone carelessly dials the crisis number. This incorporates apparition remote calls, hang-up calls and misdials. Ghost remote calls are an archived issue in the nations like United States, the United Kingdom, Australia and Canada albeit different nations where remote telephones are utilized to a great extent likewise experience this sort of issue. Such Calls happen in light of robotizing dialing, where a mobile phone client carelessly dial the 9 or 1 key on a telephone, which is prearranged to dial 911. The telephone consequently dials the number 911,even without squeezing the "send" by client. This frequently happens when a remote telephone is joinedto a belt or in a pocket and the 9 or 1 is pressed[9].

Such sort of exercises are chiefly occurring because of absence of legitimate validation during purchasing of SIM cards, Unlimited purchasing of SIM cards by a distinctive individual, Lack of appropriate discipline during counterfeit calling and prearranging of remote telephones for crisis administrations. In numerous nations like India where there is an arrangement of various numbers for various crisis administrations is additionally a major issue.

III. Prerequisites for the Secure Crisis Administration

There are following necessities to stop the above kind of occurrences.

1) Proper confirmation of client's archives, who is mentioning for SIM Card administrations. With the goal that fraud of archives can be halted.
2) Limited issue of SIM Cards for a specific client.
3) Saving of papers which are utilized during document check of client, who is applying for SIM Card.
4) Single number for all the crisis administrations.
5) Automatic dialing of crisis numbers ought to be halted.
6) Provision of discipline on counterfeit calling.

IV. THE PROPOSED EMERGENCYSERVICES FRAMEWORK

We have proposed Crisis administrations framework named KBESERV. This framework contains two phases: Enlistment and Getting to crisis administrations. These two phases are depicted in later segment. We clarified these two phases individually.

A. Registration stage

In this stage client will purchase a SIM card from any SIM Card distributer and addition the SIM into his/her versatile. In the wake of embeddings the SIM, an exchange box will open. From this discourse box client needs to compose his/her two id card's number among five given id cards like UID card, Voter-ID card, Container card, Identification and driving permit and so forth subsequent to composing the numbers client needs to choose the alternative 'Initiate your SIM Card'.

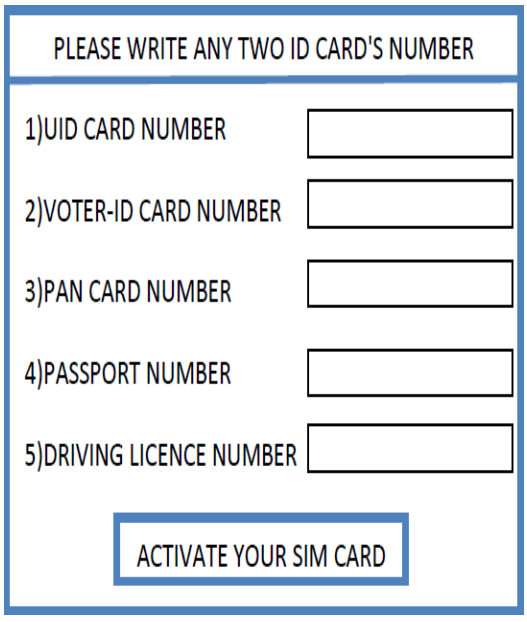

Fig. 1: Registration Stage

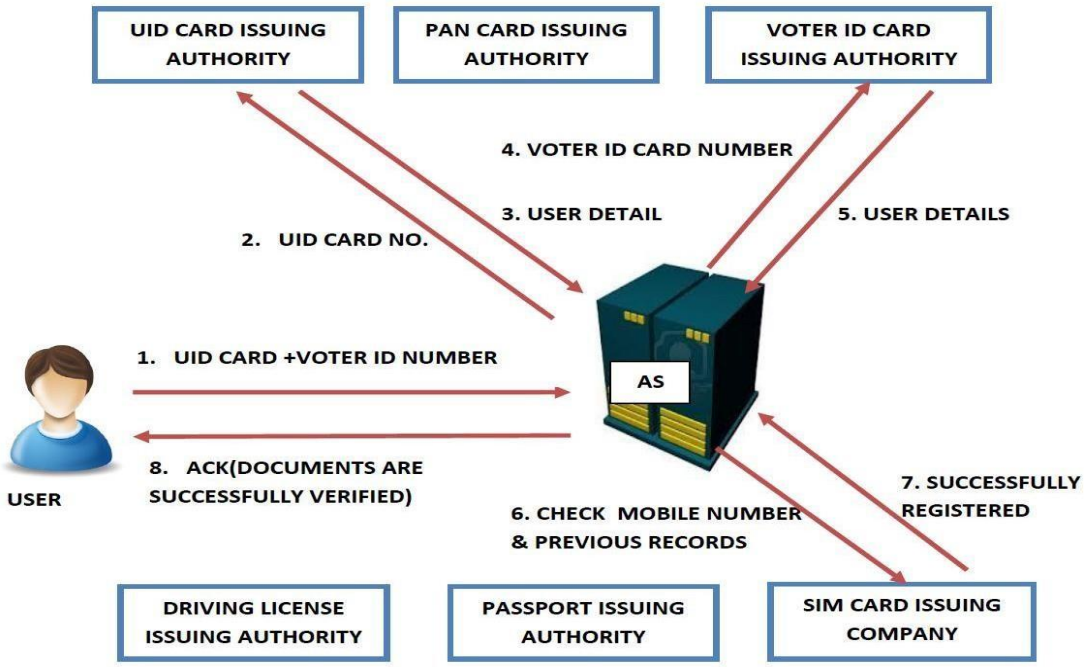

Fig. 2: Authentication Process

For example user has filled UID Card and Voter-Id Card number, these details with the correspondinguser's mobile number will be sent to theauthentication server (AS).

Now AS will send the UID card number to UID Card issuing authority. UID card issuing authority will send details like user's name, address, father's name, date of birth etc. to 'AS'. After getting these details AS will send the user's voter-id card number to voter-id card issuing authority. Voter-id card issuing authority will also send details like user's name, address, father's name, date of birth etc. to 'AS'. Now after getting these details from both the sources AS will verify and check the common details. After successful verification AS will send the user's mobile number and the above verified details to SIM Card issuing authority. The SIM Card issuing authority will check the following two details-

1) How many number of SIM Cards have been registered in the name of user or not.
2) Whether he/she is exceeding the maximum number of SIM issuing limit or not (which will be normally 2 to 3).

After these viable approvals, customer will be effectively enrolled for using SIM organizations of the looking at SIM Card giving authority. These means of affirmation not so to speak give a suitable method of affirmation of client's chronicles however in addition save the papers which are usually used in document affirmation. This will additionally end the fakes of reports. After compelling enlistment, customer will get the Certification (ACK) of "Documents are adequately affirmed" and the SIM card giving authority will also give the incorporate of using emergency organizations inside the alternative of organization organizations which can be open in client's application list.

There might be a situation when Customer needs to use more than 2-3 SIM cards. All things considered Client can go for another option of 'Drop My SIM card' which is capable be given by the SIM card giving pro. Underneath this classification customer will get 2 alternatives

1) Cancel my SIM card forever.
2) Cancel my SIM card for 2 months. In second optionfollowing 2 months, Client'

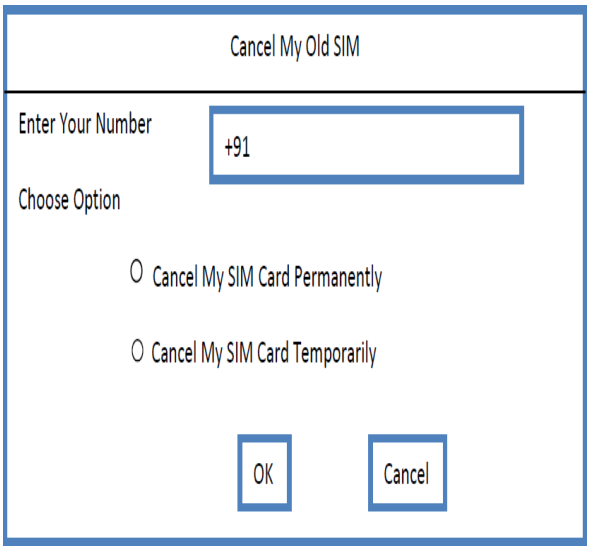

Fig. 3: Cancel My SIM Card Accessing crisis administrations

The SIM card issuing specialist will give a benefit beneath the category of Administrations, known as 'Emergency services'. Client needs to go to the company administrations choices which can ordinarily be seen in applications category of versatile. Client must select the choice of Crisis Administrations and he/she can select the sort of benefit depend on his/her prerequisite like- Ambulance/doctor benefit, Police benefit, Fire security benefit etc. Other choices can too be included by SIM card issuing specialist depend on customer's feedbacks. after selecting the alternative client can either go for call physically or call consequently, which are two voice call alternatives.

The chosen sort of alternative will be exchanged to the closest crisis benefit center through portable organize. Presently the crisis benefit center will check the user's geographic area and will provide the enlightening to the user's closest crisis administrations to supply the crisis benefit which is requested by the client and after that the comparing benefit will take after the most limited way to reach to the user's area.

The alternative of crisis benefit will moreover spare t he client from programmed dialing of emergency numbers since for utilizing crisis administrations clie nt has got to go to the inner choice of application administrations and within the case of fake calls government ought to have a arrangement of giving one caution and after that the reasonable discipline to the fake callers so that they will have a fear of fake calling to the crisis services.

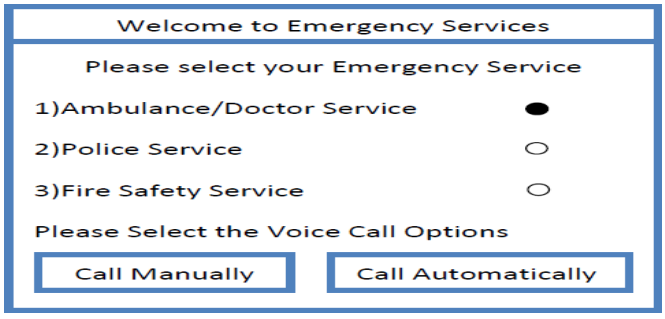

Fig. 4: Accessing emergency services stag

V. THE PROPOSED EMERGENCY SERVICES ALGORITHM

The steps of KBESERV model are given below:

A. Registration Stage

REGISTRATION_STAGE (ID_n, ID_{ni}, ID_{nj},SI_n)

1) If (ID_n ==2)
2) // ID_n will count number of IDs entered by user
3) {
4) AUTHENTICATION_PROCESS( )
5) {
6) If(ID_{ni} (details) = = ID_{nj} (details))
7) For i, j =1,2,3,4,5 and i != j // Match the common details of Both ID_{ni} and ID_{nj}, Where ID_{ni} (details) and ID_{nj} (details) contain details such as User's Date Of Birth, Name, Address, Father's Detail etc.
8) {
9) If (SI_n < 3) // Where, SI_n = No. of SIMissued and n =0,1,2,3
10) {
11) ACTIVATE_MY_SIM( );
12) }
13) else
14) {
15) CANCEL_MY_OLD_SIM( );
16) }
17) else
18) {
19) Message ("IDs are not matched");
20) }
21) else
22) {
23) Message ("Enter minimum two IDs")
24) }

ACTIVATE_MY_SIM( )

1) {
2) Message ("Your SIM card is Activatedsuccessfully")
3) }

CANCEL_MY_OLD_SIM( )

1) {
2) Enter your old number.
3) Choose the option.
4) Press OK.
5) exit( );
6) }

B. Accessing Emergency Services Stage

Accessing_Emergency_Services( )

1) {
2) Select the required emergency service.

3) Call manually or call automatically( ) 4){
5) User Ui send the request Ri toemergencyservice center through mobile network.
6) For Ui = 1,2,3,.... and Ri = 1,2,3,.....
7) Emergency service center check therequested service and identify Ui's Geographic location.
8) Emergency service center will instruct theUi's nearest emergency service and provide service.
9) }
10) }

VI. CONCLUSION

In this paper we have proposed a KBESERV model which is better known as Kerberos based emergency services system which provides a proper authentication of user's documents and it not only save papers but also restrict the forgeries of documents, forgeries of SIM cards during the distribution of SIM and this will also stop the fake calls from the unauthenticated users. Apart from these it provides an efficient and easy way of using all the emergency services and the user will get all the emergency services in one option of mobile applications. Automatic dialing of emergency numbers can be restricted easily through this model.

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A Comparative Study of Natural Language Toolkit (nltk) and Spacy for Hindi Text Summarization

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Abstract: Text summarization can be defined as a technique for the conversion of long texts or documents into short ones and extracting out all the key points from the longer text as it is into the short ones and provides the output in the modified form called summary of original text document. For this work to be done by humans document needs to be rigorously analyzed which is a very tough and time taking. In this proposed paper we are comparing pre-processing time of two tools of natural language processing one is NLTKi.e. Natural Language Toolkit and the another one is SPACY.Both are based on modern technologies and are examined for HINDI language processing. In this paper we are preforming a comparative study of both the tools on the bases of their pre-processing time for text summarization of HINDI language.

At present, there are many text summarization tools available and we seek to use them but with the help of this paper we caneasily analyze which Summarization tool is robust enough to provide us the summary with better accuracy.

Keywords: SPACY, Pre-processing time, Tokenization, TF-IDF, NLTK, Stemming, Named Entity Relationship.

1. Introduction

Nowadays information is the most valuable thing and it plays a vital role in our life. Trillions of data is floating over internet every seconds but it also consists of a lot of information which are irrelevant in order to make it further use in any domain. Thus as a solution to this problem Text Summerizer came into picture, it helps people to get the information they require by eliminating irrelevantdatafrom that text or document. Text summarization is used by a lot of applications like for instance, scientists require a tool to produce summaries for deciding whether to read the full document(text) or not and for summarizing data searched by user on Internet. News groups can use different document summarizer to group the data from various sources and summarize that. In this proposed paper we are providing by which tool the user can get the fast output so that can increase the productivity of their domain.

2. TYPES OF TEXT SUMMARIZATION

The technique of text summarization is divided into two parts which are as mentioned below:

2.1. Extractive Summarization:

Extractive summarization can be proposed as a classification subject. Its key objective is to extract the most relevant words, sentences orparagraphs fromthegiven textdata and rank them high. The highest ranked regions from all textdocumentare combined and re-ranked using same aspect and

append them to to the summary. Extractive summarization uses statistical method or say technique to select important sentences or keywords from text document.
It consists of mainly two steps:

A. Pre-processing step

B. Processing step.

Pre-processing is a well-defined representation of the original text document. It consists of following three steps:
1) Sentence segmentation:In this methodsentence's boundary are located with the help of punctuation marks present in the text document.
2) Stop-Word Removal:Stop-words or the words which do not provide relevant information to the subject are removed.
3) Stemming: Stemming is done to get the root word by removing prefix and suffix from that word.
In Processing step, features representing the relevance of sentences are decided or calculated and then weights are assigned to these features using weight learning method. Final score of each sentence is calculated using Feature-weight equation and those sentences are chosen for the final summary whose scores are highest among all the sentences in the original document.

2.2. Abstractive Text Summarization:

Abstractive text summarization provide the summary after rigorous analysis of the provided document and designing the summary using only required words and removes the rest of the irrelevant words in order to make the text short and easy to read and fast to understand.

In this method summarization of every text of the sentence is implemented and have different way as compared to the original document.

This technique can be implemented through following two approaches:

A. Structured approach

B. Semantic approach.

Structure approach uses various methods to give the required result which are tree technique, template technique, ontology technique, lead and body phrase technique and rule technique.

Semantic technique uses methods which are Multi-modal Semantic model, Information item technique, and semantic graph technique.

3. SUMMARIZATION METHODOLOGY

In this paper we are using Abstractive method of text summarization based comparative study of NLTK and SPACY, below mentioned steps are some common process of this approach :

3.1. Pre-Processing:

In this phase some steps are occurred , those steps help the pre-processing phase to get completed and then send the complied result in the processing phase.
Pre-processing method includes three steps:

1) Segmentation
2) Tokenization
3) Stop words elimination.

3.1.1. Segmentation:

This stage involves the segmentation of the given data , on the basis of sentence boundary which can be pre-defined as well as user defined. In Hindi language, sentence boundary isidentified by "|" which is known as full stop in English language. On every sentence boundary, the sentencesare broken and placeinto list. The final output of this stage is thelist of sentence and this list is send for next level processing.

3.1.2. Tokenization:

As the segmentation process completed the tokenization process starts. For Hindi language, sentences are tokenized by finding out the space separation and commas between the words. All are the words are stored in different space called list, which has elements as words and are called tokens.

3.1.3. Stop-Words Elimination:

Most frequently used words are called stop-words, these are those words which do not have any or much effect on the summary of the provided text hence are removed from the text in order to remove the congestion in the processing phase.
Example of stop-words are "के", "है", "और", "नहीं" etc.

3.2. Processing phase:

This phase acts as the backbone of the summarizer technique . In processing part, value of feature for every sentence is determined.And by reference of performed or given methodology the final summary is produced.

4. NLTK

NLTK is a powerfulPythonnatural language processing toolkit that provides a set of diverse natural languages algorithms. It is free, opensource, easy to use, large community, and well documented. NLTK consists of the most common algorithms such as tokenizing, part-of-speech tagging, stemming, sentiment analysis, topic segmentation and named entity recognition.

Steps:

1. Install NLTK module.
2. Import required libraries.
3. Remove Stop Words.
4. Create a frequency table of words.
5. Provide score to each sentence depending on the words it contains and the frequency table.
6. Provide a certain score to compare the sentences with the original one.

5. SPACY

Now a days spacy is the another choice for the data scientists and many researchers used in advance natural language processing because is simple to use and implement. Spacy perform excellent for named entity recognition that is NER.

5.1 Implementation process:

Its implementation process in python programming language have the following mentioned points.

a) Import required libraries,

b) Input is provided,

c) Boundary discloser and segmentation process,

d) Implementing Tokenization,

e) TF-IDF functionality,

f) Final summary.

6. PERFORMING COMPARISION

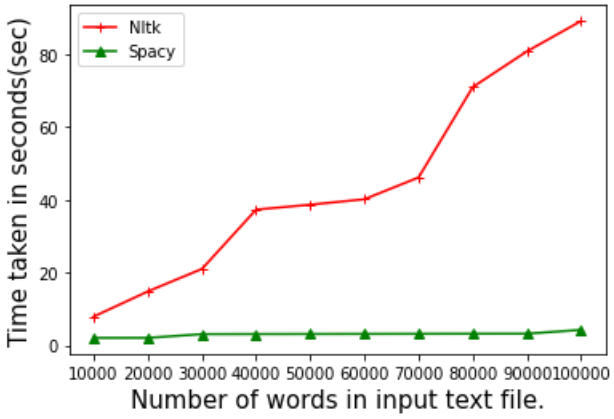
In order to compare both the tools we are considering ten hindi text data-sets in order to perform the pre-processing time for both the tools having the range from 10,000 words to 1,00,000 words .
The pre-processing time involves various steps like (removing stop words , stemming ,special character removal, sentence segmentation, tagged document , Tokenization) , the time required by text or set of words to pass all these steps and enter in the processing step or processing phase is called the pre-processing time or pre-processing phase. We had taken these observation via implementing the pre-processing phase within the time sessions function .
Before and after time difference of pre-processing phase are taken and are mentioned in the below described table.
This observation is performed on all 10 datasets and the reading for each and every phase for both the tools that is natural language toolkit and spacy are as follows:

Table 1. Comparison of pre-processing time in NLTK & Spacy

Text size (words)	NLTK (in sec)	SpaCy (in sec)
10000	7.906458	2.049776
20000	14.81356	2.062253
30000	20.997198	3.081768
40000	37.280505	3.109722
50000	38.622927	3.127685

60000	40.119452	3.153165
70000	46.102151	3.171214
80000	70.901981	3.201384
90000	80.714428	3.21147
100000	89.042275	4.246014

Fig.1. Comparison Graph



The results may slightly vary on systems with different configurations of hardware.

7. CONCLUSION

In order to draw a conclusion we can say that SPACY is faster in terms of first stage execution or pre-processing phase as compared to natural language toolkit (NLTK) also is clear from the above observations. In order to work on future research work then on the basis of this performed research spacy will be preferable choice over nltk.

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Partitioning of Digital Images for Compression as An Application of Contraction Mapping

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Abstract: With the expansion of internet activities the digital data usage has risen significantly all over. Therefore, transferring more and more digital data in quickest possible manner between the sites has become a challenging issue. This necessitated through investigations pertaining to efficient data transfer both in terms of speed, bandwidth and storage capacity. High-quality images often involve large pixel data and more space for storage and thus not transmittable rapidly. Such an image data interalia compressed video files and streams constitute very large portion in internet traffic. As a result, various image compression techniques are been developed that primarily use contraction mapping where the image is subjected to partitioning in domain and range blocks. This leads to specialized Fractal Image Compression methods that exploit the self similarity property of the image as a whole or its parts.Thus, the partitioning strategy finds a crucial role in achieving better rate of data compression with acceptable quality of the output image. This paper highlights couple of partitioning methods with better relevance. The paper subsequently defines the partitioning curve with example in relations to its utility in partitioning for image compression. Further, a new partitioning method is proposed which takes into account the centre of distribution (centroid) of the clusters for efficient compression.

Keywords: Contraction mapping, image compression, partitioning

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I. INTRODUCTION

Compression of digital images is the need of time to store and transmit high resolution images efficiently. One of the techniques is Fractal compression based on the theory of Iterated Function System (IFS) developed by Hutchinson

[1] and Bamsley [2, 3] and implemented by Jacquin [4]. Details can be referred in book by Yuval Fisher [5]. Fractal compression is lossy compression method in which the final decompressed image is approximately the original image. In this the image is partitioned into various number of non-overlapping (mutually exclusive) and exhaustive range blocks. For each range block, suitable contractive mapping and appropriate domain block from the same image is determined which is comparatively larger in size than that of the range block to ensure the mapping to be contractive which facilitate the process of image compression and can be overlapping. When the defined contractive mapping is applied to this domain block it get transformed to the respective range block (not exactly but is almost similar with some predefined dissimilarity tolerance). Creating large number of domain blocks increase the chance of finding a near perfect match for any given range block. Numerous partitioning techniques are put forth by the researchers for fast encoding of the image so as to decode efficiently. Identification of appropriate contraction mapping corresponding to each range block is an essential parameter affecting the performance of resulting code for the image compression. Current work analyses the inside process of determining the contraction mapping and proposes mathematical model to understand it's working.

II. PRELIMINARIES

Definition 2.1: [6] A mapping $T: X \to X$ in the complete metric space (X, d), is said to be contraction if $\exists\, \kappa \in [0,1)$, such that $d(Tx, Ty) \leq \kappa d(x, y) \quad \forall\, x, y \in X$
κ is the contractivity factor. A set of contractive transformations T_i in conjunction with complete metric space (X, d) constitutes an iterated function system (IFS), where the contractivity factor of T_i is $\kappa_i, i = 1, 2 \ldots . N$

Definition 2.2: Peak Signal-to-noise ratio, PSNR, is measured in decibels dB, which calculates the difference between two images and is defined as

$$PSNR = 20log_{10}\left(\frac{b}{rms}\right)$$

In this paper 8 bit test image is used for illustration, therefore b=255.

III. PARTITIONING

This section discusses the common partitioning methods used for Domain - range blocks. Quad tree partitioning is the dividing of image into squares of variable sizes and finding the best match of each in domain range block pair with upper limit of difference tolerance. If the best match of some block is not found then it is further divided into four (quad) smaller blocks of equal size and each smaller block is search for best match. This process is repeated unless the best match is found with upper tolerance of difference or the partitioning reaches to quad depth. Horizontal - Vertical (H -V) partitioning is flexible partitioning scheme which uses straight lines to divide the image into rectangles of variable size up to the required depth (not necessarily quad) in which the process of searching by repeated partitioning ceases once the best domain-range pair is found with set tolerance of difference.The triangular partitioning divides the image into two triangles with diagonal, each of which is then subdivided into four triangles by connecting the midpoints of three sides and the process is to be followed recursively

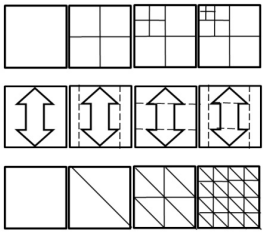

Fig. 1: Quadtree, H-V, Triangular Partitioning

IV. PROPOSED PARTITIONING

Partitioning curve is a continuous curve that connects any two points on the (image) domain boundary (usually straight line) and is defined by the method of partitioning adopted. For e.g. Partitioning the image along the most significant horizontal or vertical edge is the basis of H-V partitioning. A distinctive horizontal partitioning in the image is one which corresponds to a substantial variation in pixel values from one row to another. The process is initiated by calculating the average difference between the rows of pixel between each i^{th} and $(i + 1)^{th}$ rows as

$$\frac{\sum_j r_{i,j} - \sum_j r_{i+1,j}}{M}, 1 \le i \le ; 1 \le j \le$$

For most distinguishing horizontal line, the maximum difference calculated is considered however neglecting those which constitutes extremely slender rectangles.

This paper proposes a novel understanding of partitioning as a consequence of contraction mapping. For this, consider a metric $\rho(x_1, x_2)$, the partitioning curve C and let the point of intersection of metric

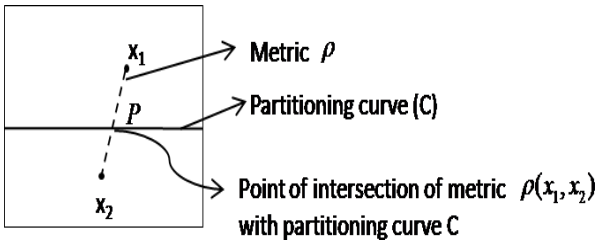

Fig. 2: $P(\rho, C)$

with C be denoted by $P(\rho(x_1, x_2), C)$ or simply $P(\rho, C)$.

The digital image is an array of pixel values. Consider the neighboring pixels having almost similar shade of color so that they form a cluster consisting of finite pixelsx_i, $i = 1,2 \dots n$. Let the respective centre of distribution (centroid) of each cluster denoted by Li the fixed point for that cluster. However, the pixels having drastic shade variation facilitate in deciding the partitioning curve. Union of all such clusters (may be overlapping) constitutes the whole image.

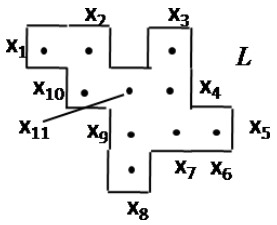

Fig. 3: Cluster of points Simple partitioning

Here we prefer to use C as a straight line. We look for cluster of points (pixels) in an image and attempt to draw C_S that encompass minimum area with the inclusion of particular cluster and d_C is the distance of partitioning curve C from the points in that cluster which depends on number of points (N) in the cluster, location of centroid (L), minimum distance of a point from the centroid (d_{min})

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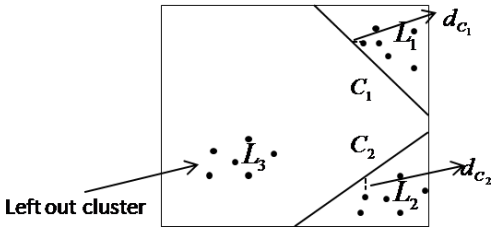


Fig. 4: Distance of C from cluster Partitioning Curve and Domain Division

Refer Figure 2 and assume that points $x1$ and $x2$ corresponds to L1 andL2 . Consequently, $\rho(x1,\ x2)$ is now divided into two namely $\rho(x1,\ C)$ and $\rho(C,\ x2)$. Here, we introduce a factor called metric maneuverability ρ for Npoints in $\mathbb{R}^2$ space as $_\rho = {}^{N}C2$ (C is the combination). Factor ρ decreases with partitioning and eases the compression process. This concept of simple partitioning can be extended to partitioning curves other than straight lines (polynomial curves of degree ≥ 2) but this will

definitely increase the volume of data to be interpreted and is not covered in this paper as the formulation is yet to be tested.

V. APPLICATION

The steps of proposed algorithm are:

1. Input a grey image I
2. Get the pixel values $p_{i,j}$ of I, $p_{i,j} \in [0,255]$, zero being black, 255 being white in between there areshades of grey.
3. The pixel value of each cell is compared with at most n^2 neighboring cells (n each horizontally and vertically) and if the value matches to tolerance of t , cluster 1 is carved out with partitioning curve C_1
4. The process is repeated unless the last cell is reached

5. If any cluster $C_r \subset C_s$, then reject C_r
6. The resulting clusters can be overlapping.
7. Find the centre of distribution (L) of all clusters.
8. Then all the points in a cluster are replaced bycorrespondingL.
9. With new pixel values the image is reconstructed.
10. Output image I'.

The centre of distribution is defined by the mapping $f: A \rightarrow B$, given as

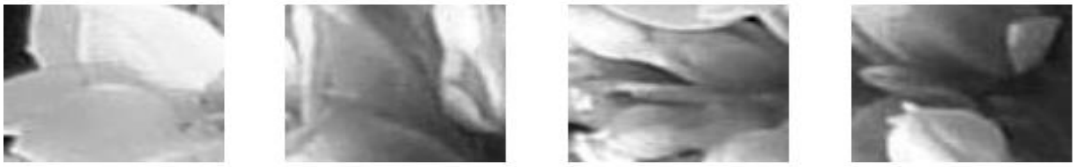
$f(A_i) = f(g(A_i)) = B_i \quad \forall A_i \in A$, where A_i is theset of all pixels in a cluster C_i

$g(A) = \frac{1}{N} \sum^{N} x \quad \forall x \in A$

ratio (PSNR) is used to report the quality of the compressed image relative to the original image.

VI. RESULT and ANALYSIS

Figure 5a, b, c, d displays the test image I (original) and 6a, b, c, d the corresponding output image I' (compressed)



a b c d

Fig.5Test image

a b c d

Fig. 6 Output image

The result obtained for the test images is summarized in thefollowing table

Table 1: Test summary

	Figure	Space (KB)	No. of clusters	PSNR
Test Image	5a	12.4	134	--
	5b	12.7	95	--
	5c	13	125	--
	5d	12.6	105	--

Output Image	6a	0.733	--	33.37
	6b	0.535	--	25.33
	6c	0.679	--	23.48
	6d	0.636	--	25.73

Increasing the number of clusters by tapering the tolerance will definitely improve the PSNR but will not be space efficient. For optimal partitioning curve, optimum numberof clusters is required.

$\not{f}$ = floor function

f is a contraction on the non-empty set of pixel points

$p_{i,j} \in [0,255]$.

The distance between two clusters C_1 and C_2 is calculated in Root Mean Square (rms) sense, metric ρ is defined as;

$$\rho(x, y) = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}$$

While forming the clusters, the outlines (if any) in the adjacent positions will not be included in any of the clusters and will be left unprocessed. Above algorithm is implemented on four 64 × 64 test image I shown in figure 5a-d. The method is lossy and the obtained output image is approximate to the original image which means the matrix representing I' is close to matrix of I. Peak signal-to-noise

VII. CONCLUSION

An algorithm is developed for partitioning the digital images into clusters of variable size which takes into account factors n and tolerance(t) . The contraction mapping is used to define the centre of distribution of the cluster. The results obtained show a considerable reduction in image size by preserving the important content and structures of the original image. The proposed partitioning method is of immense use when the input image is of significantly large size.

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Artificial Intelligence: Gateway to Human Machine Collaboration

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Abstract: We are heading towards a future where machines can think as well l as humans and work with them to build an even more exciting universe. While this future is still distant, Artificial Intelligence has still made a lot of technological advancement in these times. Artificial Intelligence (AI) refers to "*artificial consciousness*", making machines suitable for performing intelligent tasks just like human beings. The advancement of artificial intelligence has taken a significance step in recent years and since then, the development has taken place in every domain of the modern world. In the coming times, AI equipments will improve human abilities in various fields, particularly in the field of computer science and technologies. Over the most recent decades, artificial intelligence vision has extraordinarily enhanced the execution of the assembling and administration frameworks of human mind and machines, thereby improving the human-machine interaction. AI has advanced its root in every aspect of life. However, even after being such a common technology in today's world, the real essence of this technology is still an abstract to many and thus, it is very crucial to firstly understand what artificial intelligence is and how it is different from natural intelligence, which is at the heart of what makes us human. This paper provides an overview of the AI technology, its application and innovation, and additionally considers the present progress of the innovation of artificial intelligence in reality. It also enlightens the benefits of having strong artificial intelligence systems in the modern world and in the coming times.

Keywords: Artificial Intelligence, Cognitive Computing, Sustainability, Innovation

1. INTRODUCTION

Human and artificial intelligence interaction are presenting exceptional and exciting technological opportunities for mutual development in current technological environment. AI is already transforming web search, advertising, e-commerce, finance, logistics, media, and more. Artificial Intelligence (AI) is the mantra of the current era.

Systems which are based on AI, also known as cognitive systems, help us automate many jobs and gear up all the complications, which are more complex than most humans are capable of solving. In the present times, big enterprises like Google, Facebook, Microsoft, and IBM are the ones who are big players in advancing in the field of AI.

2. LITERATURE REVIEW

What is Artificial Intelligence? Artificial Intelligence is broadly considered to be a component of multidimensional machine, which helps to solve big analysis problems, and such a technology is usually associated.

with a computer, machine or associated technologies. The term artificial intelligence cannot be described using a single definition. In an article in Forbes, the author defines AI as,

"A true artificially-intelligent system is one that can learn on its own. True AI can improve on past iterations, getting smarter and more aware, allowing it to enhance its capabilities and its knowledge."

The author also stated that there is no end to the evolution of AI.

Abandoning the philosophical question of what it means for an artificial entity to think or have intelligence, ***Alan Turing [1950]*** developed an experimental test of artificial intelligence. The **Turing Test** provides a substantial way to determine whether the entity is intelligent or not. The test involves a human interrogator who is in one room, another human in second room, and an artificial entity in a third room. The interrogator is allowed to communicate with both, the other human and the artificial entity, only through a textual device such as a terminal. The interrogator is asked to differentiate the other human from the artificial entity on the basis of the answers to the questions posed by the interrogator. If the interrogator cannot do this, the Turing test is passed and we say that the artificial entity is intelligent.

History of Artificial Intelligence

Following are some of the milestones in the history of AI: **1943:** *Warren McCulloch* and *Walter Pitts* proposes a model of artificial neurons.

1950: Alan Turing publishes "*Computing Machinery and Intelligence*" in which he proposed a test, called a Turing test. The test can check the machine's ability to exhibit intelligent behavior equivalent to human intelligence.

1956: ***John McCarthy*** coins the term "Artificial Intelligence" at the *Dartmouth Conference*.

1966: *Joseph Weizenbaum* creates the first chatbot **ELIZA**, which imitates a therapist who asks open- ended questions and even respond with follow-ups.

1972: The first intelligent humanoid robot built in Japan, named as **WABOT-1**.

1974 – 1980: This duration was termed as the ***First AI Winter***. AI winter was the time period when computer scientists dealt with a severe shortage of funding from government for AI researches.

1980: After AI winter duration, AI came back with the concept of "*Expert Systems*". Expert systems were programmed that emulate the decision- making ability of a human expert.

1987 – 1993: This time period was termed as the ***Second AI Winter*** duration. Again, government funding was halted for AI research.

1997: *IBM* ***Deep Blue*** beats world chess champion, *Gary Kasparov*, and becomes the first computer to beat a world chess champion.

2002: For the first time, AI entered the home in the form of ***Roomba***, a vacuum cleaner.

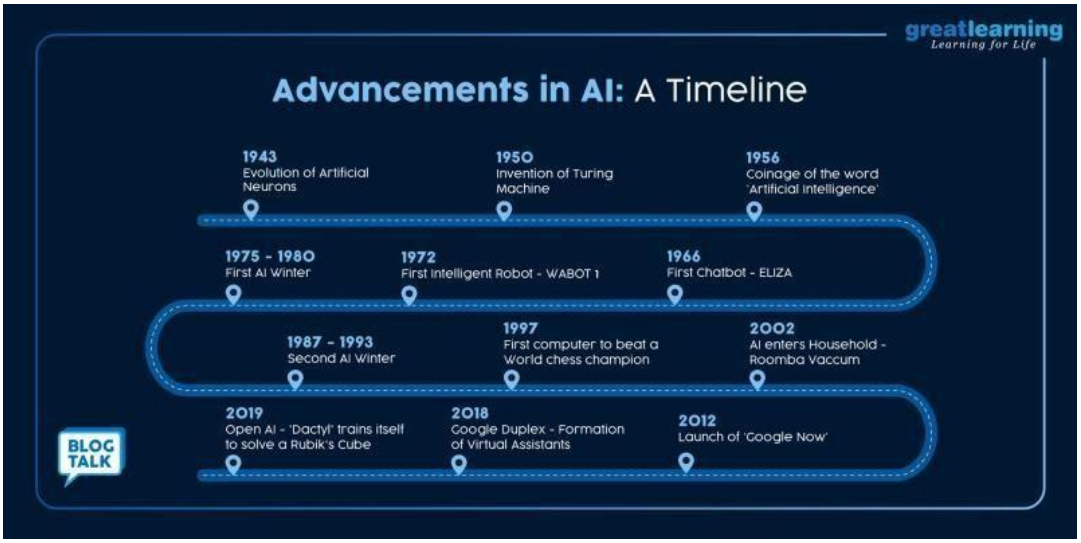
2011: *IBM's* ***Watson*** wins "*Jeopardy*", a quiz show, where it had to solve the complex questions as well as riddles. It proved that Watson could understand natural language and can solve tricky questions rapidly.

2012: Google has launched an Android app feature "***Google now***", which can provide information to the user as a prediction.

2014: Chatbot "***Eugene Goostman***" wins a competition in the infamous "Turing test." Also, with Amazon's ***Alexa***, another intelligent language-based assistant is invited into the home.

2018: Google has demonstrated an AI program "***Duplex***" which was a virtual assistant. It had taken hairdresser appointment on call, and lady on other side didn't notice that she had conversation with the machine.

2019: ***Dactyl***, OpenAI's humanoid robotic hand first developed in 2018, learns to solve a Rubik's cube one-handed.



Source: mygreatlearning.com

Types of Artificial Intelligence AI can be classified into three types:

- Artificial Narrow Intelligence (ANI)
- Artificial General Intelligence (AGI)
- Artificial Super Intelligence (ASI)

Artificial Narrow Intelligence (ANI) is the stage of ***machine learning***. It is the most common form of AI that is available in the market nowadays. These AI systems are designed to solve single problem and is able to execute a single task reallywell. *Siri, Alexa, Cortona* are someof its instances.

Artificial General Intelligence (AGI) is still a theoretical concept. It is the stage of ***machine intelligence*** and refers to machine to be as smart as a human. It is defined as AI having human-level of cognitive function.

Artificial Super Intelligence (ASI) is the stage of machine consciousness Which refers to the system that is much smarter than the human brain in every aspect. This type is also a hypothetical concept. It would be able to surpass all human capabilities.

3. DOMAINS OF ARTIFICIAL INTELLIGENCE

The domains can be listed as follows:

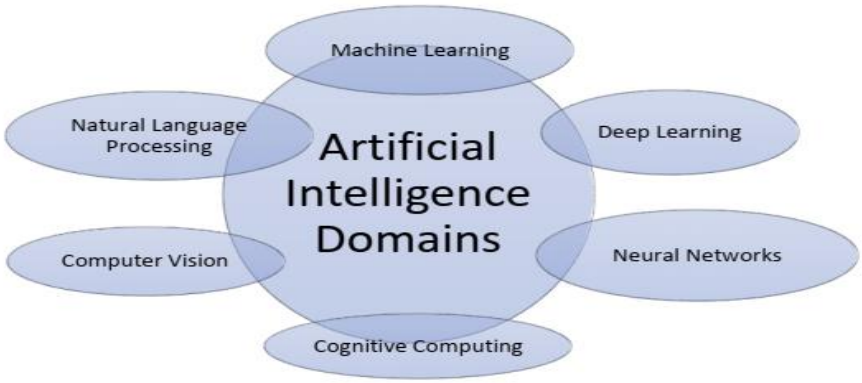


Figure: Artificial Intelligence Domains

→ ***Machine Learning:***

Most of what is considered AI today, particularly in the public sphere, is actually machine learning (ML). ML is an algorithmic field that merges ideas from statistics, computer science and many other disciplines to process data, make predictions, and help make efficient decisions. ML teaches a machine how to make interpretations and decisions based on past experience without the involvement of human experience.

→ ***Deep Learning:***

Deep Learning is a machine learning technique. It teaches a machine to process inputs through layers in order to classify, interpret and predict the outcome.

→ ***Neural Networks:***

Neural networks work on the principles similar to that of human neural cells. This technology comprises of a series of algorithms that captures the relationship between various underlying

variables, and processes the data in the similar manner as a human brain does.

→ ***Natural Language Processing:***

NLP is a technology of reading, understanding, interpreting a language by a machine. Once a machine is able to understand what the user intends to communicate, it responds accordingly and efficiently.

→ ***Computer Vision:***

Computer vision is a domain of AI where algorithms try to understand an image by breaking down an image and studying different parts of it. This allows the machine to classify and learn from a set of images and to make a better output decision based on past visual observations.

→ **Cognitive Computing:** Cognitive computing uses a number of algorithms which try to mimic a human brain by analyzing text, speech, images or any object in a manner that a human brain does and tries to give the desired output accordingly.

4. JOB OPPORTUNITIES

In the recent times, three new categories of AI-driven business and technology jobs have emerged. These categories can be labelled as:

→ Trainers

→ Explainers

→ Sustainers

TRAINERS comprise of human workers who teach AI systems how they should perform. At one end of the spectrum, trainers assist natural- anguage processors and language translators make fewer errors. At the other end, they teach AI algorithms to simulate human behaviors.

EXPLAINERS comprise of people who bridge the gap between technologists and business leaders. Explainers guide in providing clarity, which is becoming all the more important as AI systems' opaqueness is increasing with time.

SUSTAINERS comprise of people who ensure that AI systems are operating as designed and that unplanned consequences are addressed with the appropriate urgency and accordingly. Sustainers can further consist of the following jobs:

5. CONCLUSION

Whether or not we come to understand 'intelligence' any time soon, we do have a major challenge on our hands to bring together computers and humans in ways that enhance human life. Understanding what AI can do and how it fits into our strategy is the beginning, not the end, of that process. Every organization should be exploring cognitive technologies irrespective of their size and domain. There will be some bumps in the road, and there is no room for contentment on issues of workforce displacement and the ethics of smart machines. But with the right planning and development, cognitive technology or AI could lead to a golden age of productivity, work satisfaction, and prosperity in the organization.

6. FUTURE SCOPE

→ Automation using AI for drug discovery is a field that is rapidly growing, mainly because machines work faster than humans. This

advancement will surely help in successful creation of vaccine for Covid-19.

→ The future application of AI in cyber security will ensure in curbing hackers.

→ In the future, facial recognition can go beyond physical structure to emotional analysis which will tell the mood of the user.

→ AI would be able to perceive patterns in data that humans cannot during the data analysis. This enables business to target the right customers for the product.

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Intelligent Internet Of Things : An Overview

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Abstract: The word internet is connected with the Internet of Computer, Internet of things, and Internet of Everything.IOT is not only the connection between the computer network; it's merely the connection between the electronic devices. In the upcoming scenario, we have this point that all the near and surrounding things will be interconnected, such as air conditioners, refrigerators, microwaves, televisions, rice cookers, induction, and any other electronic device. The future is to connect everything and anything as much as possible. So the connection of all the tools, the interconnection between them, the transfer of data between them is not just the Internet, its Internet of things. If we involve the concept of Artificial Intelligence, the smartness of internet of thing increases. Along with smartness the security concern has definitely increased.

Keywords: Internet of Things, Artificial Intelligence, Internet of Everything

1. Introduction

The word smart has become the part of human life. To ease human life the combination of Artificial Intelligence and Internet of Things will work together. This combination can be used to solve various problem of day to day life for example if a person is driving a car or any other vehicle and he needs a emergency medical treatment then the connectivity between the vehicle and smart phone can work and the nearest hospital or any family member could be informed for immediate action. This can only be achieved if Artificial Intelligence and IOT are interlinked. This development will accelerate the digital transformation of industries.[2] Either its humans, animals, plants, machines, appliances, soil, stones, lakes, buildings or anything one can think of, connecting them and making "smart decisions" can make the world an autonomous place. These connections will be human to human, human to physical things, and physical things to physical things. Internet of Everything is also a similar idea that suggests that every living, nonliving, or virtual object is connected through some communication medium

2. Artificial Intelligence

AI is merely about 'choosing' the right decision at the appropriate time. AI can be regarded as a technique to efficiently use the data to be self-explanatory to the people involved. It should have the criteria to differentiate between the correct and incorrect function. Learning can be defined as acquiring or improving behaviors, skills, values, preferences, thereby increasing knowledge. It may also include synthesizing various types of information. Learning is the mechanism by which a system modifies its parameters such that its future performance can be improved[1]. Machines can imitate this process of learning with the help of 'machine learning.' Machine learning is an emerging field in computer science research that gives inanimate systems the ability to learn without explicitly programming them.

In contrast to more traditional uses of computers, 3in the IoT scenario where the volume, variety, velocity, and complexity of the data are overwhelming, it is impossible for a human programmer to provide explicit, finely detailed specifications to execute the task. Thus, the concept of machine learning is made to be concerned with implicit learning skills, which would

make a computer or system that eventually teach themselves to adapt to the current environment and make independent decisions. This is how machine learning makes up for the smart concept in IOT. Machine learning is an approach to achieve artificial intelligence which is based around the concept that machines should be given access to data so that they can learn for themselves. A significant part of the advancement that we have found in recent years is the fundamental changes in how we view AI working, which have been brought about mainlyby ML[3].

Machine learning is an approach to achieve artificial intelligence, which is based around the concept that machines should be given access to data so that they can learn for themselves. The way that we will eventually create human-like AI has frequently been talked about as a certainty by researchers. Indeed, we are moving towards that objective with expanding speed. A significant part of the advancement that we have found in recent years is the fundamental changes in how we view AI working, which have been brought about mainly by ML. Therefore, it would not be inappropriate to give ML the credit of instilling smartness in machines.

Table 1 should make the idea clear about the extent machine learning has spread into the idea of 'smartness.' It shows few examples of animals whose smartness has been replicated by several human- made AI machines. Such machines are capable of performing certain functions like the corresponding animal or will have some similar characteristics. Although complete replication of all the living characteristics has not been achieved, work will make it as close as possible.

Level	**Animal example**	**Machine example**	**Year**
Adaptive learning of newresponses	Earthworm	Smart thermostat	2011onwards
Learning by trial and error	Fish	CRONOS robot	2005 onwards
Learning by setting a goal, acting to achieve it, and thenassessing itself	Octopus	Cog	1999-2003
Self-consciousness andhigher-order thoughts	Chimpanzee	Siri	2011
Has emotions like frustrationand happiness	1-6year old child	Cozmo	2016 onwards
Has full theory of mind, interpret human emotions,and responds accordingly	7-11 year old child	Pepper	2014 onwards

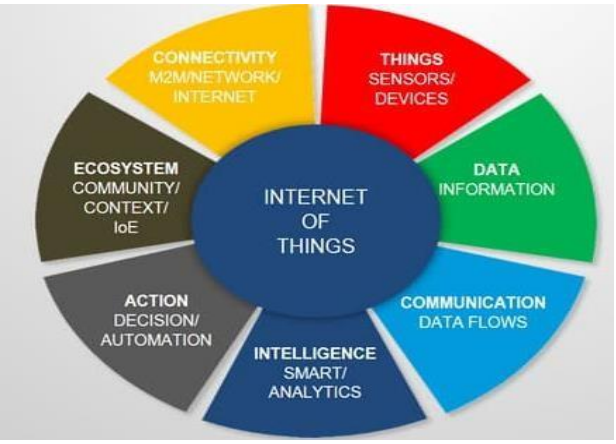
Table 1: Smart animal to smart machine analogy

3. Internet of Things

The Internet of Thing has taken a comprehensive form in our day-to-day life, from having a video call to smart security system. All of this has a wide expectations from the combination of AI and IOT. The things which are actually feasible in present time was a dream till years before but now

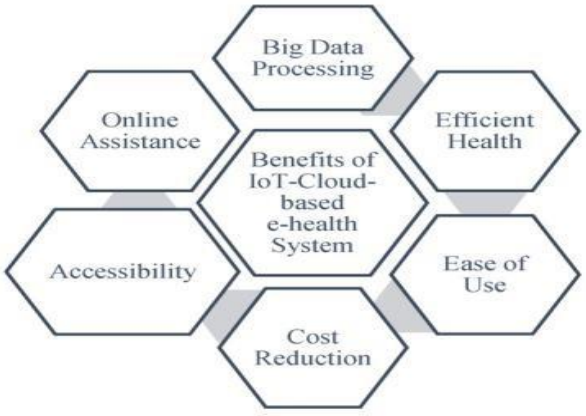
it's a reality. The area if IOT is expanded and its involved in various fields(Fig 1). People can get things done with a click on their smart phone, either it sending emails, paying bills, transferring money or booking a cab. Internet of things is just a connected system of physical things (like appliances, crop fields, plants, animals, etc.) and humans. Humans are connected to these devices using some smart objects attached to both which are capable of sending, receiving and analyzing data.

Fig. 1: Different fields merging into IoT [13]



An example of an IOT based e health system is shown in Fig2.

Fig 2: IOT based e health System[14]



Internet of Everything: Usually, people get confused about the concepts of Internet of Things and Internet of Everything. The Internet of Everything is the intelligent connection of people, process, data and things[17]. The IoE connects up the physical things to the cyber things into one cohesive whole. It is not just about allowing devices to talk to each other; it is about allowing everything (living, non-living or any virtual object) to talk about each other.

This virtual object part is missing in IoT. To get a better view of the concepts, we illustrate a Venn diagram in Fig 3.

Things ∩ Intelligence = Smart Objects (Devices)Network ∩ Intelligence = Smart Network Things ∩ Network = Networked Devices Services ∩ Intelligence = Smart Services Services ∩ Network = Internet Services

Things ∩ Intelligence ∩ Network = **Internet of Things (IoT)**
Internet Services ∩ Intelligence = **Internet of Services (IoS)**
Internet of Things ∩Internet of Services = **Internet of Everything (IoE)**
The concepts of IoT and IoE are very overlapping.

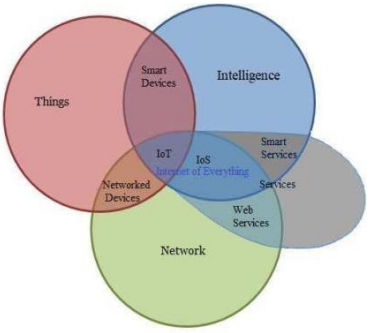


Fig 3:A Venn diagram for the concept of Internet of Things (IoT), Internet of Services (IoS) and Internet of Everything (IoE)[15]

4. AI enabled IoT

While IoT provides data, artificial intelligence acquires the power to unlock responses, offering both creativity and context to drive smart actions. As the data delivered from the sensor can be analyzed with AI, businesses can make informed decisions[14][15][17]. The artificial intelligence IoT succeeds in achieving the following agile solutions:

I. Manage, analyze and obtain meaningful insights from data
II. Ensure fast and accurate results
III. Balance requirements for localized and centralized intelligence
IV. Balance personalization with confidentiality and data privacy
V. Maintain security against cyber attack

IoT is a vast concept encompassing too many sensors, actuators, data storage and data processing capabilities interconnected by the Internet. Thus any IoT enabled device can sense its surroundings, transmit, store, and process the data gathered, and act accordingly. The real smartness of an IoT service is determined by the level of processing or action that it can perform. A non-smart IoT system will have limited capability and will be unable to evolve with the data. However, a smarter IoT system will have artificial intelligence and may serve the actual goal of automation and adaptation.

There are various examples of existing IoT services with the working of AI. Some of them have defined below:

Alexa is the voice assistant from Amazon, which is used in products like Amazon Echo, Amazon Tap, etc. A specific set of skills is known as the Alexa Skills Kit (ASK) that can be modified and updated to personalize or improve specific skills. It can be used by kids as well for entertaining like storytelling, songs, quizzes, etc.

Siri from Apple Inc. is used in Apple Homepod, which serves a similar purpose, which is used in daily life.

Google Assistant used in Google Home has additional features to recognize upto six different users and pull their respective details to converse with them.

Fig. 5: IoT architecture tree for Smart cities[16]

Thus, the opportunities and potential of both AI and IoT can advance when they are combined. Without AI, the data that the IoT generates remains useless. IoT needs to depend on AI as it is impossible for any human to find information in the data that IoT generates. Moreover, if a new pattern in data is detected, the machine will be capable enough to learn by itself, which will be impossible for a non-AI IoT system to do[17].

5. Challenges

After all the idea has been developed, the gap between an idea and a working prototype is enormous. Resources are a must for the development of a prototype, even if the working prototype is set. Even if one is able to strive past all of this, the question that stands now is how do we know if this hot new technology will succeed or fail. Latest IoT trends indicate that data is coming at a higher speed from various sources in different forms. It is not hard to find databases with some petabytes of data, but the main objective is not to let all of these data go to waste. Therefore, efforts are being made to recognize and extract meaningful information (patterns, structure, underlying relationships, etc.) from them. This task is very complicated, and it needs advanced storage and processing techniques due to the vast volumes of data.

6. Conclusion

The future is bright, s we can see the AI and IOT are going to be the backbone of our lifestyle. With all the electronic gadgets and various AI applications and IOT in our daily routine, we will be saving lots of physical efforts and time, which we can use wisely. Along with this, we should also know that there are always two sides to a coin. If we have so many advantages, then we also have some disadvantages and challenges too, which we have to understand and then act accordingly. Everything will be smart and will connect to the Internet. We will have a 'smart cyber revolution'. However, there is still a topic to debate on whether we are going towards a creative destruction or not. For instance, machines are now able to take on less-routine tasks, and this transition is occurring during an era in which many workers are already struggling. Although these systems bring myriad benefits, they also contain inherent risks, such as privacy breach, codifying and entrenching biases, reducing accountability and hindering the due process and increasing the information asymmetry between data producers and data holders So, we may need another AI system on top of such AI-enabled IoT to monitor its working effectively and safely.

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Energy Efficient Ant Colony Algorithm for theRouting of Wireless Sensor Networks

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Abstract. Based on the characteristics of routing protocol for wireless sensor networks, an energy aware ant colony algorithm (EAACA) for the routing of wireless sensor networks is proposed in this paper. When EAACA routing protocol chooses the next neighbor node, not only the distance of sink node, but also the residual energy of the next node and the path of the average energy are taken into account. Theoretical analysis and simulation results show that compared with the traditional ACA algorithm for the routing of wireless sensor network, EAACA routing protocol balances the energy consumption of nodes in the network and extends the network lifetime.

Keywords: Ant colony algorithm, Energy aware, WSN.

1 Introduction

The wireless sensor network (WSN) sends information through the sensor nodes by the self-organizing network. In order to establish the reliable links between the sensor nodes in the wireless network, the routing protocol is vital. Extensive research results have shown that the routing protocol has a direct influence on the performance of wireless sensor networks [1][2][3].

According to the network architecture of WSN, the routing protocol is divided into planar routing protocol and hierarchical routing protocol [2][4]. Hierarchical routing protocol has better scalability for large networks. However, the sensor nodes cannot be deployed rapidly because of the complexity of network topology. In addition, the cluster head node undertakes communicating with external nodes, cluster scheduling and other important work. So, the quick energy consumption of cluster head nods can make the network failure. Compared with the hierarchical routing protocol, sensor nodes in planar routing protocol have the characteristics of same status, high redundancy, high reliability and network robustness. But, due to lack of management schemes nodes with planar routing protocol cannot optimize routing paths and communication resources.

Based on the above considerations, this paper makes use of ant colony optimization to select the shortest path from the source node to sink node for the effective and fast transmission of data in the network. For the nodes of WSN, the energy is limited. So taking the energy restriction of wireless sensor node into account, an ant colony algorithm based on energy aware EAACA (Energy Aware Ant Colony Algorithm) routing protocol is proposed for wireless sensor networks. When EAACA routing protocol chooses the next hop neighbor nodes, the distance to the sink node is considered, meanwhile the residual energy of the next hop node and the average energy consumption of nodes in the network and extends the network lifetime.

2 Wireless Sensor Network Model for Routing Algorithm

Compared with the wireless sensor networks model with fixed transmitting power, the WSN with adaptive transmitting power is more energy-saving, and can further extend the network lifetime[2][4].

In the wireless sensor networks with adaptive transmitting power, the wireless transmission power of node is exponential decay with increasing distance to the other node. Two wireless channel transmission models were proposed in reference [5]. When the distance *d* between the sending node and receiving node is less than a value of *d0* , the free-space model is use, so the transmission power attenuation factor of sending node is d^2. Otherwise the multi-path fading model is used, and the transmission power attenuation factor is d^4.

$$\text{Etran}(l,d)=\{lE_{elec}+ l\, ffsd^2 \text{ if } d<d0; \quad (1)$$
$$\{lE_{elec}+ l\, fmpd^4 \text{ if } d>d0; \quad (2)$$

Communication characteristics and energy consumption models affect the advantages and performance of protocol. The wireless transmission and energy consumption model defined in the reference [7] is used in this paper. The total energy consumption of each communications is defined as equation (3).

$$E_T = E_{TX} + E_{RX} = 2E_{elec} \times k + \varepsilon_{fs} \times k \times d^2 = k(2E_{elec} + \varepsilon_{fs} \times d^2) \qquad (3)$$

The transmitting power and receiving power are defined as equation (4) and equation (5) respectively.

$$P_t = E_{elec} + \varepsilon_{fs} \times d^2 \qquad (4)$$

$$P_r = \frac{P_t \lambda^2}{(4\pi)^2 d^2} \qquad (5)$$

Where λ is the wavelength. When a node receives signal with transmission power P_t and received power P_r, the distance between transmit and receive node is

$$d = \frac{\lambda}{4\pi}\sqrt{\frac{P_t}{P_r}} \qquad (6)$$

In EAACA routing protocol, the information of each node includes matrix vector of the distance to each neighbor node. So, according to these distance, the node can use

dynamic transmission power to send the ant packets to the next hop neighbor node with the purpose of using less energy to ensure the entire network connectivity.

3 Design of EAACA Routing Protocol

The proposed EAACA protocol includes the route discovery and route maintenance process. In the route discovery process, the sensor nodes establish all valid paths to the destination node by sending a query packet (forward ant), if the ants find the destination node, then the destination node generates a response packet (backward ant). The backward ant goes back to the sending node along the reverse path, and releases pheromone while it returns. The concentration of pheromone is in inverse proportion to the distance to the destination node. Therefore, the stronger concentration of the pheromone represents the shorter distance to destination node. Once all the paths are set up, the source node begins to release the data packets and the packets transmit along the path with the highest pheromone concentration. In route maintenance process, the sensor nodes send a certain number of probe packets to the destination node periodically to monitor the quality of the existed, meanwhile probe new route to the destination node. To reduce the control packet overhead, the number of probe packets is restricted by the current concentration of pheromone [6][8][9][11].

Pheromone Rule

At a certain time interval, the source nodes release a certain number of ants periodically in the network, all forward ants find all valid paths from the source to the destination node, and all the visited node are stored in the ant packet field carried by ants. Each node maintains a simple pheromone table in the networks. The pheromone table is built the path during searching process.

Pheromone Enhancement. When the query packet or probe packet gets to the destination node, the destination node generates a response packet, and sends it back along the reverse path. The response packet in each visited node release a certain amount of pheromone $\Delta\tau$. In traditional ACA algorithms, pheromone increment as equation (7) [9][10].

$$\Delta\ \tau = c \times (HOP_{\max} - hop_{count}) \tag{7}$$

Where c is the variable parameter, $HOP_{\max}$ represents the maximum allowed number of hops for query data packets and probe data packets in the network; hop_{count} represents hops of the packet to the destination node. Therefore, when node receives the response packet from the destination node by the nth neighbor node, the node will update the pheromone concentration $\tau_{n,d}$ as equation (8).

$$\tau_{n,d} = (1-\rho)\times\tau_{n,d} + \Delta\tau \tag{8}$$

Where ρ is the pheromone evaporation coefficient; 1-ρ is the pheromone residue factor; the range of ρ is [0, 1]. EAACA not only considers the distance of path, but

also considers the energy level of path; so, the pheromone concentration is improved as follows:

$$\Delta\tau = c \times (HOP_{\max} - hop_{count}) \times Eavg_n \tag{9}$$

Each node updates pheromone table as equation (10):

$$\tau_{n,d} = (1-\rho) \times \tau_{n,d} + \Delta\tau / \omega \cdot hop_{count} \tag{10}$$

Where ω is the control factor; hop_{count} is hops of the current node packet to the destination node (the number of nodes visited by backward ants).

Pheromone Evaporation. In EAACA algorithm, the pheromone evaporation scheme is defined as equation (11), and the range of evaporation rate ρ_1 is [0, 1]. ρ_1 is used to set the speed of pheromone evaporation, the greater value represents the faster evaporation of pheromone concentration.

$$\tau_{n,d} = \begin{cases} \tau_{n,d} \times \rho_1 & if\ \tau_{n,d} \times \rho_1 >= \tau_{n,d}\_default \\ \tau_{n,d}\_default & if\ \tau_{n,d} \times \rho_1 <= \tau_{n,d}\_default \end{cases} \tag{11}$$

The concentration of pheromone cannot be reduced to 0 or negative value, so equation (11) guarantees pheromone concentration no lower than the $\tau_{n,d}$_default, and the value of $\tau_{n,d}$_default represents the lower limit of the pheromone concentration. During the process of searching path to destination node, $\tau_{n,\,d}$_default ensures that every neighbor could be the next-hop node.

Routing Selection. In a certain intermediate node, forward ants choose the next-hop neighbor based on the probability. Selecting probability in the traditional ACA routing algorithm is defined as formula (12).

$$P_{n,d} = \begin{cases} \dfrac{\tau_{n,d}^{\alpha}}{\sum_{n \notin nodes\_visit_p} \tau_{i,d}^{\alpha}} & i \in N_m - nodes\_visit_p \\ 0 & Otherwise \end{cases} \tag{12}$$

Where $P_{n,\,d}$ is the transfer packets probability of one node to the nth neighbor nodes; $\tau_{n,,d}$ is the value in the pheromone table; $\tau_{n,\,d}$ represents the pheromone concentration of the neighbor node n to the destination node d.

In EAACA routing algorithm, for calculating the packet transfer probability to the next hop neighbor, the residual energy of node is considered. So, the improved transfer probability is defined as formula (13):

$$P_{n,d} = \begin{cases} \dfrac{\tau_{n,d}^{\alpha} E^{\beta}(n)}{\sum_{n \notin nodes\_visit_p} \tau_{i,d}^{\alpha} E^{\beta}(i)} & i \in N\text{-}vnode \\ 0 & Otherwise \end{cases} \tag{13}$$

Where E= 1/ ($E_{imitial}$-E_s) , and $E_{imitial}$ is the initial energy of nodes; E_s is the actual energy of the nodes; β is the expectation heuristic factor; α and β are importance parameters to control pheromone concentration, which represent weights of nodes with more residual energy and the shorter path.

4 Simulation Results and Performance Analysis

Simulation Parameters

WSN nodes are arranged in the area of 200 x 200m^2, and wireless transmission distance is 40m between nodes. The simulation parameters are shown in Table 1.

Table 1. Experiment simulation parameters

Parameters	Value
Node initial energy	2[J]
Sink number	1
$_{fs}$	10[pJ/bit/m^2]
E_{elec}	50[nJ/bit/m]
E_{DA}	5[nJ]
MAC layer protocol	802.11

According to the proposed routing protocol based on ant colony algorithm, the algorithm parameters are defined as follows: α=1.5; β=1.5; ρ=0.5; ρ_1=0.8.

Analysis of Simulation Results

The simulation mainly compares EAACA routing algorithm with the traditional ACA routing algorithm in the average residual energy and energy loss ratio of the network nodes.

Average residual energy is the basic standards to measure the merits of routing protocol. For 10 sets of different network nodes, the average residual energy of nodes after running 200s is shown in Figure 1. It can be seen that the average residual energy of nodes in the proposed EAACA is higher than that of the traditional ACA. It is due to EAACA routing protocols considered the energy factors when the data packets select the next hop node, and they transfer packets according to the probability of distance and the weight of energy. Thus, a single node is avoided to death early because of excessive energy consumption. The energy consumption of the network is saved to extend the network lifetime.

Energy loss ratio is that the total energy consumption of the network divided by all the number of successfully received packets. Energy loss ratio not only reflects the energy consumption situation of nodes in the network, but also shows the efficiency of receiving data packets successfully by the sink node. When there are 200 nodes in WSN, the situation of energy loss ratio with the time changing is shown as Figure 2. It can be seen from Figure 2, the EAACA protocol saves more energy than traditional ACA protocol, makes the network live longer and has higher reliability.

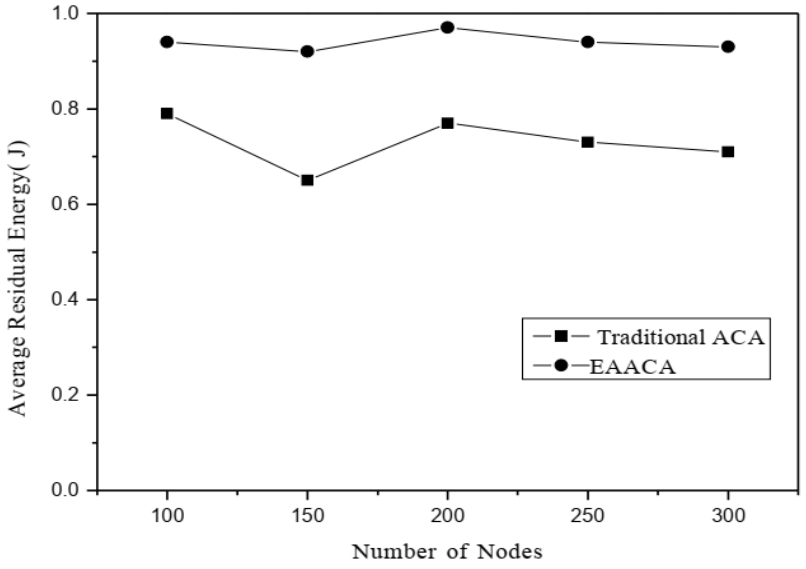

Fig. 1. Comparison of average residual energy

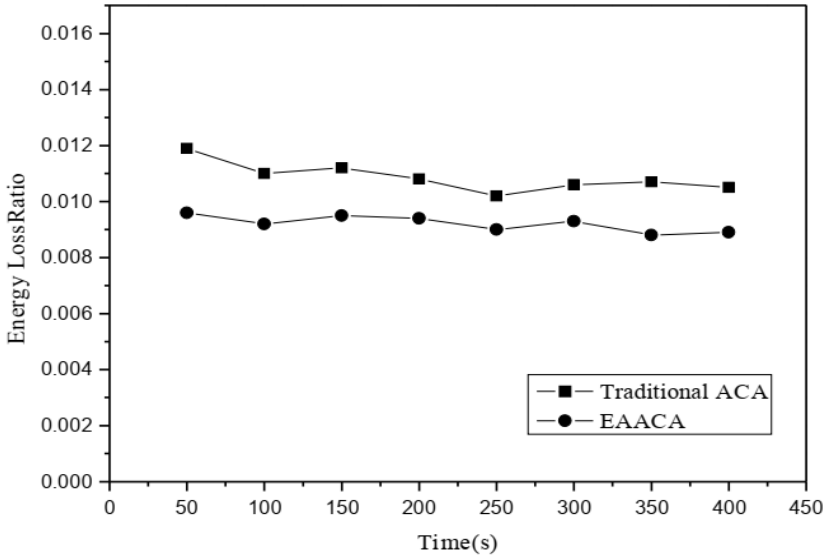

Fig. 2. Comparison of energy loss ratio

5 Conclusions

The ant colony algorithm for wireless sensor networks has the advantage of self organization, stronger local searching ability and so on. However, the wireless sensor network is energy-limited, so EAACA routing algorithm based on energy level is proposed in this paper. Simulation results show that the proposed EAACA algorithm has improved significantly in the part of average remaining energy, the energy loss ratio, and greatly extends the network life cycle.

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Heart Health Classification and Prediction Using Machine Learning

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Abstract: According to a survey [1], one in every four deaths occurs due to cardiovascular diseases. Early diagnosis of these diseases can help prevent deaths by alerting the state of heart. It has been found that medical professionals working in the field of heart diseases can predict the chances of heart attack with around 67% accuracy. Our attempt is to create a machine learning model which can be more accurate than the medical practitioners. Machine learning algorithms like support vector machines, logistic regression, random forest, and ensemble learning can provide logical reasoning to base our predictions. In order to increase accurate diagnosis on the medical practioner's part, a heart sound classification model based on heart sounds can help any physician, radiologist or patients determine the current health of their heart. It is based on S1 i.e. lub and S2 i.e. dub sounds of the heart and the model classifies the heart sound to determine how much of the sound can be classified into normal, murmur and extra systole. To identify the significant heart sound beats, a heart sound segmentation model is created. This can help physicians to provide early advice to their patients without any exclusive and time exhaustive tests, saving money and any delay. Further, a sound recorder placed inside the stethoscope can make the whole process more efficient and easier.
Keywords: Heart sound segmentation, Support Vector Machines, Regression, Random Forest, Deep Learning,Convolution Neural Network

I. INTRODUCTION

Machine learning can be defined as the identification of patterns, functions or inferences from a set of varied data in order to compute similar tasks automatically and solve statistical problems. The importance of machine learning in healthcare is its ability to process huge datasets, and then provide analysis of the data that can help doctors in planning and providing care, ultimately leading to lower costs of care, and increased patient life expectancy.

The paper consists of two major sections: Heart disease prediction based on medical records and Heart Sound Classification based on Heart Sounds . The project takes data sets from two sources. The first dataset has been taken from the University of California Irvine repository's Cleveland database. PASCAL Challenge includes a dataset that was obtained from the public using an iPhone app called iStethoscope and a clinic trial using the DigiScope digital stethoscope.

The proposed system is intended to be used by doctors, physicians as well as normal users. The users can give input to the web portal. Using the input provided by the users, the Machine Learning model can easily predict whether the user is diagnosed with heart disease or not. The doctors can

use the sound recorder present in the stethoscope to give the input to the classification model which will classify thepatient's heart sound as healthy or murmur.

II. METHODOLOGY

A. HEART DISEASE PREDICTION

In the proposed system, Support Vector Machine, Logistic regression and Random forest algorithms were used. System's workflow is discussed below:

1. The dataset initially consists of 76 attributes, out of which we selected 14 most relevant attributes.
2. During our exhaustive literature survey, we found out that Support Vector Machine along with other Machine learning algorithms such as Logistic Regression and Random Forest algorithms were excellent for predicting heart diseases. Along with these algorithms, we also made use of the ensemble learning. Hence, these algorithms were used to create our ML Model.
3. In the proposed application, users (doctor, patient, physician, etc.) will be able to input the attribute values and send it to the ML Model. The ML Model, upon receiving the input, will predict the heart disease.

The proposed system model is shown in Figure 1.

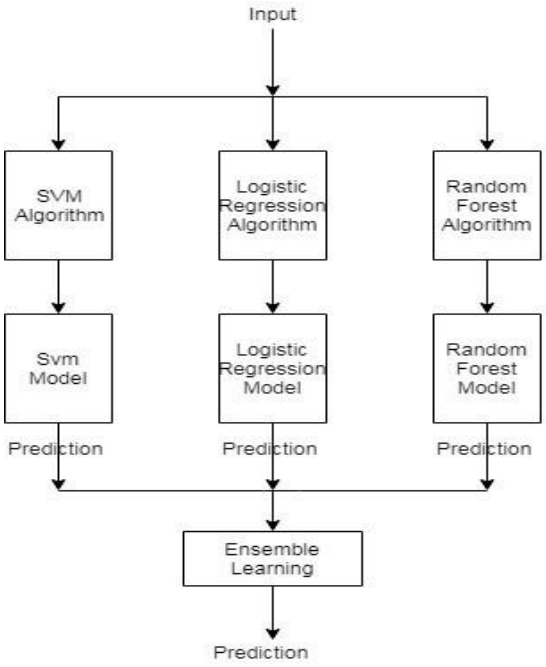

Fig. 1. System Architecture

1. Support Vector Machines (SVM): Support Vector Machine algorithm is most widely used for solving classification problems. It is based on statistical learning theory. In this, every single data-item is drawn as coordinates in the n- dimensional space. The SVM contains decision- hyperplanes

which divides different classes of data points using maximum margin. Data points near hyperplanes are called support vectors. They affect hyperplane position and their orientation. The classification process creates a non-linear decision boundary and classifies data points not represented in vector space.

2. Logistic Regression Algorithm: Logistic regression is yet another popular machine learning algorithm. It is used for binary classification and is based on the concept of probability. Logistic Regression uses a complex cost function called as the 'Sigmoid function'. This function is used for mapping any real value into another value between 0 and 1. Therefore, Logistic regression algorithm helps in predicting whether something is True or False.
3. Random Forest Algorithm: Random forest is mostly used for classification and regression problems. The random forest is composed of multiple decision trees. By averaging out the impact of several decision trees, random forests tend to improve prediction. It uses a modified tree learning algorithm that inspects, at each split in the learning process, a random subset of the features.
4. Ensemble Learning: Ensemble learning is a technique wherein different models trained over the same data are bought together and combined to solve a particular machine learning problem. It is used to increase the accuracy of the individual models since one model may predict correctly for one trend of data, while for another trend, another model may predict right. It also increases theperformance of the program.

B. HEART SOUND CLASSIFICATION

The idea of using heart sounds to classify heart health was highly popularized by Dr. Andrew Ng in 2017. It tries to mimic how a real physician would try to determine whether a certain person has heart disease or not.

The main motivation behind this technique was to enable the use of our system to detect genetic and hereditary heart problems as well that may not have been influenced by lifestyle choices. This section consists of Sound Segmentation and Classification. Both models are primarily based on the Convolutional Neural Network (CNN) algorithm.

Convolutional Neural Network Algorithm/CNN: CNN is a deep learning-based algorithm that has capability to understand features in complex media like images, audio, etc. It understands the features by finding differences between two objects. CNN is composed of neurons and layers. These neurons are defined by weights. These layers are arranged in order and receive input as the previous layer's output.

The heart sounds need to be segmented in order to determine the location of the two important beats - S1 and S2. This audio processing step will also divide the incoming wave into short segments and reduce noises. The training dataset consists of labelled locations of S1 and S2. Other files are unlabeled and need to be segmented into small sections after figuring out the locations of S1 and S2. S1 is the first sound and caused by the closure of mitral and tricuspid valves at the start of systole. The second sound, S2 is caused by the closure of the aortic and pulmonic valves. The time between S1 and S2 defines systole and the time between the S2 and

S1 defines diastole. The rising phase of the wave corresponds to the beginning of systole(S1) and the declining phase of the wave is S2. Before starting with classification, exhaustive visualization of each of the classes was done. Heart Sound Classification algorithm takes in segmented data in order to understand the duration between each lub and dub and vice versa. The order of the lub and dub and the time duration between each of these beats are very significant for classification. For example, if a lub is followed by another lub, then it denotes that the heart sound belongs to extrasystole and has some irregularity.

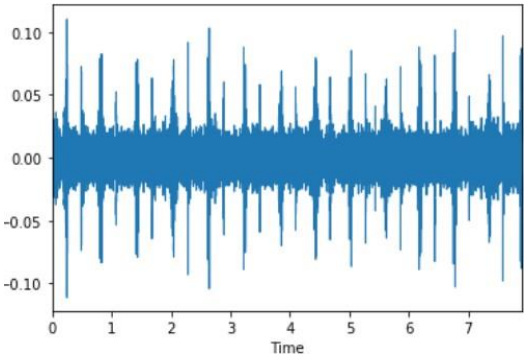

Fig. 2. Plotted waveform of an audio sample

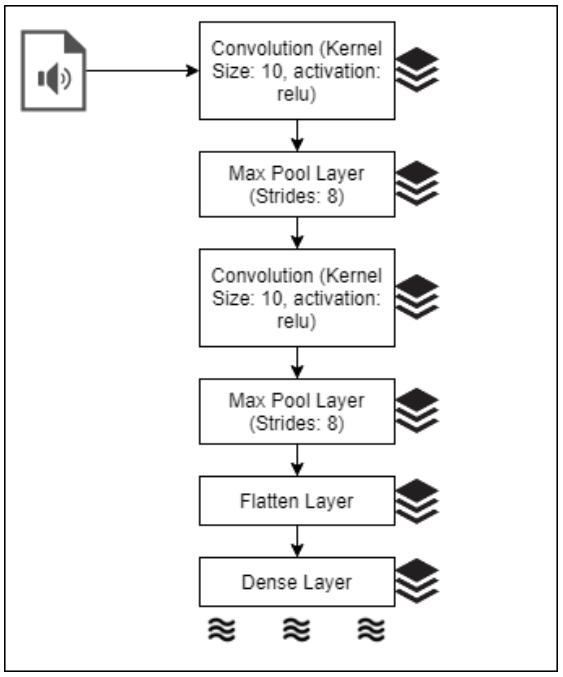

Fig. 3. CNN Model for Heart Sound Segmentation

After the sounds have been segmented and the locations of S1 and S2 beats identified, classification can be done. For this, we applied SVM algorithm and CNN Algorithm. The deep learning method helps in better audio or any media analysis. Transfer learning approach is used to obtain maximum efficiency and provide the model with more data trained model's inferences. The pretrained model is trained on Audio set Data which has around 6000 hours of audio data and is

trained over 567 categories. The structure of the pretrained model is VGG CNN. It starts with spectrograms at the base and convolution layers with full connected layers form the top. Group of Convolution Layer, Max Pool Layer and Batch Normalization Layer needs to be applied seven times for the final model. The convolution layer provides with a matrix formed by extracted features from the input audio, the max pool layer helps in reducing the dimensions of the matrix so that assumptions about the down-sampled image’s features can be made and batch normalization layer helps in scaling and independent learning between layers. The classes of the classification are presented in Input Details. The model takes about an hour and half to train for the first time. After saving it as ‘H5’ file, it took about a minute to see results for a new patient. The model is scalable as new results are combinedwith the ‘H5’ model file.

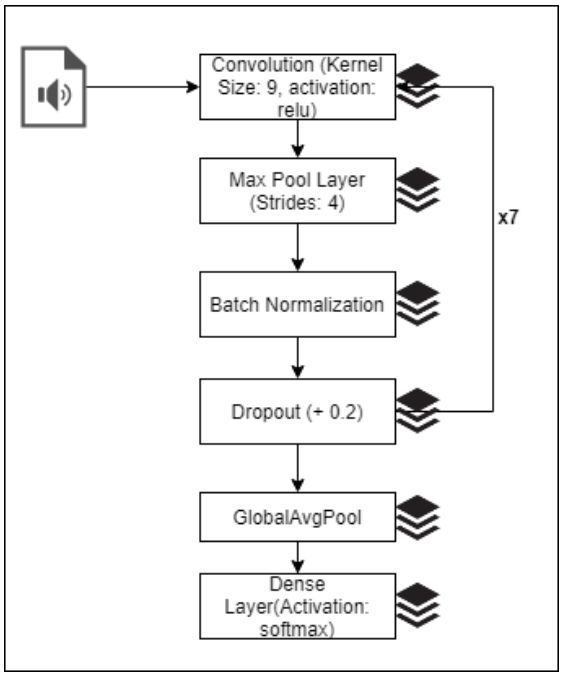

Fig. 4. CNN Model for Heart Sound Classification

III. IMPLEMENTATION

A. INPUT DETAILS

The dataset that we have used has been taken from University of California Irvine machine learning repositorywhich includes 14 attributes and have been summarized intable 1.

TABLE I. ATTRIBUTES WITH DESCRIPTION

Sr No.	Attributes	Description
1	Age	Age of patient inyears
2	Sex	1=Male, 0=Female
3	Chest Pain(cp)	1: typical angina 2: atypical angina 3: non-anginal pain 4: asymptomatic
4	Resting blood pressure	Resting blood pressure of thepatient
5	Serum cholesterol	Serum cholesterol ofthe patient
6	Fasting blood pressure	1 = true; 0 = false
7	Resting electrocardiographic results	0: normal 1: ST-T wave abnormality 2: probable hypertrophy
8	Thalach	Maximum heart rateof the patient
9	Exercise induced angina	1= Yes, 0= No
10	Oldpeak	ST depression induced by exerciserelative to rest
11	Slope	1: upsloping, 2: flat, 3: downsloping
12	CA	number of major vessels (0-3) coloredby fluoroscopy
13	Thal	3 = normal; 6 = fixed defects; 7 =reversible defects

14	Num	0: < 50% diameter 1: > 50% diameter

The other dataset that we have used is from the PASCAL Challenge that obtained data from clinical trials. The sound recordings were in the .wav format and gathered from the general public using an iPhone app called iStethoscope and DigiScope stethoscope [8]. The dataset group 1 is used for heart sound segmentation algorithm. It consists of 176 files. The training files had S1(lub) and S2(dub) locations. The dataset group 2 which is used for classification consisted of 656 audio files of about 30 seconds. Files provided are noisy and have many background noises. The categories were:

1. Normal: These are the normal. healthy heart sounds. A normal heart sound has a clear "lub dub, lub dub" pattern, and the time from "lub" to "dub" is shorter than the time from "dub" to the next "lub". Example of Temporal Description providedin the dataset website [8]:

…lub…….dub…….lub dub…
…….lub…….dub…….
lub.... dub…

2. Murmur: Heart Murmurs are found between "lub" and "dub" or between "dub" and "lub". They are precursors or indicators of many serious heart diseases. An example of temporal description of Heart Murmur from the website [8] is:

*** defines murmur.
…lub..****...dub…….lub..****..dub…
…….lub..****..dub…….
lub..****..dub …

3. Extrasystole: These are the heart sounds consisting of some irregularities like skipped or extra beats. An extrasystole may or may not be a sign of disease. The temporal description from the website [8] is

….....lub…….dub……..……lub.……
…..…….dub…….lub.lub.d
ub…….

B. OUTPUT DETAILS

The accuracy of the algorithms we have used have beensummarized in Table 2.

TABLE II. ACCURACY OF ALGORITHMS

Sr. No.	Algorithm	Accuracy
Heart Disease Prediction		
1	Support Vector Machine (SVM)	90.11%
2	Logistic Regression	86.90%
3	Random Forest	73.69%
4	Ensemble learning	83.56%
Heart Sound Classification		
5	Support Vector Machine	70%
6	Convolutional Neural Network(CNN)	85%

IV. RESULTS AND DISCUSSION

1. Home Page

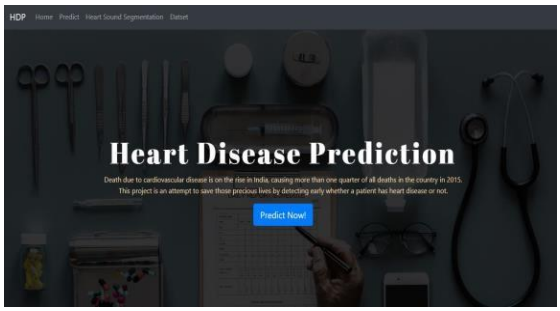

Fig. 5. Home Page

2. Input from user

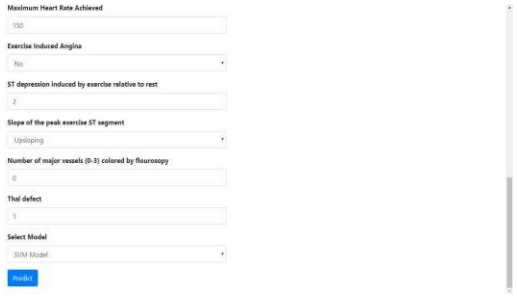

Fig. 6. Input from User

3. Result (Heart Disease Prediction based on LabTest Parameters)

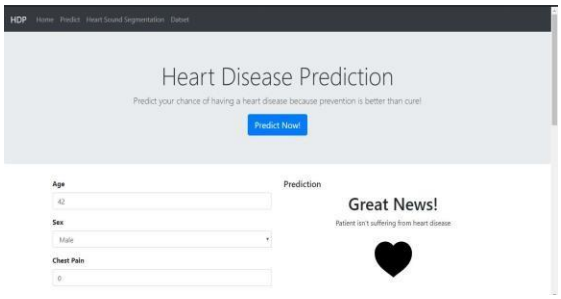

Fig. 7 (a). Result

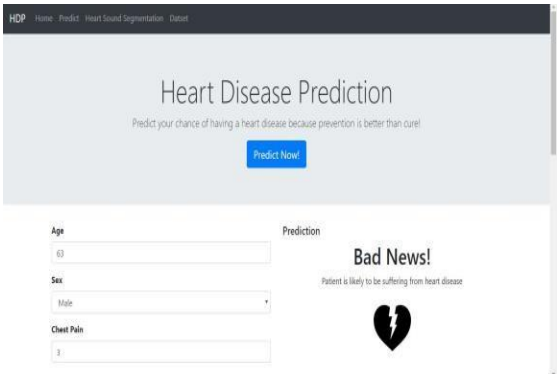

Fig. 7 (b). Result

4. Results (Heart Sound Classification)

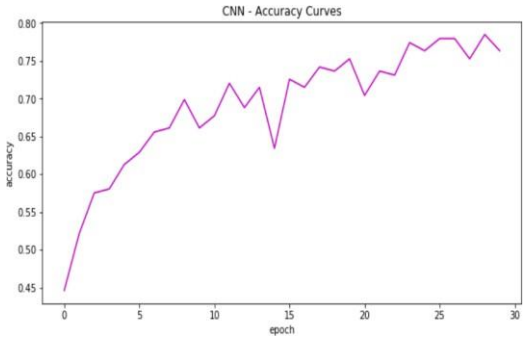

Fig. 8 (a). Accuracy Curves for CNN

You Have Medium Risk of Heart Diseases

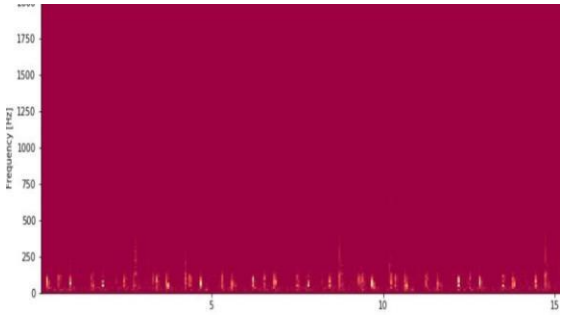

Fig. 8 (b). Wave Diagram of a Patient and Analysis/ Result

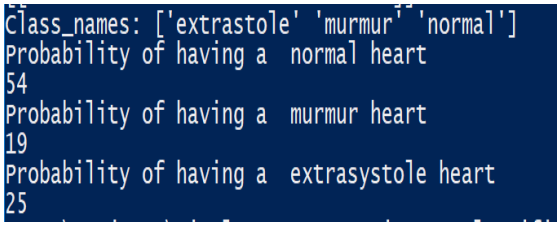

Fig. 8 (c). Probability Statistics of Another Patient

V. CONCLUSION

The system is GUI-based, user-friendly and scalable. The proposed working model can help in reducing treatment costs by providing early diagnostics in time. The model can serve the purpose of training tools for medical students and will be a soft diagnostic tool available for physician and cardiologist.

This system can easily be incorporated with doctors by incorporating heart sound recorders into their stethoscope so that they can record heart beats and the model can give them some insight into health issues. Since these recorders are cheap, even normal people can use them and check their heart health status at our website.

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Influence of Wire-EDM process parameters on material removal rate (MRR) and Tool wear of EN-24

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Abstract: Due to the advancement of mechanical industry, the demands for alloy materials with high hardness, impact resistance and toughness are increasing. The Wire-EDM machine is specialized in cutting complex contours that are difficult cut using traditional cutting methods. Wire-EDM is a non-contact non-conventional process that produces high quality product that is difficult to achieve by using of conventional processes. The present study on Wire-EDM performed on EN-24 using copper wire as electrode is conducted to establish the influence of process parameters on material removal rate. The experimental results concluded that MRR is influenced by current more than pulse on time and voltage. current is the most significant factor for MRR. The MRR also increases with increase in pulse in time but the rate is low as compare to current.

Keywords: Wire-EDM, EN-24, MRR ,TWR

1 INTRODUCTION

EDM or electric discharge machining is achieved when a discharge take place between two points of the anode and cathode, the intense heat is generated near the zone melts and evaporates the materials in the sparking zone. For improving the cutting process, the workpiece and the tool are submerged in a dielectric fluid (hydrocarbon or mineral oils). It can be improved when , both the electrodes are made of the same material, the electrode connected to positive terminal, material erodes at a faster rate from the workpiece. Due to this reason, generally workpiece are made up of anode. A gap, is maintained between the tool and the workpiece surfaces are known as contact off distance. This results in uniform material removal all over the surface, and finally workpiece conforms to the tool surface. This machining method plays its important roles for very hard metals which are not possible to machine from conventional machining methods. It has been widely used, especially for cutting complicated shape or cavities that are difficult to produce with conventional machining methods. However, one critical limitation of the EDM process, workpiece should be electrically conductive. Materials that can be machined by using EDM include nickel-based alloys (such as aerospace materials), very hard tool steels, High speed steels, conductive composites, conductive ceramics, etc.

ADVANTAGES OF WEDM

- Extremely hard materials can be machined to very close tolerances.
- A good surface finish can be obtained.
- Very fine holes can be easily drilled by using EDM machine.

- There is no mechanical contact between tool and the work piece. Therefore delicate sections and weak materials can also be machined without any distortion.

DISADVANTAGES OF WEDM

- The slow rate of material removal.
- Power consumption is very high.
- Excessive tool wear occur during machining.
- Electrically non-conductive materials can be machined only with specific setup of process.

PROBLEM FORMULATION

On the basis of above study parameters peak current (Ip), gap voltage (V) and pulse on time (Ton) are selected for this work to analyze the material removal rate, tool wear rate and surface roughness using machining parameters selected as Ton, Ip and V using Taguchi L9 orthogonal array

- To find influence on MRR with Ton, Ip and V.
- To find influence on TWR with Ton, Ip and V.
- To find influence on Surface Roughness with Ton, Ip and V.

WORK PIECE MATERIAL

The material used for this work is EN-24 STEEL specification of 36 cm length and 16 mm diameter.

Table 1.0 Properties of EN-24 material

Density (g/cm^3)	Melting point (^oC)	Yeild strength (MPa)	Elastic modulus (Gpa)	Possion's Ratio	Brinell Hardness
7.87	1421	470	190	0.28	215

TOOL MATERIAL

The tool material used for this work is 100% Copper (Cu). The tool was prepared of dimensions as 2 inches length and 3 mm diameter.

Material Removal Rate

$$MRR = \frac{\text{(Work piece weight loss (gm)) X 1000}}{\text{(Density (gm/cc) X Machining Time)}}$$

Tool Wear Rate

$$TWR = \frac{\text{(Tool weight loss (gm)) X 1000}}{\text{(Density (gm/cc) X Machining Time)}}$$

Surface Roughness

Surface roughness shows the quality of the machining of a job. It is desirable to decrease the surface roughness of the work-piece, as much as we lower the surface roughness the surface finish of the work piece will increase and the quality of the machining will improve. Surface roughness measurements are made using Mitutoyo 178-602 surface roughness tester. Figure shows the Mitutoyo 178-602 surface roughness tester.

RESULT AND DISCUSSION

(calculation of MRR (mm^3 /min)

Exp. No	Current (A)	Pulse-on-time (µsec)	Voltage	MRR(mm^3/min)
1	1	10	100	0.0787
2	1	15	125	0.1705
3	1	20	150	0.2046
4	4	10	125	0.2325
5	4	15	150	0.2842
6	4	20	100	0.3410

7	7	10	150	0.4650
8	7	15	100	0.6394
9	7	20	125	0.7673

Calculation of TWR (mm/min)

Exp. No	Current (A)	Pulse-on-time (μsec)	Voltage	TWR(mm³/mi
1	1	10	100	0.0172
2	1	15	125	0.0372
3	1	20	150	0.0446
4	4	10	125	0.1015
5	4	15	150	0.0620
6	4	20	100	0.0372
7	7	10	150	0.2029
8	7	15	100	0.2790
9	7	20	125	0.2832

CONCLUSION

Following conclusions are made:

- MRR tends to increase at a high rate than pulse on time and voltage. Current is the most significant factor for MRR. The MRR also increases with increase in pulse on time, but the rate is low as compared to that of current. The discharge energy is higher at higher levels of pulse on time thus we get higher material removal rate. For lower pulse on time, the discharge energy is insufficient thus the material removal rate is low. Higher the current, intensity of spark is increased and thus metal removal rate increases. In the case of voltage, initially the MRR tends to increase, but further increase in its value tends to degrade the MRR. The MRR increases with

increase in gap voltage and then it starts to decrease. This is due to increase in gap voltage result in higher discharge energy per spark because of large ionization of dielectric between working gap. Consequently, the MRR increases. However, a too high voltage result in high discharge energy per spark which causes unfavorable break down of dielectric and large amount of debris between the working gap which unable the material removal rate increases.

- The Tool wear rate increases with increase in current. Initially TWR increases at a slower rate with current but with further increase in current the TWR increases at a faster rate. This is because of the increased pulse duration. The minimum TWR is generated at 1 A. In case of pulse of time, TWR do not vary much and we get almost a flat graph for it. The pulse-on-time does not have any significant affect on TWR. With increase in voltage the TWR initially increases, but with further increase in voltage the TWR decreases. This is due to unfavorable breakdown of dielectric. Minimum TWR is seen at 100V.

- By increasing the pulse on time the surface roughness increases and the surface finish starts to degrade. Very rough surface is generated as we increase the pulse on time. Pulse on time has a great impact on surface roughness. For 7.5 μsec of pulse on time we get minimum surface roughness. Higher current causes more frequent cracking of dielectric molecule so it is found that more frequent melt explosion thus results in poor surface finish. Minimum surface finish is obtained at 1 Ampere of current. With increase in the value of voltage, the surface roughness decreases.

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Software Analysis on CFD of Statically Determinate Beam

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Abstract: This study investigates the deflection and stress distribution in a long, slender cantilever beam of uniform rectangular cross section made of linear elastic material properties that are homogeneous and isotropic. The deflection of a cantilever beam is essentially a three dimensional problem. An elastic stretching in one direction is accompanied by a compression in perpendicular directions.

Keywords: Finite Element Analysis, Cantilever Beam, Static and Model Analysis.

I. INTRODUCTION

Beams are characterized by their profile (shape of cross-section), their length, and their material. Beams are traditionally descriptions of building or civil engineering structural elements, but smaller structures such as truck or automobile frames, machine frames, and other mechanical or structural systems contain beam structures that are designed and analyzed in a similar fashion.

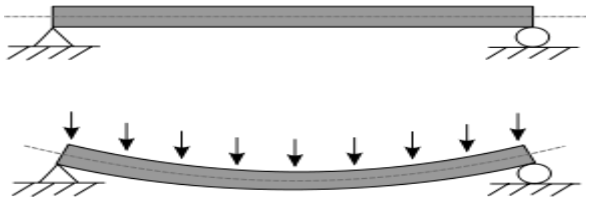


Fig1. A statically determinate beam, bending (sagging) under a uniformly distributed load

II. LITERATURE REVIEW MODELLING, SIMULATION AND ANALYSIS OF CANTILEVER BEAM OF DIFFERENT MATERIAL BY FINITE ELEMENT METHOD, ANSYS

The dynamic analysis of a beam with multiple degree of freedom (MDOF) are studied in this paper. Due to the destructive effects of vibration in machines and structures due to resonance. In multiple degree of freedom system, there are n natural frequencies and the concept of resonance is complicated by the effect of mode shapes. In the present work cantilever beam of different materials and dimensions is considered for the dynamic analysis of free vibration at no load condition as well as comparison between materials.

The methodology followed in the project is as follows:

- Create a 3D model of the cantilever beam assembly using parametric software pro-engineer.
- Convert the surface model into Para solid file and import the model into ANSYS to do analysis.
- Perform static analysis on the cantilever beam.
- Perform model analysis on the existing model of the cantilever beam.

III. INTRODUCTION TO CAD/CAE

Computer-aided design (CAD), also known as computer- aided design and drafting (CADD), is the use of computer technology for the process of design and design- documentation.

A. Introduction To Pro-Engineer

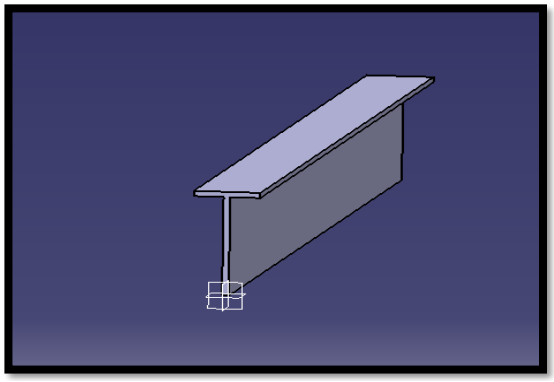
Pro/ENGINEER Wildfire is the standard in 3D product design, featuring industry-leading productivity tools that promote best practices in design while ensuring compliance with your industry and company standards. Integrated

Pro/ENGINEER CAD/CAM/CAE solutions allow you to design faster than ever, while maximizing innovation and quality to ultimately create exceptional products.

Different modules in pro/engineer: Part design, Assembly, Drawing& Sheet metal.

B. Introduction to Finite Element Method:

Finite Element Method (FEM) is also called as Finite Element Analysis (FEA). Finite Element Method is a basic analysis technique for resolving and substituting complicated problems by simpler ones, obtaining approximate solutions Finite element method being a flexible tool is used in various industries to solve several practical engineering problems. In finite element method it is feasible to generate the relative results.



IV. RESULTS AND DISCUSSIONS

A. Models of cantilever beam using pro-e wildfire 5.0

The cantilever beam is modeled using the given specifications and design formula from data book. The cantilever beam outer casing body profile is sketched in sketcher and then it is extruded using extrude option.

Cantilever beam 3D model :

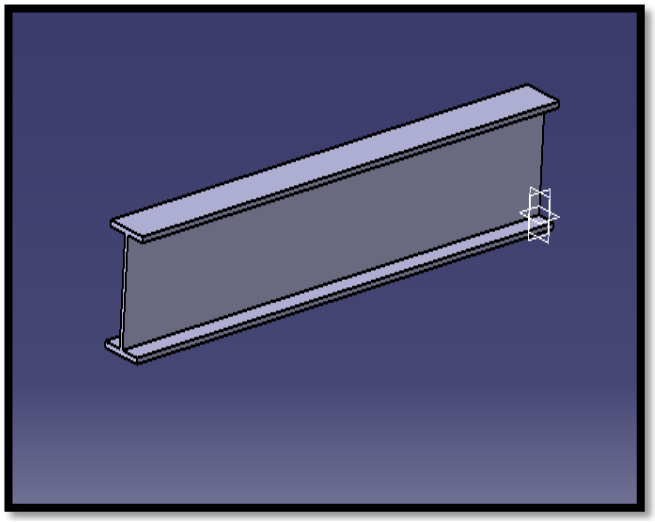


Fig. I-Section.

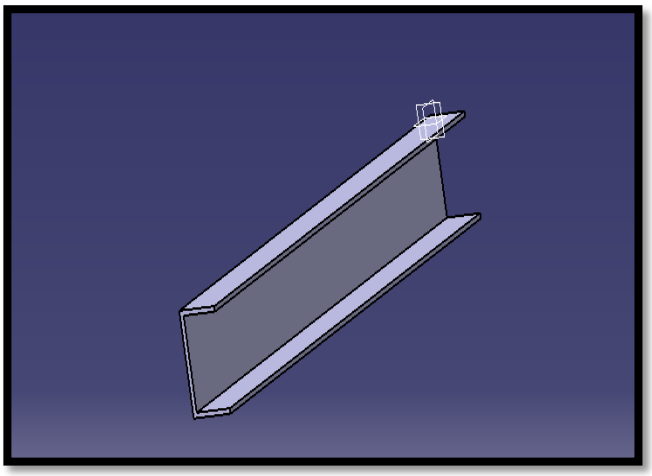


Fig. C-Section.

B. Analysis Of Cantilever Beam

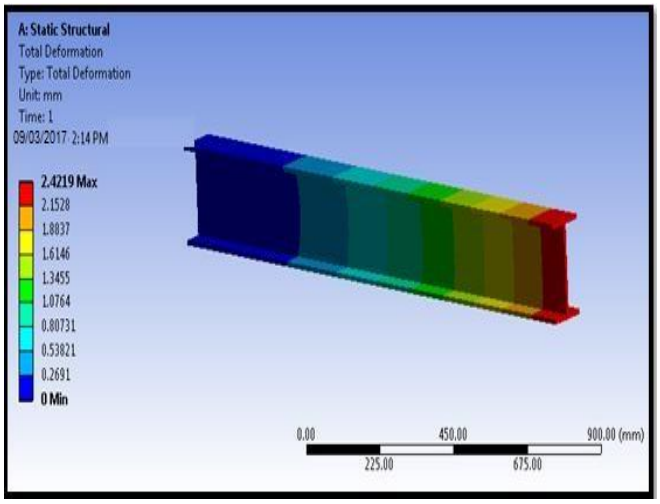


Fig. Material-Steel.

According to the above contour plot, the deformation is maximum at the free end of the beam and the deformation is minimum at the fixed end. At this condition the maximum deformation of the beam is 2.429.

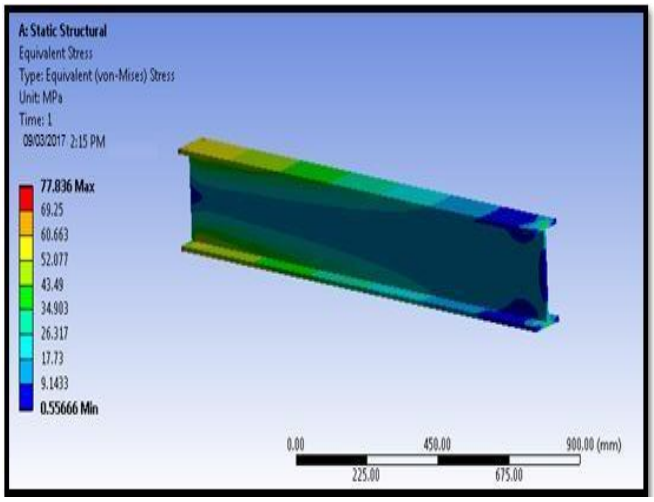
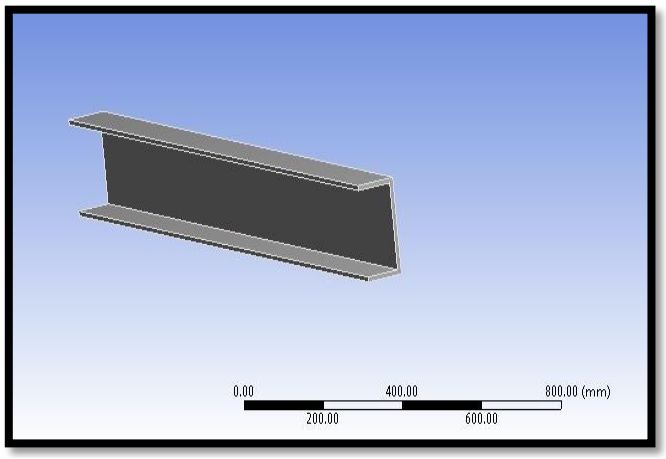


Fig . Stress



According to the above contour plot, the maximum stress is at the fixed the fixed end because we are applying the loads at the free end.

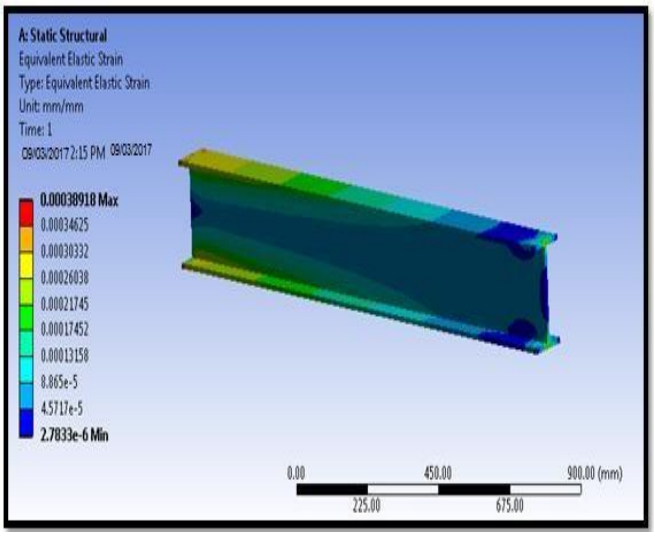


Fig. Total deformation-3

According to the above contour plot, the maximum strain occurs at the fixed end of the beam i.e.,0.00038918.

C. Modal Analysis of cantilever Beam Material-Steel

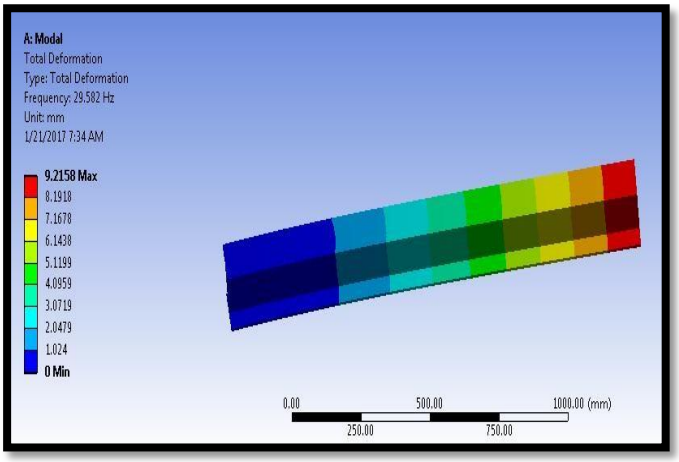


Fig. Total Deformation-1.

Material Properties:

Steel material properties Density : 7850kg/m^3 Young's modulus : 205000Mpa Poisson's ratio : 0.3

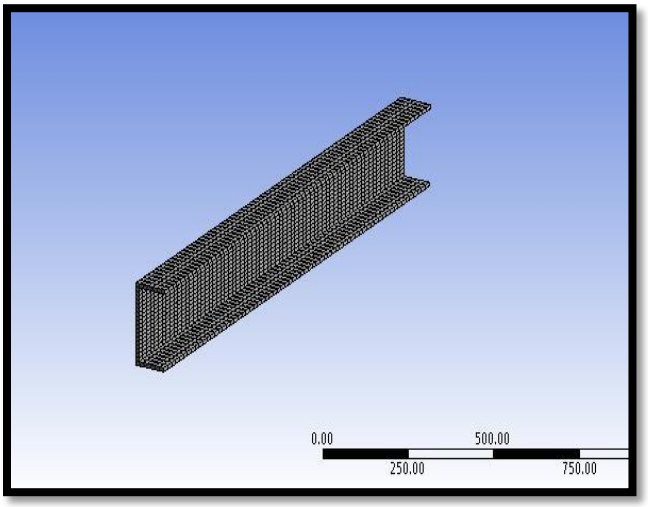


Fig. Meshed Model

Finite element analysis or FEA representing a real project as a "mesh" a series of small, regularly shaped tetrahedron connected elements, as shown in the above fig. And then setting up and solving huge arrays of simultaneous equations. The finer the mesh, the more accurate the results but more computing power is required.

V. *RESULTS AND DISCUSSIONS CFD ANALYSIS RESULT TABLE*

Static analysis results I-section

Material	Deformation(mm)	Stress (N/mm²)	Strain
Steel	1.2	23	11
Stainless steel	22	31	0.2
Cast iron	12	7	0.3

C-section

Material	Deformation(mm)	Stress (N/mm²)	Strain
Steel	2.2	16	0.002
Stainless steel	10.778	2.32	0.01
Cast iron	18.696	16	0.01

T-section

Material	Deformation(mm)	Stress (N/mm²)	Strain
Steel	40	20	3
Stainless steel	41	20	2
Cast iron	86	20	1

Modal analysis results

Material	Total Deformation 1(mm)	Total Deformation 2(mm)	Total Deformation 3(mm)
Steel	9	11.7	9.06
Stainless steel	11	11.8	9.12
Cast iron	9.6	10.2	9.1

C-section

Material	Total Deformation 1(mm)	Total Deformation 2(mm)	Total Deformation 3(mm)
Steel	2.2	1	1
Stainless steel	10.012	14.192	12
Cast iron	1.3	1.2	11

T-section

Material	Total Deformation 1(mm)	Total Deformation 2(mm)	Total Deformation 3(mm)
Steel	1.2	13.465	10.829
Stainless steel	1.6	13	10.76
Cast iron	1	13	11.2

VI. CONCLUSION

In this work we compared the stress and natural frequency for different material having same I, C and T cross- sectional beam. The cantilever beam is designed and analyzed in ANSYS. The cantilever beam which is fixed atone end is vibrated to obtain the natural frequency, mode shapes and deflection with different sections and materials. By observing the static analysis the deformation and stress values are less for I-section cantilever beam at cast iron material than steel and stainless steel. By observing the modal analysis results the deformation and frequency values are less for I-section cantilever beam more for T-section. So it can be conclude the cast iron material is better material for cantilever beam in this type I-section model.

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Quantum Cryptography: An Improved Technique for Information Security

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Abstract: Quantum cryptography is an advance technology in which two parties can secure network
Communications by applying the concept of quantum physics. The security of these transmissions is based on the inviolability of the laws of quantum mechanics The quantum cryptography based on two important elements of quantum mechanics-the Heisenberg uncertainty principle and the principle of photon polarization. The Heisenberg uncertainty principle states that, the quantum state of any system is not measured without distributing that system. The principle of photon polarization states that, an eavesdropper cannot copy unknown qubits t that is unknown quantum states, due to no-cloning Theorem which was first presented by woottersandzurek in 1982. This research paper includes on the theory of quantum cryptography, and how this technology contributes to the network security.

This research paper presents the current state of Quantum cryptography, and the real world application implementation of this technology and finally the future direction in which quantum cryptography is forwards.

1. INTRODUCTION

Cryptography operates by a sender encrypting the original message or plaintext in a systematic way that obscures its meaning. The encrypted message or crypto-text is transmitted, and the receiver recovers the message by decrypting the transmission Existing cryptographic techniques are usually identified as "traditional" or "modern."
The main practical problem with secret key encryption is exchanging a secret key. In principle any two users who wished to communicate could first meet to agree on a key in advance, but in practice this could be inconvenient.
By quantum theory , light waves are operatedas discrete particles known as photons. A photon is a mass-less particle, the quantum of the electromagnetic field, carrying energy, momentum, and angular momentum. Entangled pairs" are pairs of photons generated by certain particle reactions. Each pair contains two photons of different but related polarization. Entanglement affects the randomness of measurements.

2. QUANTUM CRYPOGRAPHY

The foundation of quantum cryptography based in the Heisenberg uncertainty principle, which states that certain pairs of physical properties are related in such a way that measuring one property prevents the observer from The advantage of quantum cryptography over traditional key exchange methods is that the exchange of information is secure. Quantum cryptography uses quantum mechanics that enables the two communicating parties to produce a shared random bit string called as a key to encrypt and decrypt messages for secure communication and it uses photons to transmit a key securely. Once the key is transmitted, encryption and decryption using the usual secret-key method can take place.

Experimental implementations of quantum cryptography have existed since 1990, and today quantum cryptography is performed over distances of 30-40 kilometers using optical fibers. Essentially, two technologies make quantum key distribution possible: the equipment for creating single photons and that for detecting them. The ideal source is a so-called photon gun that fires a single photon on demand.

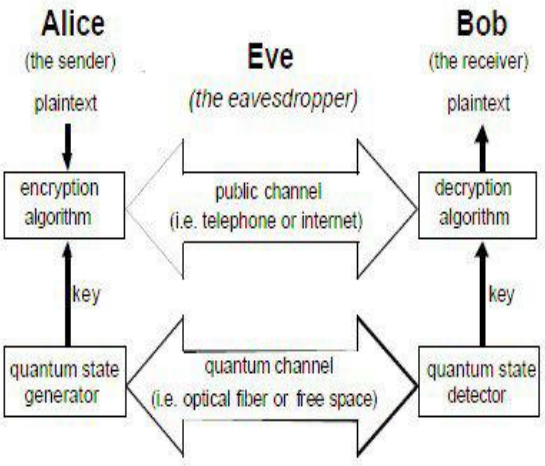


Fig. A Quantum Cryptographic Communication system for surely Transmitting random key

3. QUANTUM PHYSICS

3.1 Polarization of Photon Particles

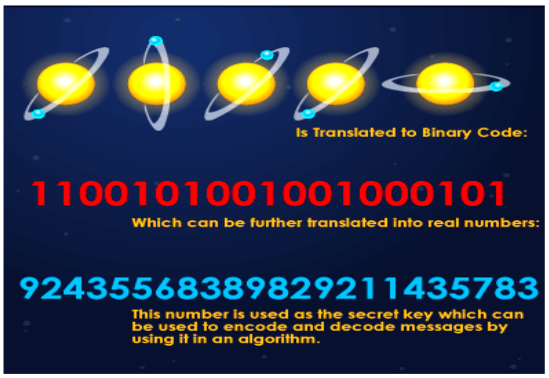
Photons are some amazing particles. They have no mass, the smallest measure of light, and they can exist in all of possible states at once, called the wave function. This means that whatever direction a photon can spin i.e either diagonally, vertically and horizontally, it does all at once. Light in this state is called unpolarized. The foundation of quantum physics is the unpredictability factor defined by Heisenberg's Uncertainty Principle. This principle says that it is impossible to know both an object's position and velocity at the same time.

To create a photon, quantum cryptographers use LEDs (light emitting diodes), a source of unpolarized light. LEDs are capable of creating one photon at a time and using this way a string of photons can be created. By using the polarization filters, the photon can be forced to take one state or another or polarize it. If a vertical polarizing filter situated beyond a LED is used, photons that emerge can be polarized: The photons that are not absorbed will emerge on the other side with a vertical spin.

3.2 Photons becoming the keys

Here, the binary code comes into play. Each type of a photon's spin represents one piece of information usually a 1 or a 0, for binary code. This code uses strings of 1s and 0s to create a message**For ex:** 11100100110 could correspond with h-e-l-l-o. So a binary code can be assigned to each photon.

For ex: a photon that has a vertical spin (|) can be assigned a 1. Suppose, Ali sends her photons through randomly chosen filters and record the polarization of each photon. When Ali sends her photons to Bob using an LED, Ali randomly polarize them through either the X or the + filters, so that each polarized photon has one of four possible states: (|), (--), (/) or ( ).



On the other side, when Bob receives these photons, Bob decides whether to measure each with either his + or X filter but could not use both the filters together. Bob has no idea about which filter to use for each photon but can guess for each one. After the entire transmission, Bob and Ali have a non-encrypted discussion about the transmission. Bob calls Ali and informs which filter he used for each photon, and Alice confirms whether it was the correct or incorrect filter to use. The conversation sounds like this:
*Bob:PlusAli:Correct *Bob:PlusAli:Incorrect *Bob:XAli:Correct Since Bob does not reveal the measurements but only the type of filter used, a third party listening the conversation cannot find out the actual photon sequence.

For ex: Ali sent one photon as a (/) and Bob says he used a + filter to measure it. Ali will say "incorrect" to Bob. But if Bob says he used an X filter to measure that particular photon, Ali will say "correct." A person listening will only know that the photon could be either a (/) or a ( ). Bob knows that his measurements are correct, because a (--) photon travelling through a + filter will remain polarized as a (--) photon after it passes through the filter.
Ali and Bob with identical strings of polarized photons look like this: -- / | | | / -- -- | | | -- / | Â¦ so on. Once binary code is applied, the photons become a message. Bob and Ali can agree on binary assignments, say 1 for photons polarized as ( ) and (--) and 0 for photons polarized like (/) and (|). String of photons looks like this: 11110000011110001010. They are translated into English, prime numbers or others. So, Bob and Ali use them as codes for the keys in their encryption process.

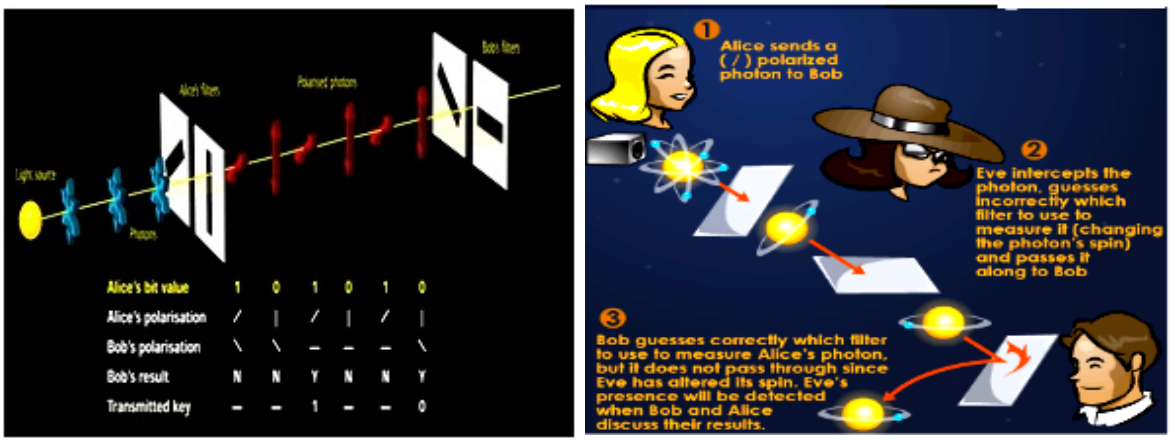


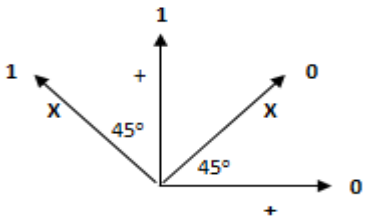
Fig. Use of photons as Keys using polarization filter

4. QUANTUM KEY DISTRIBUTION (QKD)

Quantum key distribution is a method used in the framework of quantum cryptography in order to reduce a perfectly random key which is shared by a sender and a receiver while making sure that nobody else has a chance to learn about the key, e.g. by capturing the communication channel used during the process. The best known and popular scheme of quantum key distribution is based on the Bennet–Brassard protocol(i.e. BB84), which was invented in 1984. It depends on the no-cloning theorem for non-orthogonal quantum states.

4.1 Quantum Coding Scheme

Polarization and measurement of polarization of photons can be done with the use of Polaroid. For the purpose of evolving a simple coding scheme, let us consider only the rectilinear and diagonal polarization schemes. This gives us 4 directions of polarization of a photon. See figure below.



Mapping of quantum digits to binary digits

The 4 possible quantum states (shown in the figure) give us 4 quantum bits or 'qubits'. With the 4 qubits we can represent the classical bits 1 and 0 as follows.

Bit 0 = photon with horizontal polarization or by a photon with polarization at 45 degrees to the horizontal direction.

Bit 1 = photon with vertical polarization or by a photon with polarization at 135 degrees to the horizontal direction.

The above scheme, by Charles H. Bennett and Gilles Brassard, was the first proposed quantum encoding of classical bits and is referred to as the BB84 coding scheme.

We shall use the following notations:

'+' to represent the rectilinear scheme

'X' to represent the diagonal scheme

'-' to represent 0 (Horizontal polarization quantum state)

'/' to represent 0 (45 degrees to horizontal polarization state)
'|' to represent 1 (Vertical polarization quantum state)
'\' to represent 1 (45 degrees to vertical polarization state)
So, using the above qubit representations, a BB84 transmission for the binary 11010011 could look like this:

Alice : Bits	1	1	0	1	0	0	1	1
Alice : Qubit	↕	↕	↔	↕	⁄	⁄	\	↕
Bob : Scheme	+	X	X	+	+	X	X	+
Bob : Qubit	↕	\	\	↕	↔	⁄	\	↕
Bob : Bits	1	1	1	1	0	0	1	1
Key Selection	√			√		√	√	√

Quantum cryptology also has a few fundamental flaws one is the length under which the system will work is too short is because of interference. A photon's spin can be changed when it bounces off other particles, and so when it's received, it may no longer be polarized the way it was originally intended to be. This means that a 1 may come through as a 0. As the distance a photon must travel is increased, so, too, is the chance that it will meet other particles and be influenced by them.

CONCLUSIONS

As of today, most of the transactions are protected using encryption unproven to be secure against a computational attack. The basic notion of quantum cryptography is to employ single photon transmissions to distribute the random key material, while removing the threat of an undetected eavesdropper.
Quantum cryptography obtains its fundamental security from the fact that each qubit is carried by a single photon, and each photon will be altered as soon as it is read. This makes impossible to intercept message without being detected.It is based on quantum theory which ensures that presence of Eve can be detected when Alice and Bob are exchanging the onetime key pad (which is an unbreakable key).
However for quantum cryptography to become practically viable a lot more progress has to be made to overcome the issue of single photon production, achieving long distances of transmission, understanding all possible attacks. Current key generation rate using quantum cryptography is in the order of 1000 bits/second.

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Fog Computing and it's Aapplications

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Abstract: Today about billions of users are using different smart devices like smartphone, in advanced vehicles like Mercedes Benz you can control your car from anywhere what you want to control, smart security cameras, and may more. This becomes possible because of fog computing advanced and abroad infrastructure. Fog Computing also consists control methods and designing a software. For example, on the data design, it enables computer services to change the type of the network as sent to all servers in a data-format. When we compare to fog computing with cloud computingsuch as (e.g. high rate costs, security policies, the act of using all resources), due to dense geographical distribution and concerns computational and lots of resources, also to reduce and to be good bandwidth savings to get a better quality of services. This paper gives an overview of fog computing, its advantages, disadvantages, Applications.
Keywords : Fog Computing, Edge, Cloud, Security

I. INTRODUCTION

Fog Computing spreads the Cloud Computing paradigm tothe edge of the network, so enabling a new range of services and applications [1].Today Fog Computing is very useful and it is used in high scale for making large projects data structures, helping to get access information easily in openminded. For what reason do people use fog Computing? Although people use for several reasons, but there few major reasons why they use Fog Computing are here asfollows:-

1. Fog Computing helps to improves information that everyone can accesseasily and it reduce the amount of data transfer that is done daily via cloud forprocess.
2. It is easy to analysis and has large amount of storage.
3. Fog Computing is may also be used for security purposes in large areas this can also be a reasons for using it.
4. Fog computing has large applications include smart technology, making smart metropolitan area or cities, smart multitasking devices, and software designednetworks.

II. Cloud Computing

The term fog computing (FC) (also known as edge computing) was coined in 2012 by Cisco[2].Cloud computing has been highly useful for next upcoming modern world. Today infrastructure is becoming vast and helpful to everyone because of its high facilities to the users to access data in different formats available online Cloud computing provide three main models. Fog computing is a distributed computing paradigm that provides cloud like services to the edge of the network.[3]They are as (SaaS) Software as a service, (PaaS) Platform as services, (IaaS) Infrastructure as services , These are all types of services are used by the cloud

users. SaaS provide to the end user to pay for any of the platform and helps them to allows them to send their own applications and softwares on the cloud users. PaaS provides user to opportunity to the second user to pay for the application and can get access to the cloud from around the world. IaaS control the age the system there has terms and conditions of applications, network connectivity and are also for backup. The providers provides services for better understanding let us take an example like Yahoo, Flipkart and Uber. The second user to access services related to types of project's and essential facilities at very low charge of cost.

Edge computing: The basic concept of fog computing is to access communication facilities near to all users. Data processing are handled closed to all of the network computing. Edge network are mainly made up of two types of all devices that is end devices and edge devices. End devices basically contains mobile phones, smart control devices etc. Edge devices mainly consist of the border of router, wifi, broadband and set-topboxes,Fog computing networking takes all the information that are on internet and in which most of the devices which are used by everyone according to their needs and they will be connected to each other so that to share information easily. Examples include smartphone, for healthmonitoring devices, connected vehicles and many more.

III. ADVANTAGES and DISADVANTAGES OF FOG COMPUTING

Fog Computing has many advantages because its multitasking and they can be useful in alarge amount of field it is very easy fast to use. It is one of the greatest application which can be used in any field of art because it very easily used millions of people do their work with the help of fog computing. It is fast multitasking and can be used in any field of smartdevices. It becomes easy to develop fog applications using all tools which machines can fill instructions as per customers needs. Few more advantages are :

- It is highly also secured to use.
- Increased business productivity and agility.
- Has data security excellent.
- It also reduce operation cost.
- Fog Computing are mobile or inside in our own nature. Hence you are able toconnect wherever you want.
- Fog computing reduction in loss of data and secured them locally. This is due to lessamount of data security loss .

As everything has its own advantages and disadvantages fog computing also has disadvantages.There is nothing immaculate, and cloud technology has some downsides, especially for the Internet of Things services. Disadvantages of Fog Computing are asfollows:

- It's sometimes gets confusing and highlycomplex.
- Increased connections mean increasedrisks.
- Data leaving thepremises.
- To access high data securities for users which is highly challenging and requires more efforts to keep them safe for gettingmissuse.
- Power usage are very high in fog computing as wecompare to centralized cloud architecture.
- It has limitedadaptable.
- High risk of physical securityconsiderations.

IV. FOG COMPUTING APPLICATIONS

Smart Computing:

Smart computing will be the next upcomming generation whether you talk about electric power distribution network in any field of work. Smart computing contain all types of transmission lines, different network substations, transformer at any place any timeanywhere. It also utilizes extra power and data to make an automatic and also for strength of energy distribution over all networks. Smart computing also gives an ultimate power distributions and also provide services for users also watch and control the cost of the products in any area using softwares, production and transportation at realtime.

Health care system management:

Health care offers all types of applications may be late response and can make confident information of the users authority.Data which is made or developed contains sensitive and secured data system. So for locating data is also a sensitive for some situations. The increased in functionality can also cause many types of problems in healthcare and medicines application usage. These types of situations can be used in healthcaremonitoring.

Augmented inReality:

Augmented in reality is the way to overview the digital and things into the real world. The augments in reality inform that are required, high or low information to handle rate to provide all current information as shown by the users locations. Applications of augments in real are also highly for the users. A very small delay to response may damages the users skill at any time. So, fog computing can be possible to turn into an player in the area of augments in real.

V. Traffic system control analysis:

In traffic system control analysis, the cameras which helps to detects the lights of an ambulance can be able to automatically changes the traffic lightsaber and also help to open all the ways for the vehicle to cross that particular traffic areas because of intelligently traffic light with sensors, advanced features helps to identifying the movement of the person and for the person who is driving cycle and can create the distance and speed of coming large or small vehicle's near to it. About these types of smart lightings is designed to deduct automatically switched off or on once the sensors gets any type of the movements and it alsoturnsoffwheneverthetrafficpassesisneeded.So,withthehelpofintelligent lightingfog devices also helps to coordinate or creates green traffic signalingand also send a warning signals for the all approaching vehicles near to it or traffic areas.

Video streaming system development:

As we see today you are able to stream video live any time anywhere this becomes possible because of fog applications advanced video applications also allows the users to watch the live from anywhere, recently or passed video are also available on screen on any devices. The main role of fog is to provide best process and quick decisions making. For some examples like, upload video streaming for any social networking apps, you are able to chat via video calling like whatsapp, Google duo or send your video from the app to the users you want to share. If mobile devices like smartphones, laptop are able to used as fog servers and processes video streaming, also for transferring data from surveillance area to the cloud at any time.

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A Survey on Cyber Security for Smart Grid Communications

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Abstract: A smart grid is a modern type of electricity network using digital communications and control technology, progressive and revolutionary regime of current power grids with high fidelity power-flow control, self-healing, energy efficiency, and energy protection to as the next-generation power infrastructure. A smart Grid is expected to dramatically increase the efficiency and reliability of future power grids with renewable energy resources, as well as distributed intelligence and demand response, with the convergence of advanced computing and communication technologies. It needs substantial reliance on intelligent and stable communication infrastructures to upgrade an existing power grid into a smart grid. Security frameworks for distributed communications, ubiquitous computing, and Smart grids sensing technologies are needed. However, because many of the communication technologies currently proposed for use by a smart grid are vulnerable to cyber security, it may lead to ineffective device operations, causing both utilities and customers excessive investment and even a consequential catastrophe. In this paper, we present a detailed survey of cyber security problems for the Smart Grid. The cyber security criteria and potential weaknesses in smart grid communications are outlined, and existing cyber security solutions for smart grid communications are designed. We concentrate on evaluating and addressing security specifications, network vulnerabilities, countermeasures to attack, Smart Grid secure communication protocols, and architectures. We intend to provide a deep understanding of the Smart Grid security vulnerabilities and solutions and shed light on future Smart Grid security research directions.

Analysis of Software Requirement Traceability and its impact on Software Quality

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Abstract : In this paper, we discuss the importance of requirement traceability in software development process. In order to produce quality requirements, the prerequisite is that it should be quantified and traced throughout the project lifecycle. The need and importance of requirement traceability is discussed and the process with which the traceability can be achieved is also discussed. This paper also highlights how the requirement traceability impacts the quality of the final software.

Programming A Scara Robot for a Manufacturing Cell to Assemble and Produce Medical Devices

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Abstract: Manufacturing cell operation depends on parts to be assembled. The Primary target of this manufacturing cell is to glue three parts together to produce a small medical device with limited human intervention. There are three different trajectory actions required to completely assemble the part. This research paper talks about how to program a low-cost Scara robot for the manufacturing cell which performs multiple sequential operations to produce the device.
First operation is to glue part "A" and part "B" together to produce a part 'AB". The second operation is the glue drying time of part "AB". The third operation is to glue part "C" to part "AB". The forth operation is to dry part "ABC". Since there is a minimum robot trajectory activity during the glue drying process, a buffer of part "AB" is created to utilize that time. By utilizing the glue drying time the buffered part "AB" gets ready for the third operation. This means that as soon as the buffer part "AB" has been dried, the robot performs its third operation that is joining the part "C" with the dried buffer part "AB". Then the robot performs again its 1st and 3rd operation sequentially. Although, a minimum robot trajectory activity is required during the fourth operation of glue drying of part "ABC, nevertheless it is a required step for the complete part assembly. In this way the process is maximizing its throughput and minimizing the production cycle time.
Keywords: Software tool "JR Points" , glue drying

Cognitive Computational Model Based Task Allocation

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Abstract: Cognitive computational model have been developed for the negotiation and brokering in B2B e-commerce .Few of the models consider the mental states and social settings (trust and reputation) but rarely any model depicts their combination. In this work, we present three mathematical models. First cognitive computational model which is combined model of belief, desire, intention (BDI) model for agent's mental attitudes and social settings; is used for the computation of trust and then index of negotiation which is based on trust and reputation and the second computation model is developed for the computation of business index that characterizes the parameters of some of the business processes, which match the buyer's satisfaction level. The third computation model of utility is used for negotiation between seller and buyer to achieve maximum combined utility increment (CUI) which is the difference of marginal utility gain (MUG) of buyer and marginal utility cost (MUC) of seller.
Keywords: Negotiation, Agent, multi-agent system, MC, CRM.

A Contraction Mapping Approach in Biotechnology - An Increase in Cell Population

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Abstract: To study the population growth of cells under certain biological boundaries, like degree of maturity of the cell, a mathematical model containing a partial differential equation has been suggested and modeled by Rotenberg, M., which was further analyzed by Boulanouar to check its applicability for the same. The daughter and mother cells of the represented model are associated through a certain rule of their reproduction. The two parameters by which the model of cell population is distinguished are:

μ-the degree of maturity and v $(=\frac{d\mu}{dt})$–the maturation velocity. The problem expressed by given equation is not reversible as the maturity of the cell in population is never less, so that the velocity of maturation is always positive. Thus, the population density of the cell can be expressed as a function of the two aforementioned parameters and time as:

$\Psi = \Psi(t, \mu, v)$.

The concept of self-mapping in Banach space is used to get a fixed point as a solution of the suggested model, the uniqueness of which is shown by some iteration based on contraction principle. The rapid increase in the cell population can be modeled by Rotenberg method by which some agricultural and ecological concerns may be dealt with ease in nature. We wish to sketch a draft having a contraction mapping with some suitable iteration based on probabilistic approach of metric space to suggest another method for modeling the formulation expressed as above in this discourse.

Keywords: *biological boundaries, metric space, probabilistic space, fixed point theorem.*s-Mobile Cloud Computing, Global Pandemic, Revolution, Remote Working.

A Study Based Approch for Text Summarization

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Abstract: In this Big Data era, textual data is growing rapidly and are accessible in many languages. It's hard to read the whole text in the fast-moving world. The need for a concise text is therefore needed. Automatic Hindi text Summarization is a technique that compresses broad Hindi text to a shortened material. Extractive summaries and abstractive summaries are two forms of summarization. The extraction of entire selective sentences from the source text creates extractive summaries. A reformulation of source text sentences produces abstractive summaries. In recent years, numerous text summary techniques for English and various European languages have been suggested, but for the Indian native languages very few techniques can be identified. In this *project an approach has been suggested for summarizing Hind i text by using various Python libraries have also highlighted few areas still und er work*

Study of Rule based Models in Intelligent Systems

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Abstract: In today's fast-growing digital era Artificial Intelligence and Machine Learning are the main domains of interest. Intelligent models play a very vital role in the optimization of resources and time for humans. Basically, decision theory or decision models deals with the concept that how humans make and how they should make decisions. Further Rule based models basically assumes that humans follow some set of rules to make decisions. These rules vary from fixed and adaptive modes. But these rules and models are easy and simple to design and follow. But to accurately follow these rules and models, totally depends upon situations and humans. This paper presents a detailed study of rule based models in intelligent systems. This study may be further elaborated to discuss and design any particular aspect of application specific Intelligent system.

Keywords: Rule-based model, Intelligent Models, Modelling People, Fixed and Adaptive Rules/Strategies.

Design & Analysis of Electric Car Frame

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Abstract: The sporty look to the vehicle increases the aesthetics and gives the driving feel. The ergonomics are the main factor with driver safety. The model of the chassis space frame is built using CATIA V5R20 and then imported the .stp file to ANSYS 14.5 to find its finite element module, to perform torsion and bending test on the computational prototype chassis to determine its torsional stiffness. To incorporate a design improvement, optimize and note the effect on the global torsional stiffness of the chassis. The strength, deflection, pressure and torque are calculated the force to be impacted on the chassis. The power train drive should be safe from the foreign and body forces for the continuous drivemotion.

Keywords: CATIA V5R20; ANSYS 14.5; Tadpole Pattern; FEA; CFD; Bending Strength, Bending Stiffness; Structural Analysis; Modal Analysis; Explicit Analysis; CFD (Fluent); Forces.

Study of Cyber Security Threats in Today's Pandemic World

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Abstract: In todays Pandemic state of the world, almost every transaction and communication has been converted into online mode. We may take cases from business, education, trading etc, majority of these domains are now performed through virtual manner. This transformation has already unlocked a wide opportunity to wrong doers. Now amount and types of cyber security threats has attracted the criminals to focus more and more for their target areas through cyber world. Moreover, the pace at which cyber crime is increasing is much higher as compared to the laws related to it. Basically, this study discusses various types of threats and challenges to cyber security along with Kali Linux, which is used by the hackers to perform and prevent these hacking issues. Here, we have also discussed some common types of cyber security threats and their sources along with the effect of these cyber crime in this pandemic situation. Moreover, we have also discussed some examples and techniques for preventing cybercrimes. This study may be further elaborated to briefly describe any one dimension of cyber security.

Keywords: Challenges to Cyber Security, Cyber Threats, Cyber Crime, Cyber Security.

Finite Element Analysis of Connecting rod of Automotive Internal Combustion Engine

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Abstract: Connecting rod is an integral component i.e. an intermediate link between the piston and the crank of an Internal Combustion engine serves the purpose of converting the reciprocating motion of the piston to rotary motion of the crank. In operating conditions of an automotive I.C. engine, the connecting rod undergoes dynamic and static loadings. The present work deals with the finite element study of connecting rod , under static condition loading. For the purpose of FEA study, solid CAD model is developed using Solid works. AISI 1045 steel is used for the study. Further, Solid works, a FEA software package provide a platform for the study of stresses developed i.e.von-mises stresses and deformation under static condition loading . This FEA study provide a liberty to think a design engineer to optimized its weight or change the material of the component on the same strength.

Key Words : Finite element analysis, static conditions,von-mises stress, deformation etc.

Concept of Modelling People in Intelligent Systems: A Study

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Abstract: In today's rapidly growing and technically advanced era, the need and requirement of Intelligent systems are increasing according to innovations and optimization of human resources. To work in the direction of implementing Intelligent systems, the concept of Modelling People plays a very vital role. In this, mainly three models can be utilized for constructing the base for algorithm or approach for proposing the Intelligent Model. These are Rational Actor, Behaviour and Rule-based models. These models are based on the concepts thar human perform decisions rationally, based on their behaviour at different situations and based on some fixed or adaptive rules respectively. In this paper, we have studied about these models in details along with some of the examples. Further, we may utilize these concepts to propose the basic approach for different application specific Intelligent Systems.

Keywords: Intelligent Models, Modelling People, Rational Actor Model, Behaviour Model, Rule-based model.

Study of Low Observable Radar Cross Section (RCS) using Different Parameters of Meta Materials for Stealth Applications

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Abstract: As we are aware that stealth systems are low observable platforms, which bring together technologies for different applications such as defense, ships, personnel, satellites, missiles, aircraft and ground vehicles which shows ideally zero visibility to radar. Radar absorbing materials play a key role in the designing of such stealth applications. This paper exhibits a study in the designing of radar absorbing material based on different parameters of metamaterial. A metamaterial makes any smart material that is not found in the real world like natural materials. Metamaterials are as artificially designed structures which reflect rare electromagnetic effects are discussed with the different possible applications such as shielding, cloaking, etc. Metamaterials geometry, size, shape and arrangement makes them spruce properties which are capable of changing electromagnetic waves by enhancing, absorbing, blocking and reflecting. Some of the proposed designs are chessboard, checkerboard topology, pyramid and non-periodic structures etc. The study of simulation findings of the design over frequency band yields good absorption of EM waves. It has been noticed that, the significant absorption of proposed designs in frequency band shows that it has potential applications in stealth technology.

Index Terms: Radar absorbing material, Metamaterial, Stealth technology etc.

Image Classification Through Deep Learning

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Abstract: Deep learning is an AI function that copies the activities of the human mind in preparing information and making designs for use in basic decision making. Deep learning is a subset of AI in computerized reasoning that has systems fit for learning unaided from information that is unstructured or unlabelled. Otherwise it is called deep neural learning or deep neural system. A great part of the cutting-edge developments in image recognition is dependent on Deep Learning innovation. CNN – as we know it is a machine learning algorithm for machines to comprehend the features of the picture with prescience and remember the features to figure whether the name of the new picture fed to the machine. This paper presents a detailed study of how CNN is applied to the Image classifiers.

Keywords: CNN, Image classification, Deep Learning,AI

A Review of Solar Radiation Models

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Abstract: The economic, social, industrial development and civilization of any country is measured by the proper utilization of energy by the people for their needs. The energy demand is increasing day-by-day due to population increases, industrialization increases, transportation increases etc. Solar energy plays a crucial role to fulfill the future energy requirements. For this purpose, solar radiation data particular diffuse, beam and global is very essential for prediction, study and design of solar energy systems. Therefore, through this paper, we are presenting an analysis of diffuse solar radiation models on horizontal surface from 1960 up to 2020. Keeping in mind, the need of appropriate correlation to develop diffuse solar radiation data, models have been grouped into five parts (clearness index based, sunshine based, clearness and sunshine based, models with other parameters and extraterrestrial based models). Further, we have classified models into linear and non-linear correlations. A total of sixty one empirical models in linear, quadratic, cubic, logarithmic, exponential and hybrid forms using clearness index, sunshine hours and models with other parameters have been selected, tested and compared to decide which model is recommended on the basis of statistical error tests for four prominent locations (Jodhpur, Ahmedabad, Kolkata and Mumbai) of India.

***Keywords*:** industrial development; civilization; solar energy systems; solar radiation models.

Common Fixed Point of Cyclic Mappings in Complete Metric Spaces

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Abstract: The aim of this research paper is to establish a theorem of unique common fixed point theorem for a pair of cyclic mappings in a complete metric space. Many authors as indexed in references have proved fixed point theorem of a single cyclic mapping in different metric spaces. It is the new concept of having common fixed point for a pair of cyclic mappings in a complete metric space .The concept of equivalent sequences is used to prove the theorem.

Keywords: *Cyclical mappings, Jungck Contraction, Commuting mappings, equivalent sequence.*

Weight reduction of Automotive Brake Pedal Using Topology Optimization

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Abstract: For a design engineer, light weight structure design is most preferred and desirable one, and it can be achieved through reducing the weight of the design without compromising the strength. In the present work, the topology optimization procedure is employed to an automotive component i.e. brake pedal. Reduction of the weight of the automotive components results light weight vehicle and greater fuel efficiency .Finite Element study is performed on the initial design of brake pedal. Stress and deformation behaviour were studied. Solid isotropic material with penalization (SIMP) technique which is implemented through Finite Element Analysis solver package. Stress constrained Topology optimization is performed which results a new optimized design. The proposed design suggests about 10% of weight reduction in an existing brake pedal on the same strength.
Key Words: weight reduction, finite element analysis, topology optimization, redesign.

Data Modification and Security Authentication Approach For Data Distribution: A Review

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Abstract: Distributed Environment can evolve their different behaviors based on their changes in data distribution area. In this research paper, we discuss security mechanism design issues and implementation of propose security metrics issues also in the context of distributed environment. A key premise with design layouts of distributed environment is that in order to detect their changes, authentication and information must be collected by different approaches of monitoring in environment. How design approaches should be done, what steps should be monitored, and the impact of security monitoring may have on the security mechanism of the design issues in target system need for carefully considered. Conversely, the impact of security mechanism design layouts on the securing of data distribution environment via email authentication. We implement a novel approach in security metrics that can be used to quantify the impact of different monitoring on the distributed security mechanism issues of the target for data distribution in distributed environment as data and email authentication.

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